# FCC CFR47 PART 27L
# CLASS II PERMISSIVE CHANGE
# CERTIFICATION TEST REPORT

**FOR**

**CELLULAR/PCS GSM/GPRS/EDGE/CDMA/EDO/WCDMA/HSPA AND 700MHZ LTE WIRELESS MODULE**

**MODEL NUMBER: MC7750**

**FCC ID: N7NMC7750, N7NMC7750-L**

**REPORT NUMBER: 11U14140-2**

**ISSUE DATE: MARCH 26, 2012**

*Prepared for*

**SIERRA WIRELESS INC.**
**2290 COSMOS CT**
**CARLSBAD, CA 92010, U.S.A.**

*Prepared by*

**COMPLIANCE CERTIFICATION SERVICES (UL CCS)**
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NVLAP LAB CODE 200065-0

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| --- | 03/26/12 | Initial Issue | T. Chan |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SIERRA WIRELESS INC.
2290 COSMOS CT
CARLSBAD, CA 92010, U.S.A

**EUT DESCRIPTION:** CELLULAR/PCS GSM/GPRS/EDGE/CDMA/EDO/WCDMA/HSPA AND 700MHZ LTE WIRELESS MODULE

**MODEL:** MC7750

**SERIAL NUMBER**: 431

**DATE TESTED:** MARCH 9 TO 13, 2012, and MARCH 23, 2012

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| FCC PART 27L | Pass |

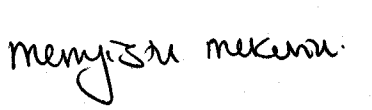
Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties 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:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:



MENGISTU MEKURIA
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, and FCC CFR 47 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 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 EUT is a Cellular/PCS GSM/GPRS/EDGE/CDMA/EDO/WCDMA/HSPA AND 700MHZ LTE WIRELESS MODULE that is manufactured by Sierra Wireless Inc.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum average conducted output powers as follows:

| Part 27 LTE Band 13 MODE (5MHz BANDWIDTH) | | | |
|---|---|---|---|
| Frequency range (MHz) | Modulation | Conducted Average Power | |
| | | dBm | mW |
| 779.5 | QPSK | 23.39 | 218.3 |
| 784.5 | | 23.73 | 236.0 |
| 779.5 | 16QAM | 23.21 | 209.4 |
| 784.5 | | 23.52 | 224.9 |

| Part 27 LTE Band 13 MODE (10MHz BANDWIDTH) | | | |
|---|---|---|---|
| Frequency range (MHz) | Modulation | Conducted Average Power | |
| | | dBm | mW |
| 782 | QPSK | 22.97 | 198.2 |
| 782 | 16QAM | 22.67 | 184.9 |

## 5.3. CLASS II PERMISSIVE CHANGE DESCRIPTION

The major change filed under this application is the PCB change for the diversity receiver circuitry.

## 5.4. SOFTWARE AND FIRMWARE

The EUT made a radio link with R&S CMW500 communication test set during the test.

## 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:
- LTE Band 13

For the fundamental investigation, since the EUT has multi-directional diversity antennas; therefore X and Z orientations have been investigated. And after the investigations the worst case was found to be a Z-position.

## 5.6. DESCRIPTION OF TEST SETUP

**RADIATED TESTS SUPPORT EQUIPMENT**

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** |
| Test Jig | SIERRA WIRELESS | 1201477-2.0 | MCDK2410 |
| AC Adapter | ELPAC POWER SYSTEMS | FW1805 | 32619 |

**I/O CABLES ( RF Conducted Test)**

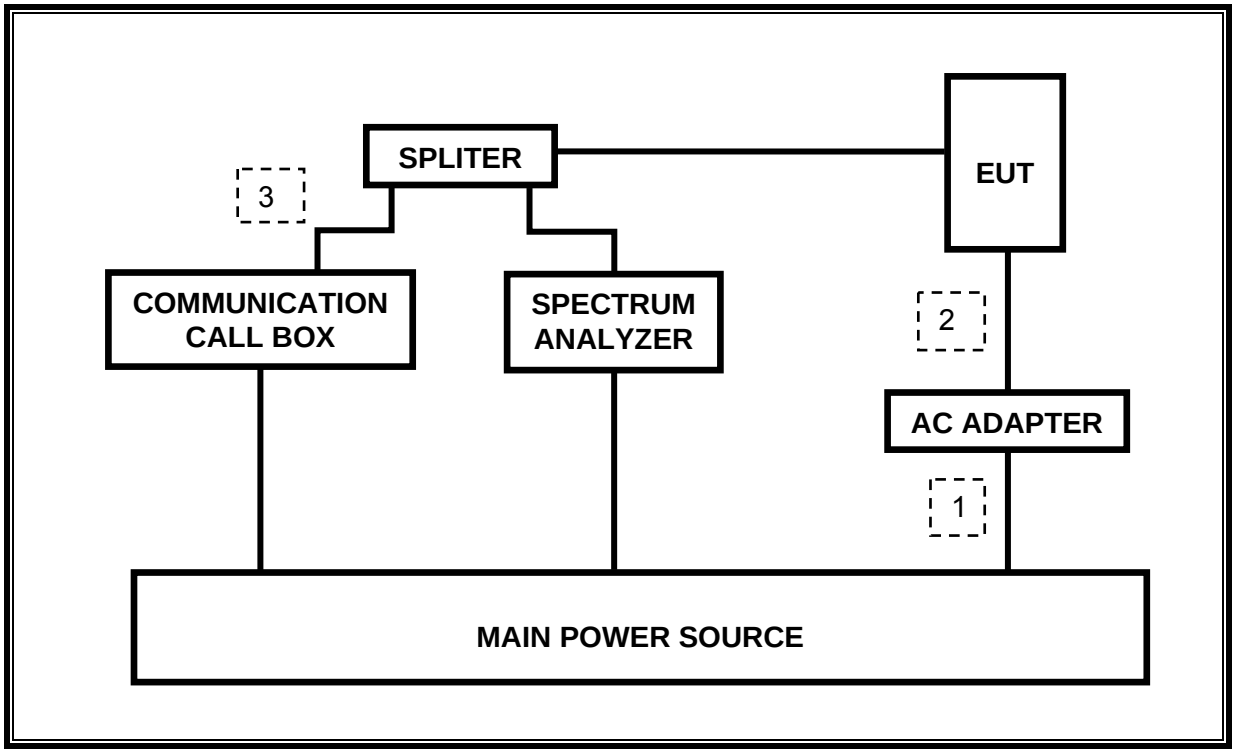
| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identic Ports** | **Connector Type** | **Cable Type** | **Cable Length** | **Remarks** |
| 1 | AC | 1 | AC | UN-SHELDED | 2.0m | N/A |
| 2 | DC | 1 | DC | UN-SHELDED | 2.0m | N/A |
| 3 | RF | 1 | SMA | SHELDED | 0.6 m | N/A |

**I/O CABLES ( RF Radiated Test)**

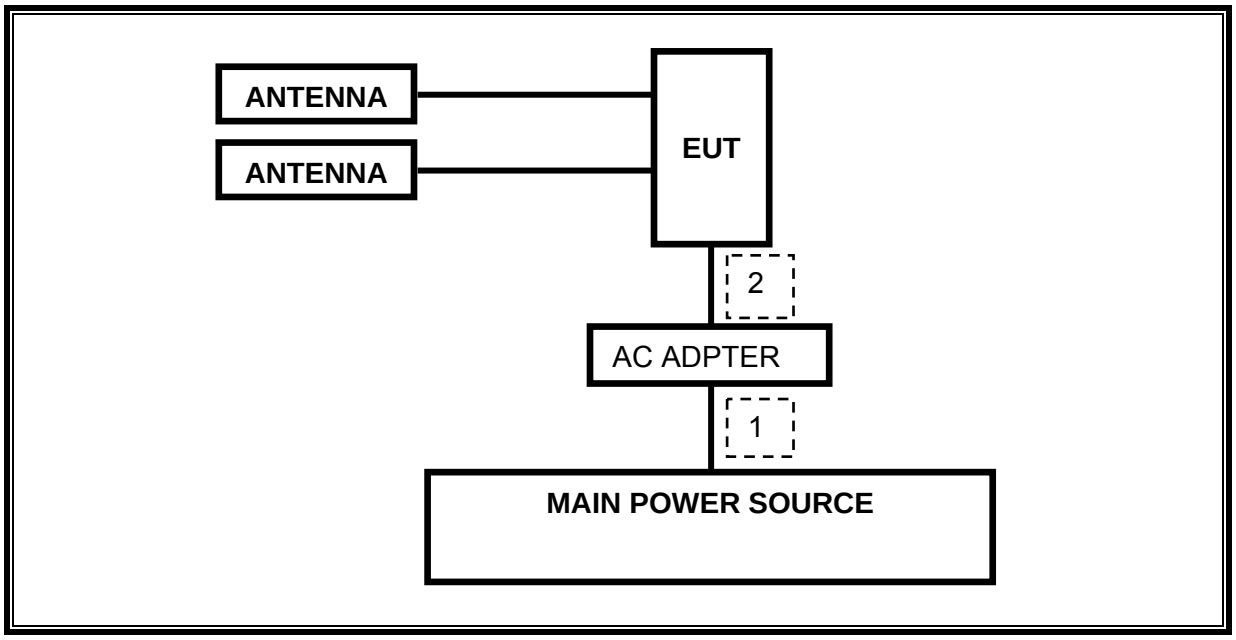
| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identic Ports** | **Connector Type** | **Cable Type** | **Cable Length** | **Remarks** |
| 1 | AC | 1 | AC | UN-SHELDED | 2.0m | N/A |
| 2 | DC | 1 | DC | UN-SHELDED | 2.0m | N/A |

**TEST SETUP**

**CONDUCTED SETUP DIAGRAM FOR TESTS**



**RADIATED SETUP DIAGRAM FOR 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, 26.5 GHz | Agilent / HP | E4440A | C01179 | 02/16/13 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01012 | 09/02/12 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00783 | 06/29/12 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00945 | 06/29/12 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01011 | 06/30/12 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00558 | 11/11/12 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01052 | 07/12/12 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01063 | 07/12/12 |
| Communication Test Set | R & S | CMU 200 | C01131 | 06/24/12 |
| Temperature / Humidity Chamber | Thermotron | SE 600-10-10 | C00930 | 04/20/12 |
| Highpass Filter, 1.5 GHz | Micro-Tronics | HPM13193 | N02689` | CNR |
| Directional Coupler, 4.2 GHz, 40 dB | A-R | DC7144A | C00983 | CNR |
| Sleeve Dipole 1730~2030 MHz | ETS | 3126-1880 | C01157 | 10/27/12 |
| Signal Generator, 20 GHz | Agilent / HP | 83732B | C00774 | 07/14/12 |
| Antenna, Tuned Dipole 400~1000 MHz | ETS | 3121C DB4 | C00993 | 07/10/12 |

# 7. CONDUCTED TEST RESULTS

## 7.1. BAND EDGE

**RULE PART(S)**

FCC: § 27.53 (c)

**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 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.

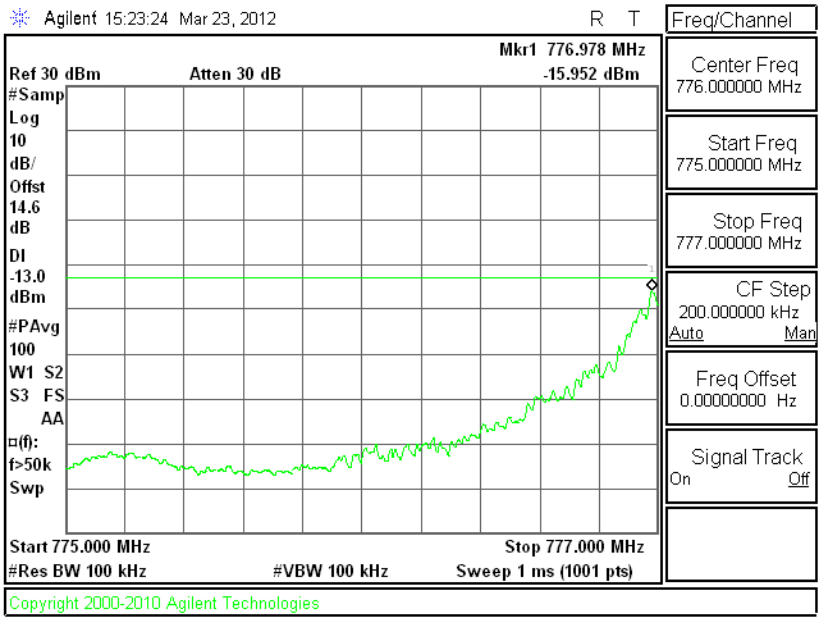
**MODES TESTED**

- LTE BAND 13

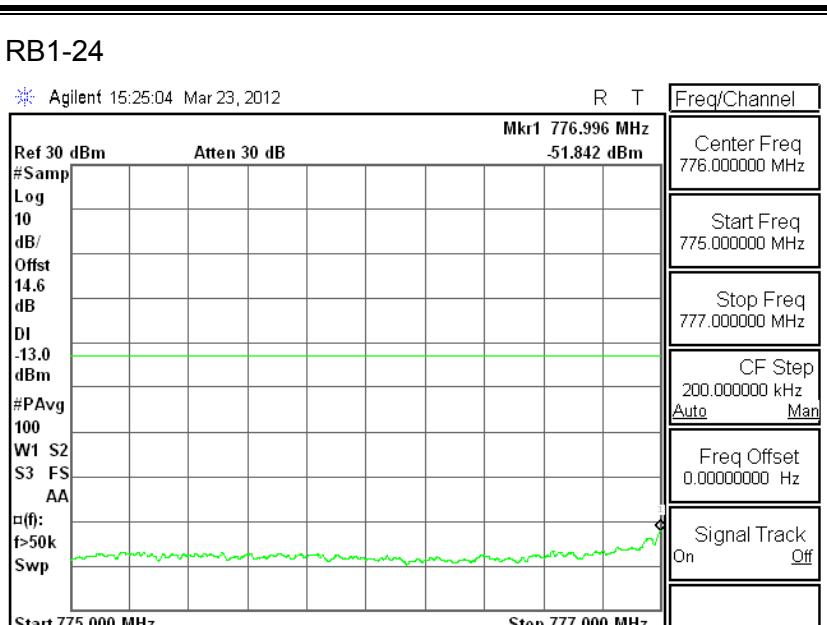
**RESULTS**

**LTE QPSK 779.5 MHz Band 13, 775 – 777MHz (5MHz Bandwidth)**

RB1-0,




RB1-24



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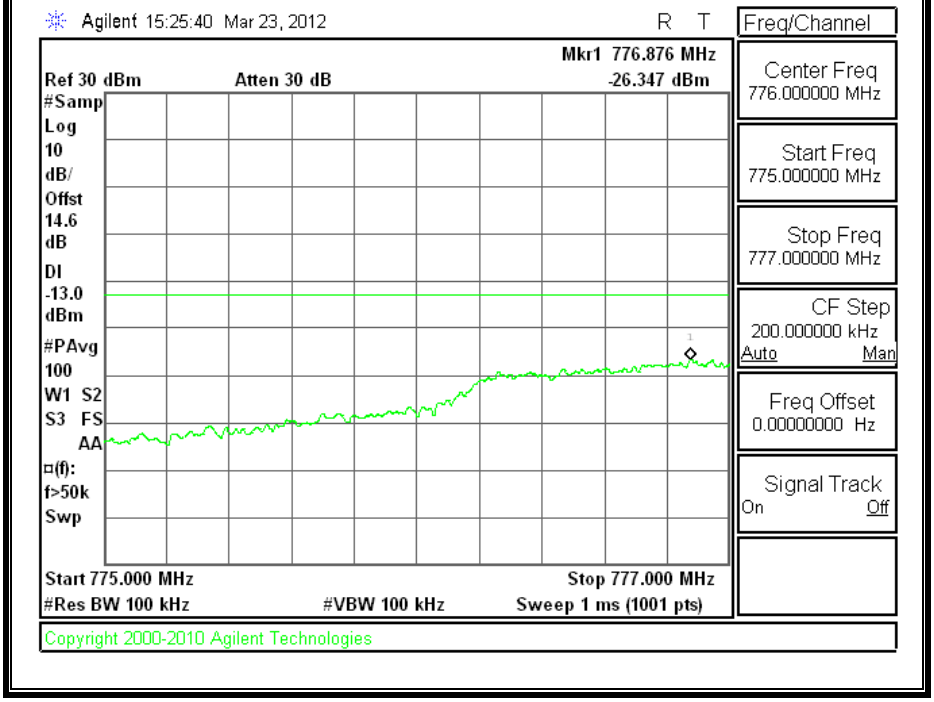


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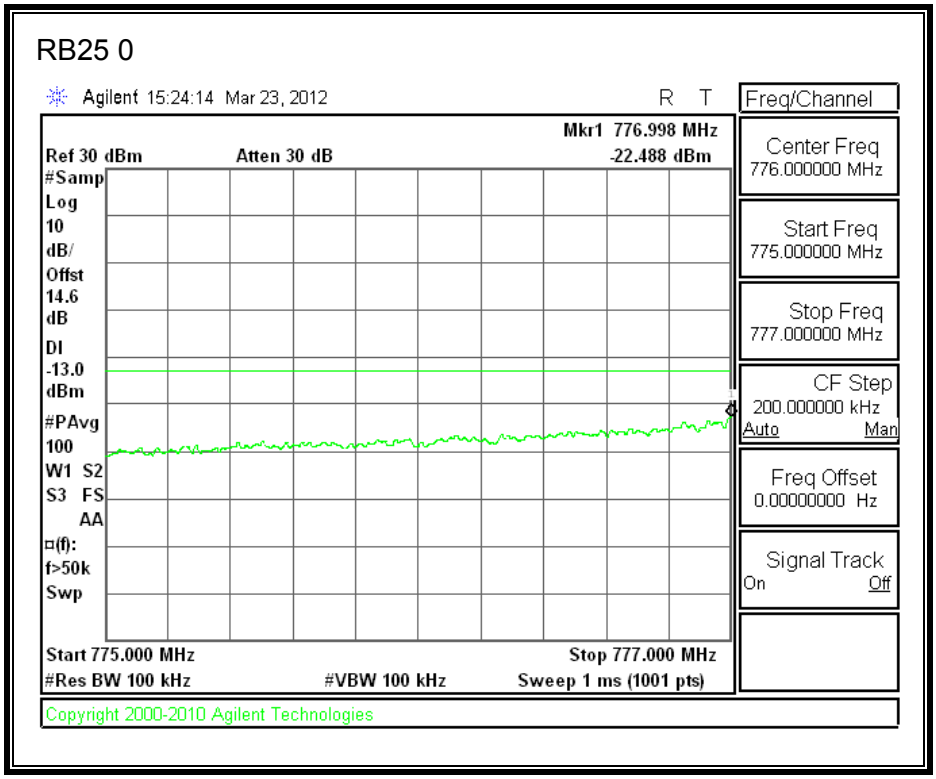
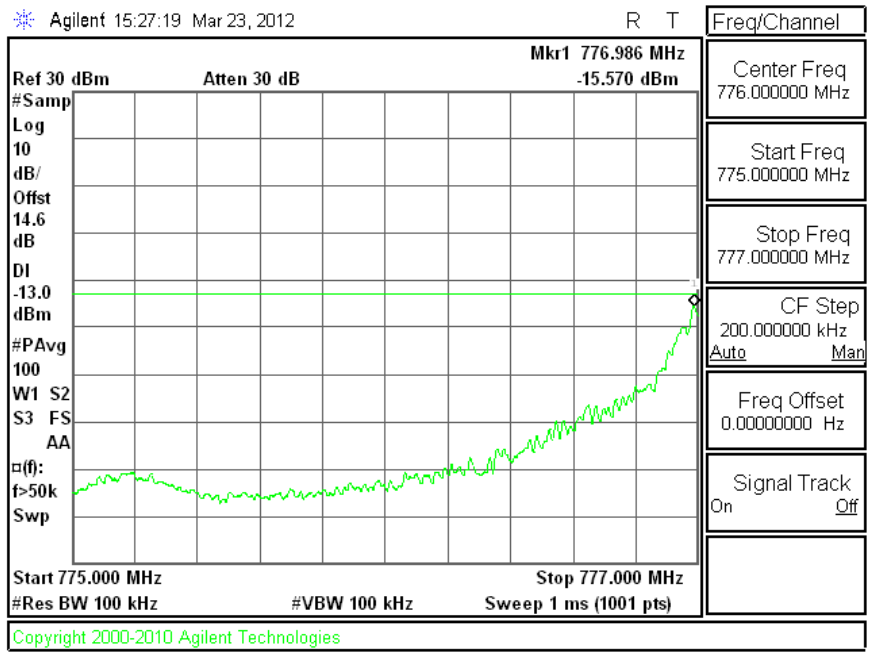


**LTE 16QAM 779.5MHz Band 13, 775 - 777MHz (5MHz Bandwidth)**

RB1-0

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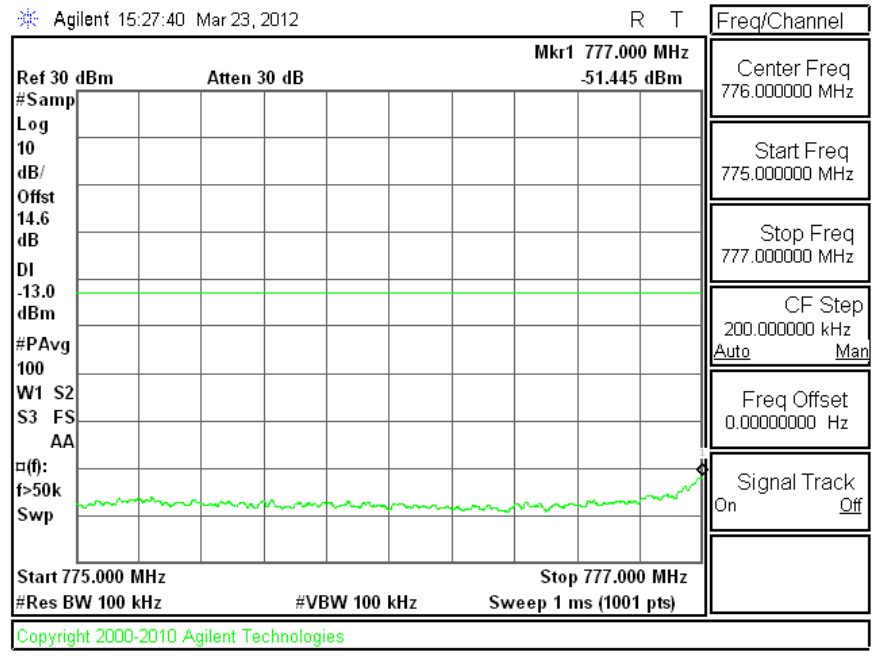

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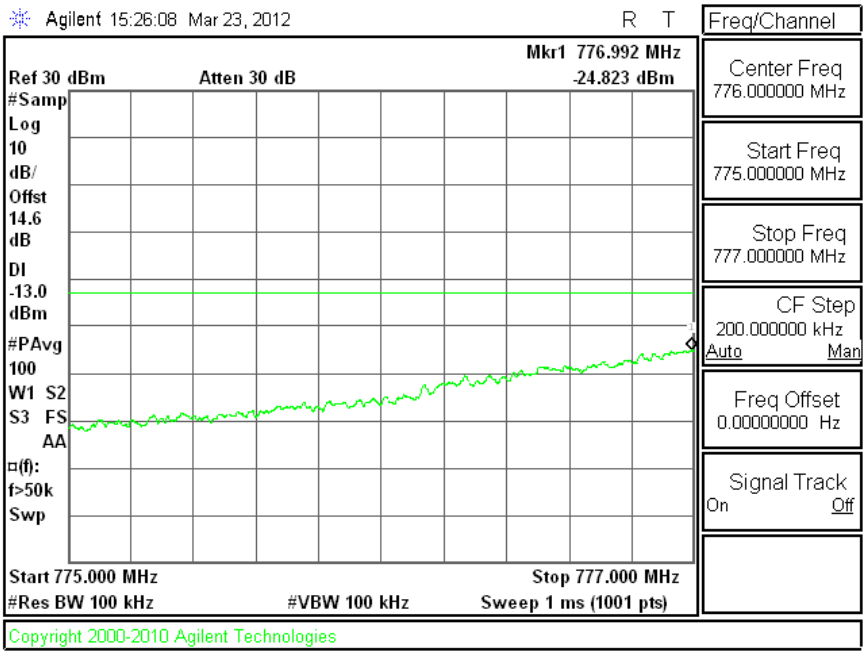


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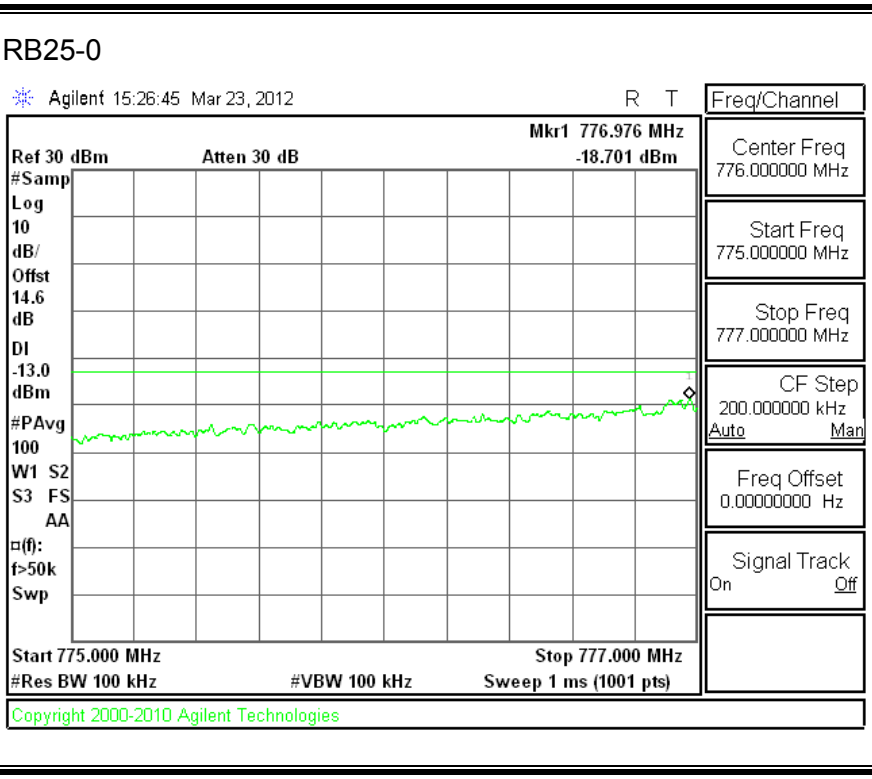

**LTE QPSK 779.5MHz Band 13, 783 - 793MHz (5MHz Bandwidth)**

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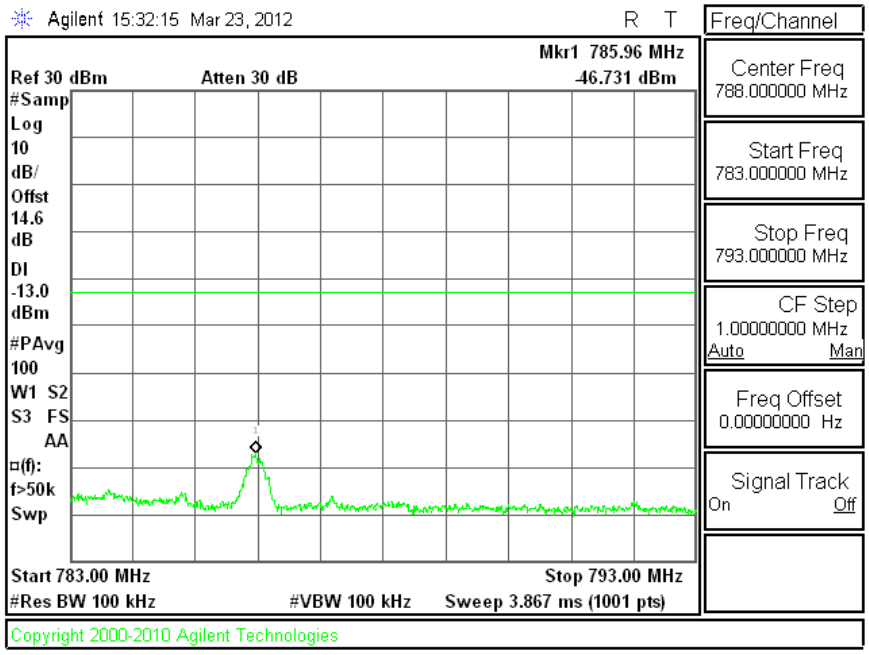


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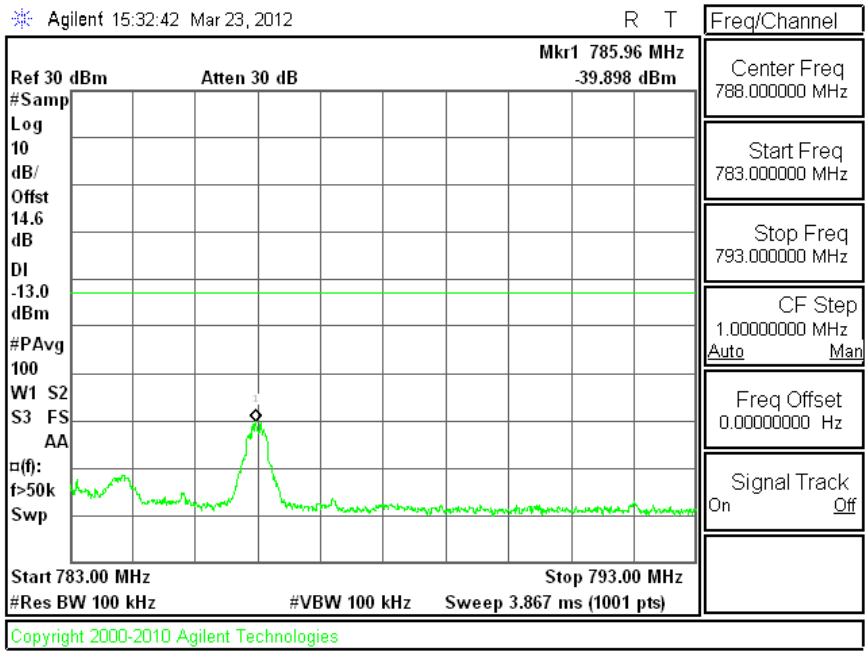

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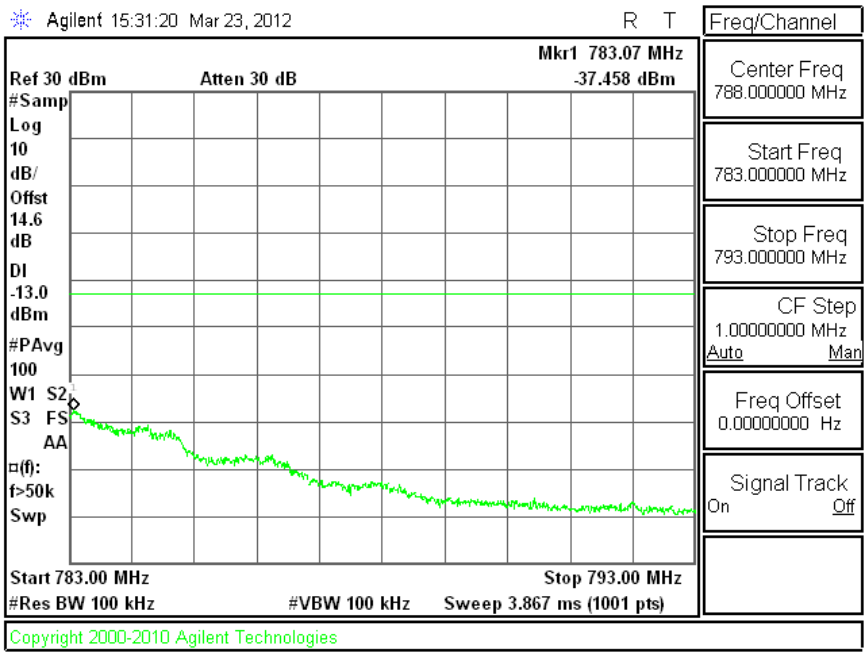


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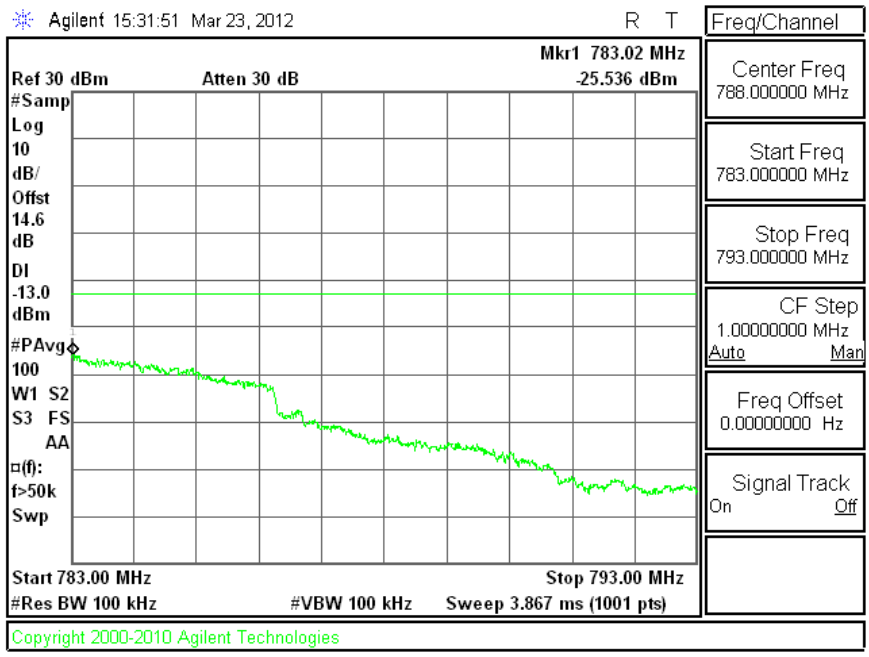

**LTE 16QAM 779.5MHz Band 13, 783 - 793MHz (5MHz Bandwidth)**

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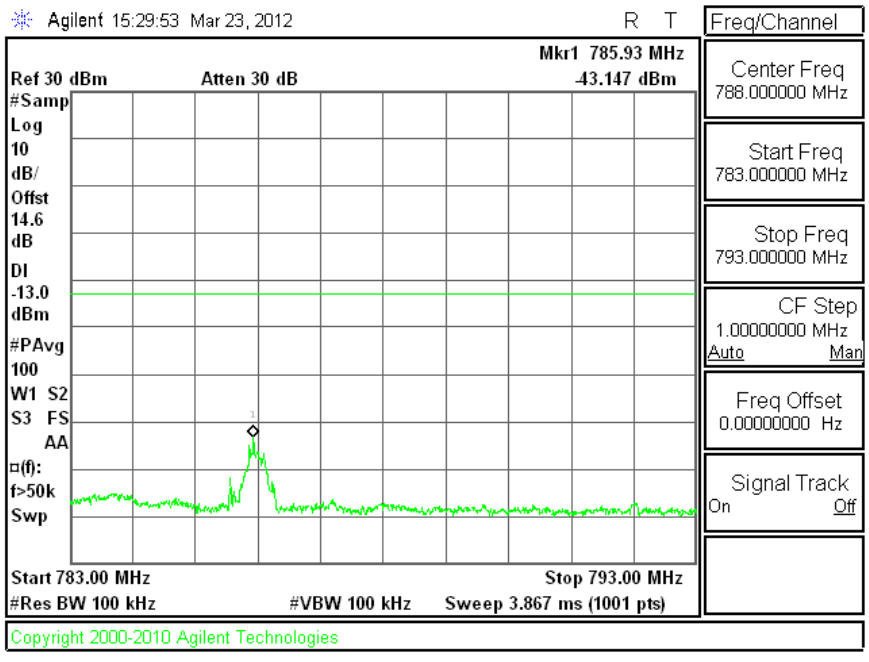


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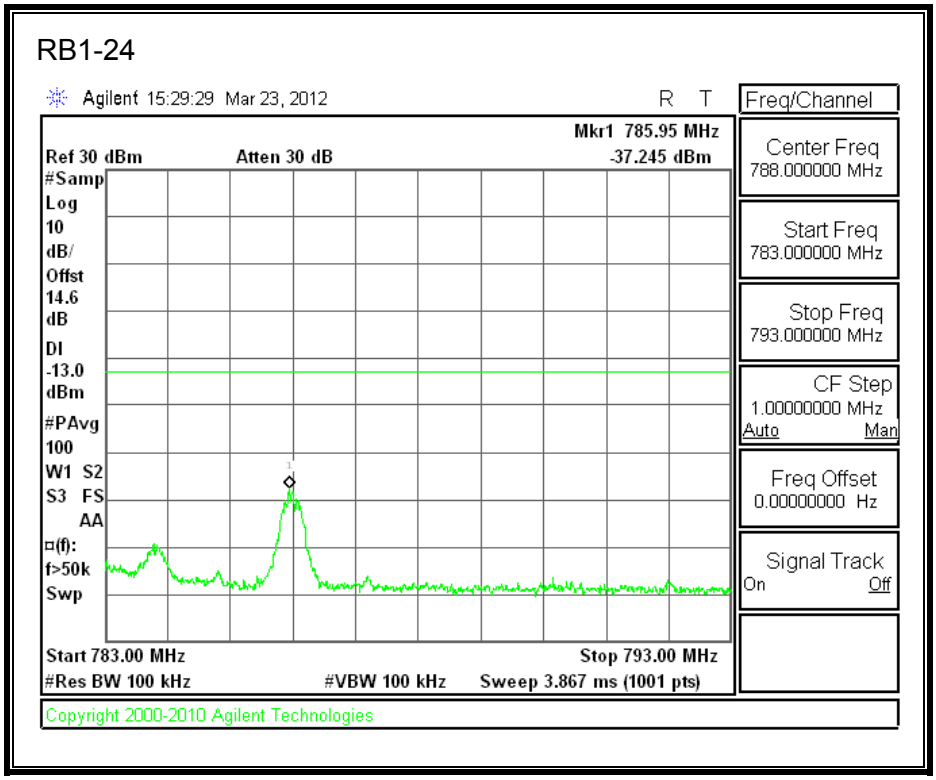

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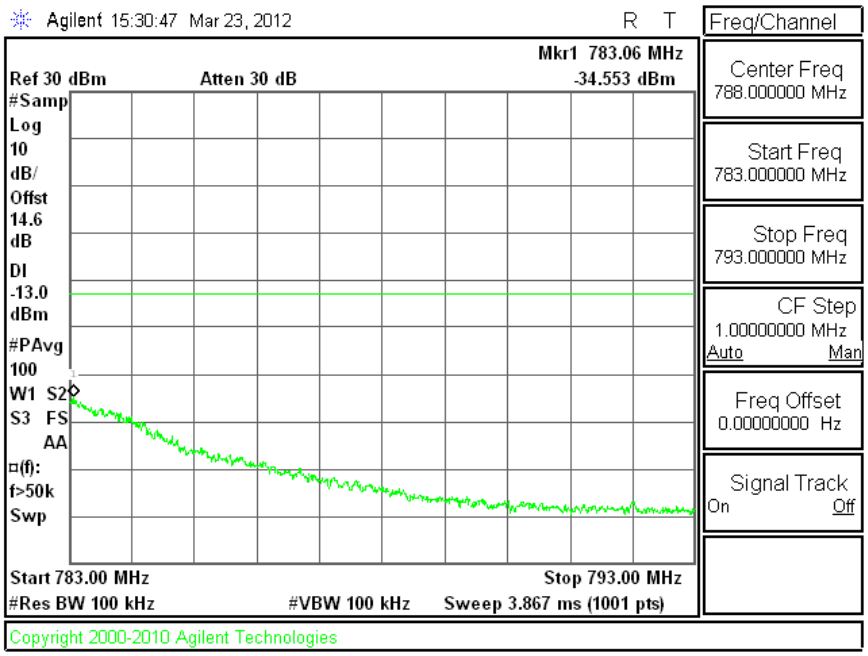


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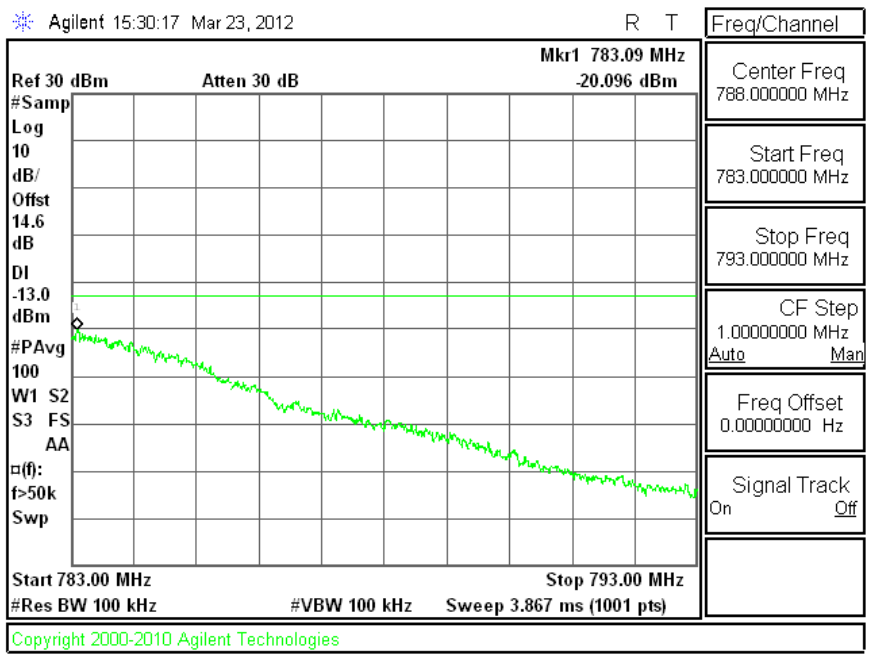
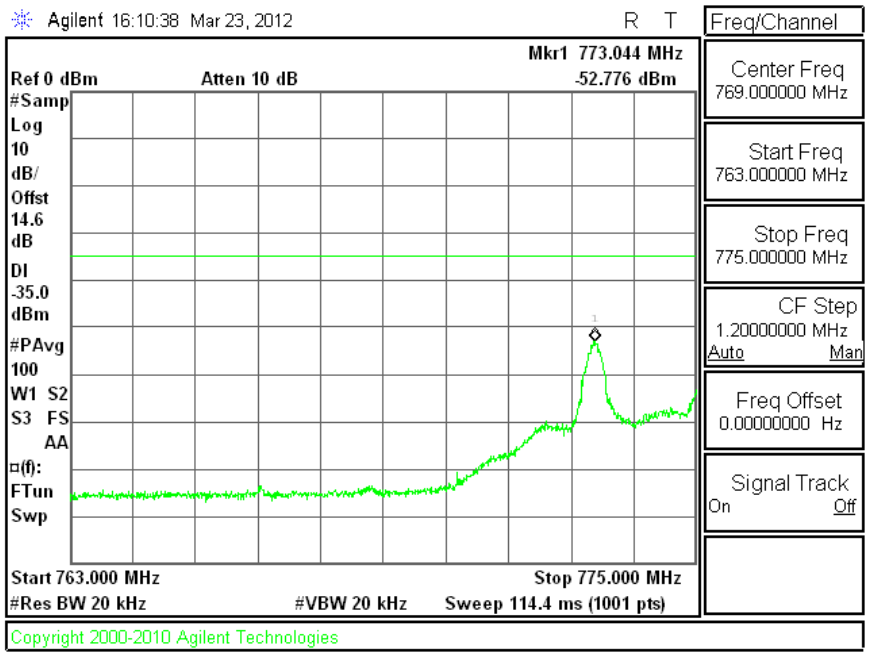


**LTE QPSK 779.5MHz Band 13, 763 - 775MHz (5MHz Bandwidth)**

RB1-0

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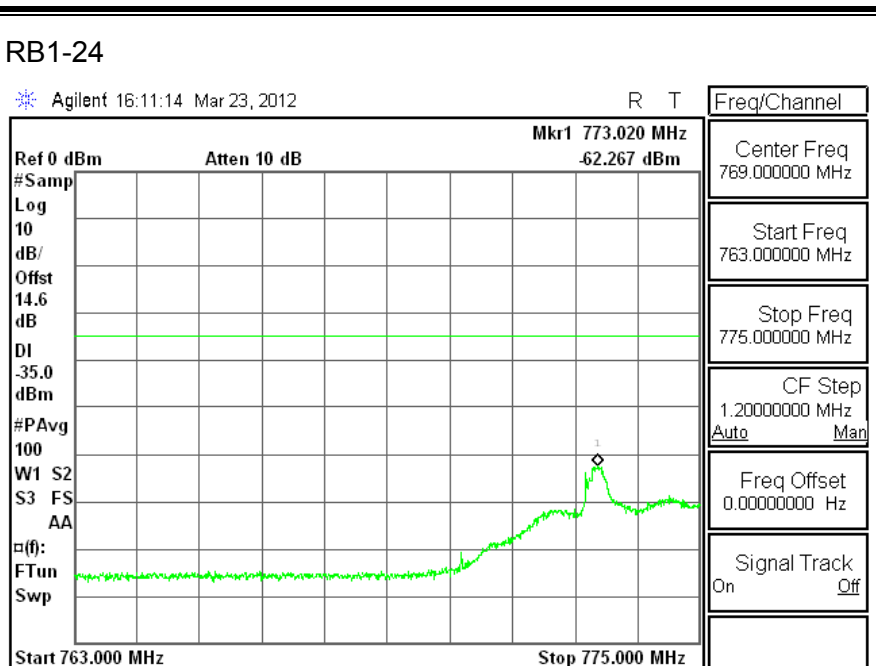

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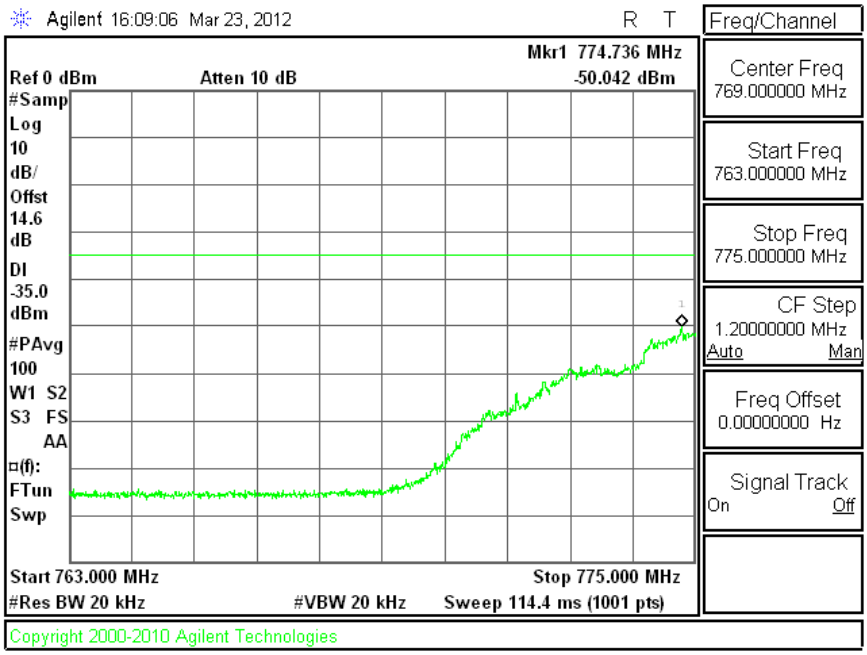


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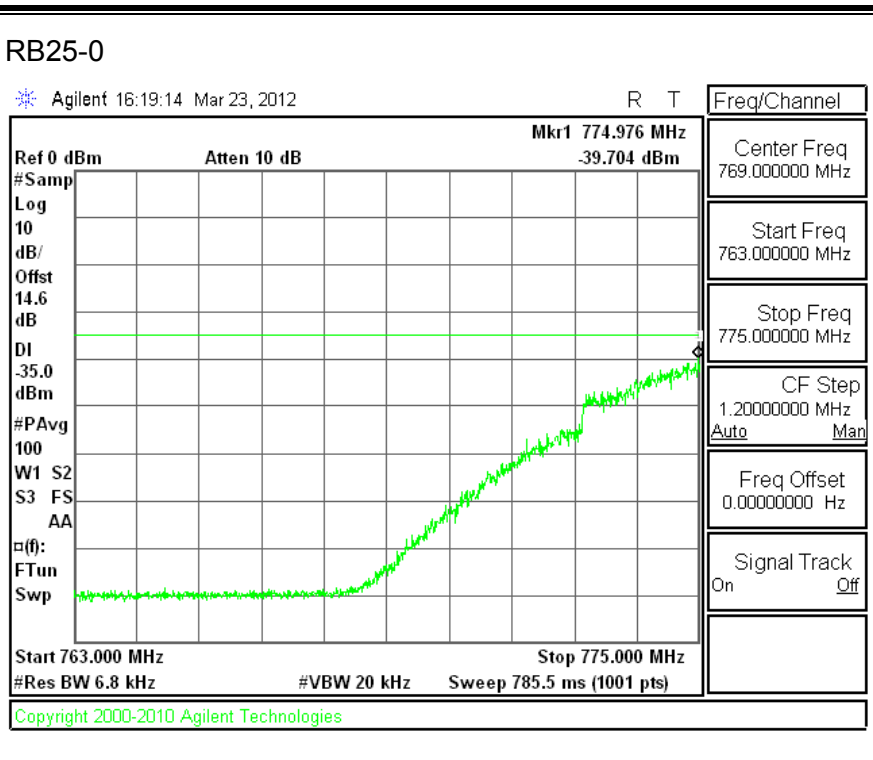

**LTE 16QAM 779.5MHz Band 13, 763-775MHz (5MHz Bandwidth)**

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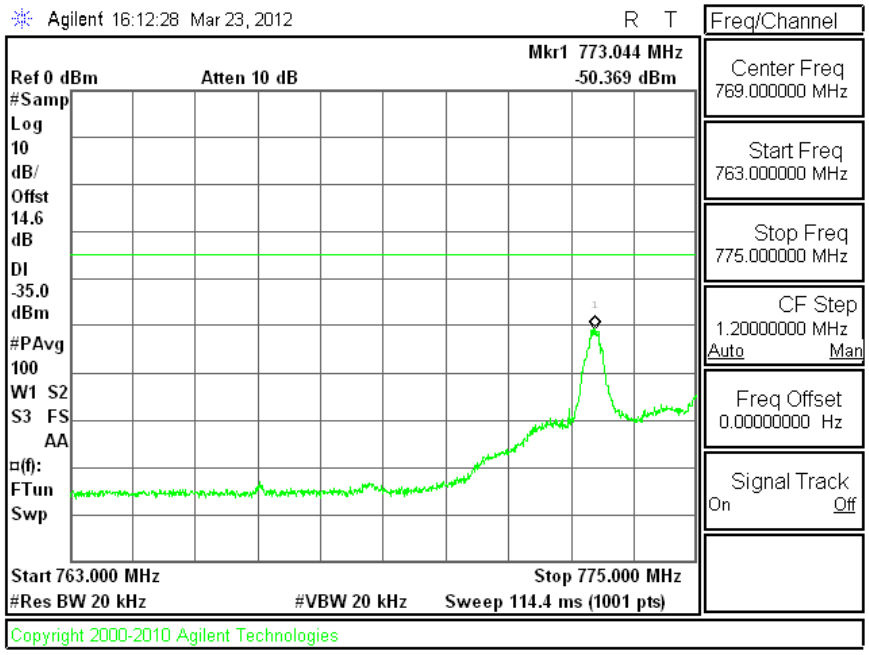


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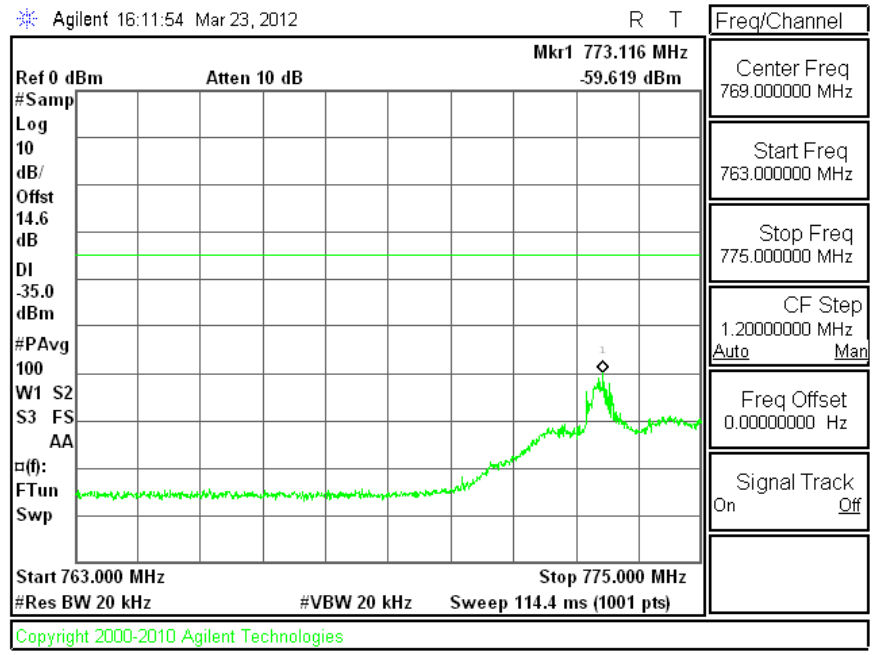

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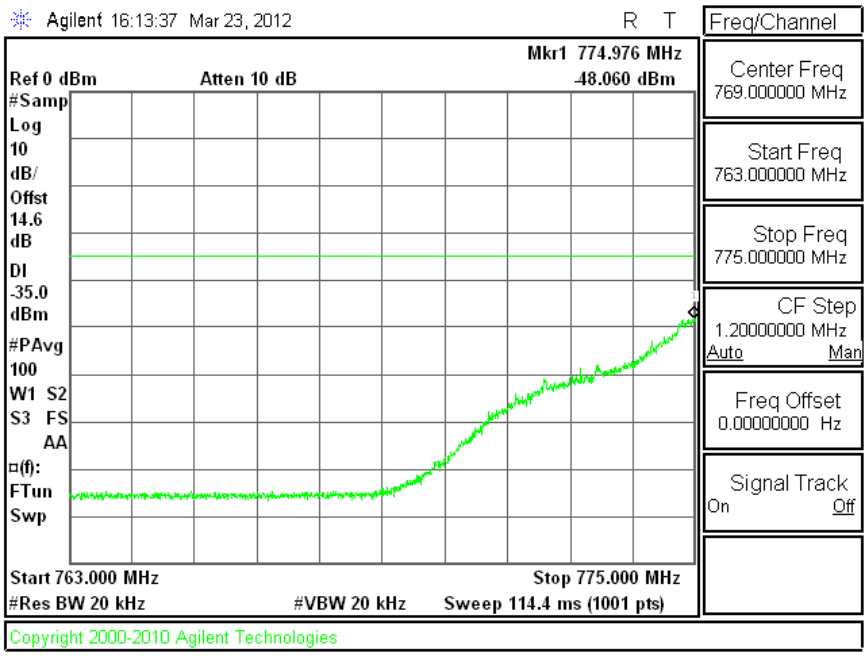


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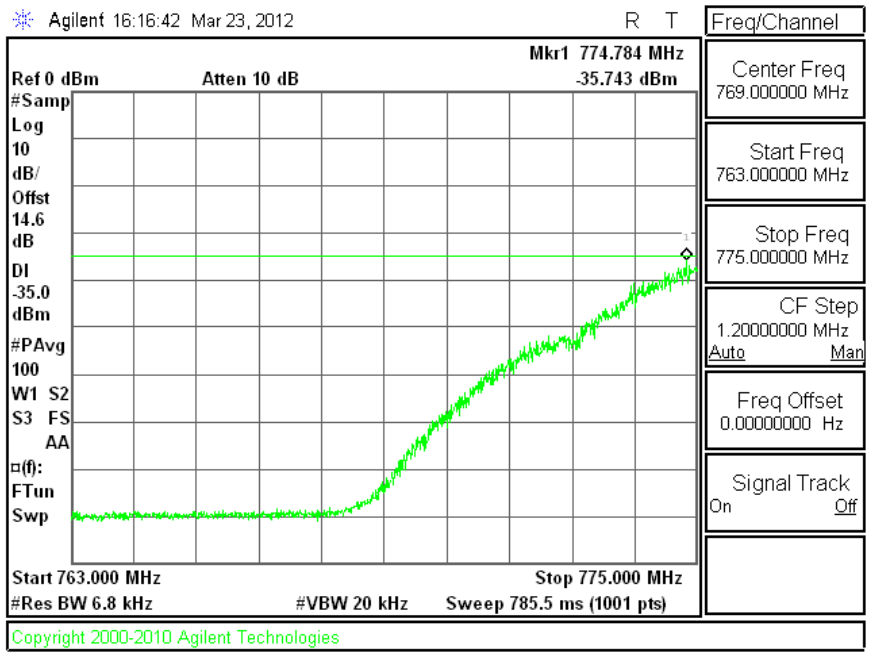

**LTE QPSK 779.5MHz Band 13, 793 - 805MHz (5MHz Bandwidth)**

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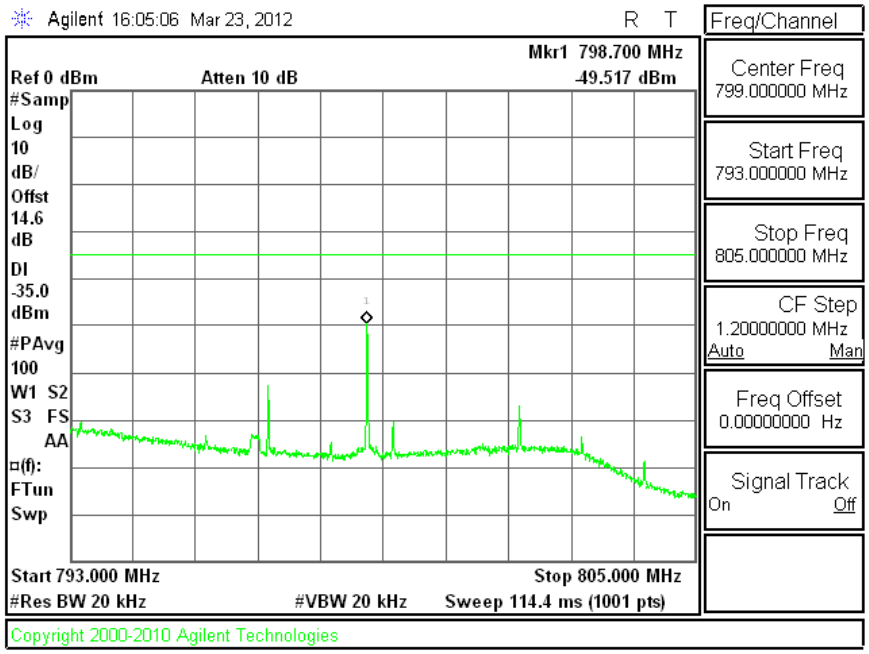


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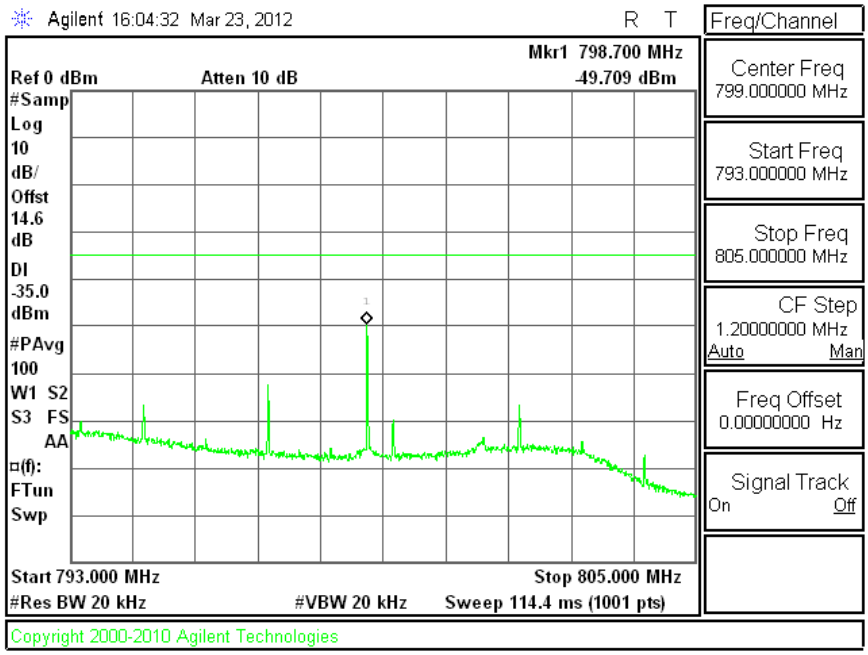

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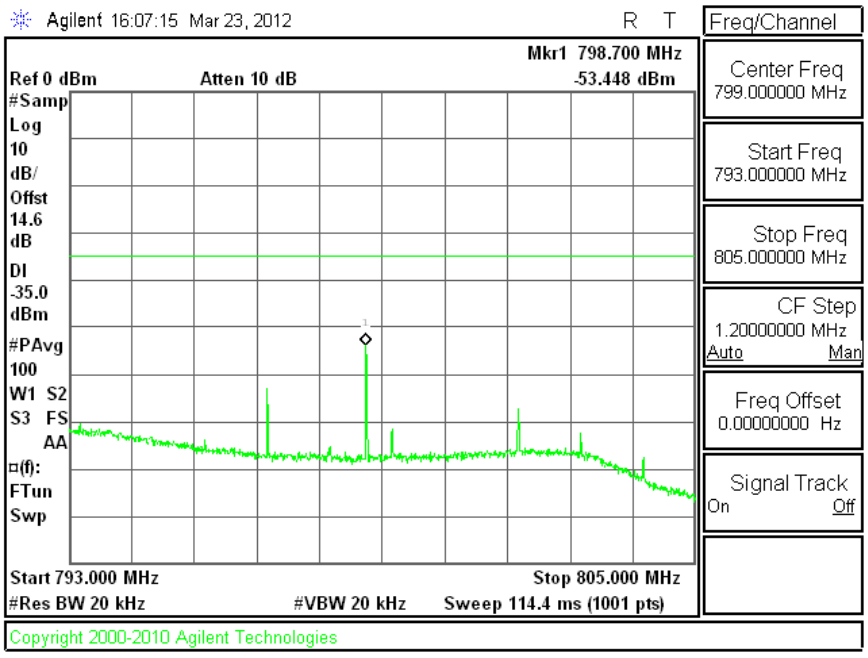


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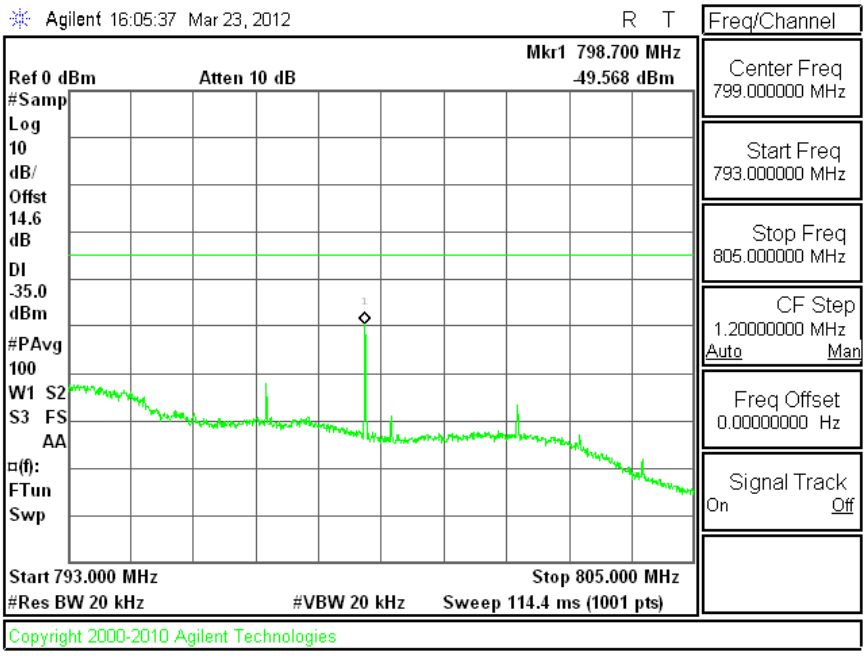

**LTE 16QAM 779.5MHz Band 13, 793 - 805MHz (5MHz Bandwidth)**

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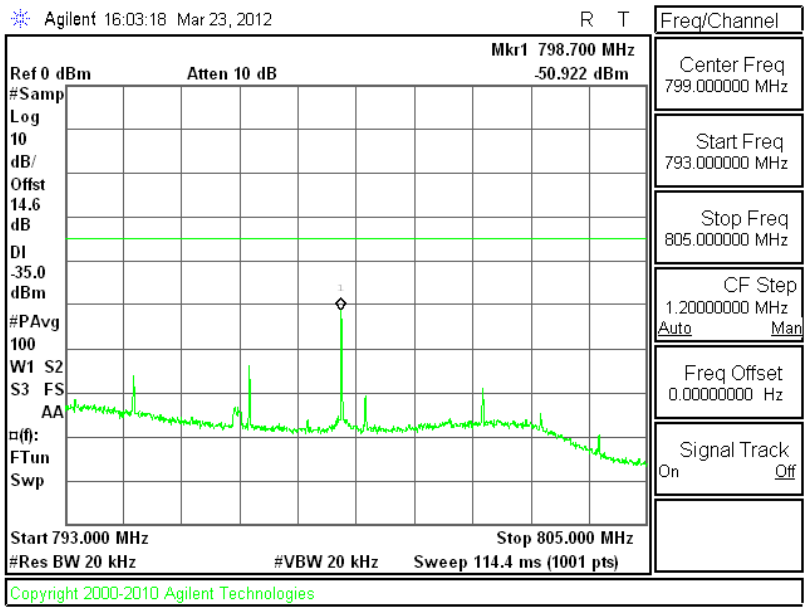


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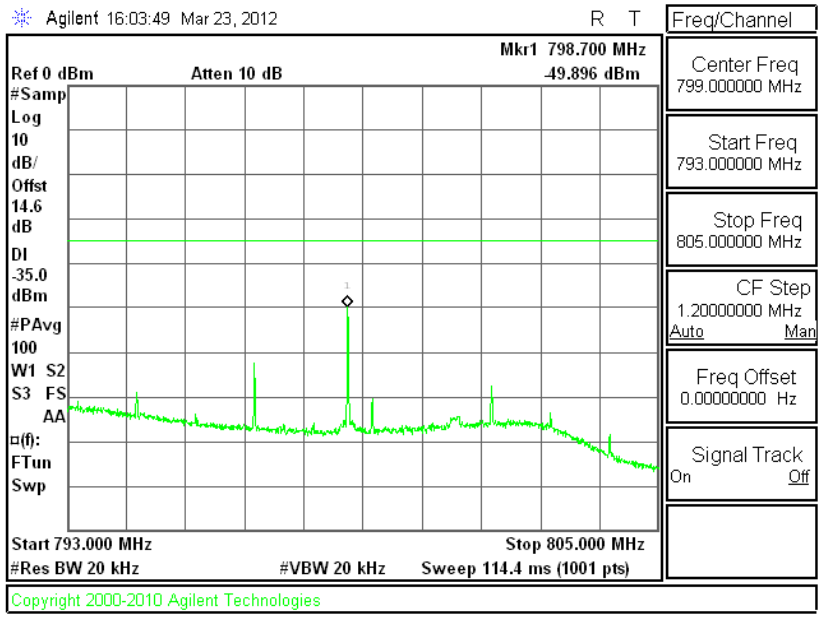

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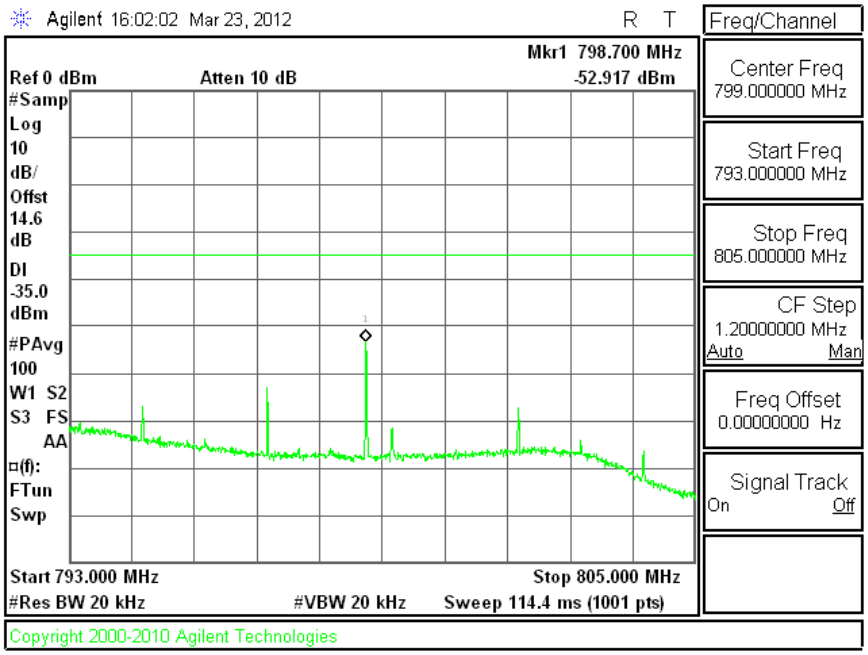


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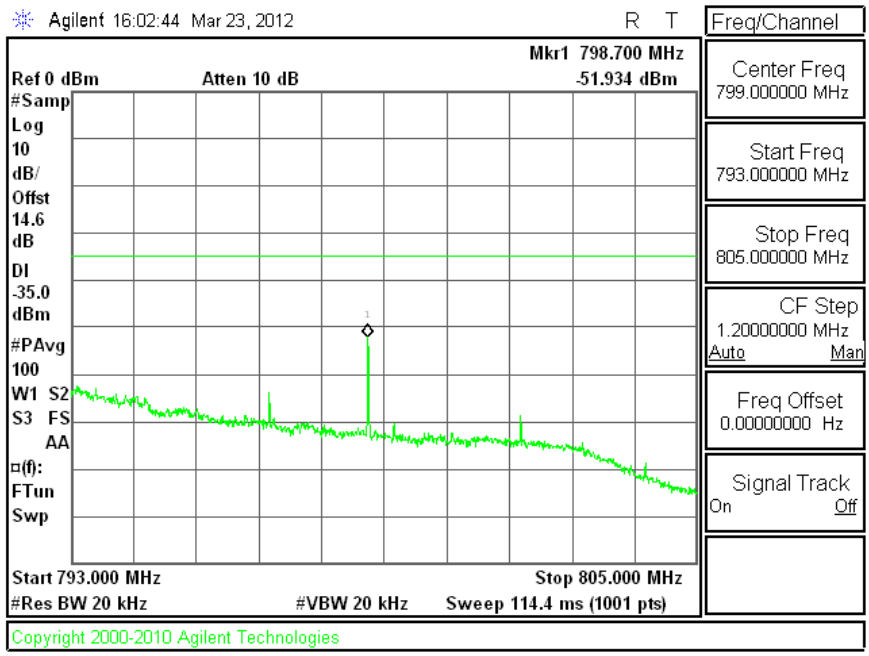
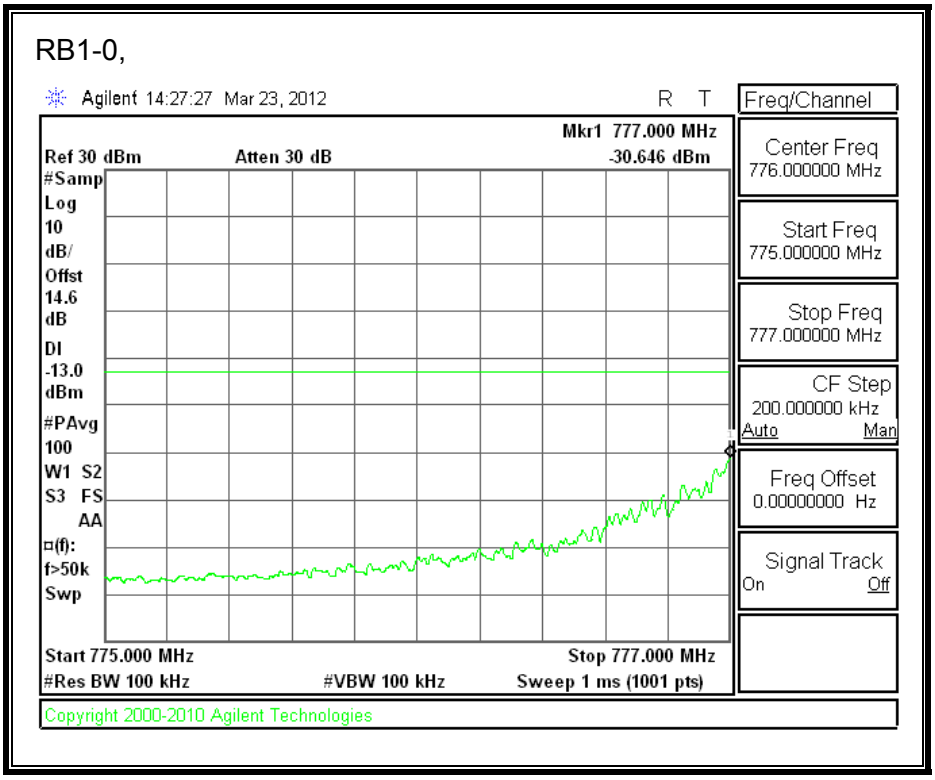
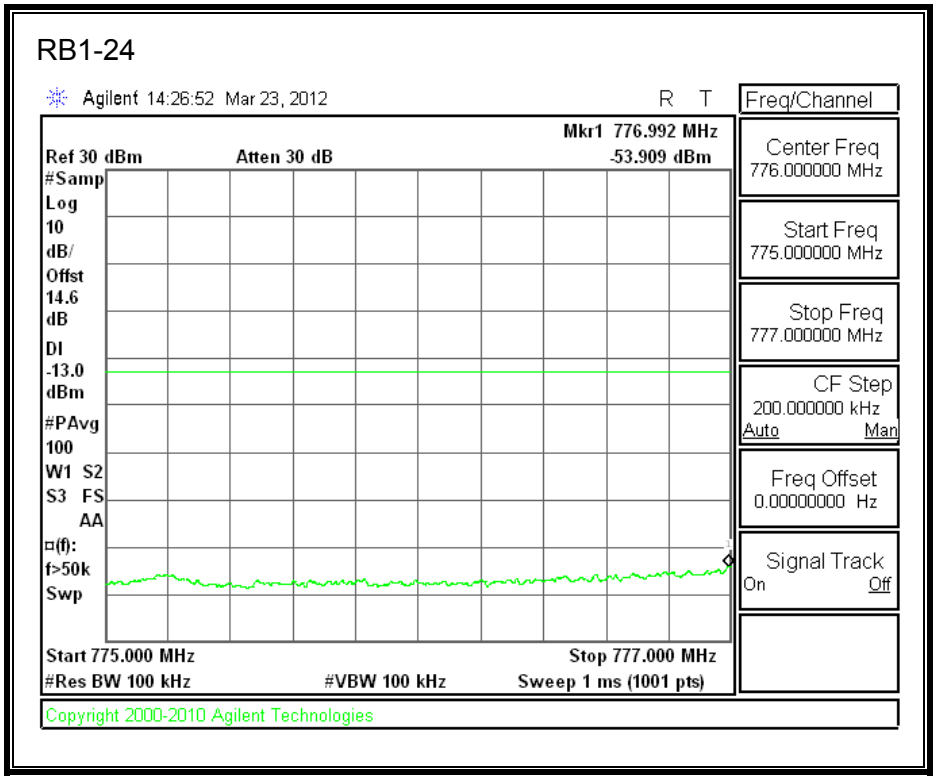


**LTE QPSK 782 MHz Band 13, 775 - 777MHz (10MHz Bandwidth)**

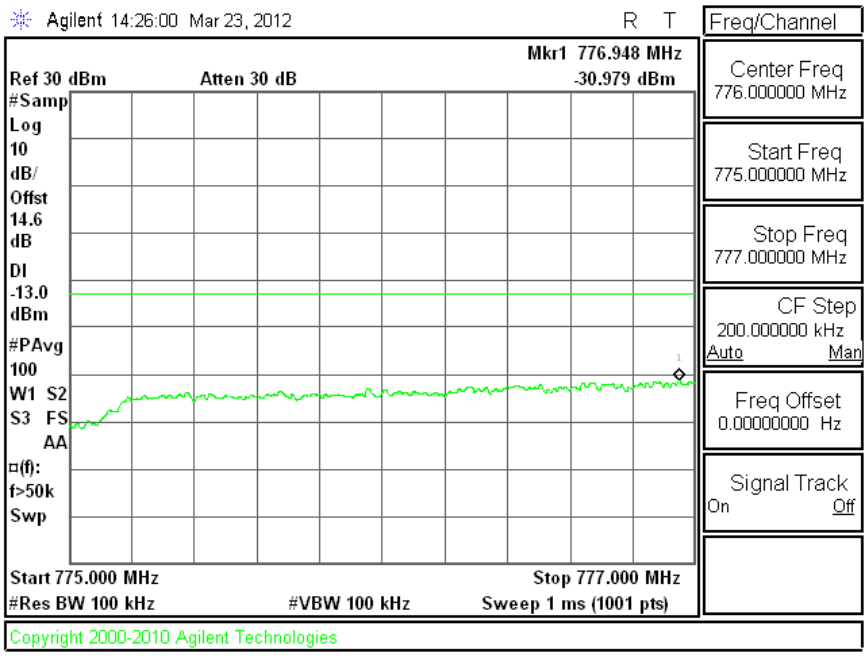
RB1-0,



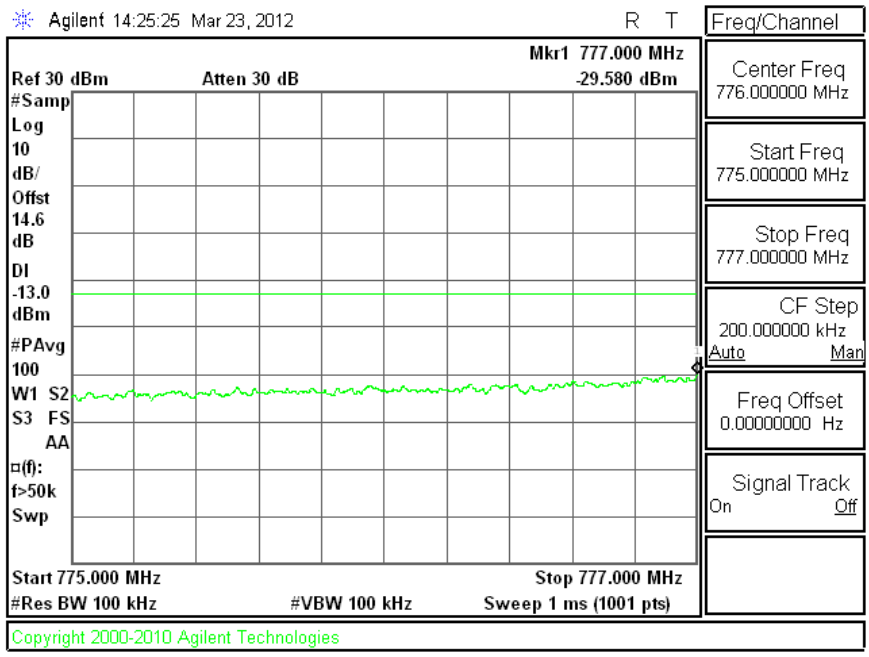

RB1-24



RB12-6

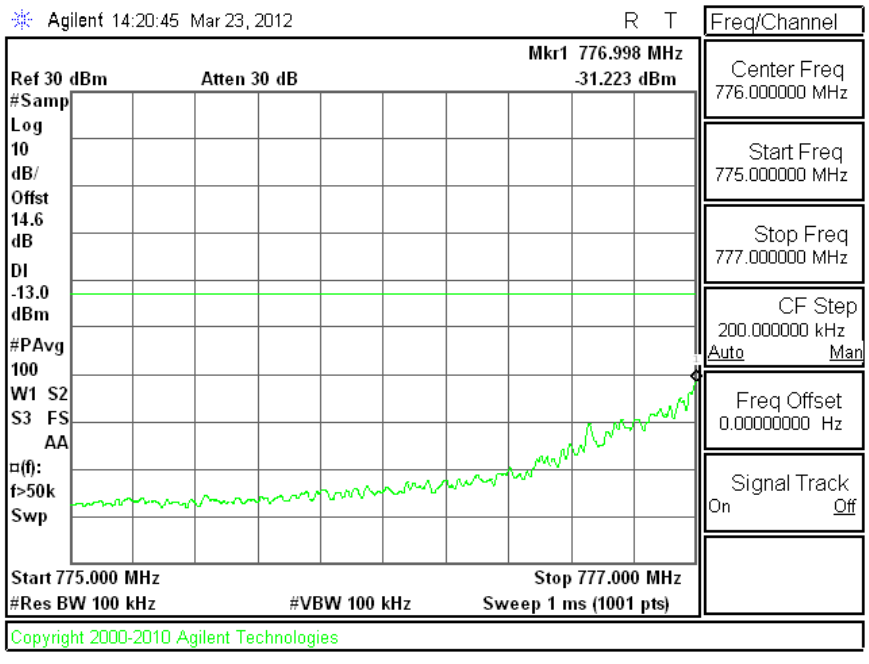



RB25-0

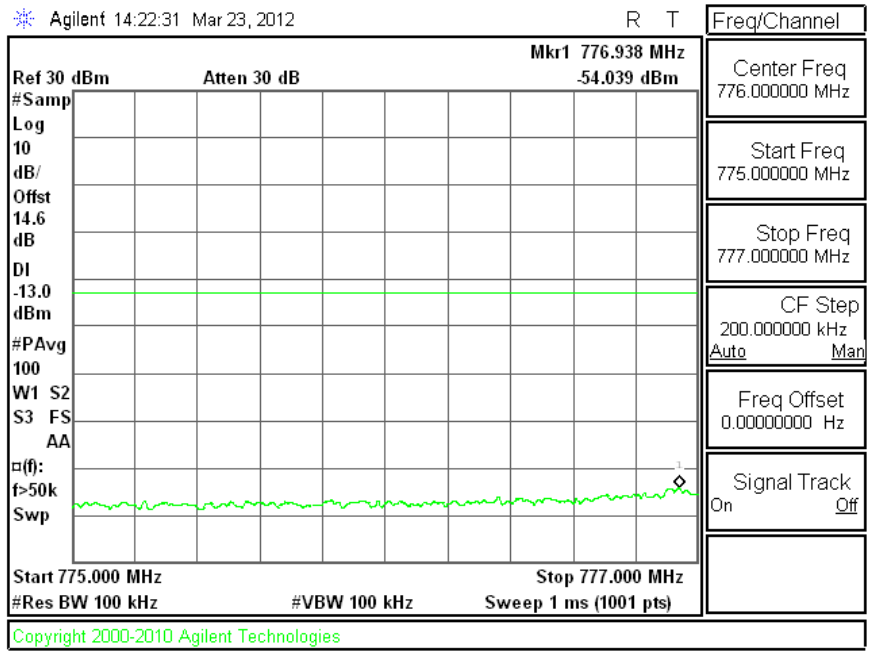


**LTE 16QAM 782MHz Band 13, 775 - 777MHz (10MHz Bandwidth)**

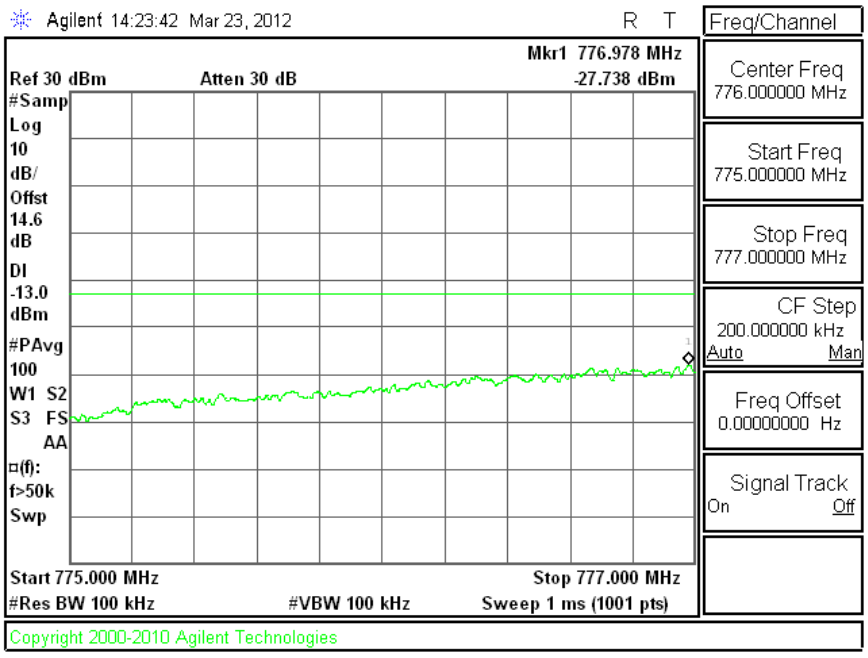
RB1-0



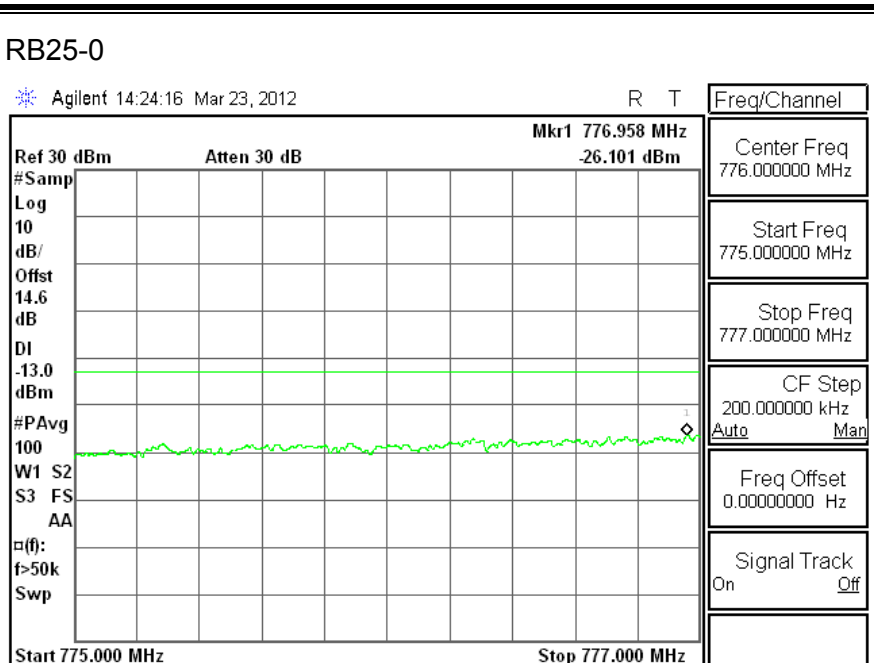

RB1-24,



RB12-6

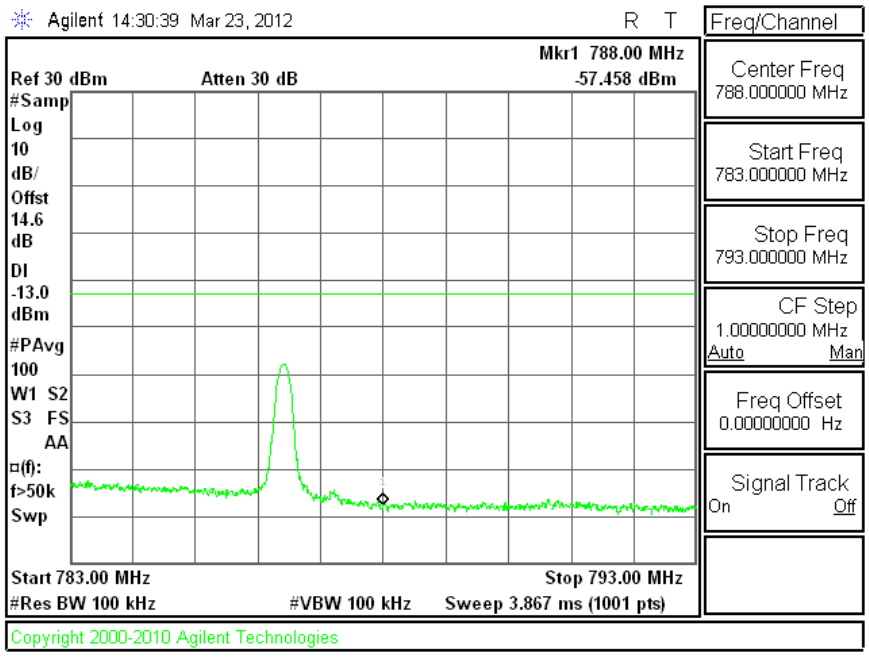



RB25-0

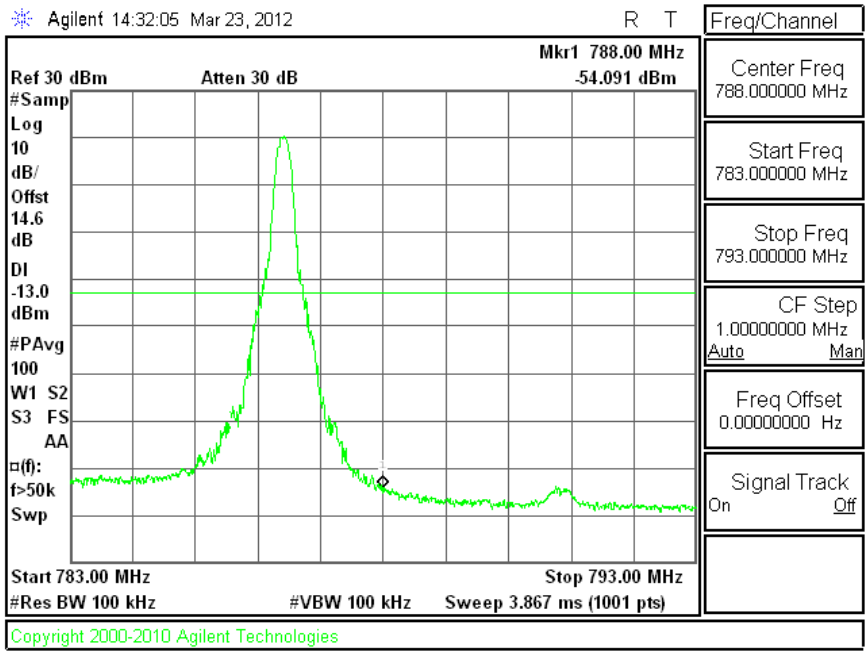


**LTE QPSK 782MHz Band 13, 783 - 793MHz (10MHz Bandwidth)**

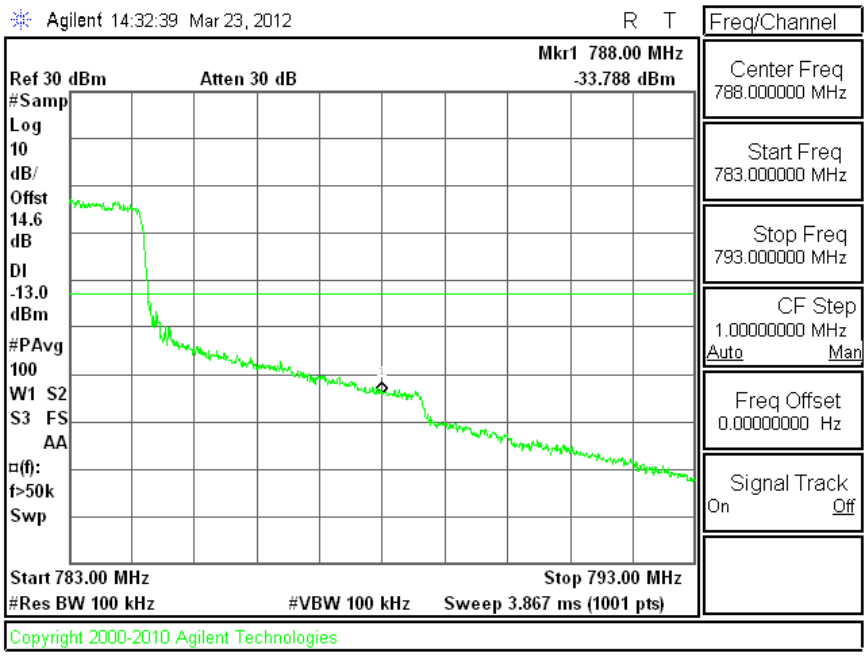
RB1-0



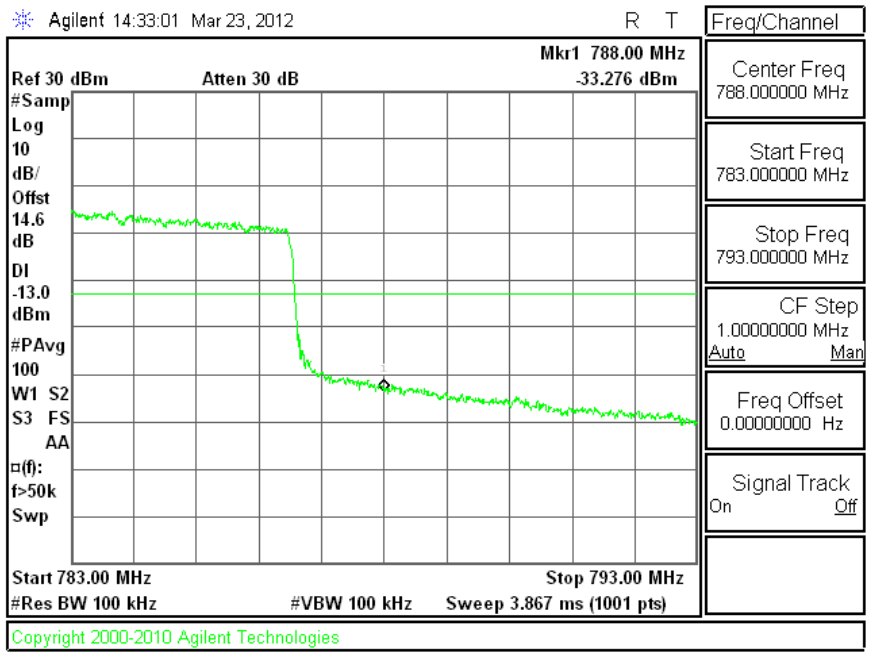

RB1-24



RB12-6

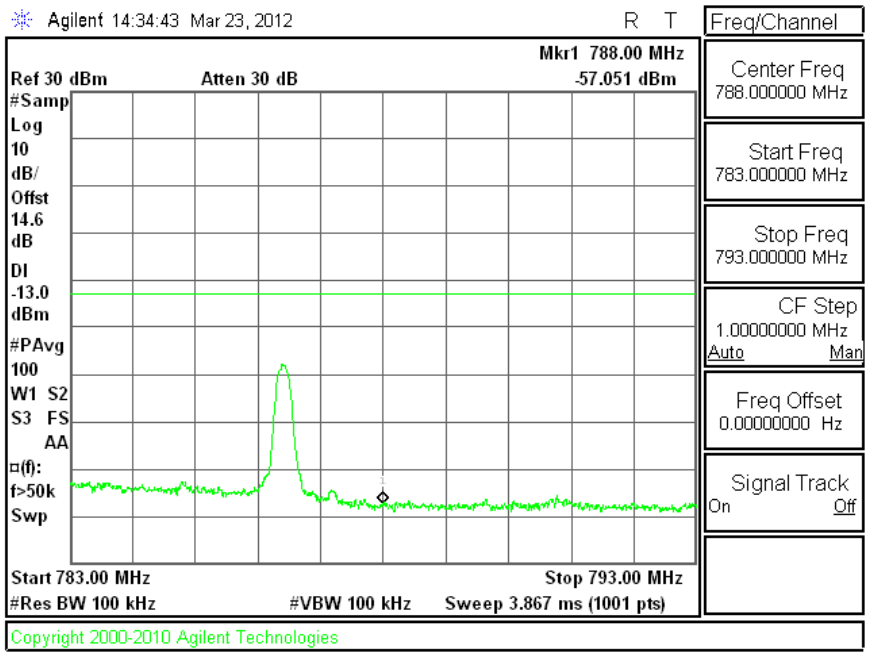



RB25-0

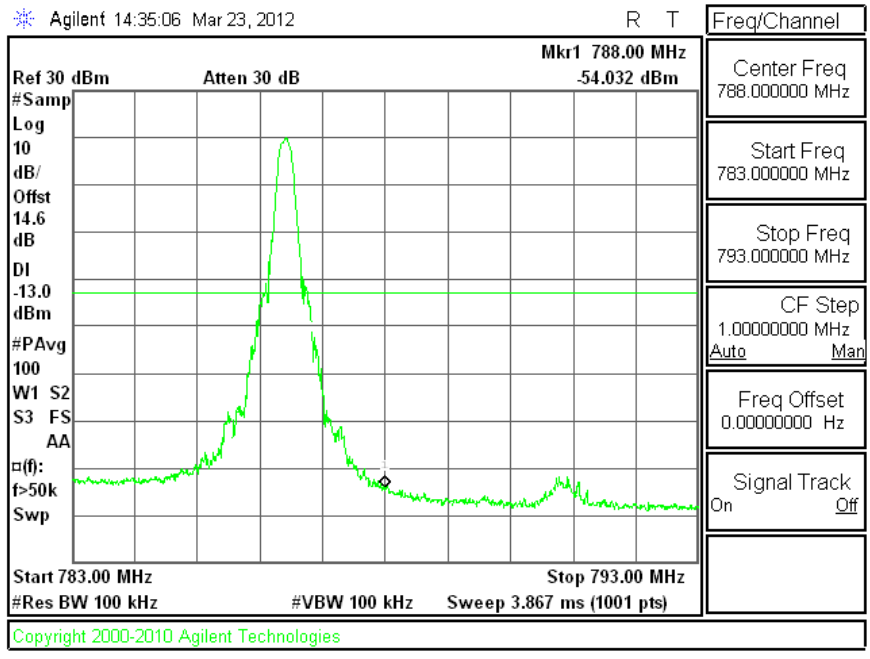


**LTE 16QAM 782MHz Band 13, 783 - 793MHz (10MHz Bandwidth)**

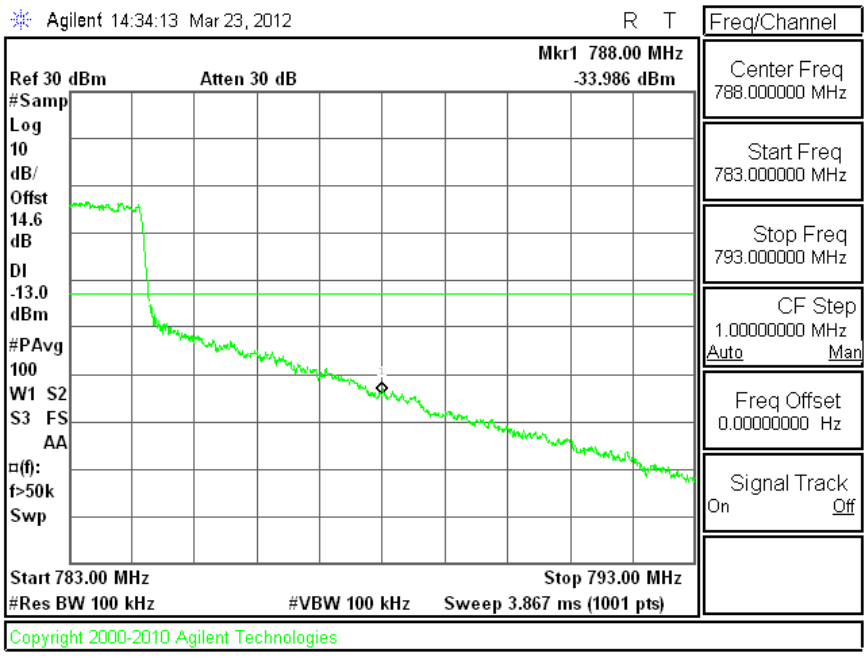
RB1-0



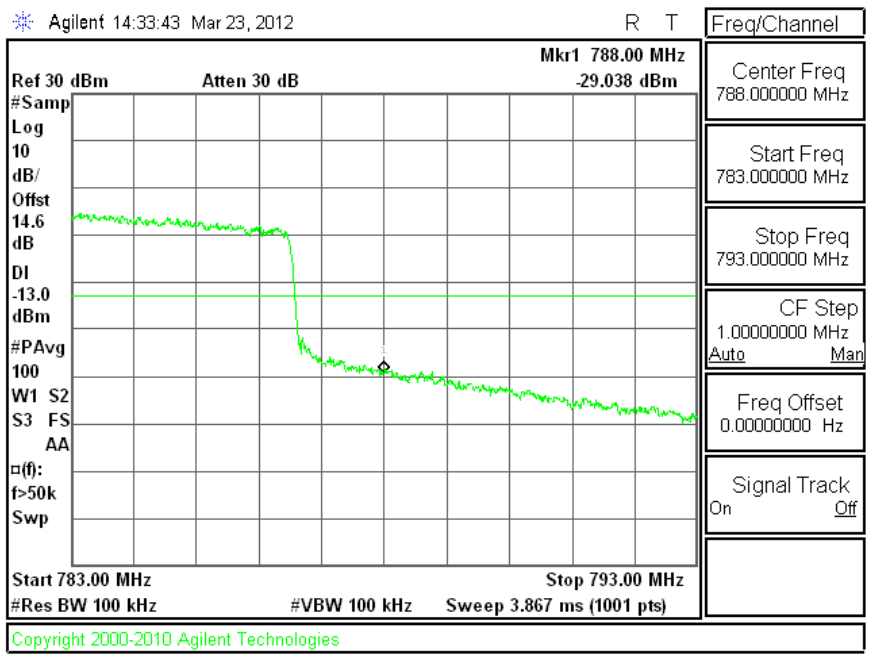

RB1-24



RB12-6

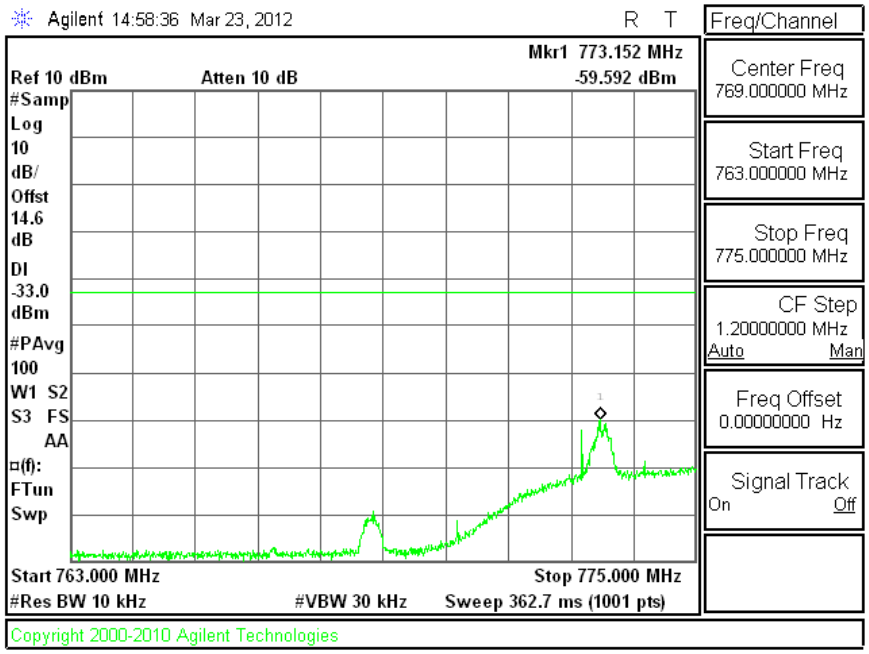



RB25-0

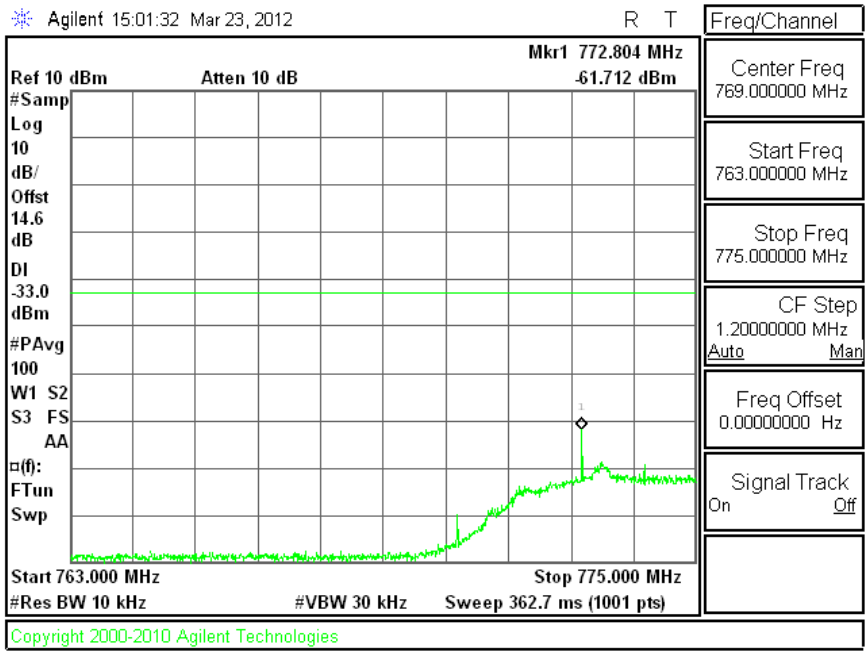


**LTE QPSK 782MHz Band 13, 763 - 775MHz (10MHz Bandwidth)**

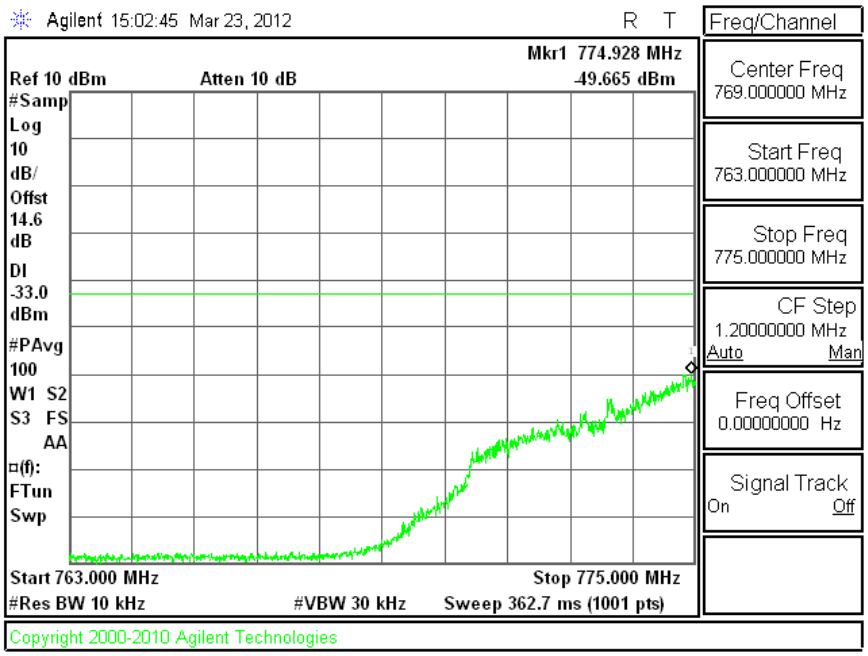
RB1-0



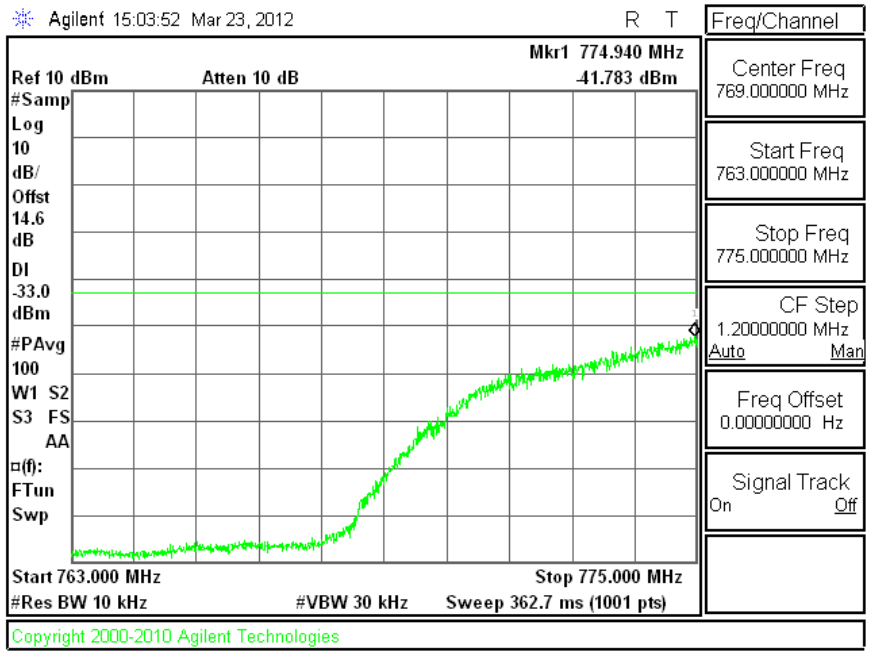

RB1-24



RB12-6

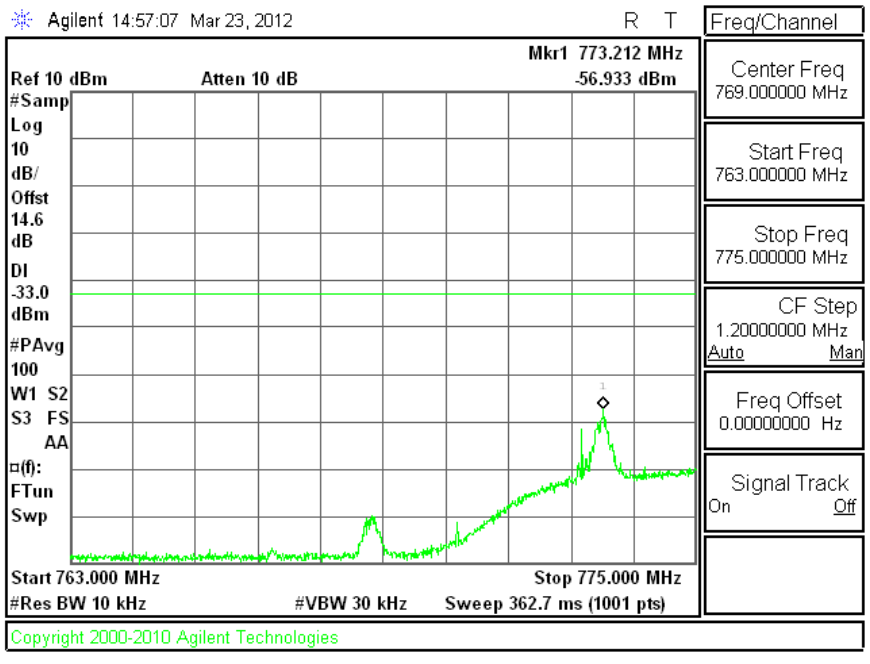



RB25-0

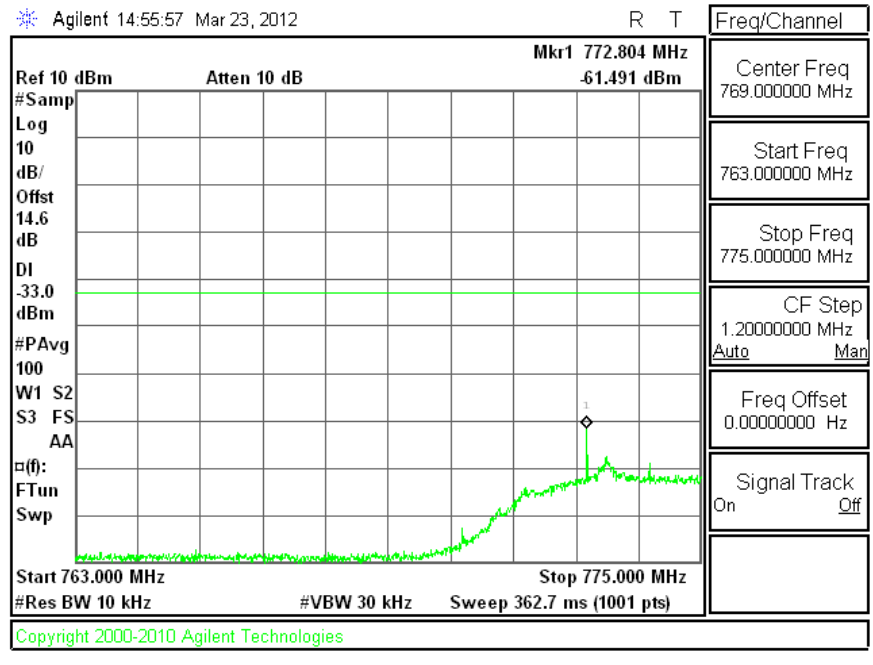


**LTE 16QAM 782MHz Band 13, 763-775MHz (10MHz Bandwidth)**

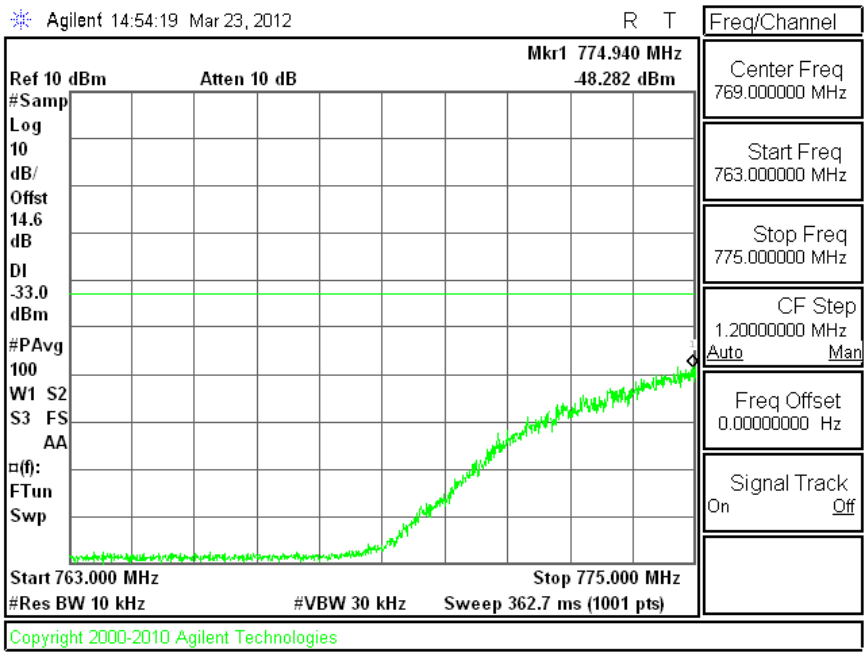
RB1-0



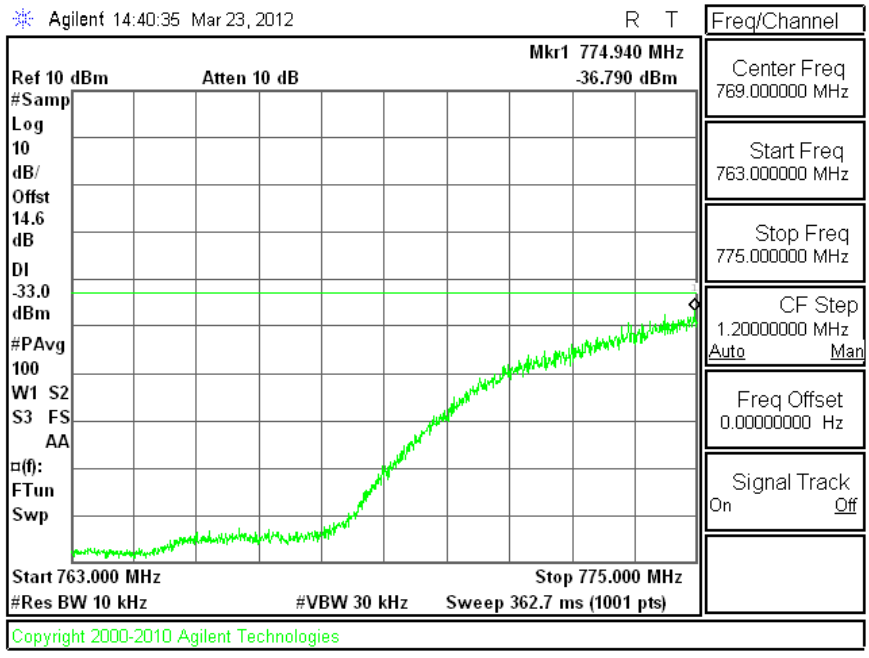

RB1-24



RB12-6

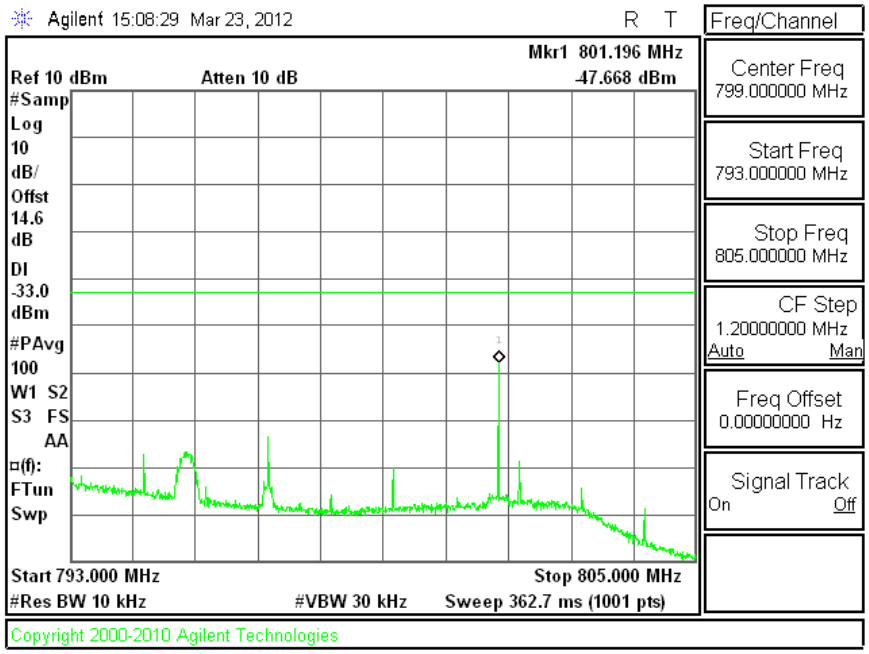



RB25-0

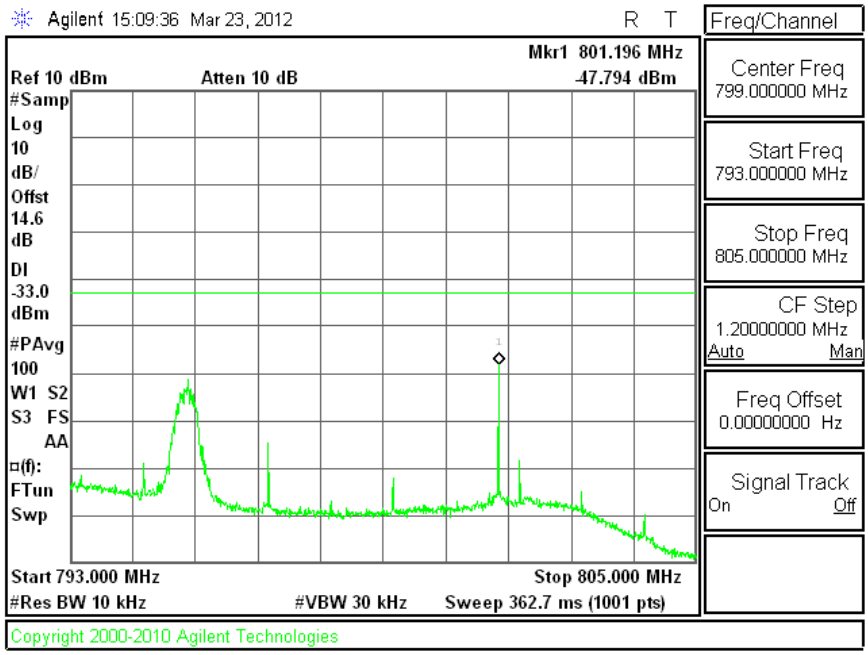


**LTE QPSK 782.0MHz Band 13, 793 - 805MHz (10MHz Bandwidth)**

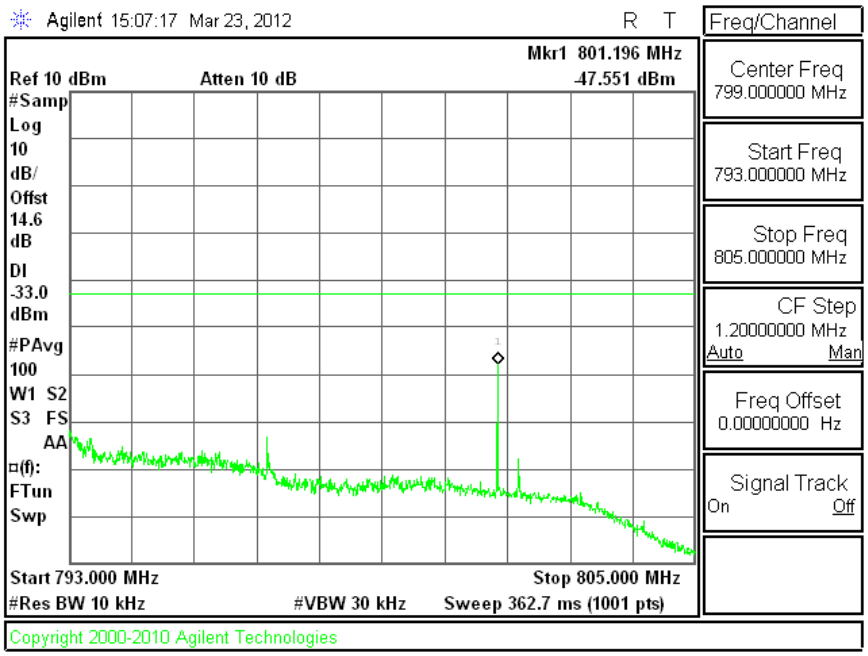
RB1-0



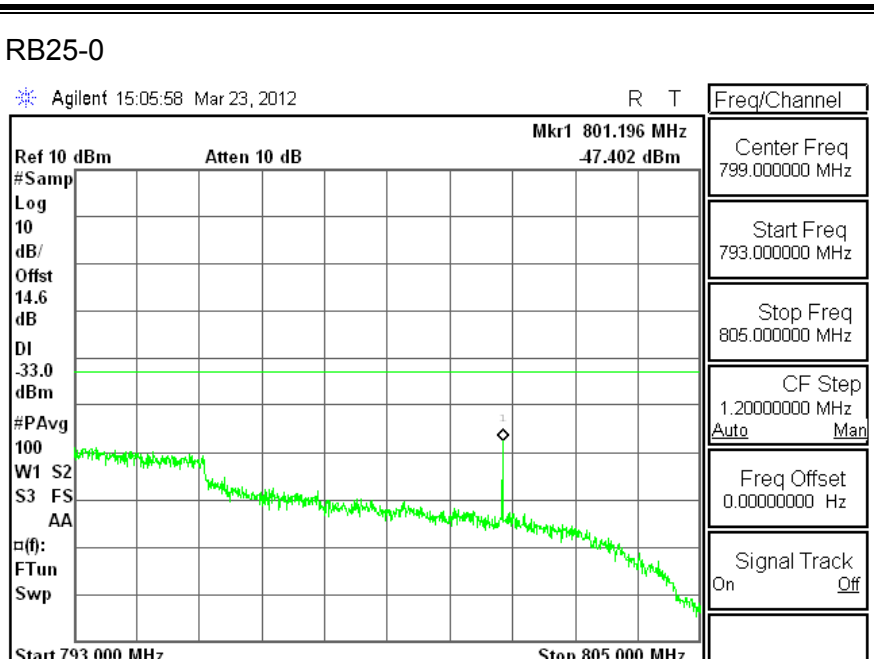

RB1-24



RB12-6

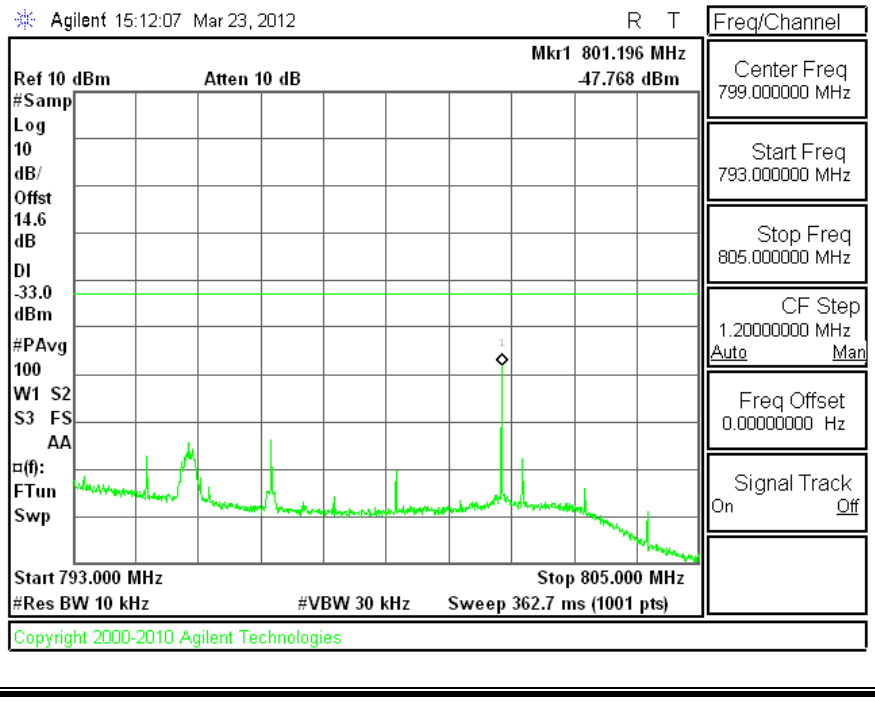



RB25-0

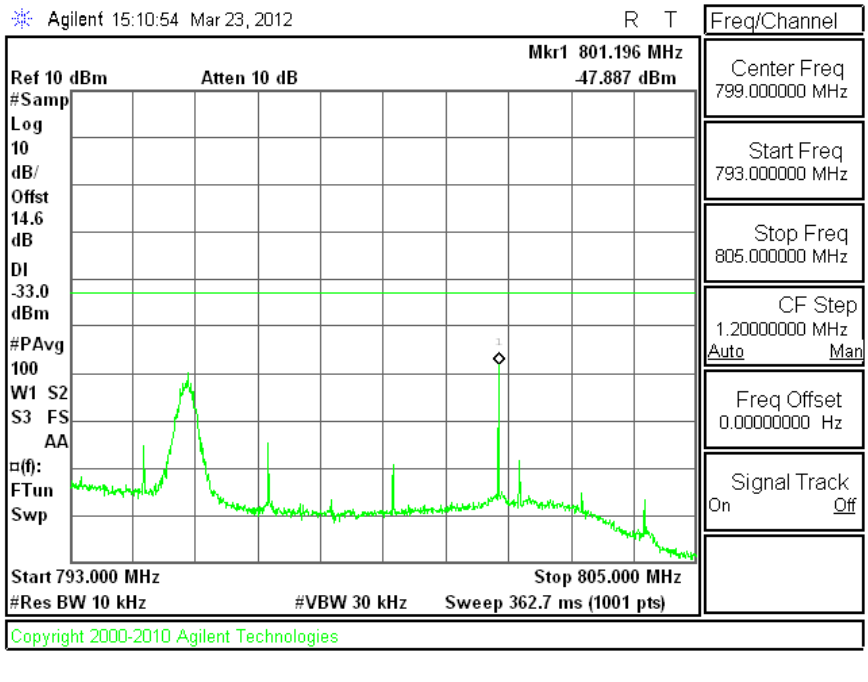


**LTE 16QAM 782.0MhZ Band 13, 793 - 805MHz (10MHz Bandwidth)**

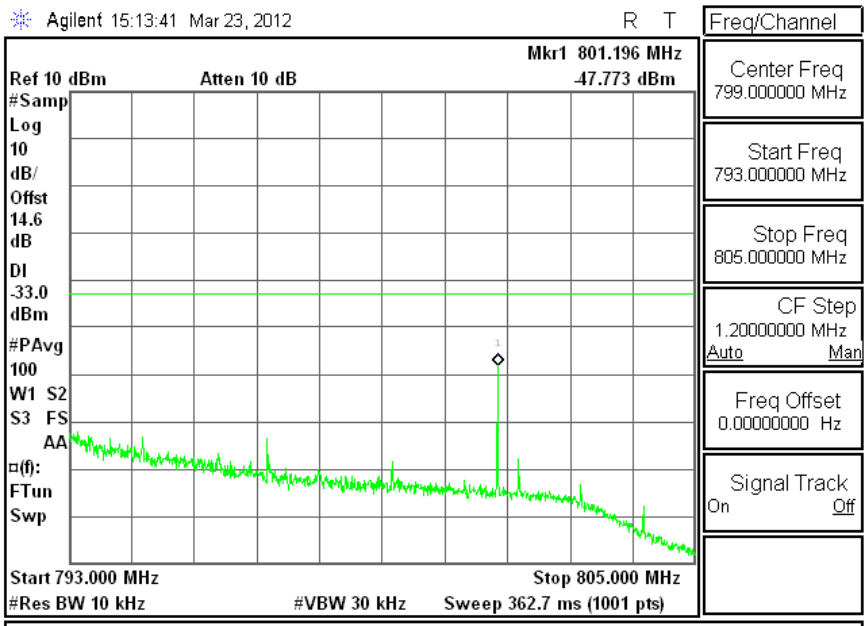
RB1-0



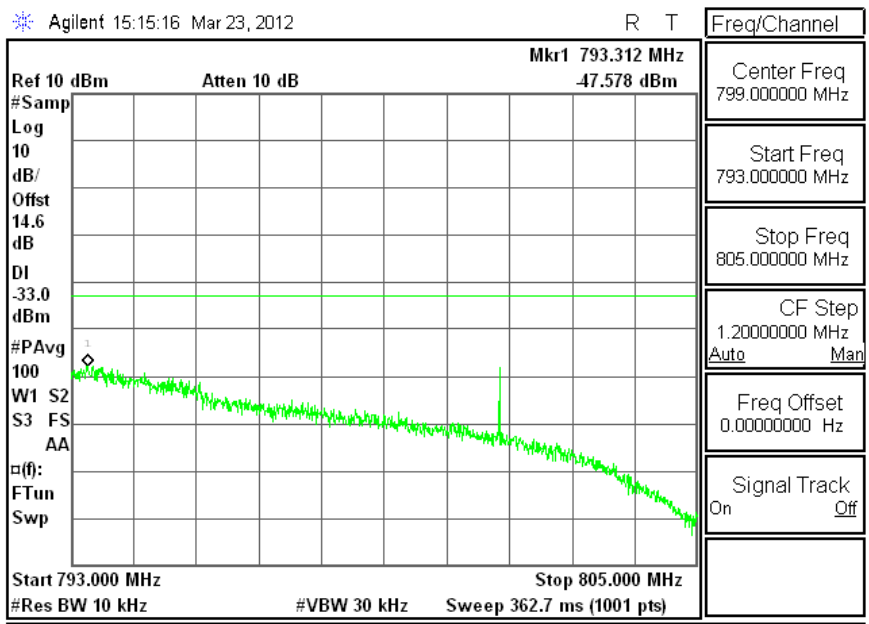

RB1-24



RB12-6

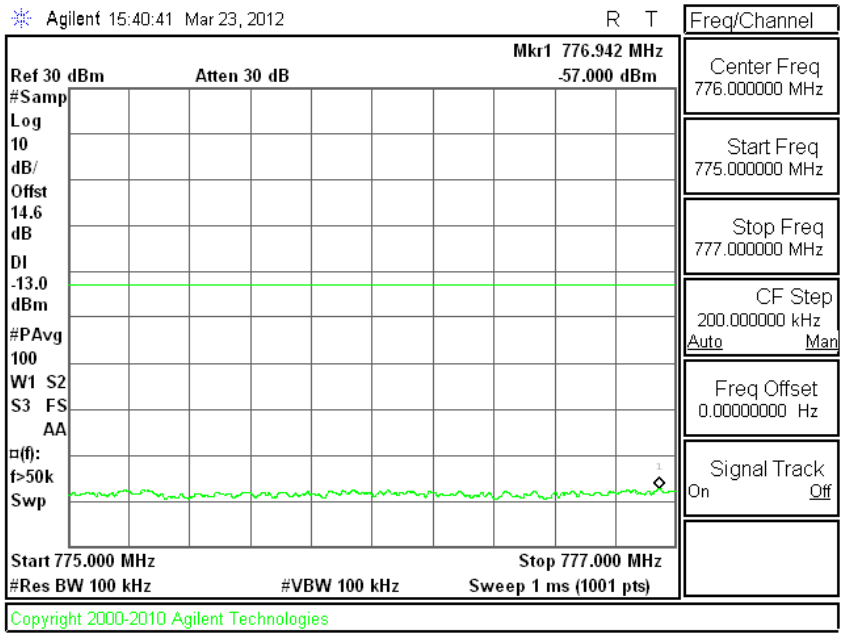



RB25-0

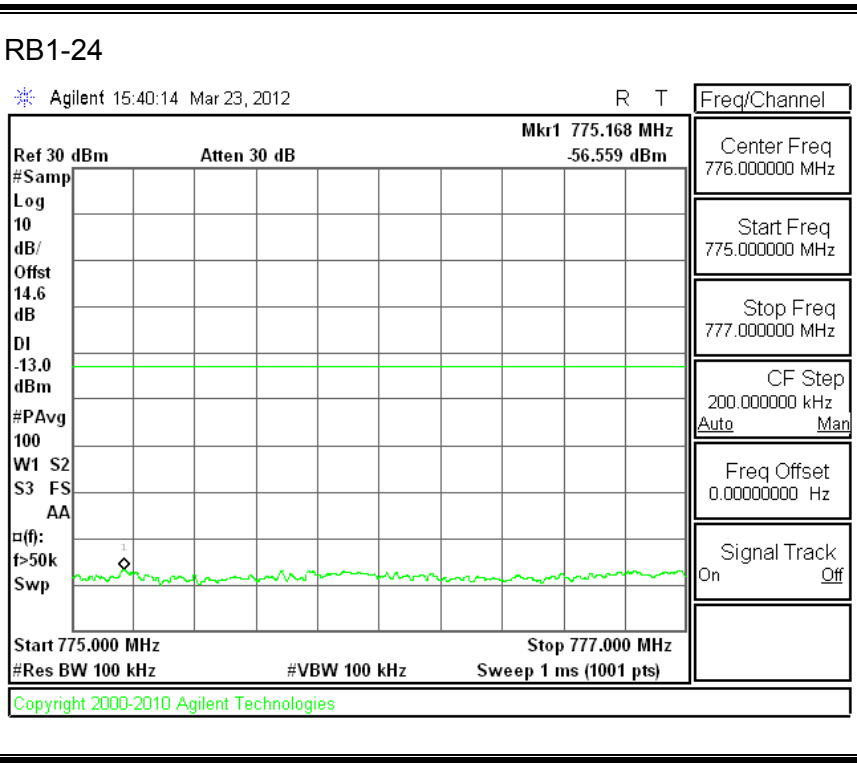


**LTE QPSK 784.5 MHz Band 13, 775 - 777MHz (5MHz Bandwidth)**

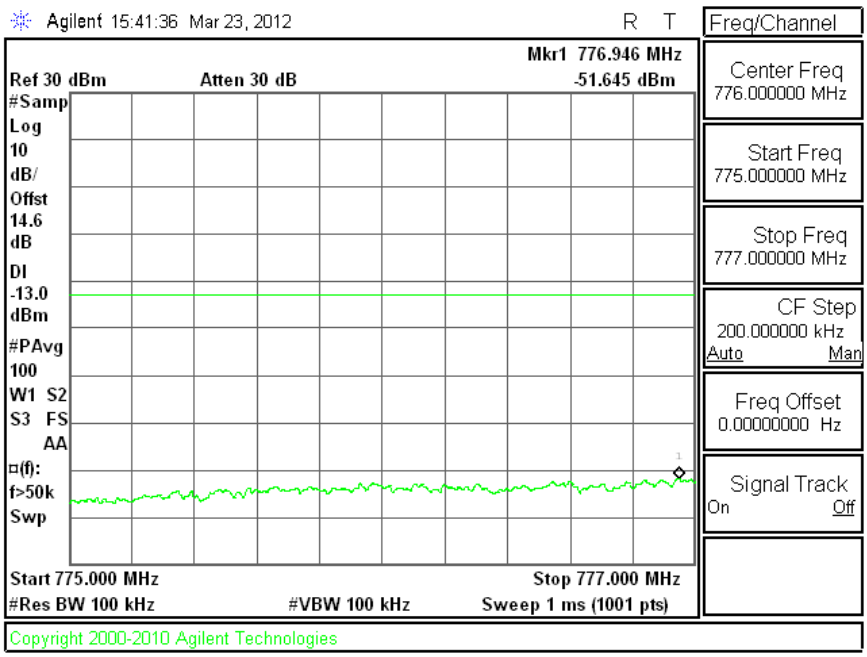
RB1-0



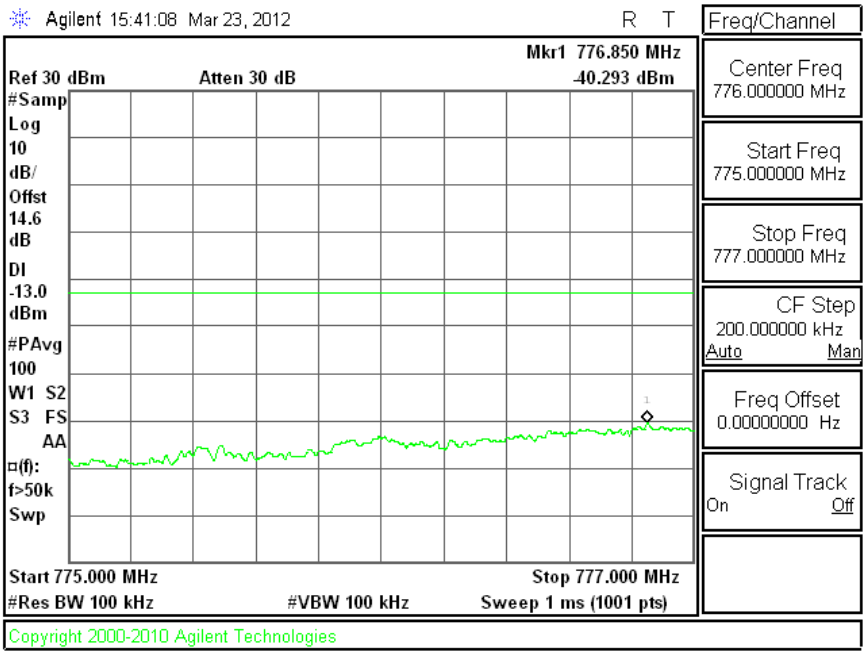

RB1-24



RB12-6

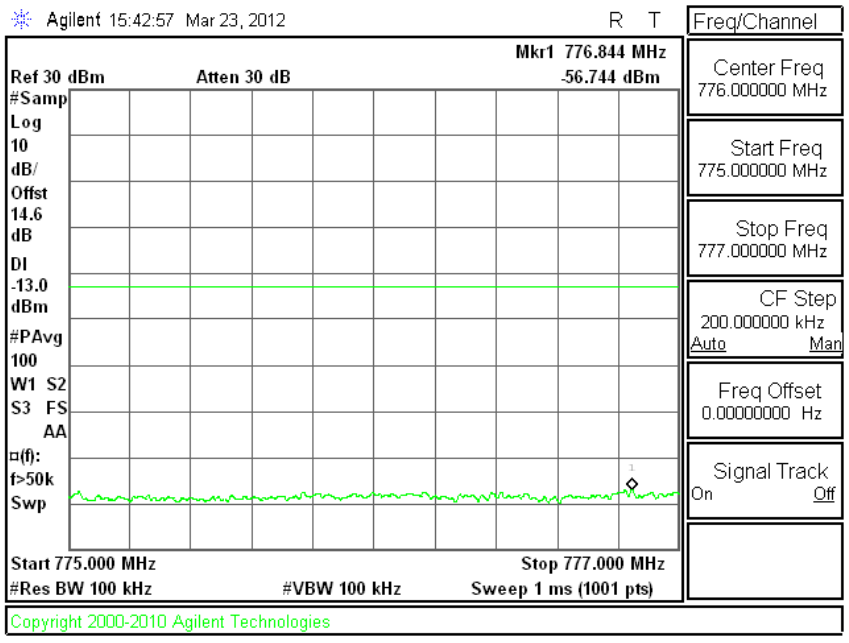



RB25-0

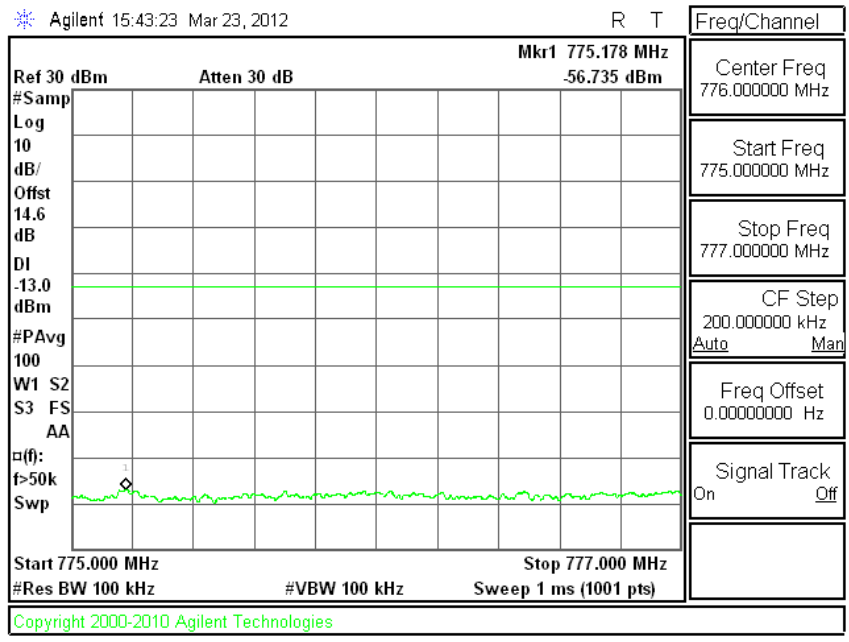


**LTE 16QAM 784.5MHz Band 13, 775 - 777MHz (5MHz Bandwidth)**

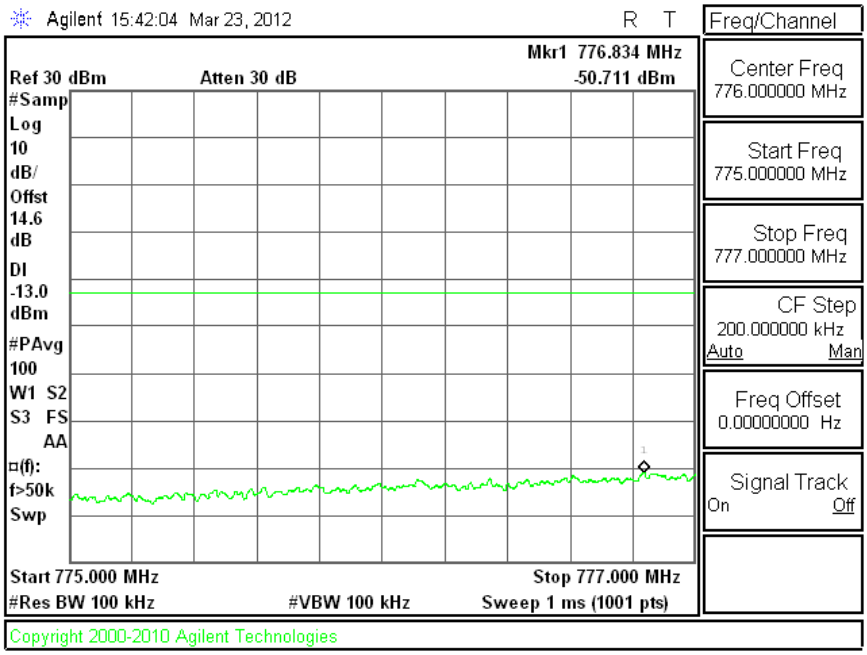
RB1-0



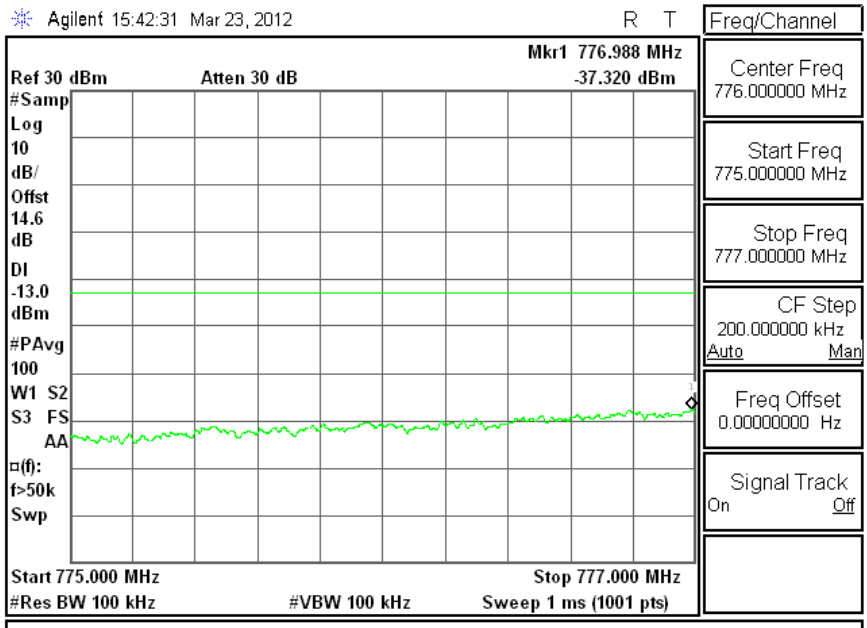

RB1-24



RB12-6

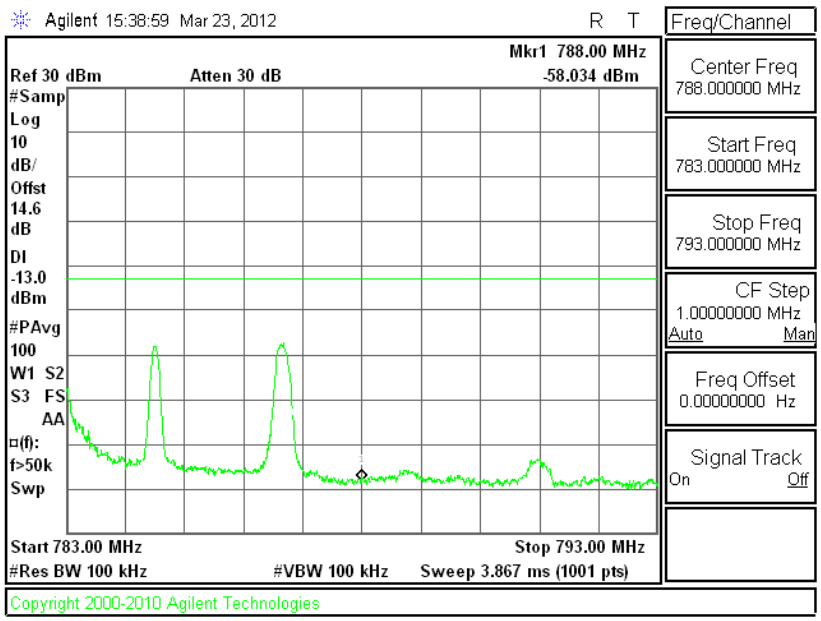



RB25-0

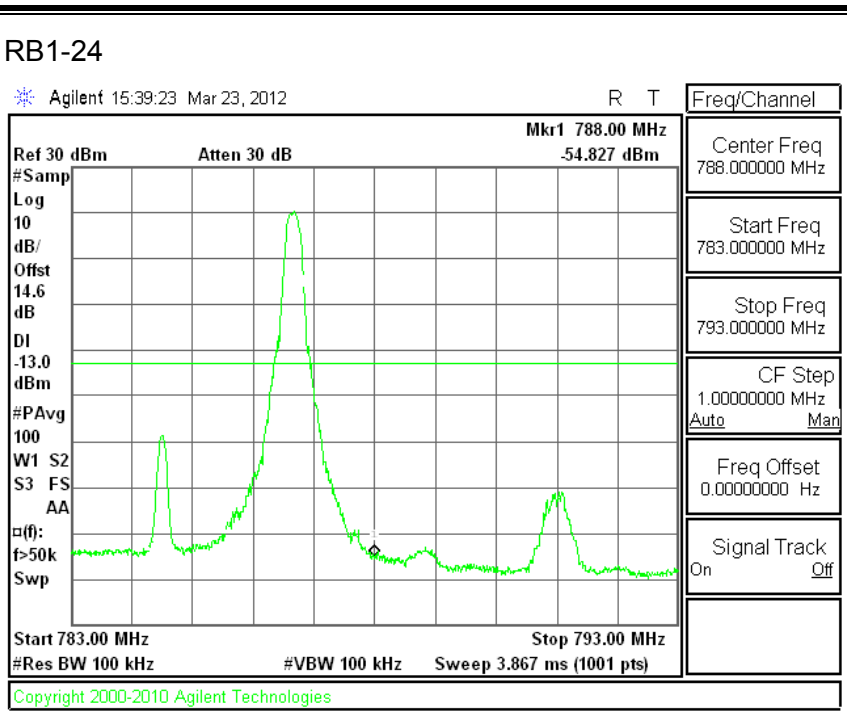


**LTE QPSK 784.5MHz Band 13, 783 - 793MHz (5MHz Bandwidth)**

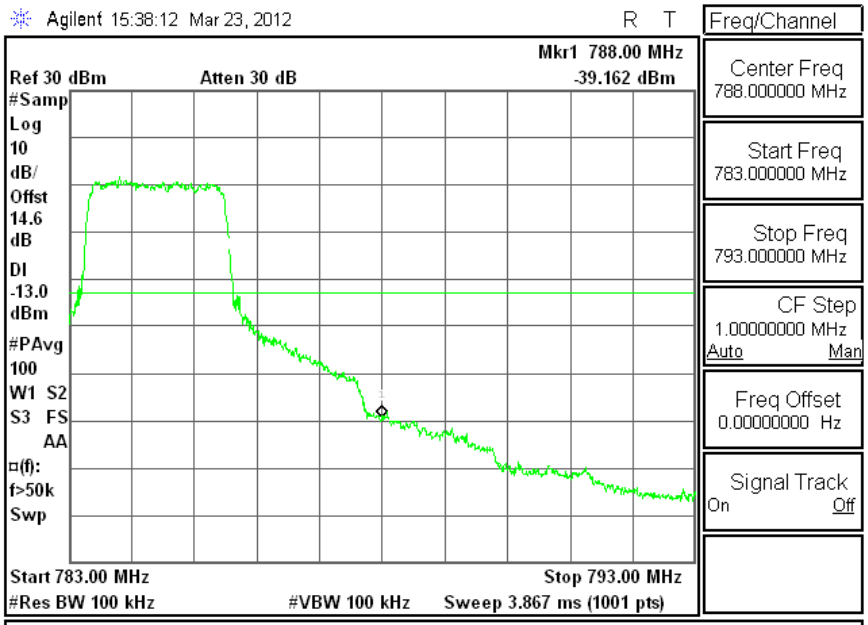
RB1-0



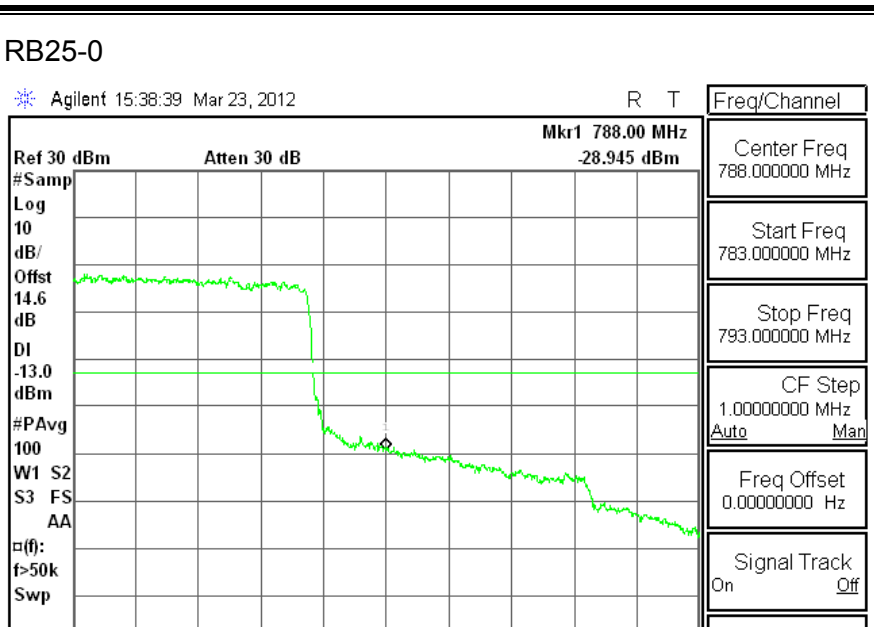

RB1-24



RB12-6

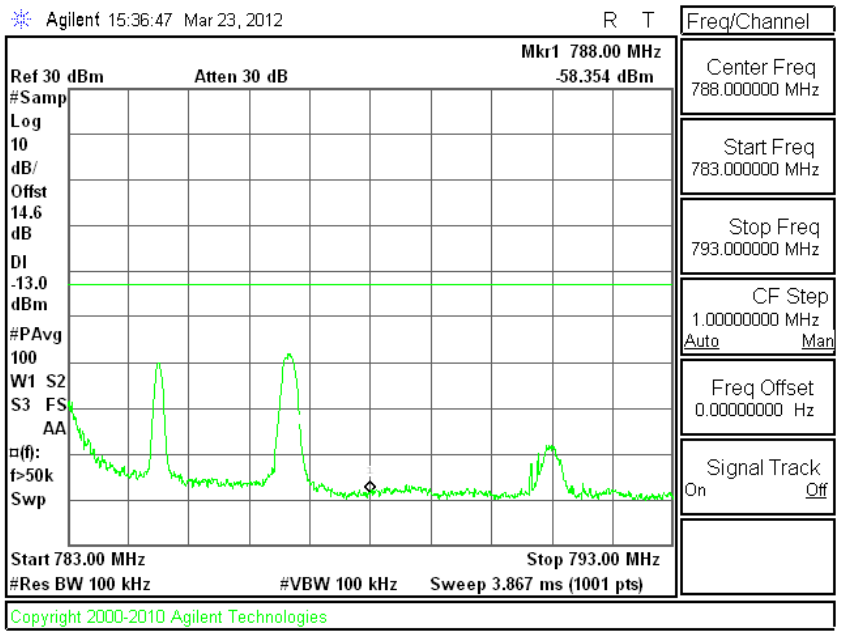



RB25-0

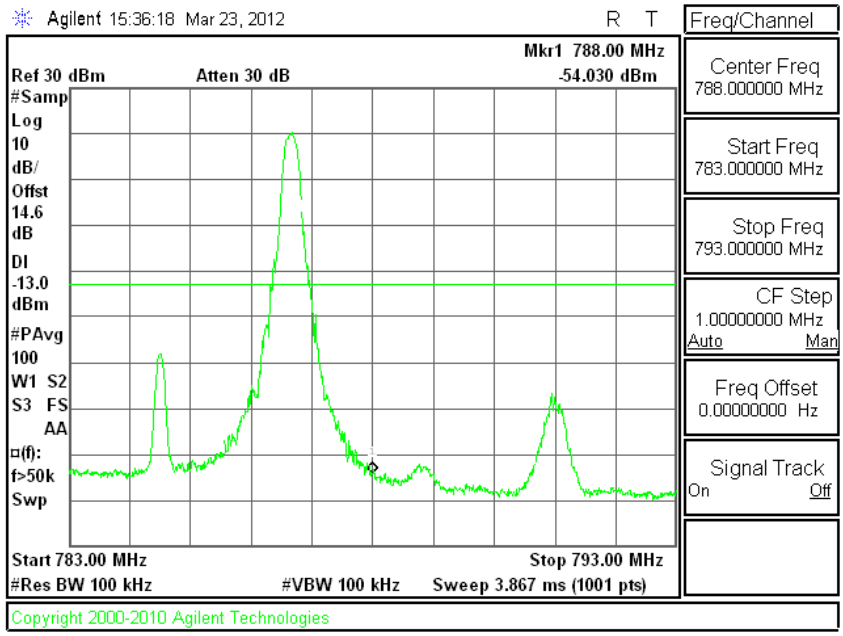



**LTE 16QAM 784.5MHz Band 13, 783 - 793MHz (5MHz Bandwidth)**

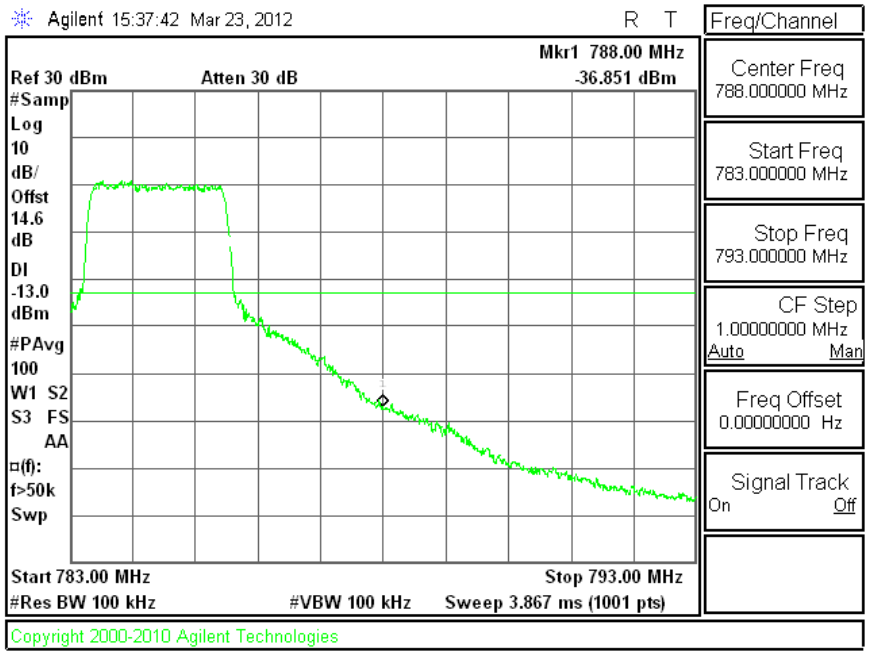
RB1-0



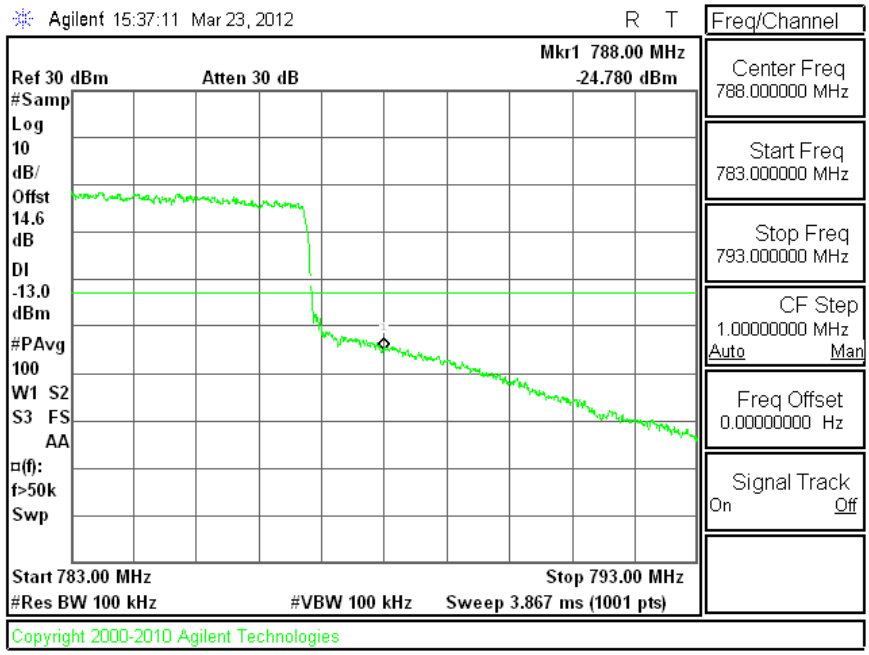

RB1-24



RB12-6

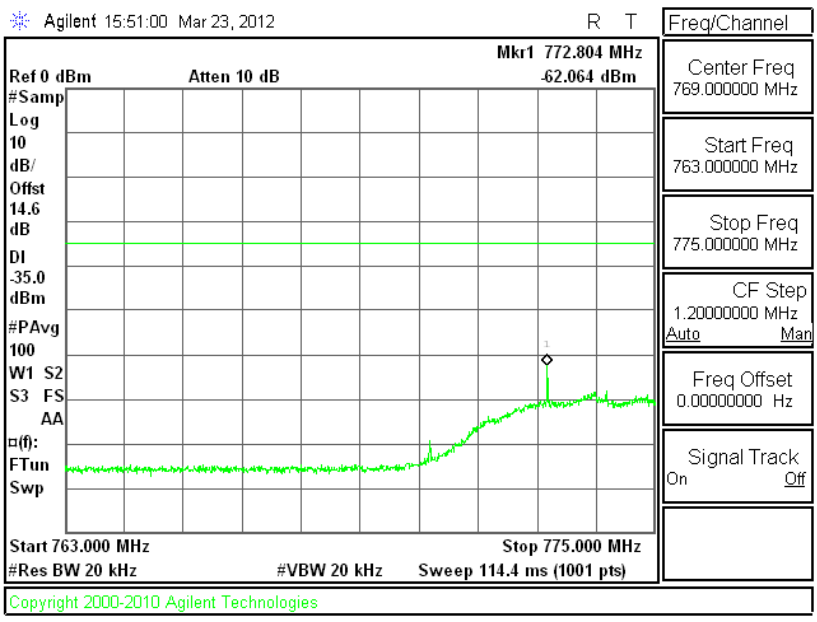



RB25-0

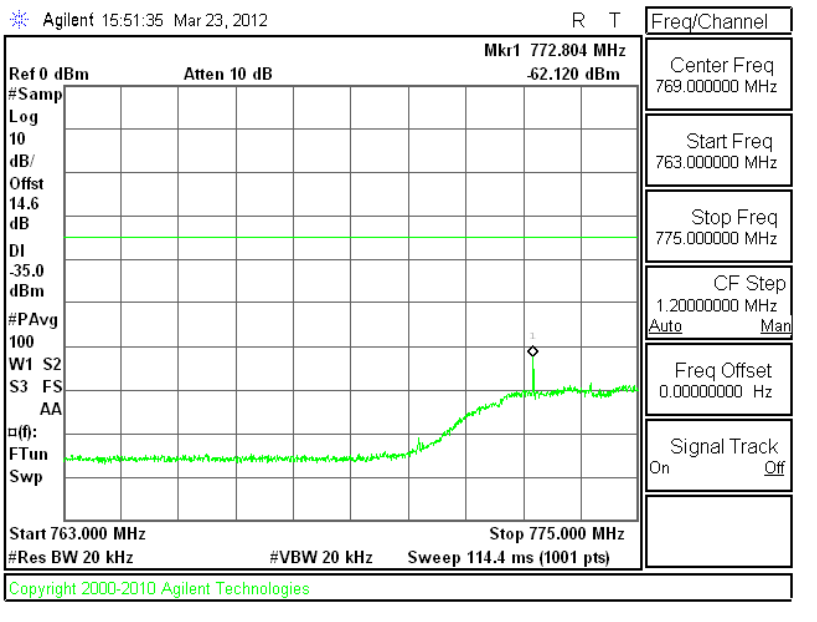


**LTE QPSK 784.5MHz Band 13, 763 - 775MHz (5MHz Bandwidth)**

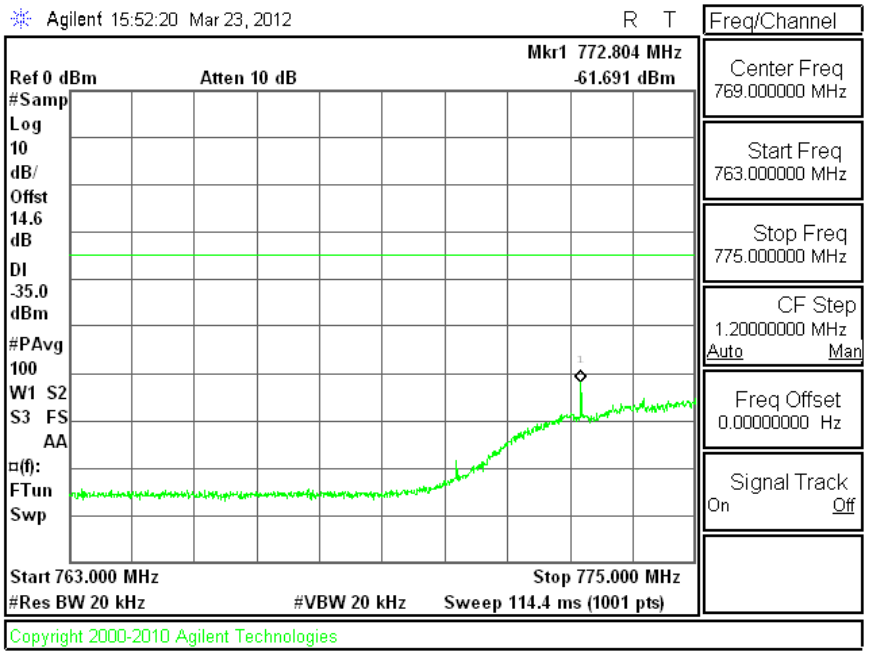
RB1-0



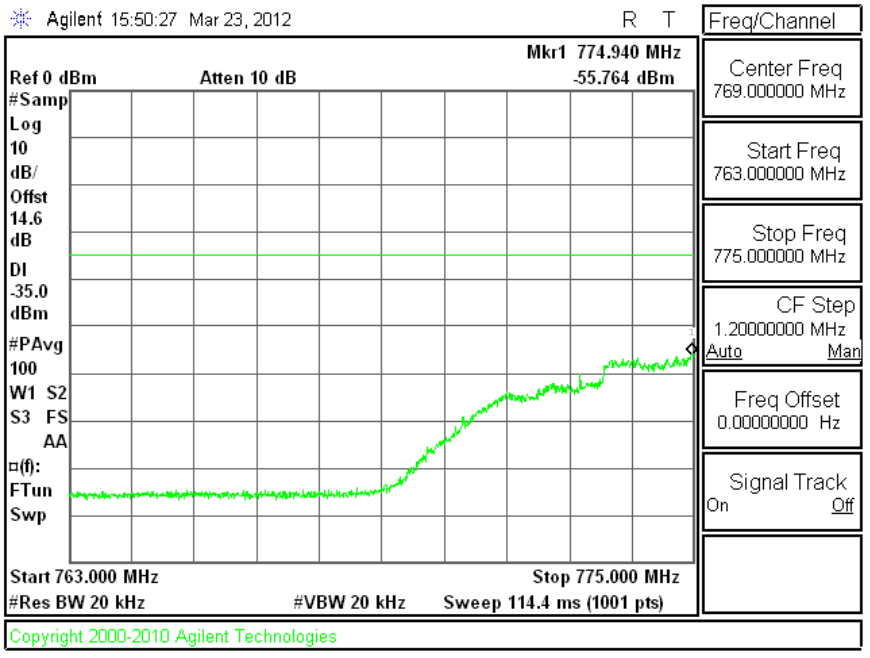

RB1-24



RB12-6

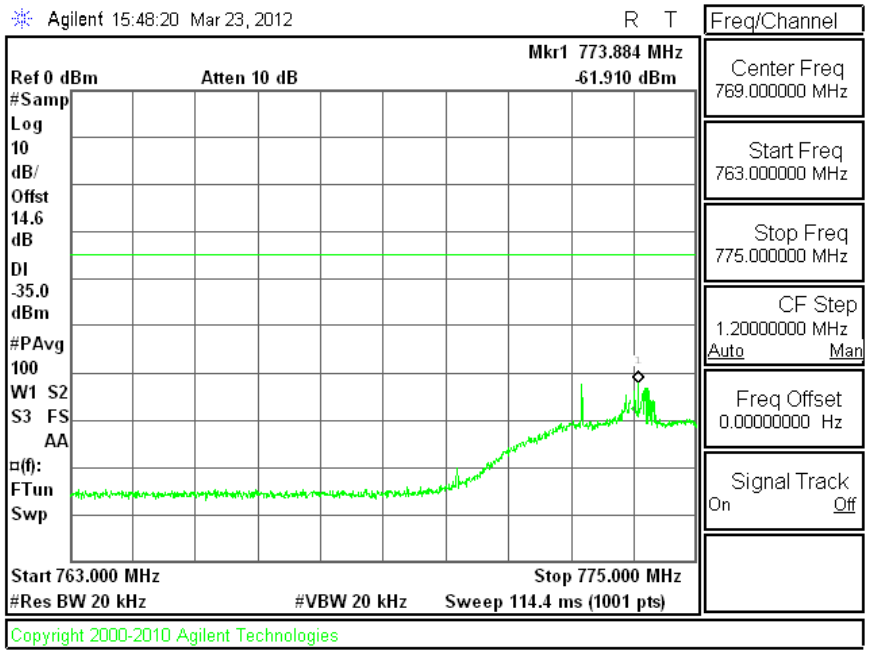



RB25-0

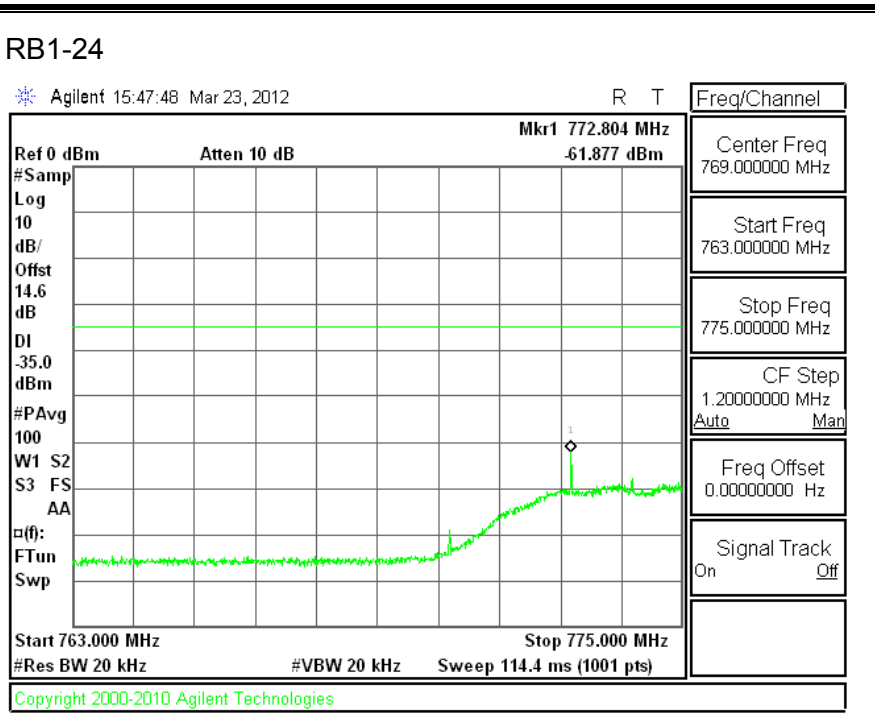


**LTE 16QAM 784.5MHz Band 13, 763-775MHz (5MHz Bandwidth)**

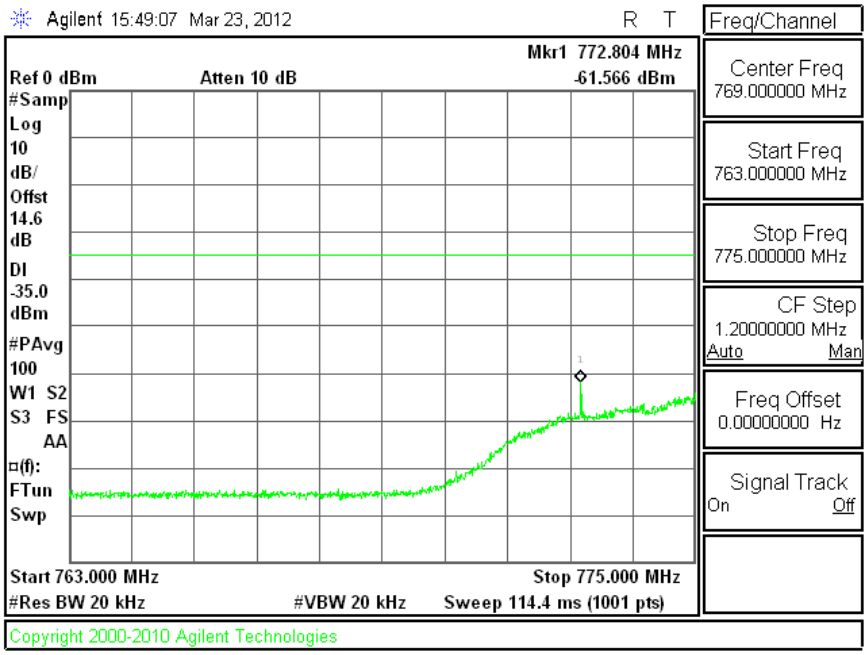
RB1-0



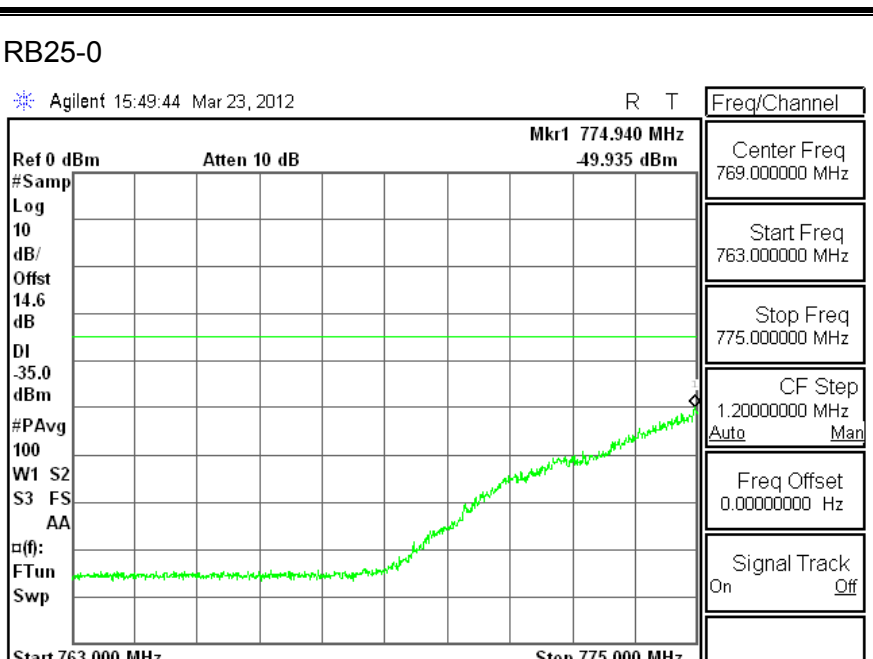

RB1-24



RB12-6

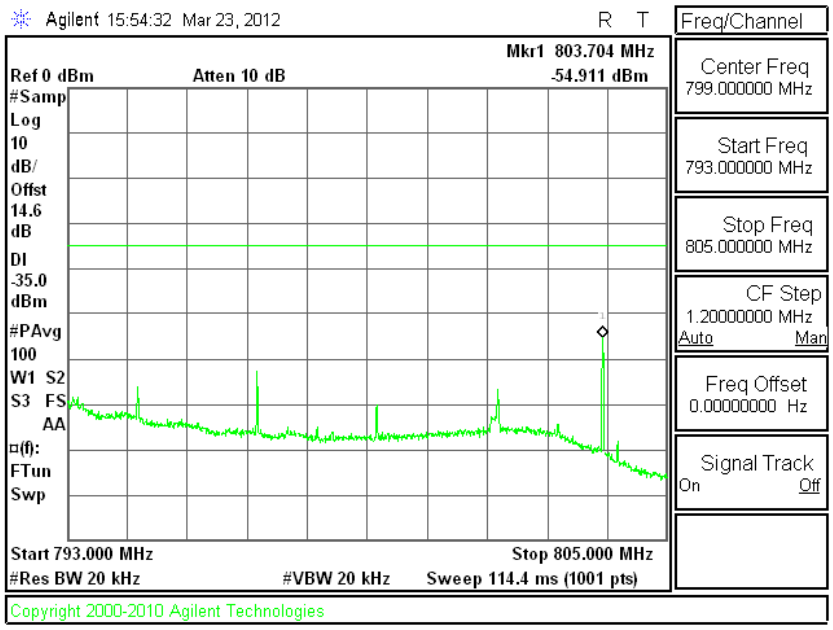



RB25-0

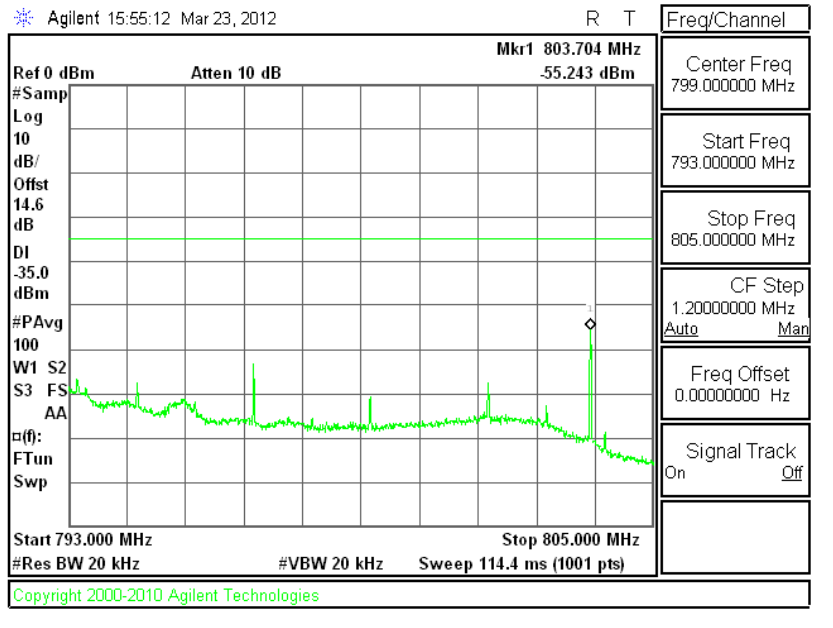


**LTE QPSK 784.5MHz Band 13, 793 - 805MHz (5MHz Bandwidth)**

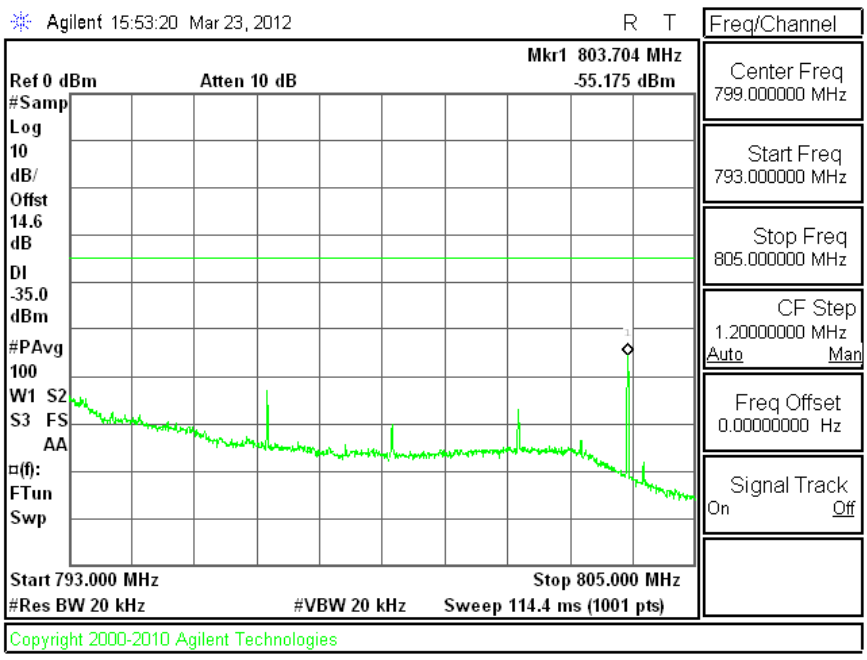
RB1-0



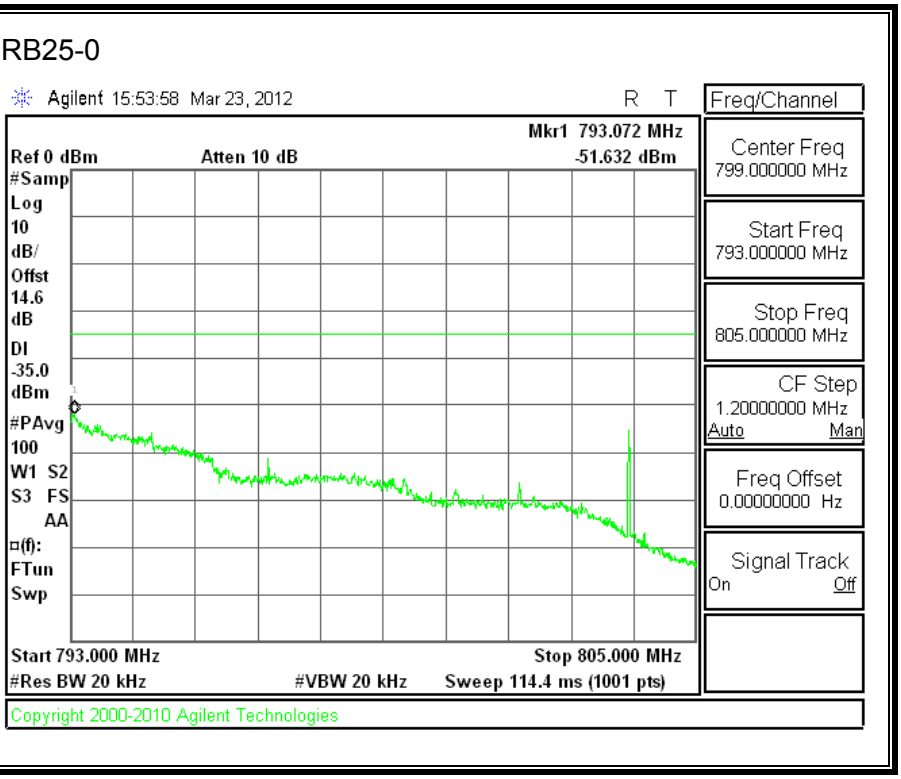

RB1-24



RB12-6

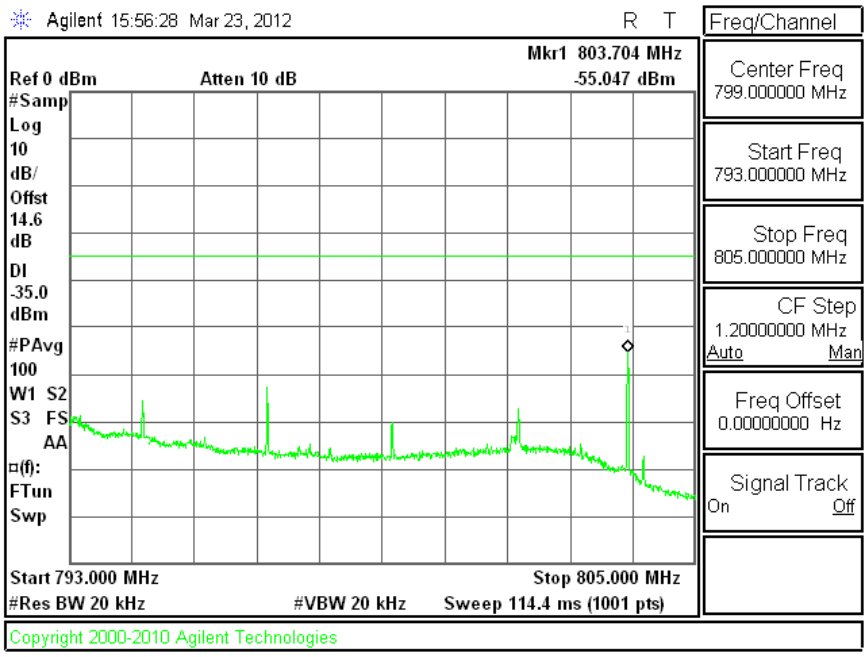



RB25-0

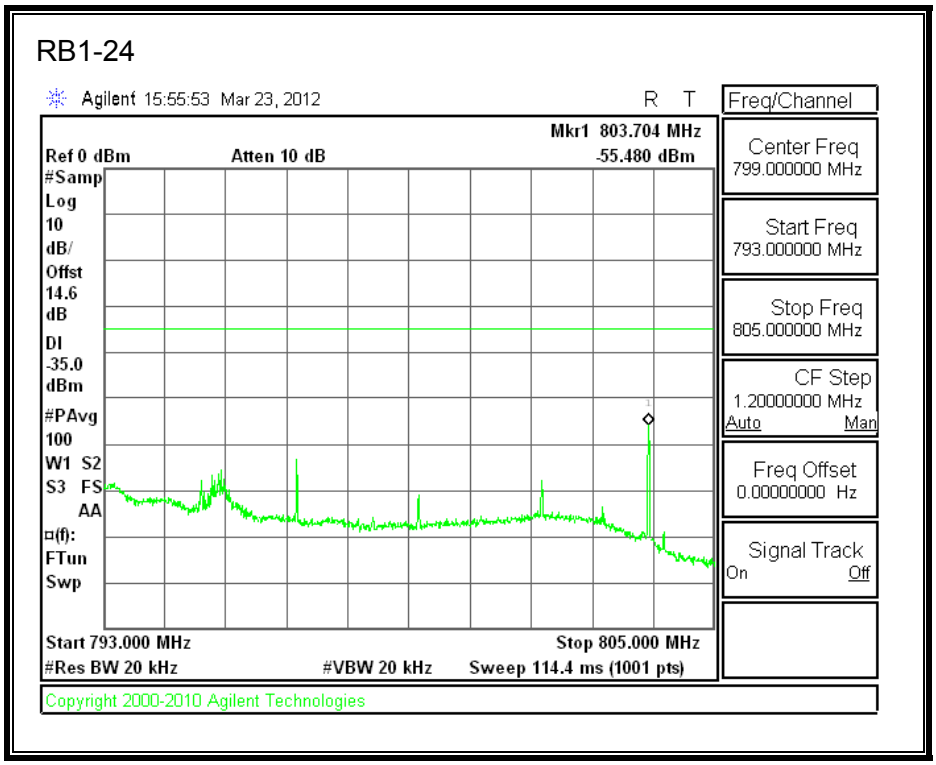


**LTE 16QAM 784.5MhZ Band 13, 793 - 805MHz (5MHz Bandwidth)**

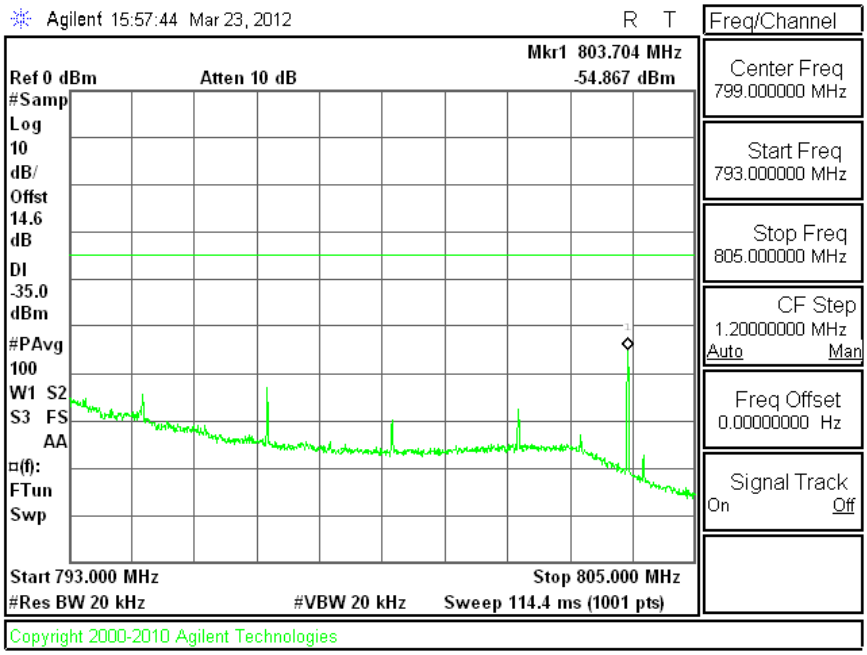
RB1-0



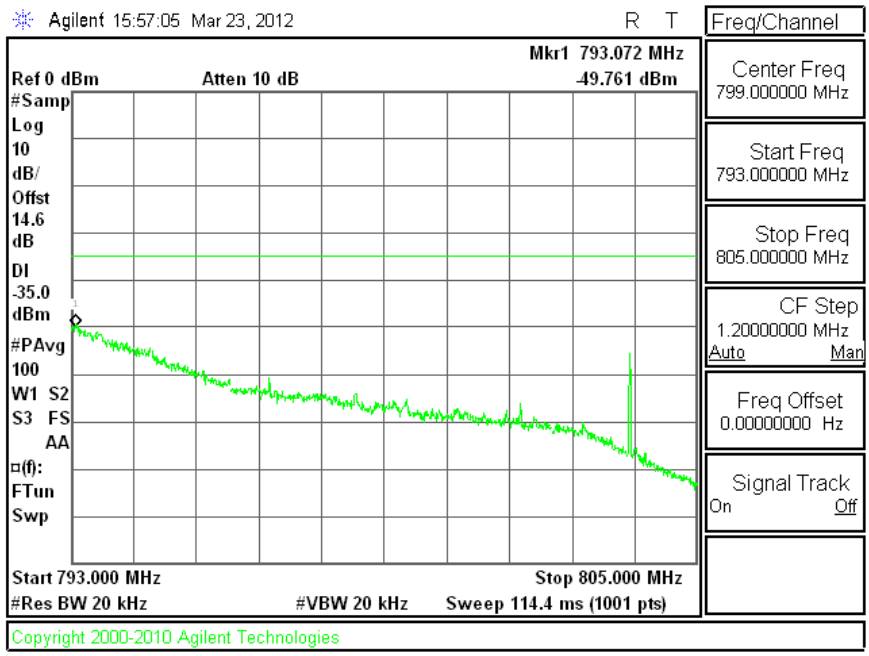

RB1-24



RB12-6




RB25-0



## 7.2. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §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 RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

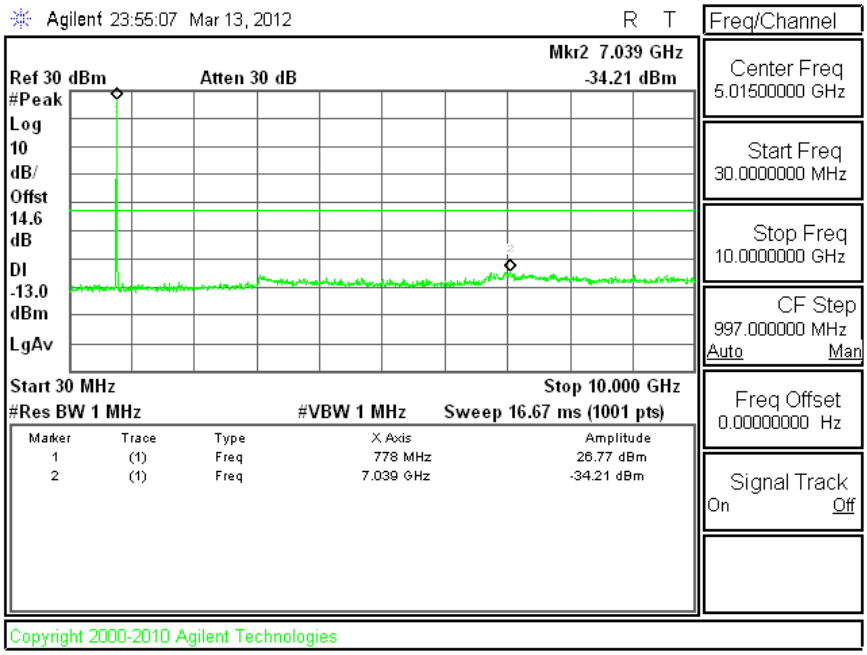
**MODES TESTED**

- LTE BAND 13

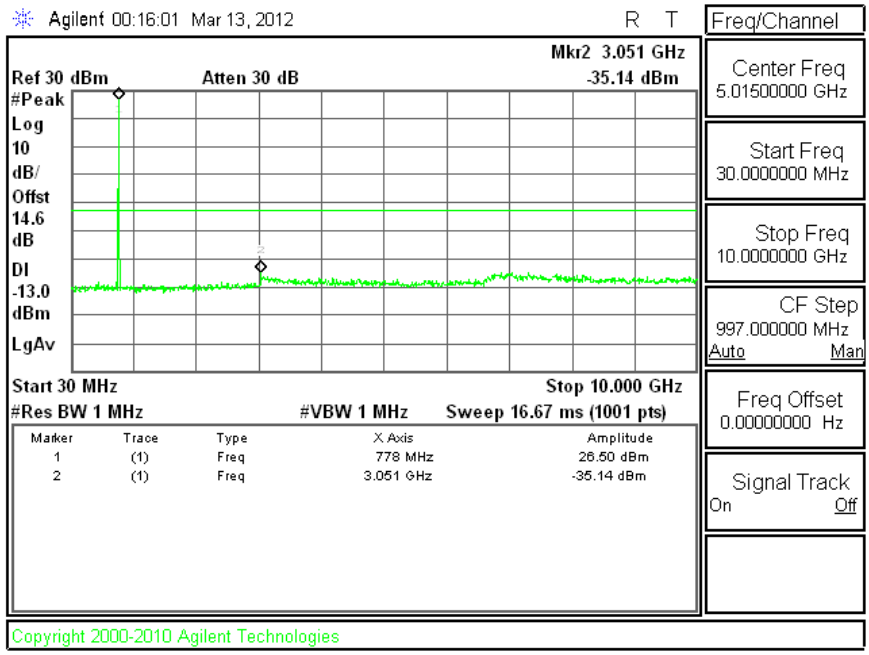
**RESULTS**

**LTE QPSK Band 13 (5MHz BAND WIDTH )**

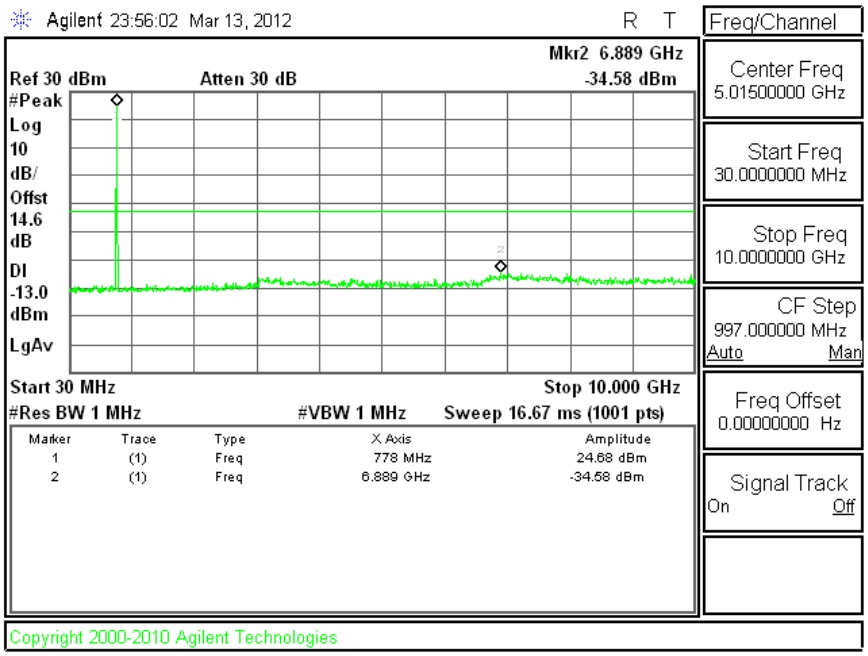
LOW, RB1-0, 30 TO 10000 MHz



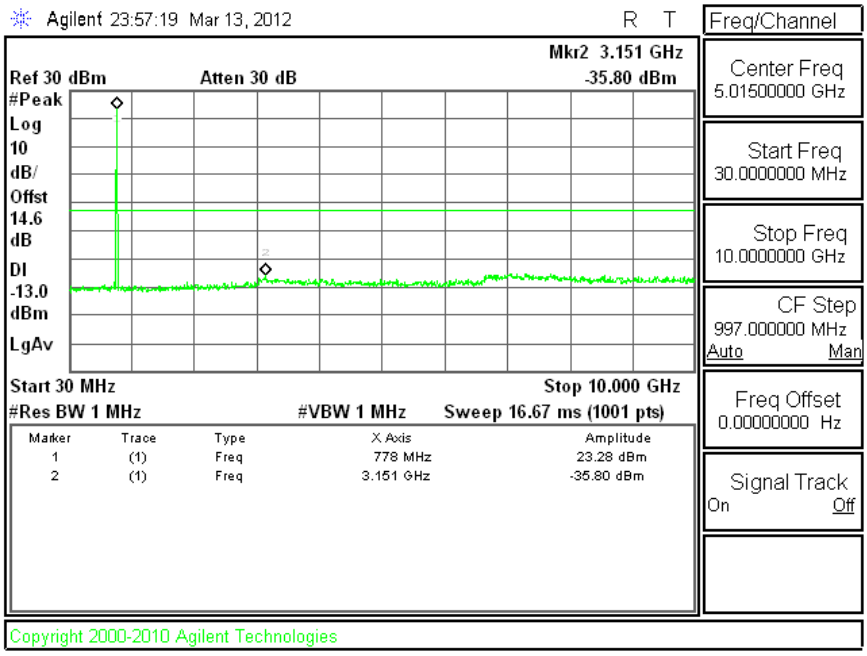

LOW, RB1-24, 30 TO 10000 MHz



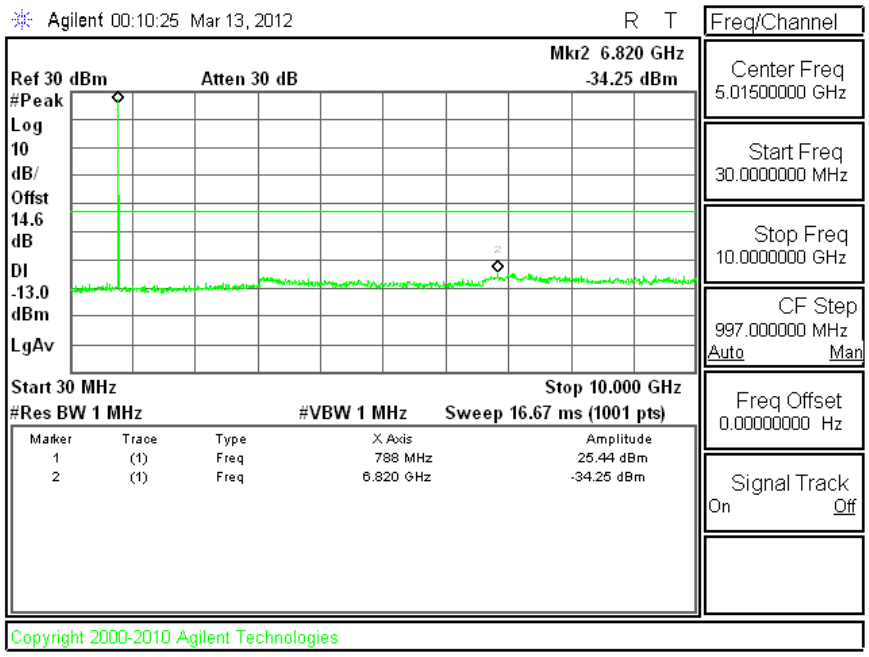
LOW, RB25_12, 30 TO 10000 MHz



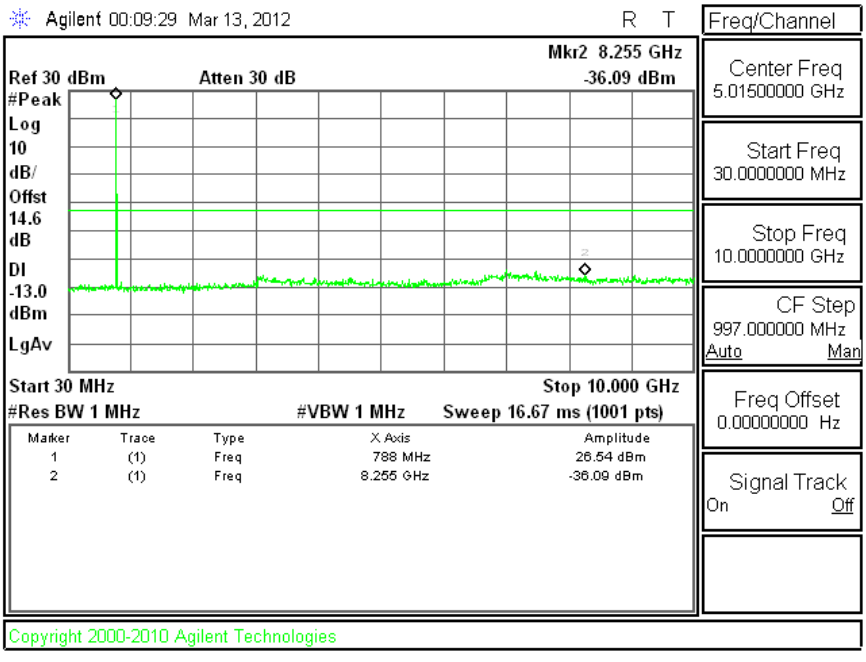

LOW, RB25_0, 30 TO 10000 MHz



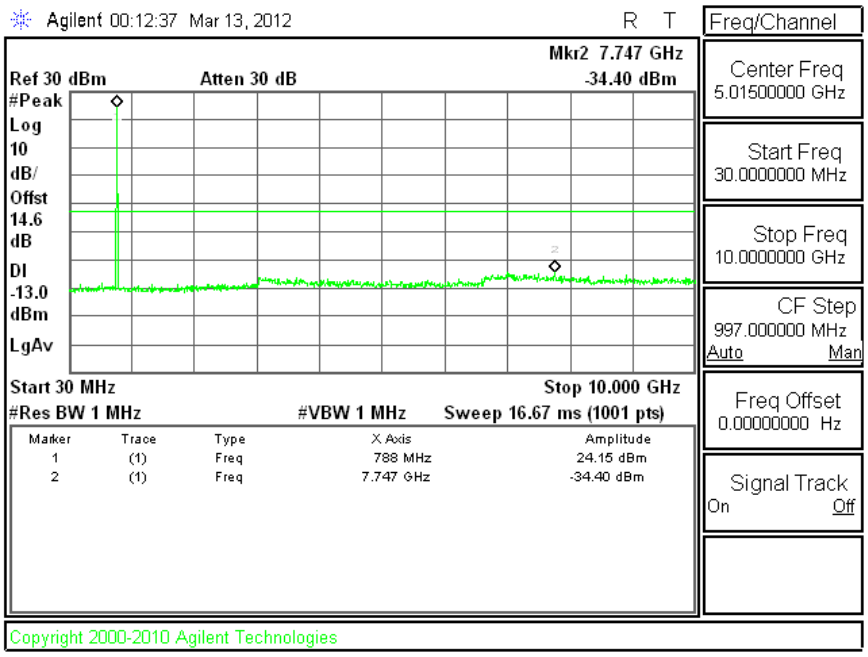
HIGH, RB1_0, 30 TO 10000 MHz



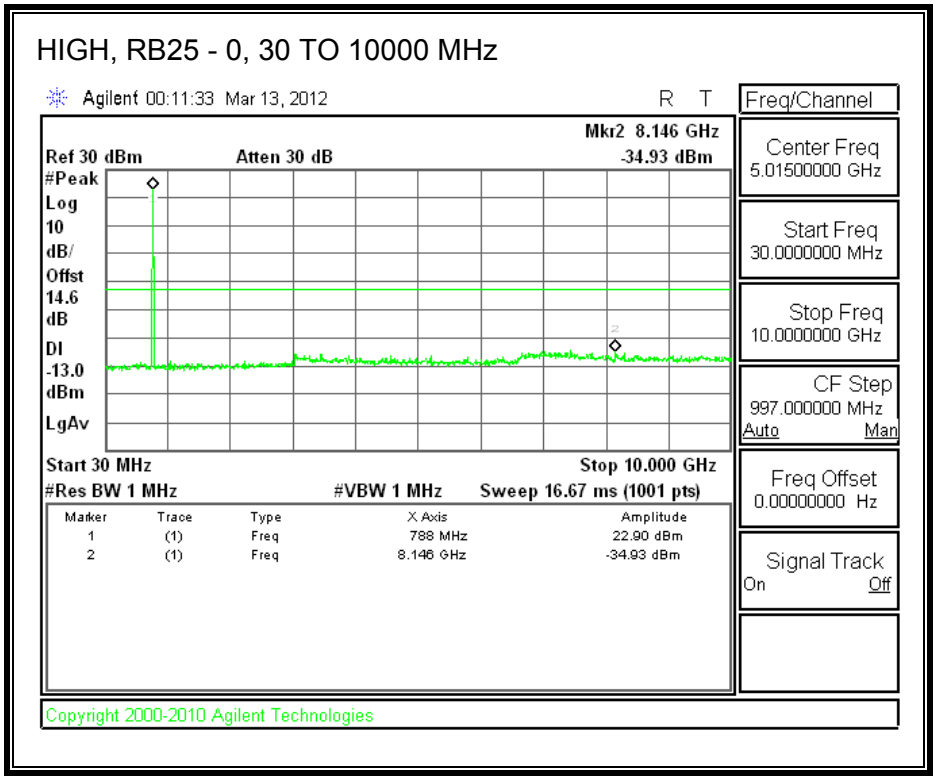

HIGH, RB1_24, 30 TO 10000 MHz



HIGH, RB12_6, 30 TO 10000 MHz

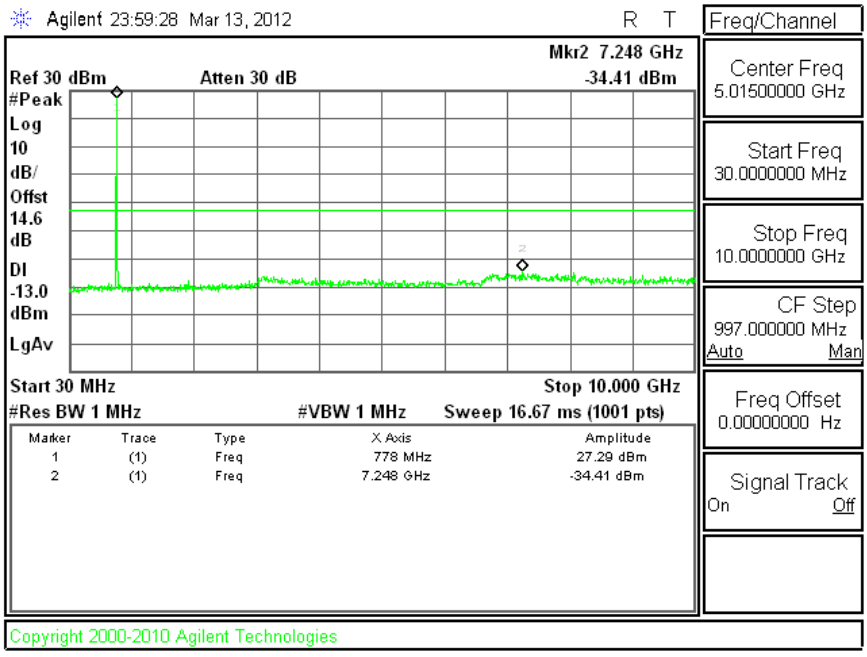



HIGH, RB25 - 0, 30 TO 10000 MHz

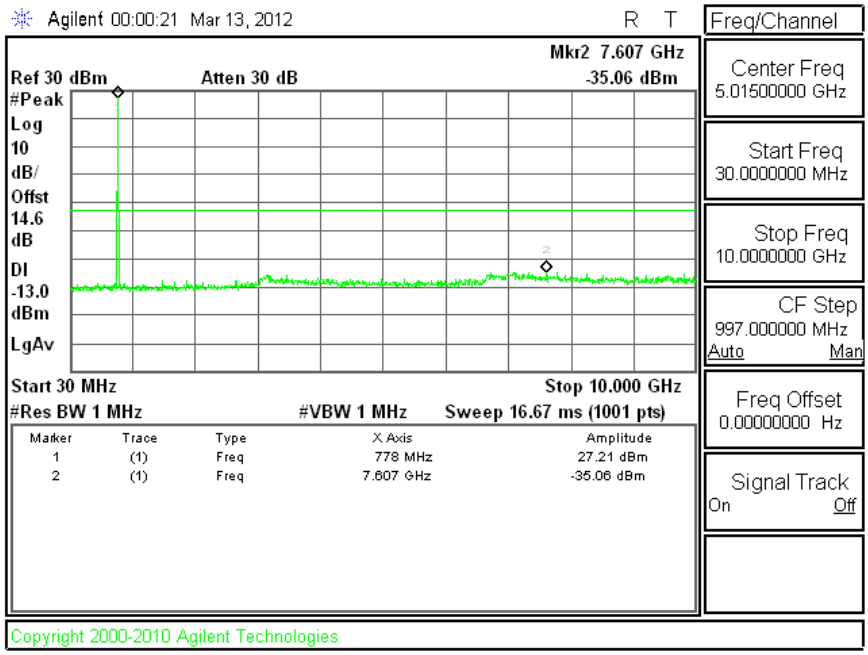


**LTE 16QAM Band 13 (5MHz BAND WIDTH)**

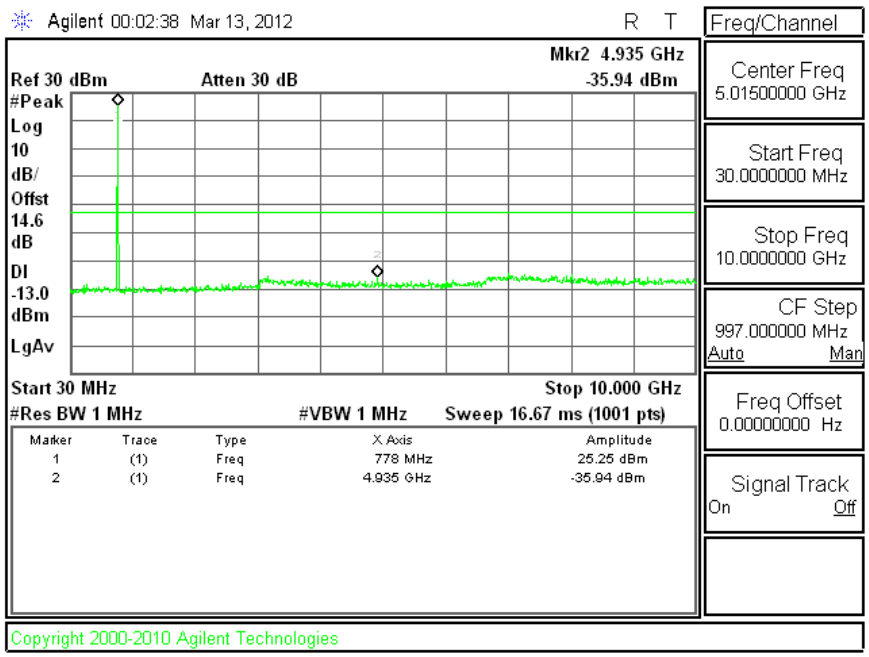
LOW, RB1_0, 30 TO 10000 MHz



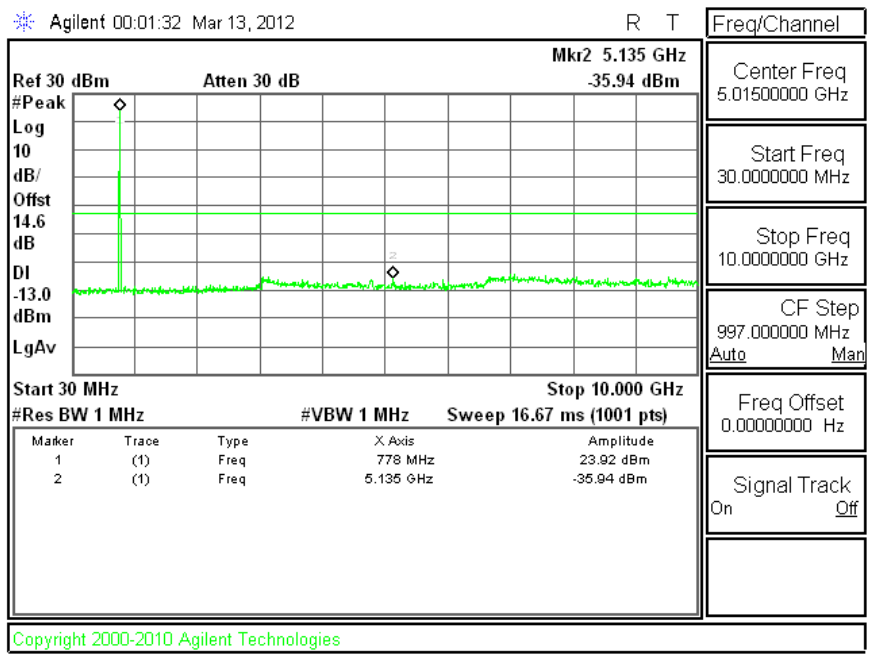

LOW, RB1_24, 30 TO 10000 MHz



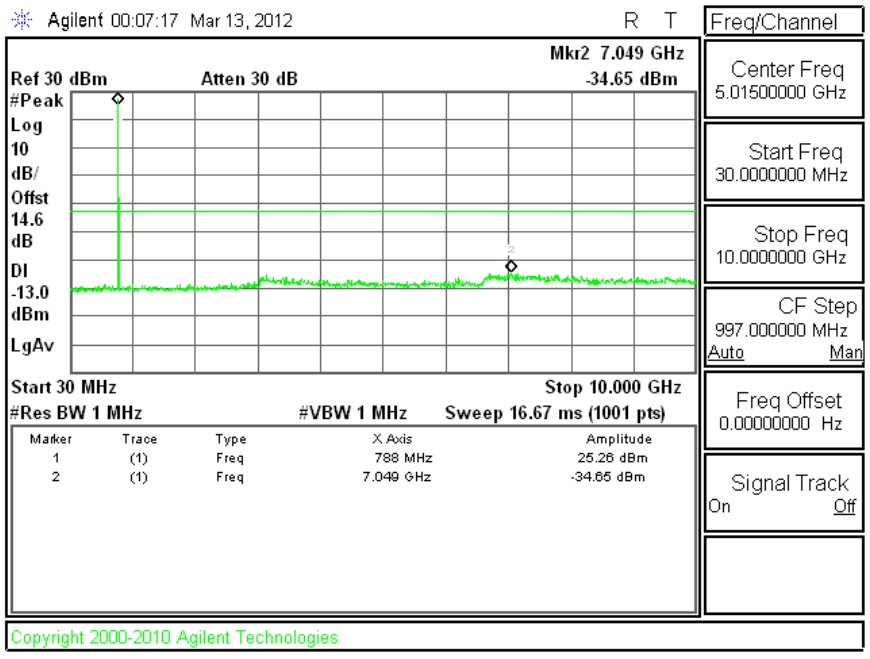
LOW, RB12_6, 30 TO 10000 MHz



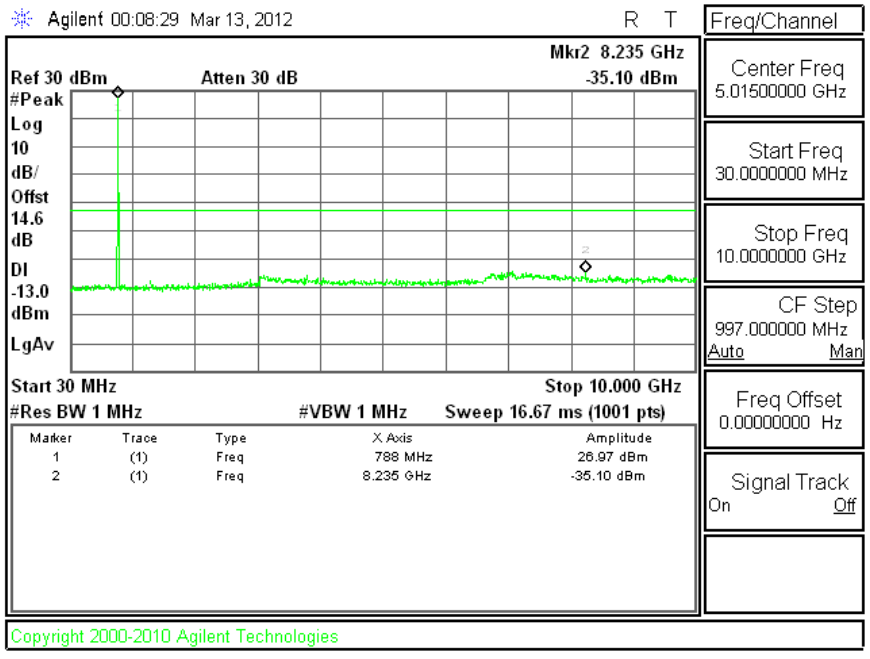

LOW, RB25 - 0, 30 TO 10000 MHz



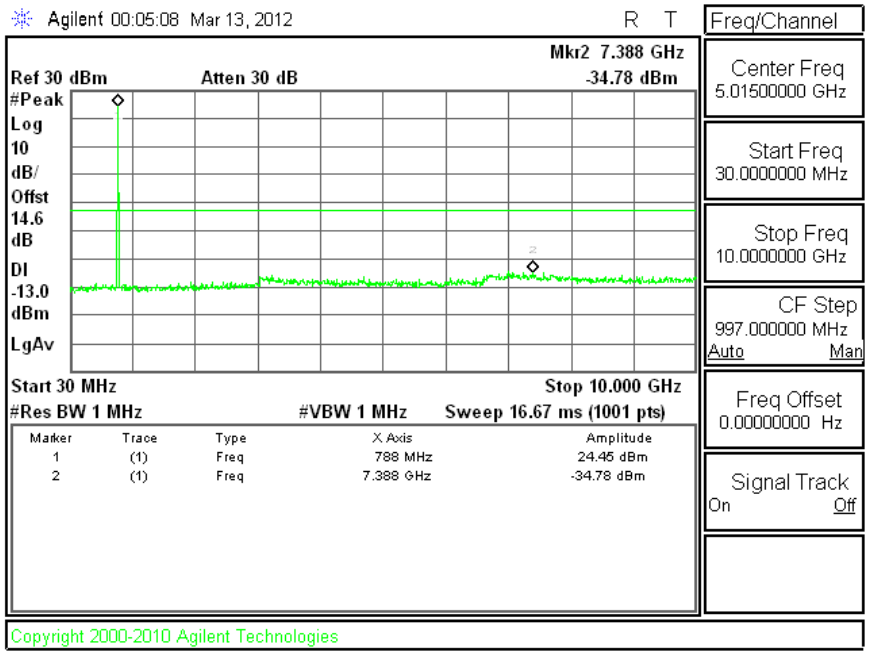
HIGH, RB1_0, 30 TO 10000 MHz



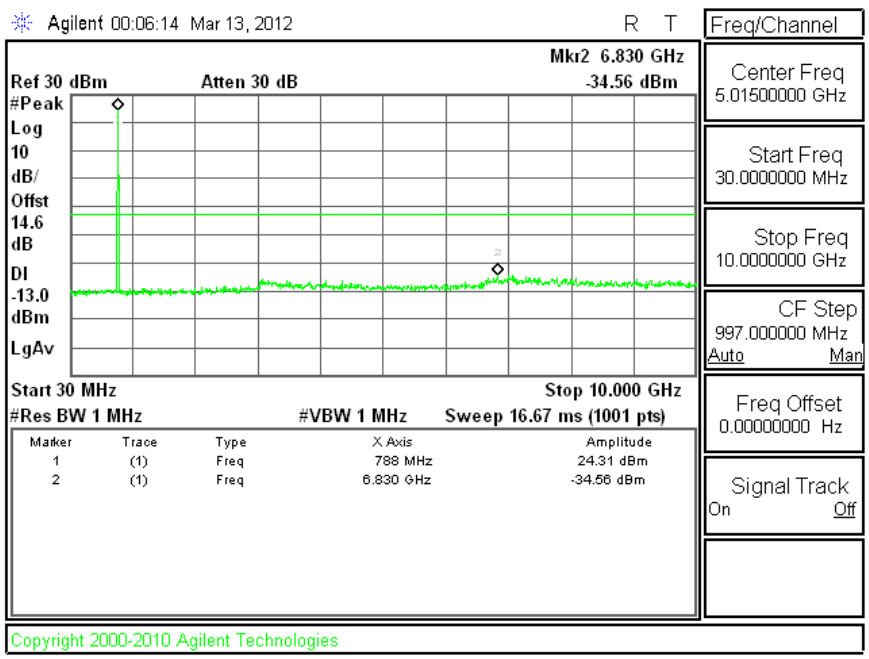

HIGH, RB1_24, 30 TO 10000 MHz



HIGH, RB12_6, 30 TO 10000 MHz

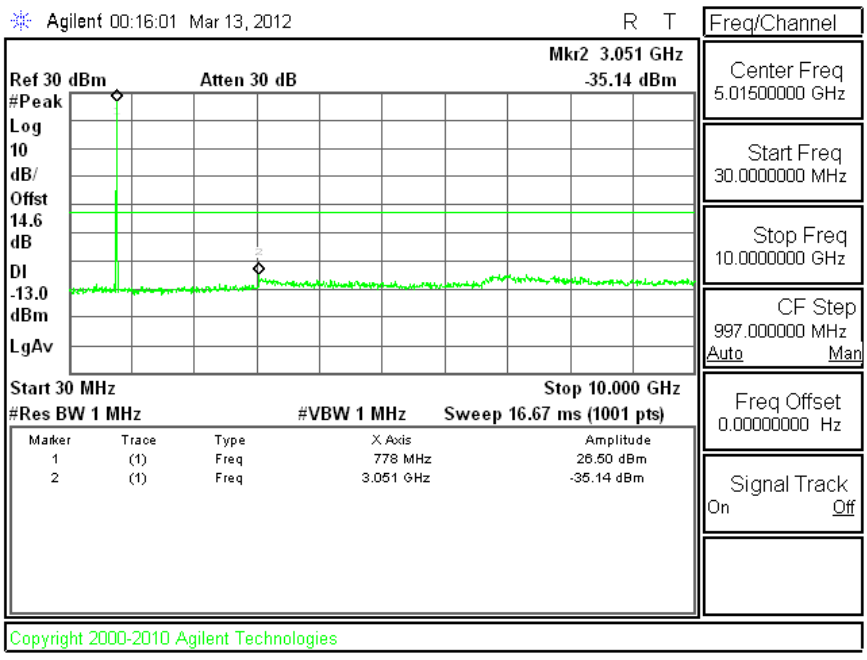



HIGH, RB25 - 0, 30 TO 10000 MHz

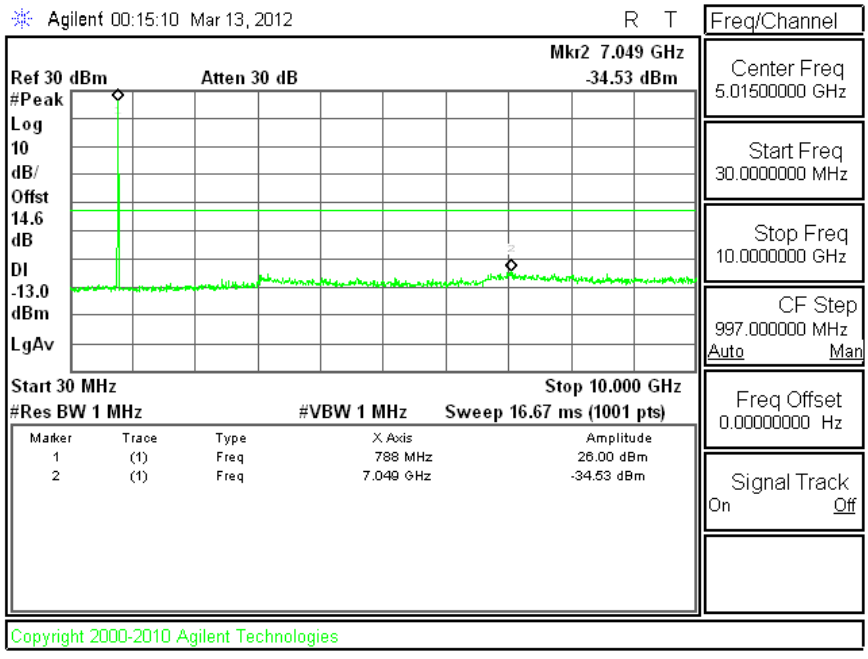


**LTE QPSK Band 13 (10MHz BAND WIDTH)**

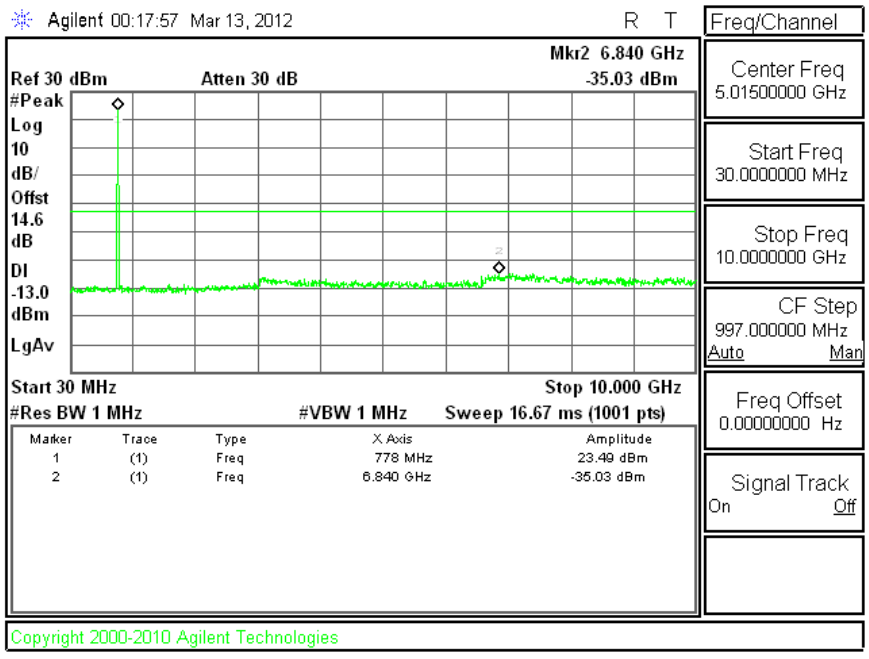
MID, RB1-0, 30 TO 10000 MHz



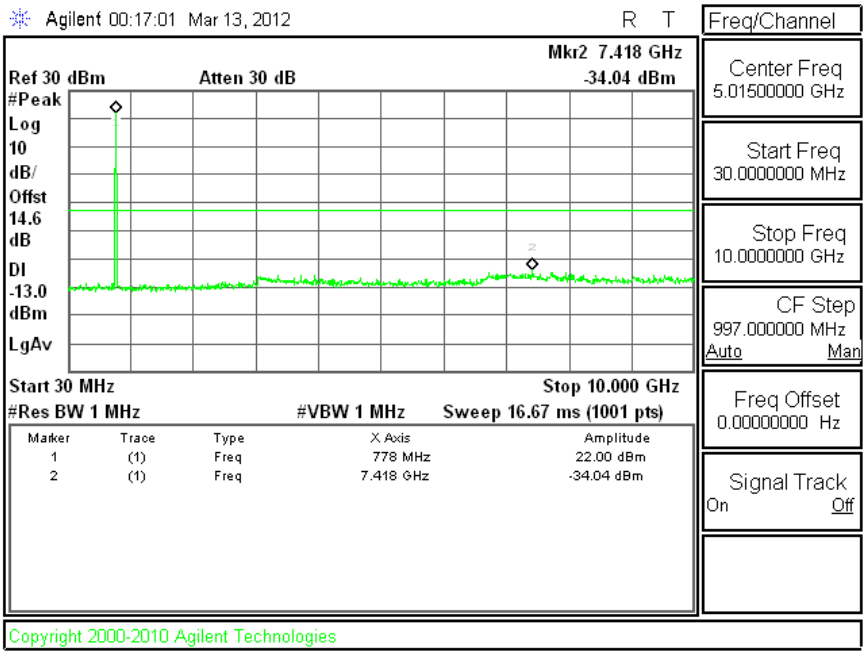

MID, RB1-49, 30 TO 10000 MHz



MID, RB25_12, 30 TO 10000 MHz

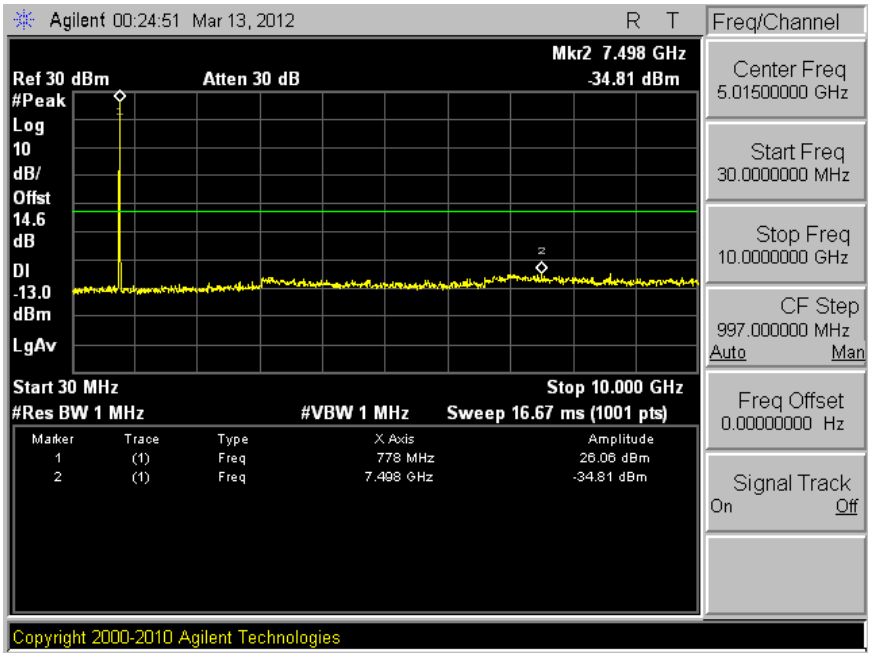



MID, RB50_0, 30 TO 10000 MHz

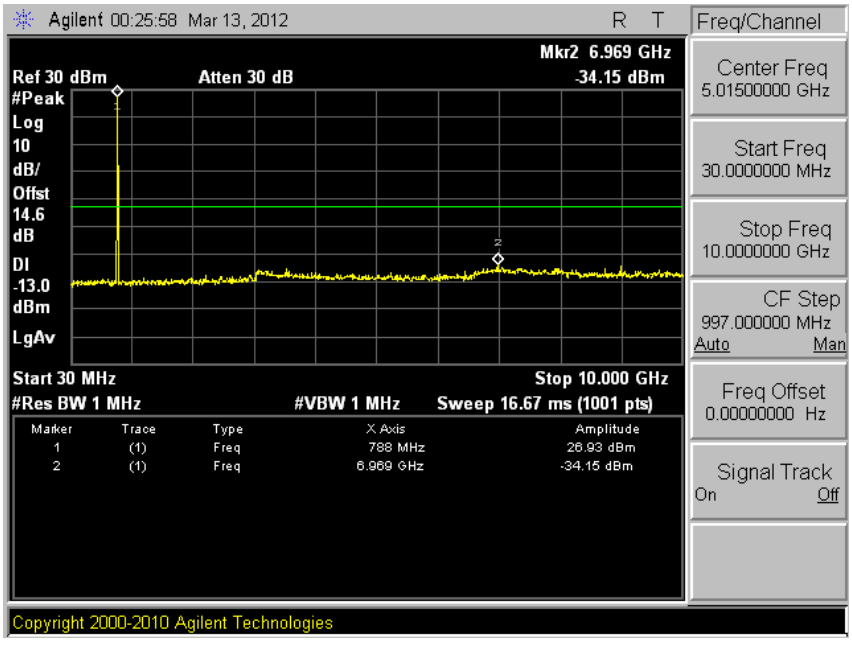


**LTE 16QAM Band 13 (10MHz BAND WIDTH)**

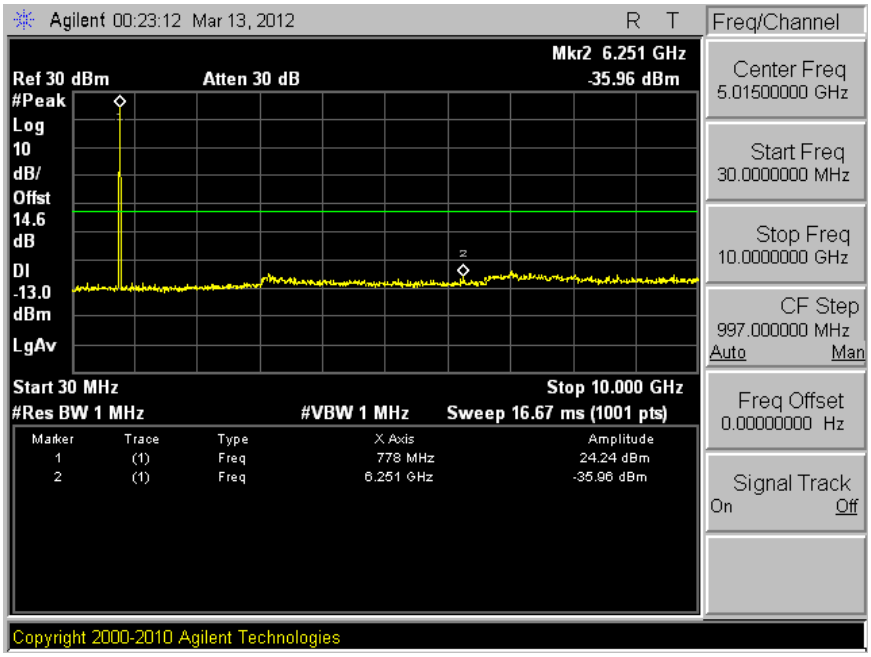
MID, RB1-0, 30 TO 10000 MHz



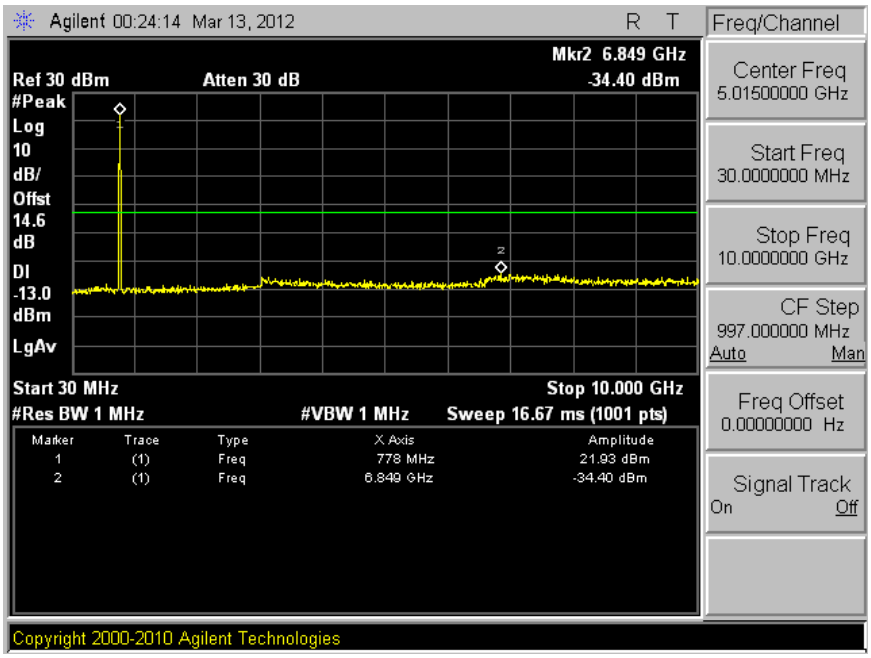

MID, RB1-49, 30 TO 10000 MHz



MID, RB25_12, 30 TO 10000 MHz




MID, RB50_0, 30 TO 10000 MHz



# 8. RADIATED TEST RESULTS

## 8.1. FIELD STRENGTH OF SPURIOUS RADIATION

**RULE PART(S)**

FCC: §2.1053, §27.53.

**LIMIT**

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

**TEST PROCEDURE**

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

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

**MODES TESTED**

- LTE BAND 13

**ERP LTE QPSK Band 13 (5 & 10MHz BAND WIDTH)**

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

**Company:** SIERRA WIRELESS
**Project #:** 11U14140
**Date:** 03/13/12
**Test Engineer:** MENGISTU MEKURIA
**Configuration:** EUT WITH TEST JIG AND AC ADAPTER
**Mode:** TX, QPSK MODE

| Chamber | Pre-amplifer | Filter | Limit |
|---|---|---|---|
| 5m Chamber B | T145 8449B | Filter 1 | Part 27 |

| f GHz | SG reading (dBm) | Ant. Pol. (H/V) | Distance (m) | Preamp (dB) | Filter (dB) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| LOW CHANNEL (779.5 MHz) | | | | | | | | | |
| RB1_0 | | | | | | | | | |
| 1.555 | -24.7 | V | 3.0 | 35.6 | 1.0 | -59.3 | -13.0 | -46.3 | |
| 2.332 | -21.5 | V | 3.0 | 35.4 | 1.0 | -55.9 | -13.0 | -42.9 | |
| 1.555 | -21.6 | H | 3.0 | 35.6 | 1.0 | -56.2 | -13.0 | -43.2 | |
| 2.332 | -22.6 | H | 3.0 | 35.4 | 1.0 | -57.0 | -13.0 | -44.0 | |
| | | | | | | | | | |
| RB1_24 | | | | | | | | | |
| 1.563 | -25.2 | V | 3.0 | 35.6 | 1.0 | -59.8 | -13.0 | -46.8 | |
| 2.345 | -21.9 | V | 3.0 | 35.4 | 1.0 | -56.4 | -13.0 | -43.4 | |
| 1.563 | -23.8 | H | 3.0 | 35.6 | 1.0 | -58.4 | -13.0 | -45.4 | |
| 2.345 | -22.8 | H | 3.0 | 35.4 | 1.0 | -57.2 | -13.0 | -44.2 | |
| | | | | | | | | | |
| MID CHANNEL (782.0 MHz) | | | | | | | | | |
| RB1_0 | | | | | | | | | |
| 1.556 | -23.0 | V | 3.0 | 35.6 | 1.0 | -57.6 | -13.0 | -44.6 | |
| 2.333 | -21.7 | V | 3.0 | 35.4 | 1.0 | -56.1 | -13.0 | -43.1 | |
| 1.556 | -22.9 | H | 3.0 | 35.6 | 1.0 | -57.5 | -13.0 | -44.5 | |
| 2.333 | -22.8 | H | 3.0 | 35.4 | 1.0 | -57.3 | -13.0 | -44.3 | |
| | | | | | | | | | |
| RB1_49 | | | | | | | | | |
| 1.573 | -25.5 | V | 3.0 | 35.6 | 1.0 | -60.1 | -13.0 | -47.1 | |
| 2.360 | -22.3 | V | 3.0 | 35.4 | 1.0 | -56.7 | -13.0 | -43.7 | |
| 1.573 | -23.8 | H | 3.0 | 35.6 | 1.0 | -58.4 | -13.0 | -45.4 | |
| 2.360 | -23.6 | H | 3.0 | 35.4 | 1.0 | -58.0 | -13.0 | -45.0 | |
| | | | | | | | | | |
| HIGH CHANNEL (784.5MHz) | | | | | | | | | |
| RB1_0 | | | | | | | | | |
| 1.565 | -24.8 | V | 3.0 | 35.6 | 1.0 | -59.4 | -13.0 | -46.4 | |
| 2.347 | -22.1 | V | 3.0 | 35.4 | 1.0 | -56.5 | -13.0 | -43.5 | |
| 1.565 | -22.8 | H | 3.0 | 35.6 | 1.0 | -57.4 | -13.0 | -44.4 | |
| 2.347 | -22.6 | H | 3.0 | 35.4 | 1.0 | -57.1 | -13.0 | -44.1 | |
| | | | | | | | | | |
| RB1_24 | | | | | | | | | |
| 1.573 | -26.5 | V | 3.0 | 35.6 | 1.0 | -61.1 | -13.0 | -48.1 | |
| 2.360 | -22.2 | V | 3.0 | 35.4 | 1.0 | -56.6 | -13.0 | -43.6 | |
| 1.573 | -22.6 | H | 3.0 | 35.6 | 1.0 | -57.2 | -13.0 | -44.2 | |
| 2.360 | -24.0 | H | 3.0 | 35.4 | 1.0 | -58.5 | -13.0 | -45.5 | |

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

**ERP LTE 16QAM Band 13 (5 & 10MHz BAND WIDTH)**

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

**Company:** SIERRA WIRELESS
**Project #:** 11U14140
**Date:** 03/13/12
**Test Engineer:** MENGISTU MEKURIA
**Configuration:** EUT WITH TEST JIG AND AC ADAPTER
**Mode:** TX, 16QAM MODE

| Chamber | Pre-amplifer | Filter | Limit |
|---|---|---|---|
| 5m Chamber B | T145 8449B | Filter 1 | Part 27 |

| f GHz | SG reading (dBm) | Ant. Pol. (H/V) | Distance (m) | Preamp (dB) | Filter (dB) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| LOW CHANNEL (779.5 MHz) | | | | | | | | | |
| RB1_0 | | | | | | | | | |
| 1.555 | -24.3 | V | 3.0 | 35.6 | 1.0 | -58.9 | -13.0 | -45.9 | |
| 2.332 | -21.6 | V | 3.0 | 35.4 | 1.0 | -56.0 | -13.0 | -43.0 | |
| 1.555 | -21.7 | H | 3.0 | 35.6 | 1.0 | -56.3 | -13.0 | -43.3 | |
| 2.332 | -23.0 | H | 3.0 | 35.4 | 1.0 | -57.4 | -13.0 | -44.4 | |
| RB1_24 | | | | | | | | | |
| 1.563 | -25.0 | V | 3.0 | 35.6 | 1.0 | -59.5 | -13.0 | -46.5 | |
| 2.345 | -21.1 | V | 3.0 | 35.4 | 1.0 | -55.5 | -13.0 | -42.5 | |
| 1.563 | -23.3 | H | 3.0 | 35.6 | 1.0 | -57.9 | -13.0 | -44.9 | |
| 2.345 | -23.0 | H | 3.0 | 35.4 | 1.0 | -57.4 | -13.0 | -44.4 | |
| MID CHANNEL (782.0 MHz) | | | | | | | | | |
| RB1_0 | | | | | | | | | |
| 1.556 | -25.9 | V | 3.0 | 35.6 | 1.0 | -60.5 | -13.0 | -47.5 | |
| 2.333 | -21.4 | V | 3.0 | 35.4 | 1.0 | -55.9 | -13.0 | -42.9 | |
| 1.556 | -24.1 | H | 3.0 | 35.6 | 1.0 | -58.7 | -13.0 | -45.7 | |
| 2.333 | -22.2 | H | 3.0 | 35.4 | 1.0 | -56.6 | -13.0 | -43.6 | |
| RB1_49 | | | | | | | | | |
| 1.573 | -24.4 | V | 3.0 | 35.6 | 1.0 | -59.0 | -13.0 | -46.0 | |
| 2.360 | -20.1 | V | 3.0 | 35.4 | 1.0 | -54.5 | -13.0 | -41.5 | |
| 1.573 | 101.0 | H | 3.0 | 35.6 | 1.0 | 66.4 | -13.0 | 79.4 | |
| 2.360 | -21.8 | H | 3.0 | 35.4 | 1.0 | -56.3 | -13.0 | -43.3 | |
| HIGH CHANNEL (784.5MHz) | | | | | | | | | |
| RB1_0 | | | | | | | | | |
| 1.565 | -24.9 | V | 3.0 | 35.6 | 1.0 | -59.5 | -13.0 | -46.5 | |
| 2.347 | -22.2 | V | 3.0 | 35.4 | 1.0 | -56.6 | -13.0 | -43.6 | |
| 1.565 | -23.3 | H | 3.0 | 35.6 | 1.0 | -57.9 | -13.0 | -44.9 | |
| 2.347 | -23.3 | H | 3.0 | 35.4 | 1.0 | -57.8 | -13.0 | -44.8 | |
| RB1_24 | | | | | | | | | |
| 1.567 | -27.1 | V | 3.0 | 35.6 | 1.0 | -61.6 | -13.0 | -48.6 | |
| 2.349 | -22.3 | V | 3.0 | 35.4 | 1.0 | -56.8 | -13.0 | -43.8 | |
| 1.564 | -23.1 | H | 3.0 | 35.6 | 1.0 | -57.7 | -13.0 | -44.7 | |
| 2.353 | -24.5 | H | 3.0 | 35.4 | 1.0 | -58.9 | -13.0 | -45.9 | |

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

# 9. FREQUENCY STABILITY

**RULE PART(S)**

FCC: §27.54

**LIMITS**

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

**TEST PROCEDURE**

Use Agilent 8960 and CMW 500 with Frequency Error measurement capability.

- Temp. = −20° to +50°C
- Voltage = 115 Vac (85% - 115%)
-

**Frequency Stability vs Temperature:**

The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

**Frequency Stability vs Voltage:**

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

**MODES TESTED**

- LTE BAND 13

**RESULTS**

See the following pages.

**LTE BAND 13, QPSK MODULATION – MID CHANNEL**

| Reference Frequency: Cellular Mid Channel 781.99999486MHz @ 20°C<br>Limit: to stay +- 2.5 ppm = 1955.000 Hz | | | | |
|---|---|---|---|---|
| Power Supply | Environment | Frequency Deviation Measureed with Time Elapse | | |
| (Vdc) | Temperature (°C) | (MHz) | Delta (ppm) | Limit (ppm) |
| 5.00 | 50 | 781.9999951 | 0.000 | 2.5 |
| 5.00 | 40 | 781.9999954 | -0.001 | 2.5 |
| 5.00 | 30 | 781.9999957 | -0.001 | 2.5 |
| ***5.00*** | ***20*** | ***781.9999949*** | ***0.000*** | 2.5 |
| 5.00 | 10 | 781.9999951 | 0.000 | 2.5 |
| 5.00 | 0 | 781.9999956 | -0.001 | 2.5 |
| 5.00 | -10 | 781.9999956 | -0.001 | 2.5 |
| 5.00 | -20 | 781.9999956 | -0.001 | 2.5 |
| 5.00 | -30 | 781.9999954 | -0.001 | 2.5 |

| Reference Frequency: Cellular Mid Channel 836.600004MHz @ 20°C<br>Limit: to stay +- 2.5 ppm = 1955.000 Hz | | | | |
|---|---|---|---|---|
| Power Supply | Environment | Frequency Deviation Measureed with Time Elapse | | |
| (Vdc) | Temperature (°C) | (MHz) | Delta (ppm) | Limit (ppm) |
| ***100%*** | ***20*** | ***781.9999949*** | ***0*** | ***2.5*** |
| 85% | 20 | 781.9999940 | *0.001* | 2.5 |
| 115% | 20 | 781.9999954 | *-0.001* | 2.5 |

**LTE BAND 13, 16QAM MODULATION – MID CHANNEL**

| Reference Frequency: Cellular Mid Channel 782.00000522MHz @ 20°C<br>Limit: to stay +- 2.5 ppm = 1955.000 Hz | | | | |
|---|---|---|---|---|
| Power Supply | Environment | Frequency Deviation Measureed with Time Elapse | | |
| (Vdc) | Temperature (°C) | (MHz) | Delta (ppm) | Limit (ppm) |
| 5.00 | 50 | 782.0000058 | -0.001 | 2.5 |
| 5.00 | 40 | 782.0000053 | 0.000 | 2.5 |
| 5.00 | 30 | 782.0000052 | 0.000 | 2.5 |
| ***5.00*** | ***20*** | ***782.0000052*** | ***0*** | 2.5 |
| 5.00 | 10 | 782.0000049 | 0.000 | 2.5 |
| 5.00 | 0 | 782.0000044 | 0.001 | 2.5 |
| 5.00 | -10 | 782.0000044 | 0.001 | 2.5 |
| 5.00 | -20 | 782.0000044 | 0.001 | 2.5 |
| 5.00 | -30 | 781.9999957 | 0.012 | 2.5 |

| Reference Frequency: Cellular Mid Channel 836.600004MHz @ 20°C<br>Limit: to stay +- 2.5 ppm = 1955.000 Hz | | | | |
|---|---|---|---|---|
| Power Supply | Environment | Frequency Deviation Measureed with Time Elapse | | |
| (Vdc) | Temperature (°C) | (MHz) | Delta (ppm) | Limit (ppm) |
| ***100%*** | ***20*** | ***782.0000052*** | ***0*** | ***2.5*** |
| 85% | 20 | 782.0000047 | *0.001* | 2.5 |
| 115% | 20 | 782.0000051 | *0.000* | 2.5 |