

5.4. Band Edge Compliance

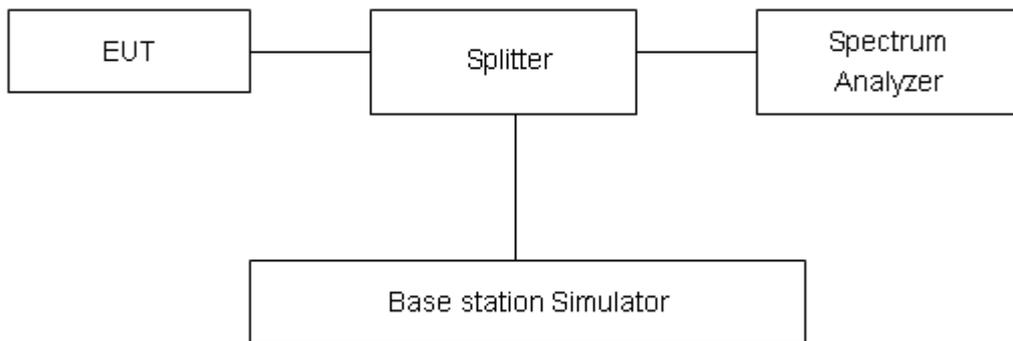
Ambient condition

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 23°C ~25°C | 45%~50% | 101.5kPa |

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The Average detector is used and RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900, RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band II, RBW is set to 15kHz, VBW is set to 51kHz for CDMA BC1, RBW is set to 15kHz, VBW is set to 51kHz for LTE Band 2/25(1.4MHz), RBW is set to 30kHz, VBW is set to 100kHz for LTE Band 2/25 (3MHz), RBW is set to 51kHz, VBW is set to 160kHz for LTE Band 2/25 (5MHz), RBW is set to 100kHz, VBW is set to 300kHz for LTE Band 2/25(10MHz), RBW is set to 150kHz, VBW is set to 510kHz for LTE Band 2/25(15MHz), RBW is set to 200kHz, VBW is set to 620kHz for LTE Band 2/25(20MHz). Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.”

| | |
|-------|---------|
| Limit | -13 dBm |
|-------|---------|

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=0.684\text{dB}$.

Test Result:

| Mode | Carrier frequency (MHz) | Reference value (dBm) | Limit (dBm) | Conclusion |
|---------------------------|-------------------------|-----------------------|-------------|------------|
| GSM 1900 (GSM) | 1850.0 | -34.065 | -13 | PASS |
| | 1910.0 | -33.854 | -13 | PASS |
| GPRS 1900 (GMSK) | 1850.0 | -28.821 | -13 | PASS |
| | 1910.0 | -28.644 | -13 | PASS |
| EGPRS 1900 (8-PSK) | 1850.0 | -35.556 | -13 | PASS |
| | 1910.0 | -34.642 | -13 | PASS |
| WCDMA Band II RMC | 1850 | -27.914 | -13 | PASS |
| | 1910 | -25.520 | -13 | PASS |
| CDMA BC1 1xRTT | 1850 | -32.201 | -13 | PASS |
| | 1910 | -33.313 | -13 | PASS |

| LTE Band 2 | | Channel | RB | Reference value (dBm) | Limit (dBm) | Conclusion |
|---------------|------------|---------|---------|-----------------------|-------------|------------|
| Bandwidth | Modulation | | | | | |
| 1.4MHz | QPSK | 18607 | 1 | -24.604 | -13 | PASS |
| | | | 100% | -26.661 | -13 | PASS |
| | | 19193 | 1 | -24.308 | -13 | PASS |
| | | | 100% | -29.080 | -13 | PASS |
| | 16QAM | 18607 | 1 | -25.000 | -13 | PASS |
| | | | 100% | -26.992 | -13 | PASS |
| 19193 | | 1 | -24.934 | -13 | PASS | |
| | | 100% | -29.069 | -13 | PASS | |
| 3MHz | QPSK | 18615 | 1 | -21.571 | -13 | PASS |
| | | | 100% | -28.632 | -13 | PASS |
| | | 19185 | 1 | -20.732 | -13 | PASS |
| | | | 100% | -27.954 | -13 | PASS |
| | 16QAM | 18615 | 1 | -21.715 | -13 | PASS |
| | | | 100% | -27.349 | -13 | PASS |
| | | 19185 | 1 | -20.626 | -13 | PASS |
| | | | 100% | -27.816 | -13 | PASS |
| 5MHz | QPSK | 18625 | 1 | -22.855 | -13 | PASS |
| | | | 100% | -30.133 | -13 | PASS |
| | | 19175 | 1 | -20.794 | -13 | PASS |
| | | | 100% | -29.137 | -13 | PASS |



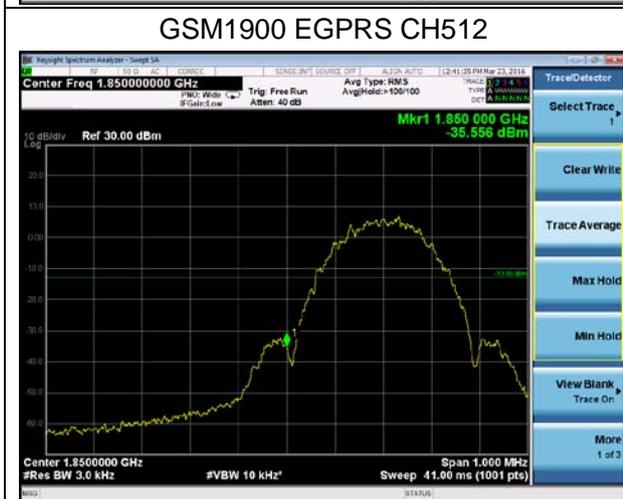
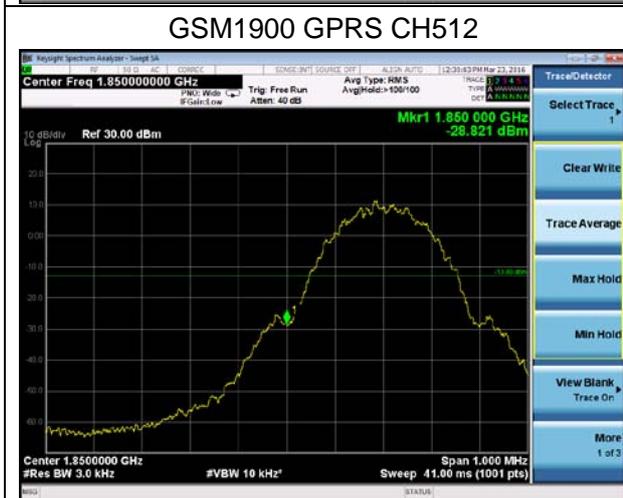
| LTE Band 2 | | Channel | RB | Reference value (dBm) | Limit (dBm) | Conclusion |
|------------|------------|---------|------|--------------------------|----------------|------------|
| Bandwidth | Modulation | | | | | |
| | 16QAM | 18625 | 1 | -22.019 | -13 | PASS |
| | | | 100% | -30.004 | -13 | PASS |
| | | 19175 | 1 | -21.713 | -13 | PASS |
| | | | 100% | -30.339 | -13 | PASS |
| 10MHz | QPSK | 18650 | 1 | -34.255 | -13 | PASS |
| | | | 100% | -33.144 | -13 | PASS |
| | | 19150 | 1 | -30.136 | -13 | PASS |
| | | | 100% | -33.110 | -13 | PASS |
| | 16QAM | 18650 | 1 | -32.823 | -13 | PASS |
| | | | 100% | -33.223 | -13 | PASS |
| | | 19150 | 1 | -31.977 | -13 | PASS |
| | | | 100% | -32.309 | -13 | PASS |
| 15MHz | QPSK | 18675 | 1 | -28.141 | -13 | PASS |
| | | | 100% | -34.921 | -13 | PASS |
| | | 19125 | 1 | -27.648 | -13 | PASS |
| | | | 100% | -33.516 | -13 | PASS |
| | 16QAM | 18675 | 1 | -30.573 | -13 | PASS |
| | | | 100% | -34.701 | -13 | PASS |
| | | 19125 | 1 | -28.780 | -13 | PASS |
| | | | 100% | -33.621 | -13 | PASS |
| 20MHz | QPSK | 18700 | 1 | -31.875 | -13 | PASS |
| | | | 100% | -35.451 | -13 | PASS |
| | | 19100 | 1 | -32.061 | -13 | PASS |
| | | | 100% | -32.460 | -13 | PASS |
| | 16QAM | 18700 | 1 | -33.816 | -13 | PASS |
| | | | 100% | -35.757 | -13 | PASS |
| | | 19100 | 1 | -28.811 | -13 | PASS |
| | | | 100% | -32.173 | -13 | PASS |

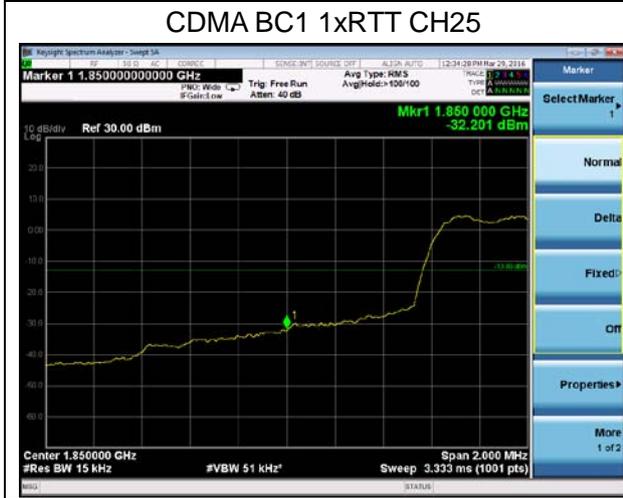


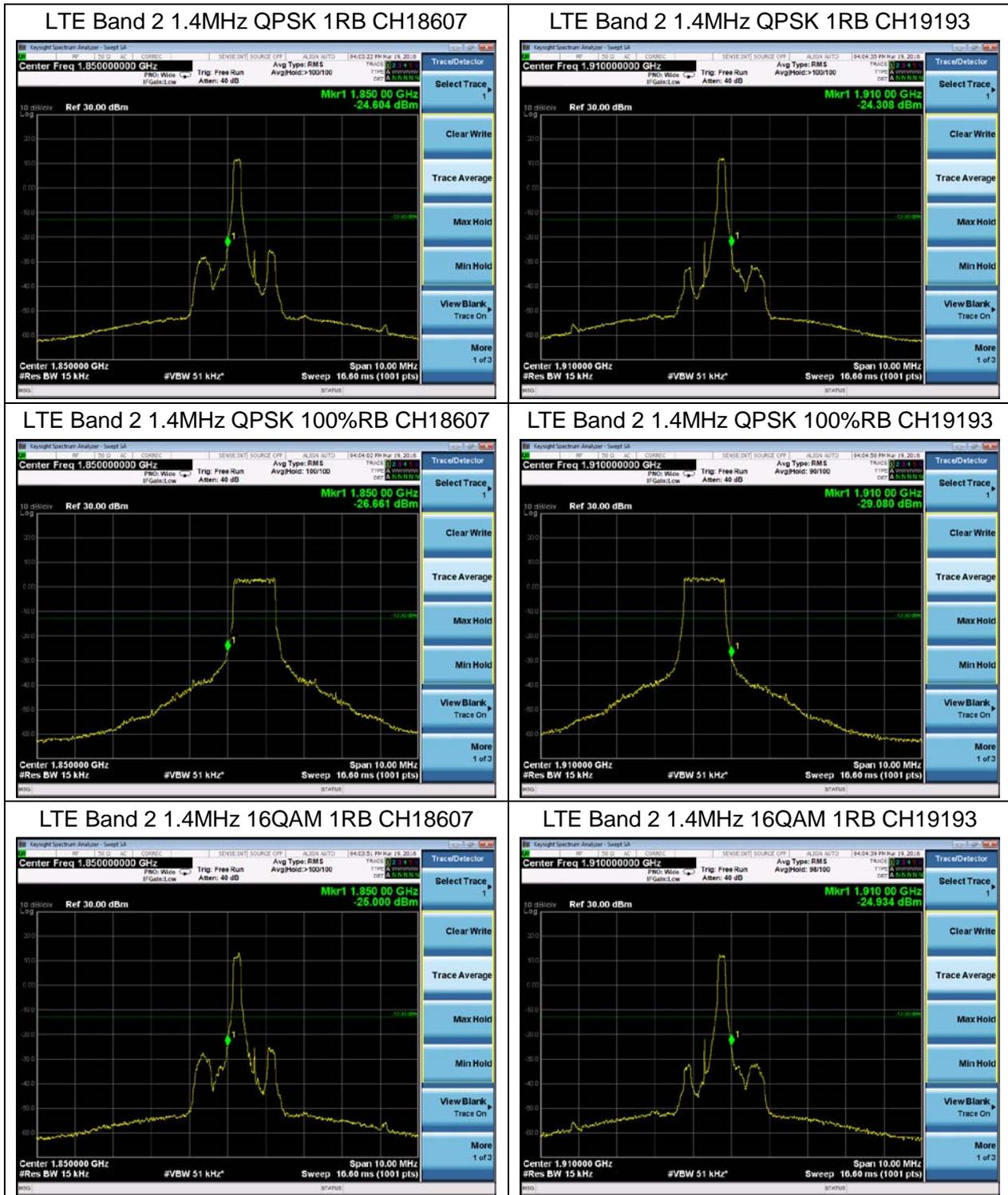
| LTE Band 25 | | Channel | RB | Reference value (dBm) | Limit (dBm) | Conclusion |
|-------------|------------|---------|------|-----------------------|-------------|------------|
| Bandwidth | Modulation | | | | | |
| 1.4MHz | QPSK | 26047 | 1 | -24.411 | -13 | PASS |
| | | | 100% | -27.027 | -13 | PASS |
| | | 26683 | 1 | -22.414 | -13 | PASS |
| | | | 100% | -27.750 | -13 | PASS |
| | 16QAM | 26047 | 1 | -24.703 | -13 | PASS |
| | | | 100% | -26.599 | -13 | PASS |
| | | 26683 | 1 | -23.389 | -13 | PASS |
| | | | 100% | -26.783 | -13 | PASS |
| 3MHz | QPSK | 26055 | 1 | -21.342 | -13 | PASS |
| | | | 100% | -27.869 | -13 | PASS |
| | | 26675 | 1 | -20.079 | -13 | PASS |
| | | | 100% | -28.056 | -13 | PASS |
| | 16QAM | 26055 | 1 | -21.270 | -13 | PASS |
| | | | 100% | -27.177 | -13 | PASS |
| | | 26675 | 1 | -18.525 | -13 | PASS |
| | | | 100% | -28.071 | -13 | PASS |
| 5MHz | QPSK | 26065 | 1 | -23.412 | -13 | PASS |
| | | | 100% | -30.456 | -13 | PASS |
| | | 26665 | 1 | -22.314 | -13 | PASS |
| | | | 100% | -28.447 | -13 | PASS |
| | 16QAM | 26065 | 1 | -21.574 | -13 | PASS |
| | | | 100% | -29.626 | -13 | PASS |
| | | 26665 | 1 | -19.592 | -13 | PASS |
| | | | 100% | -29.899 | -13 | PASS |
| 10MHz | QPSK | 26090 | 1 | -33.777 | -13 | PASS |
| | | | 100% | -32.417 | -13 | PASS |
| | | 26640 | 1 | -29.324 | -13 | PASS |
| | | | 100% | -33.628 | -13 | PASS |
| | 16QAM | 26090 | 1 | -35.047 | -13 | PASS |
| | | | 100% | -33.341 | -13 | PASS |
| | | 26640 | 1 | -31.369 | -13 | PASS |
| | | | 100% | -33.294 | -13 | PASS |
| 15MHz | QPSK | 26115 | 1 | -30.358 | -13 | PASS |
| | | | 100% | -34.093 | -13 | PASS |
| | | 26615 | 1 | -31.111 | -13 | PASS |
| | | | 100% | -35.325 | -13 | PASS |
| | 16QAM | 26115 | 1 | -29.329 | -13 | PASS |
| | | | 100% | -34.067 | -13 | PASS |
| | | 26615 | 1 | -28.857 | -13 | PASS |
| | | | 100% | -33.823 | -13 | PASS |
| 20MHz | QPSK | 26140 | 1 | -35.819 | -13 | PASS |



| LTE Band 25 | | Channel | RB | Reference value (dBm) | Limit (dBm) | Conclusion |
|-------------|------------|---------|------|-----------------------|-------------|------------|
| Bandwidth | Modulation | | | | | |
| | | 26590 | 100% | -34.994 | -13 | PASS |
| | | | 1 | -32.840 | -13 | PASS |
| | | | 100% | -32.895 | -13 | PASS |
| | 16QAM | 26140 | 1 | -34.484 | -13 | PASS |
| | | | 100% | -35.208 | -13 | PASS |
| | | 26590 | 1 | -30.863 | -13 | PASS |
| | | | 100% | -33.959 | -13 | PASS |
| | | | | | | |

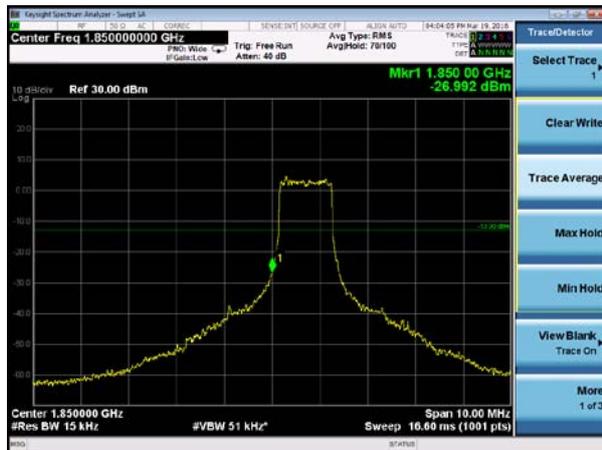








LTE Band 2 1.4MHz 16QAM 100%RB CH18607



LTE Band 2 1.4MHz 16QAM 100%RB CH19193



LTE Band 2 3MHz QPSK 1RB CH18615



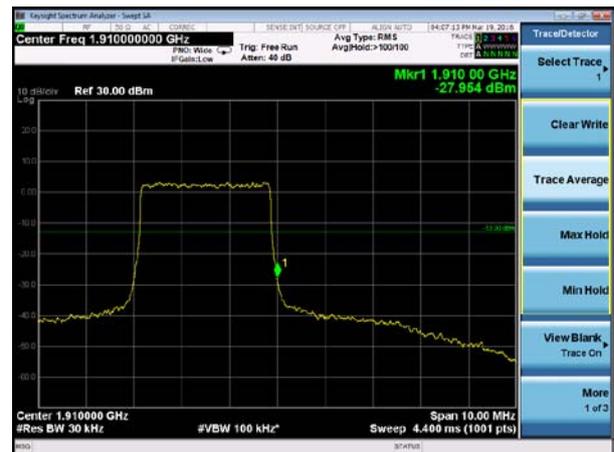
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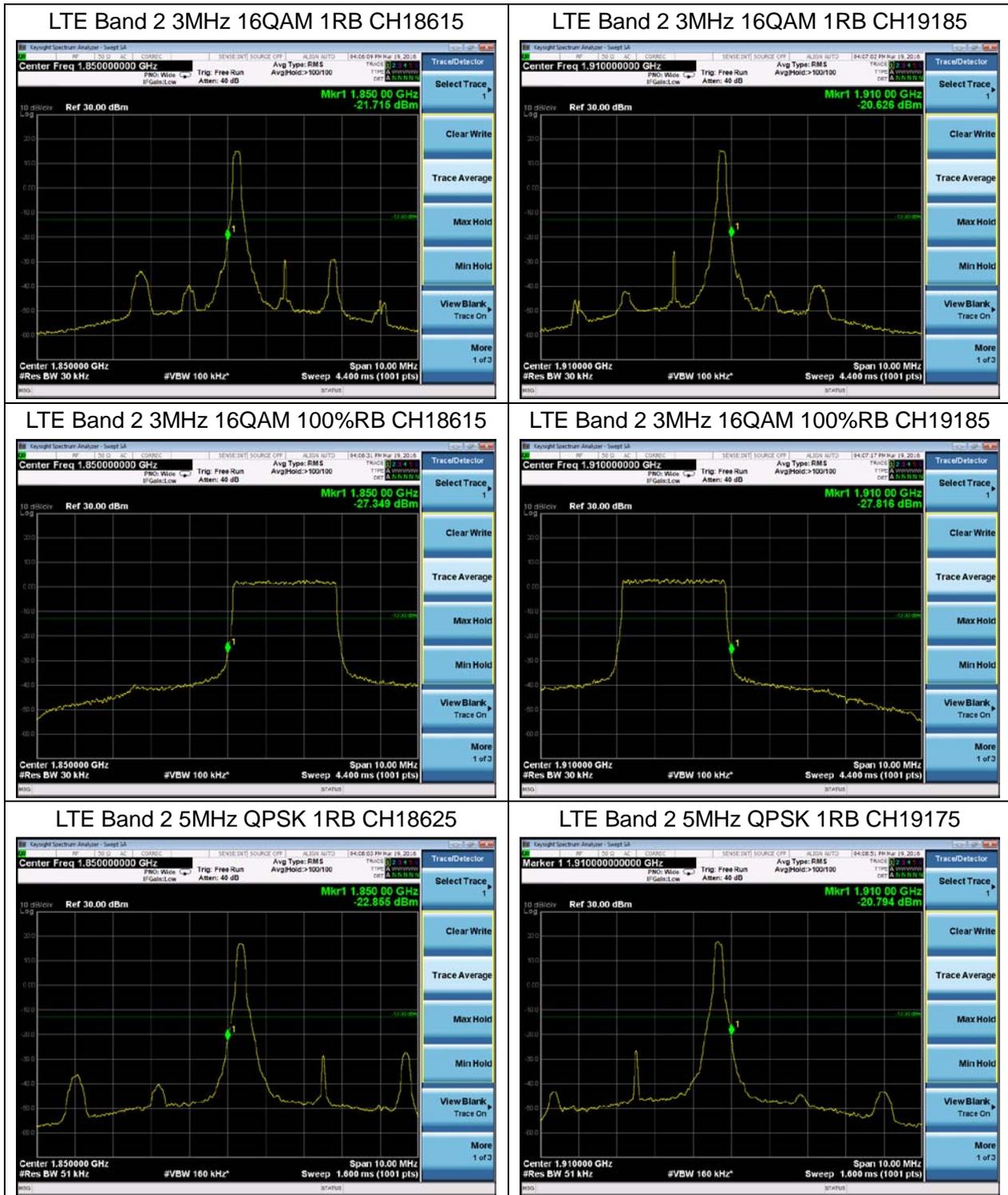


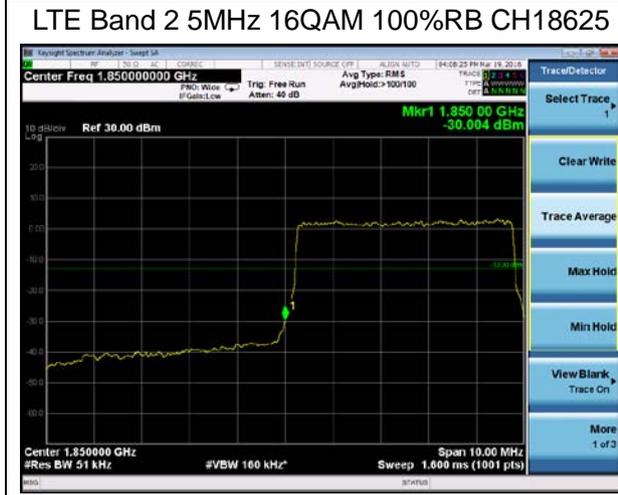
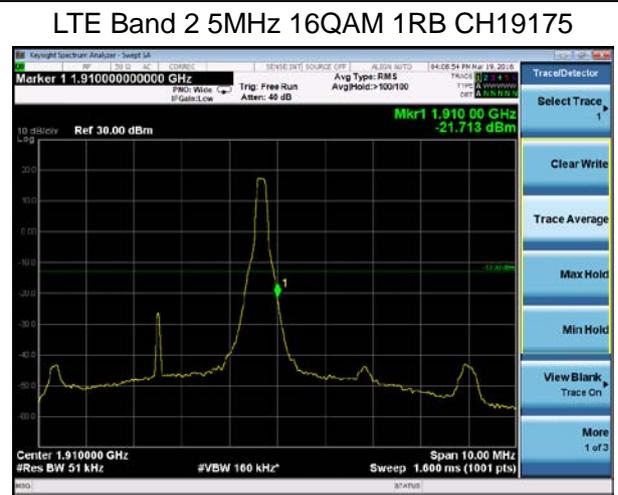
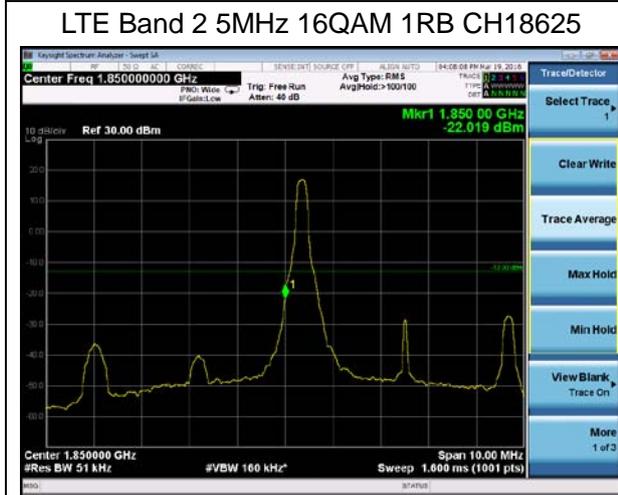
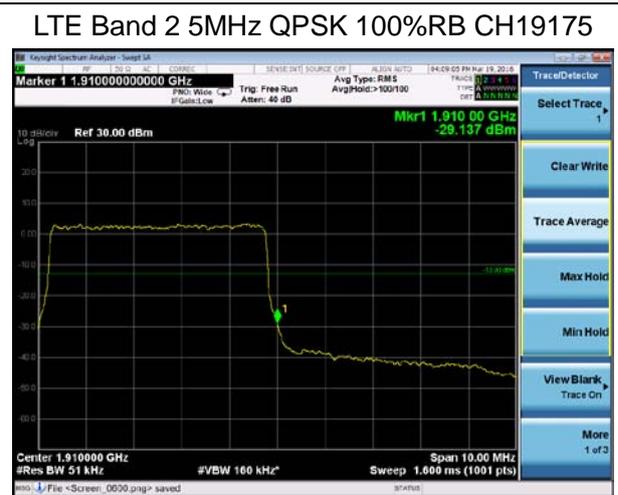
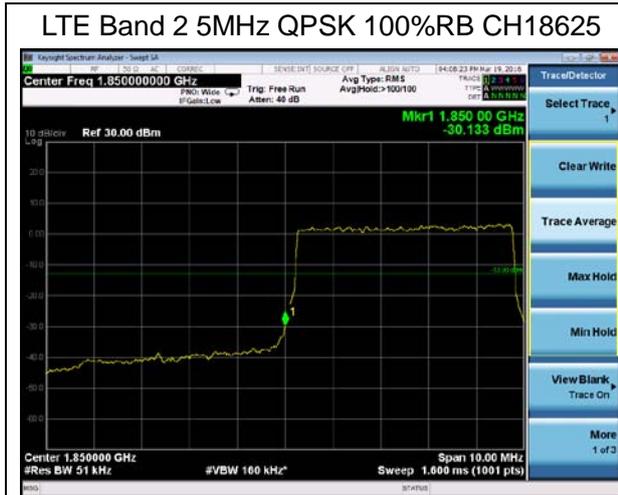
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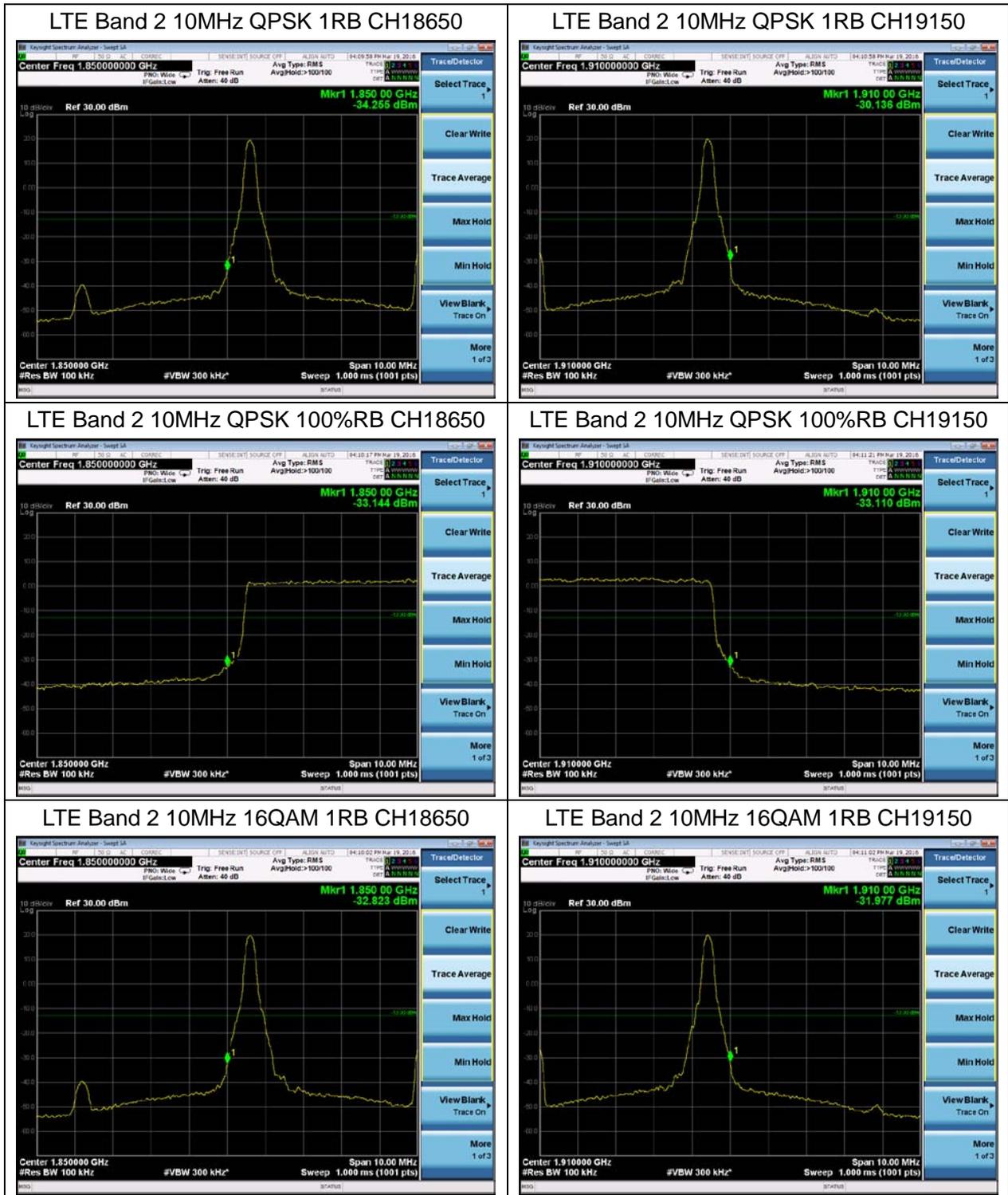


LTE Band 2 3MHz QPSK 100%RB CH19185











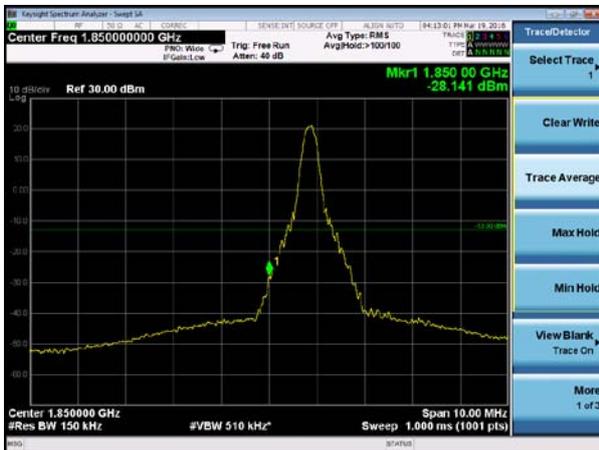
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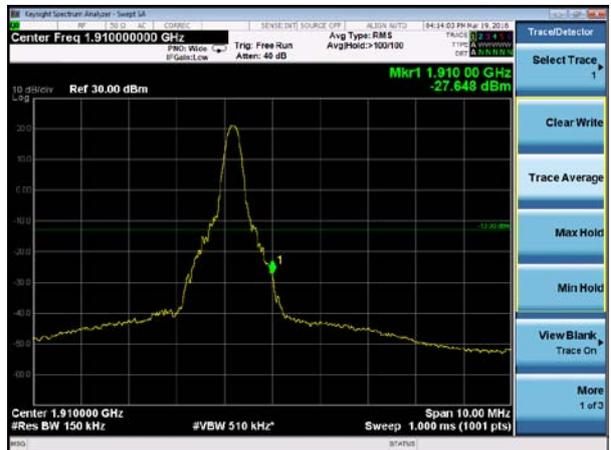
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LTE Band 2 15MHz QPSK 1RB CH18675



LTE Band 2 15MHz QPSK 1RB CH19125

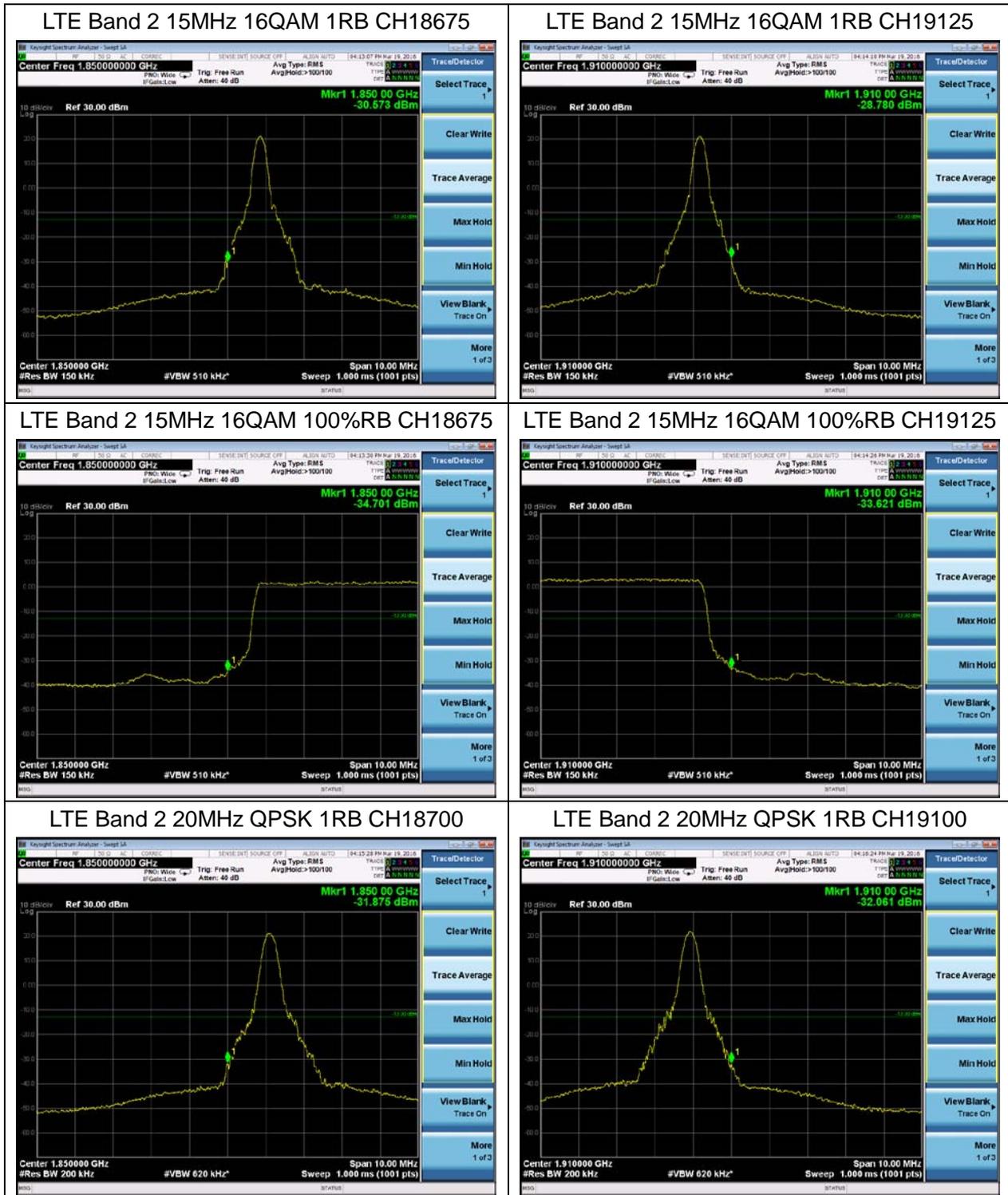


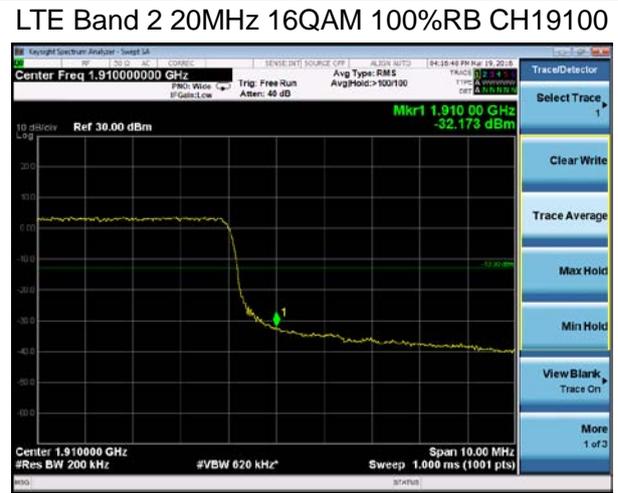
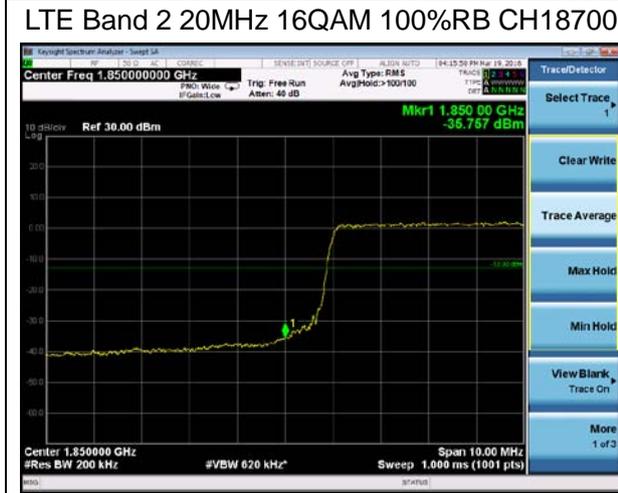
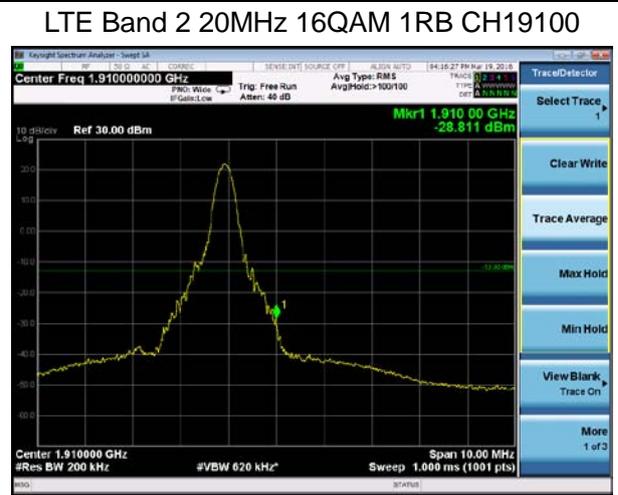
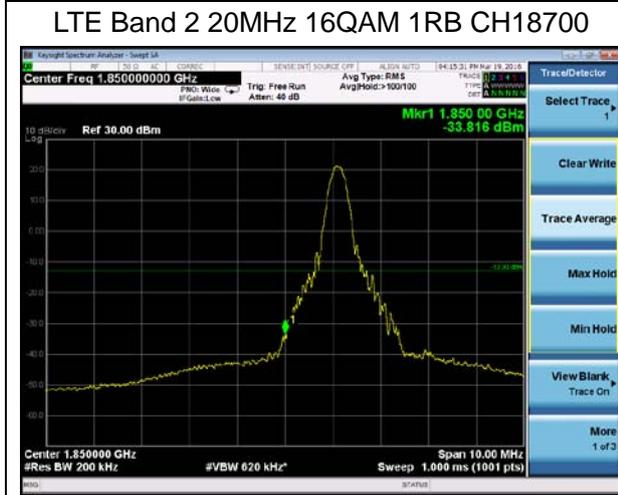
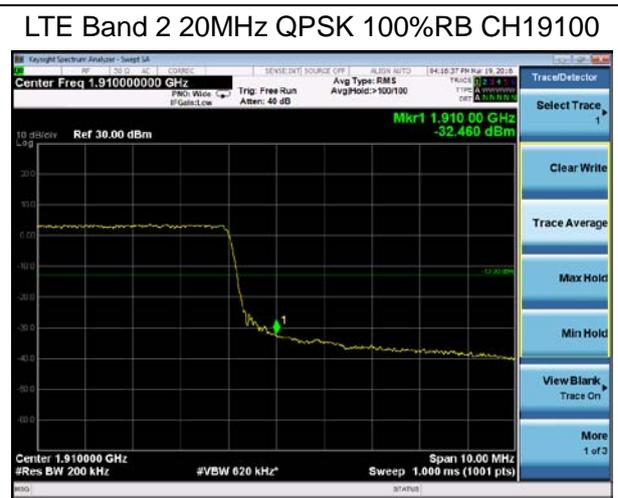
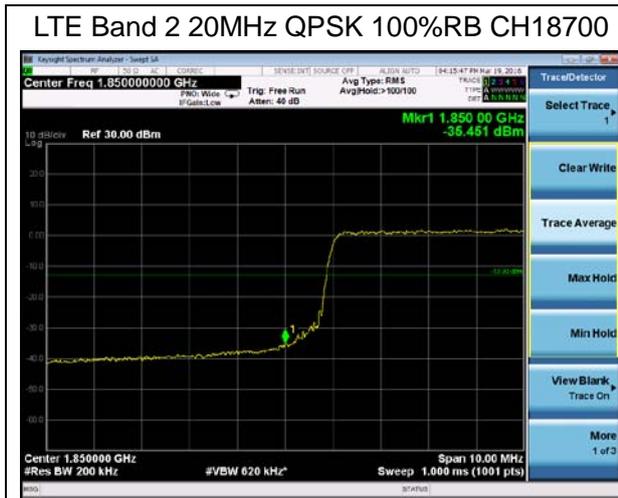
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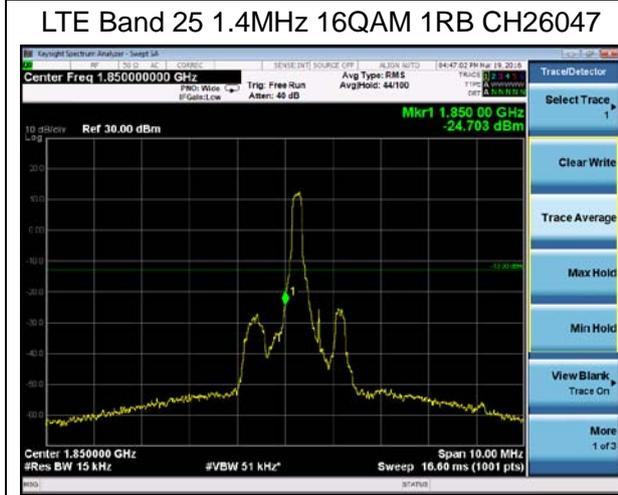
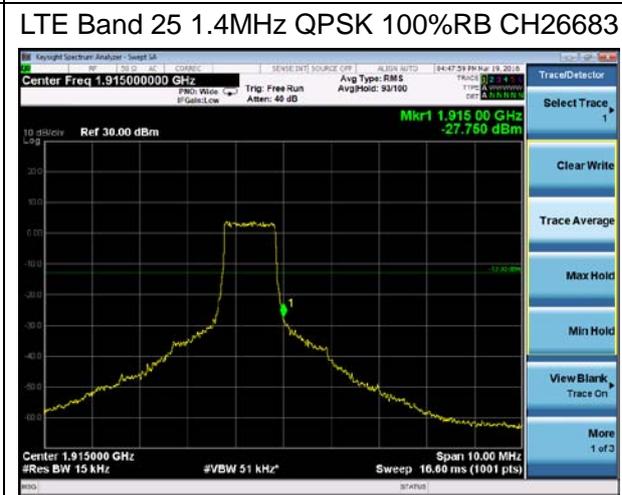
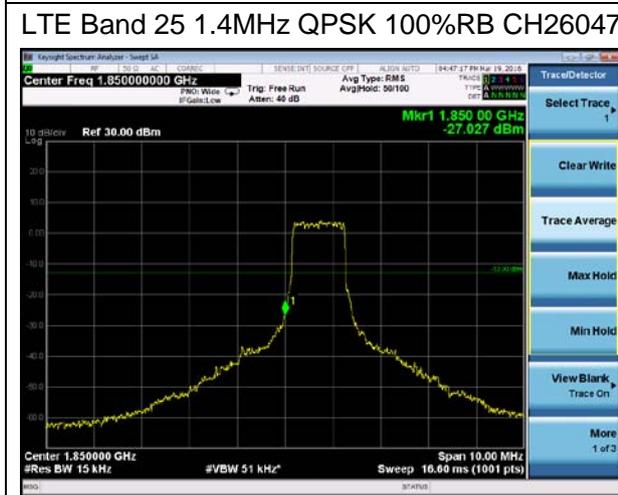
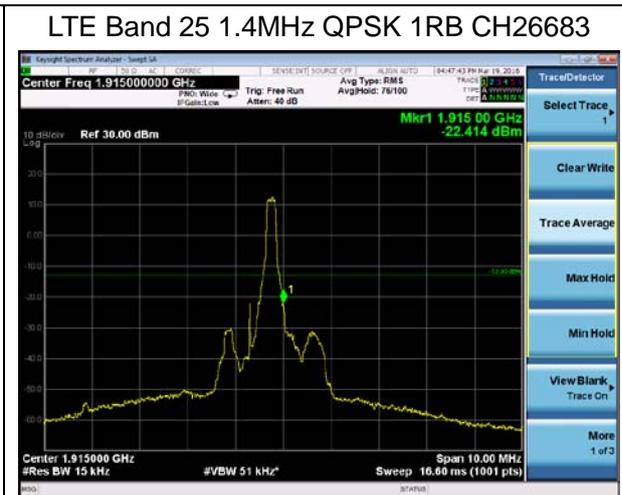
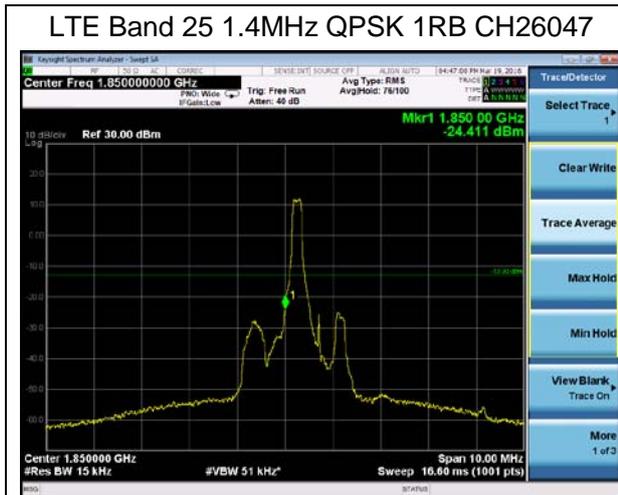


LTE Band 2 15MHz QPSK 100%RB CH19125



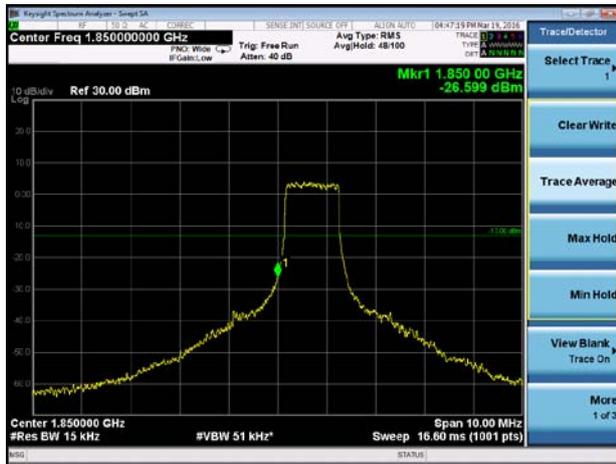




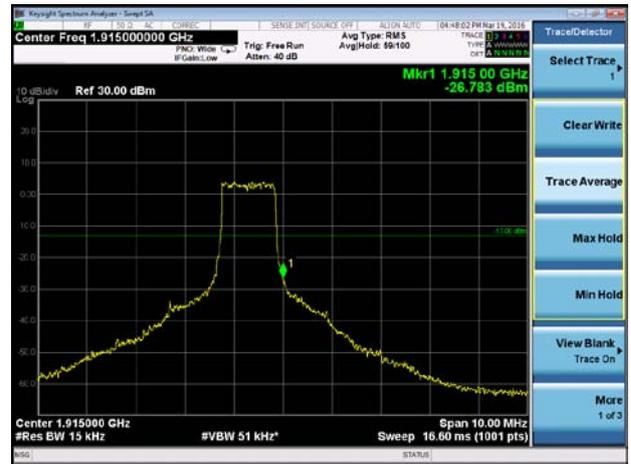




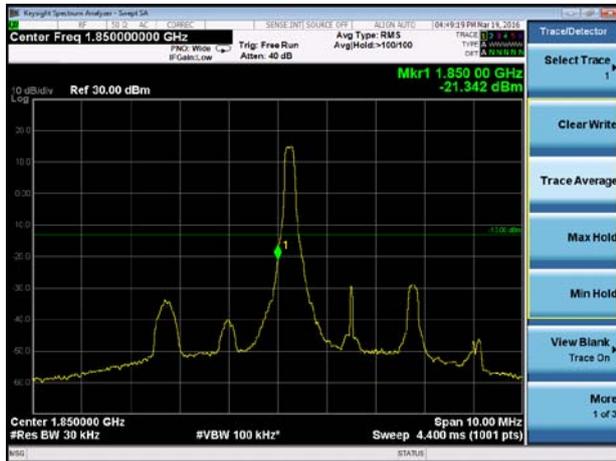
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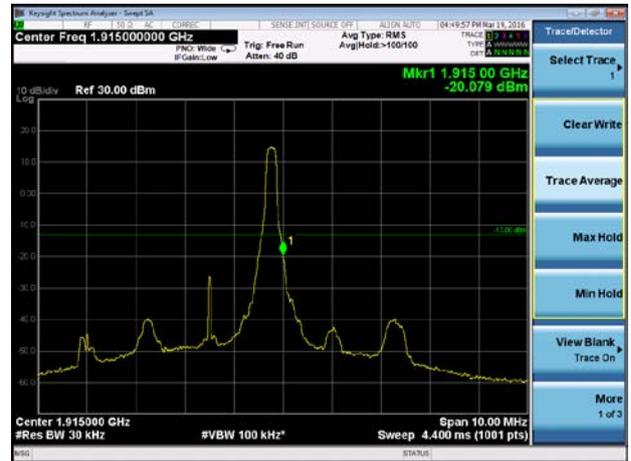
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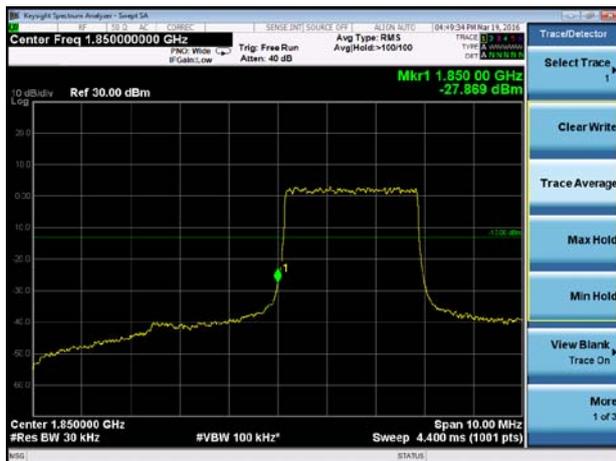
LTE Band 25 3MHz QPSK 1RB CH26055



LTE Band 25 3MHz QPSK 1RB CH26675



LTE Band 25 3MHz QPSK 100%RB CH26055

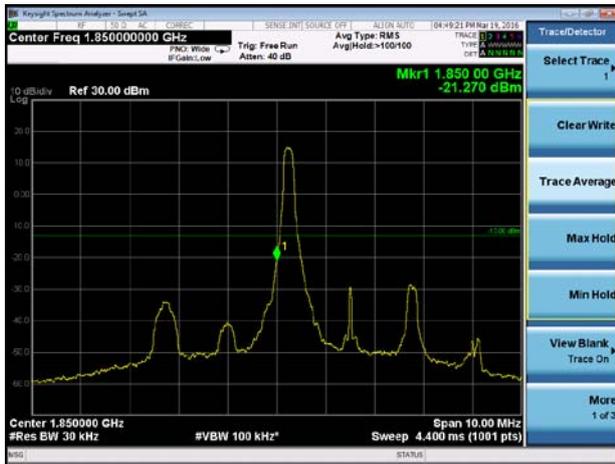


LTE Band 25 3MHz QPSK 100%RB CH26675

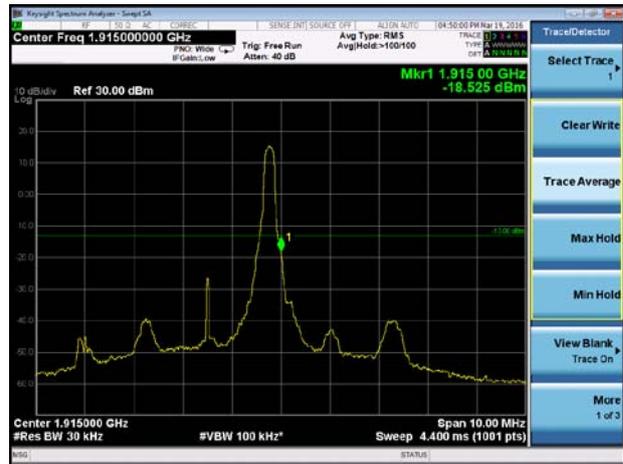




LTE Band 25 3MHz 16QAM 1RB CH26055



LTE Band 25 3MHz 16QAM 1RB CH26675



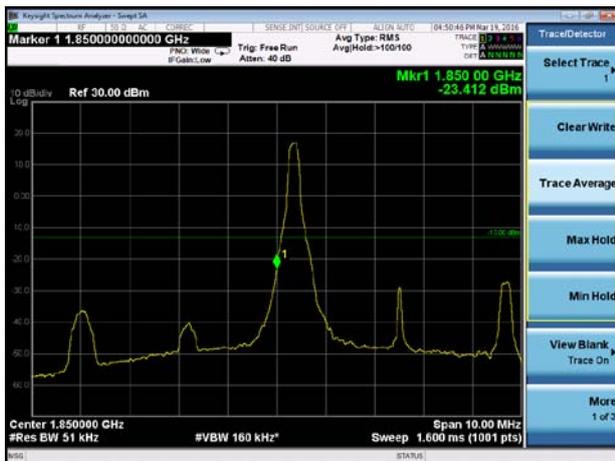
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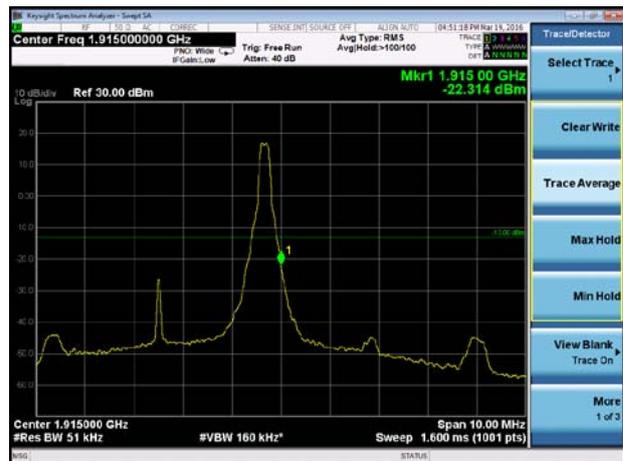
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LTE Band 25 5MHz QPSK 1RB CH26065



LTE Band 25 5MHz QPSK 1RB CH26665





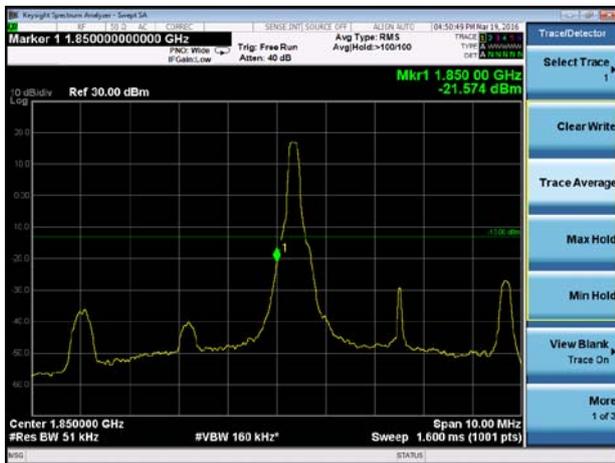
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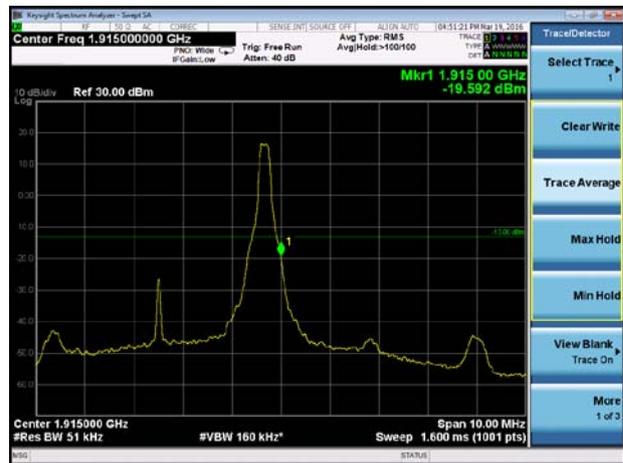
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LTE Band 25 5MHz 16QAM 1RB CH26065



LTE Band 25 5MHz 16QAM 1RB CH26665



LTE Band 25 5MHz 16QAM 100%RB H26065

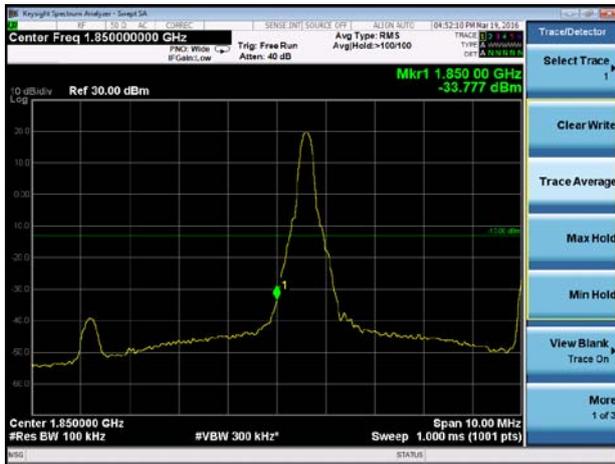


LTE Band 25 5MHz 16QAM 100%RB CH26665

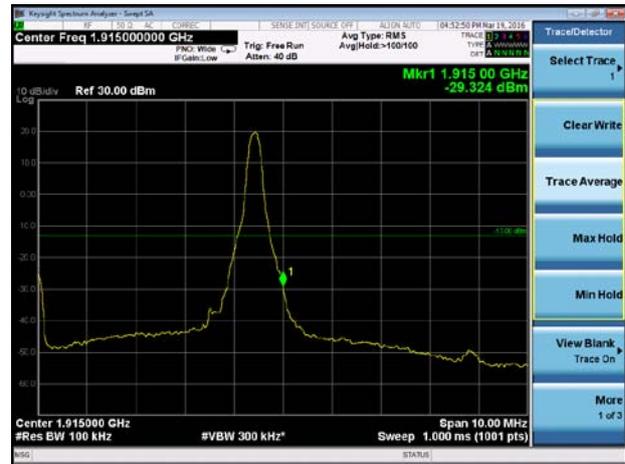




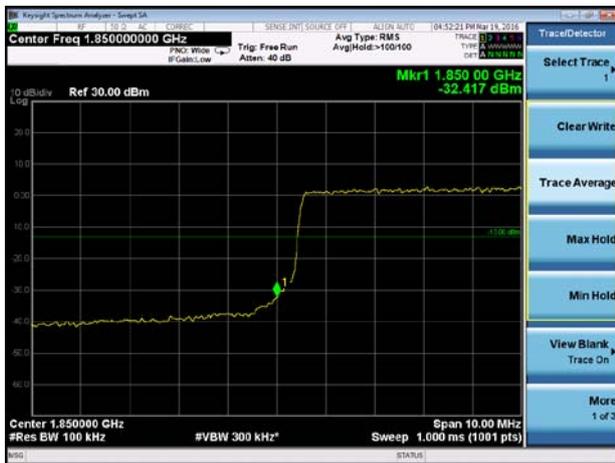
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LTE Band 25 10MHz QPSK 1RB CH26640



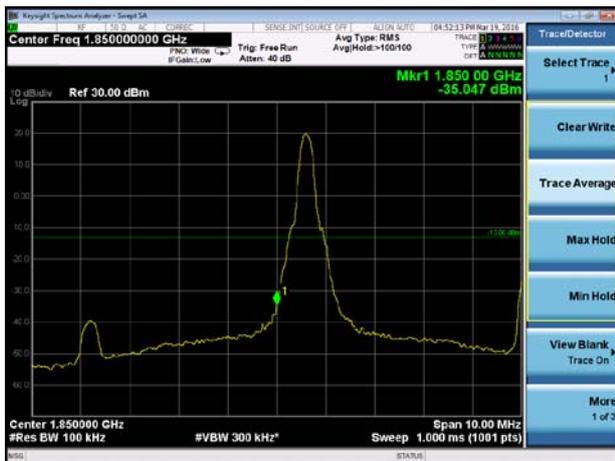
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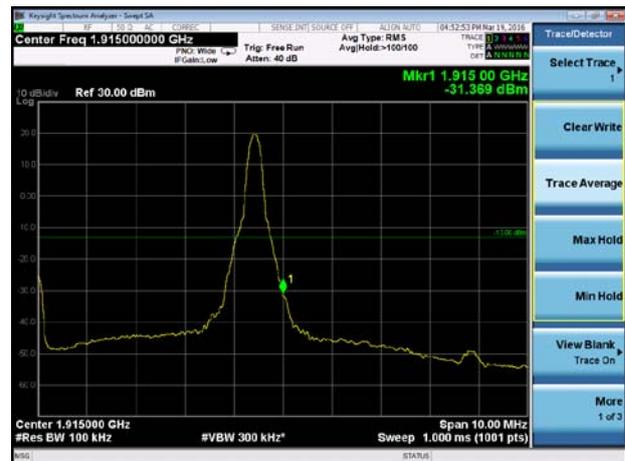
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LTE Band 25 10MHz 16QAM 1RB CH26090



LTE Band 25 10MHz 16QAM 1RB CH26640





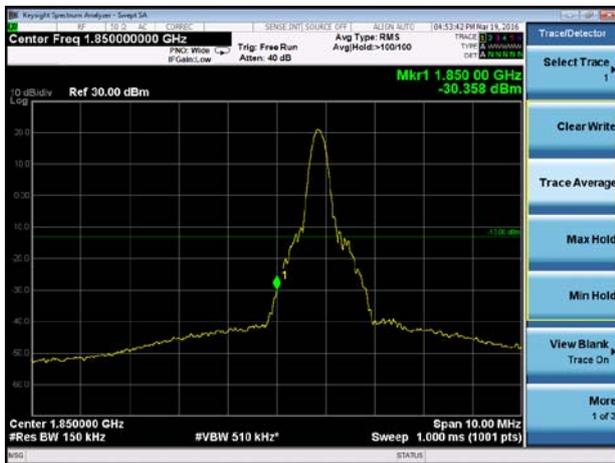
LTE Band 25 10MHz 16QAM 100%RB CH26090



LTE Band 25 10MHz 16QAM 100%RB CH26640



LTE Band 25 15MHz QPSK 1RB CH26115



LTE Band 25 15MHz QPSK 1RB CH26615



LTE Band 25 15MHz QPSK 100%RB CH26115



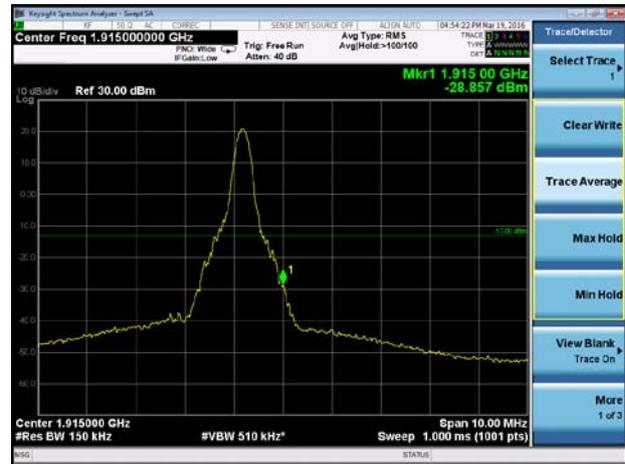
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LTE Band 25 15MHz 16QAM 1RB CH26115



LTE Band 25 15MHz 16QAM 1RB CH26615



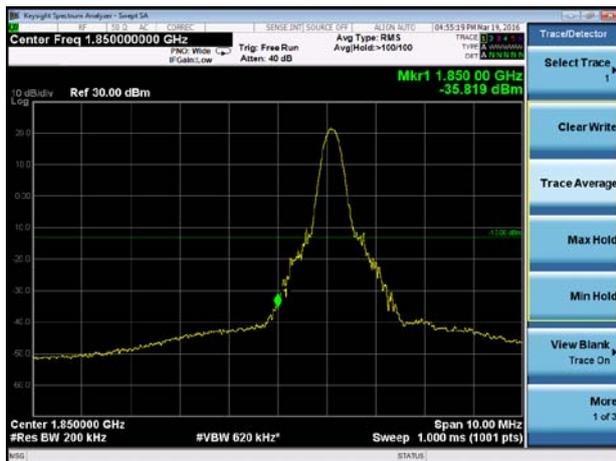
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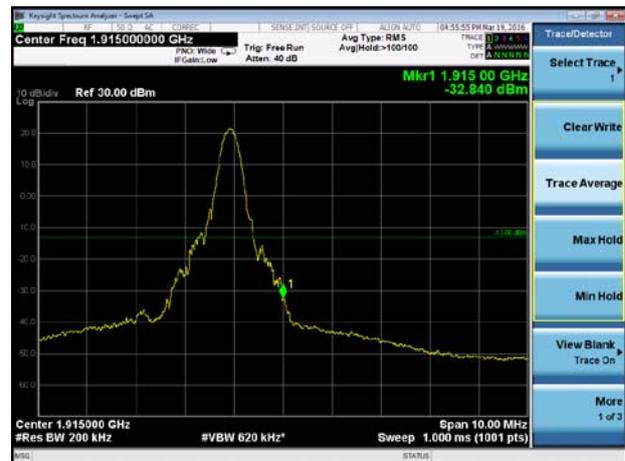
LTE Band 25 15MHz 16QAM 100%RB CH26615



LTE Band 25 20MHz QPSK 1RB CH26140



LTE Band 25 20MHz QPSK 1RB CH26590





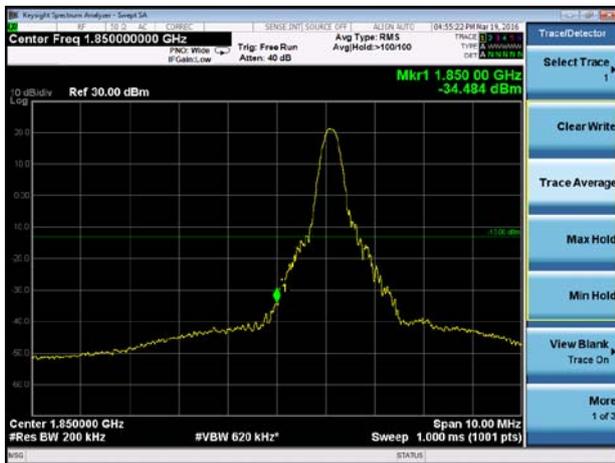
LTE Band 25 20MHz QPSK 100%RB CH26140



LTE Band 25 20MHz QPSK 100%RB CH26590



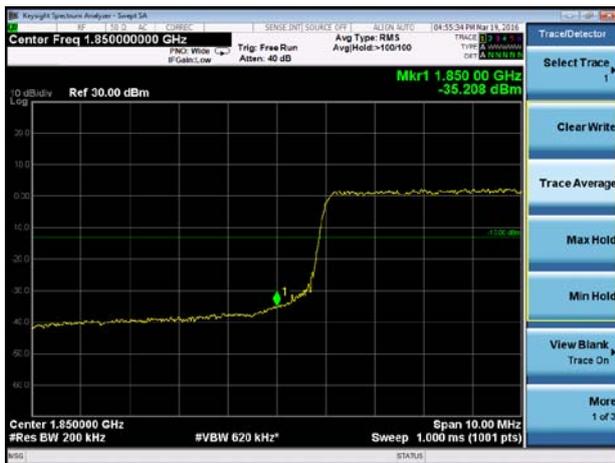
LTE Band 25 20MHz 16QAM 1RB CH26140



LTE Band 25 20MHz 16QAM 1RB CH26590



LTE Band 25 20MHz 16QAM 100%RB CH26140



LTE Band 25 20MHz 16QAM 100%RB CH26590



5.5. Peak-to-Average Power Ratio (PAPR)

Ambient condition

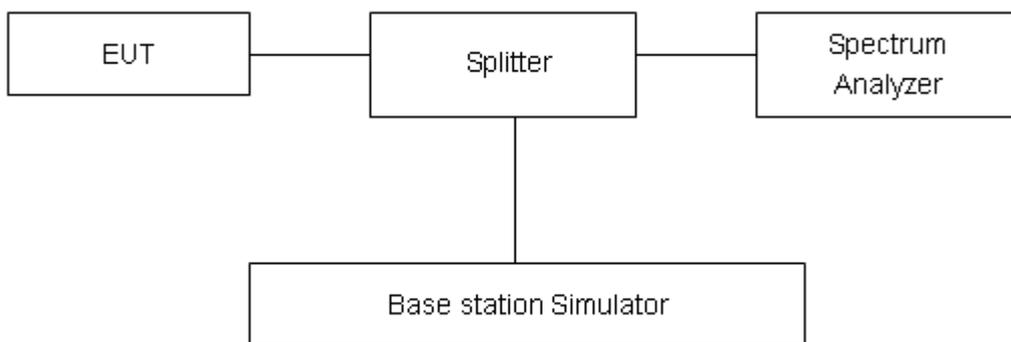
| Temperature | Relative humidity |
|-------------|-------------------|
| 21°C ~25°C | 40%~60% |

Methods of Measurement

Measure the total peak power and record as PPK. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = PPK (dBm) - PAvg (dBm).$$

Test Setup



Limits

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB in 24.232(d).

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.

**Test Results**

| Mode | Channel | Frequency (MHz) | Peak(dBm) | Avg(dBm) | PAPR(dB) | Conclusion |
|----------------------------|---------|-----------------|-----------|----------|----------|------------|
| GSM 1900 (GSM) | 512 | 1850.2 | 29.35 | 29.33 | 0.019 | PASS |
| | 661 | 1880 | 29.50 | 29.47 | 0.032 | PASS |
| | 810 | 1909.8 | 29.46 | 29.44 | 0.021 | PASS |
| GPRS 1900 (GMSK) | 512 | 1850.2 | 29.41 | 29.29 | 0.043 | PASS |
| | 661 | 1880 | 29.43 | 29.43 | 0.029 | PASS |
| | 810 | 1909.8 | 29.52 | 29.37 | 0.031 | PASS |
| EGPRS 1900 (8-PSK) | 512 | 1850.2 | 25.52 | 25.48 | 0.039 | PASS |
| | 661 | 1880 | 25.49 | 25.43 | 0.056 | PASS |
| | 810 | 1909.8 | 25.58 | 25.50 | 0.084 | PASS |
| WCDMA Band II (RMC) | 9262 | 1852.4 | 27.47 | 24.24 | 3.23 | PASS |
| | 9400 | 1880 | 27.47 | 24.27 | 3.2 | PASS |
| | 9538 | 1907.6 | 27.5 | 24.31 | 3.19 | PASS |
| CDMA BC1 1xRTT | 25 | 1851.25 | 27.15 | 23.14 | 4.01 | PASS |
| | 600 | 1880 | 27.67 | 23.23 | 4.44 | PASS |
| | 1175 | 1908.75 | 27.02 | 23.05 | 3.97 | PASS |