MOTOROLA MOBILITY

MOBILE DEVICES BUSINESS

PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY

EMC TEST REPORT

Test Report Number – 24956-1 LTE

Report Date – June 14, 2012

The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Engineer, I hereby declare that the equipment tested as specified in this report conforms to the requirements indicated.

Signature:  Name: Albert J. Patapack

Title: EMC Engineer Date: June 14, 2012

This report must not be reproduced, except in full, without written approval from this laboratory.

THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY UKAS OR ANY AGENCY OF THE U.S. GOVERNMENT.

ilac-MRA UKAS TESTING

2404

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Test Report Details

All Tests, except Radiated Power, Performed By:

ADR Testing Service
Location Code: ADR LV
Motorola Mobility Inc
Product Safety and Compliance Group
600 North US Hwy 45
Libertyville, IL 60048
PH (847) 523-6167 Fax (847) 523-4538
FCC Registration Number: 316588
Industry Canada Number: 109O-1

Radiated Power Testing Performed By:

PCTEST Engineering Laboratory, Inc.
6660-B Dobbin Road,
Columbia, MD 21045 USA
PH (410) 290-6652
FCC Registration Number: 90864
Industry Canada Number: 2451A-1

Tests Requested By:	Motorola Mobility Inc. 600 North US Hwy 45 Libertyville, IL 60048
Product Type:	Cellular Phone
Signaling Capability:	CDMA 800/1900, CDMA 1X/EV-DO Release A, LTE Band 13, WCDMA 850/1900, GSM 850/1900, 850/1900 EDGE, HSDPA, HSUPA, GPRS, Bluetooth LE + EDR, 802.11a/b/g/n **Note:** The GSM/EDGE/WCDMA network functions have been disabled by firmware and are SIM locked for all US operators.
FCC ID:	IHDT56NG1
Serial Numbers:	LVQV2H0032, LVQV2L0040, LVQV2L0041, LVQV2L0031
Testing Complete Date:	June 12, 2012

Applicable Standards

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

__X__ Part 2
__X__ Part 27 – Miscellaneous Wireless Communications Services

Applicable Standards: ANSI 63.4 2003, ANSI/TIA-603-C-2004, RSS-Gen Issue 3, RSS-129 Issue 2, RSS-132 Issue 2, RSS-133 Issue 5

Summary of Testing

Test #	Test Name	Pass/Fail
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	Pass
3	Occupied Bandwidth	Pass
4	Band Edge	Pass
5	Spurious Emissions at Antenna Terminal	Pass
6	Field Strength of Spurious Emissions	Pass
7	Frequency Stability	Pass

Test #	Test Name	Margin with respect to the Limit
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	See results
3	Occupied Bandwidth	See Plots
4	Band Edge	See Plots
5	Spurious Emissions at Antenna Terminal	See Plots
6	Field Strength of Spurious Emissions	See results
7	Frequency Stability	See results

The margin with respect to the limit is the minimum margin for all modes and bands.

General and Special Conditions

This product utilizes an internal battery that is not removable. When applicable, EMC testing was performed with the internal battery fully charged. Where the internal battery could not be used due to the need for a controlled variation of input voltage, the internal battery was disconnected and an external power supply was utilized.

In addition to the CDMA bands, the EUT operates on LTE Band 13. The transmitting frequency range for LTE is 777-787 MHz. It supports both QPSK and 16 QAM modulation scheme. The bandwidth supported is 10 MHz.

All testing was done in an indoor controlled environment. The temperature and the relative humidity were maintained within the ANSI C63.4 2003 Standard requirements during the entire duration of testing.

Equipment List

For all testing performed by ADR Testing Service

Manufacturer	Equipment Type	Model No.	Serial Number	Calibration Due Date
Rohde & Schwarz	Receiver	ESI26	100001	12/30/2012
Rohde & Schwarz	Receiver	ESU40	100286	7/13/2012
Hewlett Packard	EMC Analyzer	E7405	US39440191	9/23/2012
Agilent	MXA Signal Analyzer	N9020A	US46470586	01/20/2014
Agilent	Signal Generator	83712A	3429A00286	3/26/2013
ETS	DRG Horn Antenna	SAS 200/571	265	1/18/2013
A. H. Systems	DRG Horn Antenna	SAS 200/571	365	8/24/2012
ETS	Log-Periodic Antenna	3148	1188	12/12/2012
ETS	Biconical Antenna	3110B	3369	12/14/2012
Attenuator	Weinschel	AS-6	6675	NCR
Attenuator	Weinschel	AS-6	6677	NCR
Thermotron	Environmental Chamber	S-4	31580	11/16/2012
Agilent	Power Meter	E4416A	GB41293258	7/15/2013
Agilent	Power Sensor	E9323A	US40412063	8/19/2012
Agilent	Microwave Preamplifier	8449B	3008A01442	9/22/2012

Note that the Agilent power meter, Signal Generator and MXA signal analyzer are on a two-year calibration cycle. All other equipment is on a one-year calibration cycle. All testing was performed using equipment that was within calibration at the time that the test was performed. No equipment listed in the table above was used after the specified calibration due date. If, during the course of product testing, a piece of equipment went out of calibration and that piece of equipment was needed to complete product testing, a similar piece of calibrated equipment was substituted. If a substitution was made, that new piece of equipment would be listed in the above table along with the piece that was removed from service.

For Radiated Power testing performed by PCTEST Engineering Laboratory, Inc.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx1	Licensed Transmitter Cable Set	1/25/2012	Annual	1/25/2013	N/A
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	6/7/2011	Annual	6/7/2012	N/A
Agilent	E8257D	(250kHz-20GHz) Signal Generator	6/8/2011	Annual	6/8/2012	MY45470194
Anritsu	MA2411B	Power Sensor	3/5/2012	Annual	3/5/2013	846215
Anritsu	ML2495A	Power Meter	10/13/2011	Annual	10/13/2012	1039008
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/22/2011	Annual	7/22/2012	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	10/1/2010	Biennial	10/1/2012	128337
Mini-Circuits	VHF-1200+	High Pass Filter	1/15/2012	Annual	1/15/2013	30923
Mini-Circuits	VHF-3100+	High Pass Filter	1/15/2012	Annual	1/15/2013	30841
Rohde & Schwarz	CMU200	Base Station Simulator	N/A		N/A	836072/0063
Rohde & Schwarz	RS-PR18	1-18 GHz Pre-Amplifier	6/9/2011	Annual	6/9/2012	100071
Rohde & Schwarz	ESU26	EMI Test Receiver	12/15/2011	Annual	12/15/2012	100342
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	N/A		N/A	102060
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/14/2011	Biennial	11/14/2013	9105-2404
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Tx	11/14/2011	Biennial	11/14/2013	9105-2403
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A

Measurement Procedures and Data

RF POWER OUTPUT

Measurement Procedure

The RF output port of the Equipment Under Test, EUT, is directly coupled to the input of a Wideband Communication Tester through a 20dB passive attenuator, adaptor (if needed), and specialized RF connector. The average output power is measured.

Measurement Results

Band	Channel	Conducted power (dBm) for LTE modes			
		QPSK, Start RB: 13, RB Aloc 50%	QPSK, Start RB: 0, RB Aloc 100%	QPSK, Start RB: 49, RB Aloc: 1RB@high end	QPSK, Start RB: 0, RB Aloc: 1RB@low end
LTE Band 13	23230	23.48	23.35	24.07	23.71

Band	Channel	Conducted power (dBm) for LTE modes			
		16QAM, Start RB: 13, RB Aloc 50%	16QAM, Start RB: 0, RB Aloc 100%	16QAM, Start RB: 49, RB Aloc: 1RB@high end	16QAM, Start RB: 0, RB Aloc: 1RB@low end
LTE Band 13	23230	22.5	22.32	23.15	23.25

RADIATED POWER (ERP)

§27.50 (b) (10)

Measurement Procedure

Radiated power measurements are performed on the 3 meter OATS per the guidelines of ANSI/TIA-603-C-2004. The measurement area is situated on an 18 meter x 20 meter galvanized 1/2" hardware cloth as the conducting ground plane. This material is sewn together in sections 4 feet wide and 60 feet long. A total of eighteen sections are required to cover the entire measurement area. Sections are laid across the width of the pad, overlapped 1" and sewn and soldered together at intervals of 3" (7.6 cm.) The terrain of the test site is reasonably flat and level. Power and cable to the test site are buried 18" deep into the ground outside the perimeter of the site. An all-weather non-metallic housing is situated on a 2 x 3 meter area adjacent to the measurement area to house the test equipment. The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

A half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the radiated power level of the EUT. The power is calculated using the following formula:

$$P_{d\,[dBm]} = P_{g\,[dBm]} - \text{cable loss}_{\,[dB]} + \text{antenna gain}_{\,[dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\,[dBm]} - \text{cable loss}_{\,[dB]}$.

Measurement Results

Frequency [MHz]	Modulation	Measured Level [dBm]	Substitute Level [dBm]	Antenna Gain [dBd]	Pol [H/V]	ERP [dBm]	ERP [Watts]	Power Source
782.00	QPSK	-15.480	21.26	0.00	V	21.26	0.134	Battery
782.00	16-QAM	-16.010	20.73	0.00	V	20.73	0.118	Battery

OCCUPIED BANDWIDTH

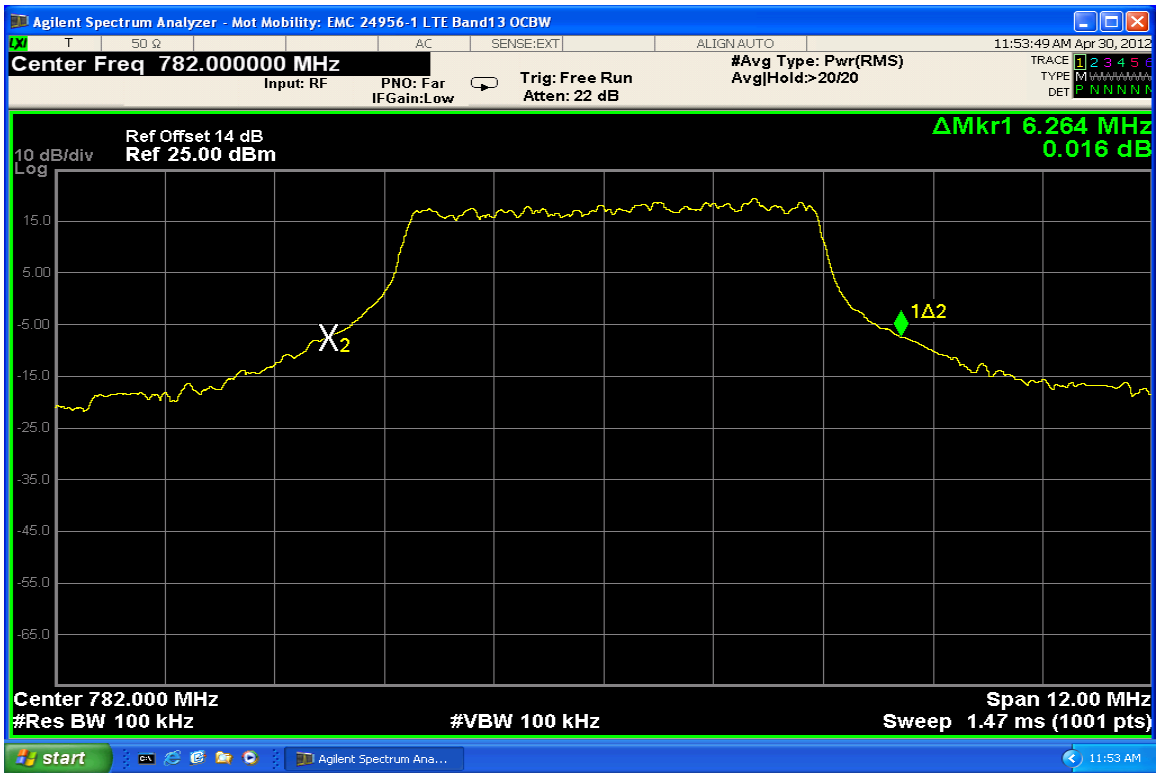
§ 2.1049

Measurement Procedure

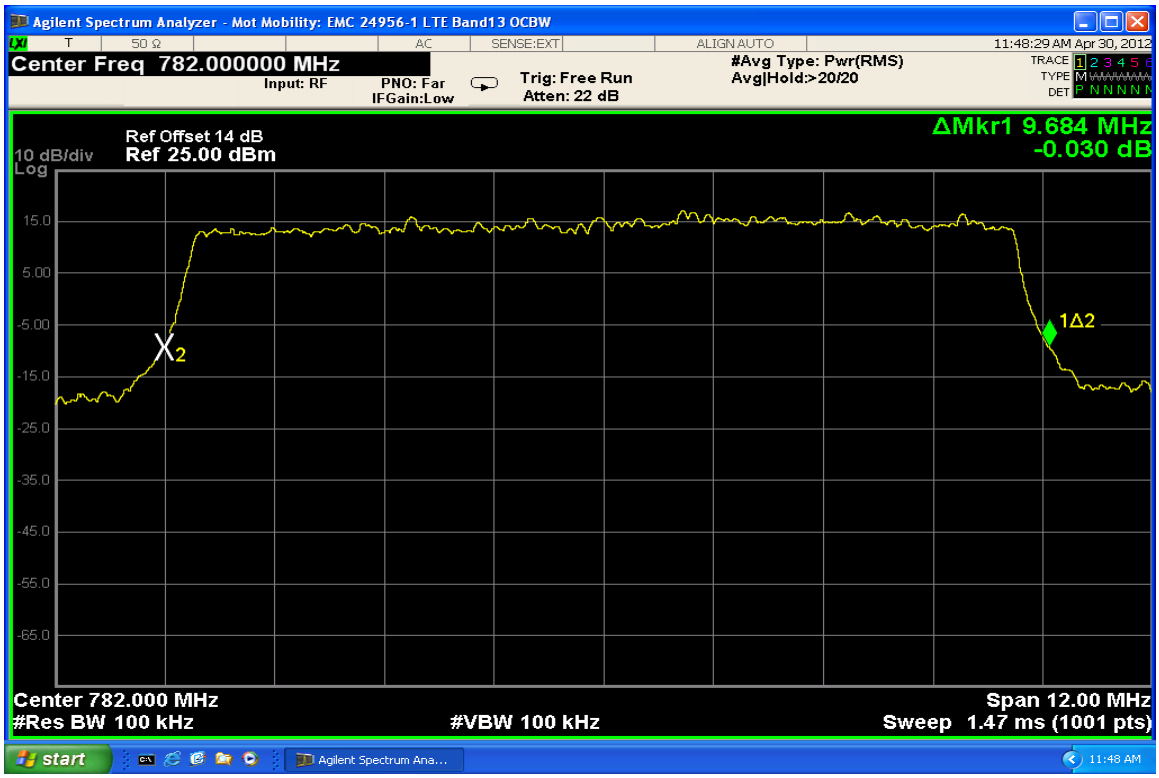
The RF output port of the EUT is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. The amplitude of the spectrum analyzer is corrected for the attenuator and any other applicable losses. The analyzer is set for Peak Detector and each trace is set for Max Hold. The fully charged internal battery was used for the supply voltage.

Measurement Results
Attached

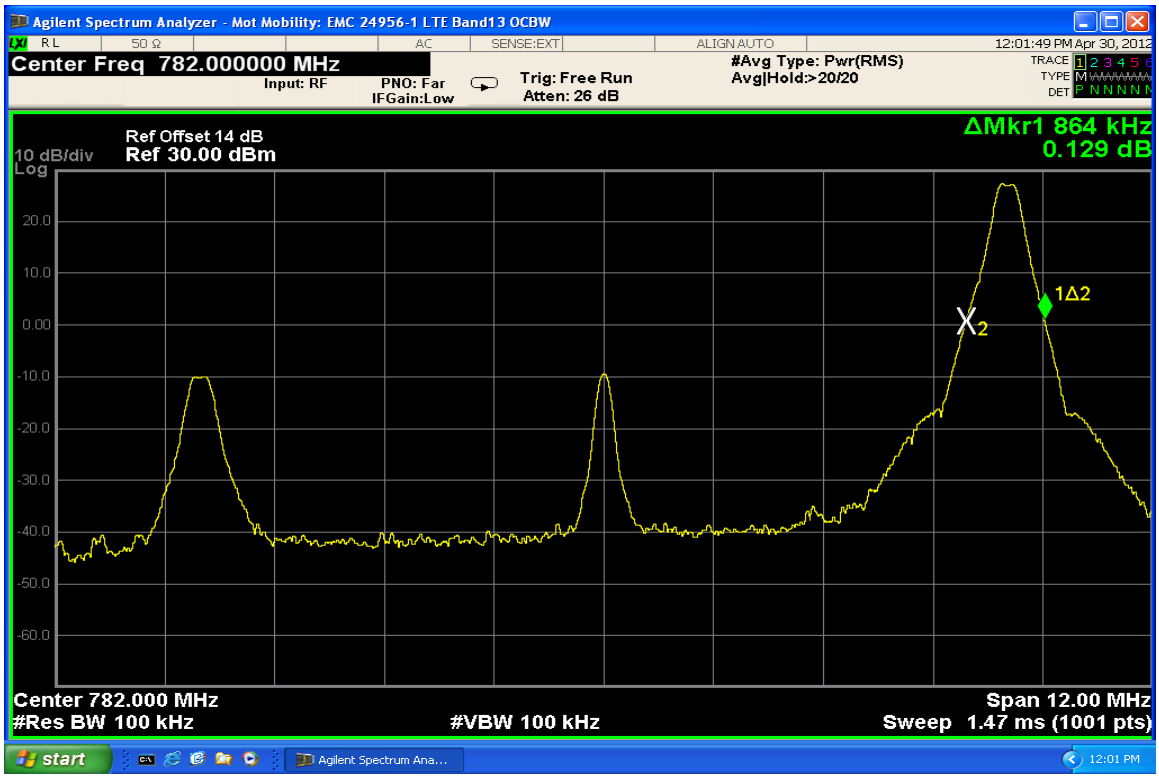
Measurement Results



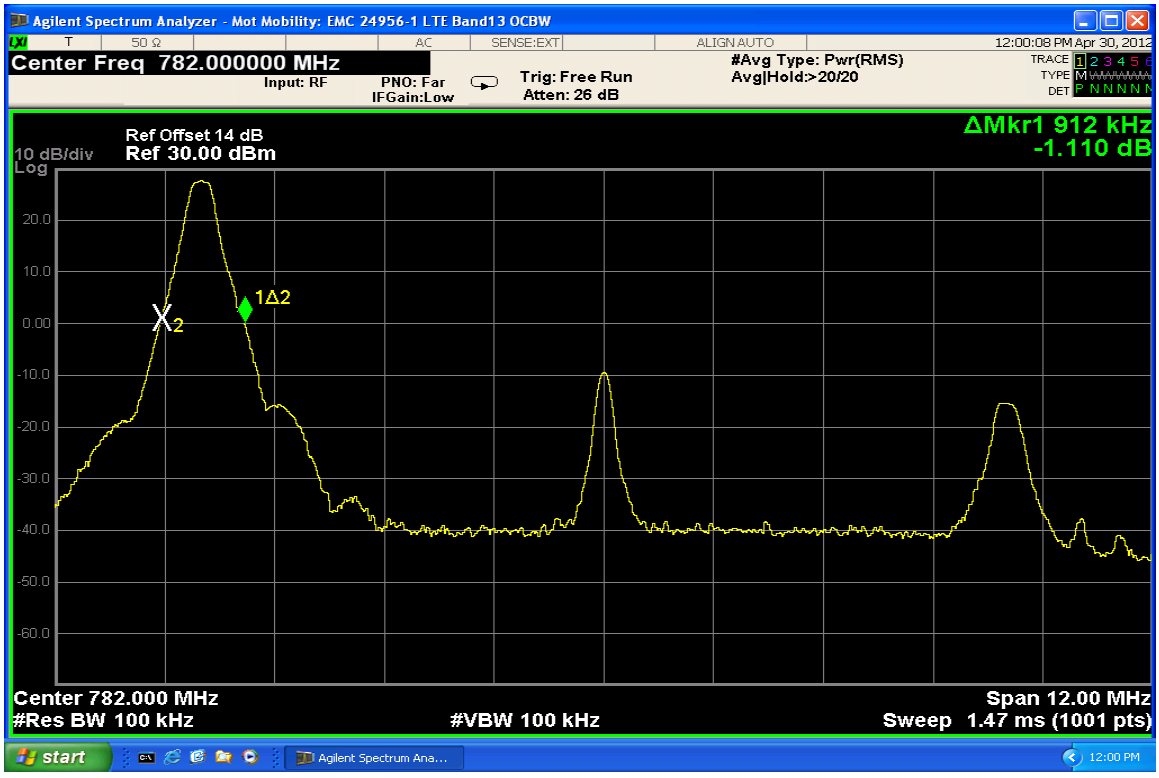
LTE – Band 13 - QPSK, Start RB: 13, RB Allocation 50%



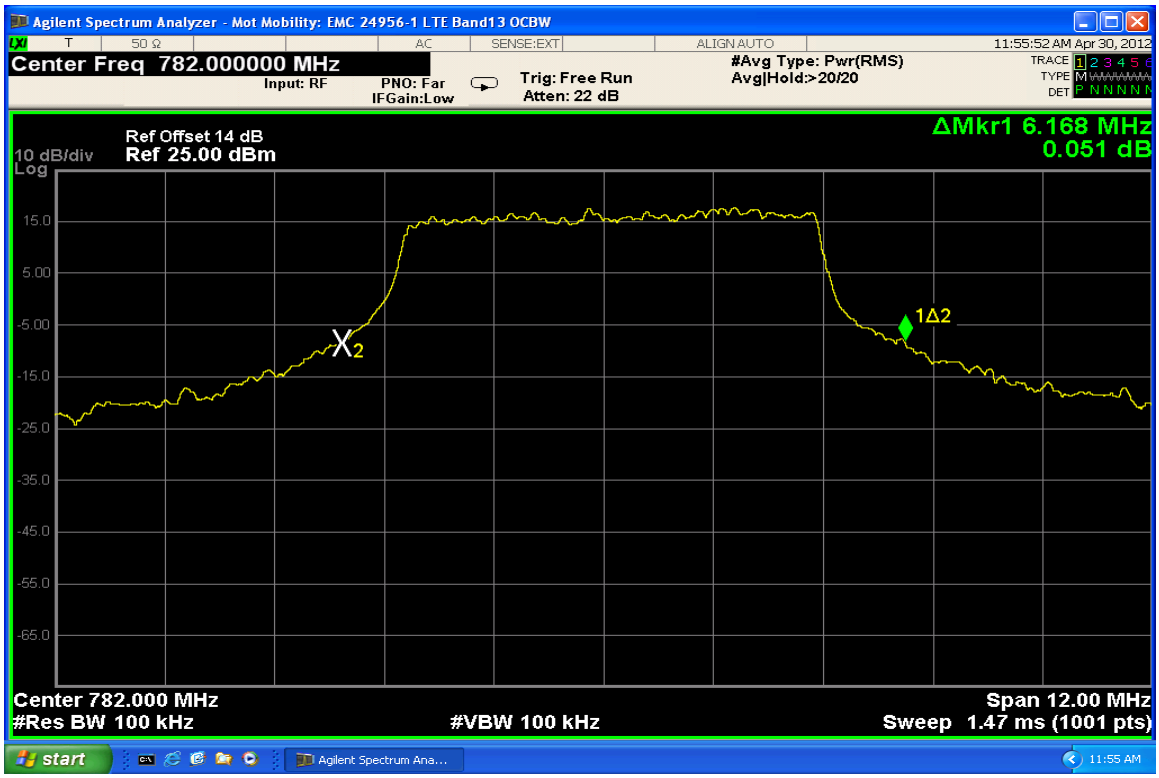
LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%



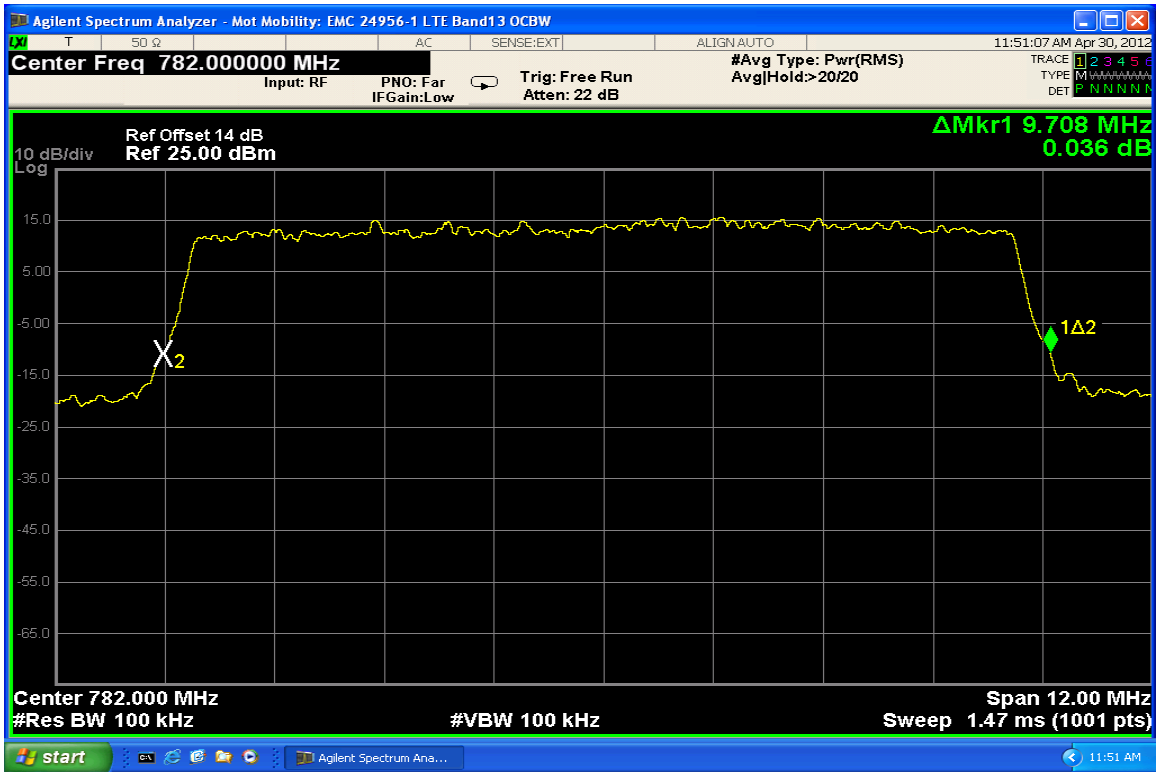
LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end



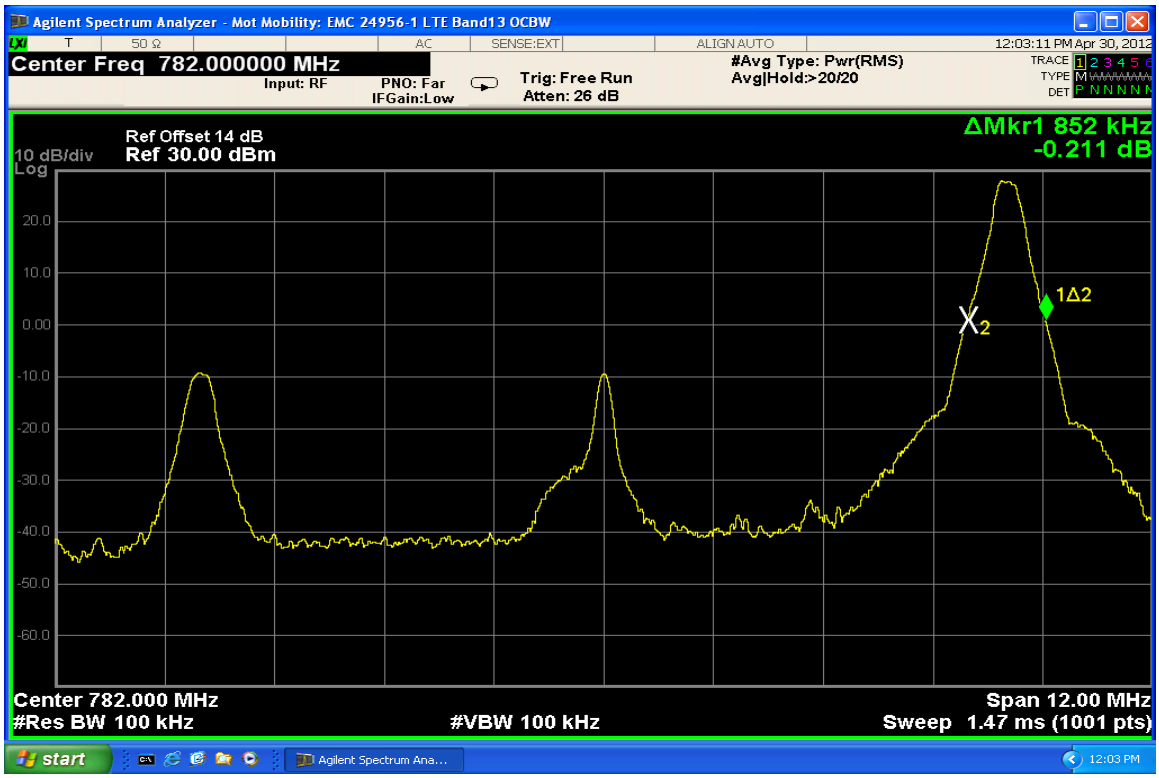
LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end



LTE – Band 13 - 16 QAM, Start RB: 13, RB Allocation 50%



LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%



LTE – Band 13 - 16 QAM, Start RB: 49, 1RB@ high end

LTE – Band 13 - 16 QAM, Start RB: 0, 1RB@ low end

BAND EDGE MEASUREMENTS

§27.53 (c) (4)

Measurement Procedure

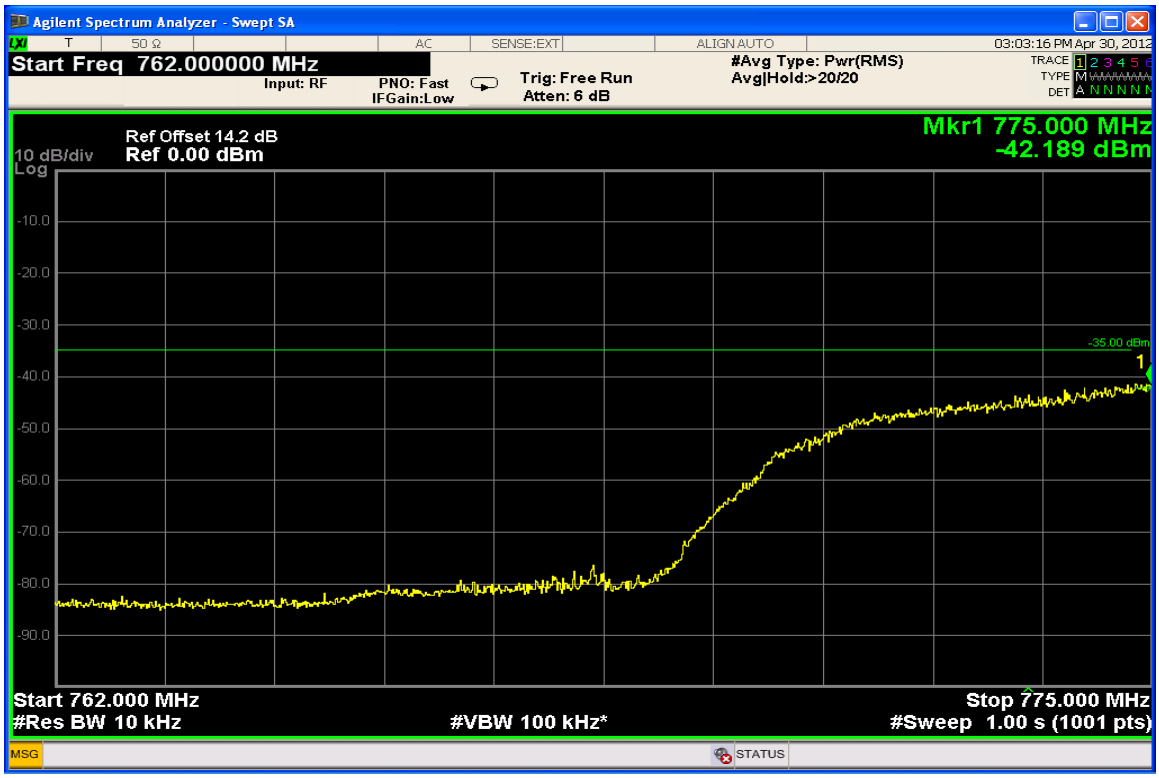
The RF output port of the EUT is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. The amplitude of the spectrum analyzer is corrected for the attenuator and any other applicable losses. The analyzer is set for Average Detector and each trace is set for Max Hold. The fully charged internal battery was used for the supply voltage.

Any emissions in the band 763–775 MHz and 793–805 MHz, has to be less by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

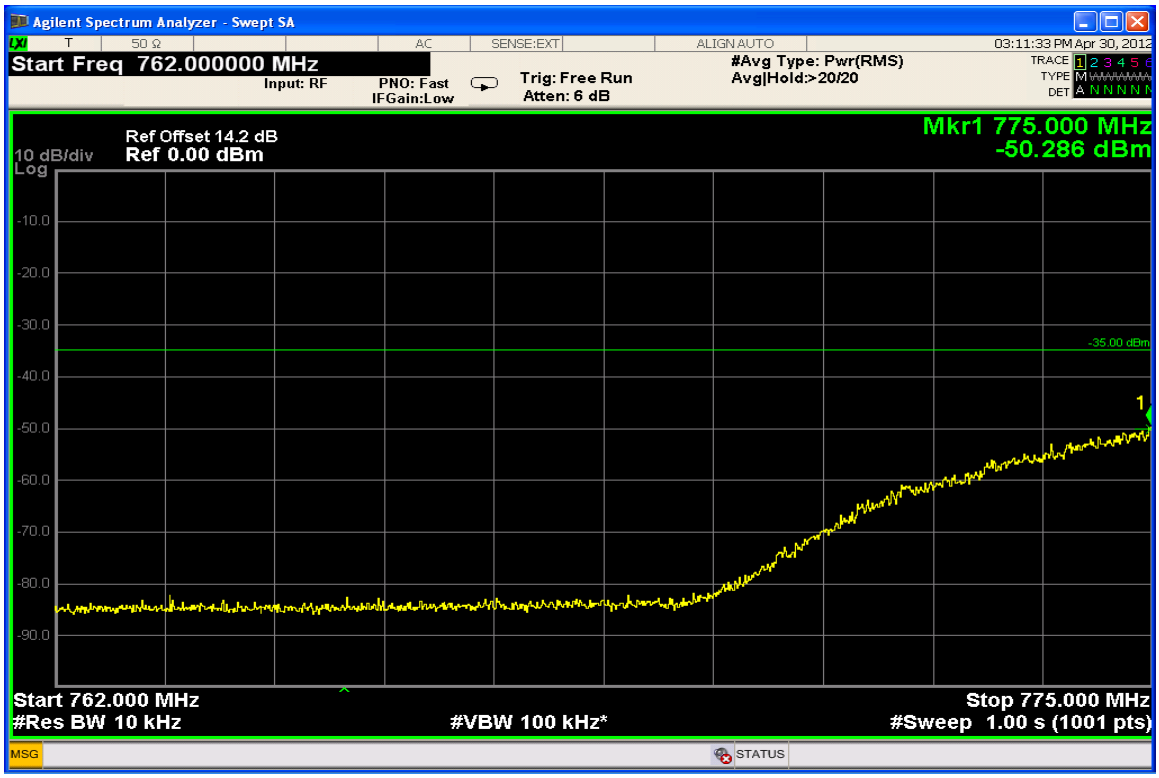
All measurements were performed with a 10 kHz Resolution bandwidth and the limit line was set at -35 dBm.

Measurement Results
Attached

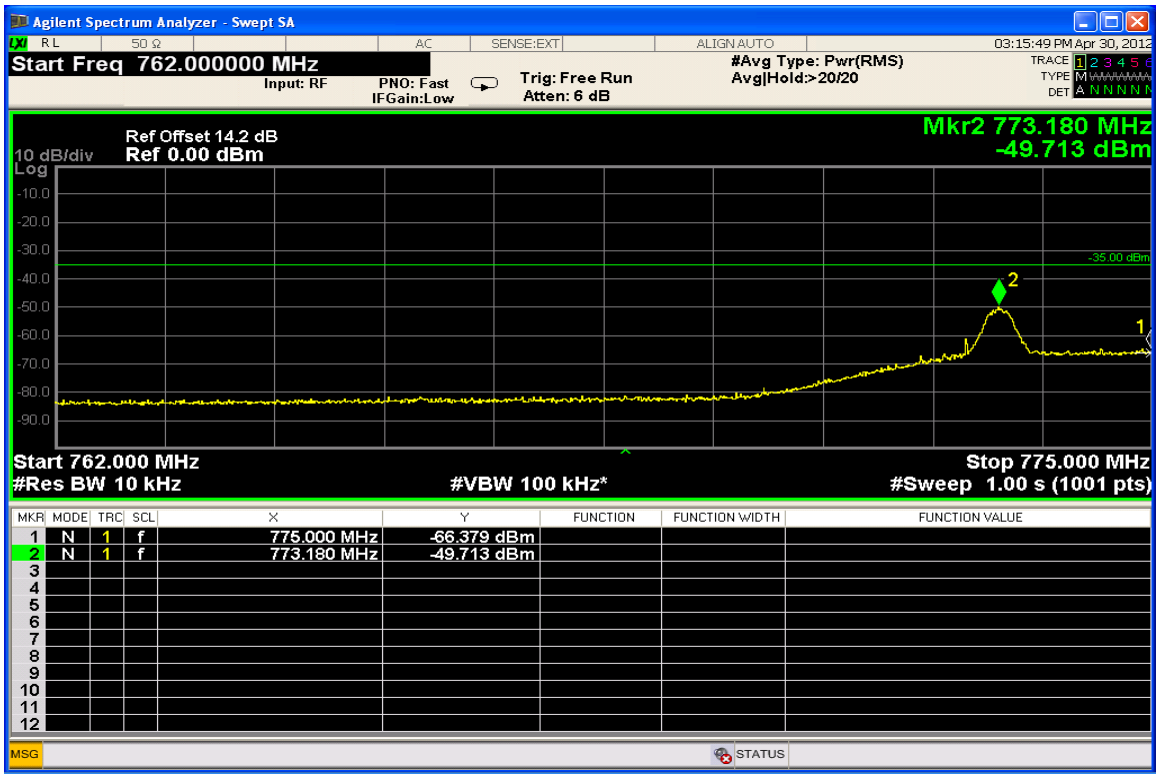
Measurement Results: Low Band Edge



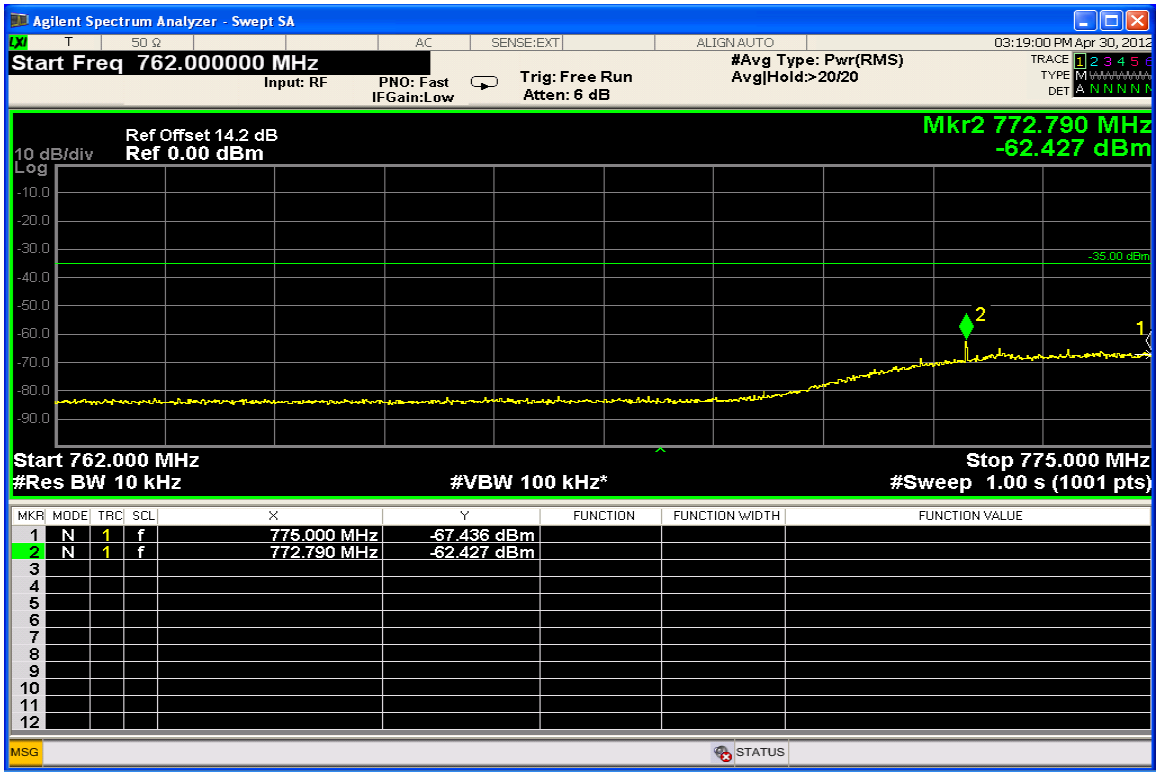
LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%



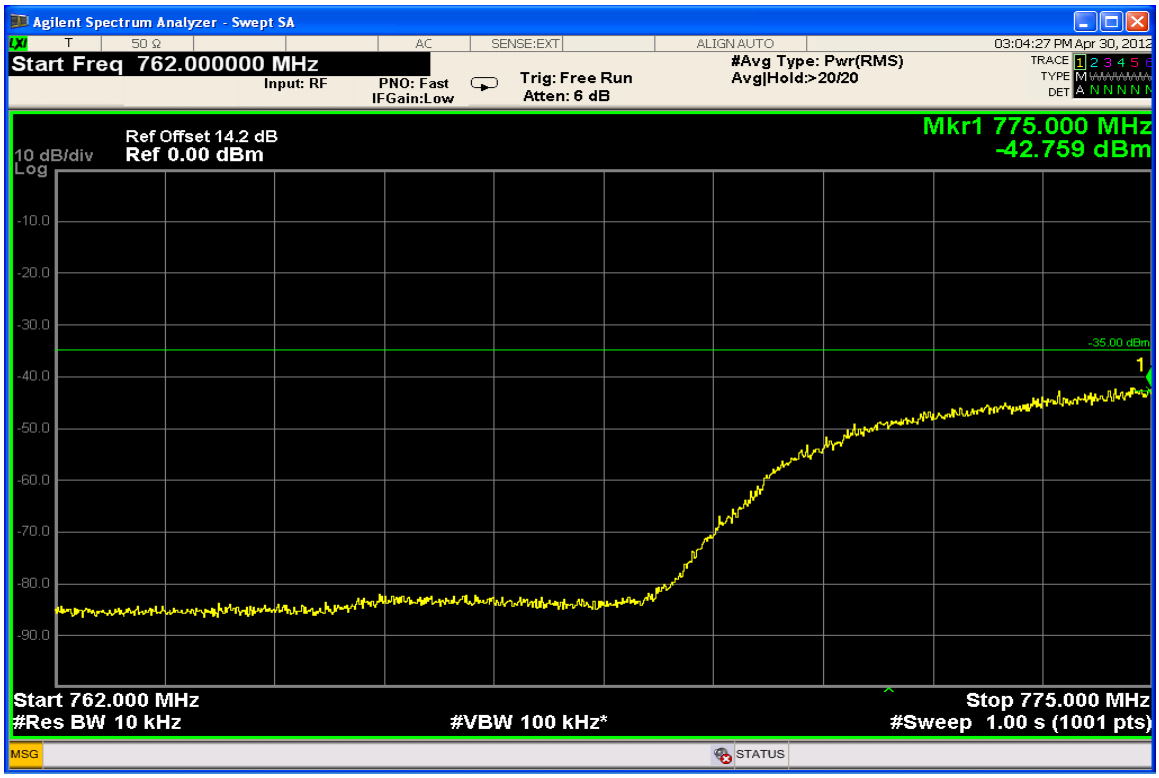
LTE – Band 13 - QPSK, Start RB: 13, RB Allocation 50%



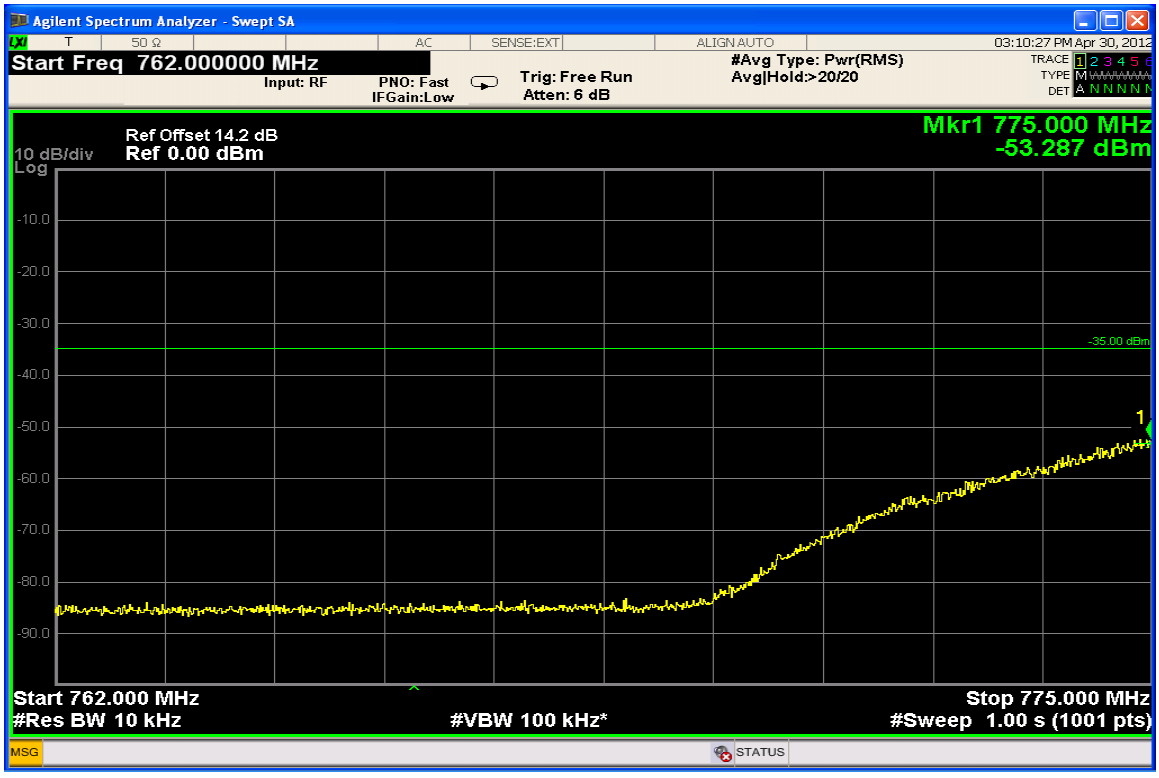
LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end



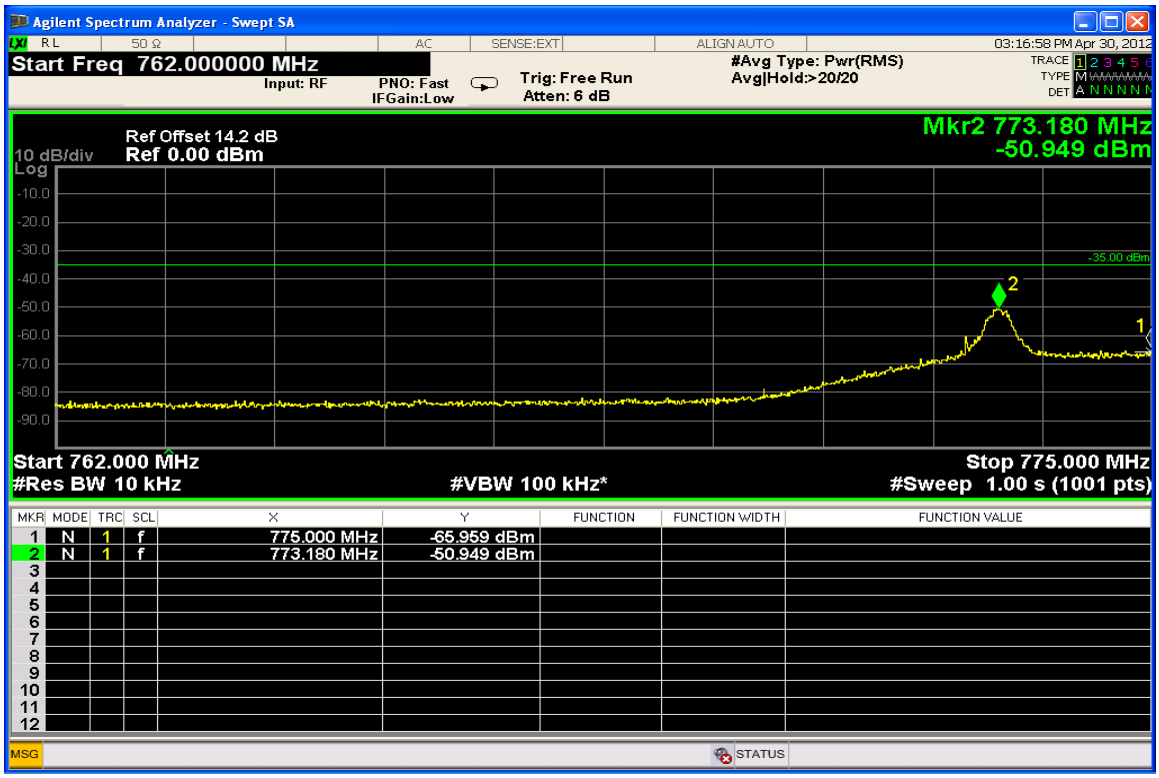
LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end



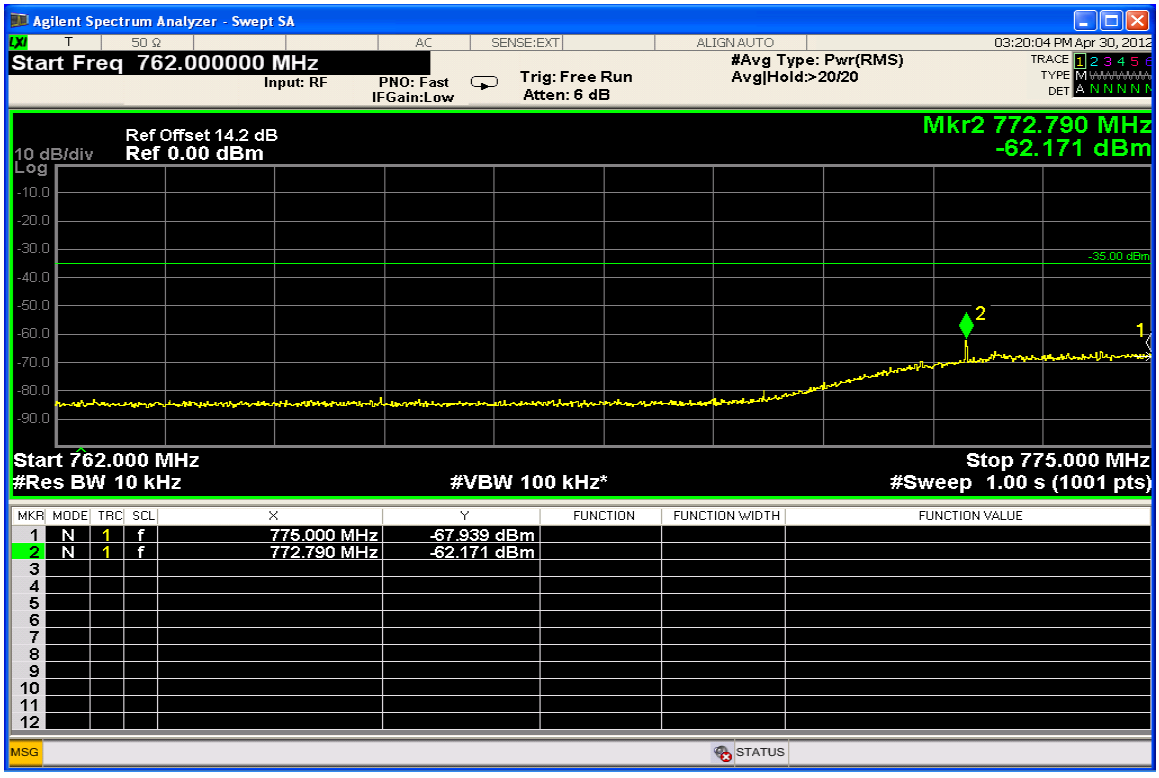
LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%



LTE – Band 13 – 16 QAM, Start RB: 13, RB Allocation 50%



LTE – Band 13 – 16 QAM, Start RB: 0, 1RB@ low end

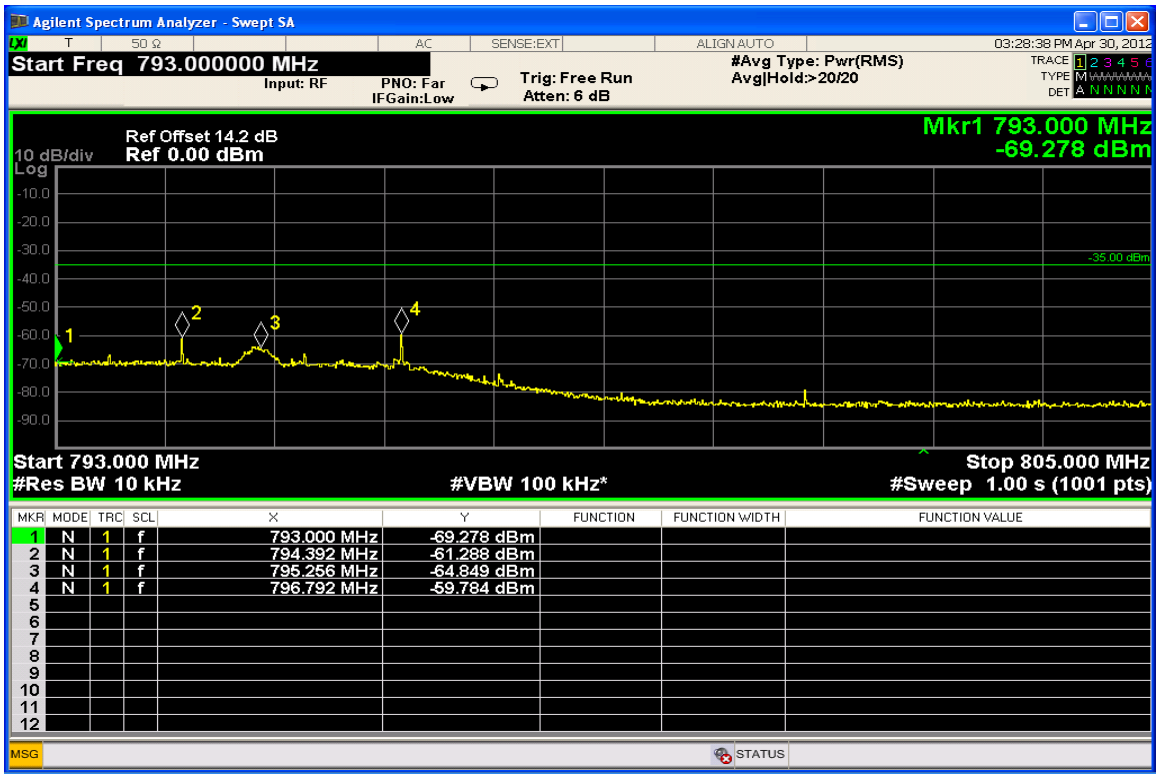


LTE – Band 13 – 16 QAM, Start RB: 49, 1RB@ high end

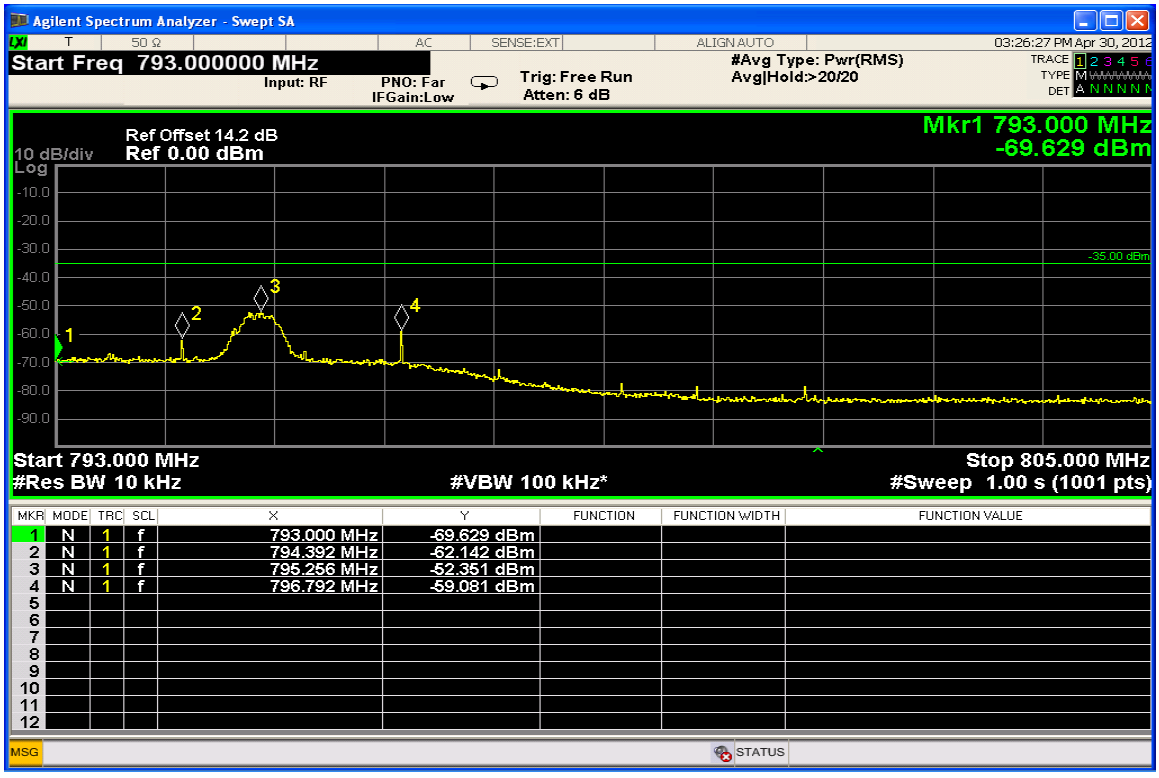
Measurement Results: High Band Edge

LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%

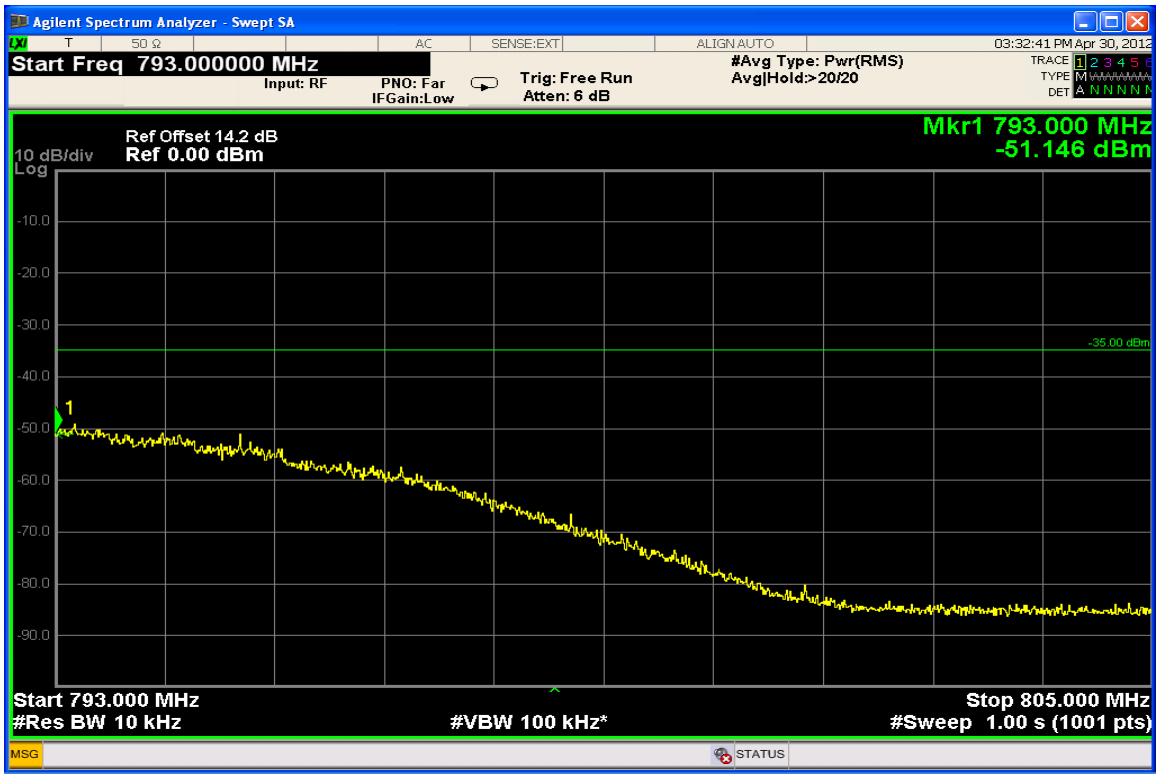
LTE – Band 13 - QPSK, Start RB: 13, RB Allocation 50%



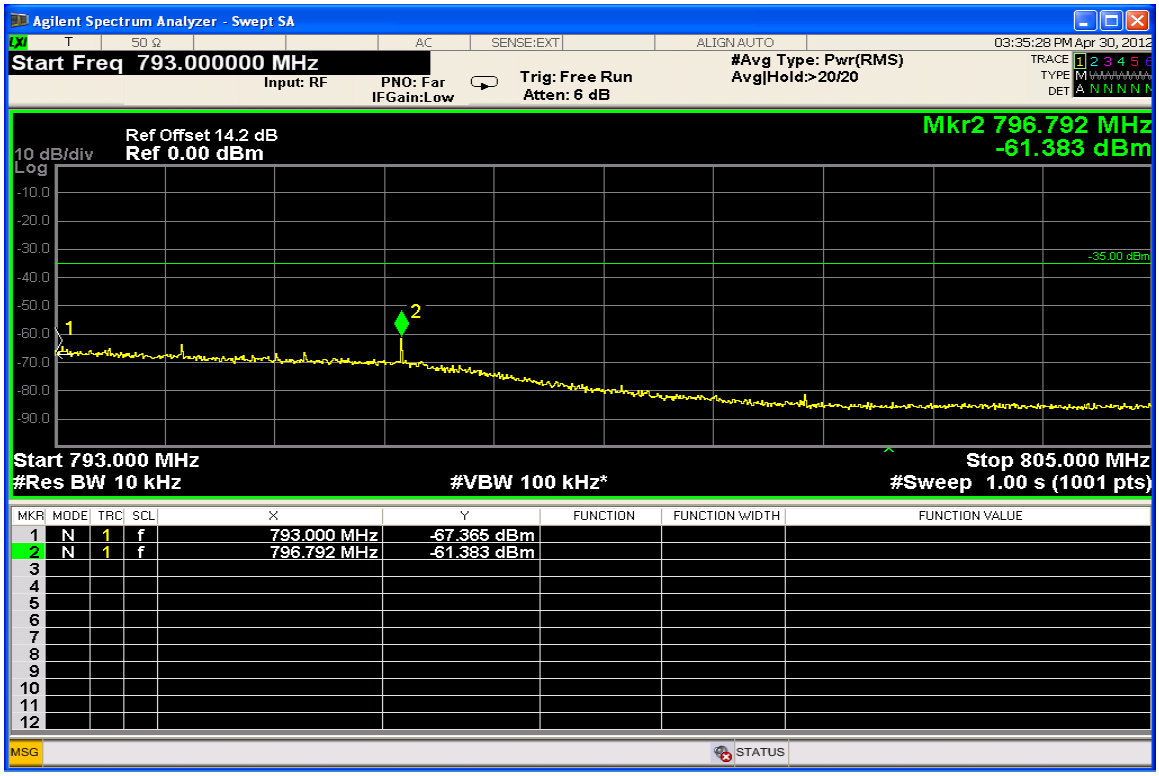
LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end



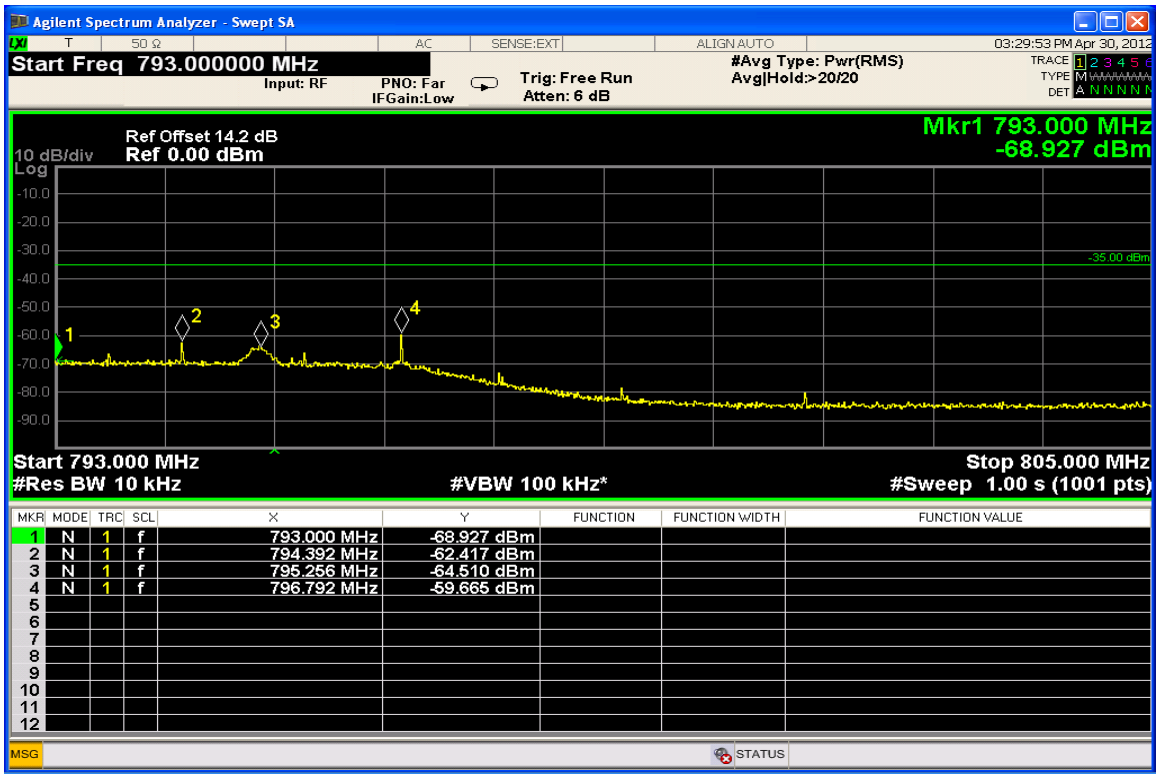
LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end



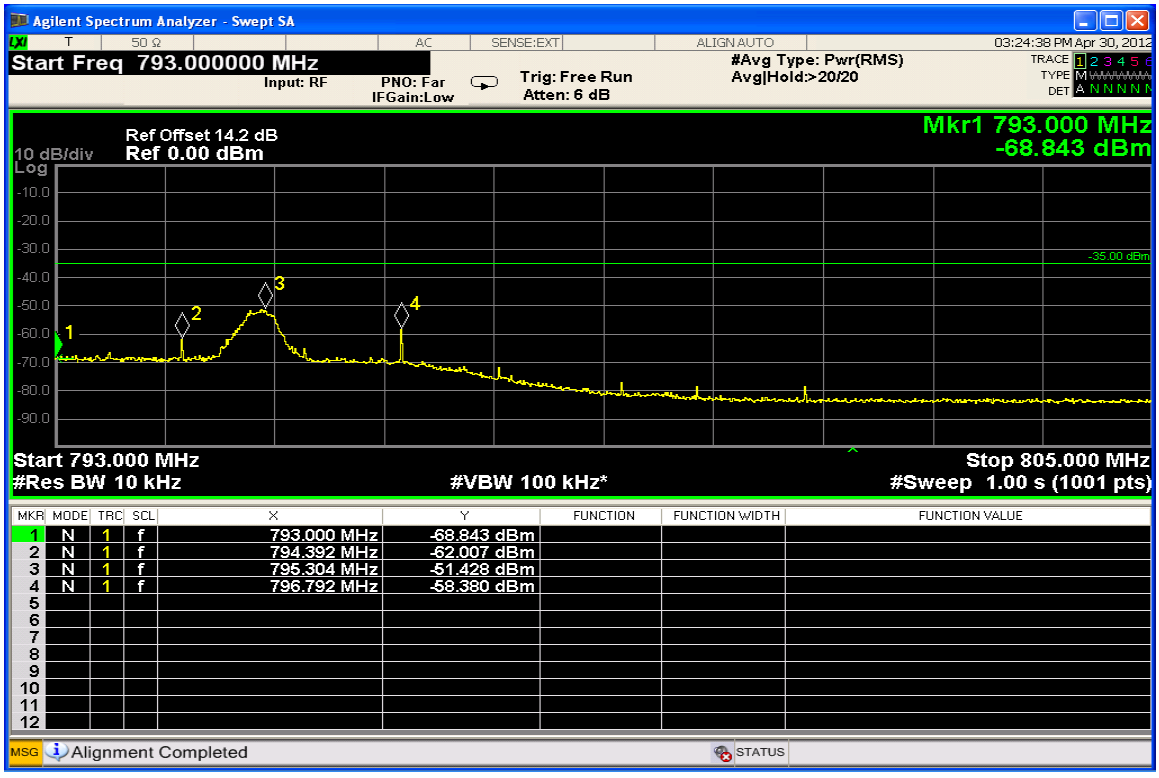
LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%



LTE – Band 13 – 16 QAM, Start RB: 13, RB Allocation 50%



LTE – Band 13 – 16 QAM, Start RB: 0, 1RB@ low end



LTE – Band 13 – 16 QAM, Start RB: 49, 1RB@ high end

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

§27.53 (c) (2), §27.53 (c) (5)

Measurement Procedure

The RF output port of the EUT is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. The fully charged internal battery was used for the supply voltage.

The spectrum was investigated from the lowest frequency signal generated, without going below 9 kHz, up to at least the tenth harmonic of the fundamental or 40 GHz, whichever is lower.

Any emissions 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;

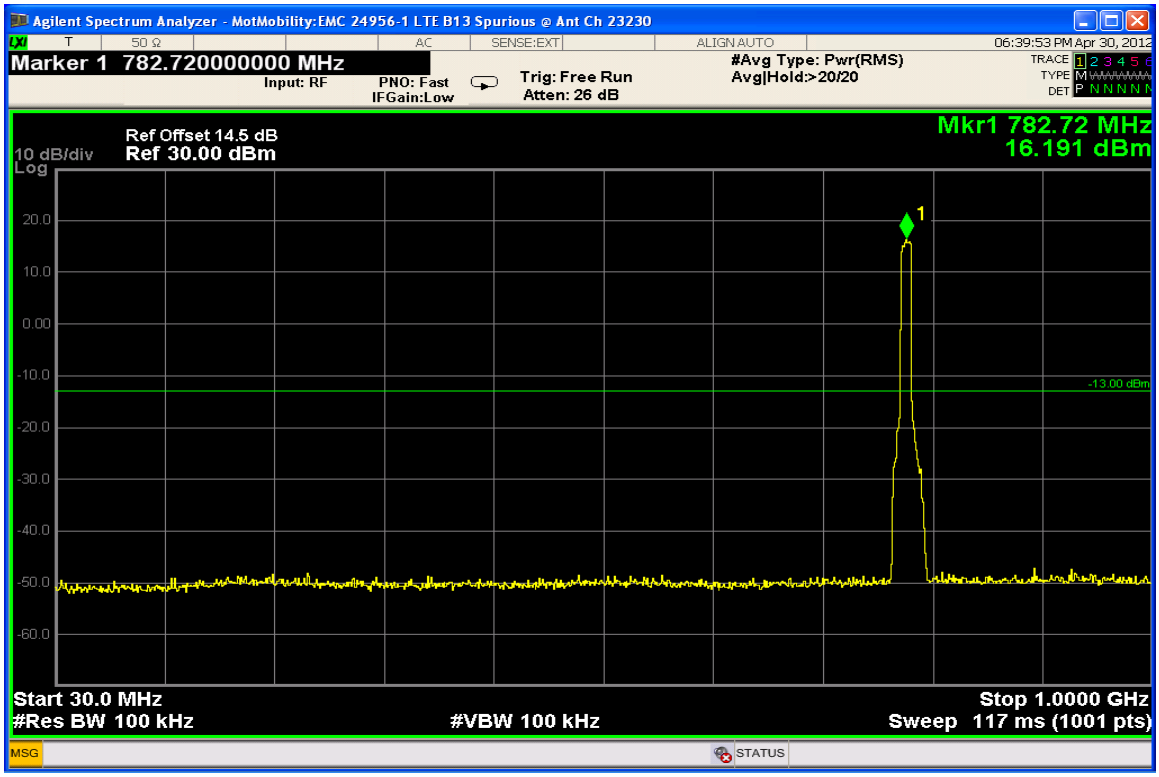
All measurements were performed with a 100 kHz Resolution bandwidth and the limit line was set at -13 dBm.

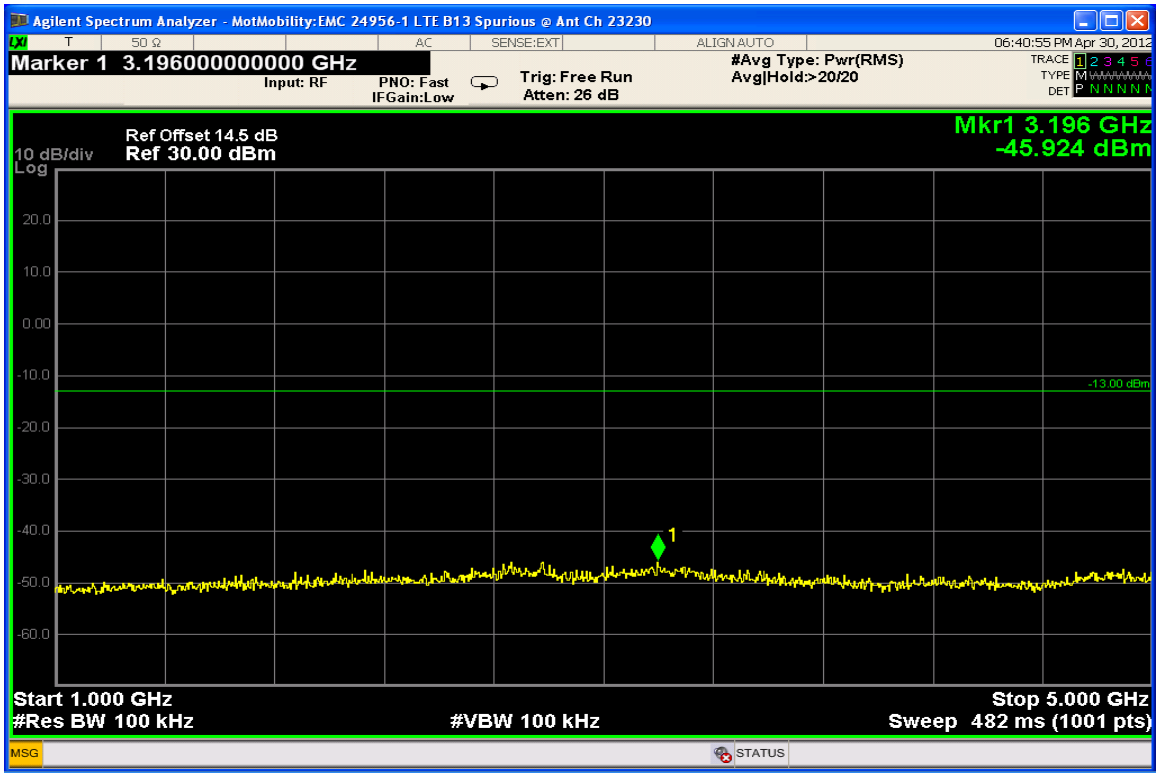
The spectrum analyzer settings were as follows:

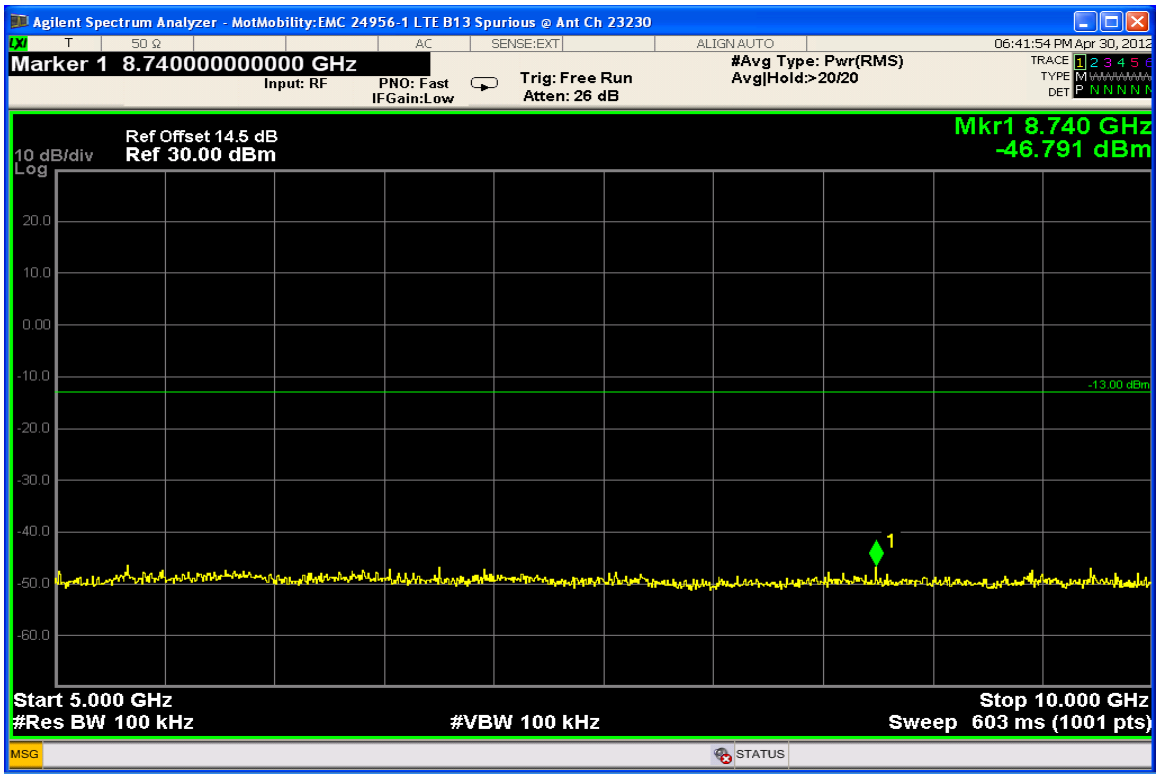
Units	dBm
Divisions	10 dB
Detector	Peak Detector
Resolution Bandwidth	100 kHz for spurious emissions at antenna terminals testing 30kHz and 100kHz for band edge testing
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

Measurement Results

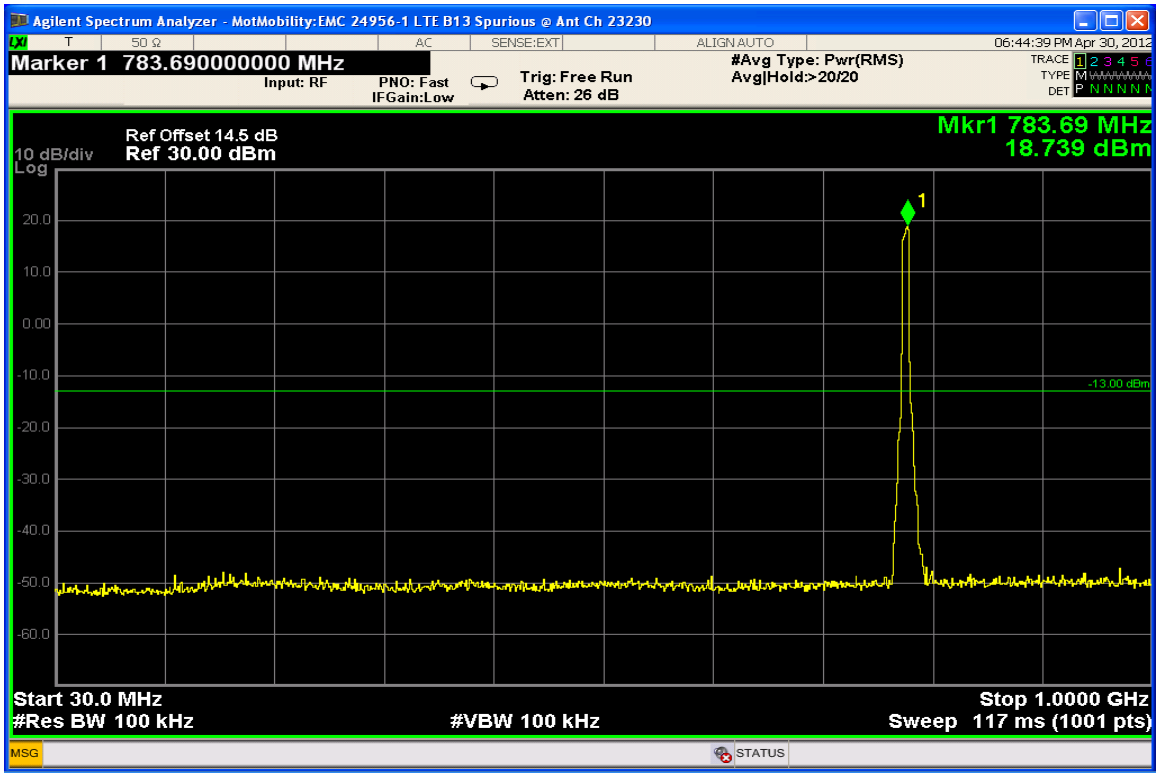
Mode: LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%

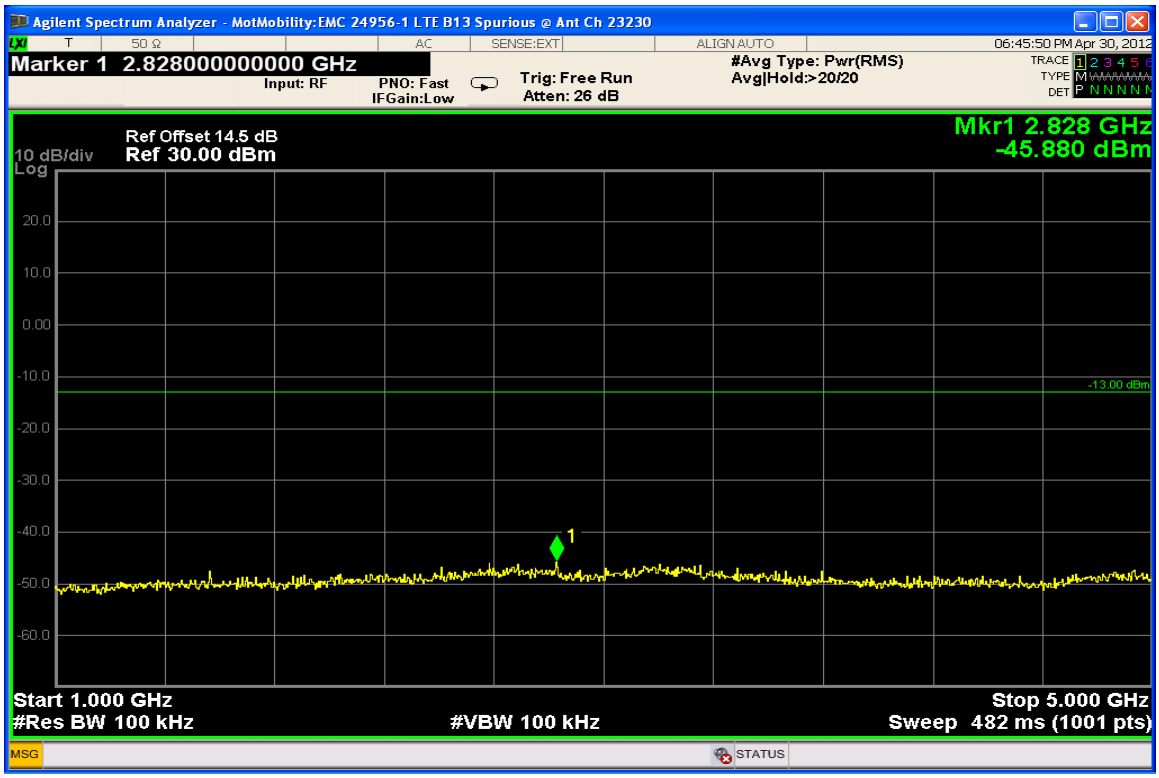


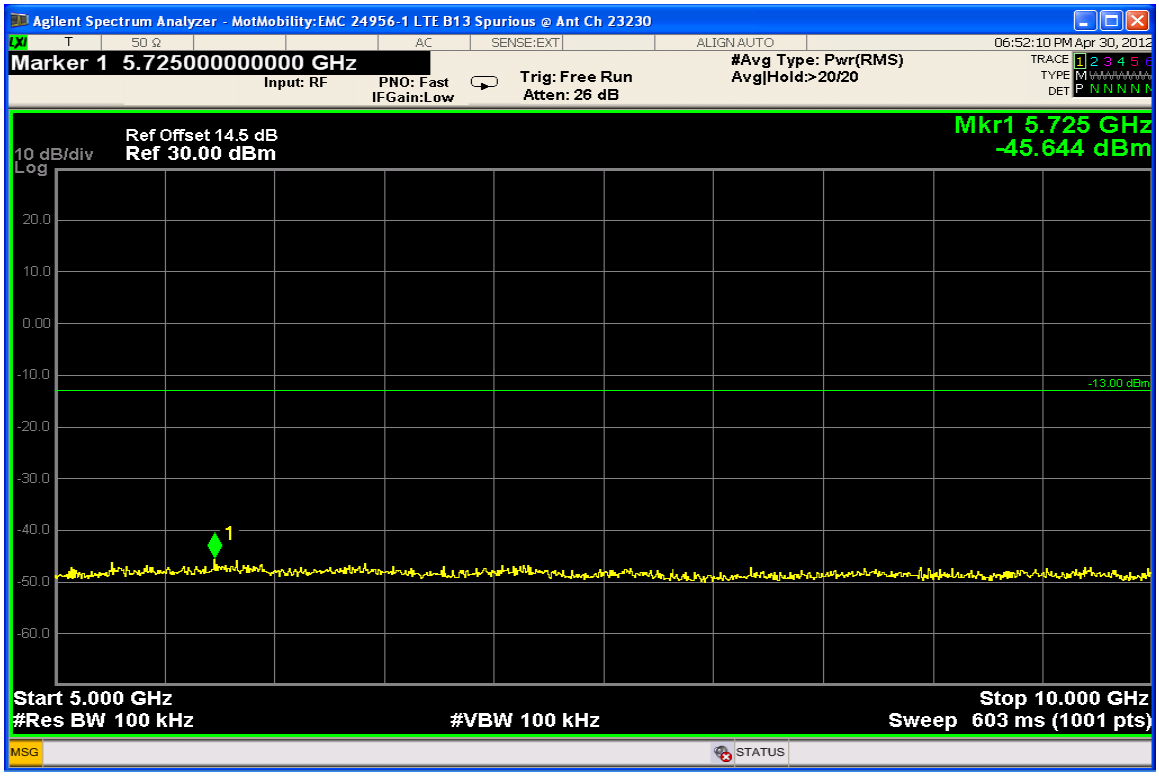




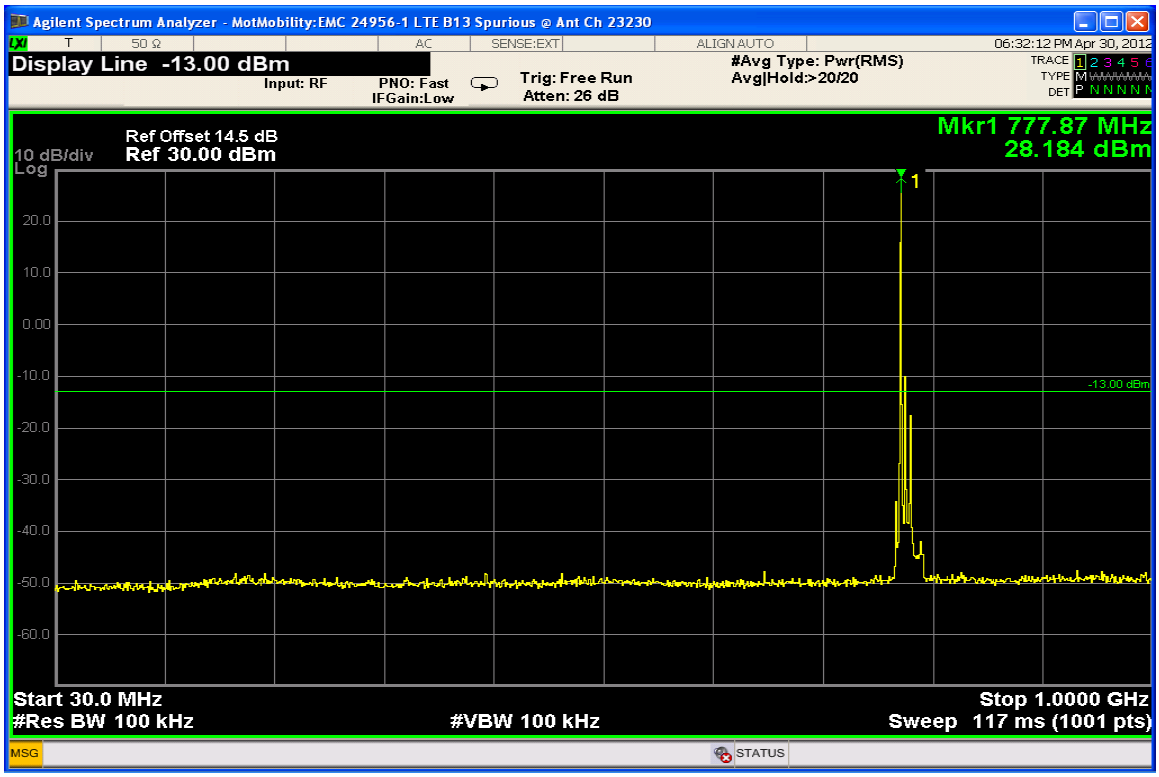
Mode: LTE – Band 13 - QPSK, Start RB: Start RB: 13, RB Allocation 50%

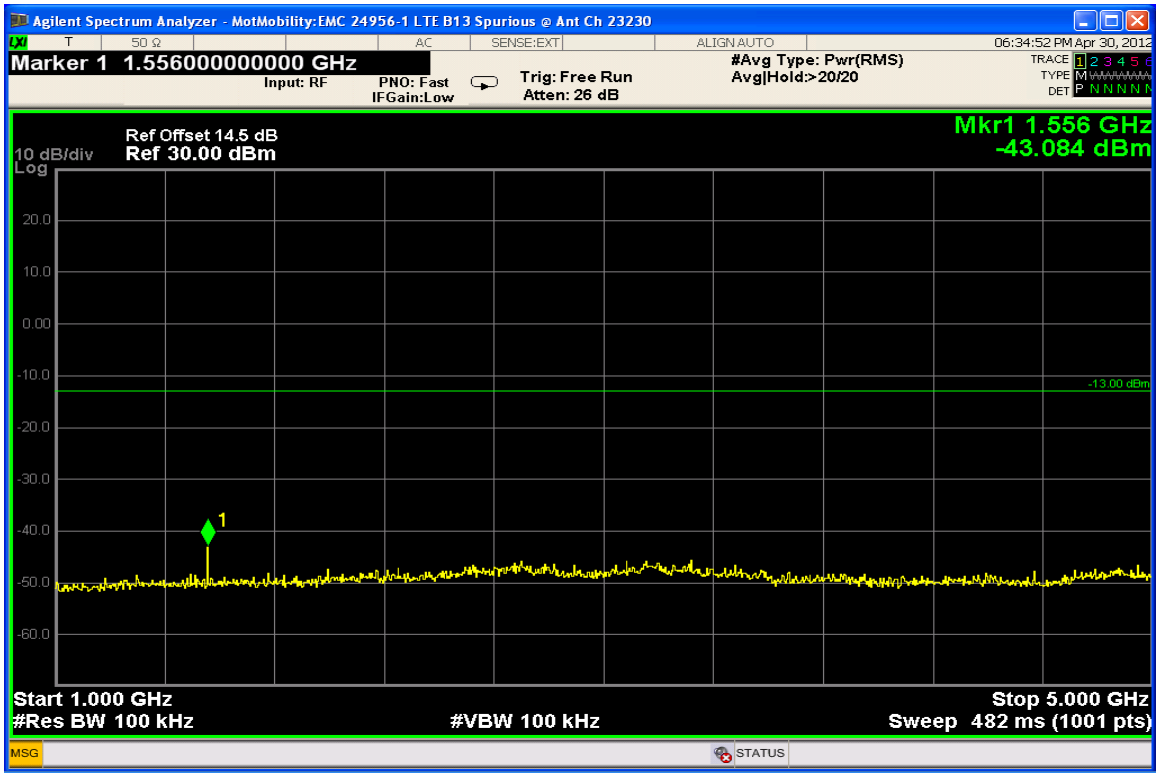


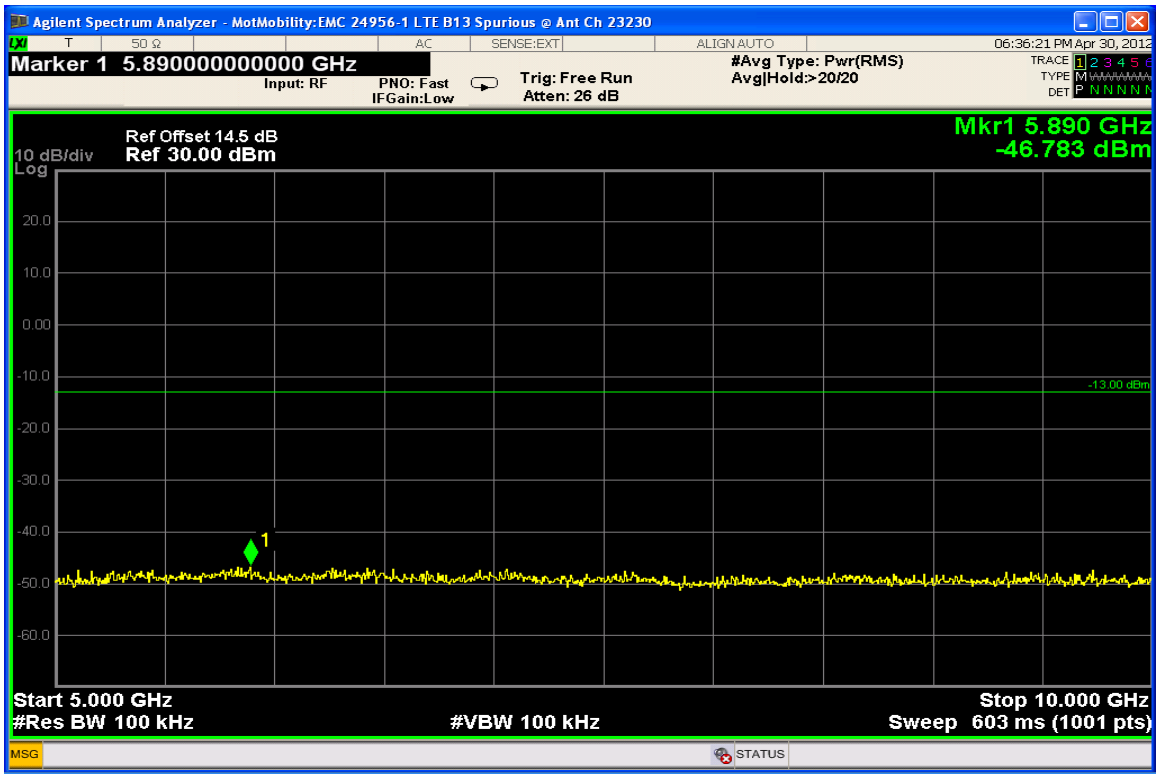

Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 2.828000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
06:45:50 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 2.828 GHz
-45.880 dBm
-13.00 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 5.000 GHz
Sweep 482 ms (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 5.725000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
06:52:10 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 5.725 GHz
-45.644 dBm
-13.00 dBm
Start 5.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 10.000 GHz
Sweep 603 ms (1001 pts)
MSG
STATUS

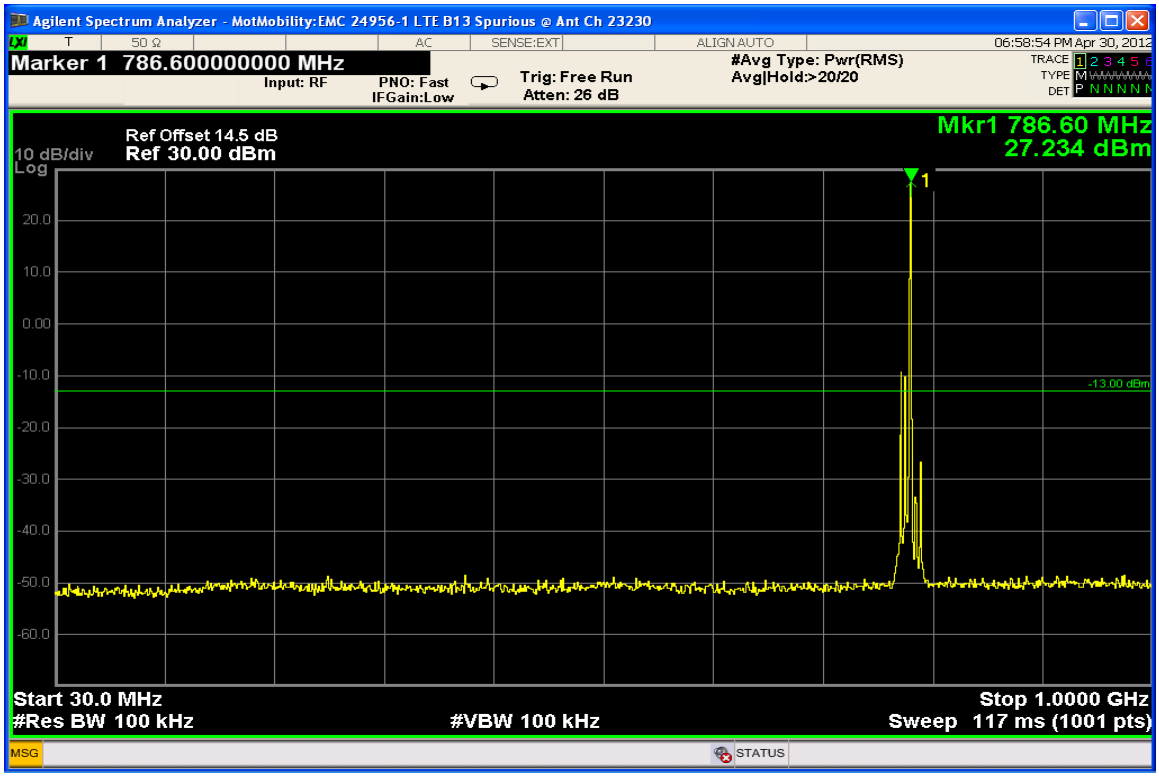
Mode: LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end

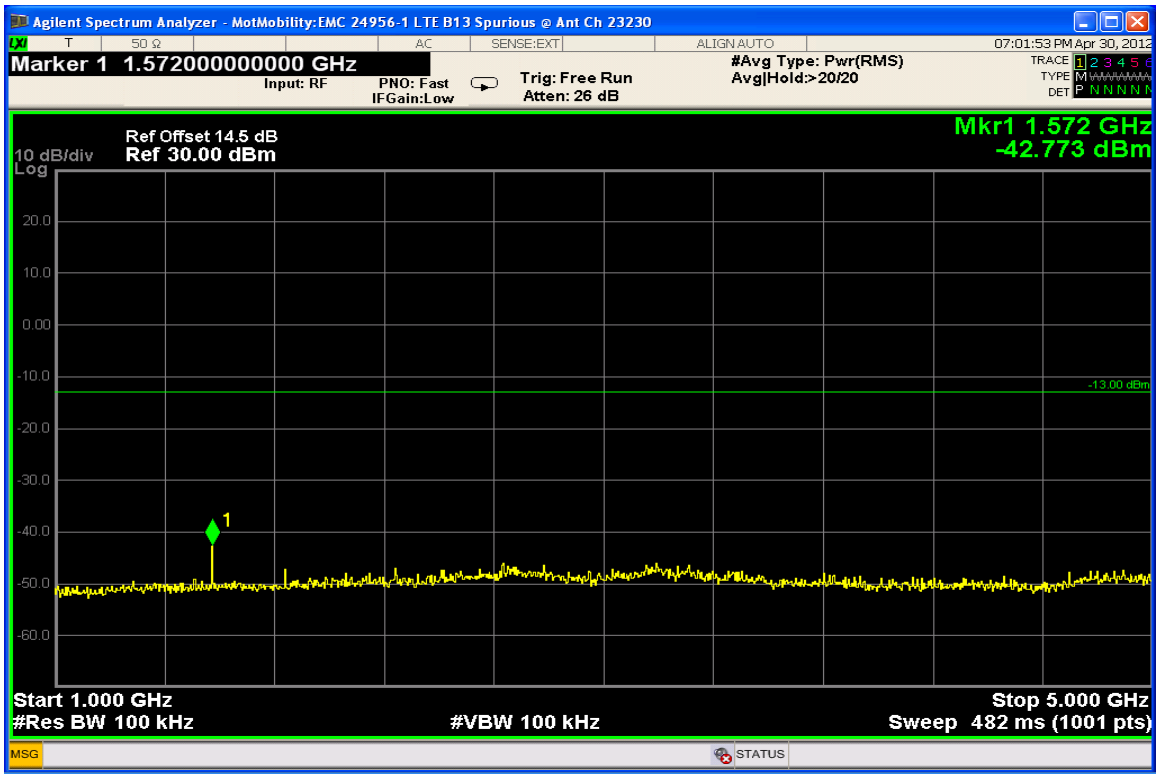


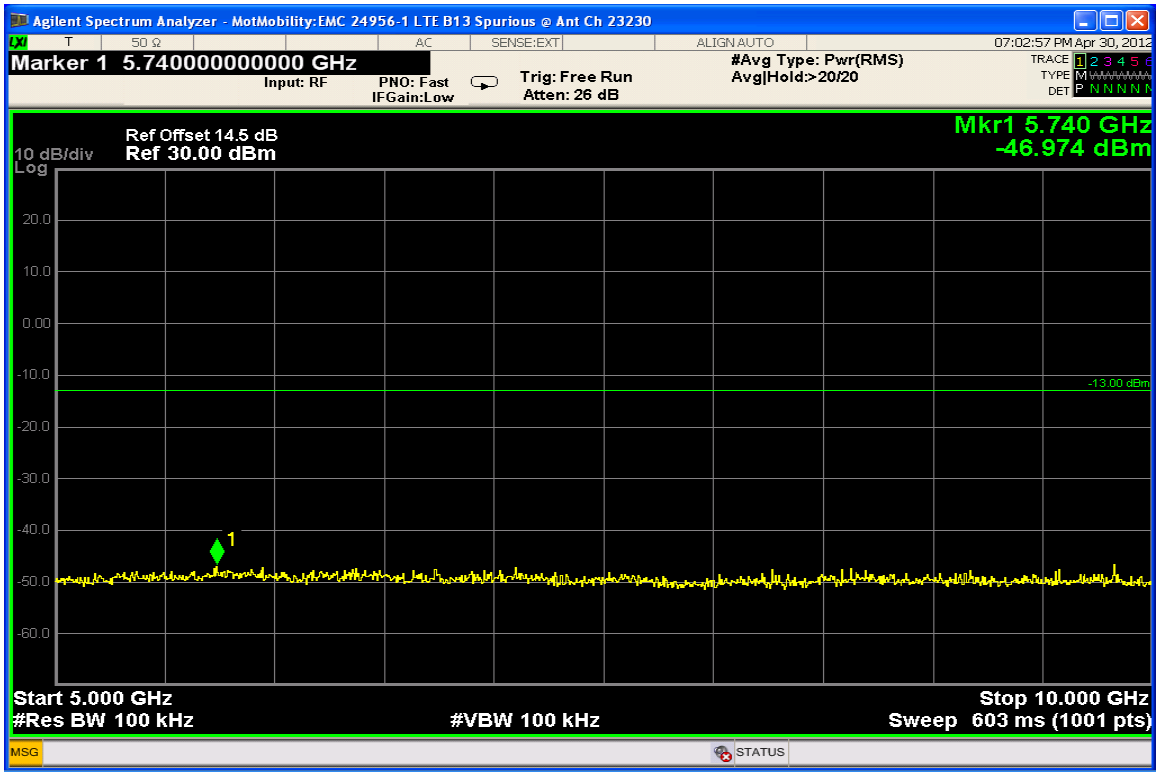




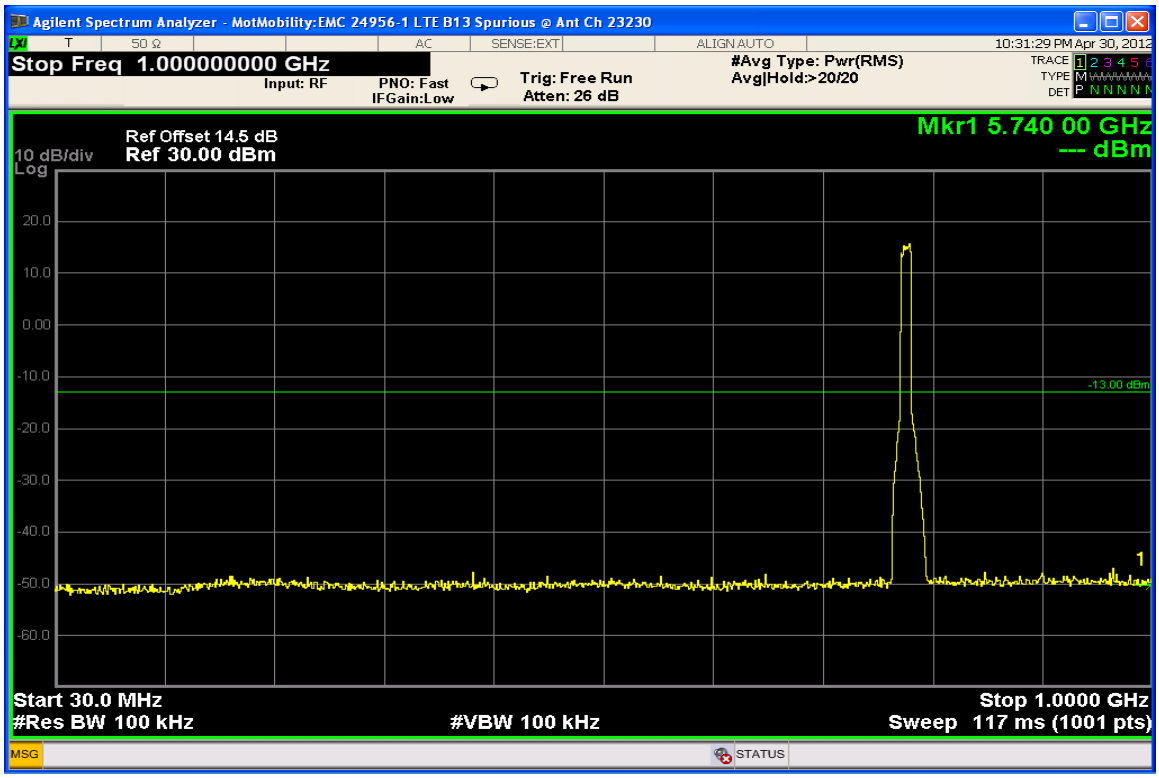
Mode: LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end

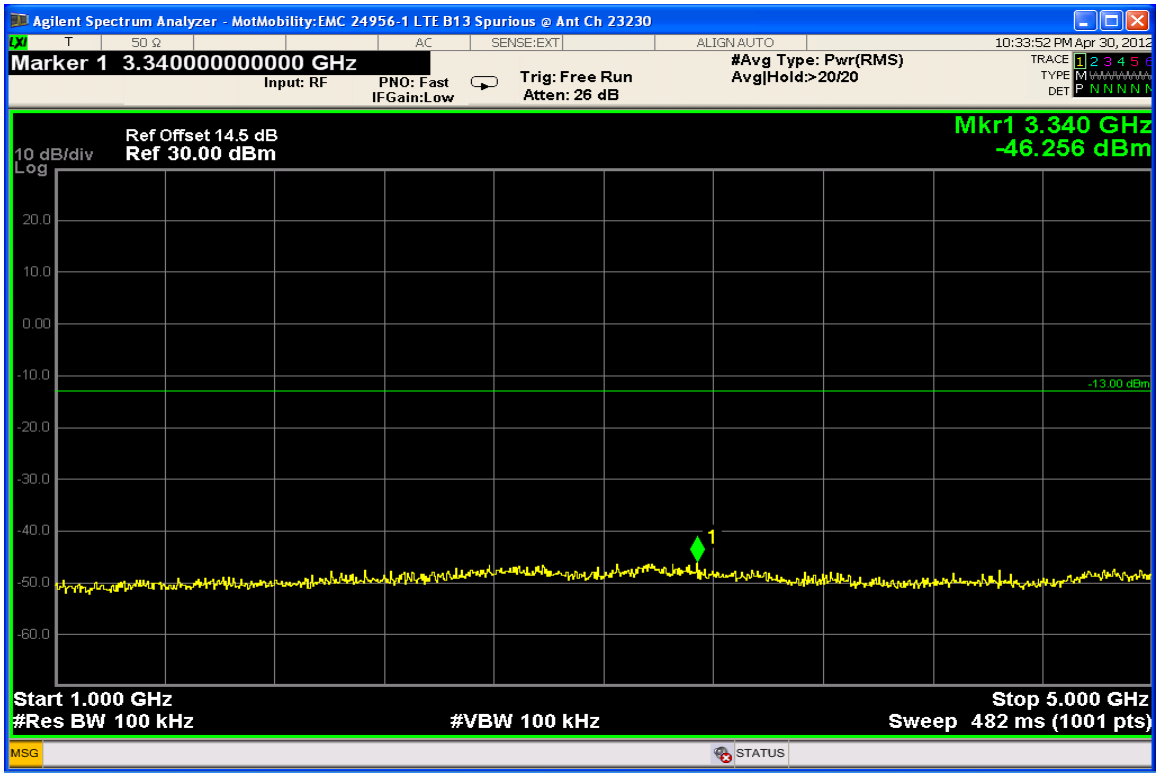


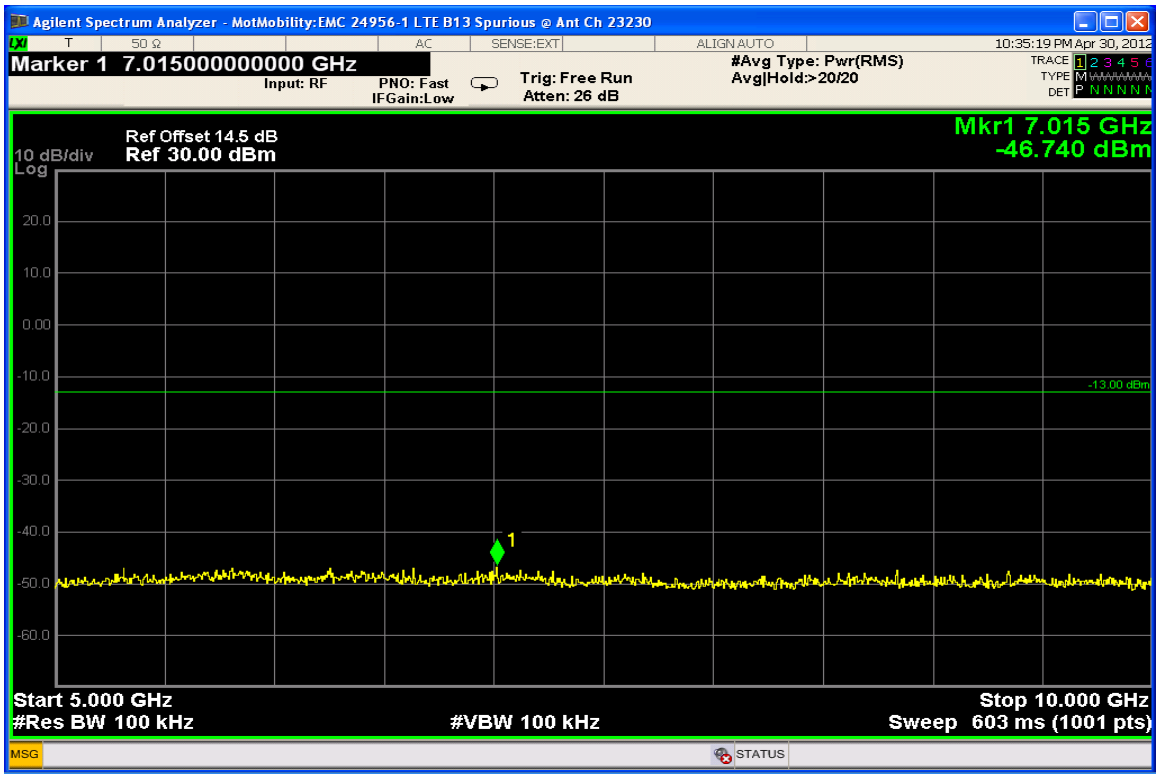

Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 1.572000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
07:01:53 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 1.572 GHz
-42.773 dBm
-13.00 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 5.000 GHz
Sweep 482 ms (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 5.740000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
07:02:57 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 5.740 GHz
-46.974 dBm
-13.00 dBm
Start 5.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 10.000 GHz
Sweep 603 ms (1001 pts)
MSG
STATUS

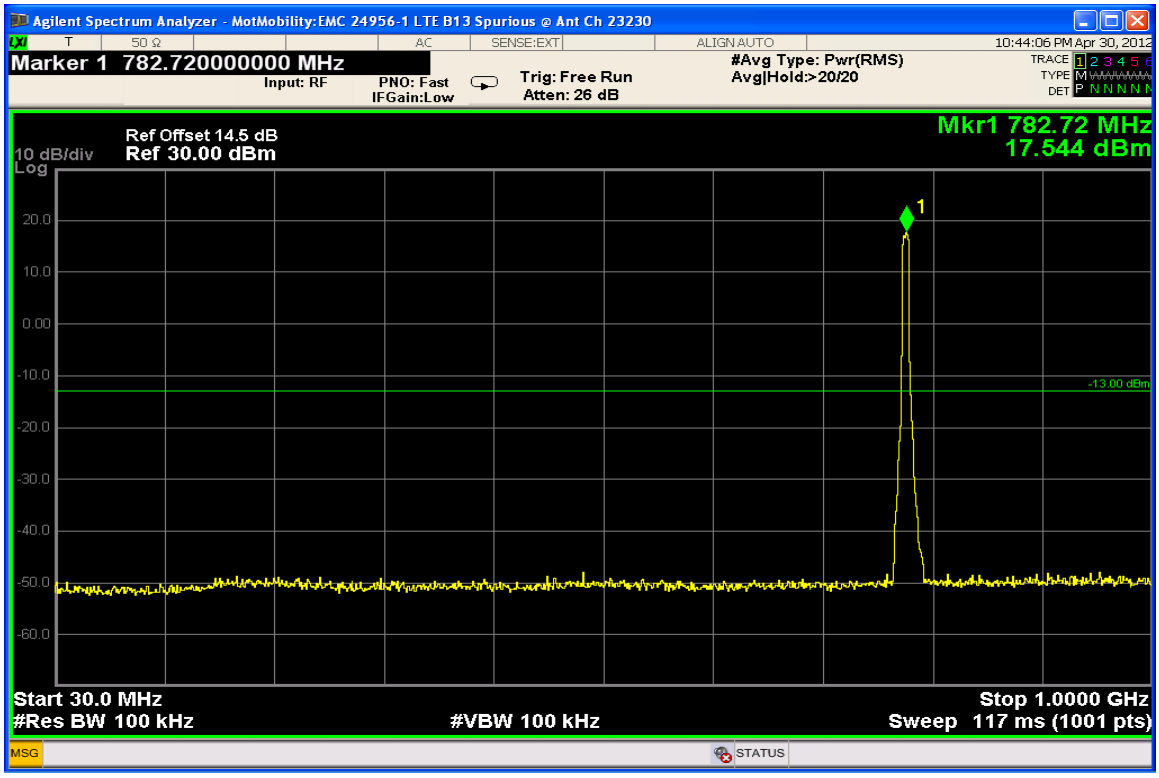
Mode: LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%

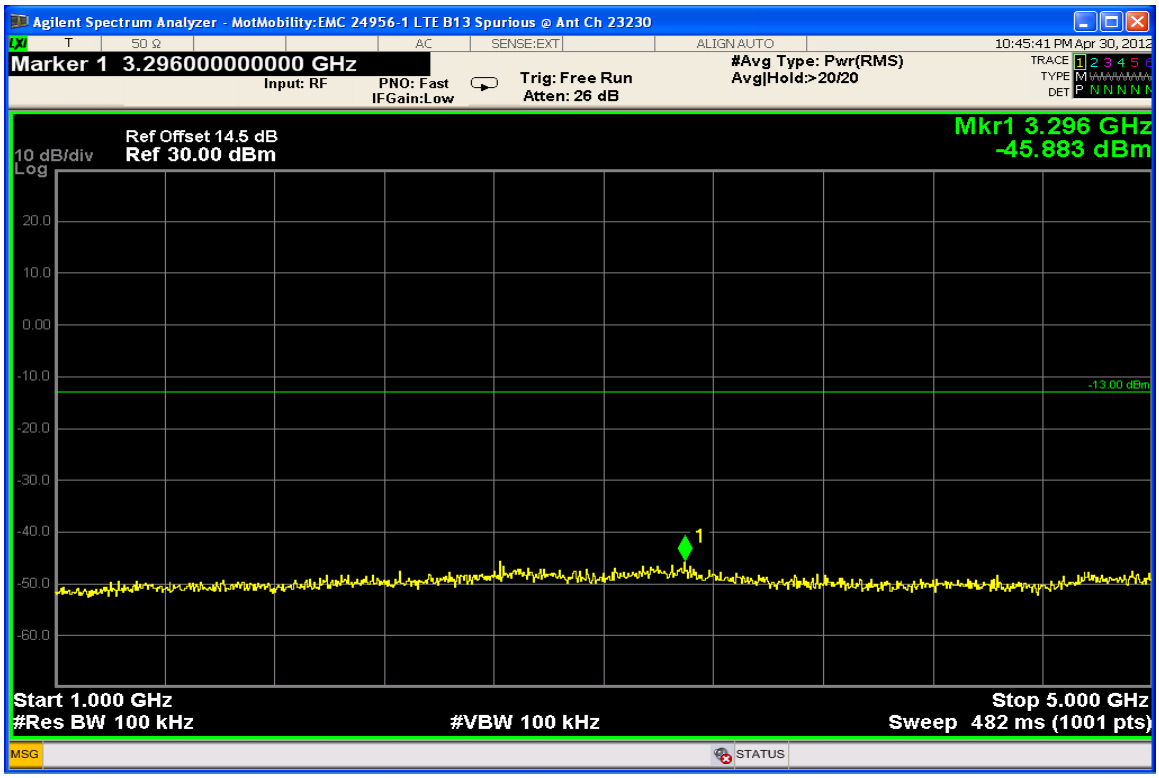


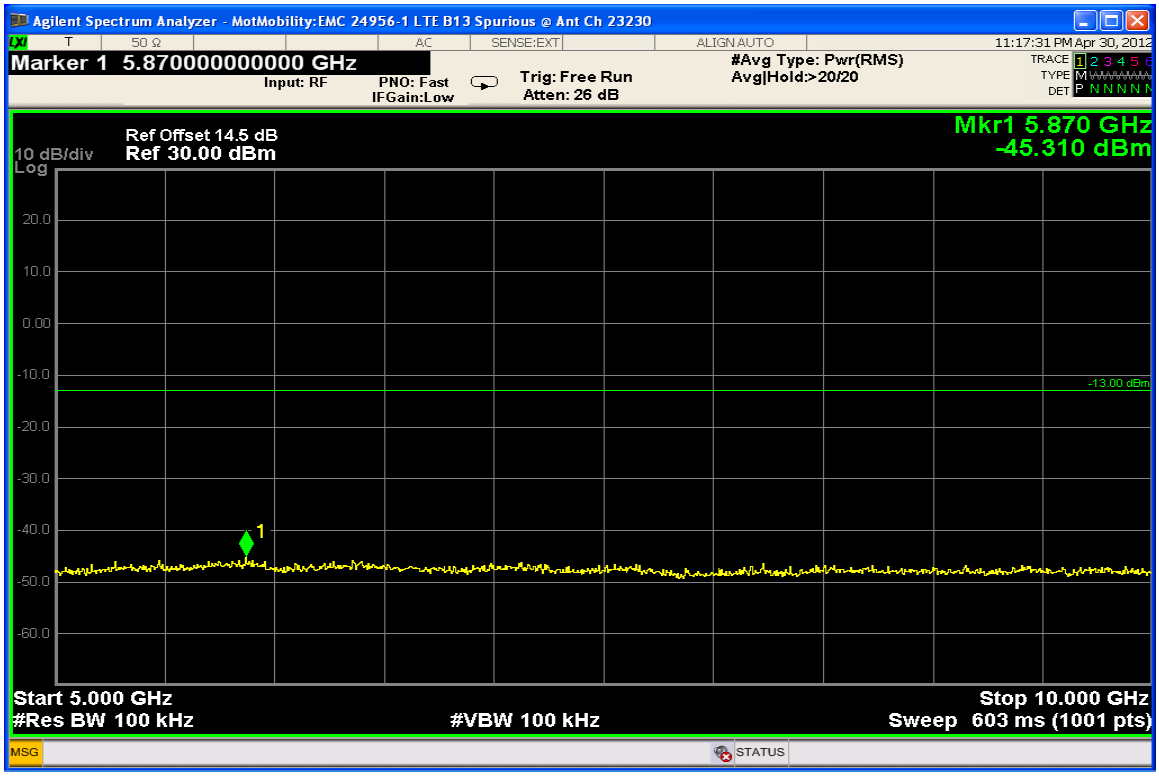




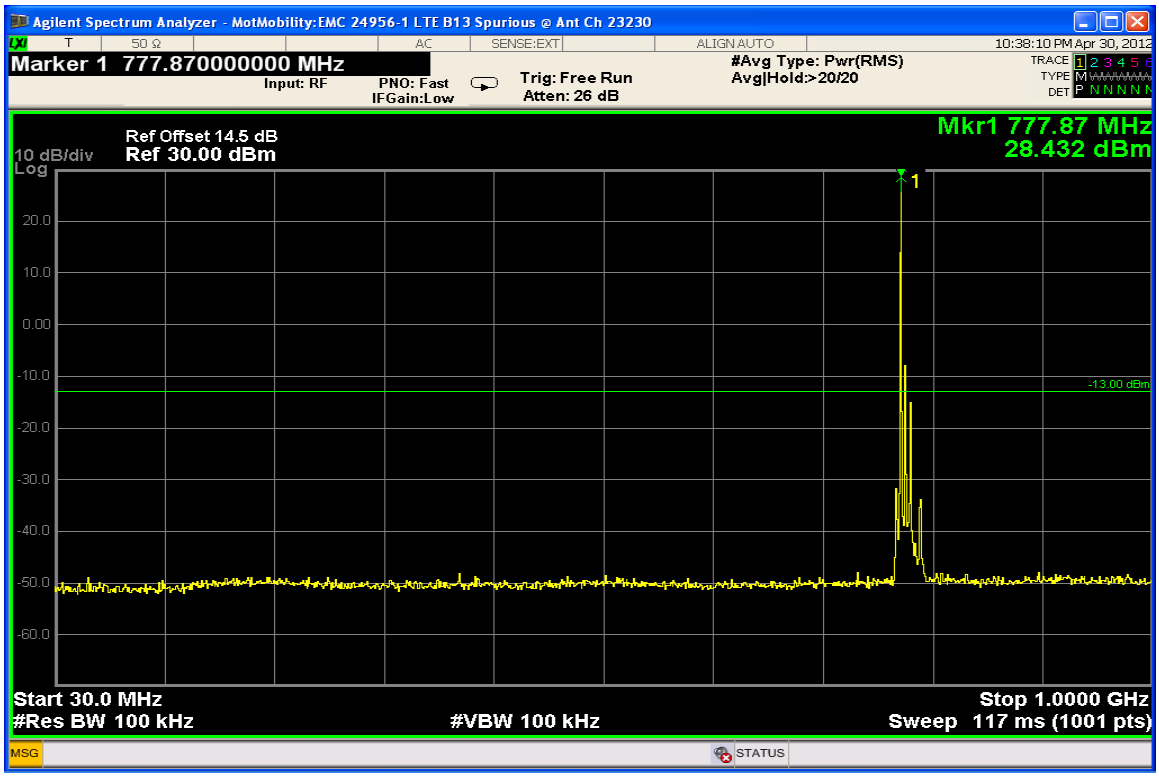
Mode: LTE – Band 13 - 16 QAM, Start RB: 13, RB Allocation 50%

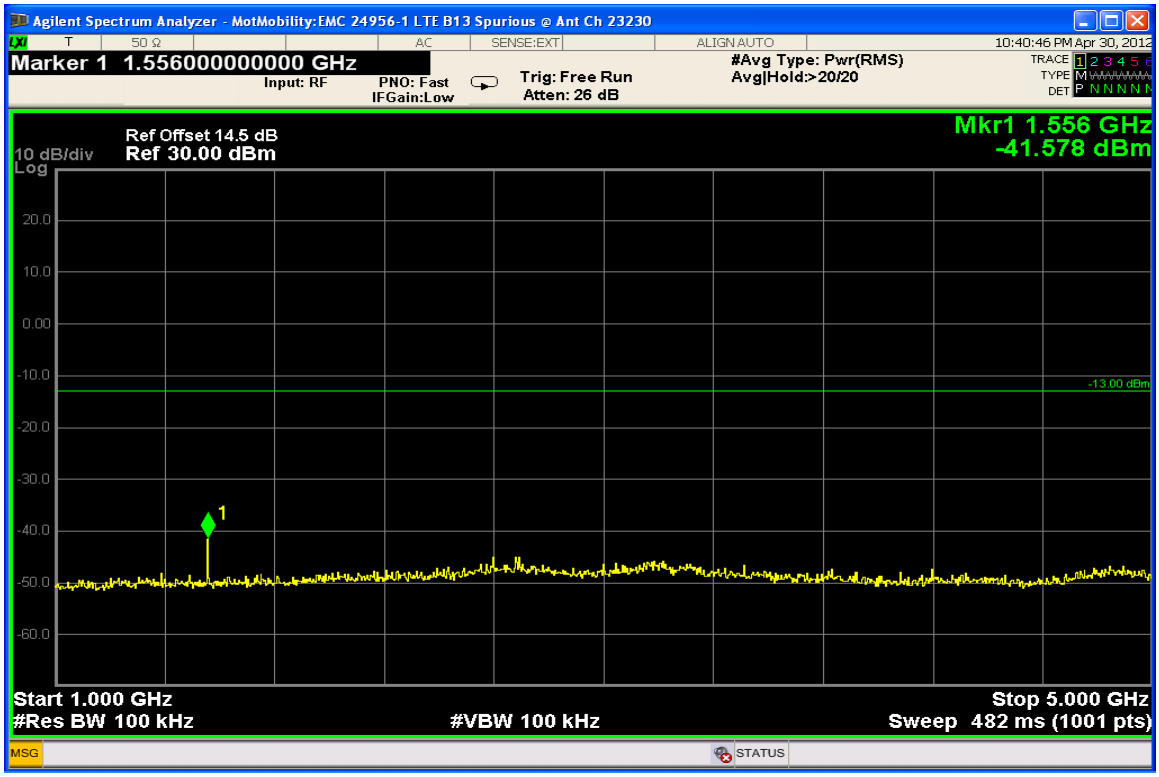


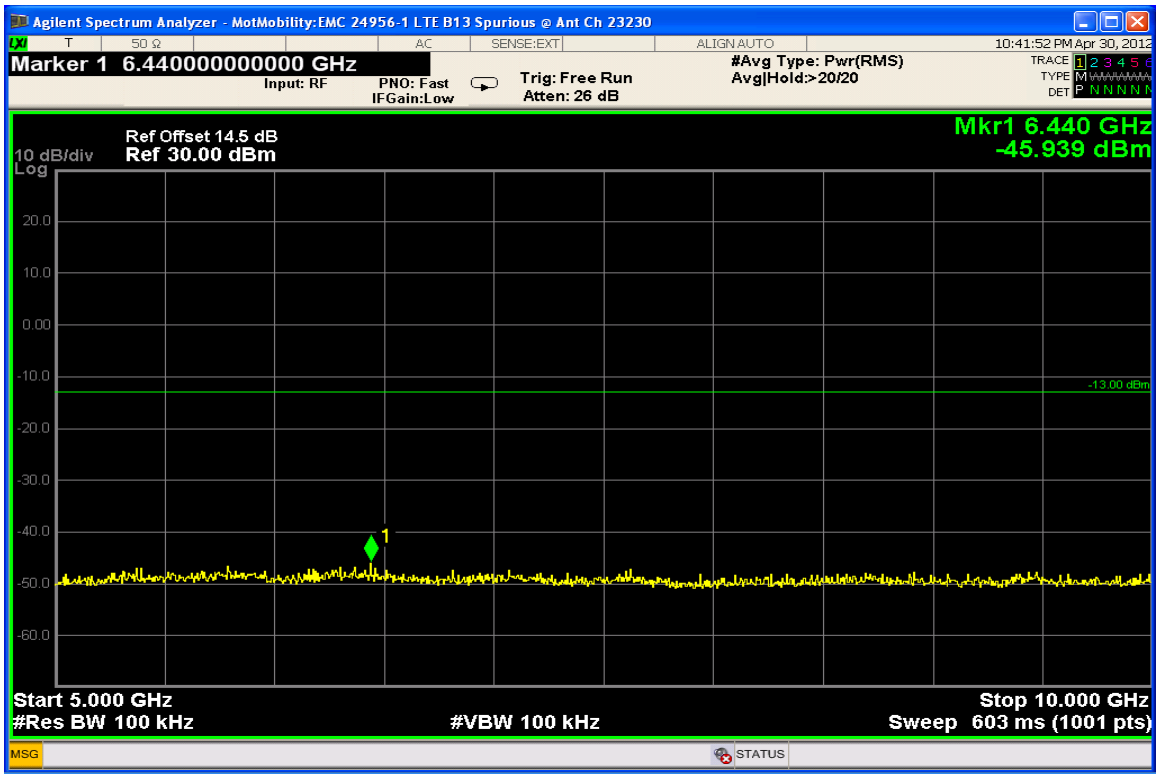

Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 3.296000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
10:45:41 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 3.296 GHz
-45.883 dBm
-13.00 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 5.000 GHz
Sweep 482 ms (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 5.870000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
11:17:31 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 5.870 GHz
-45.310 dBm
-13.00 dBm
Start 5.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 10.000 GHz
Sweep 603 ms (1001 pts)
MSG
STATUS

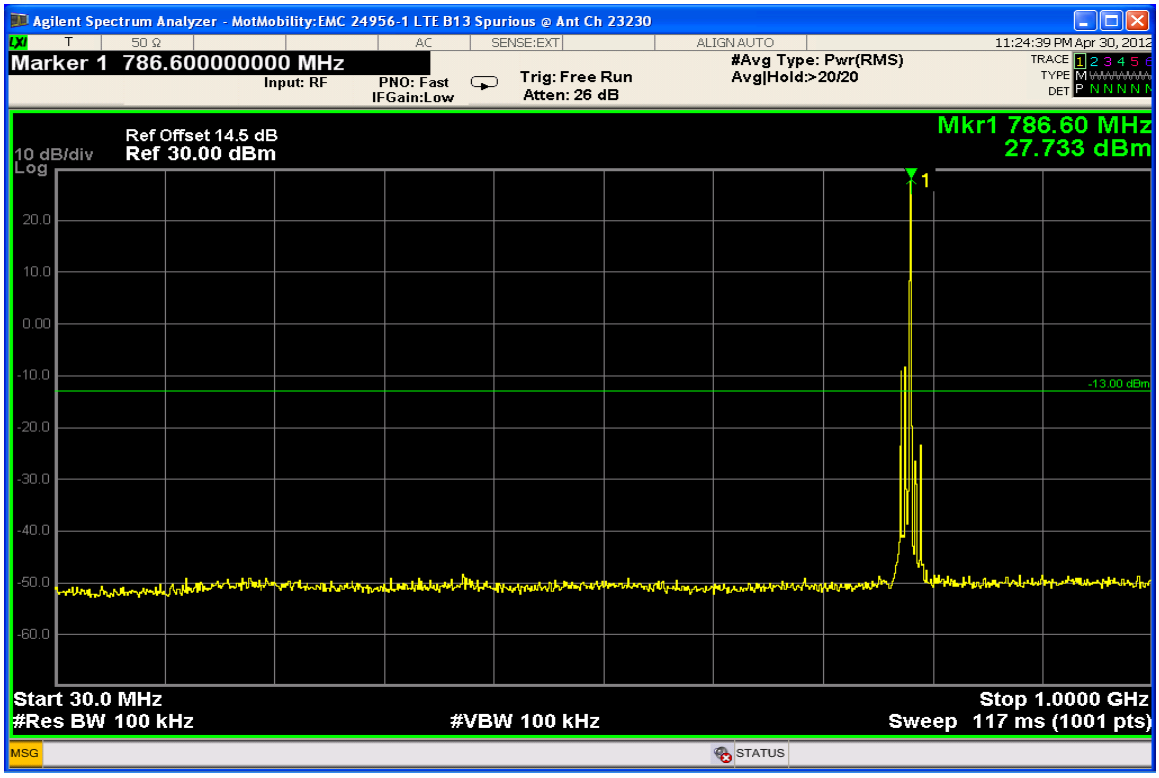
Mode: LTE – Band 13 - 16 QAM, Start RB: 0, 1RB@ low end

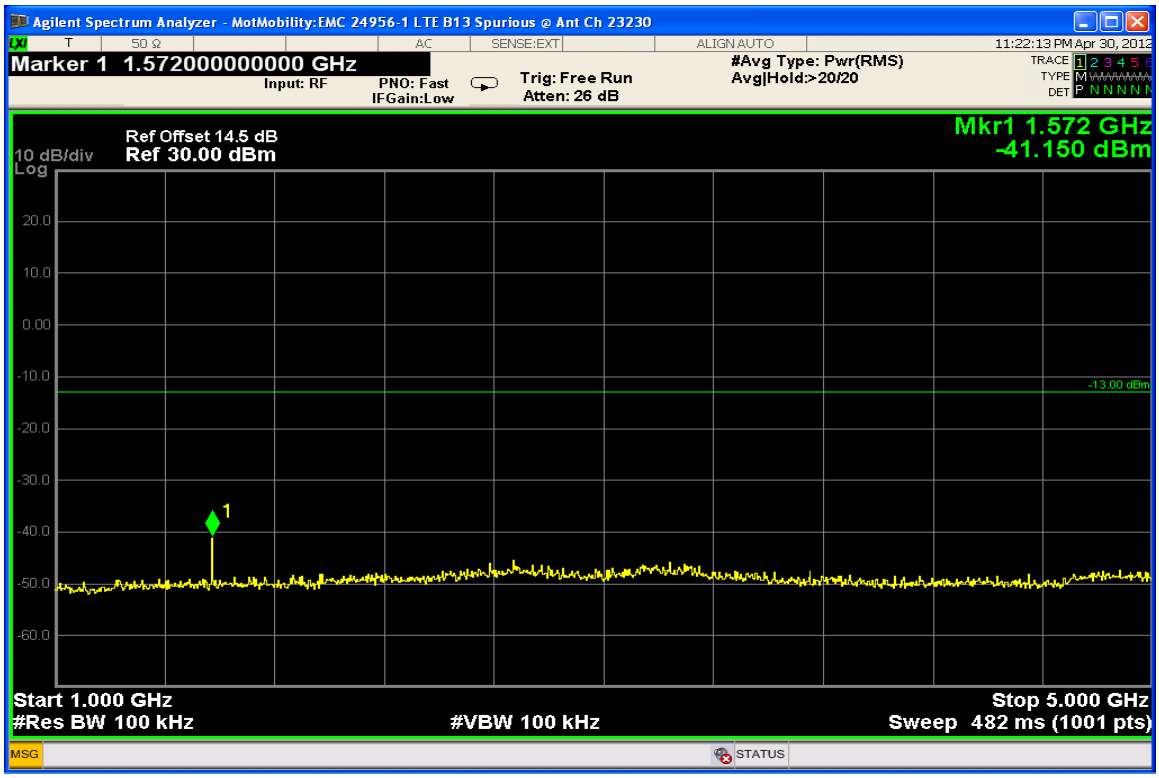


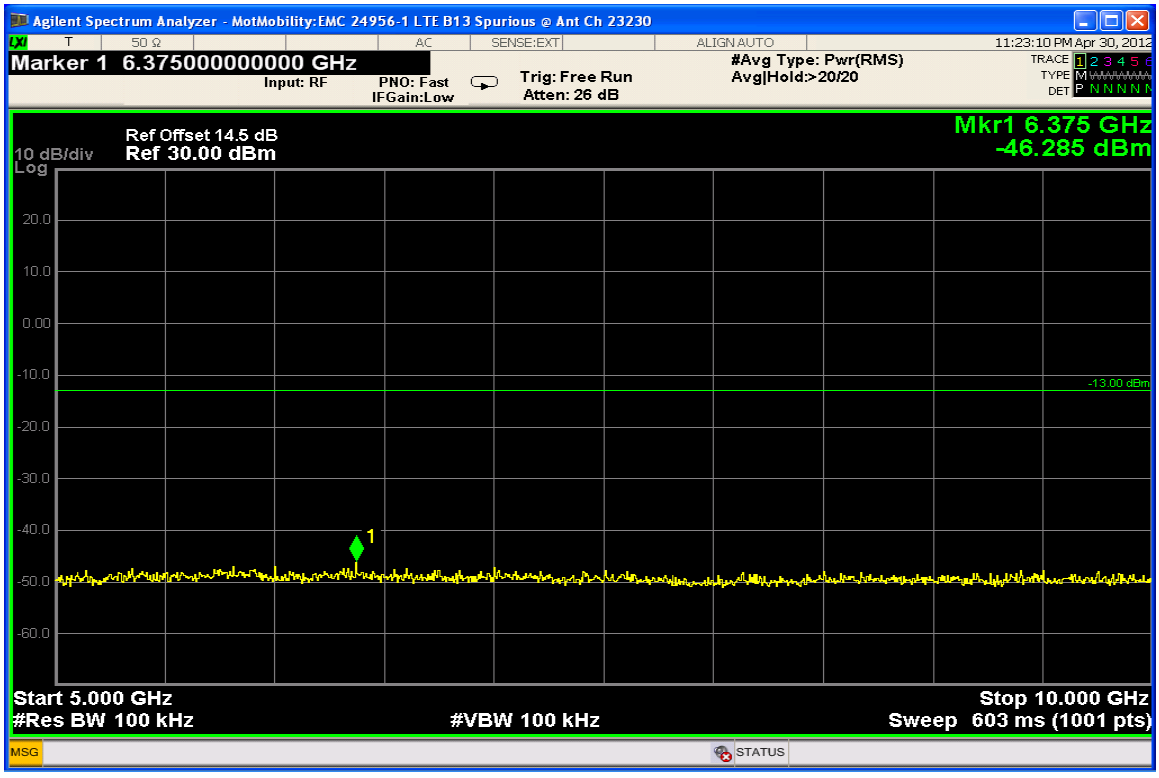




Mode: LTE – Band 13 - 16 QAM, Start RB: 49, 1RB@ high end

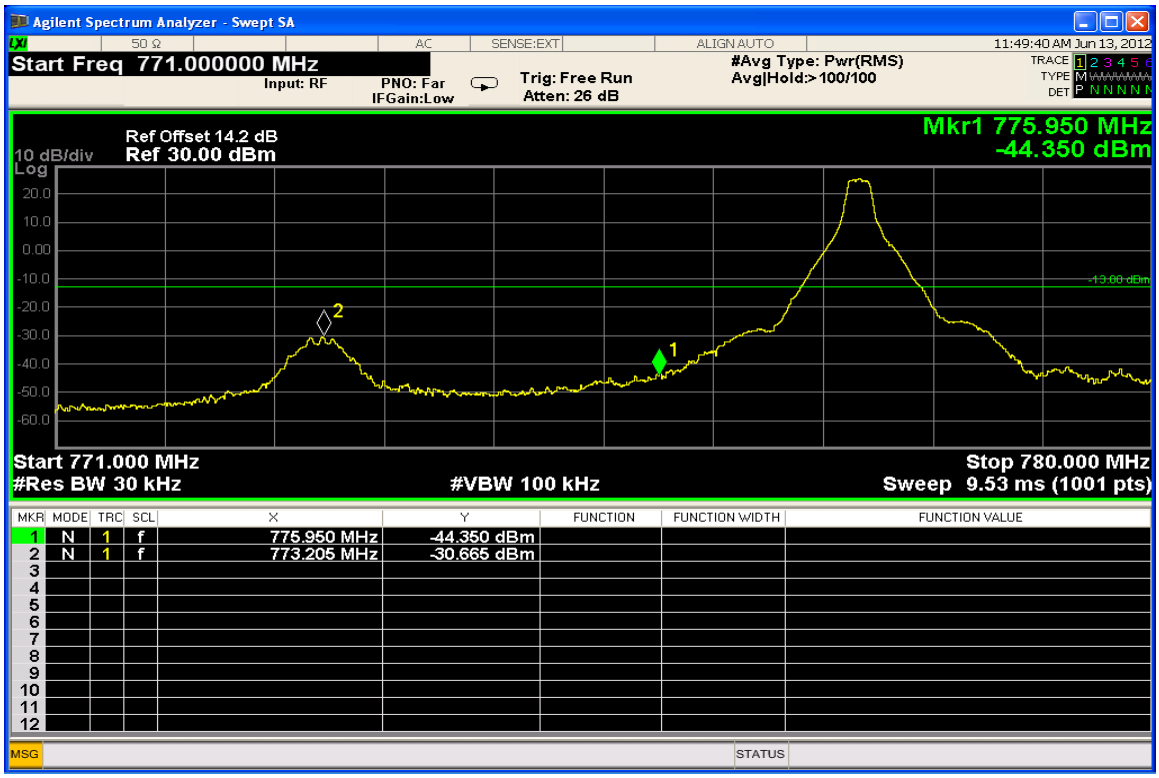



Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 1.572000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
11:22:13 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 1.572 GHz
-41.150 dBm
-13.00 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 5.000 GHz
Sweep 482 ms (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - MotMobility:EMC 24956-1 LTE B13 Spurious @ Ant Ch 23230
Marker 1 6.375000000000 GHz
Input: RF
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
#Avg Type: Pwr(RMS)
Avg|Hold:>20/20
11:23:10 PM Apr 30, 2012
Ref Offset 14.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 6.375 GHz
-46.285 dBm
-13.00 dBm
Start 5.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 10.000 GHz
Sweep 603 ms (1001 pts)
MSG
STATUS

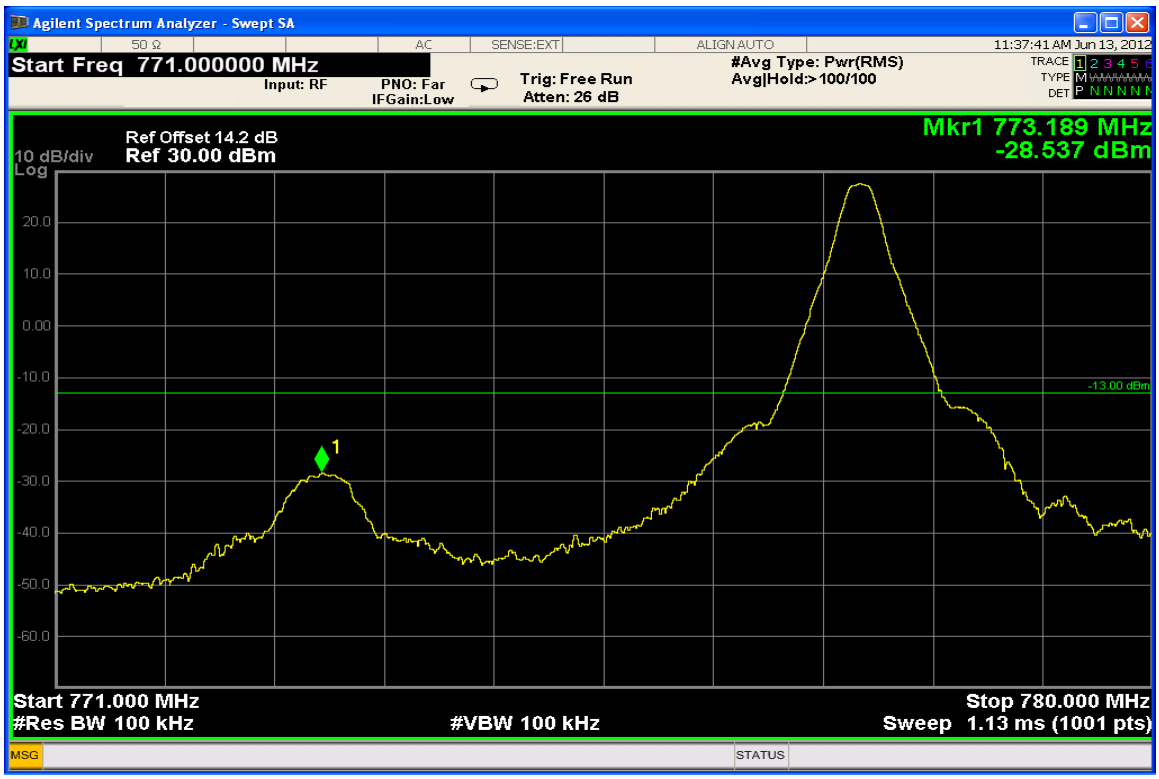
Low Band Edge, Channel 782

QPSK Start RB: 0, RB Allocation 100% 30kHz RBW

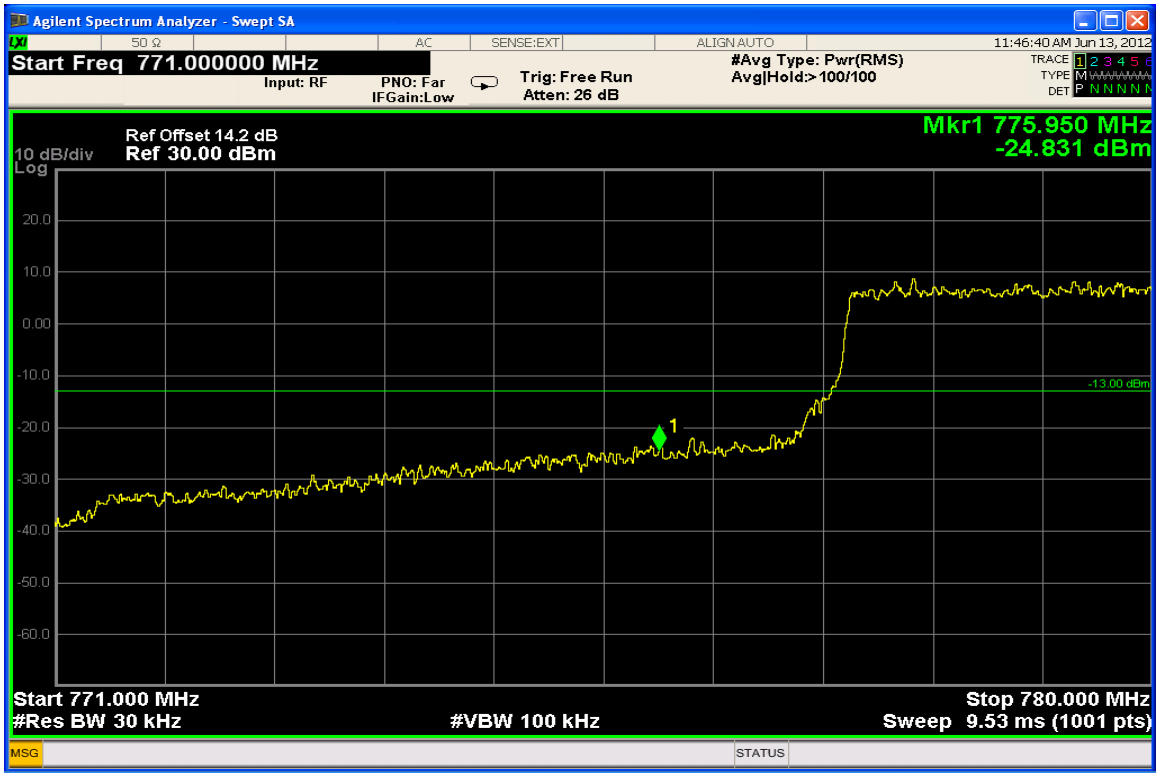


QPSK Start RB: 0, 1RB 30kHz RBW

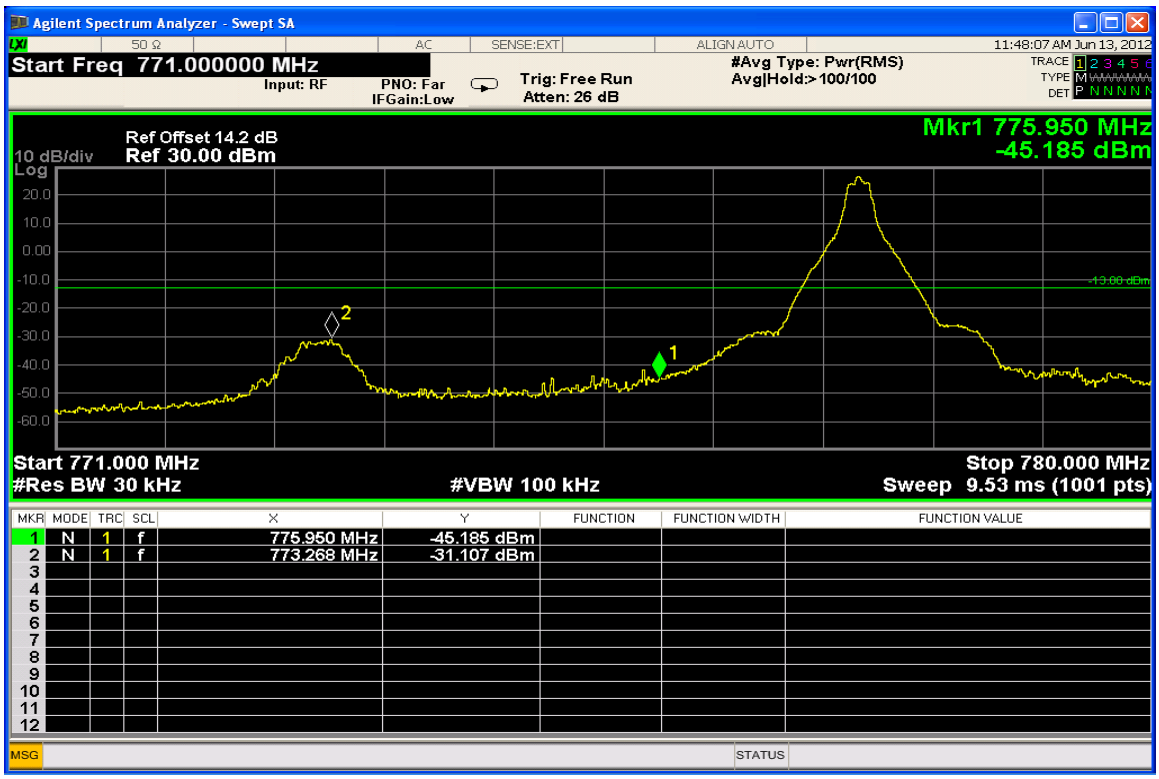
QPSK Start RB: 0, RB Allocation 100% 100kHz RBW



QPSK Start RB: 0, 1RB 100kHz RBW

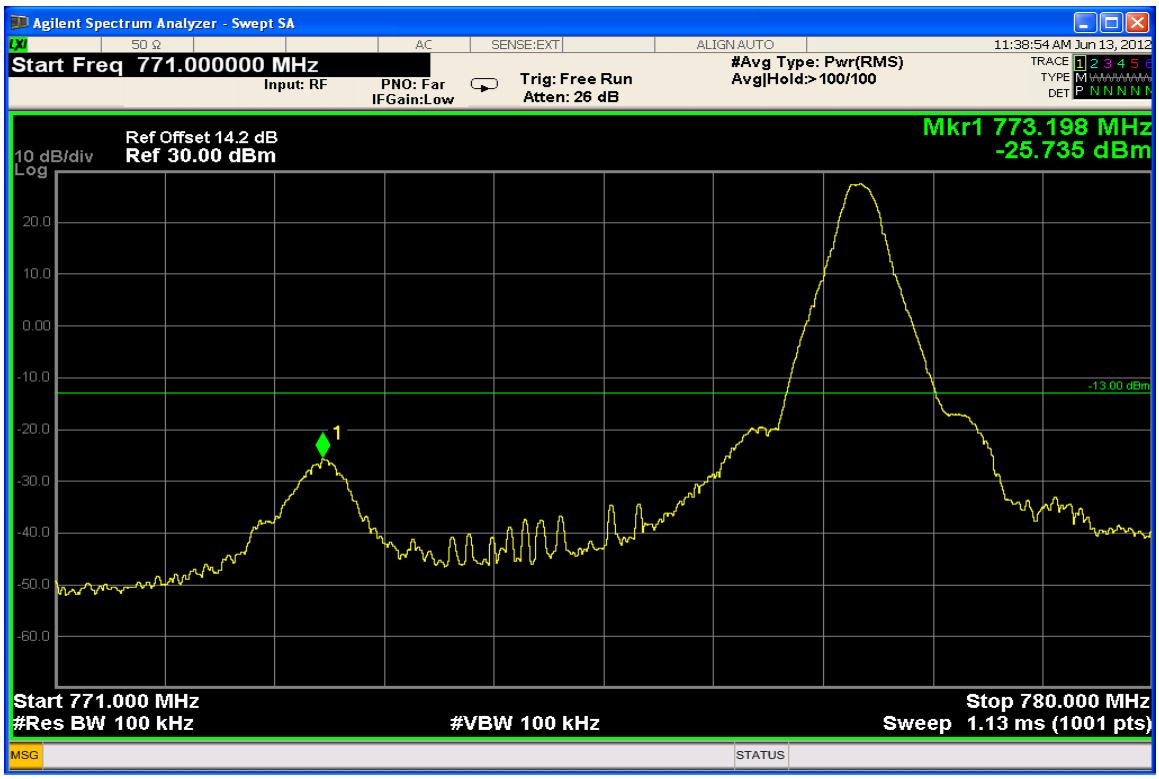


16QAM Start RB: 0, RB Allocation 100% 30kHz RBW



16QAM Start RB: 0, 1RB 30kHz RBW

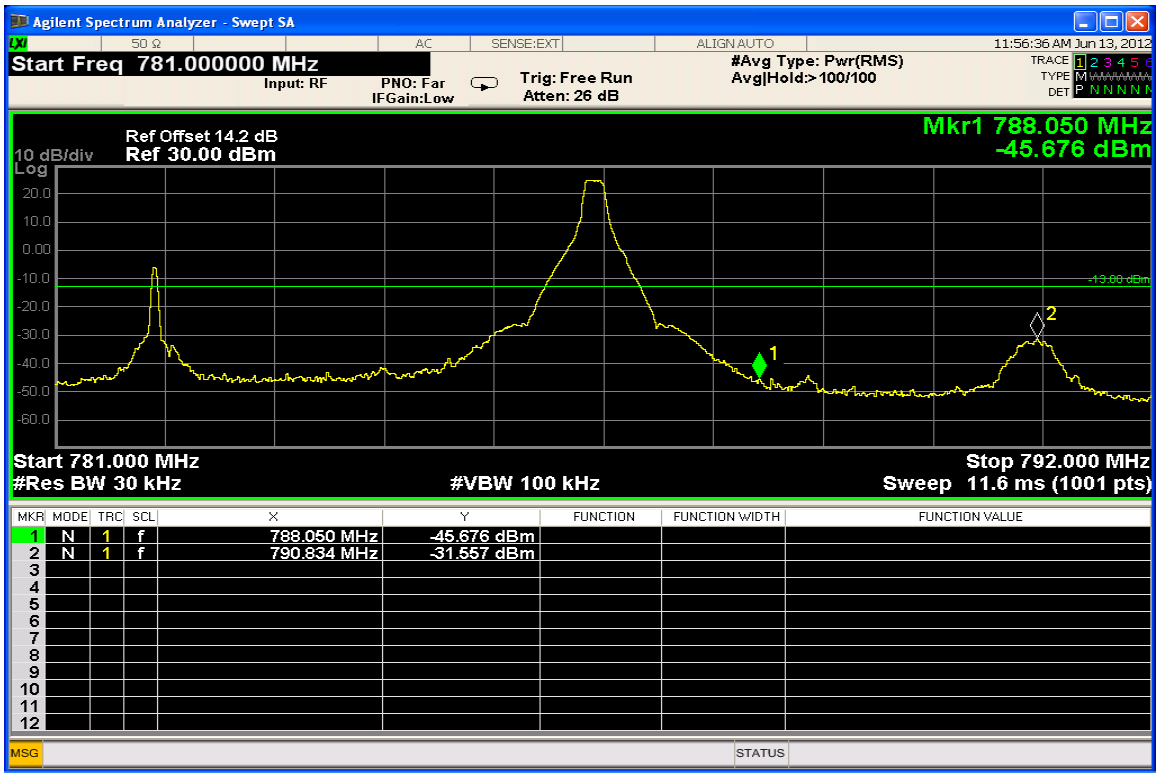
16QAM Start RB: 0, RB Allocation 100% 100kHz RBW



16QAM Start RB: 0, 1RB 100kHz RBW

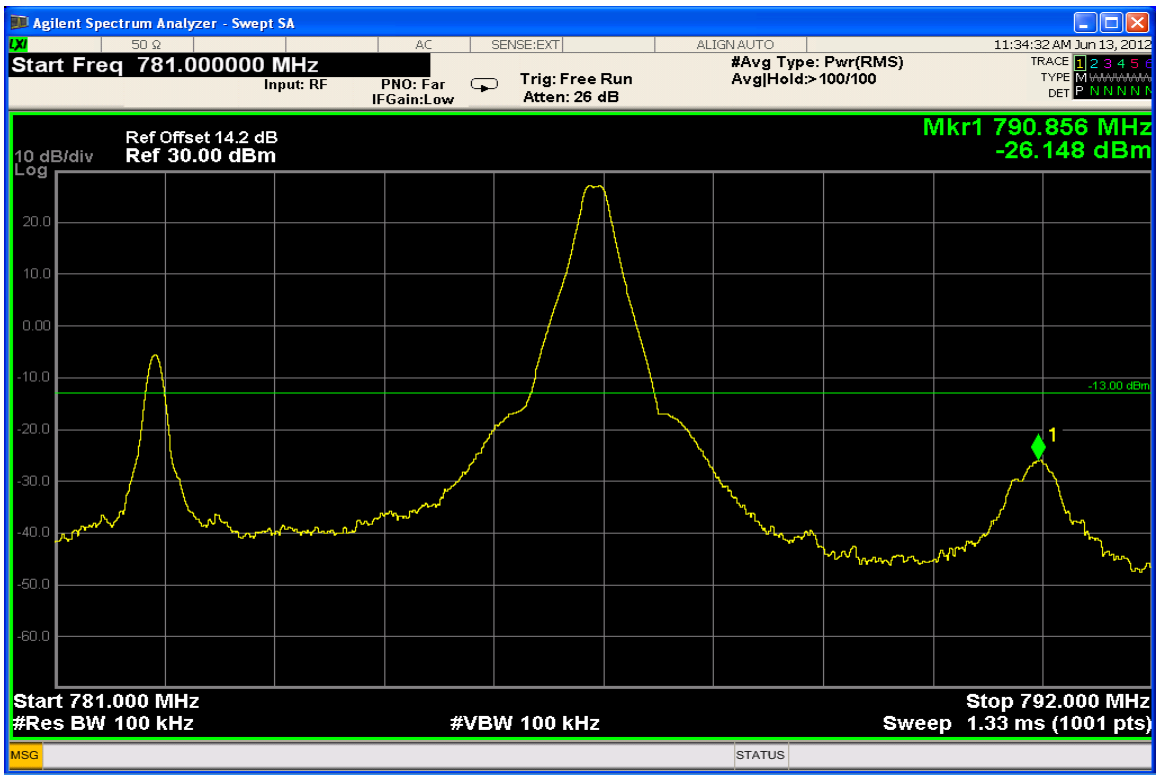
High Band Edge, Channel 782

QPSK Start RB: 0, RB Allocation 100% 30kHz RBW

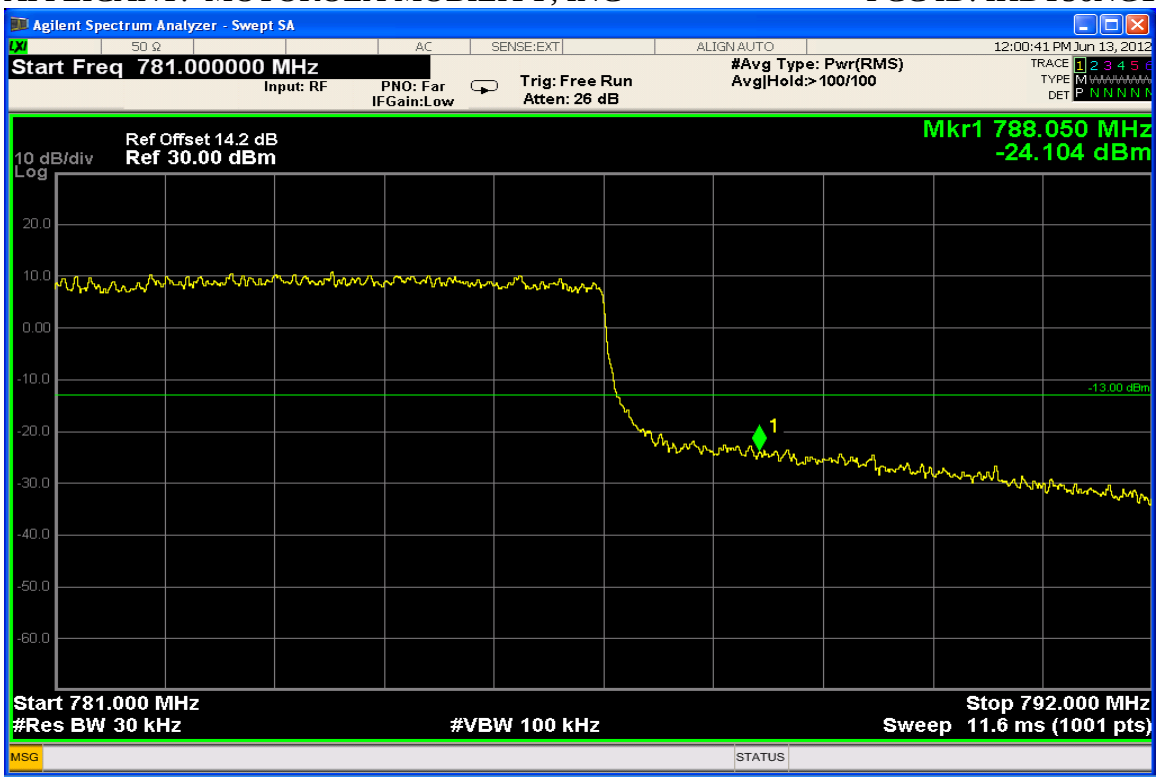


QPSK Start RB: 49, 1RB 30kHz RBW

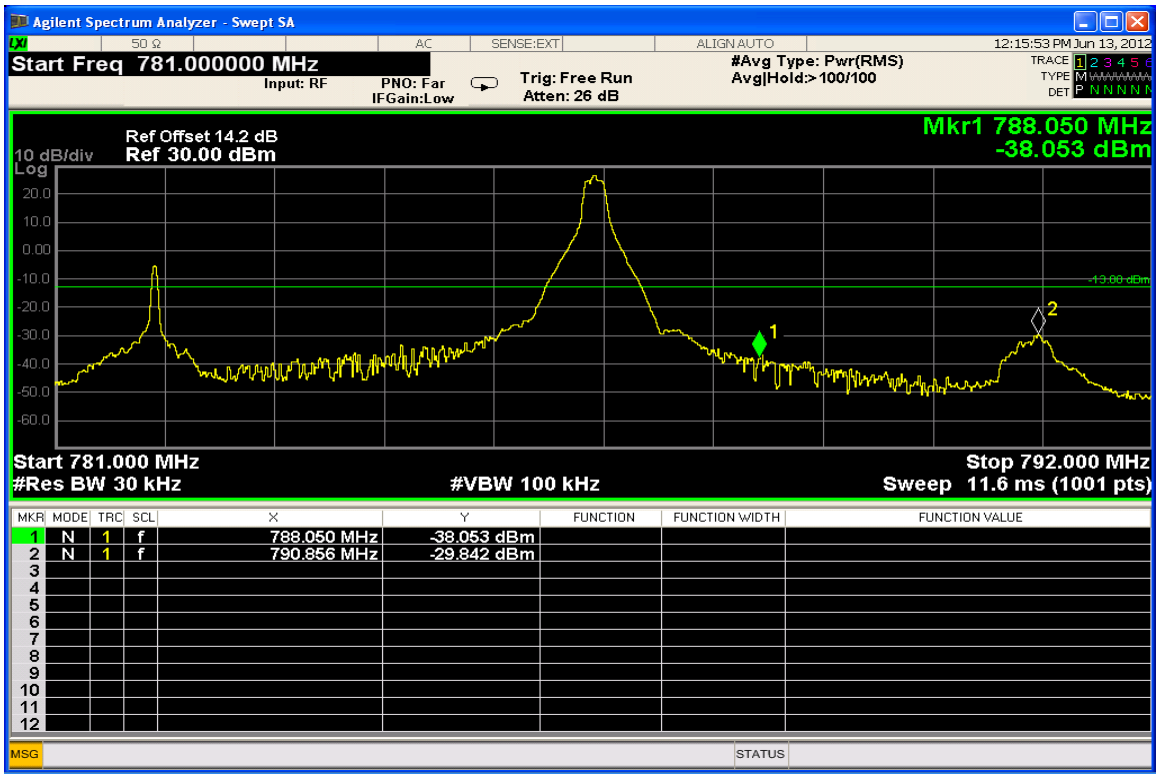
QPSK Start RB: 0, RB Allocation 100% 100kHz RBW



QPSK Start RB: 49, 1RB 100kHz RBW

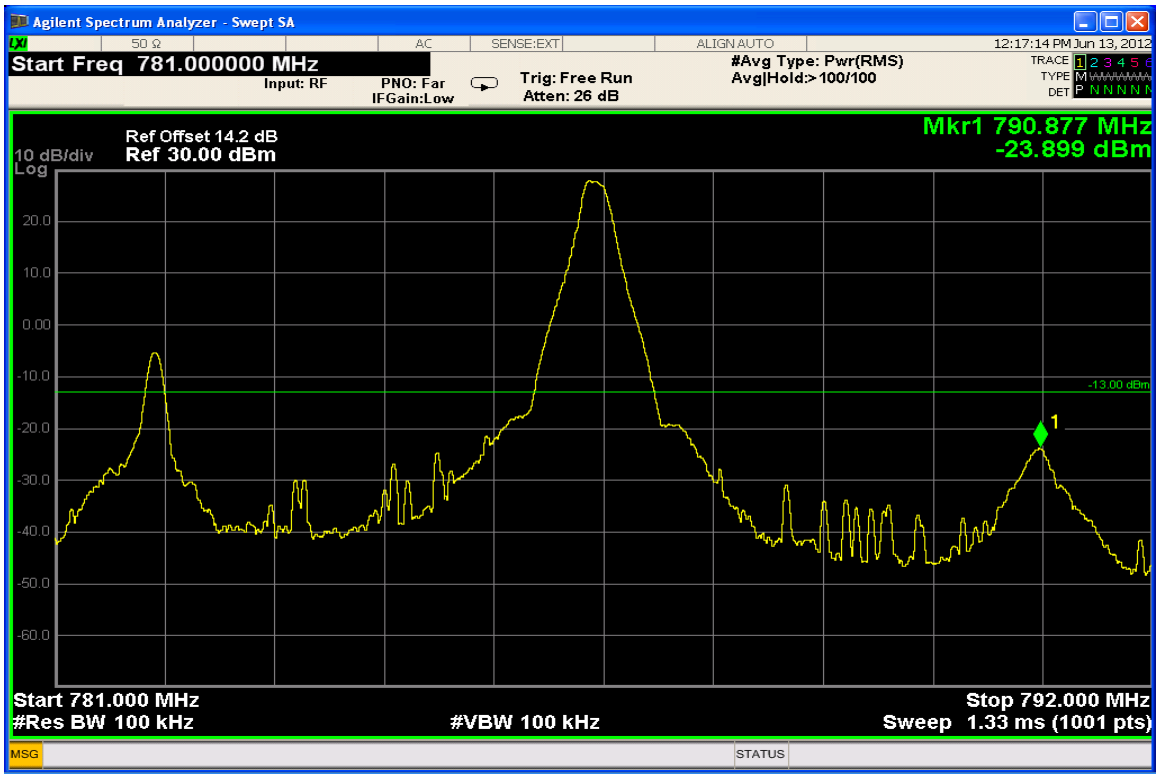


16QAM Start RB: 0, RB Allocation 100% 30kHz RBW



16QAM Start RB: 49, 1RB 30kHz RBW

16QAM Start RB: 0, RB Allocation 100% 100kHz RBW



16QAM Start RB: 49, 1RB 100kHz RBW

FIELD STRENGTH OF SPURIOUS EMISSIONS

§27.53 (c) (2)

Measurement Procedure

The EUT is placed inside the semi-anechoic chamber on a wooden table at the turntable center. For each spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer. This is repeated for both horizontal and vertical polarizations of the receive antenna.

The EUT is then replaced with a substitution antenna fed by a signal generator. With the signal generator tuned to a particular spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters to obtain a maximum reading at the spectrum analyzer. The output of the signal generator is then adjusted until a reading identical to that obtained with the actual transmitter is achieved.

The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole. A fully charged battery was used for the supply voltage. Testing was performed in three orthogonal planes where the X plane is with the EUT orientated vertically, the Y plane is with the EUT orientated on its side and the Z plane with the EUT laying flat on the table. The worst case emission is reported for each tested mode.

Any emissions 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.

The settings of the receiver were as follows:

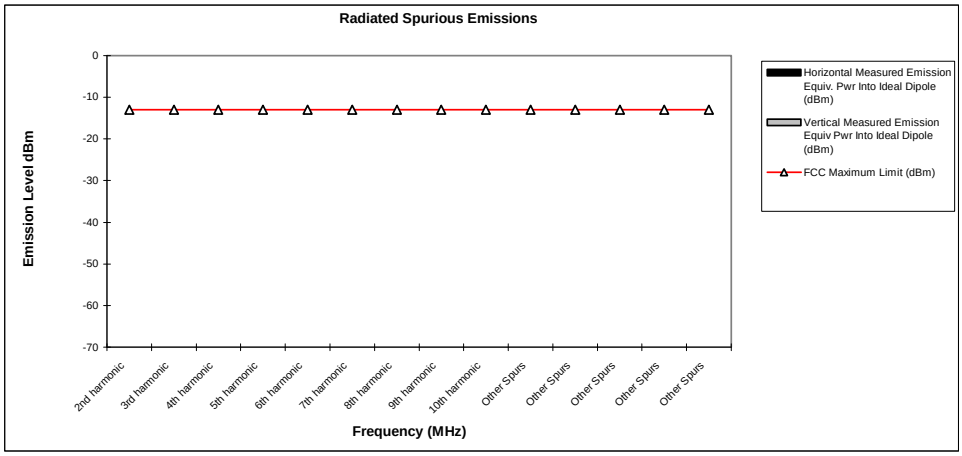
Units	dBm
Divisions	5 dB
Detector	Peak Detector
Resolution Bandwidth	1 MHz
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

Measurement Results

Band: LTE Band 13.
Modulation: QPSK and 16 QAM.
RB configuration: 1 RB Start 0, 1 RB Start 49, 25 RB's Start 13, 50 RB's

Radiated Spurious and Harmonic Emissions

Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	*	*
3rd harmonic	-13	*	*
4th harmonic	-13	*	*
5th harmonic	-13	*	*
6th harmonic	-13	*	*
7th harmonic	-13	*	*
8th harmonic	-13	*	*
9th harmonic	-13	*	*
10th harmonic	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*



Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients or the emissions are lower than -33 dBm.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum was investigated from 30 MHz to the tenth harmonic of the fundamental.

The margin with respect to the limit is the minimum margin for all modes and bands.

FIELD STRENGTH OF SPURIOUS EMISSIONS IN 1559-1610 MHz
§27.53 (f)

Measurement Procedure

The EUT is placed inside the semi-anechoic chamber on a wooden table at the turntable center. For each spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer. This is repeated for both horizontal and vertical polarizations of the receive antenna.

The EUT is then replaced with a substitution antenna fed by a signal generator. With the signal generator tuned to a particular spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters to obtain a maximum reading at the spectrum analyzer. The output of the signal generator is then adjusted until a reading identical to that obtained with the actual transmitter is achieved.

The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole. The fully charged internal battery was used for the supply voltage.

The power any emissions in the 1559-1610 MHz band shall be < - 40 dBm/MHz EIRP (Wideband) and < - 50dBm EIRP (narrowband).

The settings of the receiver were as follows:

Units	dBm
Divisions	5 dB
Detector	Peak Detector
Resolution Bandwidth	1 MHz for Wideband Emissions
Resolution bandwidth	1 kHz for Narrowband Emisssions
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

Measurement Results

Band: LTE Band 13.
Modulation: QPSK and 16 QAM.
RB configuration: 1 RB Start 0, 1 RB Start 49, 25 RB's Start 13, 50 RB's

There were no emissions found in the 1559-1610 MHz band.

FREQUENCY STABILITY

§Part 27.54

Measurement Procedure

The EUT is placed in an environmental chamber. The antenna port of the EUT is directly coupled to the input of the measurement equipment through a specialized RF connector. A power supply is attached as the primary voltage supply.

Frequency measurements are made at the extremes of the temperature range -30º C to +60º C and at intervals of 10º C with the primary supply voltage set to the nominal battery operating voltage. A period of time sufficient to stabilize all components of the equipment is allowed at each frequency measurement. The maximum variation of frequency is measured.

At room temperature, the primary supply voltage is reduced to the battery operating endpoint of the equipment under test. The maximum variation of frequency is measured. A power supply was used for the input supply voltage.

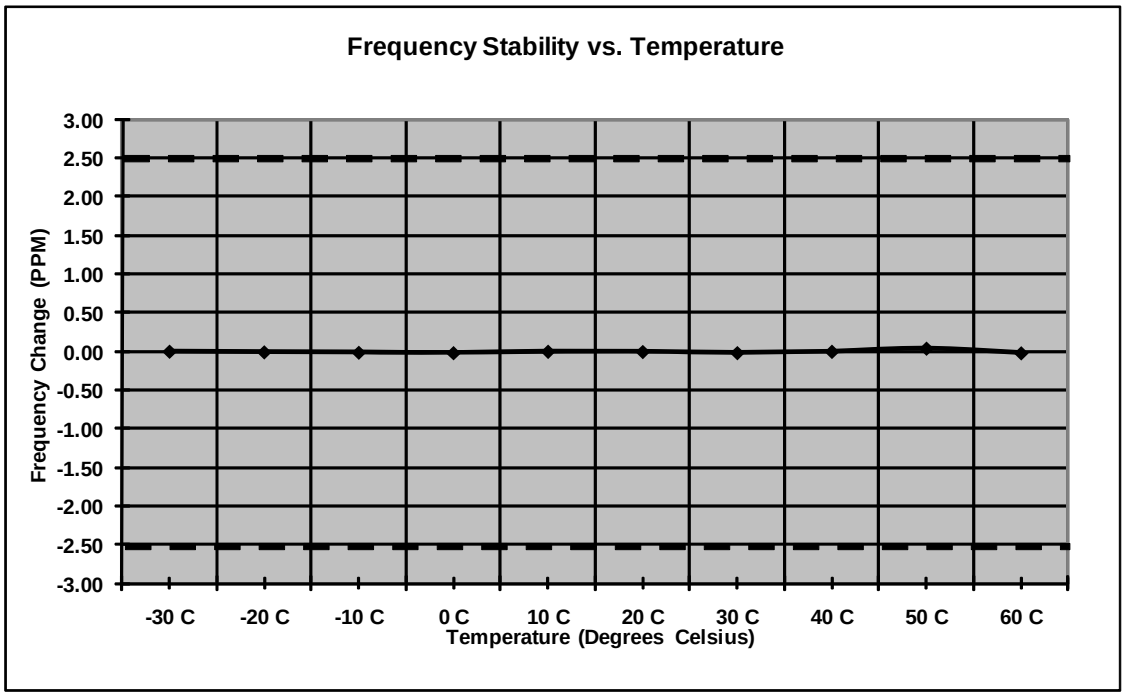
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Measurement Results

Modulation: LTE Band 13 QPSK

Mode: LTE Band 13 **Operating Frequency:** 782MHz
Channel: 23230 **Deviation Limit (PPM):** 2.5 ppm
50 RB low QPSK

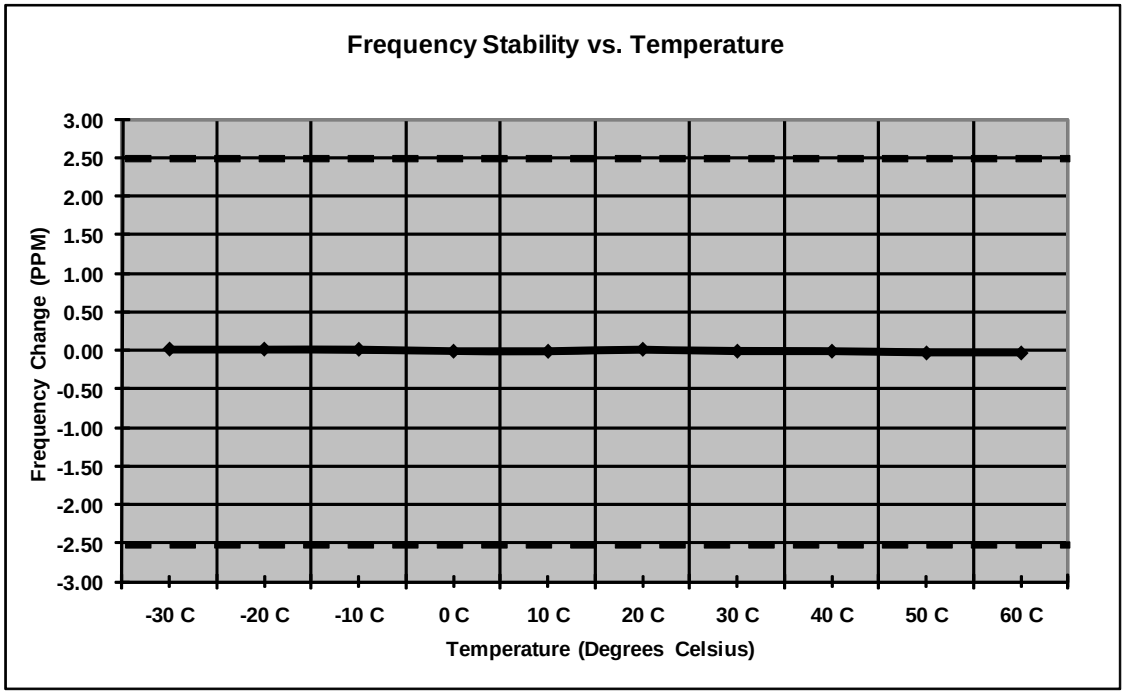
Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-4.85**	**-0.006**	100%	3.80
-20 C	**-11.19**	**-0.014**	100%	3.80
-10 C	**-15.38**	**-0.020**	100%	3.80
0 C	**-20.38**	**-0.026**	100%	3.80
10 C	**-5.28**	**-0.007**	100%	3.80
20 C	**-7.38**	**-0.009**	100%	3.80
30 C	**-18.95**	**-0.024**	100%	3.80
40 C	**-5.97**	**-0.008**	100%	3.80
50 C	**27.17**	**0.035**	100%	3.80
60 C	**-21.64**	**-0.028**	100%	3.80
20 C	**11.14**	**0.014**	Battery Endpoint	3.20



Modulation: LTE Band 13 16 QAM

Mode: LTE Band 13 **Operating Frequency:** 782 MHz
Channel: 23230 **Deviation Limit (PPM):** 2.5 ppm
50 RB low 16 QAM

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	**9.14**	**0.012**	100%	3.80
-20 C	**9.47**	**0.012**	100%	3.80
-10 C	**7.82**	**0.010**	100%	3.80
0 C	**-11.77**	**-0.015**	100%	3.80
10 C	**-11.93**	**-0.015**	100%	3.80
20 C	**8.41**	**0.011**	100%	3.80
30 C	**-11.09**	**-0.014**	100%	3.80
40 C	**-11.16**	**-0.014**	100%	3.80
50 C	**-28.20**	**-0.036**	100%	3.80
60 C	**-28.57**	**-0.037**	100%	3.80
20 C	**15.18**	**0.019**	Battery Endpoint	3.20



End of Test Report