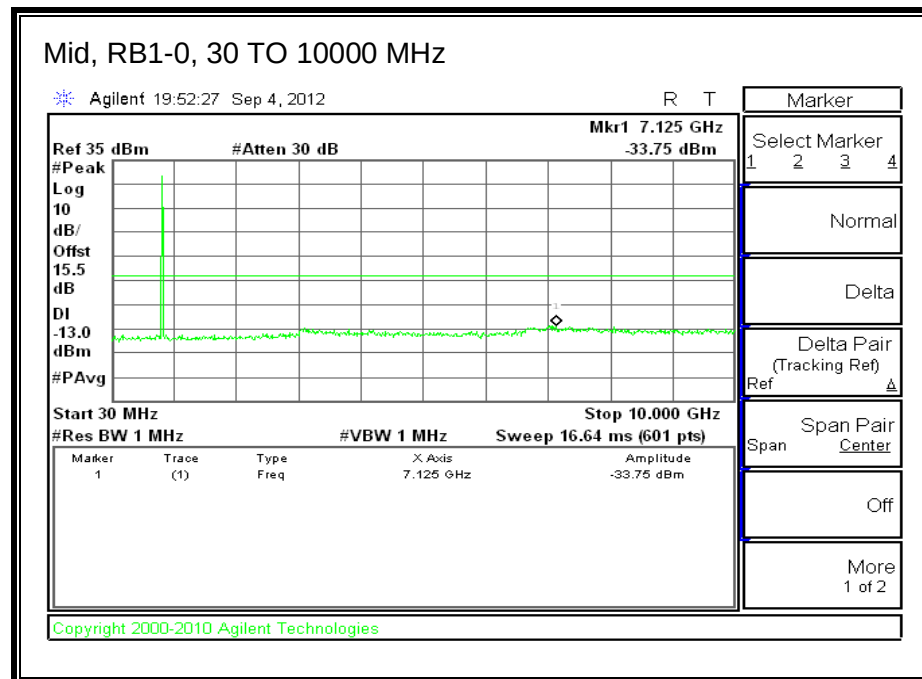
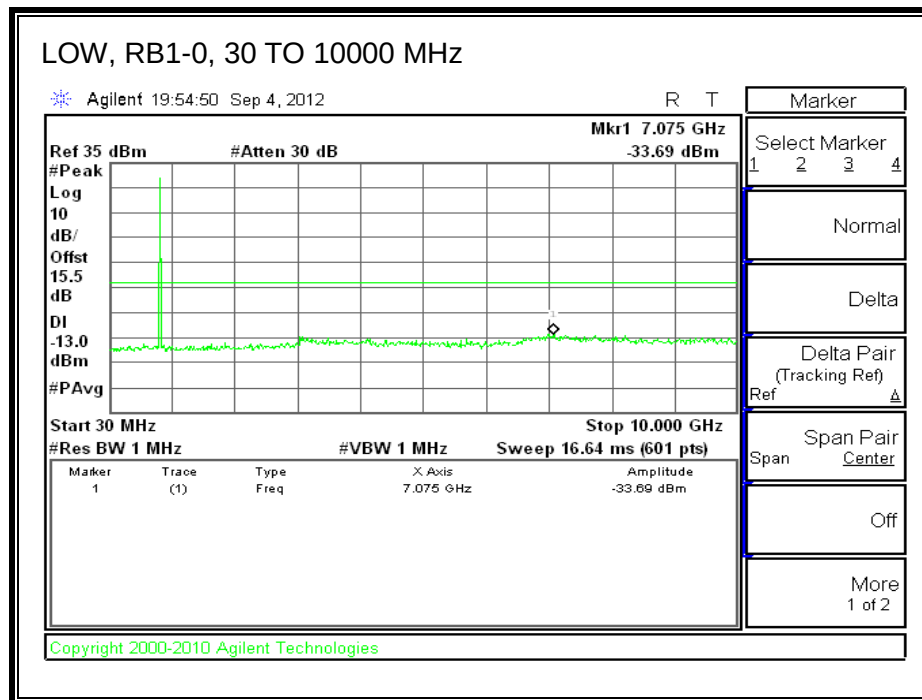
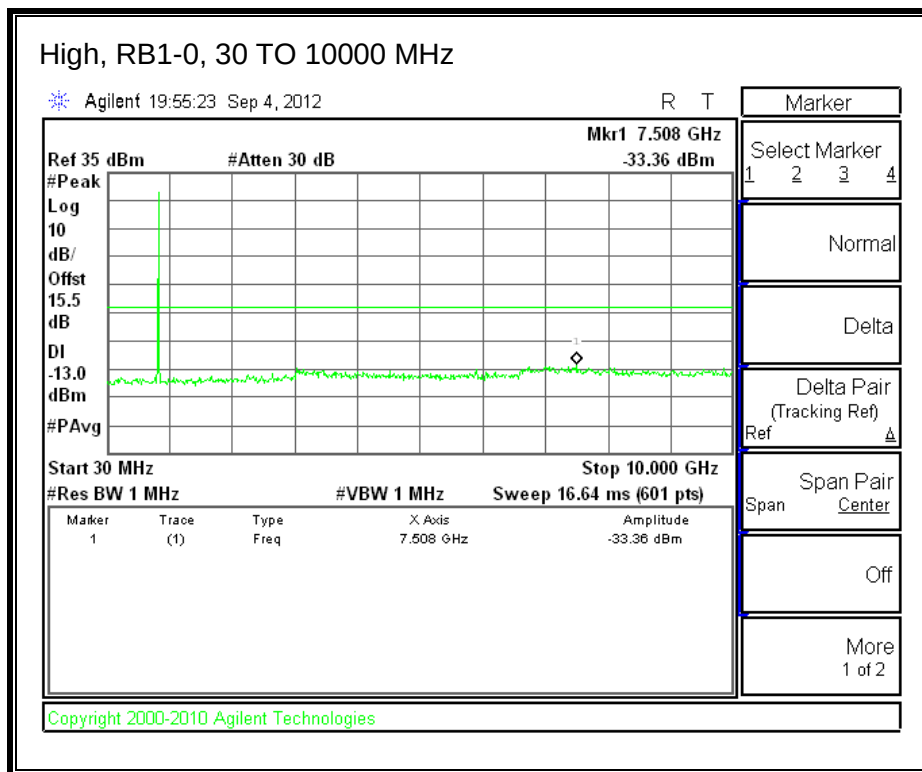


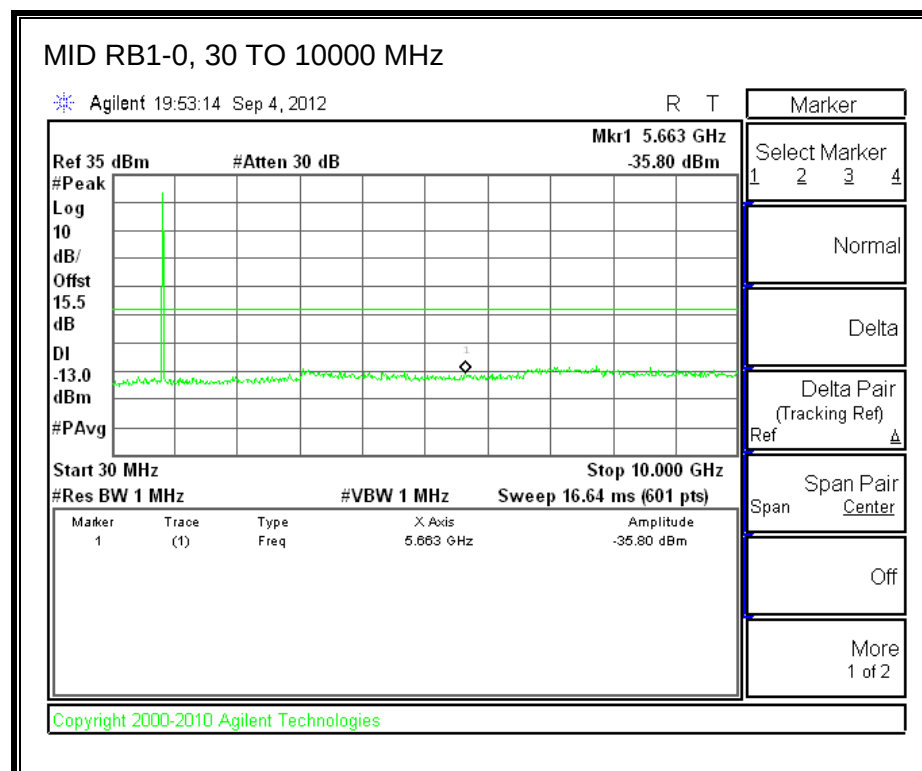
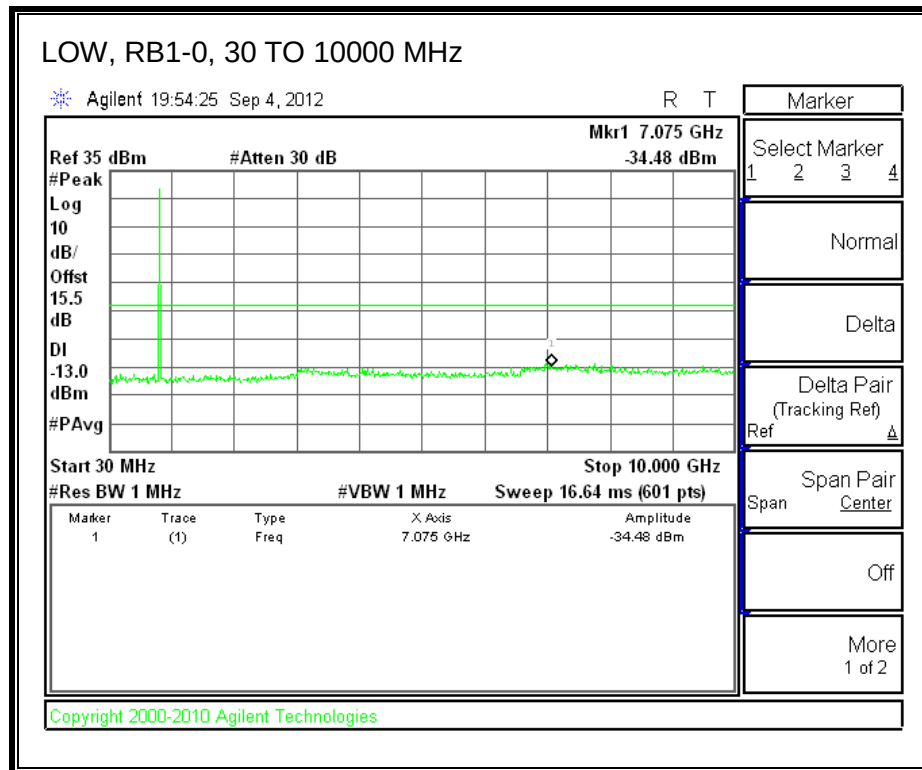
**Band 5 (5 MHz BANDWIDTH)**

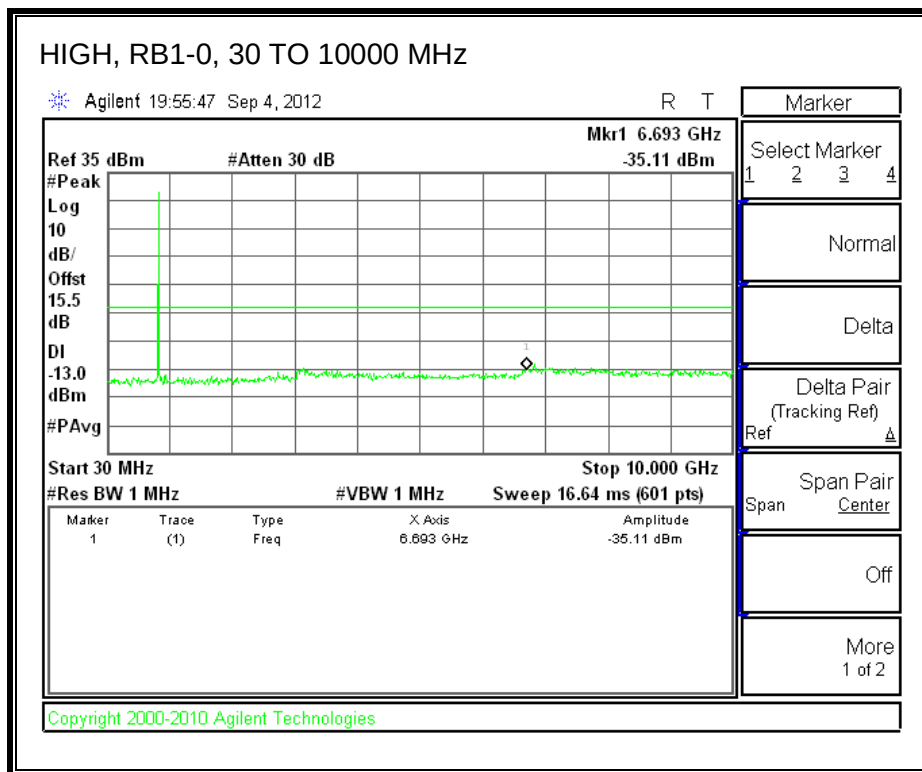
**LTE QPSK**





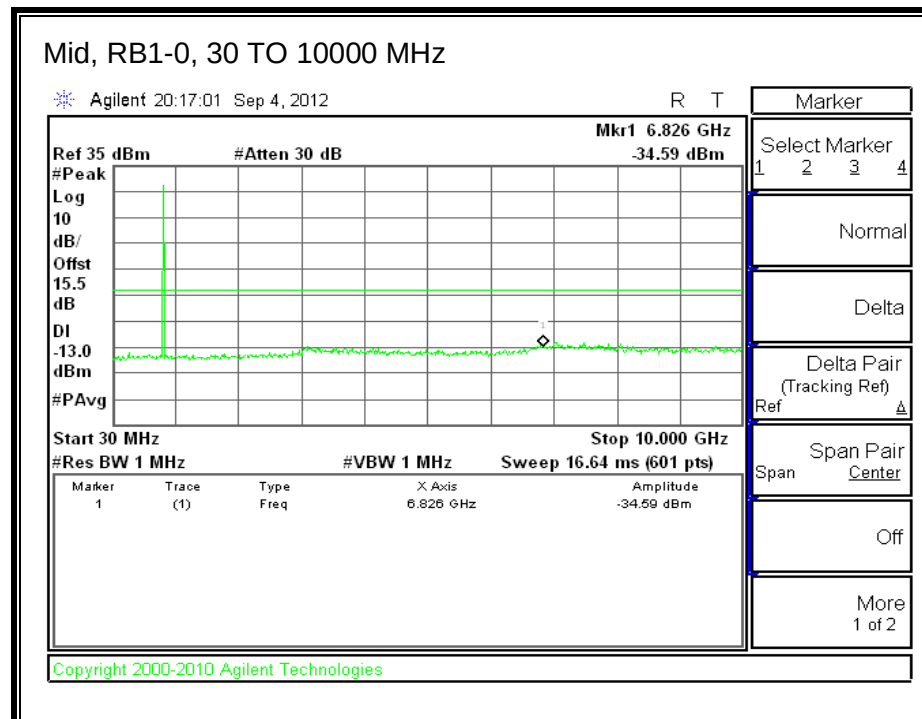
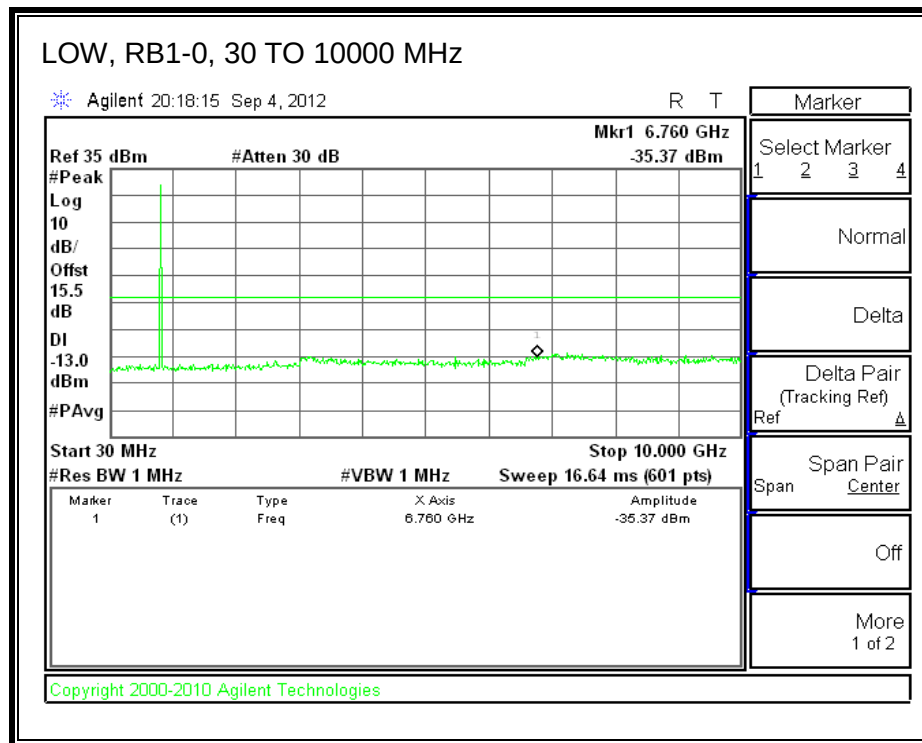
**LTE 16QAM**

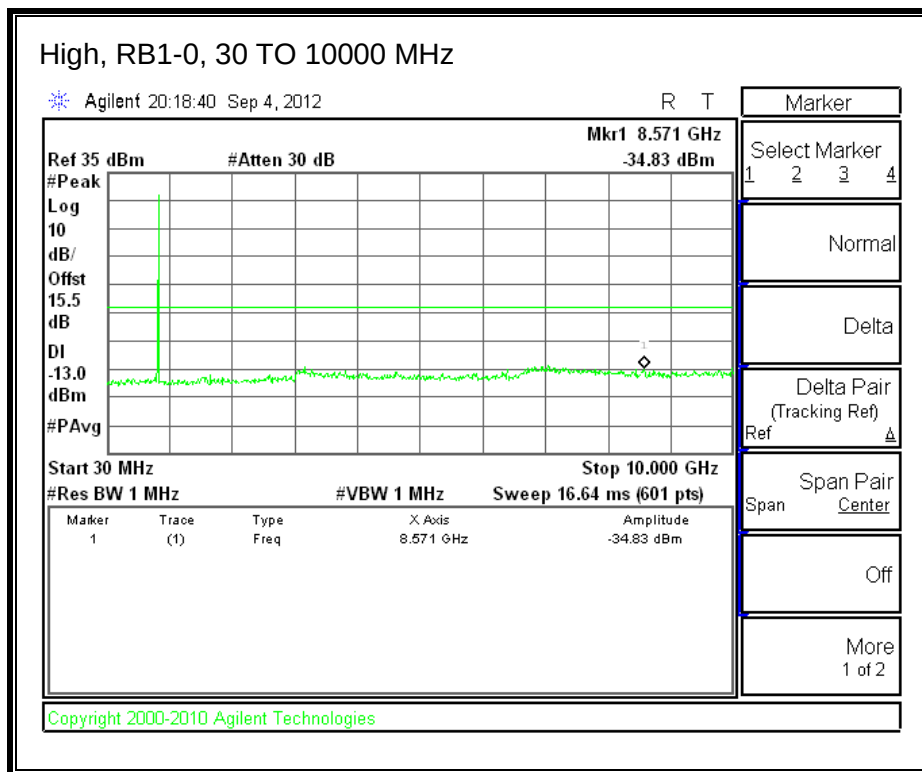




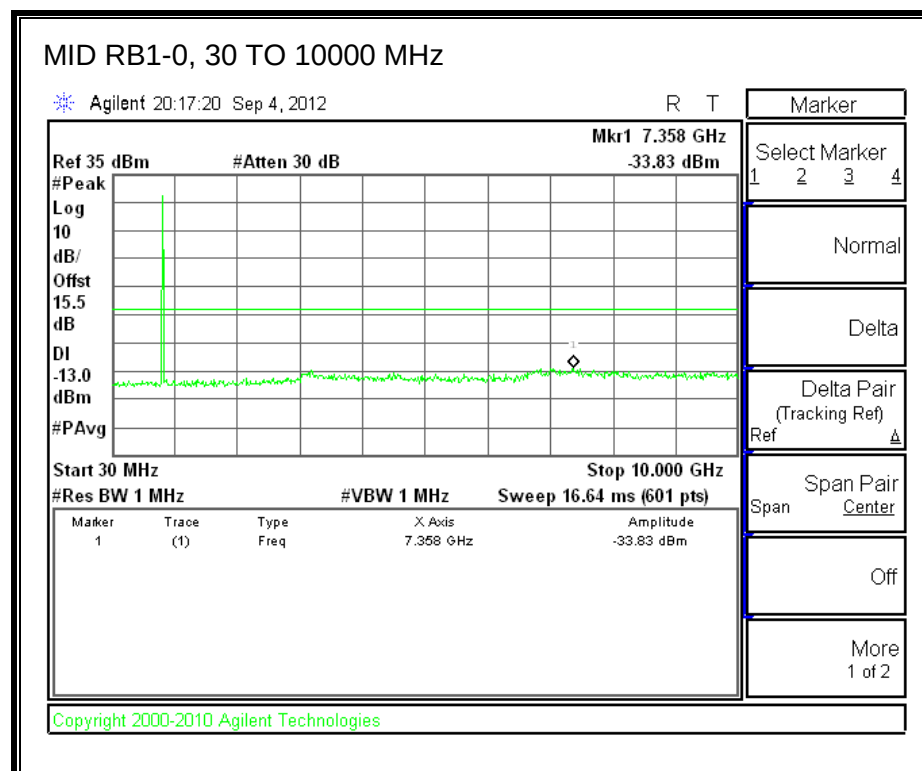
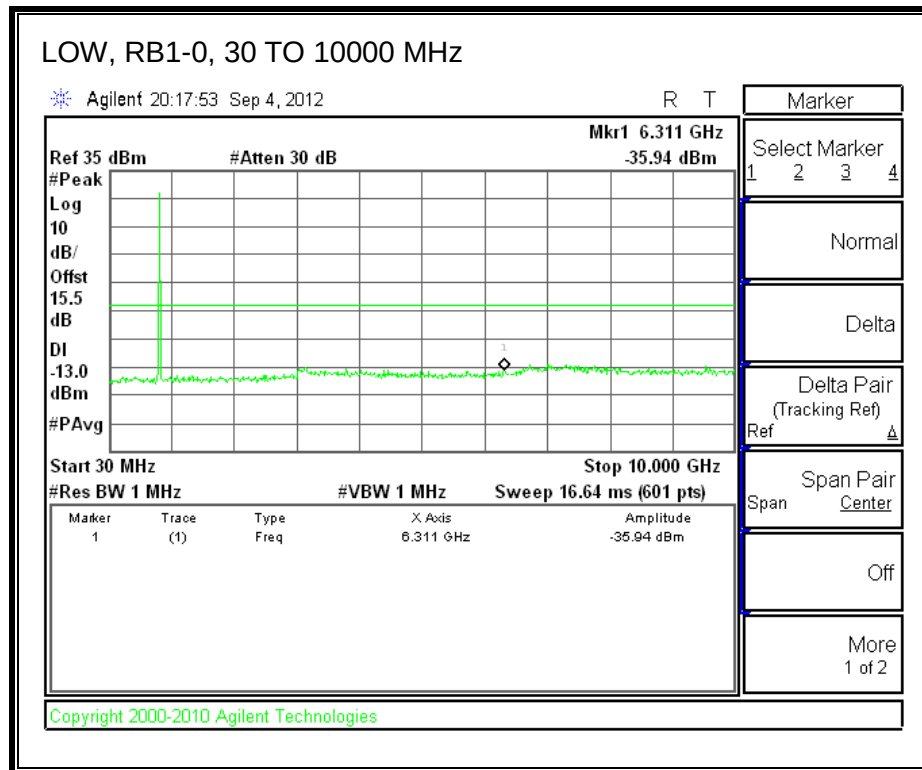
**Band 5 (10 MHz BANDWIDTH)**

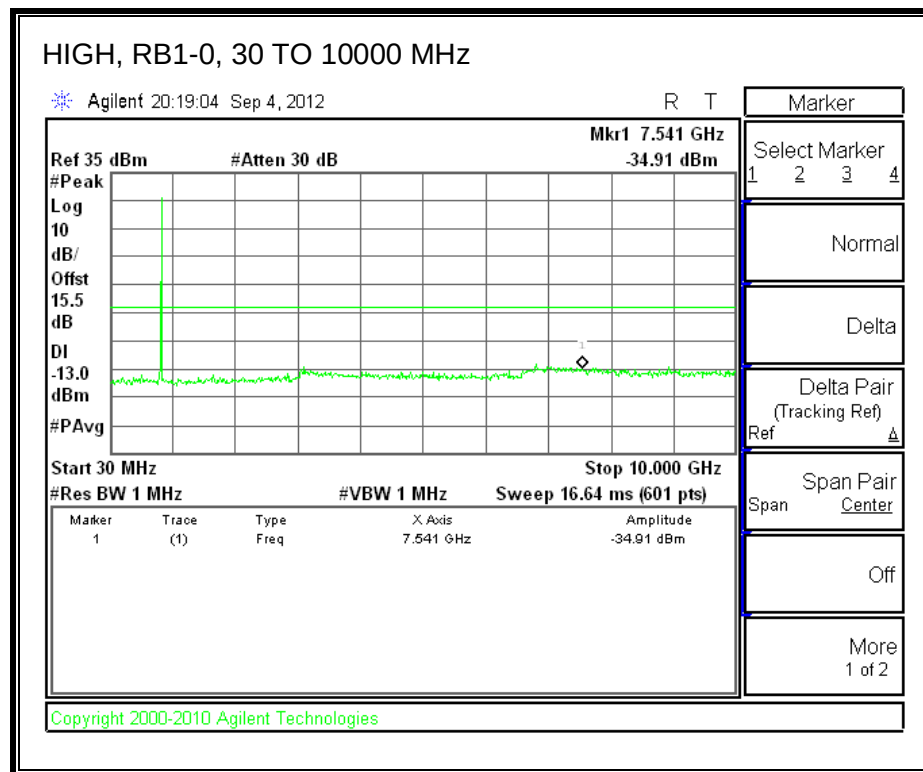
**LTE QPSK**





**LTE 16QAM**

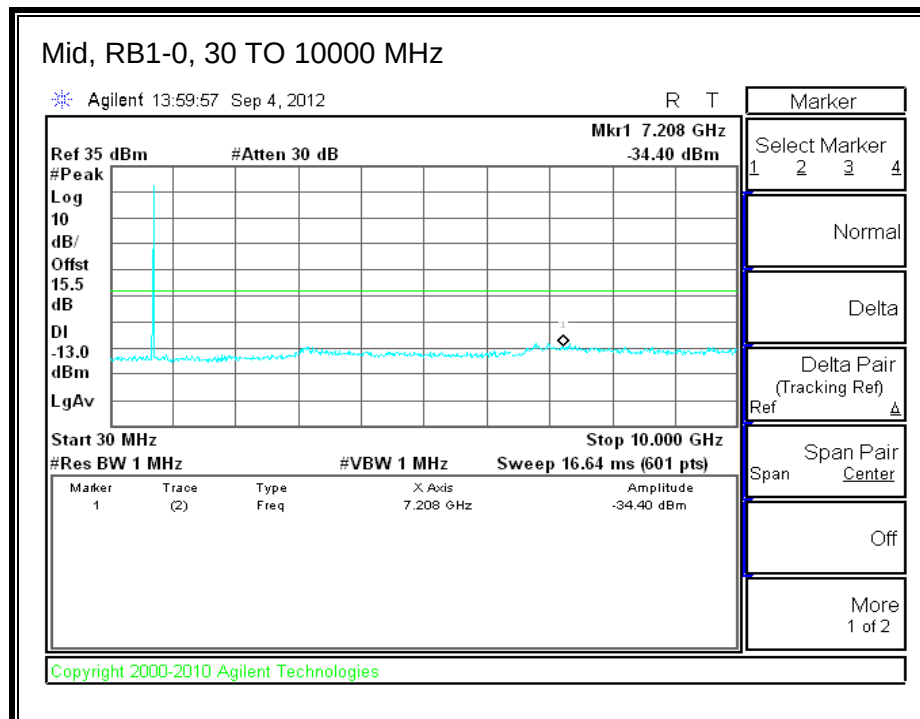
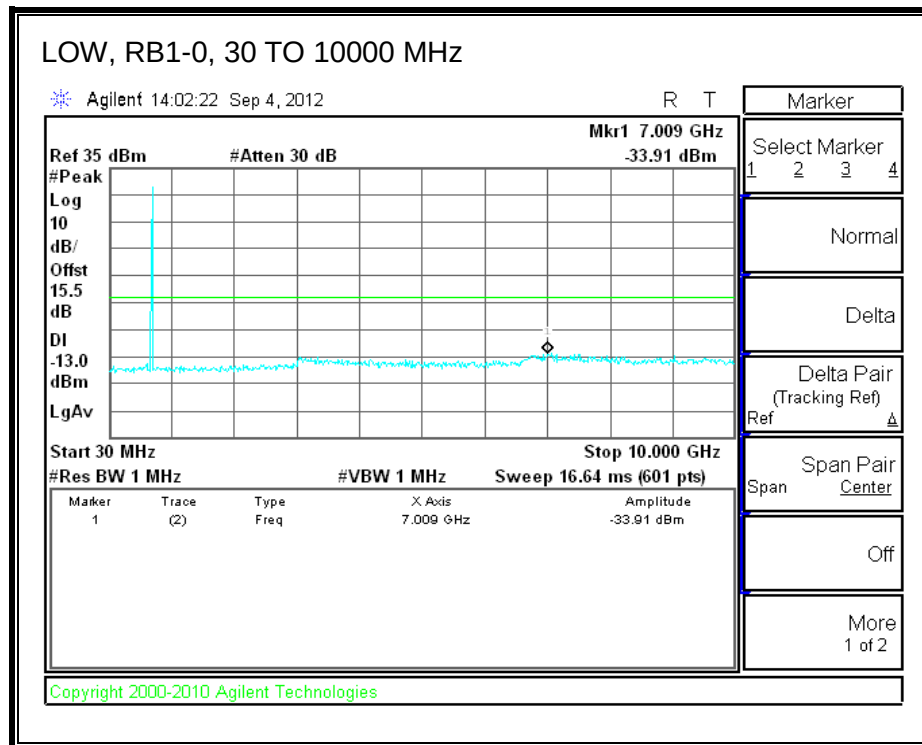


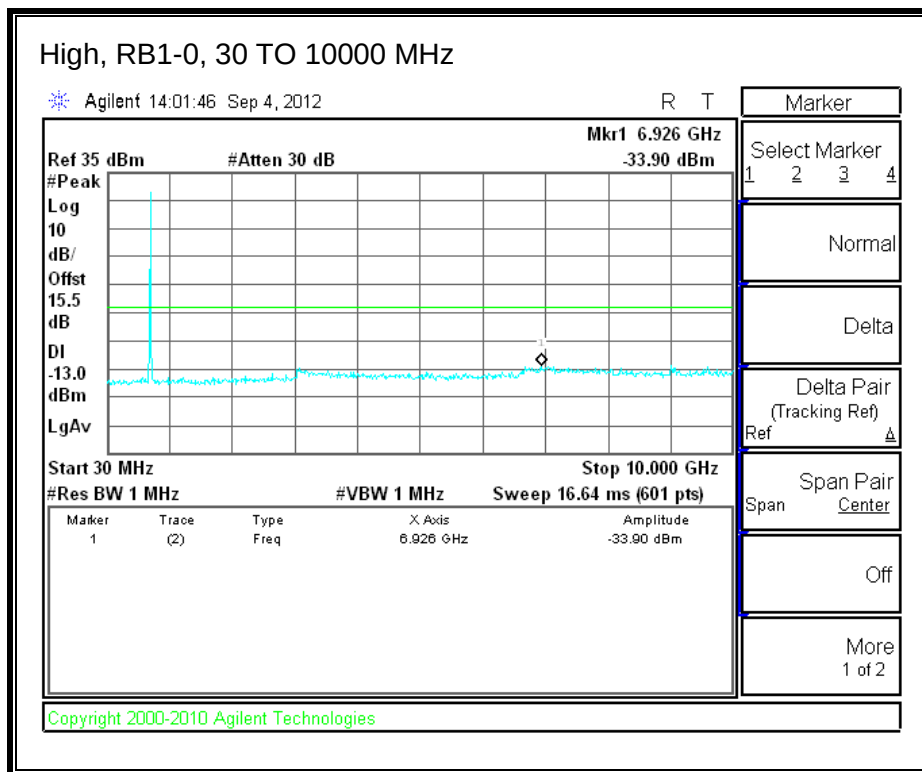




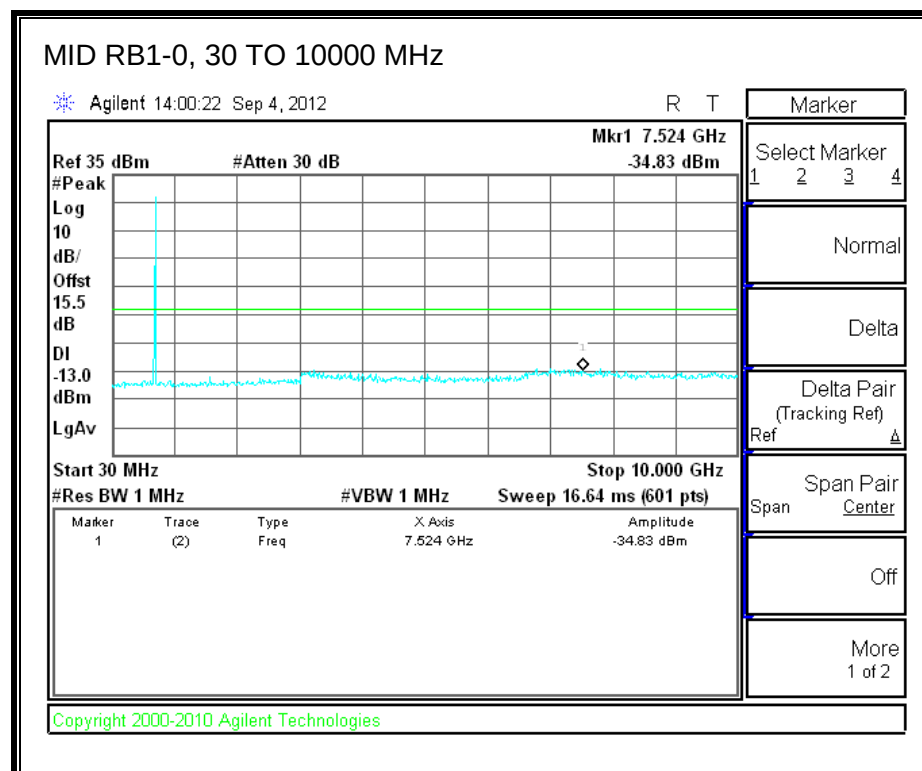
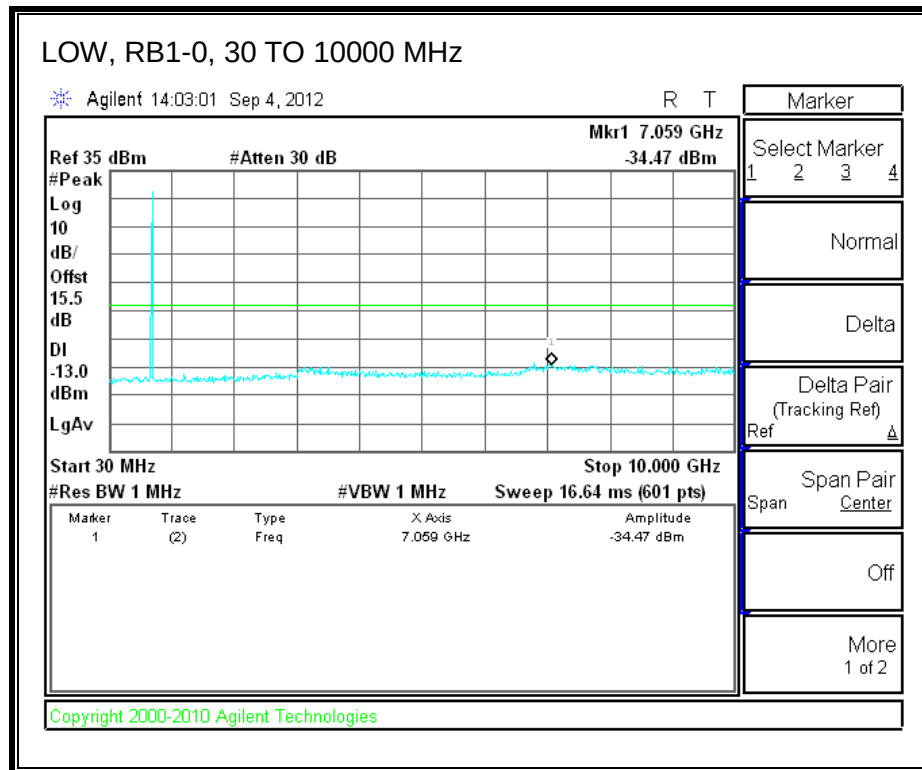
### 8.3.4. LTE BAND 17

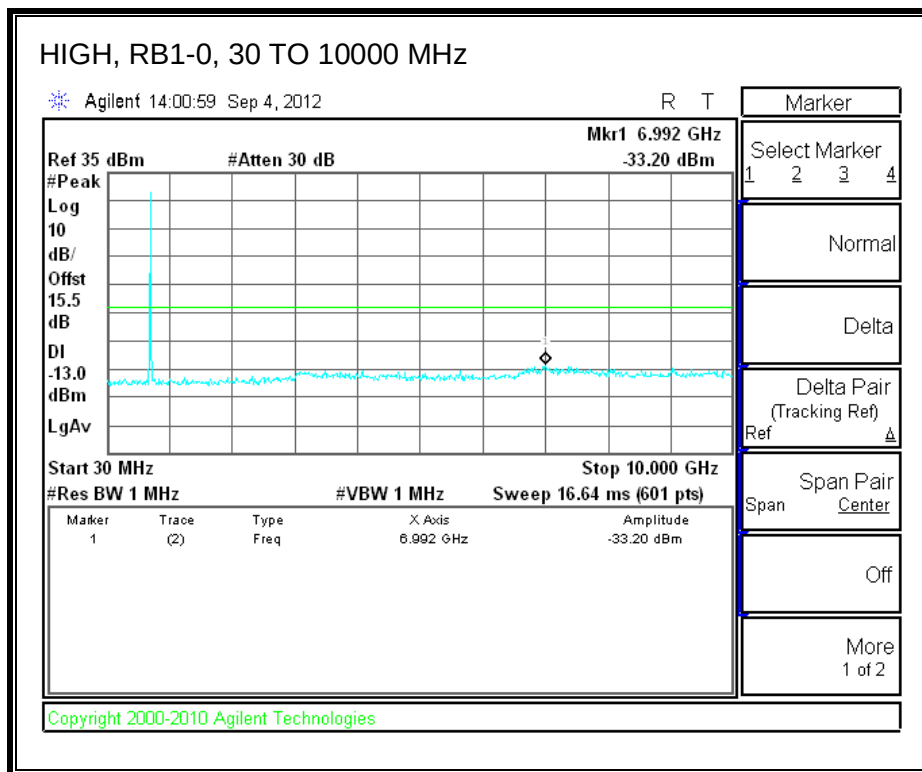
#### LTE QPSK (5 MHz BANDWIDTH)





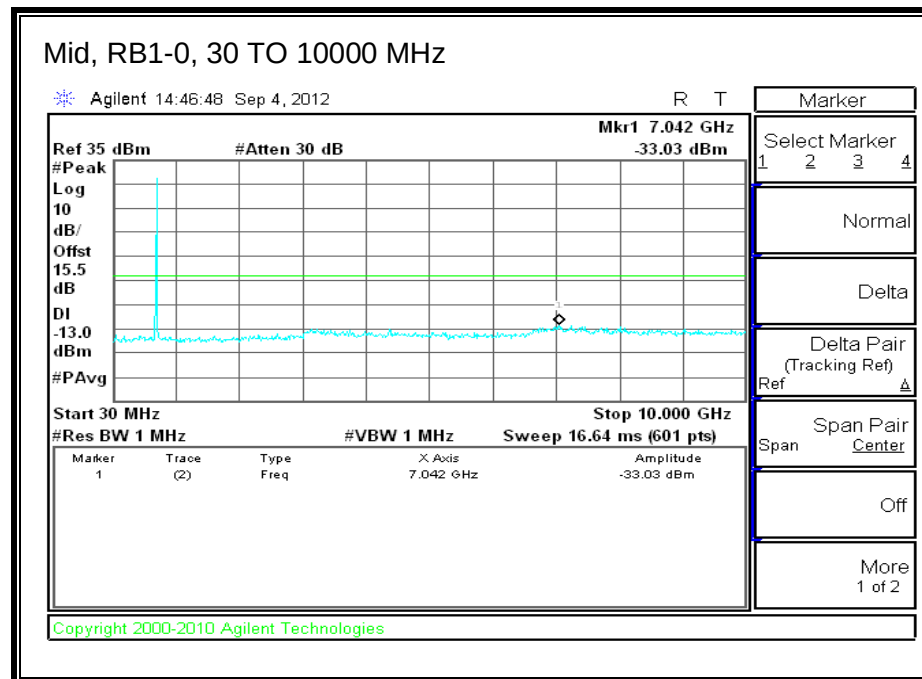
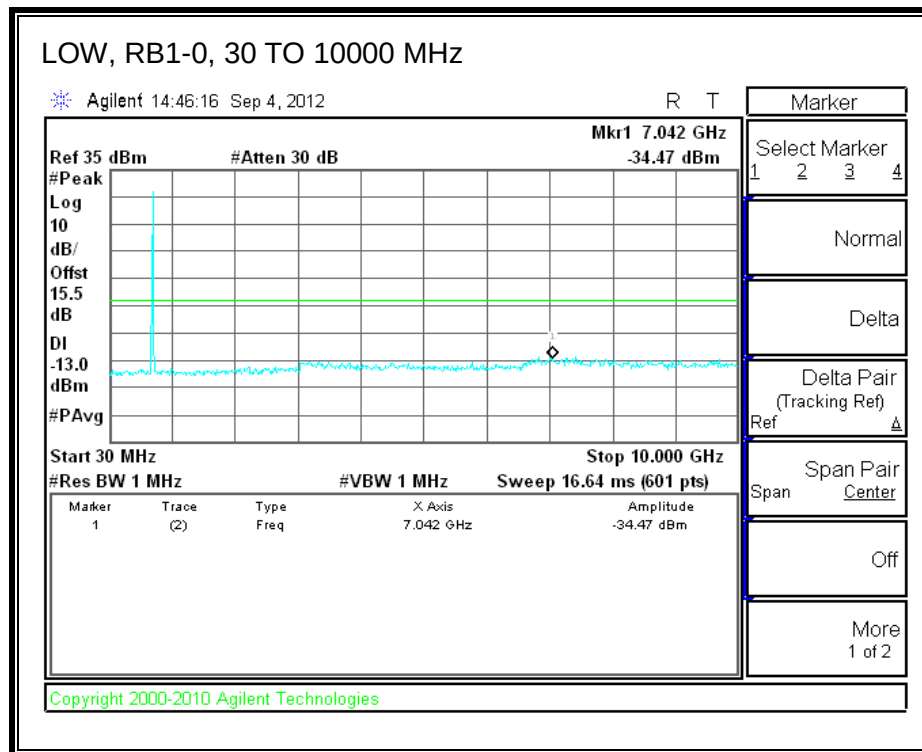
**LTE 16QAM**

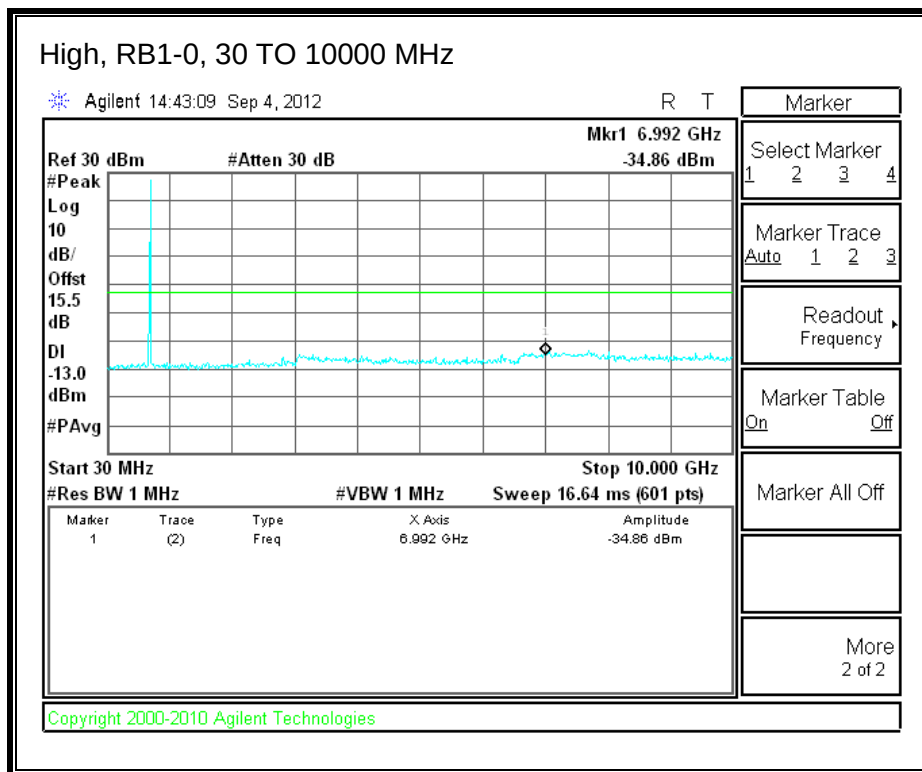




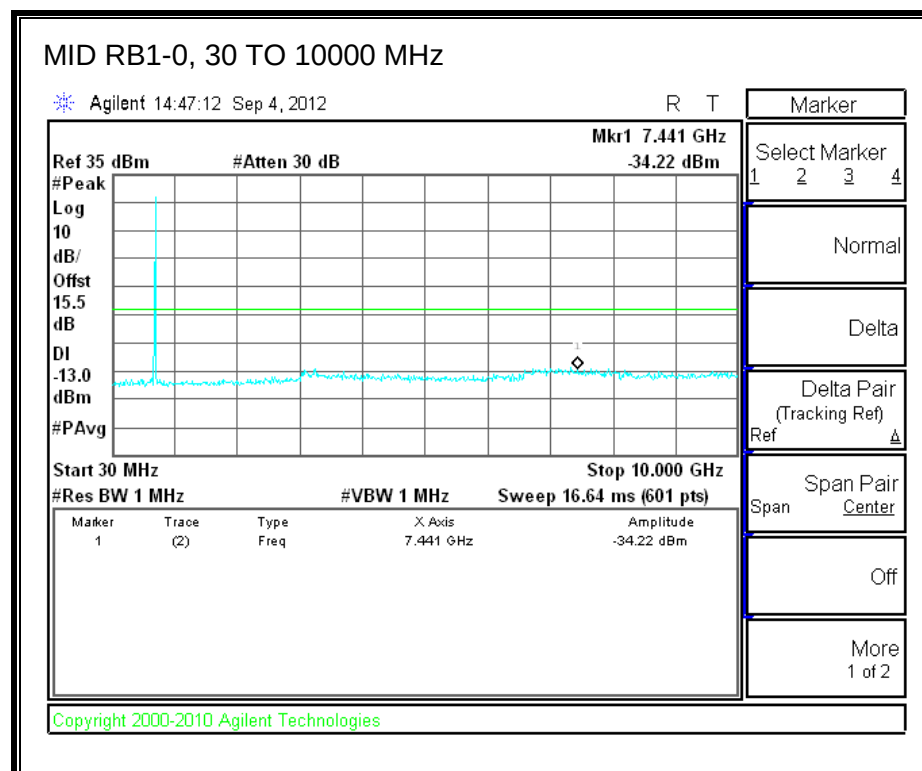
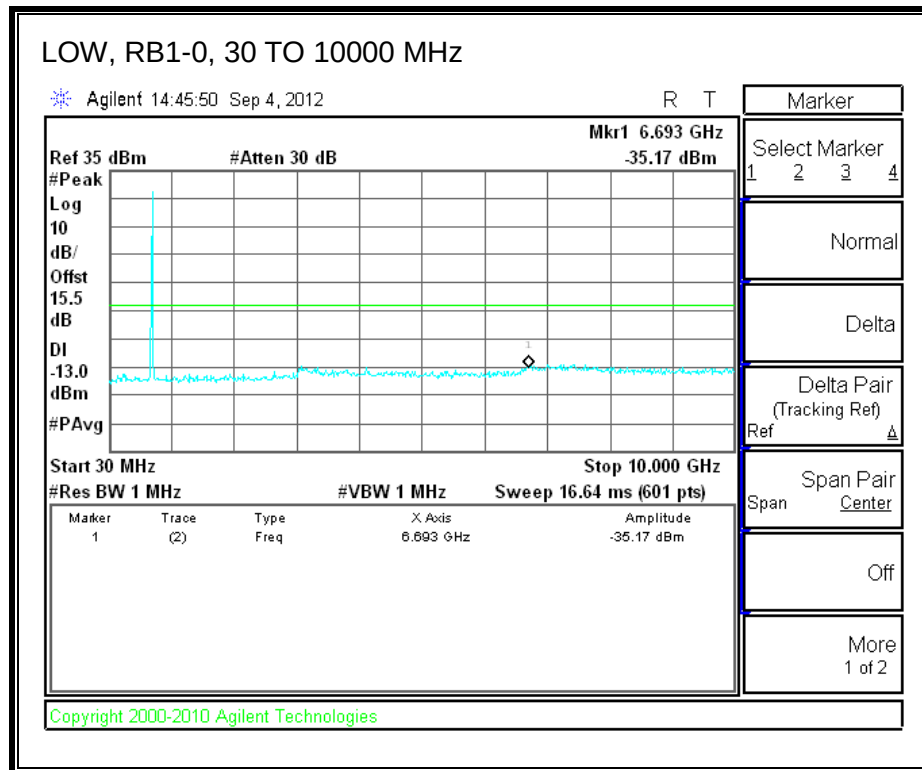
**Band 17 (10 MHz BANDWIDTH)**

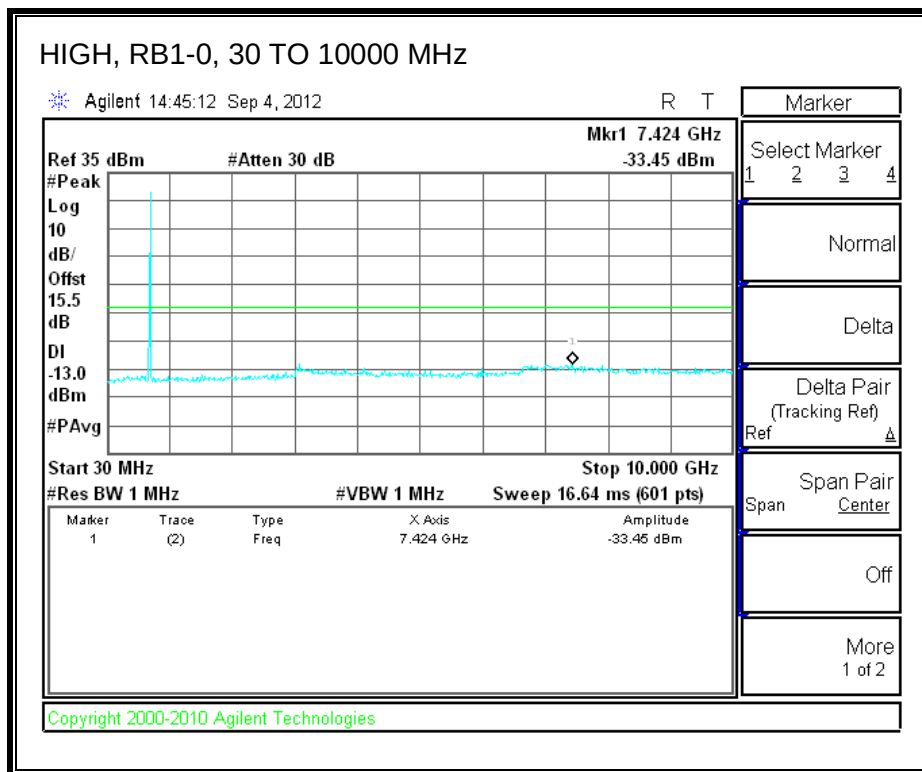
**LTE QPSK**





**LTE 16QAM**







## 8.4. FREQUENCY STABILITY

### RULE PART(S)

FCC: §2.1055, §22.355, §24.235

### LIMITS

- §22.355 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.
- §24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### TEST PROCEDURE

Use Agilent 8960 with Frequency Error measurement capability.

- Temp. =  $-30^{\circ}$  to  $+50^{\circ}\text{C}$
- Voltage = Low, 3.4VDC, Normal, 3.8VDC and High, 4.3VDC.

#### **Frequency Stability vs Temperature:**

The EUT is placed inside a temperature chamber. The temperature is set to  $20^{\circ}\text{C}$  and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until  $+50^{\circ}\text{C}$  is reached.

#### **Frequency Stability vs Voltage:**

The peak frequency error is recorded (worst-case).

### MODES TESTED

- GPRS, EGPRS
- WCDMA, HSDPA
- LTE BAND 2
- LTE BAND 4
- LTE BAND 5
- LTE BAND 17
- 

### RESULTS

**CELL, GPRS MODULATION – MID CHANNEL**

| Reference Frequency: Cellular Mid Channel 836.600018 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 2091.500 Hz |                                 |                                               |              |             |
|-------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|--------------|-------------|
| DC Power Supply<br>(Vdc)                                                                                    | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |              |             |
|                                                                                                             |                                 | (MHz)                                         | Delta (ppm)  | Limit (ppm) |
| 3.80                                                                                                        | 50                              | 836.599965                                    | 0.063        | 2.5         |
| 3.80                                                                                                        | 40                              | 836.599994                                    | 0.029        | 2.5         |
| 3.80                                                                                                        | 30                              | 836.600003                                    | 0.018        | 2.5         |
| <b>3.80</b>                                                                                                 | <b>20</b>                       | <b>836.600018</b>                             | <b>0</b>     | 2.5         |
| 3.80                                                                                                        | 10                              | 836.600040                                    | -0.026       | 2.5         |
| 3.80                                                                                                        | 0                               | 836.600041                                    | -0.027       | 2.5         |
| 3.80                                                                                                        | -10                             | 836.600049                                    | -0.037       | 2.5         |
| 3.80                                                                                                        | -20                             | 836.600050                                    | -0.038       | 2.5         |
| 3.80                                                                                                        | -30                             | 836.600052                                    | -0.041       | 2.5         |
| Reference Frequency: Cellular Mid Channel 836.600018 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 2091.500 Hz |                                 |                                               |              |             |
| DC Power Supply<br>(Vdc)                                                                                    | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |              |             |
|                                                                                                             |                                 | (MHz)                                         | Delta (ppm)  | Limit (ppm) |
| <b>3.80</b>                                                                                                 | 20                              | 836.600018                                    | <b>0.000</b> | 2.5         |
| 4.30                                                                                                        | 20                              | 836.600010                                    | 0.010        | 2.5         |
| 3.40                                                                                                        | 20                              | 836.600041                                    | -0.027       | 2.5         |
| End Volt (3.2)                                                                                              | 20                              | 836.600036                                    | -0.022       | 2.5         |

**PCS, GPRS MODULATION – MID CHANNEL**

| Reference Frequency: PCS Mid Channel 1880.000056 MHz @ 20°C<br>Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz |                                 |                                               |             |             |
|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                                           | 50                              | 1880.000033                                   | 0.012       | 2.5         |
| 3.80                                                                                                                           | 40                              | 1880.000030                                   | 0.014       | 2.5         |
| 3.80                                                                                                                           | 30                              | 1880.000111                                   | -0.029      | 2.5         |
| 3.80                                                                                                                           | <b>20</b>                       | 1880.000056                                   | <b>0</b>    | <b>2.5</b>  |
| 3.80                                                                                                                           | 10                              | 1880.000143                                   | -0.046      | 2.5         |
| 3.80                                                                                                                           | 0                               | 1880.000157                                   | -0.054      | 2.5         |
| 3.80                                                                                                                           | -10                             | 1880.000152                                   | -0.051      | 2.5         |
| 3.80                                                                                                                           | -20                             | 1880.000098                                   | -0.022      | 2.5         |
| 3.80                                                                                                                           | -30                             | 1880.000144                                   | -0.047      | 2.5         |
| Reference Frequency: PCS Mid Channel 1880.000056 MHz @ 20°C<br>Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                                           | <b>20</b>                       | 1880.000056                                   | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                                                                           | 20                              | 1880.000076                                   | -0.011      | 2.5         |
| 3.40                                                                                                                           | 20                              | 1880.000109                                   | -0.028      | 2.5         |
| End Volt(3.2)                                                                                                                  | 20                              | 1880.000098                                   | -0.022      | 2.5         |

**CELL, EGPRS MODULATION – MID CHANNEL**

| Reference Frequency: Cellular Mid Channel 836.600041 MHz @ 20°C |                              |                                               |              |             |
|-----------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|-------------|
| Limit: to stay +/- 2.5 ppm = 2091.500 Hz                        |                              |                                               |              |             |
| DC Power Supply (Vdc)                                           | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |              |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm)  | Limit (ppm) |
| 3.80                                                            | 50                           | 836.600011                                    | 0.036        | 2.5         |
| 3.80                                                            | 40                           | 836.600019                                    | 0.026        | 2.5         |
| 3.80                                                            | 30                           | 836.600071                                    | -0.036       | 2.5         |
| <b>3.80</b>                                                     | <b>20</b>                    | <b>836.600041</b>                             | <b>0</b>     | 2.5         |
| 3.80                                                            | 10                           | 836.600103                                    | -0.074       | 2.5         |
| 3.80                                                            | 0                            | 836.600096                                    | -0.066       | 2.5         |
| 3.80                                                            | -10                          | 836.600084                                    | -0.051       | 2.5         |
| 3.80                                                            | -20                          | 836.600089                                    | -0.057       | 2.5         |
| 3.80                                                            | -30                          | 836.599999                                    | 0.050        | 2.5         |
| Reference Frequency: Cellular Mid Channel 836.600041 MHz @ 20°C |                              |                                               |              |             |
| Limit: to stay +/- 2.5 ppm = 2091.500 Hz                        |                              |                                               |              |             |
| DC Power Supply (Vdc)                                           | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |              |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm)  | Limit (ppm) |
| <b>3.80</b>                                                     | 20                           | 836.600041                                    | <b>0.000</b> | 2.5         |
| 4.30                                                            | 20                           | 836.600028                                    | 0.016        | 2.5         |
| 3.40                                                            | 20                           | 836.600044                                    | -0.004       | 2.5         |
| End Volt (3.2)                                                  | 20                           | 836.599995                                    | 0.055        | 2.5         |

**PCS, EGPRS MODULATION – MID CHANNEL**

| Reference Frequency: PCS Mid Channel 1880.000064 MHz @ 20°C     |                              |                                               |             |             |
|-----------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz |                              |                                               |             |             |
| Power Supply (Vdc)                                              | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                            | 50                           | 1880.000037                                   | 0.014       | 2.5         |
| 3.80                                                            | 40                           | 1880.000035                                   | 0.015       | 2.5         |
| 3.80                                                            | 30                           | 1880.000079                                   | -0.008      | 2.5         |
| 3.80                                                            | <b>20</b>                    | 1880.000064                                   | <b>0</b>    | <b>2.5</b>  |
| 3.80                                                            | 10                           | 1880.000139                                   | -0.040      | 2.5         |
| 3.80                                                            | 0                            | 1880.000146                                   | -0.044      | 2.5         |
| 3.80                                                            | -10                          | 1880.000155                                   | -0.048      | 2.5         |
| 3.80                                                            | -20                          | 1880.000098                                   | -0.018      | 2.5         |
| 3.80                                                            | -30                          | 1880.000035                                   | 0.015       | 2.5         |

| Reference Frequency: PCS Mid Channel 1880.000064 MHz @ 20°C     |                              |                                               |             |             |
|-----------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz |                              |                                               |             |             |
| Power Supply (Vdc)                                              | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                            | <b>20</b>                    | 1880.000064                                   | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                            | 20                           | 1880.000122                                   | -0.031      | 2.5         |
| 3.40                                                            | 20                           | 1880.000133                                   | -0.037      | 2.5         |
| End Volt(3.2)                                                   | 20                           | 1880.000126                                   | -0.033      | 2.5         |

**CELL WCDMA – MID CHANNEL**

| Reference Frequency: Cellular Mid Channel 836.000021 MHz @ 20°C |                              |                                               |              |             |
|-----------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|-------------|
| Limit: to stay +/- 2.5 ppm = 2090.000 Hz                        |                              |                                               |              |             |
| DC Power Supply (Vdc)                                           | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |              |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm)  | Limit (ppm) |
| 3.80                                                            | 50                           | 836.000024                                    | -0.004       | 2.5         |
| 3.80                                                            | 40                           | 836.000023                                    | -0.002       | 2.5         |
| 3.80                                                            | 30                           | 836.000023                                    | -0.002       | 2.5         |
| <b>3.80</b>                                                     | <b>20</b>                    | <b>836.000021</b>                             | <b>0</b>     | 2.5         |
| 3.80                                                            | 10                           | 836.000023                                    | -0.002       | 2.5         |
| 3.80                                                            | 0                            | 835.999998                                    | 0.028        | 2.5         |
| 3.80                                                            | -10                          | 836.000001                                    | 0.024        | 2.5         |
| 3.80                                                            | -20                          | 836.000017                                    | 0.005        | 2.5         |
| 3.80                                                            | -30                          | 835.999998                                    | 0.028        | 2.5         |
| Reference Frequency: Cellular Mid Channel 835.999996MHz @ 20°C  |                              |                                               |              |             |
| Limit: to stay +/- 2.5 ppm = 2090.000 Hz                        |                              |                                               |              |             |
| DC Power Supply (Vdc)                                           | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |              |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm)  | Limit (ppm) |
| <b>3.80</b>                                                     | 20                           | 836.000021                                    | <b>0.000</b> | 2.5         |
| 4.30                                                            | 20                           | 835.999999                                    | 0.026        | 2.5         |
| 3.40                                                            | 20                           | 836.000022                                    | -0.001       | 2.5         |
| End Volt (3.2)                                                  | 20                           | 836.000025                                    | -0.005       | 2.5         |

**PCS, WCDMA – MID CHANNEL**

| Reference Frequency: PCS Mid Channel 1879.999966 MHz @ 20°C     |                              |                                               |             |             |
|-----------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz |                              |                                               |             |             |
| Power Supply (Vdc)                                              | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                            | 50                           | 1879.999963                                   | 0.002       | 2.5         |
| 3.80                                                            | 40                           | 1879.999959                                   | 0.004       | 2.5         |
| 3.80                                                            | 30                           | 1879.999969                                   | -0.002      | 2.5         |
| 3.80                                                            | <b>20</b>                    | 1879.999966                                   | <b>0</b>    | <b>2.5</b>  |
| 3.80                                                            | 10                           | 1880.000038                                   | -0.038      | 2.5         |
| 3.80                                                            | 0                            | 1880.000037                                   | -0.038      | 2.5         |
| 3.80                                                            | -10                          | 1880.000040                                   | -0.039      | 2.5         |
| 3.80                                                            | -20                          | 1880.000039                                   | -0.039      | 2.5         |
| 3.80                                                            | -30                          | 1880.000037                                   | -0.038      | 2.5         |
| Reference Frequency: PCS Mid Channel 1879.999966 MHz @ 20°C     |                              |                                               |             |             |
| Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz |                              |                                               |             |             |
| Power Supply (Vdc)                                              | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                              | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                            | <b>20</b>                    | 1879.999966                                   | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                            | 20                           | 1879.999983                                   | -0.009      | 2.5         |
| 3.40                                                            | 20                           | 1879.999966                                   | 0.000       | 2.5         |
| End Volt(3.2)                                                   | 20                           | 1879.999975                                   | -0.005      | 2.5         |

**QPSK, LTE BAND 2 – 1880.0 MHz**

| Reference Frequency: LTE Band 2, 1880.000011 MHz @ 20°C             |                                 |                                               |             |             |
|---------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: to stay +/- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                               | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                     |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                | 50                              | 1880.000020                                   | -0.005      | 2.5         |
| 3.80                                                                | 40                              | 1880.000018                                   | -0.004      | 2.5         |
| 3.80                                                                | 30                              | 1880.000019                                   | -0.004      | 2.5         |
| 3.80                                                                | <b>20</b>                       | <b>1880.000011</b>                            | <b>0</b>    | 2.5         |
| 3.80                                                                | 10                              | 1880.000020                                   | -0.005      | 2.5         |
| 3.80                                                                | 0                               | 1880.000019                                   | -0.004      | 2.5         |
| 3.80                                                                | -10                             | 1880.000021                                   | -0.005      | 2.5         |
| 3.80                                                                | -20                             | 1880.000019                                   | -0.004      | 2.5         |
| 3.80                                                                | -30                             | 1880.000018                                   | -0.004      | 2.5         |
| Reference Frequency: LTE Band 2, Mid Channel 1880.000011 MHz @ 20°C |                                 |                                               |             |             |
| Limit: to stay +/- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                               | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                     |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                         | <b>20</b>                       | <b>1880.000011</b>                            | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                | 20                              | 1880.000019                                   | -0.004      | 2.5         |
| 3.40                                                                | 20                              | 1880.000022                                   | -0.006      | 2.5         |
| End Voltage(3.3)                                                    | 20                              | 1880.000021                                   | -0.005      | 2.5         |

**16QAM-LTE BAND 2 – 1880.0 MHz**

| Reference Frequency: LTE Band 2, 1880.000007 MHz @ 20°C             |                                 |                                               |             |             |
|---------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: to stay +/- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                               | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                     |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                | 50                              | 1880.000016                                   | -0.005      | 2.5         |
| 3.80                                                                | 40                              | 1880.000015                                   | -0.004      | 2.5         |
| 3.80                                                                | 30                              | 1880.000015                                   | -0.004      | 2.5         |
| 3.80                                                                | <b>20</b>                       | <b>1880.000007</b>                            | <b>0</b>    | 2.5         |
| 3.80                                                                | 10                              | 1880.000015                                   | -0.004      | 2.5         |
| 3.80                                                                | 0                               | 1880.000017                                   | -0.005      | 2.5         |
| 3.80                                                                | -10                             | 1880.000018                                   | -0.006      | 2.5         |
| 3.80                                                                | -20                             | 1880.000016                                   | -0.005      | 2.5         |
| 3.80                                                                | -30                             | 1880.000015                                   | -0.004      | 2.5         |
| Reference Frequency: LTE Band 2, Mid Channel 1880.000007 MHz @ 20°C |                                 |                                               |             |             |
| Limit: to stay +/- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                               | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                     |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                         | <b>20</b>                       | <b>1880.000007</b>                            | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                | 20                              | 1880.000017                                   | -0.005      | 2.5         |
| 3.40                                                                | 20                              | 1880.000018                                   | -0.006      | 2.5         |
| End Voltage(3.2)                                                    | 20                              | 1880.000019                                   | -0.006      | 2.5         |

**LTE BAND 4 – 1732.5 MHz QPSK**

| Reference Frequency: LTE Band 4_Mid Channel 1732.499991 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 4331.250 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                           | 50                              | 1732.499985                                   | 0.0035      | 2.5         |
| 3.80                                                                                                           | 40                              | 1732.499984                                   | 0.0040      | 2.5         |
| 3.80                                                                                                           | 30                              | 1732.499982                                   | 0.0052      | 2.5         |
| 3.80                                                                                                           | <b>20</b>                       | <b>1732.499991</b>                            | <b>0</b>    | 2.5         |
| 3.80                                                                                                           | 10                              | 1732.499984                                   | 0.0040      | 2.5         |
| 3.80                                                                                                           | 0                               | 1732.499986                                   | 0.0029      | 2.5         |
| 3.80                                                                                                           | -10                             | 1732.499985                                   | 0.0035      | 2.5         |
| 3.80                                                                                                           | -20                             | 1732.499986                                   | 0.0029      | 2.5         |
| 3.80                                                                                                           | -30                             | 1732.499987                                   | 0.0023      | 2.5         |

| Reference Frequency: LTE Band 4_Mid Channel 1732.499991 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 4331.250 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                                                                    | <b>20</b>                       | <b>1732.499991</b>                            | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                                                           | 20                              | 1732.499985                                   | 0.0035      | 2.5         |
| 3.40                                                                                                           | 20                              | 1732.499984                                   | 0.0040      | 2.5         |
| End Volt(3.2)                                                                                                  | 20                              | 1732.499983                                   | 0.0046      | 2.5         |

**LTE BAND 4 – 1732.5 MHz, 16QAM**

| Reference Frequency: LTE Band 4_Mid Channle 1732.499989 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 4331.250 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                           | 50                              | 1732.500003                                   | -0.0081     | 2.5         |
| 3.80                                                                                                           | 40                              | 1732.499997                                   | -0.0046     | 2.5         |
| 3.80                                                                                                           | 30                              | 1732.499992                                   | -0.0017     | 2.5         |
| 3.80                                                                                                           | <b>20</b>                       | <b>1732.499989</b>                            | <b>0</b>    | 2.5         |
| 3.80                                                                                                           | 10                              | 1732.499985                                   | 0.0023      | 2.5         |
| 3.80                                                                                                           | 0                               | 1732.499981                                   | 0.0046      | 2.5         |
| 3.80                                                                                                           | -10                             | 1732.499978                                   | 0.0063      | 2.5         |
| 3.80                                                                                                           | -20                             | 1732.499977                                   | 0.0069      | 2.5         |
| 3.80                                                                                                           | -30                             | 1732.499982                                   | 0.0040      | 2.5         |

| Reference Frequency: LTE Band 4_Mid Channel 1732.499989 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 4331.250 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                                                                    | <b>20</b>                       | <b>1732.499989</b>                            | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                                                           | 20                              | 1732.499981                                   | 0.0046      | 2.5         |
| 3.40                                                                                                           | 20                              | 1732.499978                                   | 0.0063      | 2.5         |
| End Volt(3.2)                                                                                                  | 20                              | 1732.499975                                   | 0.0081      | 2.5         |

**LTE BAND 5 – 836.5MHz, QPSK**

| Reference Frequency: LTE Band 5_Mid Channe 836.500008 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 2091.250 Hz |                                 |                                               |             |             |
|--------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                        | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                              |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                         | 50                              | 836.500013                                    | -0.006      | 2.5         |
| 3.80                                                                                                         | 40                              | 836.500014                                    | -0.007      | 2.5         |
| 3.80                                                                                                         | 30                              | 836.500012                                    | -0.005      | 2.5         |
| 3.80                                                                                                         | <b>20</b>                       | <b>836.500008</b>                             | <b>0</b>    | 2.5         |
| 3.80                                                                                                         | 10                              | 836.500014                                    | -0.007      | 2.5         |
| 3.80                                                                                                         | 0                               | 836.500014                                    | -0.007      | 2.5         |
| 3.80                                                                                                         | -10                             | 836.500015                                    | -0.008      | 2.5         |
| 3.80                                                                                                         | -20                             | 836.500014                                    | -0.007      | 2.5         |
| 3.80                                                                                                         | -30                             | 836.500016                                    | -0.010      | 2.5         |

| Reference Frequency: LTE Band 5_Mid channel 836.500008 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 2091.250 Hz |                                 |                                               |             |             |
|---------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                         | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                               |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                          | 20                              | 836.500008                                    | 0           | 2.5         |
| 4.30                                                                                                          | 20                              | 836.500013                                    | -0.006      | 2.5         |
| 3.40                                                                                                          | 20                              | 836.500015                                    | -0.008      | 2.5         |
| End Volt(3.2)                                                                                                 | 20                              | 836.500012                                    | -0.005      | 2.5         |

**LTE BAND 5 – 836.5 MHz, 16QAM**

| Reference Frequency: LTE Band 5_Mid Channel 836.500006 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 2091.250 Hz |                                 |                                               |             |             |
|---------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vac)                                                                                         | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                               |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                          | 50                              | 836.500013                                    | -0.008      | 2.5         |
| 3.80                                                                                                          | 40                              | 836.500025                                    | -0.023      | 2.5         |
| 3.80                                                                                                          | 30                              | 836.500019                                    | -0.016      | 2.5         |
| 3.80                                                                                                          | <b>20</b>                       | <b>836.500006</b>                             | <b>0</b>    | 2.5         |
| 3.80                                                                                                          | 10                              | 836.500013                                    | -0.008      | 2.5         |
| 3.80                                                                                                          | 0                               | 836.500012                                    | -0.007      | 2.5         |
| 3.80                                                                                                          | -10                             | 836.500012                                    | -0.007      | 2.5         |
| 3.80                                                                                                          | -20                             | 836.500013                                    | -0.008      | 2.5         |
| 3.80                                                                                                          | -30                             | 836.500013                                    | -0.008      | 2.5         |

| Reference Frequency: LTE Band 5_Mid Channel 836.500006 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 2091.250 Hz |                                 |                                               |             |             |
|---------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vac)                                                                                         | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                               |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                          | 20                              | 836.500006                                    | 0           | 2.5         |
| 4.30                                                                                                          | 20                              | 836.500010                                    | -0.005      | 2.5         |
| 3.40                                                                                                          | 20                              | 836.500009                                    | -0.004      | 2.5         |
| End Volt(3.2)                                                                                                 | 20                              | 836.500008                                    | -0.002      | 2.5         |

**LTE BAND 17 – 710 MHz, QPSK**

| Reference Frequency: LTE Band 17_Mid Channel 710.000003 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 1775.000 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                           | 50                              | 710.000007                                    | -0.006      | 2.5         |
| 3.80                                                                                                           | 40                              | 710.000007                                    | -0.006      | 2.5         |
| 3.80                                                                                                           | 30                              | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | <b>20</b>                       | <b>710.000003</b>                             | <b>0</b>    | 2.5         |
| 3.80                                                                                                           | 10                              | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | 0                               | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | -10                             | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | -20                             | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | -30                             | 710.000006                                    | -0.004      | 2.5         |

| Reference Frequency: LTE Band 17_Mid channel 710.000003 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 1775.000 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vdc)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                                                                    | <b>20</b>                       | <b>710.000003</b>                             | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                                                           | 20                              | 710.000006                                    | -0.004      | 2.5         |
| 3.40                                                                                                           | 20                              | 710.000007                                    | -0.006      | 2.5         |
| End Volt(3.2)                                                                                                  | 20                              | 710.000007                                    | -0.006      | 2.5         |

**LTE BAND 17 – 710 MHz, 16QAM**

| Reference Frequency: LTE Band 17_Mid Channel 710.000003 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 1775.000 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vac)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                                                                           | 50                              | 710.000000                                    | 0.004       | 2.5         |
| 3.80                                                                                                           | 40                              | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | 30                              | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | <b>20</b>                       | <b>710.000003</b>                             | <b>0</b>    | 2.5         |
| 3.80                                                                                                           | 10                              | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | 0                               | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | -10                             | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | -20                             | 710.000006                                    | -0.004      | 2.5         |
| 3.80                                                                                                           | -30                             | 710.000006                                    | -0.004      | 2.5         |

| Reference Frequency: LTE Band 17_Mid Channel 710.000003 MHz @ 20°C<br>Limit: to stay +/- 2.5 ppm = 1775.000 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>(Vac)                                                                                          | Environment<br>Temperature (°C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                                                |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.70</b>                                                                                                    | <b>20</b>                       | <b>710.000003</b>                             | <b>0</b>    | <b>2.5</b>  |
| 4.30                                                                                                           | 20                              | 710.000006                                    | -0.004      | 2.5         |
| 3.40                                                                                                           | 20                              | 710.000007                                    | -0.006      | 2.5         |
| End Volt(3.2)                                                                                                  | 20                              | 710.000007                                    | -0.006      | 2.5         |



## 9. RADIATED TEST RESULTS

### 9.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232, and §27.50.

#### LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50 (c) (10) the following power and antenna height requirements apply to stations transmitting in the 698–746 MHz band, the portable stations (hand-held devices) are limited to 3 watts ERP.

27.50 (b)(10) Portable stations (hand-held devices) transmitting in the 746–757 MHz, 758–763 MHz, 776–793 MHz, and 805–806 MHz bands are limited to 3 watts ERP.

27.50 (d)(4) The following power and antenna height requirements apply to stations transmitting in the 1710–1755 MHz and 2110–2155 MHz bands: Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

Table—Equivalent Power and Antenna Heights for Base Stations in the 851–869 MHz and 935–940 MHz Bands Which Have a Requirement for a 32 km (20 mi) Service Area Radius

| Antenna height (ATT) meters (feet)   | Effective radiated power (watts) <sup>1,2,4</sup> |
|--------------------------------------|---------------------------------------------------|
| Above 1,372 (4,500)                  | 65                                                |
| Above 1,220 (4,000) to 1,372 (4,500) | 70                                                |
| Above 1,067 (3,500) to 1,220 (4,000) | 75                                                |
| Above 915 (3,000) to 1,067 (3,500)   | 100                                               |
| Above 763 (2,500) to 915 (3,000)     | 140                                               |
| Above 610 (2,000) to 763 (2,500)     | 200                                               |
| Above 458 (1,500) to 610 (2,000)     | 350                                               |
| Above 305 (1,000) to 458 (1,500)     | 600                                               |
| Up to 305 (1,000)                    | 31,000                                            |

1Power is given in terms of effective radiated power (ERP).

2Applicants in the Los Angeles, CA, area who demonstrate a need to serve both the downtown and fringe areas will be permitted to utilize an ERP of 1 kw at the following mountaintop sites: Santiago Park, Sierra Peak, Mount Lukens, and Mount Wilson.

3Stations with antennas below 305 m (1,000 ft) (AAT) will be restricted to a maximum power of 1 kw (ERP).

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

### **TEST PROCEDURE**

ANSI / TIA / EIA 603C Clause 2.2.17

### **MODES TESTED**

- GPRS and EGPRS
- WCDMA, REL 99 and HSDPA
- LTE BAND 2
- LTE BAND 4
- LTE BAND 5
- LTE BAND 17

| Mode  | Channel | f (MHz) | ERP (PEAK) |         |
|-------|---------|---------|------------|---------|
|       |         |         | dBm        | mW      |
| GPRS  | 128     | 824.20  | 30.57      | 1140.25 |
|       | 190     | 836.60  | 30.17      | 1039.92 |
|       | 251     | 848.80  | 30.65      | 1161.45 |
| EGPRS | 128     | 824.20  | 29.50      | 891.25  |
|       | 190     | 836.60  | 28.60      | 724.44  |
|       | 251     | 848.80  | 28.31      | 677.64  |

| Mode  | Channel | f (MHz) | ERP (PEAK) |         |
|-------|---------|---------|------------|---------|
|       |         |         | dBm        | mW      |
| GPRS  | 512     | 1852.40 | 31.97      | 1573.98 |
|       | 661     | 1880.00 | 31.71      | 1482.52 |
|       | 810     | 1909.80 | 31.75      | 1496.24 |
| EGPRS | 512     | 1852.40 | 29.77      | 948.42  |
|       | 661     | 1880.00 | 29.71      | 935.41  |
|       | 810     | 1909.80 | 28.75      | 749.89  |

| Mode        | Channel | f (MHz) | ERP (AVERAGE) |        |
|-------------|---------|---------|---------------|--------|
|             |         |         | dBm           | mW     |
| UMTS,REL 99 | 4357    | 826.40  | 21.40         | 138.04 |
|             | 4405    | 836.00  | 21.10         | 128.82 |
|             | 4455    | 846.00  | 21.11         | 129.12 |

| Mode        | Channel | f (MHz) | EIRP (PEAK) |        |
|-------------|---------|---------|-------------|--------|
|             |         |         | dBm         | mW     |
| UMTS,REL 99 | 9662    | 1852.40 | 26.97       | 497.74 |
|             | 9800    | 1880.00 | 27.41       | 550.81 |
|             | 9938    | 1907.60 | 26.25       | 421.70 |

| Mode        | Channel | f (MHz) | ERP (AVERAGE) |        |
|-------------|---------|---------|---------------|--------|
|             |         |         | dBm           | mW     |
| UMTS, HSUPA | 4357    | 826.40  | 20.40         | 109.65 |
|             | 4405    | 836.00  | 20.20         | 104.71 |
|             | 4455    | 846.00  | 19.91         | 97.95  |

| Mode        | Channel | f (MHz) | EIRP (PEAK) |        |
|-------------|---------|---------|-------------|--------|
|             |         |         | dBm         | mW     |
| UMTS, HSUPA | 9662    | 1850.20 | 27.67       | 584.79 |
|             | 9800    | 1880.00 | 27.51       | 563.64 |
|             | 9938    | 1907.60 | 26.55       | 451.86 |

**LTE Band 2 (1.4MHz BANDWIDTH)**

| Mode                  | RB/RB SIZE | f (MHz) | EIRP(Peak) |         |
|-----------------------|------------|---------|------------|---------|
|                       |            |         | dBm        | mW      |
| 1.4 MHZ BAND<br>QPSK  | 6/0        | 1850.7  | 30.24      | 1056.82 |
|                       |            | 1880.0  | 30.05      | 1011.58 |
|                       |            | 1909.3  | 29.30      | 851.14  |
| 1.4 MHZ BAND<br>16QAM | 6/0        | 1850.7  | 29.20      | 831.76  |
|                       |            | 1880.0  | 29.04      | 801.68  |
|                       |            | 1909.3  | 28.29      | 674.53  |

**LTE Band 2 (3MHz BANDWIDTH)**

| Mode                  | RB/RB SIZE | f (MHz) | EIRP(Peak) |         |
|-----------------------|------------|---------|------------|---------|
|                       |            |         | dBm        | mW      |
| 3.0 MHZ BAND<br>QPSK  | 15/0       | 1851.5  | 29.89      | 974.99  |
|                       |            | 1880.0  | 30.00      | 1000.00 |
|                       |            | 1908.5  | 29.59      | 909.91  |
| 3.0 MHZ BAND<br>16QAM | 15/0       | 1851.5  | 28.93      | 781.63  |
|                       |            | 1880.0  | 29.08      | 809.10  |
|                       |            | 1908.5  | 28.72      | 744.73  |

**LTE Band 2 (5MHz BANDWIDTH)**

| Mode                  | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|-----------------------|------------|---------|------------|--------|
|                       |            |         | dBm        | mW     |
| 5.0 MHZ BAND<br>QPSK  | 25/0       | 1852.5  | 29.91      | 979.49 |
|                       |            | 1880.0  | 29.93      | 984.01 |
|                       |            | 1907.5  | 29.95      | 988.55 |
| 5.0 MHZ BAND<br>16QAM | 25/0       | 1852.5  | 29.06      | 805.38 |
|                       |            | 1880.0  | 28.99      | 792.50 |
|                       |            | 1907.5  | 28.98      | 790.68 |

**LTE Band 2 (10MHz BANDWIDTH)**

| Mode                   | RB/RB SIZE | f (MHz) | EIRP(Peak) |         |
|------------------------|------------|---------|------------|---------|
|                        |            |         | dBm        | mW      |
| 10.0 MHZ BAND<br>QPSK  | 50/0       | 1855.0  | 29.95      | 988.55  |
|                        |            | 1880.0  | 29.81      | 957.19  |
|                        |            | 1905.0  | 30.31      | 1073.99 |
| 10.0 MHZ BAND<br>16QAM | 50/0       | 1855.0  | 28.97      | 788.86  |
|                        |            | 1880.0  | 28.75      | 749.89  |
|                        |            | 1905.0  | 29.29      | 849.18  |

**LTE Band 2 (15MHz BANDWIDTH)**

| Mode                   | RB/RB SIZE | f (MHz) | EIRP(Peak) |         |
|------------------------|------------|---------|------------|---------|
|                        |            |         | dBm        | mW      |
| 15.0 MHZ BAND<br>QPSK  | 75/0       | 1857.5  | 29.72      | 937.56  |
|                        |            | 1880.0  | 29.16      | 824.14  |
|                        |            | 1902.5  | 30.15      | 1035.14 |
| 15.0 MHZ BAND<br>16QAM | 75/0       | 1857.5  | 28.81      | 760.33  |
|                        |            | 1880.0  | 28.18      | 657.66  |
|                        |            | 1902.5  | 29.21      | 833.68  |

**LTE Band 2 (20MHz BANDWIDTH)**

| Mode                   | RB/RB SIZE | f (MHz) | EIRP(PEAK) |         |
|------------------------|------------|---------|------------|---------|
|                        |            |         | dBm        | mW      |
| 20.0 MHZ BAND<br>QPSK  | 100/0      | 1860.0  | 30.09      | 1020.94 |
|                        |            | 1880.0  | 29.36      | 862.98  |
|                        |            | 1900.0  | 30.21      | 1049.54 |
| 20.0 MHZ BAND<br>16QAM | 100/0      | 1860.0  | 29.09      | 810.96  |
|                        |            | 1880.0  | 28.41      | 693.43  |
|                        |            | 1900.0  | 29.21      | 833.68  |

**LTE Band 4 (1.4 MHz BANDWIDTH)**

| Mode                  | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|-----------------------|------------|---------|------------|--------|
|                       |            |         | dBm        | mW     |
| 1.4 MHZ BAND<br>QPSK  | 6/0        | 1710.7  | 29.69      | 931.11 |
|                       |            | 1732.5  | 29.17      | 826.04 |
|                       |            | 1754.3  | 29.16      | 824.14 |
| 1.4 MHZ BAND<br>16QAM | 6/0        | 1710.7  | 28.79      | 756.83 |
|                       |            | 1732.5  | 28.18      | 657.66 |
|                       |            | 1754.3  | 28.36      | 685.49 |

**LTE Band 4 (3 MHz BANDWIDTH)**

| Mode                  | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|-----------------------|------------|---------|------------|--------|
|                       |            |         | dBm        | mW     |
| 3.0 MHZ BAND<br>QPSK  | 15/0       | 1711.5  | 29.39      | 868.96 |
|                       |            | 1732.5  | 28.91      | 778.04 |
|                       |            | 1753.5  | 28.86      | 769.13 |
| 3.0 MHZ BAND<br>16QAM | 15/0       | 1711.5  | 28.49      | 706.32 |
|                       |            | 1732.5  | 27.97      | 626.61 |
|                       |            | 1753.5  | 27.96      | 625.17 |

**LTE Band 4 (5 MHz BANDWIDTH)**

| Mode                  | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|-----------------------|------------|---------|------------|--------|
|                       |            |         | dBm        | mW     |
| 5.0 MHZ BAND<br>QPSK  | 25/0       | 1712.5  | 29.29      | 849.18 |
|                       |            | 1732.5  | 29.25      | 841.40 |
|                       |            | 1752.5  | 29.16      | 824.14 |
| 5.0 MHZ BAND<br>16QAM | 25/0       | 1712.5  | 28.29      | 674.53 |
|                       |            | 1732.5  | 28.30      | 676.08 |
|                       |            | 1752.5  | 28.16      | 654.64 |

**LTE Band 4 (10 MHz BANDWIDTH)**

| Mode                   | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|------------------------|------------|---------|------------|--------|
|                        |            |         | dBm        | mW     |
| 10.0 MHZ BAND<br>QPSK  | 50/0       | 1715.0  | 29.59      | 909.91 |
|                        |            | 1732.5  | 29.07      | 807.24 |
|                        |            | 1750.0  | 29.16      | 824.14 |
| 10.0 MHZ BAND<br>16QAM | 50/0       | 1715.0  | 28.59      | 722.77 |
|                        |            | 1732.5  | 28.07      | 641.21 |
|                        |            | 1750.0  | 28.16      | 654.64 |

**LTE Band 4 (15 MHz BANDWIDTH)**

| Mode                   | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|------------------------|------------|---------|------------|--------|
|                        |            |         | dBm        | mW     |
| 15.0 MHZ BAND<br>QPSK  | 75/0       | 1717.5  | 29.19      | 829.85 |
|                        |            | 1732.5  | 28.87      | 770.90 |
|                        |            | 1747.5  | 28.86      | 769.13 |
| 15.0 MHZ BAND<br>16QAM | 75/0       | 1717.5  | 28.19      | 659.17 |
|                        |            | 1732.5  | 27.87      | 612.35 |
|                        |            | 1747.5  | 27.86      | 610.94 |

**LTE Band 4 (20 MHz BANDWIDTH)**

| Mode                   | RB/RB SIZE | f (MHz) | EIRP(Peak) |        |
|------------------------|------------|---------|------------|--------|
|                        |            |         | dBm        | mW     |
| 20.0 MHZ BAND<br>QPSK  | 100/0      | 1720.0  | 29.29      | 849.18 |
|                        |            | 1732.5  | 28.57      | 719.45 |
|                        |            | 1745.0  | 28.66      | 734.51 |
| 20.0 MHZ BAND<br>16QAM | 100/0      | 1720.0  | 28.29      | 674.53 |
|                        |            | 1732.5  | 27.77      | 598.41 |
|                        |            | 1745.0  | 27.86      | 610.94 |

**LTE Band 5 (1.4 MHz BANDWIDTH)**

| Mode              | RB/RB SIZE | f (MHz) | ERP (Average) |        |
|-------------------|------------|---------|---------------|--------|
|                   |            |         | dBm           | mW     |
| 1.4MHz Band QASK  | 1/0        | 824.7   | 20.97         | 125.03 |
|                   |            | 836.5   | 21.14         | 130.02 |
|                   |            | 848.3   | 21.00         | 125.89 |
| 1.4MHz Band 16QAM | 1/0        | 824.7   | 19.97         | 99.31  |
|                   |            | 836.5   | 19.94         | 98.63  |
|                   |            | 848.3   | 19.50         | 89.13  |

**LTE Band 5 (3 MHz BANDWIDTH)**

| Mode               | RB/RB SIZE | f (MHz) | ERP (Average) |        |
|--------------------|------------|---------|---------------|--------|
|                    |            |         | dBm           | mW     |
| 3.0 MHZ BAND QPSK  | 1/0        | 825.5   | 21.17         | 130.92 |
|                    |            | 836.5   | 21.14         | 130.02 |
|                    |            | 847.5   | 20.71         | 117.76 |
| 3.0 MHZ BAND 16QAM | 1/0        | 825.5   | 20.27         | 106.41 |
|                    |            | 836.5   | 20.54         | 113.24 |
|                    |            | 847.5   | 19.91         | 97.95  |

**LTE Band 5 (5 MHz BANDWIDTH)**

| Mode            | RB/RB SIZE | f (MHz) | ERP (Average) |        |
|-----------------|------------|---------|---------------|--------|
|                 |            |         | dBm           | mW     |
| 5MHz Band QASK  | 1/0        | 826.5   | 20.87         | 122.18 |
|                 |            | 836.5   | 21.14         | 130.02 |
|                 |            | 846.5   | 20.91         | 123.31 |
| 5MHz Band 16QAM | 1/0        | 826.5   | 19.97         | 99.31  |
|                 |            | 836.5   | 20.14         | 103.28 |
|                 |            | 846.5   | 20.11         | 102.57 |

**LTE Band 5 (10 MHz BANDWIDTH)**

| Mode                | RB/RB SIZE | f (MHz) | ERP (Average) |        |
|---------------------|------------|---------|---------------|--------|
|                     |            |         | dBm           | mW     |
| 10.0 MHZ BAND QPSK  | 1/0        | 829.0   | 21.17         | 130.92 |
|                     |            | 836.5   | 21.24         | 133.05 |
|                     |            | 844.0   | 21.01         | 126.18 |
| 10.0 MHZ BAND 16QAM | 1/0        | 829.0   | 20.47         | 111.43 |
|                     |            | 836.5   | 20.44         | 110.66 |
|                     |            | 844.0   | 20.11         | 102.57 |

**LTE Band 17 (5 MHz BANDWIDTH)**

| Mode            | RB/RB SIZE | f (MHz) | ERP (Average) |        |
|-----------------|------------|---------|---------------|--------|
|                 |            |         | dBm           | mW     |
| 5MHz Band QASK  | 1/0        | 706.5   | 21.95         | 156.68 |
|                 |            | 710.0   | 21.08         | 128.23 |
|                 |            | 713.5   | 21.29         | 134.59 |
| 5MHz Band 16QAM | 1/0        | 706.5   | 20.87         | 122.18 |
|                 |            | 710.0   | 20.49         | 111.94 |
|                 |            | 713.5   | 20.53         | 112.98 |

**LTE Band 17 (10 MHz BANDWIDTH)**

| Mode                | RB/RB SIZE | f (MHz) | ERP (Average) |        |
|---------------------|------------|---------|---------------|--------|
|                     |            |         | dBm           | mW     |
| 10.0 MHZ BAND QPSK  | 1/0        | 709.0   | 22.06         | 160.69 |
|                     |            | 710.0   | 21.92         | 155.60 |
|                     |            | 711.0   | 21.59         | 144.21 |
| 10.0 MHZ BAND 16QAM | 1/0        | 709.0   | 21.53         | 142.23 |
|                     |            | 710.0   | 20.90         | 123.03 |
|                     |            | 711.0   | 20.88         | 122.46 |



### 9.1.1. GSM

#### GPRS (Cellular Band)

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                           |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|---------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                     |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                  |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/14/12                  |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA          |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT(C12) WITH AC ACAPTER  |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, 850MHz BAND GPRS MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                           |                    |                       |              |                |                |       |
| Receiving: Sunol T243 and Chamber A N-type Cable (Setup this one for testing EUT)      |                     |                           |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                           |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)        | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 824.20                                                                                 | 31.07               | V                         | 0.5                | 0.0                   | 30.57        | 38.5           | -7.9           |       |
| 824.20                                                                                 | 26.71               | H                         | 0.5                | 0.0                   | 26.21        | 38.5           | -12.2          |       |
| 836.60                                                                                 | 30.67               | V                         | 0.5                | 0.0                   | 30.17        | 38.5           | -8.3           |       |
| 836.60                                                                                 | 25.71               | H                         | 0.5                | 0.0                   | 25.21        | 38.5           | -13.2          |       |
| 848.80                                                                                 | 31.15               | V                         | 0.5                | 0.0                   | 30.65        | 38.5           | -7.8           |       |
| 848.80                                                                                 | 26.46               | H                         | 0.5                | 0.0                   | 25.96        | 38.5           | -12.5          |       |
| Rev. 3.17.11                                                                           |                     |                           |                    |                       |              |                |                |       |

**EGPRS (Cellular Band)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                            |                    |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|----------------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        | Apple                      |                    |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      | 12U14507                   |                    |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           | 10/02/12                   |                    |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  | Chin Pang                  |                    |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  | EUT(C12) WITH AC ACAPTER   |                    |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           | TX, 850MHz BAND EGPRS MODE |                    |                    |                       |              |                |                |       |
| <b><u>Test Equipment:</u></b>                                                          |                            |                    |                    |                       |              |                |                |       |
| Receiving: Sunol T122 and Chamber B N-type Cable (Setup this one for testing EUT)      |                            |                    |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                            |                    |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm)        | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 824.20                                                                                 | 30.00                      | V                  | 0.5                | 0.0                   | 29.50        | 38.5           | -8.9           |       |
| 824.20                                                                                 | 18.30                      | H                  | 0.5                | 0.0                   | 17.80        | 38.5           | -20.6          |       |
| 836.60                                                                                 | 29.10                      | V                  | 0.5                | 0.0                   | 28.60        | 38.5           | -9.8           |       |
| 836.60                                                                                 | 17.75                      | H                  | 0.5                | 0.0                   | 17.25        | 38.5           | -21.2          |       |
| 848.80                                                                                 | 28.81                      | V                  | 0.5                | 0.0                   | 28.31        | 38.5           | -10.1          |       |
| 848.80                                                                                 | 16.93                      | H                  | 0.5                | 0.0                   | 16.43        | 38.5           | -22.0          |       |
| Rev. 3.17.11                                                                           |                            |                    |                    |                       |              |                |                |       |

**GPRS (PCS Band)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber B |                     |                    |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       | Apple               |                    |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     | 12U14507            |                    |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          | 10/02/12            |                    |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 | Chin Pang           |                    |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 | EUT and AC Adapter  |                    |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          | TX, GPRS1900        |                    |                    |                       |               |                |               |       |
| <b><u>Test Equipment:</u></b>                                                         |                     |                    |                    |                       |               |                |               |       |
| Receiving: Horn T59 and Chamber B SMA Cables                                          |                     |                    |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                    |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.850                                                                                 | 24.2                | V                  | 0.85               | 8.62                  | 31.97         | 33.0           | -1.0          |       |
| 1.850                                                                                 | 14.6                | H                  | 0.85               | 8.47                  | 22.22         | 33.0           | -10.8         |       |
| 1.880                                                                                 | 24.1                | V                  | 0.85               | 8.46                  | 31.71         | 33.0           | -1.3          |       |
| 1.880                                                                                 | 14.6                | H                  | 0.85               | 8.36                  | 22.06         | 33.0           | -10.9         |       |
| 1.910                                                                                 | 24.3                | V                  | 0.85               | 8.30                  | 31.75         | 33.0           | -1.3          |       |
| 1.910                                                                                 | 14.4                | H                  | 0.85               | 8.25                  | 21.80         | 33.0           | -11.2         |       |
| Rev. 3.17.11                                                                          |                     |                    |                    |                       |               |                |               |       |

**EGPRS (PCS Band)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber B |                     |                    |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       | Apple               |                    |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     | 12U14507            |                    |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          | 10/02/12            |                    |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 | Chin Pang           |                    |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 | EUT and AC Adapter  |                    |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          | TX, EGPRS1900       |                    |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                    |                    |                       |               |                |               |       |
| Receiving: Horn T59 and Chamber B SMA Cables                                          |                     |                    |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                    |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.850                                                                                 | 22.0                | V                  | 0.85               | 8.62                  | 29.77         | 33.0           | -3.2          |       |
| 1.850                                                                                 | 13.0                | H                  | 0.85               | 8.47                  | 20.62         | 33.0           | -12.4         |       |
| 1.880                                                                                 | 22.1                | V                  | 0.85               | 8.46                  | 29.71         | 33.0           | -3.3          |       |
| 1.880                                                                                 | 13.2                | H                  | 0.85               | 8.36                  | 20.66         | 33.0           | -12.3         |       |
| 1.910                                                                                 | 21.3                | V                  | 0.85               | 8.30                  | 28.75         | 33.0           | -4.3          |       |
| 1.910                                                                                 | 13.1                | H                  | 0.85               | 8.25                  | 20.50         | 33.0           | -12.5         |       |
| Rev. 3.17.11                                                                          |                     |                    |                    |                       |               |                |               |       |

## 9.1.2. WCDMA

### REL 99 (Cellular Band)

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber B |                     |                              |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                        |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                     |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 10/02/12                     |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | Chin Pang                    |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT and AC Adapter           |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, 850MHz BAND WCDMA REL 99 |                    |                       |              |                |                |       |
|                                                                                        |                     | Average                      |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                              |                    |                       |              |                |                |       |
| Receiving: Sunol T122, and Chamber B N-type Cable (Setup this one for testing EUT)     |                     |                              |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                              |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 826.40                                                                                 | 21.90               | V                            | 0.5                | 0.0                   | 21.40        | 38.5           | -17.0          |       |
| 826.40                                                                                 | 12.20               | H                            | 0.5                | 0.0                   | 11.70        | 38.5           | -26.7          |       |
| 836.00                                                                                 | 21.60               | V                            | 0.5                | 0.0                   | 21.10        | 38.5           | -17.3          |       |
| 836.00                                                                                 | 11.80               | H                            | 0.5                | 0.0                   | 11.30        | 38.5           | -27.1          |       |
| 846.00                                                                                 | 21.61               | V                            | 0.5                | 0.0                   | 21.11        | 38.5           | -17.3          |       |
| 846.00                                                                                 | 11.90               | H                            | 0.5                | 0.0                   | 11.40        | 38.5           | -27.0          |       |
|                                                                                        |                     |                              |                    |                       |              |                |                |       |
|                                                                                        |                     |                              |                    |                       |              |                |                |       |
| Rev. 3.17.11                                                                           |                     |                              |                    |                       |              |                |                |       |

**REL 99 (PCS Band)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber B |                     |                                    |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                              |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                           |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 10/02/12                           |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | Chin Pang                          |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT and AC Adapter                 |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, UMTS, PCS band, Rel 99<br>Peak |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                    |                    |                       |               |                |               |       |
| Receiving: Horn T59, and Chamber B SMA Cables                                         |                     |                                    |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                    |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                 | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.852                                                                                 | 19.2                | V                                  | 0.85               | 8.62                  | 26.97         | 33.0           | -6.0          |       |
| 1.852                                                                                 | 13.3                | H                                  | 0.85               | 8.47                  | 20.92         | 33.0           | -12.1         |       |
| 1.880                                                                                 | 19.8                | V                                  | 0.85               | 8.46                  | 27.41         | 33.0           | -5.6          |       |
| 1.880                                                                                 | 13.9                | H                                  | 0.85               | 8.36                  | 21.36         | 33.0           | -11.6         |       |
| 1.908                                                                                 | 18.8                | V                                  | 0.85               | 8.30                  | 26.25         | 33.0           | -6.8          |       |
| 1.908                                                                                 | 13.7                | H                                  | 0.85               | 8.25                  | 21.10         | 33.0           | -11.9         |       |
| Rev. 3.17.11                                                                          |                     |                                    |                    |                       |               |                |               |       |

**HSUPA (Cellular Band)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber B |                     |                             |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|-----------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                       |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12u14507                    |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 10/02/12                    |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | Chin Pang                   |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT and AC Adapter          |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, 850MHz BAND WCDMA HSUPA |                    |                       |              |                |                |       |
|                                                                                        |                     | Average                     |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                             |                    |                       |              |                |                |       |
| Receiving: Sunol T122, and Chamber B N-type Cable (Setup this one for testing EUT)     |                     |                             |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                             |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)          | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 826.40                                                                                 | 20.90               | V                           | 0.5                | 0.0                   | 20.40        | 38.5           | -18.0          |       |
| 826.40                                                                                 | 11.70               | H                           | 0.5                | 0.0                   | 11.20        | 38.5           | -27.2          |       |
| 836.00                                                                                 | 20.70               | V                           | 0.5                | 0.0                   | 20.20        | 38.5           | -18.2          |       |
| 836.00                                                                                 | 11.40               | H                           | 0.5                | 0.0                   | 10.90        | 38.5           | -27.5          |       |
| 846.00                                                                                 | 20.41               | V                           | 0.5                | 0.0                   | 19.91        | 38.5           | -18.5          |       |
| 846.00                                                                                 | 11.30               | H                           | 0.5                | 0.0                   | 10.80        | 38.5           | -27.6          |       |
| Rev. 3.17.11                                                                           |                     |                             |                    |                       |              |                |                |       |

**HSUPA (PCS Band)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                           |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|---------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                     |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                  |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 10/02/12                  |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | Chin Pang                 |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT and AC Adapter        |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, UMTS, PCS band, HSUPA |                    |                       |               |                |               |       |
|                                                                                       |                     | Peak                      |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                           |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                           |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                           |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)        | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.852                                                                                 | 19.9                | V                         | 0.85               | 8.62                  | 27.67         | 33.0           | -5.3          |       |
| 1.852                                                                                 | 13.1                | H                         | 0.85               | 8.47                  | 20.72         | 33.0           | -12.3         |       |
| 1.880                                                                                 | 19.9                | V                         | 0.85               | 8.46                  | 27.51         | 33.0           | -5.5          |       |
| 1.880                                                                                 | 13.1                | H                         | 0.85               | 8.36                  | 20.56         | 33.0           | -12.4         |       |
| 1.908                                                                                 | 19.1                | V                         | 0.85               | 8.30                  | 26.55         | 33.0           | -6.5          |       |
| 1.908                                                                                 | 13.0                | H                         | 0.85               | 8.25                  | 20.40         | 33.0           | -12.6         |       |
| Rev. 3.17.11                                                                          |                     |                           |                    |                       |               |                |               |       |



### 9.1.3. LTE BAND 2

#### EIRP QPSK (1.4MHz Bandwidth)

#### PEAK

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                     |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Company:                                                                              |                     | Apple                               |                    |                       |               |                |               |       |
| Project #:                                                                            |                     | 12U14507                            |                    |                       |               |                |               |       |
| Date:                                                                                 |                     | 09/18/12                            |                    |                       |               |                |               |       |
| Test Engineer:                                                                        |                     | MENGISTU MEKURIA                    |                    |                       |               |                |               |       |
| Configuration:                                                                        |                     | EUT WITH AC ADAPTER                 |                    |                       |               |                |               |       |
| Mode:                                                                                 |                     | TX, LTE band 2, 1.4MHz BW_QPSK MODE |                    |                       |               |                |               |       |
| <u>Test Equipment:</u>                                                                |                     |                                     |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                     |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                     |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                  | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.851                                                                                 | 22.5                | V                                   | 0.85               | 8.62                  | 30.24         | 33.0           | -2.8          |       |
| 1.851                                                                                 | 16.7                | H                                   | 0.85               | 8.47                  | 24.32         | 33.0           | -8.7          |       |
| 1.880                                                                                 | 22.4                | V                                   | 0.85               | 8.46                  | 30.05         | 33.0           | -3.0          |       |
| 1.880                                                                                 | 17.2                | H                                   | 0.85               | 8.36                  | 24.69         | 33.0           | -8.3          |       |
| 1.909                                                                                 | 21.9                | V                                   | 0.85               | 8.30                  | 29.30         | 33.0           | -3.7          |       |
| 1.909                                                                                 | 17.5                | H                                   | 0.85               | 8.25                  | 24.90         | 33.0           | -8.1          |       |
| Rev. 3.17.11                                                                          |                     |                                     |                    |                       |               |                |               |       |

**EIRP 16QAM Band 2 (1.4 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Company:                                                                              |                     | Apple                                |                    |                       |               |                |               |       |
| Project #:                                                                            |                     | 12U14507                             |                    |                       |               |                |               |       |
| Date:                                                                                 |                     | 09/18/12                             |                    |                       |               |                |               |       |
| Test Engineer:                                                                        |                     | MENGISTU MEKURIA                     |                    |                       |               |                |               |       |
| Configuration:                                                                        |                     | EUT WITH AC ADAPTER                  |                    |                       |               |                |               |       |
| Mode:                                                                                 |                     | TX, LTE band 2, 1.4MHz BW_16QAM MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                      |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                      |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                      |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.851                                                                                 | 21.4                | V                                    | 0.85               | 8.62                  | 29.20         | 33.0           | -3.8          |       |
| 1.851                                                                                 | 15.6                | H                                    | 0.85               | 8.47                  | 23.22         | 33.0           | -9.8          |       |
| 1.880                                                                                 | 21.4                | V                                    | 0.85               | 8.46                  | 29.04         | 33.0           | -4.0          |       |
| 1.880                                                                                 | 16.1                | H                                    | 0.85               | 8.36                  | 23.59         | 33.0           | -9.4          |       |
| 1.909                                                                                 | 20.8                | V                                    | 0.85               | 8.30                  | 28.29         | 33.0           | -4.7          |       |
| 1.909                                                                                 | 16.0                | H                                    | 0.85               | 8.25                  | 23.40         | 33.0           | -9.6          |       |
| Rev. 3.17.11                                                                          |                     |                                      |                    |                       |               |                |               |       |

**LTE QPSK Band 2 (3 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                     |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                               |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                            |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                            |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                    |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                 |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 3.0MHz BW_QPSK MODE |                    |                       |               |                |               |       |
| <b><u>Test Equipment:</u></b>                                                         |                     |                                     |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                     |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                     |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                  | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.852                                                                                 | 22.1                | V                                   | 0.85               | 8.62                  | 29.89         | 33.0           | -3.1          |       |
| 1.852                                                                                 | 16.7                | H                                   | 0.85               | 8.47                  | 24.32         | 33.0           | -8.7          |       |
| 1.880                                                                                 | 22.4                | V                                   | 0.85               | 8.46                  | 30.00         | 33.0           | -3.0          |       |
| 1.880                                                                                 | 17.2                | H                                   | 0.85               | 8.36                  | 24.66         | 33.0           | -8.3          |       |
| 1.909                                                                                 | 22.1                | V                                   | 0.85               | 8.30                  | 29.59         | 33.0           | -3.4          |       |
| 1.909                                                                                 | 17.0                | H                                   | 0.85               | 8.25                  | 24.40         | 33.0           | -8.6          |       |
| Rev. 3.17.11                                                                          |                     |                                     |                    |                       |               |                |               |       |

**LTE 16QAM Band 2 (3 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                                |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                             |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                             |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                     |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                  |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 3.0MHz BW_16QAM MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                      |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                      |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                      |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.852                                                                                 | 21.2                | V                                    | 0.85               | 8.62                  | 28.93         | 33.0           | -4.1          |       |
| 1.852                                                                                 | 16.1                | H                                    | 0.85               | 8.47                  | 23.72         | 33.0           | -9.3          |       |
| 1.880                                                                                 | 21.5                | V                                    | 0.85               | 8.46                  | 29.08         | 33.0           | -3.9          |       |
| 1.880                                                                                 | 16.2                | H                                    | 0.85               | 8.36                  | 23.75         | 33.0           | -9.3          |       |
| 1.909                                                                                 | 21.3                | V                                    | 0.85               | 8.30                  | 28.72         | 33.0           | -4.3          |       |
| 1.909                                                                                 | 16.0                | H                                    | 0.85               | 8.25                  | 23.40         | 33.0           | -9.6          |       |
| Rev. 3.17.11                                                                          |                     |                                      |                    |                       |               |                |               |       |

**LTE QPSK Band 2 (5 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                     |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                               |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                            |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                            |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                    |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                 |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 5.0MHz BW_QPSK MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                     |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                     |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                     |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                  | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.853                                                                                 | 22.1                | V                                   | 0.85               | 8.62                  | 29.91         | 33.0           | -3.1          |       |
| 1.853                                                                                 | 16.8                | H                                   | 0.85               | 8.47                  | 24.42         | 33.0           | -8.6          |       |
| 1.880                                                                                 | 22.3                | V                                   | 0.85               | 8.46                  | 29.93         | 33.0           | -3.1          |       |
| 1.880                                                                                 | 17.3                | H                                   | 0.85               | 8.36                  | 24.84         | 33.0           | -8.2          |       |
| 1.908                                                                                 | 22.5                | V                                   | 0.85               | 8.30                  | 29.95         | 33.0           | -3.1          |       |
| 1.908                                                                                 | 17.0                | H                                   | 0.85               | 8.25                  | 24.40         | 33.0           | -8.6          |       |
| Rev. 3.17.11                                                                          |                     |                                     |                    |                       |               |                |               |       |

**LTE 16QAM Band 2 (5 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                                |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                             |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                             |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                     |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                  |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 5.0MHz BW_16QAM MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                      |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Camber A SMA Cables                                          |                     |                                      |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                      |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.853                                                                                 | 21.3                | V                                    | 0.85               | 8.62                  | 29.06         | 33.0           | -3.9          |       |
| 1.853                                                                                 | 16.2                | H                                    | 0.85               | 8.47                  | 23.82         | 33.0           | -9.2          |       |
| 1.880                                                                                 | 21.4                | V                                    | 0.85               | 8.46                  | 28.99         | 33.0           | -4.0          |       |
| 1.880                                                                                 | 16.4                | H                                    | 0.85               | 8.36                  | 23.93         | 33.0           | -9.1          |       |
| 1.908                                                                                 | 21.5                | V                                    | 0.85               | 8.30                  | 28.98         | 33.0           | -4.0          |       |
| 1.908                                                                                 | 16.0                | H                                    | 0.85               | 8.25                  | 23.40         | 33.0           | -9.6          |       |
| Rev. 3.17.11                                                                          |                     |                                      |                    |                       |               |                |               |       |

**LTE QPSK Band 2 (10 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                                |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                             |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                             |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                     |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                  |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 10.0MHz BW_QPSK MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                      |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                      |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                      |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.855                                                                                 | 22.2                | V                                    | 0.85               | 8.62                  | 29.95         | 33.0           | -3.1          |       |
| 1.855                                                                                 | 16.8                | H                                    | 0.85               | 8.47                  | 24.42         | 33.0           | -8.6          |       |
| 1.880                                                                                 | 22.2                | V                                    | 0.85               | 8.46                  | 29.81         | 33.0           | -3.2          |       |
| 1.880                                                                                 | 17.3                | H                                    | 0.85               | 8.36                  | 24.85         | 33.0           | -8.2          |       |
| 1.905                                                                                 | 22.9                | V                                    | 0.85               | 8.30                  | 30.31         | 33.0           | -2.7          |       |
| 1.905                                                                                 | 17.0                | H                                    | 0.85               | 8.25                  | 24.40         | 33.0           | -8.6          |       |
| Rev. 3.17.11                                                                          |                     |                                      |                    |                       |               |                |               |       |

**LTE 16QAM Band 2 (10 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                       |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|---------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                                 |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                              |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                              |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                      |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                   |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 10.0MHz BW_16QAM MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                       |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                       |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                       |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                    | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.855                                                                                 | 21.2                | V                                     | 0.85               | 8.62                  | 28.97         | 33.0           | -4.0          |       |
| 1.855                                                                                 | 15.9                | H                                     | 0.85               | 8.47                  | 23.52         | 33.0           | -9.5          |       |
| 1.880                                                                                 | 21.1                | V                                     | 0.85               | 8.46                  | 28.75         | 33.0           | -4.3          |       |
| 1.880                                                                                 | 16.3                | H                                     | 0.85               | 8.36                  | 23.84         | 33.0           | -9.2          |       |
| 1.905                                                                                 | 21.8                | V                                     | 0.85               | 8.30                  | 29.29         | 33.0           | -3.7          |       |
| 1.905                                                                                 | 16.0                | H                                     | 0.85               | 8.25                  | 23.40         | 33.0           | -9.6          |       |
| Rev. 3.17.11                                                                          |                     |                                       |                    |                       |               |                |               |       |



**LTE QPSK Band 2 (15 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                                |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                             |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                             |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                     |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                  |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 15.0MHz BW_QPSK MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                      |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                      |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                      |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.858                                                                                 | 22.0                | V                                    | 0.85               | 8.62                  | 29.72         | 33.0           | -3.3          |       |
| 1.858                                                                                 | 16.6                | H                                    | 0.85               | 8.47                  | 24.22         | 33.0           | -8.8          |       |
| 1.880                                                                                 | 21.6                | V                                    | 0.85               | 8.46                  | 29.16         | 33.0           | -3.8          |       |
| 1.880                                                                                 | 17.1                | H                                    | 0.85               | 8.36                  | 24.64         | 33.0           | -8.4          |       |
| 1.903                                                                                 | 22.7                | V                                    | 0.85               | 8.30                  | 30.15         | 33.0           | -2.9          |       |
| 1.903                                                                                 | 17.4                | H                                    | 0.85               | 8.25                  | 24.80         | 33.0           | -8.2          |       |
| Rev. 3.17.11                                                                          |                     |                                      |                    |                       |               |                |               |       |

**LTE 16QAM Band 2 (15 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                       |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|---------------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                                 |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                              |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/18/12                              |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA                      |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER                   |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE band 2, 15.0MHz BW_16QAM MODE |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                       |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                       |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                     |                                       |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                    | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.858                                                                                 | 21.0                | V                                     | 0.85               | 8.62                  | 28.81         | 33.0           | -4.2          |       |
| 1.858                                                                                 | 15.5                | H                                     | 0.85               | 8.47                  | 23.12         | 33.0           | -9.9          |       |
| 1.880                                                                                 | 20.6                | V                                     | 0.85               | 8.46                  | 28.18         | 33.0           | -4.8          |       |
| 1.880                                                                                 | 16.1                | H                                     | 0.85               | 8.36                  | 23.56         | 33.0           | -9.4          |       |
| 1.903                                                                                 | 21.8                | V                                     | 0.85               | 8.30                  | 29.21         | 33.0           | -3.8          |       |
| 1.903                                                                                 | 16.0                | H                                     | 0.85               | 8.25                  | 23.40         | 33.0           | -9.6          |       |
| Rev. 3.17.11                                                                          |                     |                                       |                    |                       |               |                |               |       |

**LTE QPSK Band 2 (20 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                                    |                    |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       | Apple                              |                    |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     | 12U14507                           |                    |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          | 09/18/12                           |                    |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 | MENGISTU MEKURIA                   |                    |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 | EUT WITH AC ADAPTER                |                    |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          | TX, LTE band 2, 20MHz BW_QPSK MODE |                    |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                                    |                    |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                                    |                    |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                                    |                    |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm)                | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.855                                                                                 | 22.3                               | V                  | 0.85               | 8.62                  | 30.09         | 33.0           | -2.9          |       |
| 1.855                                                                                 | 15.8                               | H                  | 0.85               | 8.47                  | 23.42         | 33.0           | -9.6          |       |
| 1.880                                                                                 | 21.8                               | V                  | 0.85               | 8.46                  | 29.36         | 33.0           | -3.6          |       |
| 1.880                                                                                 | 16.4                               | H                  | 0.85               | 8.36                  | 23.94         | 33.0           | -9.1          |       |
| 1.910                                                                                 | 22.8                               | V                  | 0.85               | 8.30                  | 30.21         | 33.0           | -2.8          |       |
| 1.910                                                                                 | 16.5                               | H                  | 0.85               | 8.25                  | 23.90         | 33.0           | -9.1          |       |
| Rev. 3.17.11                                                                          |                                    |                    |                    |                       |               |                |               |       |

**LTE 16QAM Band 2 (20 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                                     |                    |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|-------------------------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Company:                                                                              | Apple                               |                    |                    |                       |               |                |               |       |
| Project #:                                                                            | 12U14507                            |                    |                    |                       |               |                |               |       |
| Date:                                                                                 | 09/18/12                            |                    |                    |                       |               |                |               |       |
| Test Engineer:                                                                        | MENGISTU MEKURIA                    |                    |                    |                       |               |                |               |       |
| Configuration:                                                                        | EUT WITH AC ADAPTER                 |                    |                    |                       |               |                |               |       |
| Mode:                                                                                 | TX, LTE band 2, 20MHz BW_16QAM MODE |                    |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                                     |                    |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                                     |                    |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 4ft SMA Cable (244639001) Warehouse             |                                     |                    |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm)                 | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.855                                                                                 | 21.3                                | V                  | 0.85               | 8.62                  | 29.09         | 33.0           | -3.9          |       |
| 1.855                                                                                 | 15.7                                | H                  | 0.85               | 8.47                  | 23.32         | 33.0           | -9.7          |       |
| 1.880                                                                                 | 20.8                                | V                  | 0.85               | 8.46                  | 28.41         | 33.0           | -4.6          |       |
| 1.880                                                                                 | 16.2                                | H                  | 0.85               | 8.36                  | 23.73         | 33.0           | -9.3          |       |
| 1.910                                                                                 | 21.8                                | V                  | 0.85               | 8.30                  | 29.21         | 33.0           | -3.8          |       |
| 1.910                                                                                 | 16.4                                | H                  | 0.85               | 8.25                  | 23.80         | 33.0           | -9.2          |       |
| Rev. 3.17.11                                                                          |                                     |                    |                    |                       |               |                |               |       |

#### 9.1.4. LTE BAND 4

##### LTE QPSK Band 4 (1.4 MHz BANDWIDTH)

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                          |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                       |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                       |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA               |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER            |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 1.4MHz BW_QPSK |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                                |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.711                                                                                 | 21.8                | V                              | 0.67               | 8.56                  | 29.69         | 30.0           | -0.3          |       |
| 1.711                                                                                 | 12.8                | H                              | 0.67               | 8.43                  | 20.56         | 30.0           | -9.4          |       |
| 1.733                                                                                 | 21.2                | V                              | 0.67               | 8.64                  | 29.17         | 30.0           | -0.8          |       |
| 1.733                                                                                 | 13.0                | H                              | 0.67               | 8.48                  | 20.79         | 30.0           | -9.2          |       |
| 1.754                                                                                 | 21.1                | V                              | 0.67               | 8.73                  | 29.16         | 30.0           | -0.8          |       |
| 1.754                                                                                 | 13.0                | H                              | 0.67               | 8.54                  | 20.87         | 30.0           | -9.1          |       |
| Rev. 1.24.7                                                                           |                     |                                |                    |                       |               |                |               |       |

**LTE 16QAM Band 4 (1.4 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                 |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|---------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Company:                                                                              |                     | Apple                           |                    |                       |               |                |               |       |
| Project #:                                                                            |                     | 12U14507                        |                    |                       |               |                |               |       |
| Date:                                                                                 |                     | 09/19/12                        |                    |                       |               |                |               |       |
| Test Engineer:                                                                        |                     | MENGISTU MEKURIA                |                    |                       |               |                |               |       |
| Configuration:                                                                        |                     | EUT WITH AC ADAPTER             |                    |                       |               |                |               |       |
| Mode:                                                                                 |                     | TX, LTE BAND 4, 1.4MHz BW_16QAM |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                 |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                 |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                                 |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)              | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.711                                                                                 | 20.9                | V                               | 0.67               | 8.56                  | 28.79         | 30.0           | -1.2          |       |
| 1.711                                                                                 | 11.9                | H                               | 0.67               | 8.43                  | 19.66         | 30.0           | -10.3         |       |
| 1.733                                                                                 | 20.2                | V                               | 0.67               | 8.64                  | 28.18         | 30.0           | -1.8          |       |
| 1.733                                                                                 | 12.0                | H                               | 0.67               | 8.48                  | 19.81         | 30.0           | -10.2         |       |
| 1.754                                                                                 | 20.3                | V                               | 0.67               | 8.73                  | 28.36         | 30.0           | -1.6          |       |
| 1.754                                                                                 | 11.8                | H                               | 0.67               | 8.54                  | 19.67         | 30.0           | -10.3         |       |
| Rev. 1.24.7                                                                           |                     |                                 |                    |                       |               |                |               |       |

**LTE QPSK Band 4 (3 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                              |                    |                       |               |                |               |       |  |
|---------------------------------------------------------------------------------------|---------------------|------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--|
| <b>Company:</b>                                                                       |                     | Apple                        |                    |                       |               |                |               |       |  |
| <b>Project #:</b>                                                                     |                     | 12U14507                     |                    |                       |               |                |               |       |  |
| <b>Date:</b>                                                                          |                     | 09/19/12                     |                    |                       |               |                |               |       |  |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA             |                    |                       |               |                |               |       |  |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER          |                    |                       |               |                |               |       |  |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 3MHz BW_QPSK |                    |                       |               |                |               |       |  |
| <b>Test Equipment:</b>                                                                |                     |                              |                    |                       |               |                |               |       |  |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                              |                    |                       |               |                |               |       |  |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                              |                    |                       |               |                |               |       |  |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |  |
| 1.7115                                                                                | 21.5                | V                            | 0.67               | 8.56                  | 29.39         | 30.0           | -0.6          |       |  |
| 1.7115                                                                                | 12.7                | H                            | 0.67               | 8.43                  | 20.46         | 30.0           | -9.5          |       |  |
| 1.7325                                                                                | 20.9                | V                            | 0.67               | 8.64                  | 28.91         | 30.0           | -1.1          |       |  |
| 1.7325                                                                                | 13.0                | H                            | 0.67               | 8.48                  | 20.77         | 30.0           | -9.2          |       |  |
| 1.7535                                                                                | 20.8                | V                            | 0.67               | 8.73                  | 28.86         | 30.0           | -1.1          |       |  |
| 1.7535                                                                                | 13.0                | H                            | 0.67               | 8.54                  | 20.87         | 30.0           | -9.1          |       |  |
| Rev. 1.24.7                                                                           |                     |                              |                    |                       |               |                |               |       |  |

**LTE 16QAM Band 4 (3 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                               |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                         |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                      |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                      |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA              |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER           |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 3MHz BW_16QAM |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                               |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                               |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                               |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7115                                                                                | 20.6                | V                             | 0.67               | 8.56                  | 28.49         | 30.0           | -1.5          |       |
| 1.7115                                                                                | 11.6                | H                             | 0.67               | 8.43                  | 19.36         | 30.0           | -10.6         |       |
| 1.7325                                                                                | 20.0                | V                             | 0.67               | 8.64                  | 27.97         | 30.0           | -2.0          |       |
| 1.7325                                                                                | 12.0                | H                             | 0.67               | 8.48                  | 19.83         | 30.0           | -10.2         |       |
| 1.7535                                                                                | 19.9                | V                             | 0.67               | 8.73                  | 27.96         | 30.0           | -2.0          |       |
| 1.7535                                                                                | 12.2                | H                             | 0.67               | 8.54                  | 20.07         | 30.0           | -9.9          |       |
| Rev. 1.24.7                                                                           |                     |                               |                    |                       |               |                |               |       |



**LTE QPSK Band 4 (5 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                              |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                        |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                     |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                     |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA             |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER          |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 5MHz BW_QPSK |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                              |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                              |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                              |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7125                                                                                | 21.4                | V                            | 0.67               | 8.56                  | 29.29         | 30.0           | -0.7          |       |
| 1.7125                                                                                | 12.7                | H                            | 0.67               | 8.43                  | 20.46         | 30.0           | -9.5          |       |
| 1.7325                                                                                | 21.3                | V                            | 0.67               | 8.64                  | 29.25         | 30.0           | -0.8          |       |
| 1.7325                                                                                | 13.1                | H                            | 0.67               | 8.48                  | 20.94         | 30.0           | -9.1          |       |
| 1.7525                                                                                | 21.1                | V                            | 0.67               | 8.73                  | 29.16         | 30.0           | -0.8          |       |
| 1.7525                                                                                | 12.9                | H                            | 0.67               | 8.54                  | 20.77         | 30.0           | -9.2          |       |
| Rev. 1.24.7                                                                           |                     |                              |                    |                       |               |                |               |       |

**LTE 16QAM Band 4 (5 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                               |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Company:                                                                              |                     | Apple                         |                    |                       |               |                |               |       |
| Project #:                                                                            |                     | 12U14507                      |                    |                       |               |                |               |       |
| Date:                                                                                 |                     | 09/19/12                      |                    |                       |               |                |               |       |
| Test Engineer:                                                                        |                     | MENGISTU MEKURIA              |                    |                       |               |                |               |       |
| Configuration:                                                                        |                     | EUT WITH AC ADAPTER           |                    |                       |               |                |               |       |
| Mode:                                                                                 |                     | TX, LTE BAND 4, 5MHz BW_16QAM |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                               |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                               |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                               |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7125                                                                                | 20.4                | V                             | 0.67               | 8.56                  | 28.29         | 30.0           | -1.7          |       |
| 1.7125                                                                                | 11.7                | H                             | 0.67               | 8.43                  | 19.46         | 30.0           | -10.5         |       |
| 1.7325                                                                                | 20.3                | V                             | 0.67               | 8.64                  | 28.30         | 30.0           | -1.7          |       |
| 1.7325                                                                                | 12.1                | H                             | 0.67               | 8.48                  | 19.90         | 30.0           | -10.1         |       |
| 1.7525                                                                                | 20.1                | V                             | 0.67               | 8.73                  | 28.16         | 30.0           | -1.8          |       |
| 1.7525                                                                                | 12.9                | H                             | 0.67               | 8.54                  | 20.77         | 30.0           | -9.2          |       |
| Rev. 1.24.7                                                                           |                     |                               |                    |                       |               |                |               |       |

**LTE QPSK Band 4 (10 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                               |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                         |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                      |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                      |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA              |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER           |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 10MHz BW_QPSK |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                               |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                               |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                               |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7150                                                                                | 21.7                | V                             | 0.67               | 8.56                  | 29.59         | 30.0           | -0.4          |       |
| 1.7150                                                                                | 12.9                | H                             | 0.67               | 8.43                  | 20.66         | 30.0           | -9.3          |       |
| 1.7325                                                                                | 21.1                | V                             | 0.67               | 8.64                  | 29.07         | 30.0           | -0.9          |       |
| 1.7325                                                                                | 13.1                | H                             | 0.67               | 8.48                  | 20.86         | 30.0           | -9.1          |       |
| 1.7500                                                                                | 21.1                | V                             | 0.67               | 8.73                  | 29.16         | 30.0           | -0.8          |       |
| 1.7500                                                                                | 12.8                | H                             | 0.67               | 8.54                  | 20.67         | 30.0           | -9.3          |       |
| Rev. 1.24.7                                                                           |                     |                               |                    |                       |               |                |               |       |

**LTE 16QAM Band 4 (10 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                          |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                       |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                       |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA               |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER            |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 10MHz BW_16QAM |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                                |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7150                                                                                | 20.7                | V                              | 0.67               | 8.56                  | 28.59         | 30.0           | -1.4          |       |
| 1.7150                                                                                | 10.9                | H                              | 0.67               | 8.43                  | 18.66         | 30.0           | -11.3         |       |
| 1.7325                                                                                | 20.1                | V                              | 0.67               | 8.64                  | 28.07         | 30.0           | -1.9          |       |
| 1.7325                                                                                | 11.3                | H                              | 0.67               | 8.48                  | 19.11         | 30.0           | -10.9         |       |
| 1.7500                                                                                | 20.1                | V                              | 0.67               | 8.73                  | 28.16         | 30.0           | -1.8          |       |
| 1.7500                                                                                | 11.3                | H                              | 0.67               | 8.54                  | 19.17         | 30.0           | -10.8         |       |
| Rev. 1.24.7                                                                           |                     |                                |                    |                       |               |                |               |       |

**LTE QPSK Band 4 (15 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                               |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Company:                                                                              |                     | Apple                         |                    |                       |               |                |               |       |
| Project #:                                                                            |                     | 12U14507                      |                    |                       |               |                |               |       |
| Date:                                                                                 |                     | 09/19/12                      |                    |                       |               |                |               |       |
| Test Engineer:                                                                        |                     | MENGISTU MEKURIA              |                    |                       |               |                |               |       |
| Configuration:                                                                        |                     | EUT WITH AC ADAPTER           |                    |                       |               |                |               |       |
| Mode:                                                                                 |                     | TX, LTE BAND 4, 15MHz BW_QPSK |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                               |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                               |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                               |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7175                                                                                | 21.3                | V                             | 0.67               | 8.56                  | 29.19         | 30.0           | -0.8          |       |
| 1.7175                                                                                | 13.4                | H                             | 0.67               | 8.43                  | 21.16         | 30.0           | -8.8          |       |
| 1.7325                                                                                | 20.9                | V                             | 0.67               | 8.64                  | 28.87         | 30.0           | -1.1          |       |
| 1.7325                                                                                | 13.8                | H                             | 0.67               | 8.48                  | 21.61         | 30.0           | -8.4          |       |
| 1.7475                                                                                | 20.8                | V                             | 0.67               | 8.73                  | 28.86         | 30.0           | -1.1          |       |
| 1.7475                                                                                | 13.5                | H                             | 0.67               | 8.54                  | 21.37         | 30.0           | -8.6          |       |
| Rev. 1.24.7                                                                           |                     |                               |                    |                       |               |                |               |       |

**LTE 16QAM Band 4 (15 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                                |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                          |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                       |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                       |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA               |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER            |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 15MHz BW_16QAM |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                                |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                                |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                                |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7175                                                                                | 20.3                | V                              | 0.67               | 8.56                  | 28.19         | 30.0           | -1.8          |       |
| 1.7175                                                                                | 11.6                | H                              | 0.67               | 8.43                  | 19.36         | 30.0           | -10.6         |       |
| 1.7325                                                                                | 19.9                | V                              | 0.67               | 8.64                  | 27.87         | 30.0           | -2.1          |       |
| 1.7325                                                                                | 11.9                | H                              | 0.67               | 8.48                  | 19.71         | 30.0           | -10.3         |       |
| 1.7475                                                                                | 19.8                | V                              | 0.67               | 8.73                  | 27.86         | 30.0           | -2.1          |       |
| 1.7475                                                                                | 11.8                | H                              | 0.67               | 8.54                  | 19.67         | 30.0           | -10.3         |       |
| Rev. 1.24.7                                                                           |                     |                                |                    |                       |               |                |               |       |

**LTE QPSK Band 4 (20 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                     |                               |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------|-------------------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       |                     | Apple                         |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     |                     | 12U14507                      |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          |                     | 09/19/12                      |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 |                     | MENGISTU MEKURIA              |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 |                     | EUT WITH AC ADAPTER           |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          |                     | TX, LTE BAND 4, 20MHz BW_QPSK |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                     |                               |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                     |                               |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                     |                               |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7200                                                                                | 21.4                | V                             | 0.67               | 8.56                  | 29.29         | 30.0           | -0.7          |       |
| 1.7200                                                                                | 12.9                | H                             | 0.67               | 8.43                  | 20.66         | 30.0           | -9.3          |       |
| 1.7325                                                                                | 20.6                | V                             | 0.67               | 8.64                  | 28.57         | 30.0           | -1.4          |       |
| 1.7325                                                                                | 13.2                | H                             | 0.67               | 8.48                  | 20.97         | 30.0           | -9.0          |       |
| 1.7450                                                                                | 20.6                | V                             | 0.67               | 8.73                  | 28.66         | 30.0           | -1.3          |       |
| 1.7450                                                                                | 12.9                | H                             | 0.67               | 8.54                  | 20.72         | 30.0           | -9.3          |       |
| Rev. 1.24.7                                                                           |                     |                               |                    |                       |               |                |               |       |

**LTE 16QAM Band4 (20 MHz BANDWIDTH)**

| High Frequency Fundamental Measurement<br>Compliance Certification Services Chamber A |                                 |                    |                    |                       |               |                |               |       |
|---------------------------------------------------------------------------------------|---------------------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                       | Apple                           |                    |                    |                       |               |                |               |       |
| <b>Project #:</b>                                                                     | 12U14507                        |                    |                    |                       |               |                |               |       |
| <b>Date:</b>                                                                          | 09/19/12                        |                    |                    |                       |               |                |               |       |
| <b>Test Engineer:</b>                                                                 | MENGISTU MEKURIA                |                    |                    |                       |               |                |               |       |
| <b>Configuration:</b>                                                                 | EUT WITH AC ADAPTER             |                    |                    |                       |               |                |               |       |
| <b>Mode:</b>                                                                          | TX, LTE BAND 4, 20MHz BW, 16QAM |                    |                    |                       |               |                |               |       |
| <b>Test Equipment:</b>                                                                |                                 |                    |                    |                       |               |                |               |       |
| Receiving: Horn T73, and Chamber A SMA Cables                                         |                                 |                    |                    |                       |               |                |               |       |
| Substitution: Horn T217 Substitution, 6ft SMA Cable (244640002) Warehouse             |                                 |                    |                    |                       |               |                |               |       |
| f<br>GHz                                                                              | SG reading<br>(dBm)             | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| 1.7200                                                                                | 20.4                            | V                  | 0.67               | 8.56                  | 28.29         | 30.0           | -1.7          |       |
| 1.7200                                                                                | 12.0                            | H                  | 0.67               | 8.43                  | 19.76         | 30.0           | -10.2         |       |
| 1.7325                                                                                | 19.8                            | V                  | 0.67               | 8.64                  | 27.77         | 30.0           | -2.2          |       |
| 1.7325                                                                                | 12.2                            | H                  | 0.67               | 8.48                  | 20.05         | 30.0           | -10.0         |       |
| 1.7450                                                                                | 19.8                            | V                  | 0.67               | 8.73                  | 27.86         | 30.0           | -2.1          |       |
| 1.7450                                                                                | 11.9                            | H                  | 0.67               | 8.54                  | 19.76         | 30.0           | -10.2         |       |
| Rev. 1.24.7                                                                           |                                 |                    |                    |                       |               |                |               |       |



### 9.1.5. LTE BAND 5

#### LTE QPSK Band 5 (1.4 MHz BANDWIDTH)

#### AVERAGE

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                                     |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|-------------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                               |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                            |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/17/12                            |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA                    |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT WITH AC ADAPTER                 |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, LTE band 5, 1.4MHz BW_QPSK MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                                     |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                     |                                     |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                                     |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                  | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 824.70                                                                                 | 21.47               | V                                   | 0.5                | 0.0                   | 20.97        | 38.5           | -17.5          |       |
| 824.70                                                                                 | 16.13               | H                                   | 0.5                | 0.0                   | 15.63        | 38.5           | -22.8          |       |
| 836.50                                                                                 | 21.64               | V                                   | 0.5                | 0.0                   | 21.14        | 38.5           | -17.3          |       |
| 836.50                                                                                 | 15.88               | H                                   | 0.5                | 0.0                   | 15.38        | 38.5           | -23.1          |       |
| 848.30                                                                                 | 21.50               | V                                   | 0.5                | 0.0                   | 21.00        | 38.5           | -17.4          |       |
| 848.30                                                                                 | 16.53               | H                                   | 0.5                | 0.0                   | 16.03        | 38.5           | -22.4          |       |

**LTE QPSK Band 5 (1.4 MHz BANDWIDTH)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                                |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                             |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/17/12                             |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA                     |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT WITH AC ADAPTER                  |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, LTE band 5, 1.4MHz BW_16QAM MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                                      |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                     |                                      |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                                      |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 824.70                                                                                 | 20.47               | V                                    | 0.5                | 0.0                   | 19.97        | 38.5           | -18.5          |       |
| 824.70                                                                                 | 16.13               | H                                    | 0.5                | 0.0                   | 15.63        | 38.5           | -22.8          |       |
| 836.50                                                                                 | 20.44               | V                                    | 0.5                | 0.0                   | 19.94        | 38.5           | -18.5          |       |
| 836.50                                                                                 | 15.88               | H                                    | 0.5                | 0.0                   | 15.38        | 38.5           | -23.1          |       |
| 848.30                                                                                 | 20.00               | V                                    | 0.5                | 0.0                   | 19.50        | 38.5           | -18.9          |       |
| 848.30                                                                                 | 16.53               | H                                    | 0.5                | 0.0                   | 16.03        | 38.5           | -22.4          |       |

**LTE QPSK Band 5 (3 MHz BANDWIDTH)****High Frequency Substitution Measurement  
Compliance Certification Services Chamber A**

**Company:** Apple  
**Project #:** 12U14507  
**Date:** 09/17/12  
**Test Engineer:** MENGISTU MEKURIA  
**Configuration:** EUT WITH AC ADAPTER  
**Mode:** TX, LTE band 5, 3.0MHz BW\_QPSK MODE

**Test Equipment:**

Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)

Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| 825.50   | 21.67               | V                  | 0.5                | 0.0                   | 21.17        | 38.5           | -17.3          |       |
| 825.50   | 16.23               | H                  | 0.5                | 0.0                   | 15.73        | 38.5           | -22.7          |       |
| 836.50   | 21.64               | V                  | 0.5                | 0.0                   | 21.14        | 38.5           | -17.3          |       |
| 836.50   | 15.53               | H                  | 0.5                | 0.0                   | 15.03        | 38.5           | -23.4          |       |
| 847.50   | 21.21               | V                  | 0.5                | 0.0                   | 20.71        | 38.5           | -17.7          |       |
| 847.50   | 16.51               | H                  | 0.5                | 0.0                   | 16.01        | 38.5           | -22.4          |       |

**LTE 16QAM Band 5 (3 MHz BANDWIDTH)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                                |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                             |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/17/12                             |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA                     |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT WITH AC ADAPTER                  |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, LTE band 5, 3.0MHz BW_16QAM MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                                      |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                     |                                      |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                                      |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 825.50                                                                                 | 20.77               | V                                    | 0.5                | 0.0                   | 20.27        | 38.5           | -18.2          |       |
| 825.50                                                                                 | 16.23               | H                                    | 0.5                | 0.0                   | 15.73        | 38.5           | -22.7          |       |
| 836.50                                                                                 | 21.04               | V                                    | 0.5                | 0.0                   | 20.54        | 38.5           | -17.9          |       |
| 836.50                                                                                 | 15.53               | H                                    | 0.5                | 0.0                   | 15.03        | 38.5           | -23.4          |       |
| 847.50                                                                                 | 20.41               | V                                    | 0.5                | 0.0                   | 19.91        | 38.5           | -18.5          |       |
| 847.50                                                                                 | 16.51               | H                                    | 0.5                | 0.0                   | 16.01        | 38.5           | -22.4          |       |

**LTE QPSK Band 5 (5 MHz BANDWIDTH)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                                     |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|-------------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                               |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                            |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/17/12                            |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA                    |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT WITH AC ADAPTER                 |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, LTE band 5, 5.0MHz BW_QPSK MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                                     |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                     |                                     |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                                     |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                  | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 826.50                                                                                 | 21.37               | V                                   | 0.5                | 0.0                   | 20.87        | 38.5           | -17.6          |       |
| 826.50                                                                                 | 16.40               | H                                   | 0.5                | 0.0                   | 15.90        | 38.5           | -22.5          |       |
| 836.50                                                                                 | 21.64               | V                                   | 0.5                | 0.0                   | 21.14        | 38.5           | -17.3          |       |
| 836.50                                                                                 | 15.51               | H                                   | 0.5                | 0.0                   | 15.01        | 38.5           | -23.4          |       |
| 846.50                                                                                 | 21.41               | V                                   | 0.5                | 0.0                   | 20.91        | 38.5           | -17.5          |       |
| 846.50                                                                                 | 16.40               | H                                   | 0.5                | 0.0                   | 15.90        | 38.5           | -22.5          |       |

**LTE 16QAM Band 5 (5 MHz BANDWIDTH)****High Frequency Substitution Measurement  
Compliance Certification Services Chamber A**

**Company:** Apple  
**Project #:** 12U14507  
**Date:** 09/17/12  
**Test Engineer:** MENGISTU MEKURIA  
**Configuration:** EUT WITH AC ADAPTER  
**Mode:** TX, LTE band 5, 5.0MHz BW\_16QAM MODE

**Test Equipment:**

**Receiving:** Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)

**Substitution:** Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| 826.50   | 20.47               | V                  | 0.5                | 0.0                   | 19.97        | 38.5           | -18.5          |       |
| 826.50   | 16.40               | H                  | 0.5                | 0.0                   | 15.90        | 38.5           | -22.5          |       |
| 836.50   | 20.64               | V                  | 0.5                | 0.0                   | 20.14        | 38.5           | -18.3          |       |
| 836.50   | 15.51               | H                  | 0.5                | 0.0                   | 15.01        | 38.5           | -23.4          |       |
| 846.50   | 20.61               | V                  | 0.5                | 0.0                   | 20.11        | 38.5           | -18.3          |       |
| 846.50   | 16.40               | H                  | 0.5                | 0.0                   | 15.90        | 38.5           | -22.5          |       |

**LTE QPSK Band 5 (10 MHz BANDWIDTH)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                                |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                             |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/17/12                             |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA                     |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT WITH AC ADAPTER                  |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, LTE band 5, 10.0MHz BW_QPSK MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                                      |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                     |                                      |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                                      |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 829.00                                                                                 | 21.67               | V                                    | 0.5                | 0.0                   | 21.17        | 38.5           | -17.3          |       |
| 829.00                                                                                 | 16.16               | H                                    | 0.5                | 0.0                   | 15.66        | 38.5           | -22.8          |       |
| 836.50                                                                                 | 21.74               | V                                    | 0.5                | 0.0                   | 21.24        | 38.5           | -17.2          |       |
| 836.50                                                                                 | 15.24               | H                                    | 0.5                | 0.0                   | 14.74        | 38.5           | -23.7          |       |
| 844.00                                                                                 | 21.51               | V                                    | 0.5                | 0.0                   | 21.01        | 38.5           | -17.4          |       |
| 844.00                                                                                 | 16.75               | H                                    | 0.5                | 0.0                   | 16.25        | 38.5           | -22.2          |       |

**LTE 16QAM Band 5 (10 MHz BANDWIDTH)****High Frequency Substitution Measurement  
Compliance Certification Services Chamber A**

**Company:** Apple  
**Project #:** 12U14507  
**Date:** 09/17/12  
**Test Engineer:** MENGISTU MEKURIA  
**Configuration:** EUT WITH AC ADAPTER  
**Mode:** TX, LTE band 5, 10.0MHz BW\_16QAM MODE

**Test Equipment:**

Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)

Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| 829.00   | 20.97               | V                  | 0.5                | 0.0                   | 20.47        | 38.5           | -18.0          |       |
| 829.00   | 16.16               | H                  | 0.5                | 0.0                   | 15.66        | 38.5           | -22.8          |       |
| 836.50   | 20.94               | V                  | 0.5                | 0.0                   | 20.44        | 38.5           | -18.0          |       |
| 836.50   | 15.24               | H                  | 0.5                | 0.0                   | 14.74        | 38.5           | -23.7          |       |
| 844.00   | 20.61               | V                  | 0.5                | 0.0                   | 20.11        | 38.5           | -18.3          |       |
| 844.00   | 16.75               | H                  | 0.5                | 0.0                   | 16.25        | 38.5           | -22.2          |       |
|          |                     |                    |                    |                       |              |                |                |       |



## 9.1.6. LTE BAND 17

### LTE QPSK, Band 17 (5 MHz BANDWIDTH)

#### AVERAGE

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                     |                                      |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------|--------------------------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        |                     | Apple                                |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      |                     | 12U14507                             |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           |                     | 09/17/12                             |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  |                     | MENGISTU MEKURIA                     |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  |                     | EUT WITH AC ADAPTER                  |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           |                     | TX, LTE band 17, 5.0MHz BW_QPSK MODE |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                     |                                      |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                     |                                      |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                     |                                      |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                   | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 706.50                                                                                 | 22.45               | V                                    | 0.5                | 0.0                   | 21.95        | 34.8           | -12.9          |       |
| 706.50                                                                                 | 16.31               | H                                    | 0.5                | 0.0                   | 15.81        | 34.8           | -19.0          |       |
| 710.00                                                                                 | 21.58               | V                                    | 0.5                | 0.0                   | 21.08        | 34.8           | -13.7          |       |
| 710.00                                                                                 | 15.69               | H                                    | 0.5                | 0.0                   | 15.19        | 34.8           | -19.6          |       |
| 713.50                                                                                 | 21.79               | V                                    | 0.5                | 0.0                   | 21.29        | 34.8           | -13.5          |       |
| 713.50                                                                                 | 16.10               | H                                    | 0.5                | 0.0                   | 15.60        | 34.8           | -19.2          |       |
| Rev. 3.17.11                                                                           |                     |                                      |                    |                       |              |                |                |       |

**LTE 16QAM Band 17 (5 MHz BANDWIDTH)****High Frequency Substitution Measurement  
Compliance Certification Services Chamber A**

**Company:** Apple  
**Project #:** 12U14507  
**Date:** 09/17/12  
**Test Engineer:** MENGISTU MEKURIA  
**Configuration:** EUT WITH AC ADAPTER  
**Mode:** TX, LTE band 17, 5.0MHz BW\_16QAM MODE

**Test Equipment:**

**Receiving:** Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)

**Substitution:** Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| 706.50   | 21.37               | V                  | 0.5                | 0.0                   | 20.87        | 34.8           | -13.9          |       |
| 706.50   | 15.24               | H                  | 0.5                | 0.0                   | 14.74        | 34.8           | -20.1          |       |
| 710.00   | 20.99               | V                  | 0.5                | 0.0                   | 20.49        | 34.8           | -14.3          |       |
| 710.00   | 15.22               | H                  | 0.5                | 0.0                   | 14.72        | 34.8           | -20.1          |       |
| 713.50   | 21.03               | V                  | 0.5                | 0.0                   | 20.53        | 34.8           | -14.3          |       |
| 713.50   | 15.26               | H                  | 0.5                | 0.0                   | 14.76        | 34.8           | -20.0          |       |

Rev. 3.17.11

**LTE QPSK Band 17 (10 MHz BANDWIDTH)**

| High Frequency Substitution Measurement<br>Compliance Certification Services Chamber A |                                       |                    |                    |                       |              |                |                |       |
|----------------------------------------------------------------------------------------|---------------------------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| <b>Company:</b>                                                                        | Apple                                 |                    |                    |                       |              |                |                |       |
| <b>Project #:</b>                                                                      | 12U14507                              |                    |                    |                       |              |                |                |       |
| <b>Date:</b>                                                                           | 09/17/12                              |                    |                    |                       |              |                |                |       |
| <b>Test Engineer:</b>                                                                  | MENGISTU MEKURIA                      |                    |                    |                       |              |                |                |       |
| <b>Configuration:</b>                                                                  | EUT WITH AC ADAPTER                   |                    |                    |                       |              |                |                |       |
| <b>Mode:</b>                                                                           | TX, LTE band 17, 10.0MHz BW_QPSK MODE |                    |                    |                       |              |                |                |       |
| <br>                                                                                   |                                       |                    |                    |                       |              |                |                |       |
| <b>Test Equipment:</b>                                                                 |                                       |                    |                    |                       |              |                |                |       |
| Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)     |                                       |                    |                    |                       |              |                |                |       |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.          |                                       |                    |                    |                       |              |                |                |       |
| f<br>MHz                                                                               | SG reading<br>(dBm)                   | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
| 709.00                                                                                 | 22.56                                 | V                  | 0.5                | 0.0                   | 22.06        | 34.8           | -12.7          |       |
| 709.00                                                                                 | 16.55                                 | H                  | 0.5                | 0.0                   | 16.05        | 34.8           | -18.8          |       |
| 710.00                                                                                 | 22.42                                 | V                  | 0.5                | 0.0                   | 21.92        | 34.8           | -12.9          |       |
| 710.00                                                                                 | 16.14                                 | H                  | 0.5                | 0.0                   | 15.64        | 34.8           | -19.2          |       |
| 711.00                                                                                 | 22.09                                 | V                  | 0.5                | 0.0                   | 21.59        | 34.8           | -13.2          |       |
| 711.00                                                                                 | 16.04                                 | H                  | 0.5                | 0.0                   | 15.54        | 34.8           | -19.3          |       |
| Rev. 3.17.11                                                                           |                                       |                    |                    |                       |              |                |                |       |

**LTE 16QAM Band 17 (10 MHz BANDWIDTH)****High Frequency Substitution Measurement  
Compliance Certification Services Chamber A**

**Company:** Apple  
**Project #:** 12U14507  
**Date:** 09/17/12  
**Test Engineer:** MENGISTU MEKURIA  
**Configuration:** EUT WITH AC ADAPTER  
**Mode:** TX, LTE band 17, 10.0MHz BW\_16QAM MODE

**Test Equipment:**

Receiving: Sunol T243, and Chamber A N-type Cable (Setup this one for testing EUT)

Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| 709.00   | 22.03               | V                  | 0.5                | 0.0                   | 21.53        | 34.8           | -13.3          |       |
| 709.00   | 15.81               | H                  | 0.5                | 0.0                   | 15.31        | 34.8           | -19.5          |       |
| 710.00   | 21.40               | V                  | 0.5                | 0.0                   | 20.90        | 34.8           | -13.9          |       |
| 710.00   | 15.33               | H                  | 0.5                | 0.0                   | 14.83        | 34.8           | -20.0          |       |
| 711.00   | 21.38               | V                  | 0.5                | 0.0                   | 20.88        | 34.8           | -13.9          |       |
| 711.00   | 15.11               | H                  | 0.5                | 0.0                   | 14.61        | 34.8           | -20.2          |       |

Rev. 3.17.11

## 9.2. PEAK-TO-AVERAGE RATIO

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

### WCDMA

#### Peak-To-Average Ratio:

| Mode                                                    | Channel Band-width (KHZ) | Modulation | Couducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|-----------------------|---------|-----------------------------|
|                                                         |                          |            | *Peak                 | Average |                             |
| UMTS                                                    | 5                        | REL99      | 27.37                 | 24.34   | 3.03                        |
|                                                         |                          |            |                       |         |                             |
| Mode                                                    | Channel Band-width (MHZ) | Ch. No.    | Couducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|                                                         |                          |            | *Peak                 | Average |                             |
| UMTS                                                    | 5                        | HSDPA      | 28.14                 | 23.29   | 4.85                        |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |                       |         |                             |

### LTE BAND 5

| Mode                                                    | Channel Band-width (MHZ) | Modulation | f (MHz) | Couducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|---------|-----------------------|---------|-----------------------------|
|                                                         |                          |            |         | *Peak                 | Average |                             |
| QPSK                                                    | 1.4                      | RB1 0      | 836.5   | 29.41                 | 23.97   | 5.44                        |
|                                                         |                          |            |         |                       |         |                             |
| Mode                                                    | Channel Band-width       | Ch. No.    | f (MHz) | Couducted Power (dBm) |         | Peak-to-Average Ratio       |
|                                                         |                          |            |         | *Peak                 | Average |                             |
| 16QAM                                                   | 1.4                      | RB1 0      | 836.5   | 29.45                 | 22.78   | 6.67                        |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |         |                       |         |                             |

| Mode                                                    | Channel Band-width (MHZ) | Modulation | f (MHz) | Conducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|---------|-----------------------|---------|-----------------------------|
|                                                         |                          |            |         | *Peak                 | Average |                             |
| QPSK                                                    | 3                        | RB1 0      | 836.5   | 30.04                 | 23.83   | 6.21                        |
|                                                         |                          |            |         |                       |         |                             |
| Mode                                                    | Channel Band-width       | Ch. No.    | f (MHz) | Conducted Power (dBm) |         | Peak-to-Average Ratio       |
|                                                         |                          |            |         | *Peak                 | Average |                             |
| 16QAM                                                   | 3                        | RB1 0      | 836.5   | 29.52                 | 22.59   | 6.93                        |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |         |                       |         |                             |

| Mode                                                    | Channel Band-width (MHZ) | Modulation | f (MHz) | Conducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|---------|-----------------------|---------|-----------------------------|
|                                                         |                          |            |         | *Peak                 | Average |                             |
| QPSK                                                    | 5                        | RB1 0      | 836.5   | 30.2                  | 23.85   | 6.35                        |
|                                                         |                          |            |         |                       |         |                             |
| Mode                                                    | Channel Band-width       | Ch. No.    | f (MHz) | Conducted Power (dBm) |         | Peak-to-Average Ratio       |
|                                                         |                          |            |         | *Peak                 | Average |                             |
| 16QAM                                                   | 5                        | RB1 0      | 1880    | 30.25                 | 23.00   | 7.25                        |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |         |                       |         |                             |

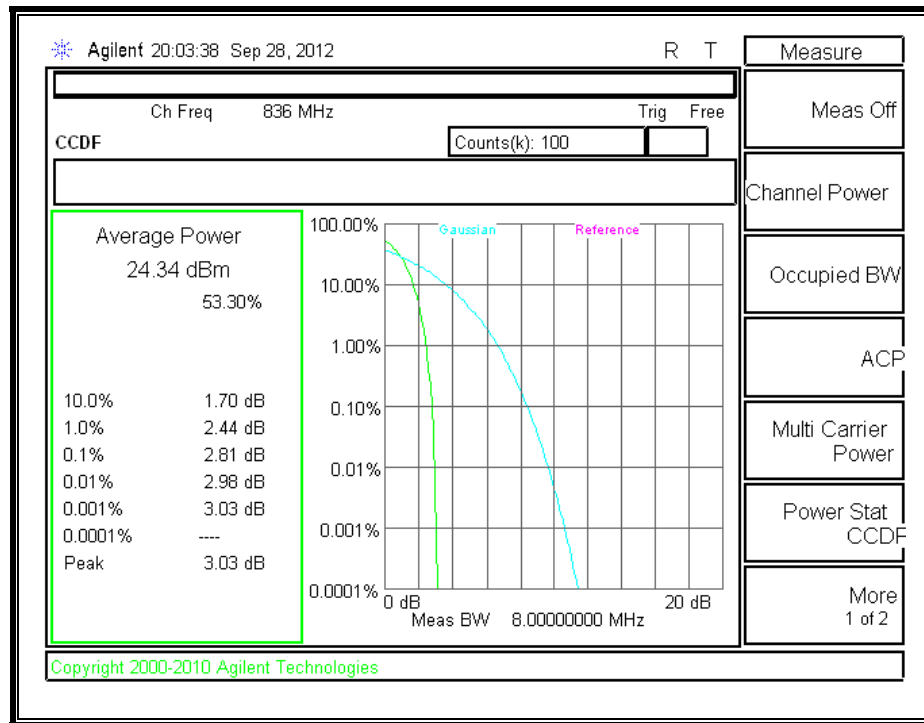
| Mode                                                    | Channel Band-width (MHZ) | Modulation | f (MHz) | Conducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|---------|-----------------------|---------|-----------------------------|
|                                                         |                          |            |         | *Peak                 | Average |                             |
| QPSK                                                    | 10                       | RB1 0      | 836.5   | 30.08                 | 23.91   | 6.17                        |
|                                                         |                          |            |         |                       |         |                             |
| Mode                                                    | Channel Band-width       | Ch. No.    | f (MHz) | Conducted Power (dBm) |         | Peak-to-Average Ratio       |
|                                                         |                          |            |         | *Peak                 | Average |                             |
| 16QAM                                                   | 10                       | RB1 0      | 836.5   | 29.99                 | 22.64   | 7.35                        |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |         |                       |         |                             |

**LTE BAND 17**

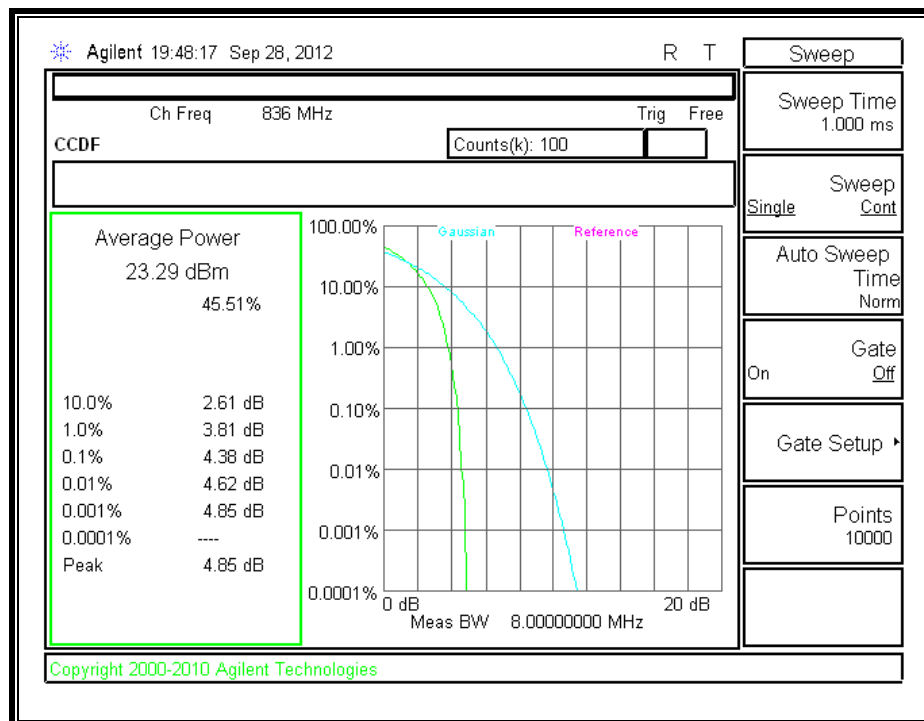
| Mode                                                    | Channel Band-width (MHZ) | Modulation | f (MHz) | Couducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|---------|-----------------------|---------|-----------------------------|
|                                                         |                          |            |         | *Peak                 | Average |                             |
| QPSK                                                    | 5                        | RB1 0      | 710     | 27.56                 | 23.97   | 3.59                        |
|                                                         |                          |            |         |                       |         |                             |
| Mode                                                    | Channel Band-width       | Ch. No.    | f (MHz) | Couducted Power (dBm) |         | Peak-to-Average Ratio       |
|                                                         |                          |            |         | *Peak                 | Average |                             |
| 16QAM                                                   | 5                        | RB1 0      | 710     | 27.57                 | 23.07   | 4.5                         |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |         |                       |         |                             |

| Mode                                                    | Channel Band-width (MHZ) | Modulation | f (MHz) | Couducted Power (dBm) |         | Peak-to-Average Ratio (PAR) |
|---------------------------------------------------------|--------------------------|------------|---------|-----------------------|---------|-----------------------------|
|                                                         |                          |            |         | *Peak                 | Average |                             |
| QPSK                                                    | 10                       | RB1 0      | 710     | 27.52                 | 23.96   | 3.56                        |
|                                                         |                          |            |         |                       |         |                             |
| Mode                                                    | Channel Band-width       | Ch. No.    | f (MHz) | Couducted Power (dBm) |         | Peak-to-Average Ratio       |
|                                                         |                          |            |         | *Peak                 | Average |                             |
| 16QAM                                                   | 10                       | RB1 0      | 710     | 27.65                 | 22.78   | 4.87                        |
| *Peak Reading = Average Reading + Peak-to-Average Ratio |                          |            |         |                       |         |                             |

**WCDMA850, REL 99**



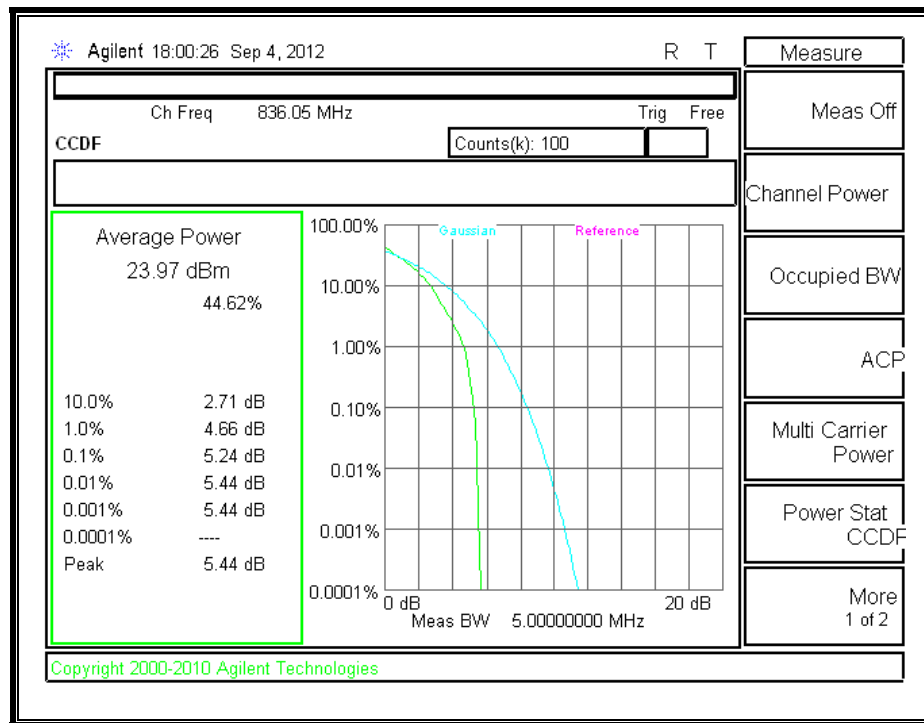
**WCDMA850, HSDPA**



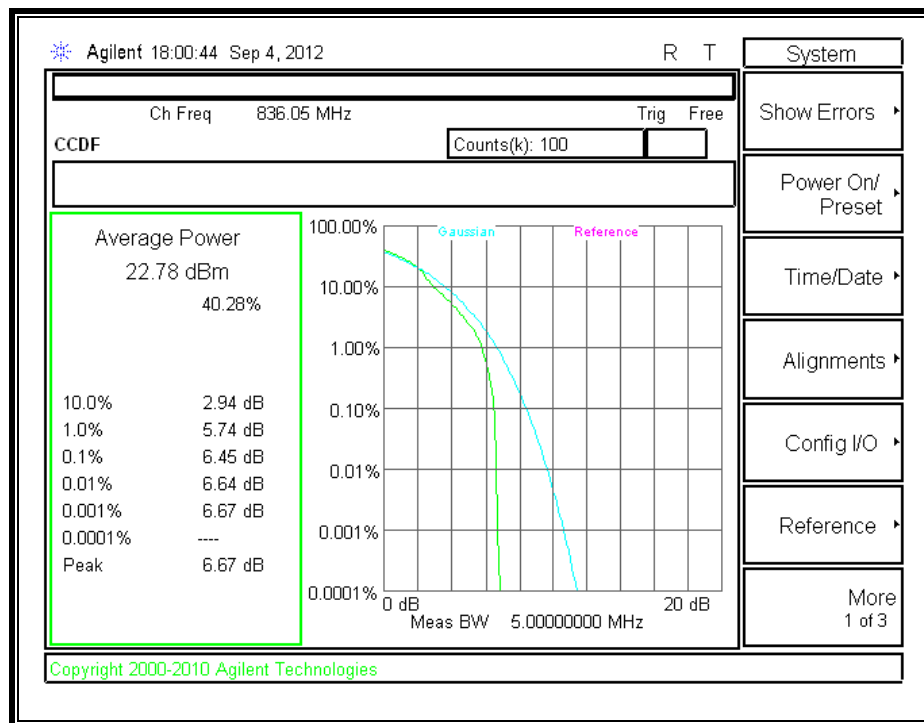


## LTE BAND 5

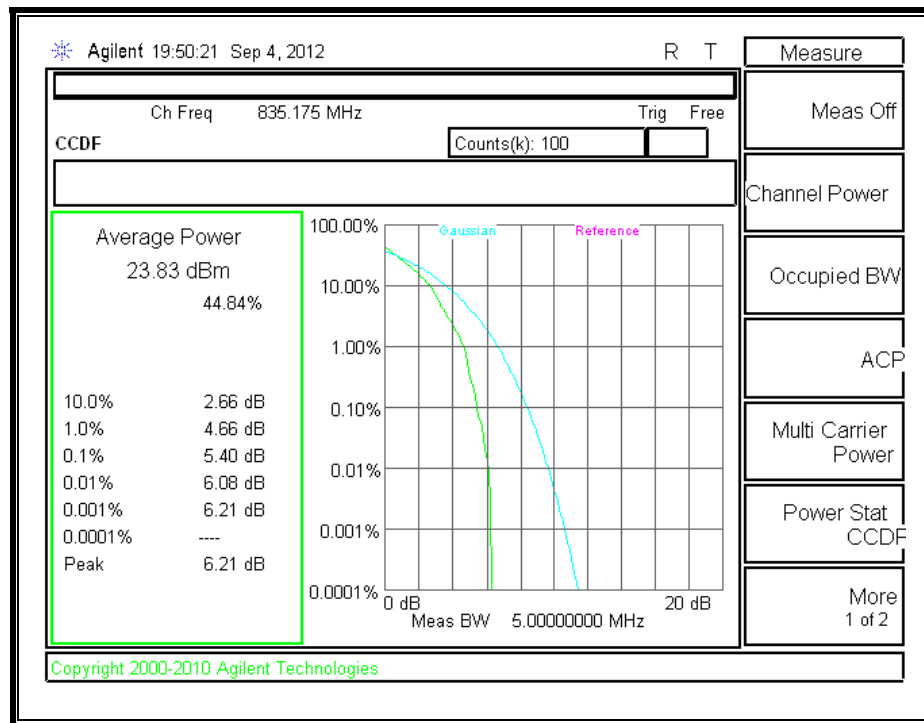
### 1.4MHz QPSK



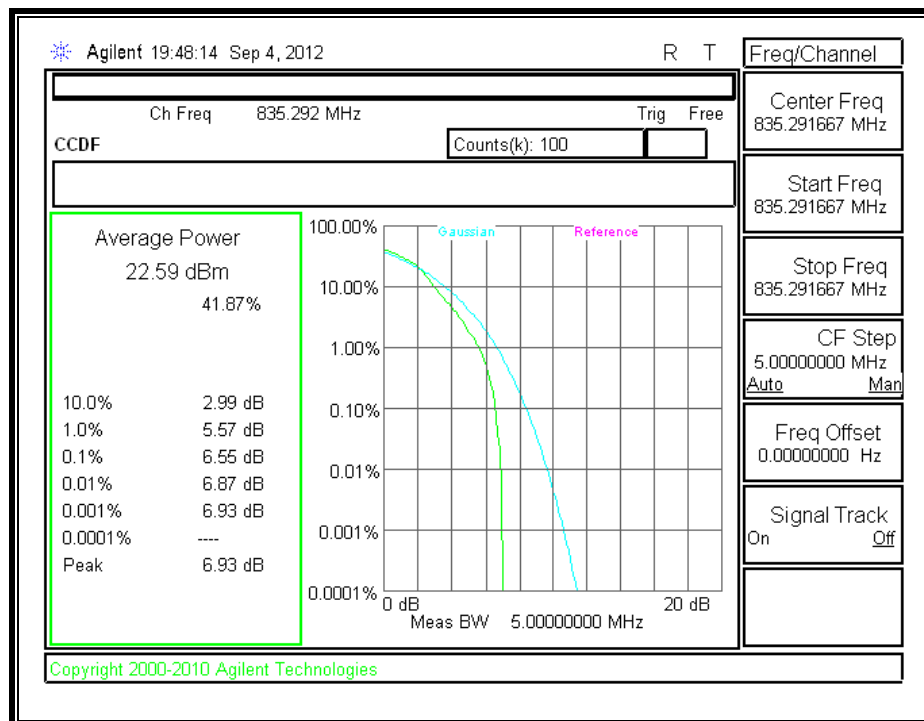
### 1.4MHz 16QAM



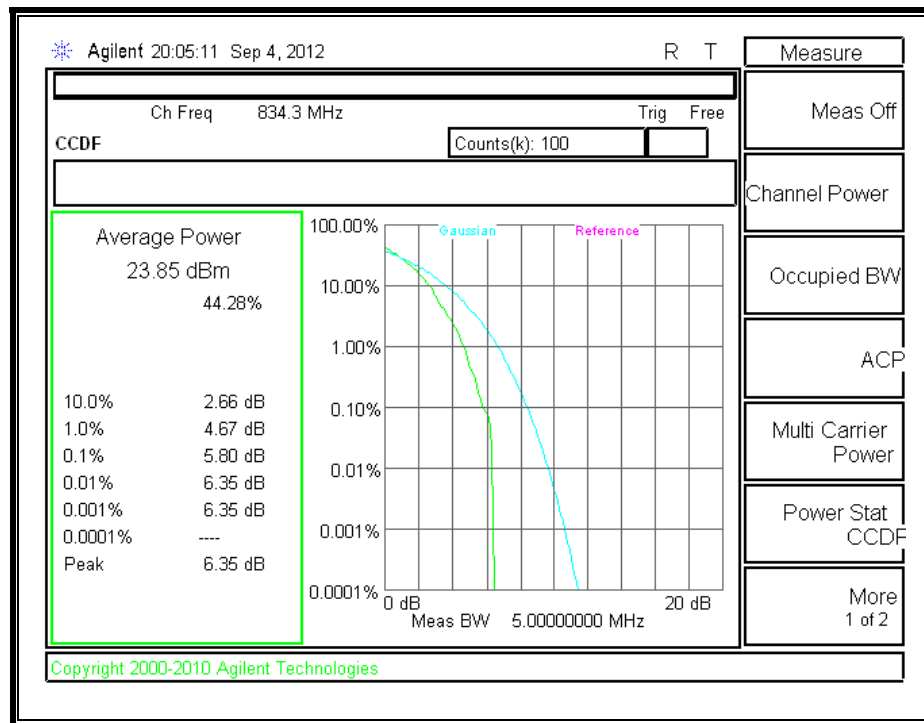
**3MHz QPSK, RB1-0**



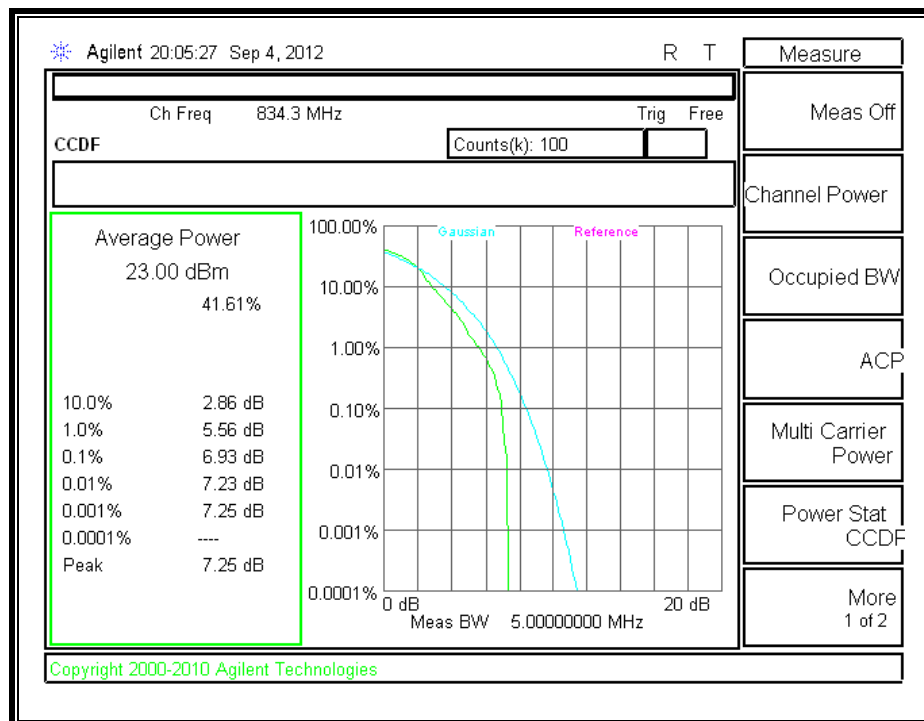
**3MHz 16QAM**



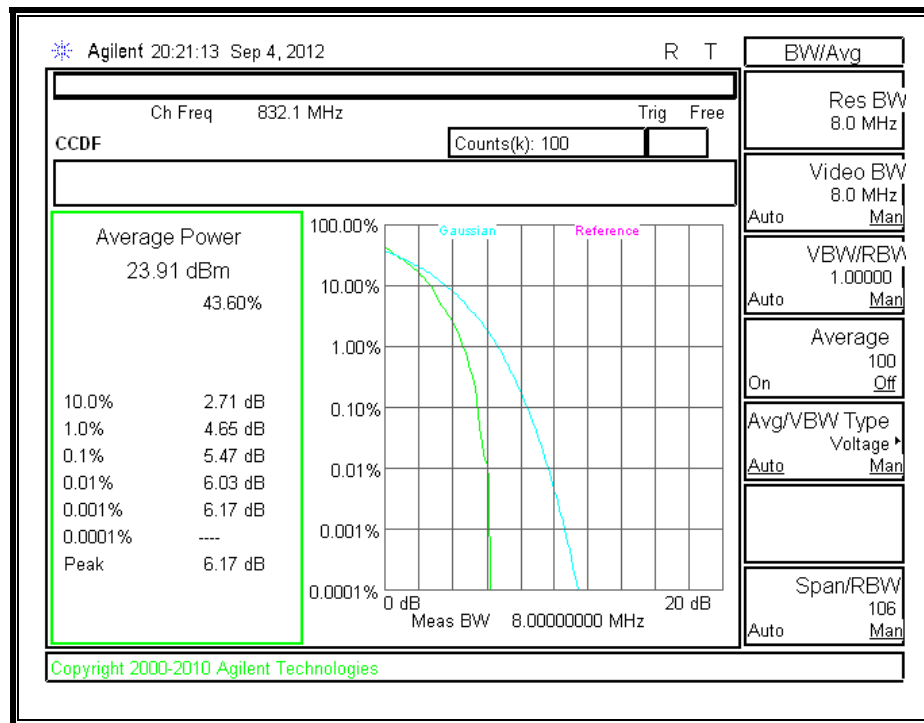
**5MHz\_QPSK**



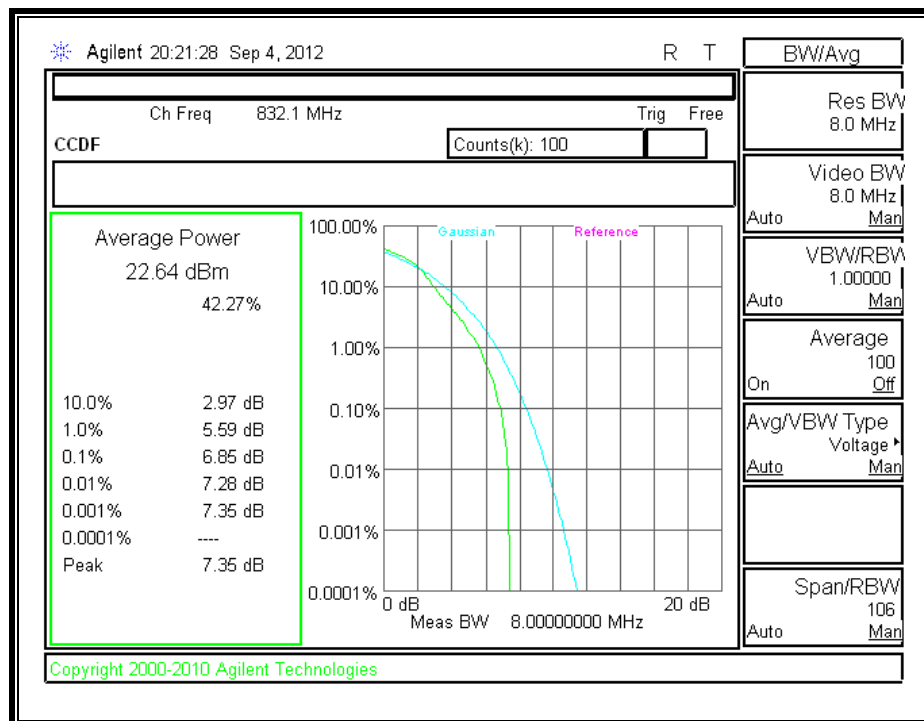
**5MHz\_16QAM**



**10MHz QPSK**

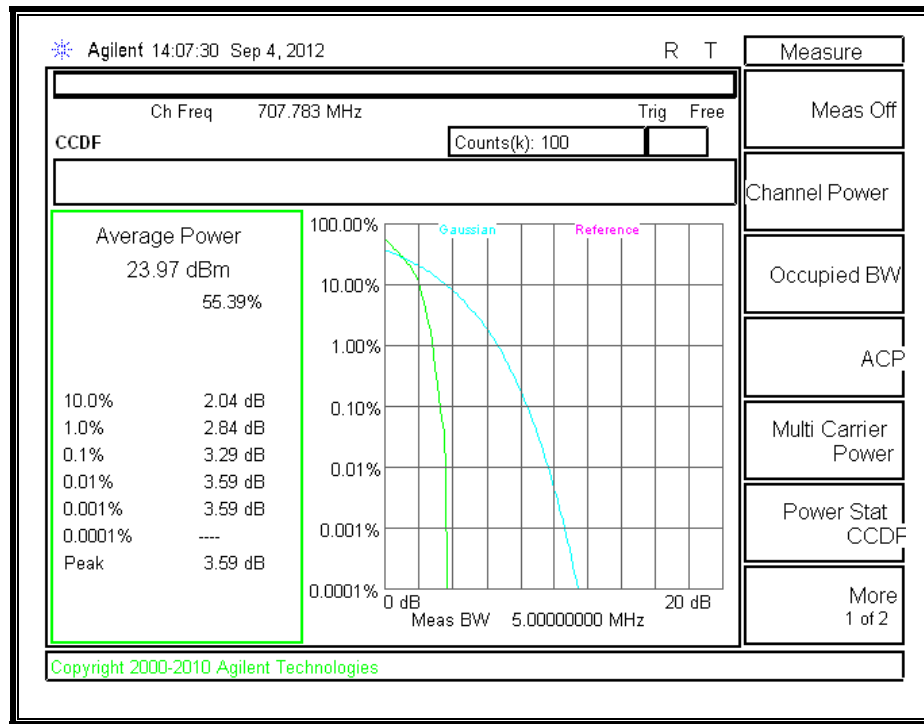


**10MHz 16QAM**

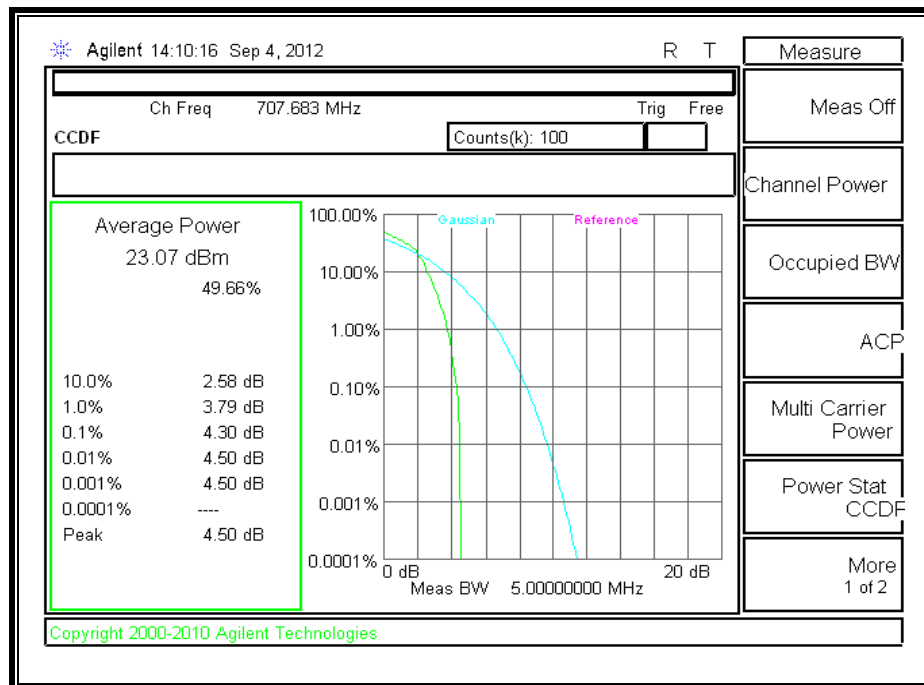


## LTE BAND 17

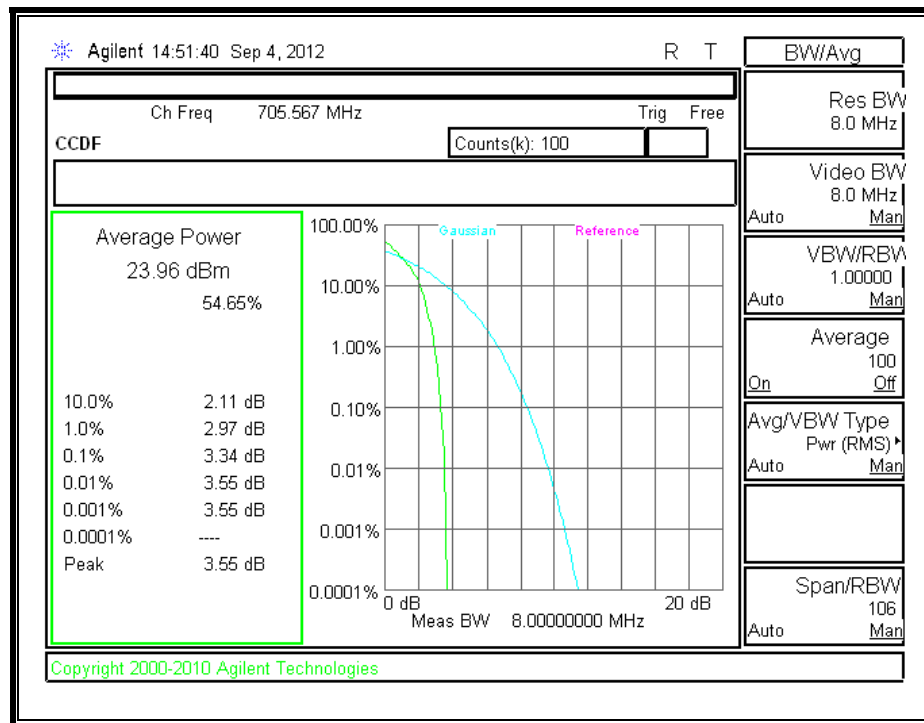
### 5MHz QPSK



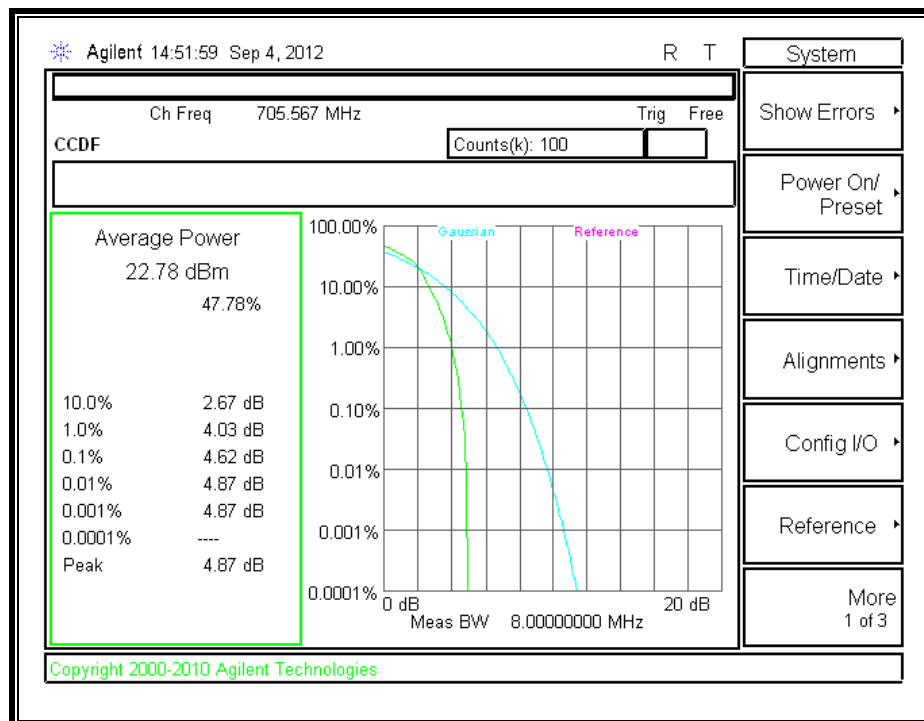
### 5MHz 16QAM



**10MHz QPSK, RB1-0**



**10MHz 16QAM**



### **9.3. FIELD STRENGTH OF SPURIOUS RADIATION**

#### **RULE PART(S)**

FCC: §2.1053, §22.917, §24.238, and §27.53

#### **LIMIT**

§22.917 (e) and §24.238 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

§27.53 (g) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

§27.53 (h) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.

#### **TEST PROCEDURE**

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth ( i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth ( i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

#### **MODES TESTED:**

- GPRS and EGPRS
- WCDMA, REL 99 and HSUPA
- LTE BAND 2
- LTE BAND 4
- LTE BAND 5
- LTE BAND 17

#### **RESULTS**

**GPRS (Cellular Band)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                           |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|---------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                     |                 |                |                |              |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                  |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/14/12                  |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | MENGISTU MEKURIA          |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT(C12) WITH AC ACAPTER  |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, 850MHz BAND GPRS MODE |                 |                |                |              |                |               |       |
| Chamber                                                                                 |                     | Pre-amplifier             |                 | Filter         |                | Limit        |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)        | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (824.2MHz)</b>                                                               |                     |                           |                 |                |                |              |                |               |       |
| 1.648                                                                                   | -2.2                | V                         | 3.0             | 38.2           | 1.0            | -39.3        | -13.0          | -26.3         |       |
| 2.473                                                                                   | -3.3                | V                         | 3.0             | 37.5           | 1.0            | -39.8        | -13.0          | -26.8         |       |
| 1.648                                                                                   | -9.5                | H                         | 3.0             | 38.2           | 1.0            | -46.6        | -13.0          | -33.6         |       |
| 2.473                                                                                   | -8.4                | H                         | 3.0             | 37.5           | 1.0            | -44.9        | -13.0          | -31.9         |       |
| <b>Mid Ch, (836.6MHz)</b>                                                               |                     |                           |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -4.9                | V                         | 3.0             | 38.1           | 1.0            | -42.0        | -13.0          | -29.0         |       |
| 2.510                                                                                   | -3.0                | V                         | 3.0             | 37.5           | 1.0            | -39.5        | -13.0          | -26.5         |       |
| 1.673                                                                                   | -8.2                | H                         | 3.0             | 38.1           | 1.0            | -45.3        | -13.0          | -32.3         |       |
| 2.510                                                                                   | -5.9                | H                         | 3.0             | 37.5           | 1.0            | -42.4        | -13.0          | -29.4         |       |
| <b>High Ch, (848.8MHz)</b>                                                              |                     |                           |                 |                |                |              |                |               |       |
| 1.698                                                                                   | -7.6                | V                         | 3.0             | 38.1           | 1.0            | -44.7        | -13.0          | -31.7         |       |
| 2.546                                                                                   | -3.8                | V                         | 3.0             | 37.5           | 1.0            | -40.3        | -13.0          | -27.3         |       |
| 1.698                                                                                   | -7.0                | H                         | 3.0             | 38.1           | 1.0            | -44.1        | -13.0          | -31.1         |       |
| 2.546                                                                                   | -3.2                | H                         | 3.0             | 37.5           | 1.0            | -39.7        | -13.0          | -26.7         |       |
| Rev. 03.03.09                                                                           |                     |                           |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                           |                 |                |                |              |                |               |       |



**EGPRS (Cellular Band)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                          |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|--------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                    |                 |                |                |              |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                 |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                 |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter       |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, CELL BAND EGPRS MODE |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>     |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B               |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)       | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (824.2MHz)</b>                                                               |                     |                          |                 |                |                |              |                |               |       |
| 1.648                                                                                   | -11.2               | V                        | 3.0             | 35.5           | 1.0            | -45.8        | -13.0          | -32.8         |       |
| 2.473                                                                                   | -4.3                | V                        | 3.0             | 35.4           | 1.0            | -38.7        | -13.0          | -25.7         |       |
| 1.648                                                                                   | -8.8                | H                        | 3.0             | 35.5           | 1.0            | -43.3        | -13.0          | -30.3         |       |
| 2.473                                                                                   | -9.2                | H                        | 3.0             | 35.4           | 1.0            | -43.6        | -13.0          | -30.6         |       |
| <b>Mid Ch, (836.6MHz)</b>                                                               |                     |                          |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -12.9               | V                        | 3.0             | 35.5           | 1.0            | -47.4        | -13.0          | -34.4         |       |
| 2.510                                                                                   | -10.2               | V                        | 3.0             | 35.4           | 1.0            | -44.6        | -13.0          | -31.6         |       |
| 1.673                                                                                   | -13.5               | H                        | 3.0             | 35.5           | 1.0            | -48.1        | -13.0          | -35.1         |       |
| 2.510                                                                                   | -14.1               | H                        | 3.0             | 35.4           | 1.0            | -48.5        | -13.0          | -35.5         |       |
| <b>High Ch, (848.8MHz)</b>                                                              |                     |                          |                 |                |                |              |                |               |       |
| 1.698                                                                                   | -7.6                | V                        | 3.0             | 35.5           | 1.0            | -42.1        | -13.0          | -29.1         |       |
| 2.546                                                                                   | -3.0                | V                        | 3.0             | 35.4           | 1.0            | -37.5        | -13.0          | -24.5         |       |
| 1.698                                                                                   | -13.3               | H                        | 3.0             | 35.5           | 1.0            | -47.8        | -13.0          | -34.8         |       |
| 2.546                                                                                   | -11.9               | H                        | 3.0             | 35.4           | 1.0            | -46.3        | -13.0          | -33.3         |       |
| Rev. 03.03.09                                                                           |                     |                          |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                          |                 |                |                |              |                |               |       |

**WCDMA REL 99 (Cellular Band)**

| <b>Compliance Certification Services</b><br><b>Above 1GHz High Frequency Substitution Measurement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                 |                |                |              |                |               |       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b> Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                 |                |                |              |                |               |       |
| <b>Project #:</b> 12u14507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                    |                 |                |                |              |                |               |       |
| <b>Date:</b> 10/02/12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b> Chin Pang                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |              |                |               |       |
| <b>Configuration:</b> EUT and AC Adapter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                    |                 |                |                |              |                |               |       |
| <b>Mode:</b> TX, WCDMA 850MHz, Rel 99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                 |                |                |              |                |               |       |
| <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 5px; background-color: #e0f7fa;">Chamber</div> <div style="border: 1px solid black; padding: 5px; background-color: #e0f7fa;">Pre-amplifier</div> <div style="border: 1px solid black; padding: 5px; background-color: #e0f7fa;">Filter</div> <div style="border: 1px solid black; padding: 5px; background-color: #e0f7fa;">Limit</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">5m Chamber B</div> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">T145 8449B</div> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">Filter 1</div> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">FCC Part 22</div> </div> |                     |                    |                 |                |                |              |                |               |       |
| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Channel (826.4MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                 |                |                |              |                |               |       |
| 1.653                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -18.2               | V                  | 3.0             | 35.5           | 1.0            | -52.7        | -13.0          | -39.7         |       |
| 2.479                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -12.3               | V                  | 3.0             | 35.4           | 1.0            | -46.7        | -13.0          | -33.7         |       |
| 1.653                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -18.7               | H                  | 3.0             | 35.5           | 1.0            | -53.3        | -13.0          | -40.3         |       |
| 2.479                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -20.2               | H                  | 3.0             | 35.4           | 1.0            | -54.6        | -13.0          | -41.6         |       |
| <b>Mid Channel (836MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                    |                 |                |                |              |                |               |       |
| 1.672                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -18.9               | V                  | 3.0             | 35.5           | 1.0            | -53.4        | -13.0          | -40.4         |       |
| 2.508                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -13.4               | V                  | 3.0             | 35.4           | 1.0            | -47.8        | -13.0          | -34.8         |       |
| 1.672                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -18.5               | H                  | 3.0             | 35.5           | 1.0            | -53.1        | -13.0          | -40.1         |       |
| 2.508                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -19.6               | H                  | 3.0             | 35.4           | 1.0            | -54.0        | -13.0          | -41.0         |       |
| <b>High Channel (846MHz)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                    |                 |                |                |              |                |               |       |
| 1.692                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -16.6               | V                  | 3.0             | 35.5           | 1.0            | -51.1        | -13.0          | -38.1         |       |
| 2.538                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -13.1               | V                  | 3.0             | 35.4           | 1.0            | -47.5        | -13.0          | -34.5         |       |
| 1.692                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -19.6               | H                  | 3.0             | 35.5           | 1.0            | -54.1        | -13.0          | -41.1         |       |
| 2.538                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -18.9               | H                  | 3.0             | 35.4           | 1.0            | -53.4        | -13.0          | -40.4         |       |
| Rev. 03.03.09<br>Note: No other emissions were detected above the system noise floor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                 |                |                |              |                |               |       |

**WCDMA HSUPA (Cellular Band)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                         |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                   |                 |                |                |              |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12u14507                |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang               |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter      |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, WCDMA 850MHz, HSUPA |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>    |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B              |                 | Filter 1       |                | FCC Part 22  |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)      | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Channel (826.4MHz)</b>                                                           |                     |                         |                 |                |                |              |                |               |       |
| 1.653                                                                                   | -14.2               | V                       | 3.0             | 35.5           | 1.0            | -48.7        | -13.0          | -35.7         |       |
| 2.479                                                                                   | -18.3               | V                       | 3.0             | 35.4           | 1.0            | -52.7        | -13.0          | -39.7         |       |
| 1.653                                                                                   | -18.7               | H                       | 3.0             | 35.5           | 1.0            | -53.3        | -13.0          | -40.3         |       |
| 2.479                                                                                   | -21.2               | H                       | 3.0             | 35.4           | 1.0            | -55.6        | -13.0          | -42.6         |       |
| <b>Mid Channel (836MHz)</b>                                                             |                     |                         |                 |                |                |              |                |               |       |
| 1.672                                                                                   | -17.9               | V                       | 3.0             | 35.5           | 1.0            | -52.4        | -13.0          | -39.4         |       |
| 2.508                                                                                   | -18.2               | V                       | 3.0             | 35.4           | 1.0            | -52.6        | -13.0          | -39.6         |       |
| 1.672                                                                                   | -19.5               | H                       | 3.0             | 35.5           | 1.0            | -54.1        | -13.0          | -41.1         |       |
| 2.508                                                                                   | -21.1               | H                       | 3.0             | 35.4           | 1.0            | -55.5        | -13.0          | -42.5         |       |
| <b>High Channel (846MHz)</b>                                                            |                     |                         |                 |                |                |              |                |               |       |
| 1.692                                                                                   | -13.6               | V                       | 3.0             | 35.5           | 1.0            | -48.1        | -13.0          | -35.1         |       |
| 2.538                                                                                   | -21.1               | V                       | 3.0             | 35.4           | 1.0            | -55.5        | -13.0          | -42.5         |       |
| 1.692                                                                                   | -19.4               | H                       | 3.0             | 35.5           | 1.0            | -53.9        | -13.0          | -40.9         |       |
| 2.538                                                                                   | -20.9               | H                       | 3.0             | 35.4           | 1.0            | -55.4        | -13.0          | -42.4         |       |
| Rev. 03.03.09                                                                           |                     |                         |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                         |                 |                |                |              |                |               |       |

**GPRS (PCS Band)**

**Compliance Certification Services**  
**Above 1GHz High Frequency Substitution Measurement**

**Company:** Apple  
**Project #:** 12U14507  
**Date:** 09/14/12  
**Test Engineer:** MENGISTU MEKURIA  
**Configuration:** EUT(C12) WITH AC ACAPTER  
**Mode:** TX, 1900MHz BAND GPRS MODE

| Chamber      | Pre-amplifier | Filter   | Limit   |
|--------------|---------------|----------|---------|
| 5m Chamber A | T144 8449B    | Filter 1 | Part 24 |

| f<br>GHz                     | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Low Ch, (1850.20MHz)</b>  |                     |                    |                 |                |                |               |                |               |       |
| 3.705                        | -12.1               | V                  | 3.0             | 36.8           | 1.0            | -47.9         | -13.0          | -34.9         |       |
| 5.557                        | -9.7                | V                  | 3.0             | 36.3           | 1.0            | -45.0         | -13.0          | -32.0         |       |
| 3.705                        | -14.1               | V                  | 3.0             | 36.8           | 1.0            | -49.9         | -13.0          | -36.9         |       |
| 5.557                        | -10.7               | V                  | 3.0             | 36.3           | 1.0            | -46.0         | -13.0          | -33.0         |       |
| <b>Mid Ch, (1880.00MHz)</b>  |                     |                    |                 |                |                |               |                |               |       |
| 3.760                        | -10.9               | V                  | 3.0             | 36.8           | 1.0            | -46.7         | -13.0          | -33.7         |       |
| 5.640                        | -10.6               | V                  | 3.0             | 36.3           | 1.0            | -45.9         | -13.0          | -32.9         |       |
| 3.760                        | -12.9               | V                  | 3.0             | 36.8           | 1.0            | -48.7         | -13.0          | -35.7         |       |
| 5.640                        | -11.6               | V                  | 3.0             | 36.3           | 1.0            | -46.9         | -13.0          | -33.9         |       |
| <b>High Ch, (1909.80MHz)</b> |                     |                    |                 |                |                |               |                |               |       |
| 3.815                        | -9.8                | V                  | 3.0             | 36.7           | 1.0            | -45.6         | -13.0          | -32.6         |       |
| 5.723                        | -9.5                | V                  | 3.0             | 36.3           | 1.0            | -44.8         | -13.0          | -31.8         |       |
| 3.815                        | -11.8               | V                  | 3.0             | 36.7           | 1.0            | -47.6         | -13.0          | -34.6         |       |
| 5.723                        | -11.5               | V                  | 3.0             | 36.3           | 1.0            | -46.8         | -13.0          | -33.8         |       |

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Note: No other emissions were detected above the system noise floor.

**EGPRS (PCS Band)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                      |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507             |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12             |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang            |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter   |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, PCS BAND EGPRS   |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b> |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B           |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)   | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (1850.2MHz)</b>                                                              |                     |                      |                 |                |                |               |                |               |       |
| 5.551                                                                                   | -5.8                | V                    | 3.0             | 35.4           | 1.0            | -40.2         | -13.0          | -27.2         |       |
| 7.400                                                                                   | -8.7                | V                    | 3.0             | 35.7           | 1.0            | -43.4         | -13.0          | -30.4         |       |
| 5.551                                                                                   | -7.0                | H                    | 3.0             | 35.4           | 1.0            | -41.4         | -13.0          | -28.4         |       |
| 7.400                                                                                   | -7.0                | H                    | 3.0             | 35.7           | 1.0            | -41.7         | -13.0          | -28.7         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                      |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -9.7                | V                    | 3.0             | 35.3           | 1.0            | -44.1         | -13.0          | -31.1         |       |
| 5.640                                                                                   | -10.7               | V                    | 3.0             | 35.4           | 1.0            | -45.1         | -13.0          | -32.1         |       |
| 3.760                                                                                   | -11.5               | H                    | 3.0             | 35.3           | 1.0            | -45.8         | -13.0          | -32.8         |       |
| 5.640                                                                                   | -9.8                | H                    | 3.0             | 35.4           | 1.0            | -44.3         | -13.0          | -31.3         |       |
| <b>High Ch, (1909.8MHz)</b>                                                             |                     |                      |                 |                |                |               |                |               |       |
| 3.820                                                                                   | -13.6               | V                    | 3.0             | 35.3           | 1.0            | -47.9         | -13.0          | -34.9         |       |
| 5.729                                                                                   | -10.6               | V                    | 3.0             | 35.4           | 1.0            | -45.1         | -13.0          | -32.1         |       |
| 3.820                                                                                   | -14.3               | H                    | 3.0             | 35.3           | 1.0            | -48.6         | -13.0          | -35.6         |       |
| 5.729                                                                                   | -11.7               | H                    | 3.0             | 35.4           | 1.0            | -46.1         | -13.0          | -33.1         |       |
| Rev. 03.03.09                                                                           |                     |                      |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                      |                 |                |                |               |                |               |       |

**WCDMA REL 99 (PCS Band)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                            |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                      |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                   |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                   |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                  |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter         |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, PCS BAND WCDMA, REL 99 |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>       |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                 |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)         | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1852.4MHz</b>                                                                |                     |                            |                 |                |                |               |                |               |       |
| 3.704                                                                                   | -14.9               | V                          | 3.0             | 35.4           | 1.0            | -49.2         | -13.0          | -36.2         |       |
| 5.557                                                                                   | -12.8               | V                          | 3.0             | 35.4           | 1.0            | -47.2         | -13.0          | -34.2         |       |
| 3.704                                                                                   | -15.7               | H                          | 3.0             | 35.4           | 1.0            | -50.0         | -13.0          | -37.0         |       |
| 5.557                                                                                   | -13.0               | H                          | 3.0             | 35.4           | 1.0            | -47.4         | -13.0          | -34.4         |       |
| <b>Mid Ch, 1880.0MHz</b>                                                                |                     |                            |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -14.7               | V                          | 3.0             | 35.3           | 1.0            | -49.1         | -13.0          | -36.1         |       |
| 5.640                                                                                   | -12.7               | V                          | 3.0             | 35.4           | 1.0            | -47.1         | -13.0          | -34.1         |       |
| 3.760                                                                                   | -17.5               | H                          | 3.0             | 35.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| 5.640                                                                                   | -13.8               | H                          | 3.0             | 35.4           | 1.0            | -48.3         | -13.0          | -35.3         |       |
| <b>High Ch, 1907.6MHz</b>                                                               |                     |                            |                 |                |                |               |                |               |       |
| 3.815                                                                                   | -14.6               | V                          | 3.0             | 35.3           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| 5.723                                                                                   | -12.6               | V                          | 3.0             | 35.4           | 1.0            | -47.1         | -13.0          | -34.1         |       |
| 3.815                                                                                   | -17.3               | H                          | 3.0             | 35.3           | 1.0            | -51.6         | -13.0          | -38.6         |       |
| 5.723                                                                                   | -13.7               | H                          | 3.0             | 35.4           | 1.0            | -48.1         | -13.0          | -35.1         |       |
| Rev. 03.03.09                                                                           |                     |                            |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                            |                 |                |                |               |                |               |       |

**WCDMA HSDPA (PCS Band)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                           |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|---------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                     |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                  |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                  |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                 |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter        |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, PCS BAND WCDMA, HSDPA |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>      |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)        | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1852.4MHz</b>                                                                |                     |                           |                 |                |                |               |                |               |       |
| 3.704                                                                                   | -12.9               | V                         | 3.0             | 35.4           | 1.0            | -47.2         | -13.0          | -34.2         |       |
| 5.557                                                                                   | -10.8               | V                         | 3.0             | 35.4           | 1.0            | -45.2         | -13.0          | -32.2         |       |
| 3.704                                                                                   | -14.7               | H                         | 3.0             | 35.4           | 1.0            | -49.0         | -13.0          | -36.0         |       |
| 5.557                                                                                   | -12.0               | H                         | 3.0             | 35.4           | 1.0            | -46.4         | -13.0          | -33.4         |       |
| <b>Mid Ch, 1880.0MHz</b>                                                                |                     |                           |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -12.7               | V                         | 3.0             | 35.3           | 1.0            | -47.1         | -13.0          | -34.1         |       |
| 5.640                                                                                   | -10.7               | V                         | 3.0             | 35.4           | 1.0            | -45.1         | -13.0          | -32.1         |       |
| 3.760                                                                                   | -15.5               | H                         | 3.0             | 35.3           | 1.0            | -49.8         | -13.0          | -36.8         |       |
| 5.640                                                                                   | -11.8               | H                         | 3.0             | 35.4           | 1.0            | -46.3         | -13.0          | -33.3         |       |
| <b>High Ch, 1907.6MHz</b>                                                               |                     |                           |                 |                |                |               |                |               |       |
| 3.815                                                                                   | -14.6               | V                         | 3.0             | 35.3           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| 5.723                                                                                   | -11.6               | V                         | 3.0             | 35.4           | 1.0            | -46.1         | -13.0          | -33.1         |       |
| 3.815                                                                                   | -14.3               | H                         | 3.0             | 35.3           | 1.0            | -48.6         | -13.0          | -35.6         |       |
| 5.723                                                                                   | -10.7               | H                         | 3.0             | 35.4           | 1.0            | -45.1         | -13.0          | -32.1         |       |
| Rev. 03.03.09                                                                           |                     |                           |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                           |                 |                |                |               |                |               |       |

**LTE QPSK Band 2 (1.4.0 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/27/12                         |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 1.4MHz BW        |                 |                |                |               |                |               |       |
|                                                                                         |                     | QPSK                             |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1850.7MHz</b>                                                                |                     |                                  |                 |                |                |               |                |               |       |
| 3.701                                                                                   | -21.3               | V                                | 3.0             | 36.8           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.552                                                                                   | -17.7               | V                                | 3.0             | 36.3           | 1.0            | -53.0         | -13.0          | -40.0         |       |
| 3.701                                                                                   | -21.7               | H                                | 3.0             | 36.8           | 1.0            | -57.5         | -13.0          | -44.5         |       |
| 5.552                                                                                   | -18.2               | H                                | 3.0             | 36.3           | 1.0            | -53.5         | -13.0          | -40.5         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                  |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -21.4               | V                                | 3.0             | 36.8           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.640                                                                                   | -18.2               | V                                | 3.0             | 36.3           | 1.0            | -53.6         | -13.0          | -40.6         |       |
| 3.760                                                                                   | -20.5               | H                                | 3.0             | 36.8           | 1.0            | -56.3         | -13.0          | -43.3         |       |
| 5.640                                                                                   | -17.8               | H                                | 3.0             | 36.3           | 1.0            | -53.1         | -13.0          | -40.1         |       |
| <b>High Ch, 1909.3MHz</b>                                                               |                     |                                  |                 |                |                |               |                |               |       |
| 3.819                                                                                   | -20.1               | V                                | 3.0             | 36.7           | 1.0            | -55.8         | -13.0          | -42.8         |       |
| 5.728                                                                                   | -18.3               | V                                | 3.0             | 36.3           | 1.0            | -53.6         | -13.0          | -40.6         |       |
| 3.819                                                                                   | -21.2               | H                                | 3.0             | 36.7           | 1.0            | -57.0         | -13.0          | -44.0         |       |
| 5.728                                                                                   | -17.7               | H                                | 3.0             | 36.3           | 1.0            | -53.0         | -13.0          | -40.0         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |               |                |               |       |



**LTE 16QAM Band 2 (1.4.0 MHz BANDWIDTH)**

| Compliance Certification Services                                    |                     |                                    |                 |                |                |               |                |               |       |
|----------------------------------------------------------------------|---------------------|------------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| Above 1GHz High Frequency Substitution Measurement                   |                     |                                    |                 |                |                |               |                |               |       |
| <b>Company:</b>                                                      |                     | Apple                              |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                         |                     | 09/27/12                           |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                |                     | Roy Zheng                          |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                |                     | EUT with AC adapter and Earphone   |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                         |                     | TX, LTE Band 2, 1.4MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                       |                     | <b>Pre-amplifier</b>               |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                         |                     | T144 8449B                         |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                 | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1850.7MHz</b>                                             |                     |                                    |                 |                |                |               |                |               |       |
| 3.701                                                                | -21.1               | V                                  | 3.0             | 36.8           | 1.0            | -56.9         | -13.0          | -43.9         |       |
| 5.552                                                                | -12.4               | V                                  | 3.0             | 36.3           | 1.0            | -47.7         | -13.0          | -34.7         |       |
| 3.701                                                                | -22.8               | H                                  | 3.0             | 36.8           | 1.0            | -58.6         | -13.0          | -45.6         |       |
| 5.552                                                                | -10.6               | H                                  | 3.0             | 36.3           | 1.0            | -45.9         | -13.0          | -32.9         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                           |                     |                                    |                 |                |                |               |                |               |       |
| 3.760                                                                | -21.4               | V                                  | 3.0             | 36.8           | 1.0            | -57.2         | -13.0          | -44.2         |       |
| 5.640                                                                | -18.4               | V                                  | 3.0             | 36.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
| 3.760                                                                | -20.3               | H                                  | 3.0             | 36.8           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 5.640                                                                | -17.9               | H                                  | 3.0             | 36.3           | 1.0            | -53.2         | -13.0          | -40.2         |       |
| <b>High Ch, 1909.3MHz</b>                                            |                     |                                    |                 |                |                |               |                |               |       |
| 3.819                                                                | -21.0               | V                                  | 3.0             | 36.7           | 1.0            | -56.7         | -13.0          | -43.7         |       |
| 5.728                                                                | -19.0               | V                                  | 3.0             | 36.3           | 1.0            | -54.4         | -13.0          | -41.4         |       |
| 3.819                                                                | -21.0               | H                                  | 3.0             | 36.7           | 1.0            | -56.8         | -13.0          | -43.8         |       |
| 5.728                                                                | -17.6               | H                                  | 3.0             | 36.3           | 1.0            | -52.9         | -13.0          | -39.9         |       |
| Rev. 03.03.09                                                        |                     |                                    |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor. |                     |                                    |                 |                |                |               |                |               |       |

**LTE QPSK Band 2 (3 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                         |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC Adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 3MHz BW<br>QPSK  |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1851.5MHz</b>                                                                |                     |                                  |                 |                |                |               |                |               |       |
| 3.704                                                                                   | -21.0               | V                                | 3.0             | 36.8           | 1.0            | -56.8         | -13.0          | -43.8         |       |
| 5.555                                                                                   | -18.7               | V                                | 3.0             | 36.3           | 1.0            | -54.0         | -13.0          | -41.0         |       |
| 3.704                                                                                   | -21.7               | H                                | 3.0             | 36.8           | 1.0            | -57.5         | -13.0          | -44.5         |       |
| 5.555                                                                                   | -17.7               | H                                | 3.0             | 36.3           | 1.0            | -53.0         | -13.0          | -40.0         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                  |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -21.1               | V                                | 3.0             | 36.8           | 1.0            | -56.9         | -13.0          | -43.9         |       |
| 5.640                                                                                   | -19.0               | V                                | 3.0             | 36.3           | 1.0            | -54.3         | -13.0          | -41.3         |       |
| 3.760                                                                                   | -21.4               | H                                | 3.0             | 36.8           | 1.0            | -57.2         | -13.0          | -44.2         |       |
| 5.640                                                                                   | -17.7               | H                                | 3.0             | 36.3           | 1.0            | -53.0         | -13.0          | -40.0         |       |
| <b>High Ch, 1908.5MHz</b>                                                               |                     |                                  |                 |                |                |               |                |               |       |
| 3.805                                                                                   | -20.2               | V                                | 3.0             | 36.7           | 1.0            | -55.9         | -13.0          | -42.9         |       |
| 5.708                                                                                   | -19.5               | V                                | 3.0             | 36.3           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 3.805                                                                                   | -21.6               | H                                | 3.0             | 36.7           | 1.0            | -57.4         | -13.0          | -44.4         |       |
| 5.708                                                                                   | -17.5               | H                                | 3.0             | 36.3           | 1.0            | -52.8         | -13.0          | -39.8         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |               |                |               |       |

**LTE 16QAM Band 2 (3 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                         |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT AC Adapter and Earphone      |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 3MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1851.5MHz</b>                                                                |                     |                                  |                 |                |                |               |                |               |       |
| 3.704                                                                                   | -22.4               | V                                | 3.0             | 36.8           | 1.0            | -58.2         | -13.0          | -45.2         |       |
| 5.555                                                                                   | -18.8               | V                                | 3.0             | 36.3           | 1.0            | -54.1         | -13.0          | -41.1         |       |
| 3.704                                                                                   | -21.9               | H                                | 3.0             | 36.8           | 1.0            | -57.7         | -13.0          | -44.7         |       |
| 5.555                                                                                   | -18.9               | H                                | 3.0             | 36.3           | 1.0            | -54.2         | -13.0          | -41.2         |       |
| <b>Mid Ch, 1880.0MHz</b>                                                                |                     |                                  |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -21.3               | V                                | 3.0             | 36.8           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.640                                                                                   | -19.0               | V                                | 3.0             | 36.3           | 1.0            | -54.3         | -13.0          | -41.3         |       |
| 3.760                                                                                   | -21.3               | H                                | 3.0             | 36.8           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.640                                                                                   | -18.4               | H                                | 3.0             | 36.3           | 1.0            | -53.7         | -13.0          | -40.7         |       |
| <b>High Ch, 1908.5MHz</b>                                                               |                     |                                  |                 |                |                |               |                |               |       |
| 3.805                                                                                   | -22.0               | V                                | 3.0             | 36.7           | 1.0            | -57.7         | -13.0          | -44.7         |       |
| 5.708                                                                                   | -18.9               | V                                | 3.0             | 36.3           | 1.0            | -54.2         | -13.0          | -41.2         |       |
| 3.805                                                                                   | -21.4               | H                                | 3.0             | 36.7           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.708                                                                                   | -18.6               | H                                | 3.0             | 36.3           | 1.0            | -53.9         | -13.0          | -40.9         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |               |                |               |       |

**LTE QPSK Band 2 (5 MHz BANDWIDTH)**

| Compliance Certification Services                                    |                     |                             |                 |                |                |               |                |               |       |
|----------------------------------------------------------------------|---------------------|-----------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| Above 1GHz High Frequency Substitution Measurement                   |                     |                             |                 |                |                |               |                |               |       |
| <b>Company:</b>                                                      |                     | Apple                       |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                         |                     | 09/28/12                    |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                |                     | Roy Zheng                   |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                |                     | EUT AC adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                         |                     | TX, LTE Band 2, 5MHz BW     |                 |                |                |               |                |               |       |
|                                                                      |                     | QPSK                        |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                       |                     | <b>Pre-amplifier</b>        |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                         |                     | T144 8449B                  |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)          | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1852.5MHz</b>                                             |                     |                             |                 |                |                |               |                |               |       |
| 3.705                                                                | -20.9               | V                           | 3.0             | 36.8           | 1.0            | -56.7         | -13.0          | -43.7         |       |
| 5.557                                                                | -19.0               | V                           | 3.0             | 36.3           | 1.0            | -54.3         | -13.0          | -41.3         |       |
| 3.705                                                                | -21.8               | H                           | 3.0             | 36.8           | 1.0            | -57.6         | -13.0          | -44.6         |       |
| 5.557                                                                | -18.1               | H                           | 3.0             | 36.3           | 1.0            | -53.4         | -13.0          | -40.4         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                           |                     |                             |                 |                |                |               |                |               |       |
| 3.760                                                                | -21.0               | V                           | 3.0             | 36.8           | 1.0            | -56.8         | -13.0          | -43.8         |       |
| 5.640                                                                | -17.9               | V                           | 3.0             | 36.3           | 1.0            | -53.2         | -13.0          | -40.2         |       |
| 3.760                                                                | -21.5               | H                           | 3.0             | 36.8           | 1.0            | -57.3         | -13.0          | -44.3         |       |
| 5.640                                                                | -18.5               | H                           | 3.0             | 36.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
| <b>High Ch, 1907.5MHz</b>                                            |                     |                             |                 |                |                |               |                |               |       |
| 3.815                                                                | -21.4               | V                           | 3.0             | 36.7           | 1.0            | -57.2         | -13.0          | -44.2         |       |
| 5.722                                                                | -17.7               | V                           | 3.0             | 36.3           | 1.0            | -53.0         | -13.0          | -40.0         |       |
| 3.815                                                                | -20.3               | H                           | 3.0             | 36.7           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 5.722                                                                | -17.2               | H                           | 3.0             | 36.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
| Rev. 03.03.09                                                        |                     |                             |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor. |                     |                             |                 |                |                |               |                |               |       |

**LTE QPSK Band 2 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                         |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and Earphone   |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 10MHz BW<br>QPSK |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1855MHz</b>                                                                  |                     |                                  |                 |                |                |               |                |               |       |
| 3.710                                                                                   | -19.5               | V                                | 3.0             | 36.8           | 1.0            | -55.3         | -13.0          | -42.3         |       |
| 5.565                                                                                   | -17.8               | V                                | 3.0             | 36.3           | 1.0            | -53.0         | -13.0          | -40.0         |       |
| 3.710                                                                                   | -14.8               | H                                | 3.0             | 36.8           | 1.0            | -50.6         | -13.0          | -37.6         |       |
| 5.565                                                                                   | -13.9               | H                                | 3.0             | 36.3           | 1.0            | -49.1         | -13.0          | -36.1         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                  |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -19.0               | V                                | 3.0             | 36.8           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 5.640                                                                                   | -17.6               | V                                | 3.0             | 36.3           | 1.0            | -52.9         | -13.0          | -39.9         |       |
| 3.760                                                                                   | -20.3               | H                                | 3.0             | 36.8           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 5.640                                                                                   | -16.4               | H                                | 3.0             | 36.3           | 1.0            | -51.7         | -13.0          | -38.7         |       |
| <b>High Ch, 1905MHz</b>                                                                 |                     |                                  |                 |                |                |               |                |               |       |
| 3.810                                                                                   | -19.7               | V                                | 3.0             | 36.7           | 1.0            | -55.4         | -13.0          | -42.4         |       |
| 5.715                                                                                   | -18.3               | V                                | 3.0             | 36.3           | 1.0            | -53.6         | -13.0          | -40.6         |       |
| 3.810                                                                                   | -20.5               | H                                | 3.0             | 36.7           | 1.0            | -56.2         | -13.0          | -43.2         |       |
| 5.715                                                                                   | -16.5               | H                                | 3.0             | 36.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |               |                |               |       |

**LTE 16QAM Band 2 (10MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                   |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                             |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                          |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                         |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/AC Adapter and Earphone     |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 10MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>              |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                        |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1855MHz</b>                                                                  |                     |                                   |                 |                |                |               |                |               |       |
| 3.710                                                                                   | 110.1               | V                                 | 3.0             | 36.8           | 1.0            | 74.3          | -13.0          | 87.3          |       |
| 5.565                                                                                   | -17.9               | V                                 | 3.0             | 36.3           | 1.0            | -53.2         | -13.0          | -40.2         |       |
| 3.710                                                                                   | -20.5               | H                                 | 3.0             | 36.8           | 1.0            | -56.3         | -13.0          | -43.3         |       |
| 5.565                                                                                   | -19.3               | H                                 | 3.0             | 36.3           | 1.0            | -54.6         | -13.0          | -41.6         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                   |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -19.6               | V                                 | 3.0             | 36.8           | 1.0            | -55.4         | -13.0          | -42.4         |       |
| 5.640                                                                                   | -16.8               | V                                 | 3.0             | 36.3           | 1.0            | -52.2         | -13.0          | -39.2         |       |
| 3.760                                                                                   | -19.4               | H                                 | 3.0             | 36.8           | 1.0            | -55.2         | -13.0          | -42.2         |       |
| 5.640                                                                                   | -16.7               | H                                 | 3.0             | 36.3           | 1.0            | -52.0         | -13.0          | -39.0         |       |
| <b>High Ch, 1905MHz</b>                                                                 |                     |                                   |                 |                |                |               |                |               |       |
| 3.810                                                                                   | -20.6               | V                                 | 3.0             | 36.7           | 1.0            | -56.3         | -13.0          | -43.3         |       |
| 5.715                                                                                   | -16.6               | V                                 | 3.0             | 36.3           | 1.0            | -51.9         | -13.0          | -38.9         |       |
| 3.810                                                                                   | -20.0               | H                                 | 3.0             | 36.7           | 1.0            | -55.7         | -13.0          | -42.7         |       |
| 5.715                                                                                   | -16.8               | H                                 | 3.0             | 36.3           | 1.0            | -52.1         | -13.0          | -39.1         |       |
| Rev. 03.03.09                                                                           |                     |                                   |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                   |                 |                |                |               |                |               |       |

**LTE QPSK Band 2 (15MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|--------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                          |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                       |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                      |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 15MHz BW       |                 |                |                |               |                |               |       |
|                                                                                         |                     | QPSK                           |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>           |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                     |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1857.5MHz</b>                                                                |                     |                                |                 |                |                |               |                |               |       |
| 3.715                                                                                   | -20.2               | V                              | 3.0             | 36.8           | 1.0            | -56.0         | -13.0          | -43.0         |       |
| 5.573                                                                                   | -18.5               | V                              | 3.0             | 36.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
| 3.715                                                                                   | -20.2               | H                              | 3.0             | 36.8           | 1.0            | -56.0         | -13.0          | -43.0         |       |
| 5.573                                                                                   | -16.8               | H                              | 3.0             | 36.3           | 1.0            | -52.1         | -13.0          | -39.1         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -19.4               | V                              | 3.0             | 36.8           | 1.0            | -55.1         | -13.0          | -42.1         |       |
| 5.640                                                                                   | -18.1               | V                              | 3.0             | 36.3           | 1.0            | -53.5         | -13.0          | -40.5         |       |
| 3.760                                                                                   | -19.8               | H                              | 3.0             | 36.8           | 1.0            | -55.5         | -13.0          | -42.5         |       |
| 5.640                                                                                   | -17.3               | H                              | 3.0             | 36.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
| <b>High Ch, 1902.5MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.805                                                                                   | -20.4               | V                              | 3.0             | 36.7           | 1.0            | -56.2         | -13.0          | -43.2         |       |
| 5.708                                                                                   | -17.4               | V                              | 3.0             | 36.3           | 1.0            | -52.7         | -13.0          | -39.7         |       |
| 3.805                                                                                   | -20.1               | H                              | 3.0             | 36.7           | 1.0            | -55.8         | -13.0          | -42.8         |       |
| 5.708                                                                                   | -16.4               | H                              | 3.0             | 36.3           | 1.0            | -51.7         | -13.0          | -38.7         |       |
| Rev. 03.03.09                                                                           |                     |                                |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                |                 |                |                |               |                |               |       |



**LTE 16QAM Band 2 (15MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                   |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                             |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                          |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                         |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and Earphone    |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 15MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>              |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                        |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1857.5MHz</b>                                                                |                     |                                   |                 |                |                |               |                |               |       |
| 3.715                                                                                   | -21.1               | V                                 | 3.0             | 36.8           | 1.0            | -56.9         | -13.0          | -43.9         |       |
| 5.573                                                                                   | -17.3               | V                                 | 3.0             | 36.3           | 1.0            | -52.5         | -13.0          | -39.5         |       |
| 3.715                                                                                   | -19.0               | H                                 | 3.0             | 36.8           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 5.573                                                                                   | -17.1               | H                                 | 3.0             | 36.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                   |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -21.3               | V                                 | 3.0             | 36.8           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.640                                                                                   | -18.3               | V                                 | 3.0             | 36.3           | 1.0            | -53.6         | -13.0          | -40.6         |       |
| 3.760                                                                                   | -21.0               | H                                 | 3.0             | 36.8           | 1.0            | -56.8         | -13.0          | -43.8         |       |
| 5.640                                                                                   | -16.9               | H                                 | 3.0             | 36.3           | 1.0            | -52.2         | -13.0          | -39.2         |       |
| <b>High Ch, 1902.5MHz</b>                                                               |                     |                                   |                 |                |                |               |                |               |       |
| 3.805                                                                                   | -20.7               | V                                 | 3.0             | 36.7           | 1.0            | -56.5         | -13.0          | -43.5         |       |
| 5.708                                                                                   | -16.9               | V                                 | 3.0             | 36.3           | 1.0            | -52.2         | -13.0          | -39.2         |       |
| 3.805                                                                                   | -21.0               | H                                 | 3.0             | 36.7           | 1.0            | -56.7         | -13.0          | -43.7         |       |
| 5.708                                                                                   | -17.1               | H                                 | 3.0             | 36.3           | 1.0            | -52.4         | -13.0          | -39.4         |       |
| Rev. 03.03.09                                                                           |                     |                                   |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                   |                 |                |                |               |                |               |       |



**LTE QPSK Band 2 (20MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                         |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/AC Adapter and Earphone    |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 2, 20MHz BW<br>QPSK |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (1860MHz)</b>                                                                |                     |                                  |                 |                |                |               |                |               |       |
| 3.720                                                                                   | -19.3               | V                                | 3.0             | 36.8           | 1.0            | -55.1         | -13.0          | -42.1         |       |
| 5.580                                                                                   | -17.2               | V                                | 3.0             | 36.3           | 1.0            | -52.5         | -13.0          | -39.5         |       |
| 3.720                                                                                   | -20.7               | H                                | 3.0             | 36.8           | 1.0            | -56.5         | -13.0          | -43.5         |       |
| 5.580                                                                                   | -18.4               | H                                | 3.0             | 36.3           | 1.0            | -53.7         | -13.0          | -40.7         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                                              |                     |                                  |                 |                |                |               |                |               |       |
| 3.760                                                                                   | -20.4               | V                                | 3.0             | 36.8           | 1.0            | -56.2         | -13.0          | -43.2         |       |
| 5.640                                                                                   | -17.3               | V                                | 3.0             | 36.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
| 3.760                                                                                   | -19.8               | H                                | 3.0             | 36.8           | 1.0            | -55.6         | -13.0          | -42.6         |       |
| 5.640                                                                                   | -16.6               | H                                | 3.0             | 36.3           | 1.0            | -51.9         | -13.0          | -38.9         |       |
| <b>High Ch, (1900MHz)</b>                                                               |                     |                                  |                 |                |                |               |                |               |       |
| 3.800                                                                                   | -20.3               | V                                | 3.0             | 36.7           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 5.700                                                                                   | -17.8               | V                                | 3.0             | 36.3           | 1.0            | -53.1         | -13.0          | -40.1         |       |
| 3.800                                                                                   | -21.5               | H                                | 3.0             | 36.7           | 1.0            | -57.2         | -13.0          | -44.2         |       |
| 5.700                                                                                   | -17.0               | H                                | 3.0             | 36.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |               |                |               |       |

**LTE 16QAM Band 2 (20MHz BANDWIDTH)**

| Compliance Certification Services                                    |                     |                                   |                 |                |                |               |                |               |       |
|----------------------------------------------------------------------|---------------------|-----------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| Above 1GHz High Frequency Substitution Measurement                   |                     |                                   |                 |                |                |               |                |               |       |
| <b>Company:</b>                                                      |                     | Apple                             |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                         |                     | 09/28/12                          |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                |                     | Roy Zheng                         |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                |                     | EUT w/ AC Adapter and Earphone    |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                         |                     | TX, LTE Band 2, 20MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                       |                     | <b>Pre-amplifier</b>              |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                         |                     | T144 8449B                        |                 | Filter 1       |                | Part 24       |                |               |       |
| f<br>GHz                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1860MHz</b>                                               |                     |                                   |                 |                |                |               |                |               |       |
| 3.720                                                                | -20.4               | V                                 | 3.0             | 36.8           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 5.580                                                                | -18.4               | V                                 | 3.0             | 36.3           | 1.0            | -53.6         | -13.0          | -40.6         |       |
| 3.720                                                                | -21.3               | H                                 | 3.0             | 36.8           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.580                                                                | -17.8               | H                                 | 3.0             | 36.3           | 1.0            | -53.1         | -13.0          | -40.1         |       |
| <b>Mid Ch, (1880.0MHz)</b>                                           |                     |                                   |                 |                |                |               |                |               |       |
| 3.760                                                                | -19.6               | V                                 | 3.0             | 36.8           | 1.0            | -55.4         | -13.0          | -42.4         |       |
| 5.640                                                                | -18.9               | V                                 | 3.0             | 36.3           | 1.0            | -54.2         | -13.0          | -41.2         |       |
| 3.760                                                                | -21.5               | H                                 | 3.0             | 36.8           | 1.0            | -57.3         | -13.0          | -44.3         |       |
| 5.640                                                                | -18.0               | H                                 | 3.0             | 36.3           | 1.0            | -53.3         | -13.0          | -40.3         |       |
| <b>High Ch, 1900MHz</b>                                              |                     |                                   |                 |                |                |               |                |               |       |
| 3.800                                                                | -21.0               | V                                 | 3.0             | 36.7           | 1.0            | -56.7         | -13.0          | -43.7         |       |
| 5.700                                                                | -17.5               | V                                 | 3.0             | 36.3           | 1.0            | -52.8         | -13.0          | -39.8         |       |
| 3.800                                                                | -21.5               | H                                 | 3.0             | 36.7           | 1.0            | -57.2         | -13.0          | -44.2         |       |
| 5.700                                                                | -18.4               | H                                 | 3.0             | 36.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
| Rev. 03.03.09                                                        |                     |                                   |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor. |                     |                                   |                 |                |                |               |                |               |       |

**LTE QPSK Band 4 (1.4.0 MHz BANDWIDTH)**

| Compliance Certification Services                                    |                     |                       |                 |                |                |               |                |               |       |
|----------------------------------------------------------------------|---------------------|-----------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| Above 1GHz High Frequency Substitution Measurement                   |                     |                       |                 |                |                |               |                |               |       |
| <b>Company:</b>                                                      |                     | Apple                 |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                    |                     | 12U14507              |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                         |                     | 10/02/12              |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                |                     | Chin Pang             |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                |                     | EUT and AC Adapter    |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                         |                     | LTE Band 4, 1.4MHz BW |                 |                |                |               |                |               |       |
|                                                                      |                     | QPSK                  |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                       |                     | <b>Pre-amplifier</b>  |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                         |                     | T145 8449B            |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)    | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1710.7MHz</b>                                             |                     |                       |                 |                |                |               |                |               |       |
| 3.421                                                                | -14.7               | V                     | 3.0             | 35.5           | 1.0            | -49.1         | -13.0          | -36.1         |       |
| 5.132                                                                | -11.2               | V                     | 3.0             | 35.3           | 1.0            | -45.5         | -13.0          | -32.5         |       |
| 3.421                                                                | -17.6               | H                     | 3.0             | 35.5           | 1.0            | -52.1         | -13.0          | -39.1         |       |
| 5.132                                                                | -13.3               | H                     | 3.0             | 35.3           | 1.0            | -47.6         | -13.0          | -34.6         |       |
| <b>Mid Ch, 1732.50MHz</b>                                            |                     |                       |                 |                |                |               |                |               |       |
| 3.464                                                                | -14.5               | V                     | 3.0             | 35.5           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| 5.160                                                                | -11.3               | V                     | 3.0             | 35.3           | 1.0            | -45.6         | -13.0          | -32.6         |       |
| 3.464                                                                | -17.5               | H                     | 3.0             | 35.5           | 1.0            | -51.9         | -13.0          | -38.9         |       |
| 5.160                                                                | -13.2               | H                     | 3.0             | 35.3           | 1.0            | -47.5         | -13.0          | -34.5         |       |
| <b>High Ch, 1754.3MHz</b>                                            |                     |                       |                 |                |                |               |                |               |       |
| 3.509                                                                | -14.3               | V                     | 3.0             | 35.4           | 1.0            | -48.8         | -13.0          | -35.8         |       |
| 5.263                                                                | -11.1               | V                     | 3.0             | 35.3           | 1.0            | -45.5         | -13.0          | -32.5         |       |
| 3.509                                                                | -17.3               | H                     | 3.0             | 35.4           | 1.0            | -51.8         | -13.0          | -38.8         |       |
| 5.263                                                                | -12.5               | H                     | 3.0             | 35.3           | 1.0            | -46.8         | -13.0          | -33.8         |       |
| Rev. 03.03.09                                                        |                     |                       |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor. |                     |                       |                 |                |                |               |                |               |       |

**LTE 16QAM Band 4 (1.4 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|--------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                          |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                       |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                       |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                      |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter             |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 1.4MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>           |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                     |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1710.7MHz</b>                                                                |                     |                                |                 |                |                |               |                |               |       |
| 3.421                                                                                   | -14.2               | V                              | 3.0             | 35.5           | 1.0            | -48.6         | -13.0          | -35.6         |       |
| 5.132                                                                                   | -12.7               | V                              | 3.0             | 35.3           | 1.0            | -47.0         | -13.0          | -34.0         |       |
| 3.421                                                                                   | -16.0               | H                              | 3.0             | 35.5           | 1.0            | -50.5         | -13.0          | -37.5         |       |
| 5.132                                                                                   | -11.8               | H                              | 3.0             | 35.3           | 1.0            | -46.1         | -13.0          | -33.1         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.464                                                                                   | -14.1               | V                              | 3.0             | 35.5           | 1.0            | -48.5         | -13.0          | -35.5         |       |
| 5.160                                                                                   | -10.3               | V                              | 3.0             | 35.3           | 1.0            | -44.6         | -13.0          | -31.6         |       |
| 3.464                                                                                   | -15.9               | H                              | 3.0             | 35.5           | 1.0            | -50.3         | -13.0          | -37.3         |       |
| 5.160                                                                                   | -11.7               | H                              | 3.0             | 35.3           | 1.0            | -46.0         | -13.0          | -33.0         |       |
| <b>High Ch, 1754.3MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.508                                                                                   | -14.3               | V                              | 3.0             | 35.4           | 1.0            | -48.8         | -13.0          | -35.8         |       |
| 5.263                                                                                   | -10.1               | V                              | 3.0             | 35.3           | 1.0            | -44.5         | -13.0          | -31.5         |       |
| 3.508                                                                                   | -15.7               | H                              | 3.0             | 35.4           | 1.0            | -50.2         | -13.0          | -37.2         |       |
| 5.263                                                                                   | -11.5               | H                              | 3.0             | 35.3           | 1.0            | -45.8         | -13.0          | -32.8         |       |
| Rev. 03.03.09                                                                           |                     |                                |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                |                 |                |                |               |                |               |       |

**LTE QPSK Band 4 (3 MHz BANDWIDTH)**

| Compliance Certification Services                                    |                  |                                |              |               |             |              |             |            |       |
|----------------------------------------------------------------------|------------------|--------------------------------|--------------|---------------|-------------|--------------|-------------|------------|-------|
| Above 1GHz High Frequency Substitution Measurement                   |                  |                                |              |               |             |              |             |            |       |
| <b>Company:</b>                                                      |                  | Apple                          |              |               |             |              |             |            |       |
| <b>Date:</b>                                                         |                  | 09/28/12                       |              |               |             |              |             |            |       |
| <b>Test Engineer:</b>                                                |                  | Roy Zheng                      |              |               |             |              |             |            |       |
| <b>Configuration:</b>                                                |                  | EUT w/ AC Adapter and Earphone |              |               |             |              |             |            |       |
| <b>Mode:</b>                                                         |                  | LTE Band 4, 3MHz BW            |              |               |             |              |             |            |       |
|                                                                      |                  | QPSK                           |              |               |             |              |             |            |       |
| <b>Chamber</b>                                                       |                  | <b>Pre-amplifier</b>           |              | <b>Filter</b> |             | <b>Limit</b> |             |            |       |
| 5m Chamber A                                                         |                  | T144 8449B                     |              | Filter 1      |             | Part 27      |             |            |       |
| f GHz                                                                | SG reading (dBm) | Ant. Pol. (H/V)                | Distance (m) | Preamp (dB)   | Filter (dB) | EIRP (dBm)   | Limit (dBm) | Delta (dB) | Notes |
| <b>Low Ch, 1711.5MHz</b>                                             |                  |                                |              |               |             |              |             |            |       |
| 3.423                                                                | -20.4            | V                              | 3.0          | 37.0          | 1.0         | -56.5        | -13.0       | -43.5      |       |
| 5.135                                                                | -18.6            | V                              | 3.0          | 36.3          | 1.0         | -53.8        | -13.0       | -40.8      |       |
| 3.423                                                                | -18.5            | H                              | 3.0          | 37.0          | 1.0         | -54.5        | -13.0       | -41.5      |       |
| 5.135                                                                | -16.8            | H                              | 3.0          | 36.3          | 1.0         | -52.1        | -13.0       | -39.1      |       |
| <b>Mid Ch, 1732.50MHz</b>                                            |                  |                                |              |               |             |              |             |            |       |
| 3.465                                                                | -22.3            | V                              | 3.0          | 37.0          | 1.0         | -58.3        | -13.0       | -45.3      |       |
| 5.160                                                                | -19.1            | V                              | 3.0          | 36.3          | 1.0         | -54.4        | -13.0       | -41.4      |       |
| 3.465                                                                | -21.7            | H                              | 3.0          | 37.0          | 1.0         | -57.7        | -13.0       | -44.7      |       |
| 5.160                                                                | -18.8            | H                              | 3.0          | 36.3          | 1.0         | -54.1        | -13.0       | -41.1      |       |
| <b>High Ch, 1753.5MHz</b>                                            |                  |                                |              |               |             |              |             |            |       |
| 3.507                                                                | -21.7            | V                              | 3.0          | 37.0          | 1.0         | -57.7        | -13.0       | -44.7      |       |
| 5.235                                                                | -17.8            | V                              | 3.0          | 36.3          | 1.0         | -53.0        | -13.0       | -40.0      |       |
| 3.490                                                                | -20.9            | H                              | 3.0          | 37.0          | 1.0         | -56.9        | -13.0       | -43.9      |       |
| 5.235                                                                | -17.9            | H                              | 3.0          | 36.3          | 1.0         | -53.1        | -13.0       | -40.1      |       |
| Rev. 03.03.09                                                        |                  |                                |              |               |             |              |             |            |       |
| Note: No other emissions were detected above the system noise floor. |                  |                                |              |               |             |              |             |            |       |

**LTE 16QAM Band 4 (3 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                               |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                         |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                      |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                     |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/AC Adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 3MHz BW<br>16QAM  |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>          |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                    |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1711.5MHz</b>                                                                |                     |                               |                 |                |                |               |                |               |       |
| 3.423                                                                                   | -20.9               | V                             | 3.0             | 37.0           | 1.0            | -56.9         | -13.0          | -43.9         |       |
| 5.135                                                                                   | -18.7               | V                             | 3.0             | 36.3           | 1.0            | -53.9         | -13.0          | -40.9         |       |
| 3.423                                                                                   | -20.7               | H                             | 3.0             | 37.0           | 1.0            | -56.7         | -13.0          | -43.7         |       |
| 5.135                                                                                   | -17.3               | H                             | 3.0             | 36.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                               |                 |                |                |               |                |               |       |
| 3.465                                                                                   | -21.8               | V                             | 3.0             | 37.0           | 1.0            | -57.8         | -13.0          | -44.8         |       |
| 5.160                                                                                   | -19.4               | V                             | 3.0             | 36.3           | 1.0            | -54.7         | -13.0          | -41.7         |       |
| 3.465                                                                                   | -21.9               | H                             | 3.0             | 37.0           | 1.0            | -57.9         | -13.0          | -44.9         |       |
| 5.160                                                                                   | -18.4               | H                             | 3.0             | 36.3           | 1.0            | -53.7         | -13.0          | -40.7         |       |
| <b>High Ch, 1753.5MHz</b>                                                               |                     |                               |                 |                |                |               |                |               |       |
| 3.507                                                                                   | -20.7               | V                             | 3.0             | 37.0           | 1.0            | -56.7         | -13.0          | -43.7         |       |
| 5.235                                                                                   | -18.6               | V                             | 3.0             | 36.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
| 3.507                                                                                   | -21.8               | H                             | 3.0             | 37.0           | 1.0            | -57.8         | -13.0          | -44.8         |       |
| 5.235                                                                                   | -18.0               | H                             | 3.0             | 36.3           | 1.0            | -53.2         | -13.0          | -40.2         |       |
| Rev. 03.03.09                                                                           |                     |                               |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                               |                 |                |                |               |                |               |       |

**LTE QPSK Band 4 (5 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|--------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                          |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                       |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                      |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 5MHz BW<br>QPSK    |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>           |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                     |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1712.5MHz</b>                                                                |                     |                                |                 |                |                |               |                |               |       |
| 3.425                                                                                   | -21.0               | V                              | 3.0             | 37.0           | 1.0            | -57.1         | -13.0          | -44.1         |       |
| 5.138                                                                                   | -19.6               | V                              | 3.0             | 36.3           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 3.425                                                                                   | -20.9               | H                              | 3.0             | 37.0           | 1.0            | -56.9         | -13.0          | -43.9         |       |
| 5.138                                                                                   | -17.6               | H                              | 3.0             | 36.3           | 1.0            | -52.9         | -13.0          | -39.9         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.465                                                                                   | -21.8               | V                              | 3.0             | 37.0           | 1.0            | -57.8         | -13.0          | -44.8         |       |
| 5.198                                                                                   | -19.0               | V                              | 3.0             | 36.2           | 1.0            | -54.3         | -13.0          | -41.3         |       |
| 3.465                                                                                   | -19.6               | H                              | 3.0             | 37.0           | 1.0            | -55.6         | -13.0          | -42.6         |       |
| 5.198                                                                                   | -17.9               | H                              | 3.0             | 36.2           | 1.0            | -53.2         | -13.0          | -40.2         |       |
| <b>High Ch, 1752.5MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.505                                                                                   | -21.5               | V                              | 3.0             | 37.0           | 1.0            | -57.4         | -13.0          | -44.4         |       |
| 5.258                                                                                   | -18.3               | V                              | 3.0             | 36.3           | 1.0            | -53.5         | -13.0          | -40.5         |       |
| 3.505                                                                                   | -20.7               | H                              | 3.0             | 37.0           | 1.0            | -56.6         | -13.0          | -43.6         |       |
| 5.258                                                                                   | -17.3               | H                              | 3.0             | 36.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
| Rev. 03.03.09                                                                           |                     |                                |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                |                 |                |                |               |                |               |       |



**LTE 16QAM Band 4 (5 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|--------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                          |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                       |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                      |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and Earphone |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 5MHz BW<br>16QAM   |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>           |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                     |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)             | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1712.5MHz</b>                                                                |                     |                                |                 |                |                |               |                |               |       |
| 3.425                                                                                   | -21.3               | V                              | 3.0             | 37.0           | 1.0            | -57.3         | -13.0          | -44.3         |       |
| 5.138                                                                                   | -18.9               | V                              | 3.0             | 36.3           | 1.0            | -54.2         | -13.0          | -41.2         |       |
| 3.425                                                                                   | -21.9               | H                              | 3.0             | 37.0           | 1.0            | -57.9         | -13.0          | -44.9         |       |
| 5.138                                                                                   | -18.6               | H                              | 3.0             | 36.3           | 1.0            | -53.9         | -13.0          | -40.9         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.465                                                                                   | -22.0               | V                              | 3.0             | 37.0           | 1.0            | -58.0         | -13.0          | -45.0         |       |
| 5.198                                                                                   | -18.6               | V                              | 3.0             | 36.2           | 1.0            | -53.9         | -13.0          | -40.9         |       |
| 3.465                                                                                   | -21.4               | H                              | 3.0             | 37.0           | 1.0            | -57.4         | -13.0          | -44.4         |       |
| 5.198                                                                                   | -17.9               | H                              | 3.0             | 36.2           | 1.0            | -53.1         | -13.0          | -40.1         |       |
| <b>High Ch, 1752.5MHz</b>                                                               |                     |                                |                 |                |                |               |                |               |       |
| 3.505                                                                                   | -22.0               | V                              | 3.0             | 37.0           | 1.0            | -58.0         | -13.0          | -45.0         |       |
| 5.258                                                                                   | -18.5               | V                              | 3.0             | 36.3           | 1.0            | -53.7         | -13.0          | -40.7         |       |
| 3.505                                                                                   | -21.8               | H                              | 3.0             | 37.0           | 1.0            | -57.8         | -13.0          | -44.8         |       |
| 5.258                                                                                   | -17.8               | H                              | 3.0             | 36.3           | 1.0            | -53.1         | -13.0          | -40.1         |       |
| Rev. 03.03.09                                                                           |                     |                                |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                |                 |                |                |               |                |               |       |



**LTE QPSK Band 4 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                              |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                        |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                     |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                     |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                    |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter           |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 10MHz BW<br>QPSK |                 |                |                |               |                |               |       |
| Chamber                                                                                 |                     | Pre-amplifier                |                 | Filter         |                | Limit         |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                   |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1715MHz</b>                                                                  |                     |                              |                 |                |                |               |                |               |       |
| 3.430                                                                                   | -14.7               | V                            | 3.0             | 37.0           | 1.0            | -50.7         | -13.0          | -37.7         |       |
| 5.145                                                                                   | -12.4               | V                            | 3.0             | 36.3           | 1.0            | -47.6         | -13.0          | -34.6         |       |
| 3.430                                                                                   | -11.8               | H                            | 3.0             | 37.0           | 1.0            | -47.8         | -13.0          | -34.8         |       |
| 5.145                                                                                   | -11.8               | H                            | 3.0             | 36.3           | 1.0            | -47.1         | -13.0          | -34.1         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                              |                 |                |                |               |                |               |       |
| 3.456                                                                                   | -16.2               | V                            | 3.0             | 37.0           | 1.0            | -52.2         | -13.0          | -39.2         |       |
| 5.184                                                                                   | -11.3               | V                            | 3.0             | 36.3           | 1.0            | -46.5         | -13.0          | -33.5         |       |
| 3.456                                                                                   | -16.7               | H                            | 3.0             | 37.0           | 1.0            | -52.7         | -13.0          | -39.7         |       |
| 5.184                                                                                   | -12.7               | H                            | 3.0             | 36.3           | 1.0            | -48.0         | -13.0          | -35.0         |       |
| <b>High Ch, 1750MHz</b>                                                                 |                     |                              |                 |                |                |               |                |               |       |
| 3.500                                                                                   | -15.5               | V                            | 3.0             | 37.0           | 1.0            | -51.5         | -13.0          | -38.5         |       |
| 5.250                                                                                   | -13.1               | V                            | 3.0             | 36.3           | 1.0            | -48.4         | -13.0          | -35.4         |       |
| 3.500                                                                                   | -17.6               | H                            | 3.0             | 37.0           | 1.0            | -53.5         | -13.0          | -40.5         |       |
| 5.250                                                                                   | -13.6               | H                            | 3.0             | 36.3           | 1.0            | -48.8         | -13.0          | -35.8         |       |
| Rev. 03.03.09                                                                           |                     |                              |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                              |                 |                |                |               |                |               |       |

**LTE 16QAM Band 4 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                               |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                         |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                      |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                      |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                     |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter            |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 10MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>          |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                    |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1715MHz</b>                                                                  |                     |                               |                 |                |                |               |                |               |       |
| 3.430                                                                                   | -16.7               | V                             | 3.0             | 37.0           | 1.0            | -52.7         | -13.0          | -39.7         |       |
| 5.145                                                                                   | -13.4               | V                             | 3.0             | 36.3           | 1.0            | -48.6         | -13.0          | -35.6         |       |
| 3.430                                                                                   | -12.8               | H                             | 3.0             | 37.0           | 1.0            | -48.8         | -13.0          | -35.8         |       |
| 5.145                                                                                   | -10.8               | H                             | 3.0             | 36.3           | 1.0            | -46.1         | -13.0          | -33.1         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                               |                 |                |                |               |                |               |       |
| 3.456                                                                                   | -16.6               | V                             | 3.0             | 37.0           | 1.0            | -52.6         | -13.0          | -39.6         |       |
| 5.184                                                                                   | -13.3               | V                             | 3.0             | 36.3           | 1.0            | -48.5         | -13.0          | -35.5         |       |
| 3.456                                                                                   | -17.2               | H                             | 3.0             | 37.0           | 1.0            | -53.2         | -13.0          | -40.2         |       |
| 5.184                                                                                   | -13.2               | H                             | 3.0             | 36.3           | 1.0            | -48.5         | -13.0          | -35.5         |       |
| <b>High Ch, 1750MHz</b>                                                                 |                     |                               |                 |                |                |               |                |               |       |
| 3.500                                                                                   | -16.8               | V                             | 3.0             | 37.0           | 1.0            | -52.8         | -13.0          | -39.8         |       |
| 5.250                                                                                   | -13.6               | V                             | 3.0             | 36.3           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| 3.500                                                                                   | -18.6               | H                             | 3.0             | 37.0           | 1.0            | -54.5         | -13.0          | -41.5         |       |
| 5.250                                                                                   | -12.8               | H                             | 3.0             | 36.3           | 1.0            | -48.1         | -13.0          | -35.1         |       |
| Rev. 03.03.09                                                                           |                     |                               |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                               |                 |                |                |               |                |               |       |

**LTE QPSK Band 4 (15MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                              |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                        |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                     |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                     |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                    |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter           |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 15MHz BW<br>QPSK |                 |                |                |               |                |               |       |
| Chamber                                                                                 |                     | Pre-amplifier                |                 | Filter         |                | Limit         |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                   |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1717.5MHz</b>                                                                |                     |                              |                 |                |                |               |                |               |       |
| 3.435                                                                                   | -13.5               | V                            | 3.0             | 35.5           | 1.0            | -48.0         | -13.0          | -35.0         |       |
| 5.152                                                                                   | -11.3               | V                            | 3.0             | 35.3           | 1.0            | -45.7         | -13.0          | -32.7         |       |
| 3.435                                                                                   | -14.6               | H                            | 3.0             | 35.5           | 1.0            | -49.1         | -13.0          | -36.1         |       |
| 5.152                                                                                   | -11.2               | H                            | 3.0             | 35.3           | 1.0            | -45.5         | -13.0          | -32.5         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                              |                 |                |                |               |                |               |       |
| 3.452                                                                                   | -13.5               | V                            | 3.0             | 35.5           | 1.0            | -48.0         | -13.0          | -35.0         |       |
| 5.178                                                                                   | -11.3               | V                            | 3.0             | 35.3           | 1.0            | -45.6         | -13.0          | -32.6         |       |
| 3.465                                                                                   | -15.5               | H                            | 3.0             | 35.5           | 1.0            | -49.9         | -13.0          | -36.9         |       |
| 5.198                                                                                   | -12.6               | H                            | 3.0             | 35.3           | 1.0            | -46.9         | -13.0          | -33.9         |       |
| <b>High Ch, 1747.5MHz</b>                                                               |                     |                              |                 |                |                |               |                |               |       |
| 3.495                                                                                   | -13.4               | V                            | 3.0             | 35.5           | 1.0            | -47.8         | -13.0          | -34.8         |       |
| 5.243                                                                                   | -11.2               | V                            | 3.0             | 35.3           | 1.0            | -45.5         | -13.0          | -32.5         |       |
| 3.495                                                                                   | -14.4               | H                            | 3.0             | 35.5           | 1.0            | -48.8         | -13.0          | -35.8         |       |
| 5.243                                                                                   | -11.0               | H                            | 3.0             | 35.3           | 1.0            | -45.4         | -13.0          | -32.4         |       |
| Rev. 03.03.09                                                                           |                     |                              |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                              |                 |                |                |               |                |               |       |

**LTE 16QAM Band 4 (15MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                               |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                         |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                      |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                      |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                     |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and AC Adapter            |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 15MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>          |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                    |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1717.5MHz</b>                                                                |                     |                               |                 |                |                |               |                |               |       |
| 3.435                                                                                   | -15.5               | V                             | 3.0             | 35.5           | 1.0            | -50.0         | -13.0          | -37.0         |       |
| 5.152                                                                                   | -13.3               | V                             | 3.0             | 35.3           | 1.0            | -47.7         | -13.0          | -34.7         |       |
| 3.435                                                                                   | -16.6               | H                             | 3.0             | 35.5           | 1.0            | -51.1         | -13.0          | -38.1         |       |
| 5.152                                                                                   | -13.7               | H                             | 3.0             | 35.3           | 1.0            | -48.0         | -13.0          | -35.0         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                               |                 |                |                |               |                |               |       |
| 3.452                                                                                   | -15.5               | V                             | 3.0             | 35.5           | 1.0            | -50.0         | -13.0          | -37.0         |       |
| 5.178                                                                                   | -13.3               | V                             | 3.0             | 35.3           | 1.0            | -47.6         | -13.0          | -34.6         |       |
| 3.465                                                                                   | -16.5               | H                             | 3.0             | 35.5           | 1.0            | -50.9         | -13.0          | -37.9         |       |
| 5.198                                                                                   | -13.6               | H                             | 3.0             | 35.3           | 1.0            | -47.9         | -13.0          | -34.9         |       |
| <b>High Ch, 1747.5MHz</b>                                                               |                     |                               |                 |                |                |               |                |               |       |
| 3.495                                                                                   | -15.4               | V                             | 3.0             | 35.5           | 1.0            | -49.8         | -13.0          | -36.8         |       |
| 5.243                                                                                   | -13.2               | V                             | 3.0             | 35.3           | 1.0            | -47.5         | -13.0          | -34.5         |       |
| 3.495                                                                                   | -16.4               | H                             | 3.0             | 35.5           | 1.0            | -50.8         | -13.0          | -37.8         |       |
| 5.243                                                                                   | -14.5               | H                             | 3.0             | 35.3           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| Rev. 03.03.09                                                                           |                     |                               |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                               |                 |                |                |               |                |               |       |

**LTE QPSK Band 4 (20 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                              |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                        |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                     |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                     |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                    |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and Earphone             |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 20MHz BW<br>QPSK |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>         |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                   |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)           | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1720MHz</b>                                                                  |                     |                              |                 |                |                |               |                |               |       |
| 3.422                                                                                   | -14.6               | V                            | 3.0             | 35.5           | 1.0            | -49.0         | -13.0          | -36.0         |       |
| 5.133                                                                                   | -11.4               | V                            | 3.0             | 35.3           | 1.0            | -45.7         | -13.0          | -32.7         |       |
| 3.422                                                                                   | -15.6               | H                            | 3.0             | 35.5           | 1.0            | -50.1         | -13.0          | -37.1         |       |
| 5.133                                                                                   | -11.8               | H                            | 3.0             | 35.3           | 1.0            | -46.1         | -13.0          | -33.1         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                              |                 |                |                |               |                |               |       |
| 3.447                                                                                   | -14.5               | V                            | 3.0             | 35.5           | 1.0            | -49.0         | -13.0          | -36.0         |       |
| 5.171                                                                                   | -11.3               | V                            | 3.0             | 35.3           | 1.0            | -45.6         | -13.0          | -32.6         |       |
| 3.447                                                                                   | -15.5               | H                            | 3.0             | 35.5           | 1.0            | -50.0         | -13.0          | -37.0         |       |
| 5.171                                                                                   | -11.7               | H                            | 3.0             | 35.3           | 1.0            | -46.0         | -13.0          | -33.0         |       |
| <b>High Ch, 1745MHz</b>                                                                 |                     |                              |                 |                |                |               |                |               |       |
| 3.475                                                                                   | -14.4               | V                            | 3.0             | 35.5           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| 5.208                                                                                   | -11.2               | V                            | 3.0             | 35.3           | 1.0            | -45.5         | -13.0          | -32.5         |       |
| 3.472                                                                                   | -15.5               | H                            | 3.0             | 35.5           | 1.0            | -49.9         | -13.0          | -36.9         |       |
| 5.208                                                                                   | -11.6               | H                            | 3.0             | 35.3           | 1.0            | -45.9         | -13.0          | -32.9         |       |
| Rev. 03.03.09                                                                           |                     |                              |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                              |                 |                |                |               |                |               |       |

**LTE 16QAM Band 4 (20MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                               |                 |                |                |               |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-------------------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                         |                 |                |                |               |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                      |                 |                |                |               |                |               |       |
| <b>Date:</b>                                                                            |                     | 10/02/12                      |                 |                |                |               |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Chin Pang                     |                 |                |                |               |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT and Earphone              |                 |                |                |               |                |               |       |
| <b>Mode:</b>                                                                            |                     | LTE Band 4, 20MHz BW<br>16QAM |                 |                |                |               |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>          |                 | <b>Filter</b>  |                | <b>Limit</b>  |                |               |       |
| 5m Chamber B                                                                            |                     | T145 8449B                    |                 | Filter 1       |                | Part 27       |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)            | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, 1720MHz</b>                                                                  |                     |                               |                 |                |                |               |                |               |       |
| 3.422                                                                                   | -16.6               | V                             | 3.0             | 35.5           | 1.0            | -51.0         | -13.0          | -38.0         |       |
| 5.133                                                                                   | -14.4               | V                             | 3.0             | 35.3           | 1.0            | -48.7         | -13.0          | -35.7         |       |
| 3.422                                                                                   | -17.1               | H                             | 3.0             | 35.5           | 1.0            | -51.6         | -13.0          | -38.6         |       |
| 5.133                                                                                   | -13.8               | H                             | 3.0             | 35.3           | 1.0            | -48.1         | -13.0          | -35.1         |       |
| <b>Mid Ch, 1732.50MHz</b>                                                               |                     |                               |                 |                |                |               |                |               |       |
| 3.447                                                                                   | -16.5               | V                             | 3.0             | 35.5           | 1.0            | -51.0         | -13.0          | -38.0         |       |
| 5.171                                                                                   | -14.3               | V                             | 3.0             | 35.3           | 1.0            | -48.6         | -13.0          | -35.6         |       |
| 3.447                                                                                   | -17.0               | H                             | 3.0             | 35.5           | 1.0            | -51.5         | -13.0          | -38.5         |       |
| 5.171                                                                                   | -13.7               | H                             | 3.0             | 35.3           | 1.0            | -48.0         | -13.0          | -35.0         |       |
| <b>High Ch, 1745MHz</b>                                                                 |                     |                               |                 |                |                |               |                |               |       |
| 3.475                                                                                   | -16.4               | V                             | 3.0             | 35.5           | 1.0            | -50.9         | -13.0          | -37.9         |       |
| 5.208                                                                                   | -14.2               | V                             | 3.0             | 35.3           | 1.0            | -48.5         | -13.0          | -35.5         |       |
| 3.472                                                                                   | -17.0               | H                             | 3.0             | 35.5           | 1.0            | -51.4         | -13.0          | -38.4         |       |
| 5.208                                                                                   | -13.6               | H                             | 3.0             | 35.3           | 1.0            | -47.9         | -13.0          | -34.9         |       |
| Rev. 03.03.09                                                                           |                     |                               |                 |                |                |               |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                               |                 |                |                |               |                |               |       |

**LTE QPSK Band 5 (1.4 MHz BANDWIDTH)**

| Compliance Certification Services                                    |                     |                                  |                 |                |                |              |                |               |       |
|----------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| Above 1GHz High Frequency Substitution Measurement                   |                     |                                  |                 |                |                |              |                |               |       |
| <b>Company:</b>                                                      |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                         |                     | 09/27/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                |                     | Roy Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                |                     | EUT with AC adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                         |                     | TX, LTE Band 5, 1.4MHz QPSK      |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                       |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                         |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (824.7MHz)</b>                                            |                     |                                  |                 |                |                |              |                |               |       |
| 1.649                                                                | -15.6               | V                                | 3.0             | 38.2           | 1.0            | -52.8        | -13.0          | -39.8         |       |
| 2.474                                                                | -13.5               | V                                | 3.0             | 37.5           | 1.0            | -50.0        | -13.0          | -37.0         |       |
| 1.649                                                                | -19.7               | H                                | 3.0             | 38.2           | 1.0            | -56.9        | -13.0          | -43.9         |       |
| 2.474                                                                | -18.7               | H                                | 3.0             | 37.5           | 1.0            | -55.2        | -13.0          | -42.2         |       |
| <b>Mid Ch, (836.5MHz)</b>                                            |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                | -20.2               | V                                | 3.0             | 38.1           | 1.0            | -57.3        | -13.0          | -44.3         |       |
| 2.510                                                                | -14.0               | V                                | 3.0             | 37.5           | 1.0            | -50.5        | -13.0          | -37.5         |       |
| 1.673                                                                | -21.2               | H                                | 3.0             | 38.1           | 1.0            | -58.3        | -13.0          | -45.3         |       |
| 2.510                                                                | -15.9               | H                                | 3.0             | 37.5           | 1.0            | -52.3        | -13.0          | -39.3         |       |
| <b>High Ch, (848.3MHz)</b>                                           |                     |                                  |                 |                |                |              |                |               |       |
| 1.697                                                                | -13.5               | V                                | 3.0             | 38.1           | 1.0            | -50.6        | -13.0          | -37.6         |       |
| 2.545                                                                | -6.6                | V                                | 3.0             | 37.5           | 1.0            | -43.1        | -13.0          | -30.1         |       |
| 1.695                                                                | -21.0               | H                                | 3.0             | 38.1           | 1.0            | -58.1        | -13.0          | -45.1         |       |
| 2.545                                                                | -16.9               | H                                | 3.0             | 37.5           | 1.0            | -53.3        | -13.0          | -40.3         |       |
| Rev. 03.03.09                                                        |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor. |                     |                                  |                 |                |                |              |                |               |       |



**LTE 16QAM Band 5(1.4 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/27/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 5, 1.4MHz 16QAM     |                 |                |                |              |                |               |       |
| Chamber                                                                                 |                     | Pre-amplifier                    |                 | Filter         |                | Limit        |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (824.7MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.649                                                                                   | -16.4               | V                                | 3.0             | 38.2           | 1.0            | -53.6        | -13.0          | -40.6         |       |
| 2.474                                                                                   | -13.0               | V                                | 3.0             | 37.5           | 1.0            | -49.5        | -13.0          | -36.5         |       |
| 1.649                                                                                   | -19.1               | H                                | 3.0             | 38.2           | 1.0            | -56.2        | -13.0          | -43.2         |       |
| 2.474                                                                                   | -18.6               | H                                | 3.0             | 37.5           | 1.0            | -55.1        | -13.0          | -42.1         |       |
| <b>Mid Ch, (836.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -20.9               | V                                | 3.0             | 38.1           | 1.0            | -58.0        | -13.0          | -45.0         |       |
| 2.510                                                                                   | -11.9               | V                                | 3.0             | 37.5           | 1.0            | -48.4        | -13.0          | -35.4         |       |
| 1.673                                                                                   | -22.2               | H                                | 3.0             | 38.1           | 1.0            | -59.3        | -13.0          | -46.3         |       |
| 2.510                                                                                   | -14.9               | H                                | 3.0             | 37.5           | 1.0            | -51.3        | -13.0          | -38.3         |       |
| <b>High Ch, (848.3MHz)</b>                                                              |                     |                                  |                 |                |                |              |                |               |       |
| 1.697                                                                                   | -19.0               | V                                | 3.0             | 38.1           | 1.0            | -56.1        | -13.0          | -43.1         |       |
| 2.545                                                                                   | -6.2                | V                                | 3.0             | 37.5           | 1.0            | -42.7        | -13.0          | -29.7         |       |
| 1.695                                                                                   | -20.0               | H                                | 3.0             | 38.1           | 1.0            | -57.1        | -13.0          | -44.1         |       |
| 2.545                                                                                   | -18.6               | H                                | 3.0             | 37.5           | 1.0            | -55.1        | -13.0          | -42.1         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |



**LTE QPSK Band 5 (3 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/26/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | ROY Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC Adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 5, 3MHz QPSK        |                 |                |                |              |                |               |       |
| Chamber                                                                                 |                     | Pre-amplifier                    |                 | Filter         |                | Limit        |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (825.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.651                                                                                   | -18.0               | V                                | 3.0             | 38.2           | 1.0            | -55.2        | -13.0          | -42.2         |       |
| 2.477                                                                                   | -4.2                | V                                | 3.0             | 37.5           | 1.0            | -40.7        | -13.0          | -27.7         |       |
| 1.651                                                                                   | -18.2               | H                                | 3.0             | 38.2           | 1.0            | -55.4        | -13.0          | -42.4         |       |
| 2.477                                                                                   | -11.0               | H                                | 3.0             | 37.5           | 1.0            | -47.5        | -13.0          | -34.5         |       |
| <b>Mid Ch, (836.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -21.5               | V                                | 3.0             | 38.1           | 1.0            | -58.6        | -13.0          | -45.6         |       |
| 2.510                                                                                   | -5.5                | V                                | 3.0             | 37.5           | 1.0            | -41.9        | -13.0          | -28.9         |       |
| 1.673                                                                                   | -21.6               | H                                | 3.0             | 38.1           | 1.0            | -58.7        | -13.0          | -45.7         |       |
| 2.510                                                                                   | -16.1               | H                                | 3.0             | 37.5           | 1.0            | -52.5        | -13.0          | -39.5         |       |
| <b>High Ch, (847.5MHz)</b>                                                              |                     |                                  |                 |                |                |              |                |               |       |
| 1.695                                                                                   | -17.0               | V                                | 3.0             | 38.1           | 1.0            | -54.1        | -13.0          | -41.1         |       |
| 2.543                                                                                   | -4.3                | V                                | 3.0             | 37.5           | 1.0            | -40.7        | -13.0          | -27.7         |       |
| 1.695                                                                                   | -18.6               | H                                | 3.0             | 38.1           | 1.0            | -55.7        | -13.0          | -42.7         |       |
| 2.543                                                                                   | -15.4               | H                                | 3.0             | 37.5           | 1.0            | -51.8        | -13.0          | -38.8         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |

**LTE 16QAM Band 5 (3 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/26/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | ROY Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC Adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 5, 3MHz 16QAM       |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (825.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.651                                                                                   | -18.4               | V                                | 3.0             | 38.2           | 1.0            | -55.6        | -13.0          | -42.6         |       |
| 2.477                                                                                   | -5.5                | V                                | 3.0             | 37.5           | 1.0            | -42.0        | -13.0          | -29.0         |       |
| 1.651                                                                                   | -18.8               | H                                | 3.0             | 38.2           | 1.0            | -56.0        | -13.0          | -43.0         |       |
| 2.477                                                                                   | -12.0               | H                                | 3.0             | 37.5           | 1.0            | -48.5        | -13.0          | -35.5         |       |
| <b>Mid Ch, (836.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -21.9               | V                                | 3.0             | 38.1           | 1.0            | -59.0        | -13.0          | -46.0         |       |
| 2.510                                                                                   | -6.7                | V                                | 3.0             | 37.5           | 1.0            | -43.2        | -13.0          | -30.2         |       |
| 1.673                                                                                   | -21.8               | H                                | 3.0             | 38.1           | 1.0            | -58.9        | -13.0          | -45.9         |       |
| 2.510                                                                                   | -8.2                | H                                | 3.0             | 37.5           | 1.0            | -44.6        | -13.0          | -31.6         |       |
| <b>High Ch, (847.5MHz)</b>                                                              |                     |                                  |                 |                |                |              |                |               |       |
| 1.695                                                                                   | -17.7               | V                                | 3.0             | 38.1           | 1.0            | -54.7        | -13.0          | -41.7         |       |
| 2.543                                                                                   | -5.1                | V                                | 3.0             | 37.5           | 1.0            | -41.5        | -13.0          | -28.5         |       |
| 1.695                                                                                   | -19.4               | H                                | 3.0             | 38.1           | 1.0            | -56.5        | -13.0          | -43.5         |       |
| 2.543                                                                                   | -17.7               | H                                | 3.0             | 37.5           | 1.0            | -54.1        | -13.0          | -41.1         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |

**LTE QPSK Band 5 (5 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Project #:</b>                                                                       |                     | 12U14507                         |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/25/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC Adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 5, 5MHz QPSK        |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (826.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.653                                                                                   | -16.1               | V                                | 3.0             | 38.1           | 1.0            | -53.3        | -13.0          | -40.3         |       |
| 2.480                                                                                   | -20.3               | V                                | 3.0             | 37.5           | 1.0            | -56.7        | -13.0          | -43.7         |       |
| 1.653                                                                                   | -18.4               | H                                | 3.0             | 38.1           | 1.0            | -55.6        | -13.0          | -42.6         |       |
| 2.480                                                                                   | -16.0               | H                                | 3.0             | 37.5           | 1.0            | -52.5        | -13.0          | -39.5         |       |
| <b>Mid Ch, (836.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -13.9               | V                                | 3.0             | 38.1           | 1.0            | -51.0        | -13.0          | -38.0         |       |
| 2.502                                                                                   | -11.2               | V                                | 3.0             | 37.5           | 1.0            | -47.6        | -13.0          | -34.6         |       |
| 1.673                                                                                   | -15.2               | H                                | 3.0             | 38.1           | 1.0            | -52.3        | -13.0          | -39.3         |       |
| 2.502                                                                                   | -8.9                | H                                | 3.0             | 37.5           | 1.0            | -45.4        | -13.0          | -32.4         |       |
| <b>High Ch, (846.5MHz)</b>                                                              |                     |                                  |                 |                |                |              |                |               |       |
| 1.693                                                                                   | -9.7                | V                                | 3.0             | 38.1           | 1.0            | -46.8        | -13.0          | -33.8         |       |
| 2.532                                                                                   | -10.1               | V                                | 3.0             | 37.5           | 1.0            | -46.5        | -13.0          | -33.5         |       |
| 1.693                                                                                   | -16.0               | H                                | 3.0             | 38.1           | 1.0            | -53.1        | -13.0          | -40.1         |       |
| 2.540                                                                                   | -16.7               | H                                | 3.0             | 37.5           | 1.0            | -53.1        | -13.0          | -40.1         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |

**LTE QPSK Band 5 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/25/21                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC Adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 5, 10MHz QPSK       |                 |                |                |              |                |               |       |
| Chamber                                                                                 |                     | Pre-amplifier                    |                 | Filter         |                | Limit        |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (829MHz)</b>                                                                 |                     |                                  |                 |                |                |              |                |               |       |
| 1.658                                                                                   | -14.1               | V                                | 3.0             | 38.1           | 1.0            | -51.2        | -13.0          | -38.2         |       |
| 2.487                                                                                   | -19.2               | V                                | 3.0             | 37.5           | 1.0            | -55.7        | -13.0          | -42.7         |       |
| 1.658                                                                                   | -19.4               | H                                | 3.0             | 38.1           | 1.0            | -56.5        | -13.0          | -43.5         |       |
| 2.487                                                                                   | -25.0               | H                                | 3.0             | 37.5           | 1.0            | -61.4        | -13.0          | -48.4         |       |
| <b>Mid Ch, (836.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -14.2               | V                                | 3.0             | 38.1           | 1.0            | -51.3        | -13.0          | -38.3         |       |
| 2.510                                                                                   | -4.7                | V                                | 3.0             | 37.5           | 1.0            | -41.1        | -13.0          | -28.1         |       |
| 1.673                                                                                   | -17.4               | H                                | 3.0             | 38.1           | 1.0            | -54.5        | -13.0          | -41.5         |       |
| 2.510                                                                                   | -7.5                | H                                | 3.0             | 37.5           | 1.0            | -43.9        | -13.0          | -30.9         |       |
| <b>High Ch, (844MHz)</b>                                                                |                     |                                  |                 |                |                |              |                |               |       |
| 1.688                                                                                   | -21.6               | V                                | 3.0             | 38.1           | 1.0            | -58.7        | -13.0          | -45.7         |       |
| 2.532                                                                                   | -3.7                | V                                | 3.0             | 37.5           | 1.0            | -40.2        | -13.0          | -27.2         |       |
| 1.688                                                                                   | -21.1               | H                                | 3.0             | 38.1           | 1.0            | -58.2        | -13.0          | -45.2         |       |
| 2.532                                                                                   | -9.5                | H                                | 3.0             | 37.5           | 1.0            | -45.9        | -13.0          | -32.9         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |

**LTE 16QAM Band 5 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/26/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT with AC Adapter and Earphone |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE Band 5, 10MHz 16QAM      |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 22      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch, (829MHz)</b>                                                                 |                     |                                  |                 |                |                |              |                |               |       |
| 1.658                                                                                   | -15.1               | V                                | 3.0             | 38.1           | 1.0            | -52.2        | -13.0          | -39.2         |       |
| 2.487                                                                                   | -19.2               | V                                | 3.0             | 37.5           | 1.0            | -55.7        | -13.0          | -42.7         |       |
| 1.658                                                                                   | -16.4               | H                                | 3.0             | 38.1           | 1.0            | -53.5        | -13.0          | -40.5         |       |
| 2.487                                                                                   | -26.0               | H                                | 3.0             | 37.5           | 1.0            | -62.4        | -13.0          | -49.4         |       |
| <b>Mid Ch, (836.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.673                                                                                   | -13.9               | V                                | 3.0             | 38.1           | 1.0            | -51.0        | -13.0          | -38.0         |       |
| 2.510                                                                                   | -3.7                | V                                | 3.0             | 37.5           | 1.0            | -40.2        | -13.0          | -27.2         |       |
| 1.673                                                                                   | -16.9               | H                                | 3.0             | 38.1           | 1.0            | -54.0        | -13.0          | -41.0         |       |
| 2.510                                                                                   | -7.7                | H                                | 3.0             | 37.5           | 1.0            | -44.2        | -13.0          | -31.2         |       |
| <b>High Ch, (844MHz)</b>                                                                |                     |                                  |                 |                |                |              |                |               |       |
| 1.688                                                                                   | -22.4               | V                                | 3.0             | 38.1           | 1.0            | -59.5        | -13.0          | -46.5         |       |
| 2.532                                                                                   | -4.3                | V                                | 3.0             | 37.5           | 1.0            | -40.7        | -13.0          | -27.7         |       |
| 1.688                                                                                   | -21.9               | H                                | 3.0             | 38.1           | 1.0            | -59.0        | -13.0          | -46.0         |       |
| 2.532                                                                                   | -6.1                | H                                | 3.0             | 37.5           | 1.0            | -42.6        | -13.0          | -29.6         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |

**LTE QPSK Band 17 (5 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                  |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                            |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                         |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                        |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/AC Adapter and earphone    |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE band 17, 5MHz BW<br>QPSK |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>             |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                       |                 | Filter 1       |                | Part 27      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)               | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch (706.5 MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.413                                                                                   | -28.1               | V                                | 3.0             | 38.6           | 1.0            | -65.7        | -13.0          | -52.7         |       |
| 2.120                                                                                   | -24.0               | V                                | 3.0             | 37.6           | 1.0            | -60.7        | -13.0          | -47.7         |       |
| 2.826                                                                                   | -23.3               | V                                | 3.0             | 37.4           | 1.0            | -59.7        | -13.0          | -46.7         |       |
| 1.413                                                                                   | -29.7               | H                                | 3.0             | 38.6           | 1.0            | -67.3        | -13.0          | -54.3         |       |
| 2.120                                                                                   | -26.1               | H                                | 3.0             | 37.6           | 1.0            | -62.7        | -13.0          | -49.7         |       |
| 2.826                                                                                   | -23.1               | H                                | 3.0             | 37.4           | 1.0            | -59.5        | -13.0          | -46.5         |       |
| <b>Mid Ch (710.0 MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.420                                                                                   | -28.9               | V                                | 3.0             | 38.5           | 1.0            | -66.4        | -13.0          | -53.4         |       |
| 2.130                                                                                   | -24.2               | V                                | 3.0             | 37.6           | 1.0            | -60.9        | -13.0          | -47.9         |       |
| 2.840                                                                                   | -21.8               | V                                | 3.0             | 37.4           | 1.0            | -58.2        | -13.0          | -45.2         |       |
| 1.420                                                                                   | -29.3               | H                                | 3.0             | 38.5           | 1.0            | -66.8        | -13.0          | -53.8         |       |
| 2.130                                                                                   | -25.8               | H                                | 3.0             | 37.6           | 1.0            | -62.5        | -13.0          | -49.5         |       |
| 2.840                                                                                   | -22.5               | H                                | 3.0             | 37.4           | 1.0            | -58.9        | -13.0          | -45.9         |       |
| <b>High Ch (713.5MHz)</b>                                                               |                     |                                  |                 |                |                |              |                |               |       |
| 1.427                                                                                   | -27.9               | V                                | 3.0             | 38.5           | 1.0            | -65.5        | -13.0          | -52.5         |       |
| 2.140                                                                                   | -23.8               | V                                | 3.0             | 37.6           | 1.0            | -60.4        | -13.0          | -47.4         |       |
| 2.854                                                                                   | -22.9               | V                                | 3.0             | 37.4           | 1.0            | -59.3        | -13.0          | -46.3         |       |
| 1.427                                                                                   | -29.9               | H                                | 3.0             | 38.5           | 1.0            | -67.4        | -13.0          | -54.4         |       |
| 2.140                                                                                   | -24.9               | H                                | 3.0             | 37.6           | 1.0            | -61.6        | -13.0          | -48.6         |       |
| 2.854                                                                                   | -23.8               | H                                | 3.0             | 37.4           | 1.0            | -60.1        | -13.0          | -47.1         |       |
| Rev. 03.03.09                                                                           |                     |                                  |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                  |                 |                |                |              |                |               |       |

**LTE 16QAM Band 17 (5 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                   |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                             |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                          |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                         |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/AC Adapter and earphone     |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE band 17, 5MHz BW<br>16QAM |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>              |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                        |                 | Filter 1       |                | Part 27      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| <b>Low Ch (706.5 MHz)</b>                                                               |                     |                                   |                 |                |                |              |                |               |       |
| 1.413                                                                                   | -28.6               | V                                 | 3.0             | 38.6           | 1.0            | -66.2        | -13.0          | -53.2         |       |
| 2.120                                                                                   | -24.5               | V                                 | 3.0             | 37.6           | 1.0            | -61.1        | -13.0          | -48.1         |       |
| 2.826                                                                                   | -23.2               | V                                 | 3.0             | 37.4           | 1.0            | -59.6        | -13.0          | -46.6         |       |
| 1.413                                                                                   | -29.7               | H                                 | 3.0             | 38.6           | 1.0            | -67.2        | -13.0          | -54.2         |       |
| 2.120                                                                                   | -25.9               | H                                 | 3.0             | 37.6           | 1.0            | -62.5        | -13.0          | -49.5         |       |
| 2.826                                                                                   | -22.1               | H                                 | 3.0             | 37.4           | 1.0            | -58.5        | -13.0          | -45.5         |       |
| <b>Mid Ch (710.0 MHz)</b>                                                               |                     |                                   |                 |                |                |              |                |               |       |
| 1.420                                                                                   | -28.4               | V                                 | 3.0             | 38.5           | 1.0            | -66.0        | -13.0          | -53.0         |       |
| 2.130                                                                                   | -24.4               | V                                 | 3.0             | 37.6           | 1.0            | -61.1        | -13.0          | -48.1         |       |
| 2.840                                                                                   | -23.3               | V                                 | 3.0             | 37.4           | 1.0            | -59.7        | -13.0          | -46.7         |       |
| 1.420                                                                                   | -28.5               | H                                 | 3.0             | 38.5           | 1.0            | -66.0        | -13.0          | -53.0         |       |
| 2.130                                                                                   | -24.8               | H                                 | 3.0             | 37.6           | 1.0            | -61.4        | -13.0          | -48.4         |       |
| 2.840                                                                                   | -23.4               | H                                 | 3.0             | 37.4           | 1.0            | -59.8        | -13.0          | -46.8         |       |
| <b>High Ch (713.5MHz)</b>                                                               |                     |                                   |                 |                |                |              |                |               |       |
| 1.427                                                                                   | -28.9               | V                                 | 3.0             | 38.5           | 1.0            | -66.4        | -13.0          | -53.4         |       |
| 2.140                                                                                   | -24.2               | V                                 | 3.0             | 37.6           | 1.0            | -60.8        | -13.0          | -47.8         |       |
| 2.854                                                                                   | -23.1               | V                                 | 3.0             | 37.4           | 1.0            | -59.5        | -13.0          | -46.5         |       |
| 1.427                                                                                   | -30.0               | H                                 | 3.0             | 38.5           | 1.0            | -67.5        | -13.0          | -54.5         |       |
| 2.140                                                                                   | -25.1               | H                                 | 3.0             | 37.6           | 1.0            | -61.8        | -13.0          | -48.8         |       |
| 2.854                                                                                   | -22.7               | H                                 | 3.0             | 37.4           | 1.0            | -59.1        | -13.0          | -46.1         |       |
| Rev. 03.03.09                                                                           |                     |                                   |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                   |                 |                |                |              |                |               |       |



**LTE QPSK Band 17 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                   |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|-----------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                             |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                          |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                         |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and earphone    |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE band 17, 10MHz BW<br>QPSK |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>              |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                        |                 | Filter 1       |                | Part 27      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| Mid Ch (710.0 MHz)                                                                      |                     |                                   |                 |                |                |              |                |               |       |
| 1.420                                                                                   | -28.1               | V                                 | 3.0             | 38.5           | 1.0            | -65.7        | -13.0          | -52.7         |       |
| 2.130                                                                                   | -24.4               | V                                 | 3.0             | 37.6           | 1.0            | -61.0        | -13.0          | -48.0         |       |
| 2.840                                                                                   | -23.1               | V                                 | 3.0             | 37.4           | 1.0            | -59.5        | -13.0          | -46.5         |       |
| 1.420                                                                                   | -28.7               | H                                 | 3.0             | 38.5           | 1.0            | -66.2        | -13.0          | -53.2         |       |
| 2.130                                                                                   | -25.6               | H                                 | 3.0             | 37.6           | 1.0            | -62.3        | -13.0          | -49.3         |       |
| 2.840                                                                                   | -23.0               | H                                 | 3.0             | 37.4           | 1.0            | -59.4        | -13.0          | -46.4         |       |
| Rev. 03.03.09                                                                           |                     |                                   |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                   |                 |                |                |              |                |               |       |



**LTE 16QAM Band 17 (10 MHz BANDWIDTH)**

| Compliance Certification Services<br>Above 1GHz High Frequency Substitution Measurement |                     |                                    |                 |                |                |              |                |               |       |
|-----------------------------------------------------------------------------------------|---------------------|------------------------------------|-----------------|----------------|----------------|--------------|----------------|---------------|-------|
| <b>Company:</b>                                                                         |                     | Apple                              |                 |                |                |              |                |               |       |
| <b>Date:</b>                                                                            |                     | 09/28/12                           |                 |                |                |              |                |               |       |
| <b>Test Engineer:</b>                                                                   |                     | Roy Zheng                          |                 |                |                |              |                |               |       |
| <b>Configuration:</b>                                                                   |                     | EUT w/ AC Adapter and earphone     |                 |                |                |              |                |               |       |
| <b>Mode:</b>                                                                            |                     | TX, LTE band 17, 10MHz BW<br>16QAM |                 |                |                |              |                |               |       |
| <b>Chamber</b>                                                                          |                     | <b>Pre-amplifier</b>               |                 | <b>Filter</b>  |                | <b>Limit</b> |                |               |       |
| 5m Chamber A                                                                            |                     | T144 8449B                         |                 | Filter 1       |                | Part 27      |                |               |       |
| f<br>GHz                                                                                | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)                 | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| Mid Ch (710.0 MHz)                                                                      |                     |                                    |                 |                |                |              |                |               |       |
| 1.420                                                                                   | -28.9               | V                                  | 3.0             | 38.5           | 1.0            | -66.5        | -13.0          | -53.5         |       |
| 2.130                                                                                   | -24.9               | V                                  | 3.0             | 37.6           | 1.0            | -61.6        | -13.0          | -48.6         |       |
| 2.840                                                                                   | -22.3               | V                                  | 3.0             | 37.4           | 1.0            | -58.7        | -13.0          | -45.7         |       |
| 1.420                                                                                   | -28.7               | H                                  | 3.0             | 38.5           | 1.0            | -66.2        | -13.0          | -53.2         |       |
| 2.130                                                                                   | -25.3               | H                                  | 3.0             | 37.6           | 1.0            | -61.9        | -13.0          | -48.9         |       |
| 2.840                                                                                   | -23.9               | H                                  | 3.0             | 37.4           | 1.0            | -60.3        | -13.0          | -47.3         |       |
| Rev. 03.03.09                                                                           |                     |                                    |                 |                |                |              |                |               |       |
| Note: No other emissions were detected above the system noise floor.                    |                     |                                    |                 |                |                |              |                |               |       |