



**FCC CFR47 PART 22H, 24E AND 27L  
CERTIFICATION TEST REPORT**

**FOR**

**GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/ LTE Radio, IEEE802.11a/b/g/n  
and Bluetooth Radio**

**MODEL NUMBER: A1454**

**FCC ID: BCGA1454**

**REPORT NUMBER: 12U14526-C16**

**ISSUE DATE: OCTOBER 05, 2012**

*Prepared for*

**APPLE, INC.  
1 INFINITE LOOP  
CUPERTINO, CA 95014, U.S.A.**

*Prepared by*

**UL CCS  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

| Rev. | Issue<br>Date | Revisions     | Revised By |
|------|---------------|---------------|------------|
| ---  | 10/05/12      | Initial Issue | T. Chan    |

## TABLE OF CONTENTS

|                                                |           |
|------------------------------------------------|-----------|
| <b>1. ATTESTATION OF TEST RESULTS .....</b>    | <b>5</b>  |
| <b>2. TEST METHODOLOGY .....</b>               | <b>6</b>  |
| <b>3. FACILITIES AND ACCREDITATION .....</b>   | <b>6</b>  |
| <b>4. CALIBRATION AND UNCERTAINTY .....</b>    | <b>6</b>  |
| 4.1. MEASURING INSTRUMENT CALIBRATION .....    | 6         |
| 4.2. SAMPLE CALCULATION .....                  | 6         |
| 4.3. MEASUREMENT UNCERTAINTY.....              | 6         |
| <b>5. EQUIPMENT UNDER TEST .....</b>           | <b>7</b>  |
| 5.1. DESCRIPTION OF EUT .....                  | 7         |
| 5.2. MAXIMUM OUTPUT POWER .....                | 7         |
| 5.3. DESCRIPTION OF AVAILABLE ANTENNAS.....    | 11        |
| 5.4. SOFTWARE AND FIRMWARE .....               | 11        |
| 5.5. WORST-CASE CONFIGURATION AND MODE.....    | 11        |
| 5.6. DESCRIPTION OF TEST SETUP .....           | 12        |
| <b>6. TEST AND MEASUREMENT EQUIPMENT .....</b> | <b>14</b> |
| <b>7. RF POWER OUTPUT VERIFICATION .....</b>   | <b>15</b> |
| 7.1. GSM .....                                 | 15        |
| 7.2. UMTS MODE.....                            | 18        |
| 7.2.1. REL99.....                              | 18        |
| 7.2.2. HSDPA REL 5 .....                       | 20        |
| 7.2.3. HSPA REL 6 (HSDPA & HSUPA) .....        | 22        |
| 7.2.4. DUAL CARRIER HSDPA.....                 | 24        |
| 7.3. LTE Band 2 .....                          | 27        |
| 7.4. LTE Band 4 .....                          | 33        |
| 7.5. LTE BAND 5.....                           | 39        |
| 7.6. LTE Band 17 .....                         | 43        |
| <b>8. CONDUCTED TEST RESULTS .....</b>         | <b>45</b> |
| 8.1. OCCUPIED BANDWIDTH .....                  | 45        |
| 8.1.1. GSM .....                               | 53        |
| 8.1.2. WCDMA.....                              | 61        |
| 8.1.3. LTE Band 2.....                         | 69        |

|            |                                                   |            |
|------------|---------------------------------------------------|------------|
| 8.1.4.     | LTE Band 4 .....                                  | 105        |
| 8.1.5.     | LTE Band 5 .....                                  | 141        |
| 8.1.6.     | LTE Band 17 .....                                 | 165        |
| 8.2.       | <i>BAND EDGE</i> .....                            | 177        |
| 8.2.1.     | GSM .....                                         | 179        |
| 8.2.2.     | WCDMA850 .....                                    | 183        |
| 8.2.1.     | LTE BAND 2 .....                                  | 187        |
| 8.2.3.     | LTE BAND 5 .....                                  | 283        |
| 8.2.4.     | LTE BAND 17 .....                                 | 315        |
| 8.3.       | <i>OUT OF BAND EMISSIONS</i> .....                | 331        |
| 8.3.1.     | GSM .....                                         | 332        |
| 8.3.2.     | WCDMA .....                                       | 340        |
| 8.3.3.     | LTE BAND 2 .....                                  | 348        |
| 8.3.4.     | LTE BAND 4 .....                                  | 372        |
| 8.3.5.     | LTE BAND 5 .....                                  | 396        |
| 8.3.6.     | LTE BAND 17 .....                                 | 412        |
| 8.4.       | <i>FREQUENCY STABILITY</i> .....                  | 420        |
| <b>9.</b>  | <b>RADIATED TEST RESULTS</b> .....                | <b>428</b> |
| 9.1.       | <i>RADIATED POWER (ERP &amp; EIRP)</i> .....      | 428        |
| 9.1.1.     | GSM .....                                         | 436        |
| 9.1.2.     | WCDMA .....                                       | 440        |
| 9.1.3.     | LTE Band 2 .....                                  | 444        |
| 9.1.4.     | LTE BAND 4 .....                                  | 456        |
| 9.1.5.     | LTE BAND 5 .....                                  | 468        |
| 9.1.6.     | LTE BAND 17 .....                                 | 476        |
| 9.2.       | <i>PEAK-TO-AVERAGE RATIO</i> .....                | 480        |
| 9.3.       | <i>FIELD STRENGTH OF SPURIOUS RADIATION</i> ..... | 490        |
| <b>10.</b> | <b>SETUP PHOTOS</b> .....                         | <b>534</b> |

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
1 INFINITE LOOP  
CUPERTINO, CA 95014, U.S.A.

**EUT DESCRIPTION:** GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/ LTE Radio,  
IEEE 802.11a/b/g/n and Bluetooth Radio

**MODEL:** A1454

**SERIAL NUMBER:** C8TJ900FF1K8

**DATE TESTED:** SEPTEMBER 03 - OCTOBER 04, 2012

| APPLICABLE STANDARDS      |              |
|---------------------------|--------------|
| STANDARD                  | TEST RESULTS |
| FCC PART 22H, 24E and 27L | Pass         |

UL CCS tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

Tested By:



THU CHAN  
ENGINEERING MANAGER  
UL CCS

CHIN PANG  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, Part 24 and Part 27.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 3.52 dB     |
| Radiated Disturbance, 30 to 1000 MHz  | 4.94 dB     |

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The Apple iPad Model A1454 is a tablet device with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n and Bluetooth radio. The rechargeable battery is not user accessible.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted and ERP / EIRP output powers; average detector is used for UMTS/CDMA mode of Cellular band, while peak detector is used for GSM mode of Cellular and all GSM/CDMA/UMTS PCS bands as follows:

| Part 22/24            |            |           |         |        |          |         |        |
|-----------------------|------------|-----------|---------|--------|----------|---------|--------|
| Frequency Range (MHz) | Modulation | Conducted |         |        | ERP/EIRP |         |        |
|                       |            | Peak      | Average | mW     | Peak     | Average | mW     |
| 824.2 - 848.8         | GPRS       | 33.70     |         | 2344.2 | 32.14    |         | 1636.8 |
| 824.2 - 848.8         | EGPRS      | 32.10     |         | 1621.8 | 30.24    |         | 1056.8 |
| 1850.2-1909.8         | GPRS       | 30.50     |         | 1122.0 | 31.21    |         | 1321.3 |
| 1850.2-1909.8         | EGPRS      | 30.50     |         | 1122.0 | 31.09    |         | 1285.3 |
| 826.4 - 846.0         | Rel 99     |           | 24.50   | 281.8  |          | 21.14   | 130.0  |
| 1852.4-1907.6         | Rel 99     | 26.10     |         | 407.4  | 28.64    |         | 731.1  |
| 826.4 - 846.0         | HSUPA      |           | 23.60   | 229.1  |          | 20.21   | 105.0  |
| 1852.4-1907.6         | HSUPA      | 27.75     |         | 595.7  | 28.81    |         | 760.3  |

**LTE BAND 2****Part 24 LTE Band 2 MODE (1.4 MHz BANDWIDTH)**

| Frequency range<br>(MHz) | Modulation   | Conducted(Peak) |       | EIRP(Peak) |        |
|--------------------------|--------------|-----------------|-------|------------|--------|
|                          |              | dBm             | mW    | dBm        | mW     |
| 1850.7 - 1909.3          | QPSK, RB6-0  | 27.85           | 609.5 | 30.76      | 1191.2 |
| 1850.7 - 1909.3          | 16QAM, RB6-0 | 28.10           | 645.7 | 29.71      | 935.4  |

**Part 24 LTE Band 2 MODE (3.0 MHz BANDWIDTH)**

| Frequency range<br>(MHz) | Modulation    | Conducted(Peak) |       | EIRP(Peak) |        |
|--------------------------|---------------|-----------------|-------|------------|--------|
|                          |               | dBm             | mW    | dBm        | mW     |
| 1851.5 - 1908.5          | QPSK, RB15-0  | 27.90           | 616.6 | 30.75      | 1188.5 |
| 1851.5 - 1908.5          | 16QAM, RB15-0 | 27.60           | 575.4 | 29.78      | 950.6  |

**Part 24 LTE Band 2 MODE (5.0 MHz BANDWIDTH)**

| Frequency range<br>(MHz) | Modulation    | Conducted(Peak) |       | EIRP(Peak) |        |
|--------------------------|---------------|-----------------|-------|------------|--------|
|                          |               | dBm             | mW    | dBm        | mW     |
| 1852.5 - 1907.5          | QPSK, RB25-0  | 27.70           | 588.8 | 30.84      | 1213.4 |
| 1852.5 - 1907.5          | 16QAM, RB25-0 | 27.80           | 602.6 | 29.87      | 970.5  |

**Part 24 LTE Band 2 MODE (10.0 MHz BANDWIDTH)**

| Frequency range<br>(MHz) | Modulation    | Conducted(Peak) |       | EIRP(Peak) |        |
|--------------------------|---------------|-----------------|-------|------------|--------|
|                          |               | dBm             | mW    | dBm        | mW     |
| 1855 - 1905              | QPSK, RB50-0  | 27.70           | 588.8 | 30.71      | 1177.6 |
| 1855 - 1905              | 16QAM, RB50-0 | 27.90           | 616.6 | 29.62      | 916.2  |

**Part 24 LTE Band 2 MODE (15.0 MHz BANDWIDTH)**

| Frequency range<br>(MHz) | Modulation    | Conducted(Peak) |       | EIRP(Peak) |        |
|--------------------------|---------------|-----------------|-------|------------|--------|
|                          |               | dBm             | mW    | dBm        | mW     |
| 1857.5 - 1902.5          | QPSK, RB75-0  | 28.00           | 631.0 | 30.72      | 1180.3 |
| 1857.5 - 1902.5          | 16QAM, RB75-0 | 28.10           | 645.7 | 29.63      | 918.3  |

**Part 24 LTE Band 2 MODE (20.0 MHz BANDWIDTH)**

| Frequency range<br>(MHz) | Modulation     | Conducted(Peak) |       | EIRP(Peak) |        |
|--------------------------|----------------|-----------------|-------|------------|--------|
|                          |                | dBm             | mW    | dBm        | mW     |
| 1860 - 1900              | QPSK, RB100-0  | 28.20           | 660.7 | 30.72      | 1180.3 |
| 1860 - 1900              | 16QAM, RB100-0 | 28.00           | 631.0 | 29.72      | 937.6  |



**5.2.1. LTE BAND 4**

| Part 27 LTE Band 4 MODE (1.4 MHz BANDWIDTH) |              |                 |       |            |       |
|---------------------------------------------|--------------|-----------------|-------|------------|-------|
| Frequency range (MHz)                       | Modulation   | Conducted(Peak) |       | EIRP(Peak) |       |
|                                             |              | dBm             | mW    | dBm        | mW    |
| 1710.7 - 1754.3                             | QPSK, RB6-0  | 28.65           | 732.8 | 28.78      | 755.1 |
| 1710.7 - 1754.3                             | 16QAM, RB6-0 | 29.23           | 837.5 | 27.28      | 534.6 |

| Part 27 LTE Band 4 MODE (3.0 MHz BANDWIDTH) |               |                 |       |            |       |
|---------------------------------------------|---------------|-----------------|-------|------------|-------|
| Frequency range (MHz)                       | Modulation    | Conducted(Peak) |       | EIRP(Peak) |       |
|                                             |               | dBm             | mW    | dBm        | mW    |
| 1711.5 - 1753.5                             | QPSK, RB15-0  | 28.90           | 776.2 | 28.95      | 785.2 |
| 1711.5 - 1753.5                             | 16QAM, RB15-0 | 28.50           | 707.9 | 27.95      | 623.7 |

| Part 27 LTE Band 4 MODE (5.0 MHz BANDWIDTH) |               |                 |       |            |       |
|---------------------------------------------|---------------|-----------------|-------|------------|-------|
| Frequency range (MHz)                       | Modulation    | Conducted(Peak) |       | EIRP(Peak) |       |
|                                             |               | dBm             | mW    | dBm        | mW    |
| 1712.5 - 1752.5                             | QPSK, RB25-0  | 28.90           | 776.2 | 29.06      | 805.4 |
| 1712.5 - 1752.5                             | 16QAM, RB25-0 | 28.90           | 776.2 | 28.06      | 639.7 |

| Part 27 LTE Band 4 MODE (10.0 MHz BANDWIDTH) |               |                 |       |            |       |
|----------------------------------------------|---------------|-----------------|-------|------------|-------|
| Frequency range (MHz)                        | Modulation    | Conducted(Peak) |       | EIRP(Peak) |       |
|                                              |               | dBm             | mW    | dBm        | mW    |
| 1715 - 1750                                  | QPSK, RB50-0  | 28.80           | 758.6 | 28.41      | 693.4 |
| 1715 - 1750                                  | 16QAM, RB50-0 | 29.20           | 831.8 | 27.71      | 590.2 |

| Part 27 LTE Band 4 MODE (15.0 MHz BANDWIDTH) |              |                 |       |            |       |
|----------------------------------------------|--------------|-----------------|-------|------------|-------|
| Frequency range (MHz)                        | Modulation   | Conducted(Peak) |       | EIRP(Peak) |       |
|                                              |              | dBm             | mW    | dBm        | mW    |
| 1717.5 - 1747.50                             | QPSK, RB75-0 | 29.20           | 831.8 | 28.06      | 639.7 |
| 1717.5 - 1747.50                             | 16QAM RB75-0 | 29.60           | 912.0 | 27.28      | 534.6 |

| Part 27 LTE Band 4 MODE (20.0 MHz BANDWIDTH) |                |                 |       |            |       |
|----------------------------------------------|----------------|-----------------|-------|------------|-------|
| Frequency range (MHz)                        | Modulation     | Conducted(Peak) |       | EIRP(Peak) |       |
|                                              |                | dBm             | mW    | dBm        | mW    |
| 1720 - 1745                                  | QPSK, RB100-0  | 29.36           | 863.0 | 28.68      | 737.9 |
| 1720 - 1745                                  | 16QAM, RB100-0 | 29.20           | 831.8 | 27.68      | 586.1 |

**5.2.2. LTE BAND 5**

| Part 22 LTE Band 5 MODE (1.4 MHz BANDWIDTH) |              |                    |       |              |       |
|---------------------------------------------|--------------|--------------------|-------|--------------|-------|
| Frequency range<br>(MHz)                    | Modulation   | Conducted(Average) |       | ERP(Average) |       |
|                                             |              | dBm                | mW    | dBm          | mW    |
| 824.7 - 848.3                               | QPSK, RB1-0  | 23.90              | 245.5 | 20.83        | 121.1 |
| 824.7 - 848.3                               | 16QAM, RB1-0 | 22.70              | 186.2 | 19.91        | 97.9  |

| Part 22 LTE Band 5 MODE (3.0 MHz BANDWIDTH) |              |                    |       |              |       |
|---------------------------------------------|--------------|--------------------|-------|--------------|-------|
| Frequency range<br>(MHz)                    | Modulation   | Conducted(Average) |       | ERP(Average) |       |
|                                             |              | dBm                | mW    | dBm          | mW    |
| 825.5 - 847.5                               | QPSK, RB1-0  | 23.80              | 239.9 | 20.92        | 123.6 |
| 825.5 - 847.5                               | 16QAM, RB1-0 | 22.80              | 190.5 | 19.94        | 98.6  |

| Part 22 LTE Band 5 MODE (5.0 MHz BANDWIDTH) |              |                    |       |              |       |
|---------------------------------------------|--------------|--------------------|-------|--------------|-------|
| Frequency range<br>(MHz)                    | Modulation   | Conducted(Average) |       | ERP(Average) |       |
|                                             |              | dBm                | mW    | dBm          | mW    |
| 826.5 - 846.5                               | QPSK, RB1-0  | 24.00              | 251.2 | 20.87        | 122.2 |
| 826.5 - 846.5                               | 16QAM, RB1-0 | 23.00              | 199.5 | 19.94        | 98.6  |

| Part 22 LTE Band 5 MODE (10.0 MHz BANDWIDTH) |              |                    |       |              |       |
|----------------------------------------------|--------------|--------------------|-------|--------------|-------|
| Frequency range<br>(MHz)                     | Modulation   | Conducted(Average) |       | ERP(Average) |       |
|                                              |              | dBm                | mW    | dBm          | mW    |
| 829 - 844                                    | QPSK, RB1-0  | 23.80              | 239.9 | 20.71        | 117.8 |
| 829 - 844                                    | 16QAM, RB1-0 | 22.60              | 182.0 | 19.74        | 94.2  |

**5.2.3. LTE BAND 17**

| Part 27 LTE Band 17 MODE (5.0 MHz BANDWIDTH) |              |                    |       |              |      |
|----------------------------------------------|--------------|--------------------|-------|--------------|------|
| Frequency range<br>(MHz)                     | Modulation   | Conducted(Average) |       | ERP(Average) |      |
|                                              |              | dBm                | mW    | dBm          | mW   |
| 706.5 - 713.5                                | QPSK, RB1-0  | 23.90              | 245.5 | 19.22        | 83.6 |
| 706.5 - 713.5                                | 16QAM, RB1-0 | 23.20              | 208.9 | 18.22        | 66.4 |

| Part 27 LTE Band 17 MODE (10.0 MHz BANDWIDTH) |              |                    |       |              |      |
|-----------------------------------------------|--------------|--------------------|-------|--------------|------|
| Frequency range<br>(MHz)                      | Modulation   | Conducted(Average) |       | ERP(Average) |      |
|                                               |              | dBm                | mW    | dBm          | mW   |
| 709 - 711                                     | QPSK, RB1-0  | 24.00              | 251.2 | 19.22        | 83.6 |
| 709 - 711                                     | 16QAM, RB1-0 | 22.70              | 186.2 | 18.32        | 67.9 |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a band gap type integral antenna with a maximum peak gain as follow:

| Frequency (MHz)              | Gain (dBi) |
|------------------------------|------------|
| GSM/UMTS Cell, 824 – 849MHz  | -1.52      |
| GSM / UMTS PCS, 1850-1910MHz | 1.41       |
| LTE Band 5, 824.7-848MHz     | -1.52      |
| LTE Band 2, 1850-1910MHz     | 1.41       |
| LTE Band 4, 1710-1755MHz     | 0.48       |
| LTE Band 17, 704-716MHz      | -4.66      |

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 2.00.01\_Debug

The EUT software installed during testing was 10A8397.

The EUT is linked with Agilent 8960 Communication, CMU200 and CMW500 Test Set.

### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel for RF radiated emissions below 1GHz and AC conducted emissions are determined as the channel with the AC Power Adapter Source

Based on the investigation results, the highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst-case modes below:

- For Cellular and PCS band: GPRS and EGPRS
- For Cellular and PCS band: UMTS, REL 99 and HSUPA.
- For LTE Band 2, 4, 5 and 17.

Both conducted and radiated emissions measurement with all bands.

The EUT has been investigated on X, Y and Z position, the worst-case was determined on Z-position for CELL and PCS band by comparing the fundamental ERP / EIRP output power.

## 5.6. DESCRIPTION OF TEST SETUP

### I/O CABLES (RF CONDUCTED TEST)

| I/O Cable List |           |                |                        |             |                  |         |
|----------------|-----------|----------------|------------------------|-------------|------------------|---------|
| Cable No       | Port      | # of identical | Connector Type         | Cable Type  | Cable Length (m) | Remarks |
| 1              | RF Out    | 1              | Spectrum Analyzer      | Un-shielded | 1m               | N/A     |
| 2              | RF In/Out | 1              | Directional Coupler    | Un-shielded | 1m               | N/A     |
| 3              | RF In/Out | 1              | Communication Test Set | Un-shielded | None             | N/A     |

### I/O CABLES (RF RADIATED TEST)

| I/O Cable List |           |                |                |             |                  |         |
|----------------|-----------|----------------|----------------|-------------|------------------|---------|
| Cable No       | Port      | # of identical | Connector Type | Cable Type  | Cable Length (m) | Remarks |
| 1              | AC        | 2              | US 115V        | Un-shielded | 2m               | NA      |
| 2              | DC        | 1              | DC             | Un-shielded | 1m               | NA      |
| 3              | Jack      | 1              | Earphone       | Un-shielded | 0.5m             | NA      |
| 4              | RF In/Out | 1              | Horn           | Un-shielded | 2m               | NA      |

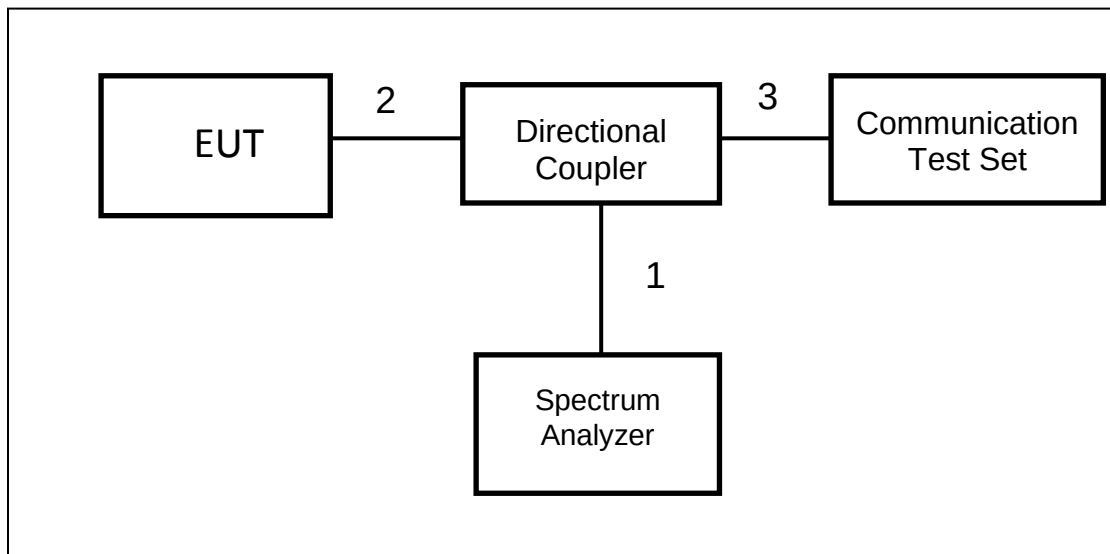
### SUPPORT EQUIPMENT

| Support Equipment List |              |           |               |        |
|------------------------|--------------|-----------|---------------|--------|
| Description            | Manufacturer | Model     | Serial Number | FCC ID |
| AC Adapter             | Apple        | NA        | NA            | DoC    |
| DC Power Supply        | Xantrex      | XHR-60-18 | 27519         | NA     |

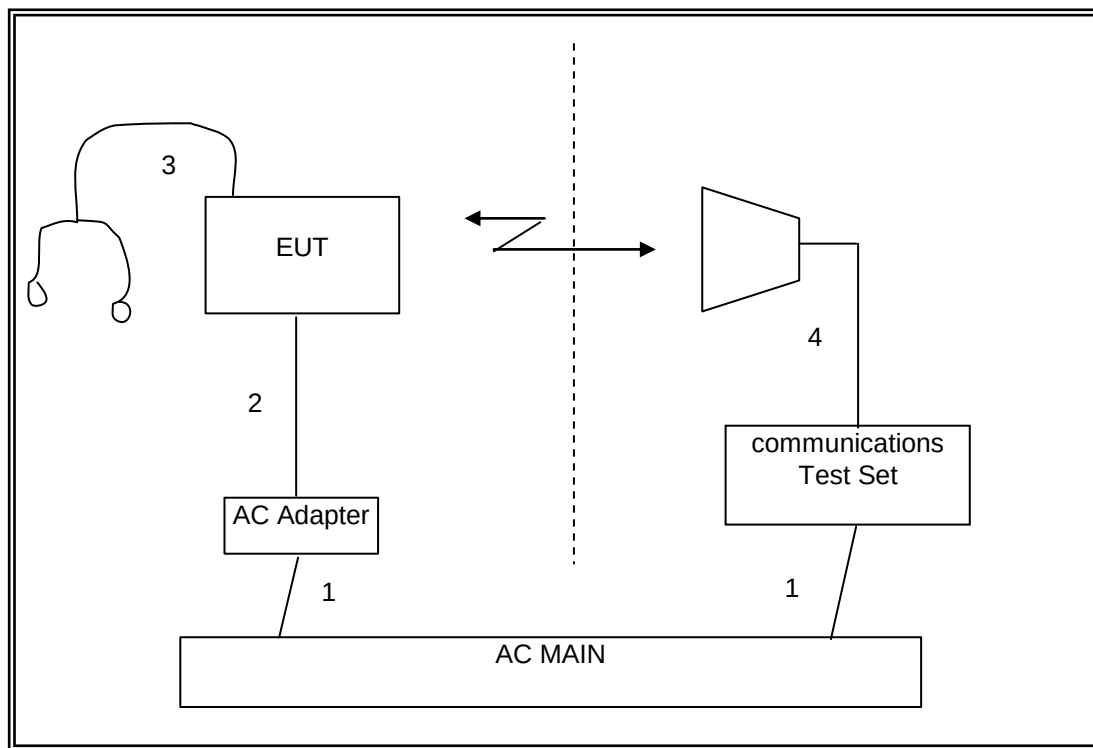
### TEST SETUP

The EUT is a stand-alone device. The Communication test set exercised the EUT.

**SETUP DIAGRAM FOR RF CONDUCTED TESTS**



**SETUP DIAGRAM FOR RF RADIATED TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| TEST EQUIPMENT LIST                |                 |           |          |          |
|------------------------------------|-----------------|-----------|----------|----------|
| Description                        | Manufacturer    | Model     | Asset    | Cal Due  |
| Spectrum Analyzer, 44 GHz          | Agilent / HP    | E4446A    | C01159   | 04/09/13 |
| Preamplifier, 1300 MHz             | Agilent / HP    | 8447D     | C00885   | 11/11/12 |
| Preamplifier, 26.5 GHz             | Agilent / HP    | 8449B     | C01063   | 11/11/12 |
| Communication Test Set             | R & S           | CMU 200   | None     | 06/06/13 |
| Wideband Communication Test Set    | R & S           | CMW 500   | None     | 12/16/12 |
| Antenna, Horn, 18 GHz              | EMCO            | 3115      | C00872   | 09/20/13 |
| Antenna, Bilog, 2 GHz              | Sunol Sciences  | JB1       | C01011   | 02/07/13 |
| Highpass Filter, 1.5 GHz           | Micro-Tronics   | HPM13193  | N02689`  | CNR      |
| Highpass Filter, 2.7 GHz           | Micro-Tronics   | HPM13194  | N02687   | CNR      |
| Temperature / Humidity Chamber     | WATLOW Controls | SK-3102   | None     | CNR      |
| Dual Channel Thermometer           | Tektronix       | DTM920    | CCS-0048 | 05/21/13 |
| Directional Coupler                | Krytar          | 1817      | N02656   | CNR      |
| Vector signal generator, 6 GHz     | Agilent / HP    | E4438C    | None     | 07/06/13 |
| Antenna, Tuned Dipole 400~1000 MHz | ETS             | 3121C DB4 | C00993   | 07/16/13 |

## 7. RF POWER OUTPUT VERIFICATION

### 7.1. GSM

#### TEST PROCEDURE

The transmitter output was connected to the input terminal of Directional Coupler via calibrated coaxial cable. The output coupling terminal of the Directional Coupler was directly connected to a spectrum analyzer while the output through terminal connected to the communication test set via calibrated coaxial cable.

The output power was measured with the spectrum analyzer at the low, middle and high channel in each band.

- Set the spectrum analyzer span wide enough or greater than the modulated signal BW.
- Set a spectrum analyzer at peak detection mode with VBW  $\geq$  RBW  $\geq$  26dB BW, typically 3MHz.
- Set a marker to point the corresponding peak value.

## **PROCEDURE USED TO ESTABLISH TEST SIGNAL**

### **GPRS/EGPRS**

Function: Menu select > GSM Mobile Station > GSM 850/900/1800/1900  
Press Connection control to choose the different menus  
Press RESET > choose all to reset all settings  
Connection Press Signal Off to turn off the signal and change settings  
Network Support > GSM+GPRS or GSM+EGPRS  
Main Service > Packet Data  
Service selection > Test Mode A – Auto Slot Config. off  
MS Signal Press Slot Config bottom on the right twice to select and change the number of time slots and power setting  
    > Slot configuration > Uplink/Gamma  
    > 33 dBm for GPRS 850/900  
    > 27 dBm for EGPRS 850/900  
    > 30 dBm for GPRS1800/1900  
    > 26 dBm for EGPRS1800/1900  
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel  
Frequency Offset > + 0 Hz  
Mode > BCCH and TCH  
BCCH Level > -85 dBm (May need to adjust if link is not stable)  
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]  
Channel Type > Off  
P0> 4 dB  
Slot Config > Unchanged (if already set under MS Signal)  
TCH > choose desired test channel  
Hopping > Off  
Main Timeslot > 3 (Default)  
Network Coding Scheme > CS4 (GPRS) and MCS9 (EGPRS)  
Bit Stream > 2E9-1PSR Bit Pattern  
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input  
Connection Press Signal On to turn on the signal and change settings

## **RESULTS**



**GPRS/EGPRS**

|       | Ch. | f (MHz) | 1 time slots |         | 2 time slots |         |
|-------|-----|---------|--------------|---------|--------------|---------|
|       |     |         | Peak         | Average | Peak         | Average |
| GPRS  | 128 | 824.2   | 33.70        | 33.50   | 33.20        | 33.00   |
|       | 190 | 836.6   | <b>33.70</b> | 33.50   | 33.20        | 33.00   |
|       | 251 | 848.8   | 33.60        | 33.40   | 33.15        | 32.90   |
| EGPRS | 128 | 824.2   | 32.10        | 29.00   | 32.00        | 28.90   |
|       | 190 | 836.6   | <b>32.10</b> | 29.00   | 32.00        | 28.90   |
|       | 251 | 848.8   | 32.00        | 28.90   | 31.95        | 28.85   |

|       | Ch. | f (MHz) | 1 time slots |         | 2 time slots |         |
|-------|-----|---------|--------------|---------|--------------|---------|
|       |     |         | Peak         | Average | Peak         | Average |
| GPRS  | 512 | 1850.2  | 30.50        | 30.00   | 29.60        | 29.40   |
|       | 661 | 1880.0  | <b>30.50</b> | 30.00   | 29.50        | 29.30   |
|       | 810 | 1909.8  | 30.20        | 29.80   | 29.50        | 29.30   |
| EGPRS | 512 | 1850.2  | 30.50        | 27.90   | 30.50        | 27.80   |
|       | 661 | 1880.0  | <b>30.50</b> | 27.90   | 30.50        | 27.90   |
|       | 810 | 1909.8  | 30.45        | 27.85   | 30.50        | 27.80   |

## 7.2. UMTS MODE

### TEST PROCEDURE

The transmitter output was connected to the input terminal of Directional Coupler via calibrated coaxial cable. The output coupling terminal of the Directional Coupler was directly connected to a spectrum analyzer while the output through terminal connected to the communication test set via calibrated coaxial cable.

The output power was measured with the spectrum analyzer at the low, middle and high channel in each band.

- Set the spectrum analyzer span wide enough or greater than the modulated signal BW.
- Set a spectrum analyzer at peak detection mode with VBW  $\geq$  RBW  $\geq$  26dB BW, typically 5MHz.
- Set a marker to point the corresponding peak value.

### 7.2.1. REL99

### TEST PROCEDURE

The following summary of these settings are illustrated below:

|                        | Mode                    | Rel99          |
|------------------------|-------------------------|----------------|
|                        | Subtest                 | -              |
| WCDMA General Settings | Loopback Mode           | Test Mode 1    |
|                        | Rel99 RMC               | 12.2kbps RMC   |
|                        | HSDPA FRC               | Not Applicable |
|                        | HSUPA Test              | Not Applicable |
|                        | Power Control Algorithm | Algorithm2     |
|                        | $\beta_c$               | Not Applicable |
|                        | $\beta_d$               | Not Applicable |
|                        | $\beta_{ec}$            | Not Applicable |
|                        | $\beta_c/\beta_d$       | 8/15           |
|                        | $\beta_{hs}$            | Not Applicable |
|                        | $\beta_{ed}$            | Not Applicable |

### RESULTS

**UMTS REL99**

| Band     | UL Ch | DL Ch | Frequency | Conducted output power (dBm) |         |
|----------|-------|-------|-----------|------------------------------|---------|
|          |       |       |           | Peak                         | Average |
| UMTS 850 | 4132  | 4357  | 826.4     | 26.80                        | 24.47   |
|          | 4180  | 4405  | 836.0     | 27.10                        | 24.45   |
|          | 4230  | 4455  | 846.0     | 27.08                        | 24.50   |

| Band      | UL Ch | DL Ch | Frequency | Conducted output power (dBm) |         |
|-----------|-------|-------|-----------|------------------------------|---------|
|           |       |       |           | Peak                         | Average |
| UMTS 1900 | 9262  | 9662  | 1852.4    | 26.05                        | 22.90   |
|           | 9400  | 9800  | 1880.0    | 26.10                        | 22.90   |
|           | 9538  | 9938  | 1907.6    | 25.85                        | 22.75   |

**7.2.2. HSDPA REL 5**

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121.

Summary of settings are illustrated below:

|                               | Mode                                 | Rel5 HSDPA   |       |       |       |
|-------------------------------|--------------------------------------|--------------|-------|-------|-------|
|                               | Subtest                              | 1            | 2     | 3     | 4     |
| WCDMA<br>General<br>Settings  | Loopback Mode                        | Test Mode 1  |       |       |       |
|                               | Rel99 RMC                            | 12.2kbps RMC |       |       |       |
|                               | HSDPA FRC                            | H-Set1       |       |       |       |
|                               | Power Control Algorithm              | Algorithm 2  |       |       |       |
|                               | $\beta_c$                            | 2/15         | 12/15 | 15/15 | 15/15 |
|                               | $\beta_d$                            | 15/15        | 15/15 | 8/15  | 4/15  |
|                               | Bd (SF)                              | 64           |       |       |       |
|                               | $\beta_c/\beta_d$                    | 2/15         | 12/15 | 15/8  | 15/4  |
|                               | $\beta_{hs}$                         | 4/15         | 24/15 | 30/15 | 30/15 |
| HSDPA<br>Specific<br>Settings | MPR (dB)                             | 0            | 0     | 0.5   | 0.5   |
|                               | $D_{ACK}$                            | 8            |       |       |       |
|                               | $D_{NAK}$                            | 8            |       |       |       |
|                               | DCQI                                 | 8            |       |       |       |
|                               | Ack-Nack repetition factor           | 3            |       |       |       |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms          |       |       |       |
|                               | CQI Repetition Factor (Table 5.2B.4) | 2            |       |       |       |
|                               | $A_{hs} = \beta_{hs}/\beta_c$        | 30/15        |       |       |       |

**Result**

| Band               | Subtest | UL Ch | DL Ch | Frequency | Conducted output power (dBm) | Conducted output power (dBm) |
|--------------------|---------|-------|-------|-----------|------------------------------|------------------------------|
|                    |         |       |       |           | Peak                         | Average                      |
| UMTS850 (Band V)   | 1       | 4132  | 4357  | 826.4     | 26.66                        | 23.50                        |
|                    |         | 4180  | 4405  | 836.0     | 26.95                        | 23.50                        |
|                    |         | 4230  | 4455  | 846.0     | 27.00                        | 23.50                        |
|                    | 2*      | 4132  | 4357  | 826.4     | 26.95                        | 23.51                        |
|                    |         | 4180  | 4405  | 836.0     | 27.43                        | 23.55                        |
|                    |         | 4230  | 4455  | 846.0     | 27.30                        | 23.50                        |
|                    | 3       | 4132  | 4357  | 826.4     | 26.90                        | 23.03                        |
|                    |         | 4180  | 4405  | 836.0     | 27.30                        | 23.06                        |
|                    |         | 4230  | 4455  | 846.0     | 27.22                        | 23.15                        |
|                    | 4       | 4132  | 4357  | 826.4     | 26.95                        | 23.04                        |
|                    |         | 4180  | 4405  | 836.0     | 27.19                        | 23.07                        |
|                    |         | 4230  | 4455  | 846.0     | 27.15                        | 23.10                        |
| UMTS1900 (Band II) | 1       | 9262  | 9662  | 1852.4    | 26.10                        | 22.80                        |
|                    |         | 9400  | 9800  | 1880.0    | 26.36                        | 22.90                        |
|                    |         | 9538  | 9938  | 1907.6    | 26.08                        | 22.78                        |
|                    | 2*      | 9262  | 9662  | 1852.4    | 26.50                        | 22.76                        |
|                    |         | 9400  | 9800  | 1880.0    | 27.10                        | 22.90                        |
|                    |         | 9538  | 9938  | 1907.6    | 26.50                        | 22.76                        |
|                    | 3       | 9262  | 9662  | 1852.4    | 26.86                        | 22.35                        |
|                    |         | 9400  | 9800  | 1880.0    | 26.82                        | 22.50                        |
|                    |         | 9538  | 9938  | 1907.6    | 26.65                        | 22.46                        |
|                    | 4       | 9262  | 9662  | 1852.4    | 26.67                        | 22.44                        |
|                    |         | 9400  | 9800  | 1880.0    | 27.00                        | 22.50                        |
|                    |         | 9538  | 9938  | 1907.6    | 26.74                        | 22.50                        |

Note 1: Asterisk (\*) represents the worst case

Note 2: Maximum output power levels that are possible for all subtests reported.

**7.2.3. HSPA REL 6 (HSDPA & HSUPA)****TEST PROCEDURE**

The following summary of these settings are illustrated below:

|                               | Mode                                 | Rel6<br>HSUPA                                                                                                                                | Rel6<br>HSUPA | Rel6<br>HSUPA                                                      | Rel6<br>HSUPA                                                                                                                                | Rel6<br>HSUPA |
|-------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                               | Subtest                              | 1                                                                                                                                            | 2             | 3                                                                  | 4                                                                                                                                            | 5             |
| WCDMA<br>General<br>Settings  | Loopback Mode                        | Test Mode 1                                                                                                                                  |               |                                                                    |                                                                                                                                              |               |
|                               | Rel99 RMC                            | 12.2kbps RMC                                                                                                                                 |               |                                                                    |                                                                                                                                              |               |
|                               | HSDPA FRC                            | H-Set1                                                                                                                                       |               |                                                                    |                                                                                                                                              |               |
|                               | HSUPA Test                           | HSUPA Loopback                                                                                                                               |               |                                                                    |                                                                                                                                              |               |
|                               | Power Control Algorithm              | Algorithm2                                                                                                                                   |               |                                                                    |                                                                                                                                              |               |
|                               | $\beta_c$                            | 11/15                                                                                                                                        | 6/15          | 15/15                                                              | 2/15                                                                                                                                         | 15/15         |
|                               | $\beta_d$                            | 15/15                                                                                                                                        | 15/15         | 9/15                                                               | 15/15                                                                                                                                        | 0             |
|                               | $\beta_{ec}$                         | 209/225                                                                                                                                      | 12/15         | 30/15                                                              | 2/15                                                                                                                                         | 5/15          |
|                               | $\beta_c/\beta_d$                    | 11/15                                                                                                                                        | 6/15          | 15/9                                                               | 2/15                                                                                                                                         | -             |
|                               | $\beta_{hs}$                         | 22/15                                                                                                                                        | 12/15         | 30/15                                                              | 4/15                                                                                                                                         | 5/15          |
| HSDPA<br>Specific<br>Settings | $\beta_{ed}$                         | 1309/225                                                                                                                                     | 94/75         | 47/15<br>47/15                                                     | 56/75                                                                                                                                        | 47/15         |
|                               | DACK                                 | 8                                                                                                                                            |               |                                                                    |                                                                                                                                              |               |
|                               | DNAK                                 | 8                                                                                                                                            |               |                                                                    |                                                                                                                                              |               |
|                               | DCQI                                 | 8                                                                                                                                            |               |                                                                    |                                                                                                                                              |               |
|                               | Ack-Nack repetition factor           | 3                                                                                                                                            |               |                                                                    |                                                                                                                                              |               |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms                                                                                                                                          |               |                                                                    |                                                                                                                                              |               |
|                               | CQI Repetition Factor (Table 5.2B.4) | 2                                                                                                                                            |               |                                                                    |                                                                                                                                              |               |
| HSUPA<br>Specific<br>Settings | $A_{hs} = \beta_{hs}/\beta_c$        | 30/15                                                                                                                                        |               |                                                                    |                                                                                                                                              |               |
|                               | D E-DPCCH                            | 6                                                                                                                                            | 8             | 8                                                                  | 5                                                                                                                                            | 7             |
|                               | DHARQ                                | 0                                                                                                                                            | 0             | 0                                                                  | 0                                                                                                                                            | 0             |
|                               | AG Index                             | 20                                                                                                                                           | 12            | 15                                                                 | 17                                                                                                                                           | 12            |
|                               | ETFCI (from 34.121 Table C.11.1.3)   | 75                                                                                                                                           | 67            | 92                                                                 | 71                                                                                                                                           | 67            |
|                               | Associated Max UL Data Rate kbps     | 242.1                                                                                                                                        | 174.9         | 482.8                                                              | 205.8                                                                                                                                        | 308.9         |
|                               | Reference E_TFCIs                    | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |               | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 75<br>E-TFCI 92<br>E-TFCI PO 18 | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |               |

**RESULTS**

| Band                  | Subtest | UL Ch | DL Ch | Frequency | Conducted output power<br>(dBm) |         |
|-----------------------|---------|-------|-------|-----------|---------------------------------|---------|
|                       |         |       |       |           | Peak                            | Average |
| UMTS850<br>(Band V)   | 1*      | 4132  | 4357  | 826.4     | 27.50                           | 23.50   |
|                       |         | 4180  | 4405  | 836.0     | 28.17                           | 23.60   |
|                       |         | 4230  | 4455  | 846.0     | 27.91                           | 23.55   |
|                       | 2       | 4132  | 4357  | 826.4     | 27.30                           | 21.80   |
|                       |         | 4180  | 4405  | 836.0     | 27.80                           | 21.80   |
|                       |         | 4230  | 4455  | 846.0     | 27.88                           | 21.75   |
|                       | 3       | 4132  | 4357  | 826.4     | 27.65                           | 22.90   |
|                       |         | 4180  | 4405  | 836.0     | 28.00                           | 22.84   |
|                       |         | 4230  | 4455  | 846.0     | 27.97                           | 22.88   |
|                       | 4       | 4132  | 4357  | 826.4     | 27.23                           | 21.80   |
|                       |         | 4180  | 4405  | 836.0     | 27.80                           | 21.85   |
|                       |         | 4230  | 4455  | 846.0     | 27.56                           | 22.00   |
|                       | 5       | 4132  | 4357  | 826.4     | 26.87                           | 23.50   |
|                       |         | 4180  | 4405  | 836.0     | 27.30                           | 23.50   |
|                       |         | 4230  | 4455  | 846.0     | 27.20                           | 23.58   |
| UMTS1900<br>(Band II) | 1*      | 9262  | 9662  | 1852.4    | 27.36                           | 22.70   |
|                       |         | 9400  | 9800  | 1880.0    | 27.75                           | 22.90   |
|                       |         | 9538  | 9938  | 1907.6    | 27.20                           | 22.70   |
|                       | 2       | 9262  | 9662  | 1852.4    | 26.28                           | 20.22   |
|                       |         | 9400  | 9800  | 1880.0    | 26.48                           | 20.46   |
|                       |         | 9538  | 9938  | 1907.6    | 26.26                           | 20.23   |
|                       | 3       | 9262  | 9662  | 1852.4    | 27.10                           | 21.80   |
|                       |         | 9400  | 9800  | 1880.0    | 27.20                           | 21.90   |
|                       |         | 9538  | 9938  | 1907.6    | 27.30                           | 21.90   |
|                       | 4       | 9262  | 9662  | 1852.4    | 26.03                           | 20.15   |
|                       |         | 9400  | 9800  | 1880.0    | 26.40                           | 20.45   |
|                       |         | 9538  | 9938  | 1907.6    | 26.00                           | 20.26   |
|                       | 5       | 9262  | 9662  | 1852.4    | 26.26                           | 22.70   |
|                       |         | 9400  | 9800  | 1880.0    | 26.50                           | 22.80   |
|                       |         | 9538  | 9938  | 1907.6    | 26.30                           | 22.70   |

Note 1: Asterisk (\*) represents the worst case

Note 2: Maximum output power levels that are possible for all subtests reported.

## 7.2.4. DUAL CARRIER HSDPA

### DC-HSDPA (Rel 8, CAT 24)

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

**Table E.5.0: Levels for HSDPA connection setup**

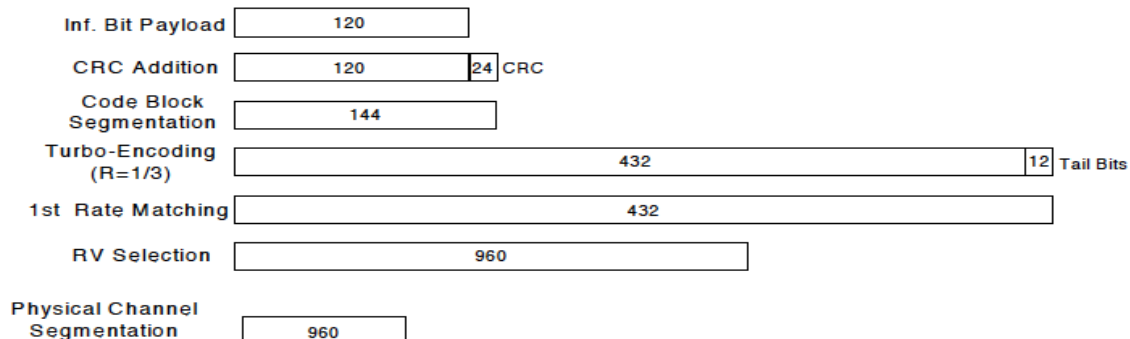
| Parameter<br>During Connection setup | Unit | Value |
|--------------------------------------|------|-------|
| P-CPICH $E_c/I_{\text{or}}$          | dB   | -10   |
| P-CCPCH and SCH $E_c/I_{\text{or}}$  | dB   | -12   |
| PICH $E_c/I_{\text{or}}$             | dB   | -15   |
| HS-PDSCH                             | dB   | off   |
| HS-SCCH_1                            | dB   | off   |
| DPCH $E_c/I_{\text{or}}$             | dB   | -5    |
| OCNS $E_c/I_{\text{or}}$             | dB   | -3.1  |

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

**Table C.8.1.12: Fixed Reference Channel H-Set 12**

| Parameter                                                                                                                                              | Unit      | Value |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|
| Nominal Avg. Inf. Bit Rate                                                                                                                             | kbps      | 60    |
| Inter-TTI Distance                                                                                                                                     | TTI's     | 1     |
| Number of HARQ Processes                                                                                                                               | Processes | 6     |
| Information Bit Payload ( $N_{\text{INF}}$ )                                                                                                           | Bits      | 120   |
| Number Code Blocks                                                                                                                                     | Blocks    | 1     |
| Binary Channel Bits Per TTI                                                                                                                            | Bits      | 960   |
| Total Available SML's in UE                                                                                                                            | SML's     | 19200 |
| Number of SML's per HARQ Proc.                                                                                                                         | SML's     | 3200  |
| Coding Rate                                                                                                                                            |           | 0.15  |
| Number of Physical Channel Codes                                                                                                                       | Codes     | 1     |
| Modulation                                                                                                                                             |           | QPSK  |
| Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.               |           |       |
| Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used. |           |       |



**Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)**



The following 4 Sub-tests for HSDPA were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

|                               | Mode                            | Rel6 HSDPA   | Rel6 HSDPA | Rel6 HSDPA | Rel6 HSDPA |
|-------------------------------|---------------------------------|--------------|------------|------------|------------|
|                               | Subtest                         | 1            | 2          | 3          | 4          |
| WCDMA<br>General<br>Settings  | Loopback Mode                   | Test Mode 1  |            |            |            |
|                               | Rel99 RMC                       | 12.2kbps RMC |            |            |            |
|                               | HSDPA FRC                       | H-Set1       |            |            |            |
|                               | Power Control Algorithm         | Algorithm2   |            |            |            |
|                               | $\beta_c$                       | 2/15         | 12/15      | 15/15      | 15/15      |
|                               | $\beta_d$                       | 15/15        | 15/15      | 8/15       | 4/15       |
|                               | $\beta_d$ (SF)                  | 64           |            |            |            |
|                               | $\beta_c/\beta_d$               | 2/15         | 12/15      | 15/8       | 15/4       |
|                               | $\beta_{hs}$                    | 4/15         | 24/15      | 30/15      | 30/15      |
|                               | MPR                             | 0            | 0          | 0.5        | 0.5        |
| HSDPA<br>Specific<br>Settings | DACK                            | 8            |            |            |            |
|                               | DNAK                            | 8            |            |            |            |
|                               | DCQI                            | 8            |            |            |            |
|                               | Ack-Nack Repetition factor      | 3            |            |            |            |
|                               | CQI Feedback                    | 4ms          |            |            |            |
|                               | CQI Repetition Factor           | 2            |            |            |            |
|                               | $A_{hs} = \beta_{hs} / \beta_c$ | 30/15        |            |            |            |

**RESULT**

| Band                  | Subtest | UL Ch | DL Ch | Frequency | Conducted output power (dBm) |         |
|-----------------------|---------|-------|-------|-----------|------------------------------|---------|
|                       |         |       |       |           | Peak                         | Average |
| UMTS850<br>(Band V)   | 1       | 4132  | 4357  | 826.4     | 27.10                        | 23.46   |
|                       |         | 4180  | 4405  | 836.0     | 27.25                        | 23.50   |
|                       |         | 4230  | 4455  | 846.0     | 27.10                        | 23.45   |
|                       | 2*      | 4132  | 4357  | 826.4     | 27.48                        | 23.50   |
|                       |         | 4180  | 4405  | 836.0     | 27.15                        | 23.50   |
|                       |         | 4230  | 4455  | 846.0     | 27.12                        | 23.45   |
|                       | 3       | 4132  | 4357  | 826.4     | 27.06                        | 23.00   |
|                       |         | 4180  | 4405  | 836.0     | 26.90                        | 23.00   |
|                       |         | 4230  | 4455  | 846.0     | 27.12                        | 23.00   |
|                       | 4       | 4132  | 4357  | 826.4     | 26.90                        | 23.00   |
|                       |         | 4180  | 4405  | 836.0     | 26.85                        | 23.00   |
|                       |         | 4230  | 4455  | 846.0     | 27.05                        | 23.00   |
| UMTS1900<br>(Band II) | 1       | 9262  | 9662  | 1852.4    | 26.46                        | 23.00   |
|                       |         | 9400  | 9800  | 1880.0    | 26.85                        | 22.95   |
|                       |         | 9538  | 9938  | 1907.6    | 26.84                        | 22.90   |
|                       | 2*      | 9262  | 9662  | 1852.4    | 26.65                        | 22.90   |
|                       |         | 9400  | 9800  | 1880.0    | 27.05                        | 22.90   |
|                       |         | 9538  | 9938  | 1907.6    | 26.77                        | 22.85   |
|                       | 3       | 9262  | 9662  | 1852.4    | 26.70                        | 22.65   |
|                       |         | 9400  | 9800  | 1880.0    | 26.72                        | 22.65   |
|                       |         | 9538  | 9938  | 1907.6    | 26.85                        | 22.60   |
|                       | 4       | 9262  | 9662  | 1852.4    | 26.68                        | 22.55   |
|                       |         | 9400  | 9800  | 1880.0    | 26.75                        | 22.60   |
|                       |         | 9538  | 9938  | 1907.6    | 26.75                        | 22.60   |

Note 1: Asterisk (\*) represents the worst case

Note 2: Maximum output power levels that are possible for all subtests reported.

### 7.3. LTE Band 2

#### Output power for LTE Band 2 (1.4MHz)

| Freq.<br>(MHz) | UL Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|------------|------------|-------------|------------|--------------|----------------------------|---------|
| 1850.7         | 18607      | QPSK       | 1.4         | 1          | 0            | 27.40                      | 22.70   |
|                |            |            |             | 1          | 5            | 27.50                      | 22.60   |
|                |            |            |             | 3          | 2            | 27.50                      | 22.50   |
|                |            |            |             | 6          | 0            | 27.55                      | 21.48   |
|                |            | 16-QAM     |             | 1          | 0            | 27.40                      | 21.60   |
|                |            |            |             | 1          | 5            | 27.30                      | 21.40   |
|                |            |            |             | 3          | 2            | 27.50                      | 21.80   |
|                |            |            |             | 6          | 0            | 27.90                      | 20.70   |
| 1880.0         | 18900      | QPSK       |             | 1          | 0            | 27.80                      | 22.75   |
|                |            |            |             | 1          | 5            | 27.75                      | 22.75   |
|                |            |            |             | 3          | 2            | 27.75                      | 22.70   |
|                |            |            |             | 6          | 0            | 27.85                      | 21.50   |
|                |            | 16-QAM     |             | 1          | 0            | 27.70                      | 21.70   |
|                |            |            |             | 1          | 5            | 27.65                      | 21.64   |
|                |            |            |             | 3          | 2            | 27.90                      | 22.00   |
|                |            |            |             | 6          | 0            | 28.10                      | 20.77   |
| 1909.3         | 19193      | QPSK       |             | 1          | 0            | 27.20                      | 22.75   |
|                |            |            |             | 1          | 5            | 27.20                      | 22.66   |
|                |            |            |             | 3          | 2            | 27.30                      | 22.55   |
|                |            |            |             | 6          | 0            | 27.40                      | 21.45   |
|                |            | 16-QAM     |             | 1          | 0            | 27.20                      | 21.50   |
|                |            |            |             | 1          | 5            | 27.10                      | 21.45   |
|                |            |            |             | 3          | 2            | 27.30                      | 21.90   |
|                |            |            |             | 6          | 0            | 27.90                      | 20.60   |

**Output power for LTE Band 2 (3 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|----------------------------|---------|
| 1851.5         | 18615         | QPSK       | 3.0         | 1          | 0            | 27.00                      | 22.70   |
|                |               |            |             | 1          | 14           | 27.00                      | 22.64   |
|                |               |            |             | 8          | 4            | 26.95                      | 21.70   |
|                |               |            |             | 15         | 0            | 27.05                      | 21.65   |
|                |               | 16-QAM     |             | 1          | 0            | 27.00                      | 21.30   |
|                |               |            |             | 1          | 14           | 27.20                      | 21.24   |
|                |               |            |             | 8          | 4            | 27.40                      | 20.90   |
|                |               |            |             | 15         | 0            | 27.25                      | 20.80   |
| 1880.0         | QPSK          | 1          |             | 0          | 27.40        | 22.75                      |         |
|                |               | 1          |             | 14         | 27.19        | 22.67                      |         |
|                |               | 8          |             | 4          | 27.15        | 21.95                      |         |
|                |               | 15         |             | 0          | 27.52        | 21.80                      |         |
|                | 16-QAM        | 1          |             | 0          | 27.15        | 21.00                      |         |
|                |               | 1          |             | 14         | 27.18        | 21.17                      |         |
|                |               | 8          |             | 4          | 27.45        | 21.00                      |         |
|                |               | 15         |             | 0          | 27.50        | 20.90                      |         |
| 1908.5         | QPSK          | 1          |             | 0          | 27.00        | 22.75                      |         |
|                |               | 1          |             | 14         | 26.50        | 22.55                      |         |
|                |               | 8          |             | 4          | 27.40        | 21.60                      |         |
|                |               | 15         |             | 0          | 27.90        | 21.70                      |         |
|                | 16-QAM        | 1          |             | 0          | 27.20        | 21.30                      |         |
|                |               | 1          |             | 14         | 27.00        | 21.00                      |         |
|                |               | 8          |             | 4          | 27.55        | 20.80                      |         |
|                |               | 15         |             | 0          | 27.60        | 21.00                      |         |

**Output power for LTE Band 2 (5 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation<br>n | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|-----------------|-------------|------------|--------------|----------------------------|---------|
| 1852.5         | 18625         | QPSK            | 5.0         | 1          | 0            | 27.20                      | 22.60   |
|                |               |                 |             | 1          | 24           | 27.10                      | 22.60   |
|                |               |                 |             | 12         | 6            | 27.00                      | 21.60   |
|                |               |                 |             | 25         | 0            | 27.30                      | 21.60   |
|                |               | 16-QAM          |             | 1          | 0            | 27.50                      | 21.70   |
|                |               |                 |             | 1          | 24           | 27.30                      | 21.80   |
|                |               |                 |             | 12         | 6            | 27.10                      | 20.90   |
|                |               |                 |             | 25         | 0            | 27.70                      | 20.70   |
| 1880.0         | 18900         | QPSK            |             | 1          | 0            | 27.60                      | 22.75   |
|                |               |                 |             | 1          | 24           | 27.50                      | 22.70   |
|                |               |                 |             | 12         | 6            | 27.40                      | 21.80   |
|                |               |                 |             | 25         | 0            | 27.70                      | 21.75   |
|                |               | 16-QAM          |             | 1          | 0            | 27.60                      | 21.80   |
|                |               |                 |             | 1          | 24           | 27.70                      | 22.00   |
|                |               |                 |             | 12         | 6            | 27.70                      | 21.00   |
|                |               |                 |             | 25         | 0            | 27.80                      | 20.90   |
| 1907.5         | 19175         | QPSK            |             | 1          | 0            | 27.20                      | 22.75   |
|                |               |                 |             | 1          | 24           | 27.00                      | 22.70   |
|                |               |                 |             | 12         | 6            | 27.10                      | 21.70   |
|                |               |                 |             | 25         | 0            | 27.60                      | 21.70   |
|                |               | 16-QAM          |             | 1          | 0            | 27.35                      | 21.80   |
|                |               |                 |             | 1          | 24           | 27.10                      | 21.70   |
|                |               |                 |             | 12         | 6            | 27.00                      | 20.90   |
|                |               |                 |             | 25         | 0            | 27.60                      | 20.85   |

**Output power for LTE Band 2 (10 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|----------------------------|---------|
| 1855           | 18650         | QPSK       | 10.0        | 1          | 0            | 27.00                      | 22.65   |
|                |               |            |             | 1          | 49           | 27.00                      | 22.50   |
|                |               |            |             | 25         | 12           | 27.30                      | 21.70   |
|                |               |            |             | 50         | 0            | 27.60                      | 21.65   |
|                |               | 16-QAM     |             | 1          | 0            | 27.05                      | 21.50   |
|                |               |            |             | 1          | 49           | 26.90                      | 21.30   |
|                |               |            |             | 25         | 12           | 26.95                      | 20.80   |
|                |               |            |             | 50         | 0            | 27.30                      | 20.70   |
| 1880.0         | 18900         | QPSK       |             | 1          | 0            | 27.22                      | 22.75   |
|                |               |            |             | 1          | 49           | 27.00                      | 22.50   |
|                |               |            |             | 25         | 12           | 27.20                      | 21.80   |
|                |               |            |             | 50         | 0            | 27.70                      | 21.70   |
|                |               | 16-QAM     |             | 1          | 0            | 27.30                      | 21.60   |
|                |               |            |             | 1          | 49           | 27.30                      | 21.30   |
|                |               |            |             | 25         | 12           | 27.40                      | 20.90   |
|                |               |            |             | 50         | 0            | 27.90                      | 20.80   |
| 1905           | 19150         | QPSK       |             | 1          | 0            | 27.00                      | 22.75   |
|                |               |            |             | 1          | 49           | 26.60                      | 22.40   |
|                |               |            |             | 25         | 12           | 27.10                      | 21.80   |
|                |               |            |             | 50         | 0            | 27.75                      | 21.80   |
|                |               | 16-QAM     |             | 1          | 0            | 27.00                      | 21.70   |
|                |               |            |             | 1          | 49           | 26.90                      | 21.20   |
|                |               |            |             | 25         | 12           | 27.30                      | 20.90   |
|                |               |            |             | 50         | 0            | 27.50                      | 20.85   |

**Output power for LTE Band 2 (15 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation<br>n | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|-----------------|-------------|------------|--------------|----------------------------|---------|
| 1857.5         | 18675         | QPSK            | 15.0        | 1          | 0            | 27.30                      | 22.75   |
|                |               |                 |             | 1          | 74           | 27.00                      | 22.70   |
|                |               |                 |             | 36         | 18           | 27.20                      | 21.70   |
|                |               |                 |             | 75         | 0            | 27.60                      | 21.62   |
|                |               | 16-QAM          |             | 1          | 0            | 27.50                      | 21.70   |
|                |               |                 |             | 1          | 74           | 27.10                      | 21.75   |
|                |               |                 |             | 36         | 18           | 26.90                      | 20.90   |
|                |               |                 |             | 75         | 0            | 27.80                      | 20.80   |
| 1880.0         | 18900         | QPSK            |             | 1          | 0            | 27.50                      | 22.75   |
|                |               |                 |             | 1          | 74           | 27.40                      | 22.65   |
|                |               |                 |             | 36         | 18           | 27.80                      | 21.80   |
|                |               |                 |             | 75         | 0            | 28.00                      | 21.70   |
|                |               | 16-QAM          |             | 1          | 0            | 27.60                      | 21.80   |
|                |               |                 |             | 1          | 74           | 27.40                      | 21.60   |
|                |               |                 |             | 36         | 18           | 27.50                      | 20.95   |
|                |               |                 |             | 75         | 0            | 28.10                      | 20.80   |
| 1902.5         | 19125         | QPSK            |             | 1          | 0            | 27.00                      | 22.70   |
|                |               |                 |             | 1          | 74           | 26.95                      | 22.60   |
|                |               |                 |             | 36         | 18           | 27.20                      | 21.88   |
|                |               |                 |             | 75         | 0            | 27.80                      | 21.80   |
|                |               | 16-QAM          |             | 1          | 0            | 26.80                      | 21.75   |
|                |               |                 |             | 1          | 74           | 27.20                      | 21.77   |
|                |               |                 |             | 36         | 18           | 26.90                      | 20.90   |
|                |               |                 |             | 75         | 0            | 28.00                      | 20.80   |

**Output power for LTE Band 2 (20 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|----------------------------|---------|
| 1860           | 18700         | QPSK       | 20          | 1          | 0            | 27.25                      | 22.70   |
|                |               |            |             | 1          | 99           | 27.23                      | 22.66   |
|                |               |            |             | 50         | 24           | 27.35                      | 21.75   |
|                |               |            |             | 100        | 0            | 27.87                      | 21.80   |
|                |               | 16-QAM     |             | 1          | 0            | 27.80                      | 21.70   |
|                |               |            |             | 1          | 99           | 27.80                      | 21.80   |
|                |               |            |             | 50         | 24           | 26.90                      | 20.70   |
|                |               |            |             | 100        | 0            | 27.90                      | 20.70   |
| 1880.0         | 18900         | QPSK       |             | 1          | 0            | 27.40                      | 22.75   |
|                |               |            |             | 1          | 99           | 26.95                      | 22.65   |
|                |               |            |             | 50         | 24           | 28.00                      | 21.90   |
|                |               |            |             | 100        | 0            | 28.20                      | 21.70   |
|                |               | 16-QAM     |             | 1          | 0            | 27.70                      | 21.80   |
|                |               |            |             | 1          | 99           | 27.60                      | 21.50   |
|                |               |            |             | 50         | 24           | 27.50                      | 20.75   |
|                |               |            |             | 100        | 0            | 28.00                      | 20.55   |
| 1900           | 19100         | QPSK       |             | 1          | 0            | 26.80                      | 22.75   |
|                |               |            |             | 1          | 99           | 27.00                      | 22.60   |
|                |               |            |             | 50         | 24           | 27.20                      | 21.80   |
|                |               |            |             | 100        | 0            | 27.75                      | 21.70   |
|                |               | 16-QAM     |             | 1          | 0            | 27.00                      | 21.60   |
|                |               |            |             | 1          | 99           | 27.20                      | 21.70   |
|                |               |            |             | 50         | 24           | 26.00                      | 20.70   |
|                |               |            |             | 100        | 0            | 27.25                      | 20.68   |



**7.4. LTE Band 4****Output power for LTE Band 4 (1.4MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|---------------|------------------|
| 1710.7         | 19957         | QPSK       | 1.4         | 1          | 0            | 28.00         | 23.80            |
|                |               |            |             | 1          | 5            | 27.67         | 23.77            |
|                |               |            |             | 3          | 2            | 27.90         | 23.40            |
|                |               |            |             | 6          | 0            | 27.73         | 22.60            |
|                |               | 16-QAM     |             | 1          | 0            | 27.74         | 22.78            |
|                |               |            |             | 1          | 5            | 27.64         | 22.99            |
|                |               |            |             | 3          | 2            | 27.60         | 22.80            |
|                |               |            |             | 6          | 0            | 28.10         | 21.65            |
| 1732.5         | 20175         | QPSK       |             | 1          | 0            | 28.60         | 24.00            |
|                |               |            |             | 1          | 5            | 28.32         | 23.98            |
|                |               |            |             | 3          | 2            | 28.60         | 23.48            |
|                |               |            |             | 6          | 0            | 28.65         | 22.65            |
|                |               | 16-QAM     |             | 1          | 0            | 28.00         | 22.85            |
|                |               |            |             | 1          | 5            | 28.40         | 22.80            |
|                |               |            |             | 3          | 2            | 28.76         | 22.75            |
|                |               |            |             | 6          | 0            | 29.23         | 21.80            |
| 1754.3         | 20393         | QPSK       |             | 1          | 0            | 27.70         | 23.76            |
|                |               |            |             | 1          | 5            | 27.68         | 23.72            |
|                |               |            |             | 3          | 2            | 27.80         | 23.57            |
|                |               |            |             | 6          | 0            | 27.70         | 22.58            |
|                |               | 16-QAM     |             | 1          | 0            | 27.65         | 22.80            |
|                |               |            |             | 1          | 5            | 27.70         | 23.00            |
|                |               |            |             | 3          | 2            | 27.60         | 22.70            |
|                |               |            |             | 6          | 0            | 28.18         | 21.75            |

**Output power for LTE Band 4 (3 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|---------------|------------------|
| 1711.5         | 19965         | QPSK       | 3.0         | 1          | 0            | 27.50         | 23.70            |
|                |               |            |             | 1          | 14           | 27.32         | 23.65            |
|                |               |            |             | 8          | 4            | 27.80         | 22.70            |
|                |               |            |             | 15         | 0            | 28.31         | 22.70            |
|                |               | 16-QAM     |             | 1          | 0            | 27.70         | 22.60            |
|                |               |            |             | 1          | 14           | 27.27         | 22.75            |
|                |               |            |             | 8          | 4            | 27.40         | 21.95            |
|                |               |            |             | 15         | 0            | 27.50         | 21.75            |
| 1732.5         | 20175         | QPSK       |             | 1          | 0            | 28.00         | 23.80            |
|                |               |            |             | 1          | 14           | 27.90         | 23.90            |
|                |               |            |             | 8          | 4            | 28.40         | 22.90            |
|                |               |            |             | 15         | 0            | 28.90         | 22.80            |
|                |               | 16-QAM     |             | 1          | 0            | 28.40         | 22.50            |
|                |               |            |             | 1          | 14           | 28.36         | 22.80            |
|                |               |            |             | 8          | 4            | 28.45         | 22.15            |
|                |               |            |             | 15         | 0            | 28.50         | 22.10            |
| 1753.5         | 20385         | QPSK       |             | 1          | 0            | 27.65         | 23.60            |
|                |               |            |             | 1          | 14           | 27.60         | 23.60            |
|                |               |            |             | 8          | 4            | 27.40         | 22.78            |
|                |               |            |             | 15         | 0            | 28.25         | 22.80            |
|                |               | 16-QAM     |             | 1          | 0            | 27.36         | 22.60            |
|                |               |            |             | 1          | 14           | 27.63         | 22.89            |
|                |               |            |             | 8          | 4            | 27.60         | 21.96            |
|                |               |            |             | 15         | 0            | 28.04         | 22.00            |

**Output power for LTE Band 4 (5 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|---------------|------------------|
| 1712.5         | 19975         | QPSK       | 5.0         | 1          | 0            | 27.70         | 23.75            |
|                |               |            |             | 1          | 24           | 27.60         | 23.70            |
|                |               |            |             | 12         | 6            | 27.43         | 22.75            |
|                |               |            |             | 25         | 0            | 28.20         | 22.70            |
|                |               | 16-QAM     |             | 1          | 0            | 27.60         | 22.90            |
|                |               |            |             | 1          | 24           | 27.50         | 22.74            |
|                |               |            |             | 12         | 6            | 27.35         | 21.70            |
|                |               |            |             | 25         | 0            | 28.11         | 21.65            |
| 1732.5         | 20175         | QPSK       |             | 1          | 0            | 28.52         | 23.97            |
|                |               |            |             | 1          | 24           | 28.25         | 23.95            |
|                |               |            |             | 12         | 6            | 28.40         | 23.00            |
|                |               |            |             | 25         | 0            | 28.90         | 22.91            |
|                |               | 16-QAM     |             | 1          | 0            | 28.80         | 22.96            |
|                |               |            |             | 1          | 24           | 28.40         | 22.80            |
|                |               |            |             | 12         | 6            | 28.80         | 21.90            |
|                |               |            |             | 25         | 0            | 28.90         | 21.80            |
| 1752.5         | 20375         | QPSK       |             | 1          | 0            | 27.30         | 23.68            |
|                |               |            |             | 1          | 24           | 27.30         | 23.65            |
|                |               |            |             | 12         | 6            | 27.20         | 22.75            |
|                |               |            |             | 25         | 0            | 27.80         | 22.60            |
|                |               | 16-QAM     |             | 1          | 0            | 27.20         | 22.80            |
|                |               |            |             | 1          | 24           | 27.50         | 22.80            |
|                |               |            |             | 12         | 6            | 27.17         | 21.70            |
|                |               |            |             | 25         | 0            | 28.00         | 21.65            |

**Output power for LTE Band 4 (10 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>Power<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|------------------------|------------------|
| 1715           | 20000         | QPSK       | 10.0        | 1          | 0            | 27.60                  | 23.80            |
|                |               |            |             | 1          | 49           | 27.60                  | 23.79            |
|                |               |            |             | 25         | 12           | 27.70                  | 23.40            |
|                |               |            |             | 50         | 0            | 28.20                  | 22.08            |
|                |               | 16-QAM     |             | 1          | 0            | 27.60                  | 22.50            |
|                |               |            |             | 1          | 49           | 27.60                  | 22.40            |
|                |               |            |             | 25         | 12           | 27.40                  | 21.85            |
|                |               |            |             | 50         | 0            | 28.40                  | 21.60            |
| 1732.5         | 20175         | QPSK       |             | 1          | 0            | 28.30                  | 24.00            |
|                |               |            |             | 1          | 49           | 28.11                  | 24.00            |
|                |               |            |             | 25         | 12           | 28.80                  | 23.30            |
|                |               |            |             | 50         | 0            | 28.80                  | 22.30            |
|                |               | 16-QAM     |             | 1          | 0            | 28.70                  | 22.70            |
|                |               |            |             | 1          | 49           | 28.36                  | 22.55            |
|                |               |            |             | 25         | 12           | 28.50                  | 21.90            |
|                |               |            |             | 50         | 0            | 29.20                  | 21.49            |
| 1750           | 20350         | QPSK       |             | 1          | 0            | 27.35                  | 23.80            |
|                |               |            |             | 1          | 49           | 27.20                  | 23.75            |
|                |               |            |             | 25         | 12           | 27.30                  | 23.37            |
|                |               |            |             | 50         | 0            | 28.30                  | 22.25            |
|                |               | 16-QAM     |             | 1          | 0            | 27.30                  | 22.50            |
|                |               |            |             | 1          | 49           | 27.30                  | 22.40            |
|                |               |            |             | 25         | 12           | 27.10                  | 21.70            |
|                |               |            |             | 50         | 0            | 27.90                  | 21.65            |

**Output power for LTE Band 4 (15 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>Power<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|------------------------|------------------|
| 1717.5         | 20025         | QPSK       | 15.0        | 1          | 0            | 27.71                  | 23.90            |
|                |               |            |             | 1          | 74           | 28.51                  | 23.80            |
|                |               |            |             | 36         | 18           | 27.90                  | 23.00            |
|                |               |            |             | 75         | 0            | 28.72                  | 22.90            |
|                |               | 16-QAM     |             | 1          | 0            | 27.65                  | 22.90            |
|                |               |            |             | 1          | 74           | 28.40                  | 22.78            |
|                |               |            |             | 36         | 18           | 27.79                  | 22.00            |
|                |               |            |             | 75         | 0            | 28.90                  | 21.90            |
| 1732.5         | 20175         | QPSK       |             | 1          | 0            | 28.70                  | 24.00            |
|                |               |            |             | 1          | 74           | 27.83                  | 23.95            |
|                |               |            |             | 36         | 18           | 28.60                  | 23.20            |
|                |               |            |             | 75         | 0            | 29.20                  | 23.05            |
|                |               | 16-QAM     |             | 1          | 0            | 28.90                  | 23.05            |
|                |               |            |             | 1          | 74           | 28.80                  | 23.00            |
|                |               |            |             | 36         | 18           | 28.90                  | 22.05            |
|                |               |            |             | 75         | 0            | 29.60                  | 21.97            |
| 1747.5         | 20325         | QPSK       |             | 1          | 0            | 27.60                  | 23.75            |
|                |               |            |             | 1          | 74           | 27.43                  | 23.70            |
|                |               |            |             | 36         | 18           | 27.50                  | 23.15            |
|                |               |            |             | 75         | 0            | 27.90                  | 22.78            |
|                |               | 16-QAM     |             | 1          | 0            | 28.20                  | 23.10            |
|                |               |            |             | 1          | 74           | 27.90                  | 22.92            |
|                |               |            |             | 36         | 18           | 27.43                  | 21.90            |
|                |               |            |             | 75         | 0            | 28.00                  | 21.80            |

**Output power for LTE Band 4 (20 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation<br>n | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>Power<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|-----------------|-------------|------------|--------------|------------------------|------------------|
| 1720           | 20050         | QPSK            | 20.0        | 1          | 0            | 27.80                  | 23.92            |
|                |               |                 |             | 1          | 99           | 28.61                  | 23.90            |
|                |               |                 |             | 50         | 24           | 28.29                  | 22.95            |
|                |               |                 |             | 100        | 0            | 28.48                  | 22.85            |
|                |               | 16-QAM          |             | 1          | 0            | 28.10                  | 23.00            |
|                |               |                 |             | 1          | 99           | 28.60                  | 23.27            |
|                |               |                 |             | 50         | 24           | 27.88                  | 21.95            |
|                |               |                 |             | 100        | 0            | 28.35                  | 22.05            |
| 1732.5         | 20175         | QPSK            |             | 1          | 0            | 28.57                  | 23.90            |
|                |               |                 |             | 1          | 99           | 27.67                  | 23.75            |
|                |               |                 |             | 50         | 24           | 28.78                  | 23.10            |
|                |               |                 |             | 100        | 0            | 29.36                  | 22.90            |
|                |               | 16-QAM          |             | 1          | 0            | 29.15                  | 23.10            |
|                |               |                 |             | 1          | 99           | 28.04                  | 23.00            |
|                |               |                 |             | 50         | 24           | 28.70                  | 22.02            |
|                |               |                 |             | 100        | 0            | 29.20                  | 21.96            |
| 1745           | 20300         | QPSK            |             | 1          | 0            | 28.28                  | 24.00            |
|                |               |                 |             | 1          | 99           | 27.60                  | 23.80            |
|                |               |                 |             | 50         | 24           | 27.60                  | 22.88            |
|                |               |                 |             | 100        | 0            | 28.64                  | 22.91            |
|                |               | 16-QAM          |             | 1          | 0            | 28.65                  | 23.10            |
|                |               |                 |             | 1          | 99           | 27.85                  | 23.01            |
|                |               |                 |             | 50         | 24           | 27.40                  | 21.75            |
|                |               |                 |             | 100        | 0            | 28.35                  | 22.00            |

**7.5. LTE BAND 5****Output power for LTE Band 5 (1.4MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|------------------------|---------|
| 824.7          | 20407         | QPSK       | 1.4         | 1          | 0            | 28.67                  | 23.90   |
|                |               |            |             | 1          | 5            | 28.10                  | 23.85   |
|                |               |            |             | 3          | 2            | 28.53                  | 23.70   |
|                |               |            |             | 6          | 0            | 28.42                  | 22.60   |
|                |               | 16-QAM     |             | 1          | 0            | 28.30                  | 22.70   |
|                |               |            |             | 1          | 5            | 28.20                  | 22.62   |
|                |               |            |             | 3          | 2            | 28.60                  | 22.10   |
|                |               |            |             | 6          | 0            | 28.76                  | 21.80   |
| 836.5          | 20525         | QPSK       |             | 1          | 0            | 28.76                  | 23.70   |
|                |               |            |             | 1          | 5            | 28.65                  | 23.69   |
|                |               |            |             | 3          | 2            | 28.90                  | 23.50   |
|                |               |            |             | 6          | 0            | 28.54                  | 22.50   |
|                |               | 16-QAM     |             | 1          | 0            | 28.54                  | 22.50   |
|                |               |            |             | 1          | 5            | 28.50                  | 22.43   |
|                |               |            |             | 3          | 2            | 28.96                  | 22.20   |
|                |               |            |             | 6          | 0            | 28.80                  | 21.70   |
| 848.3          | 20643         | QPSK       |             | 1          | 0            | 28.22                  | 23.90   |
|                |               |            |             | 1          | 5            | 28.15                  | 23.78   |
|                |               |            |             | 3          | 2            | 28.49                  | 23.60   |
|                |               |            |             | 6          | 0            | 28.42                  | 22.70   |
|                |               | 16-QAM     |             | 1          | 0            | 27.80                  | 22.70   |
|                |               |            |             | 1          | 5            | 28.17                  | 22.47   |
|                |               |            |             | 3          | 2            | 28.93                  | 22.10   |
|                |               |            |             | 6          | 0            | 29.04                  | 21.90   |

**Output power for LTE Band 5 (3 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|----------------------------|---------|
| 825.5          | 20415         | QPSK       | 3.0         | 1          | 0            | 27.76                      | 23.80   |
|                |               |            |             | 1          | 14           | 27.75                      | 23.77   |
|                |               |            |             | 8          | 4            | 28.45                      | 22.70   |
|                |               |            |             | 15         | 0            | 28.20                      | 22.65   |
|                |               | 16-QAM     |             | 1          | 0            | 28.15                      | 22.70   |
|                |               |            |             | 1          | 14           | 27.00                      | 22.33   |
|                |               |            |             | 8          | 4            | 27.85                      | 22.00   |
|                |               |            |             | 15         | 0            | 27.72                      | 21.80   |
| 836.5          | 20525         | QPSK       |             | 1          | 0            | 28.30                      | 23.75   |
|                |               |            |             | 1          | 14           | 28.30                      | 23.70   |
|                |               |            |             | 8          | 4            | 28.90                      | 22.60   |
|                |               |            |             | 15         | 0            | 28.50                      | 22.70   |
|                |               | 16-QAM     |             | 1          | 0            | 28.40                      | 22.70   |
|                |               |            |             | 1          | 14           | 28.00                      | 22.55   |
|                |               |            |             | 8          | 4            | 28.11                      | 22.00   |
|                |               |            |             | 15         | 0            | 28.12                      | 21.80   |
| 847.5          | 20635         | QPSK       |             | 1          | 0            | 28.10                      | 23.80   |
|                |               |            |             | 1          | 14           | 27.71                      | 23.60   |
|                |               |            |             | 8          | 4            | 28.60                      | 22.90   |
|                |               |            |             | 15         | 0            | 28.45                      | 22.90   |
|                |               | 16-QAM     |             | 1          | 0            | 28.50                      | 22.80   |
|                |               |            |             | 1          | 14           | 28.05                      | 22.70   |
|                |               |            |             | 8          | 4            | 28.57                      | 22.20   |
|                |               |            |             | 15         | 0            | 28.31                      | 22.00   |



**Output power for LTE Band 5 (5 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|------------------------|---------|
| 826.5          | 20425         | QPSK       | 5.0         | 1          | 0            | 28.24                  | 23.80   |
|                |               |            |             | 1          | 24           | 27.92                  | 23.80   |
|                |               |            |             | 12         | 6            | 27.60                  | 22.70   |
|                |               |            |             | 25         | 0            | 28.25                  | 22.60   |
|                |               | 16-QAM     |             | 1          | 0            | 28.42                  | 23.00   |
|                |               |            |             | 1          | 24           | 27.56                  | 22.90   |
|                |               |            |             | 12         | 6            | 29.07                  | 21.80   |
|                |               |            |             | 25         | 0            | 28.03                  | 21.70   |
| 836.5          | 20525         | QPSK       |             | 1          | 0            | 28.60                  | 23.80   |
|                |               |            |             | 1          | 24           | 28.50                  | 23.77   |
|                |               |            |             | 12         | 6            | 28.50                  | 22.70   |
|                |               |            |             | 25         | 0            | 28.78                  | 22.65   |
|                |               | 16-QAM     |             | 1          | 0            | 28.80                  | 22.90   |
|                |               |            |             | 1          | 24           | 28.80                  | 23.00   |
|                |               |            |             | 12         | 6            | 28.21                  | 21.80   |
|                |               |            |             | 25         | 0            | 28.40                  | 21.70   |
| 846.5          | 20625         | QPSK       |             | 1          | 0            | 28.40                  | 24.00   |
|                |               |            |             | 1          | 24           | 28.20                  | 23.90   |
|                |               |            |             | 12         | 6            | 28.34                  | 23.00   |
|                |               |            |             | 25         | 0            | 28.62                  | 22.90   |
|                |               | 16-QAM     |             | 1          | 0            | 28.56                  | 23.00   |
|                |               |            |             | 1          | 24           | 28.35                  | 22.90   |
|                |               |            |             | 12         | 6            | 28.50                  | 21.90   |
|                |               |            |             | 25         | 0            | 28.57                  | 21.70   |

**Output power for LTE Band 5 (10 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Max Peak<br>Power<br>(dBm) | Average |
|----------------|---------------|------------|-------------|------------|--------------|----------------------------|---------|
| 829            | 20405         | QPSK       | 10.0        | 1          | 0            | 28.00                      | 23.70   |
|                |               |            |             | 1          | 49           | 28.03                      | 23.66   |
|                |               |            |             | 25         | 12           | 28.05                      | 22.70   |
|                |               |            |             | 50         | 0            | 28.29                      | 22.60   |
|                |               | 16-QAM     |             | 1          | 0            | 27.78                      | 22.60   |
|                |               |            |             | 1          | 49           | 27.78                      | 22.26   |
|                |               |            |             | 25         | 12           | 27.45                      | 22.00   |
|                |               |            |             | 50         | 0            | 28.53                      | 21.90   |
| 836.5          | 20525         | QPSK       |             | 1          | 0            | 28.22                      | 23.80   |
|                |               |            |             | 1          | 49           | 28.15                      | 23.80   |
|                |               |            |             | 25         | 12           | 29.00                      | 22.70   |
|                |               |            |             | 50         | 0            | 29.05                      | 22.60   |
|                |               | 16-QAM     |             | 1          | 0            | 27.70                      | 22.60   |
|                |               |            |             | 1          | 49           | 27.90                      | 22.40   |
|                |               |            |             | 25         | 12           | 28.45                      | 22.00   |
|                |               |            |             | 50         | 0            | 28.51                      | 21.80   |
| 844            | 20600         | QPSK       |             | 1          | 0            | 28.20                      | 23.70   |
|                |               |            |             | 1          | 49           | 27.95                      | 23.57   |
|                |               |            |             | 25         | 12           | 28.39                      | 22.90   |
|                |               |            |             | 50         | 0            | 28.96                      | 22.60   |
|                |               | 16-QAM     |             | 1          | 0            | 28.36                      | 22.50   |
|                |               |            |             | 1          | 49           | 28.10                      | 22.35   |
|                |               |            |             | 25         | 12           | 28.56                      | 22.00   |
|                |               |            |             | 50         | 0            | 28.80                      | 21.93   |

**7.6. LTE Band 17****Output power for LTE Band 17 (5 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|---------------|------------------|
| 706.5          | 23755         | QPSK       | 5.0         | 1          | 0            | 28.40         | 23.90            |
|                |               |            |             | 1          | 24           | 27.80         | 23.90            |
|                |               |            |             | 12         | 6            | 28.10         | 22.80            |
|                |               |            |             | 25         | 0            | 28.50         | 22.70            |
|                |               | 16-QAM     |             | 1          | 0            | 28.30         | 23.20            |
|                |               |            |             | 1          | 24           | 28.10         | 23.00            |
|                |               |            |             | 12         | 6            | 28.20         | 21.80            |
|                |               |            |             | 25         | 0            | 28.60         | 21.70            |
| 710            | 23790         | QPSK       |             | 1          | 0            | 27.90         | 23.70            |
|                |               |            |             | 1          | 24           | 27.30         | 23.80            |
|                |               |            |             | 12         | 6            | 27.40         | 22.65            |
|                |               |            |             | 25         | 0            | 28.00         | 22.60            |
|                |               | 16-QAM     |             | 1          | 0            | 28.00         | 23.00            |
|                |               |            |             | 1          | 24           | 27.40         | 22.95            |
|                |               |            |             | 12         | 6            | 27.50         | 21.80            |
|                |               |            |             | 25         | 0            | 28.20         | 21.70            |
| 713.0          | 23825         | QPSK       |             | 1          | 0            | 27.60         | 23.80            |
|                |               |            |             | 1          | 24           | 27.50         | 23.78            |
|                |               |            |             | 12         | 6            | 27.20         | 23.10            |
|                |               |            |             | 25         | 0            | 27.50         | 22.80            |
|                |               | 16-QAM     |             | 1          | 0            | 27.65         | 23.00            |
|                |               |            |             | 1          | 24           | 27.50         | 22.90            |
|                |               |            |             | 12         | 6            | 27.00         | 21.90            |
|                |               |            |             | 25         | 0            | 27.70         | 21.90            |

**Output power for LTE Band 17 (10 MHz)**

| Freq.<br>(MHz) | UL<br>Channel | Modulation | BW<br>(MHz) | RB<br>Size | RB<br>Offset | Peak<br>(dBm) | Average<br>(dBm) |
|----------------|---------------|------------|-------------|------------|--------------|---------------|------------------|
| 709            | 23780         | QPSK       | 10.0        | 1          | 0            | 27.90         | 23.70            |
|                |               |            |             | 1          | 49           | 27.20         | 23.70            |
|                |               |            |             | 25         | 12           | 27.50         | 22.80            |
|                |               |            |             | 50         | 0            | 28.00         | 23.00            |
|                |               | 16-QAM     |             | 1          | 0            | 28.19         | 22.60            |
|                |               |            |             | 1          | 49           | 27.20         | 22.40            |
|                |               |            |             | 25         | 12           | 27.80         | 22.00            |
|                |               |            |             | 50         | 0            | 28.44         | 21.80            |
| 710            | 23790         | QPSK       |             | 1          | 0            | 28.60         | 24.00            |
|                |               |            |             | 1          | 49           | 27.80         | 23.90            |
|                |               |            |             | 25         | 12           | 27.50         | 22.80            |
|                |               |            |             | 50         | 0            | 28.30         | 22.70            |
|                |               | 16-QAM     |             | 1          | 0            | 28.20         | 22.70            |
|                |               |            |             | 1          | 49           | 27.40         | 22.50            |
|                |               |            |             | 25         | 12           | 27.60         | 22.00            |
|                |               |            |             | 50         | 0            | 28.15         | 21.90            |
| 711            | 23800         | QPSK       |             | 1          | 0            | 27.80         | 23.80            |
|                |               |            |             | 1          | 49           | 27.50         | 23.70            |
|                |               |            |             | 25         | 12           | 27.40         | 22.90            |
|                |               |            |             | 50         | 0            | 27.78         | 22.80            |
|                |               | 16-QAM     |             | 1          | 0            | 27.90         | 22.50            |
|                |               |            |             | 1          | 49           | 27.50         | 22.70            |
|                |               |            |             | 25         | 12           | 27.50         | 22.00            |
|                |               |            |             | 50         | 0            | 28.20         | 21.90            |

## 8. CONDUCTED TEST RESULTS

### 8.1. OCCUPIED BANDWIDTH

#### RULE PART(S)

FCC: §2.1049

IC: RSS-132, 4.5; RSS-133, 6.5

#### LIMITS

For reporting purposes only

#### TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

#### MODES TESTED

- GPRS and EGPRS
- UMTS, REL 99 and HSUPA
- LTE Band 2
- LTE Band 4
- LTE Band 5
- LTE Band 17

**RESULTS**

| MODE | BAND | Channel | f (MHz) | 99% BW (KHz) | -26dB BW (KHz) |
|------|------|---------|---------|--------------|----------------|
| GPRS | CELL | 128     | 824.20  | 249.2607     | 307.926        |
|      |      | 190     | 836.60  | 251.1096     | 303.550        |
|      |      | 251     | 848.80  | 243.5836     | 275.774        |
|      | PCS  | 512     | 1850.2  | 250.8087     | 313.609        |
|      |      | 661     | 1880.0  | 242.4720     | 307.872        |
|      |      | 810     | 1909.8  | 248.1024     | 277.184        |

| MODE  | BAND | Channel | f (MHz) | 99% BW (KHz) | -26dB BW (KHz) |
|-------|------|---------|---------|--------------|----------------|
| EGPRS | Cell | 128     | 824.20  | 244.6912     | 267.819        |
|       |      | 190     | 836.60  | 250.8333     | 301.707        |
|       |      | 251     | 848.80  | 244.4098     | 276.431        |
|       | PCS  | 512     | 1850.2  | 251.2327     | 323.965        |
|       |      | 661     | 1880.0  | 240.6925     | 333.577        |
|       |      | 810     | 1909.8  | 247.1392     | 346.785        |

| MODE   | BAND | Channel | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|--------|------|---------|---------|--------------|----------------|
| REL 99 | Cell | 4357    | 826.4   | 4.1747       | 4.655          |
|        |      | 4405    | 836.0   | 4.1892       | 4.638          |
|        |      | 4455    | 846.0   | 4.1971       | 4.568          |
|        | PCS  | 9662    | 1852.4  | 4.1800       | 4.572          |
|        |      | 9800    | 1880.0  | 4.1878       | 4.629          |
|        |      | 9938    | 1907.6  | 4.1795       | 4.573          |

| MODE  | BAND | Channel | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|-------|------|---------|---------|--------------|----------------|
| HSUPA | Cell | 4357    | 826.4   | 4.1856       | 4.609          |
|       |      | 4405    | 836.0   | 4.1765       | 4.626          |
|       |      | 4455    | 846.0   | 4.2111       | 4.655          |
|       | PCS  | 9662    | 1852.4  | 4.1649       | 4.641          |
|       |      | 9800    | 1880.0  | 4.1699       | 4.621          |
|       |      | 9938    | 1907.6  | 4.1710       | 4.583          |

| Band          | Mode                  | RB/RB SIZE | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---------------|-----------------------|------------|---------|--------------|----------------|
| LTE<br>BAND 2 | 1.4 MHz BAND<br>QPSK  | 3/2        | 1850.7  | 0.5711480    | 0.755328       |
|               |                       | 6/0        |         | 1.0941       | 1.233          |
|               | 1.4 MHz BAND<br>QPSK  | 3/2        | 1880.0  | 0.5546168    | 0.772714       |
|               |                       | 6/0        |         | 1.0816       | 1.260          |
|               | 1.4 MHz BAND<br>QPSK  | 3/2        | 1909.3  | 0.5544839    | 0.763624       |
|               |                       | 6/0        |         | 1.0894       | 1.159          |
|               | 1.4 MHz BAND<br>16QAM | 3/2        | 1850.7  | 0.5495442    | 0.646316       |
|               |                       | 6/0        |         | 1.0780       | 1.195          |
|               | 1.4 MHz BAND<br>16QAM | 3/2        | 1880.0  | 0.5513269    | 0.759749       |
|               |                       | 6/0        |         | 1.0848       | 1.214          |
|               | 1.4 MHz BAND<br>16QAM | 3/2        | 1909.3  | 0.5668363    | 0.838151       |
|               |                       | 6/0        |         | 1.0809       | 1.269          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1851.5  | 1.4364       | 1.811          |
|               |                       | 15/0       |         | 2.6759       | 2.867          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1880.0  | 1.4248       | 1.707          |
|               |                       | 15/0       |         | 2.6633       | 2.917          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1908.5  | 1.4363       | 1.886          |
|               |                       | 15/0       |         | 2.6871       | 2.866          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1851.5  | 2.6765       | 2.798          |
|               |                       | 15/0       |         | 2.6765       | 2.798          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1880.0  | 1.4245       | 1.887          |
|               |                       | 15/0       |         | 2.6636       | 2.797          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1908.5  | 1.4300       | 1.730          |
|               |                       | 15/0       |         | 2.6800       | 2.791          |
|               | 5 MHz BAND<br>QPSK    | 12/6       | 1852.5  | 2.1597       | 2.632          |
|               |                       | 25/0       |         | 4.4945       | 4.802          |
|               | 5 MHz BAND<br>QPSK    | 12/6       | 1880.0  | 2.1482       | 2.541          |
|               |                       | 25/0       |         | 4.4499       | 4.691          |
|               | 5 MHz BAND<br>QPSK    | 12/6       | 1907.5  | 2.1673       | 2.507          |
|               |                       | 25/0       |         | 4.5187       | 4.688          |
|               | 5 MHz BAND<br>16QAM   | 12/6       | 1852.5  | 2.1736       | 3.003          |
|               |                       | 25/0       |         | 4.4646       | 4.803          |
|               | 5 MHz BAND<br>16QAM   | 12/6       | 1880.0  | 2.1383       | 2.508          |
|               |                       | 25/0       |         | 4.4841       | 4.744          |
|               | 5 MHz BAND<br>16QAM   | 12/6       | 1907.5  | 2.1592       | 2.514          |
|               |                       | 25/0       |         | 4.4605       | 4.682          |

| Band          | Mode                 | RB/RB SIZE | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---------------|----------------------|------------|---------|--------------|----------------|
| LTE<br>BAND 2 | 10 MHz BAND<br>QPSK  | 25/12      | 1855.0  | 4.4747       | 5.260          |
|               |                      | 50/0       |         | 8.9205       | 9.253          |
|               | 10 MHz BAND<br>QPSK  | 25/12      | 1880.0  | 4.4407       | 4.800          |
|               |                      | 50/0       |         | 8.8478       | 9.347          |
|               | 10 MHz BAND<br>QPSK  | 25/12      | 1905.0  | 4.4258       | 5.054          |
|               |                      | 50/0       |         | 8.9566       | 9.354          |
|               | 10 MHz BAND<br>16QAM | 25/12      | 1855.0  | 4.4705       | 5.519          |
|               |                      | 50/0       |         | 8.9801       | 9.383          |
|               | 10 MHz BAND<br>16QAM | 25/12      | 1880.0  | 4.4811       | 4.709          |
|               |                      | 50/0       |         | 8.9495       | 9.332          |
|               | 10 MHz BAND<br>16QAM | 25/12      | 1905.0  | 4.4264       | 4.845          |
|               |                      | 50/0       |         | 8.9364       | 9.360          |
|               | 15 MHz BAND<br>QPSK  | 36/18      | 1857.5  | 6.4226       | 7.002          |
|               |                      | 75/0       |         | 13.4177      | 13.944         |
|               | 15 MHz BAND<br>QPSK  | 36/18      | 1880.0  | 6.4182       | 6.829          |
|               |                      | 75/0       |         | 13.4116      | 14.103         |
|               | 15 MHz BAND<br>QPSK  | 36/18      | 1902.5  | 6.4014       | 6.901          |
|               |                      | 75/0       |         | 13.4063      | 14.069         |
|               | 15 MHz BAND<br>16QAM | 36/18      | 1857.5  | 6.4428       | 7.169          |
|               |                      | 75/0       |         | 13.3784      | 13.991         |
|               | 15 MHz BAND<br>16QAM | 36/18      | 1880.0  | 6.4267       | 6.870          |
|               |                      | 75/0       |         | 13.4379      | 14.321         |
|               | 15 MHz BAND<br>16QAM | 36/18      | 1902.5  | 6.4194       | 7.145          |
|               |                      | 75/0       |         | 13.3428      | 13.991         |
|               | 20 MHz BAND<br>QPSK  | 50/19      | 1860.0  | 8.9663       | 9.535          |
|               |                      | 100/0      |         | 17.8015      | 18.803         |
|               | 20 MHz BAND<br>QPSK  | 50/19      | 1880.0  | 8.8598       | 9.366          |
|               |                      | 100/0      |         | 17.8399      | 19.136         |
|               | 20 MHz BAND<br>QPSK  | 50/19      | 1900.0  | 8.9794       | 9.557          |
|               |                      | 100/0      |         | 17.6302      | 18.608         |
|               | 20 MHz BAND<br>16QAM | 50/19      | 1860.0  | 8.9070       | 9.651          |
|               |                      | 100/0      |         | 17.6923      | 18.816         |
|               | 20 MHz BAND<br>16QAM | 50/19      | 1880.0  | 8.8694       | 9.343          |
|               |                      | 100/0      |         | 17.7733      | 18.802         |
|               | 20 MHz BAND<br>16QAM | 50/19      | 1900.0  | 8.8579       | 9.312          |
|               |                      | 100/0      |         | 17.8472      | 18.708         |



**LTE BAND 4**

| Band          | Mode                  | RB/RB SIZE | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---------------|-----------------------|------------|---------|--------------|----------------|
| LTE<br>BAND 4 | 1.4 MHz BAND<br>QPSK  | 3/2        | 1710.7  | 0.5898198    | 0.830150       |
|               |                       | 6/0        |         | 1.0723       | 1.208          |
|               | 1.4 MHz BAND<br>QPSK  | 3/2        | 1732.5  | 0.5659796    | 0.806407       |
|               |                       | 6/0        |         | 1.0874       | 1.223          |
|               | 1.4 MHz BAND<br>QPSK  | 3/2        | 1754.3  | 0.5626775    | 0.809067       |
|               |                       | 6/0        |         | 1.0795       | 1.207          |
|               | 1.4 MHz BAND<br>16QAM | 3/2        | 1710.7  | 0.5476528    | 0.772983       |
|               |                       | 6/0        |         | 1.0706       | 1.216          |
|               | 1.4 MHz BAND<br>16QAM | 3/2        | 1732.5  | 0.5545931    | 0.746381       |
|               |                       | 6/0        |         | 1.0854       | 1.161          |
|               | 1.4 MHz BAND<br>16QAM | 3/2        | 1754.3  | 0.5488464    | 0.839039       |
|               |                       | 6/0        |         | 1.0966       | 1.267          |
|               | 3 MHz BAND<br>QPSK    | 6/0        | 1711.5  | 1.4173       | 1.621          |
|               |                       | 15/0       |         | 2.6792       | 2.786          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1732.5  | 1.4415       | 2.903          |
|               |                       | 15/0       |         | 2.6836       | 1.962          |
|               | 3 MHz BAND<br>QPSK    | 8/4        | 1753.5  | 1.4409       | 1.804          |
|               |                       | 15/0       |         | 2.6623       | 2.844          |
|               | 3 MHz BAND<br>16QAM   | 6/0        | 1711.5  | 1.4316       | 1.823          |
|               |                       | 15/0       |         | 2.6795       | 2.913          |
|               | 3 MHz BAND<br>16QAM   | 8/4        | 1732.5  | 1.4281       | 1.794          |
|               |                       | 15/0       |         | 2.6753       | 2.885          |
|               | 3 MHz BAND<br>16QAM   | 8/4        | 1753.5  | 1.4460       | 1.806          |
|               |                       | 15/0       |         | 2.6631       | 2.897          |
|               | 5 MHz BAND<br>QPSK    | 12/6       | 1712.5  | 2.1562       | 2.520          |
|               |                       | 25/0       |         | 4.4772       | 4.663          |
|               | 5 MHz BAND<br>QPSK    | 12/6       | 1732.5  | 2.1166       | 2.470          |
|               |                       | 25/0       |         | 4.4588       | 4.686          |
|               | 5 MHz BAND<br>QPSK    | 12/6       | 1752.5  | 2.1690       | 2.616          |
|               |                       | 25/0       |         | 4.4420       | 5.021          |
|               | 5 MHz BAND<br>16QAM   | 12/6       | 1732.5  | 2.1587       | 2.878          |
|               |                       | 25/0       |         | 4.5060       | 4.782          |
|               | 5 MHz BAND<br>16QAM   | 12/6       | 1752.5  | 2.1211       | 2.511          |
|               |                       | 25/0       |         | 4.4995       | 4.674          |
|               | 5 MHz BAND<br>16QAM   | 12/6       | 1752.5  | 2.1620       | 2.524          |
|               |                       | 25/0       |         | 4.4799       | 4.826          |

| Band          | Mode                 | RB/RB SIZE | f (MHz) | 99% BW (kHz) | -26dB BW (kHz) |
|---------------|----------------------|------------|---------|--------------|----------------|
| LTE<br>BAND 4 | 10 MHz BAND<br>QPSK  | 25/12      | 1715.0  | 4.4392       | 5.057          |
|               |                      | 50/0       |         | 8.8769       | 9.422          |
|               | 10 MHz BAND<br>QPSK  | 25/12      | 1732.50 | 4.4048       | 5.227          |
|               |                      | 50/0       |         | 8.9005       | 9.646          |
|               | 10 MHz BAND<br>QPSK  | 25/12      | 1750.00 | 4.4193       | 4.769          |
|               |                      | 50/0       |         | 8.9408       | 9.442          |
|               | 10 MHz BAND<br>16QAM | 25/12      | 1715.0  | 4.4376       | 5.016          |
|               |                      | 50/0       |         | 8.9750       | 9.529          |
|               | 10 MHz BAND<br>16QAM | 25/12      | 1732.50 | 4.5062       | 5.514          |
|               |                      | 50/0       |         | 8.9124       | 9.295          |
|               | 10 MHz BAND<br>16QAM | 25/12      | 1750.00 | 4.4788       | 4.900          |
|               |                      | 50/0       |         | 8.8642       | 9.680          |
|               | 15 MHz BAND<br>QPSK  | 36/18      | 1717.50 | 6.3785       | 6.677          |
|               |                      | 75/0       |         | 13.1683      | 14.052         |
|               | 15 MHz BAND<br>QPSK  | 36/18      | 1732.50 | 6.5214       | 6.744          |
|               |                      | 75/0       |         | 13.4113      | 14.404         |
|               | 15 MHz BAND<br>QPSK  | 36/18      | 1747.50 | 6.3424       | 6.761          |
|               |                      | 75/0       |         | 13.3726      | 14.431         |
|               | 15 MHz BAND<br>16QAM | 36/18      | 1717.50 | 6.4600       | 7.134          |
|               |                      | 75/0       |         | 13.2950      | 14.043         |
|               | 15 MHz BAND<br>16QAM | 36/18      | 1732.50 | 6.4424       | 7.161          |
|               |                      | 75/0       |         | 13.5189      | 14.097         |
|               | 15 MHz BAND<br>16QAM | 36/18      | 1747.50 | 6.3908       | 6.887          |
|               |                      | 75/0       |         | 13.4514      | 13.970         |
|               | 20 MHz BAND<br>QPSK  | 50/19      | 1720.0  | 8.8683       | 9.318          |
|               |                      | 100/0      |         | 17.6774      | 18.879         |
|               | 20 MHz BAND<br>QPSK  | 50/19      | 1732.50 | 8.9349       | 9.316          |
|               |                      | 100/0      |         | 17.8006      | 18.692         |
|               | 20 MHz BAND<br>QPSK  | 50/19      | 1745.0  | 9.0294       | 9.535          |
|               |                      | 100/0      |         | 17.8184      | 18.794         |
|               | 20 MHz BAND<br>16QAM | 50/19      | 1720.0  | 8.8877       | 9.518          |
|               |                      | 100/0      |         | 18.0257      | 18.779         |
|               | 20 MHz BAND<br>16QAM | 50/19      | 1732.50 | 8.9023       | 9.329          |
|               |                      | 100/0      |         | 17.8292      | 18.679         |
|               | 20 MHz BAND<br>16QAM | 50/19      | 1745.0  | 8.9788       | 9.466          |
|               |                      | 100/0      |         | 17.4935      | 18.781         |

**LTE Band 5**

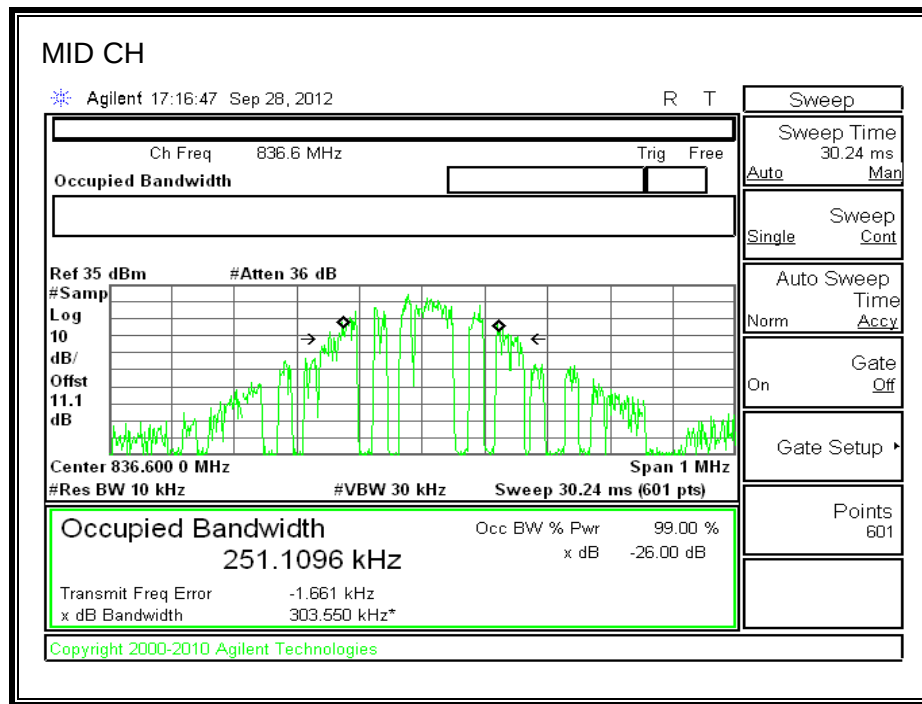
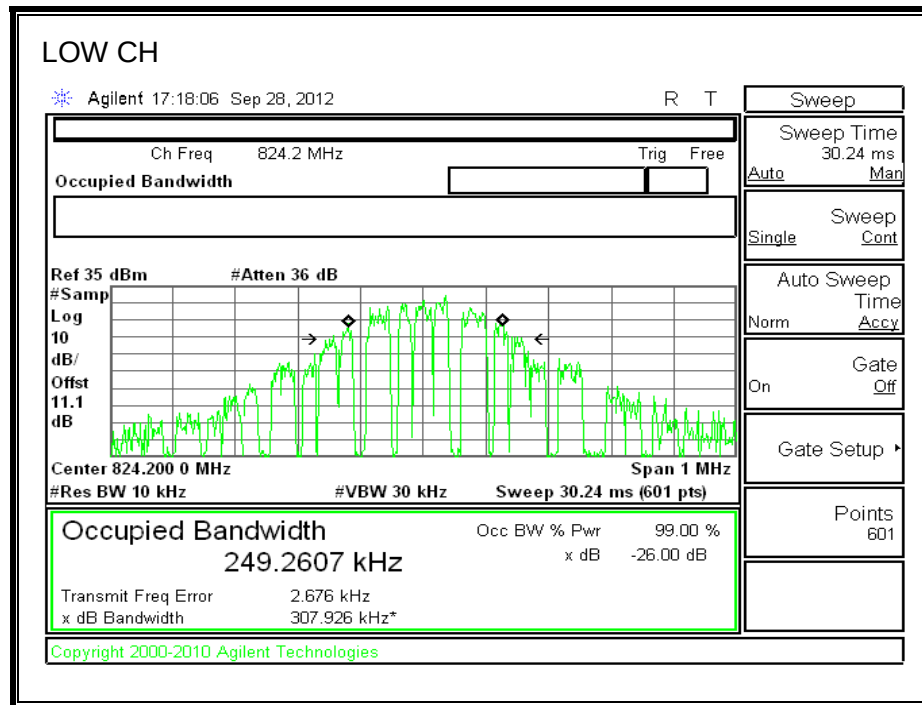
| Band       | Mode               | RB/RB SIZE | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|------------|--------------------|------------|---------|--------------|----------------|
| LTE BAND 5 | 1.4 MHz BAND QPSK  | 3/2        | 824.7   | 0.5670862    | 0.783881       |
|            |                    | 6/0        |         | 1.0719       | 1.269          |
|            | 1.4 MHz BAND QPSK  | 3/2        | 836.5   | 0.5736739    | 0.838970       |
|            |                    | 6/0        |         | 1.0696       | 1.216          |
|            | 1.4 MHz BAND QPSK  | 3/2        | 848.3   | 0.5613489    | 0.702970       |
|            |                    | 6/0        |         | 1.0572       | 1.224          |
|            | 1.4 MHz BAND 16QAM | 3/2        | 824.7   | 0.5518363    | 0.782920       |
|            |                    | 6/0        |         | 1.0879       | 1.215          |
|            | 1.4 MHz BAND 16QAM | 3/2        | 836.5   | 0.5549398    | 0.743268       |
|            |                    | 6/0        |         | 1.0791       | 1.269          |
|            | 1.4 MHz BAND 16QAM | 3/2        | 848.3   | 0.5604349    | 0.698490       |
|            |                    | 6/0        |         | 1.0871       | 1.217          |
|            | 3 MHz BAND QPSK    | 8/4        | 825.5   | 1.4268       | 1.674          |
|            |                    | 15/0       |         | 2.6605       | 2.789          |
|            | 3 MHz BAND QPSK    | 8/4        | 836.5   | 1.4363       | 1.721          |
|            |                    | 15/0       |         | 2.6700       | 2.868          |
|            | 3 MHz BAND QPSK    | 8/4        | 847.5   | 1.4374       | 1.803          |
|            |                    | 15/0       |         | 2.6597       | 2.798          |
|            | 3 MHz BAND 16QAM   | 8/4        | 825.5   | 1.4476       | 1.805          |
|            |                    | 15/0       |         | 2.6684       | 2.901          |
|            | 3 MHz BAND 16QAM   | 8/4        | 836.5   | 1.4427       | 1.737          |
|            |                    | 15/0       |         | 2.6750       | 2.795          |
|            | 3 MHz BAND 16QAM   | 8/4        | 847.5   | 1.4277       | 1.644          |
|            |                    | 15/0       |         | 2.7010       | 2.904          |
|            | 5 MHz BAND QPSK    | 12/6       | 821.5   | 2.1345       | 2.382          |
|            |                    | 25/0       |         | 4.4524       | 4.764          |
|            | 5 MHz BAND QPSK    | 12/6       | 836.5   | 2.1404       | 2.510          |
|            |                    | 25/0       |         | 4.4885       | 4.778          |
|            | 5 MHz BAND QPSK    | 12/6       | 846.5   | 2.1587       | 2.507          |
|            |                    | 25/0       |         | 4.4420       | 4.751          |
|            | 5 MHz BAND 16QAM   | 12/6       | 821.5   | 2.1494       | 2.367          |
|            |                    | 25/0       |         | 4.4840       | 4.669          |
|            | 5 MHz BAND 16QAM   | 12/6       | 836.5   | 2.1472       | 2.399          |
|            |                    | 25/0       |         | 4.3989       | 4.775          |
|            | 5 MHz BAND 16QAM   | 12/6       | 846.5   | 2.1907       | 2.880          |
|            |                    | 25/0       |         | 4.4655       | 4.774          |
|            | 10 MHz BAND QPSK   | 25/12      | 829     | 4.4585       | 5.049          |
|            |                    | 50/0       |         | 8.8657       | 9.553          |
|            | 10 MHz BAND QPSK   | 25/12      | 836.5   | 4.5167       | 5.510          |
|            |                    | 50/0       |         | 8.8740       | 9.521          |
|            | 10 MHz BAND QPSK   | 25/12      | 844     | 4.4421       | 4.778          |
|            |                    | 50/0       |         | 8.8844       | 9.405          |
|            | 10 MHz BAND 16QAM  | 25/12      | 829     | 4.4654       | 5.020          |
|            |                    | 50/0       |         | 8.8305       | 9.310          |
|            | 10 MHz BAND 16QAM  | 25/12      | 836.5   | 4.4777       | 5.015          |
|            |                    | 50/0       |         | 8.8782       | 9.396          |
|            | 10 MHz BAND 16QAM  | 25/12      | 844     | 4.4400       | 5.016          |
|            |                    | 50/0       |         | 8.9034       | 9.260          |

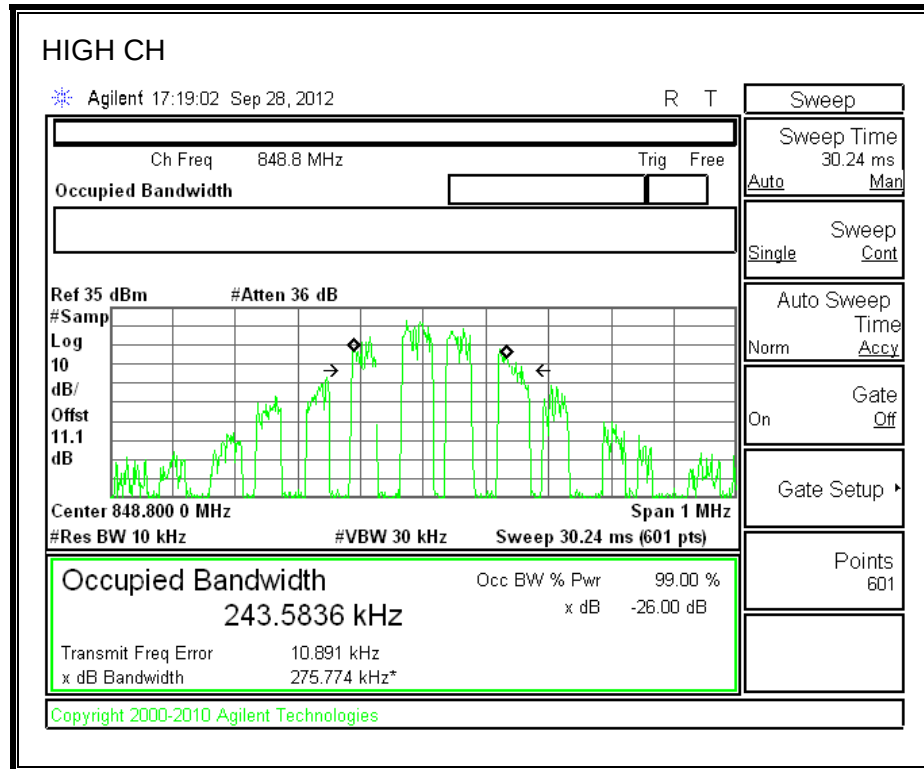
**LTE Band 17**

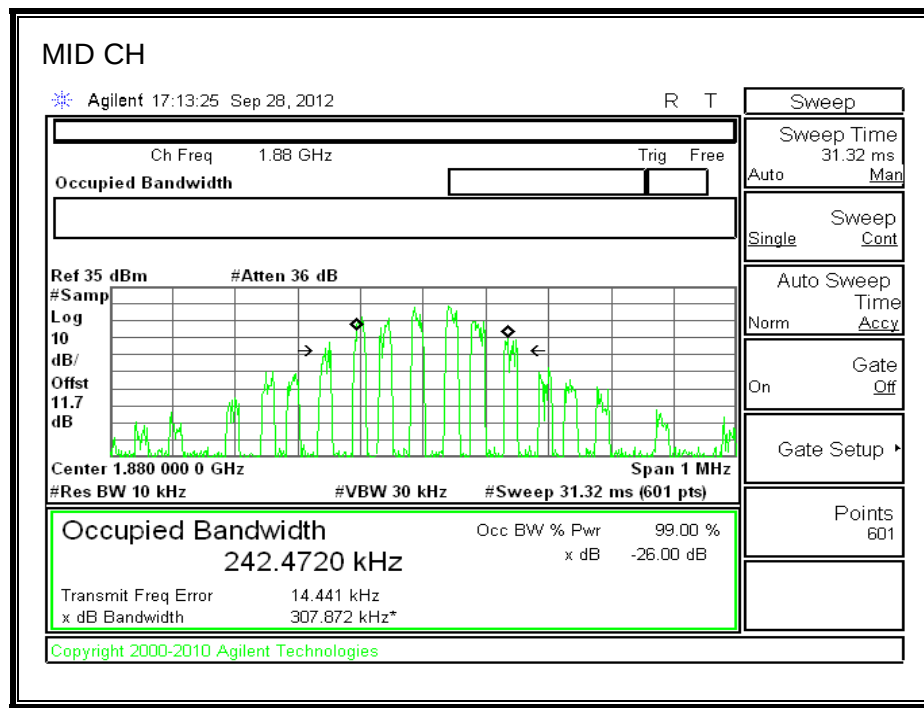
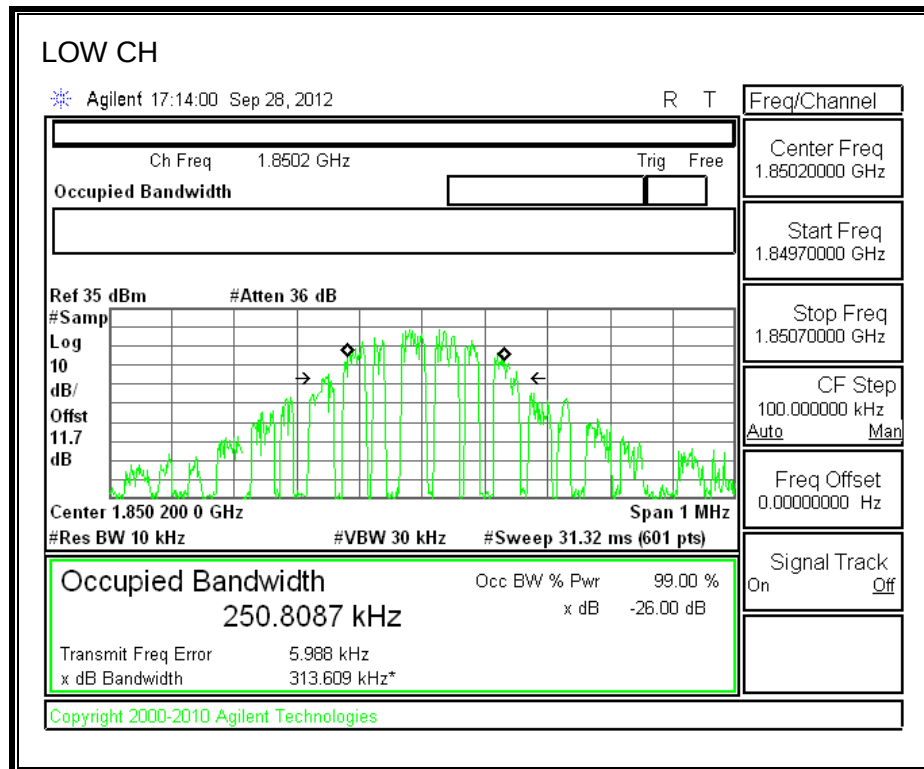
| Band           | Mode                 | RB/RB SIZE | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|----------------|----------------------|------------|---------|--------------|----------------|
| LTE<br>BAND 17 | 5 MHz BAND<br>QPSK   | 12/6       | 706.5   | 2.1364       | 2.381          |
|                |                      | 25/0       |         | 4.4614       | 4.684          |
|                | 5 MHz BAND<br>QPSK   | 12/6       | 710     | 2.1553       | 2.646          |
|                |                      | 25/0       |         | 4.4773       | 4.721          |
|                | 5 MHz BAND<br>QPSK   | 12/6       | 713.5   | 2.1429       | 2.650          |
|                |                      | 25/0       |         | 4.5000       | 4.688          |
|                | 5 MHz BAND<br>16QAM  | 12/6       | 706.5   | 2.1584       | 2.629          |
|                |                      | 25/0       |         | 4.4528       | 4.803          |
|                | 5 MHz BAND<br>16QAM  | 12/6       | 710     | 2.1571       | 2.509          |
|                |                      | 25/0       |         | 4.4674       | 4.654          |
|                | 5 MHz BAND<br>16QAM  | 12/6       | 713.5   | 2.1651       | 2.522          |
|                |                      | 25/0       |         | 4.4734       | 4.807          |
|                | 10 MHz BAND<br>QPSK  | 25/12      | 709     | 4.4559       | 6.005          |
|                |                      | 50/0       |         | 8.9282       | 9.398          |
|                | 10 MHz BAND<br>QPSK  | 25/12      | 710     | 4.4526       | 4.682          |
|                |                      | 50/0       |         | 8.7942       | 9.250          |
|                | 10 MHz BAND<br>QPSK  | 25/12      | 711     | 4.4549       | 5.422          |
|                |                      | 50/0       |         | 8.6894       | 9.336          |
|                | 10 MHz BAND<br>16QAM | 25/12      | 709     | 4.4635       | 4.910          |
|                |                      | 50/0       |         | 8.9881       | 9.389          |
|                | 10 MHz BAND<br>16QAM | 25/12      | 710     | 4.4661       | 5.020          |
|                |                      | 50/0       |         | 8.8420       | 9.349          |
|                | 10 MHz BAND<br>16QAM | 25/12      | 711     | 4.4333       | 5.027          |
|                |                      | 50/0       |         | 8.8159       | 9.307          |

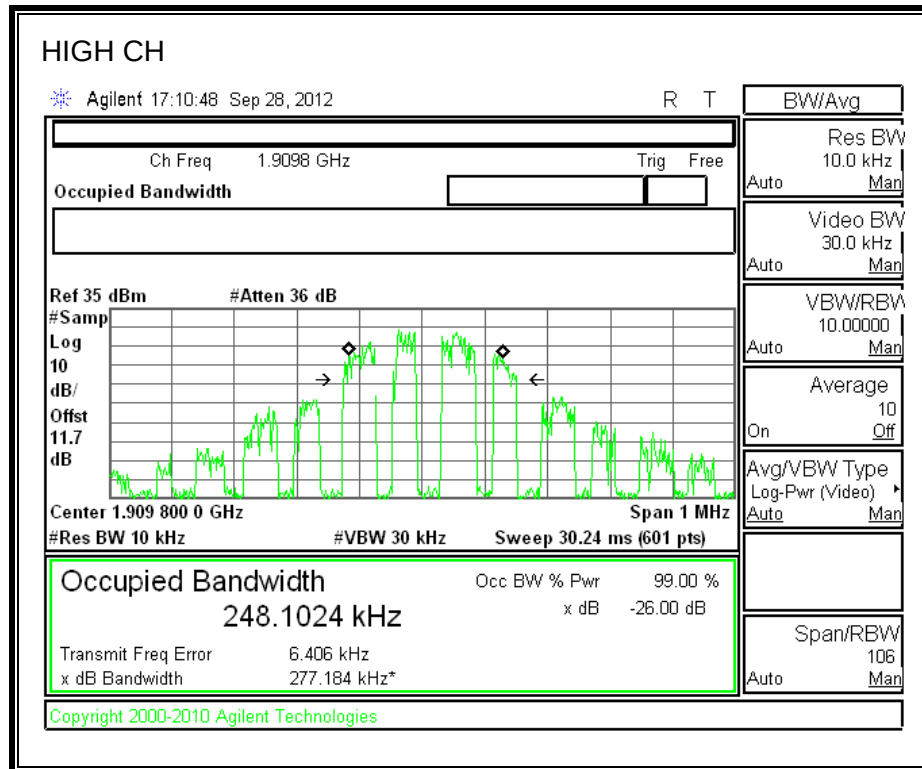
## 8.1.1. GSM

### GPRS Mode (Cellular Band)



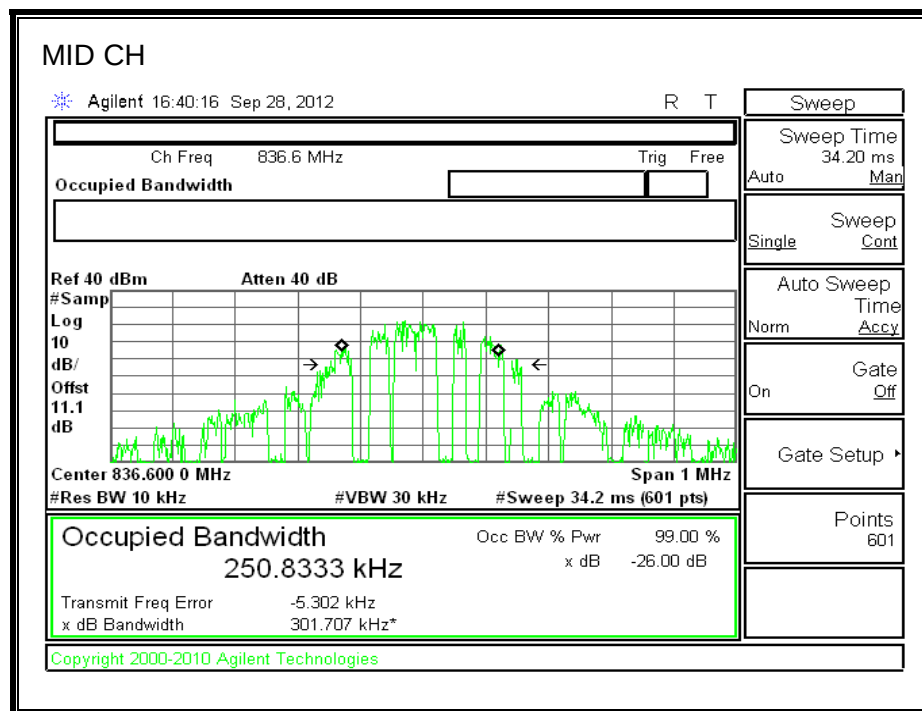
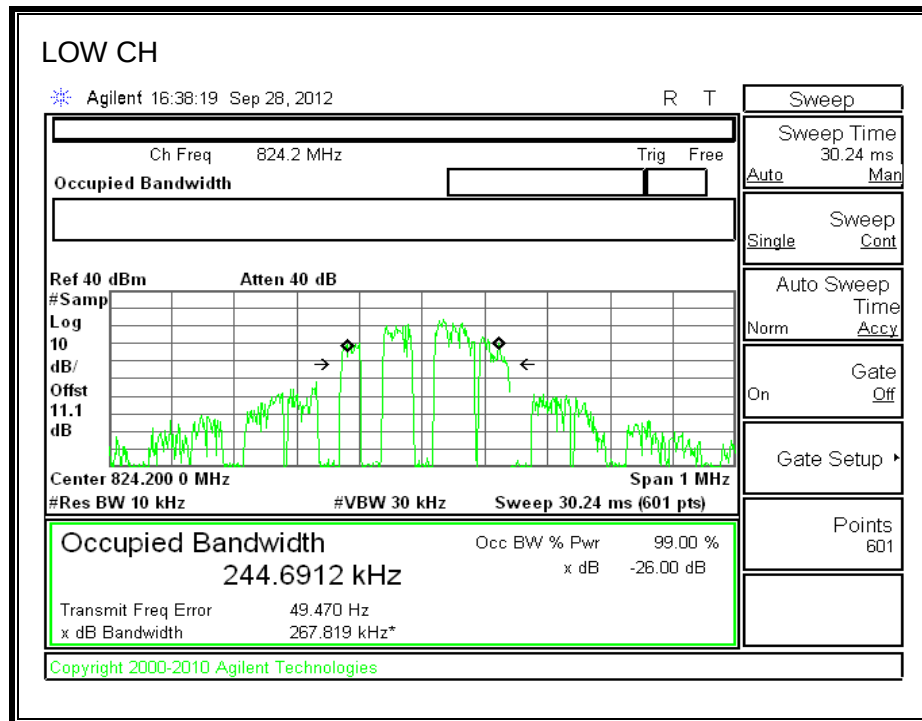


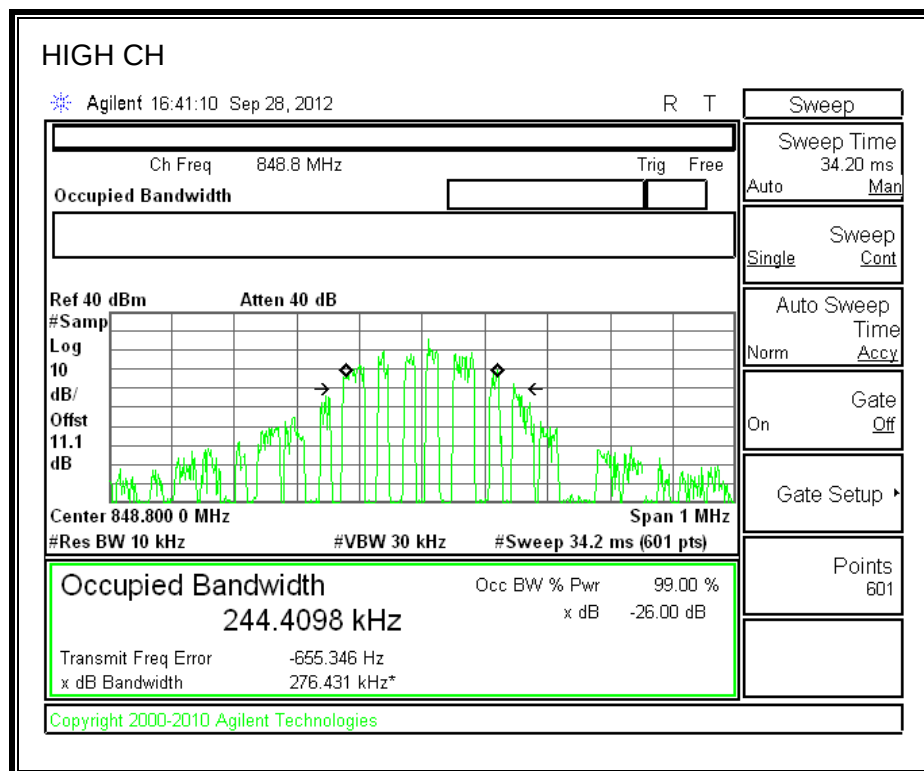
**GPRS 1900 Mode (PCS Band)**

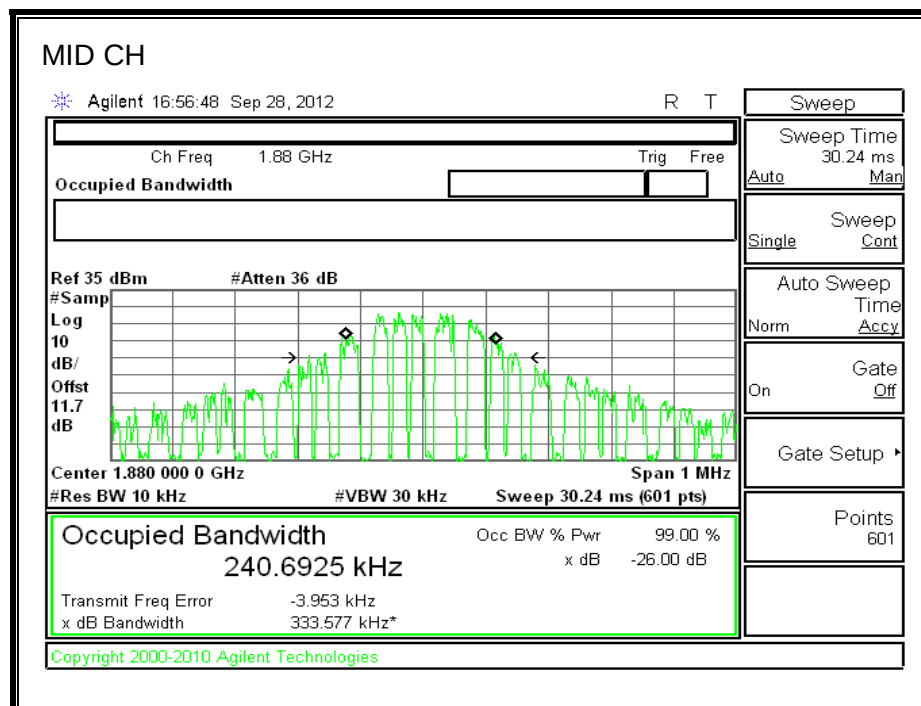
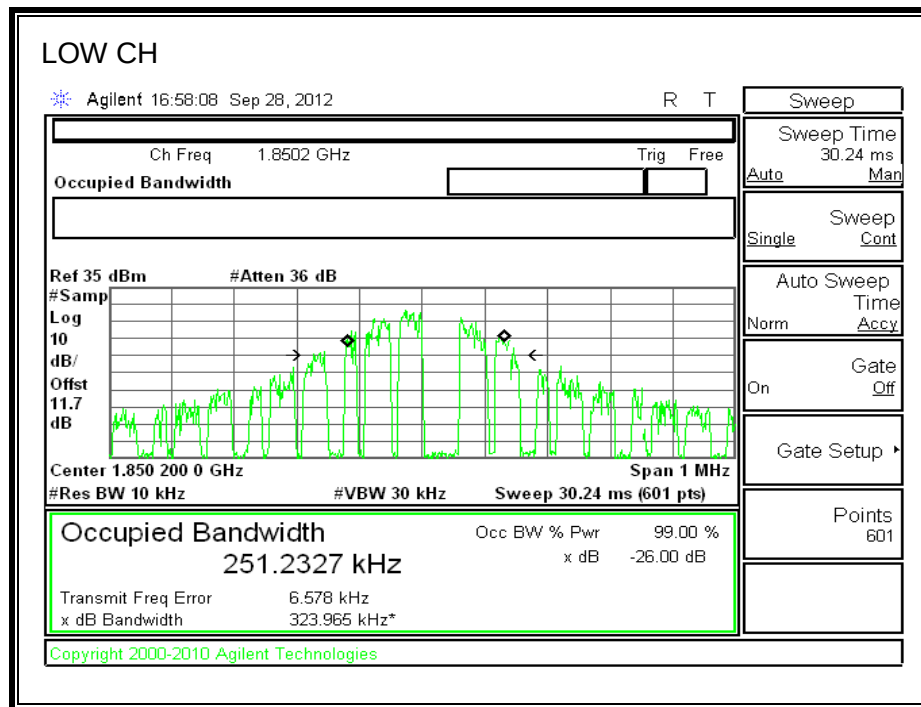


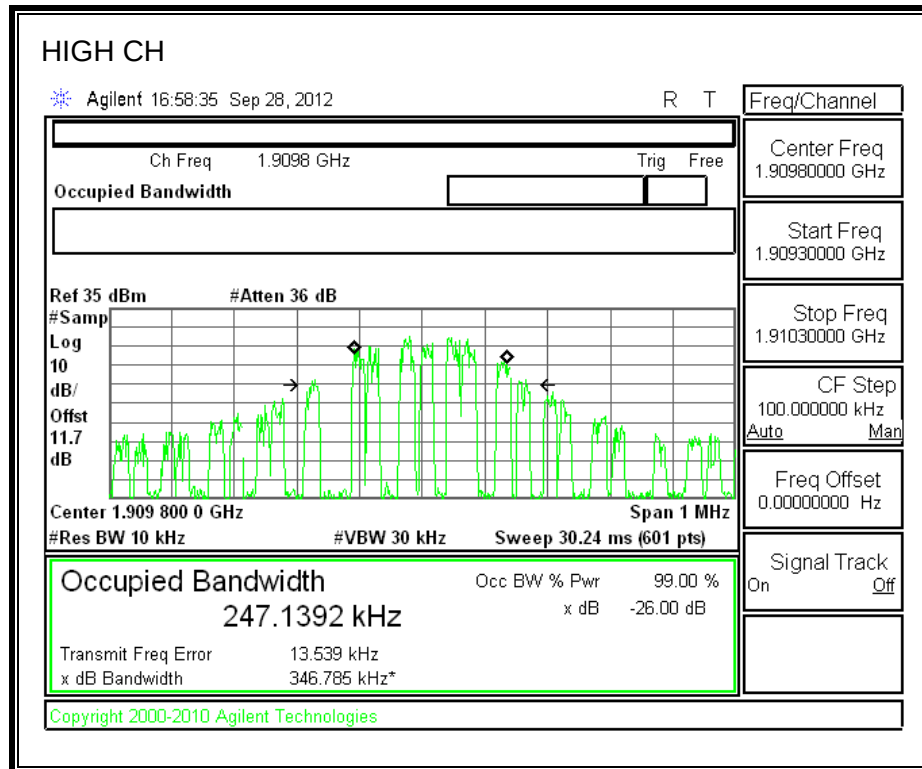


**EGPRS Cellular Band**



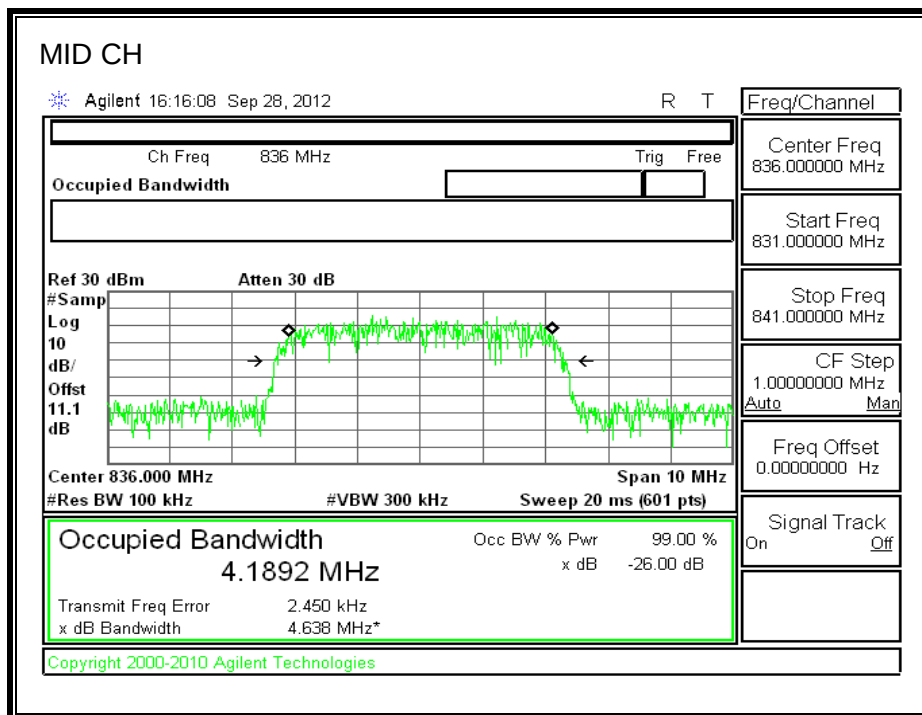
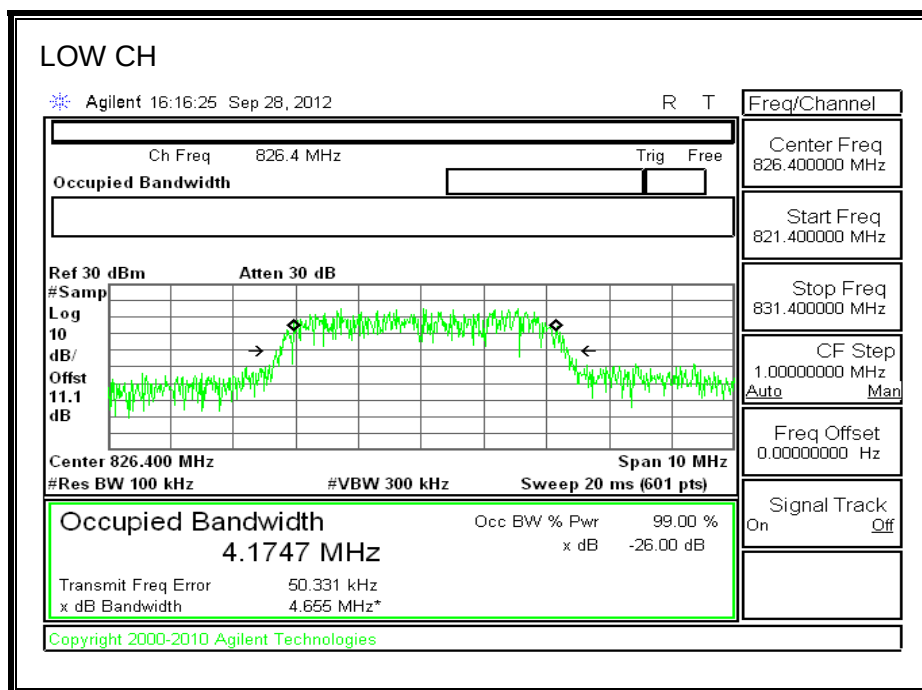


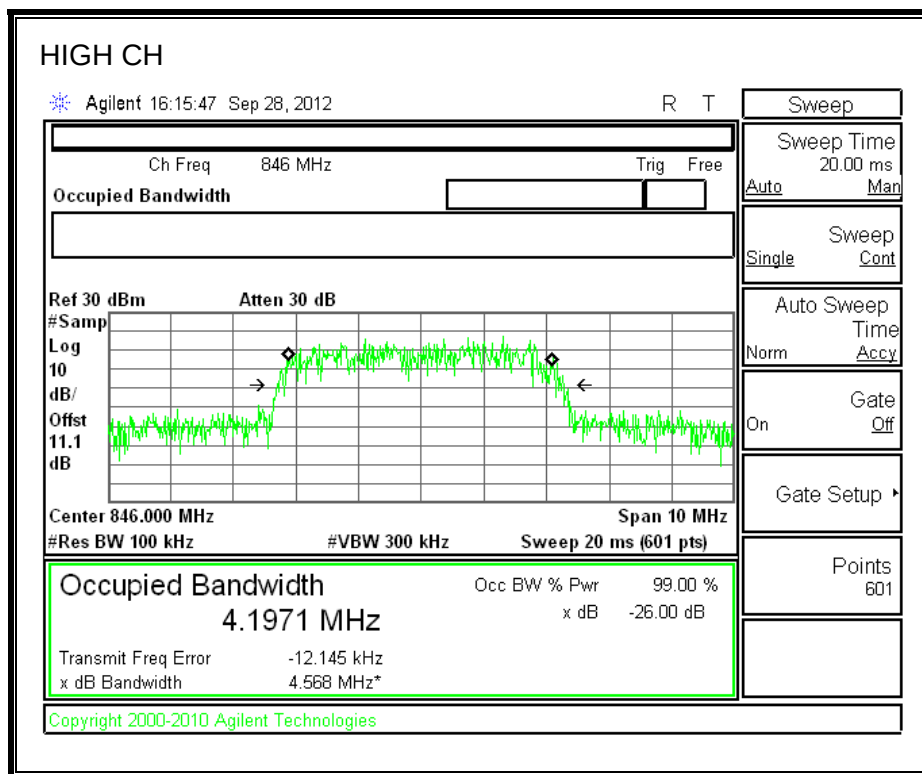
**EGPRS 1900 Mode (PCS Band)**

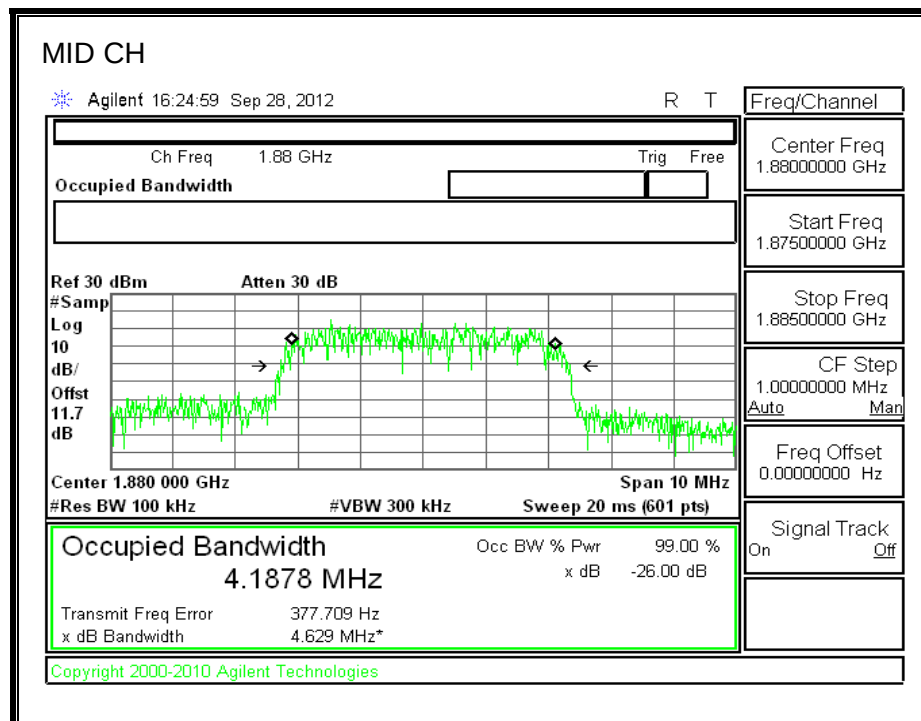
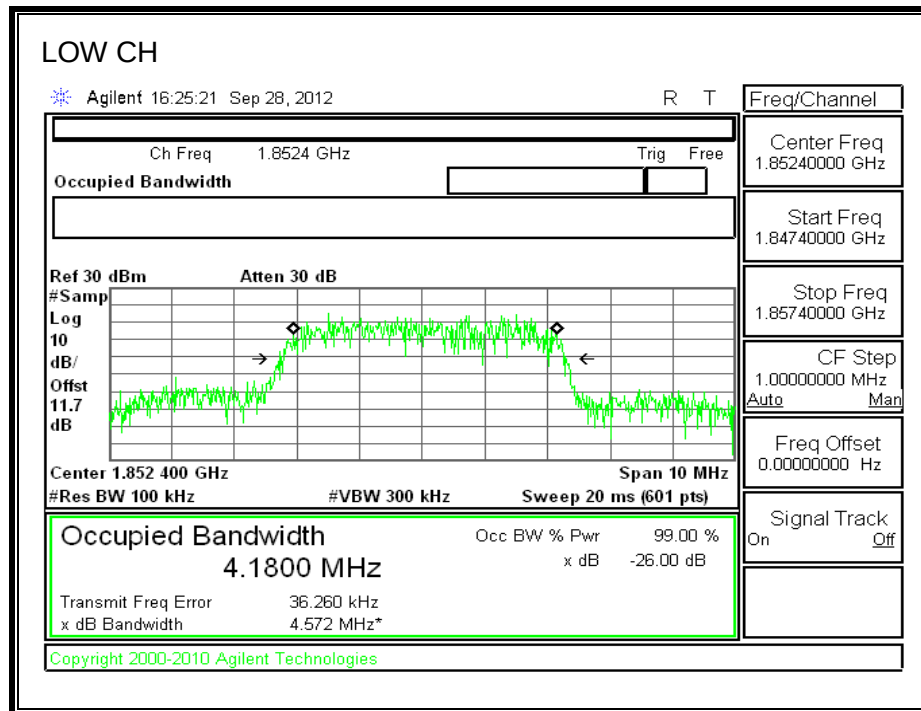


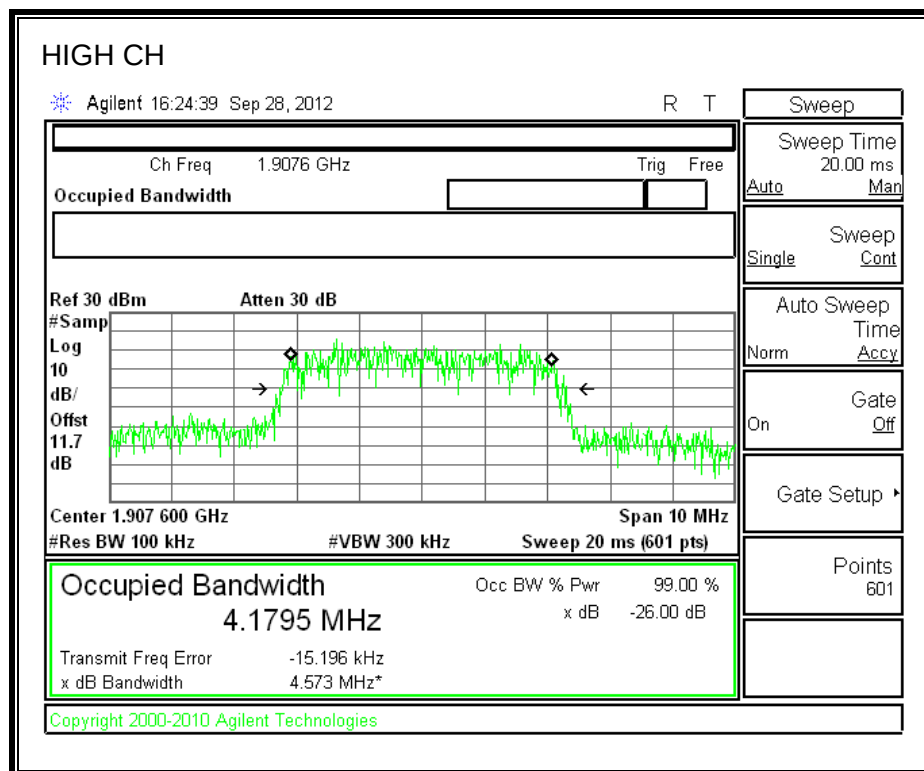
## 8.1.2. WCDMA

### Rel 99 (Cellular Band)



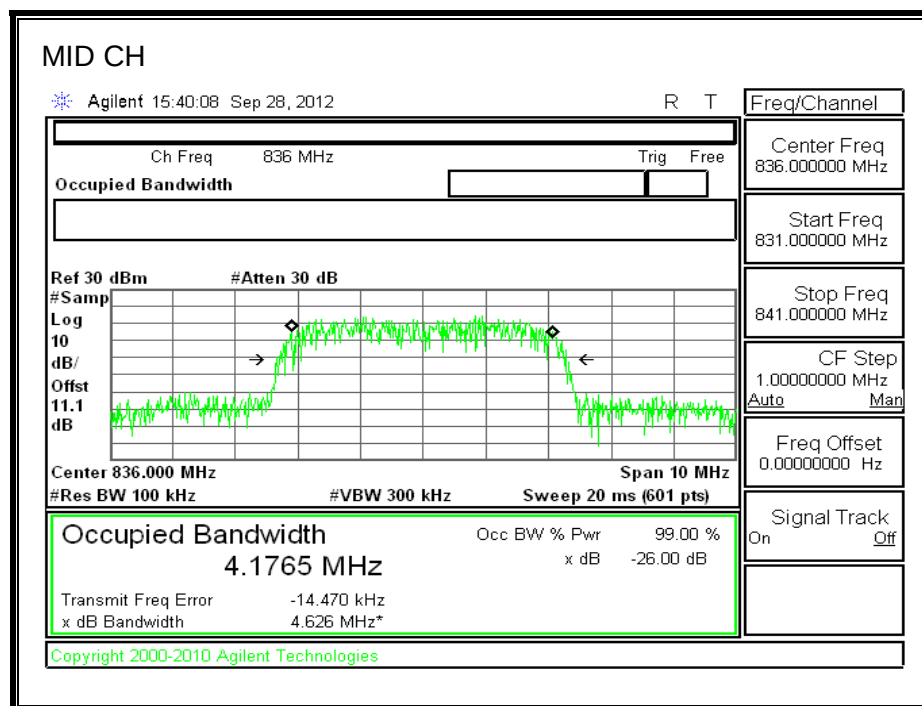
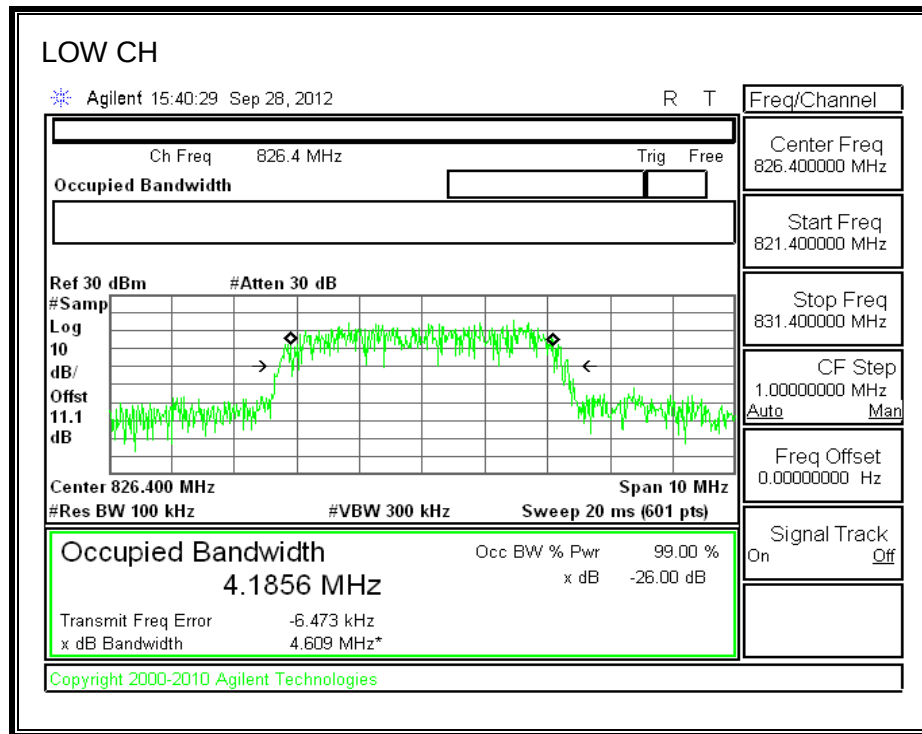


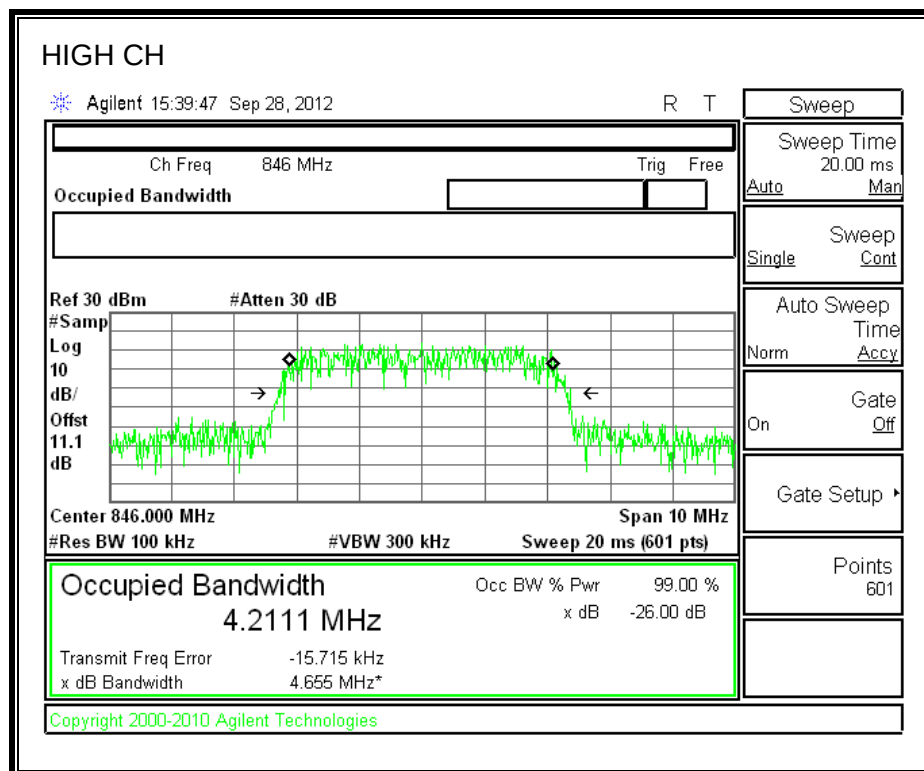
**REL 99 Mode (PCS Band)**

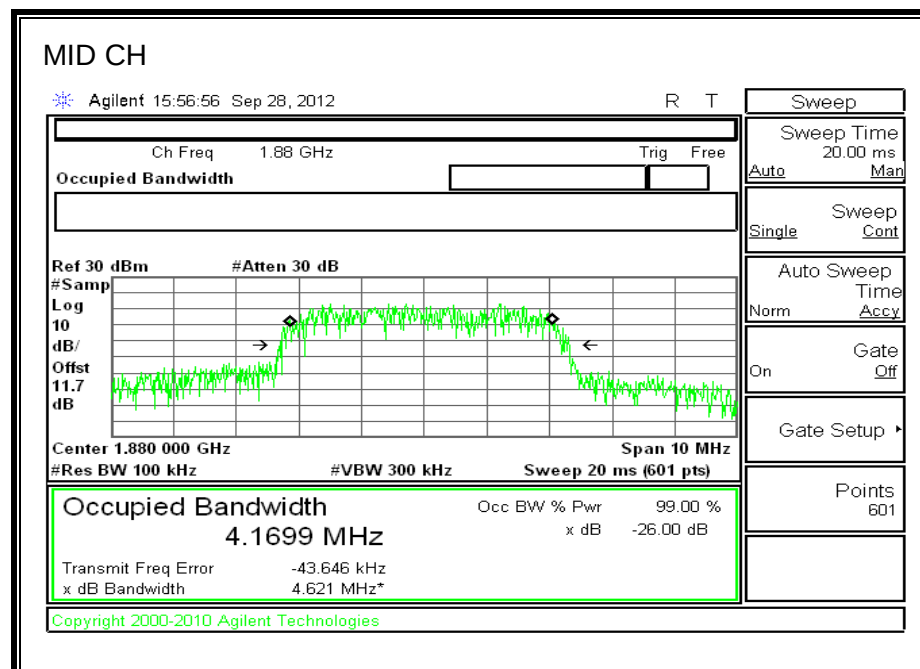
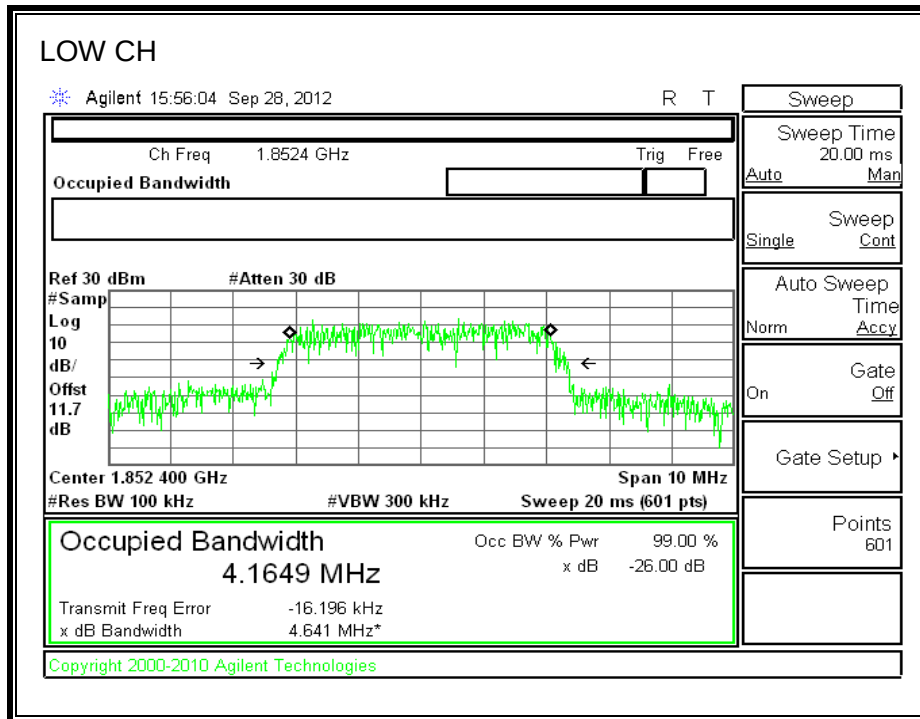


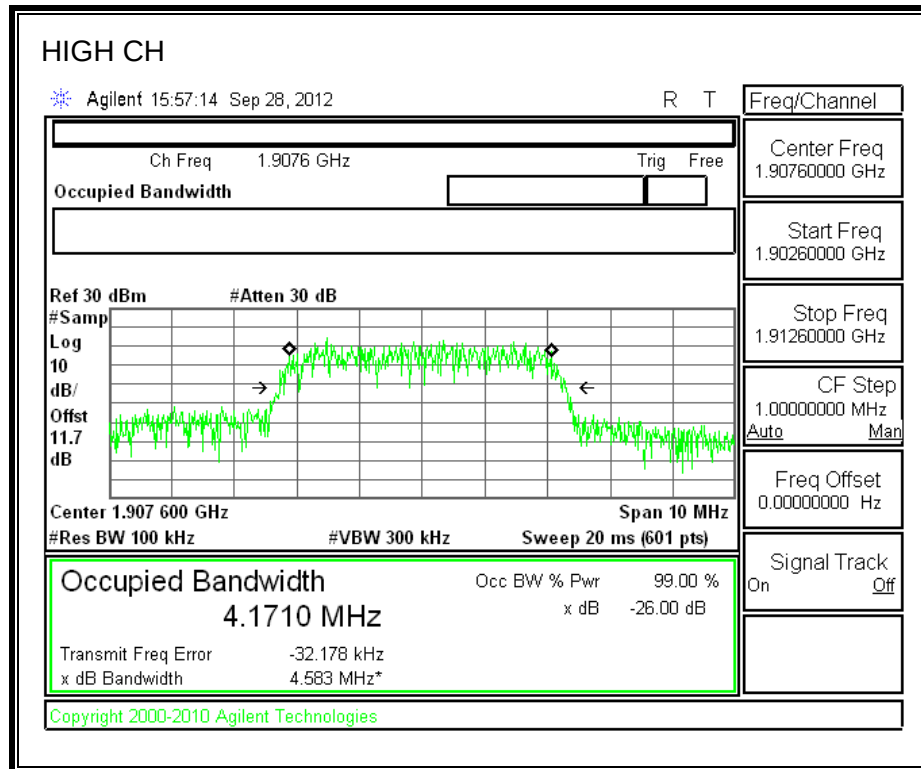


**WCDMA HSUPA (Cellular Band)**



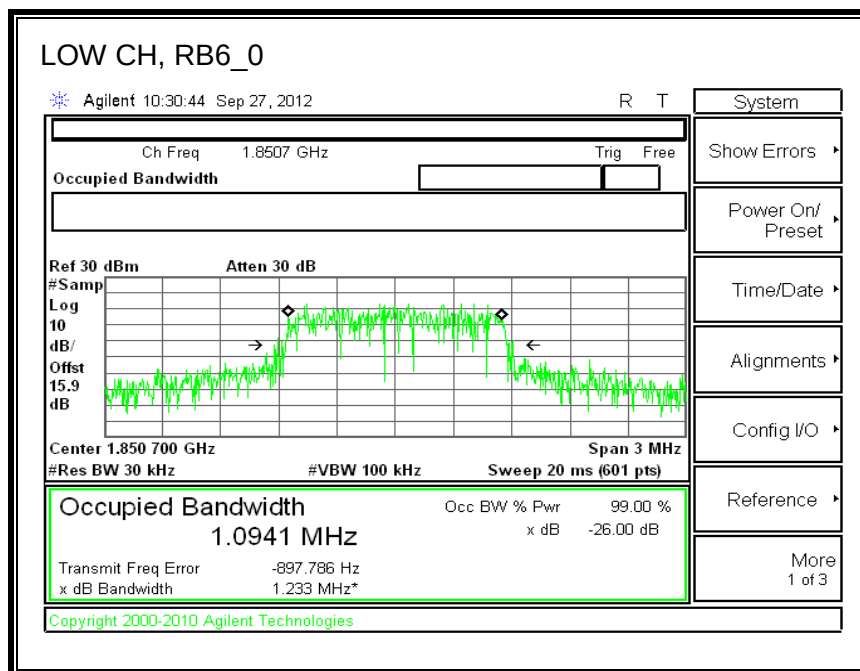
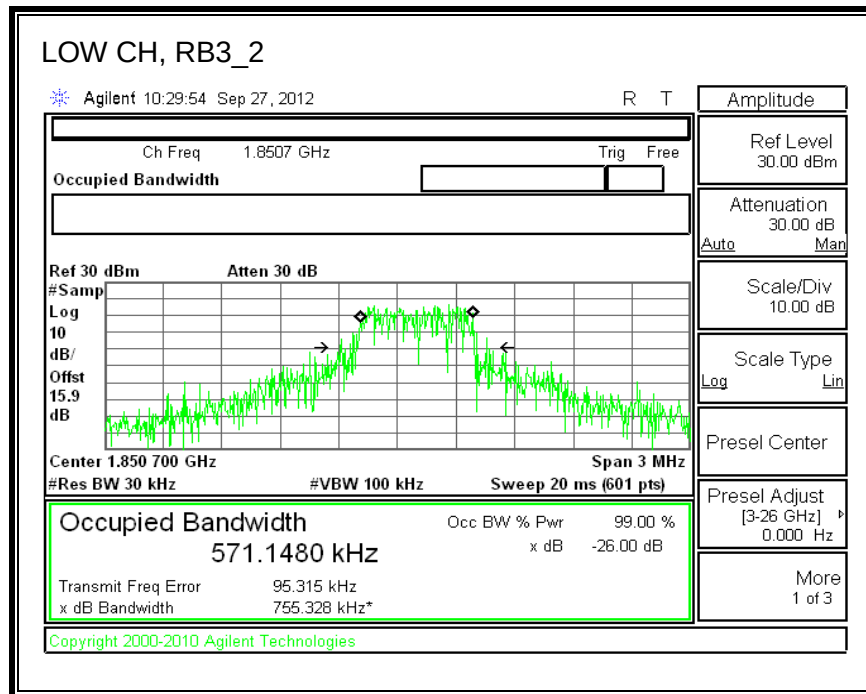


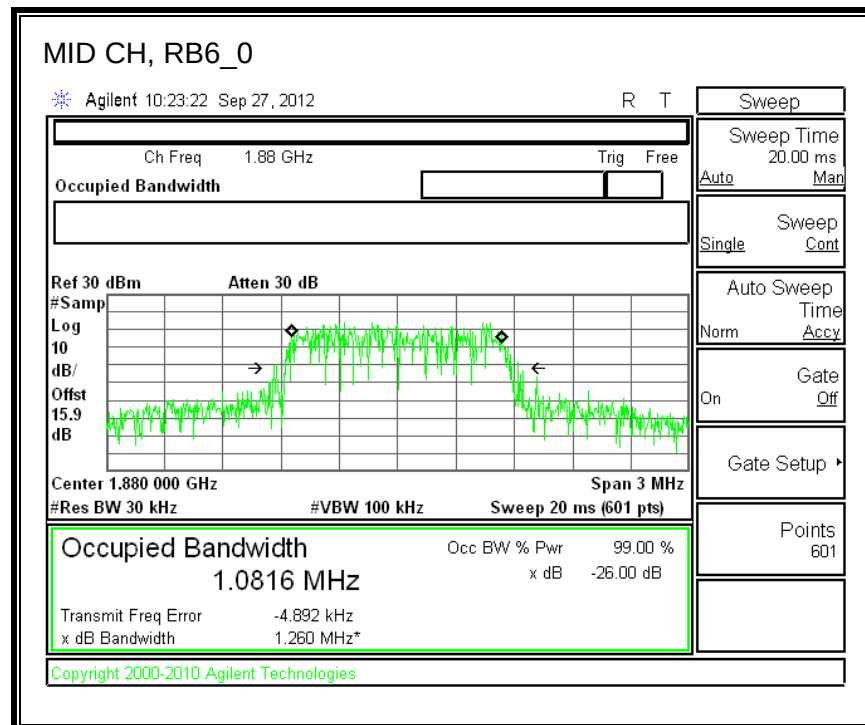
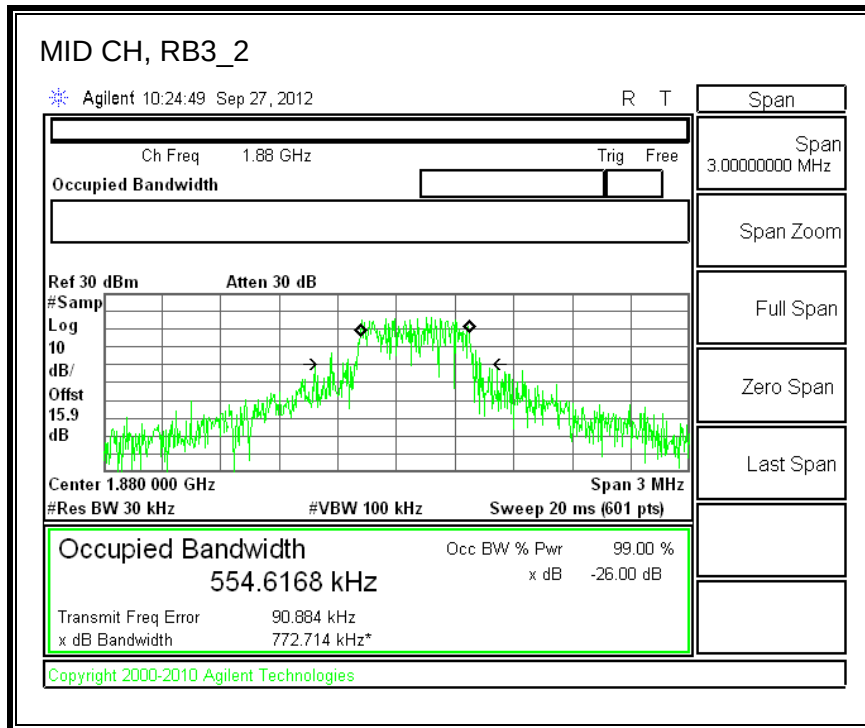
**WCDMA HSUA Mode (PCS Band)**

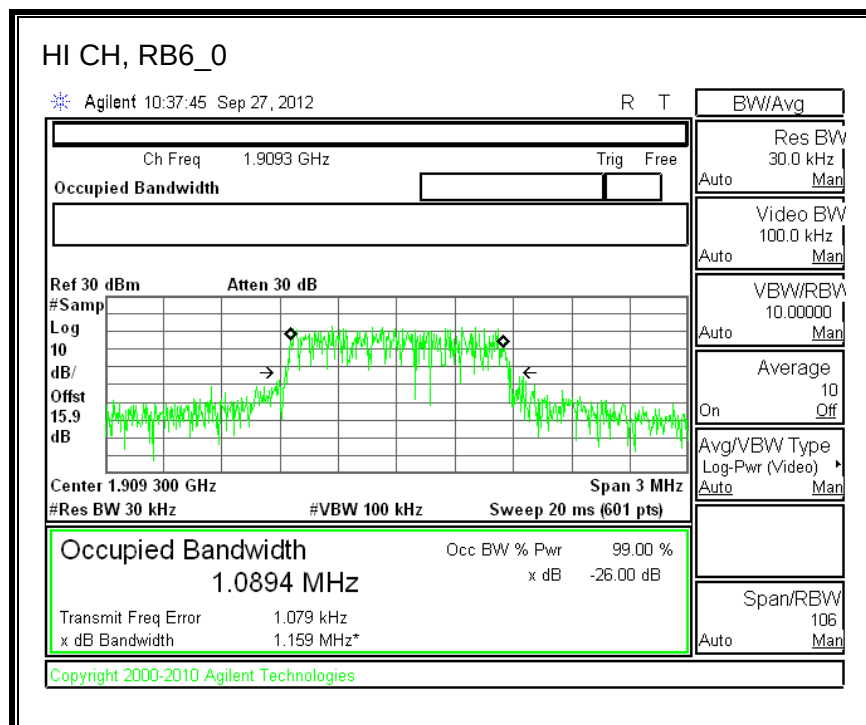
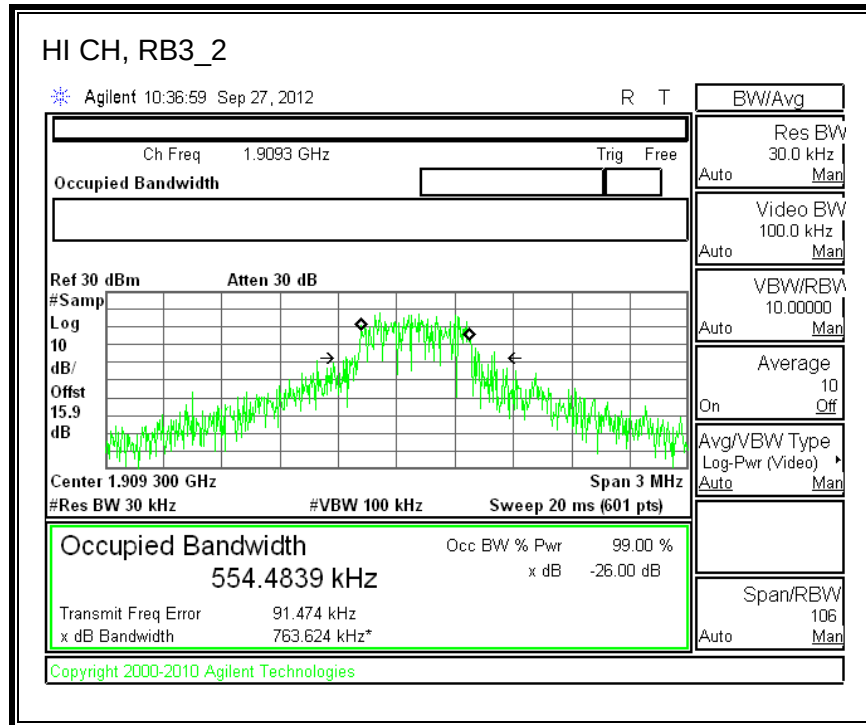


### 8.1.3. LTE Band 2

#### QPSK (1.4 MHz BANDWIDTH)

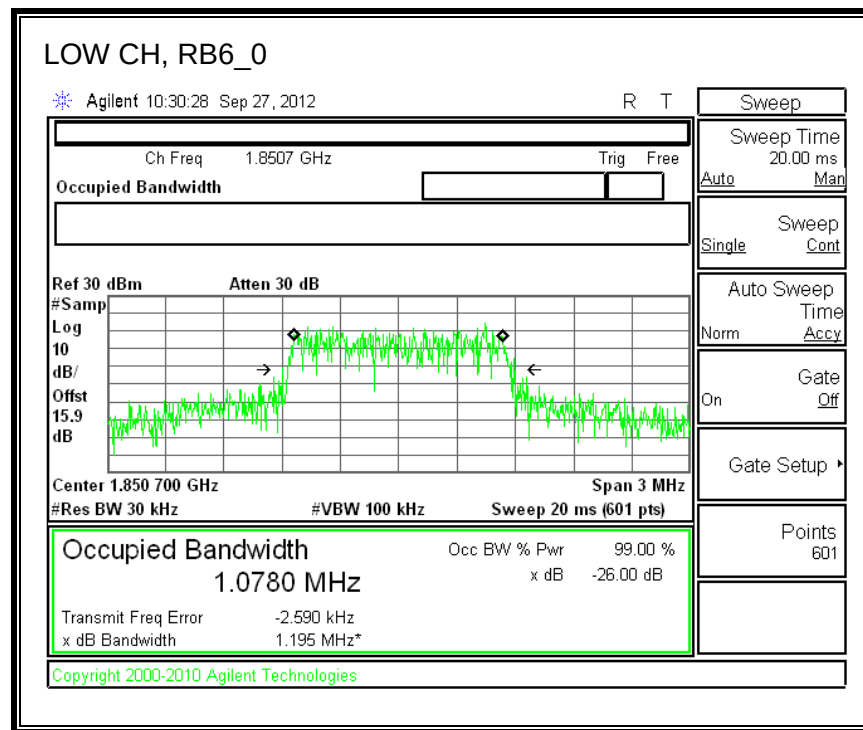
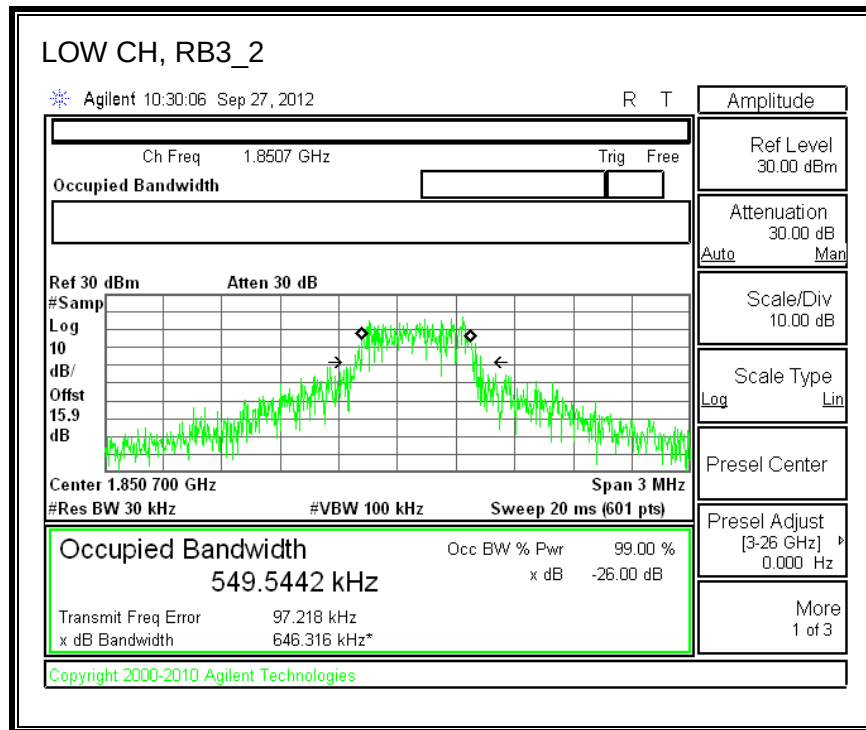




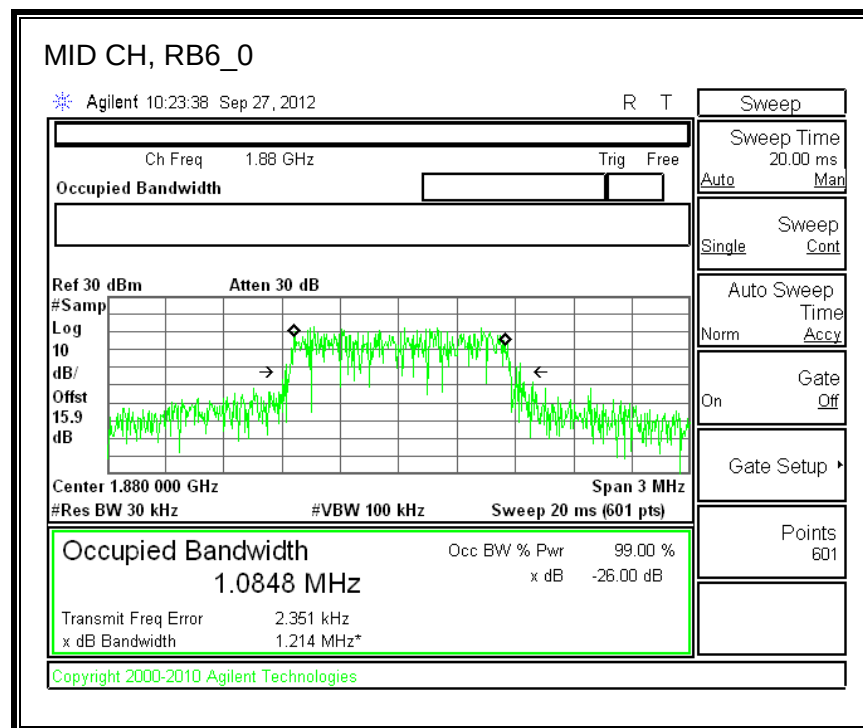
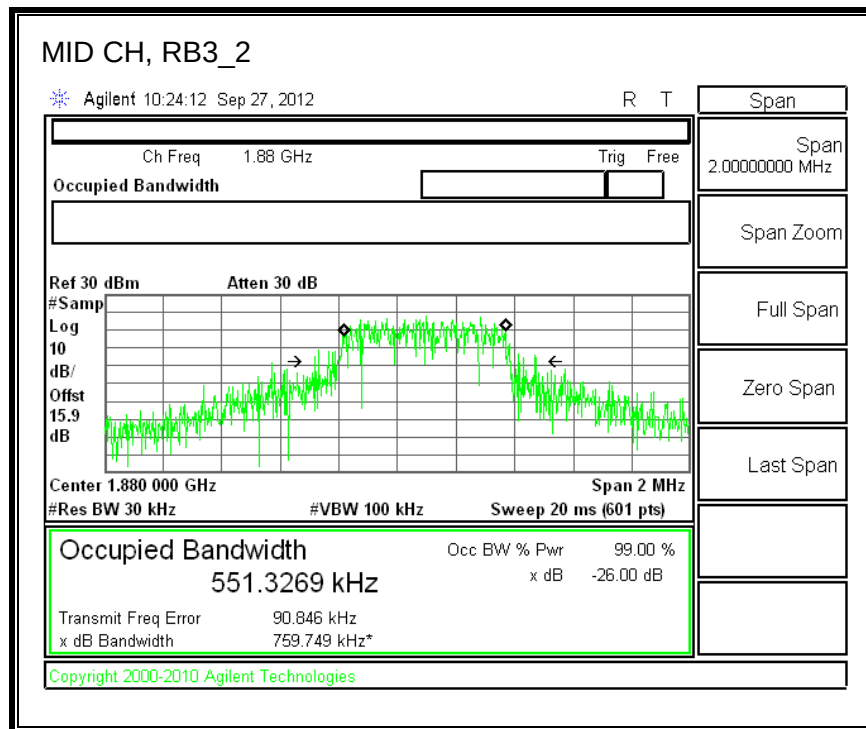


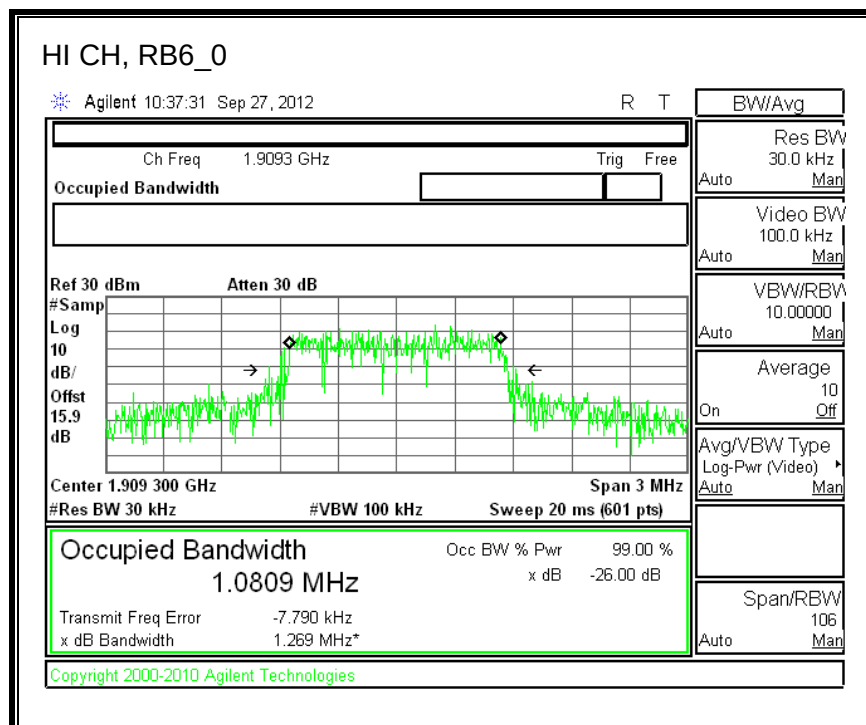
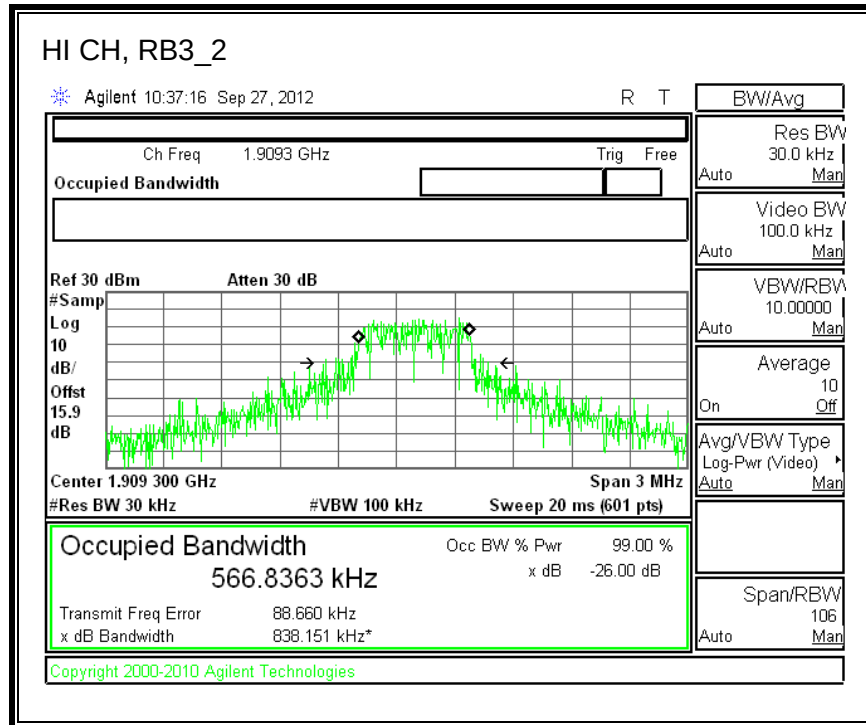
**Band 2 (1.4 MHz BANDWIDTH)**

**16QAM**



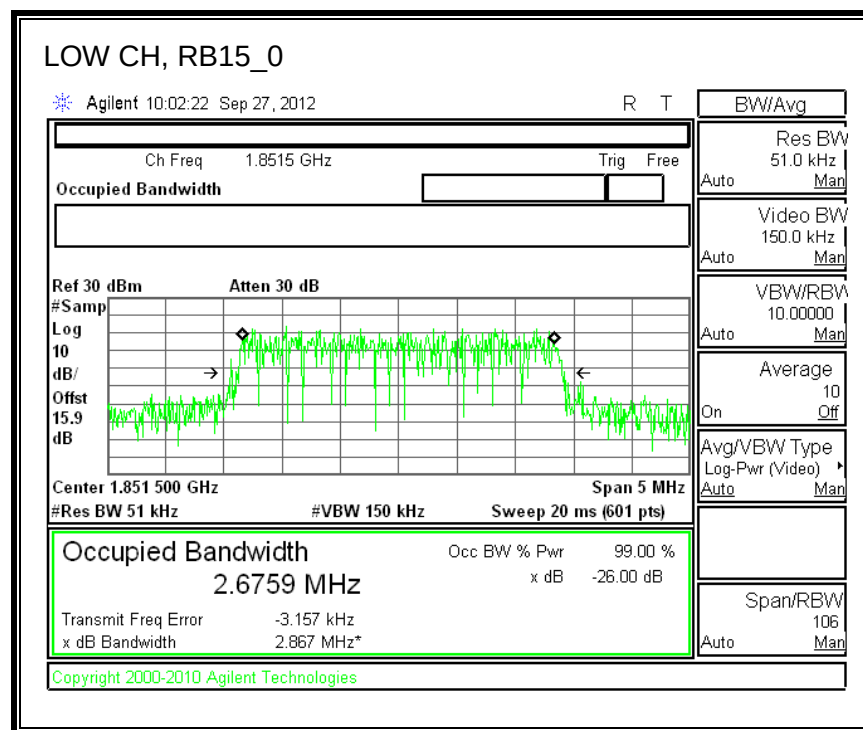
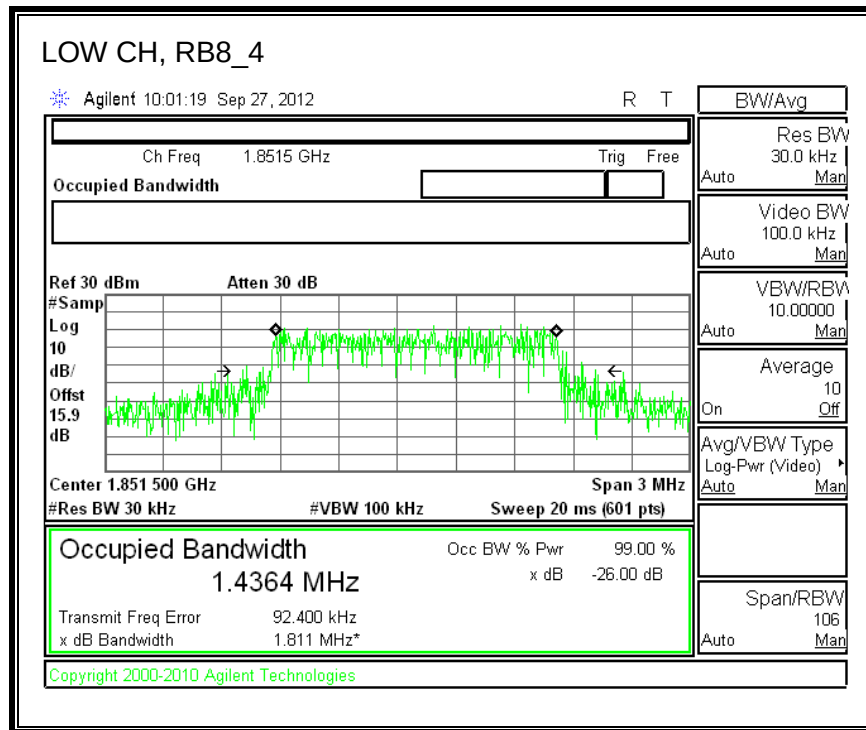


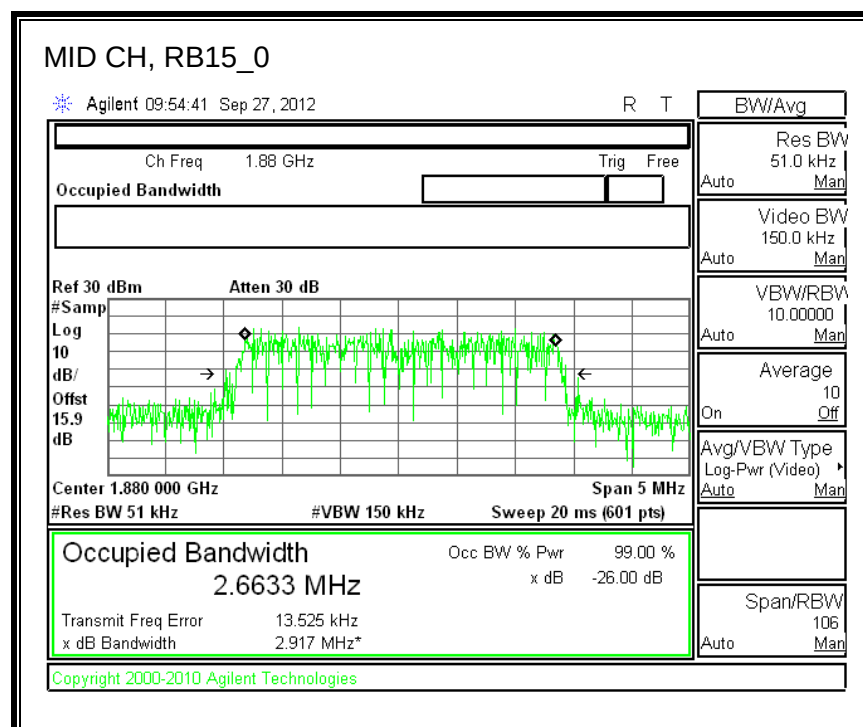
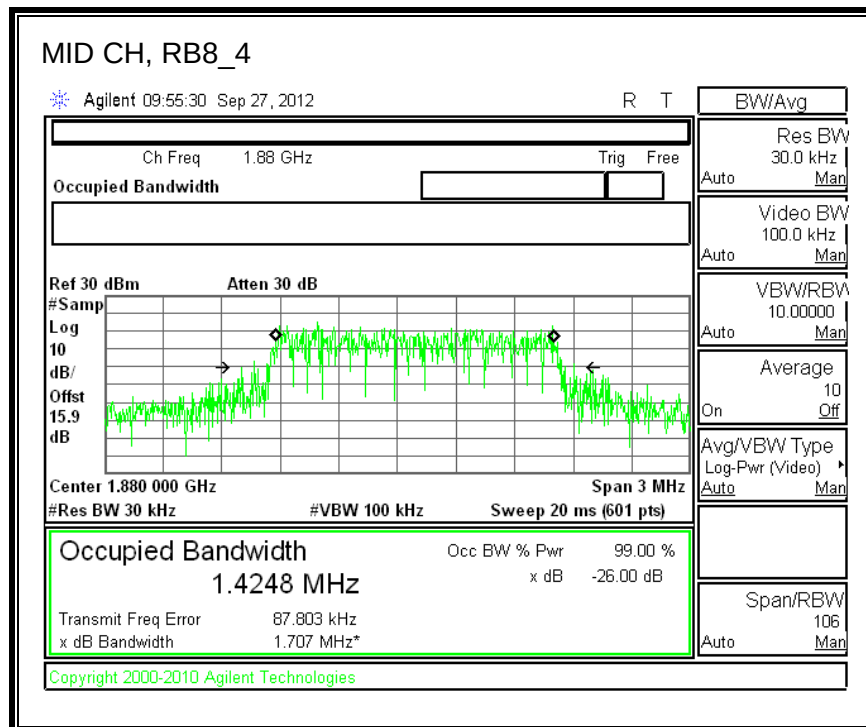


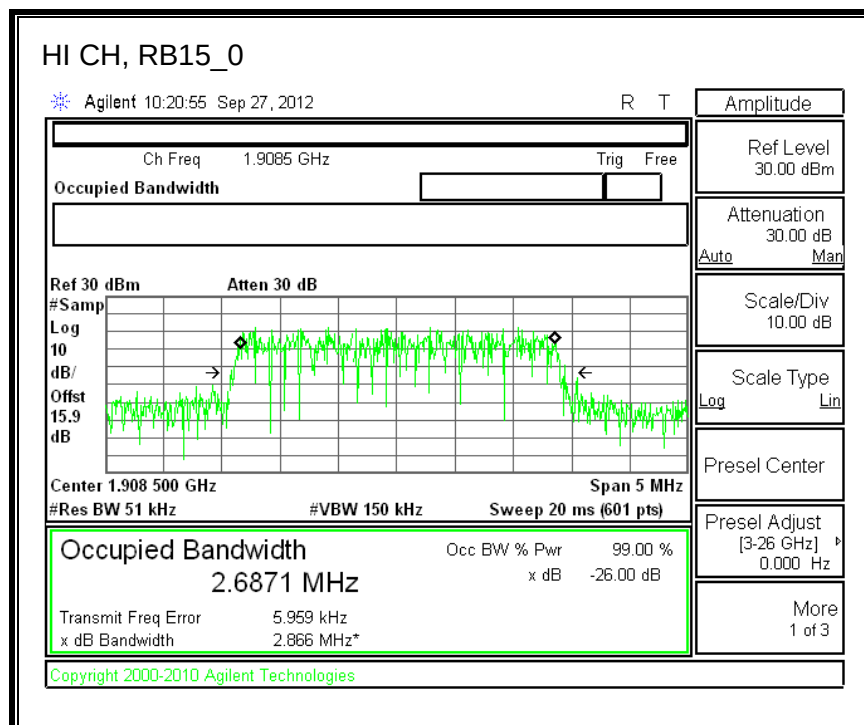
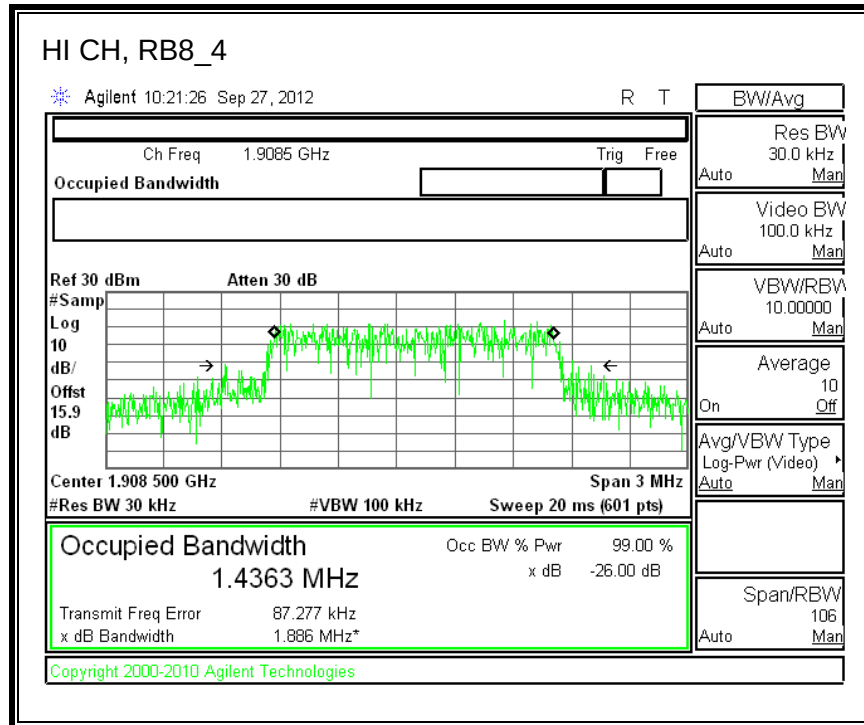


**Band 2 (3 MHz BANDWIDTH)**

**QPSK**

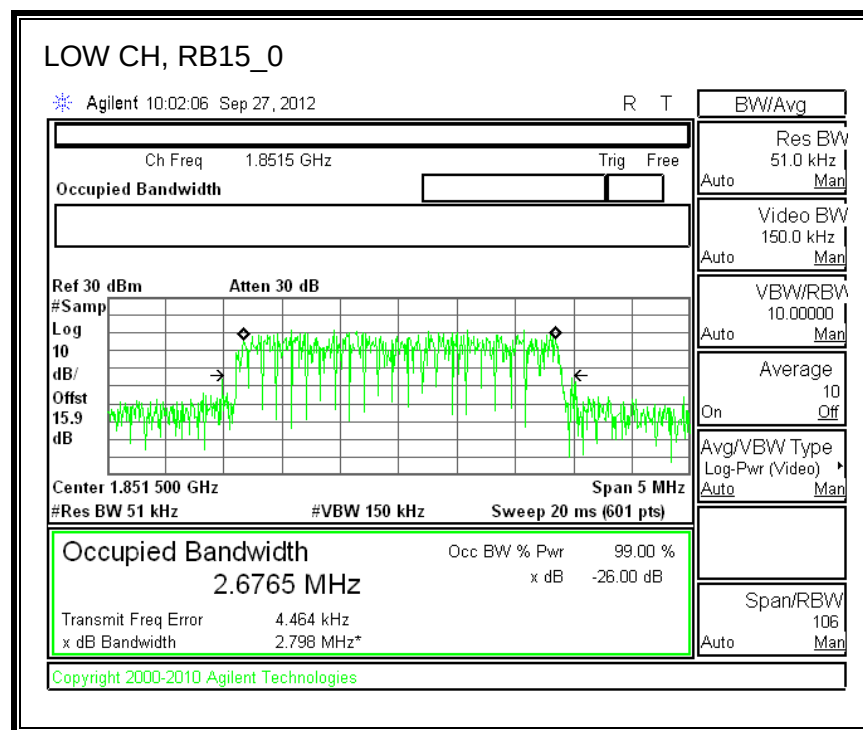
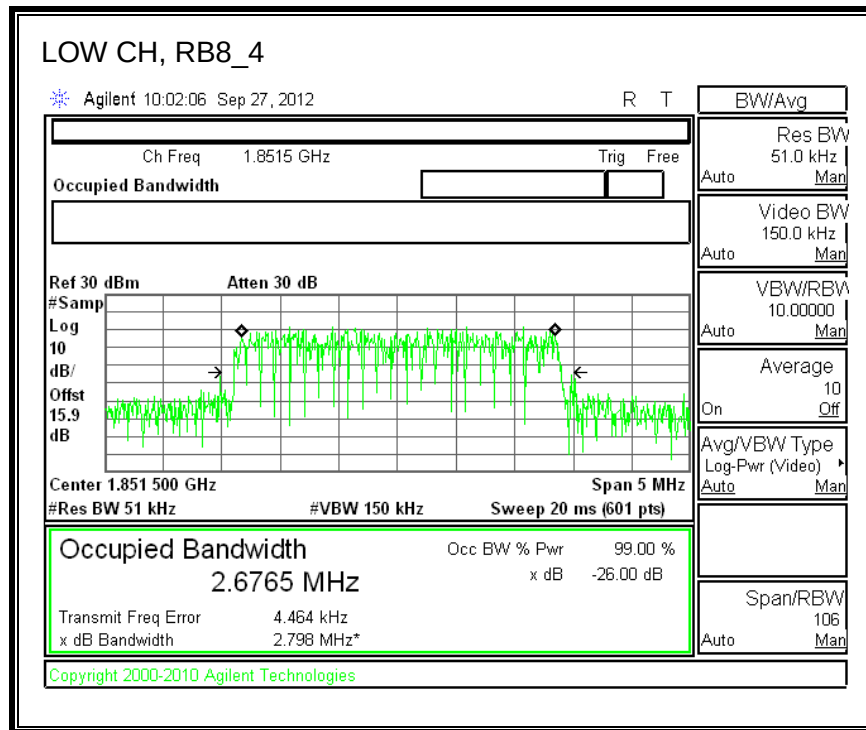


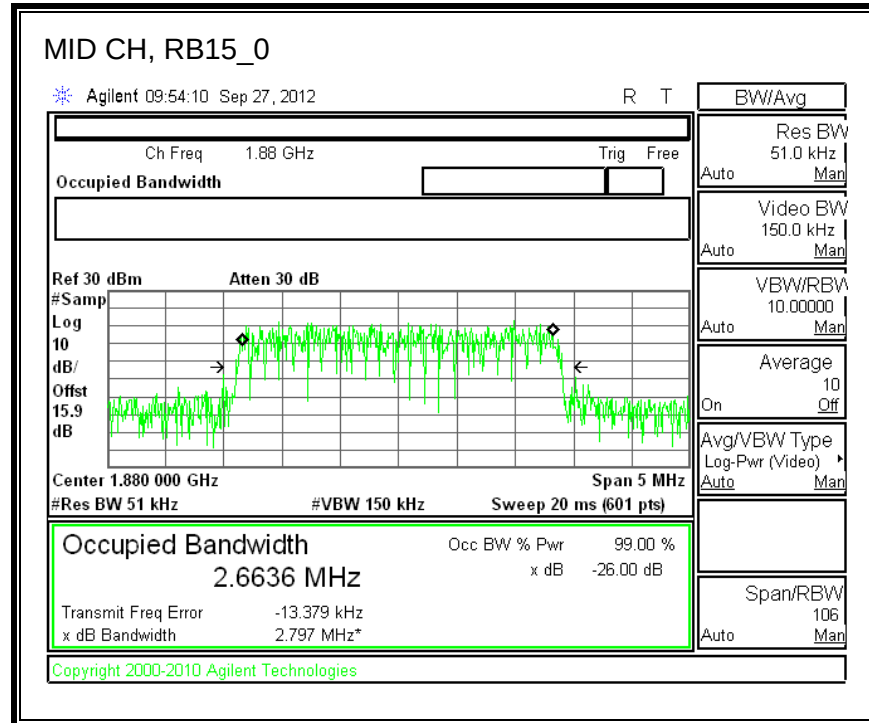
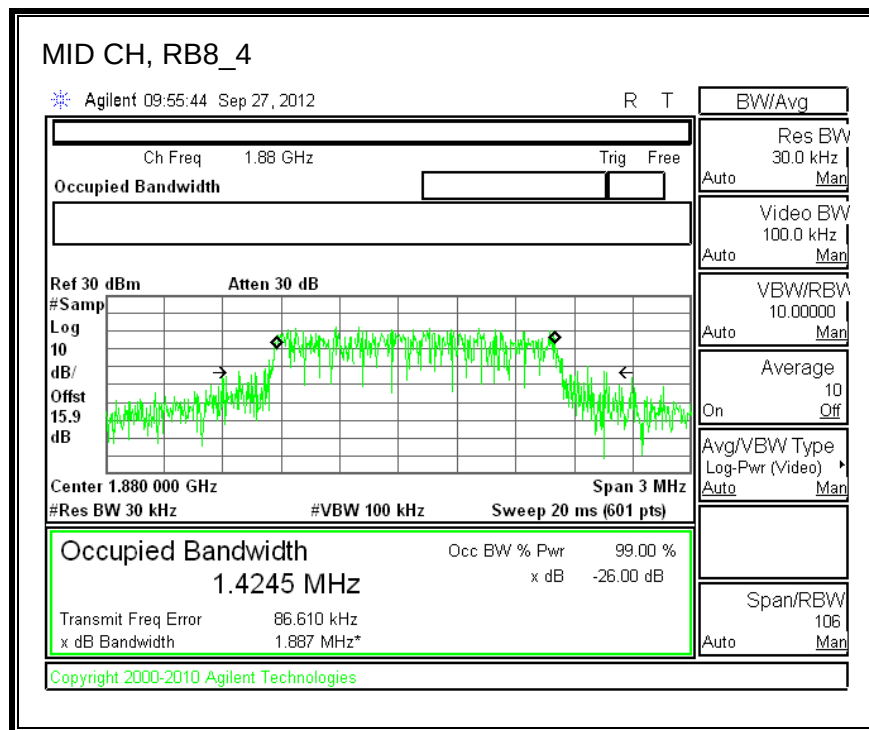


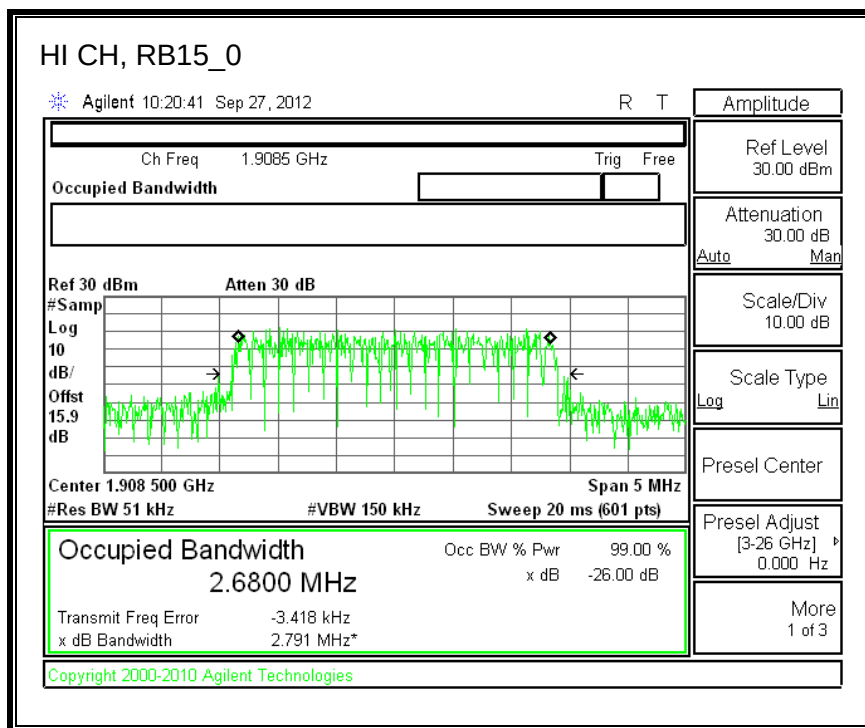
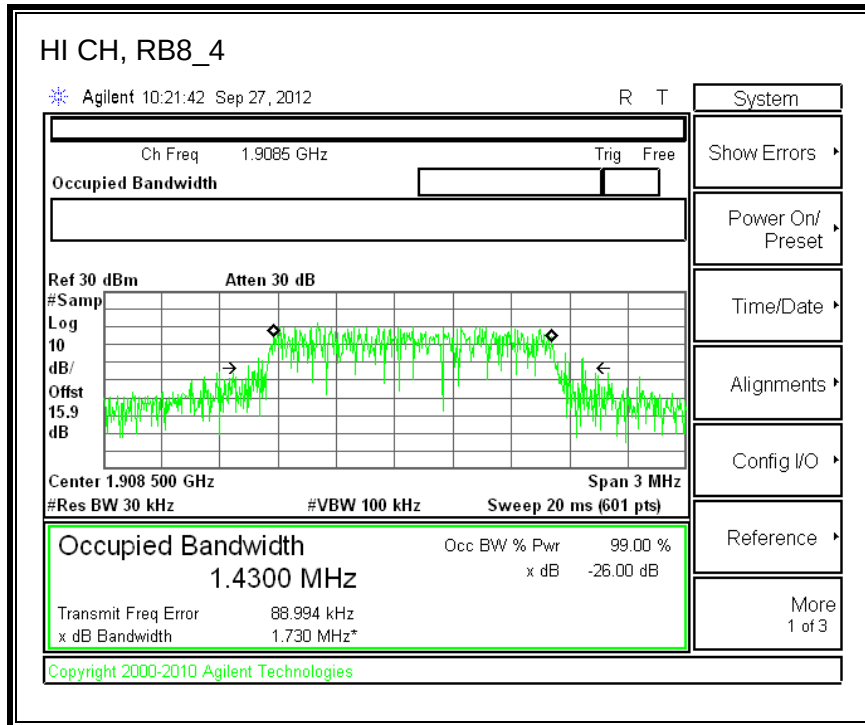


**Band 2 (3 MHz BANDWIDTH)**

**16QAM**



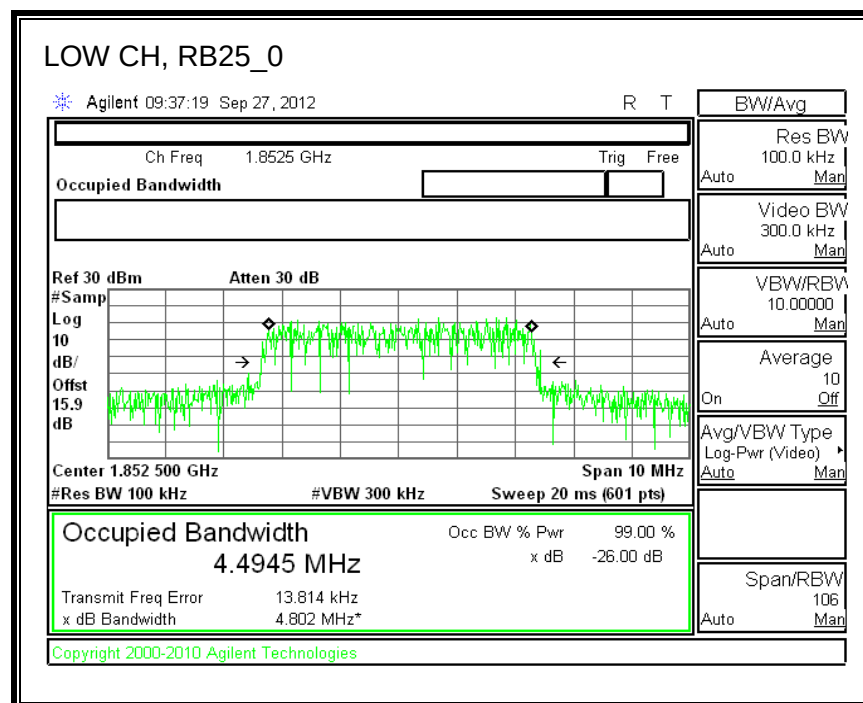
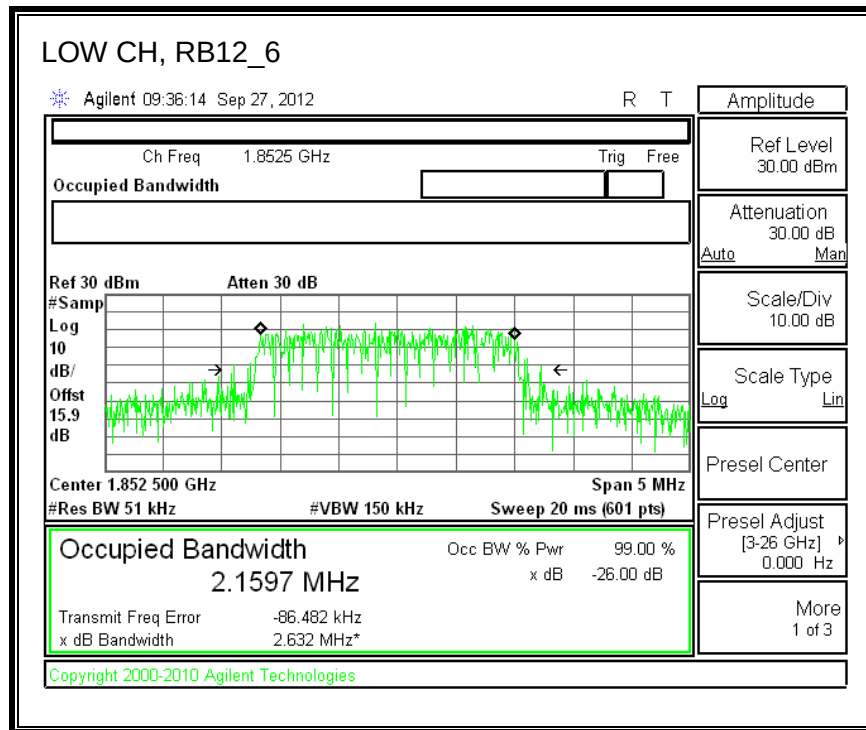


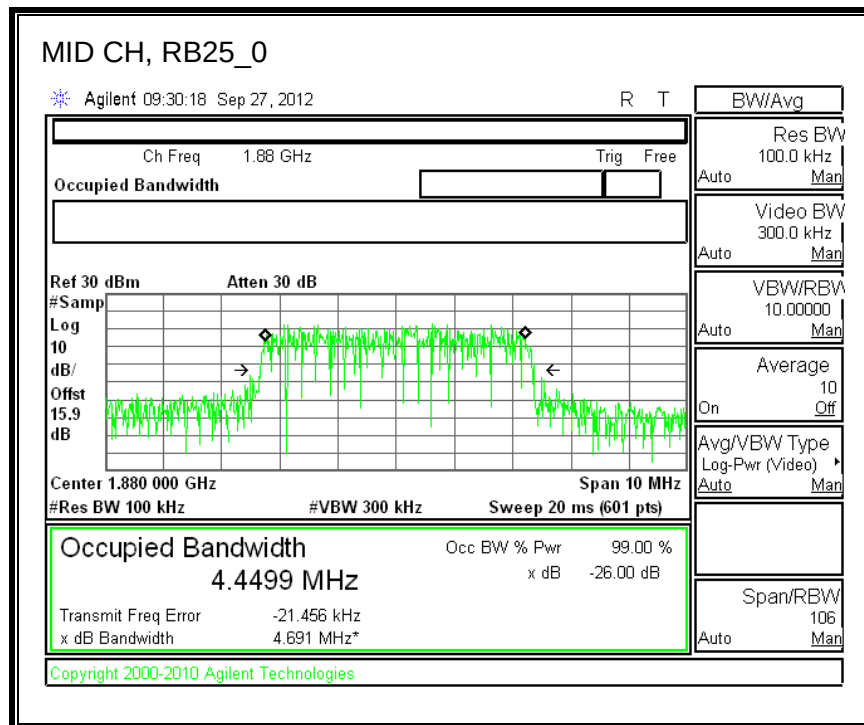
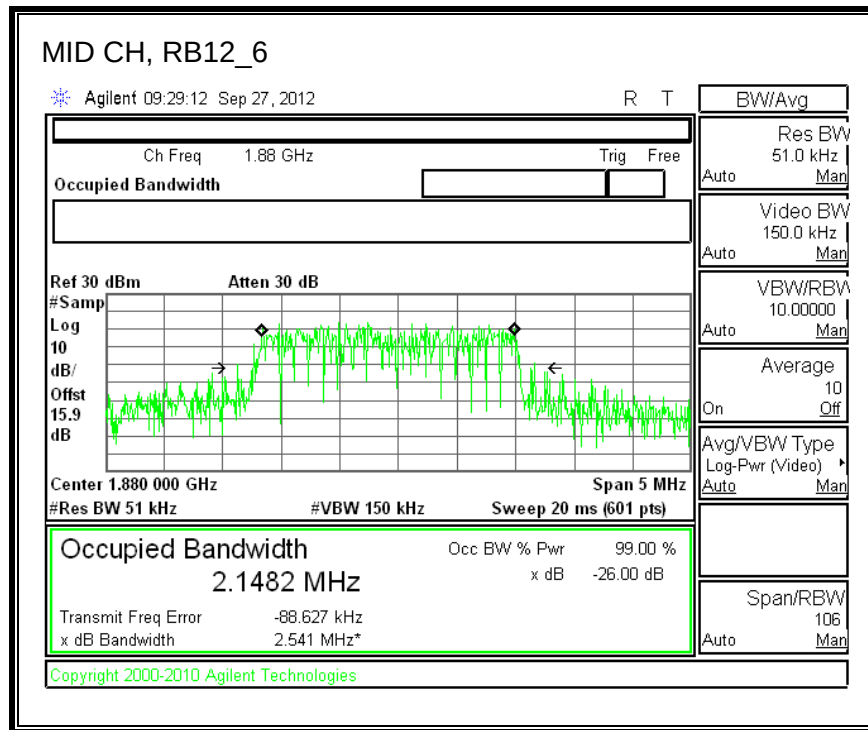


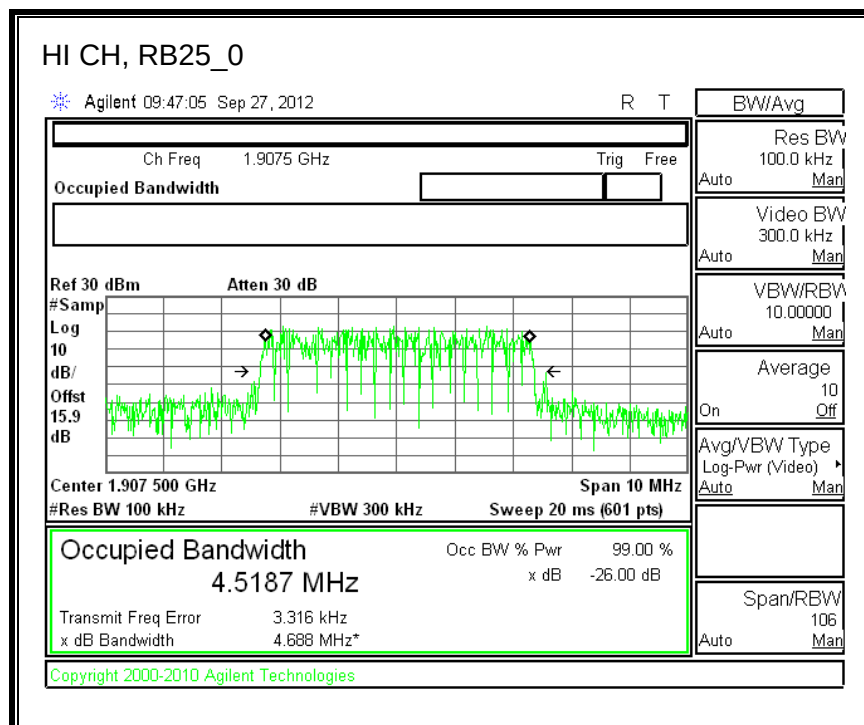
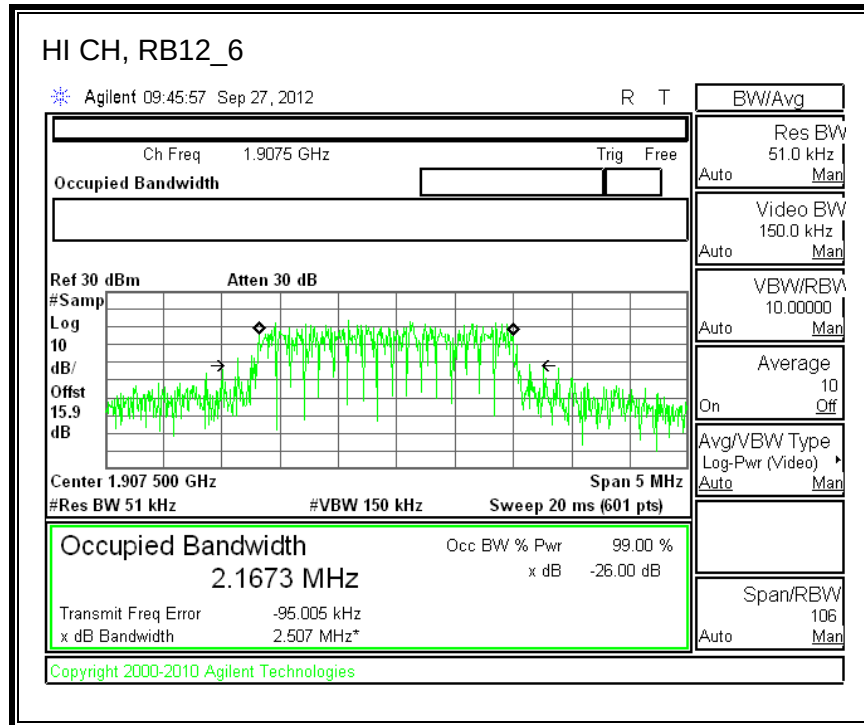


**Band 2 (5 MHz BANDWIDTH)**

**QPSK**

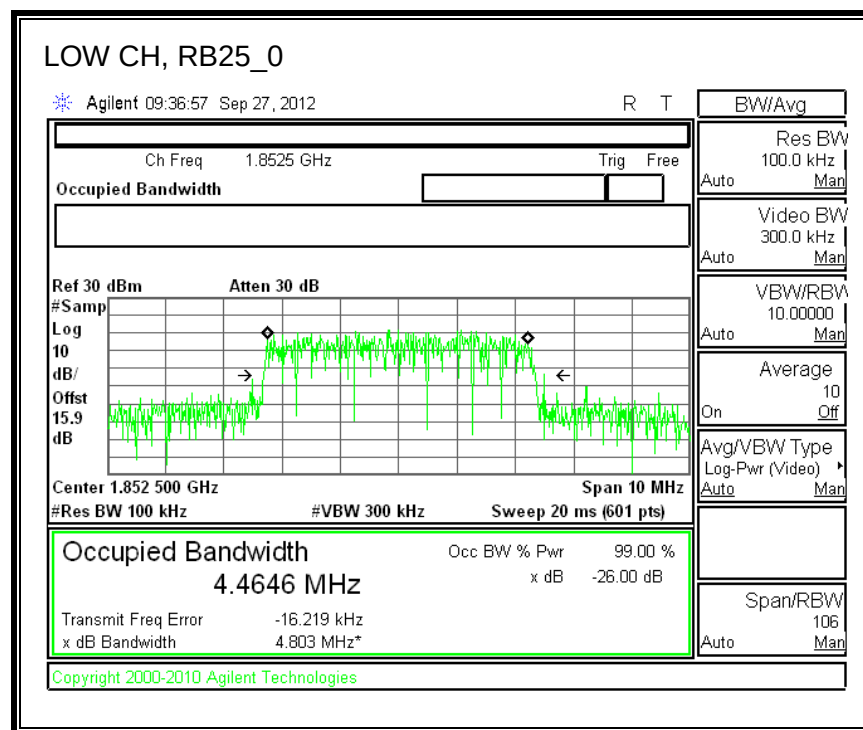
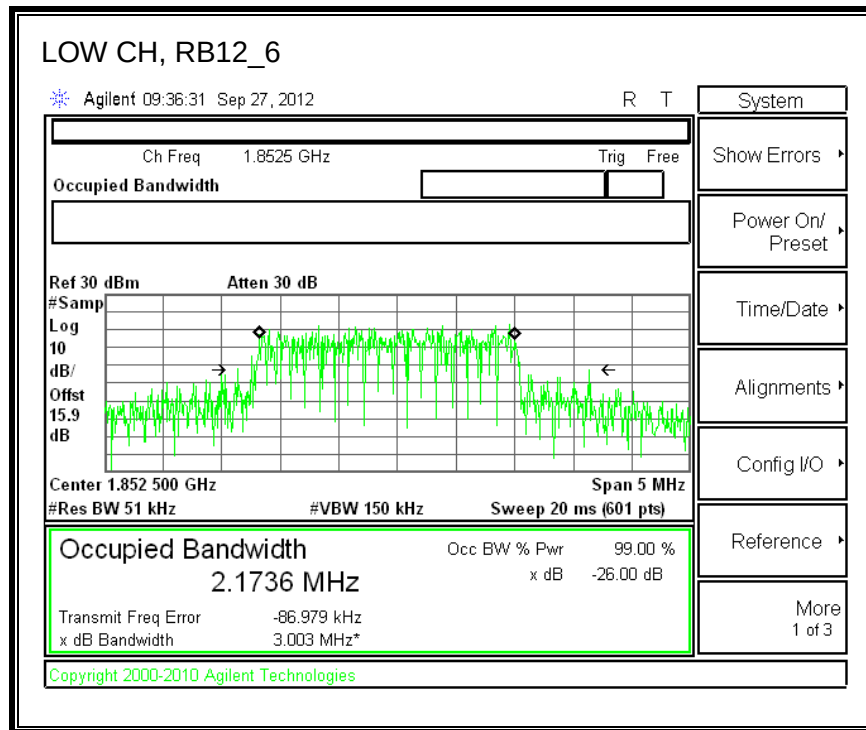


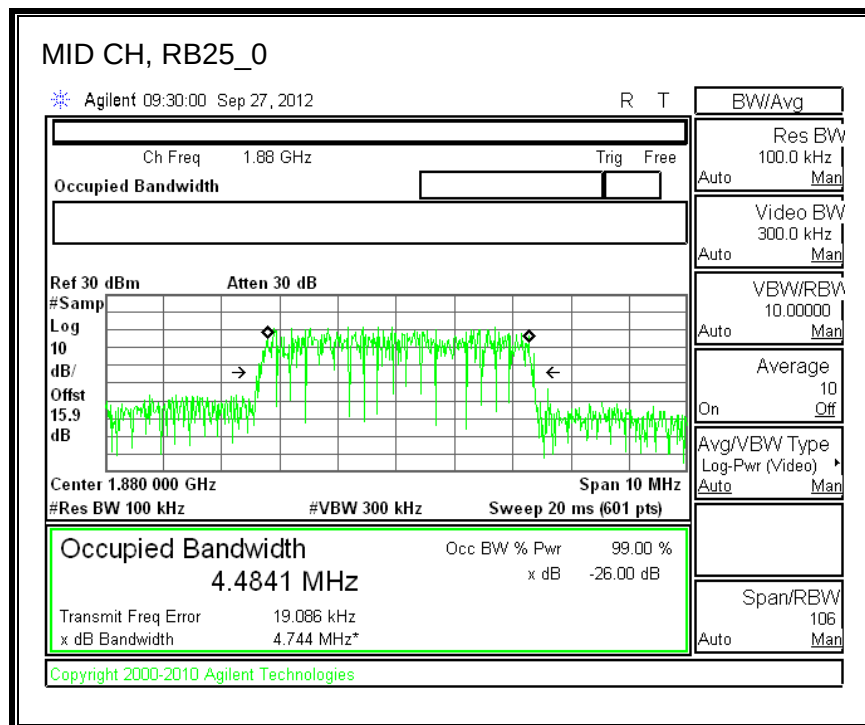
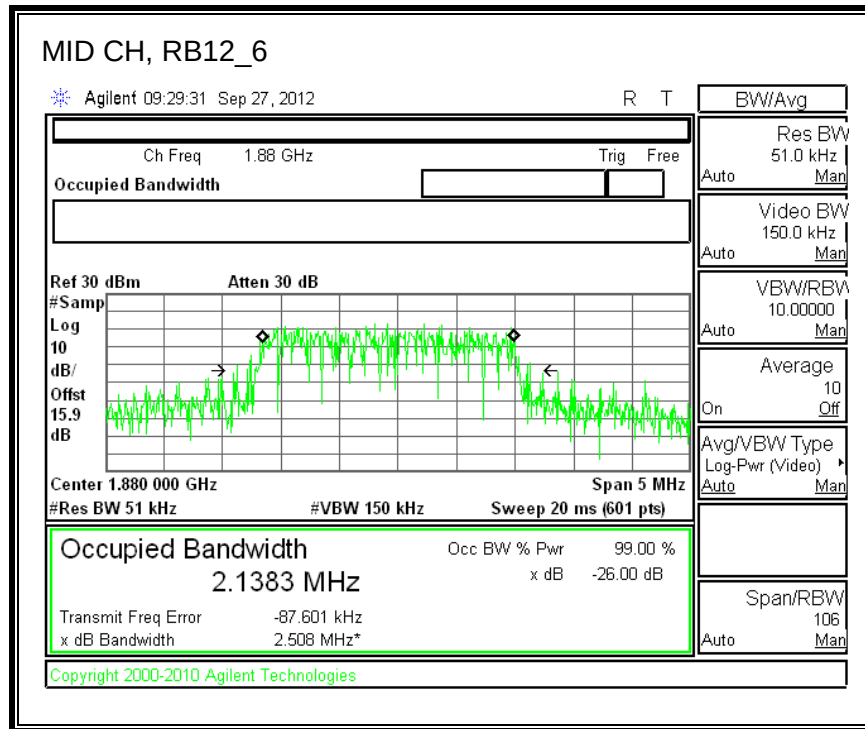


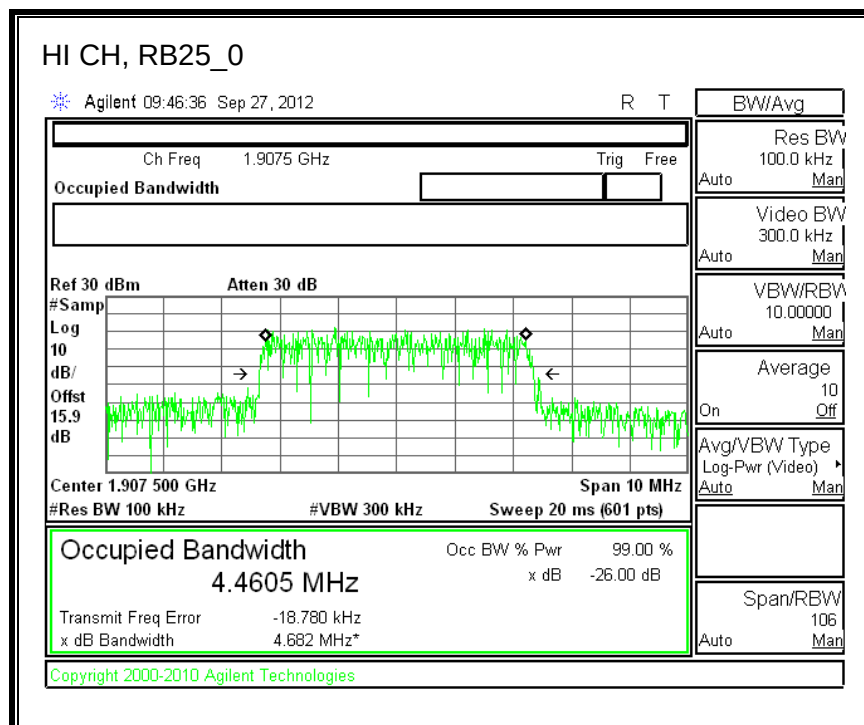
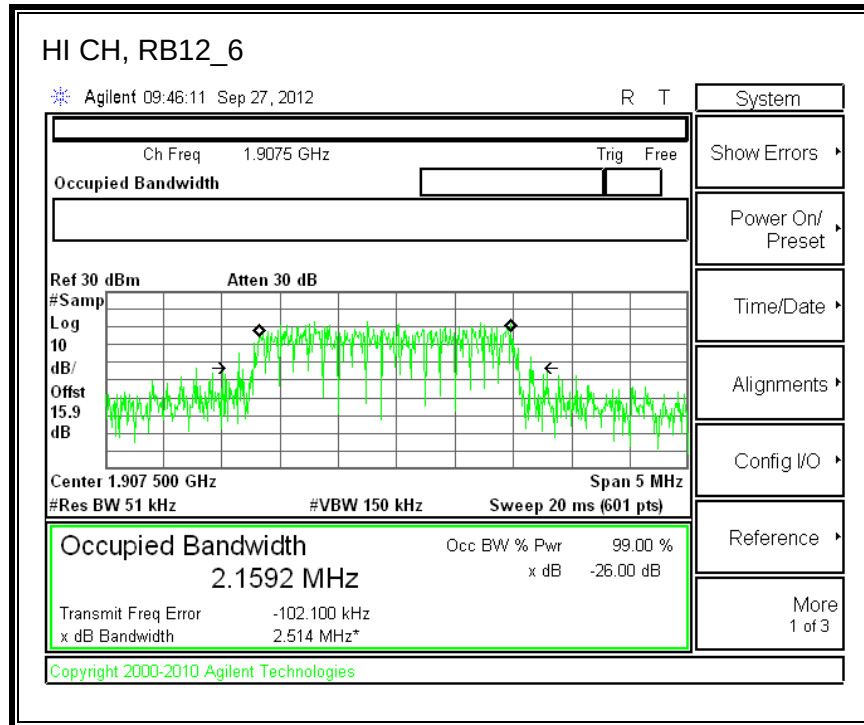


**Band 2 (5 MHz BANDWIDTH)**

**16QAM**

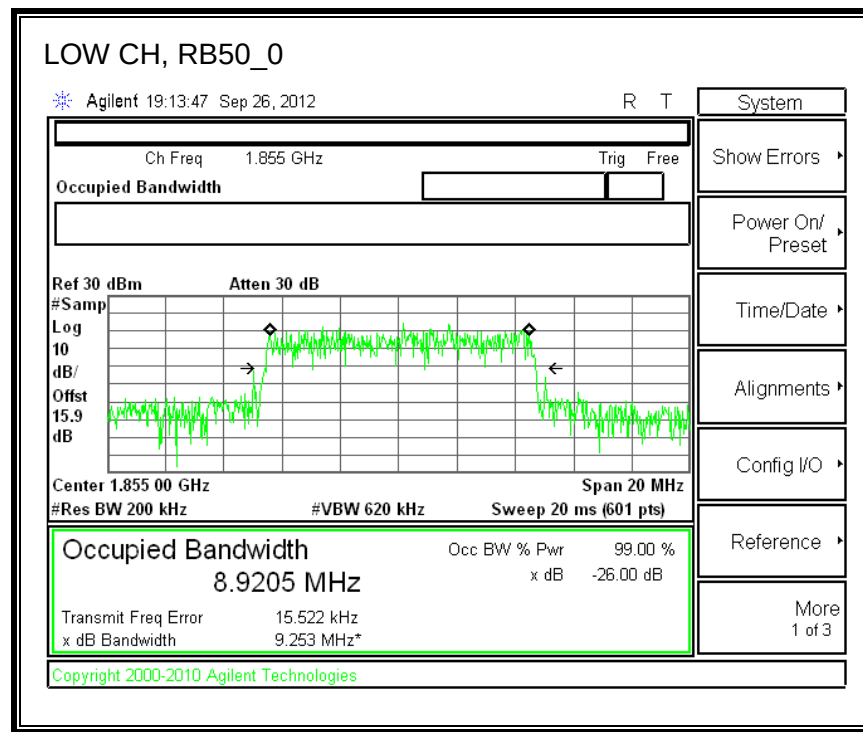
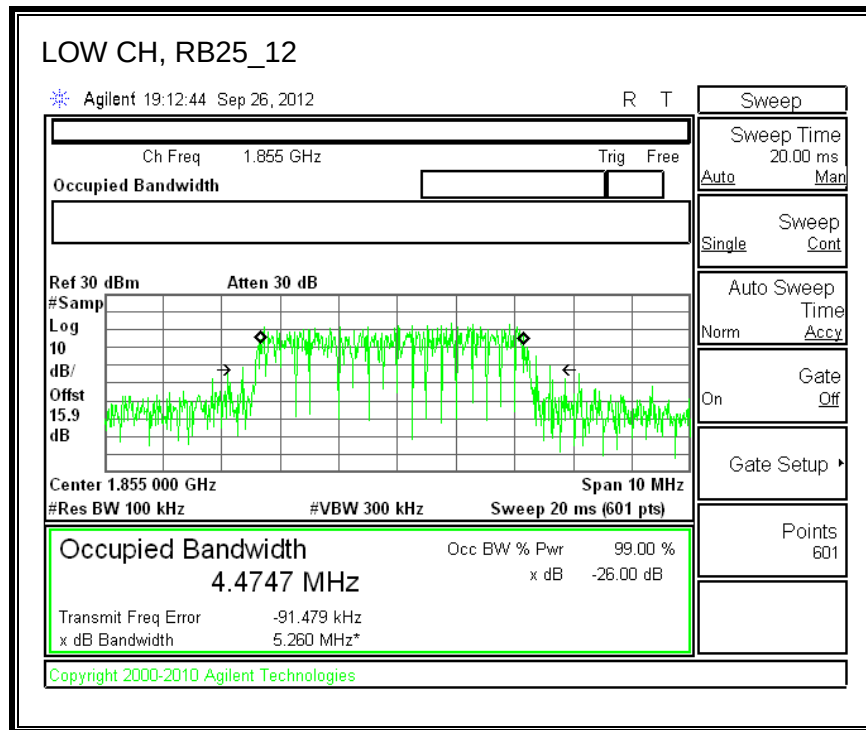


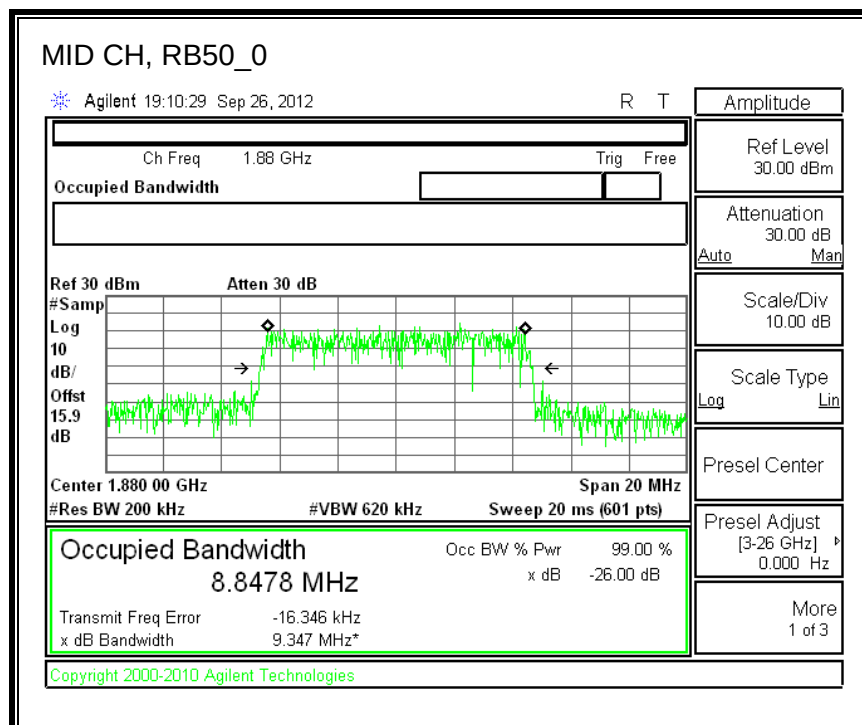
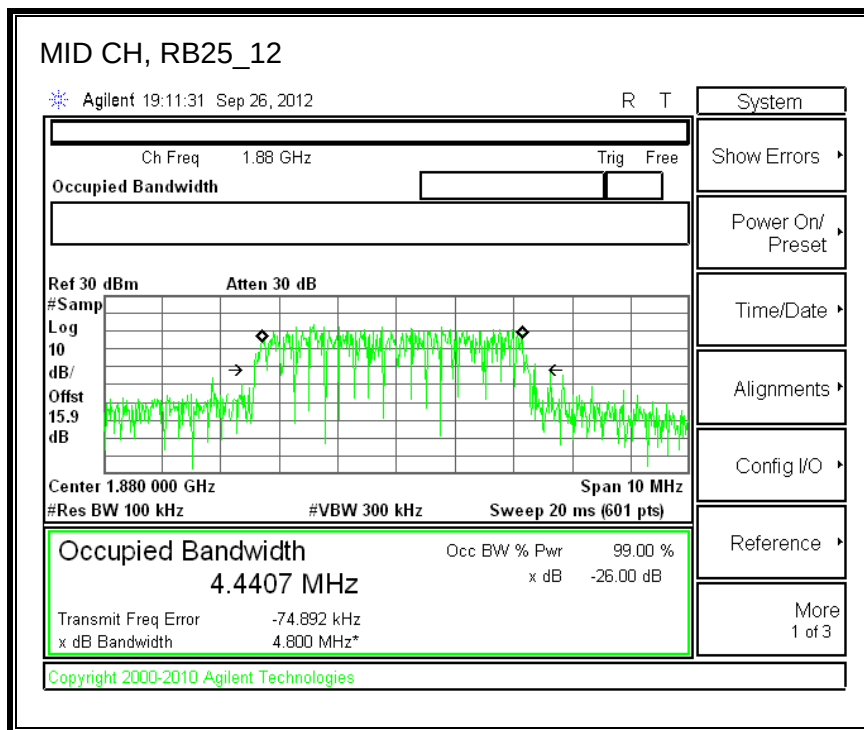




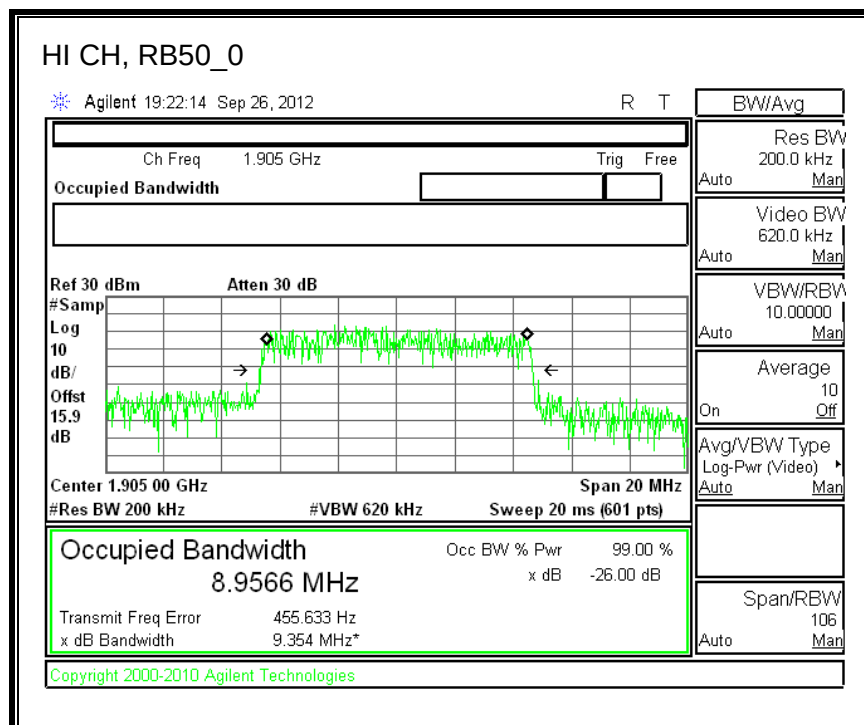
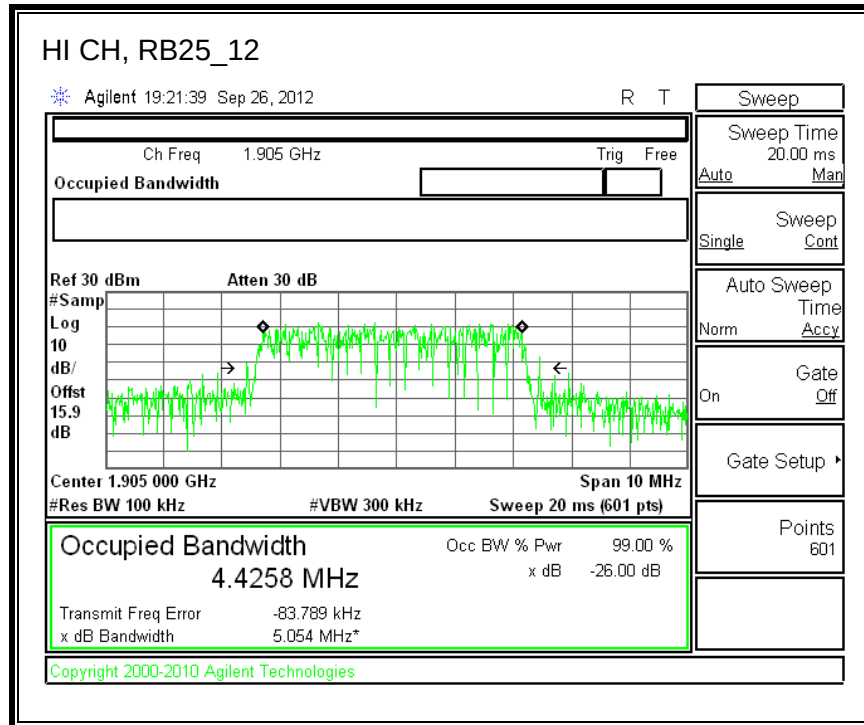
**Band 2 (10 MHz BANDWIDTH)**

**QPSK**



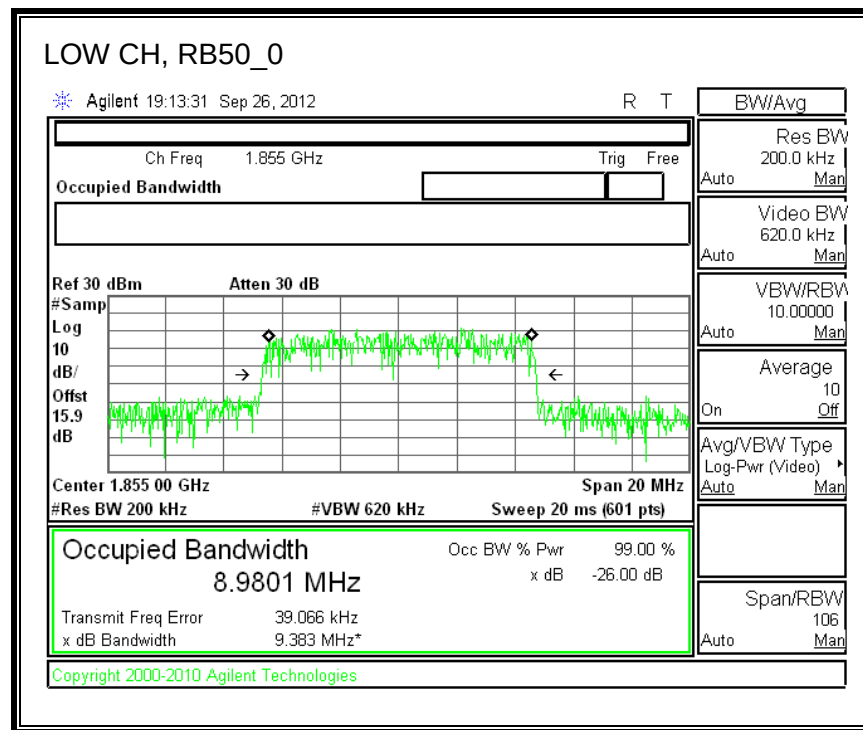
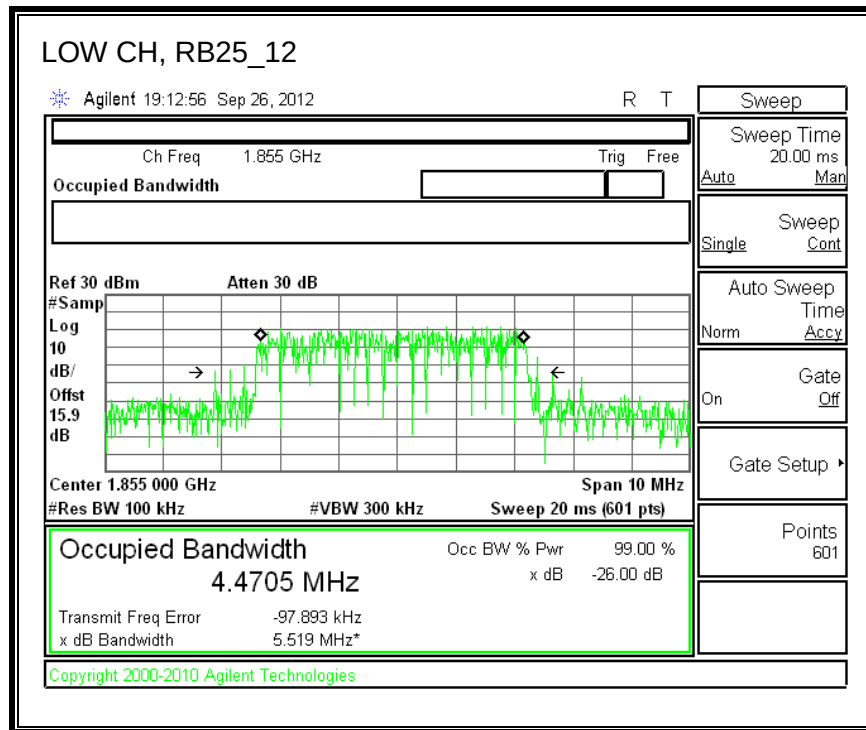


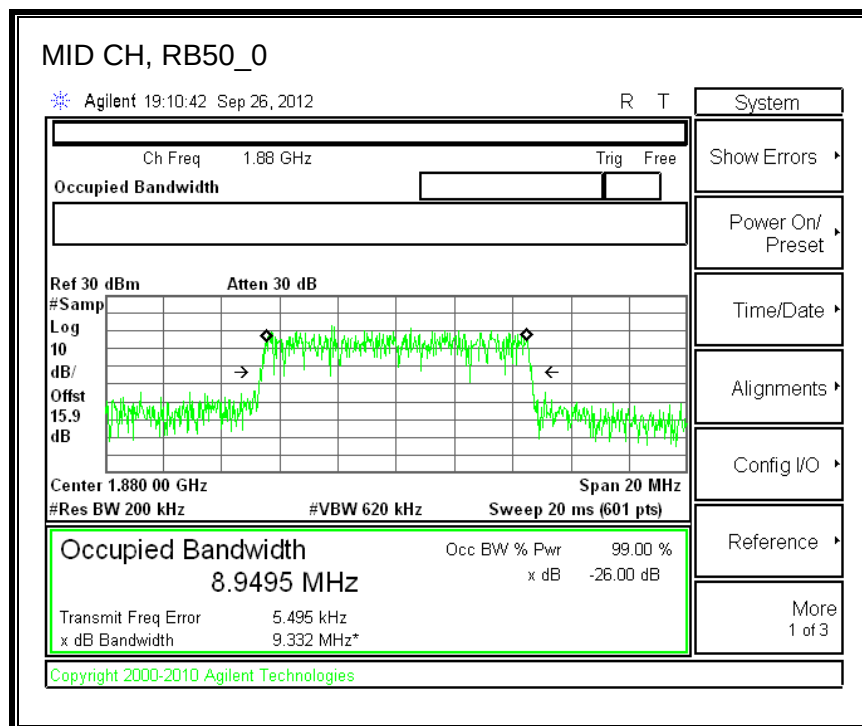
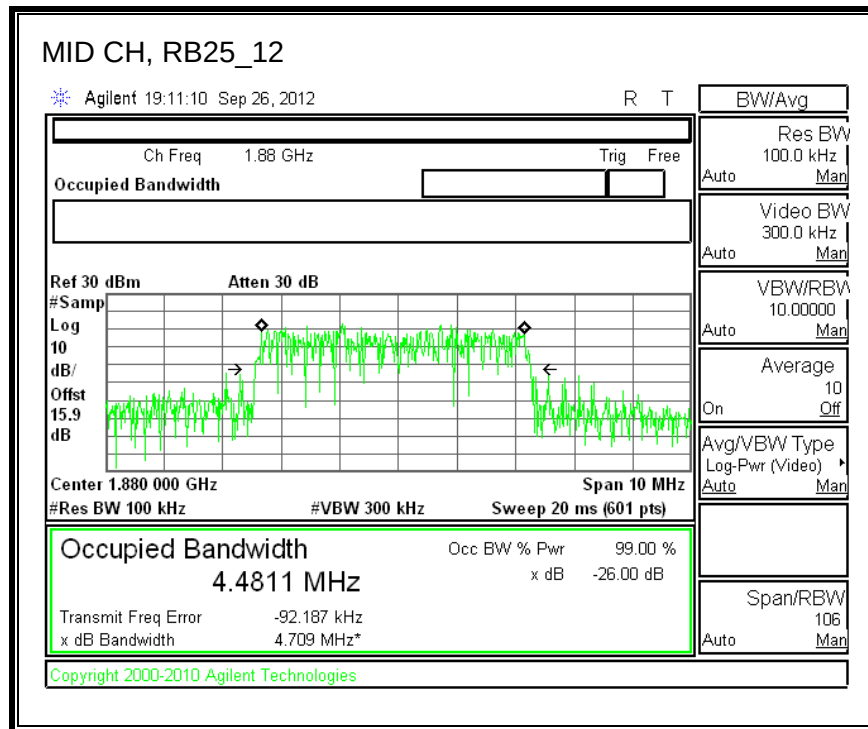


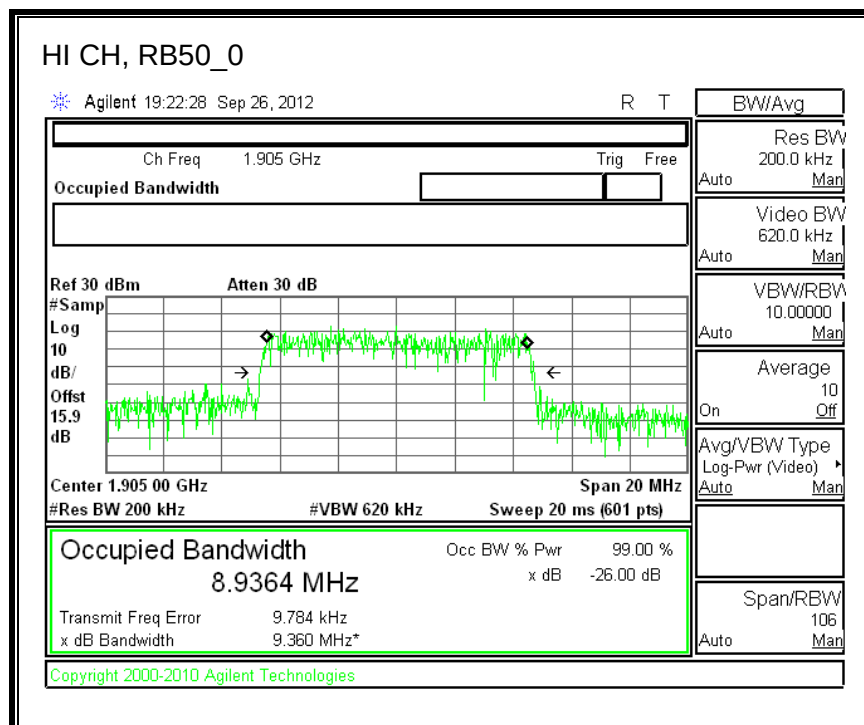
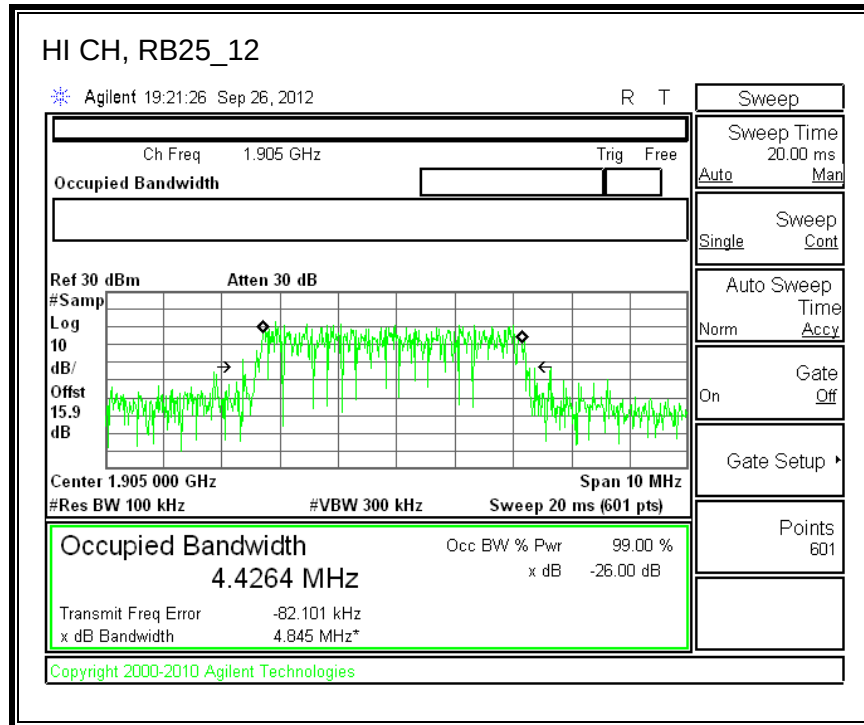


**Band 2 (10 MHz BANDWIDTH)**

**16QAM**

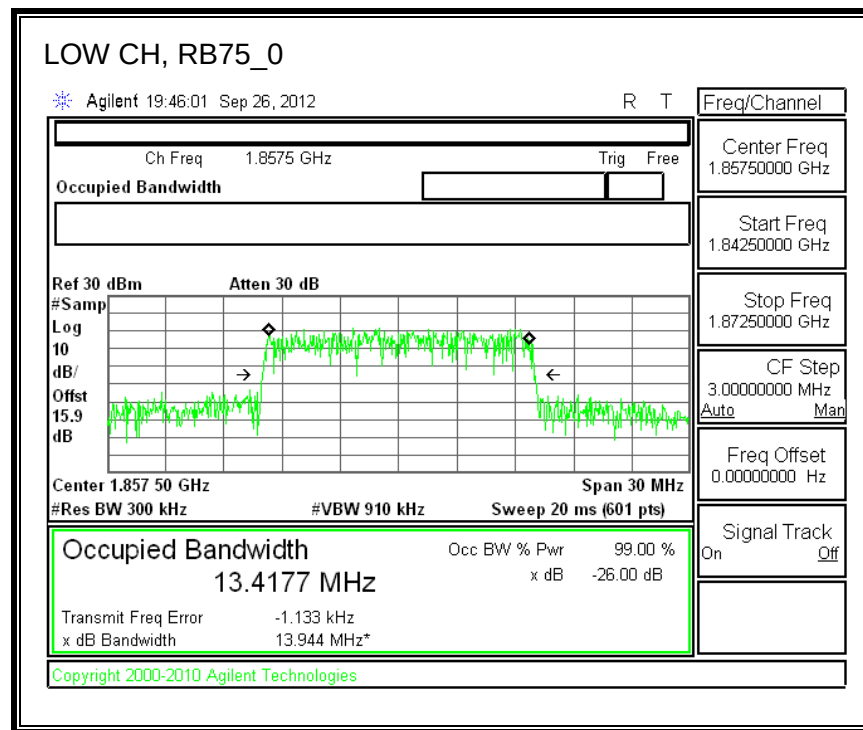
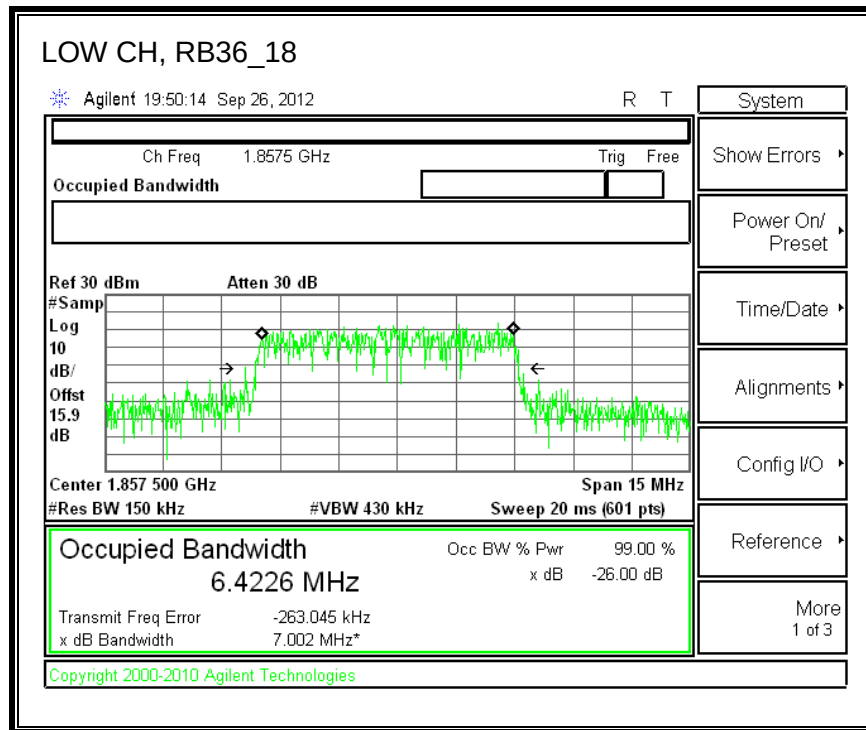


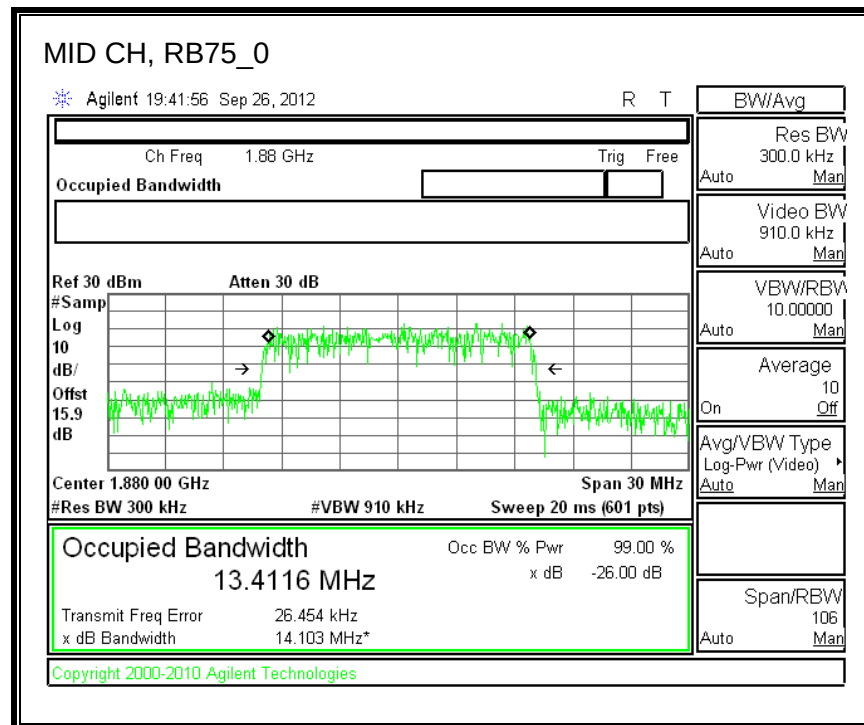
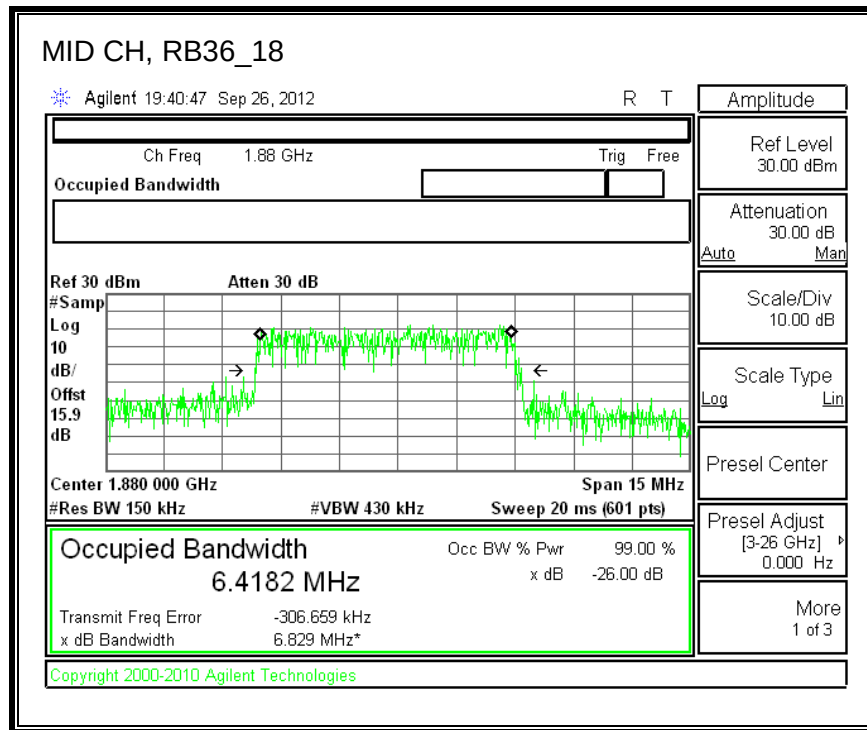


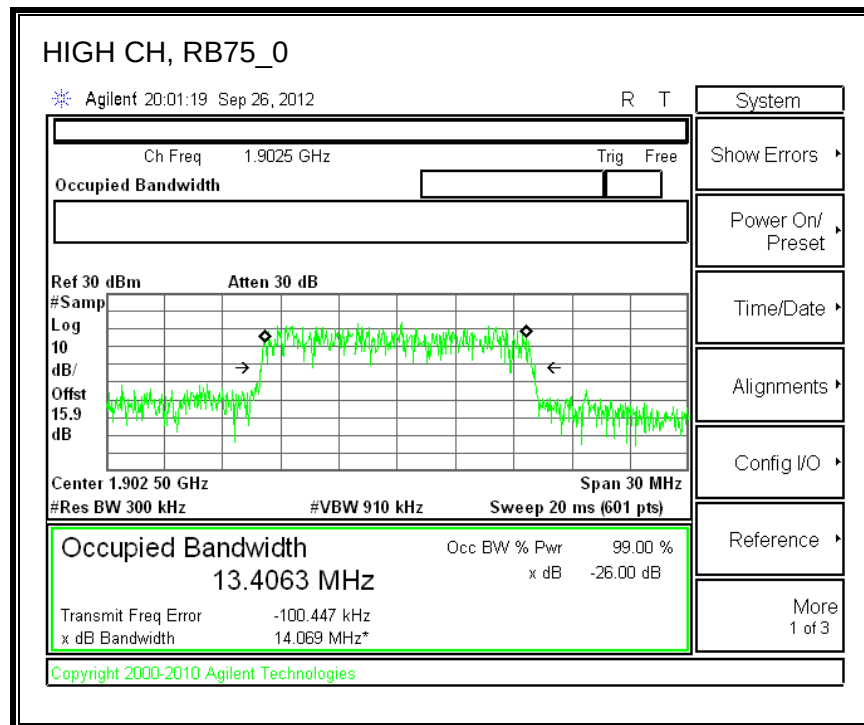
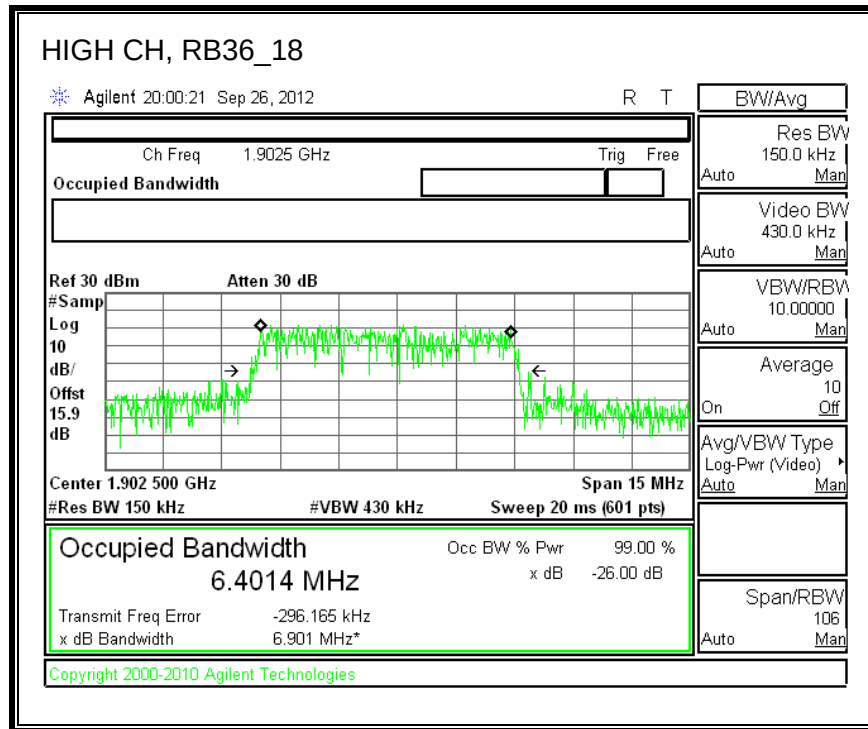


**Band 2 (15 MHz BANDWIDTH)**

**QPSK**

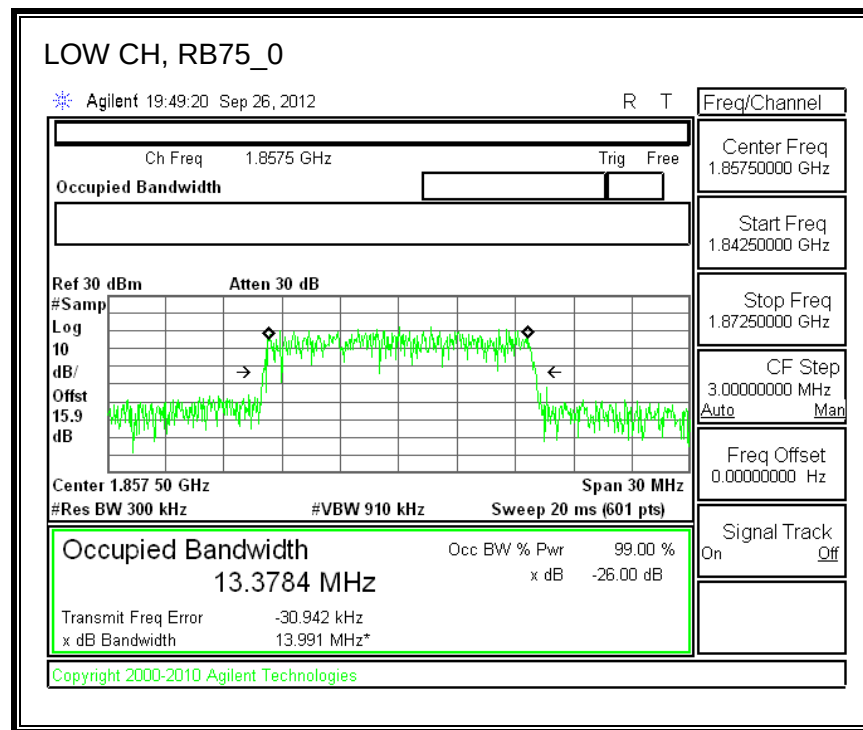
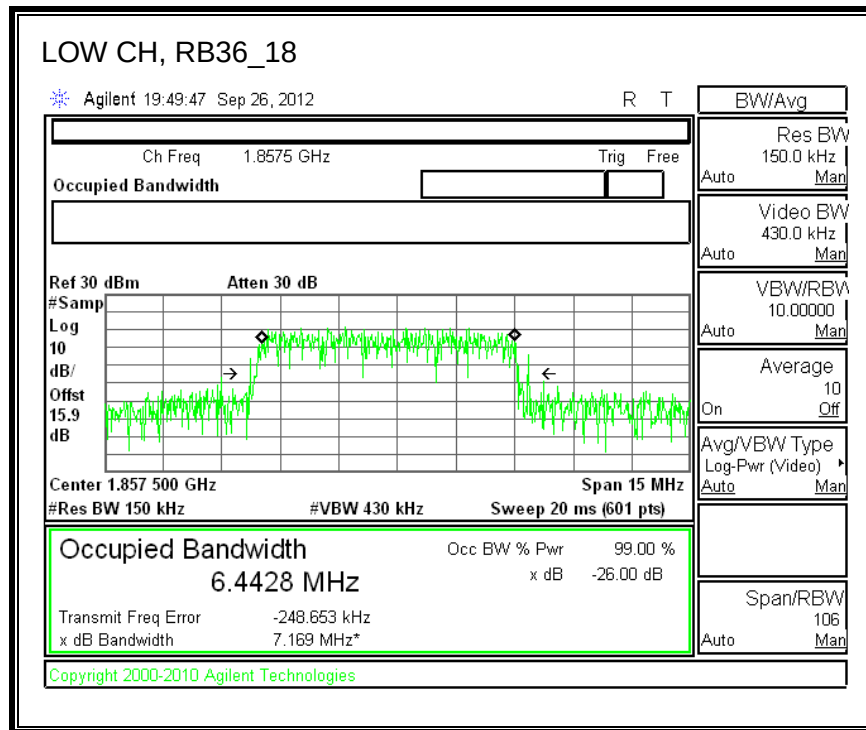




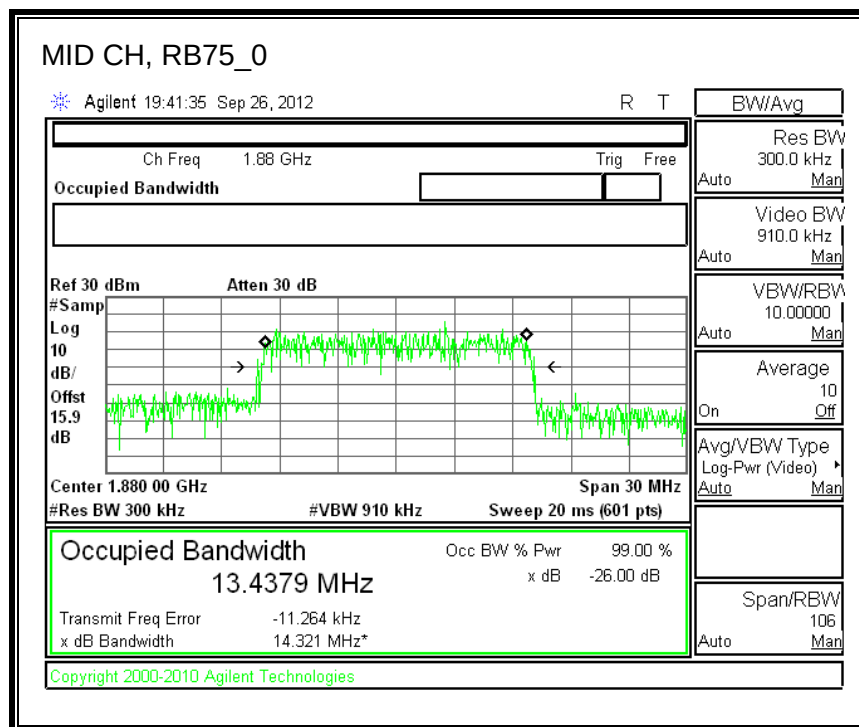
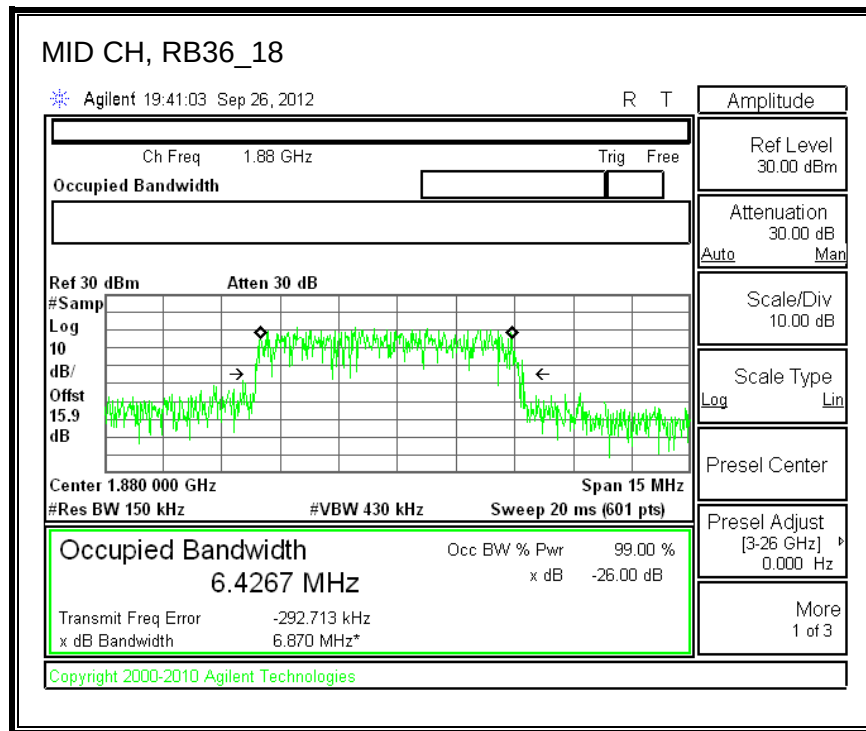


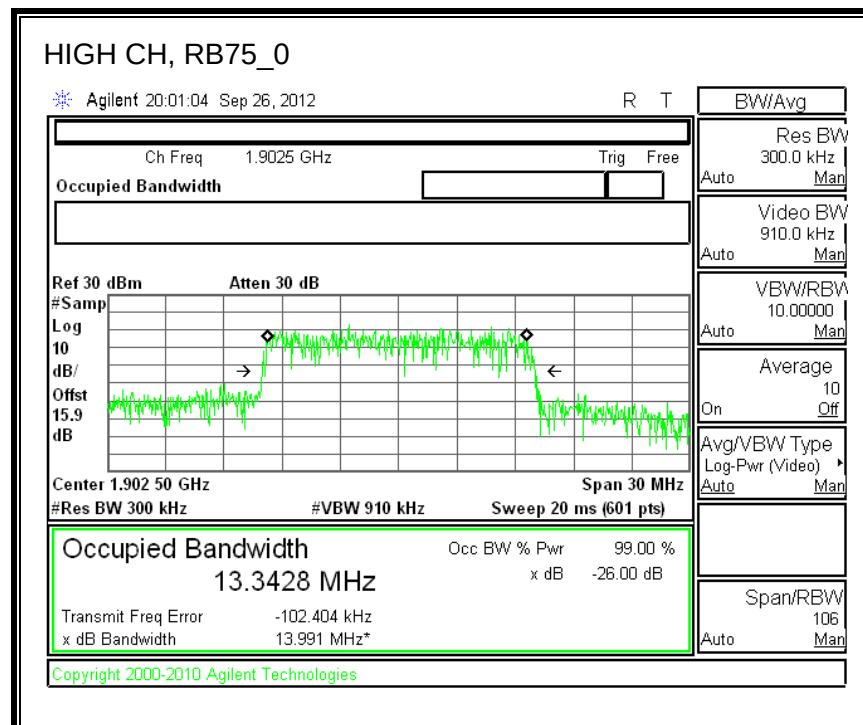
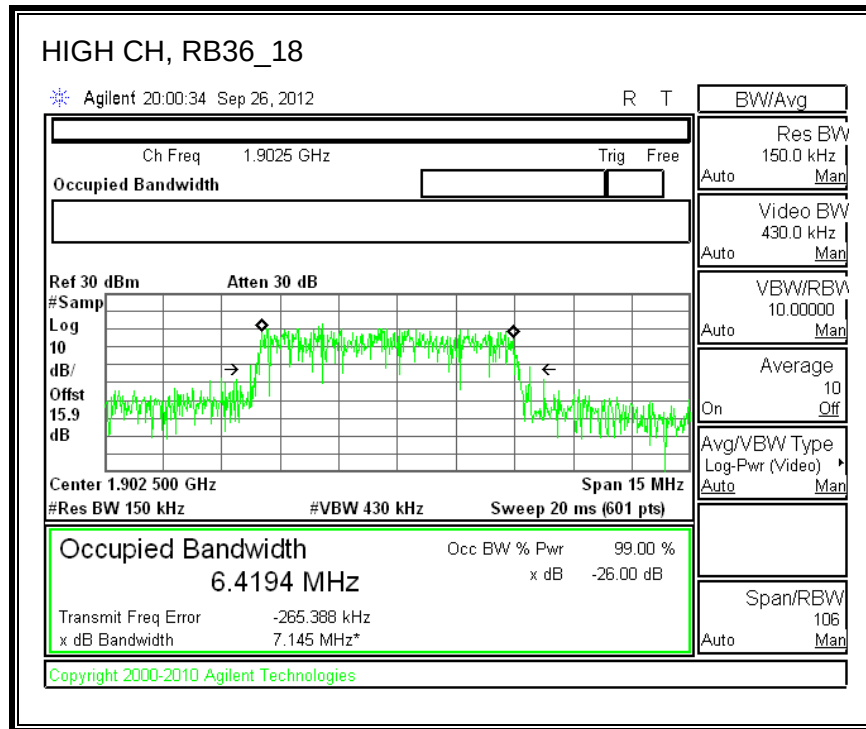
**Band 2 (15 MHz BANDWIDTH)**

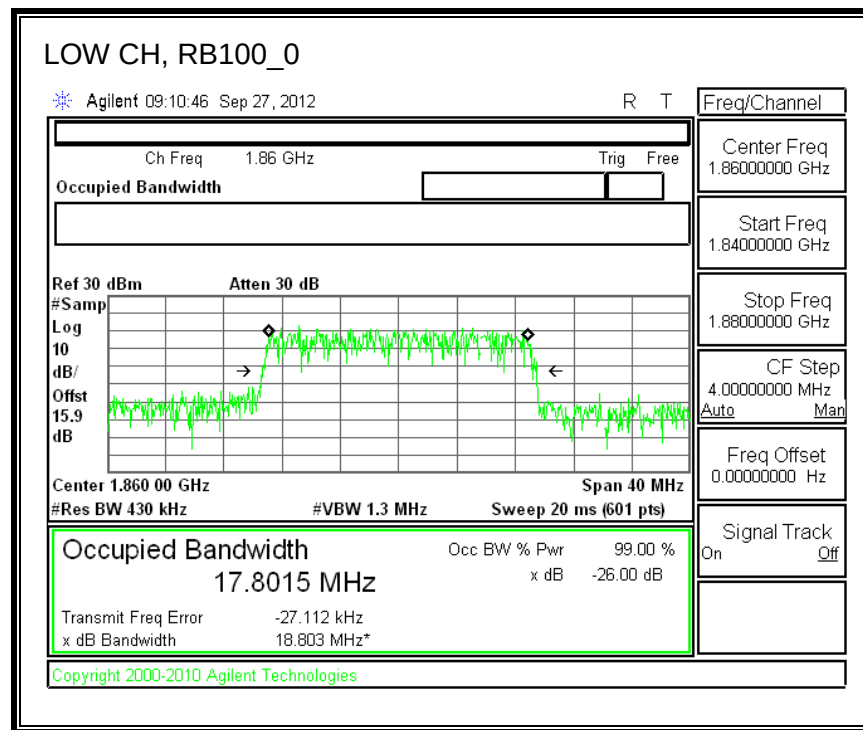
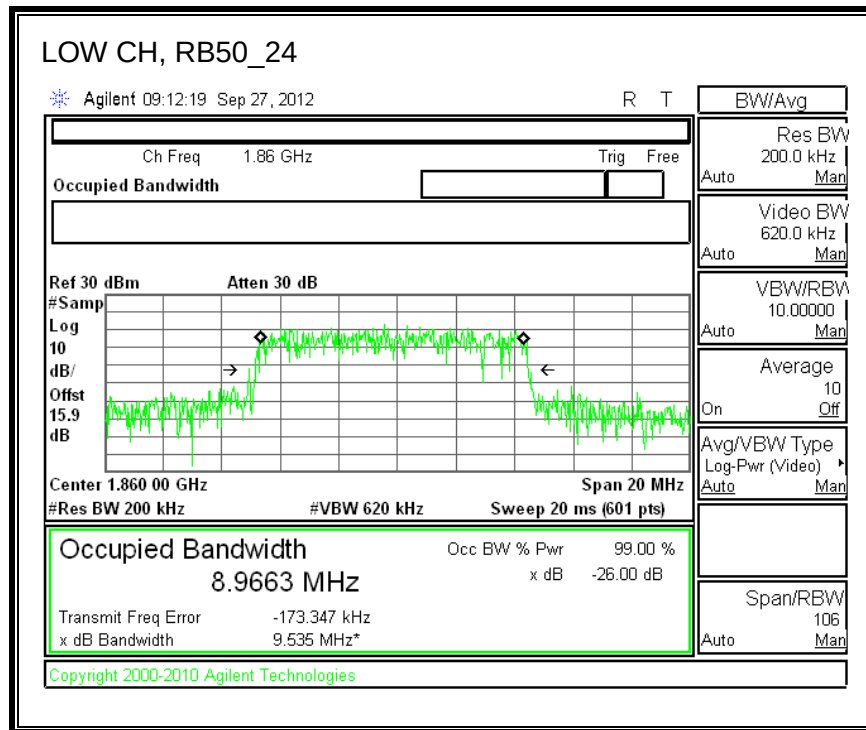
**16QAM**

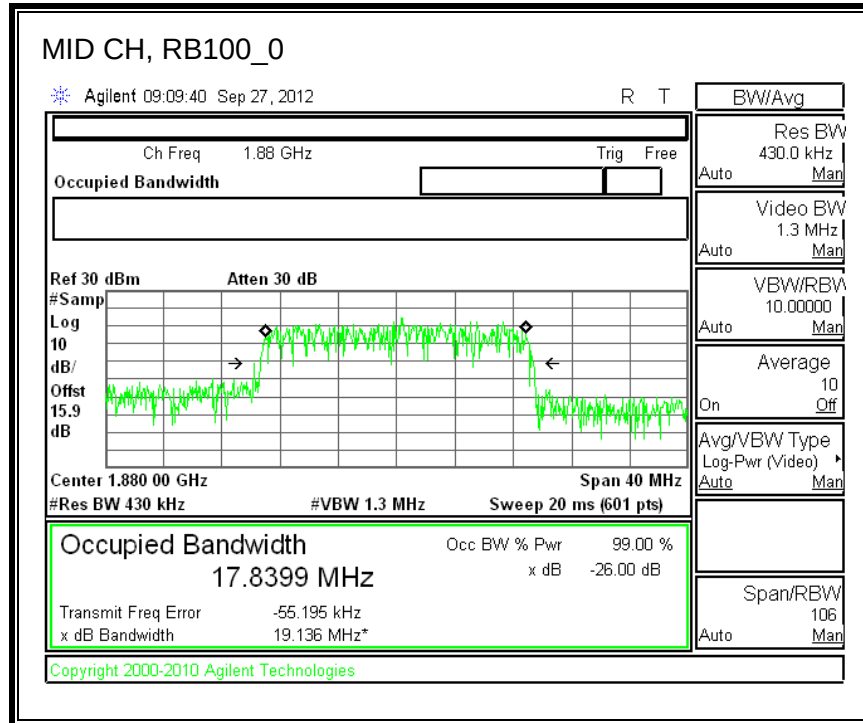
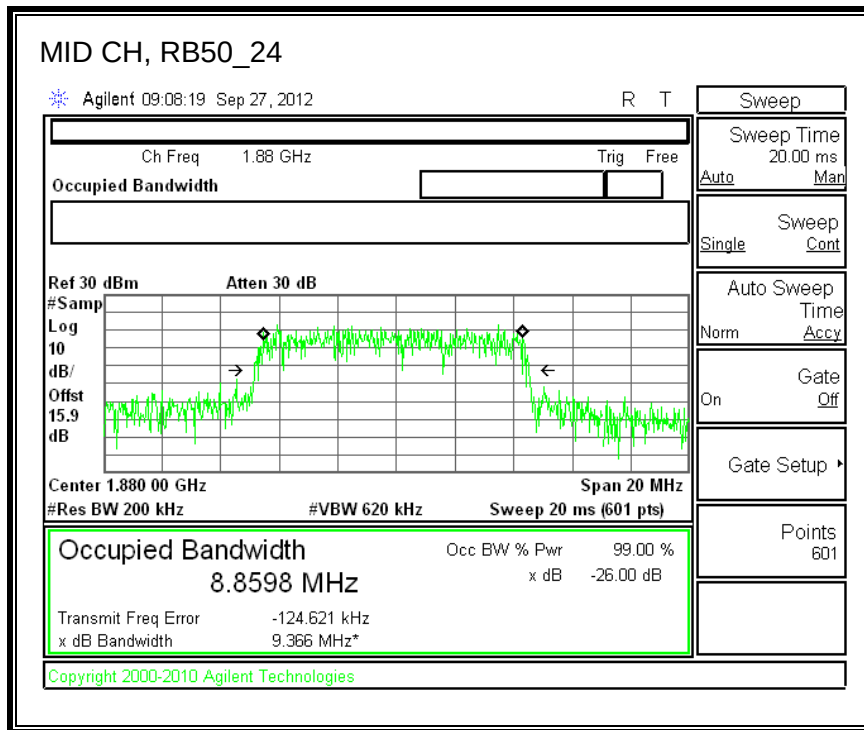


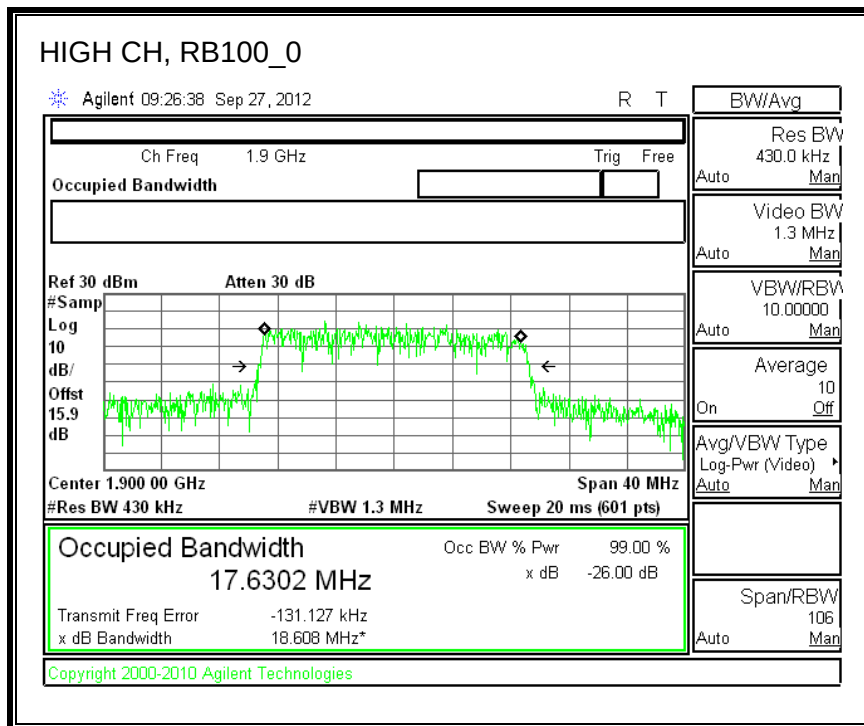
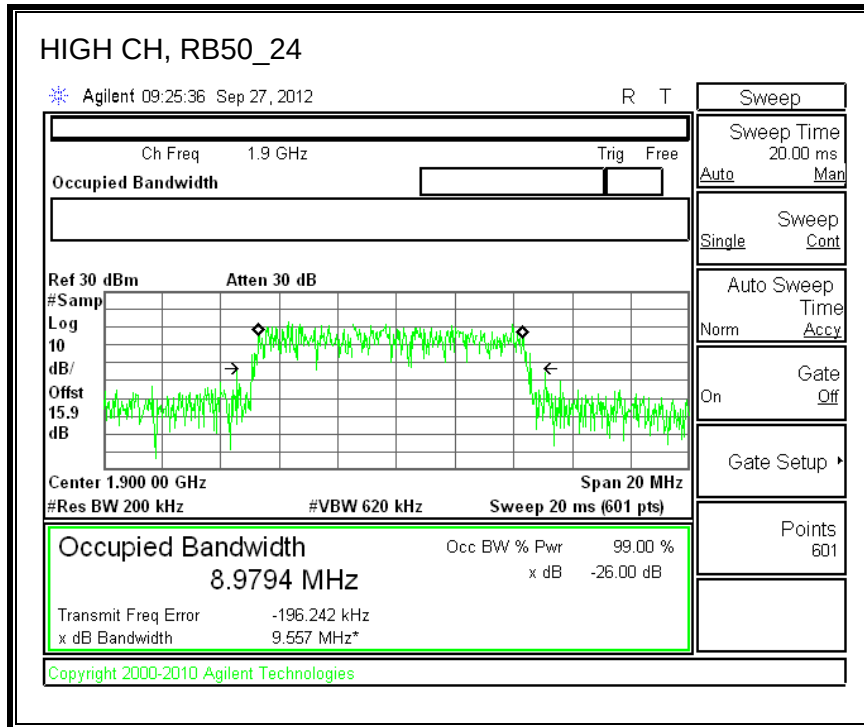






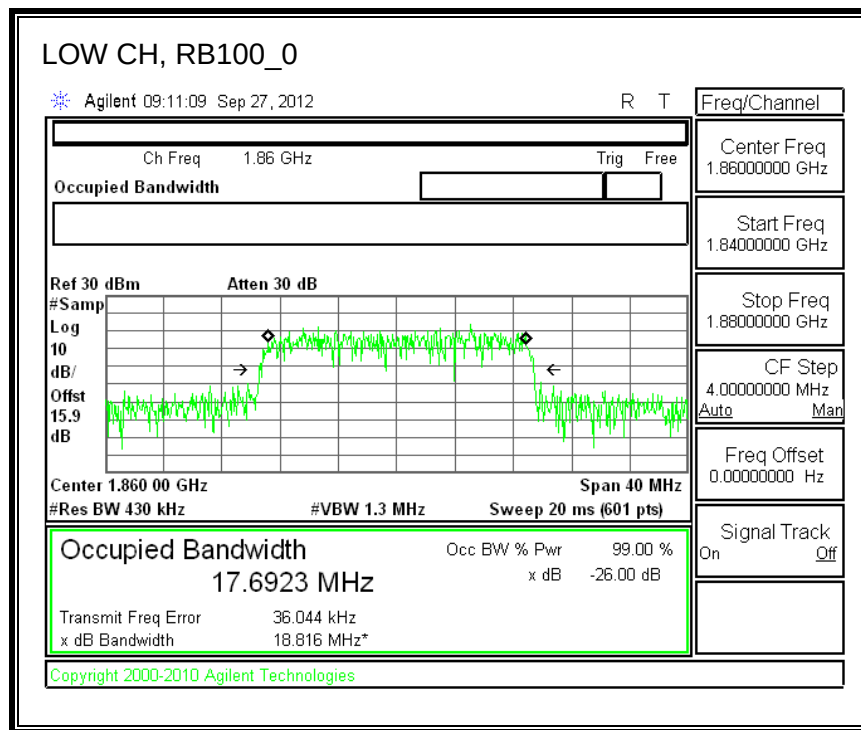
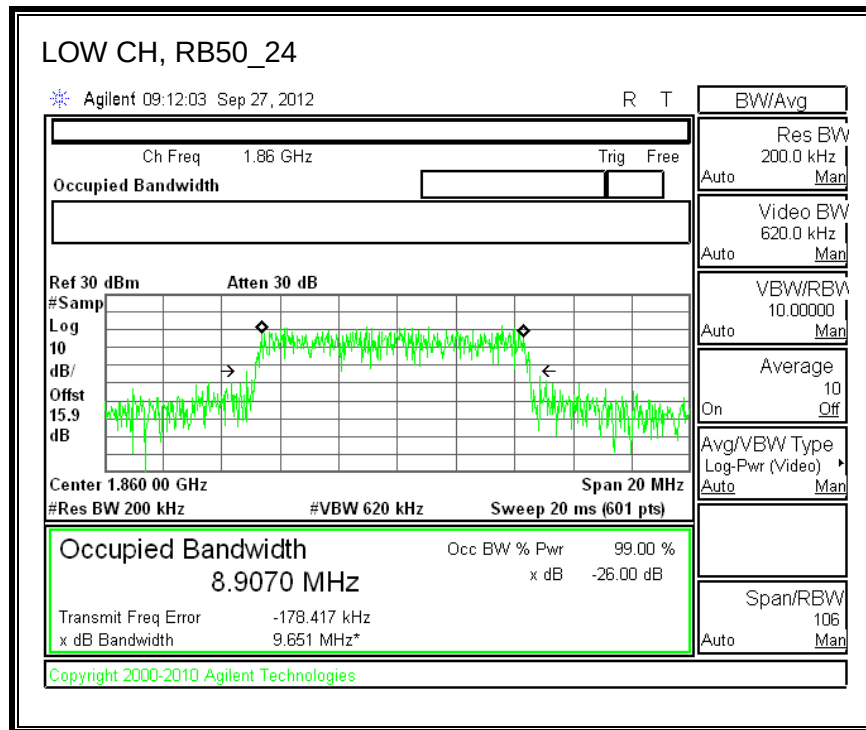
**Band 2 (20 MHz BANDWIDTH)****QPSK**

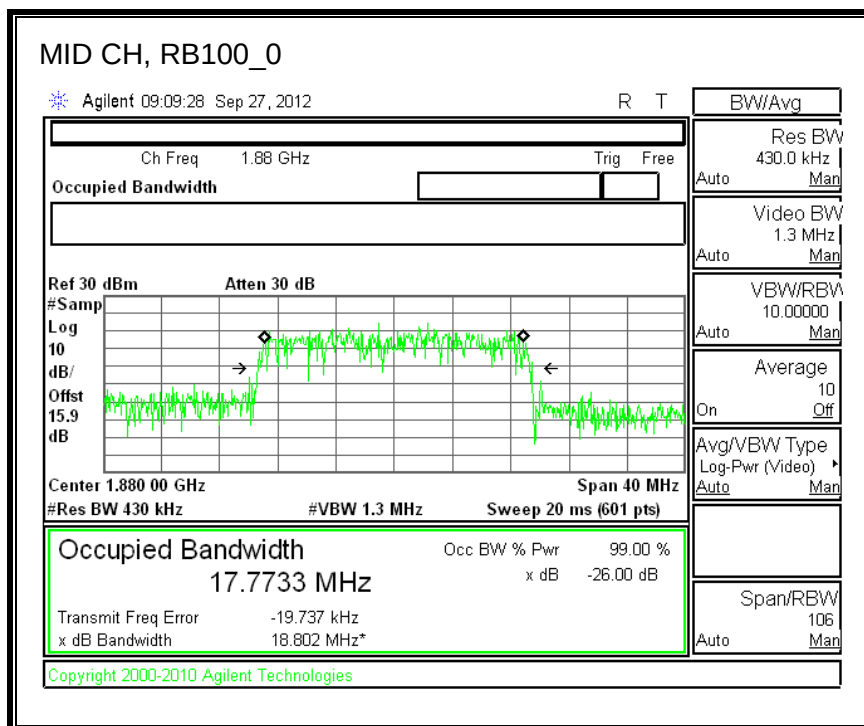
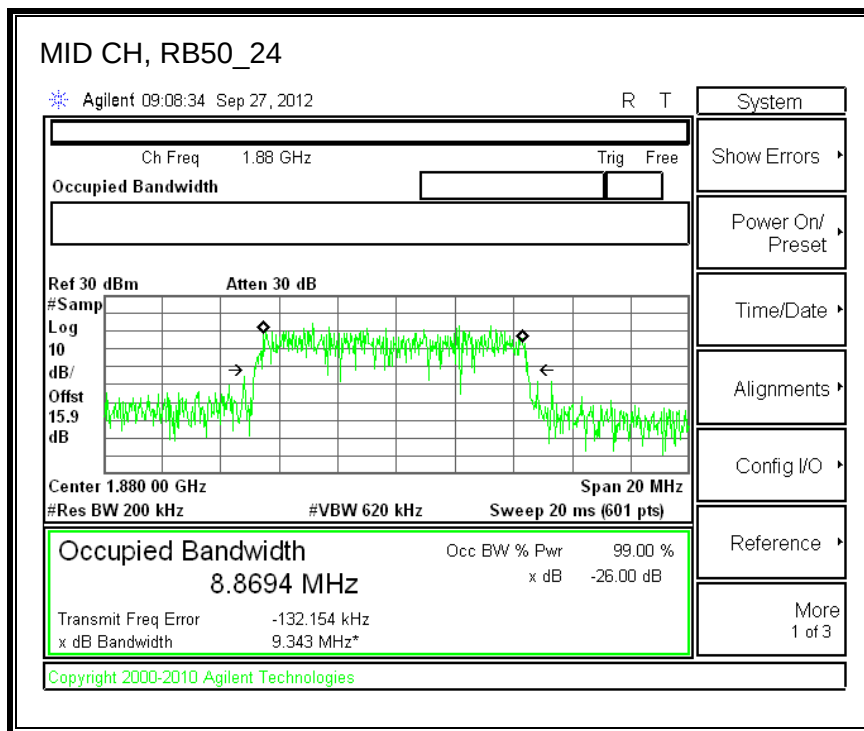


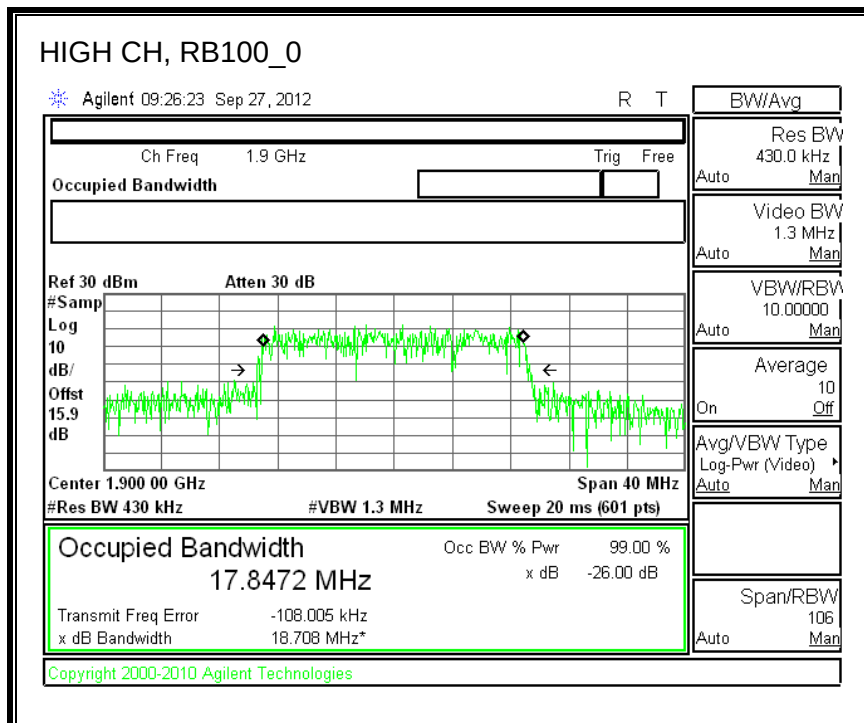
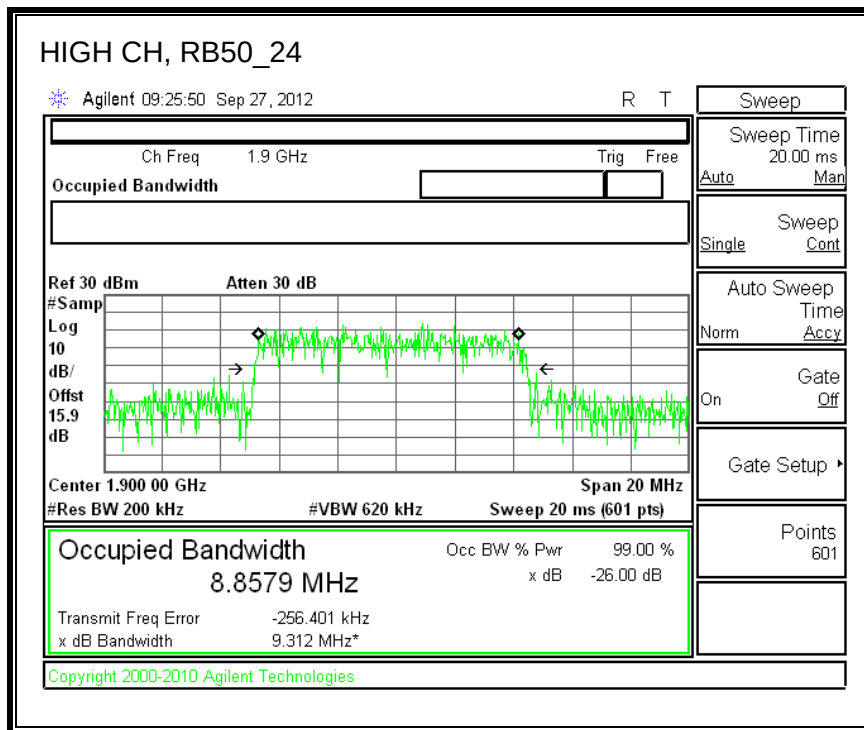


**Band 2 (20 MHz BANDWIDTH)**

**16QAM**



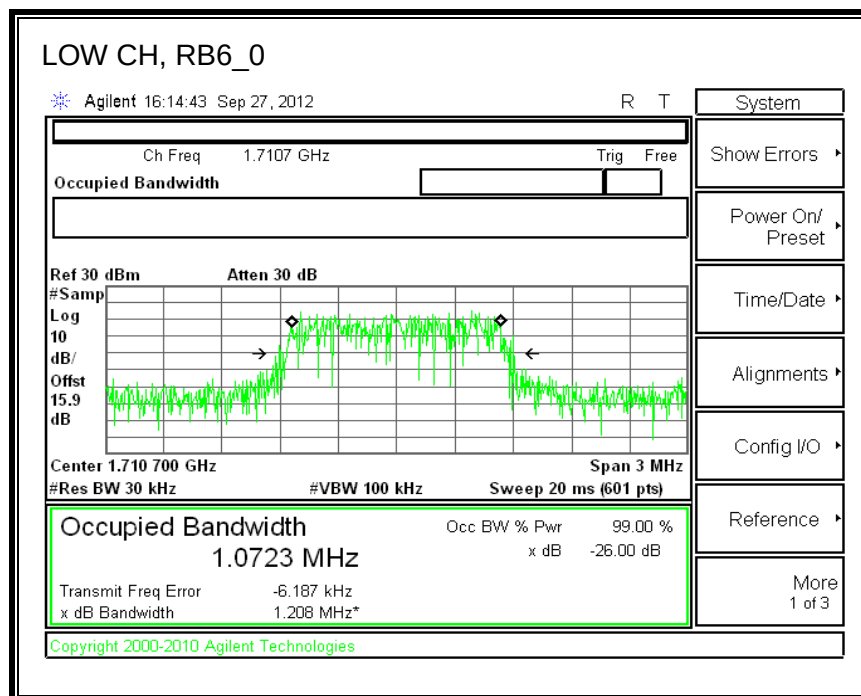
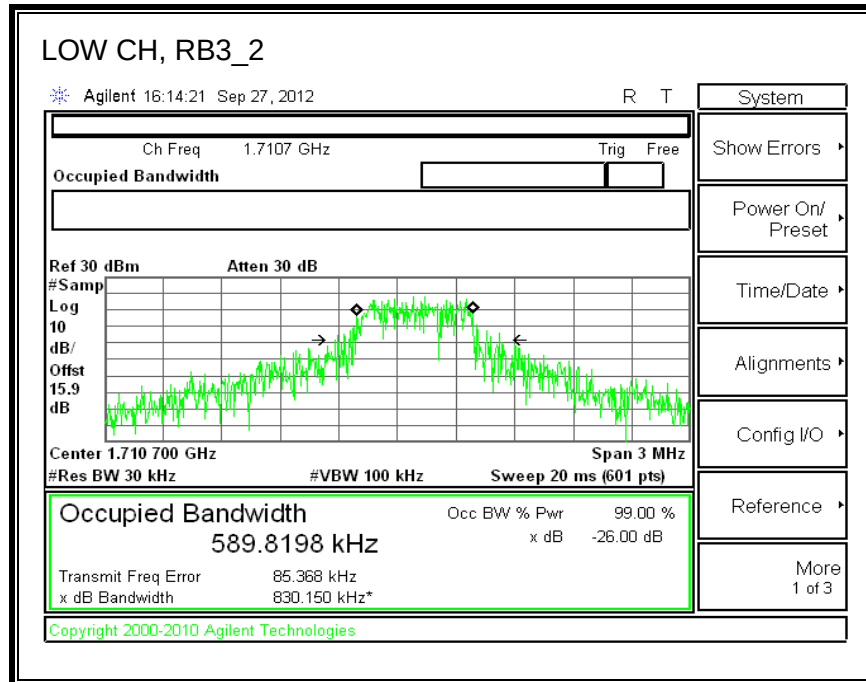


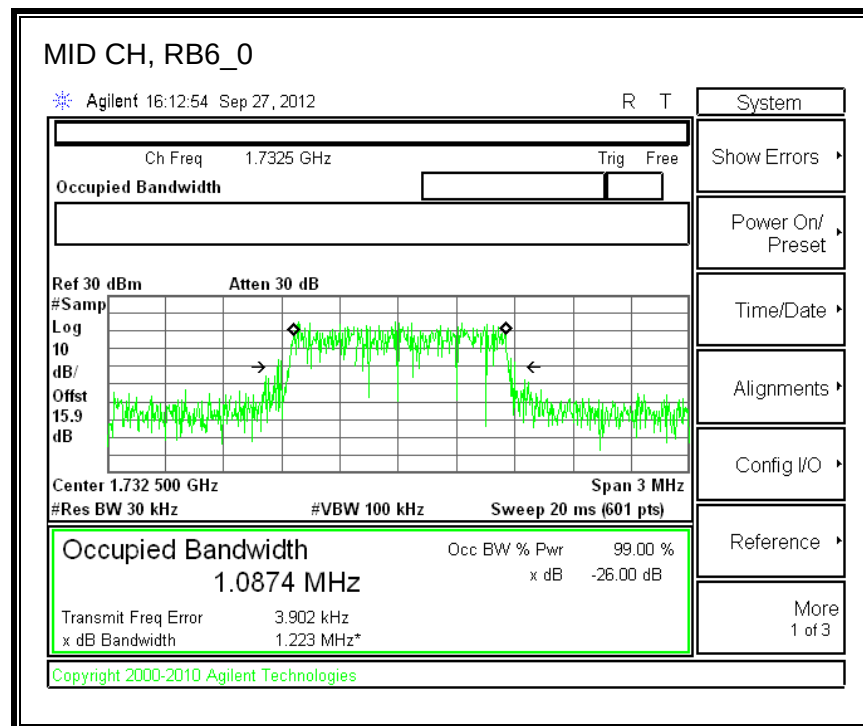
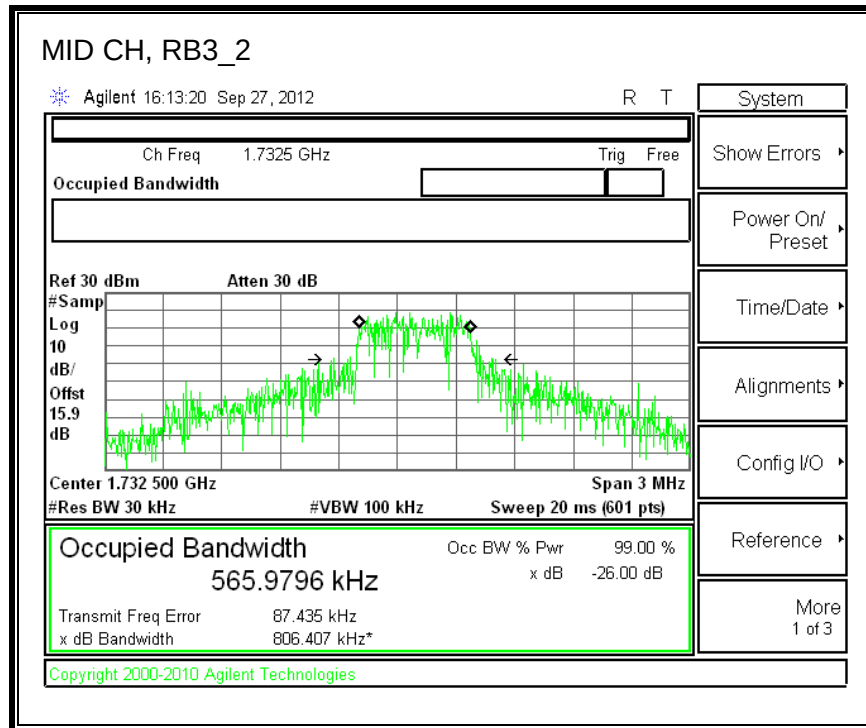


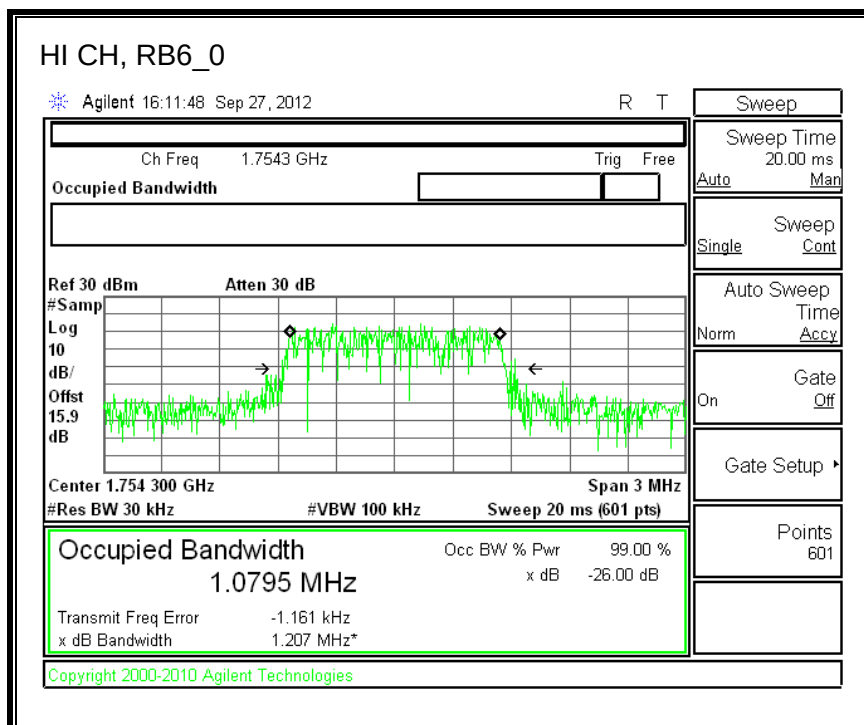
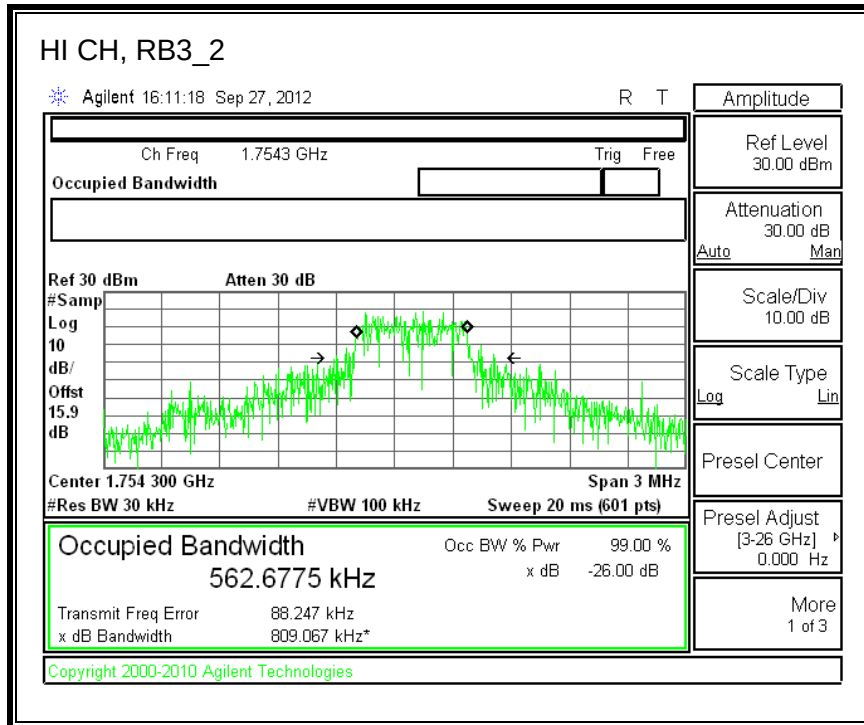


#### 8.1.4. LTE Band 4

##### QPSK 1.4 MHz BANDWIDTH)

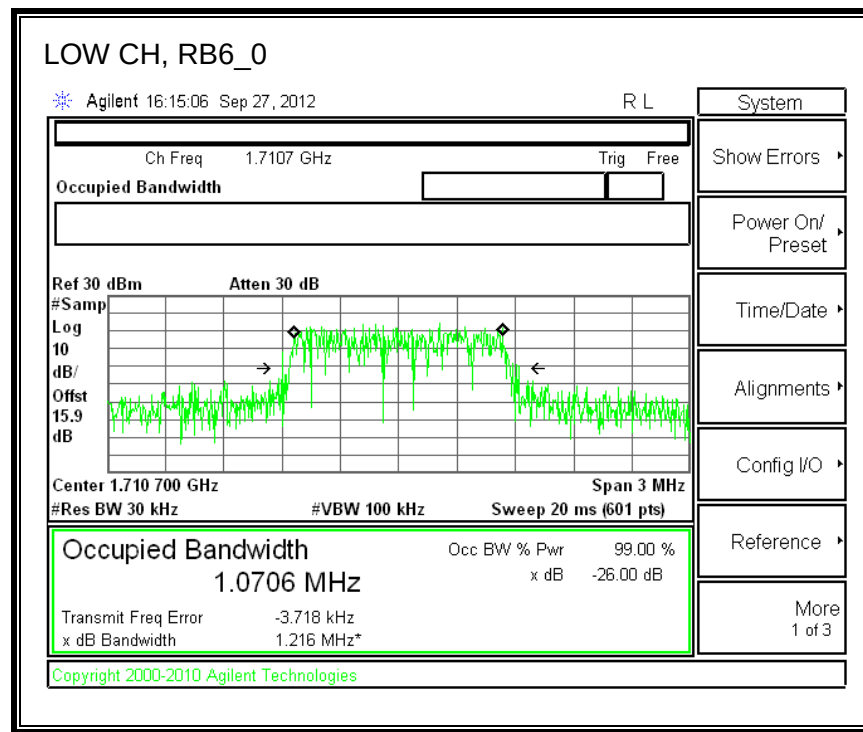
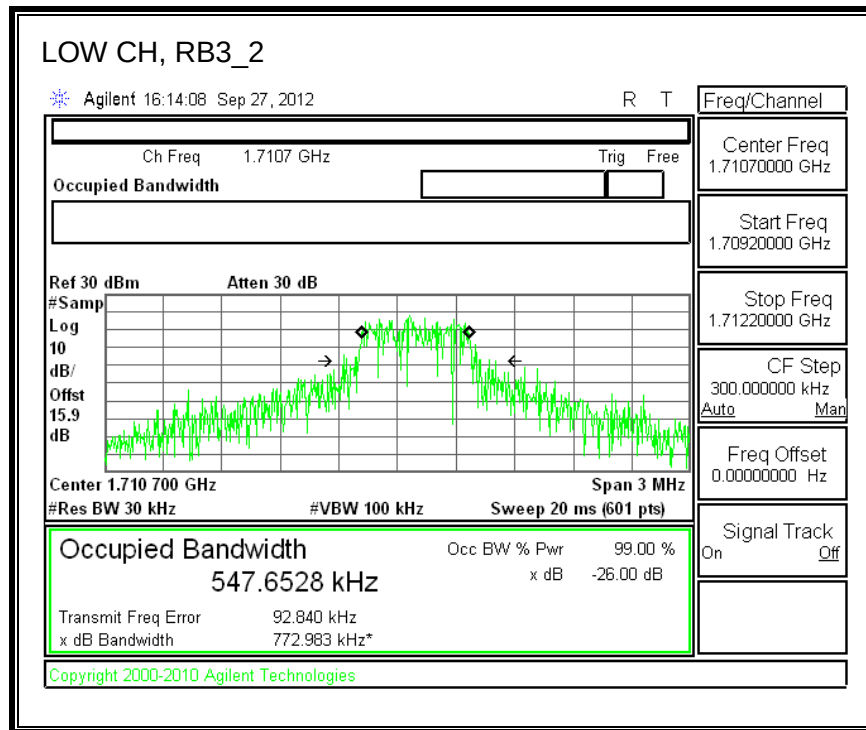


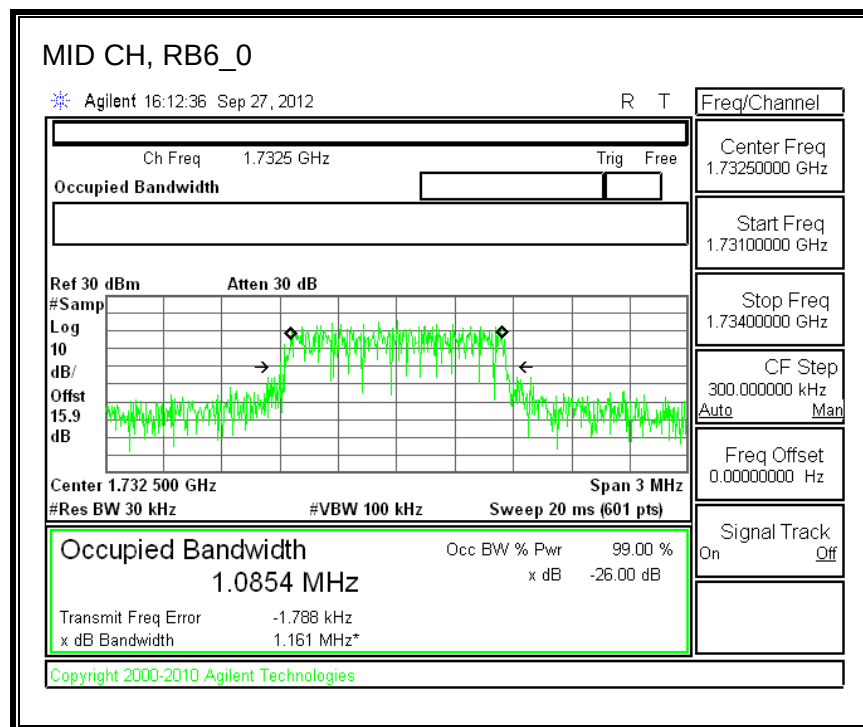
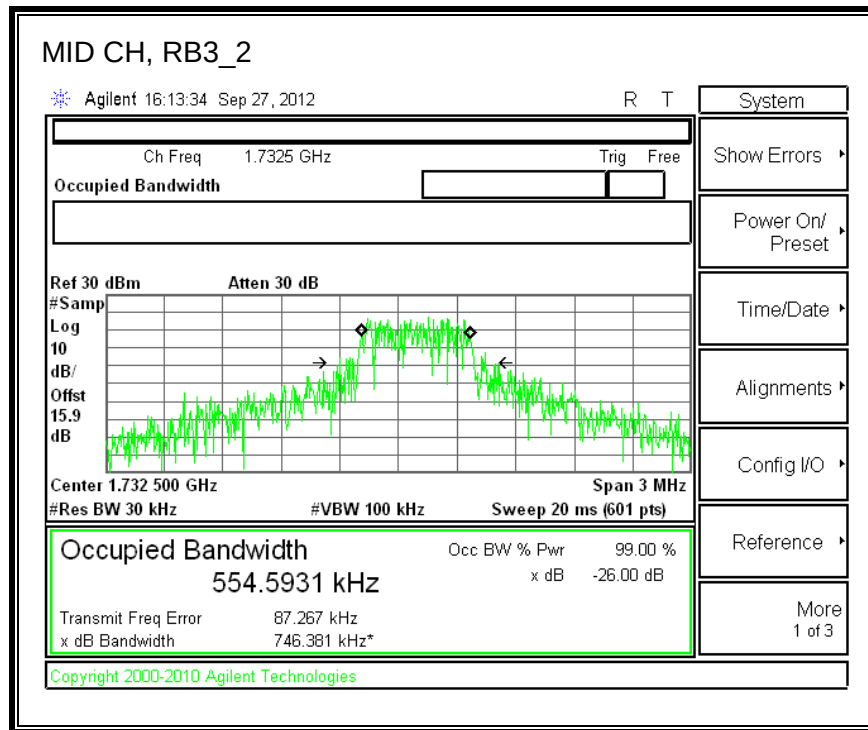


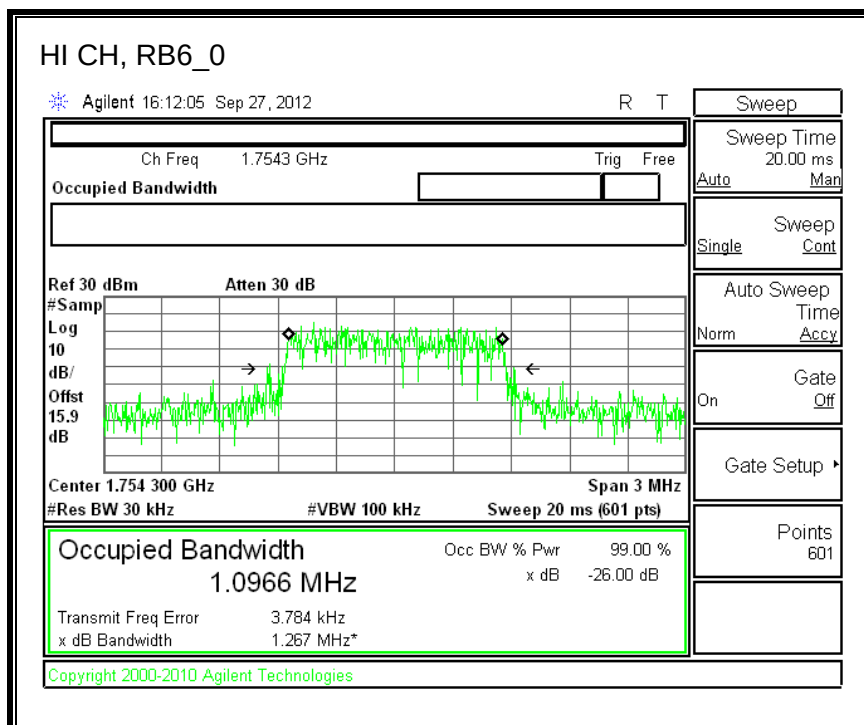
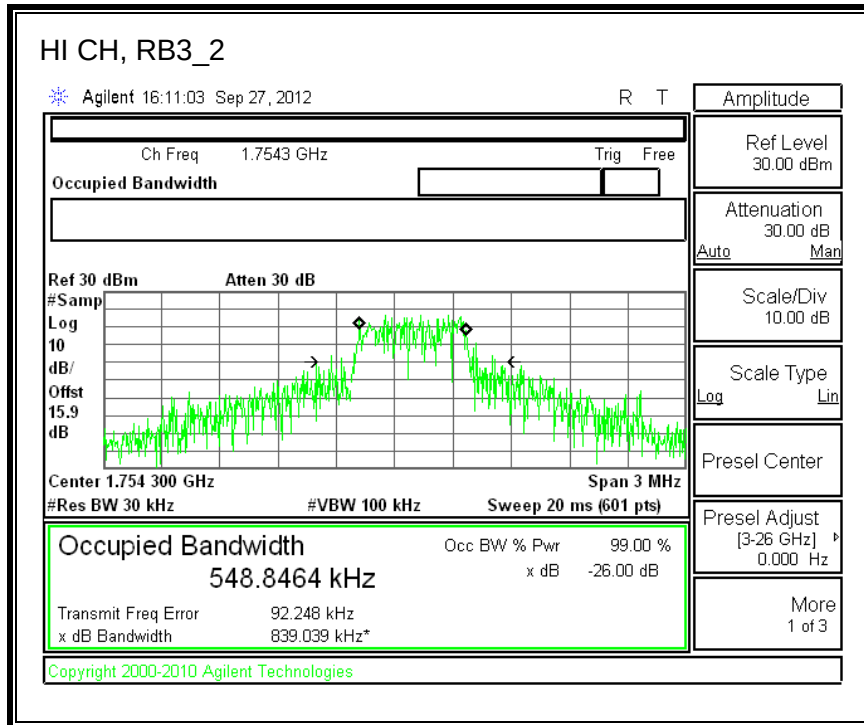


**Band 4 (1.4 MHz BANDWIDTH)**

**16QAM**

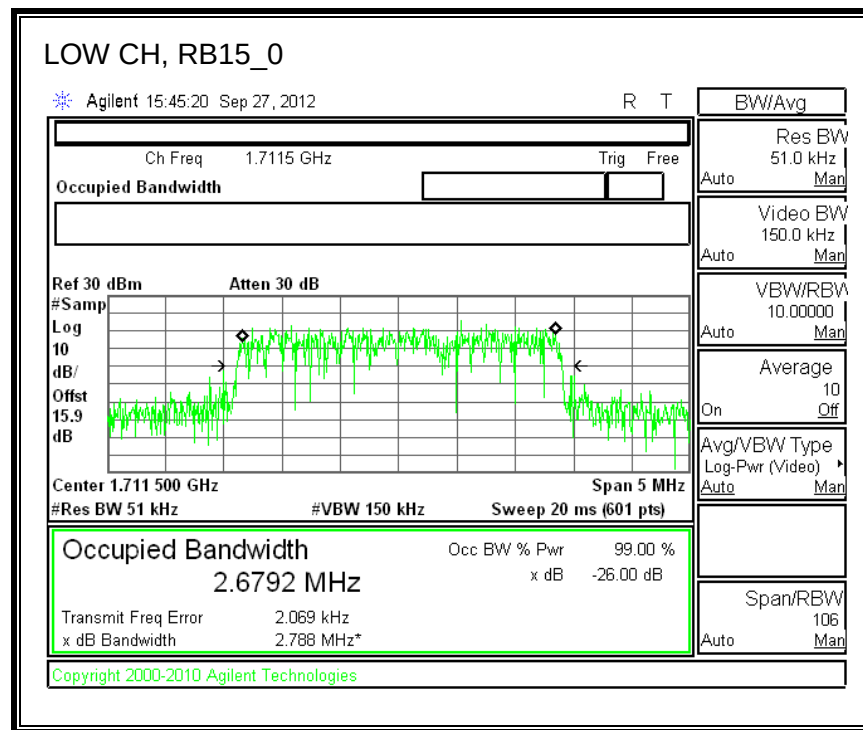
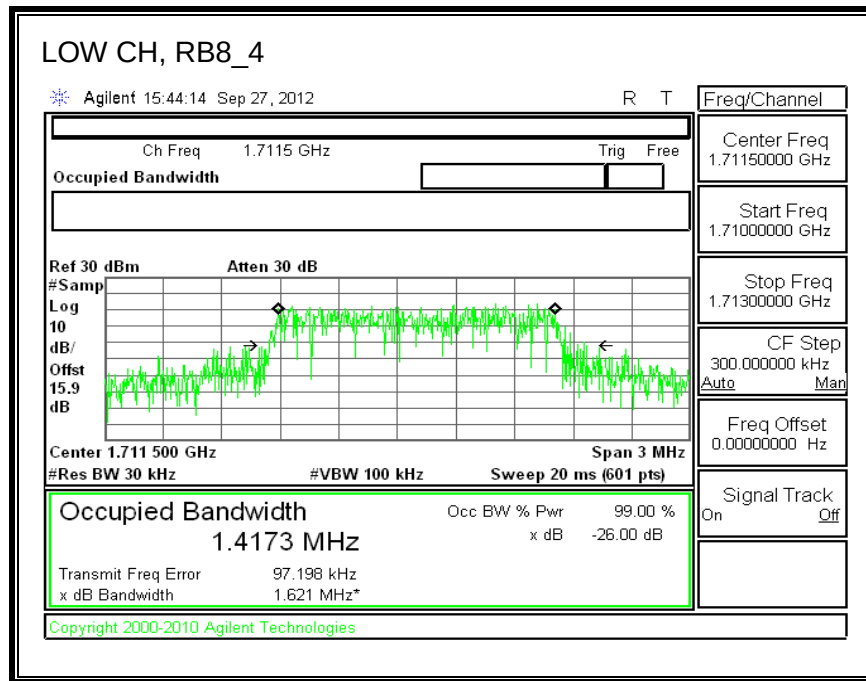


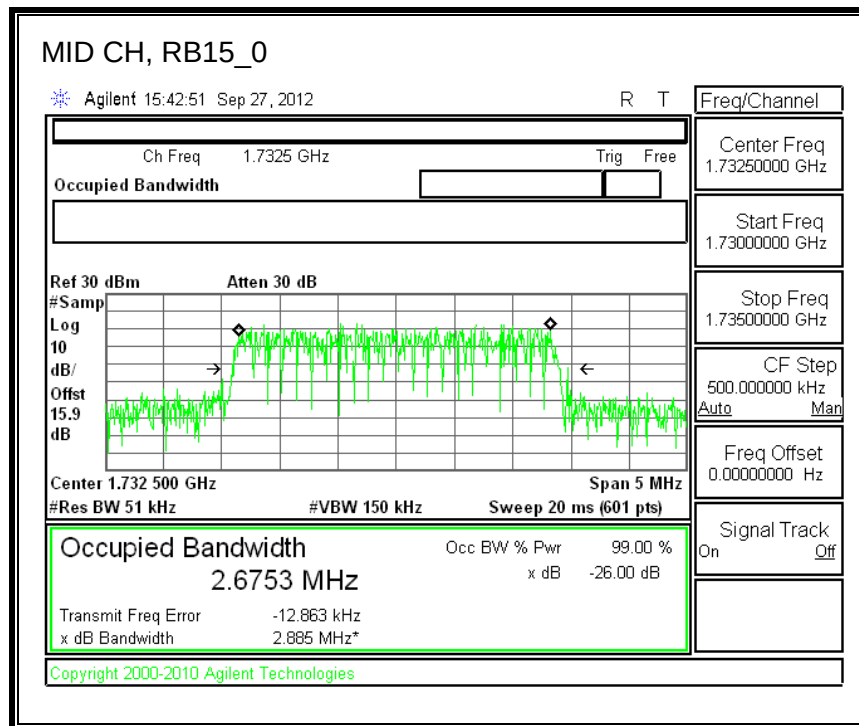
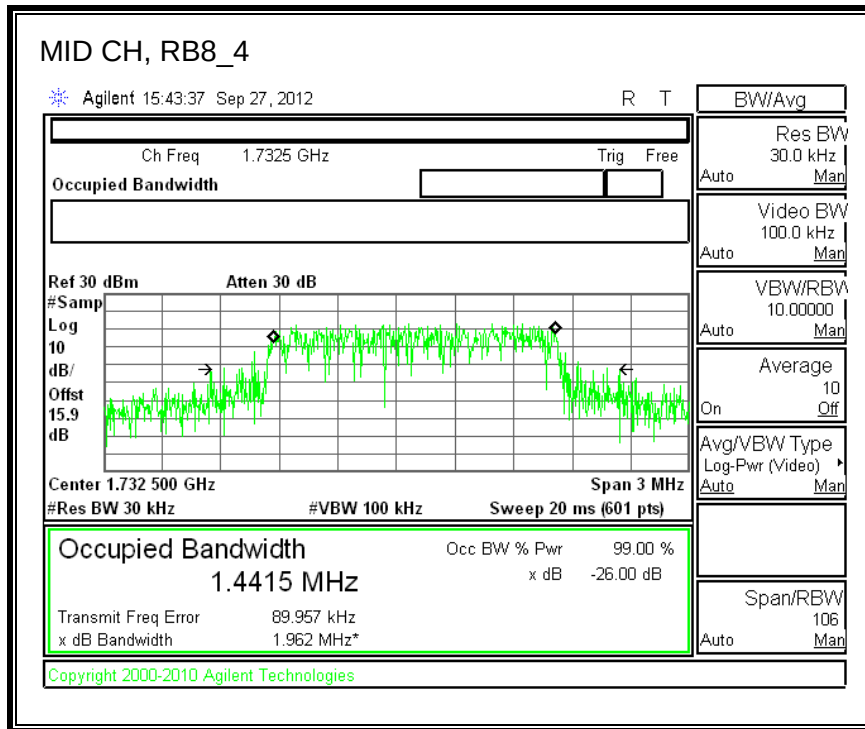




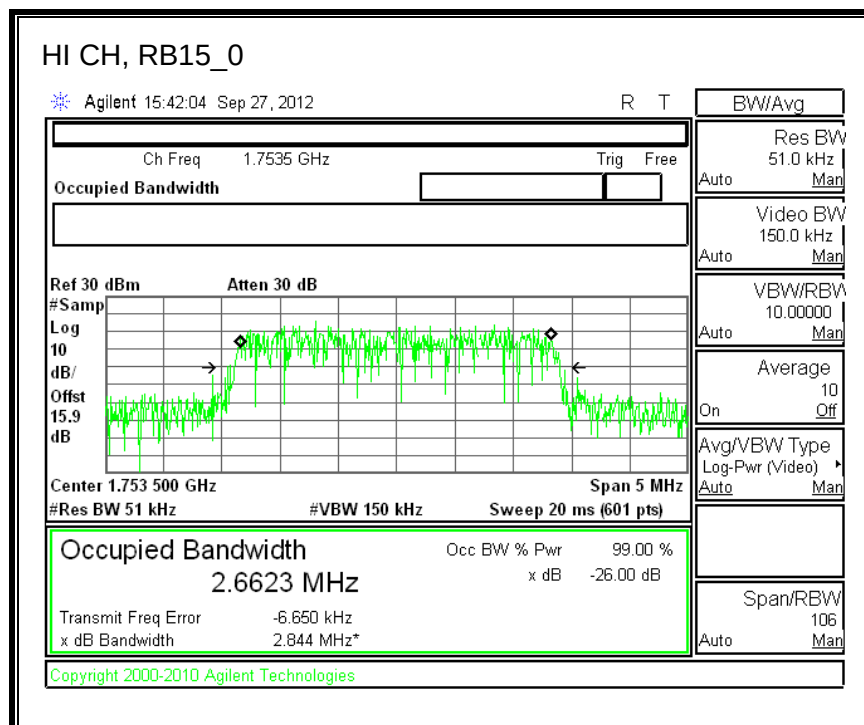
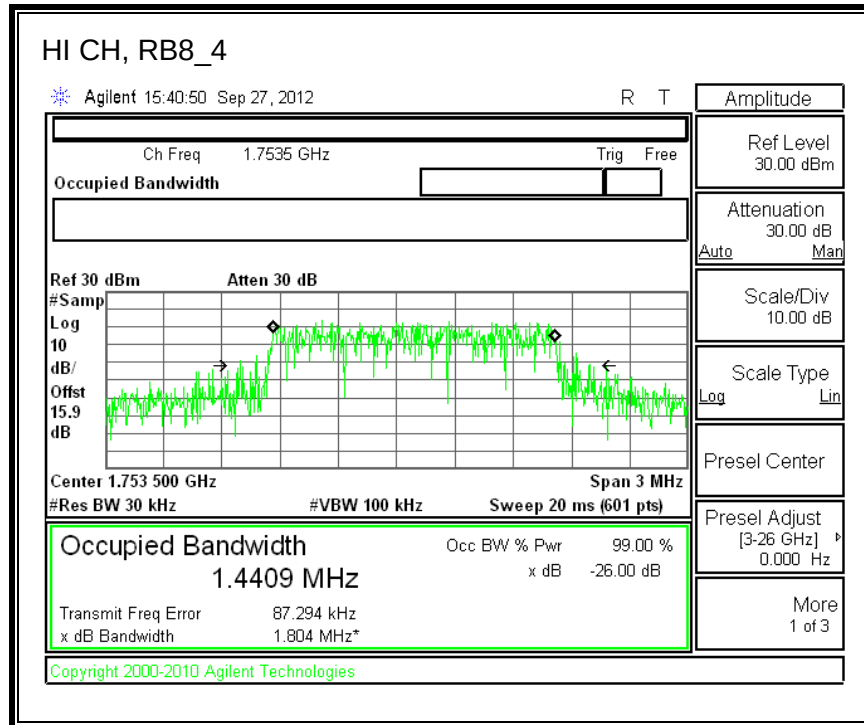
**Band 4 (3 MHz BANDWIDTH)**

**QPSK**



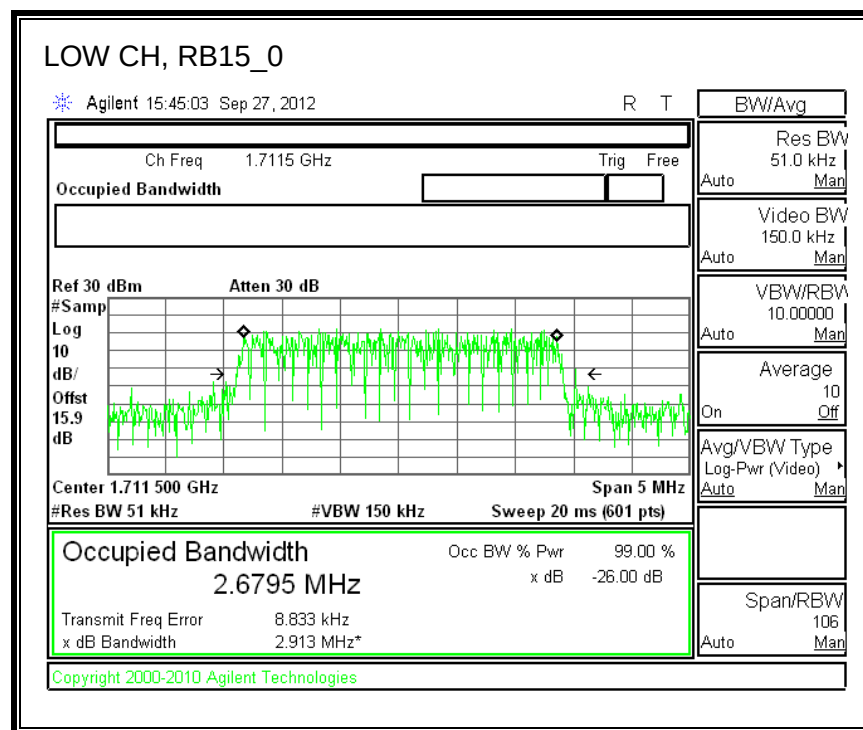
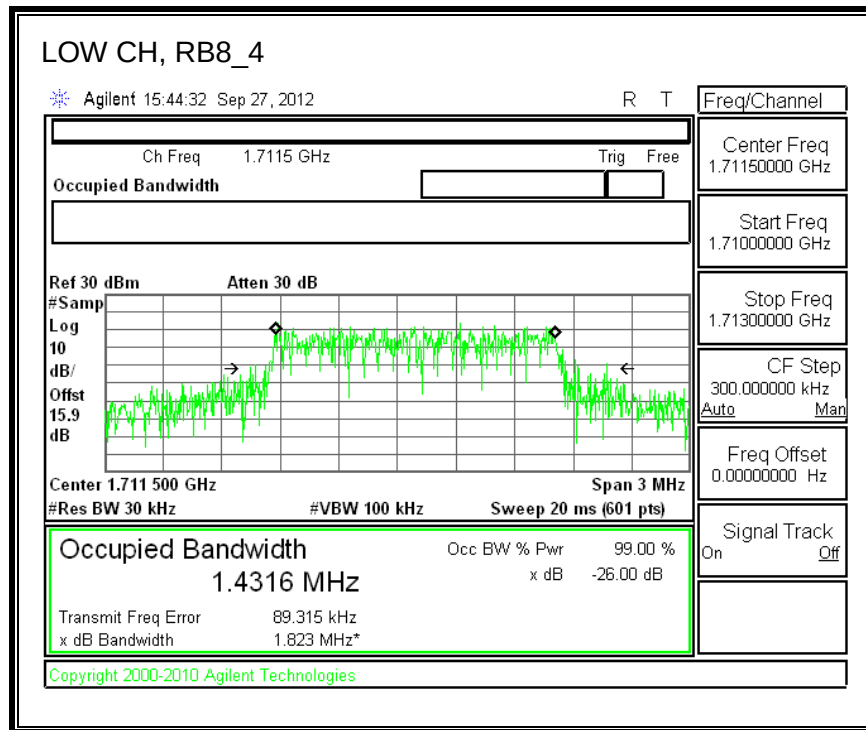


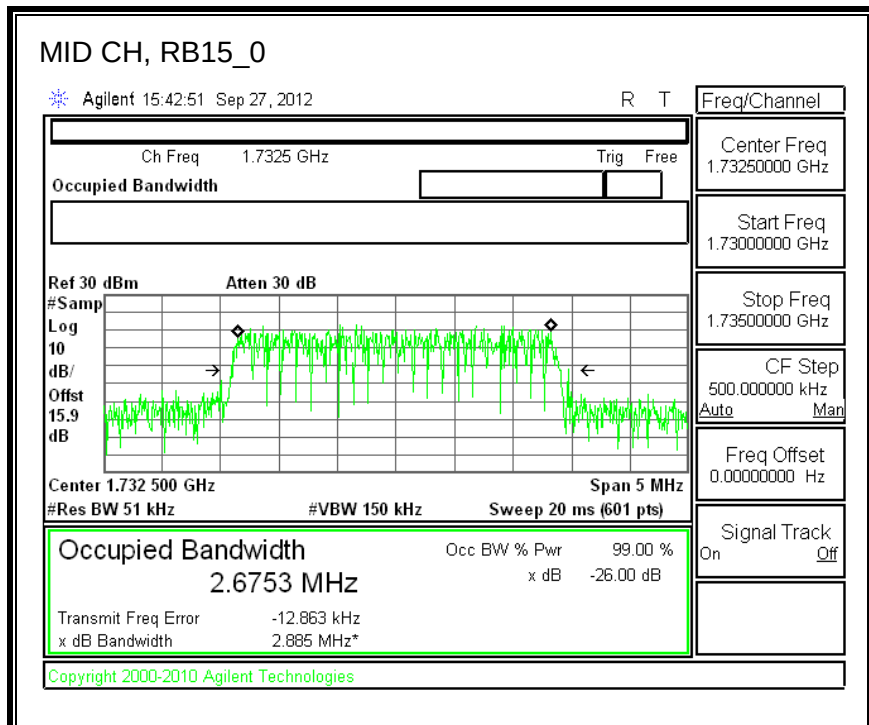
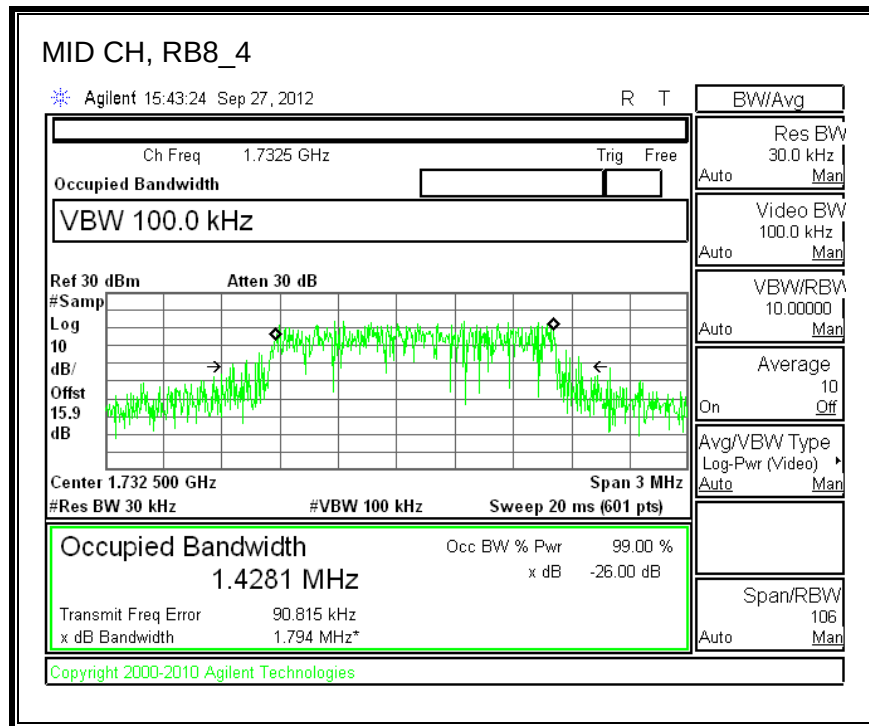


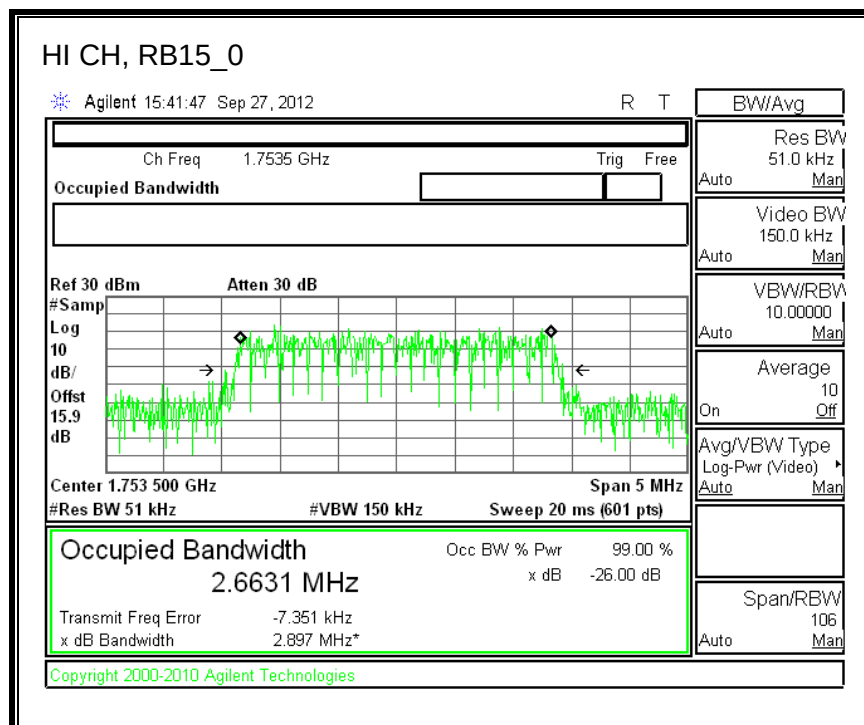
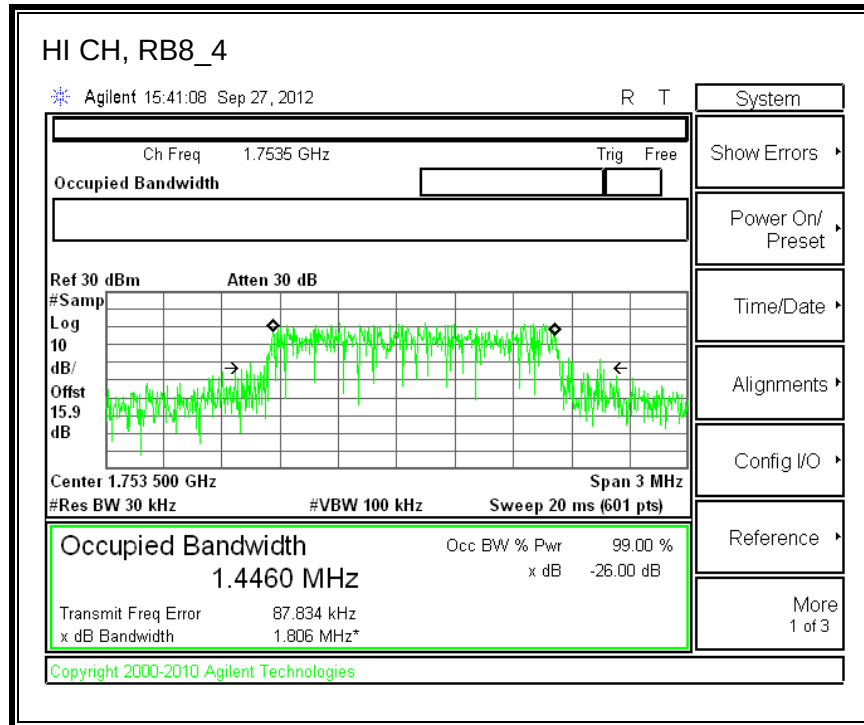


**Band 4 (3 MHz BANDWIDTH)**

**16QAM**

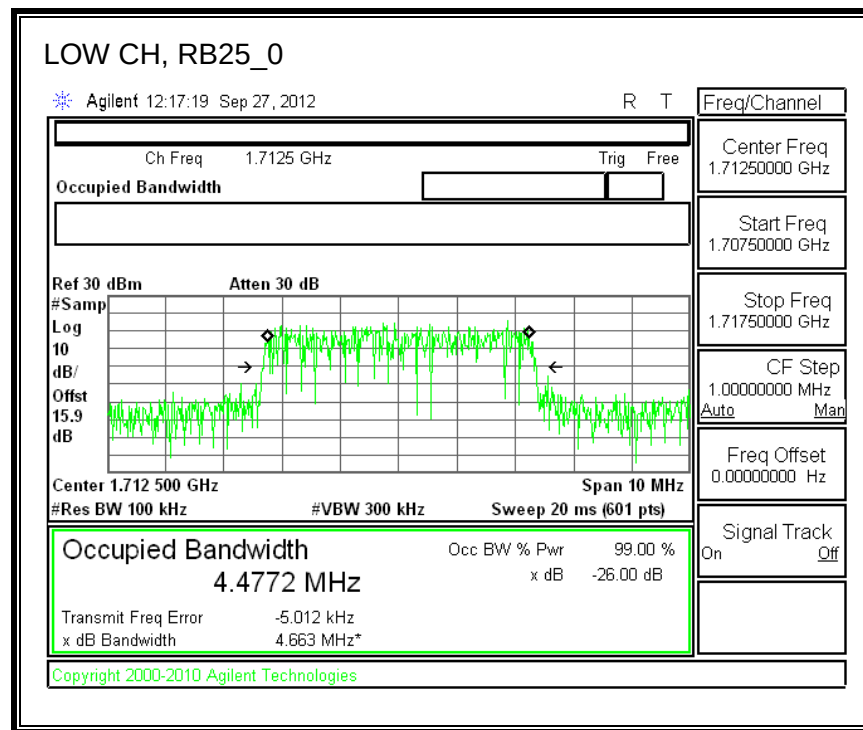
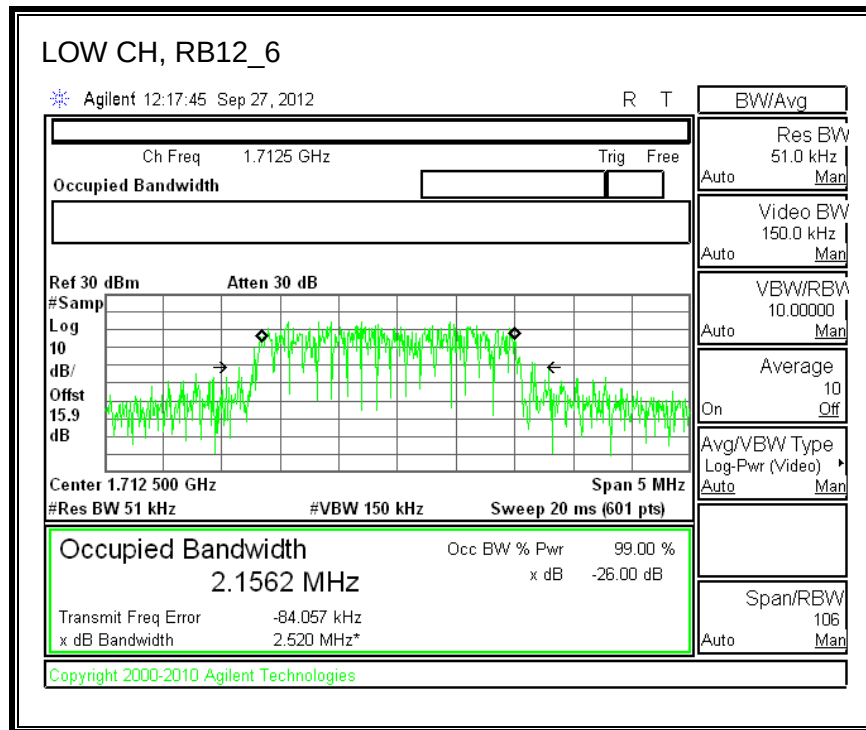


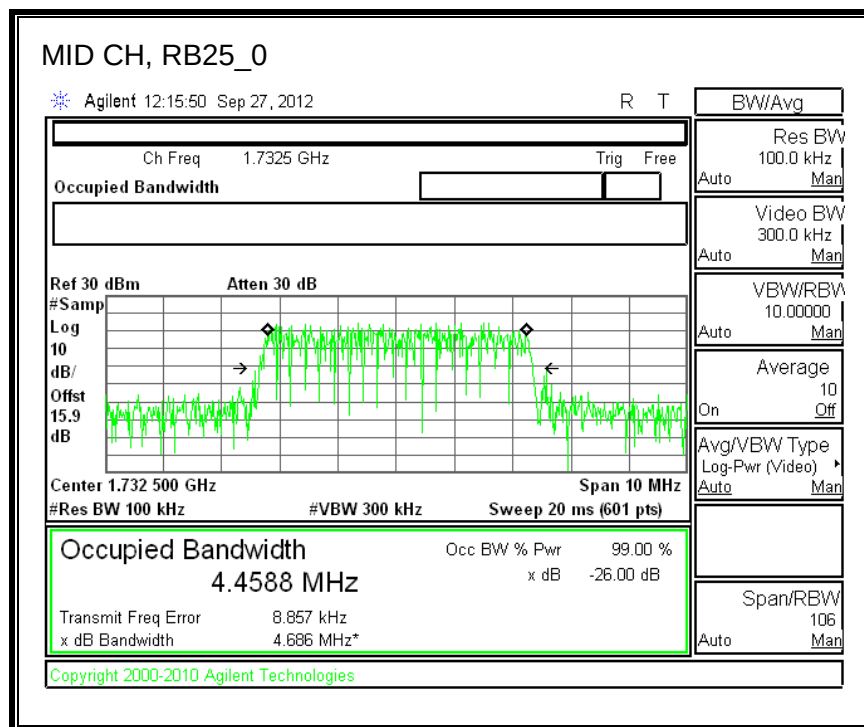
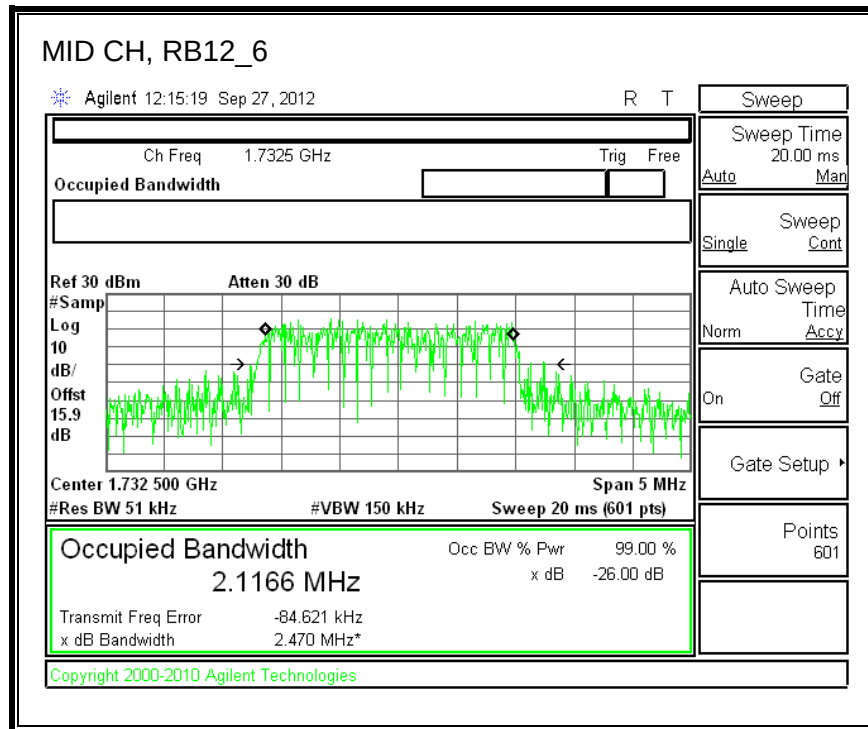


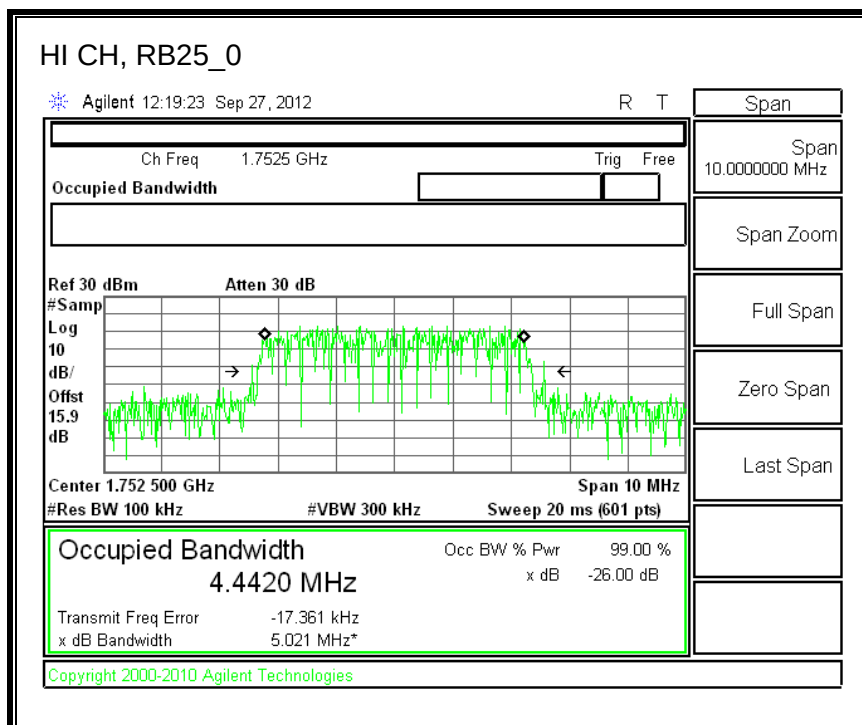
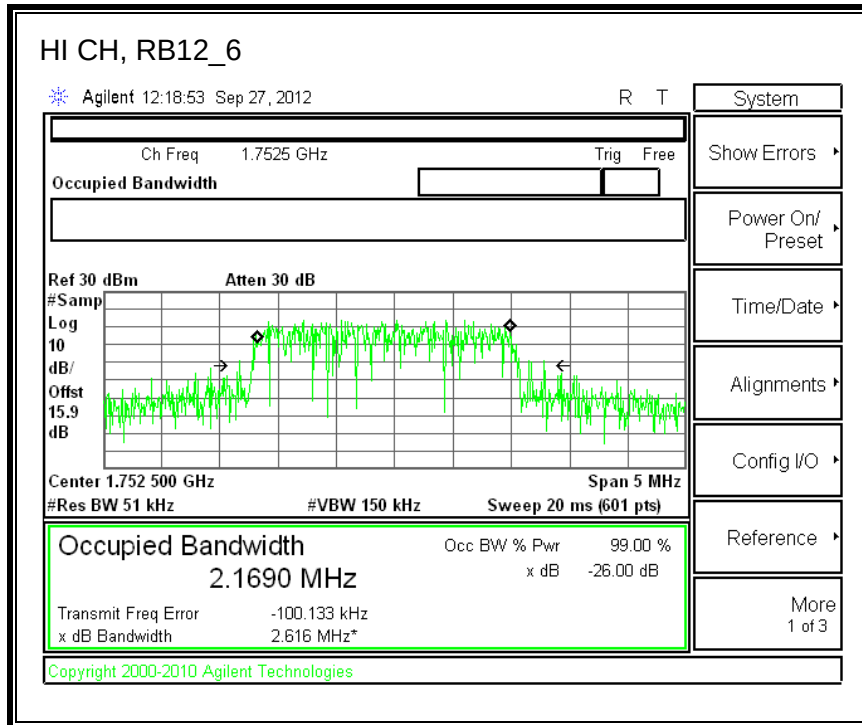


**Band 4 (5 MHz BANDWIDTH)**

**QPSK**

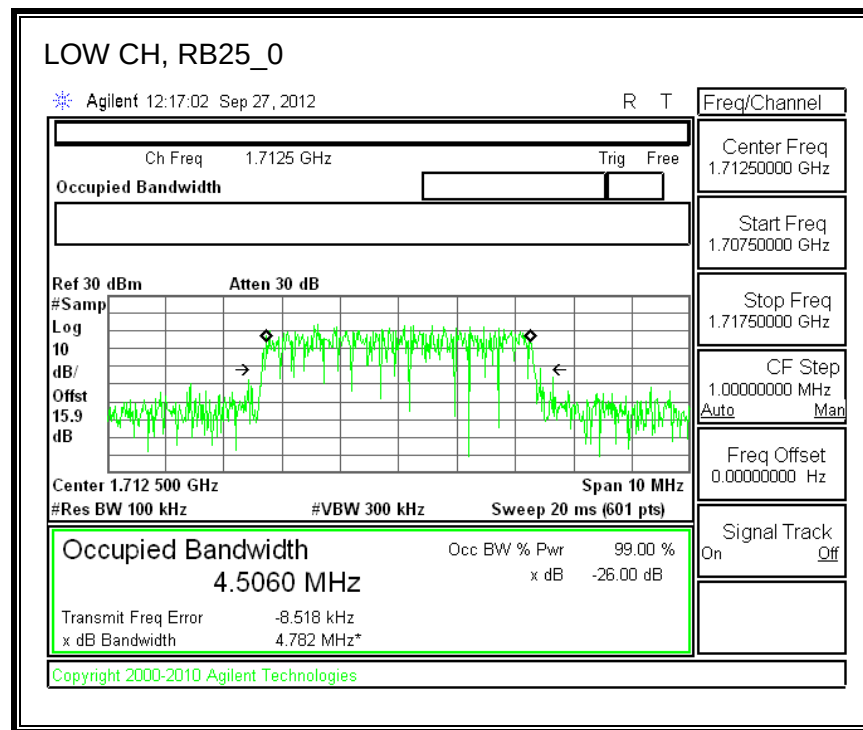
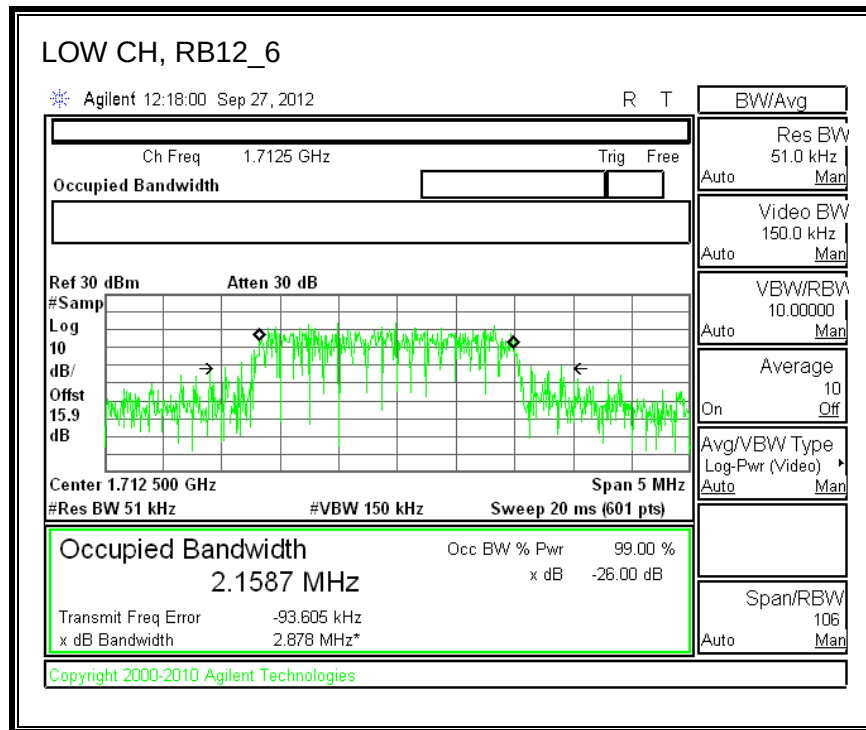




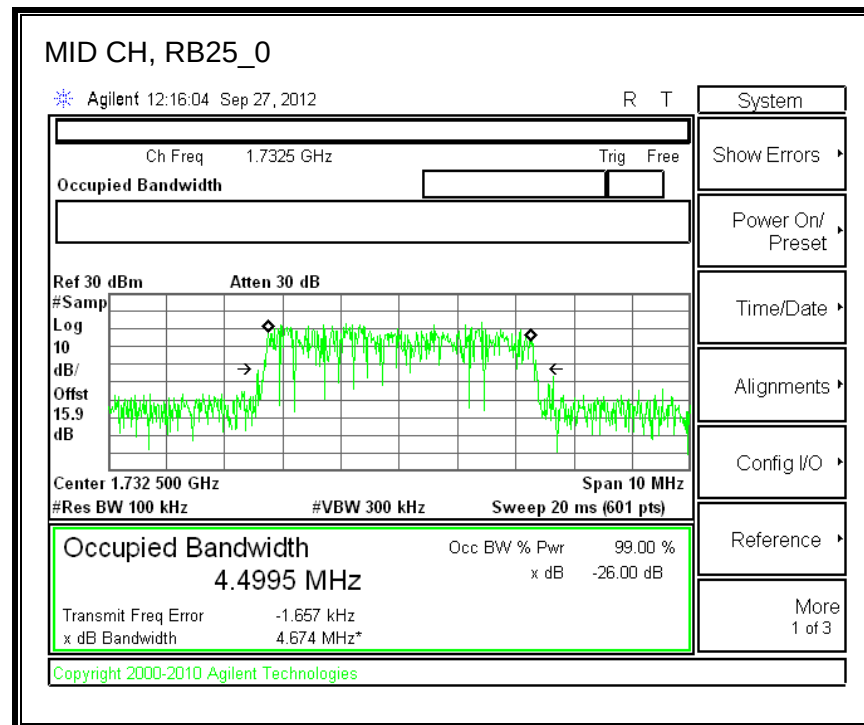
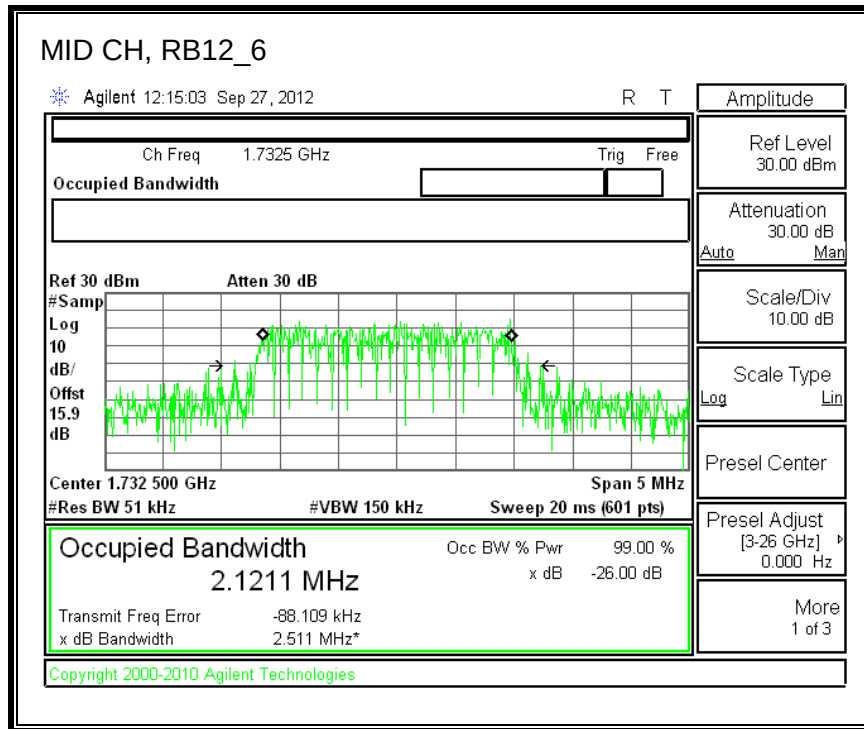


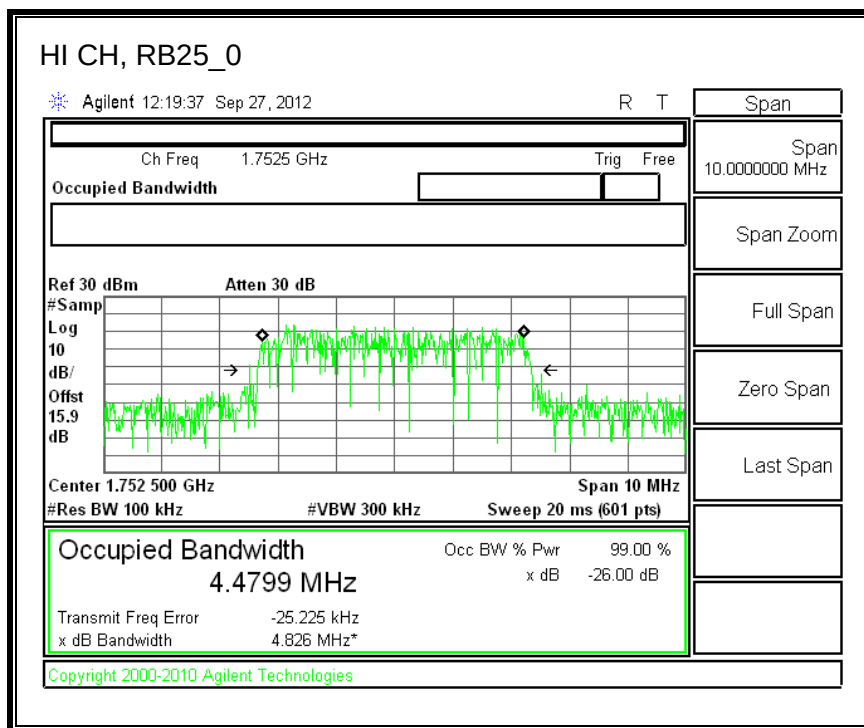
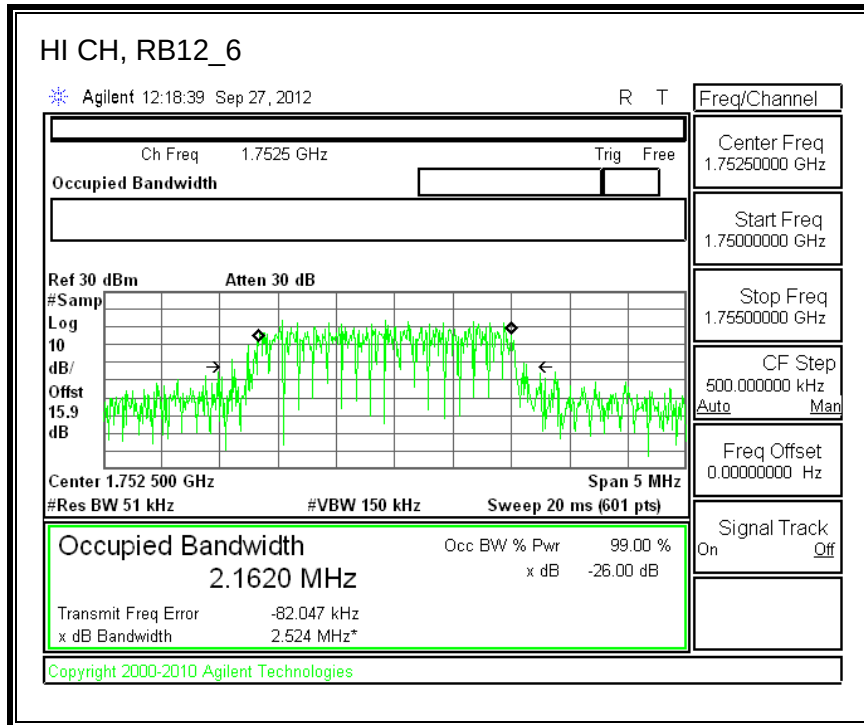
**Band 4 (5 MHz BANDWIDTH)**

**16QAM**



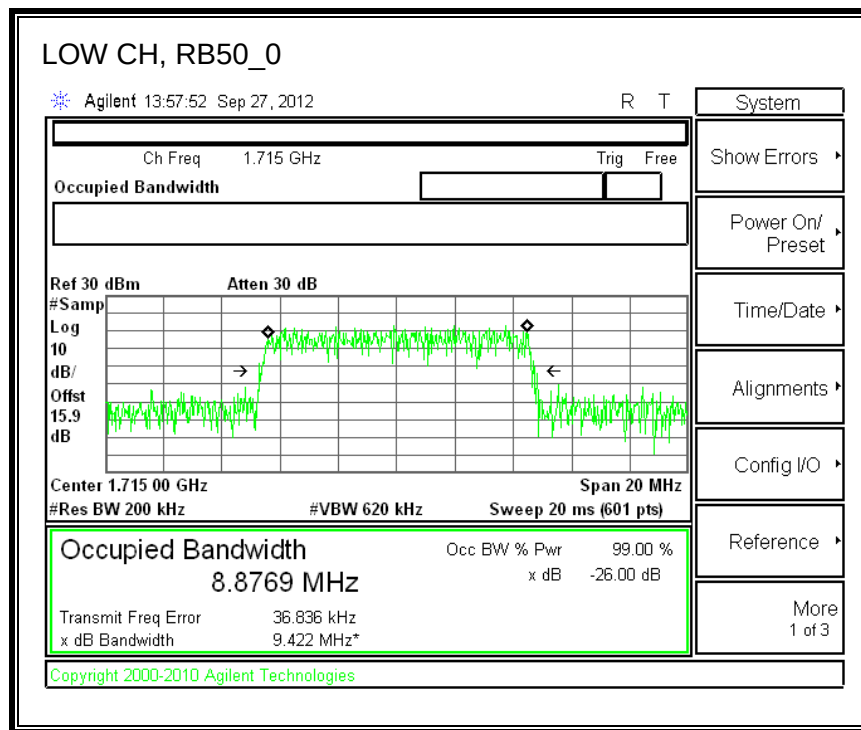
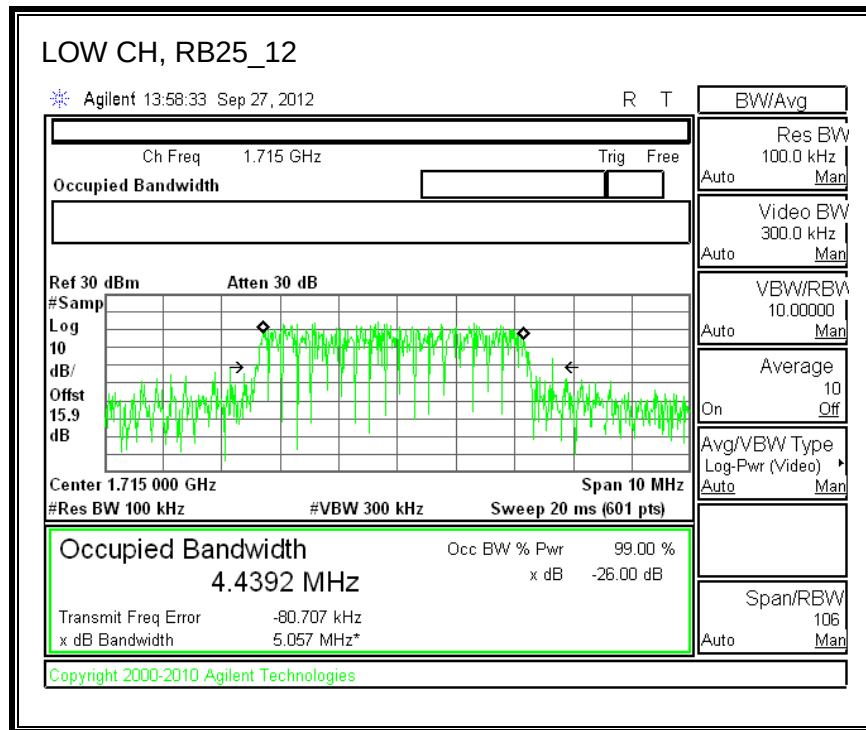


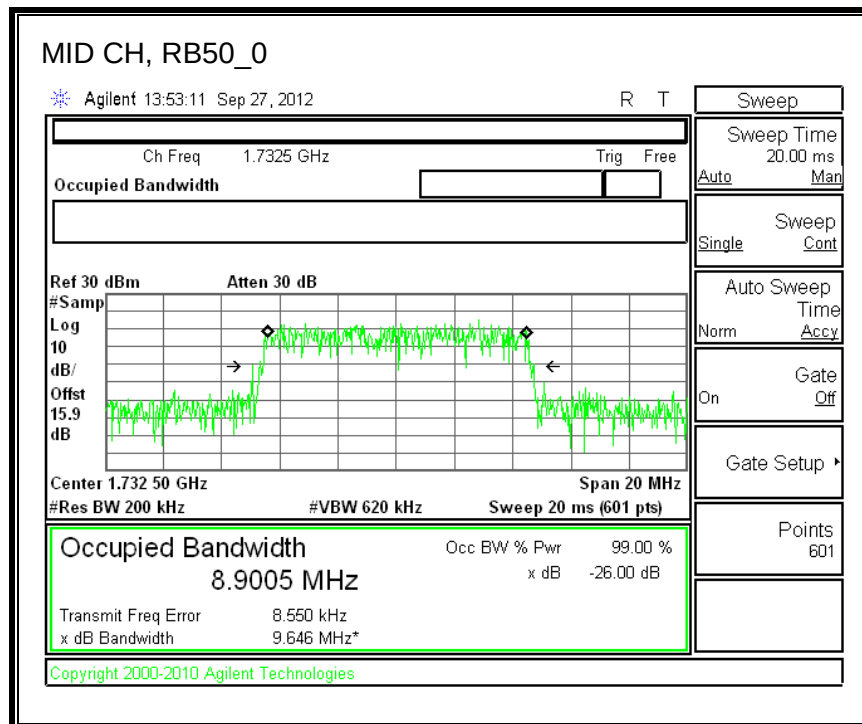
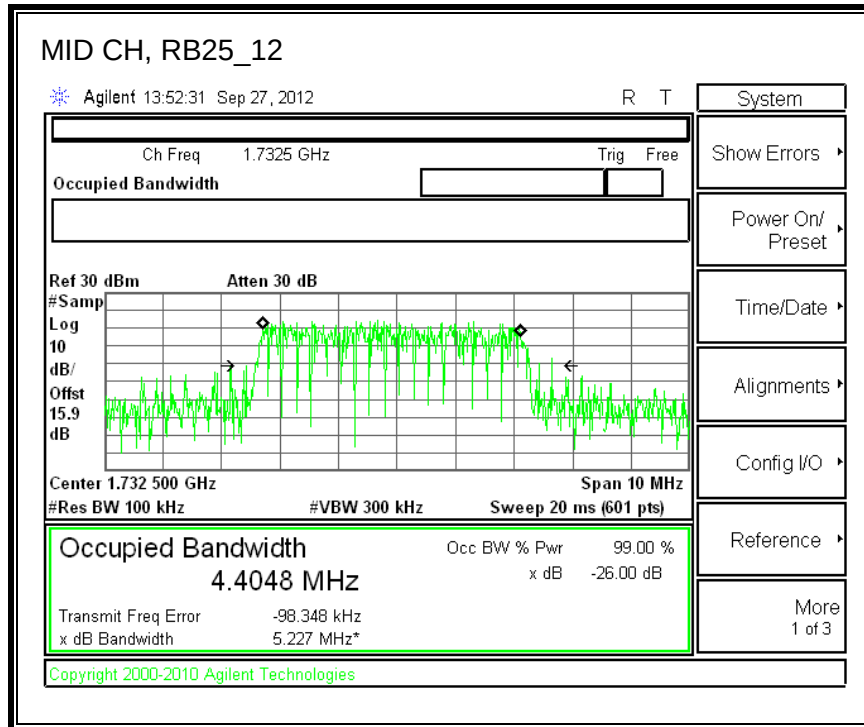


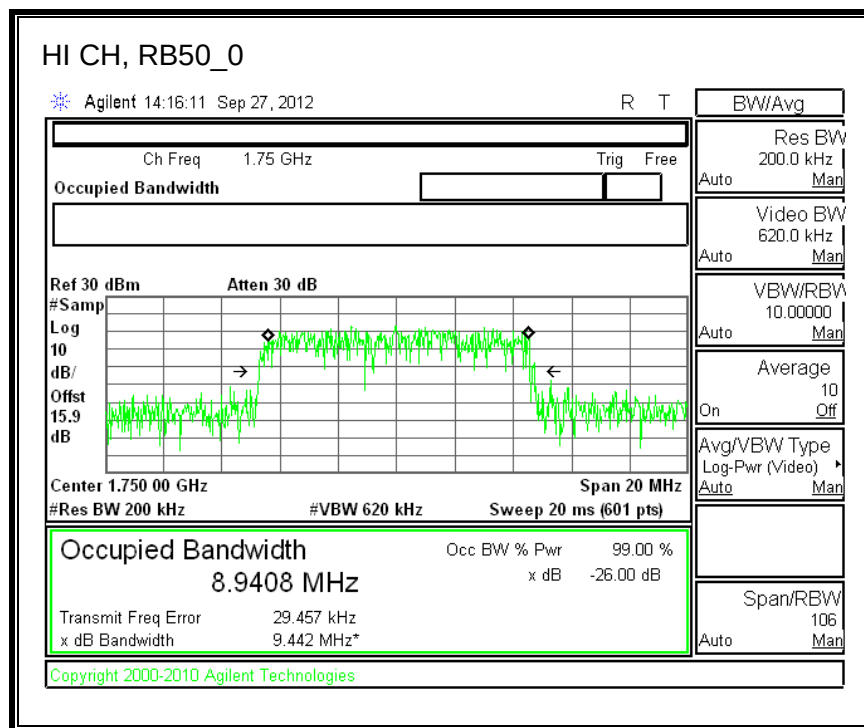
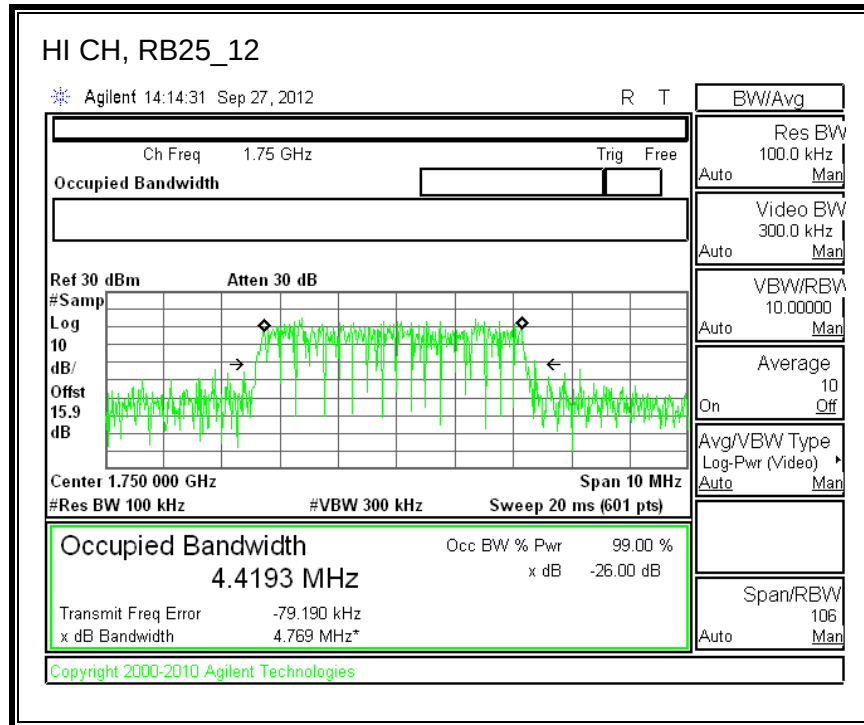


**Band 4 (10 MHz BANDWIDTH)**

**QPSK**

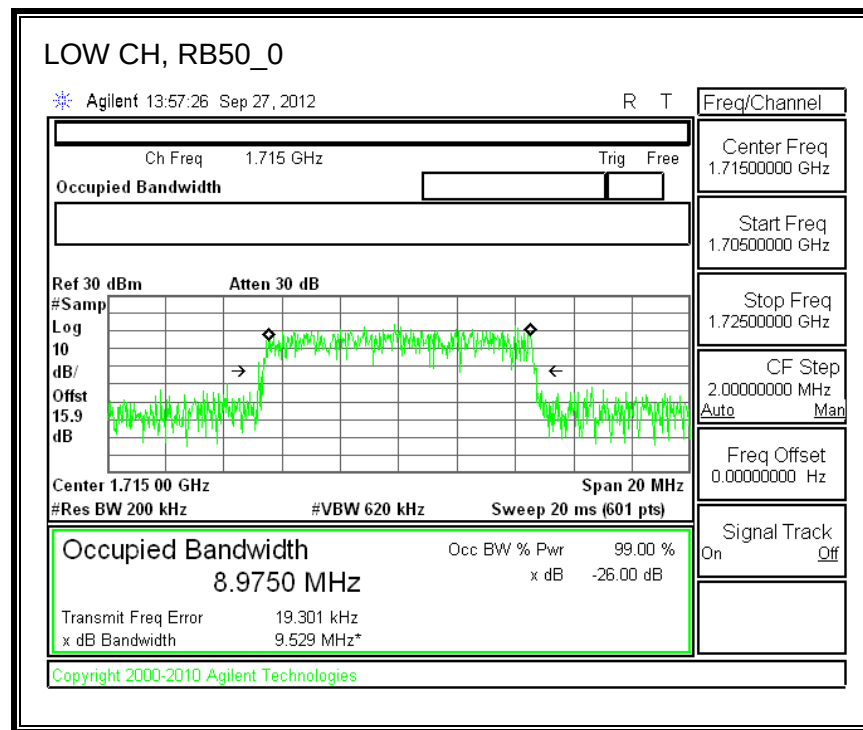
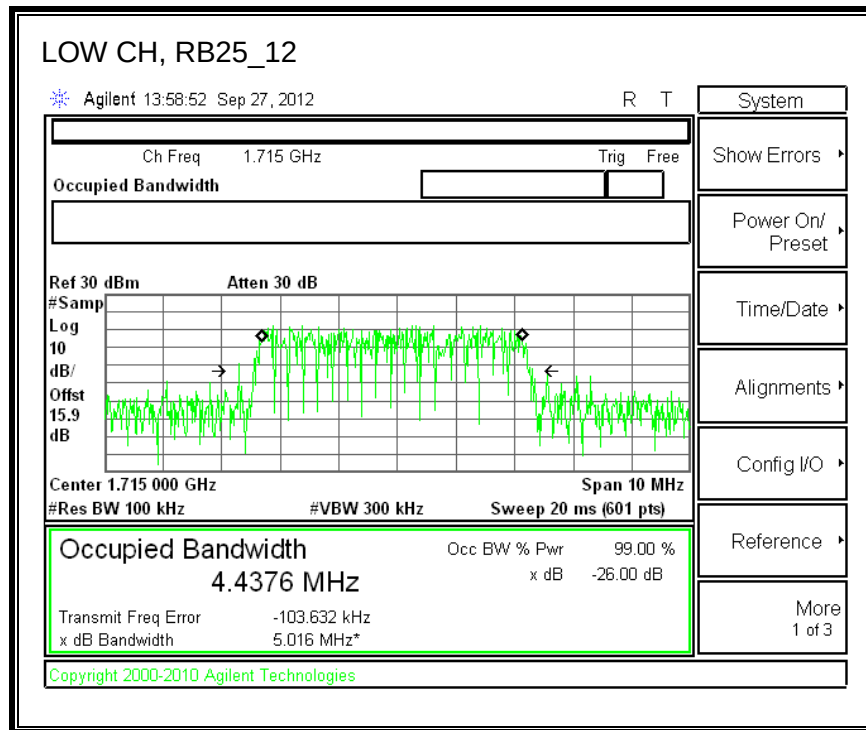


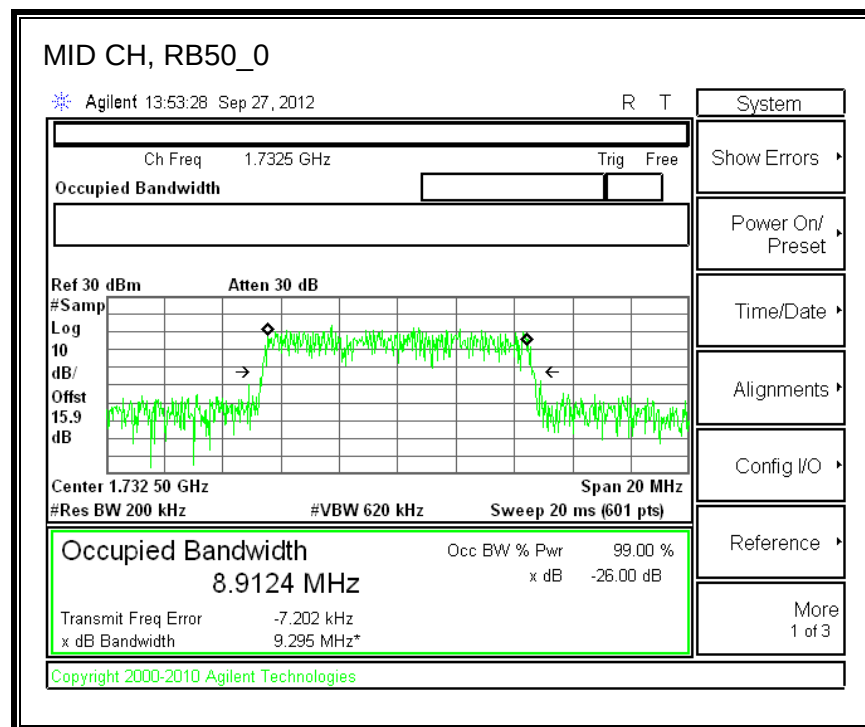
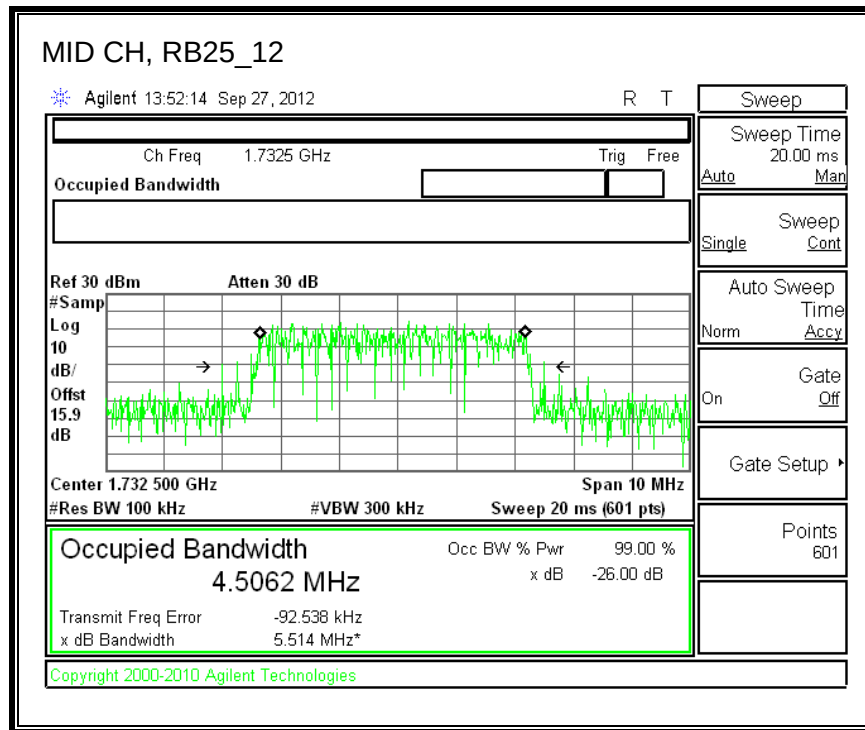


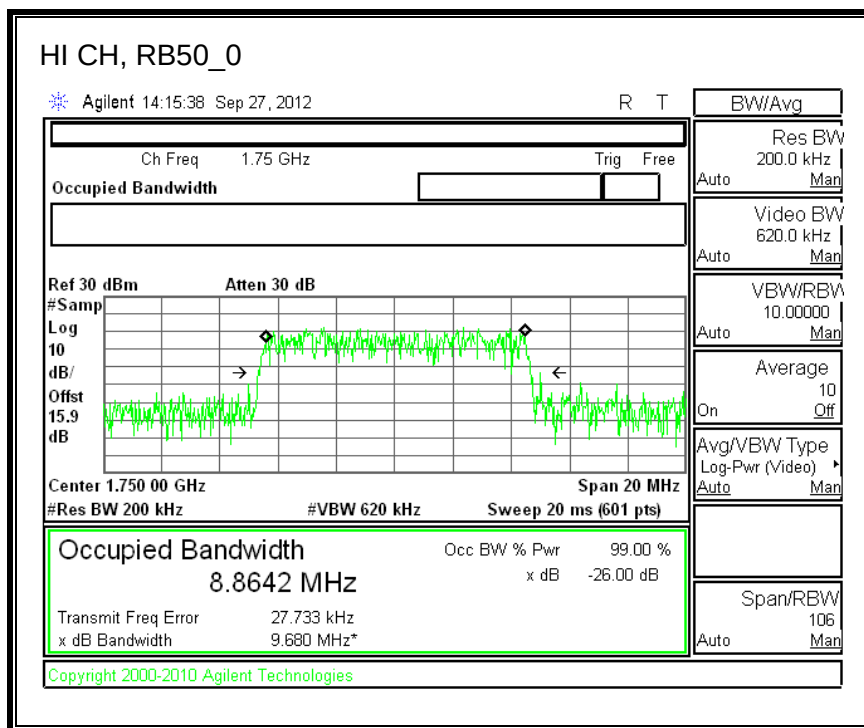
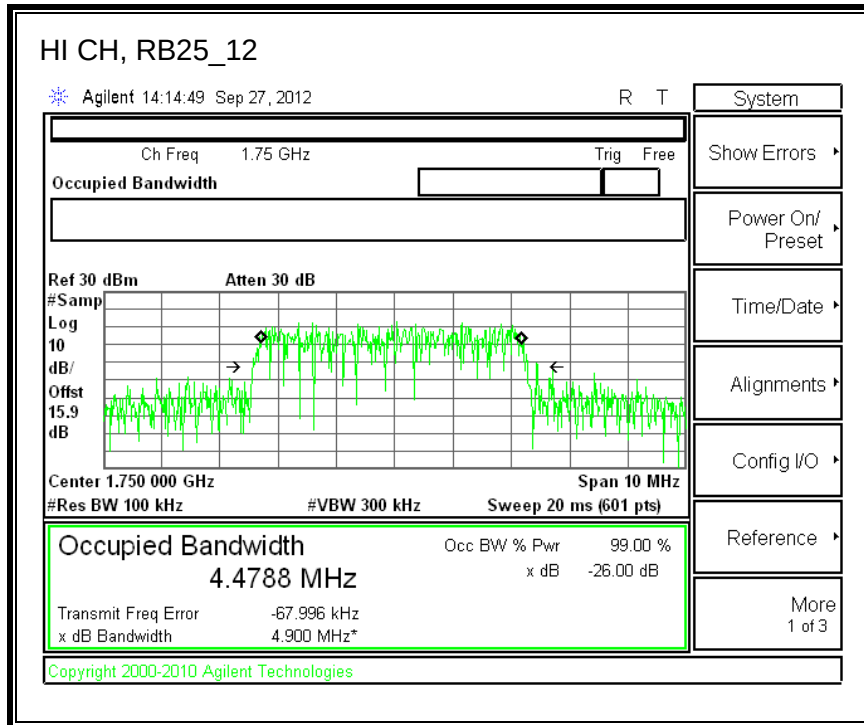


**Band 4 (10 MHz BANDWIDTH)**

**16QAM**



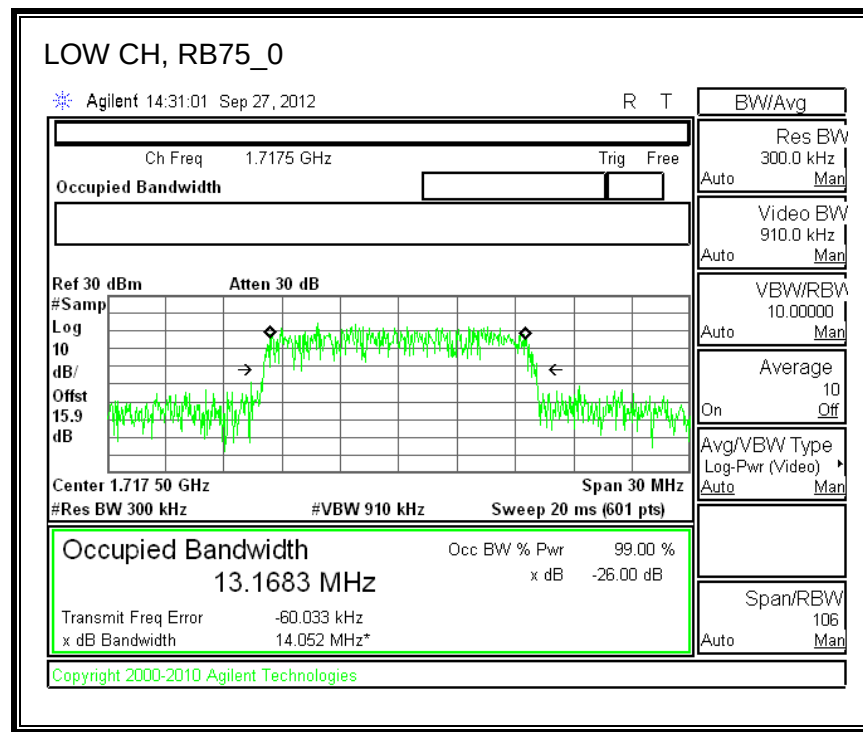
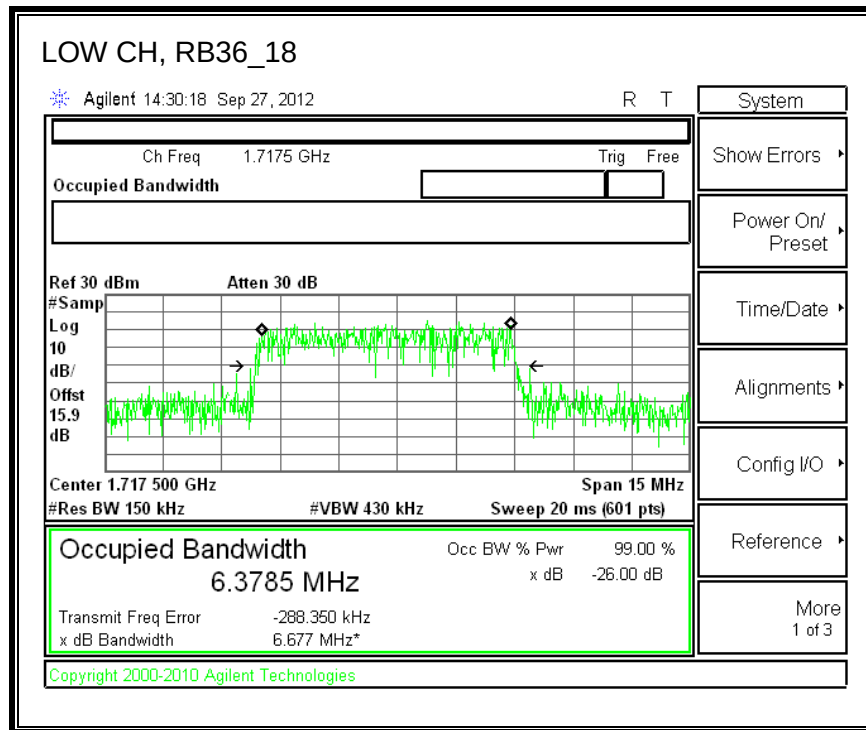


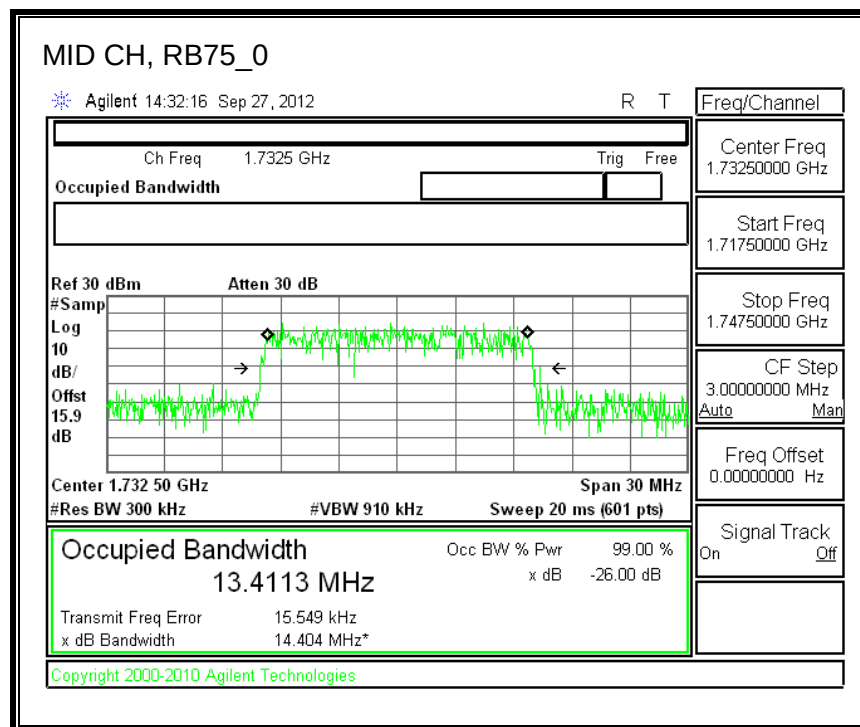
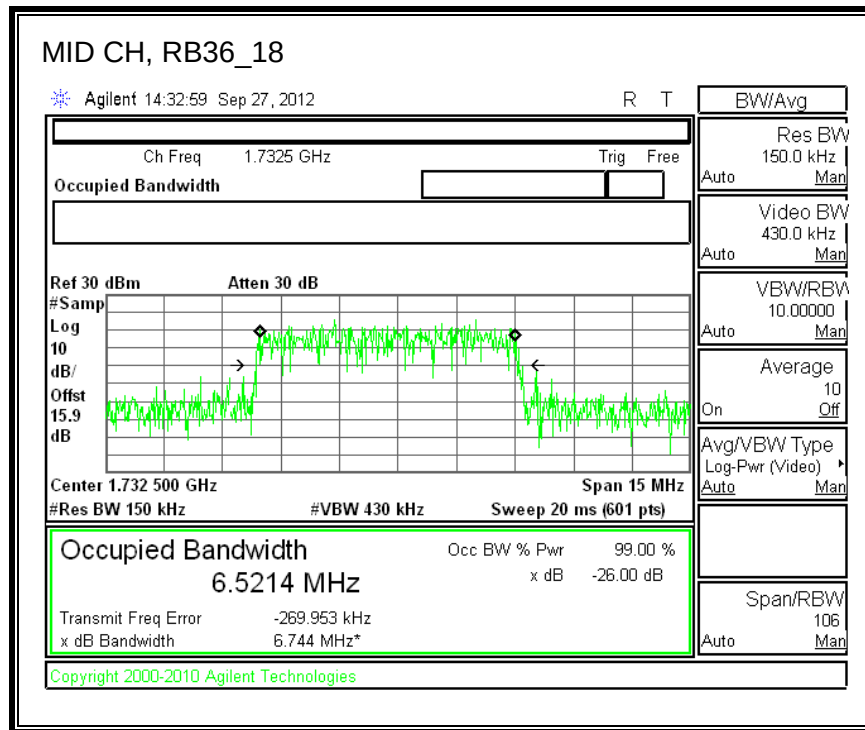


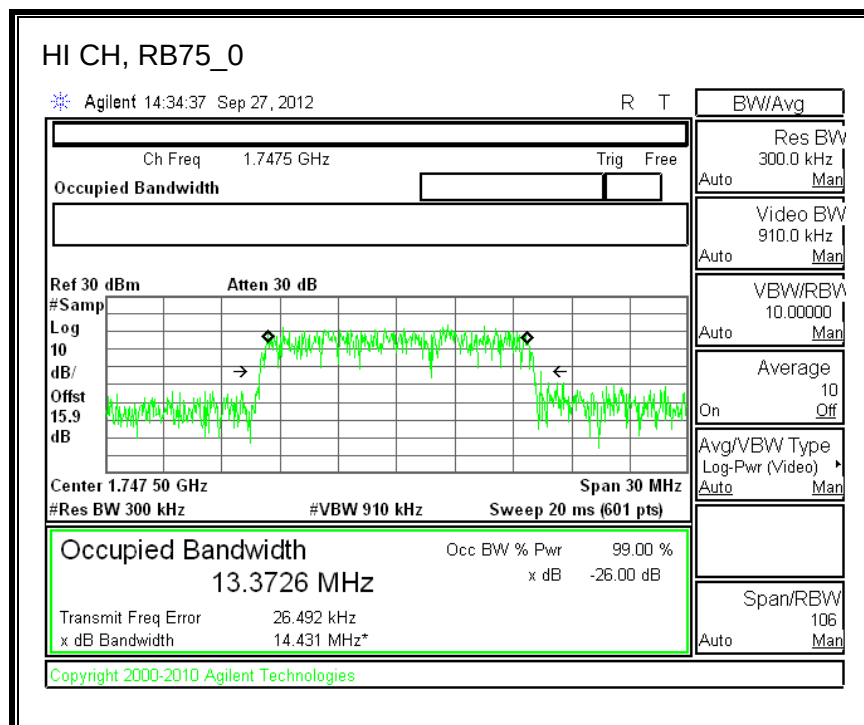
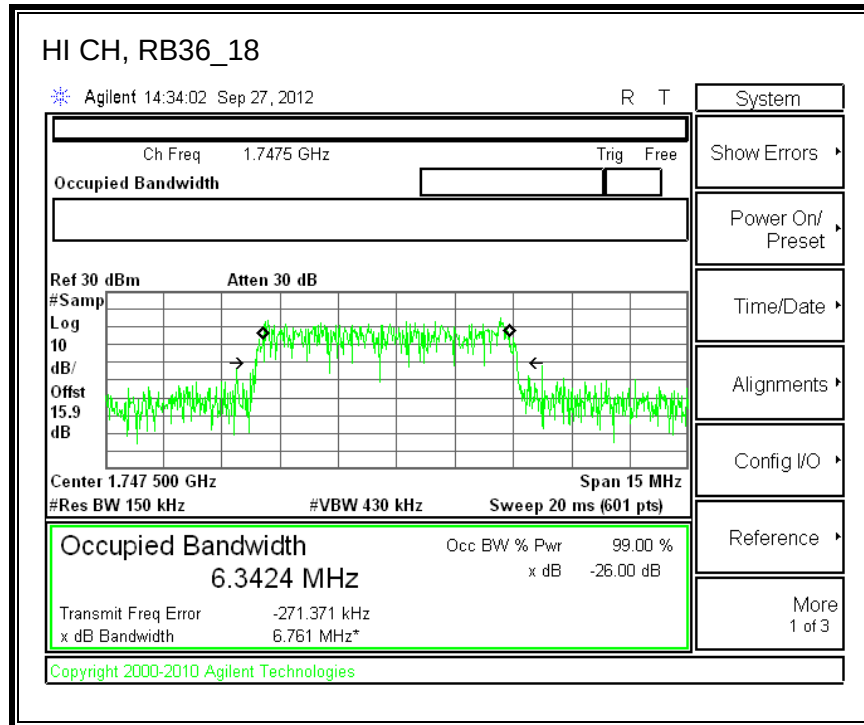


**Band 4 (15 MHz BANDWIDTH)**

**QPSK**

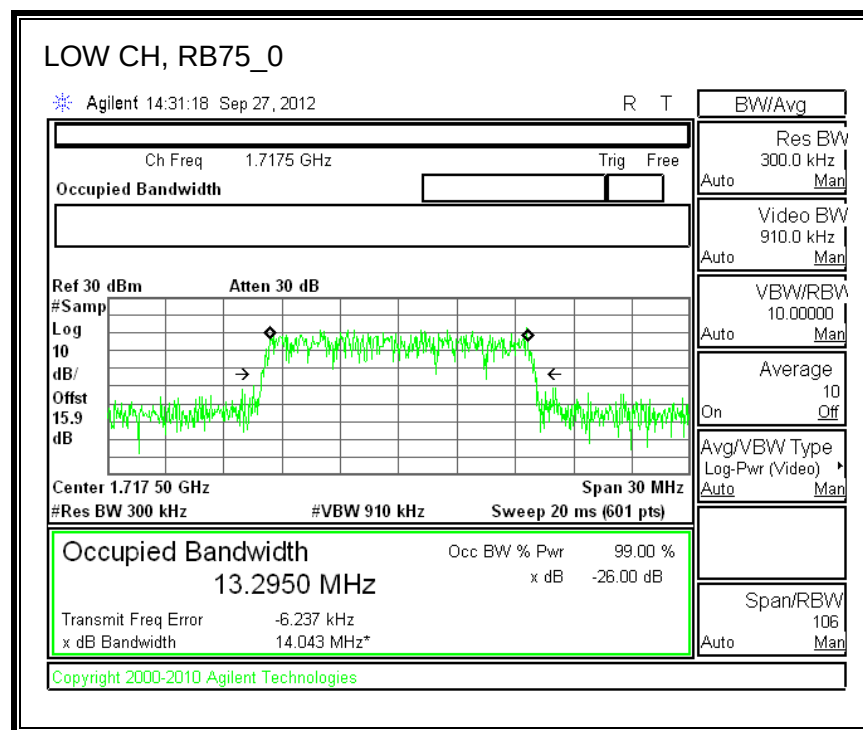
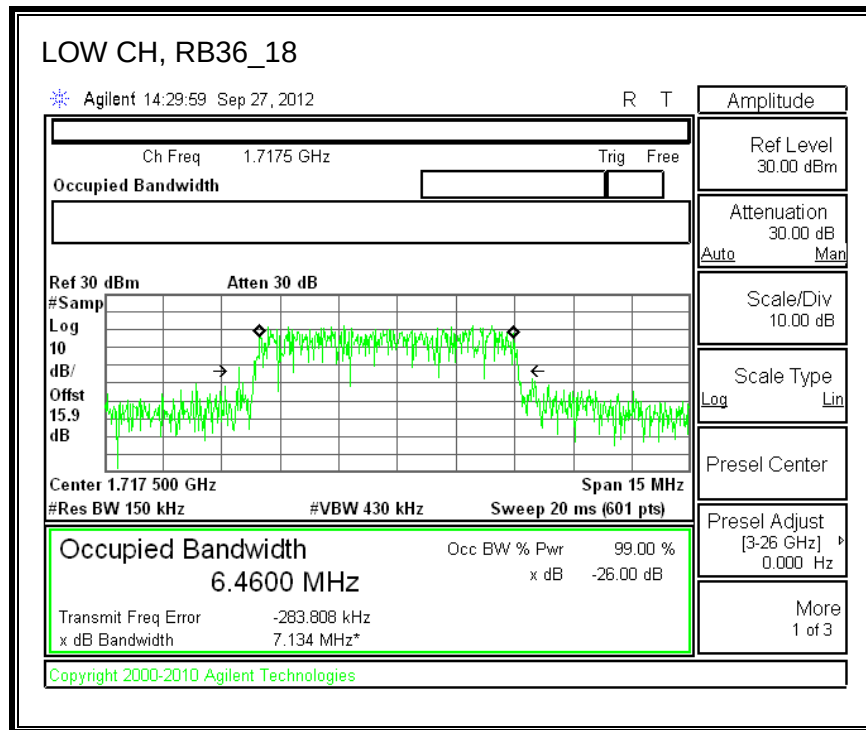


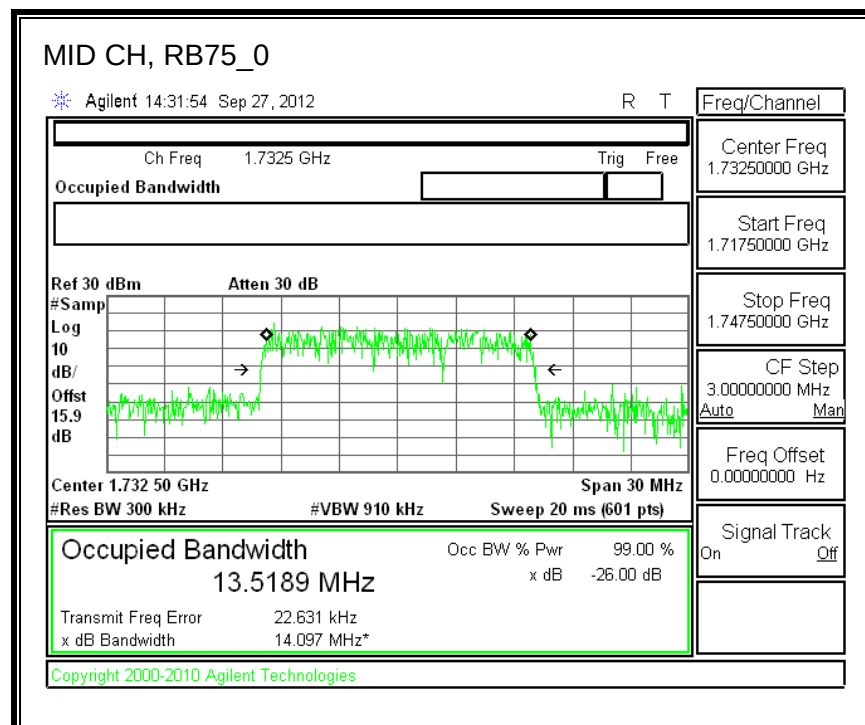
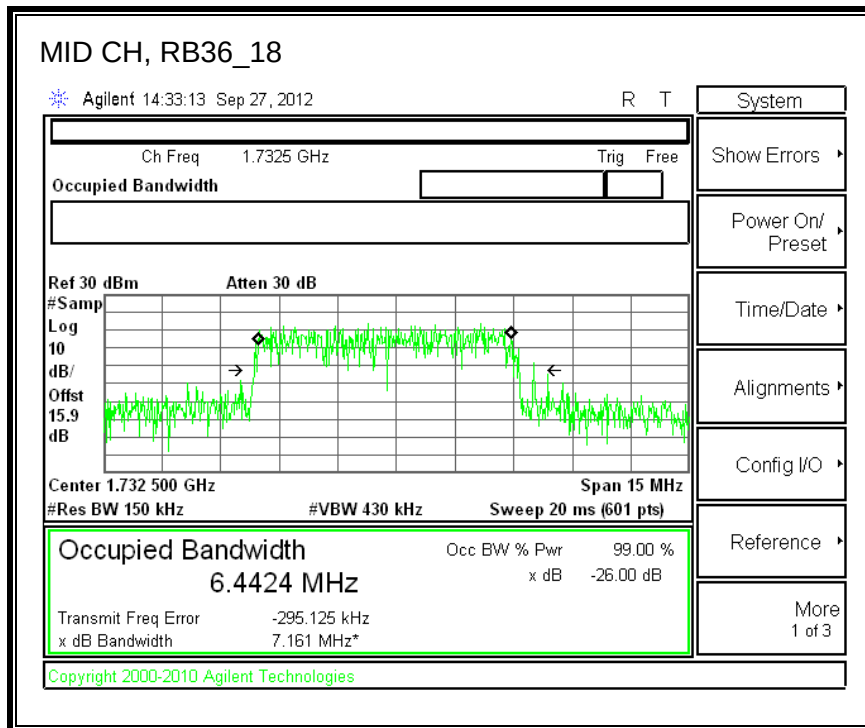


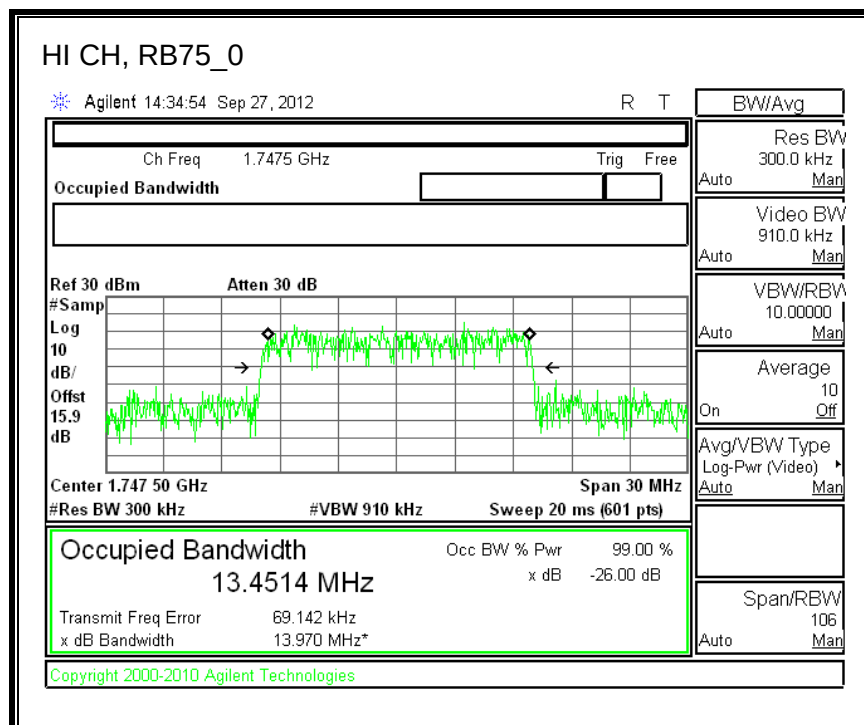
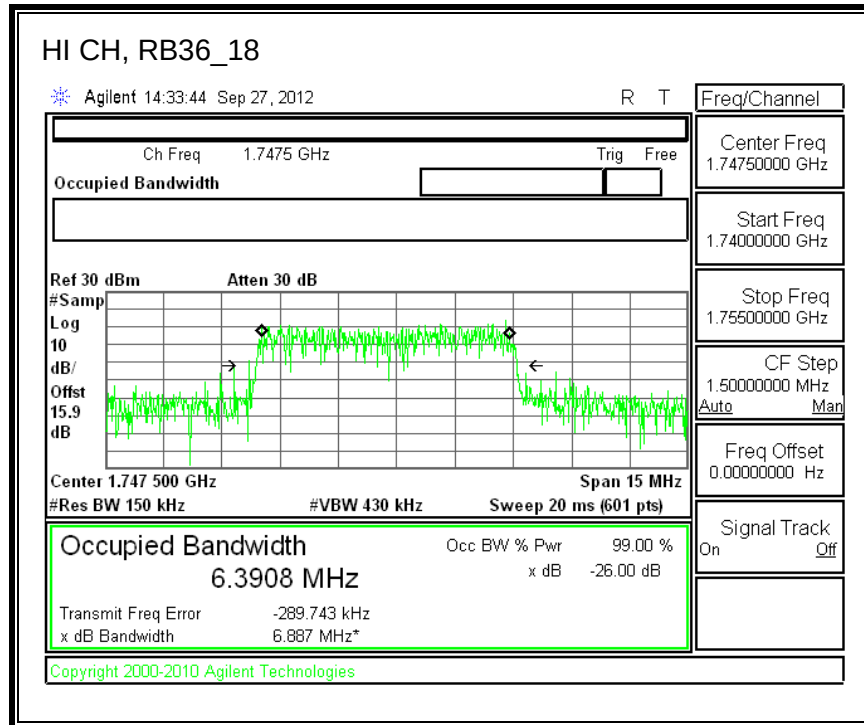


**Band 4 (15 MHz BANDWIDTH)**

**16QAM**

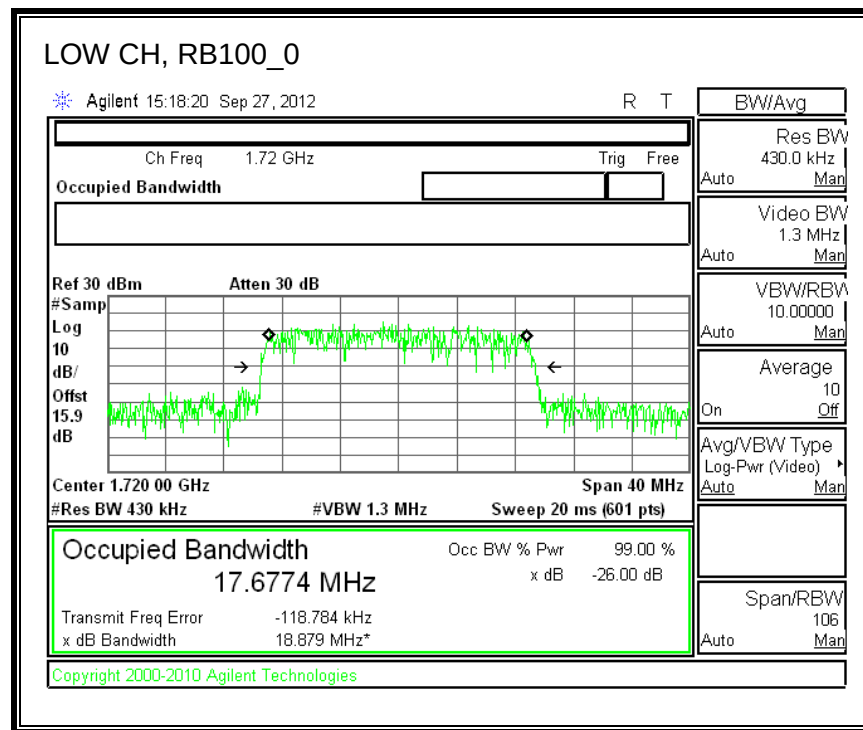
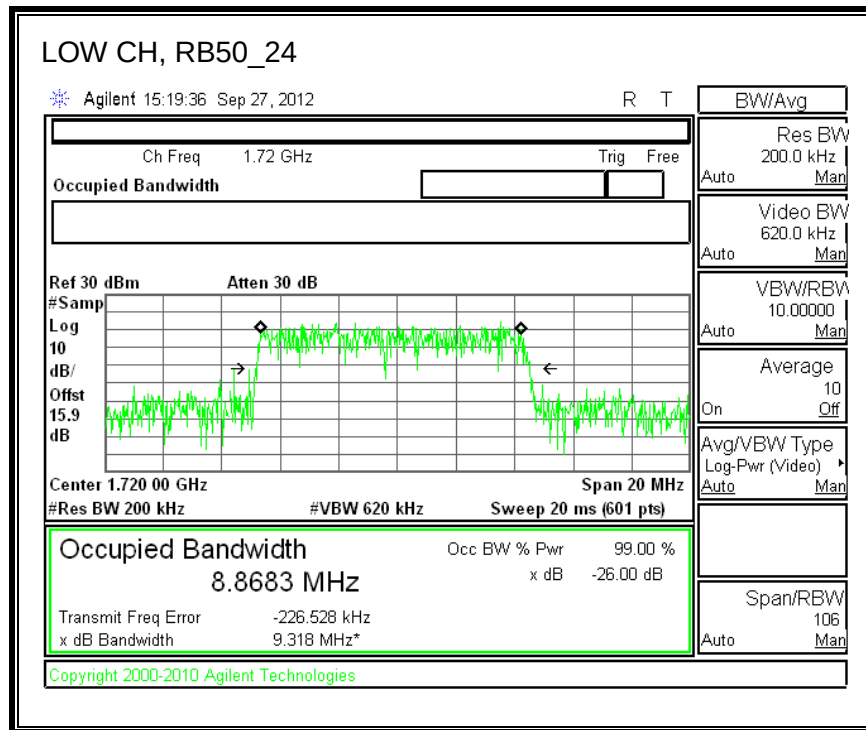


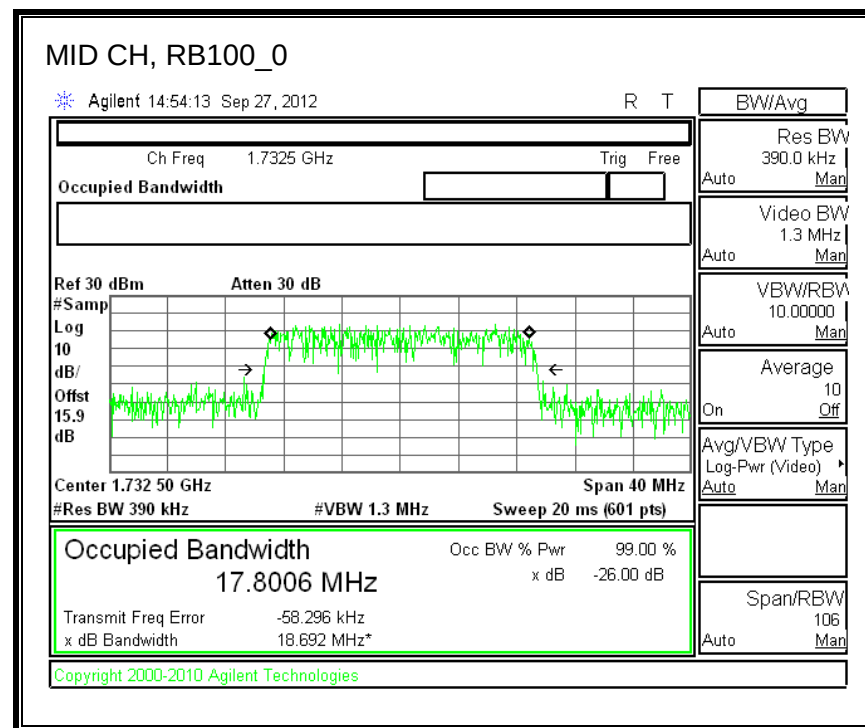
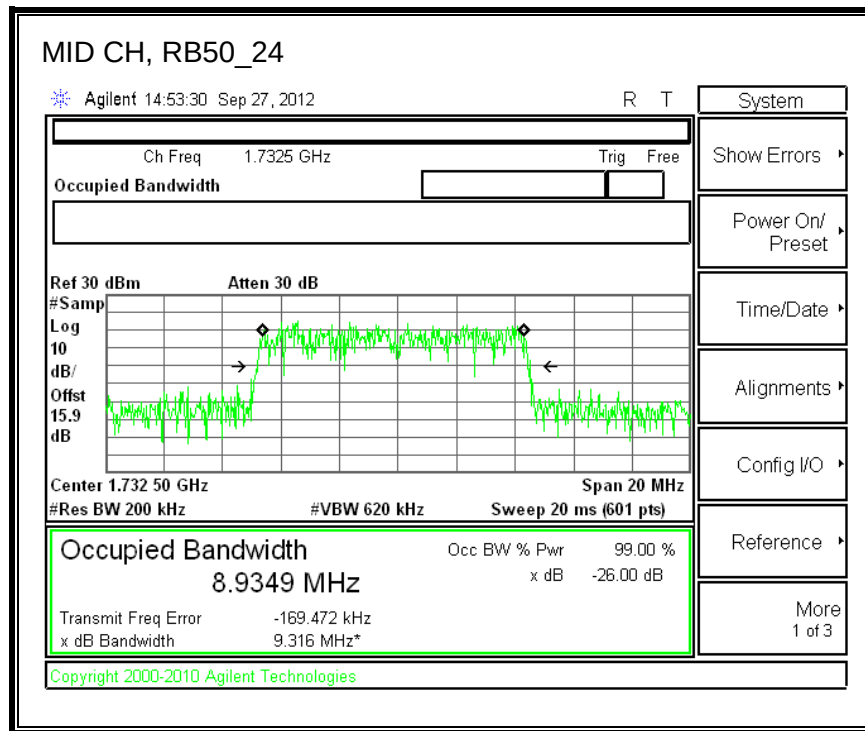




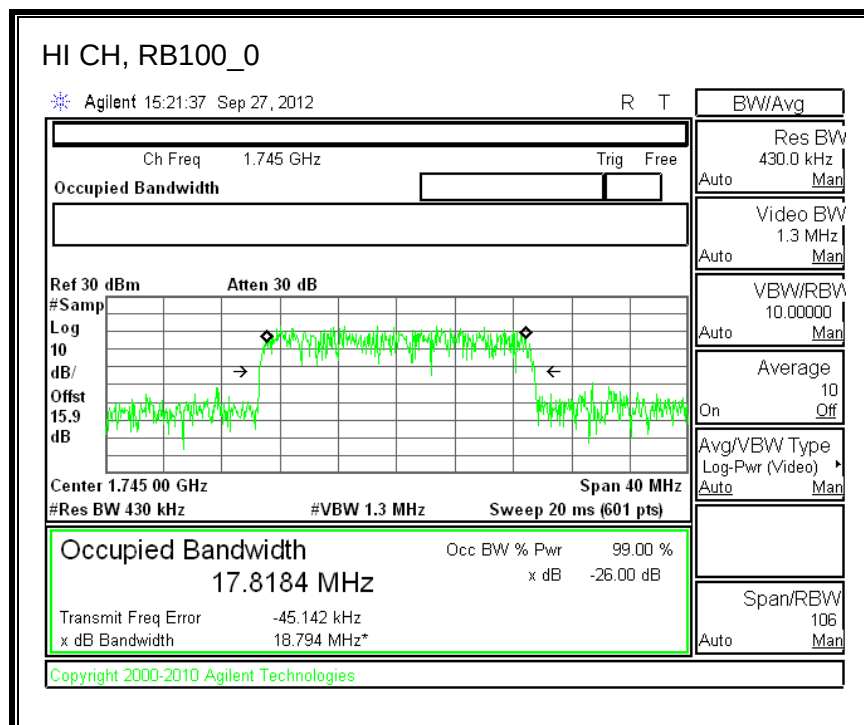
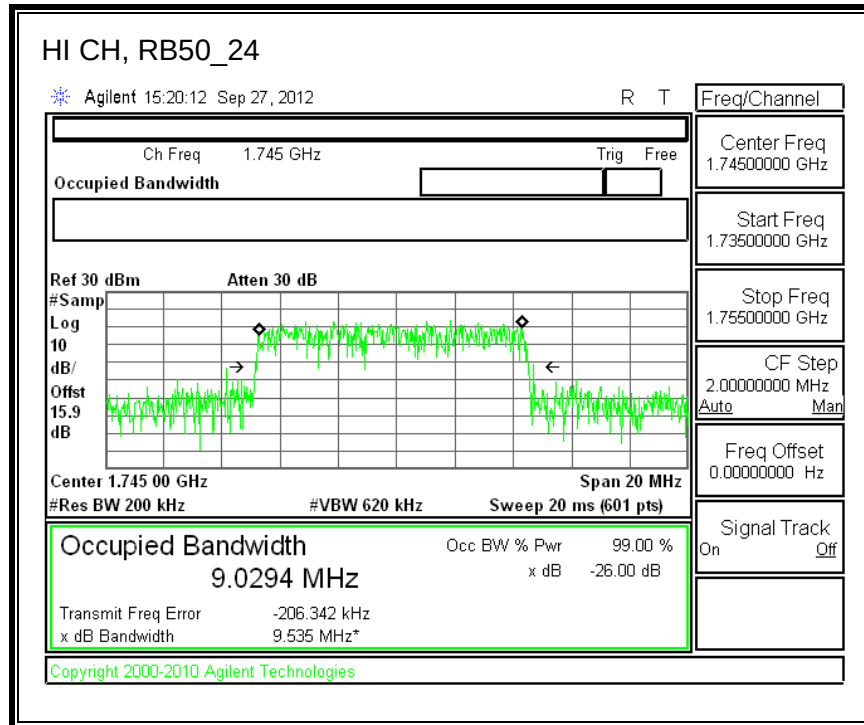
**Band 4 (20 MHz BANDWIDTH)**

**QPSK**



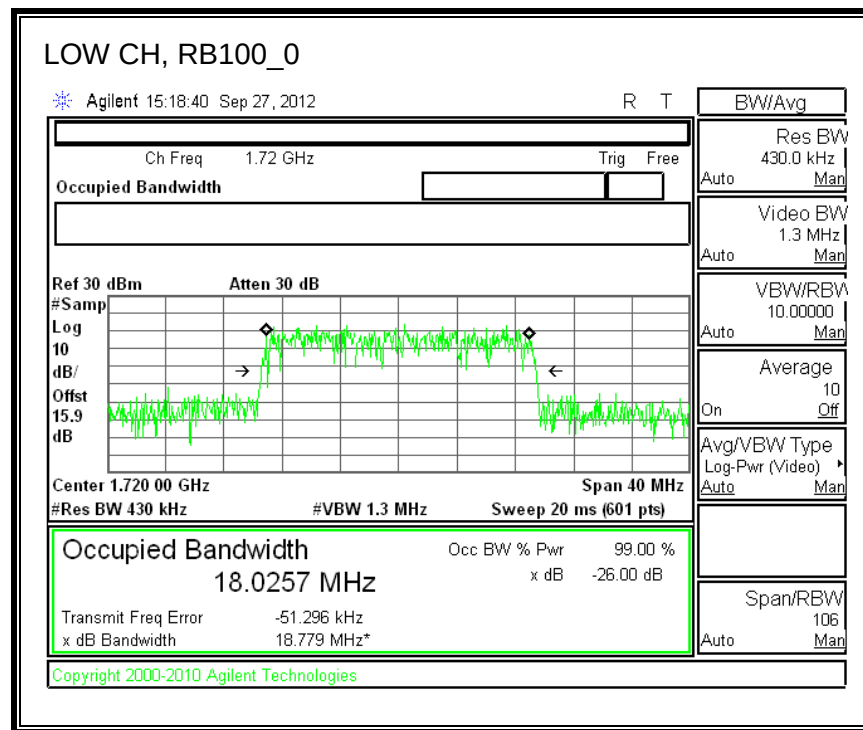
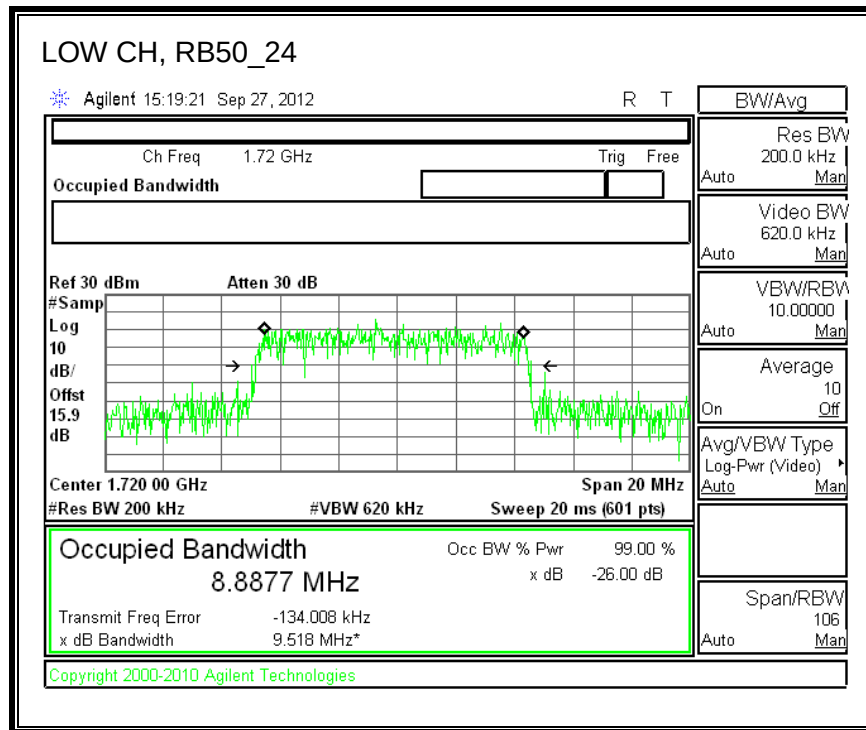


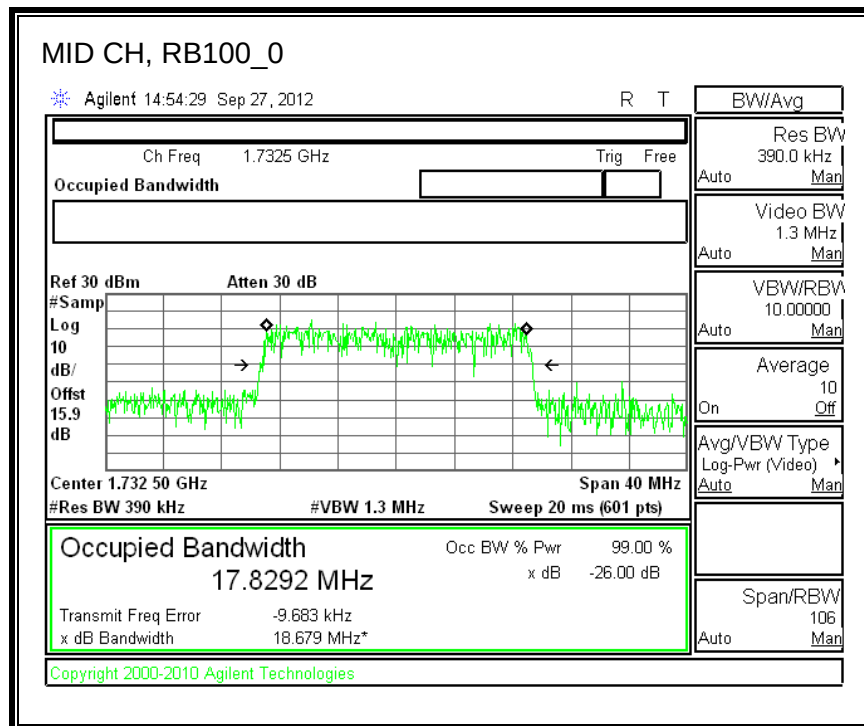
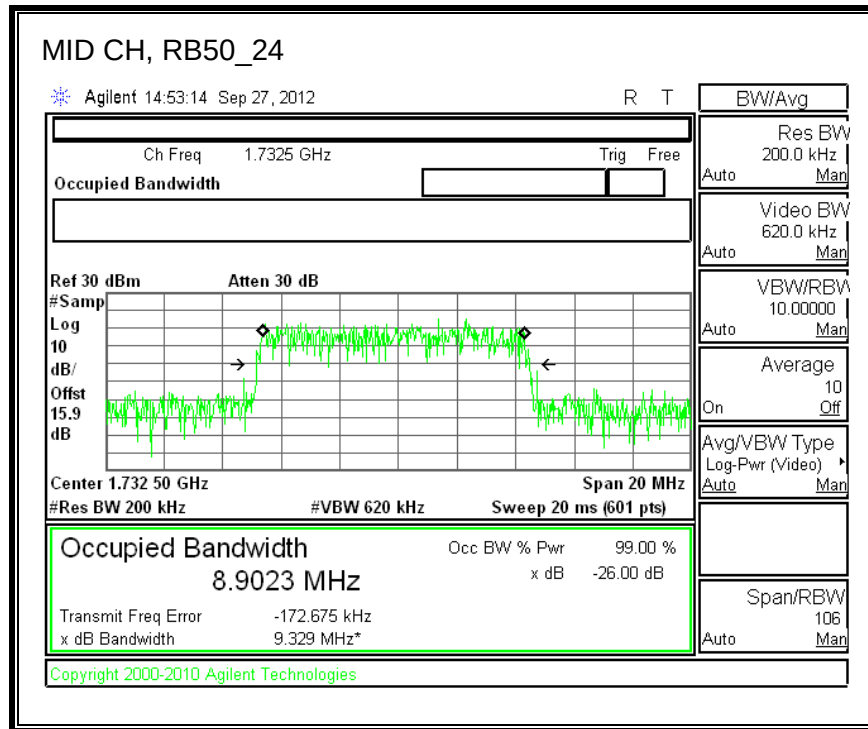


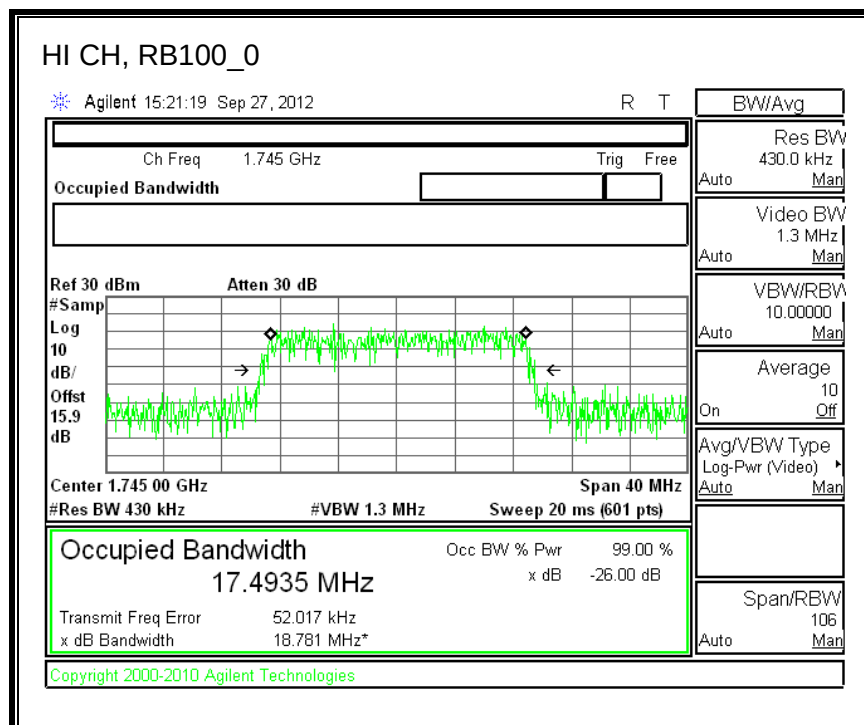
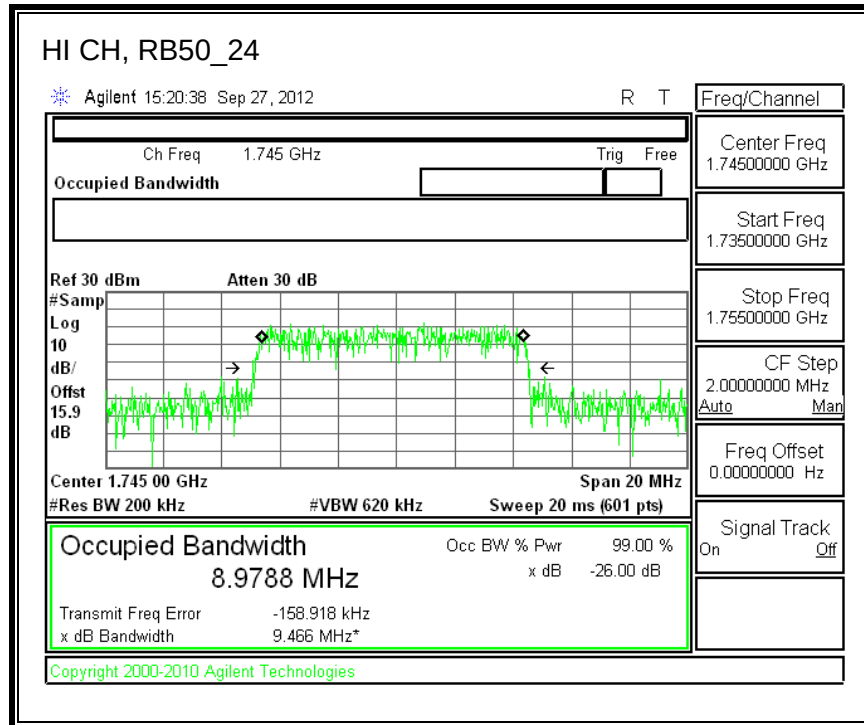


**Band 4 (20 MHz BANDWIDTH)**

**16QAM**

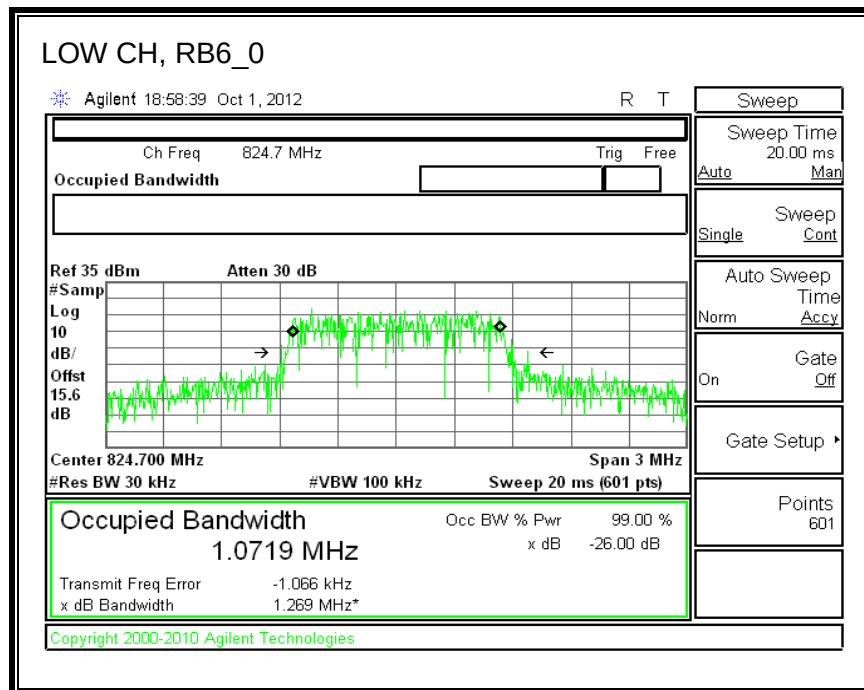
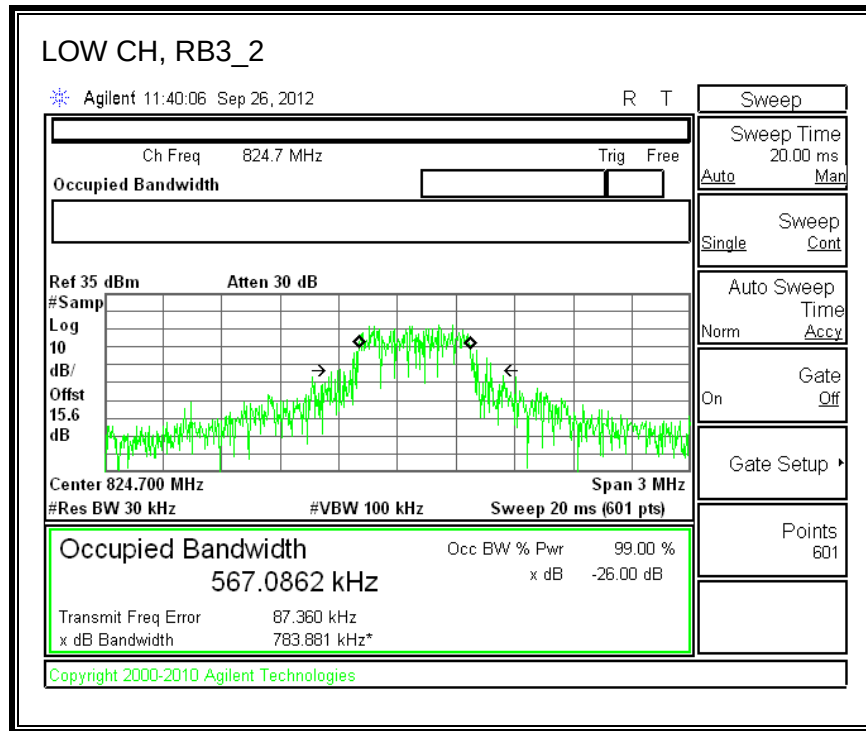


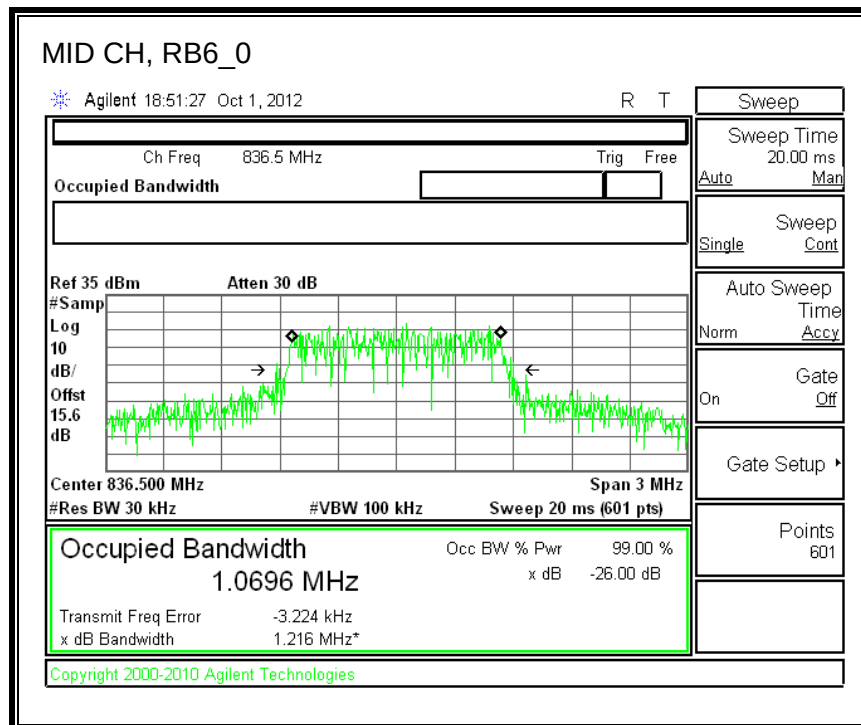
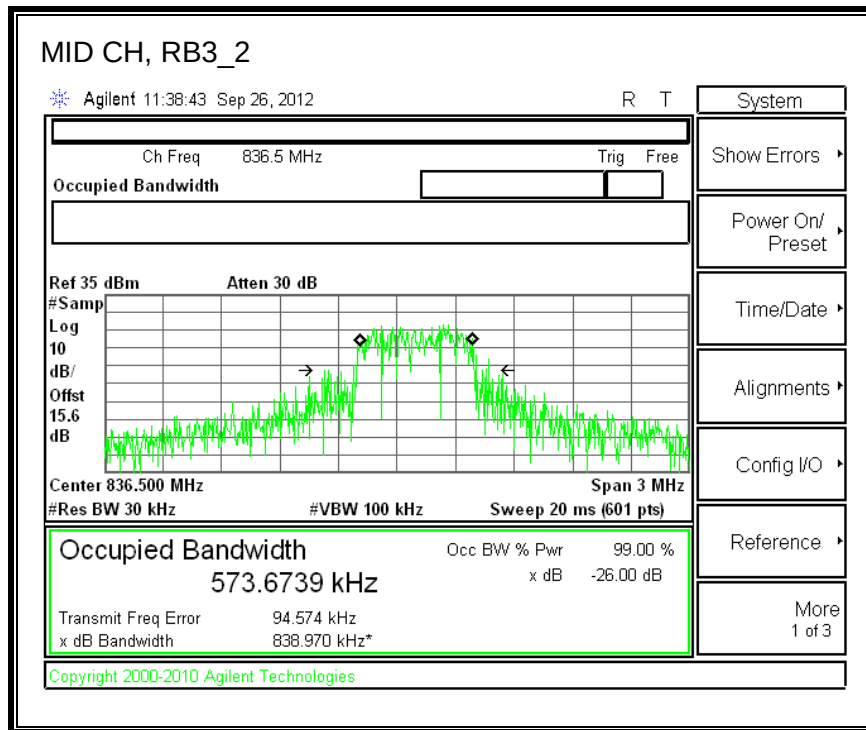


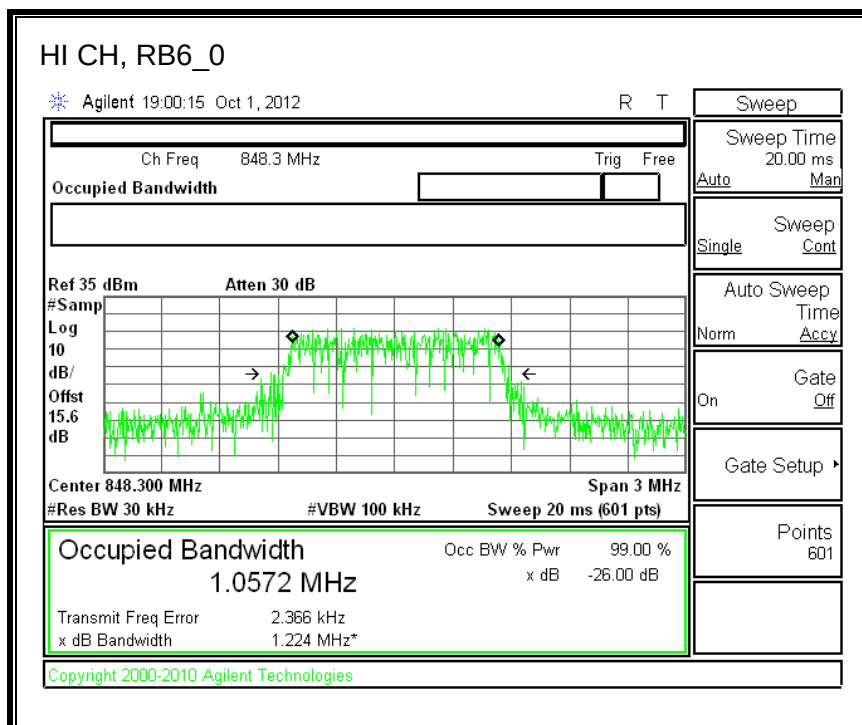
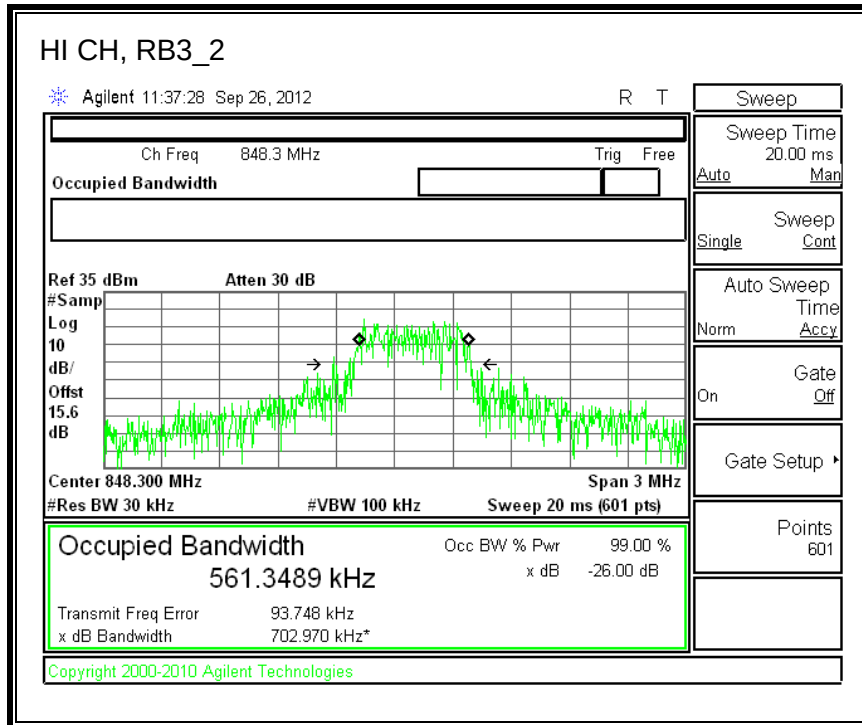


## 8.1.5. LTE Band 5

### QPSK(1.4 MHz BANDWIDTH)

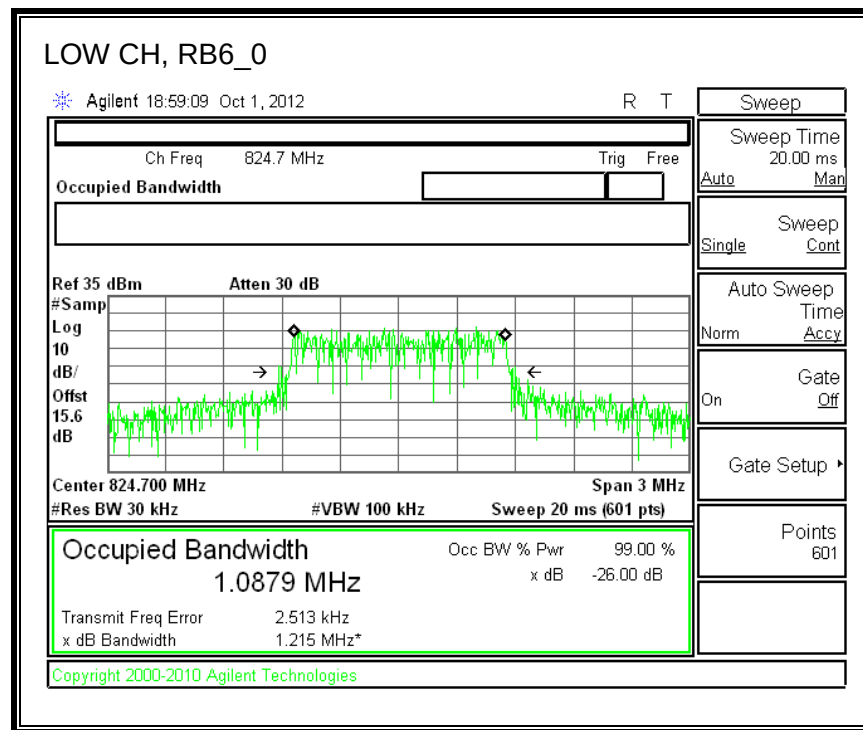
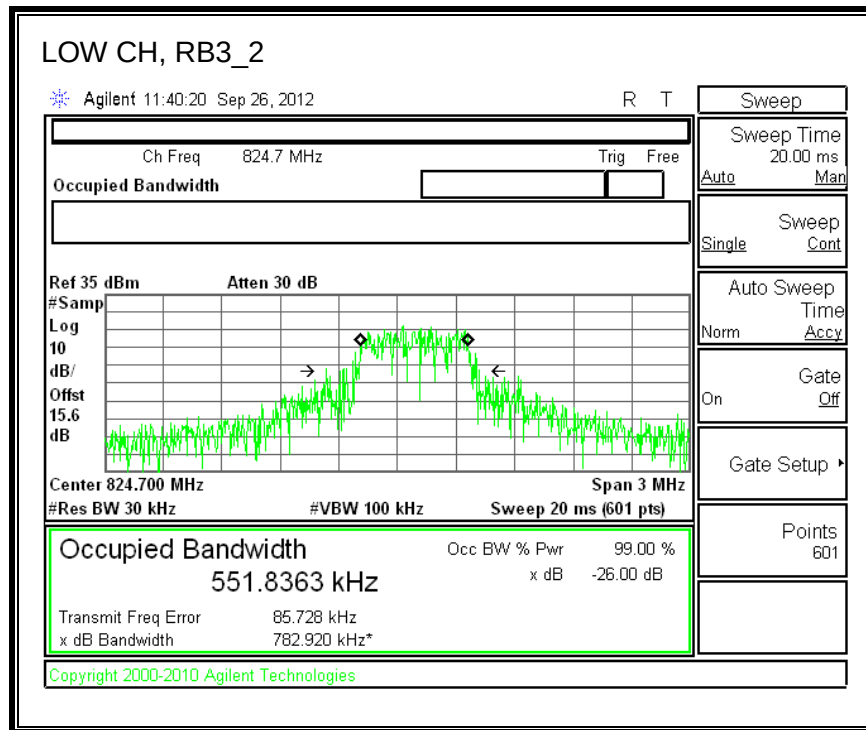




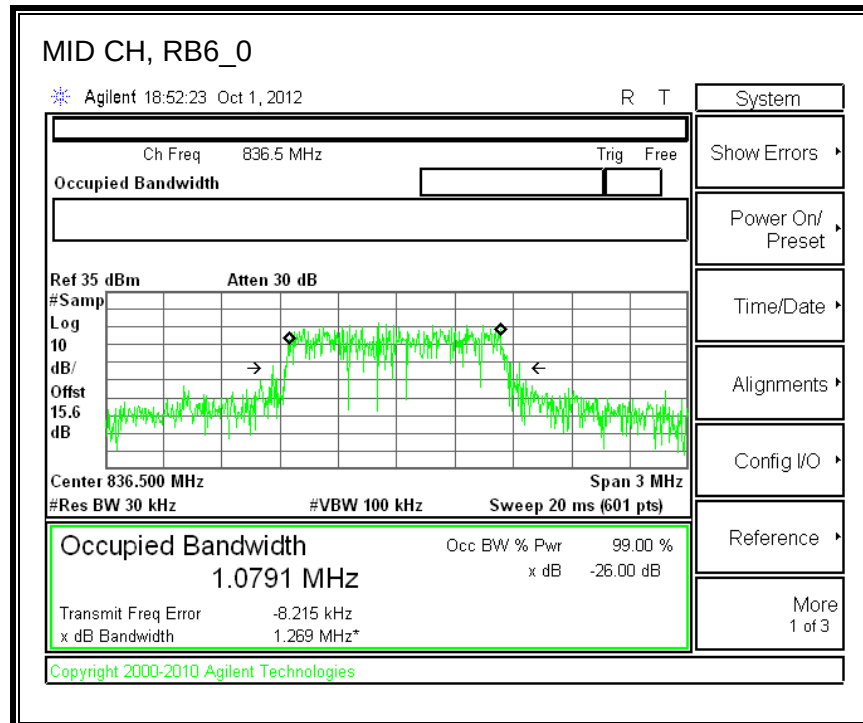
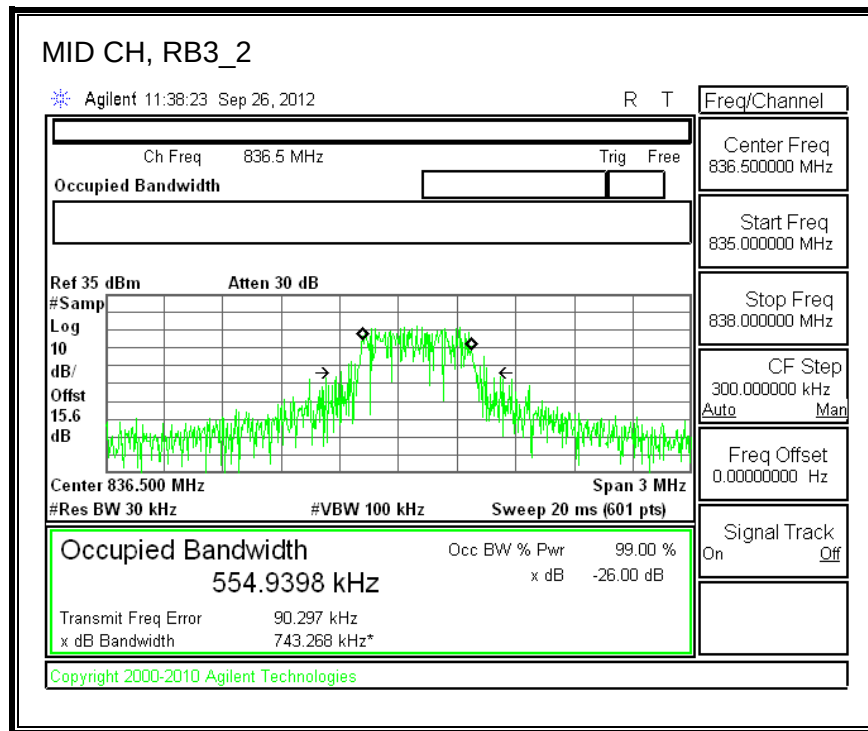


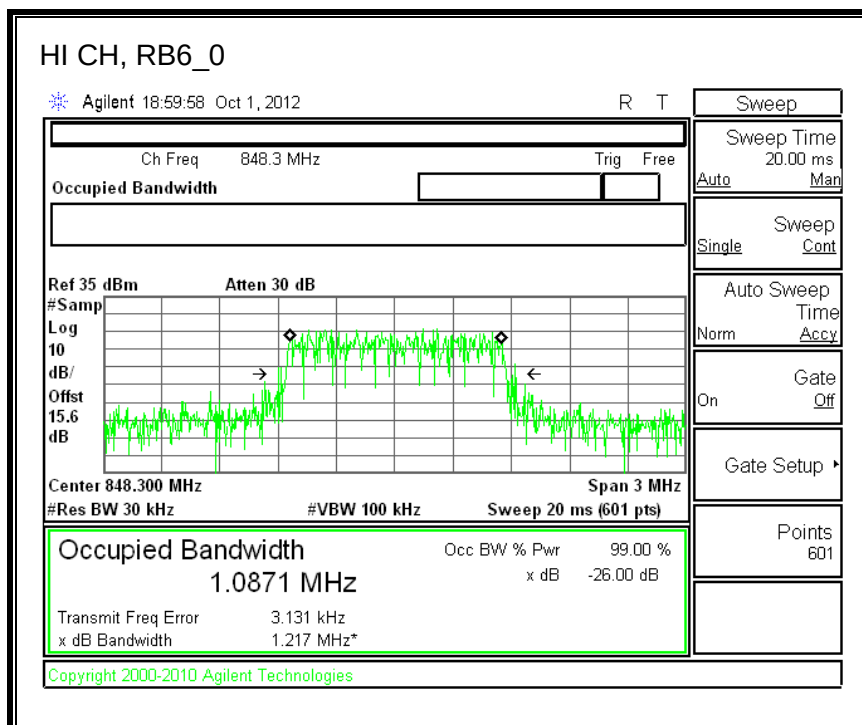
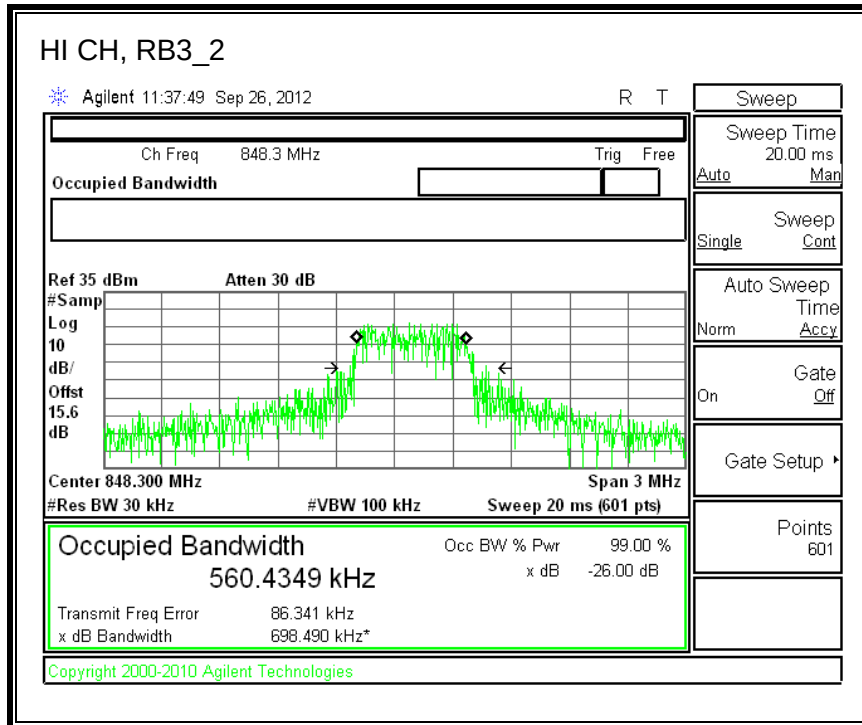
**Band 5 (1.4 MHz BANDWIDTH)**

**16QAM**



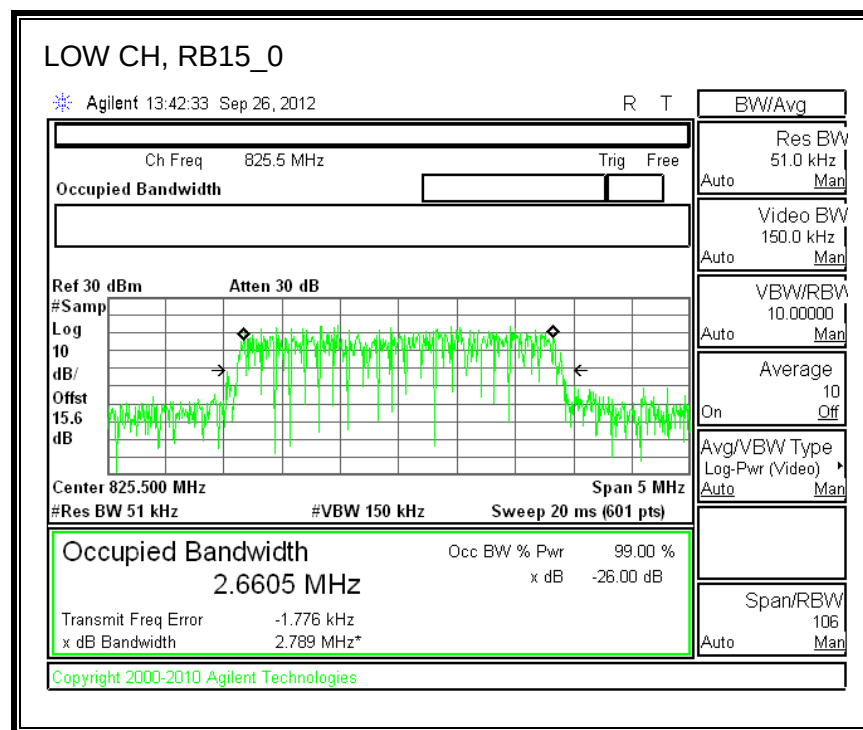
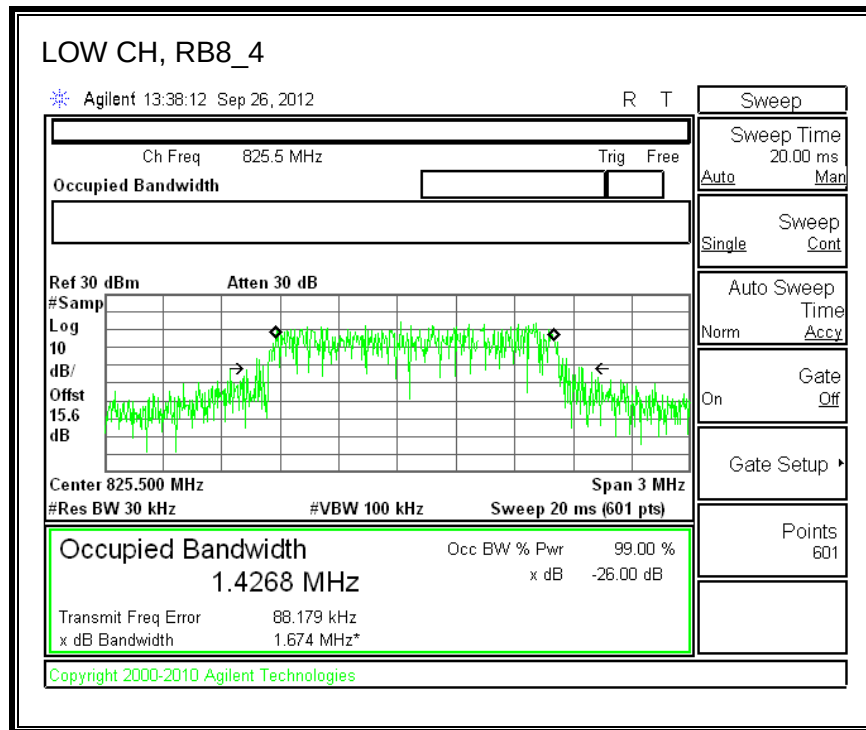


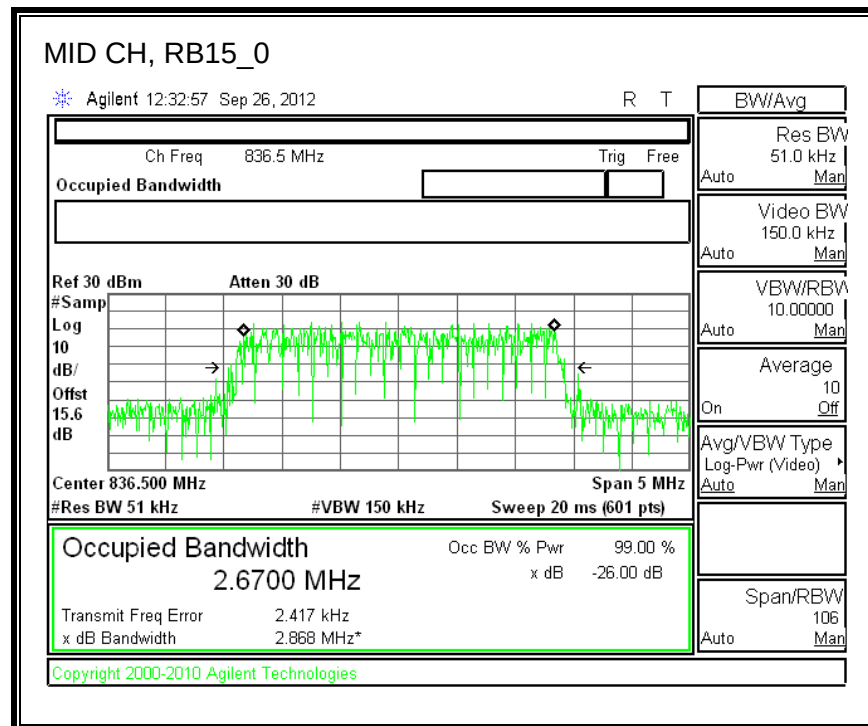
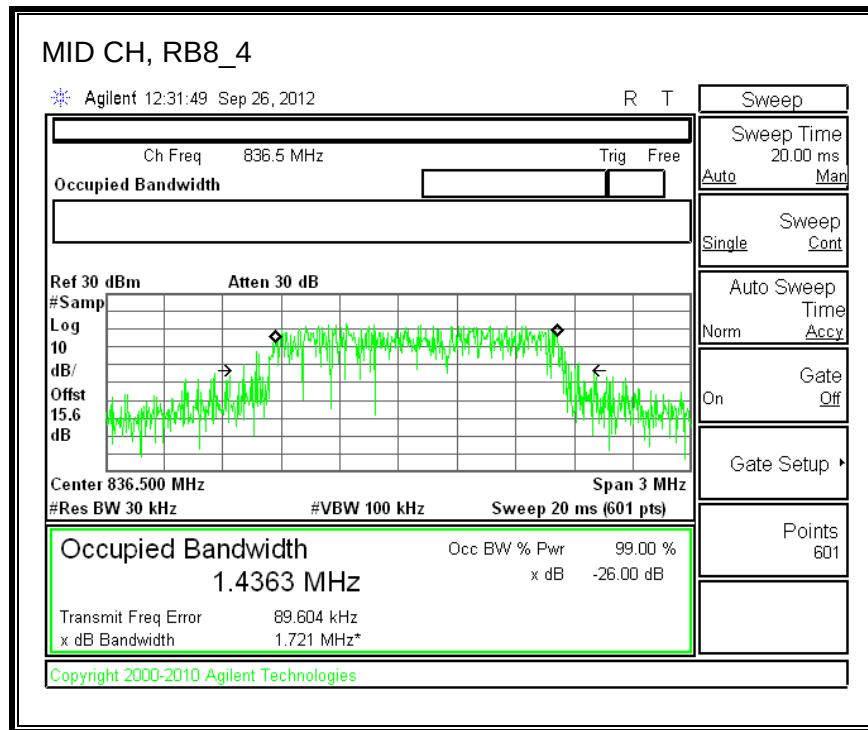


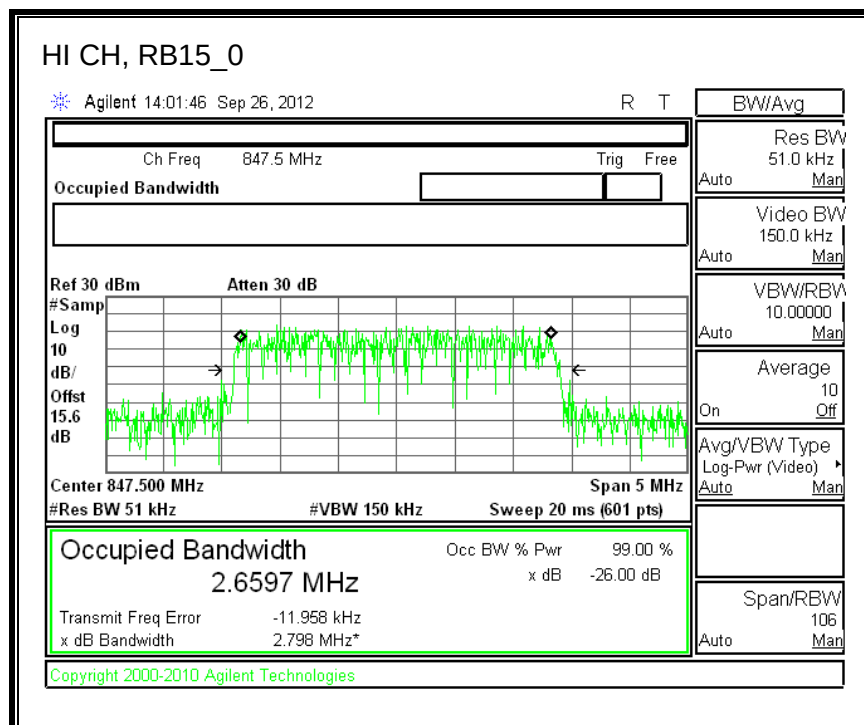
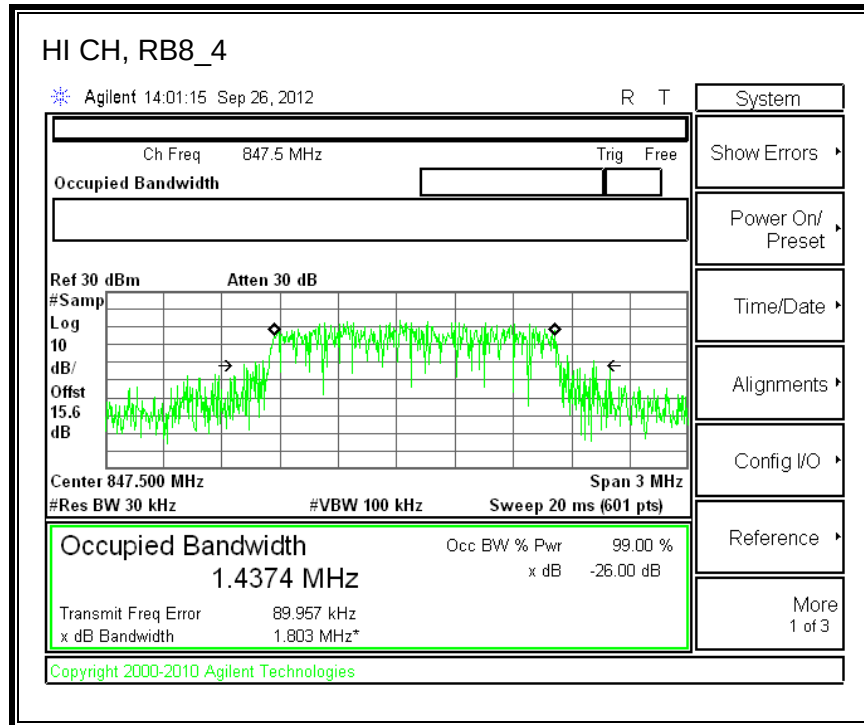


**Band 5 (3 MHz BANDWIDTH)**

**QPSK**

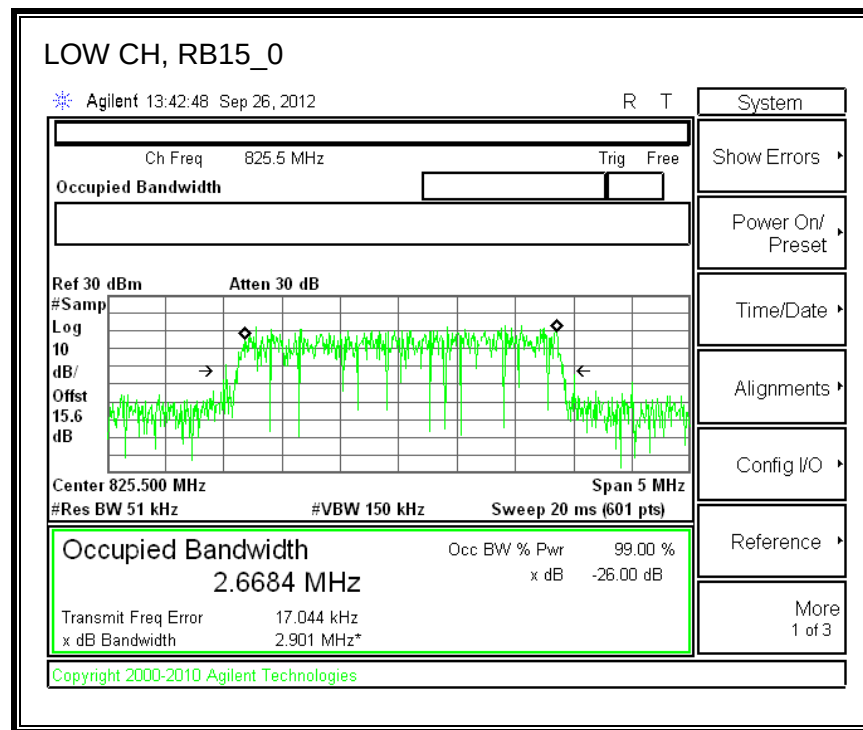
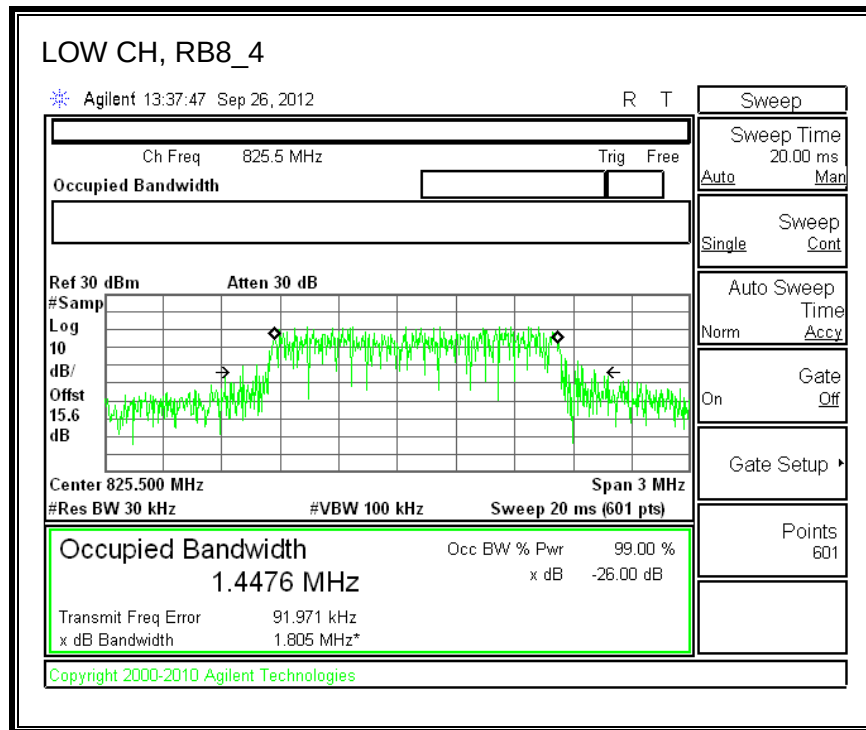


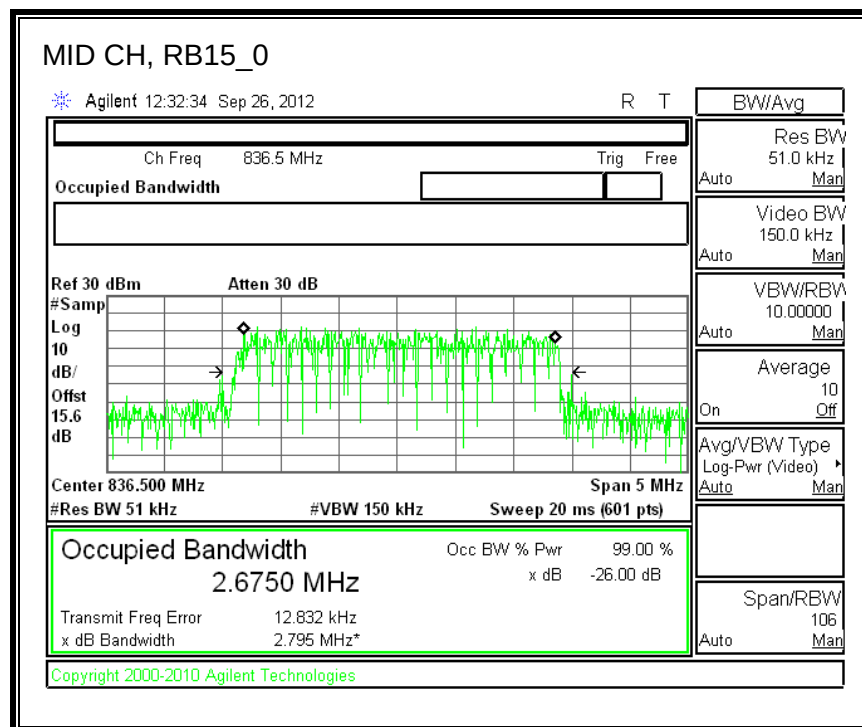
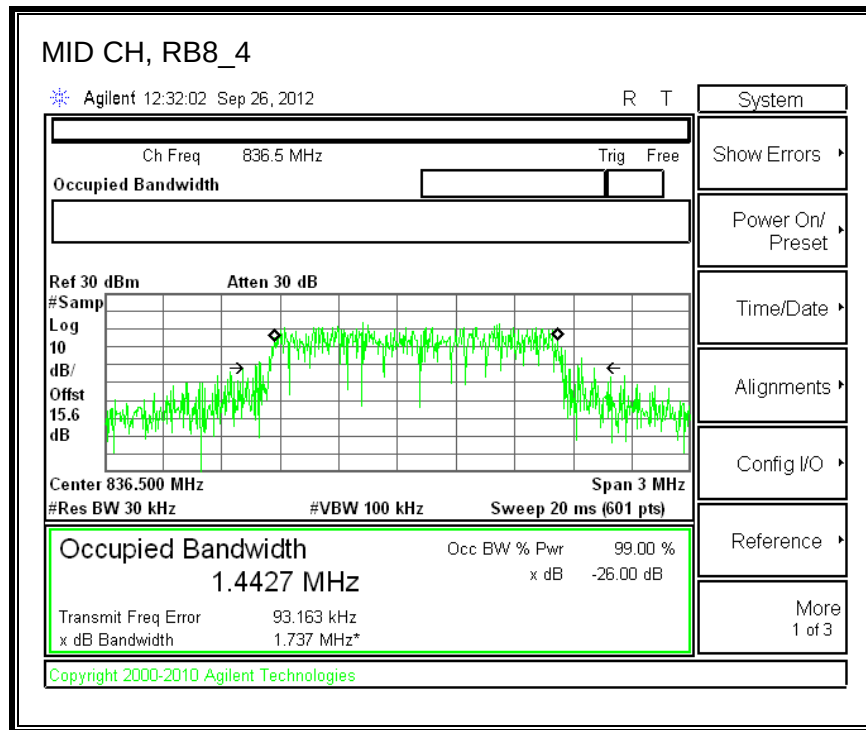


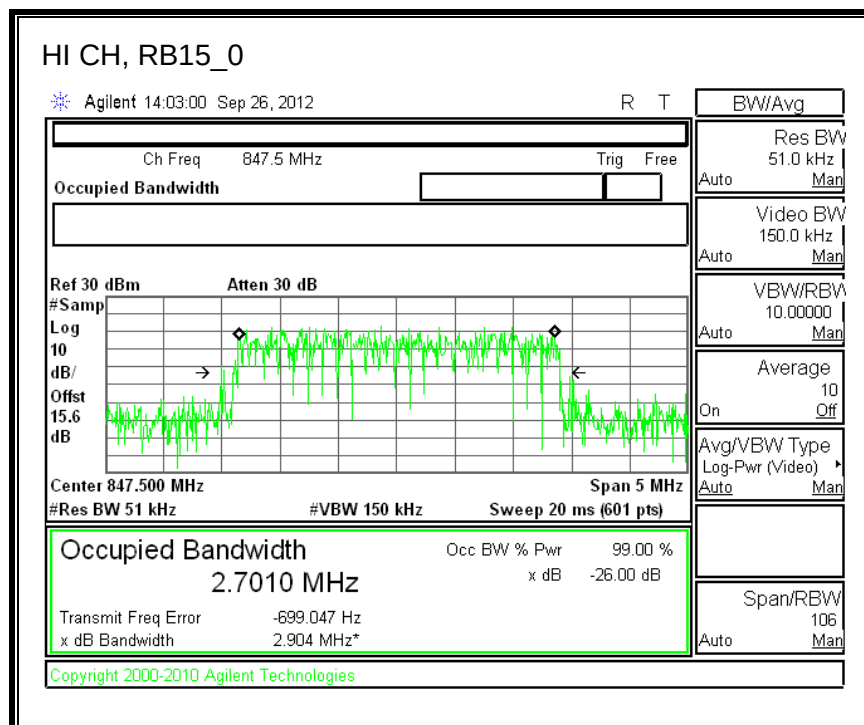
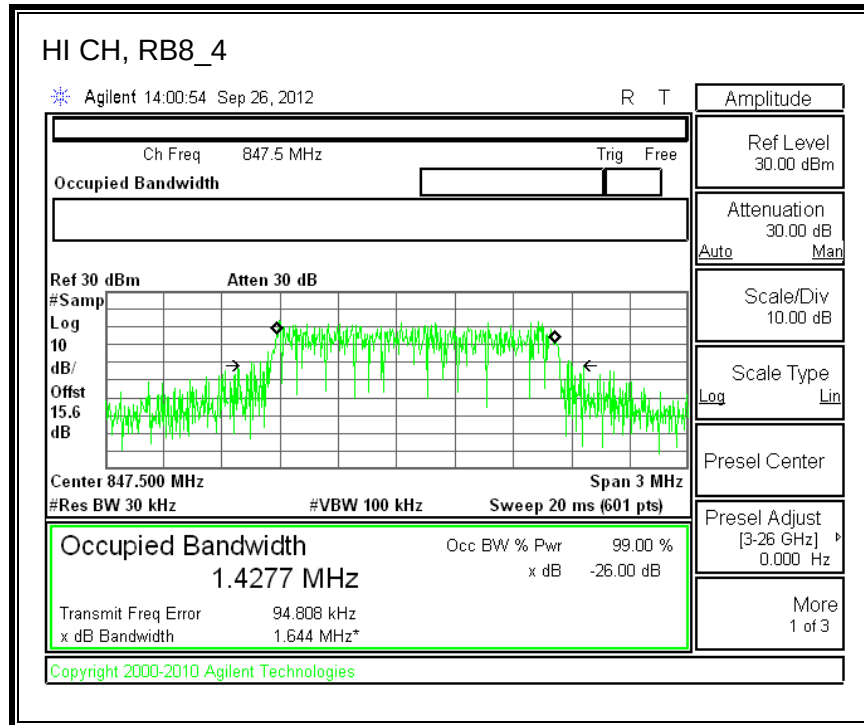


**Band 5 (3 MHz BANDWIDTH)**

**16QAM**



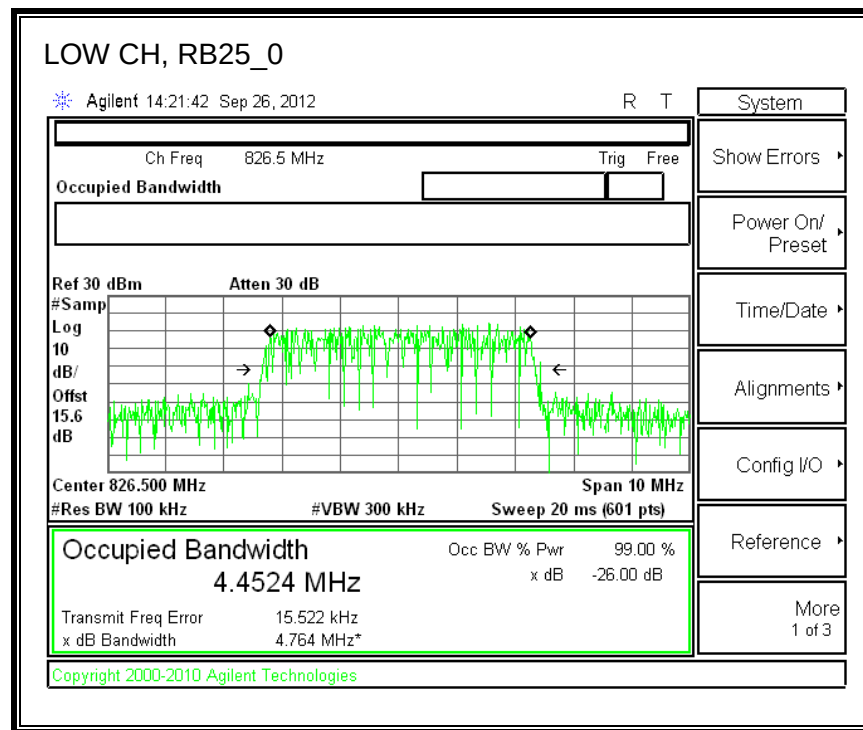
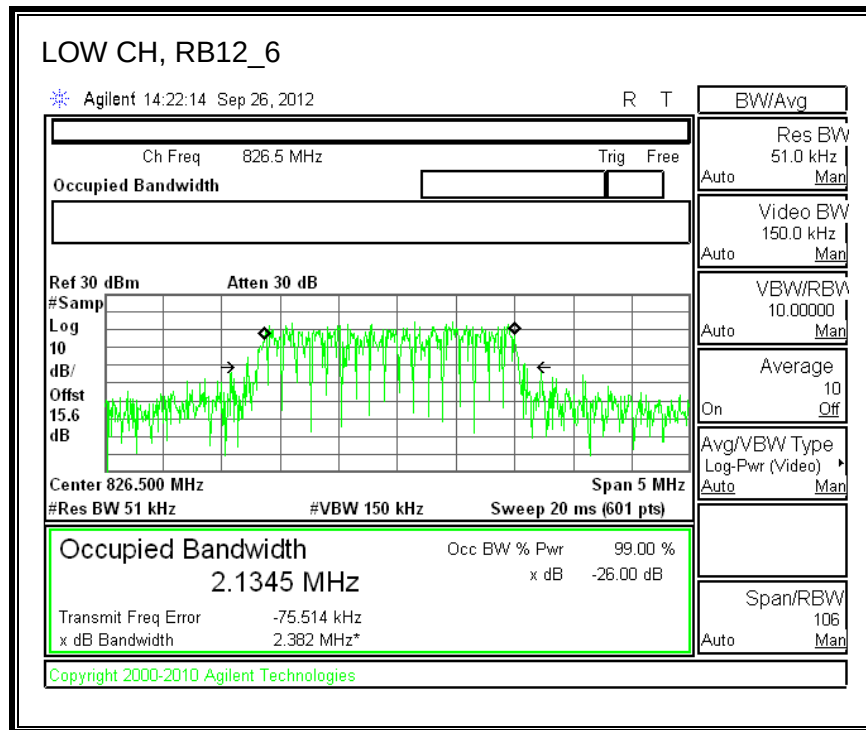


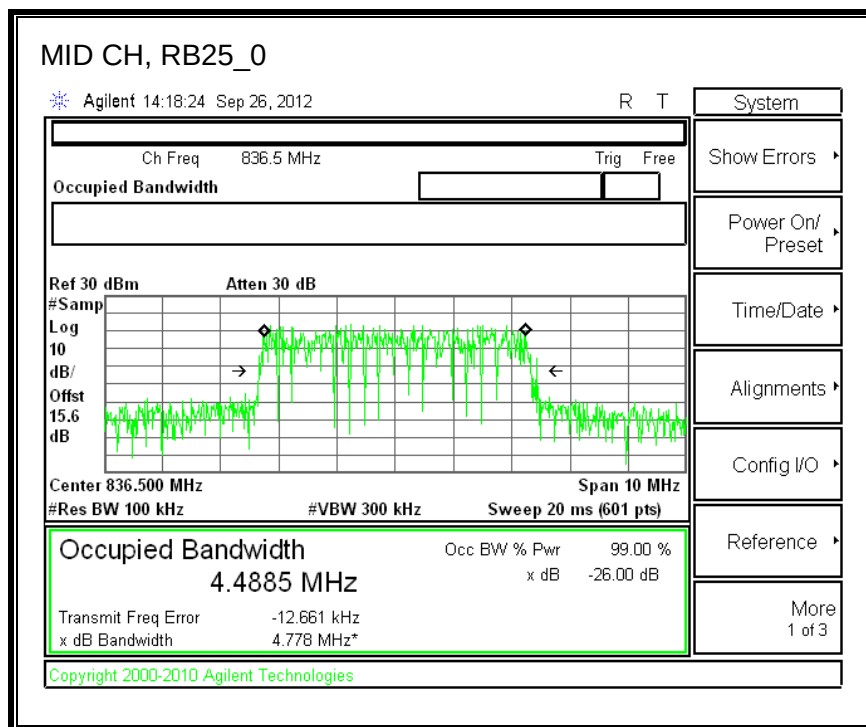
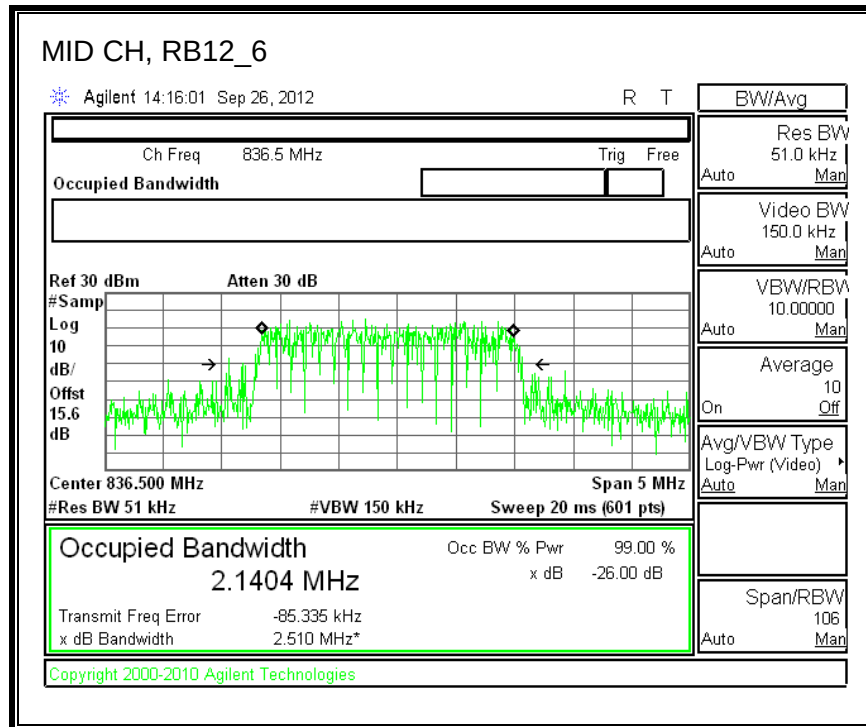


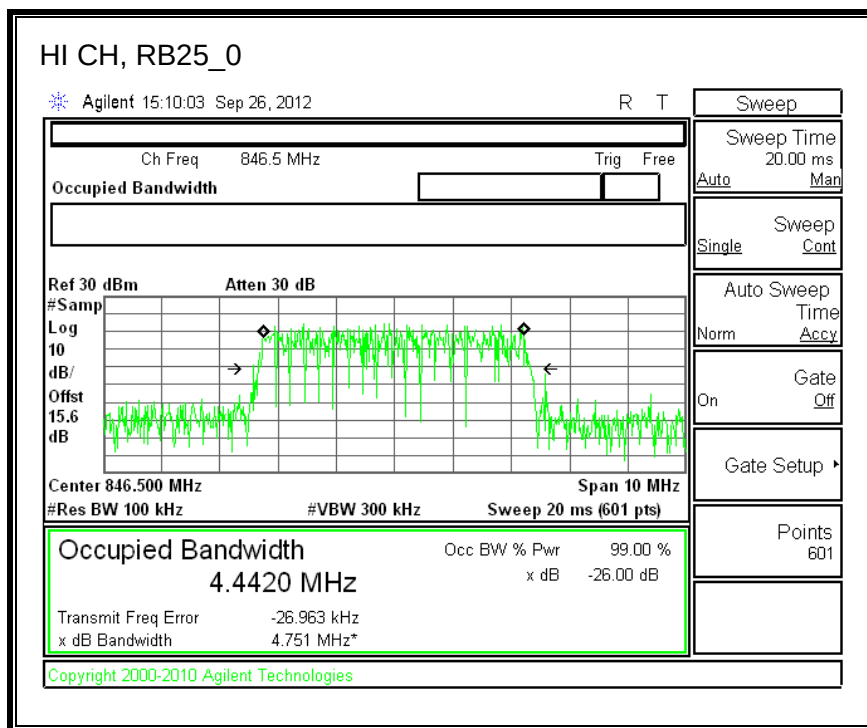
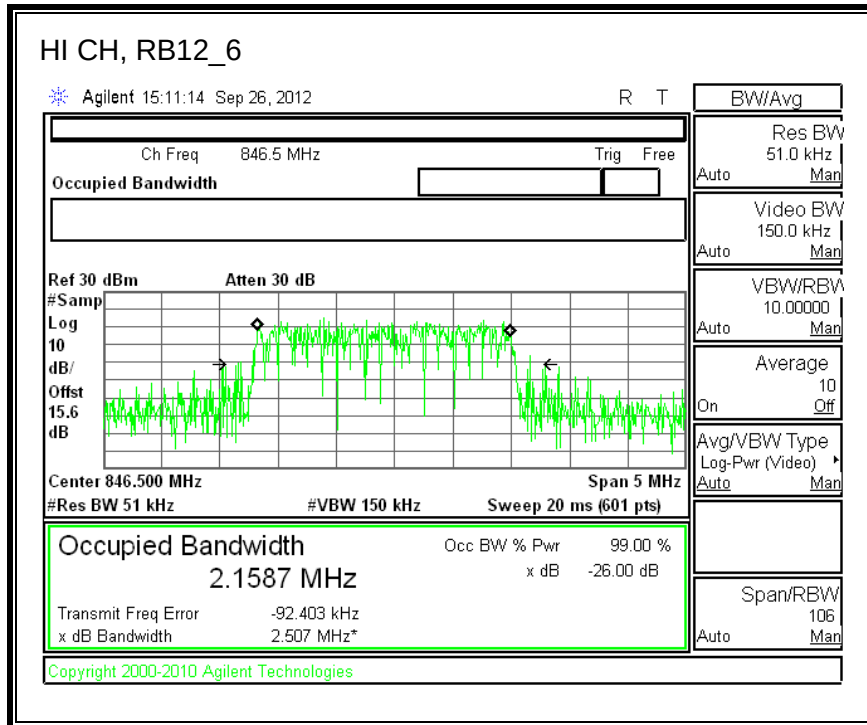


**Band 5 (5 MHz BANDWIDTH)**

**QPSK**

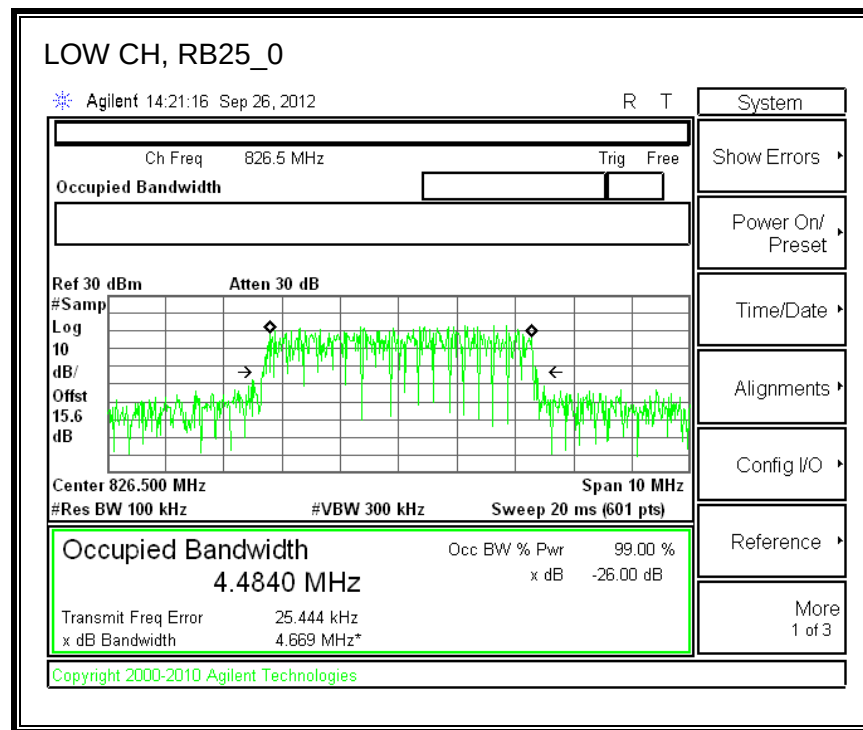
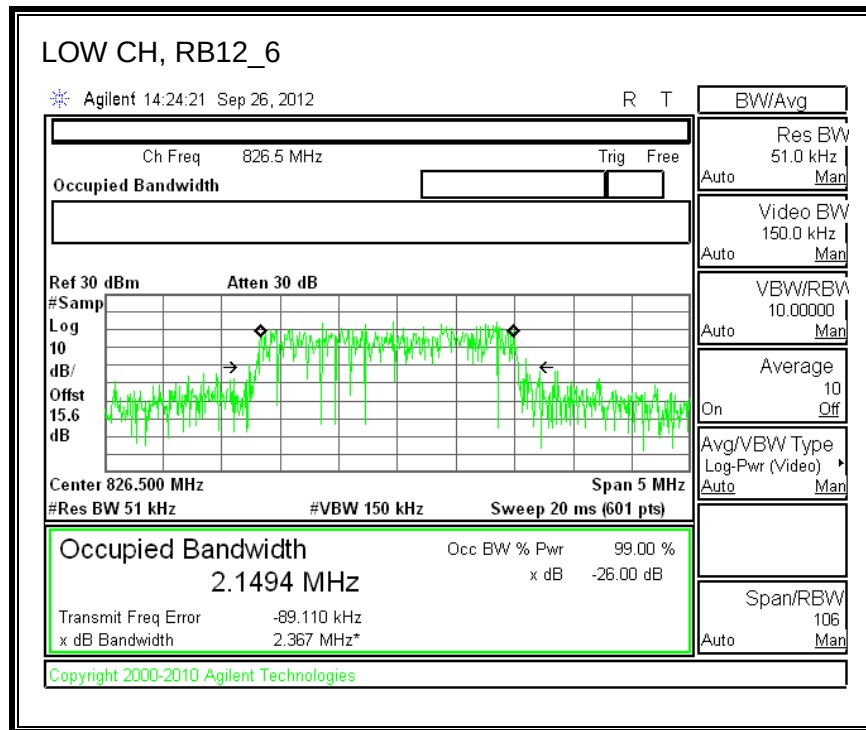


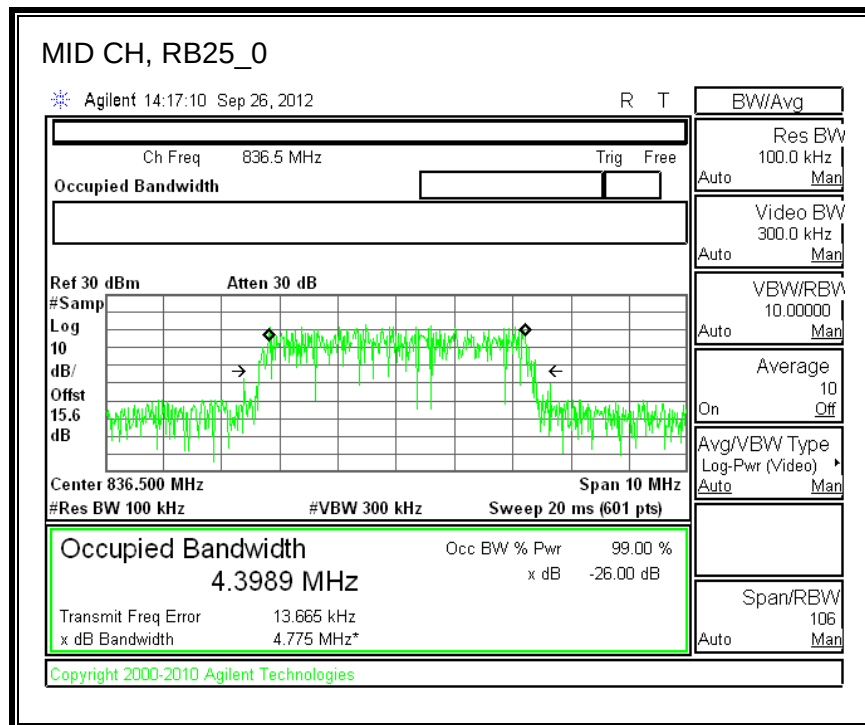
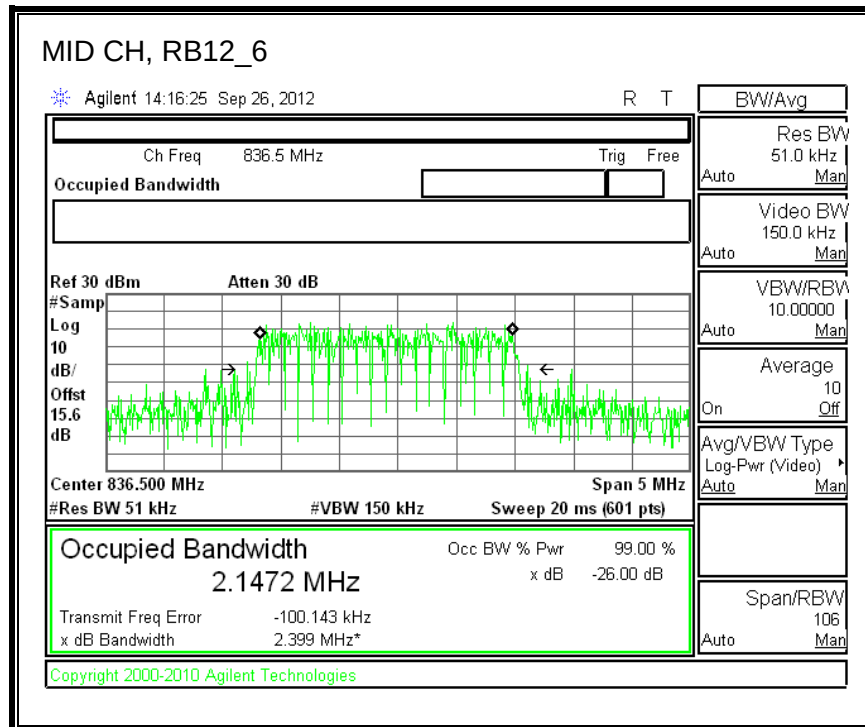


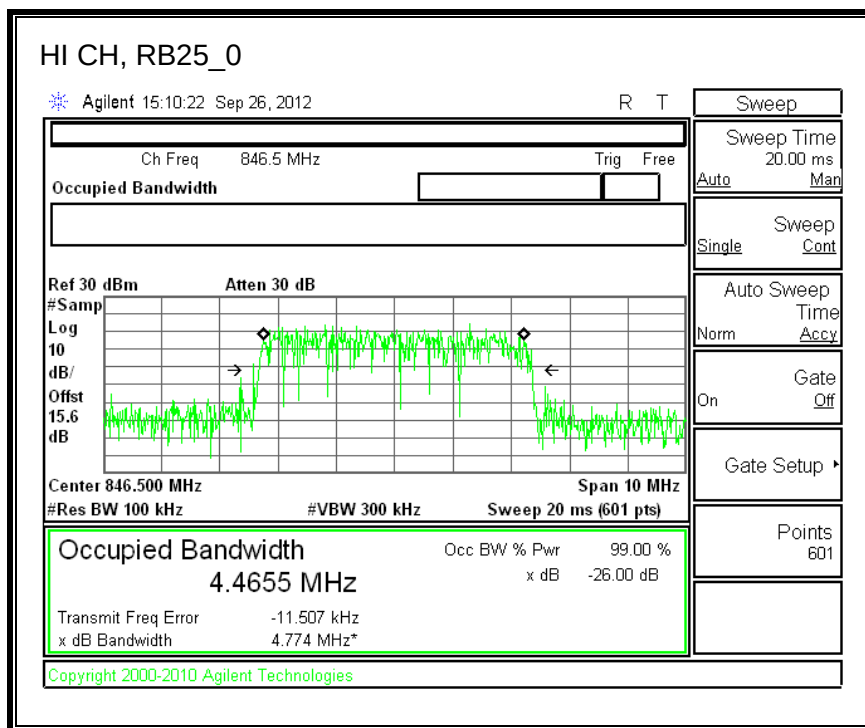
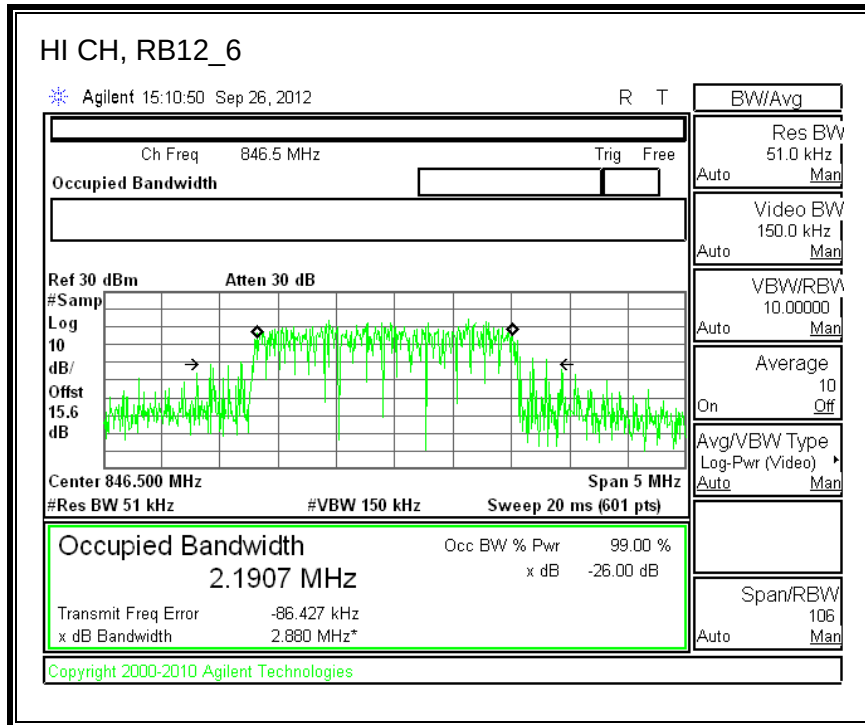


**Band 5 (5 MHz BANDWIDTH)**

**16QAM**

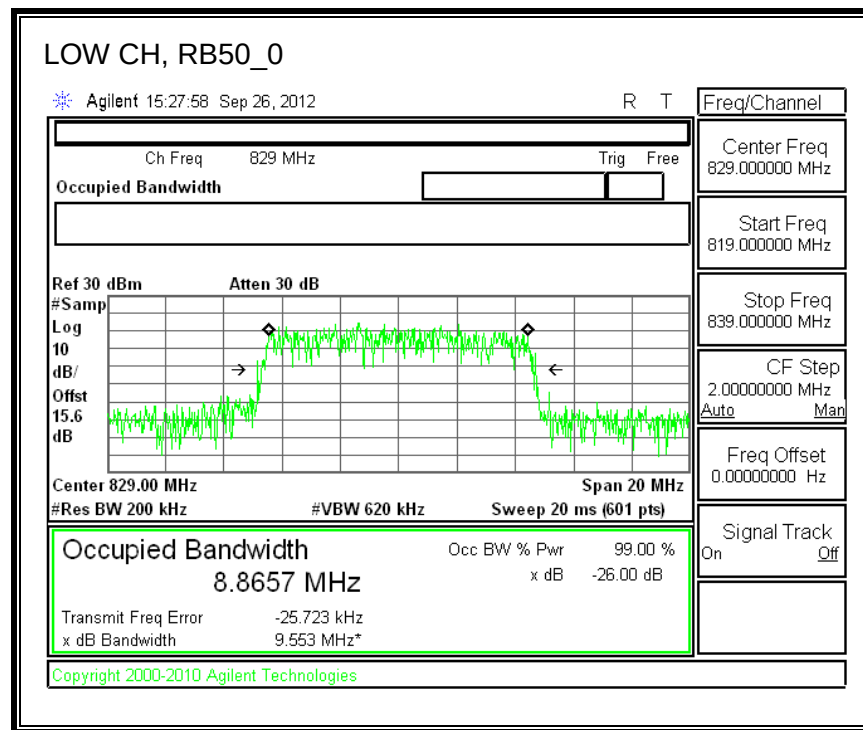
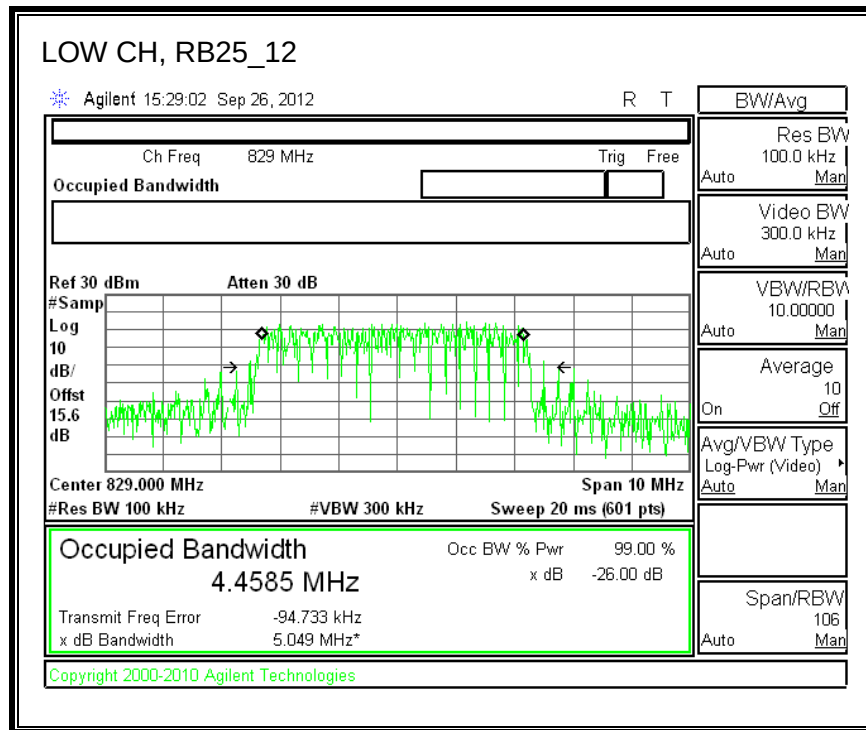


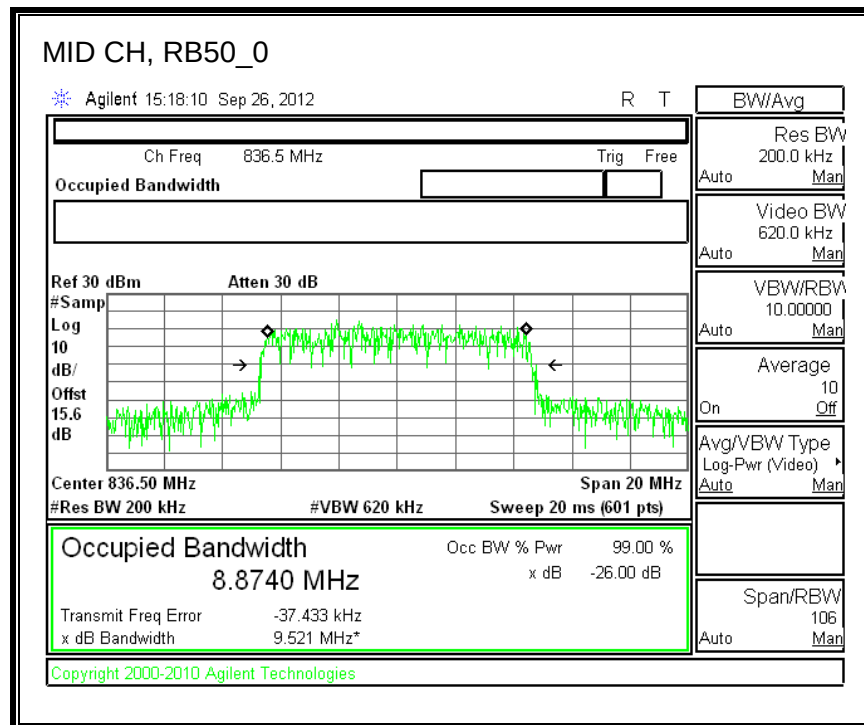
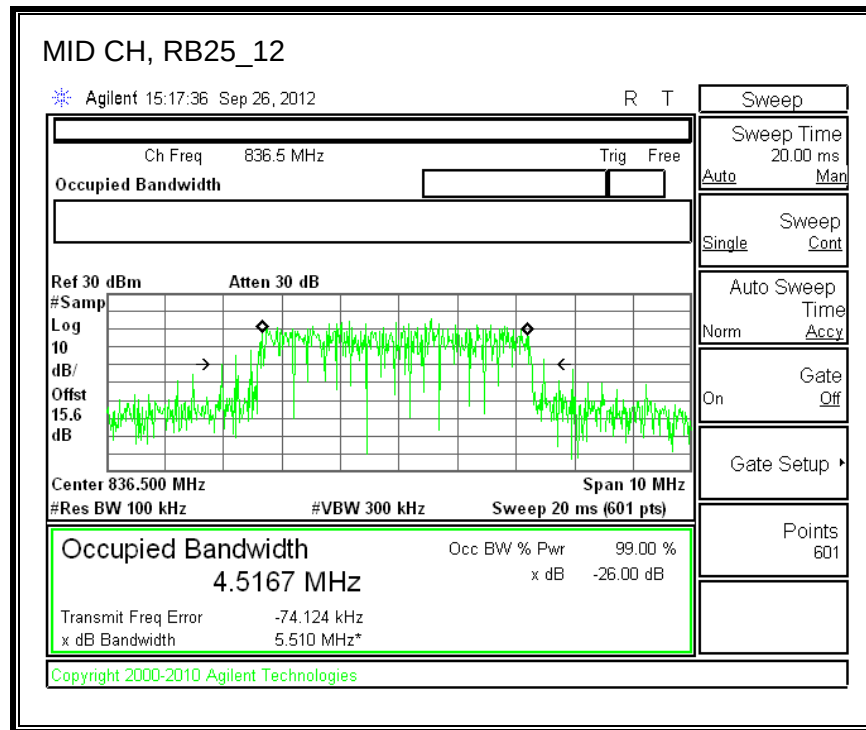




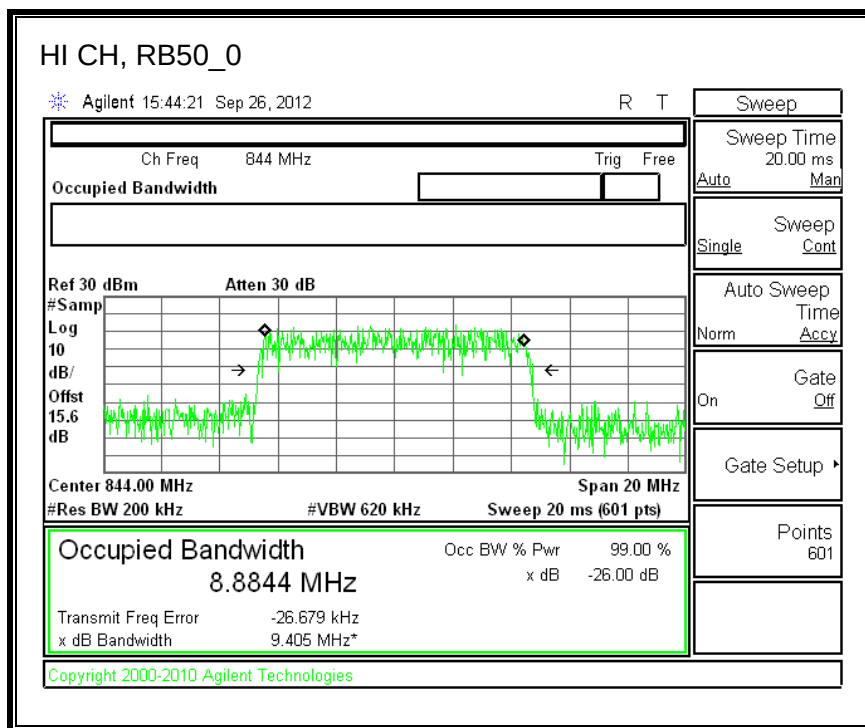
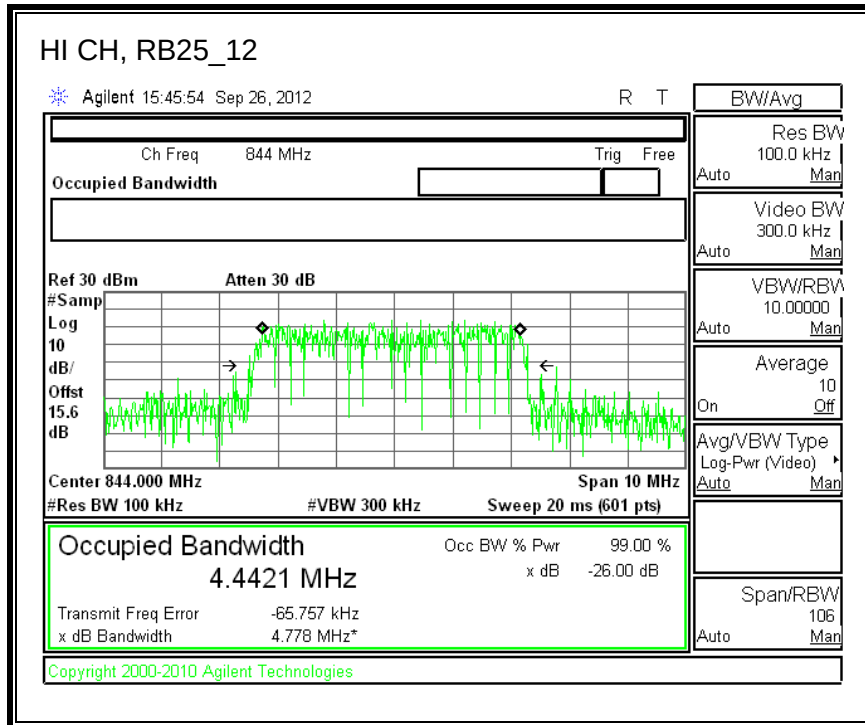
**Band 5 (10 MHz BANDWIDTH)**

**QPSK**



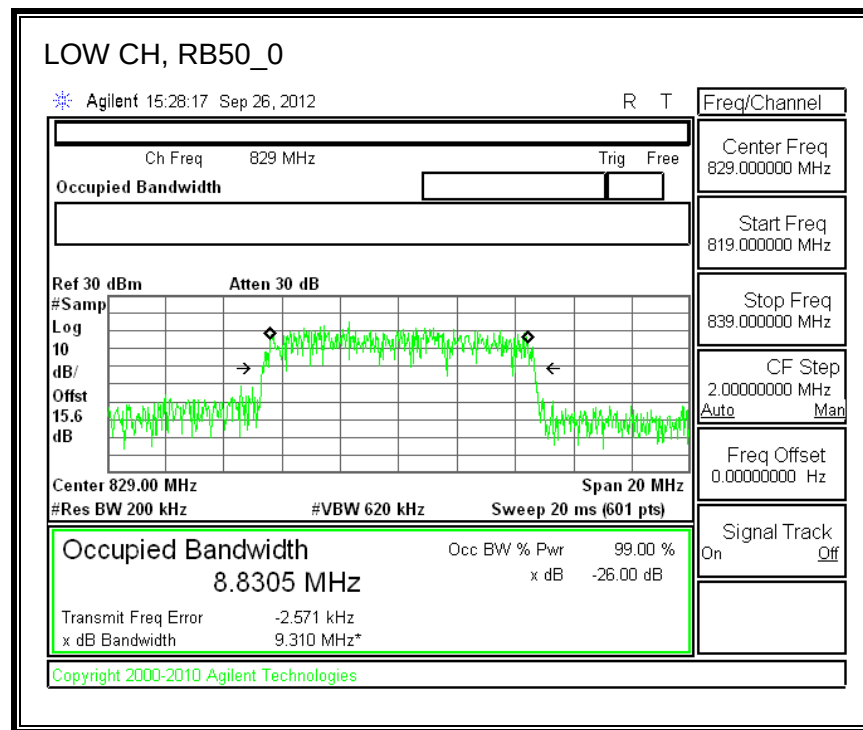
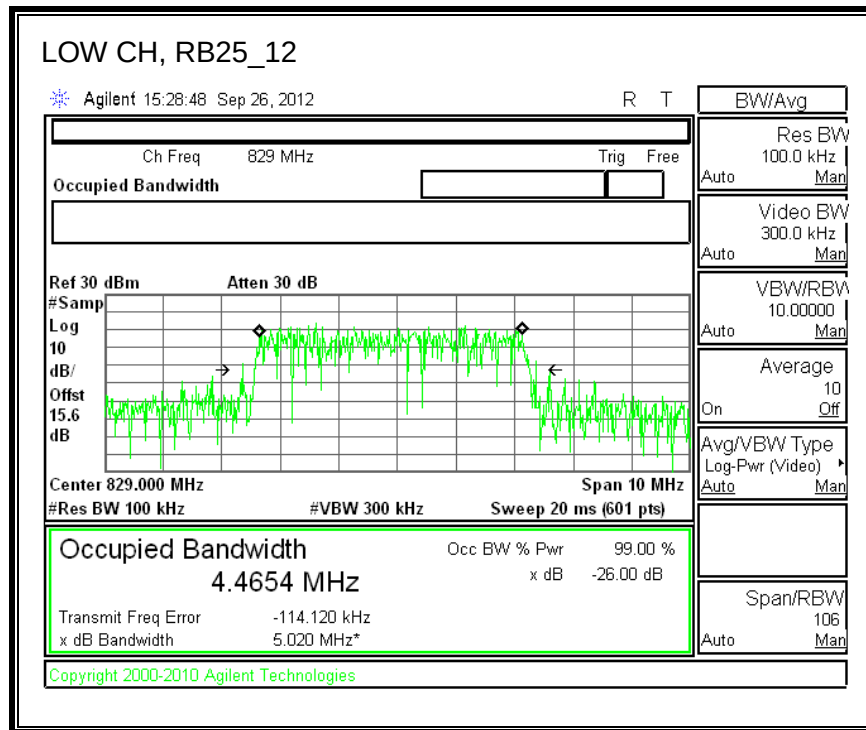


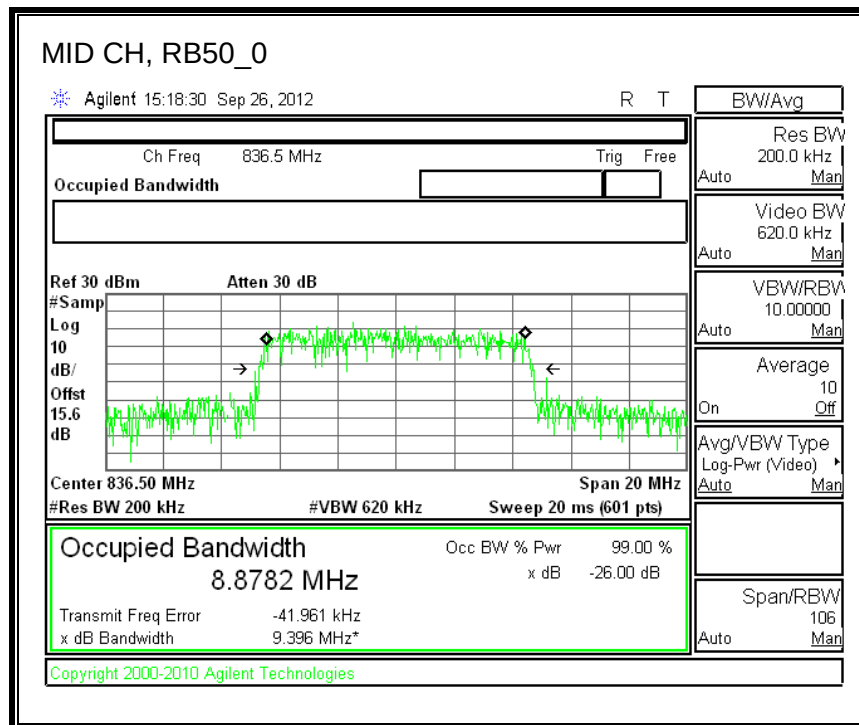
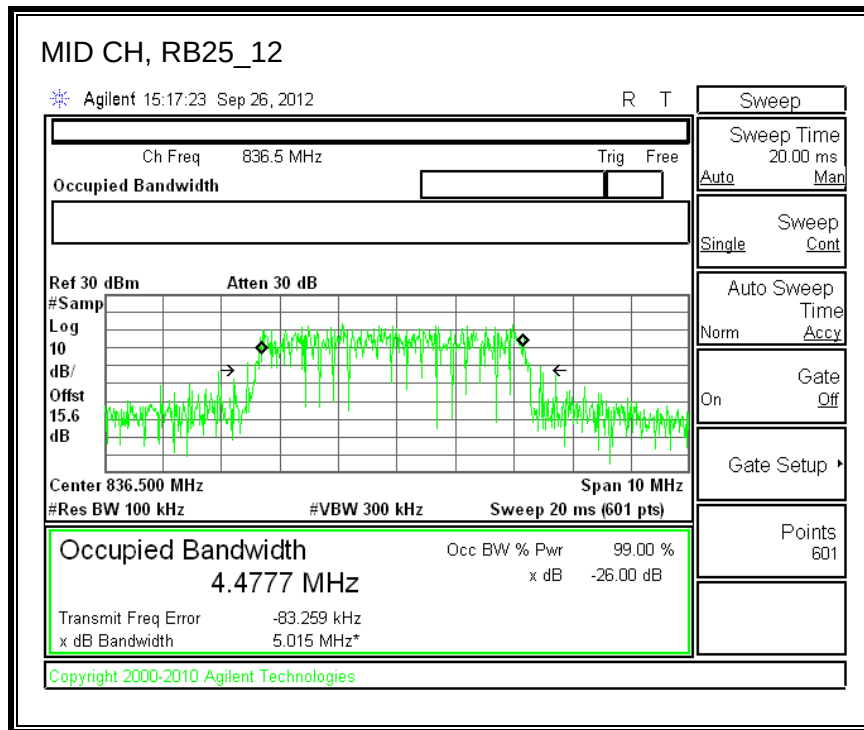


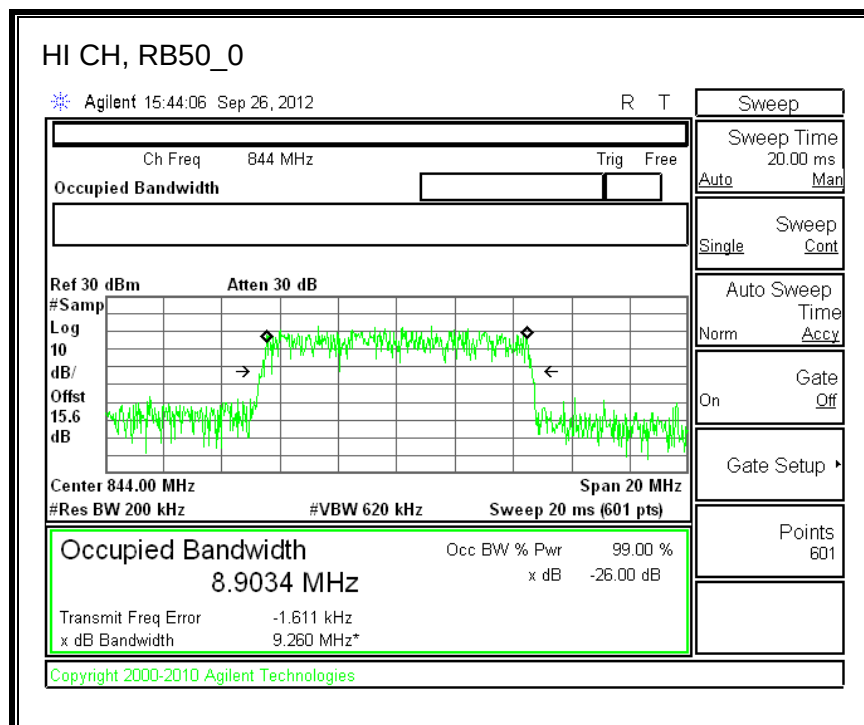
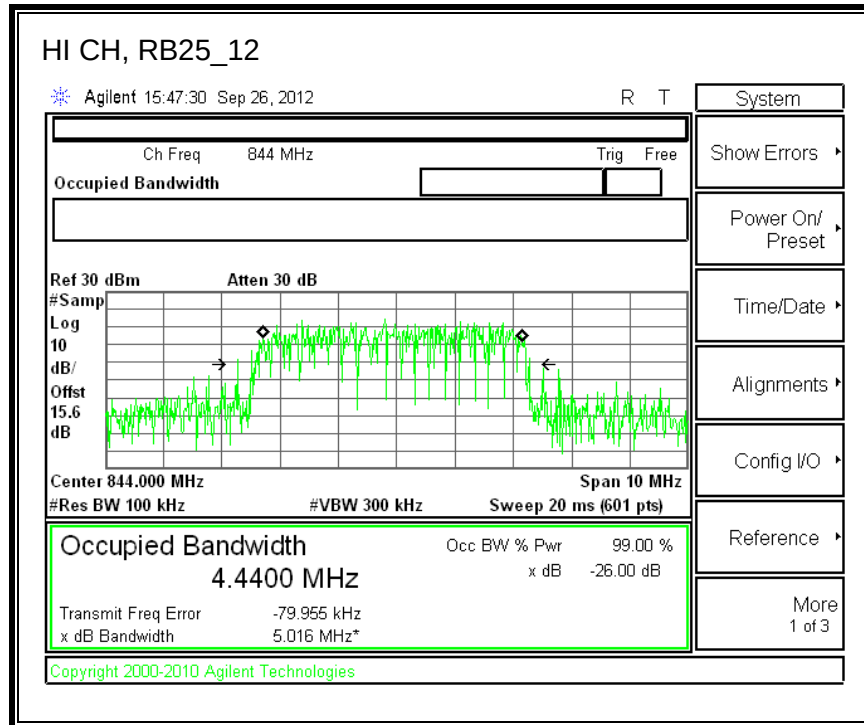


**Band 5 (10 MHz BANDWIDTH)**

**16QAM**

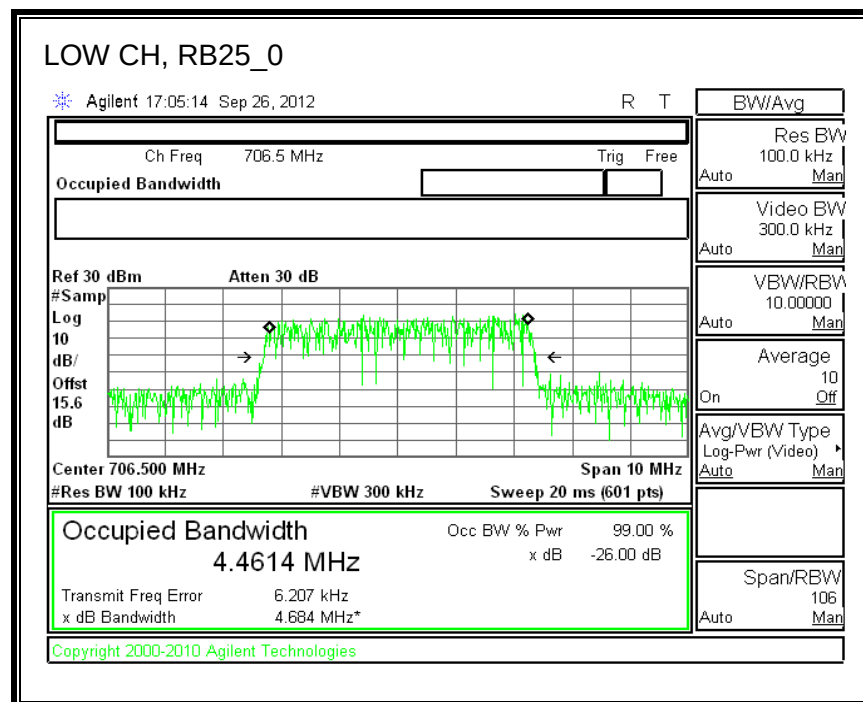
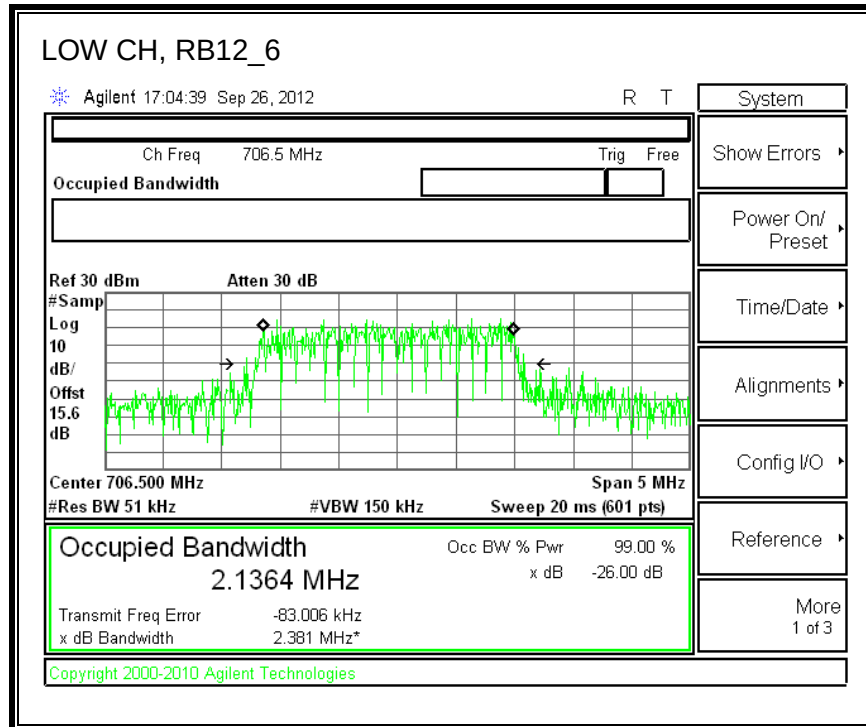


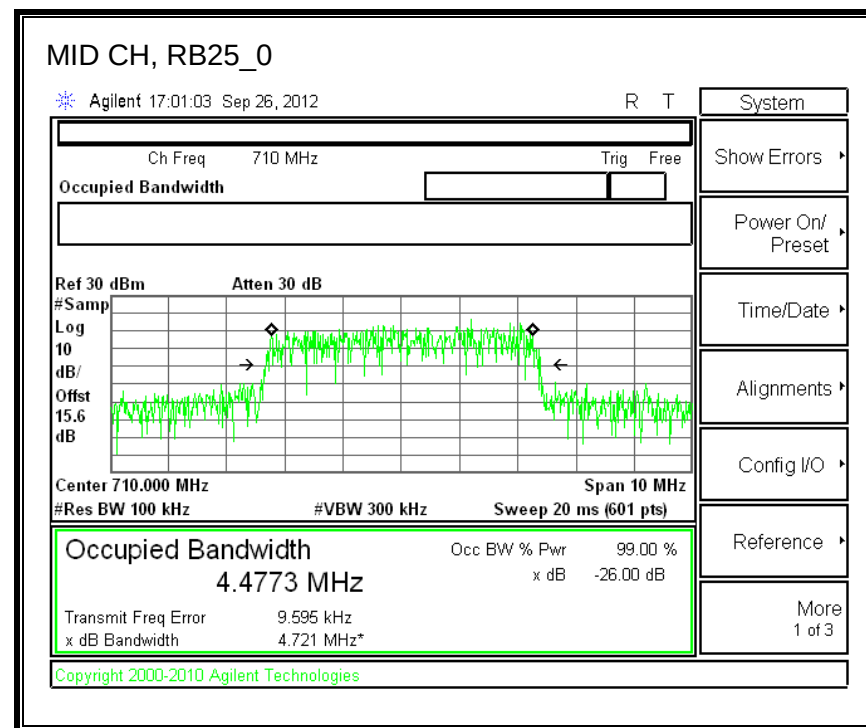
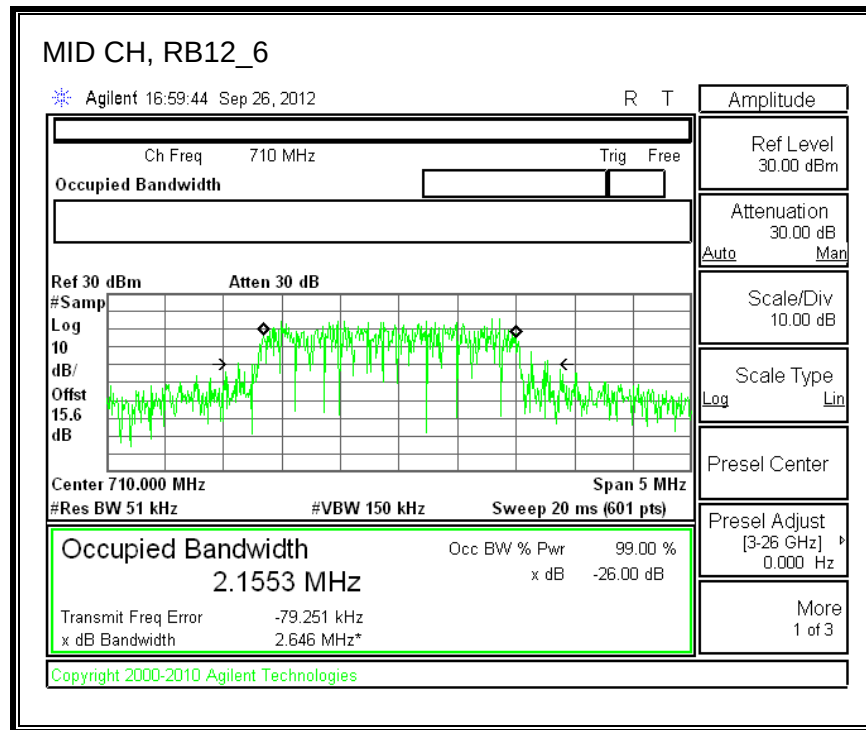


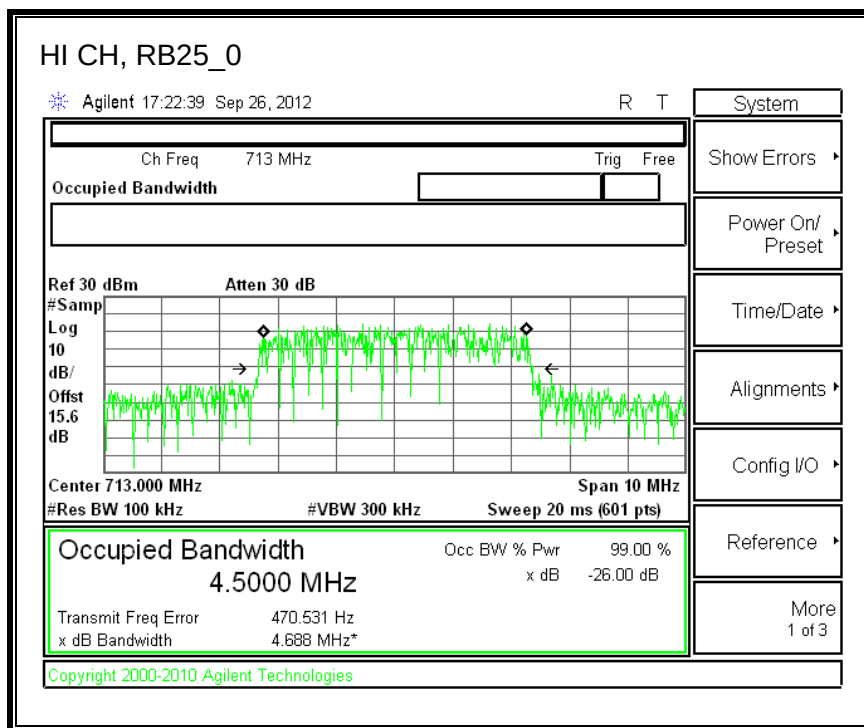
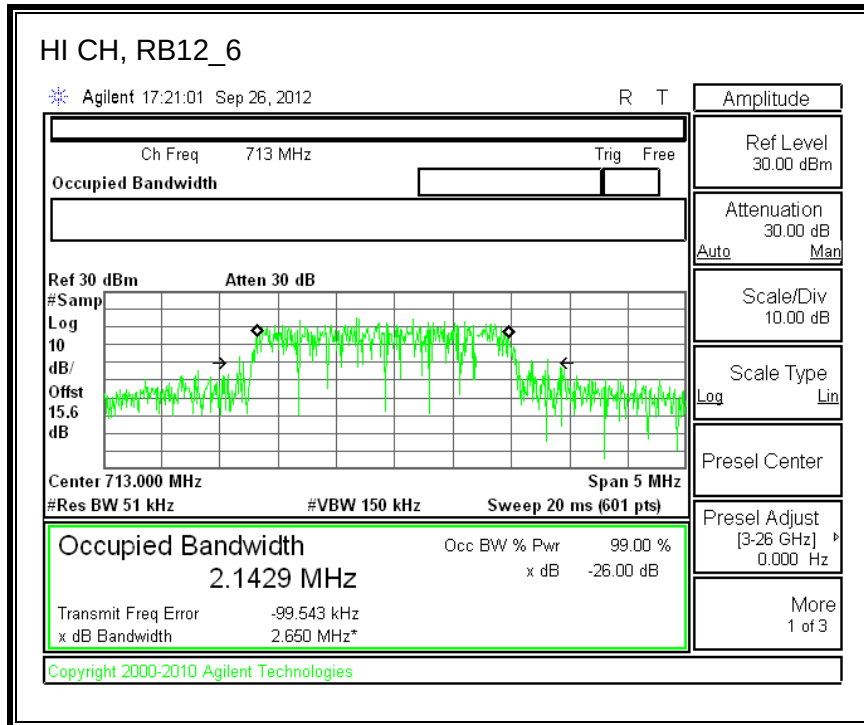


## 8.1.6. LTE Band 17

### QPSK (5 MHz BANDWIDTH)

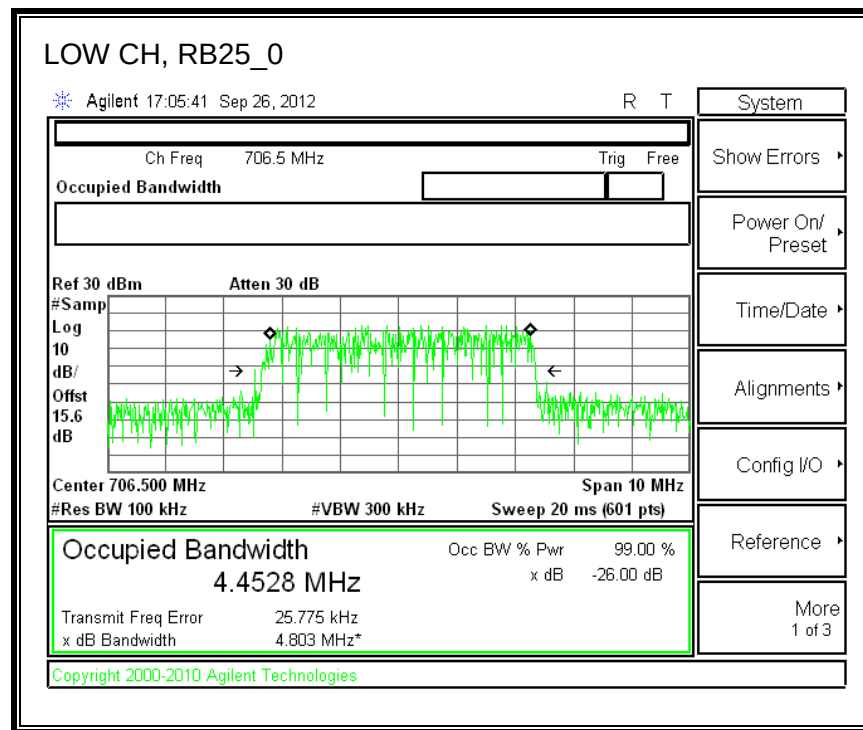
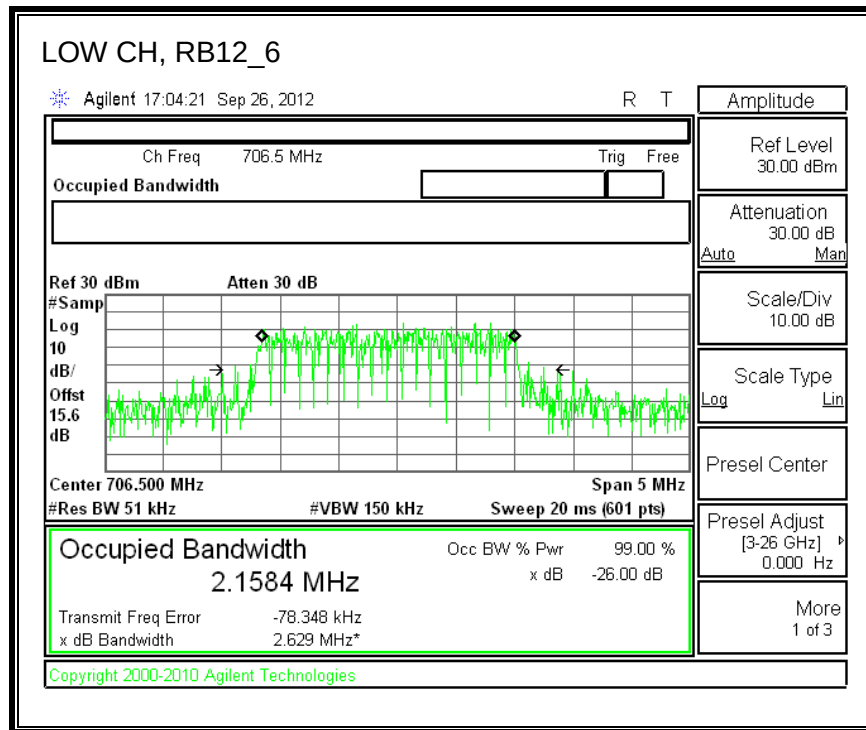




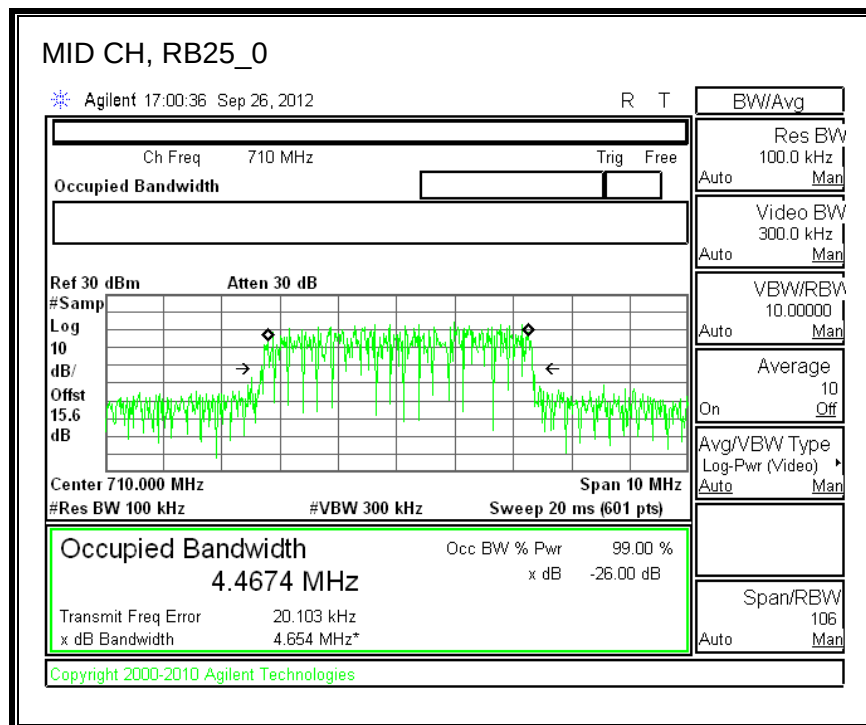
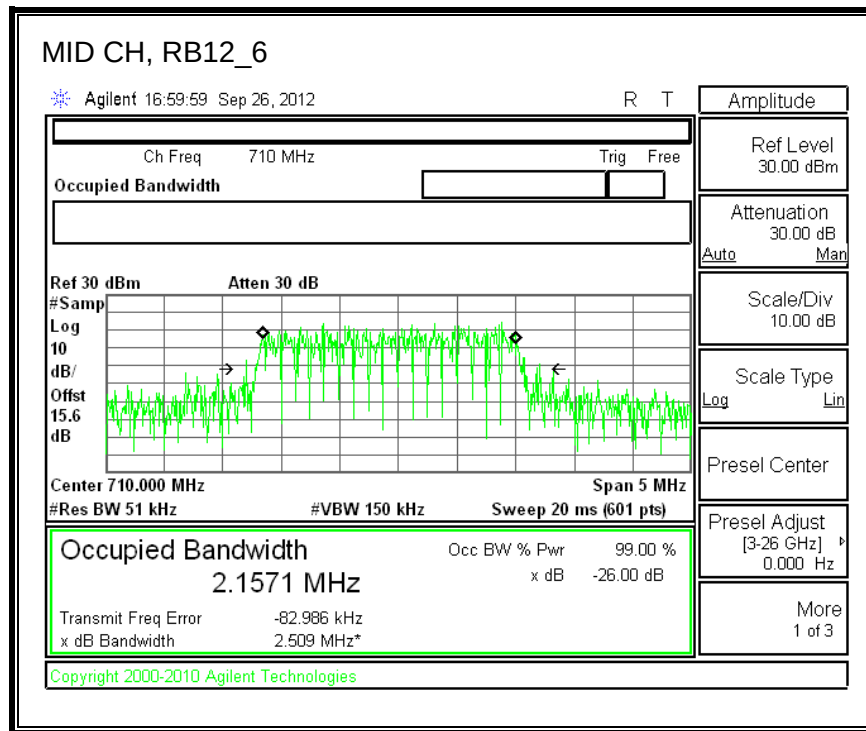


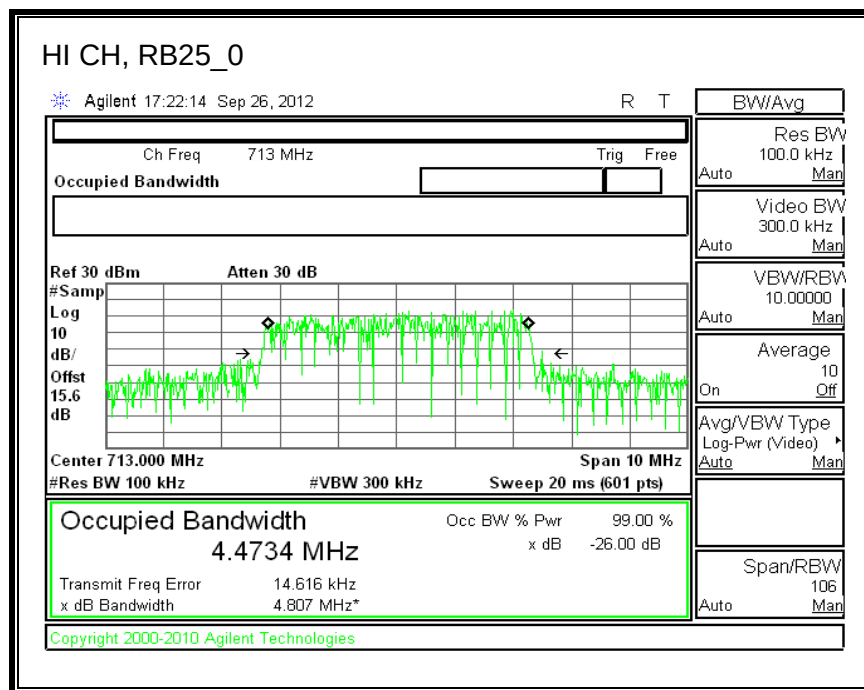
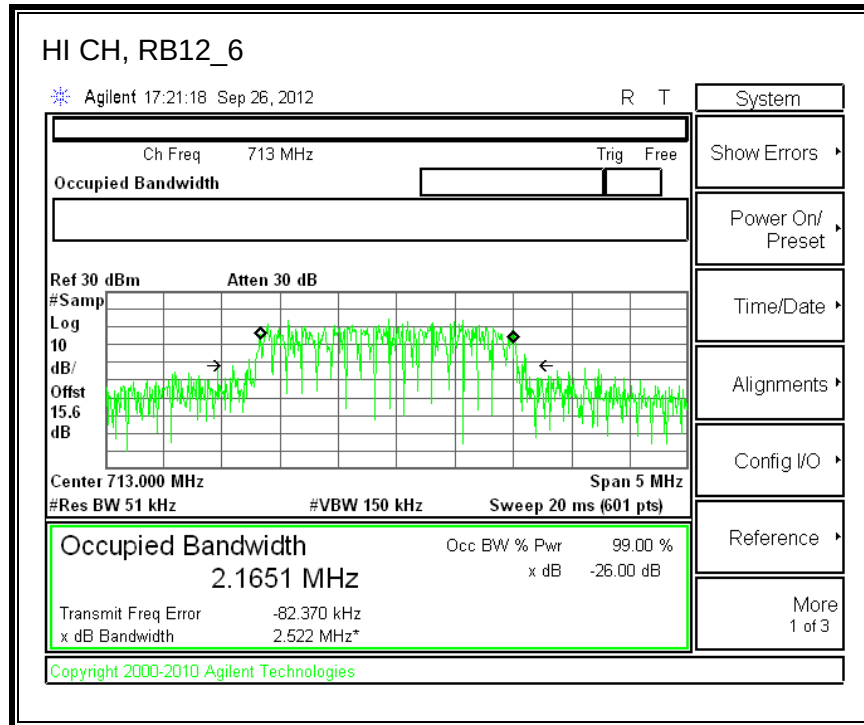
**Band 17 (5 MHz BANDWIDTH)**

**16QAM**



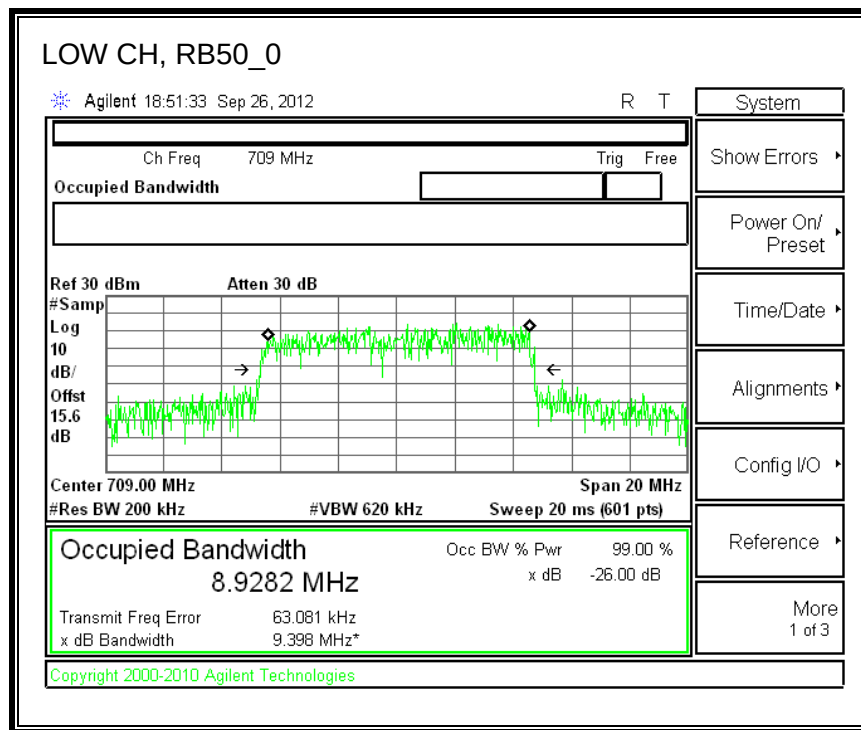
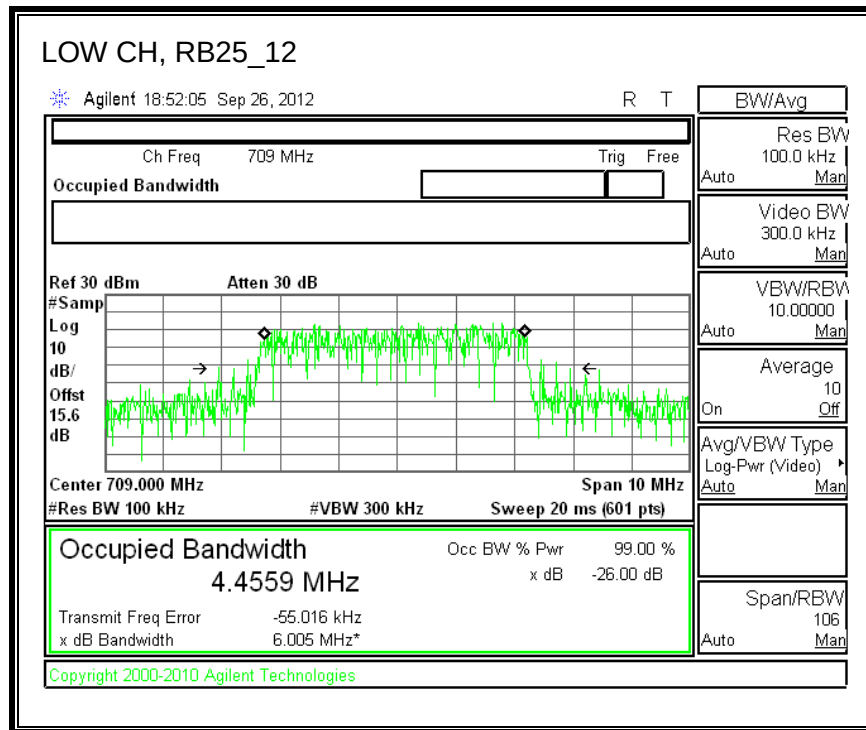


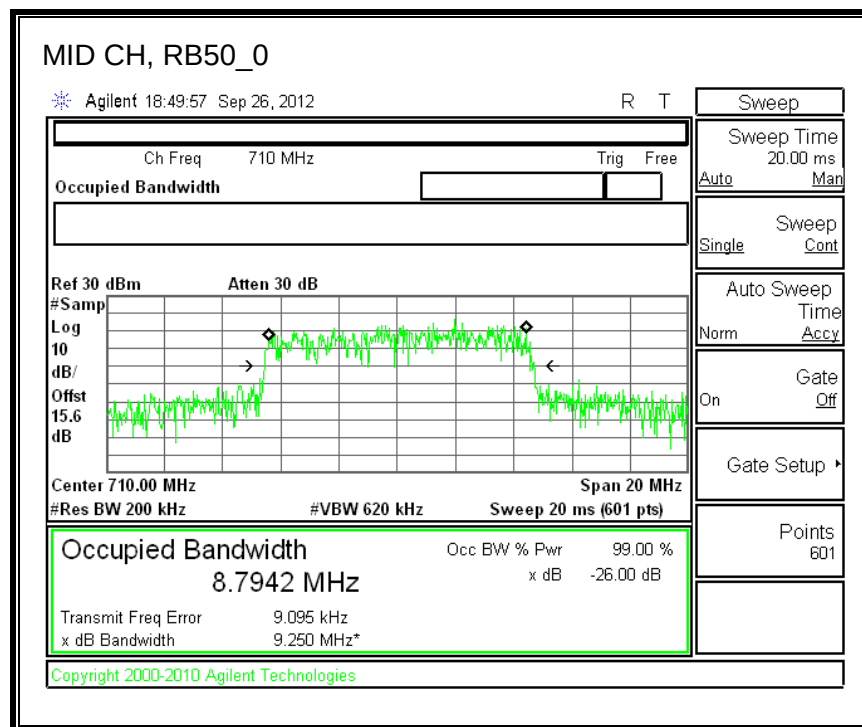
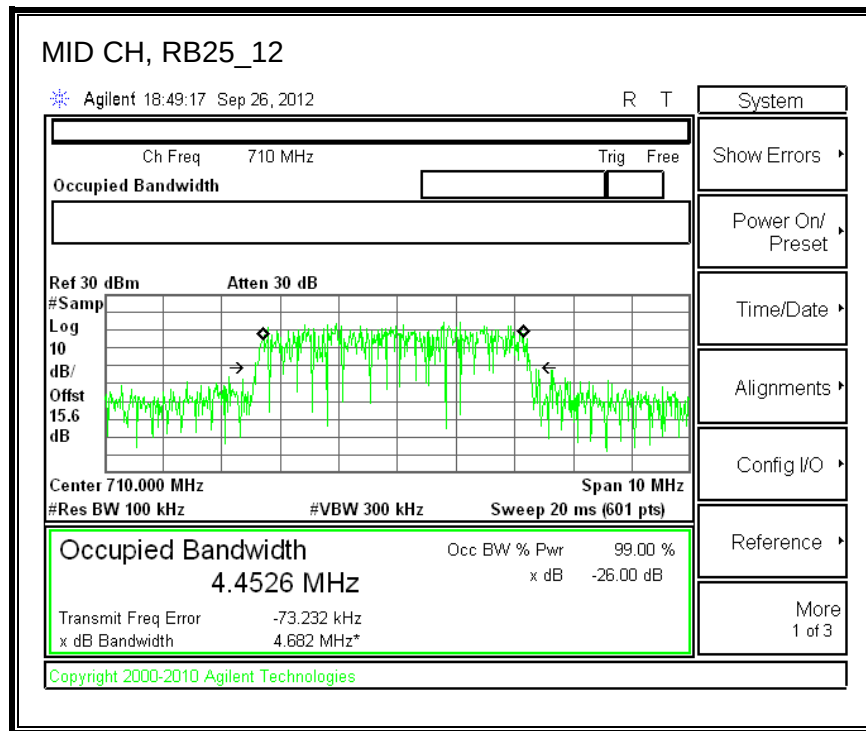


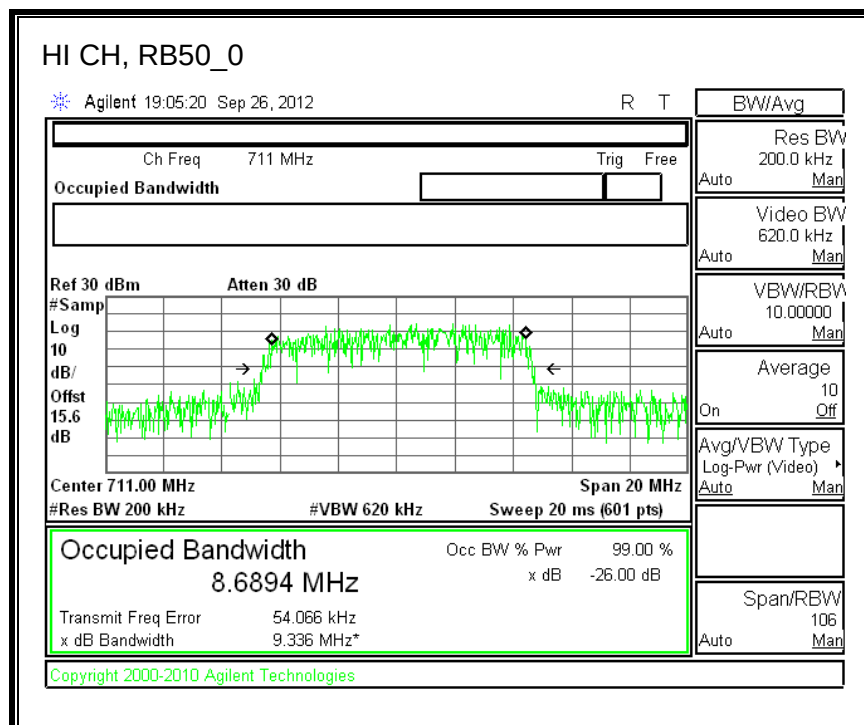
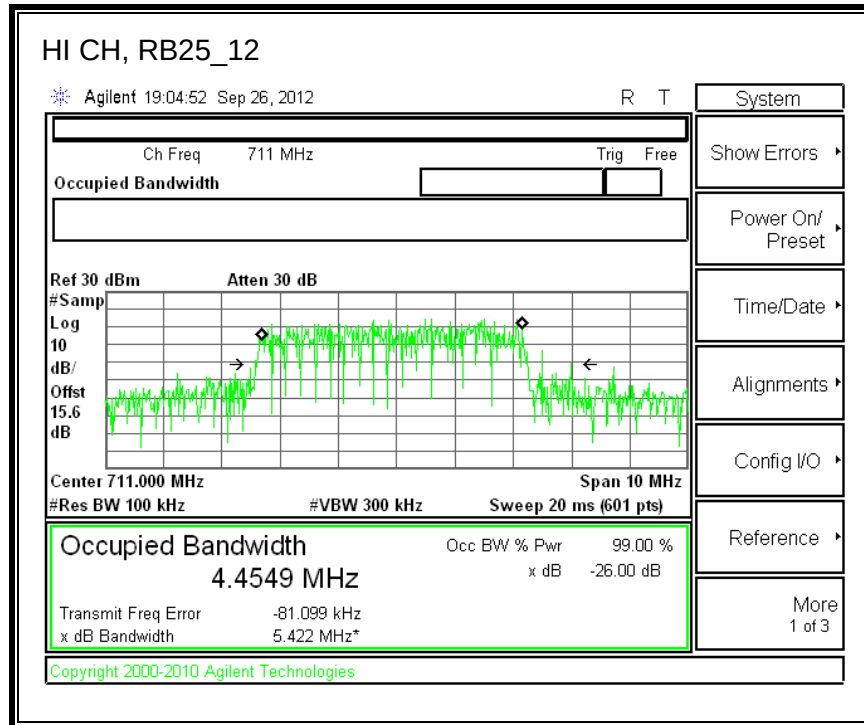


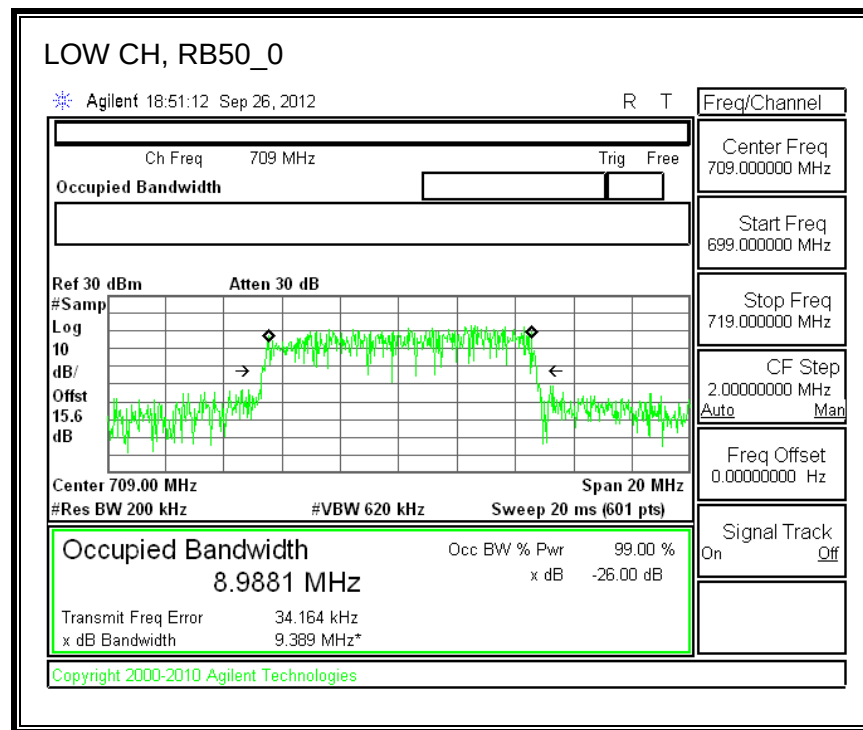
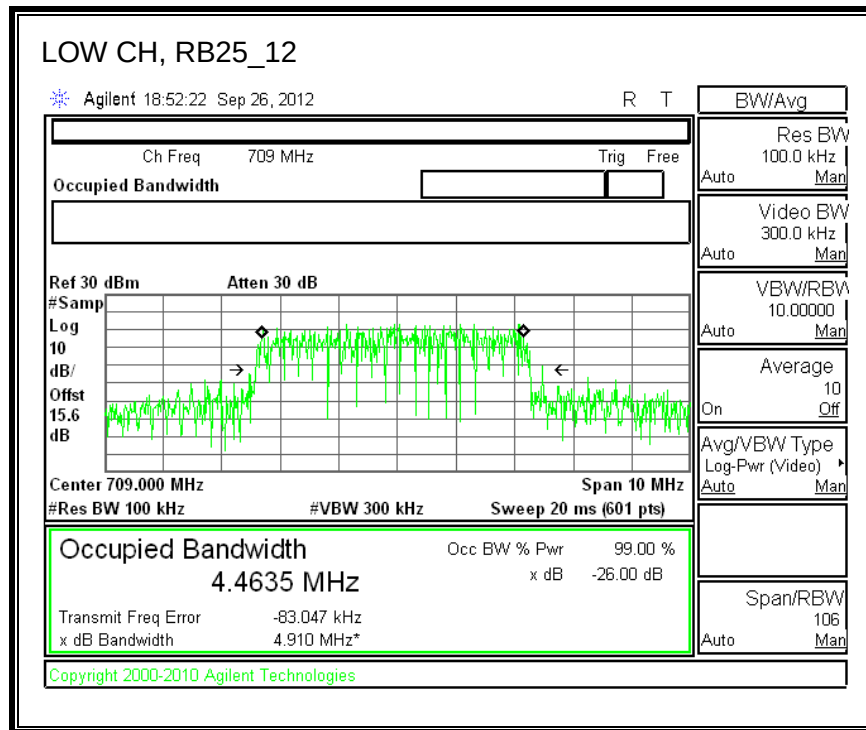
**Band 17 (10 MHz BANDWIDTH)**

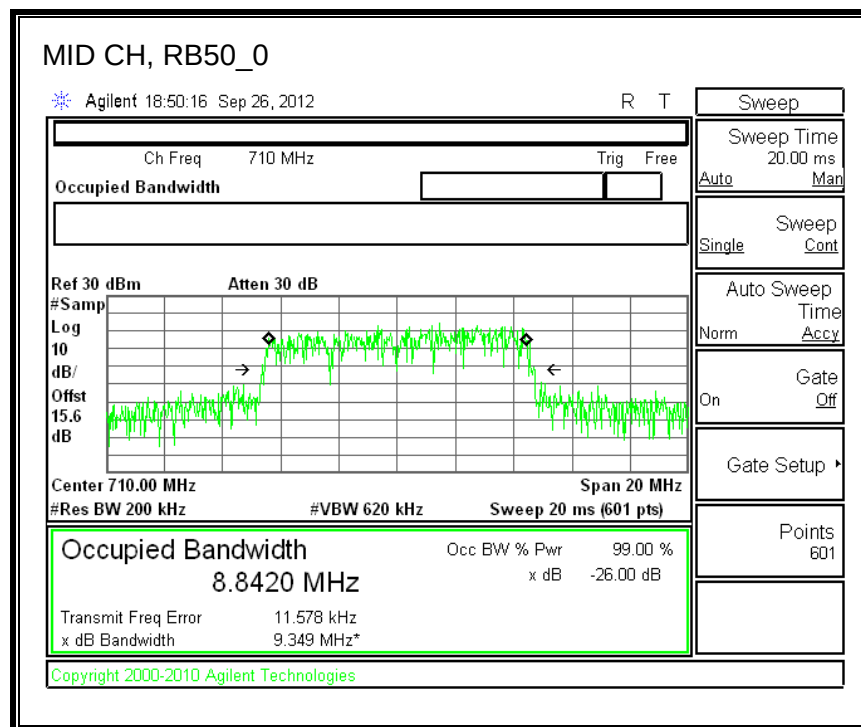
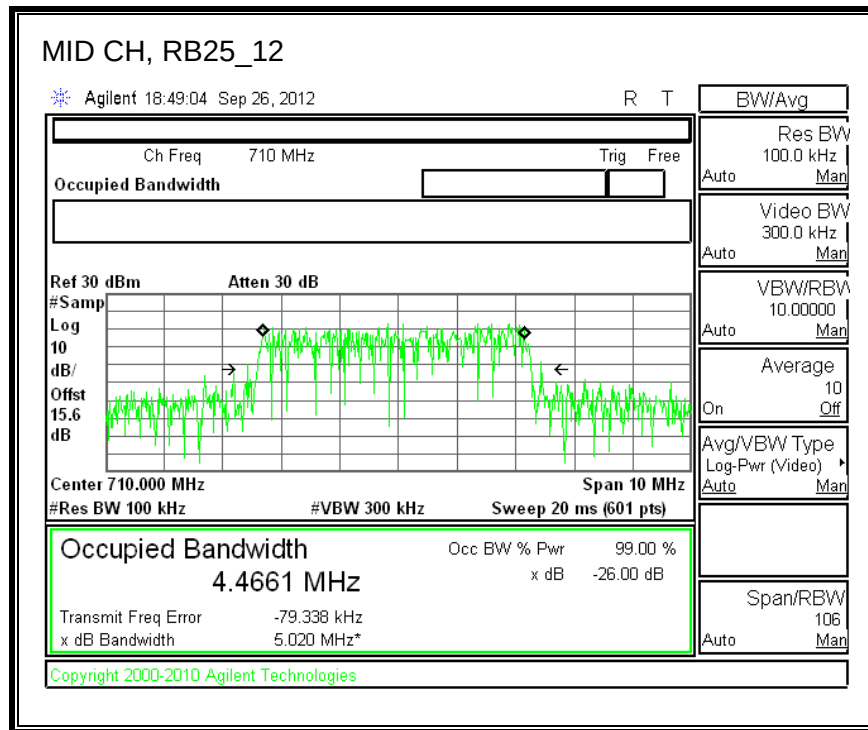
**QPSK**

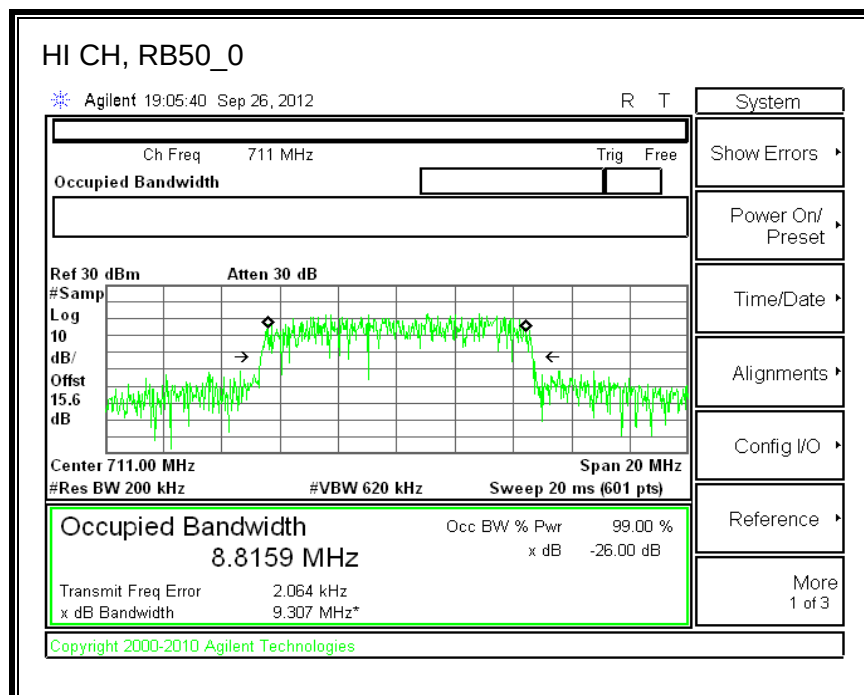
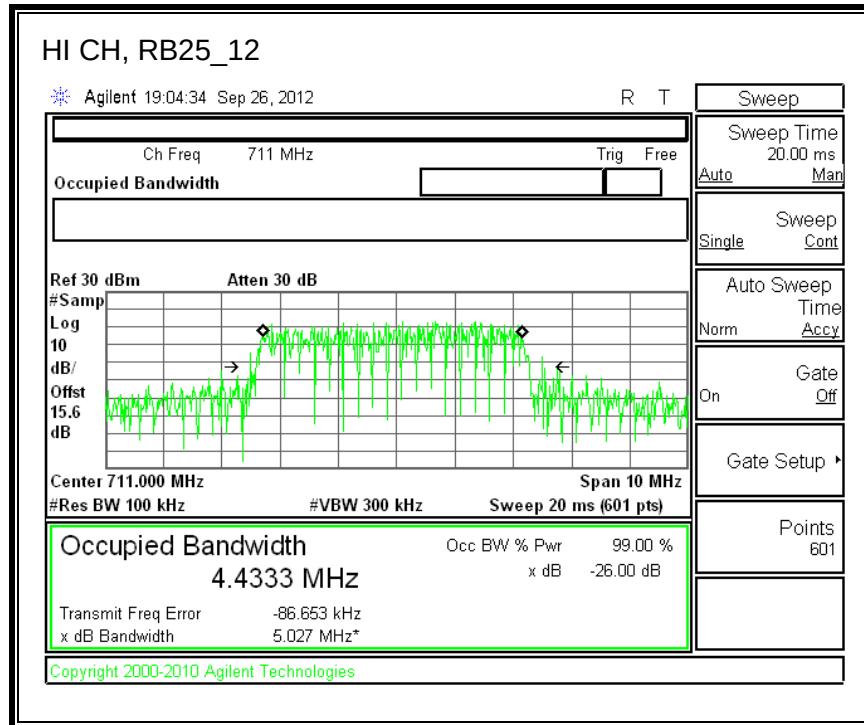






**Band 17 (10 MHz BANDWIDTH)****16QAM**







## **8.2. BAND EDGE**

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

FCC: §22.359, §24.238 and §27.53

### **LIMITS**

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.

### **TEST PROCEDURE**

The transmitter output was connected to a Agilent 8960 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency (824, 849, 1850, 1910MHz)
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

### **LIMITS**

On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

Compliance with the provisions of paragraphs above of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

### **TEST PROCEDURE**

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

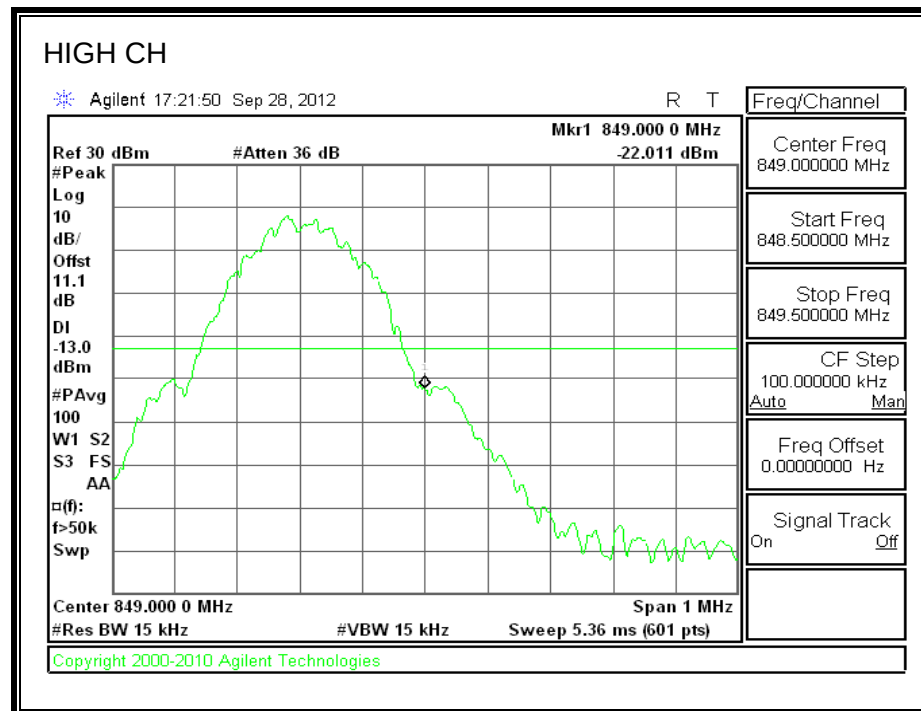
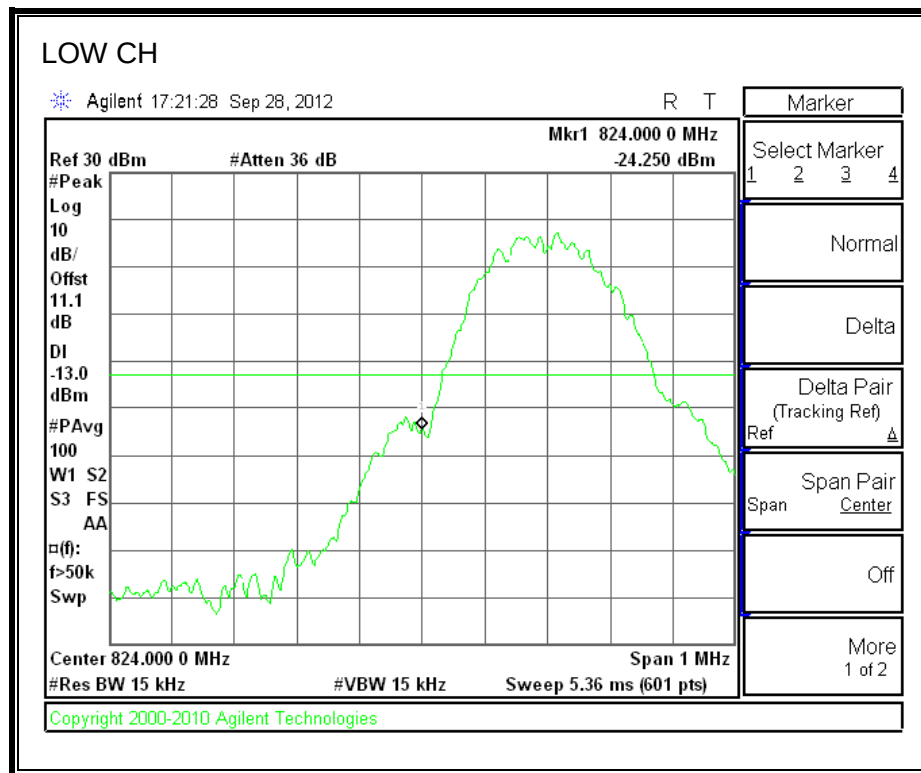
For each band edge measurement:

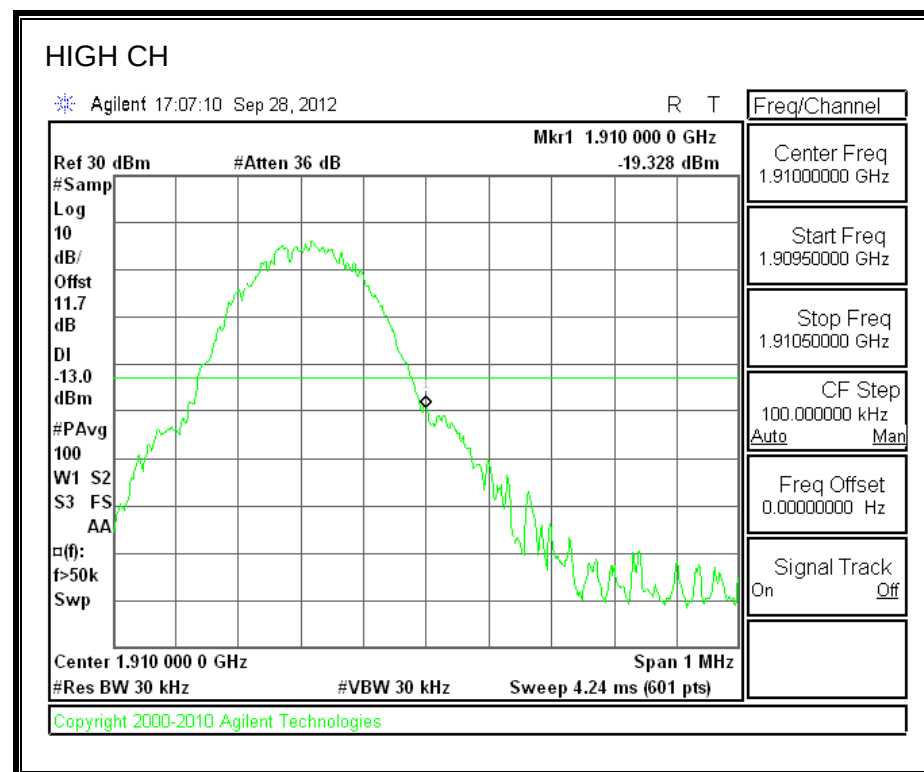
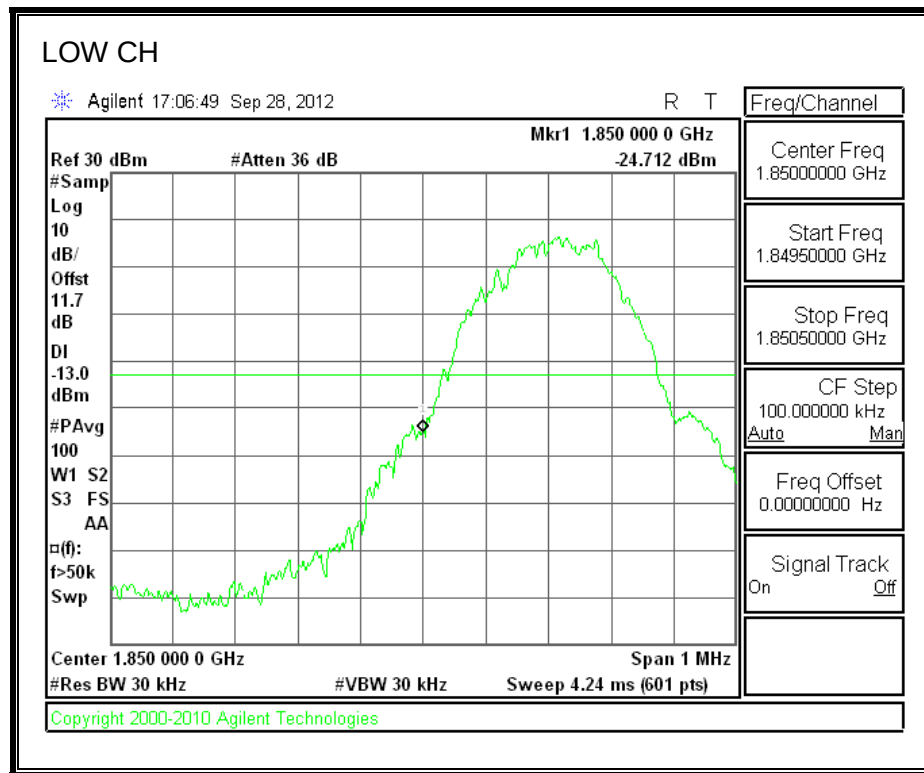
- Set the spectrum analyzer span to include the block edge frequency.
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

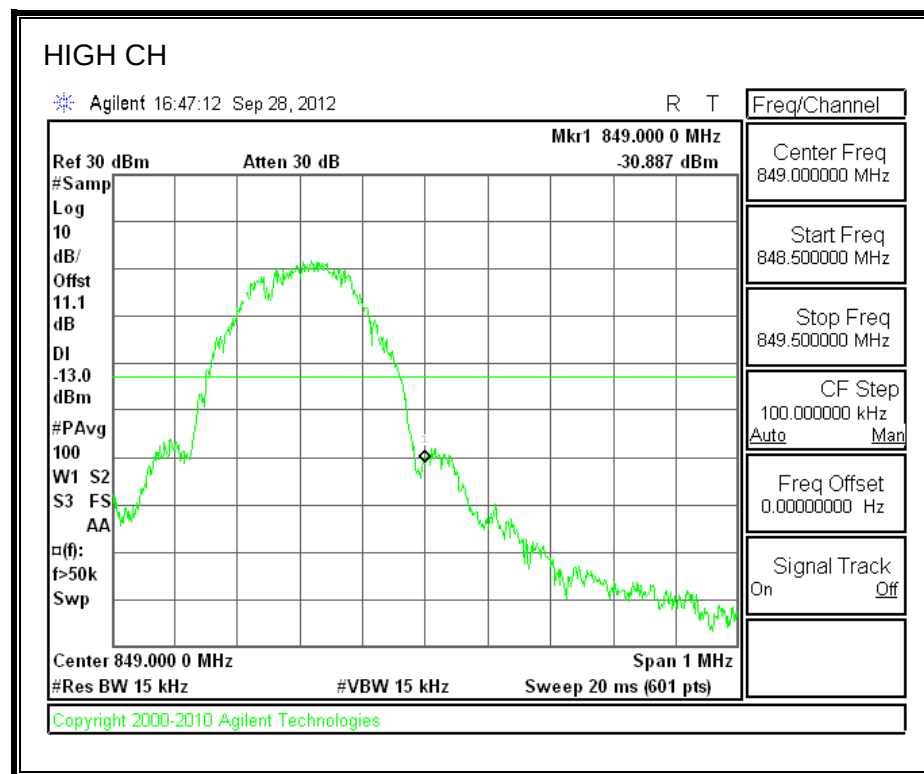
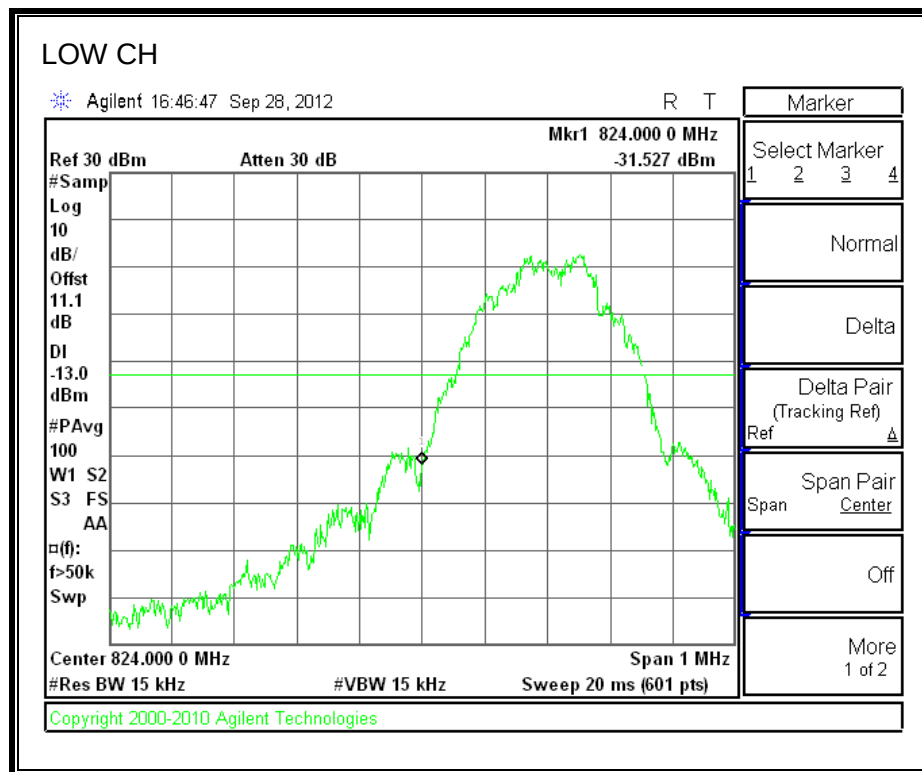
**MODES TESTED**

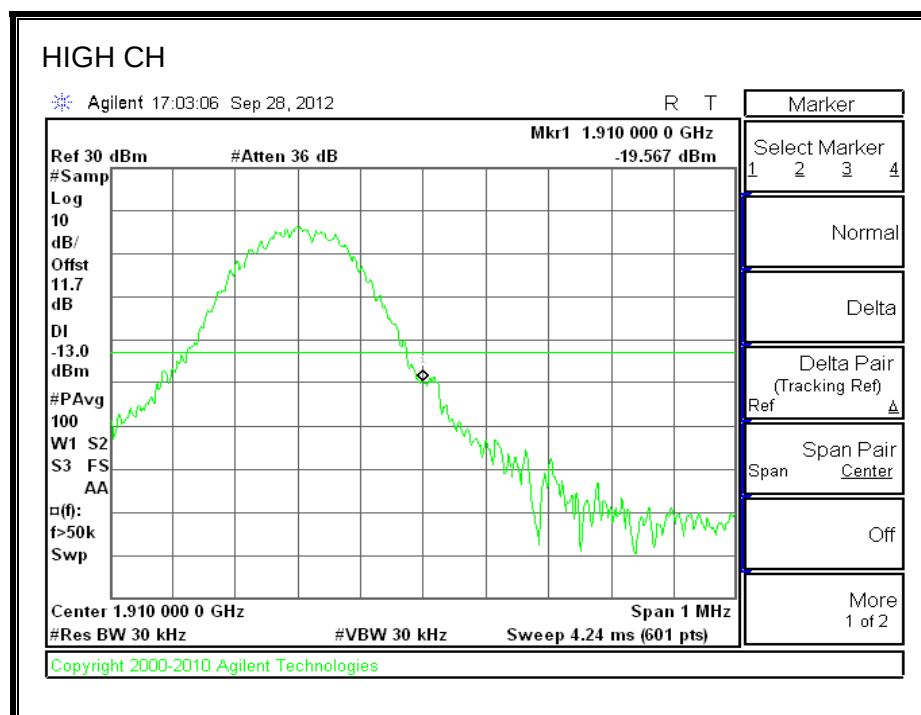
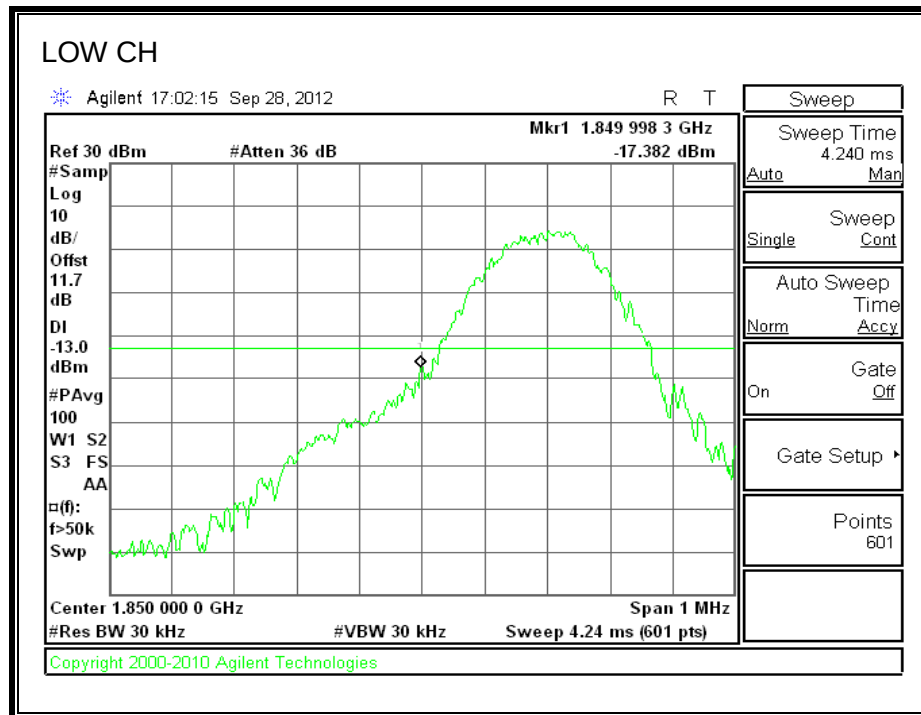
- GPRS and EGPRS
- UMTS, REL 99 and HSUPA
- LTE BAND 2
- LTE BAND 4
- LTE BAND 5
- LTE BAND 17

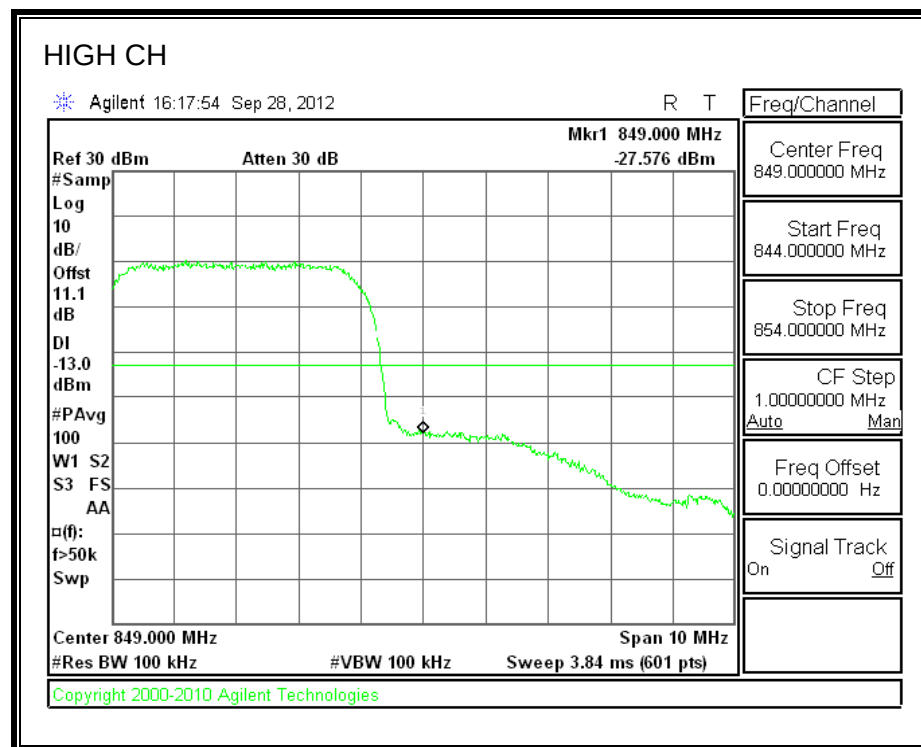
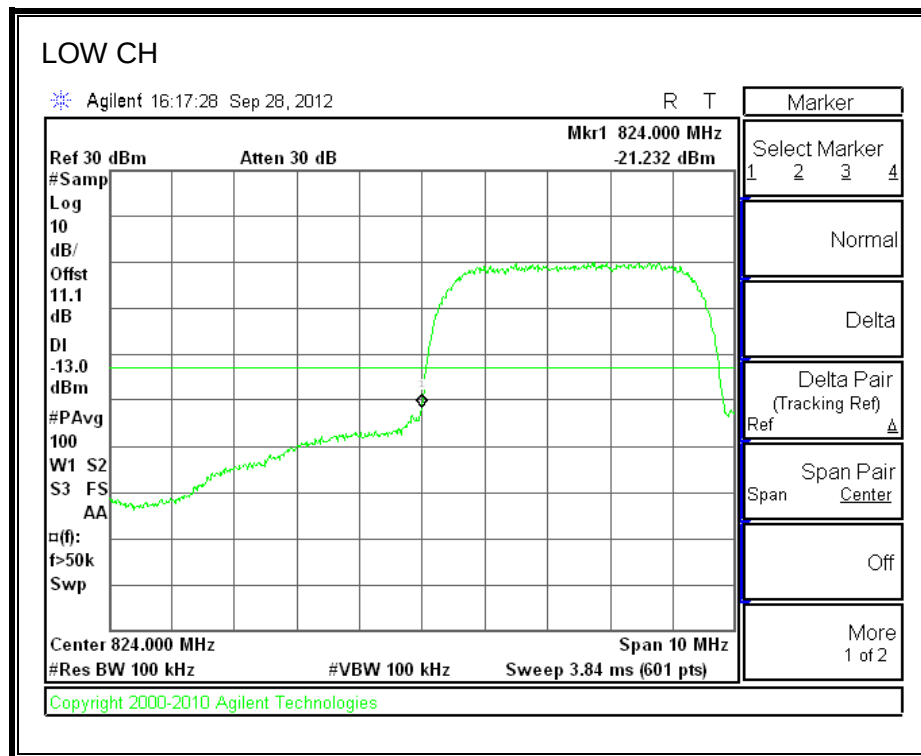
**RESULTS**

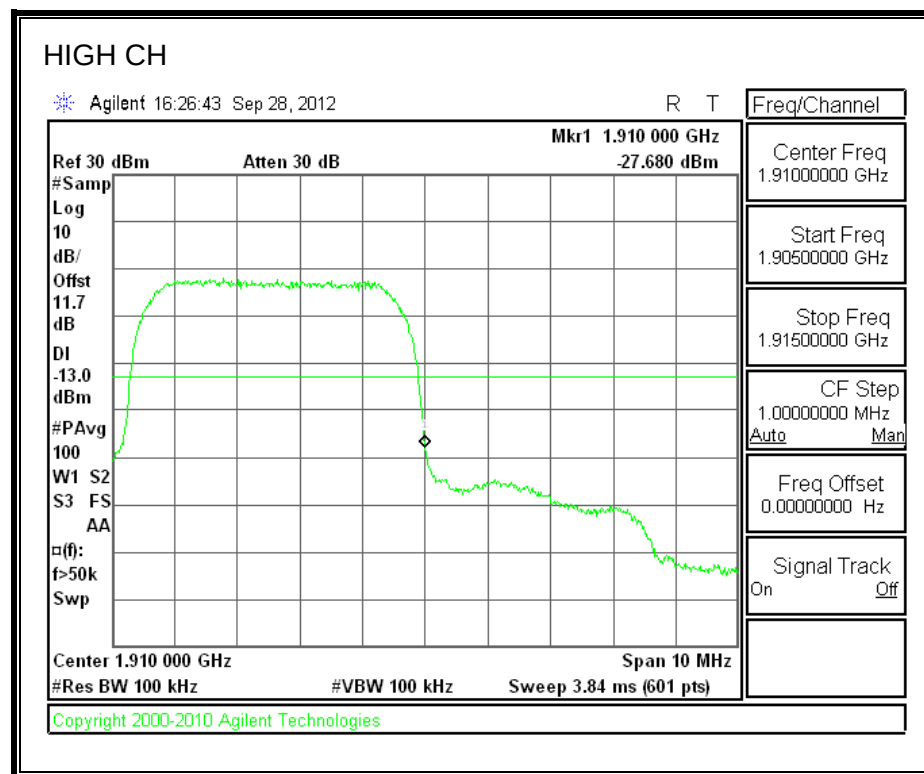
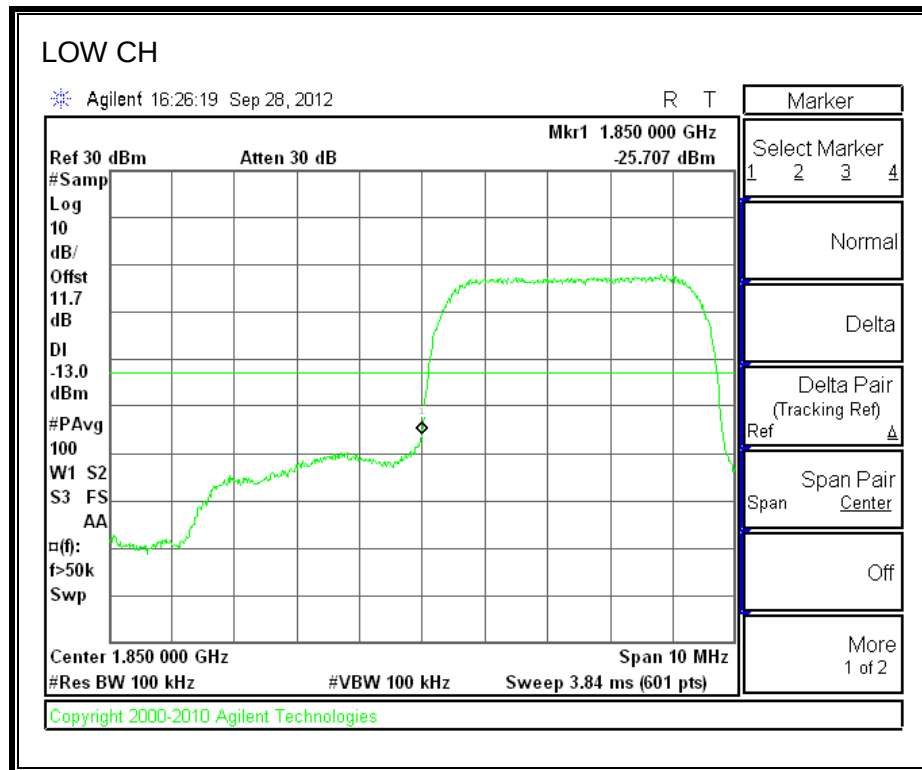
**8.2.1. GSM****CELL, GPRS**

**PCS, GPRS**

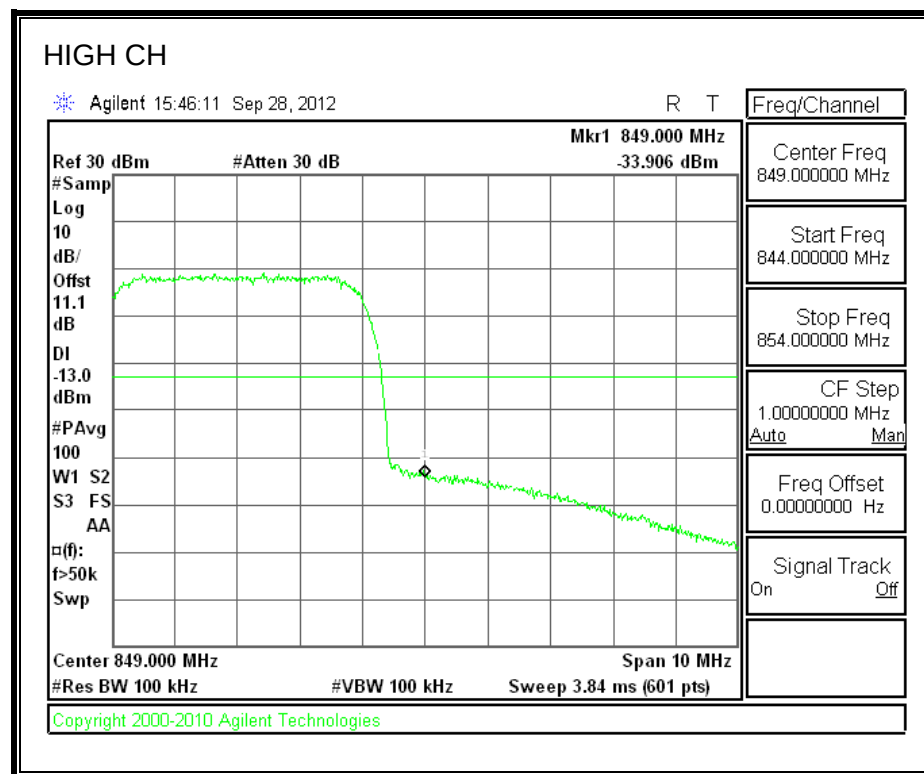
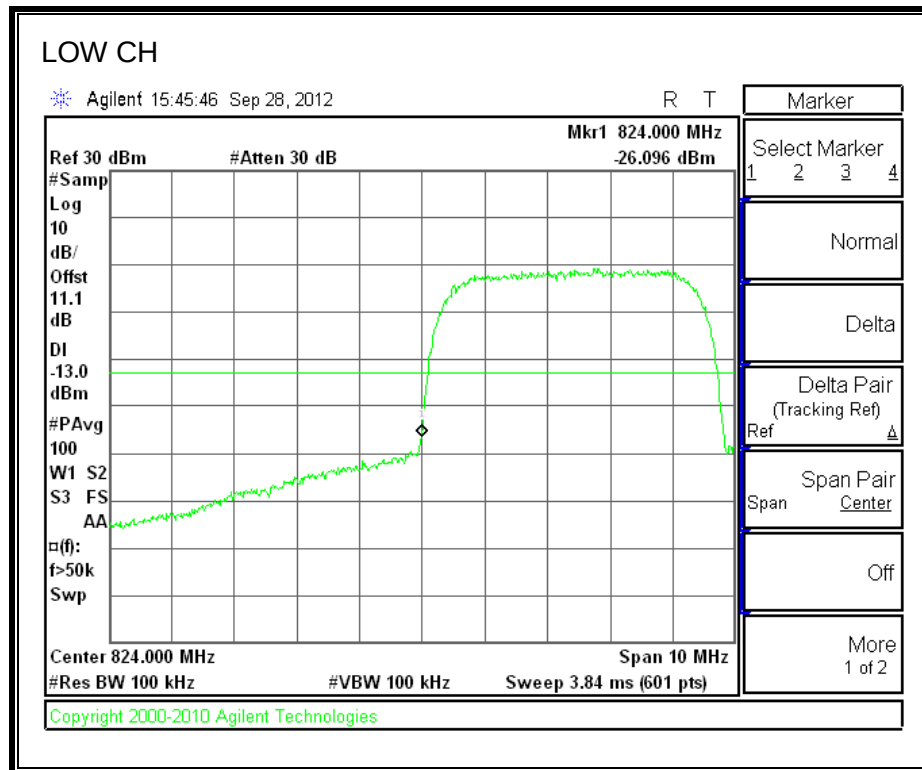
**CELL, EGPRS**

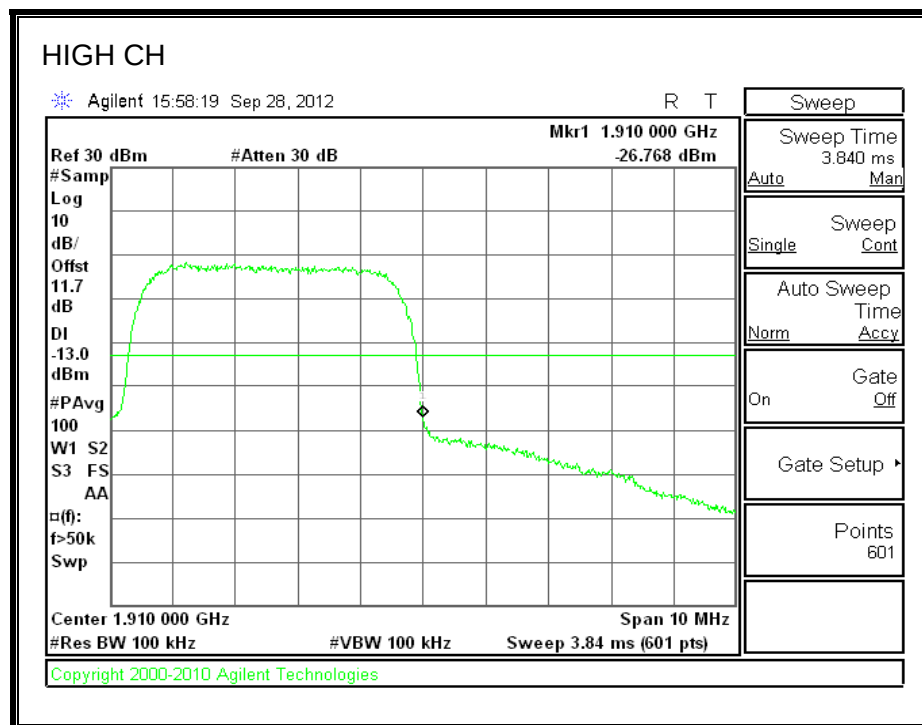
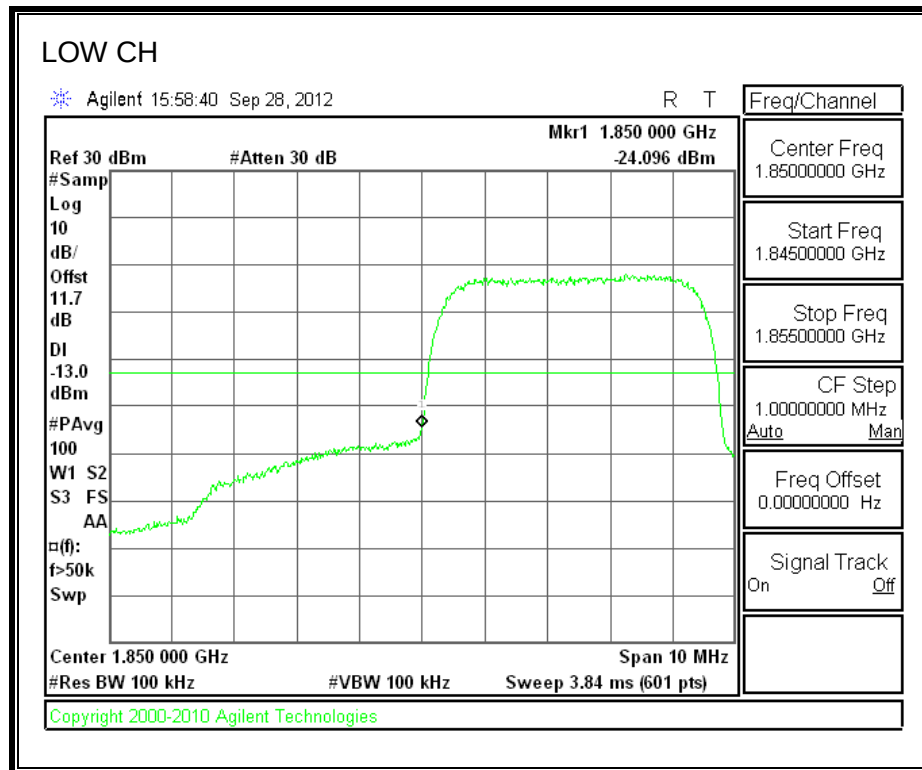
**PCS, EGPRS**

**8.2.2. WCDMA850****CELL, REL99**

**PCS, REL 99**

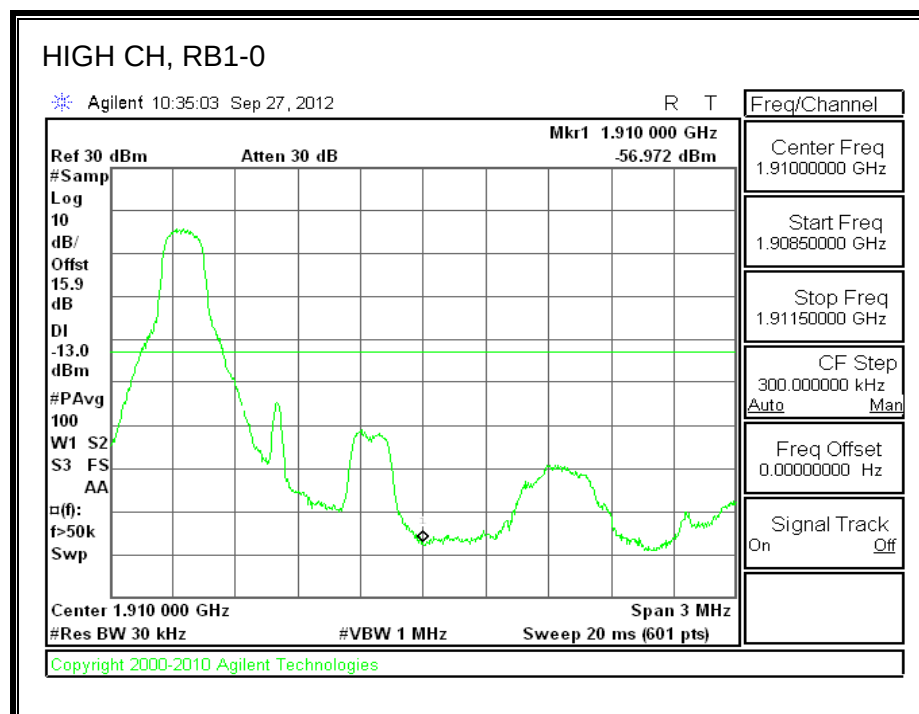
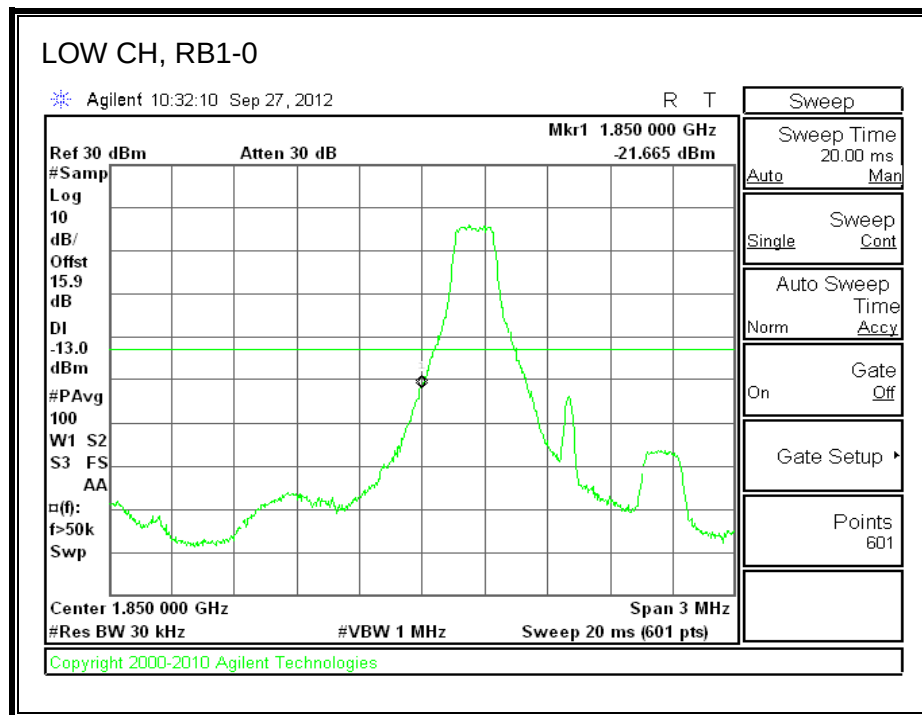


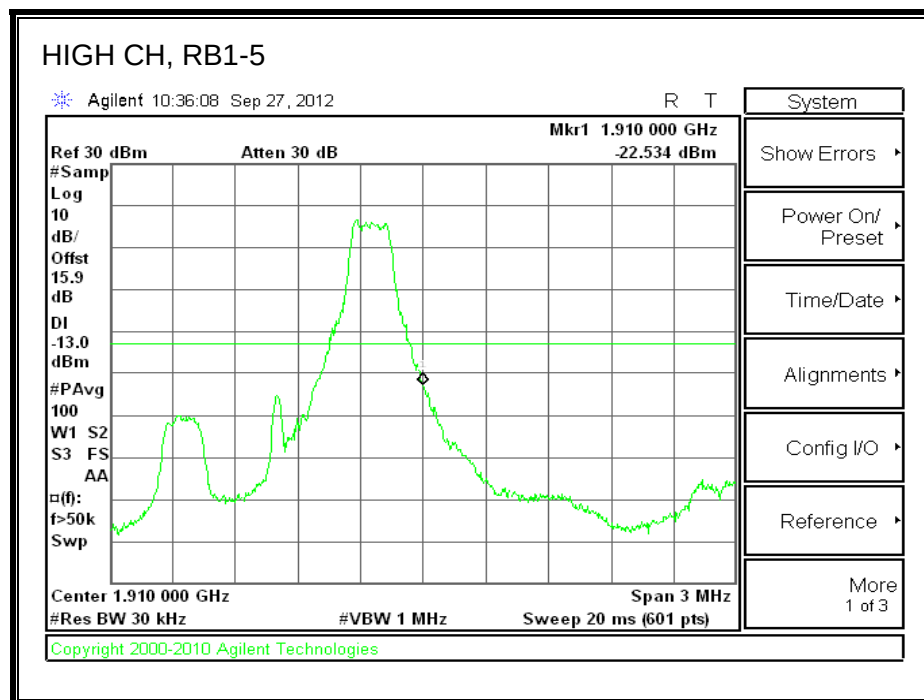
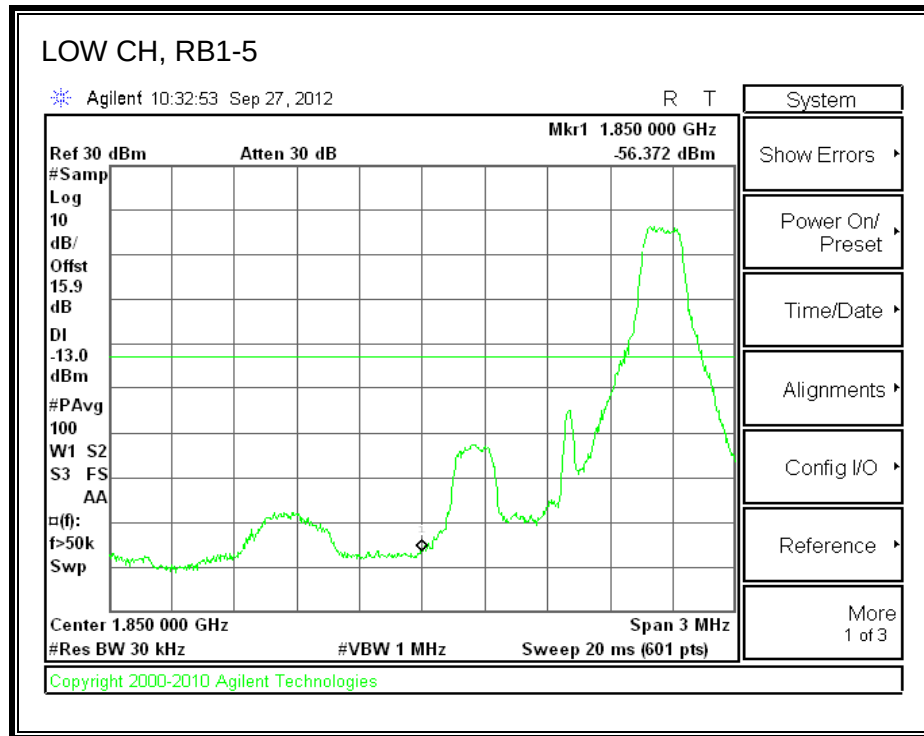
**CELL, HSUPA**

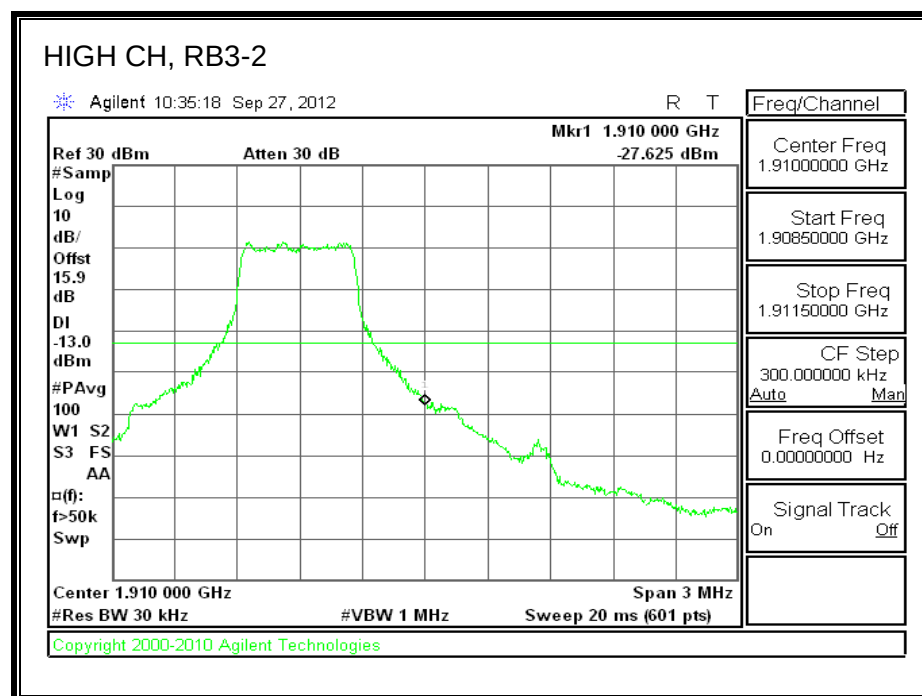
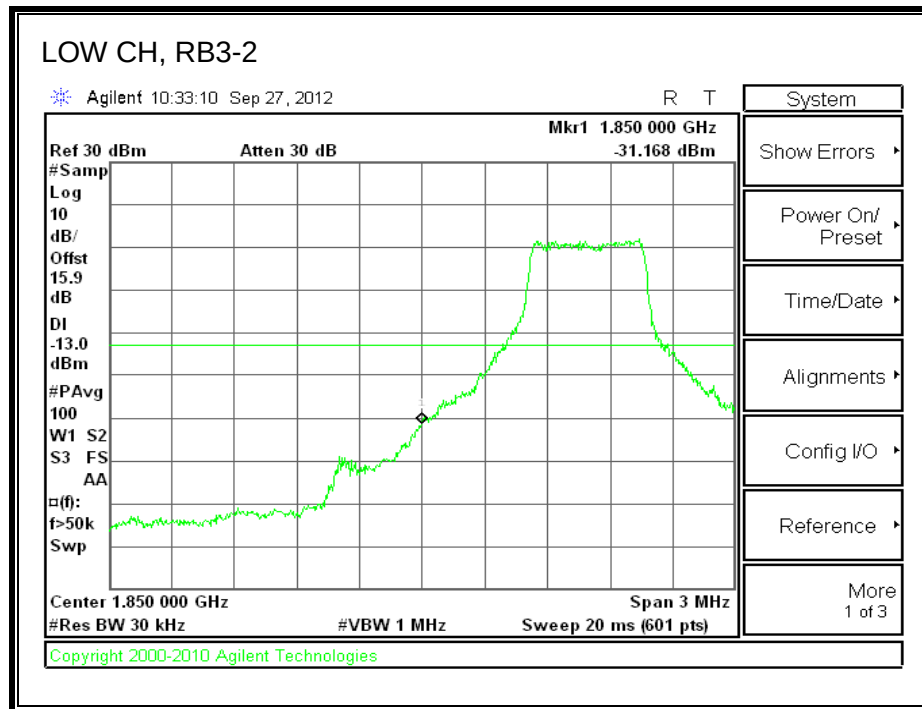
**PCS, HSPA**

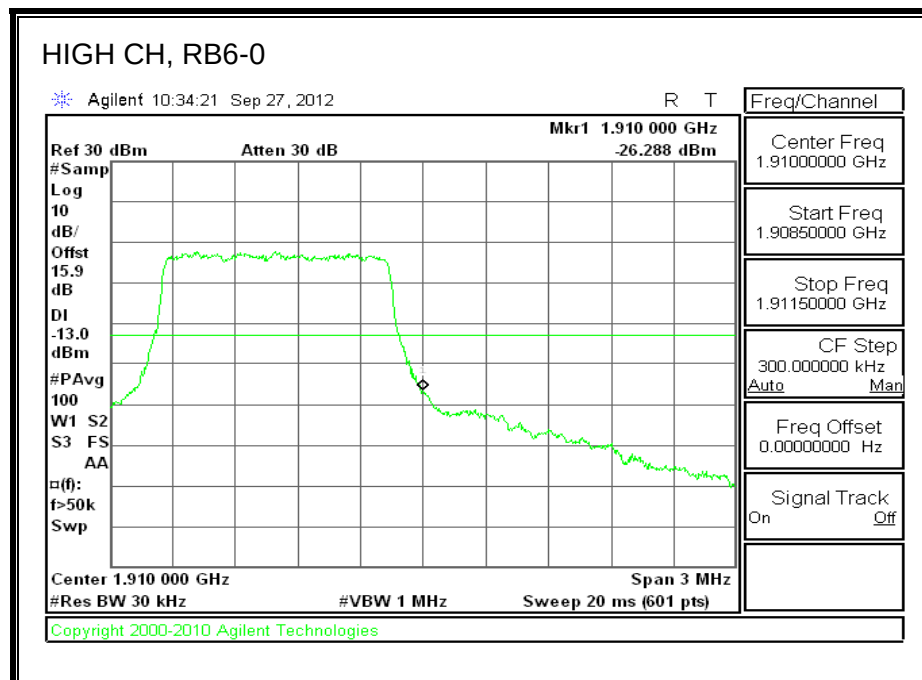
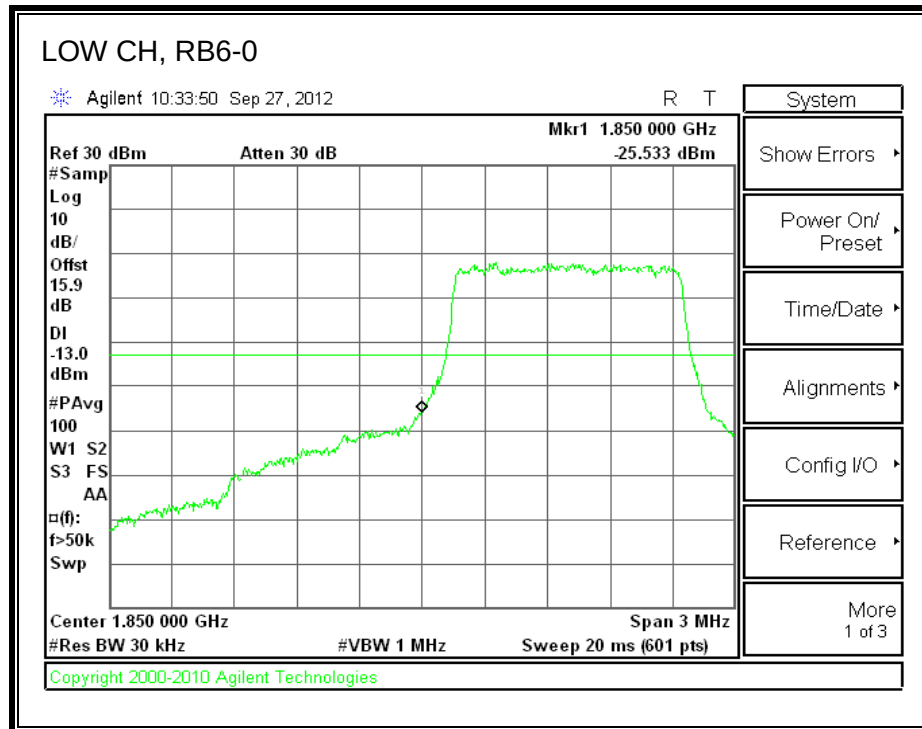
## 8.2.1. LTE BAND 2

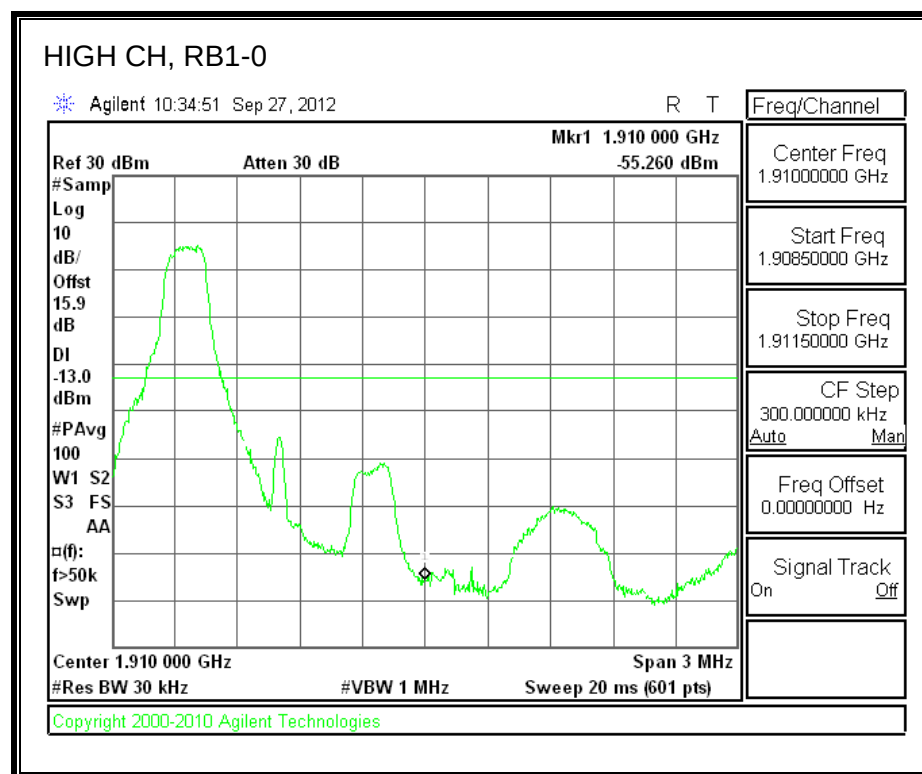
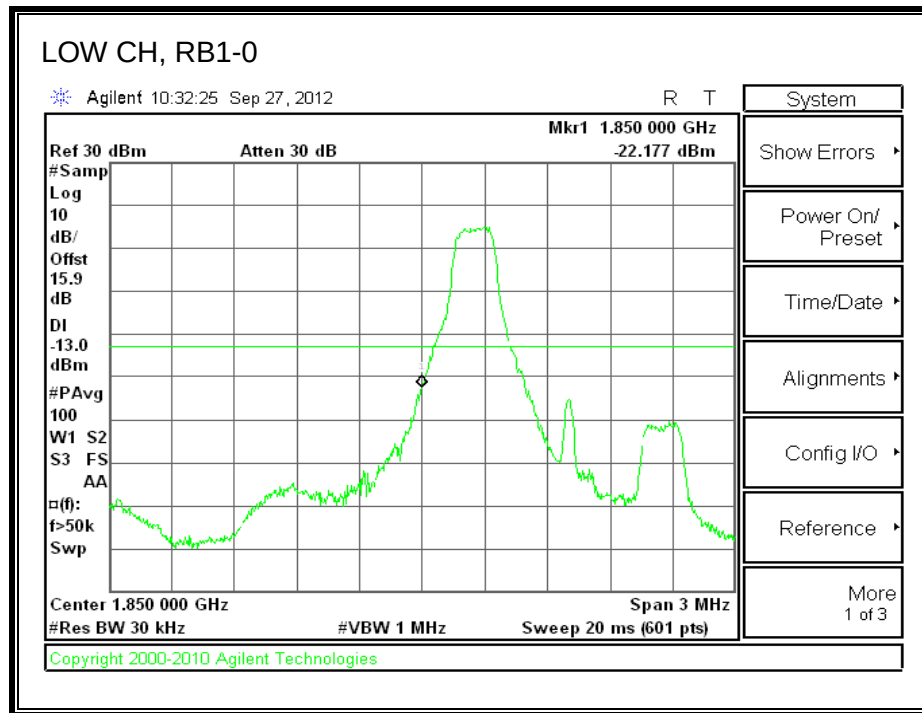
### QPSK Band 2 (1.4 MHz BANDWIDTH)

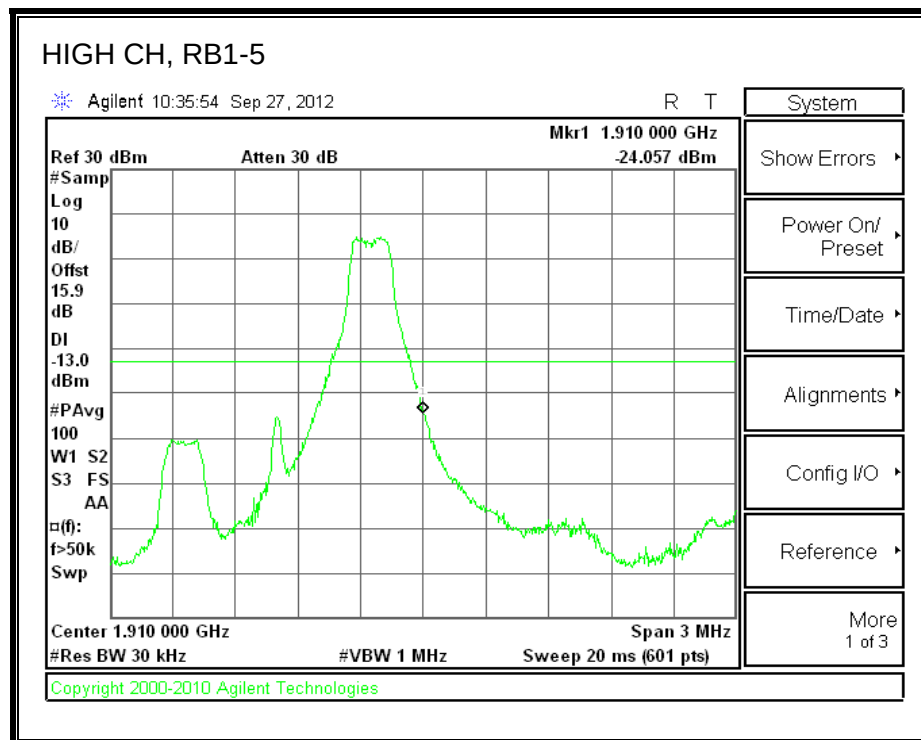
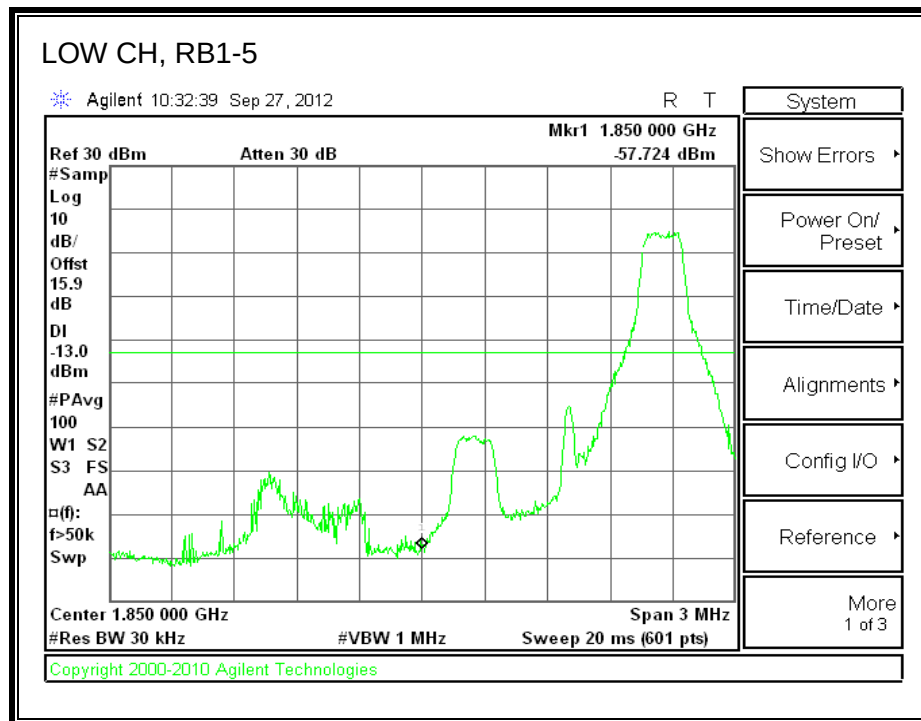




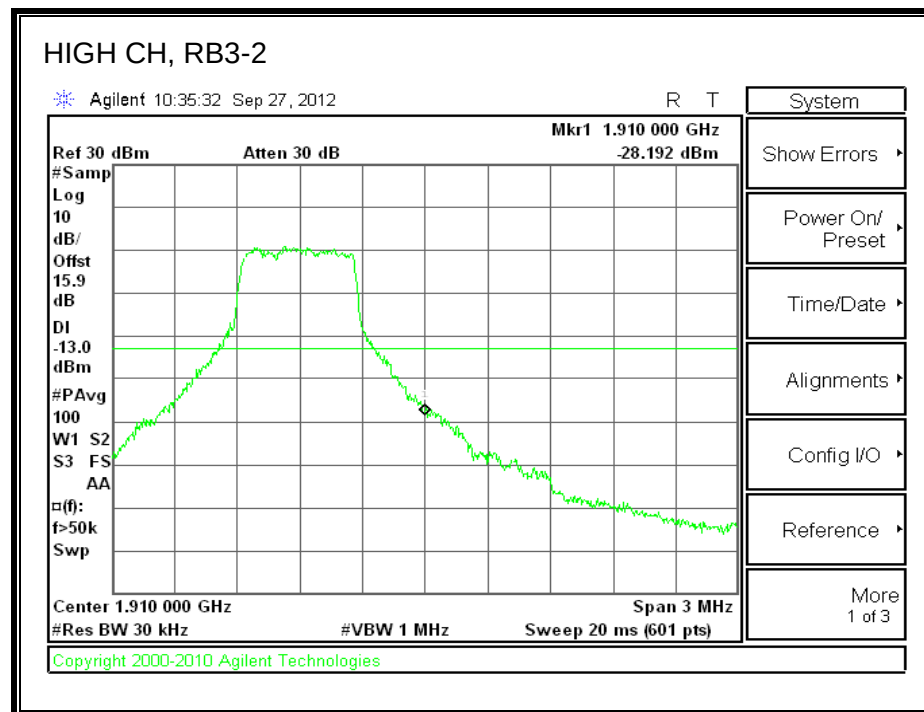
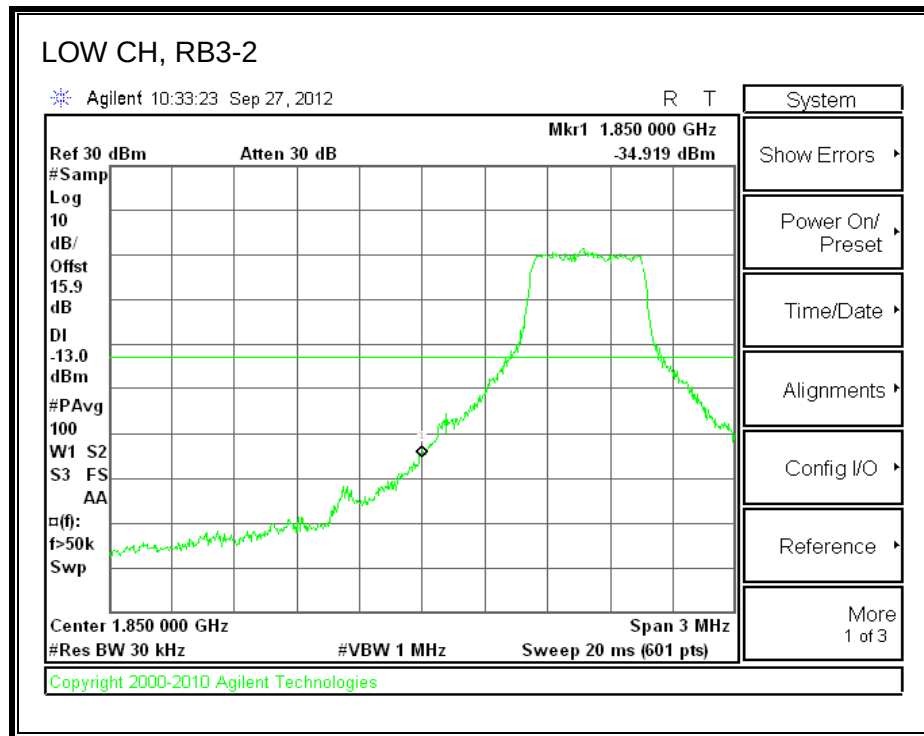


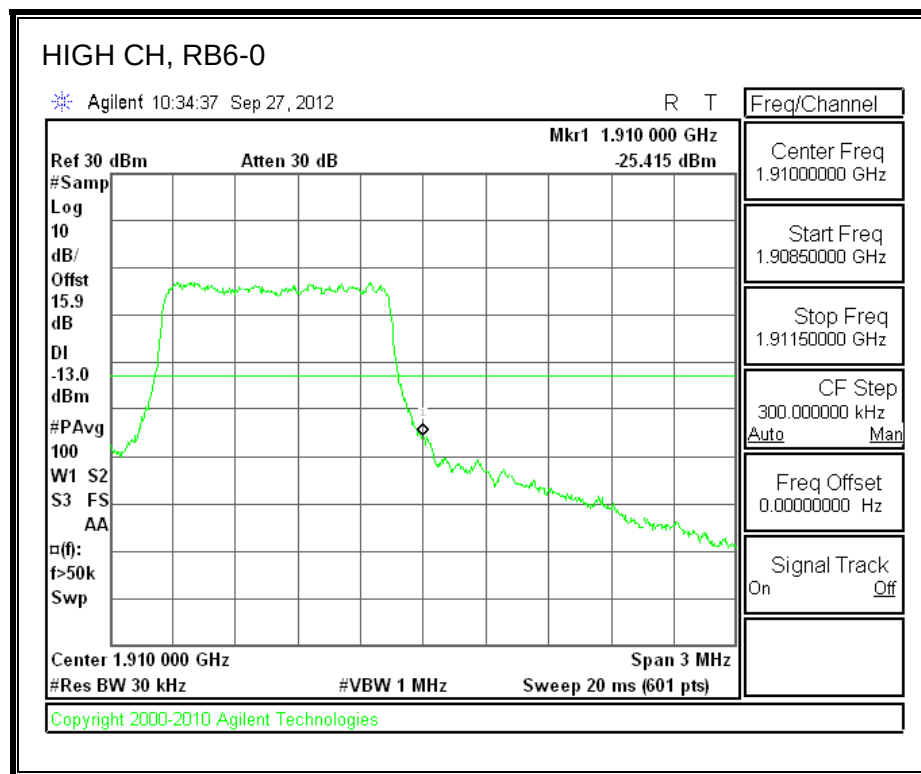
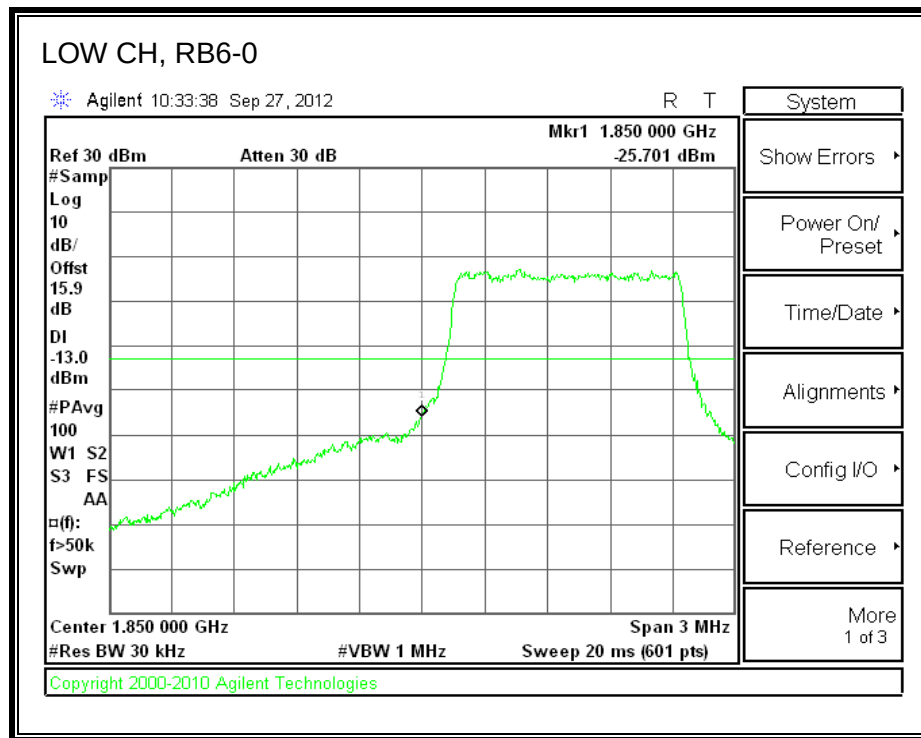


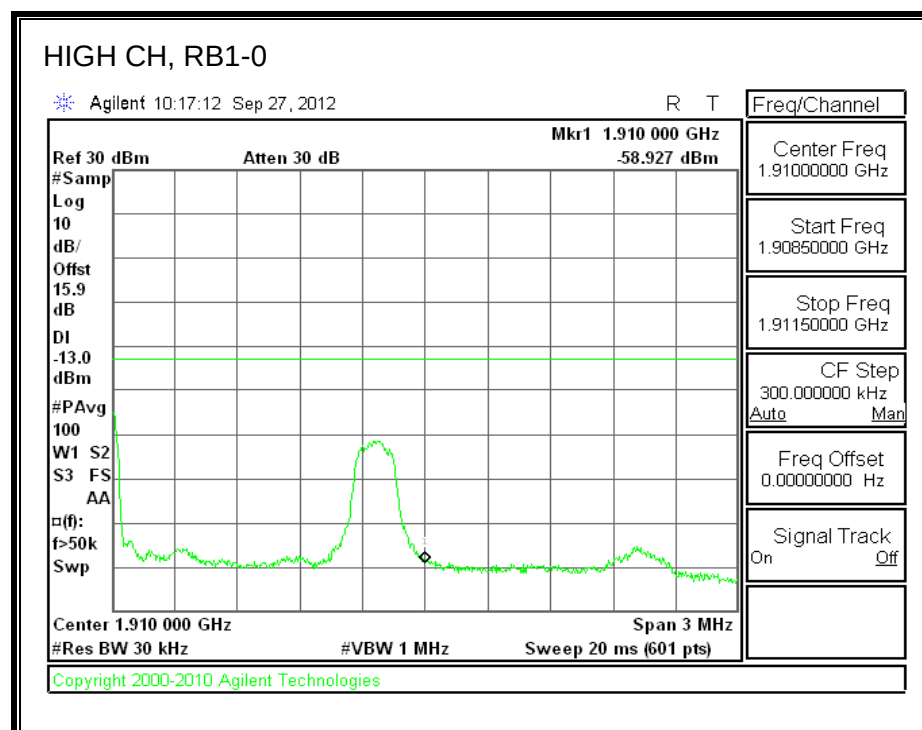
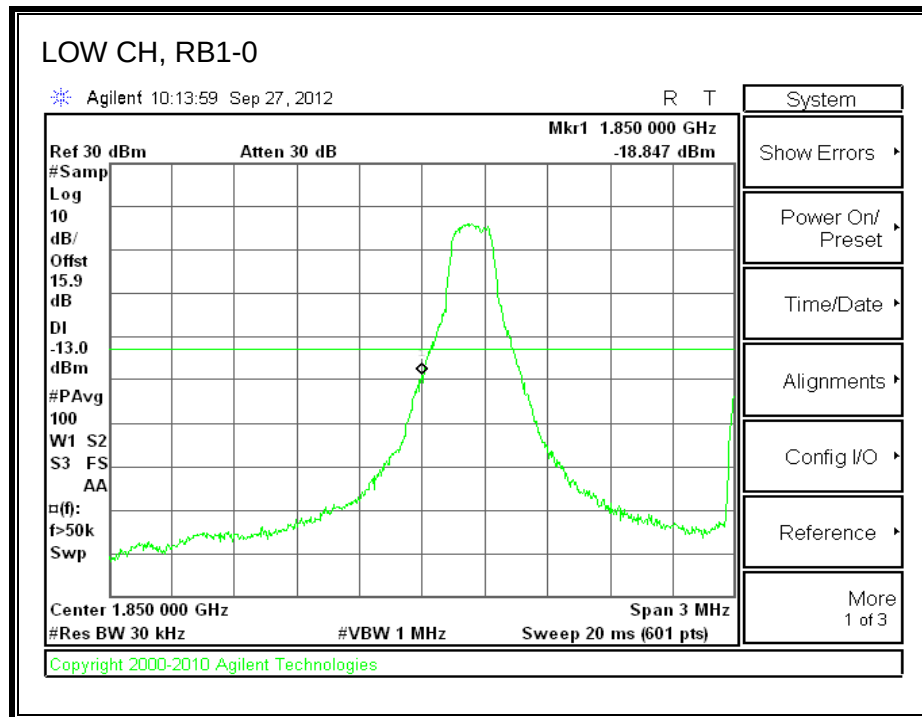
**16QAM Band 2 (1.4 MHz BANDWIDTH)**

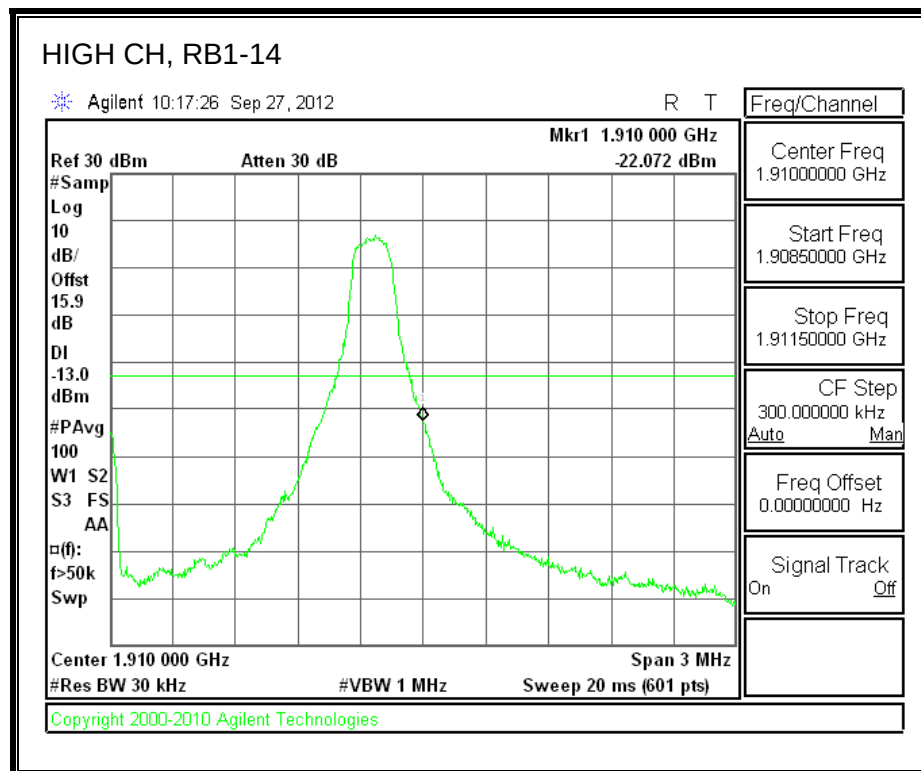
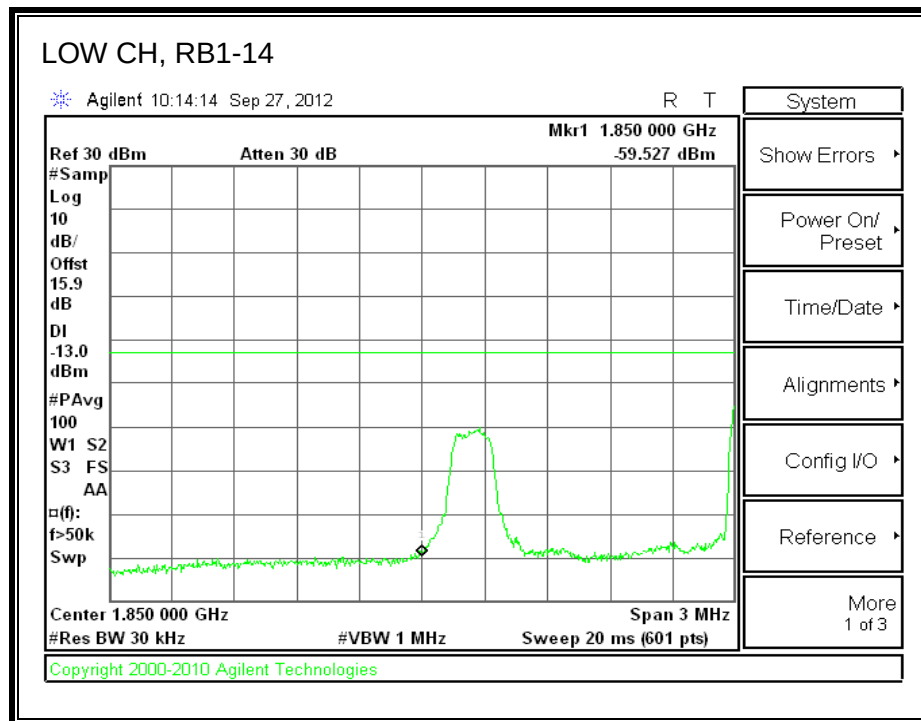


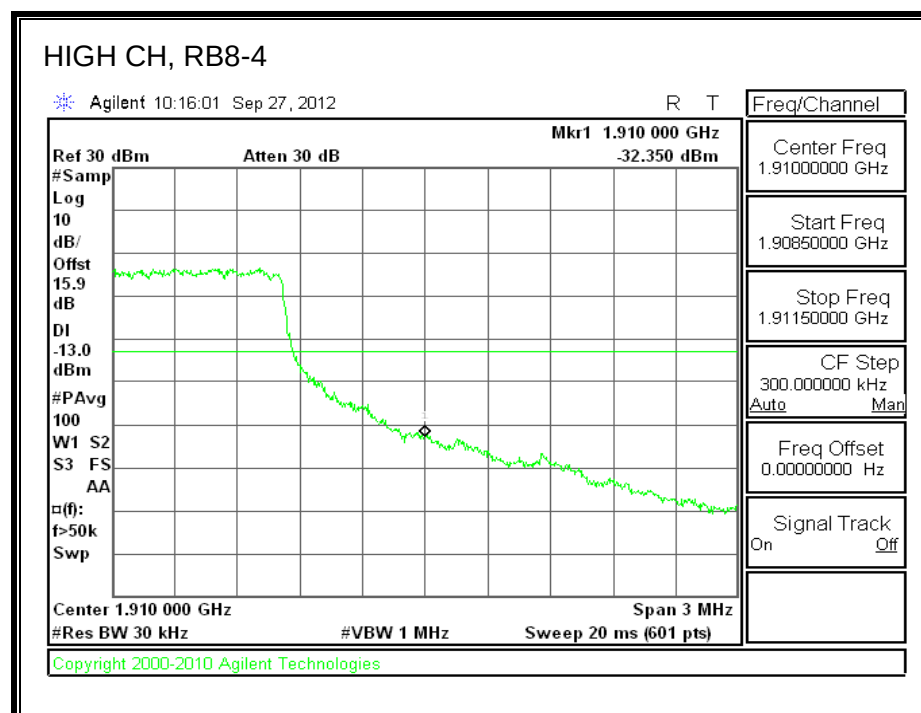
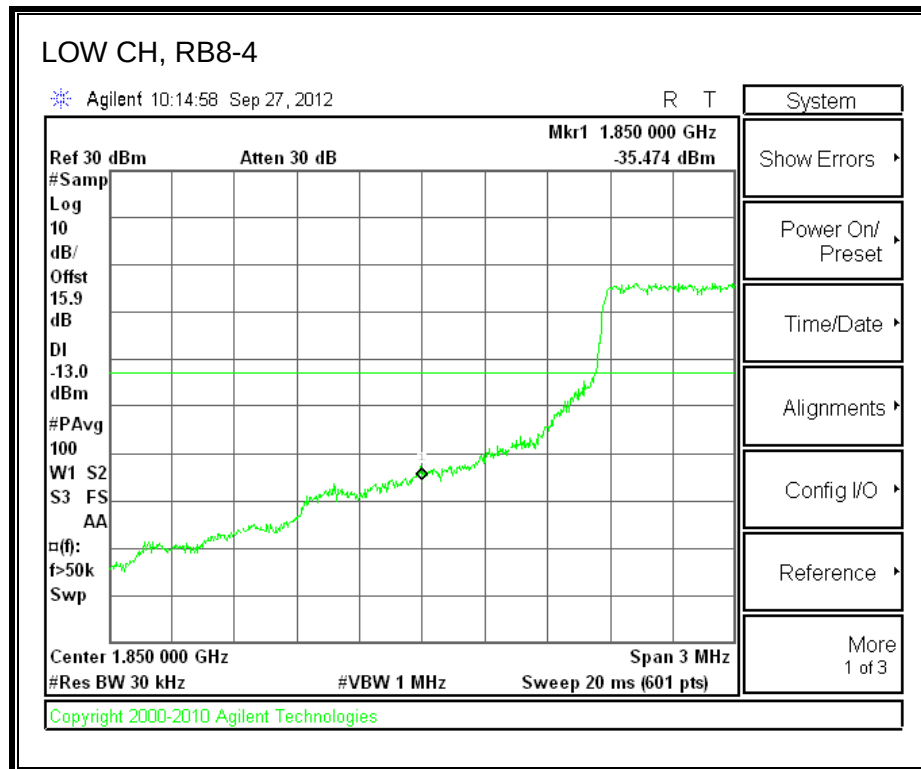


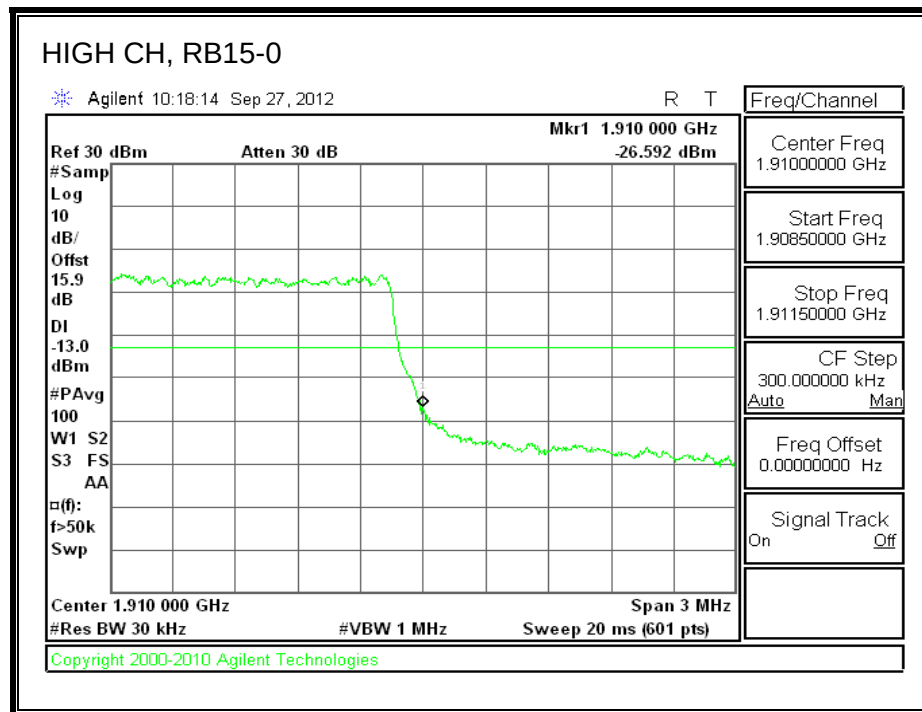
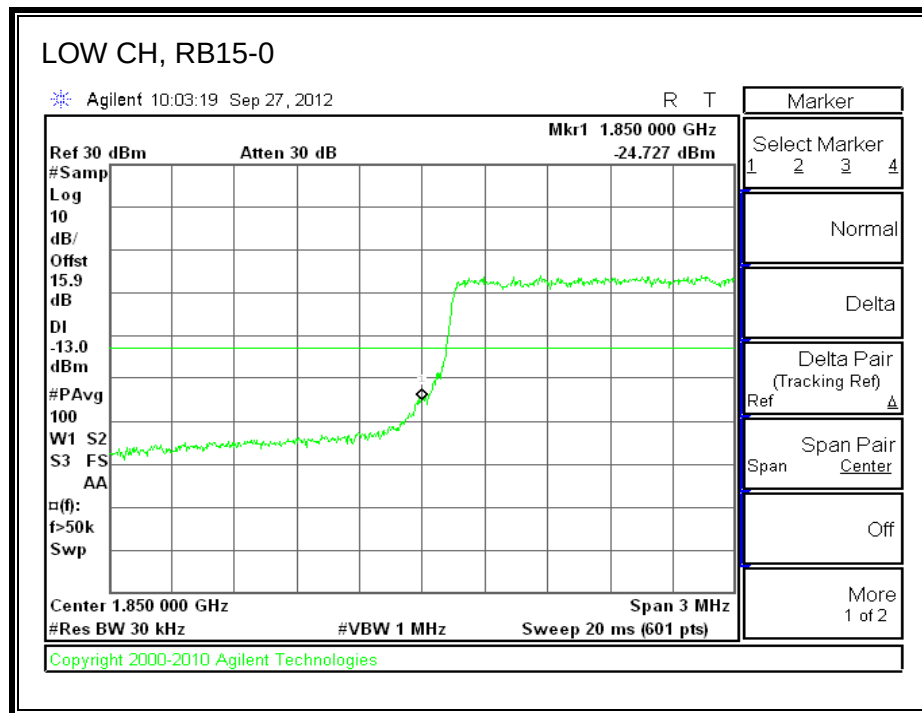




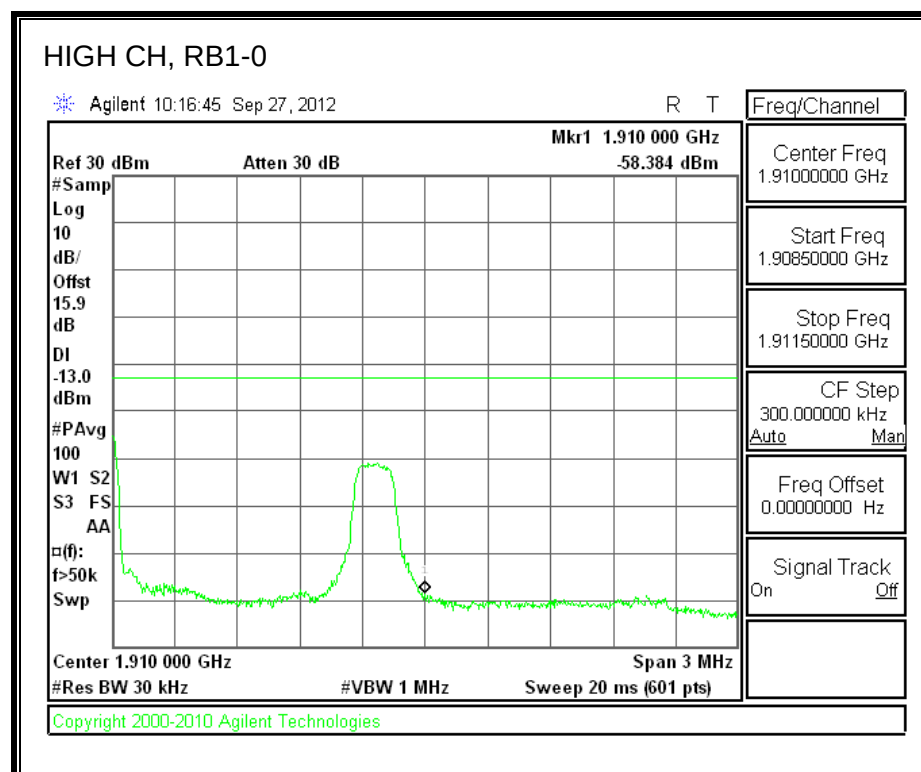
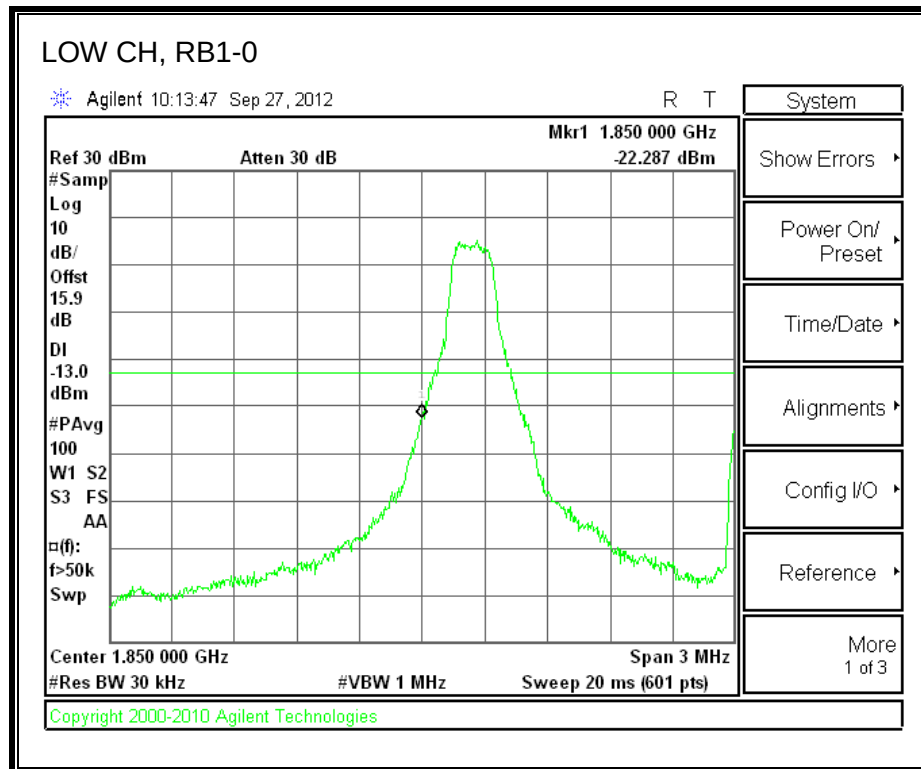
**QPSK Band 2 (3 MHz BANDWIDTH)**

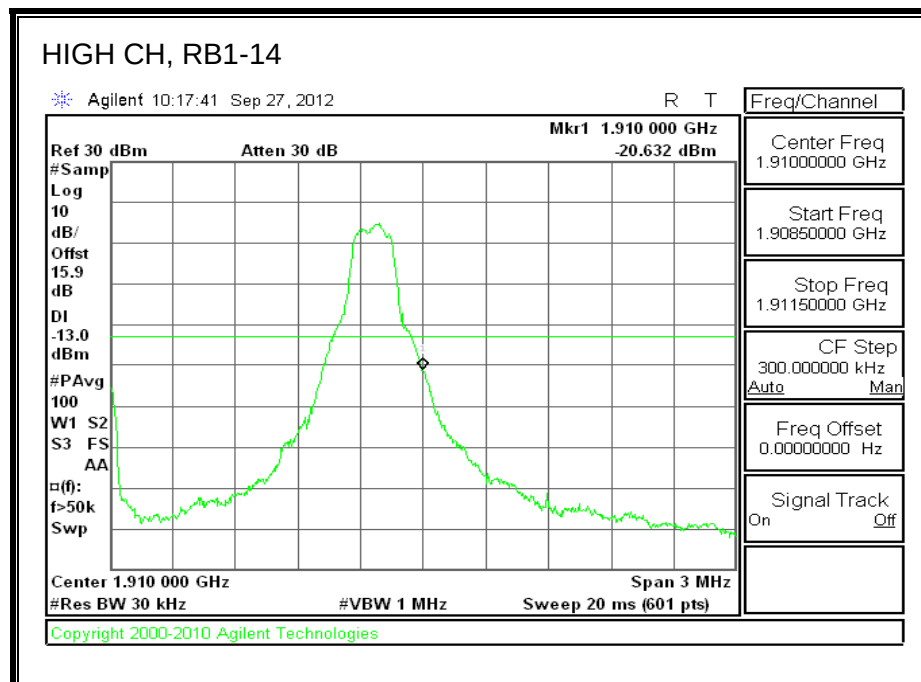
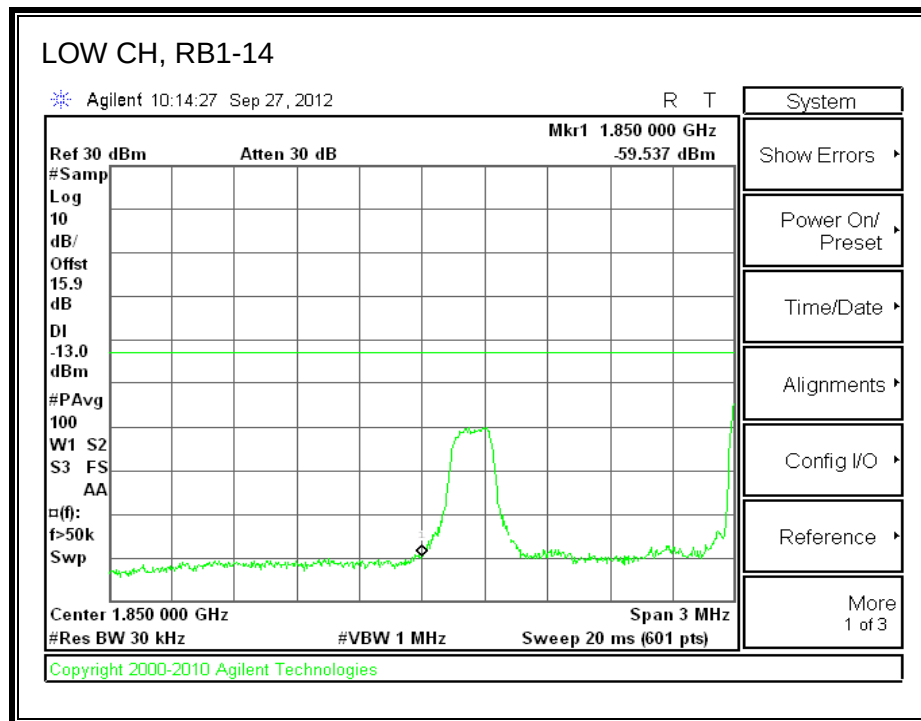




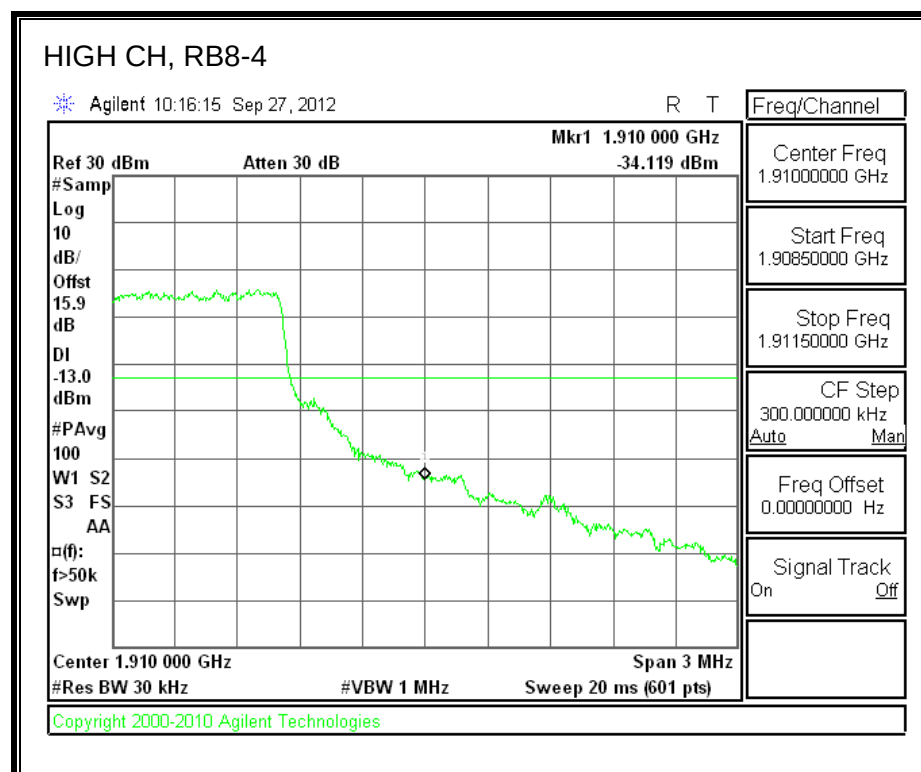
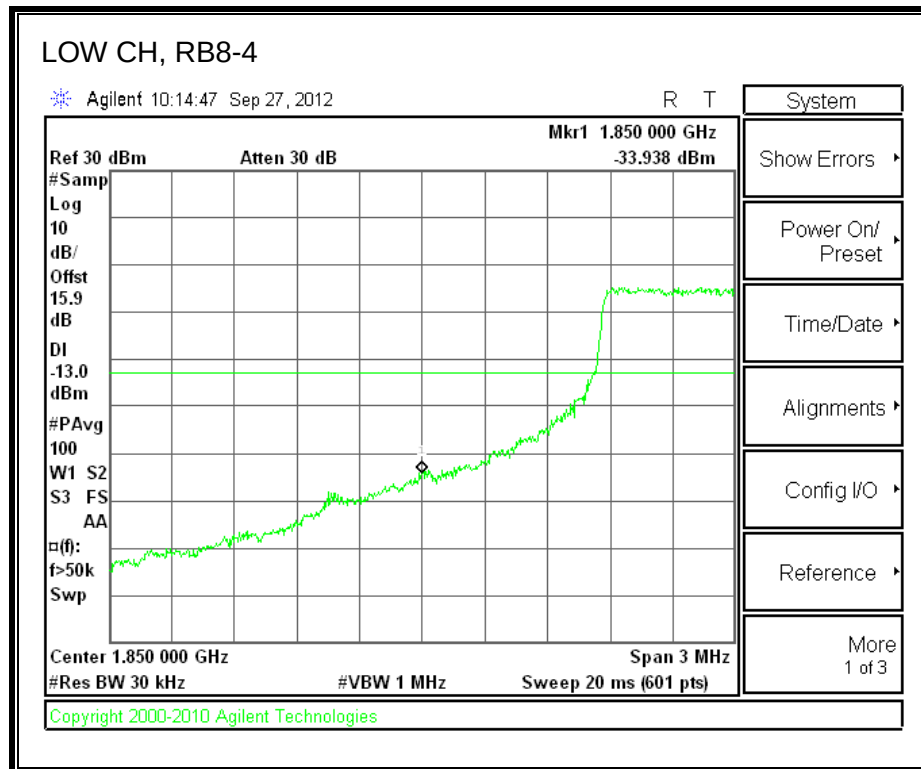


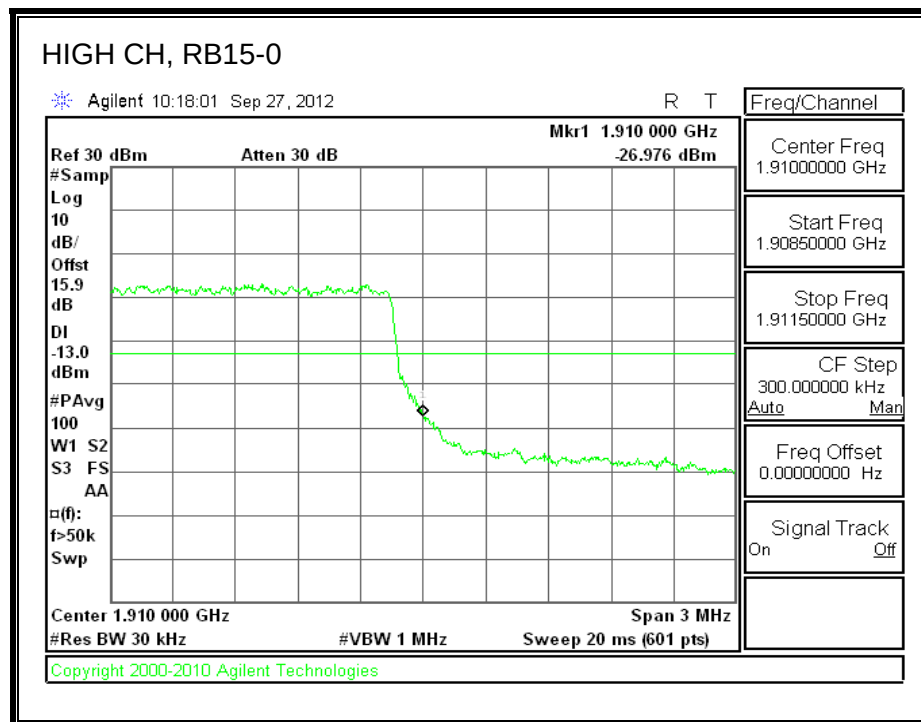
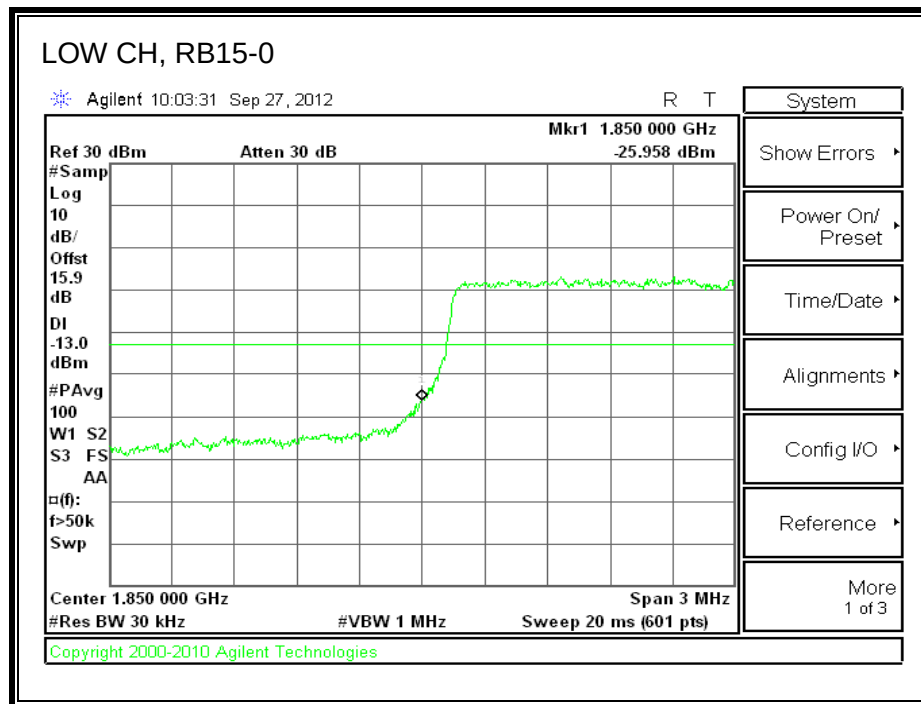
**16QAM Band 2 (3 MHz BANDWIDTH)**



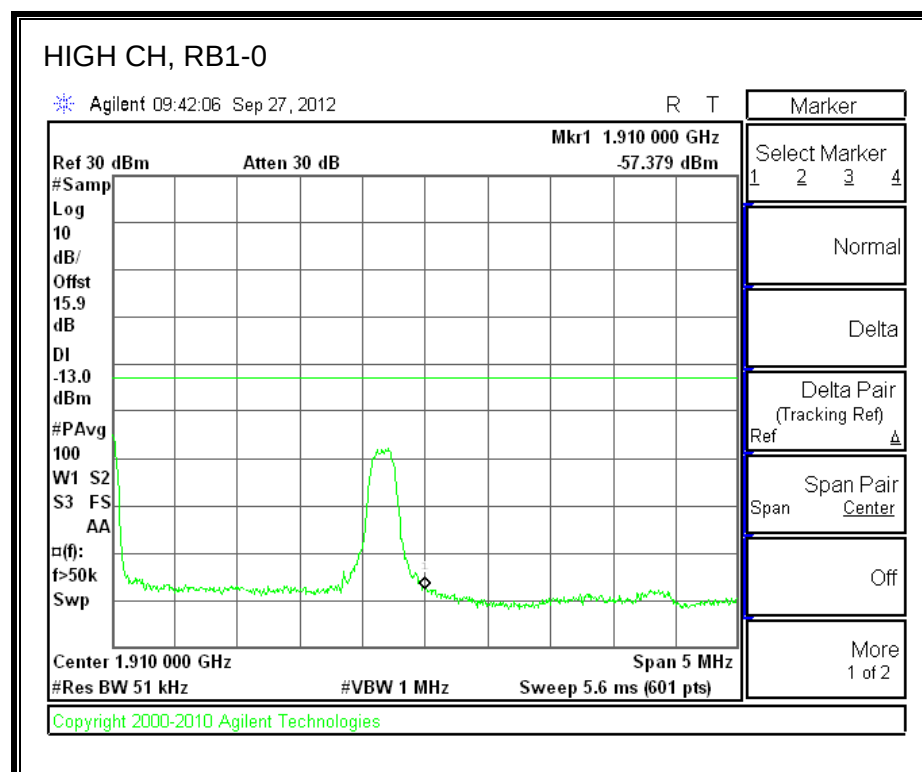
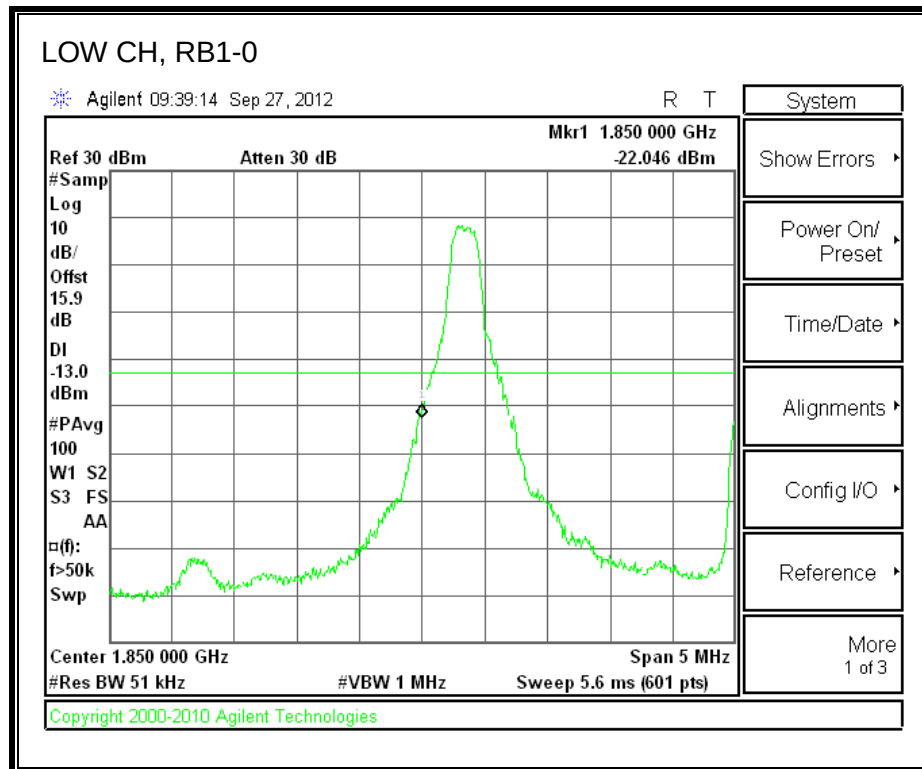


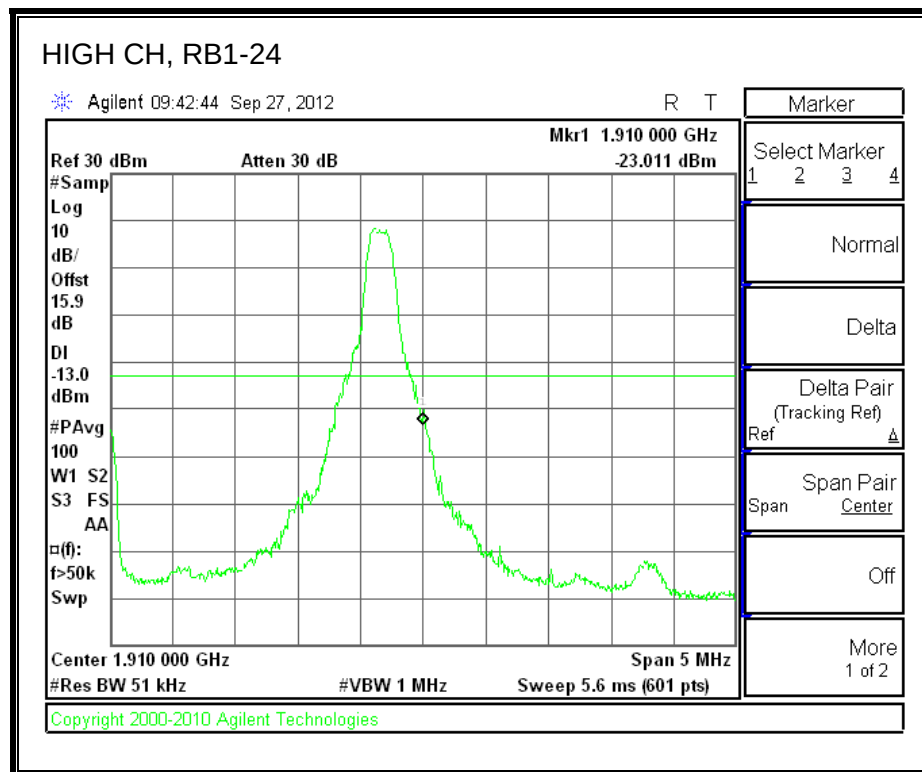
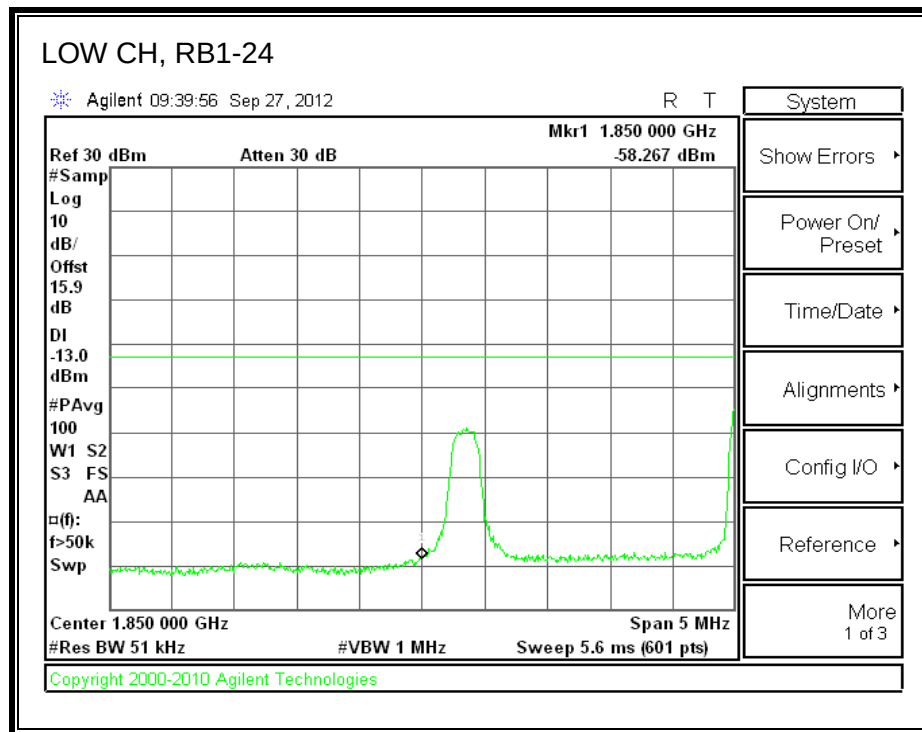


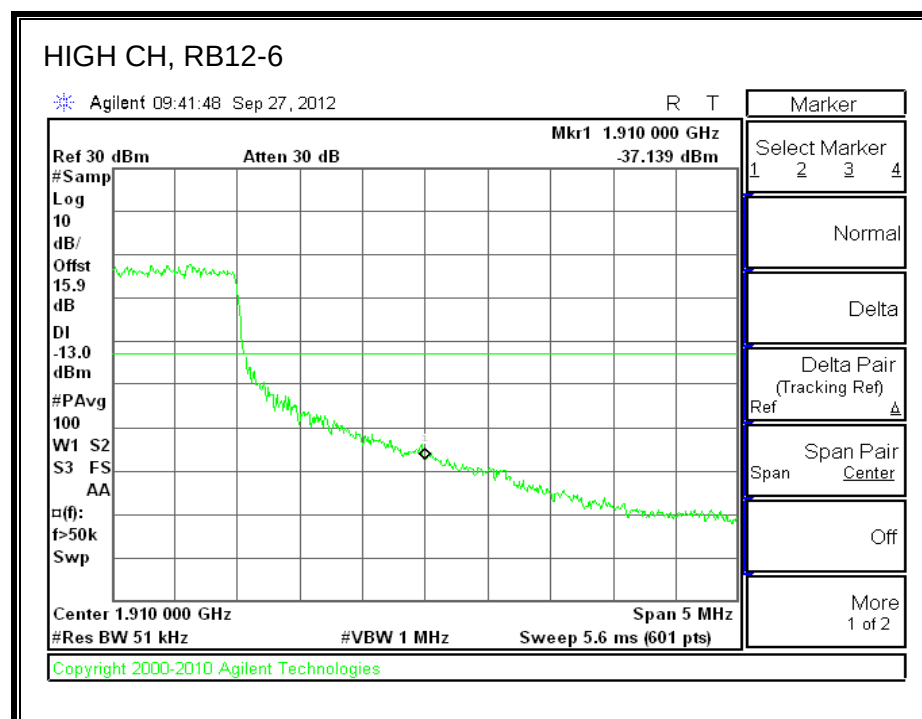
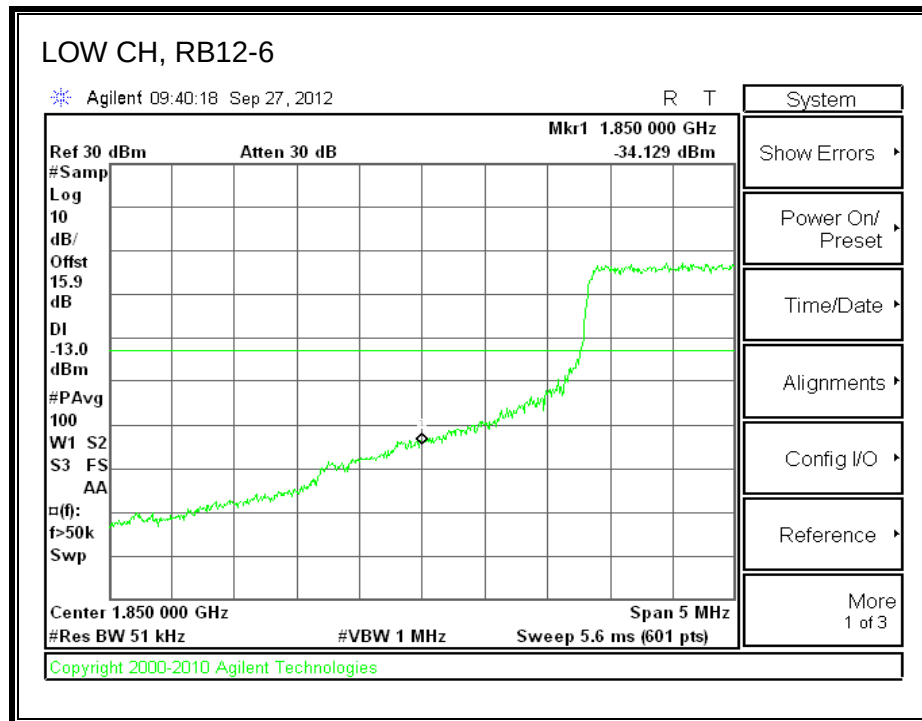


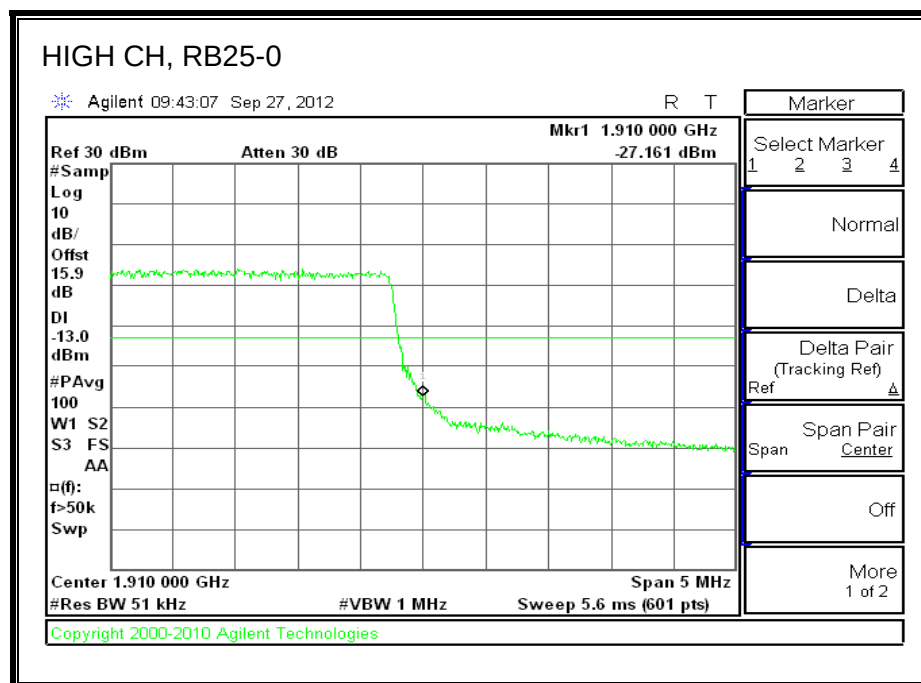
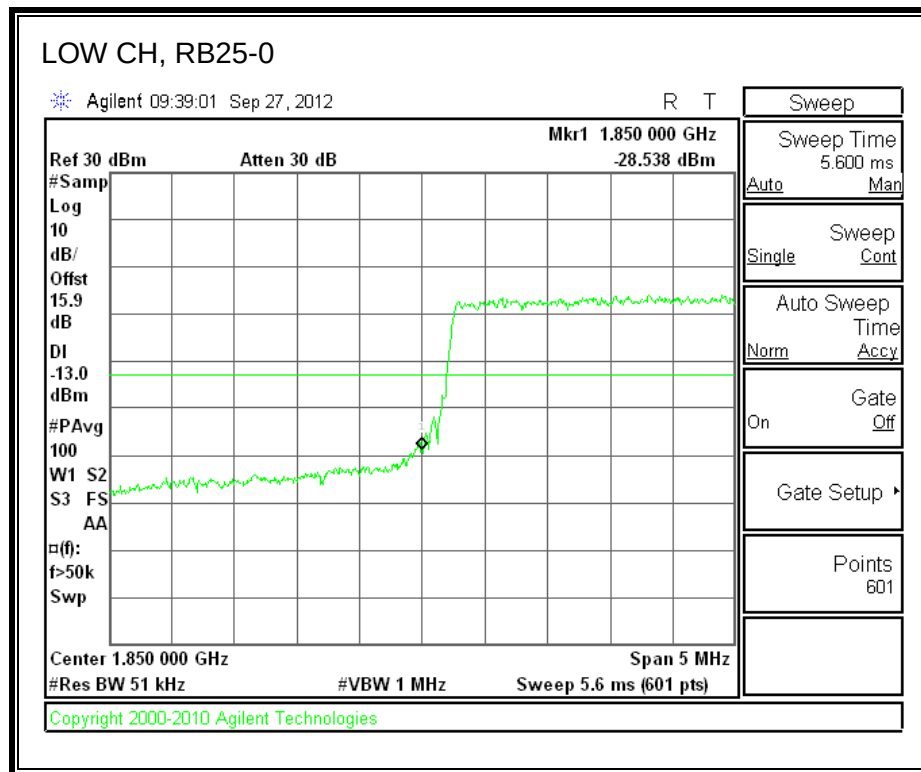


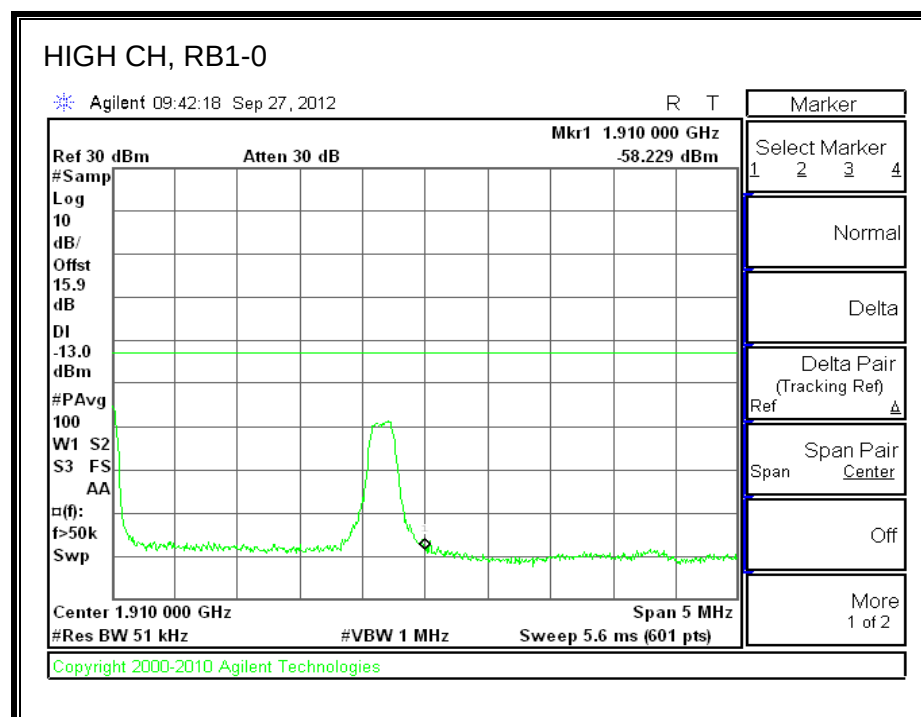
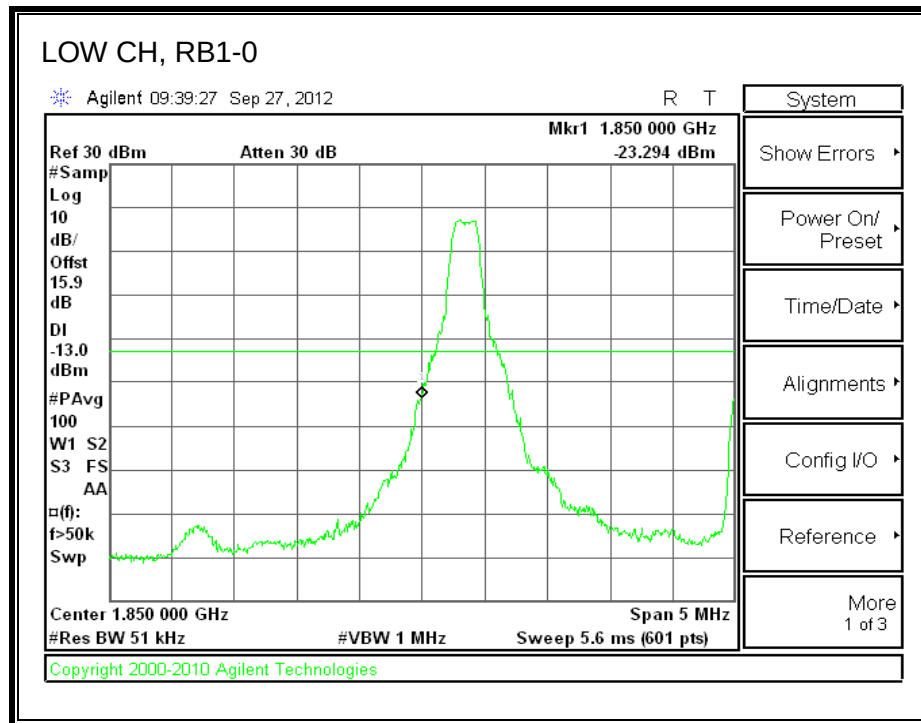
**QPSK Band 2 (5 MHz BANDWIDTH)**

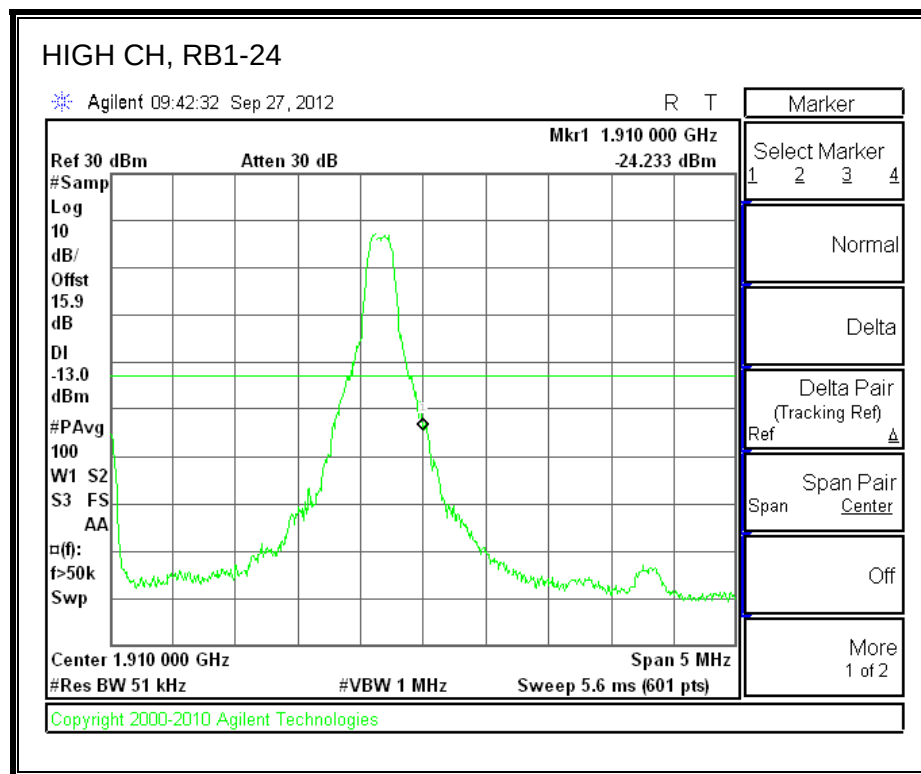
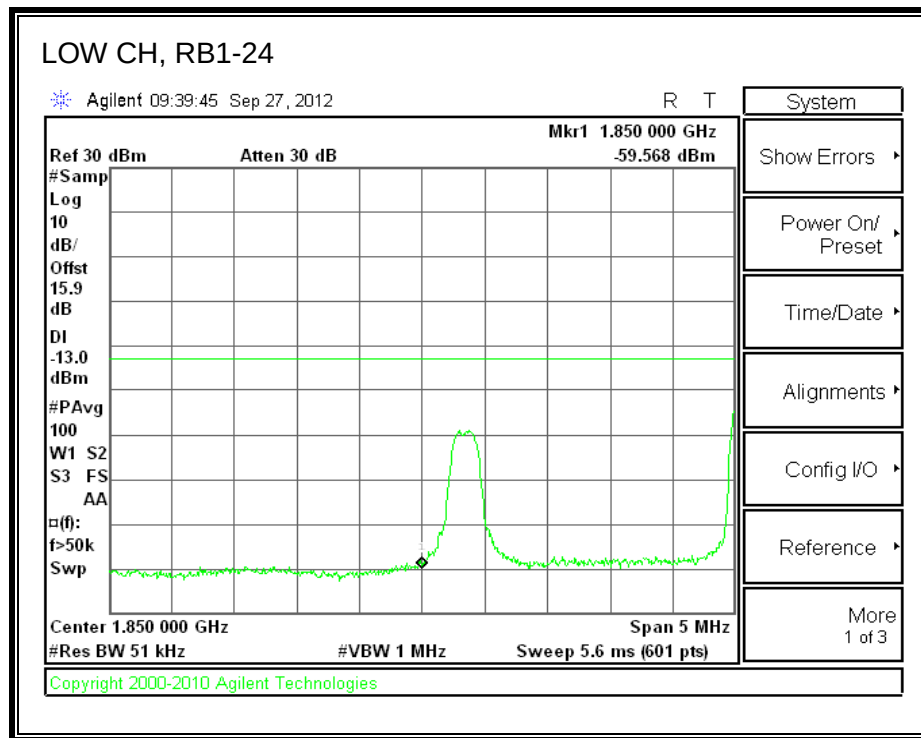




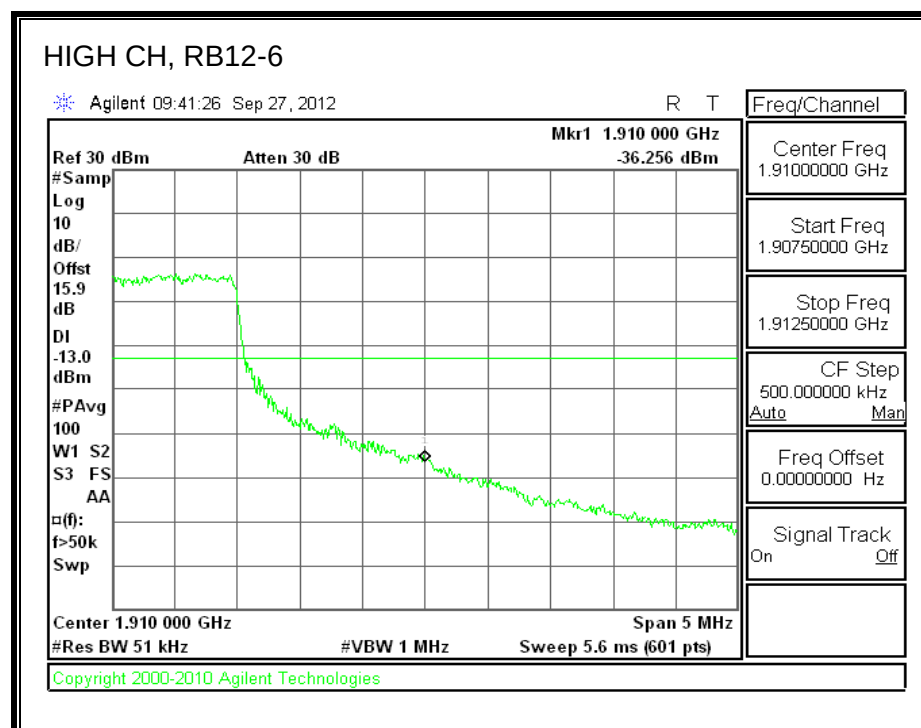
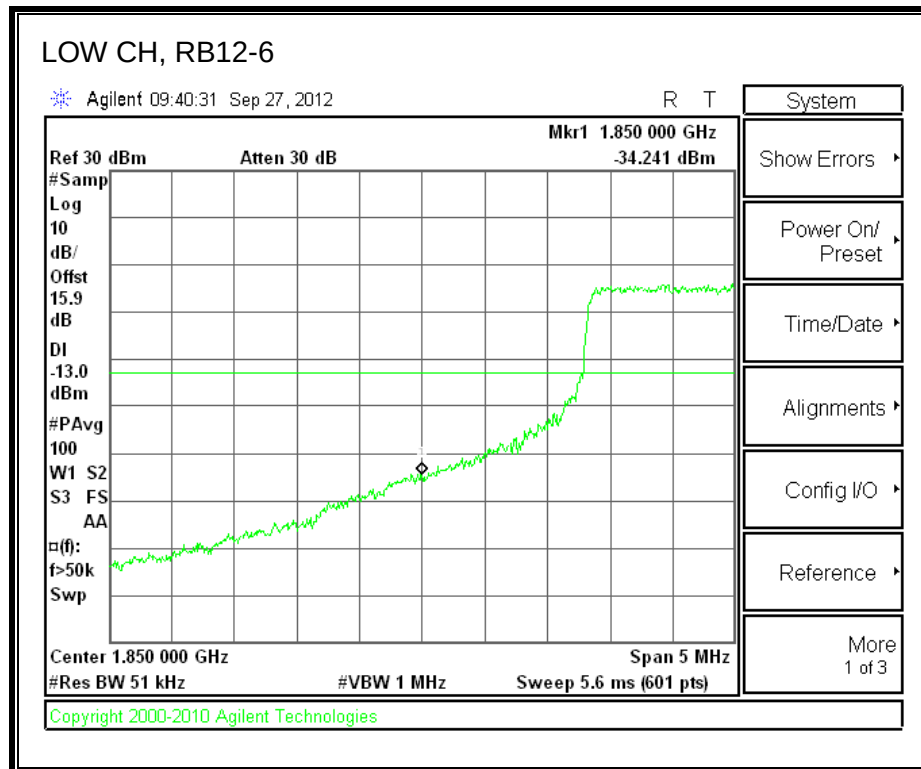


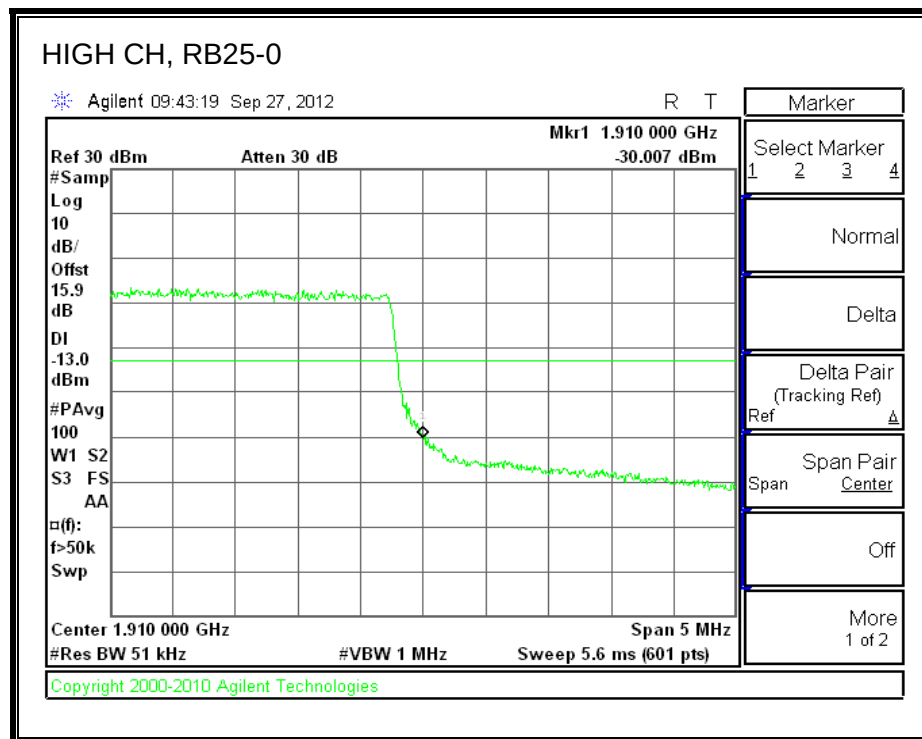
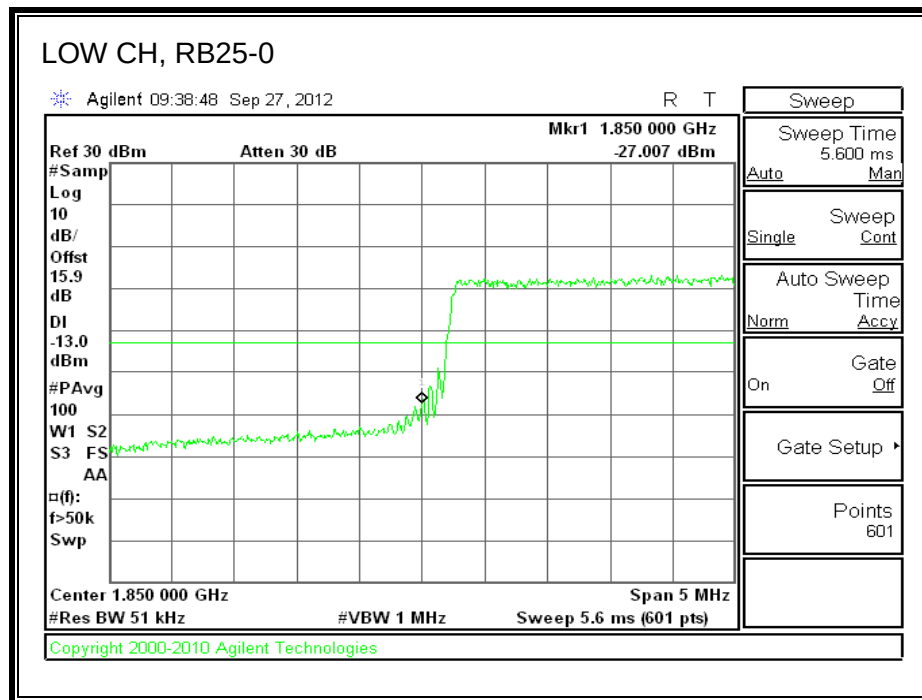


**16QAM Band 2 (5 MHz BANDWIDTH)**

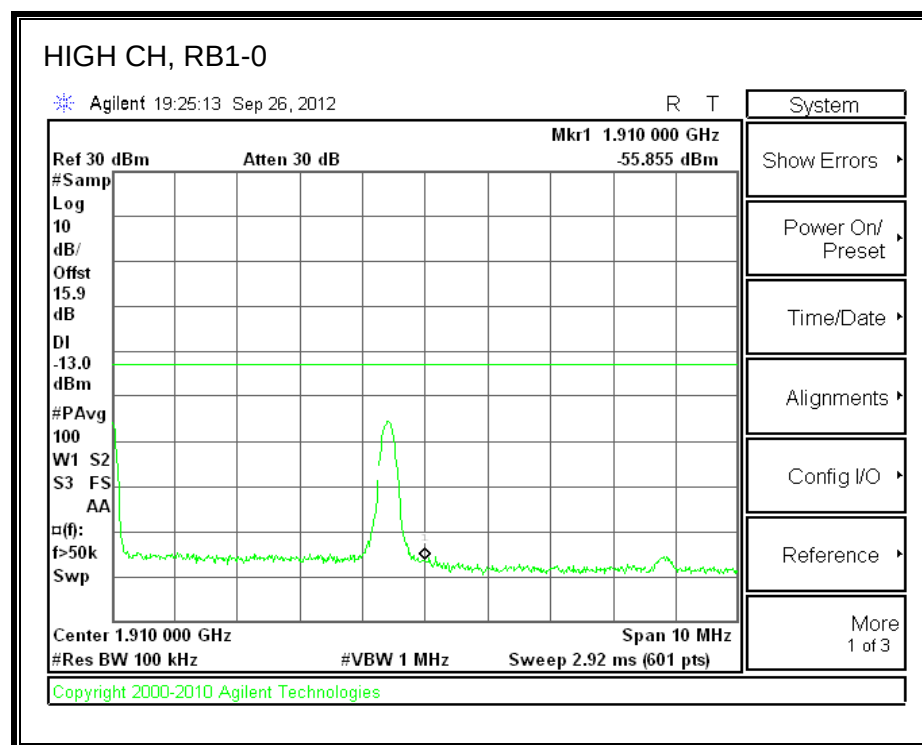
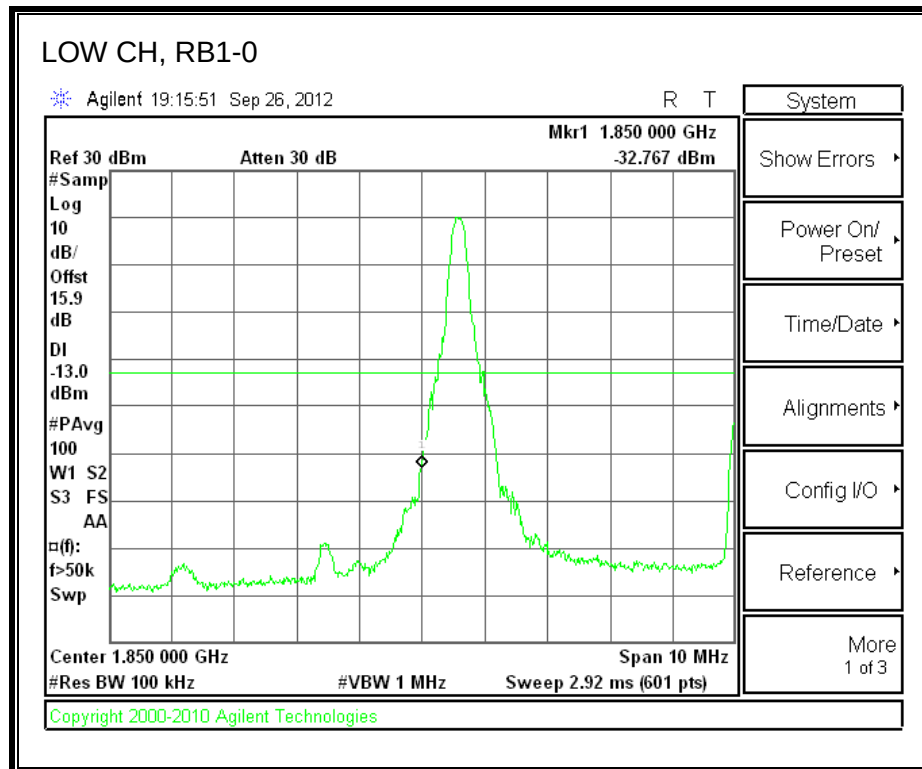


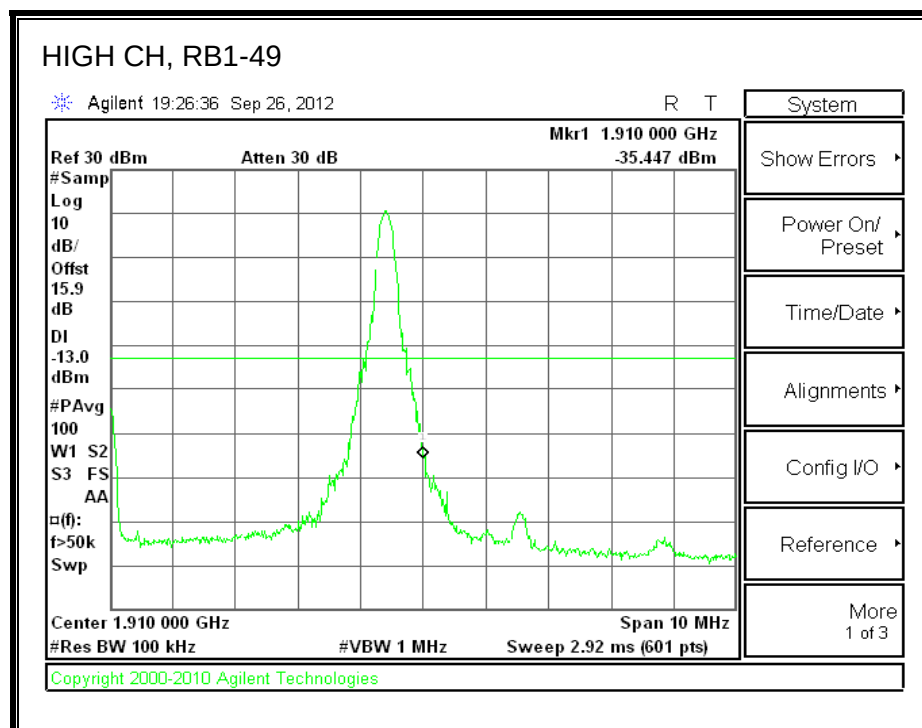
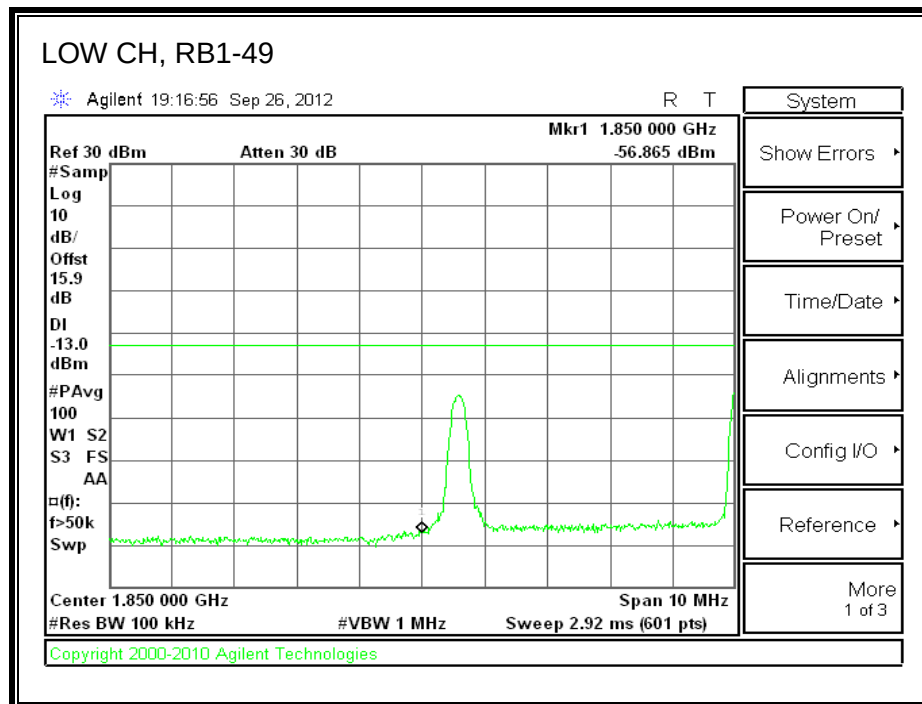


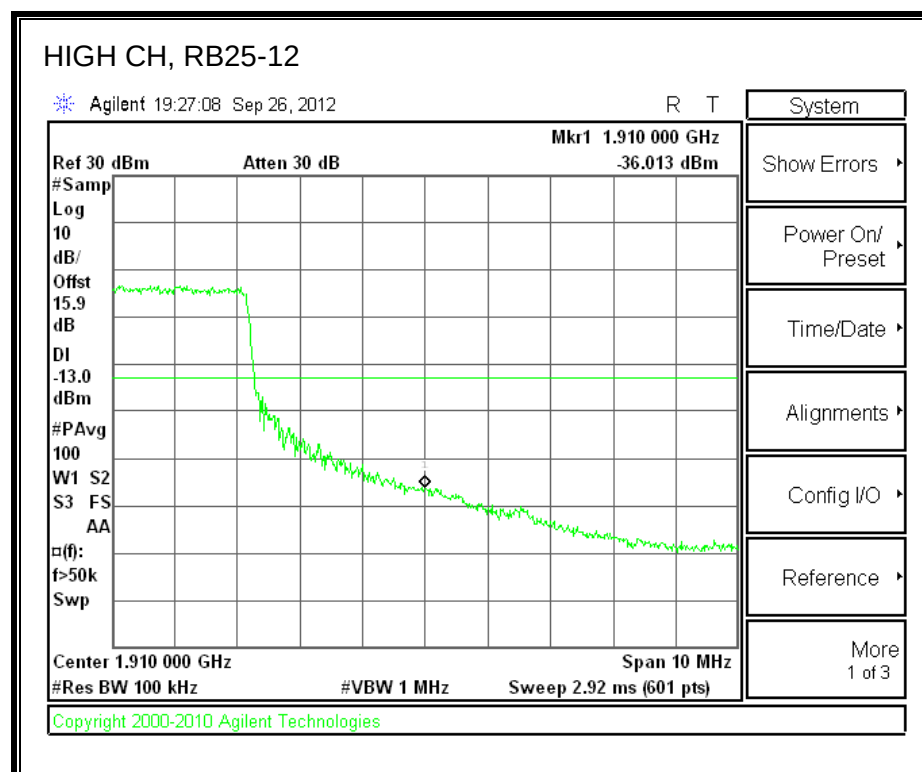
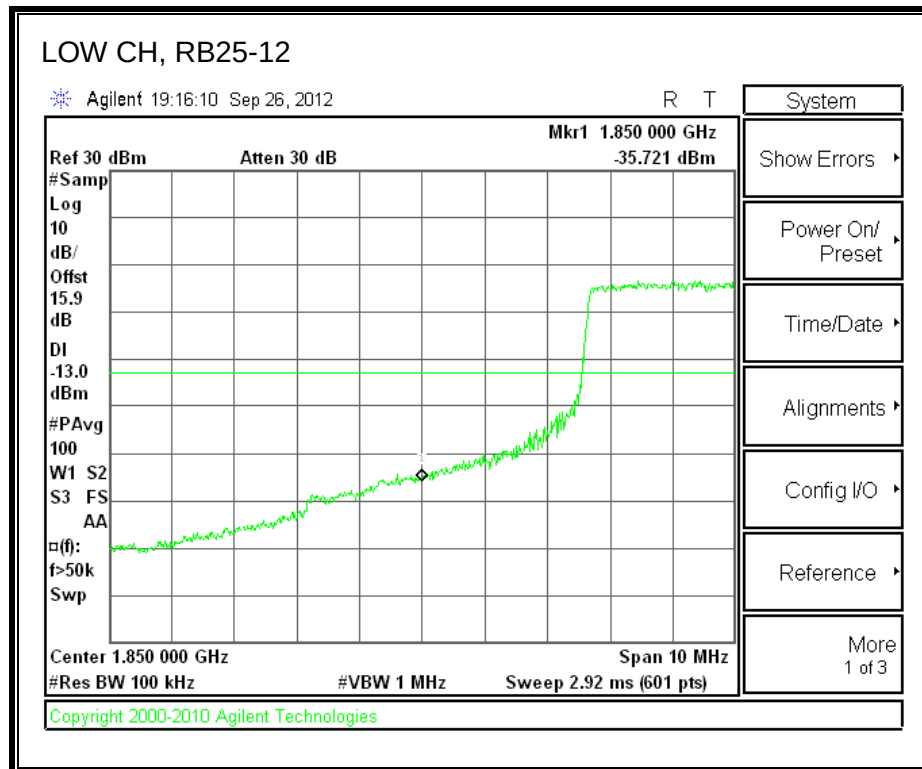


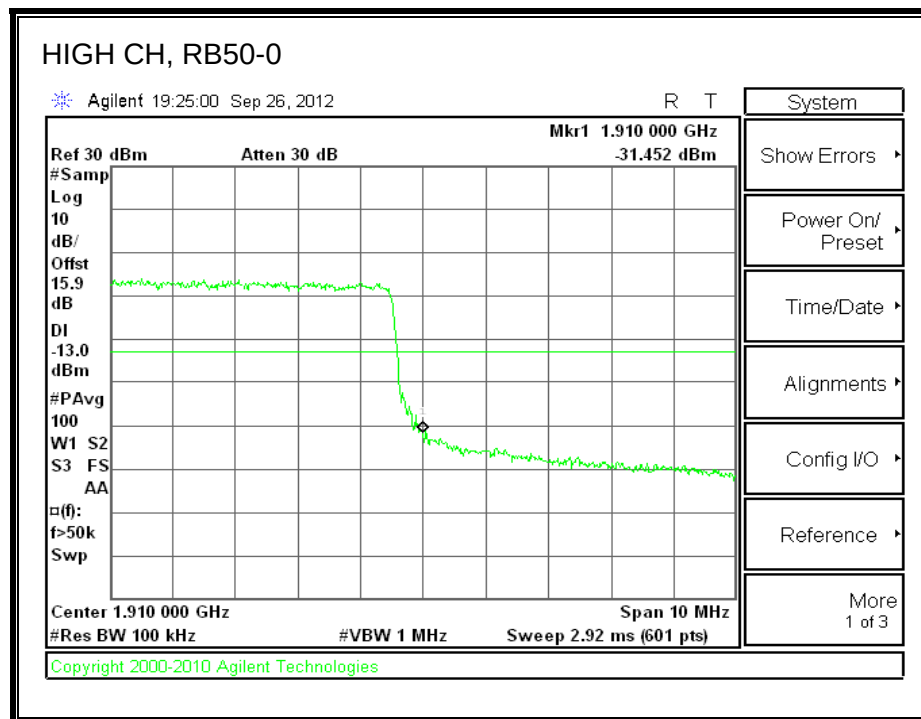
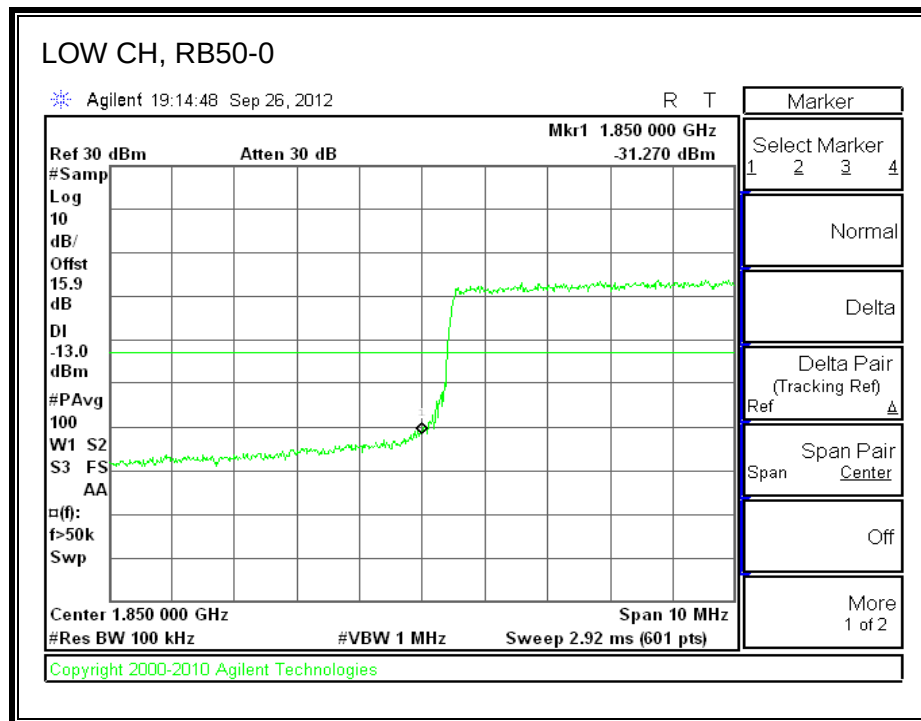


**QPSK Band 2 (10 MHz BANDWIDTH)**

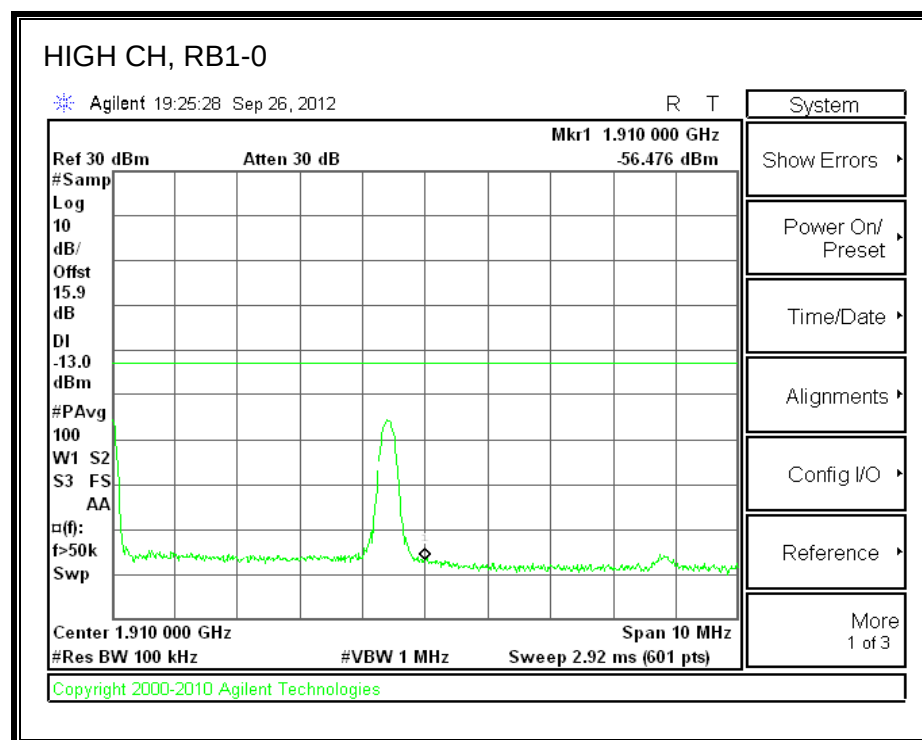
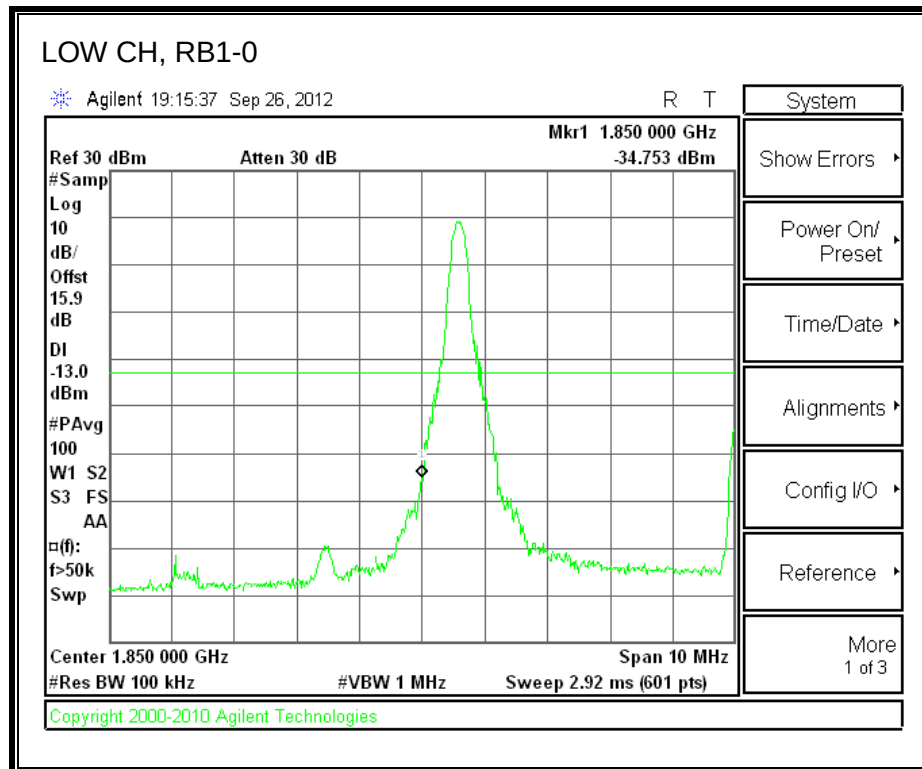


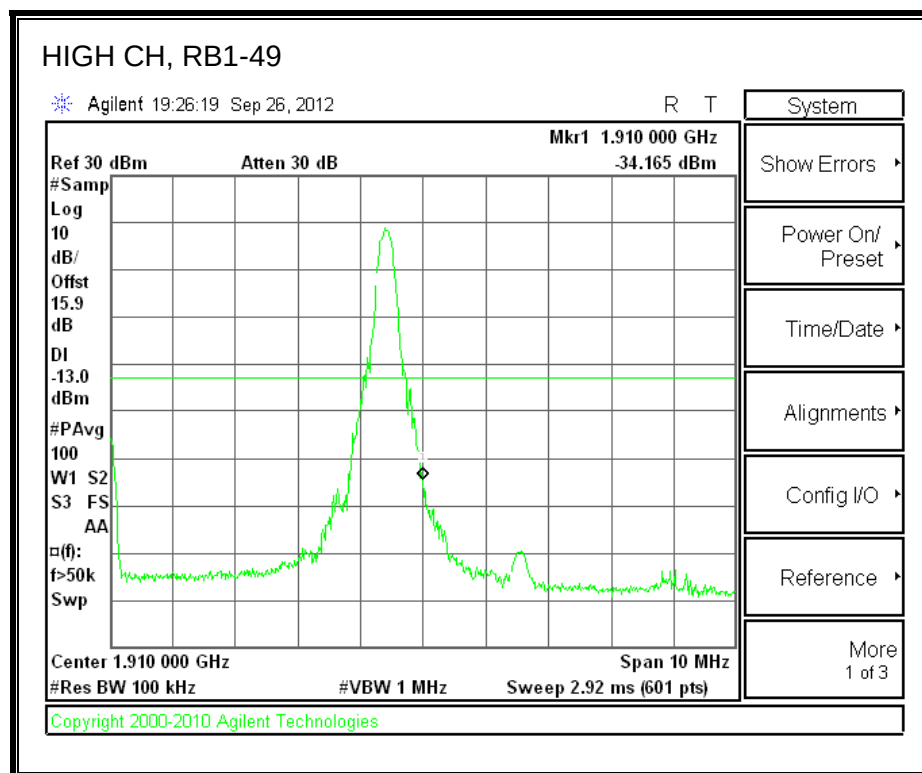
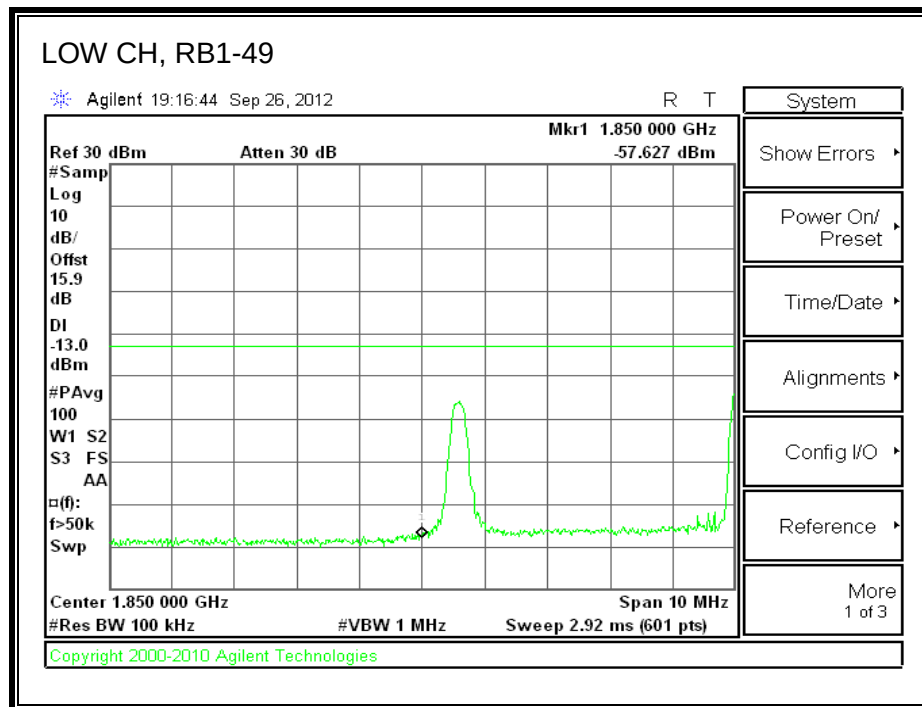




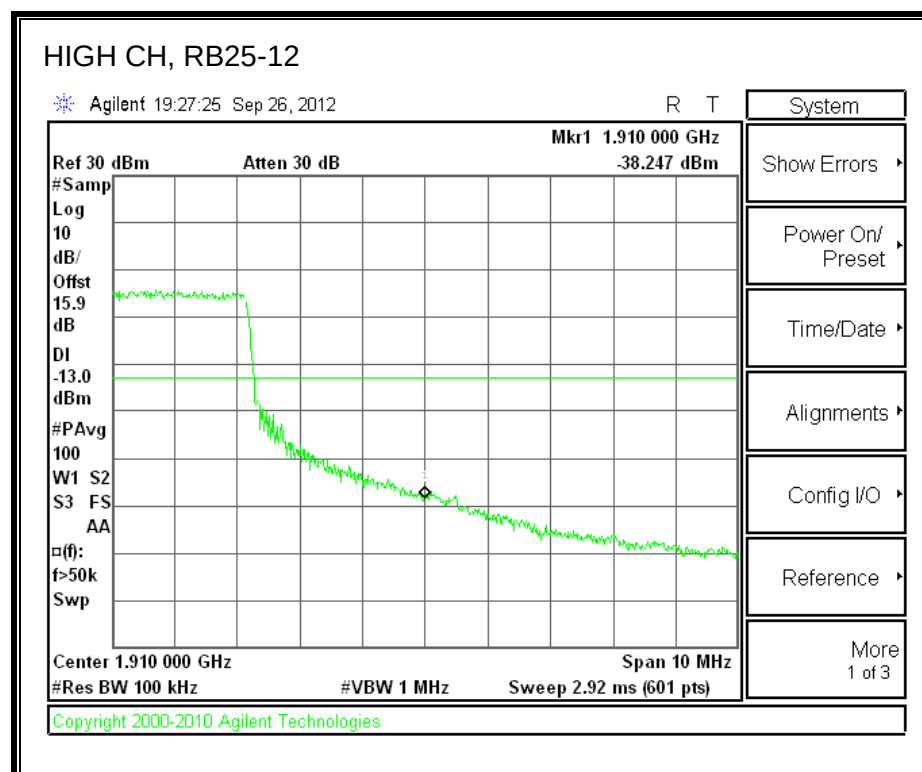
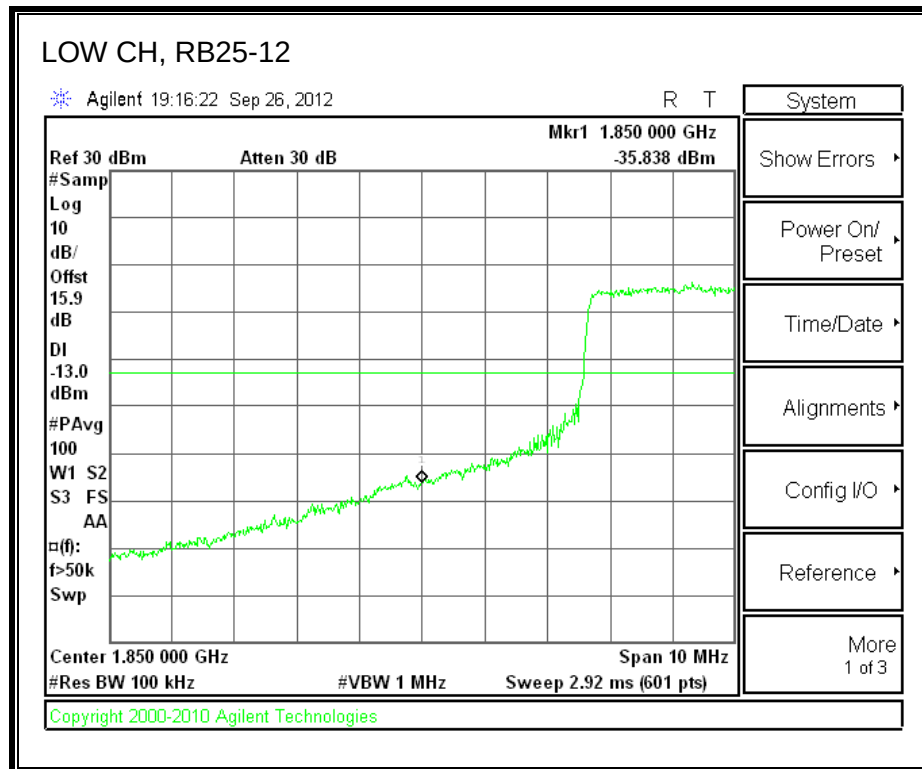


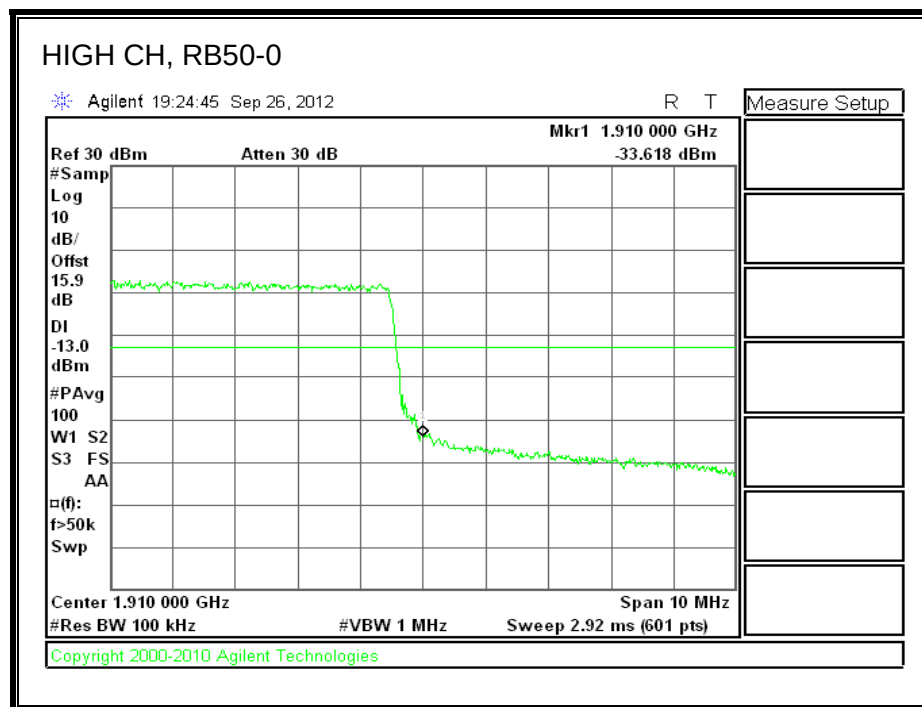
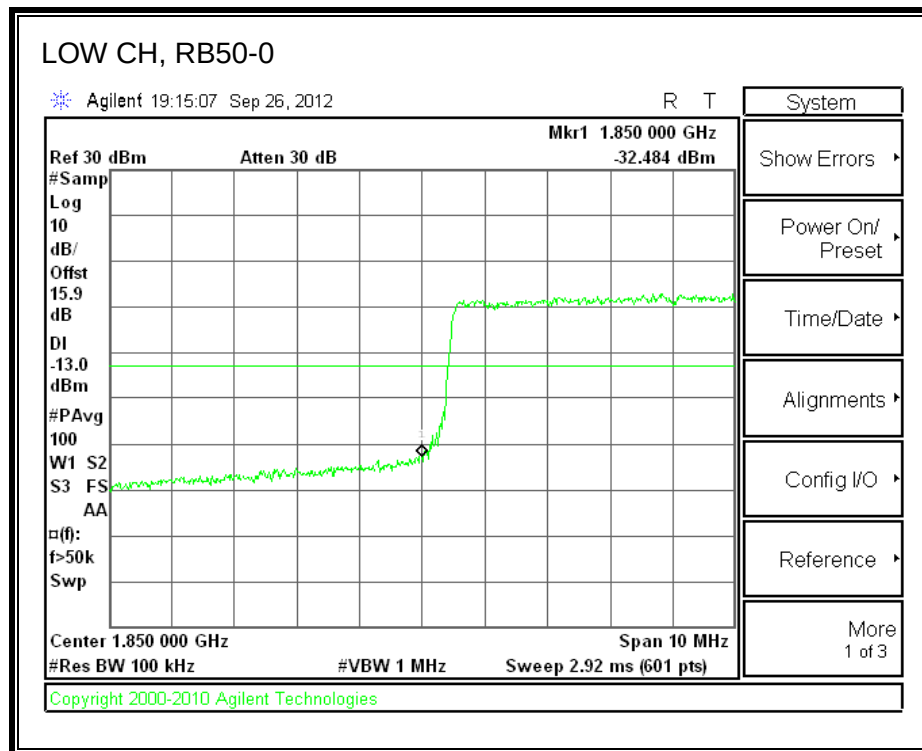
**16QAM Band 2 (10 MHz BANDWIDTH)**

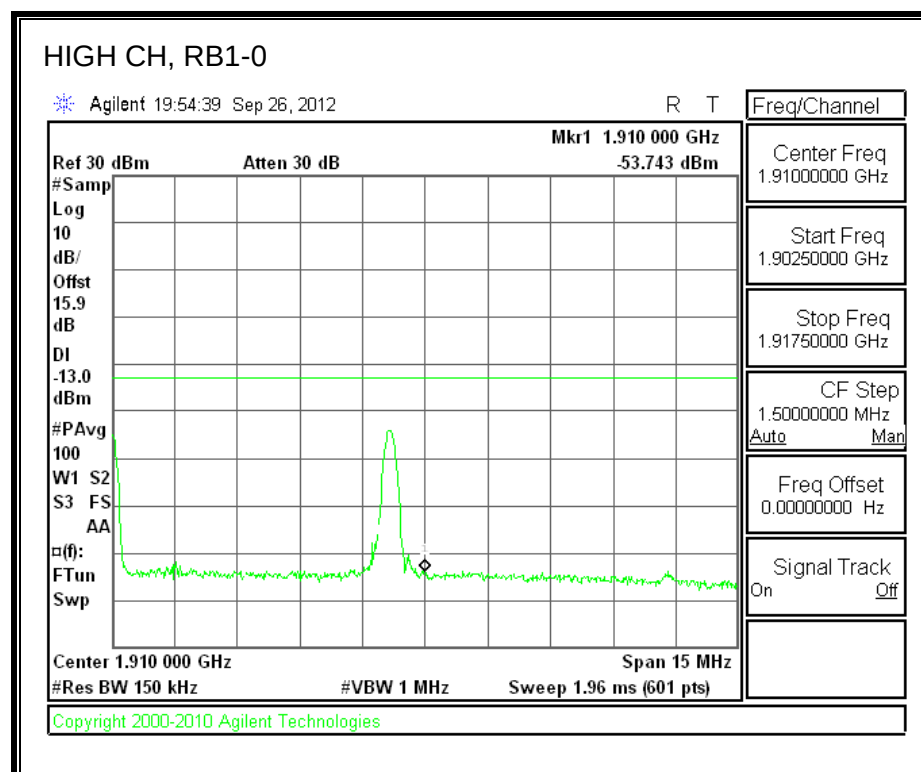
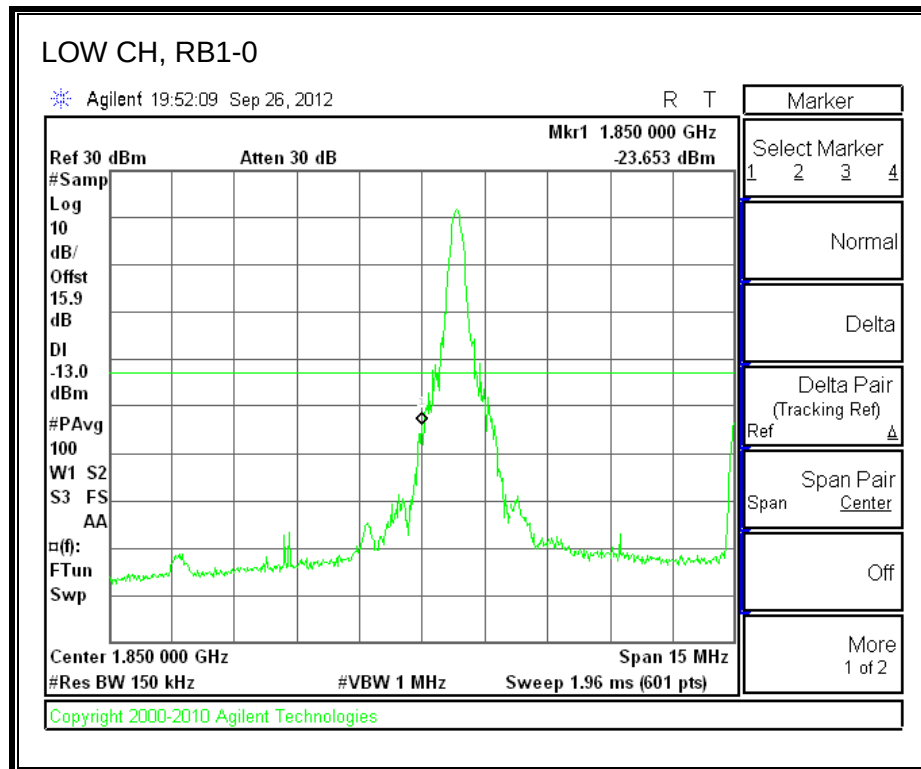


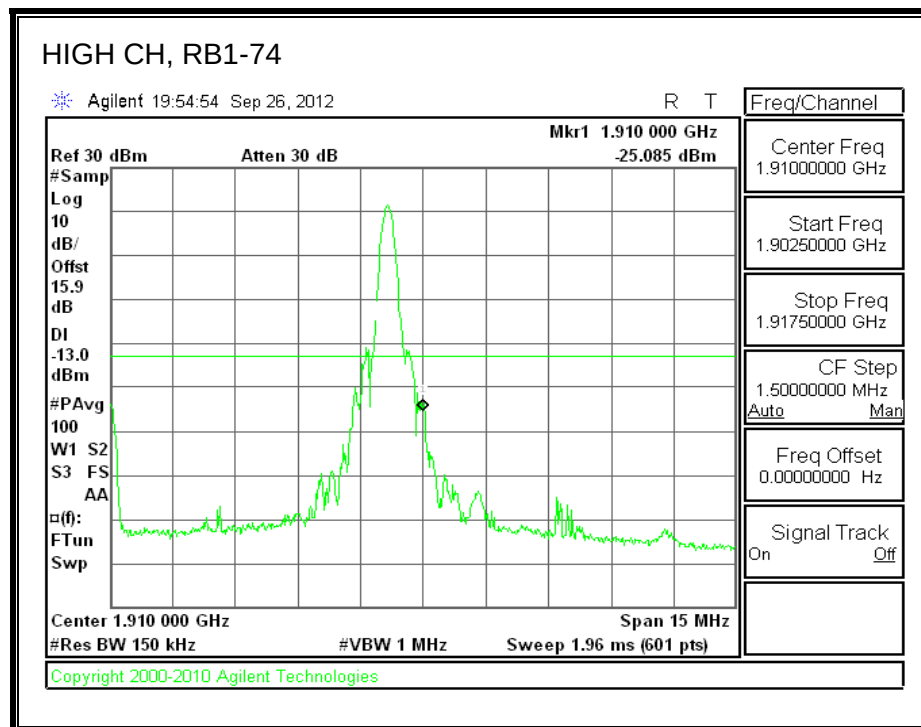
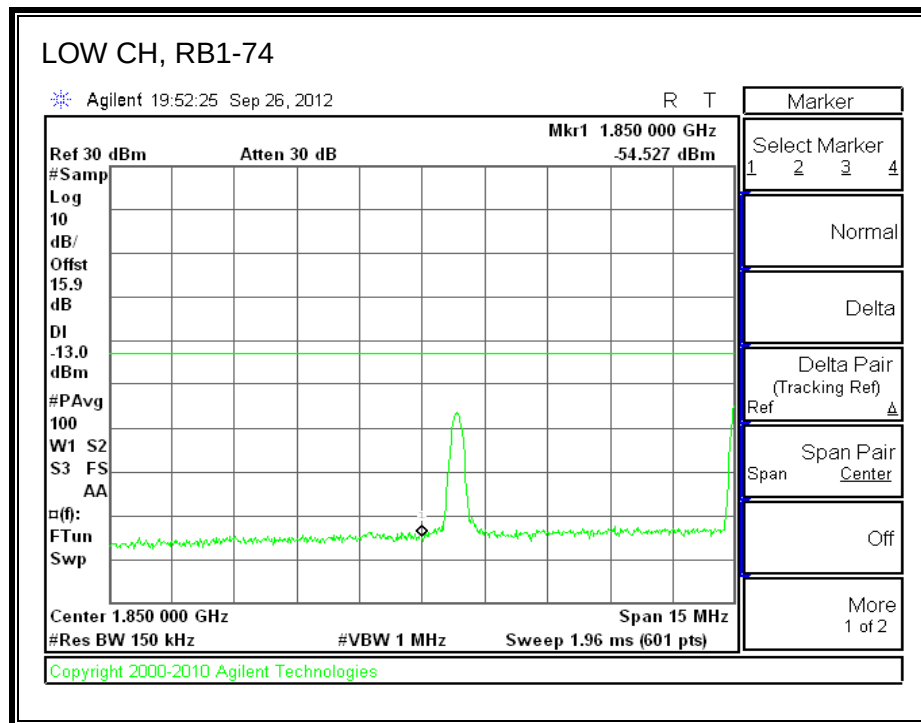


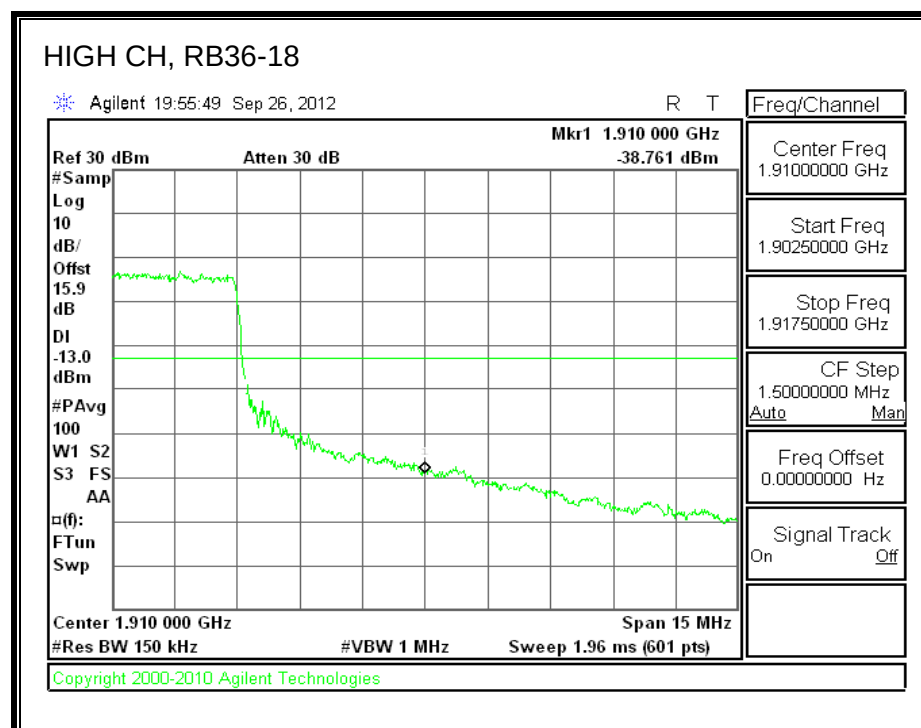
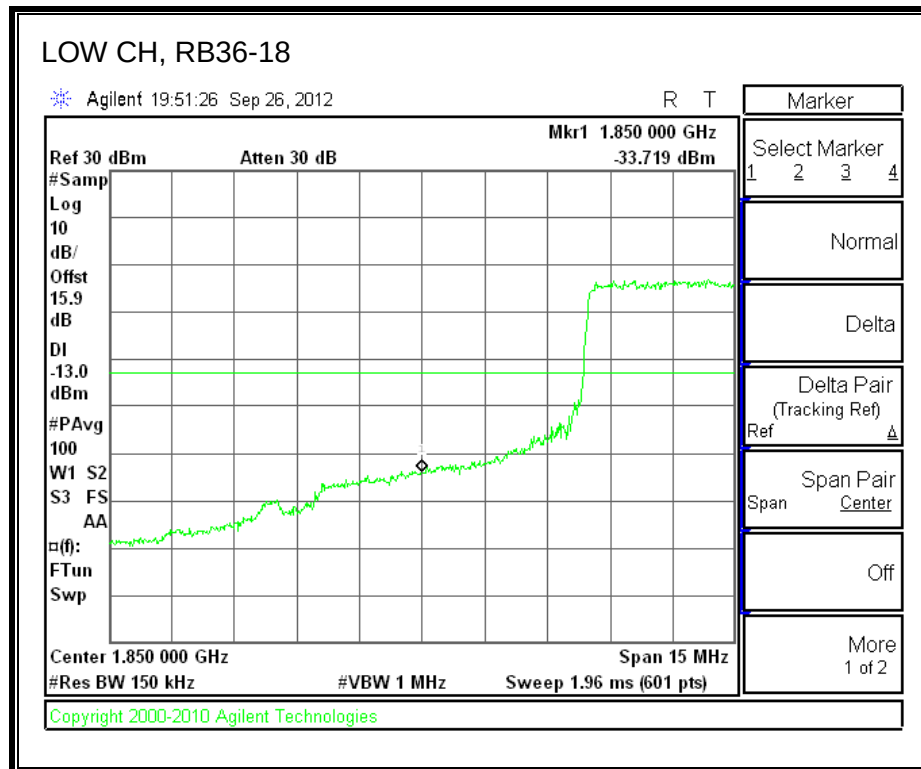


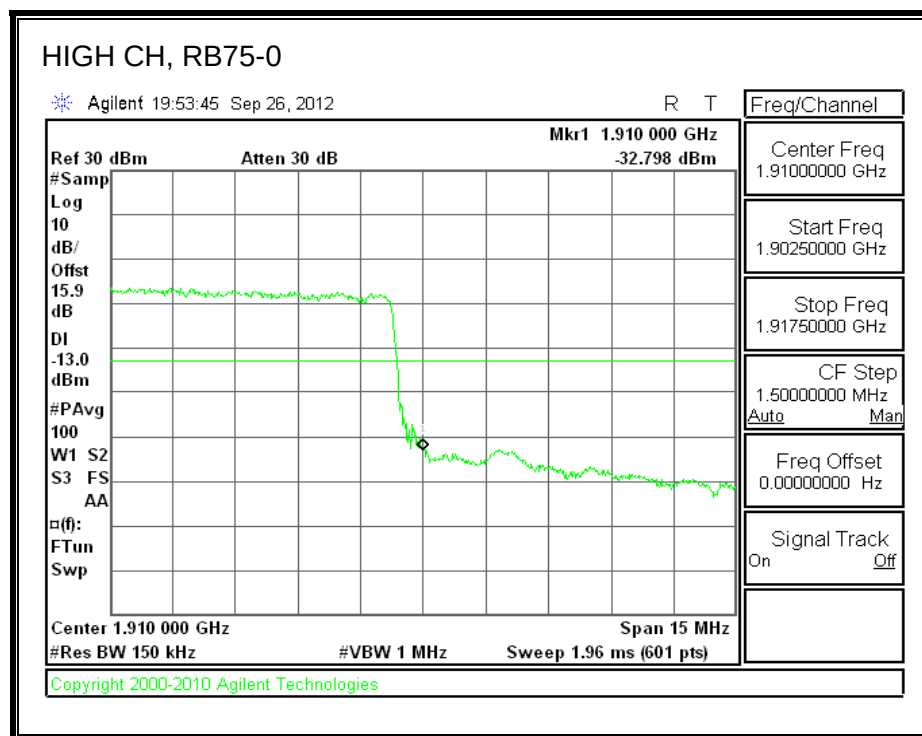
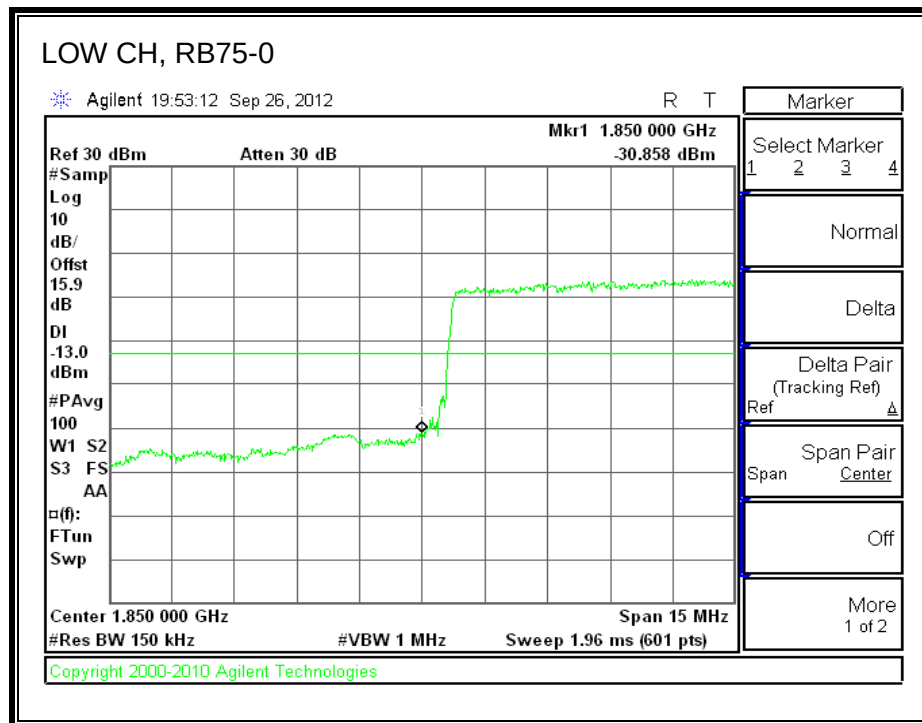


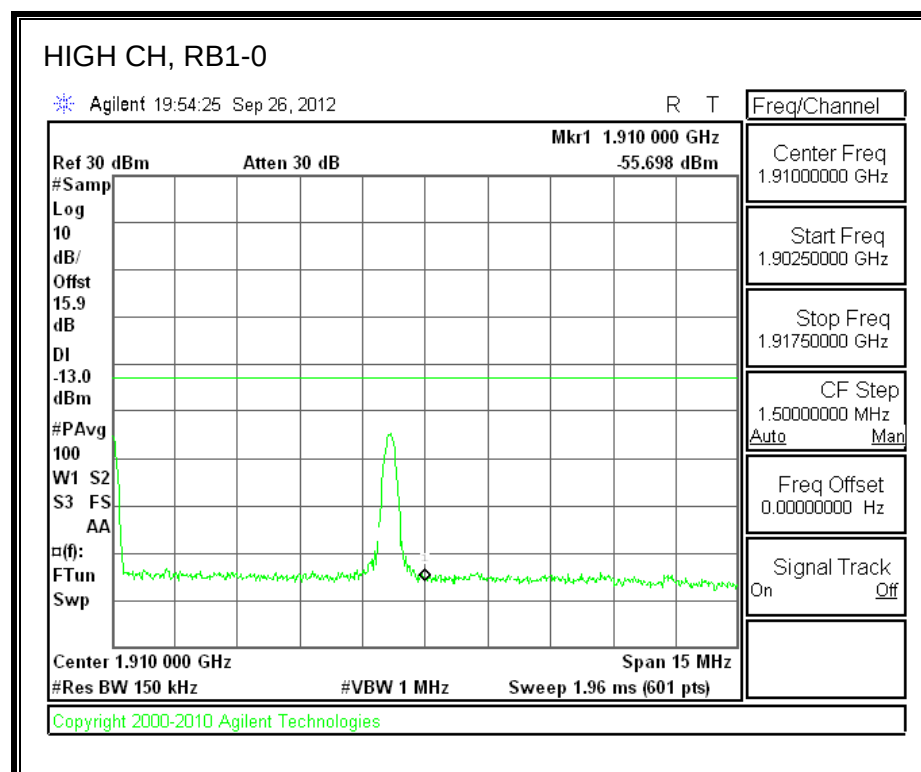
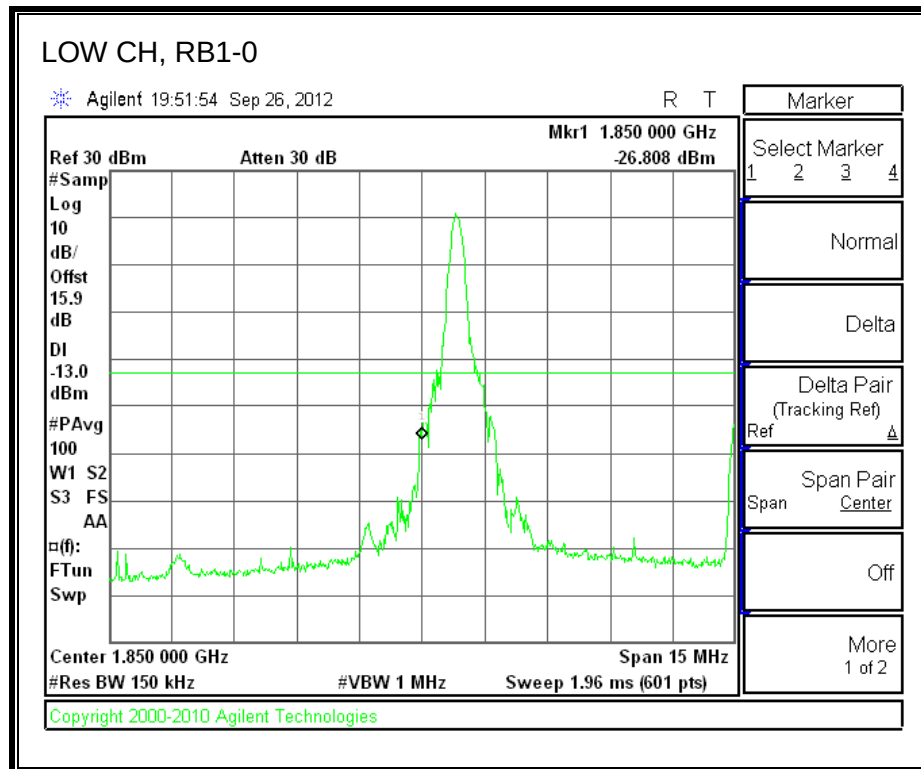


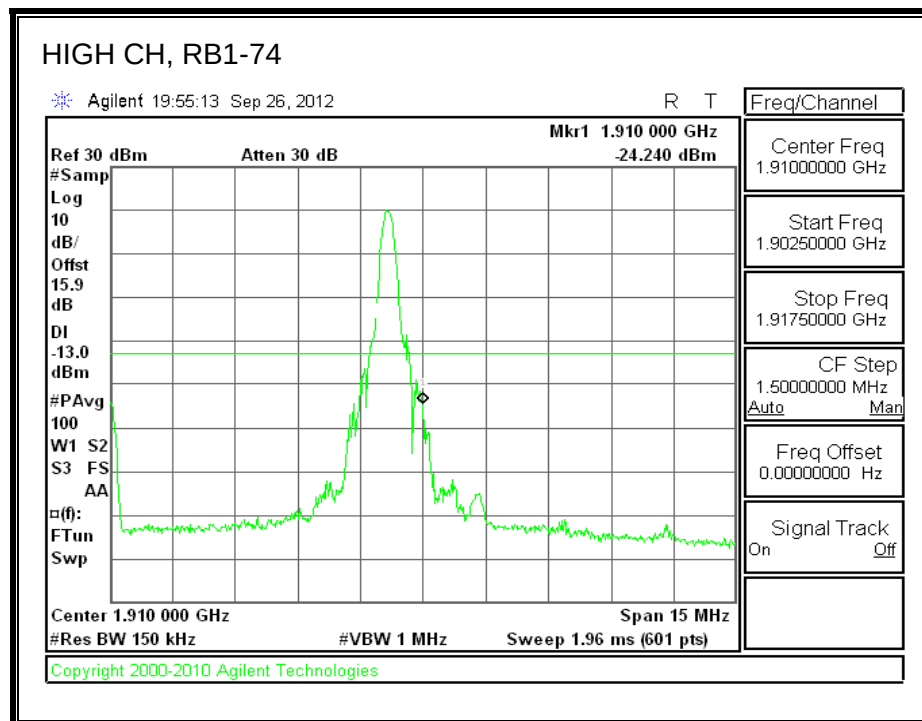
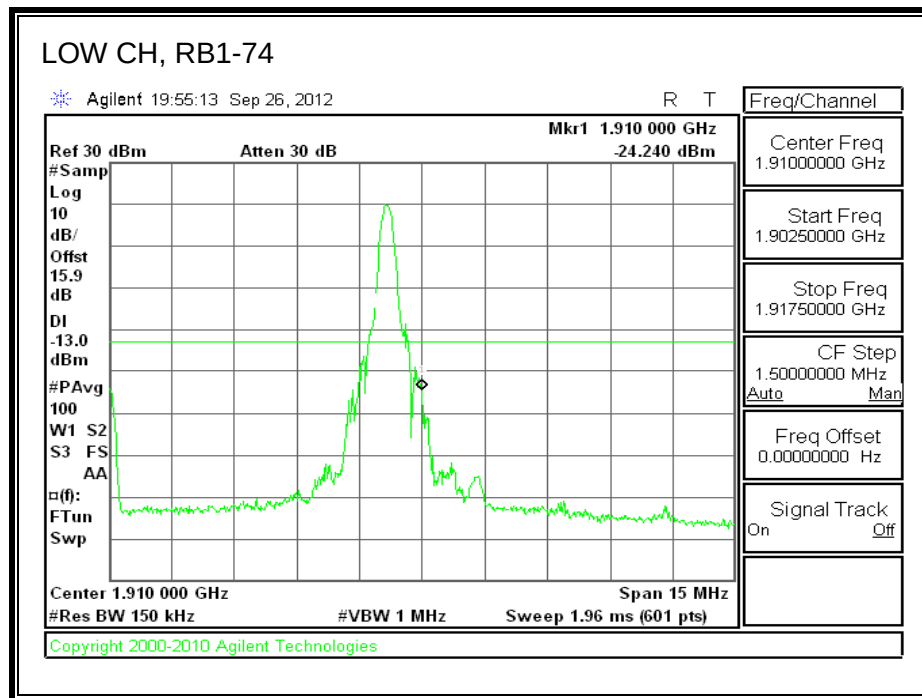
**QPSK Band 2 (15 MHz BANDWIDTH)**



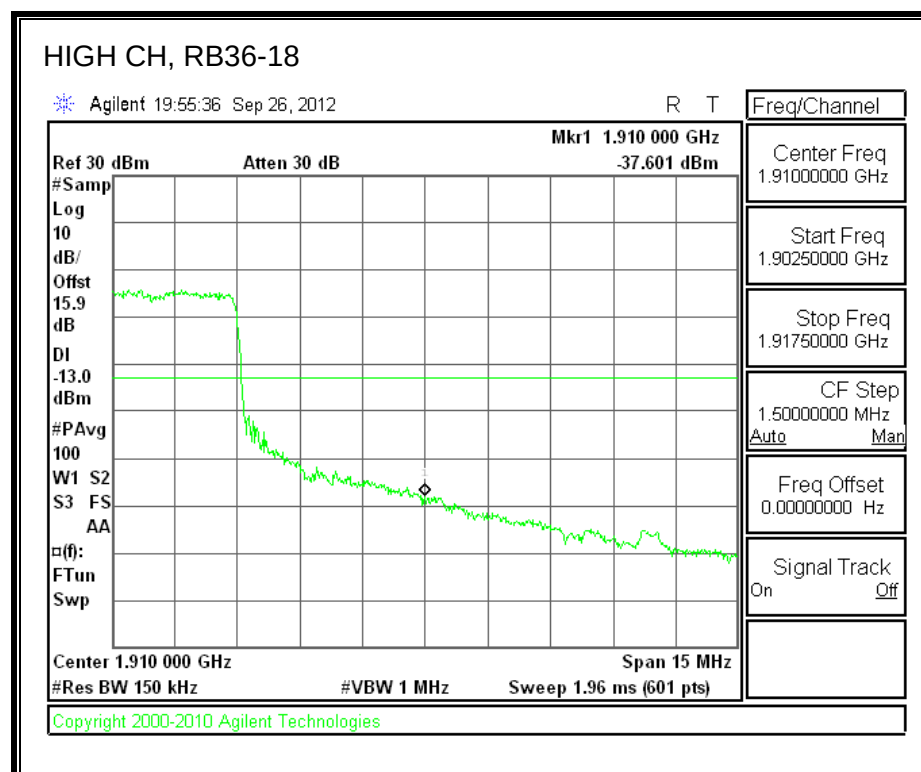
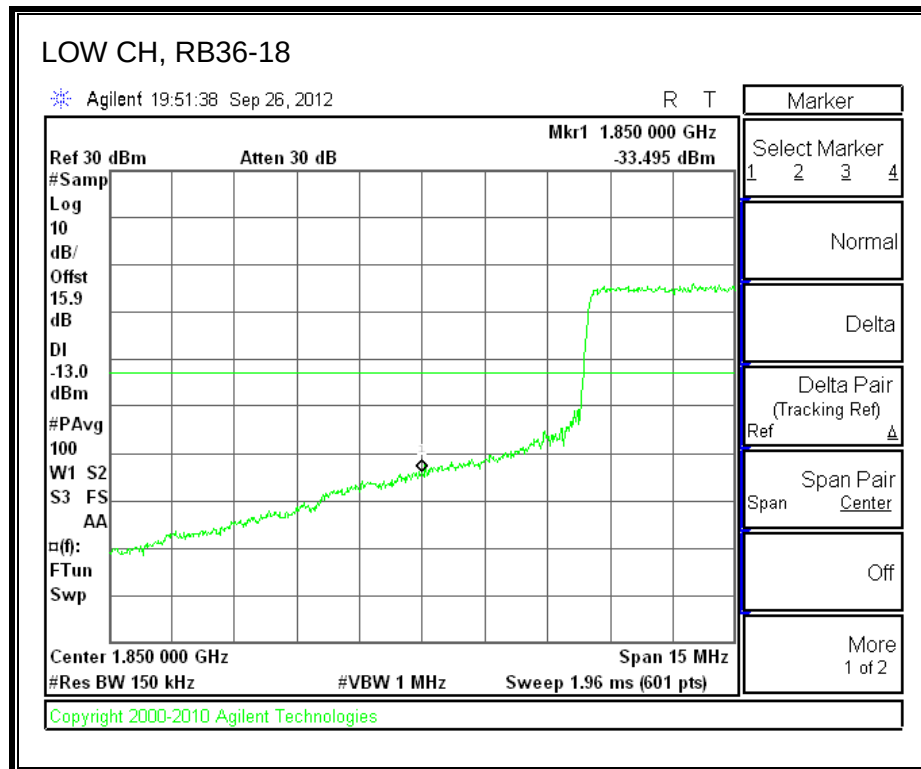


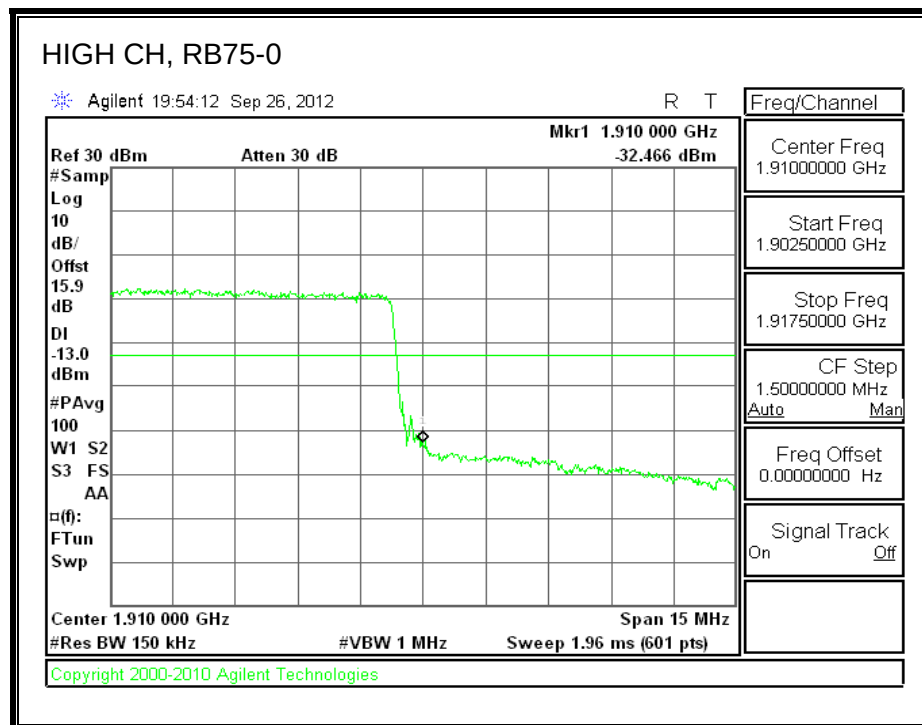
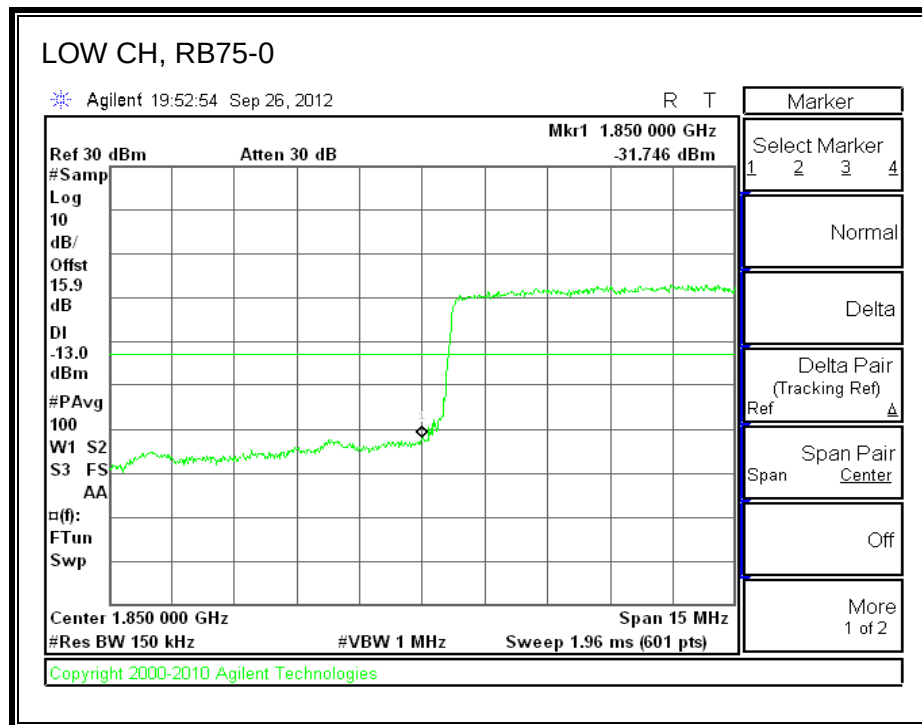


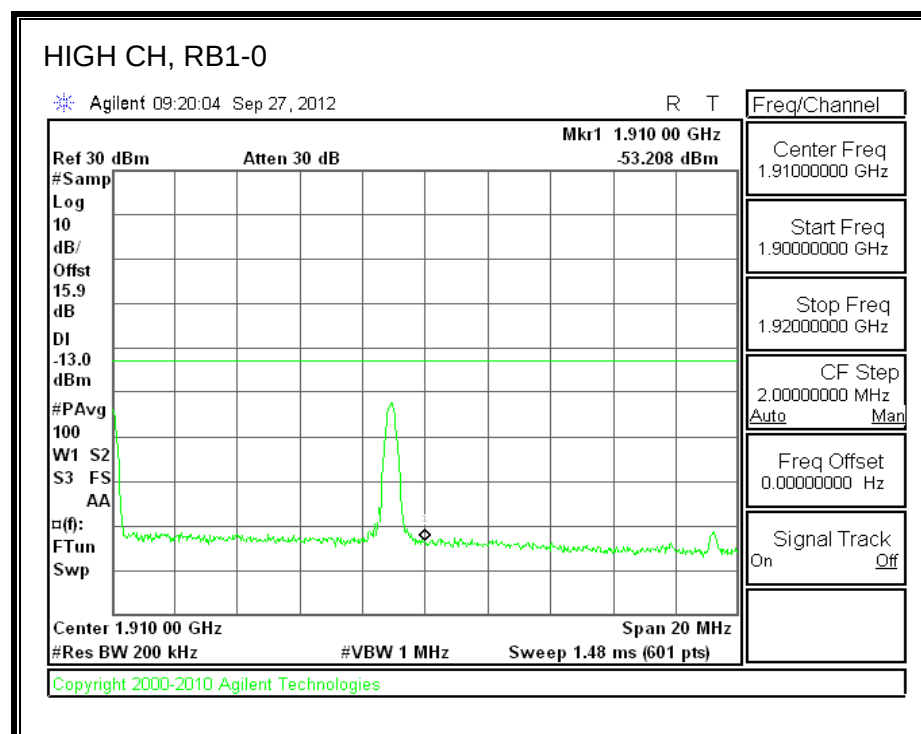
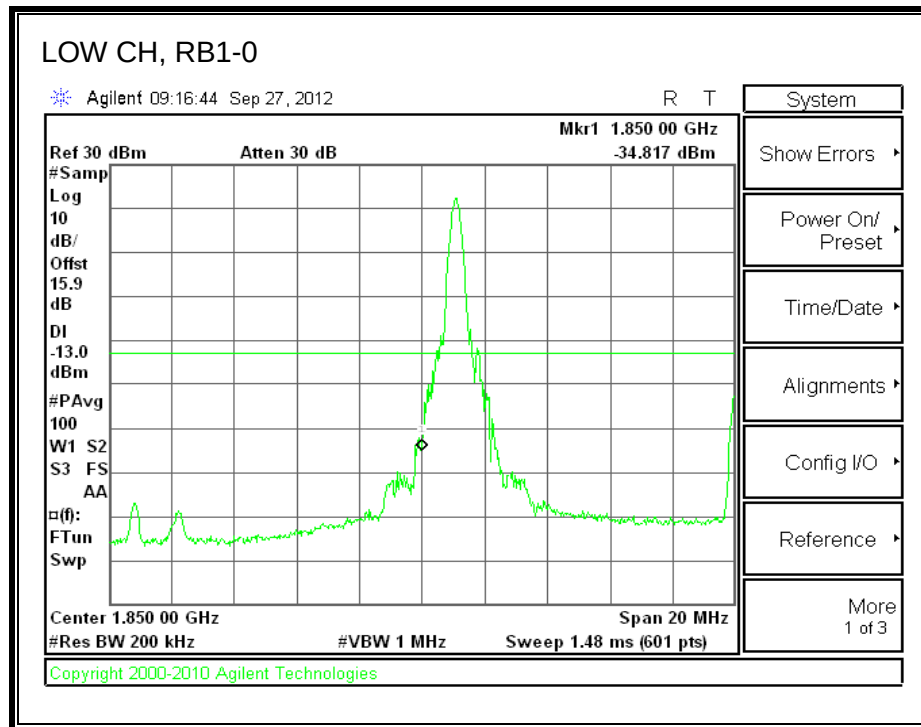
**16QAM Band 2 (15 MHz BANDWIDTH)**

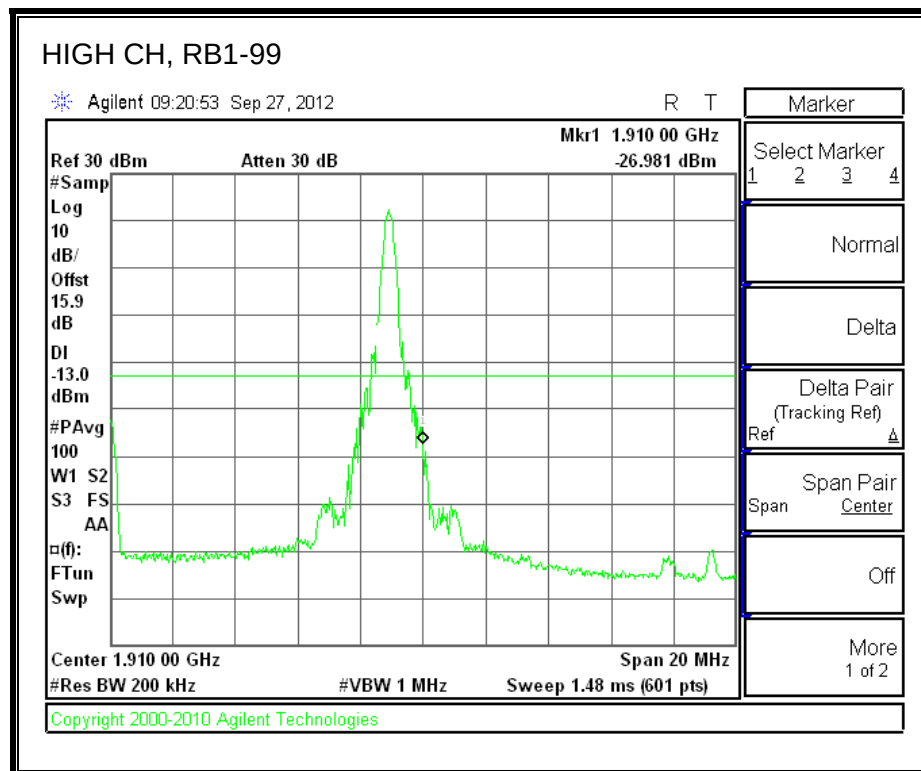
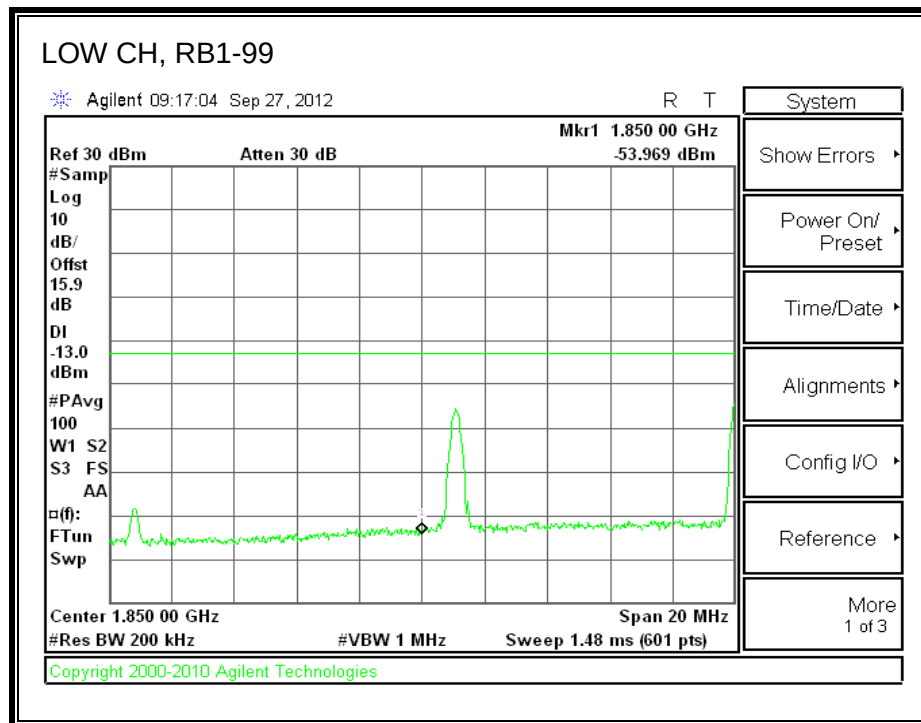


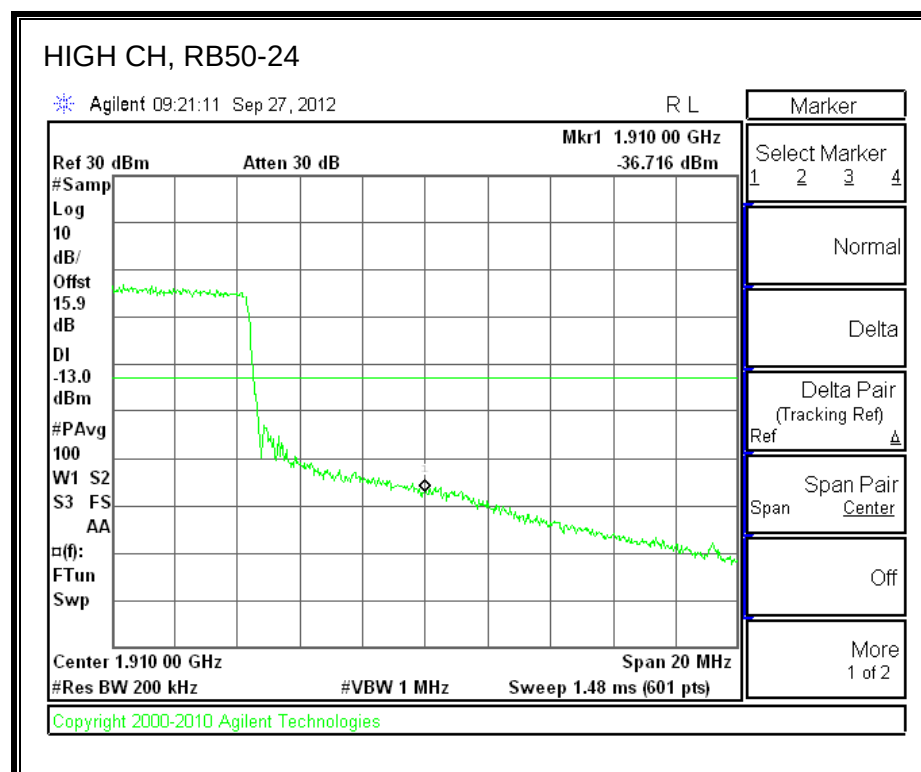
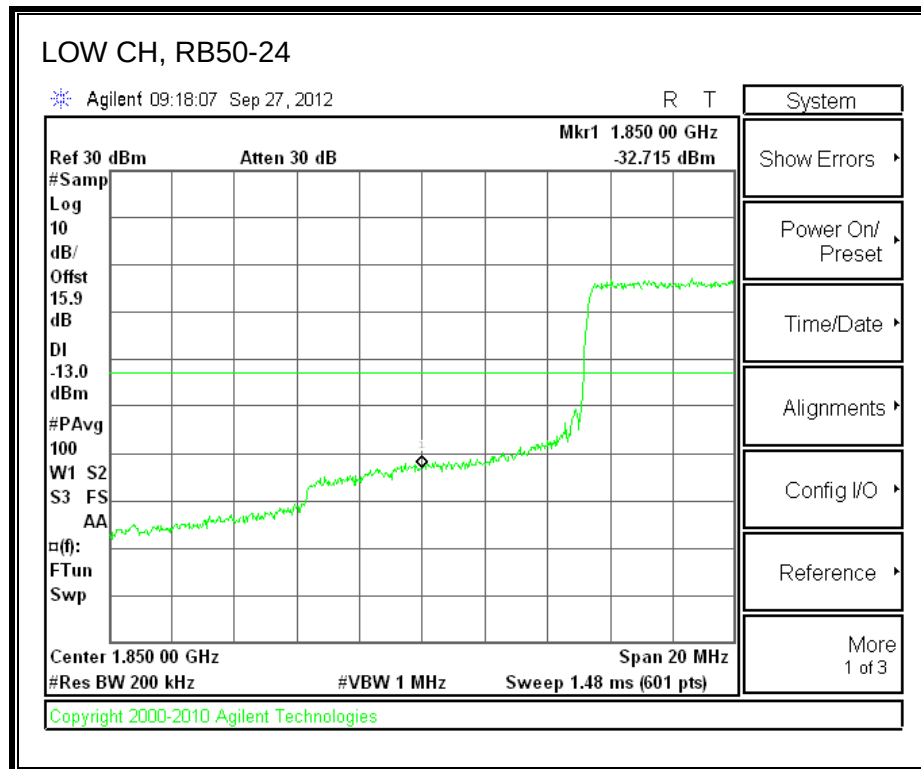


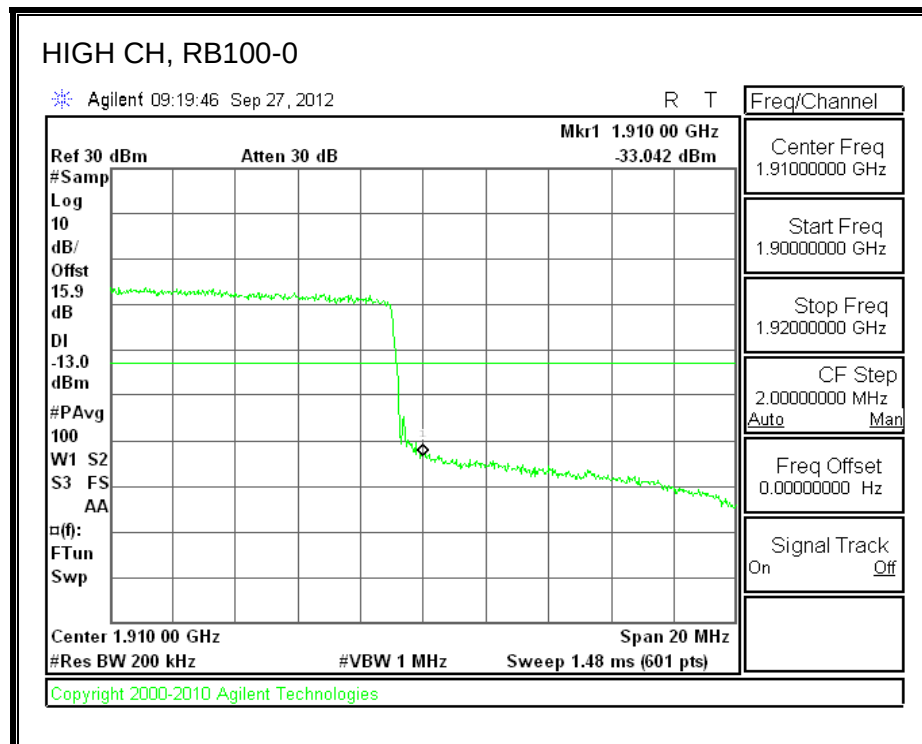
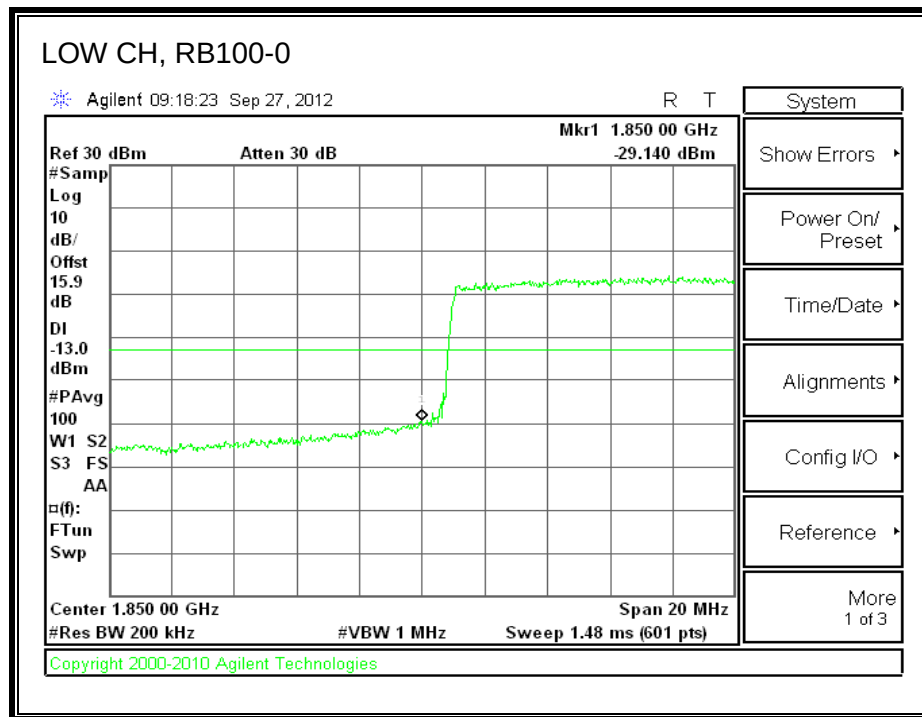




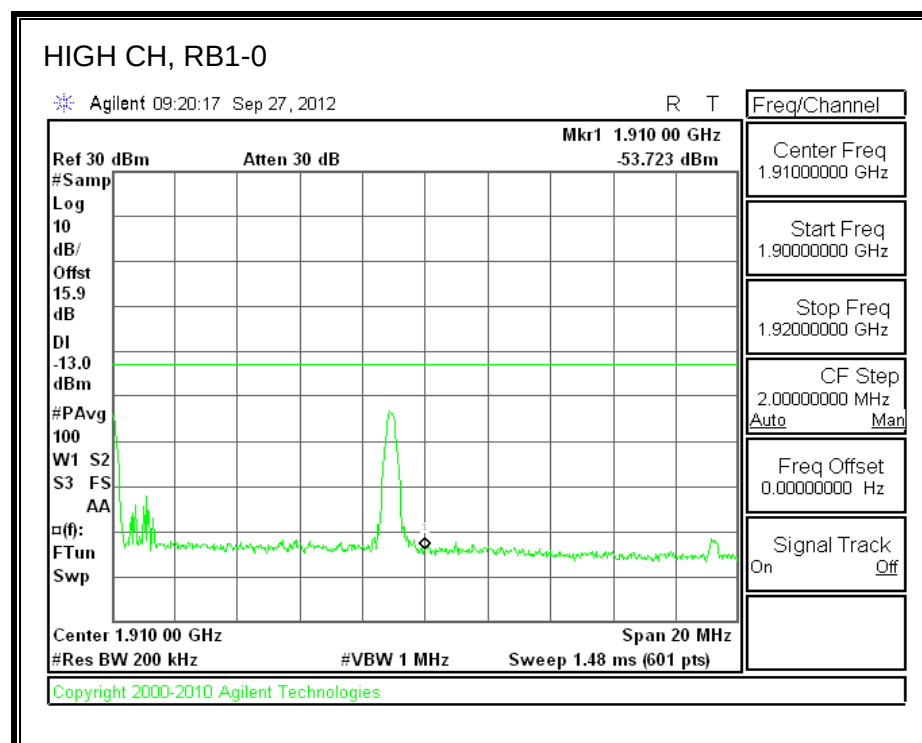
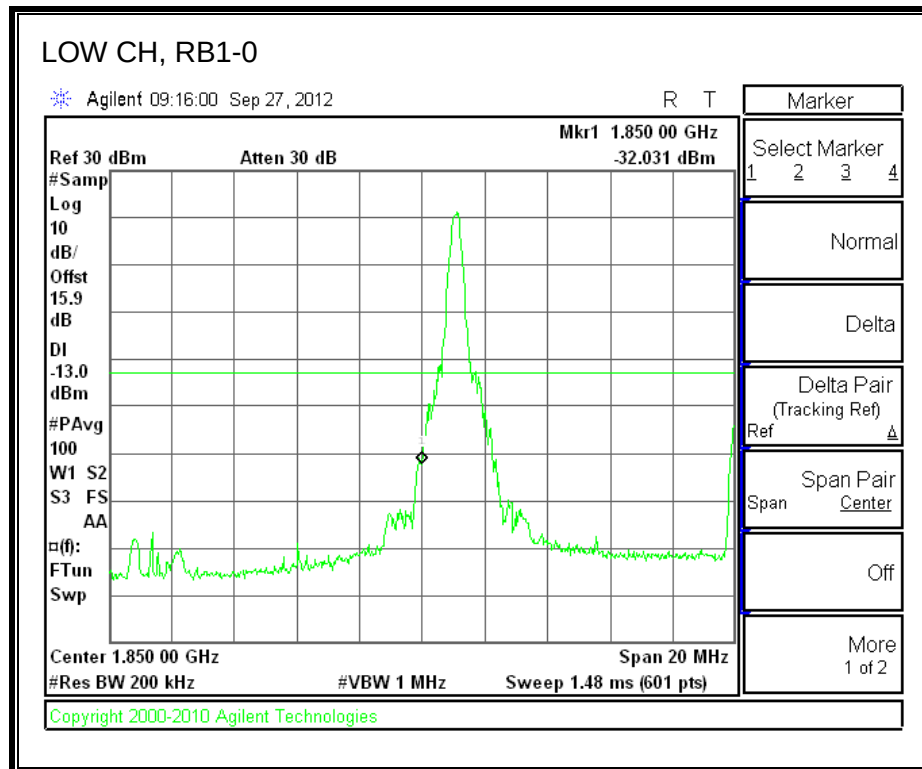
**QPSK Band 2 (20 MHz BANDWIDTH)**

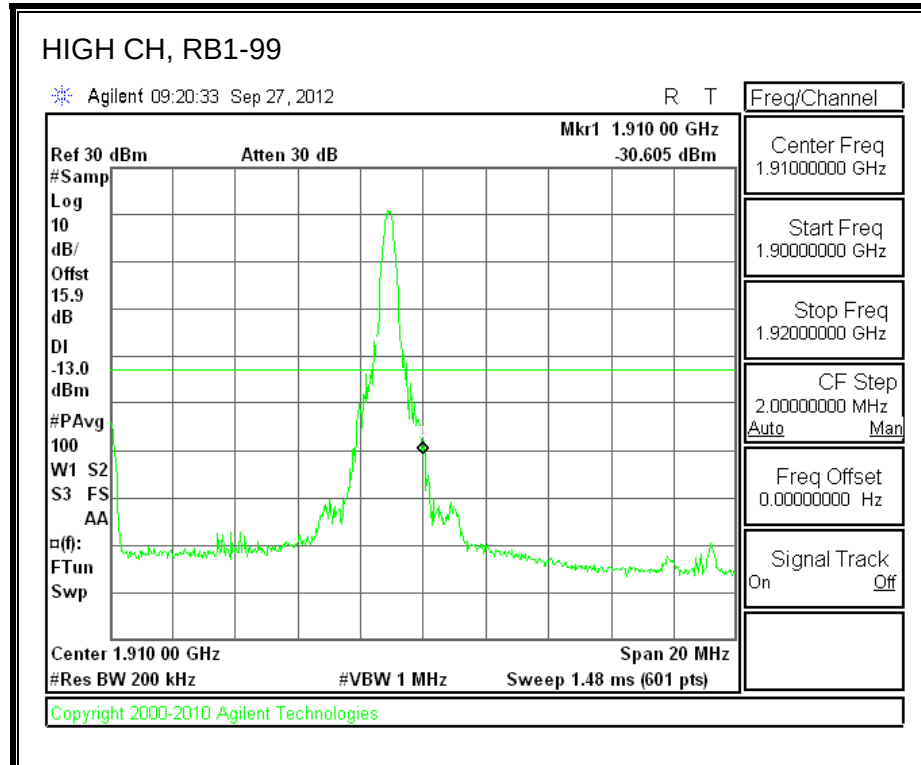
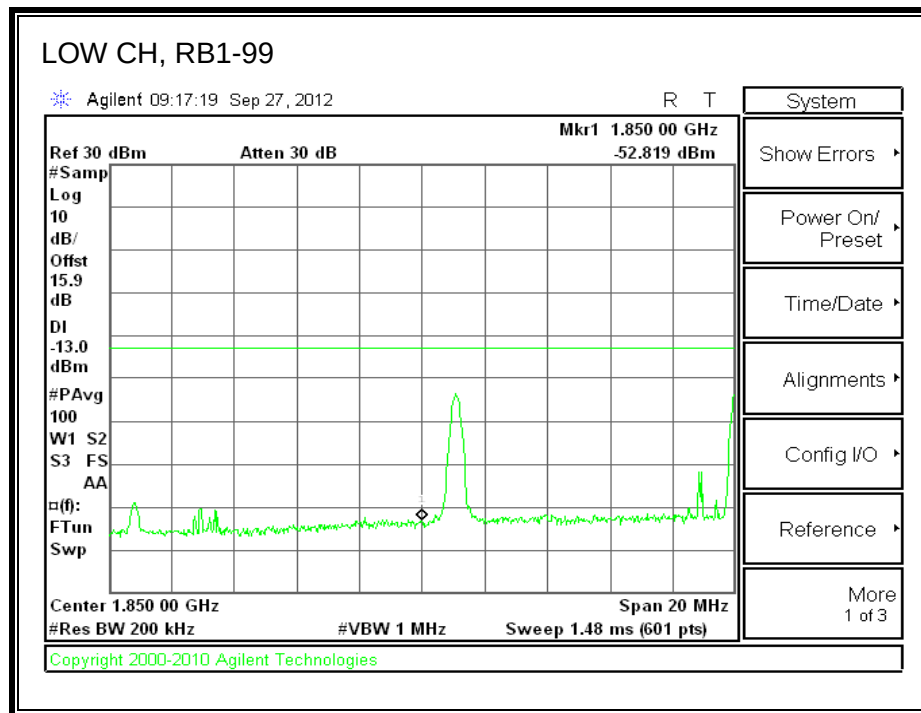




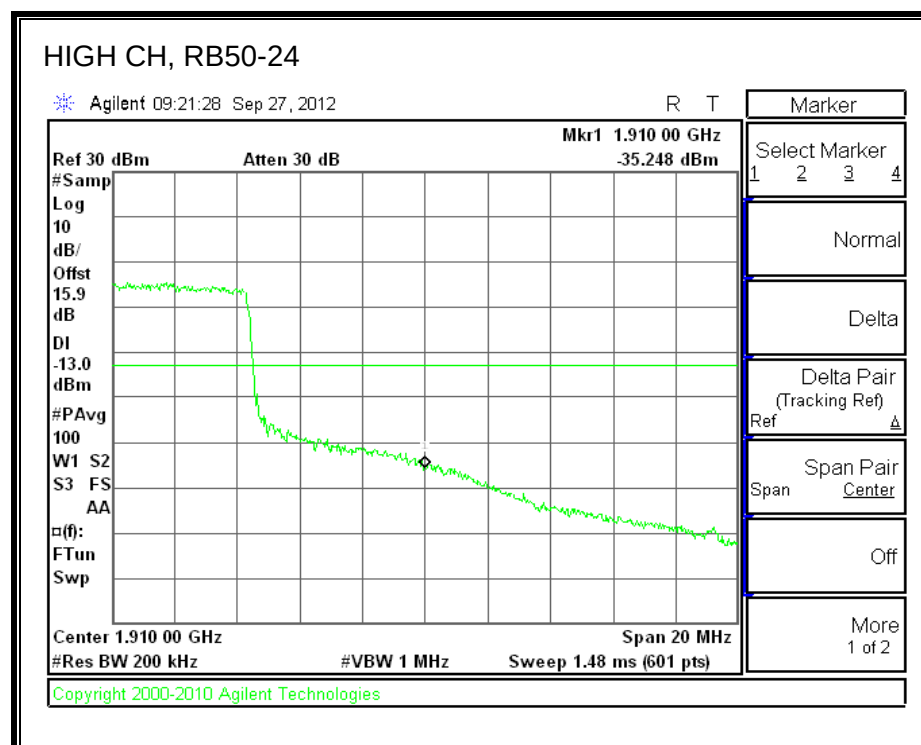
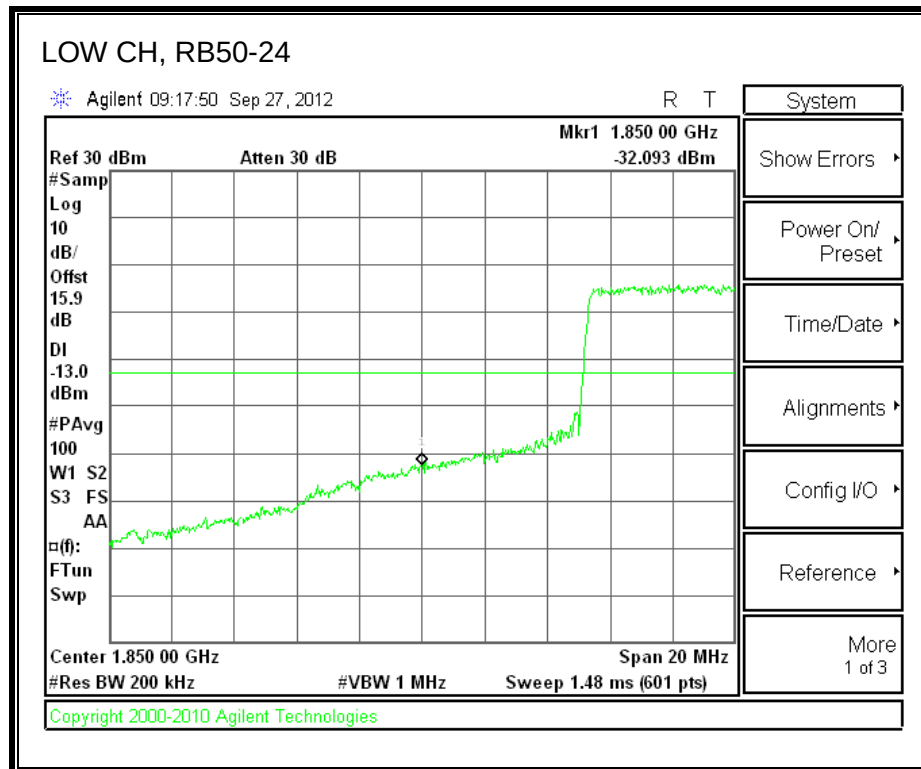


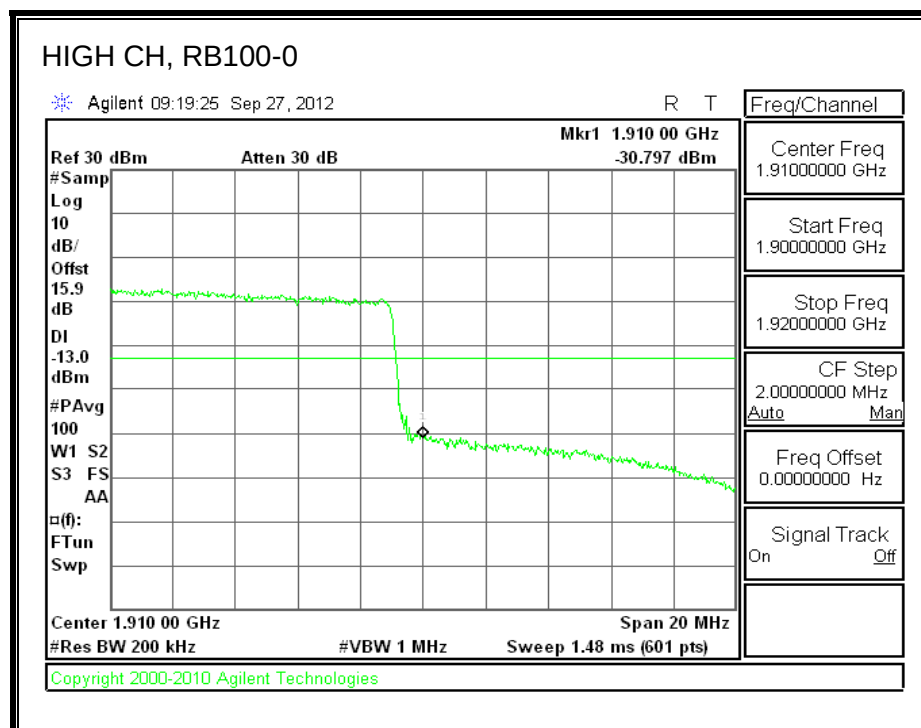
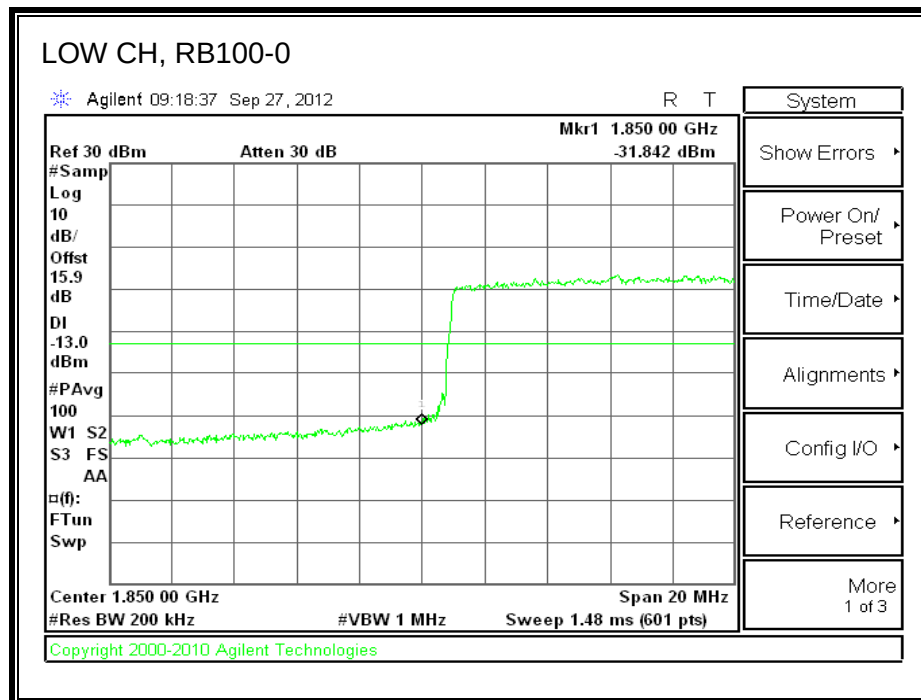
**16QAM Band 2 (20 MHz BANDWIDTH)**





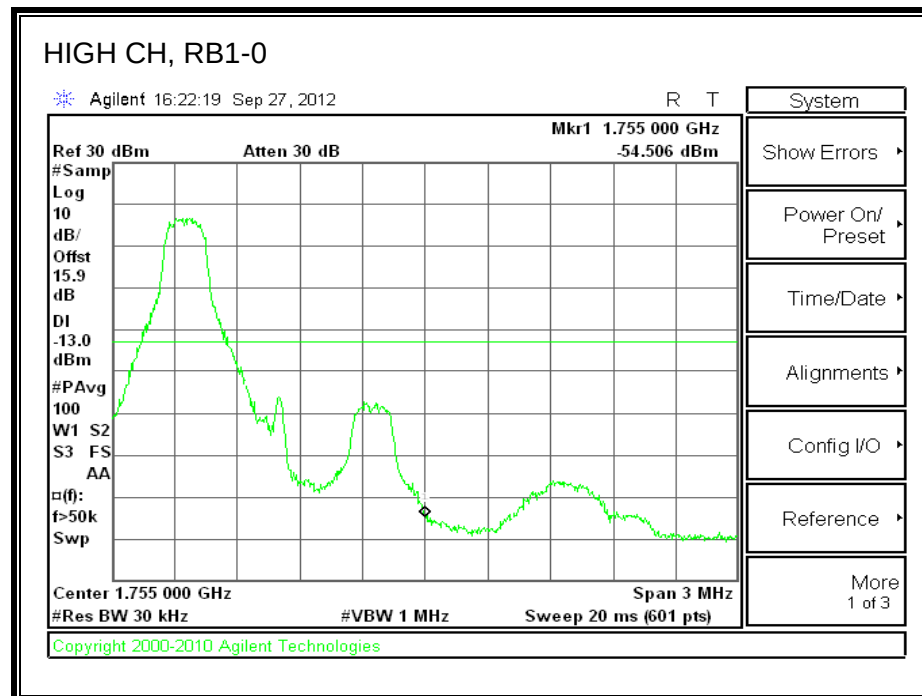
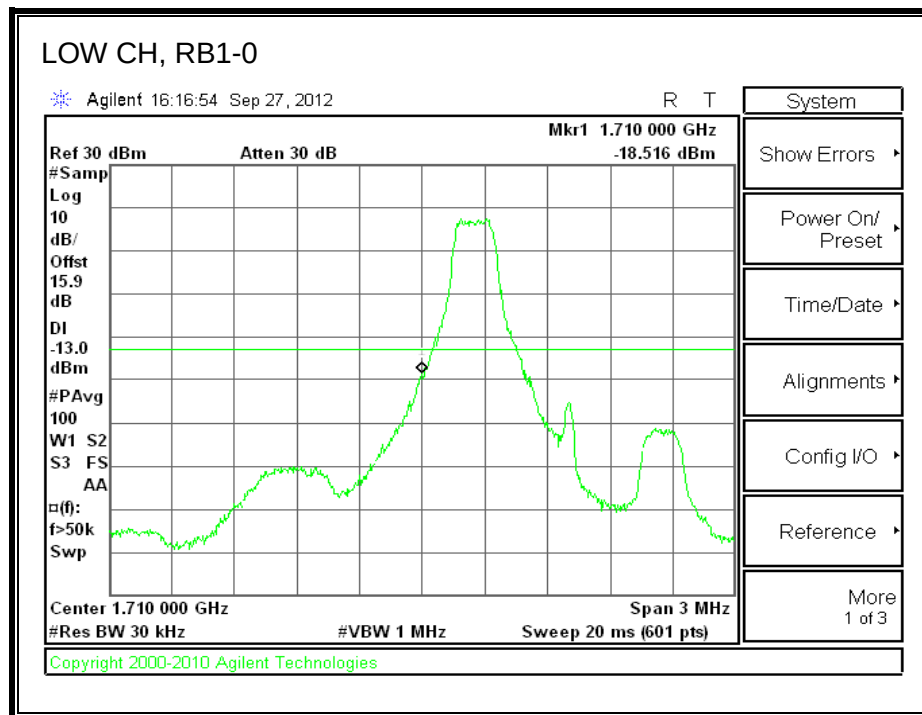


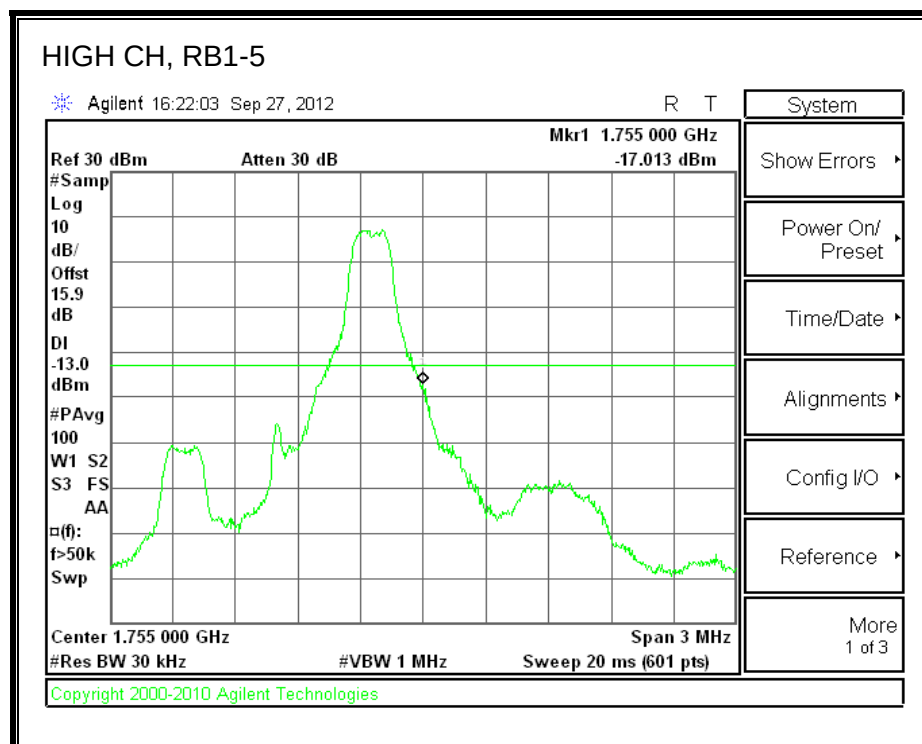
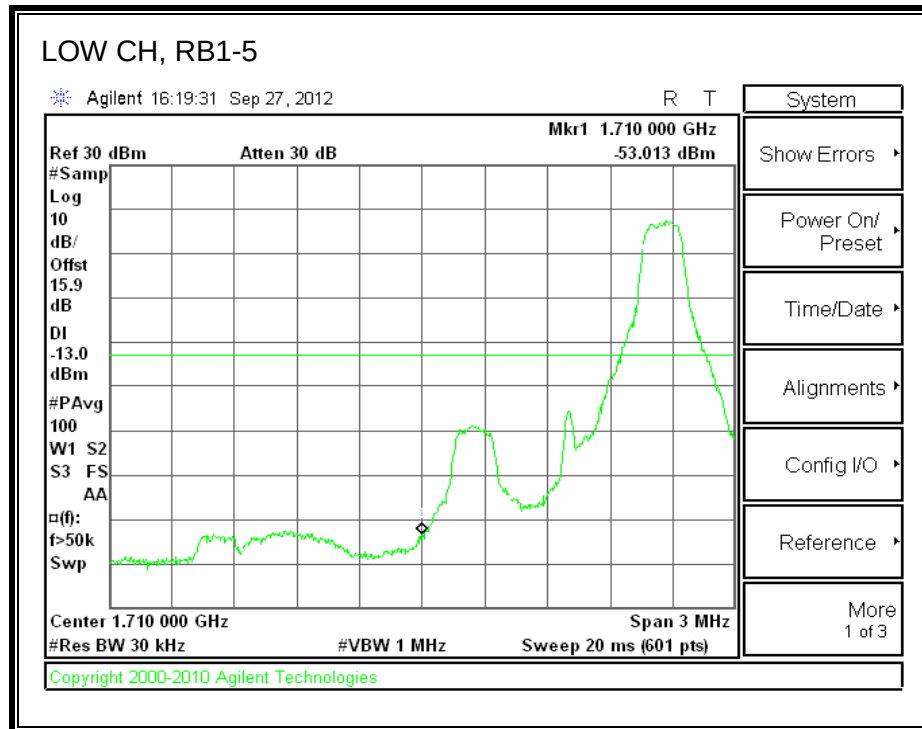


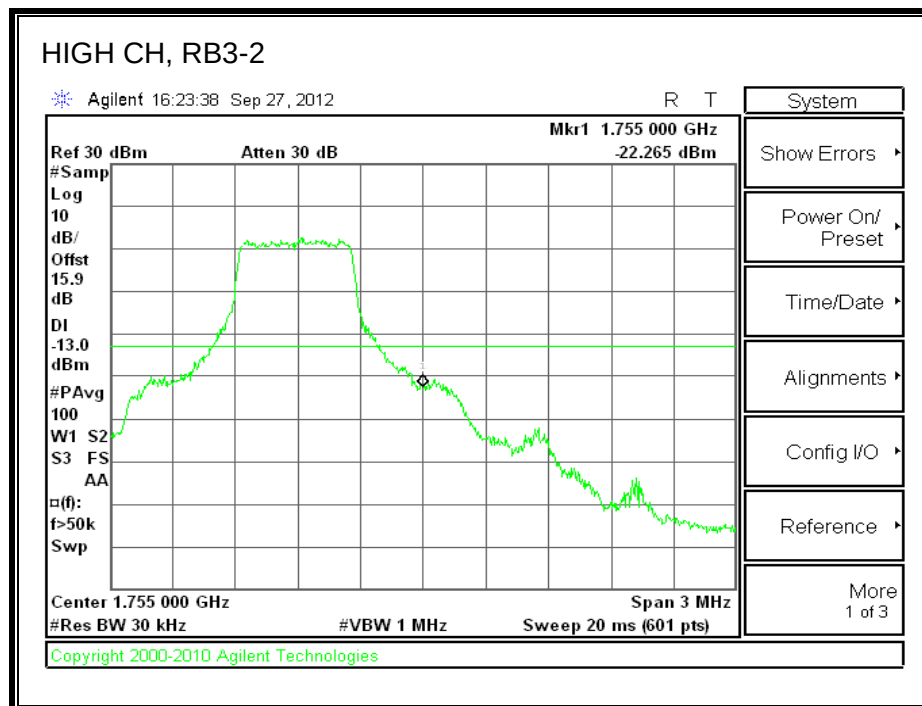
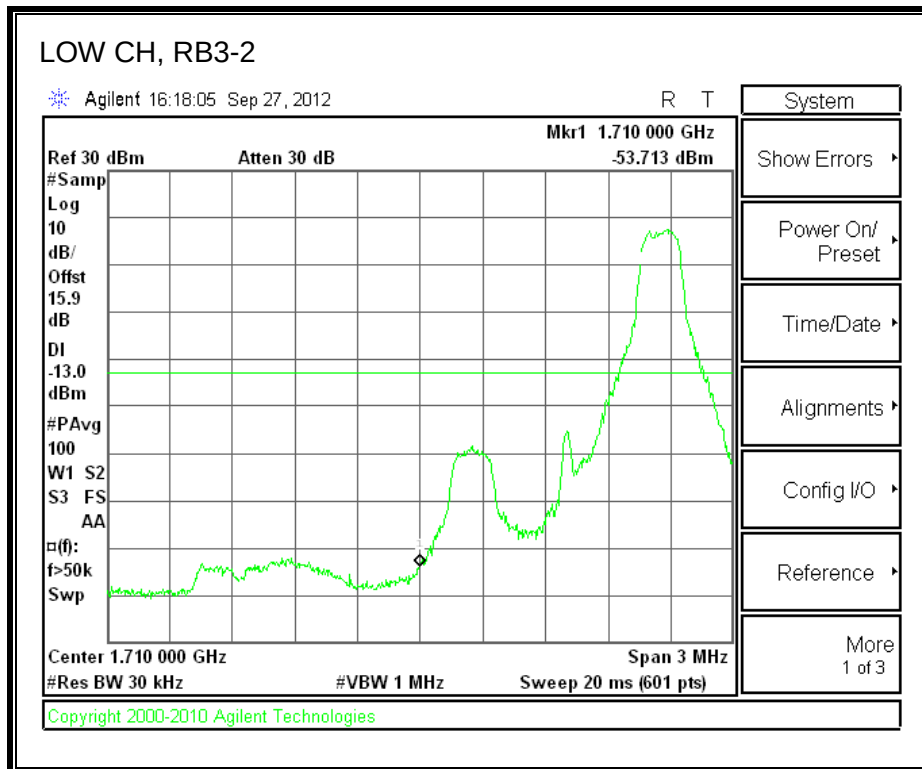


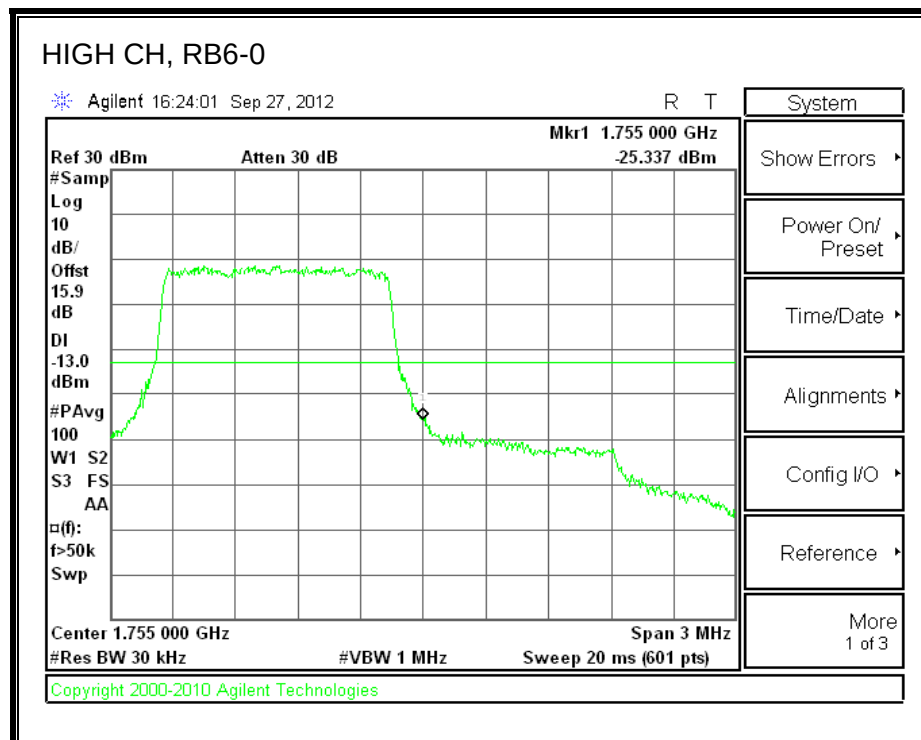
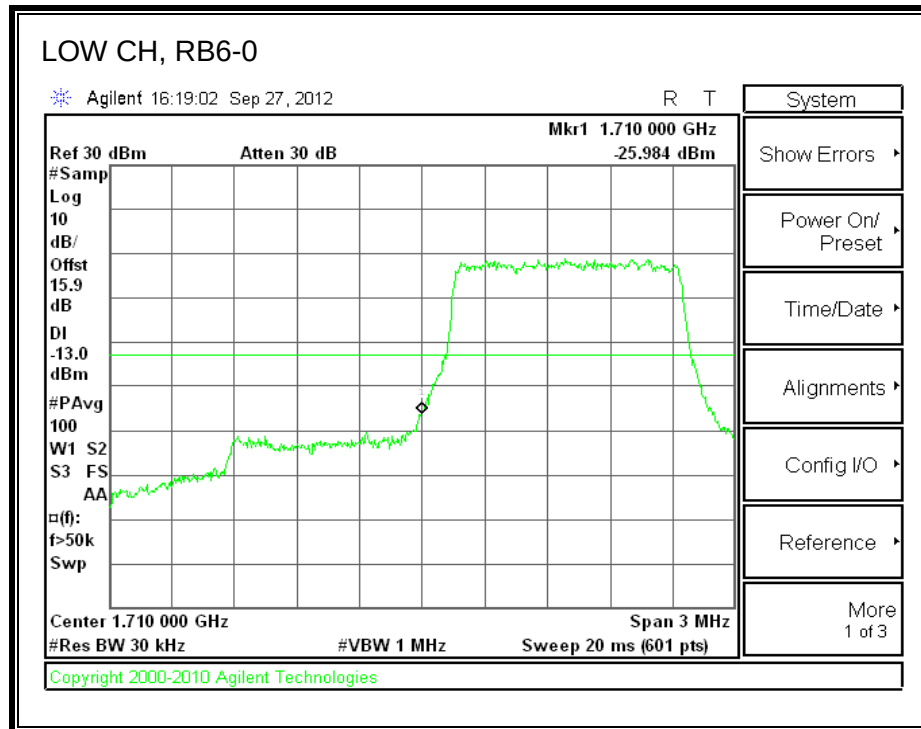
## 8.2.2. LTE BAND 4

### QPSK Band 4 (1.4 MHz BANDWIDTH)

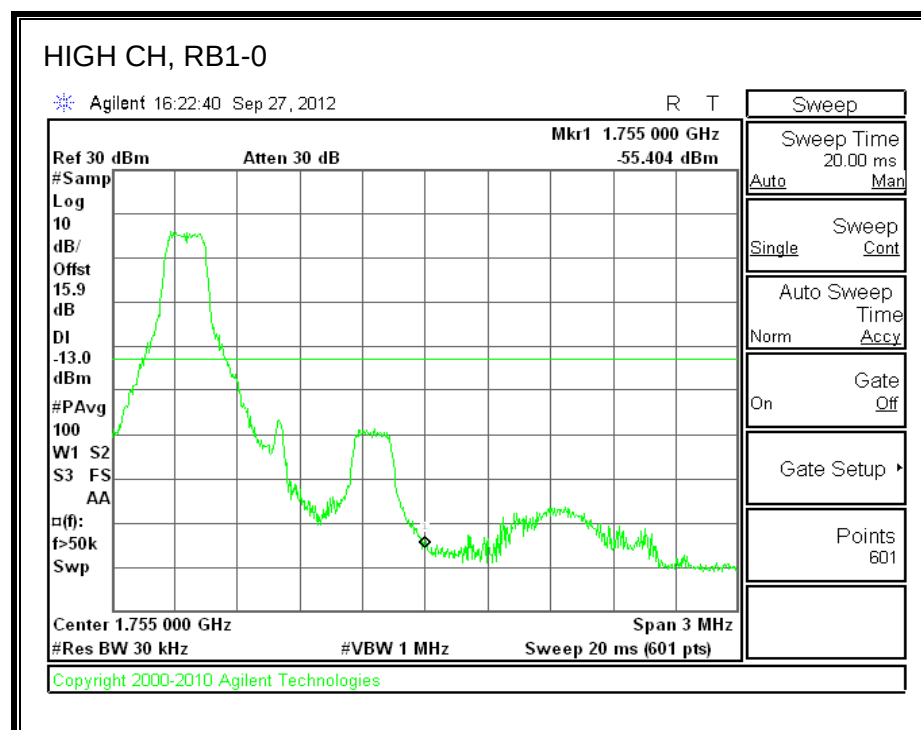
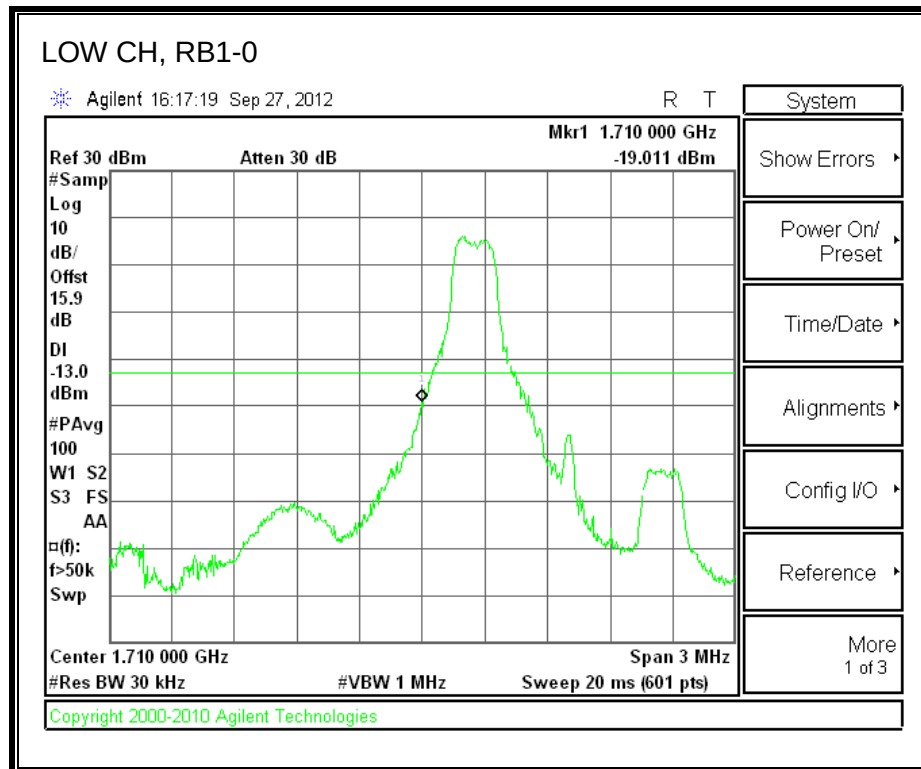


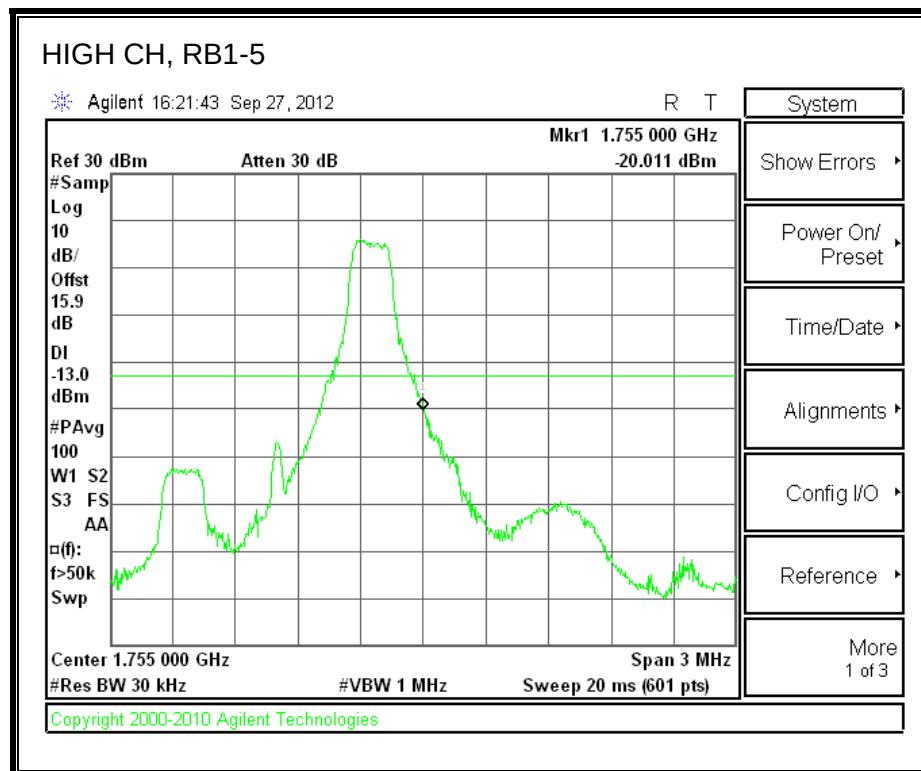
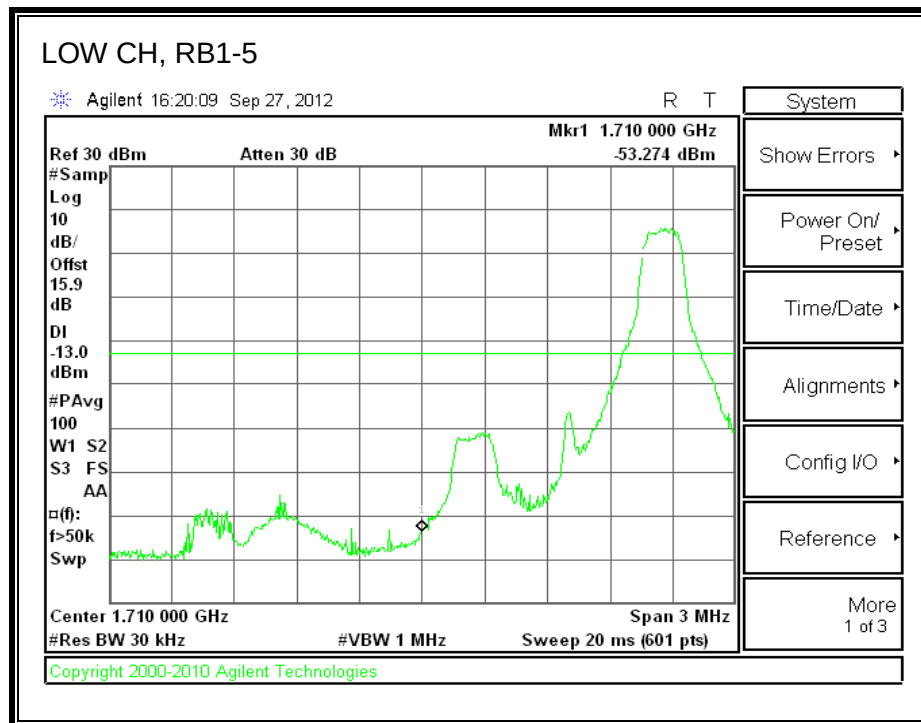




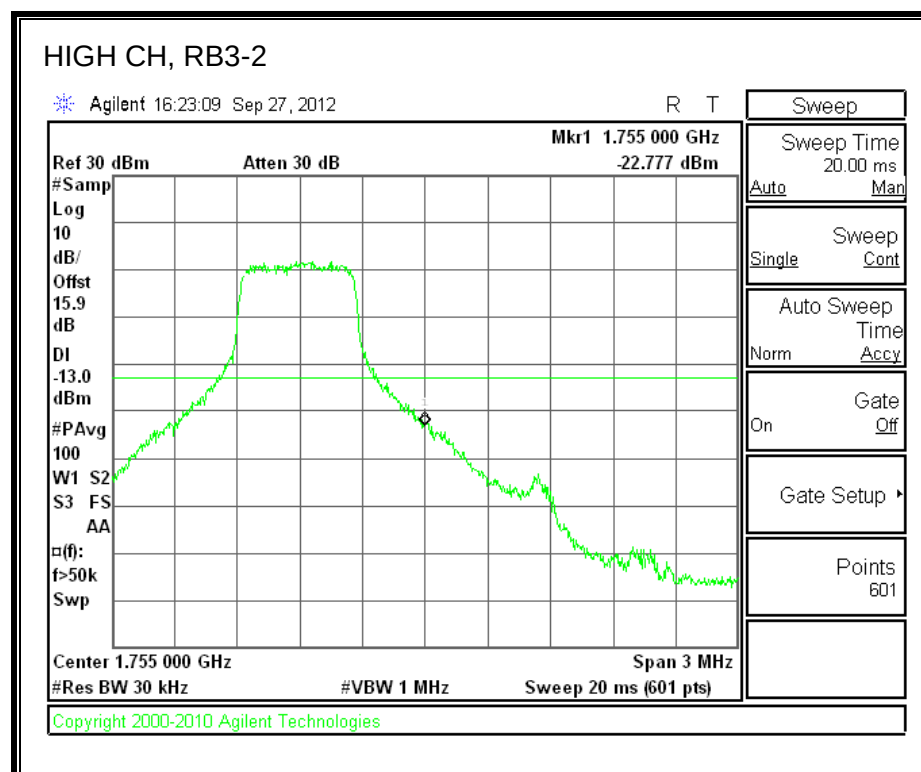
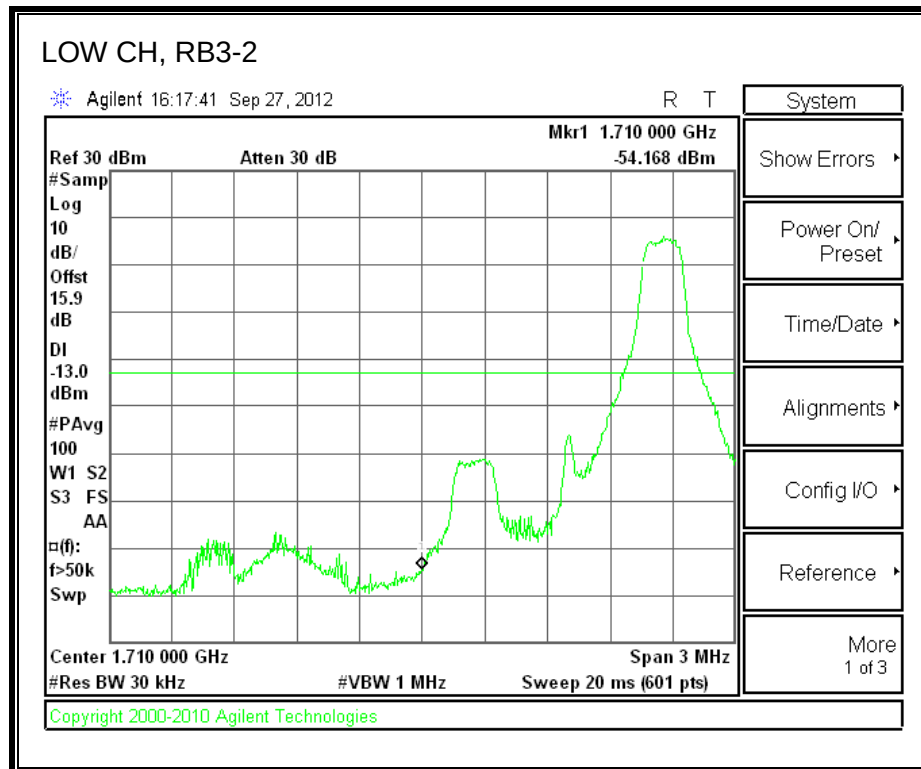


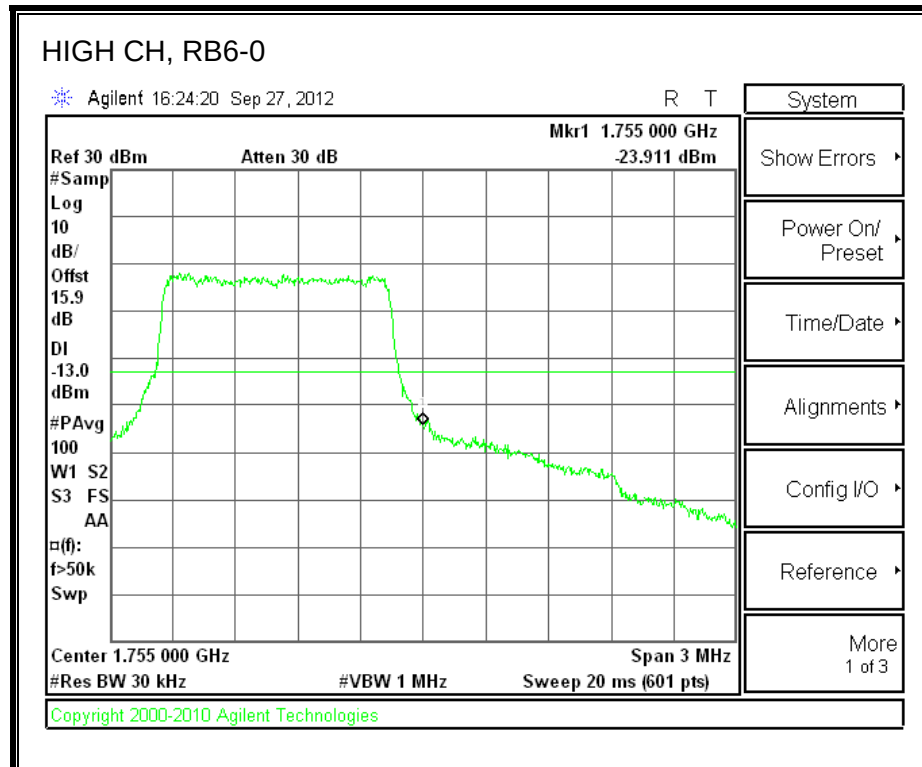
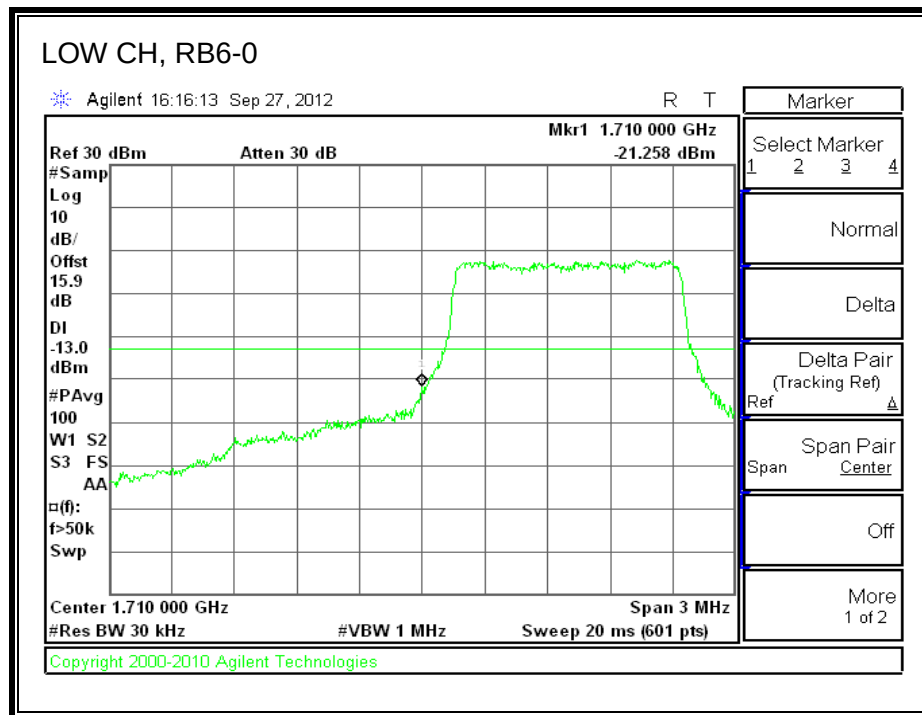
**16QAM Band 4 (1.4 MHz BANDWIDTH)**



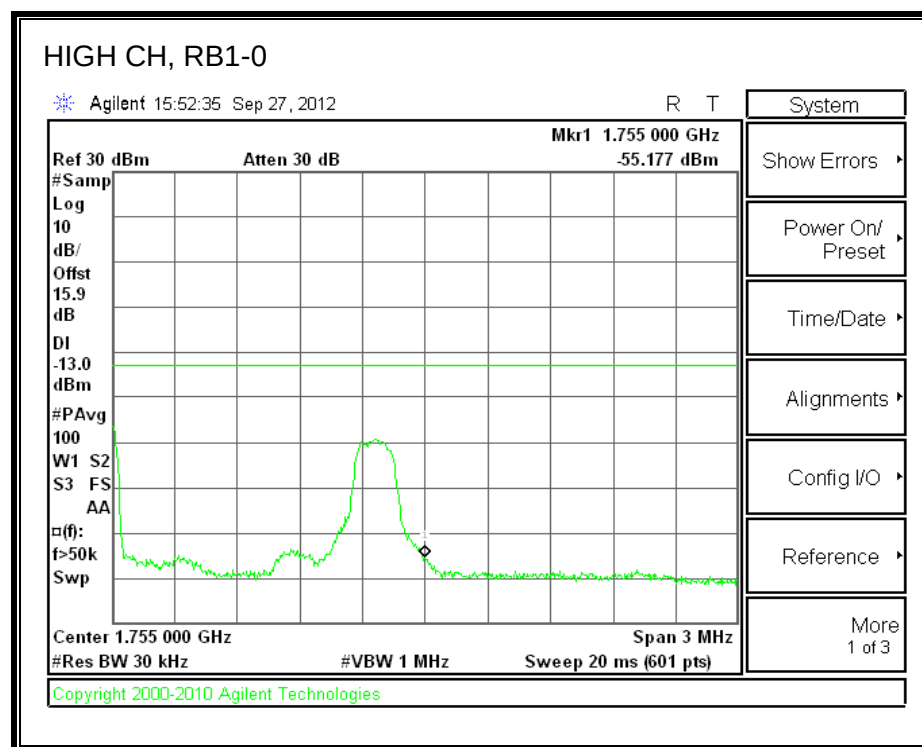
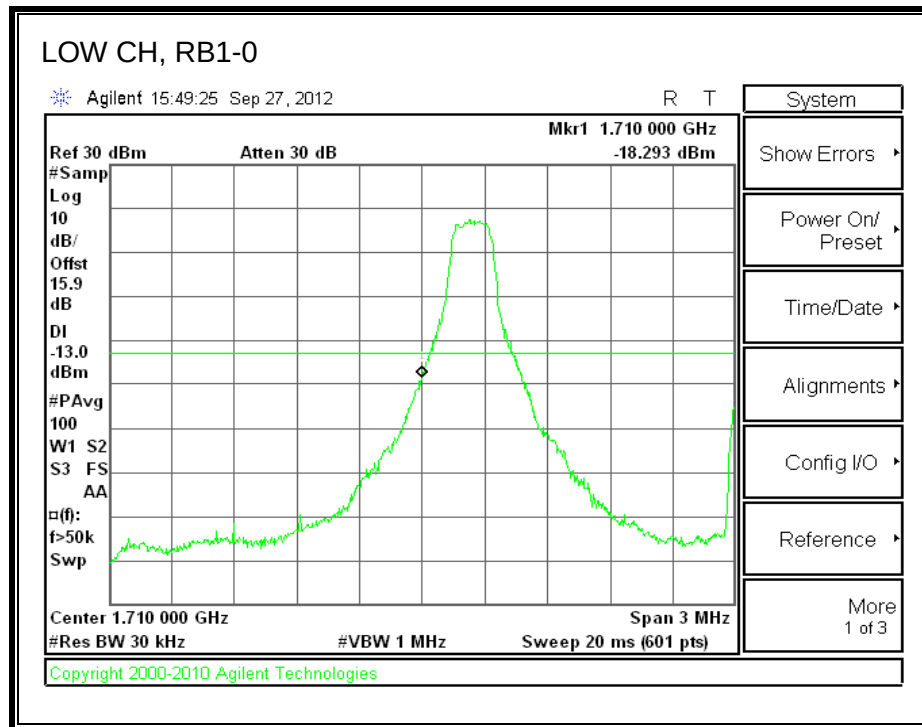


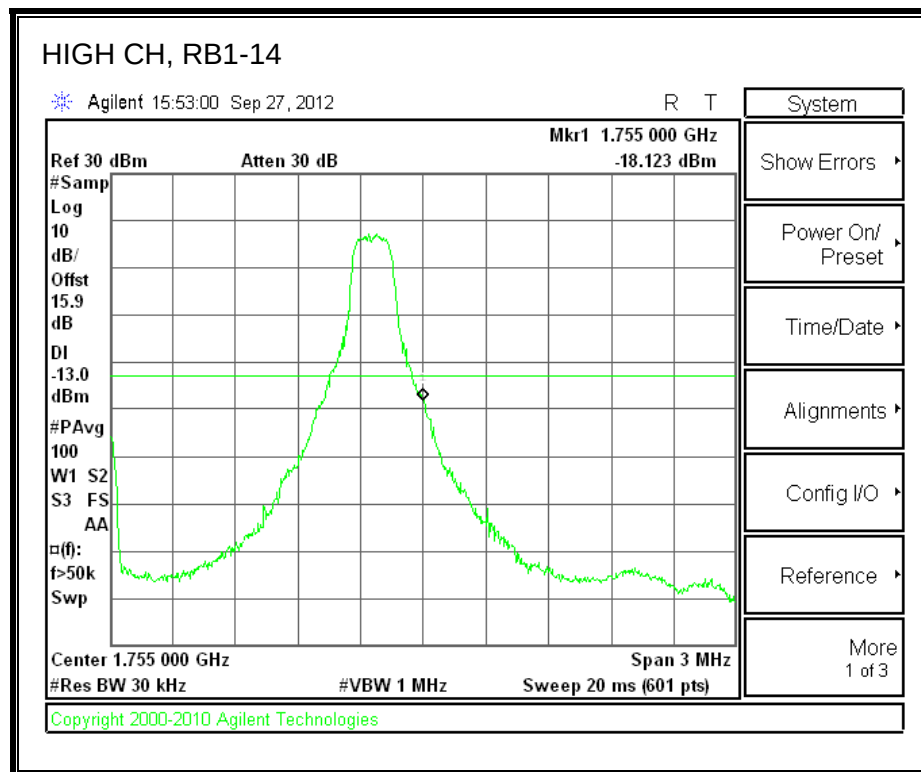
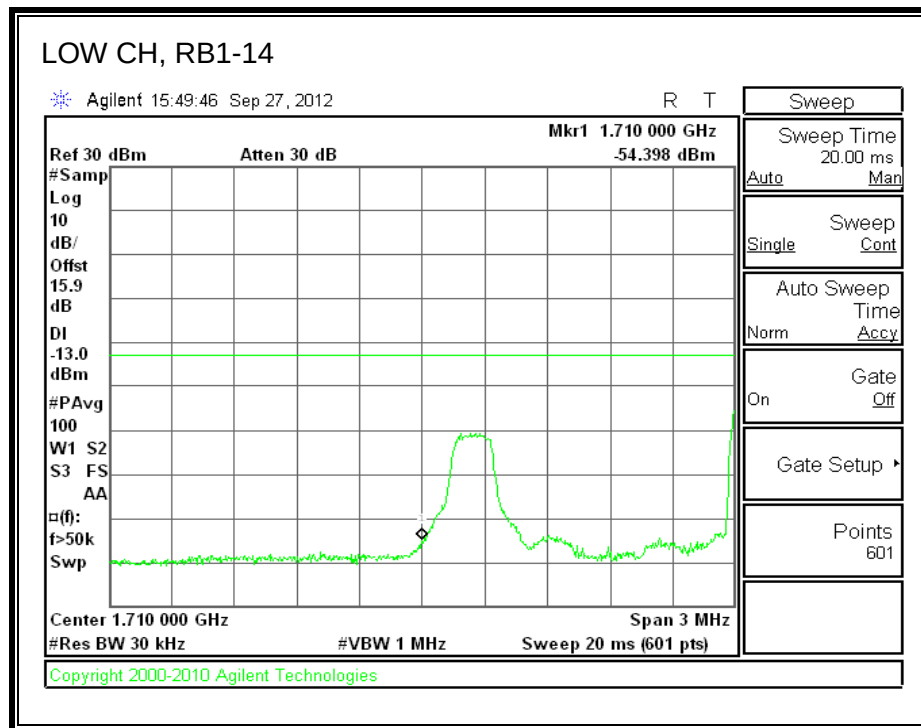


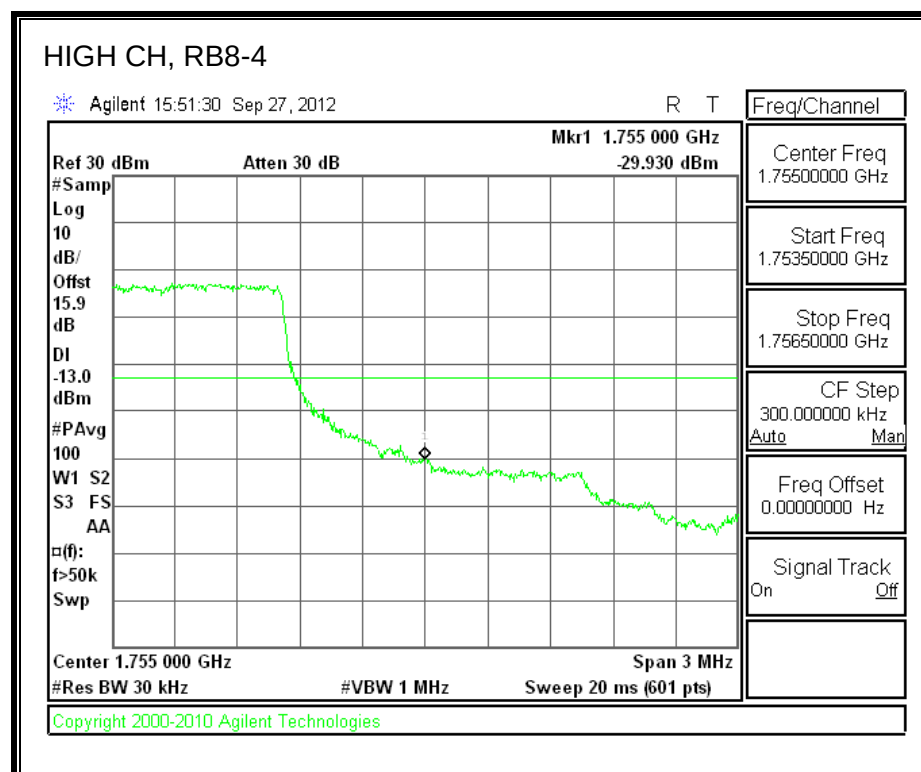
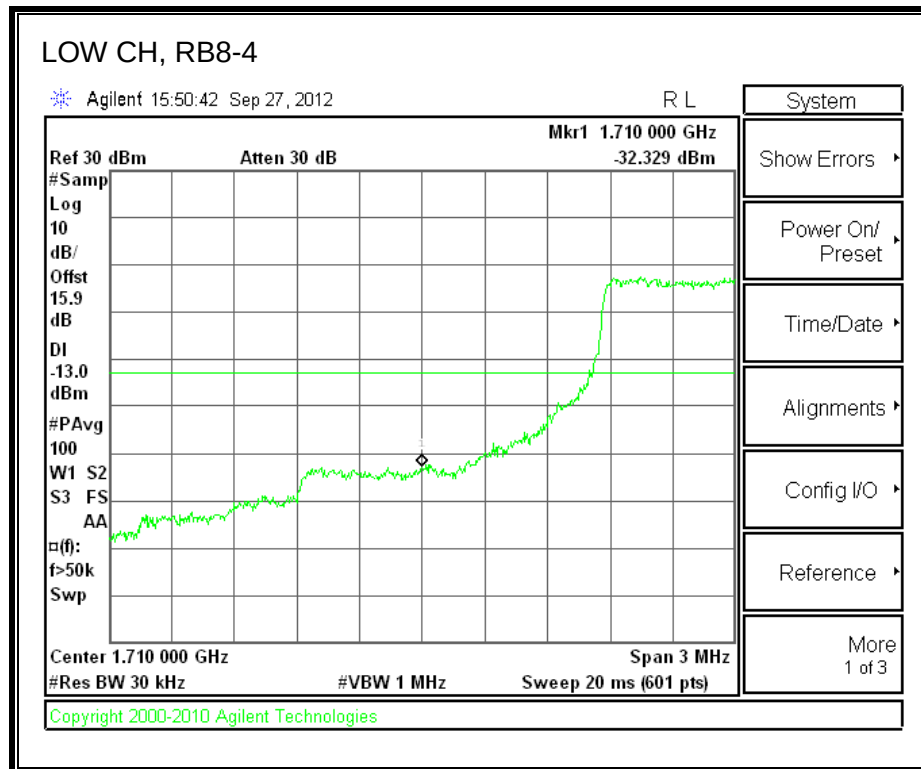


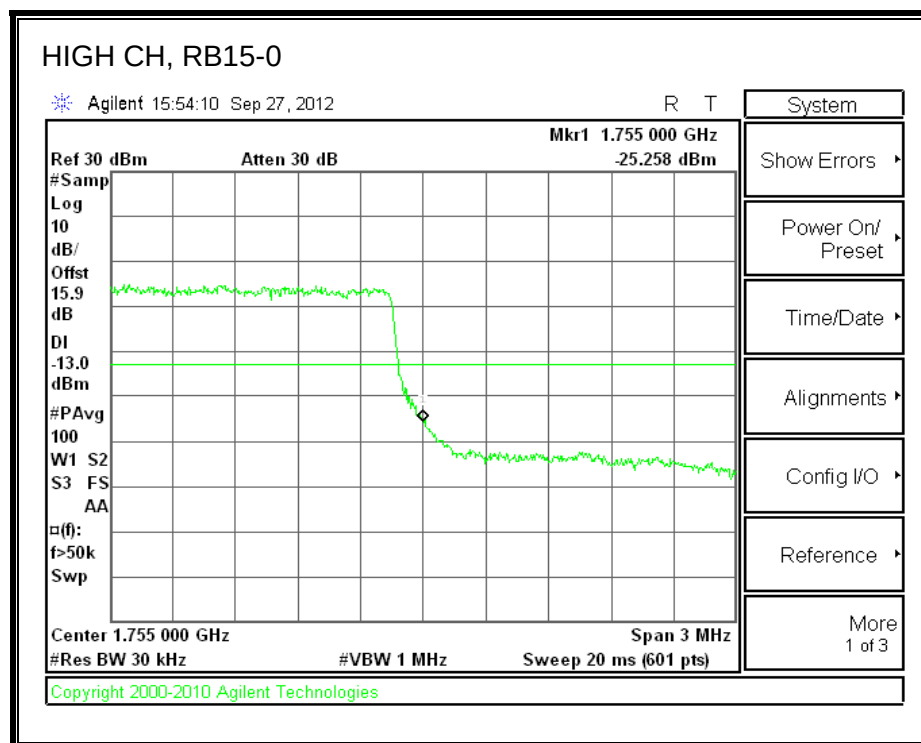
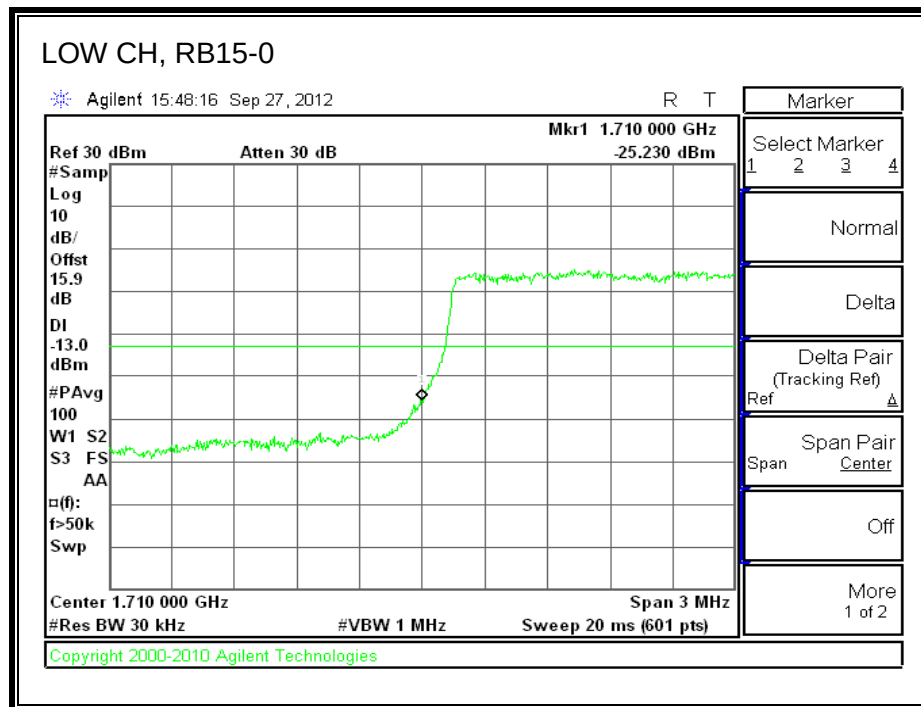


**QPSK Band 4 (3 MHz BANDWIDTH)**









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

