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MOBILE DEVICES BUSINESS

**PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY**

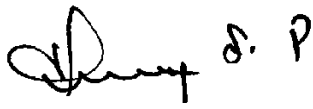
EMC TEST REPORT

Test Report Number – 24414-1

Report Date – August 2, 2011

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: Thanigaiselvan Palaniswami

Title: EMC Engineer

Date: August 2, 2011

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UKAS Certificate Number: 2404

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Test Report Details

Tests 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
FCC Registration Number: 316588
Industry Canada Number: 109O-1

Tests Requested By: Motorola Mobility Inc.
600 North US Hwy 45
Libertyville, IL 60048

Product Type: LTE Module

Signaling Capability: LTE Band 13 777 – 787 MHz

FCC ID: IHDP56LU2

Serial Numbers: T0585014D2, T0585014ES, T0585014EJ

Testing Complete Date: April 06, 2011

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

Applicable Standards: ANSI 63.4 2003, ANSI/TIA-603-C-2004

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

The EUT was tested using a fully charged battery when applicable. Where a battery could not be used due to the need for a controlled variation of input voltage, an external power supply was utilized.

All Radiated and Conducted testing were performed with the EUT (LTE module) placed inside the sole intended host (FCC ID- IHDP56LU1). All frequency stability testing was performed with the EUT (LTE module) in a standalone configuration connected to a cradle

The temperature and the relative humidity were maintained within the ANSI C63.4 2003 Standard requirements during the entire duration of testing.

Equipment List

Manufacturer	Equipment Type	Model No.	Serial Number	Calibration Due Date
Rohde & Schwarz	Receiver	ESI26	100001	9/23/11
Hewlett Packard	EMC Analyzer	E7405	US40240219	10/19/11
Agilent	MXA Signal Analyzer	N9020A	US46470586	12/18/11
Hewlett Packard	Signal Generator	83623B	3844A00935	4/24/11
Agilent	Signal Generator	83712A	3429A00286	3/26/13
A. H. Systems	DRG Horn Antenna	SAS 200/571	365	4/07/11
ETS	DRG Horn Antenna	3115	6222	3/16/12
A. H. Systems	DRG Horn Antenna	SAS 200/571	265	9/09/11
ETS	Log-Periodic Antenna	3148	1189	1/19/12
ETS	Biconical Antenna	3110B	3370	1/19/12
Attenuator	Weinschel	AS-6	6675	NCR
Attenuator	Weinschel	AS-6	6677	NCR
Thermotron	Environmental Chamber	S-4	31580	1/13/12
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	103402	02/21/12
Agilent	Power Meter	E4416A	GB41293263	9/11/11
Agilent	Power Sensor	E9323A	US40412066	8/30/11
Agilent	Microwave Preamplifier	8449B	3008A00535	10/05/11

All test equipment was within their calibration date during the time of testing. When equipment went out of calibration during testing it was replaced using a similar piece of calibrated equipment. All these equipments are listed in the equipment list.

Module Functionality

The module operates on LTE band 13. The transmitting frequency range of the module is 777-787 MHz. It supports both QPSK and 16 QAM modulation scheme. The bandwidth supported is 10 MHz

Measurement Procedures and Data**RF POWER OUTPUT****Measurement Procedure**

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

Measurement Results

Band	Channel	QPSK, Start RB: 13, RB Alloc 50%	QPSK, Start RB: 0, RB Alloc 100%	QPSK, Start RB: 49, RB Alloc: 1RB@high end	QPSK, Start RB: 0, RB Alloc: 1RB@low end
LTE Band 13	23230	23.61	24.1	24.75	23.49
		16QAM, Start RB: 13, RB Alloc 50%	16QAM, Start RB: 0, RB Alloc 100%	16QAM, Start RB: 49, RB Alloc: 1RB@high end	16QAM, Start RB: 0, RB Alloc: 1RB@low end
	23230	22.56	22.24	24.83	23.48

RADIATED POWER (ERP)

§27.50 (b) (10)

Measurement Procedure

The phone was tested in a 5 meter anechoic chamber with a 2-axis position system that permits taking complete spherical scans of the EUT's radiation patterns. For all tests, the phone was supported in a free space type environment, vertically oriented in the chamber.

All measurements were made with the phone placed in a call using a mobile station test set. The phone was weakly coupled to the test set and configured to transmit in the below RB configuration. Radiated power was measured at each 15 degree step. The radiated power was measured using a Rhode & Schwarz FSP Spectrum Analyzer using the Peak Detector. From these measurements, the software calculates the angle at which maximum radiated power occurs for each case, and the radiated power at this angle was extracted from the data. To get ERP (effective radiated power referenced to a half-wave dipole), subtract 2.1 dB from these numbers.

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

Measurement Results

LTE Band 13	RB's Configuration	EIRP dBm	ERP dBm
	QPSK, Start RB: 13, RB Alloc 50%	29.38	27.28
	QPSK, Start RB: 0, RB Alloc 100%	26.16	24.06
	QPSK, Start RB: 49, RB Alloc: 1RB@high end	28.90	26.80
	QPSK, Start RB: 0, RB Alloc: 1RB@low end	29.13	27.03
	16QAM, Start RB: 13, RB Alloc 50%	29.44	27.34
	16QAM, Start RB: 0, RB Alloc 100%	28.97	26.87
	16QAM, Start RB: 49, RB Alloc: 1RB@high end	29.34	27.24
	16QAM, Start RB: 0, RB Alloc: 1RB@low end	29.31	27.21

OCCUPIED BANDWIDTH

§ 2.1049

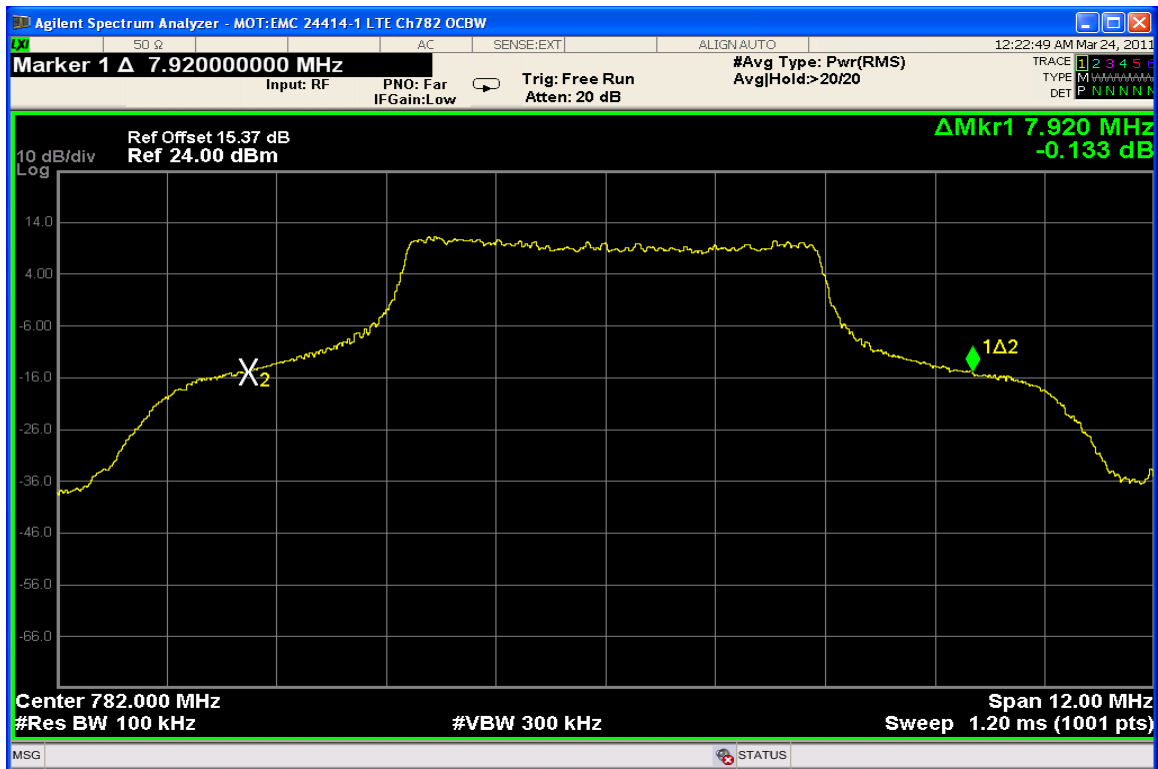
Measurement Procedure

The RF output port of the equipment under test 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. A fully charged battery was used for the supply voltage.

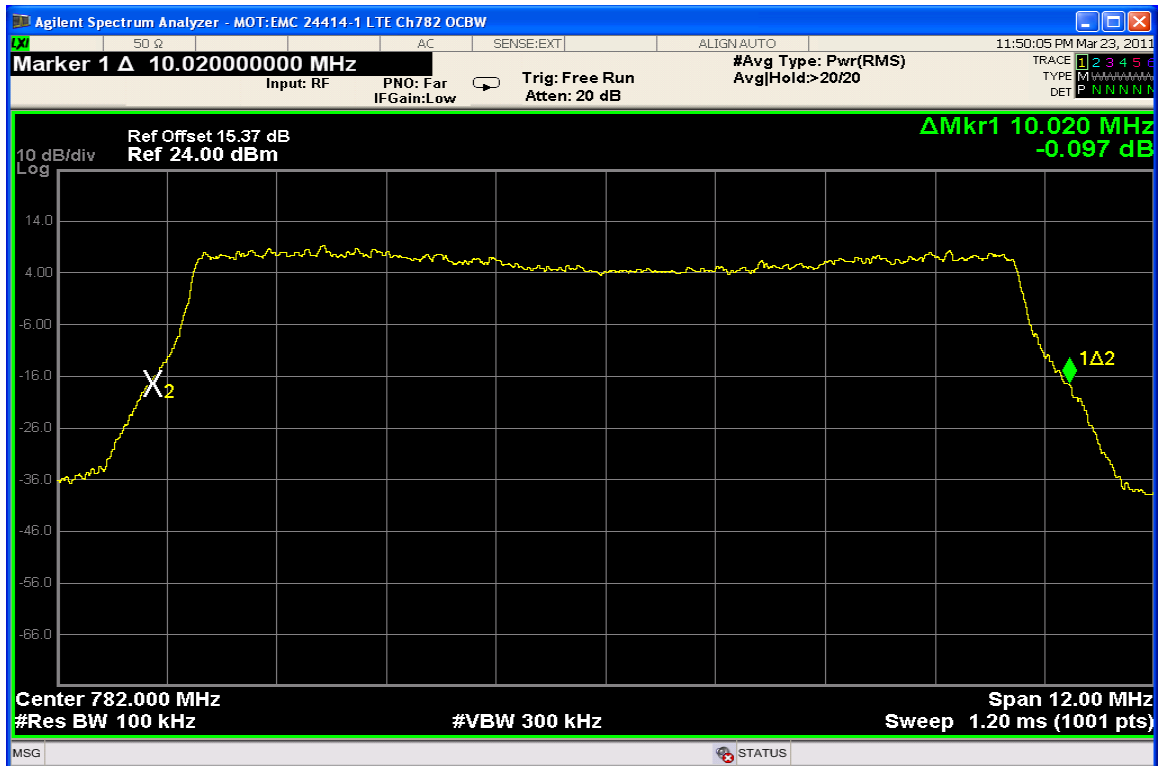
Measurement Results

Attached

Measurement Results



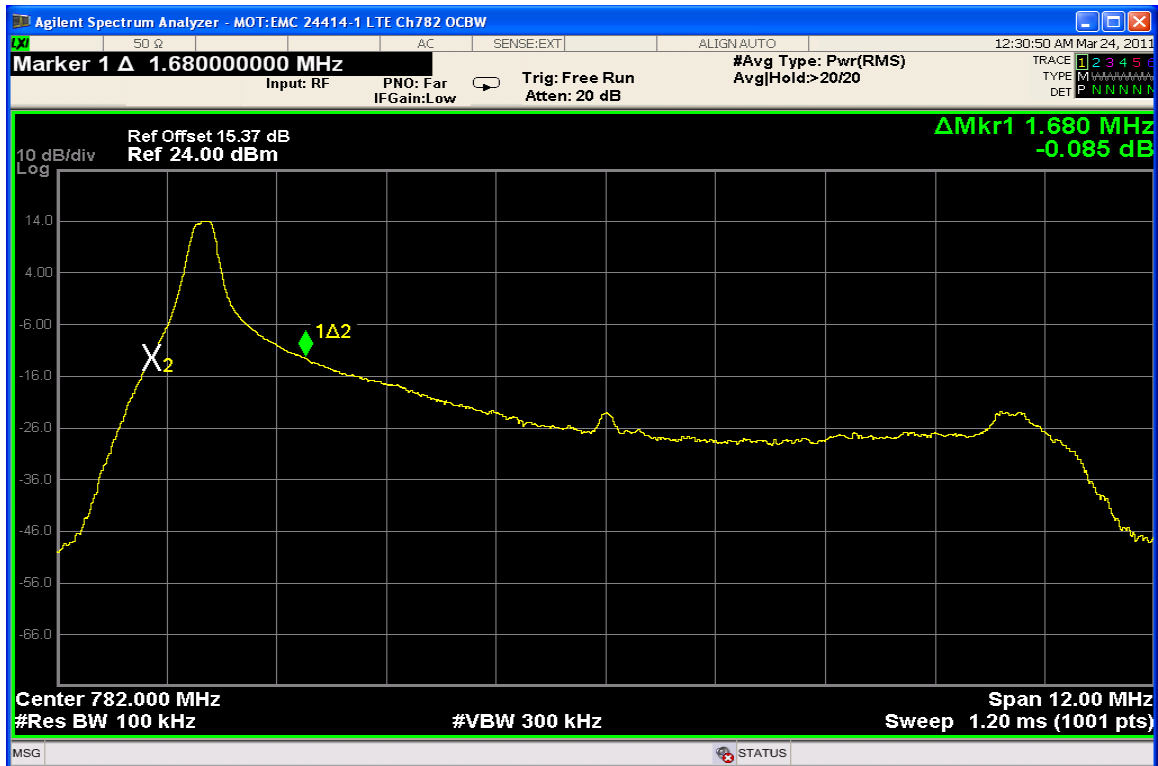
LTE – Band 13 - QPSK, Start RB: 13, RB Allocation 50%



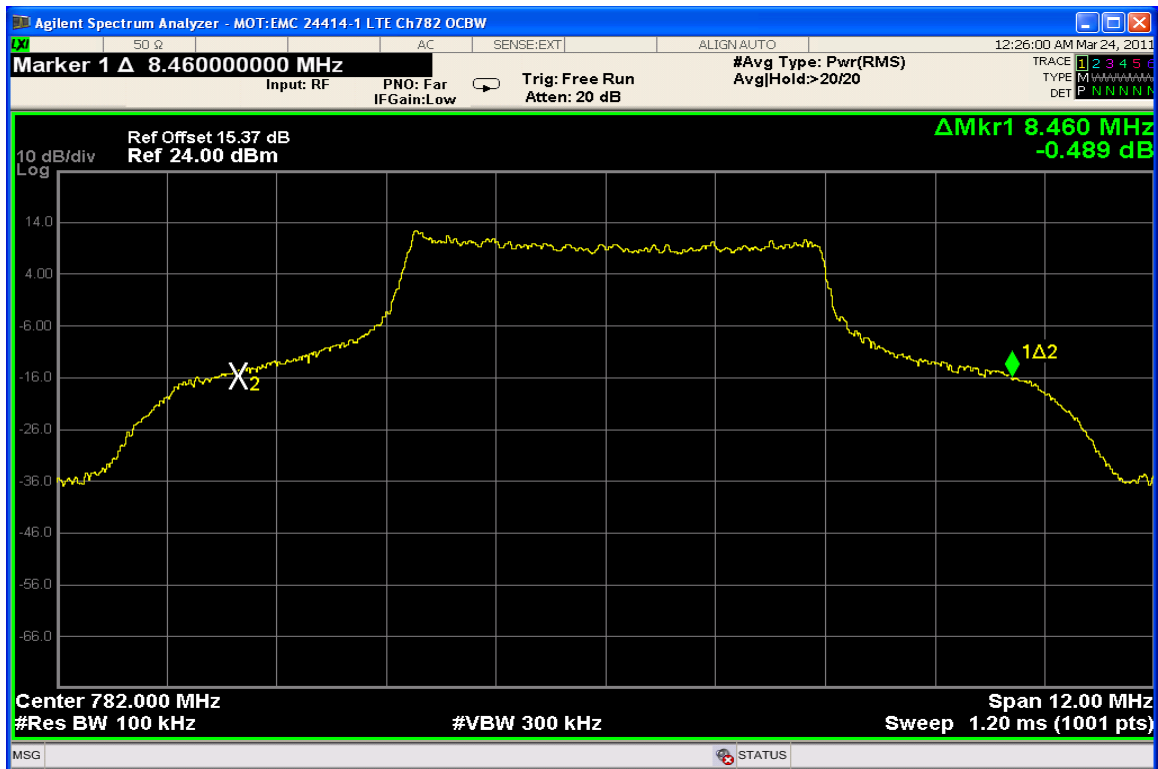
LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%



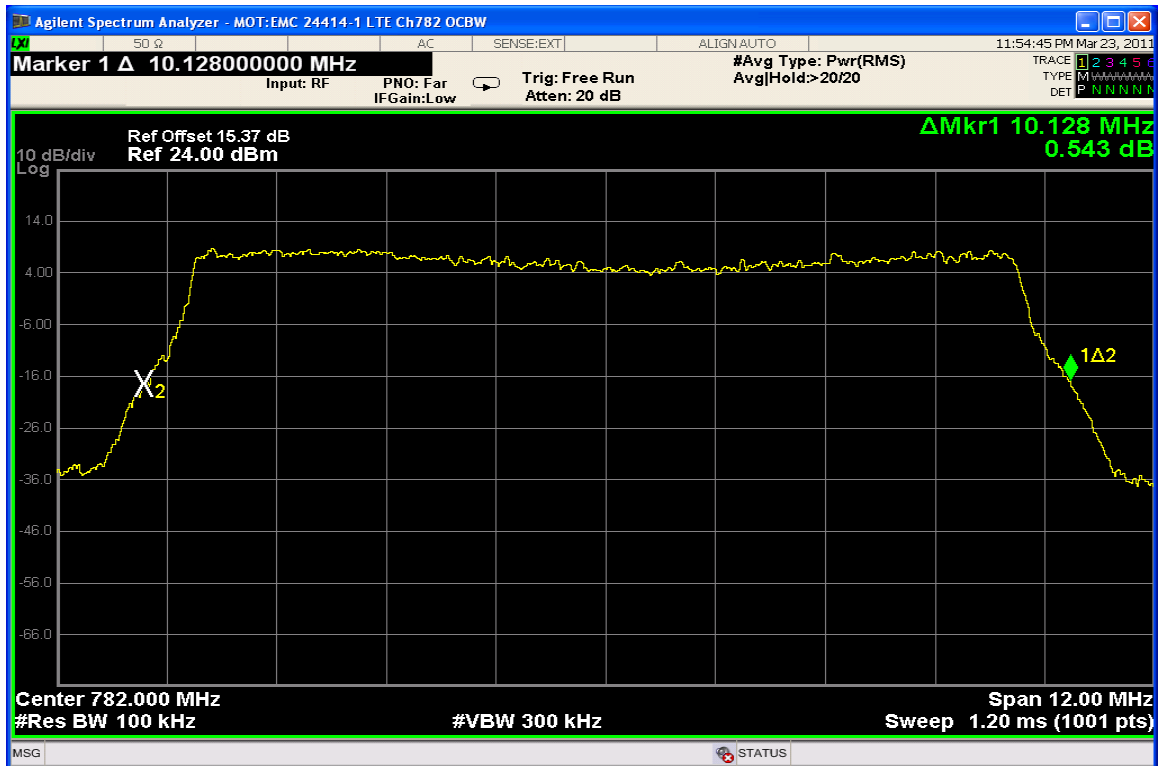
LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end



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



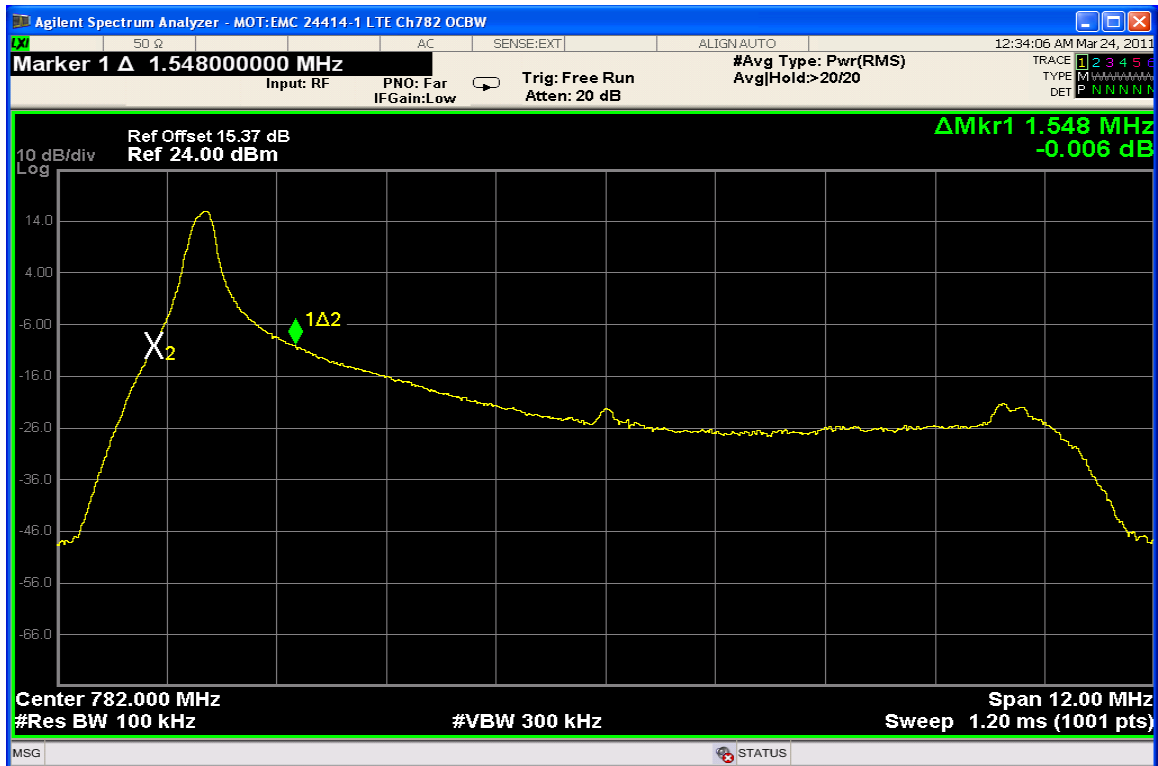
LTE – Band 13 - 16 QAM, Start RB: 13, RB Allocation 50%



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

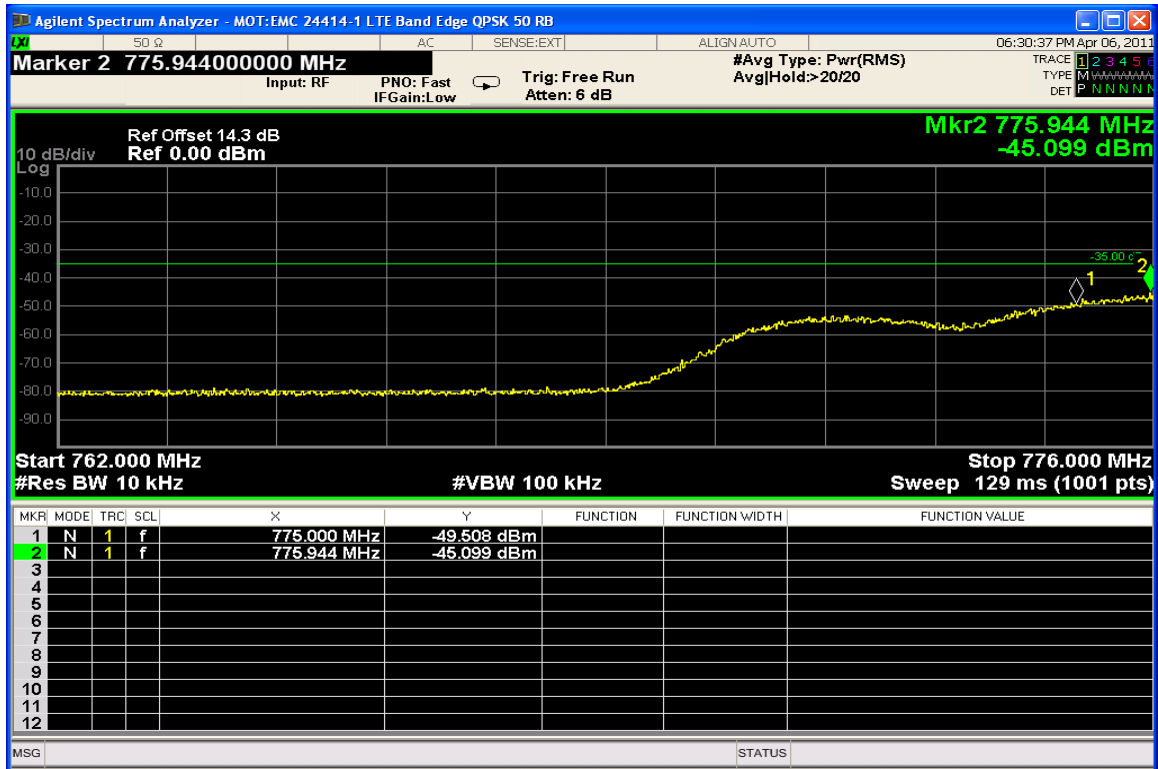
The RF output port of the equipment under test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. The amplitude of the spectrum analyzer is corrected for the attenuator and any other applicable losses. The analyzer is set for Peak Detector and each trace is set for Max Hold. A fully charged 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.

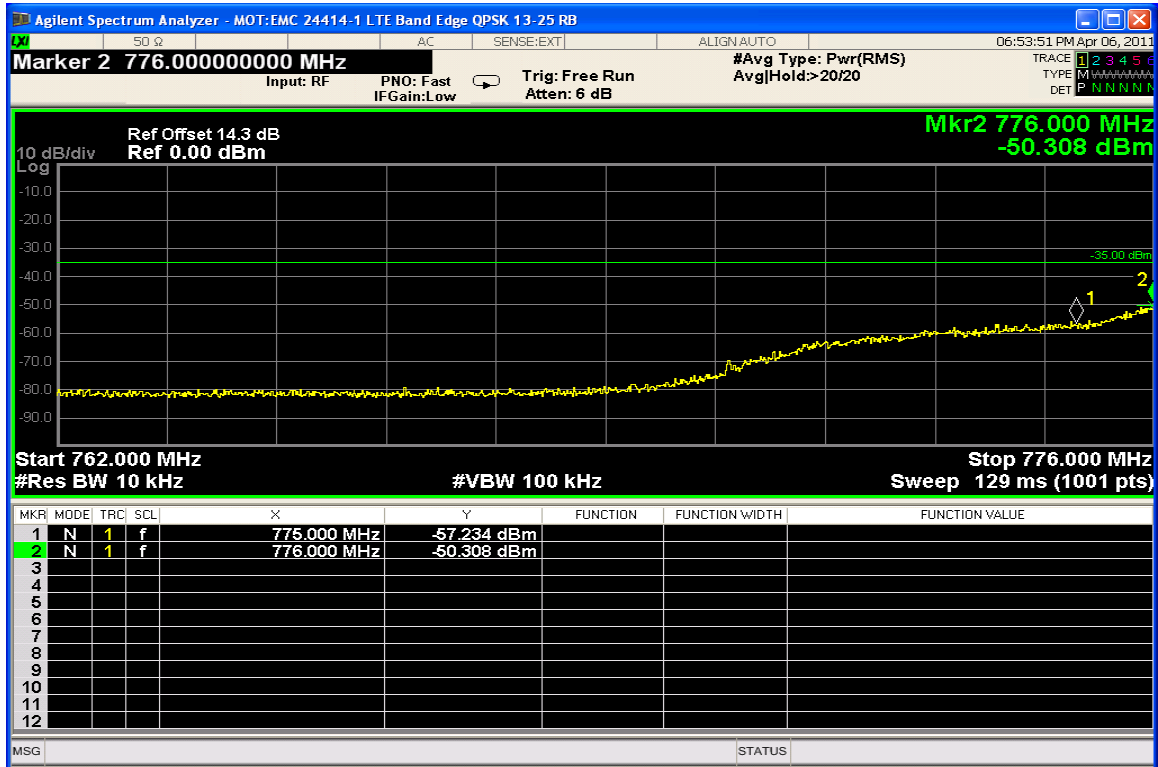
All measurements were performed with a 10 kHz Resolution bandwidth and the limit line was set at -35 dBm.

Measurement Results
Attached

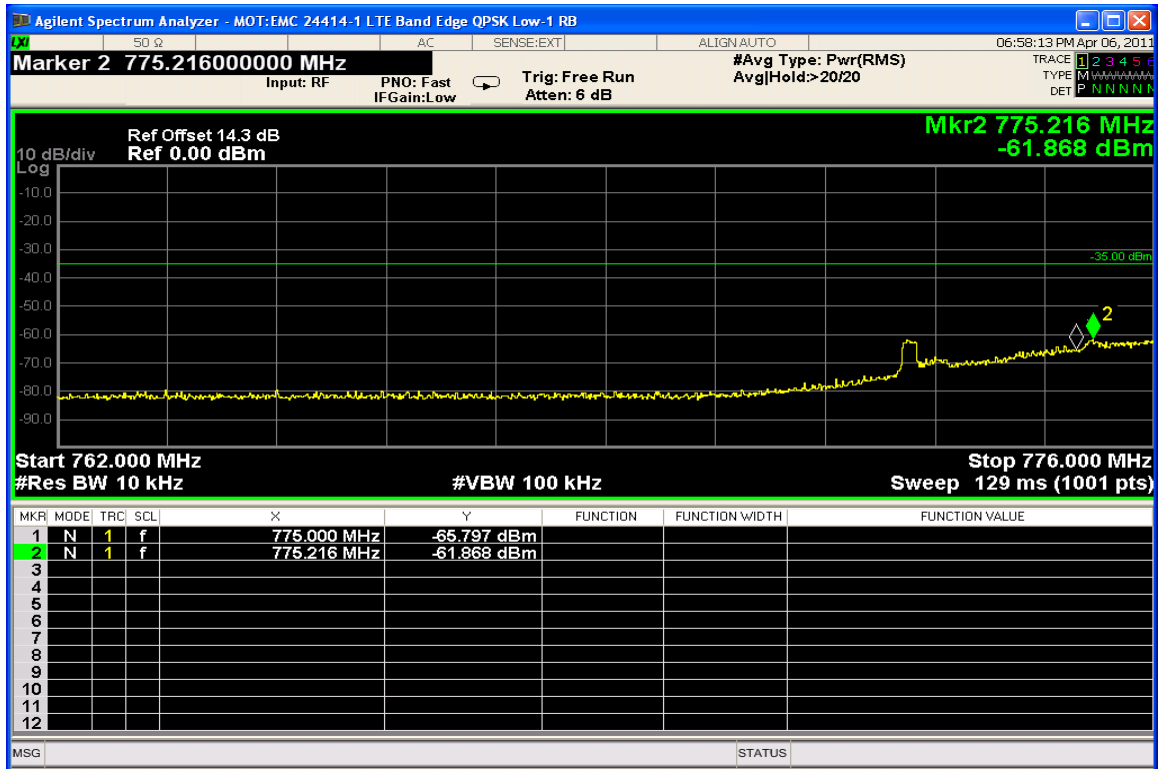
Measurement Results



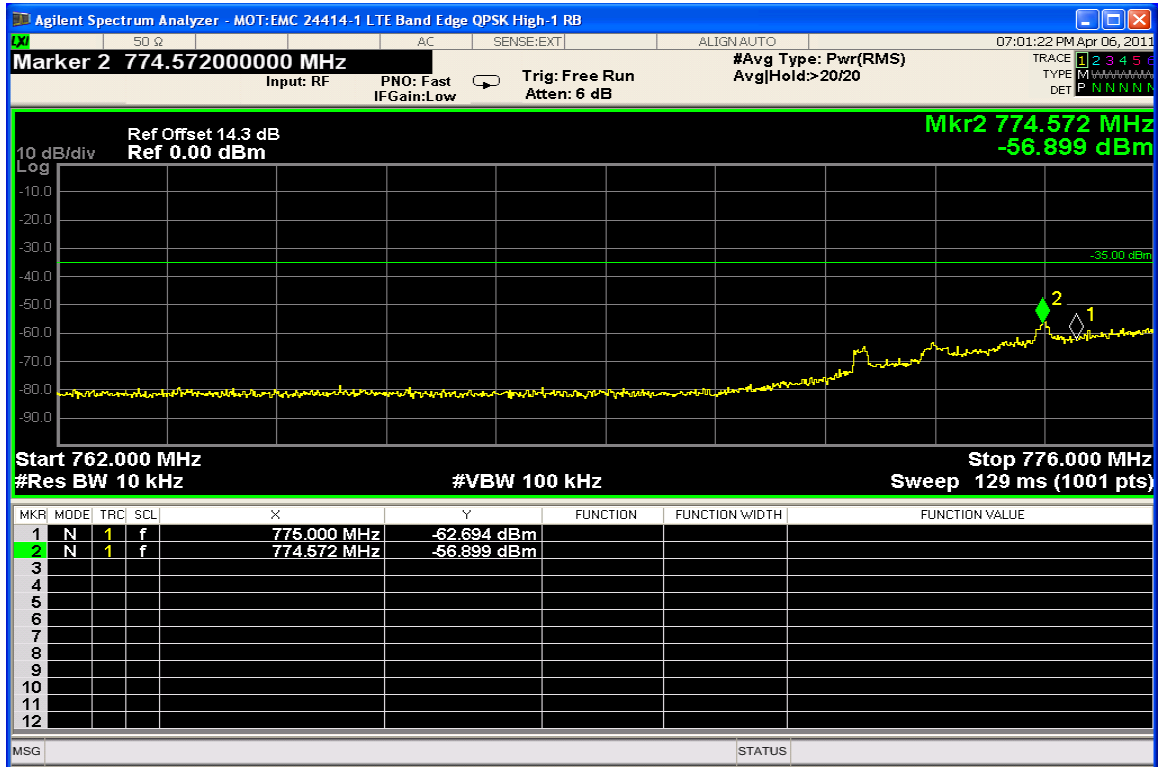
LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%



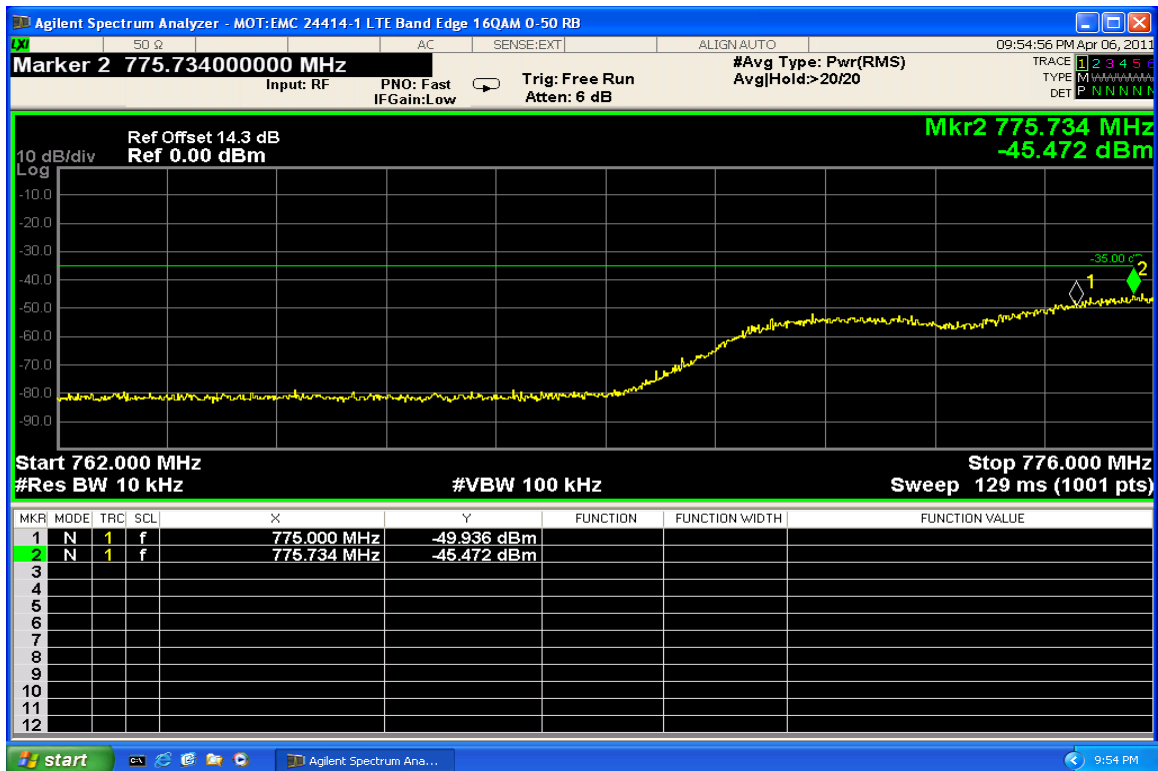
LTE – Band 13 - QPSK, Start RB: 13, RB Allocation 50%



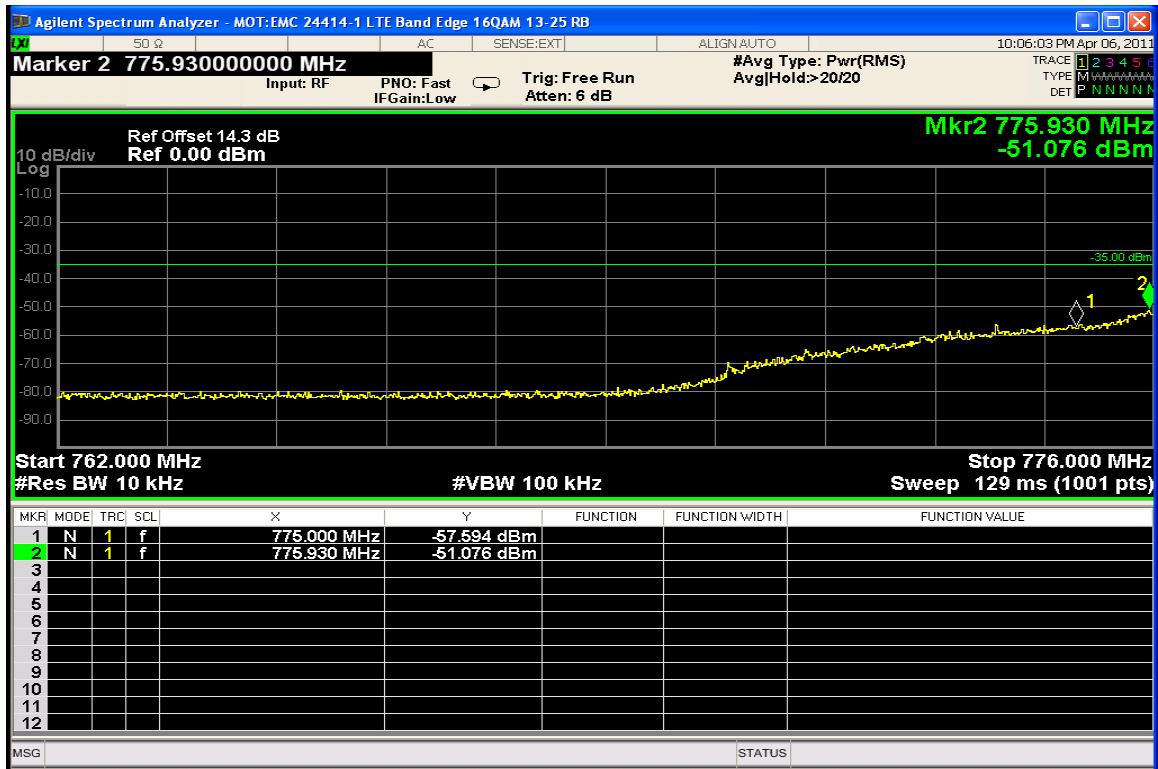
LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end



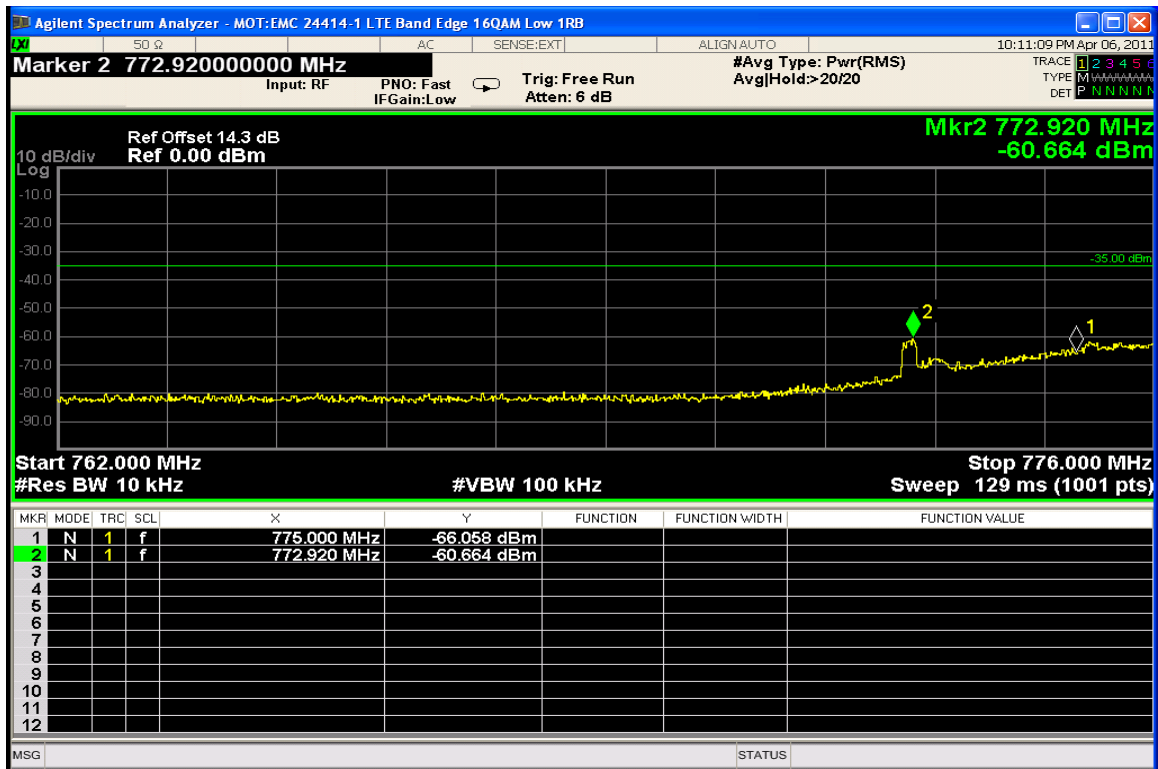
LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end



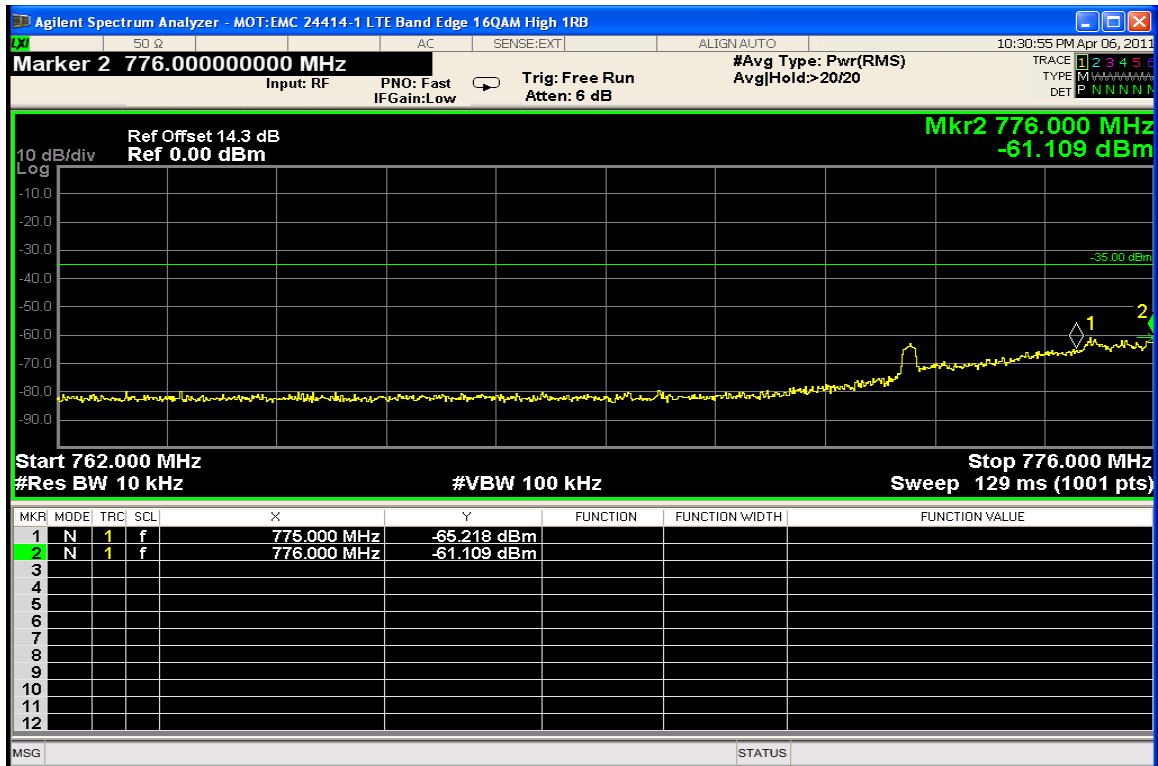
LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%



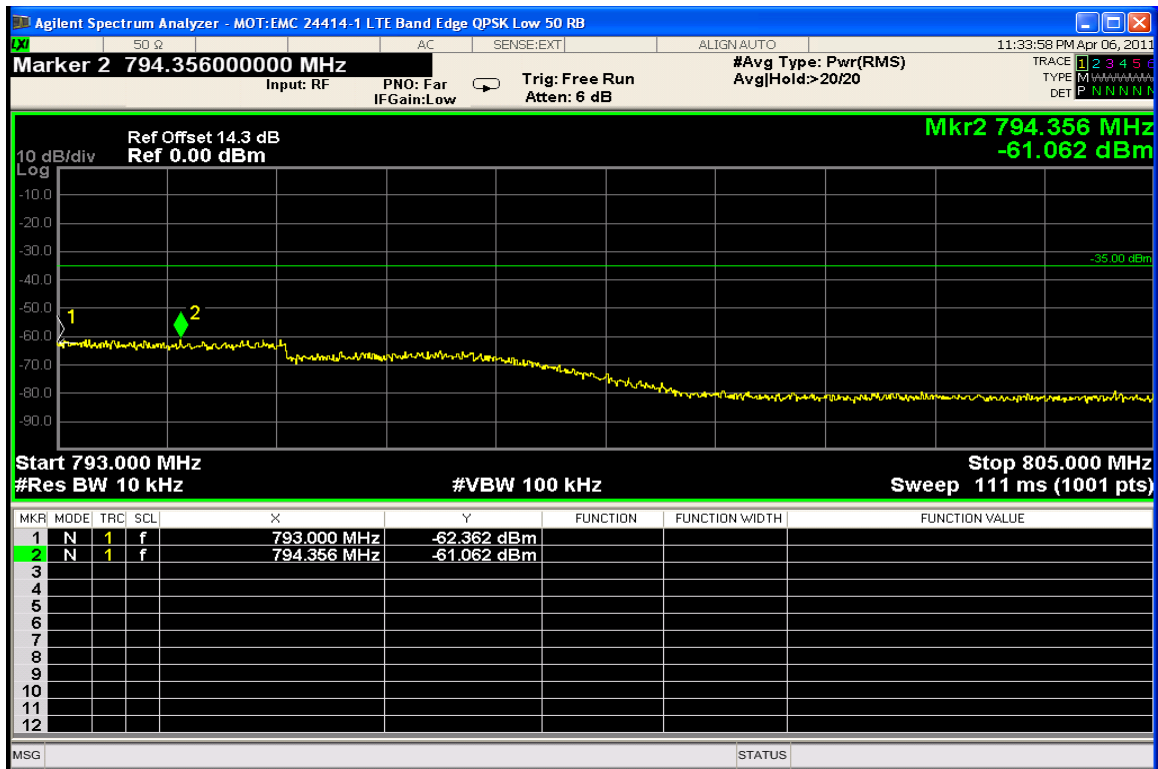
LTE – Band 13 – 16 QAM, Start RB: 13, RB Allocation 50%



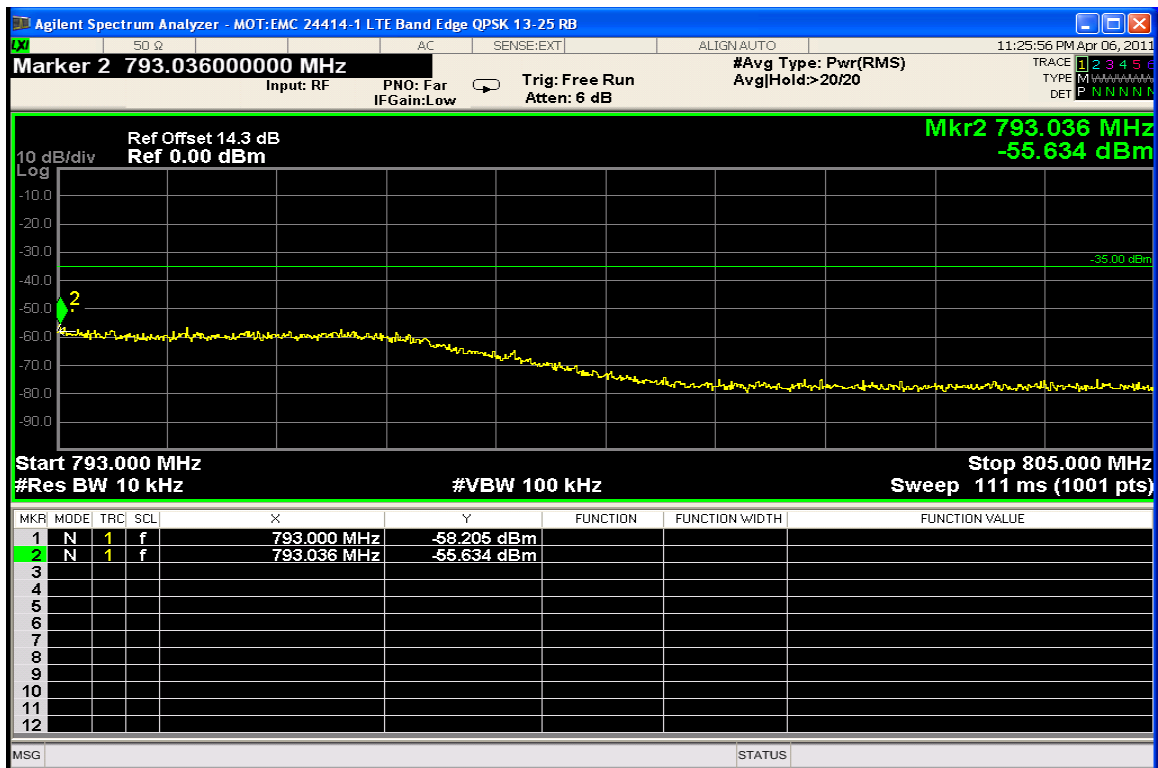
LTE – Band 13 – 16 QAM, Start RB: 0, 1RB@ low end



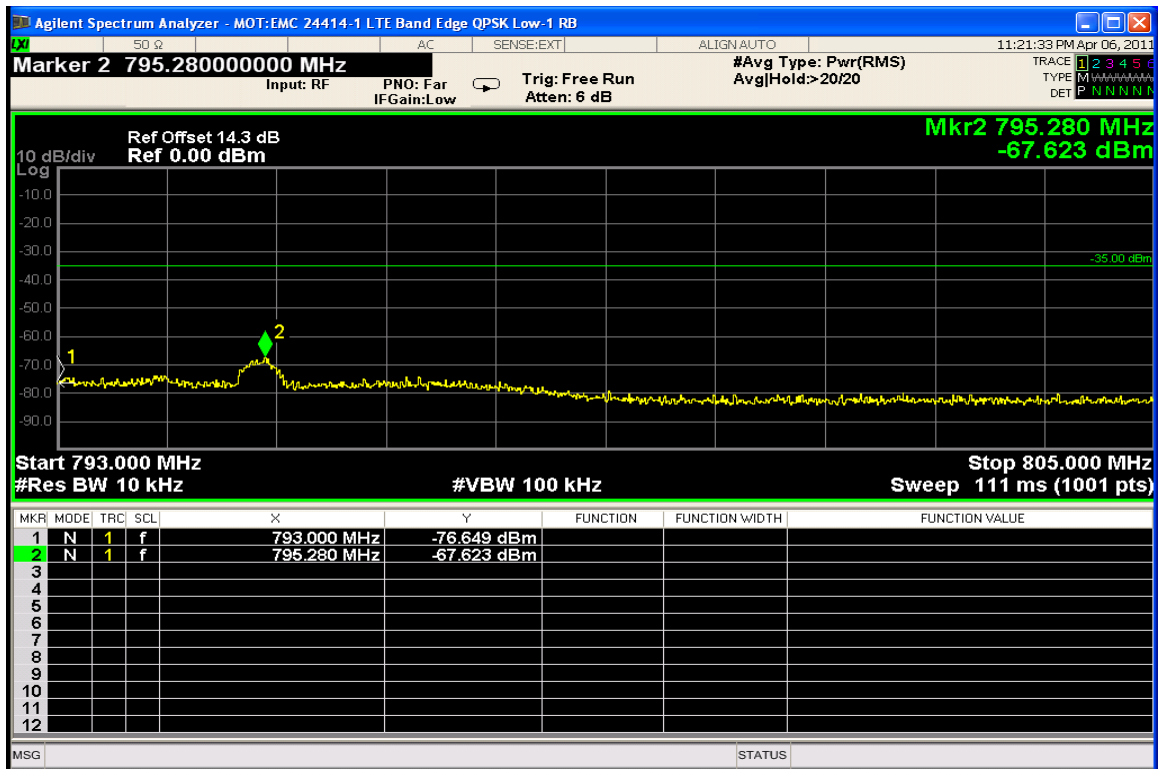
LTE – Band 13 – 16 QAM, Start RB: 49, 1RB@ high end



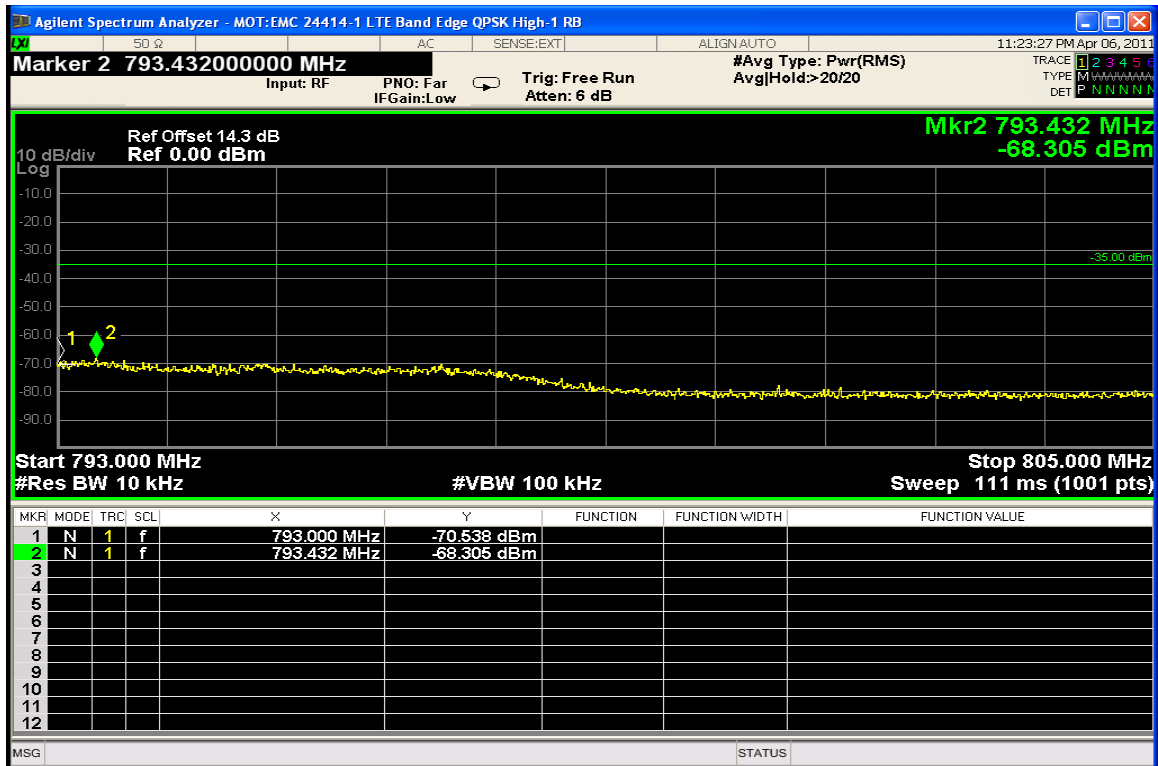
LTE – Band 13 - QPSK, Start RB: 0, RB Allocation 100%



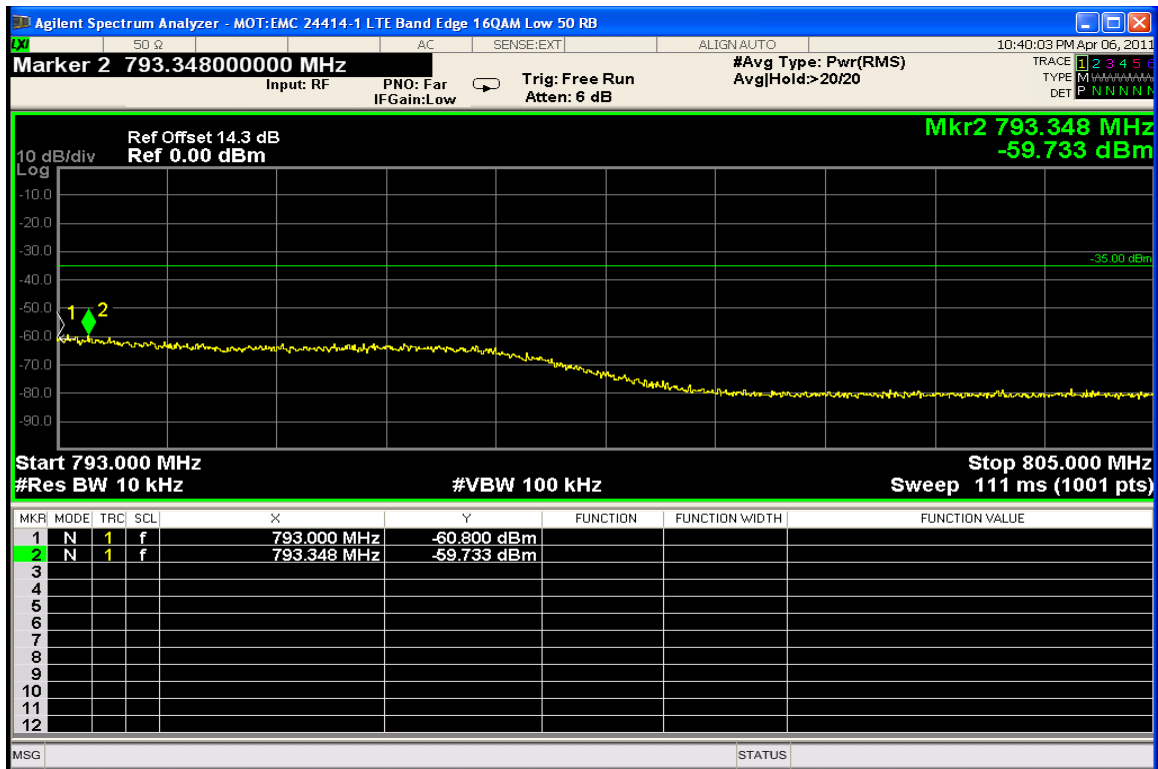
LTE – Band 13 - QPSK, Start RB: 13, RB Allocation 50%



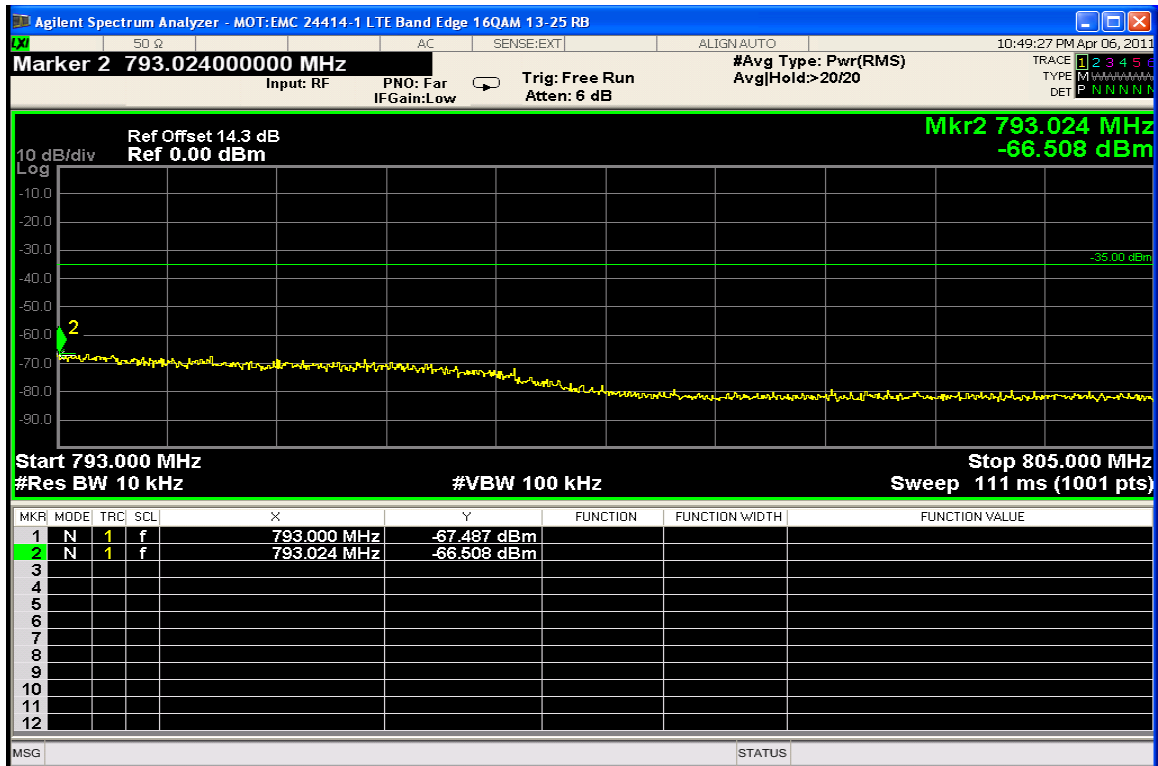
LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end



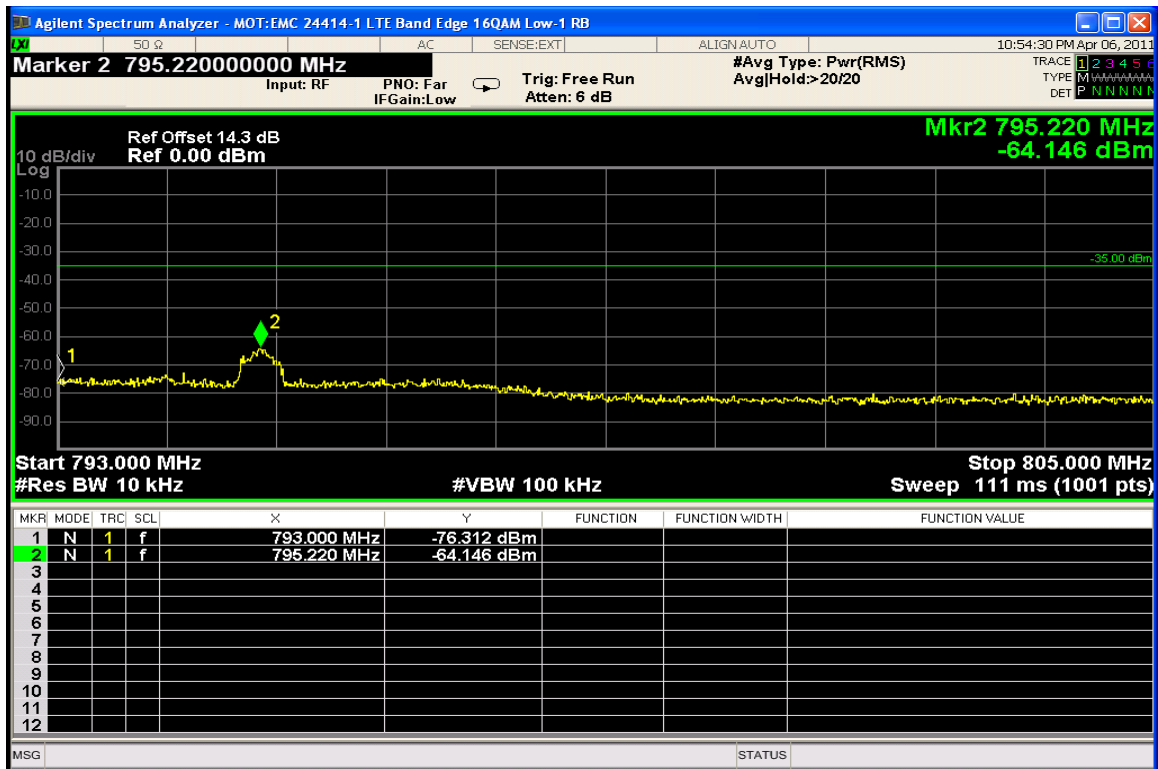
LTE – Band 13 - QPSK, Start RB: 49, 1RB@ high end



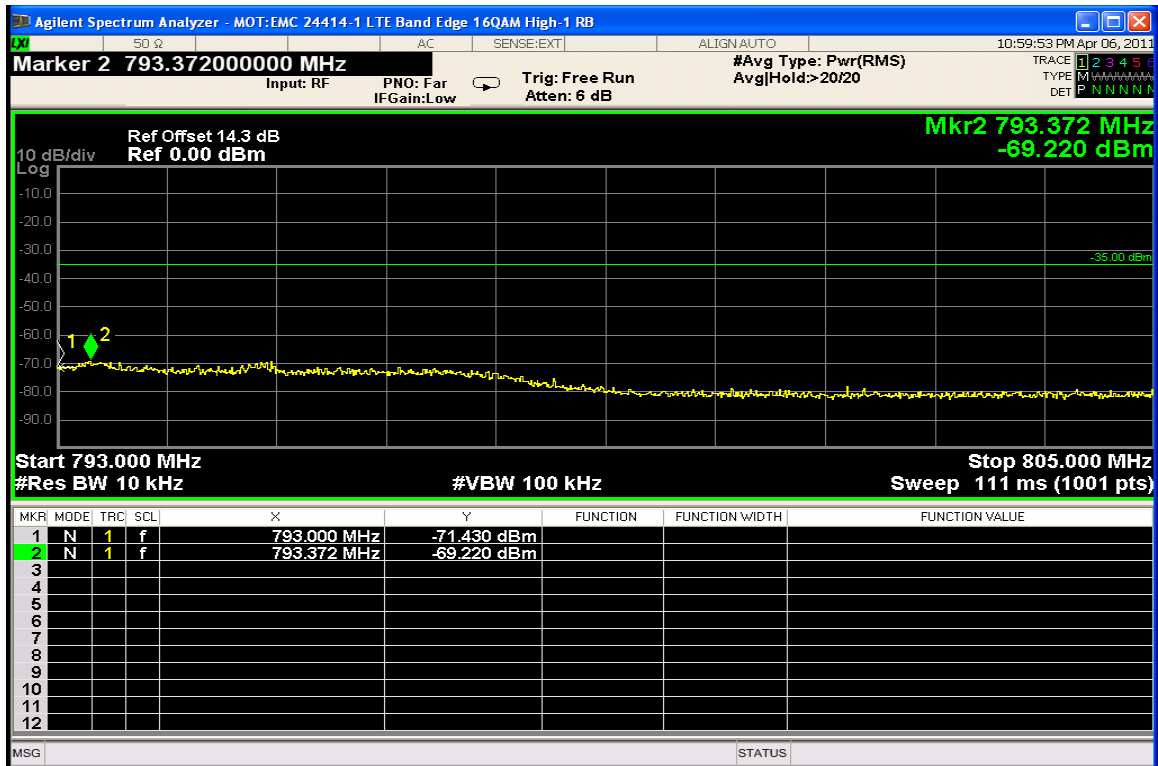
LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%



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)**Measurement Procedure**

The RF output port of the Equipment Under Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged 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.

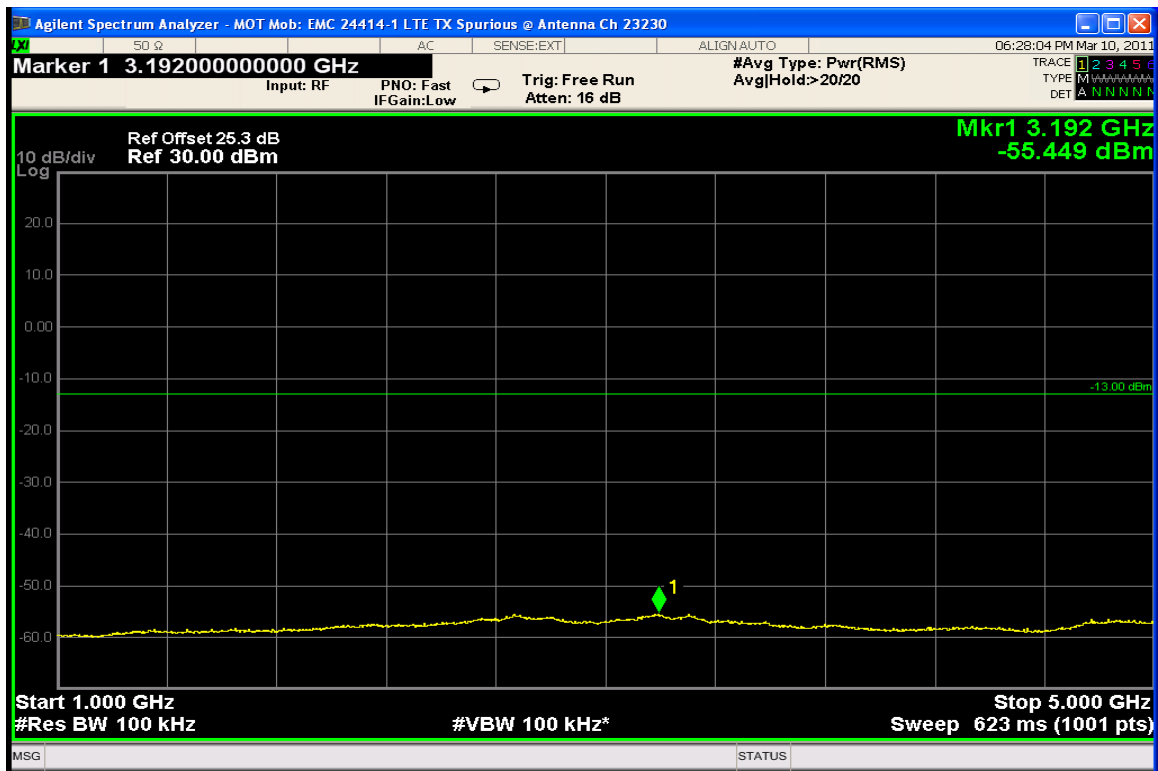
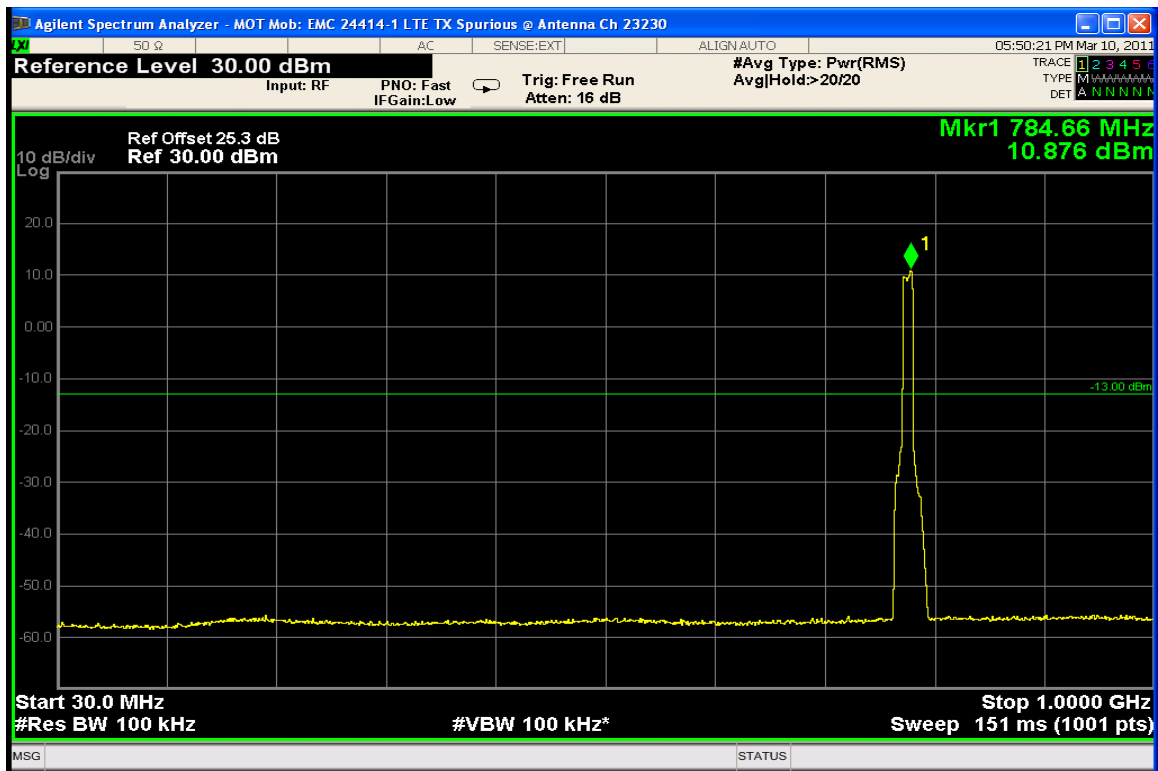
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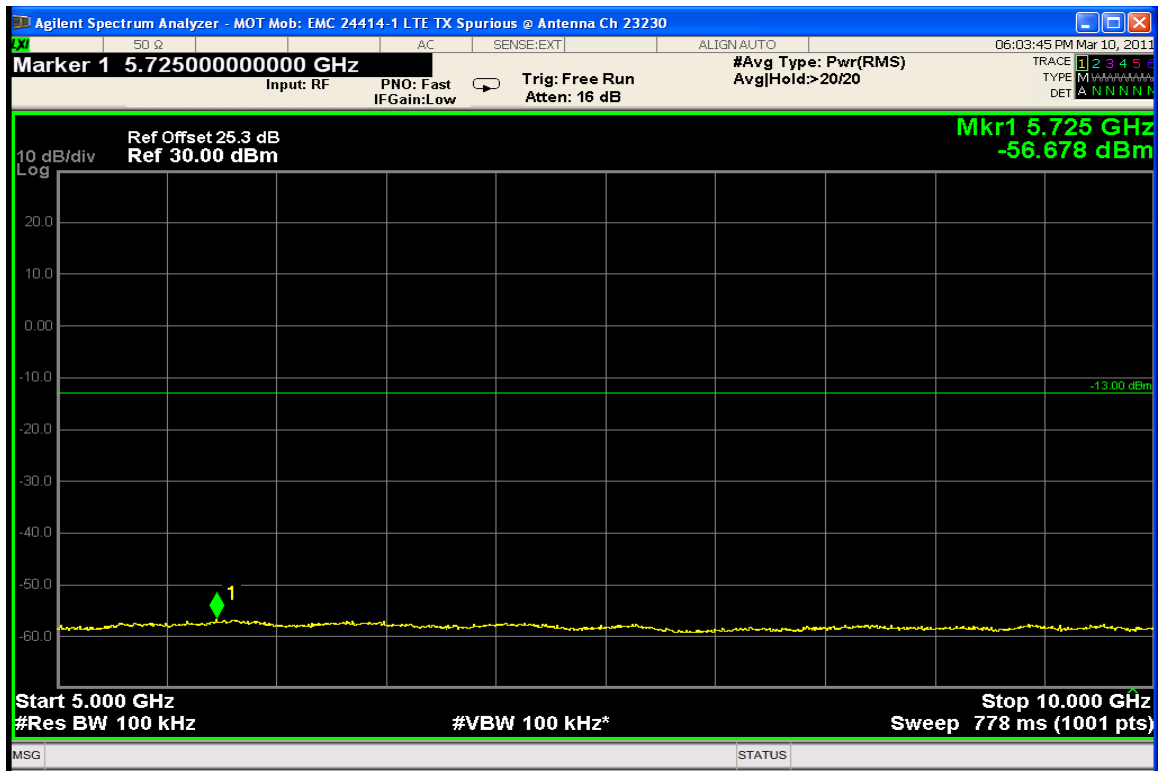
Units	dBm
Divisions	10 dB
Detector	Average Detector
Resolution Bandwidth	100 kHz
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

Measurement Results

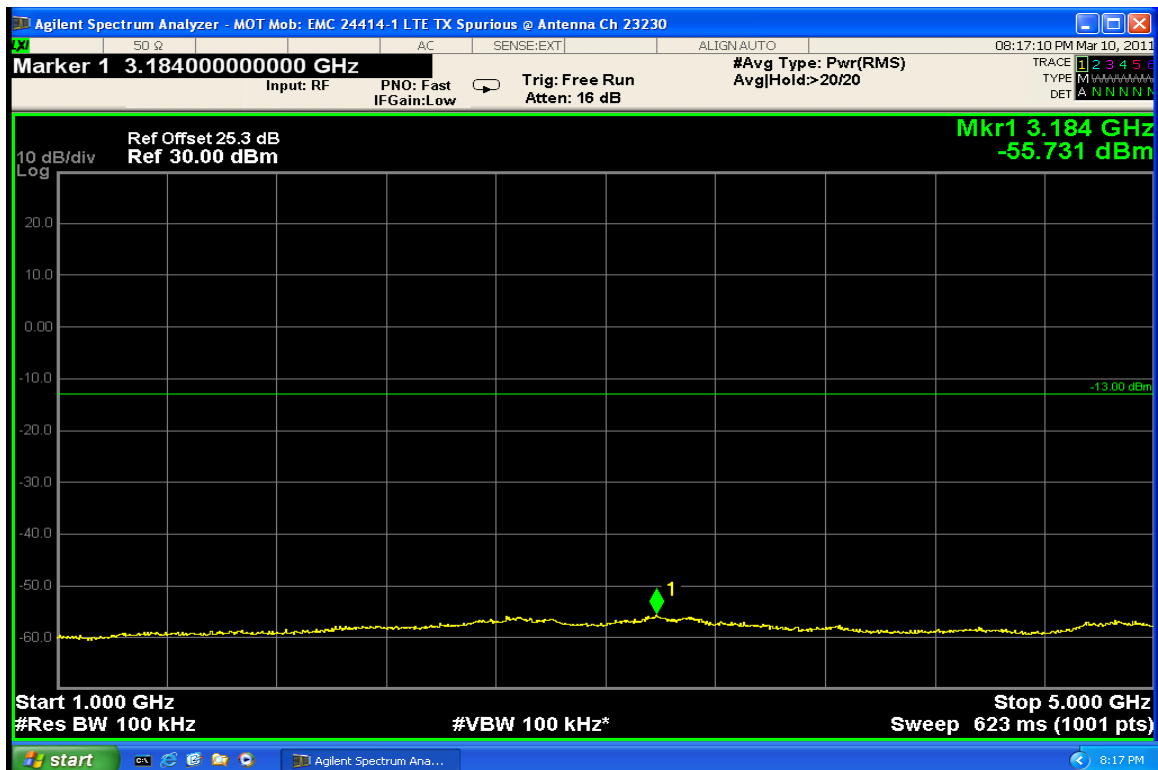
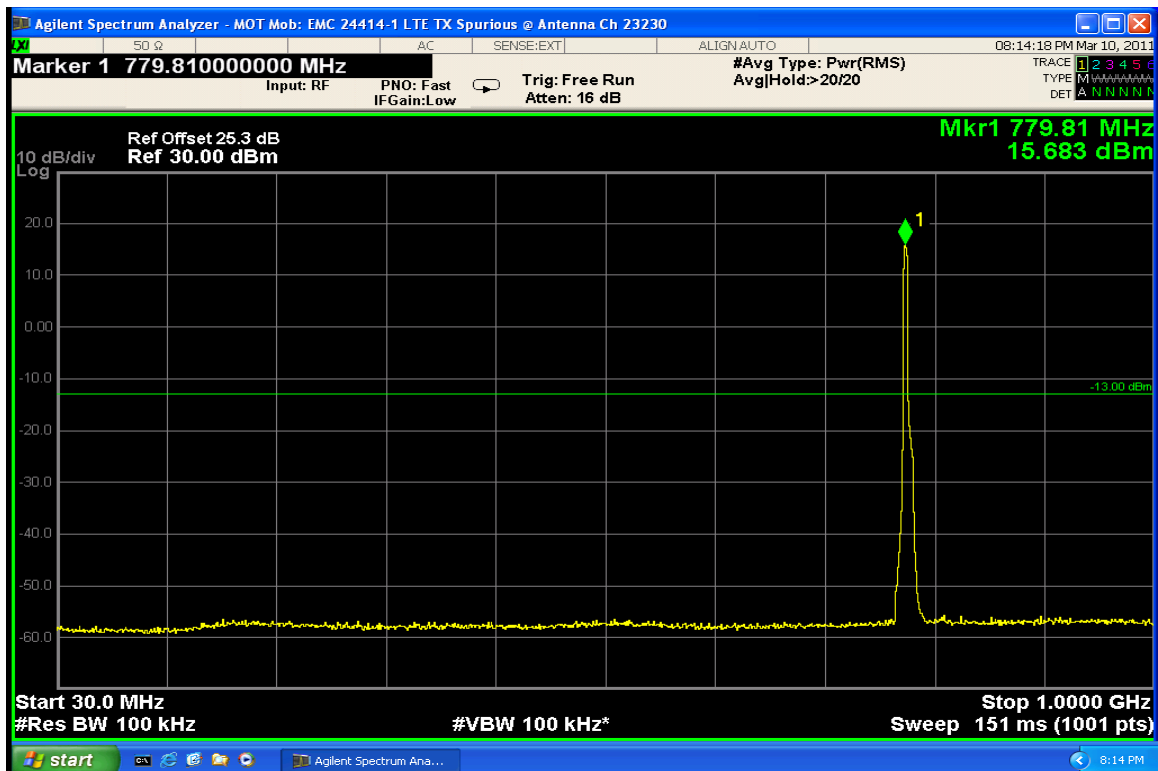
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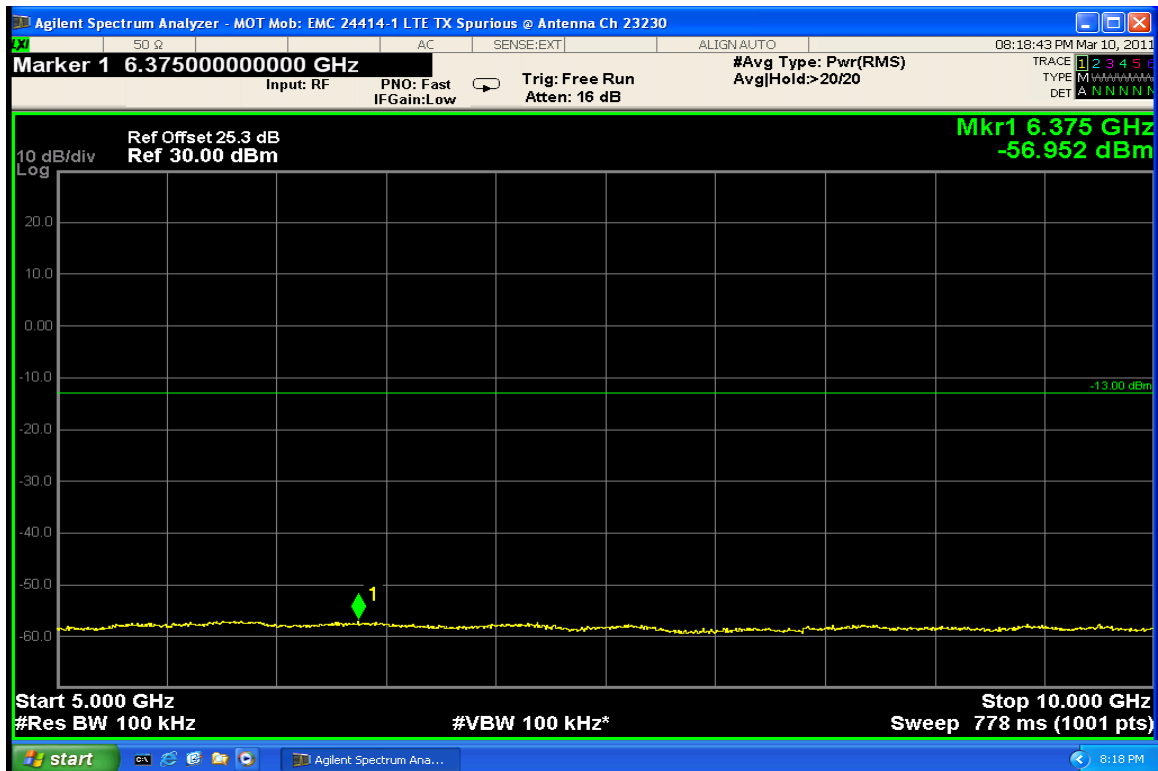
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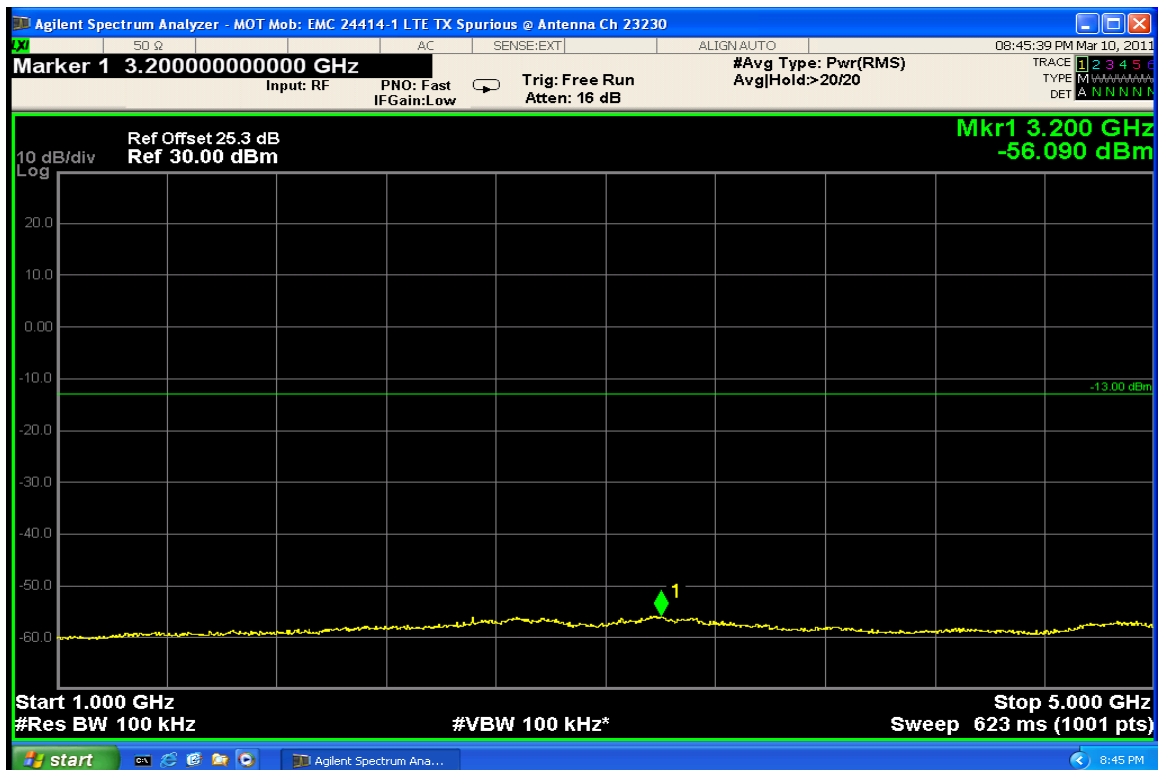
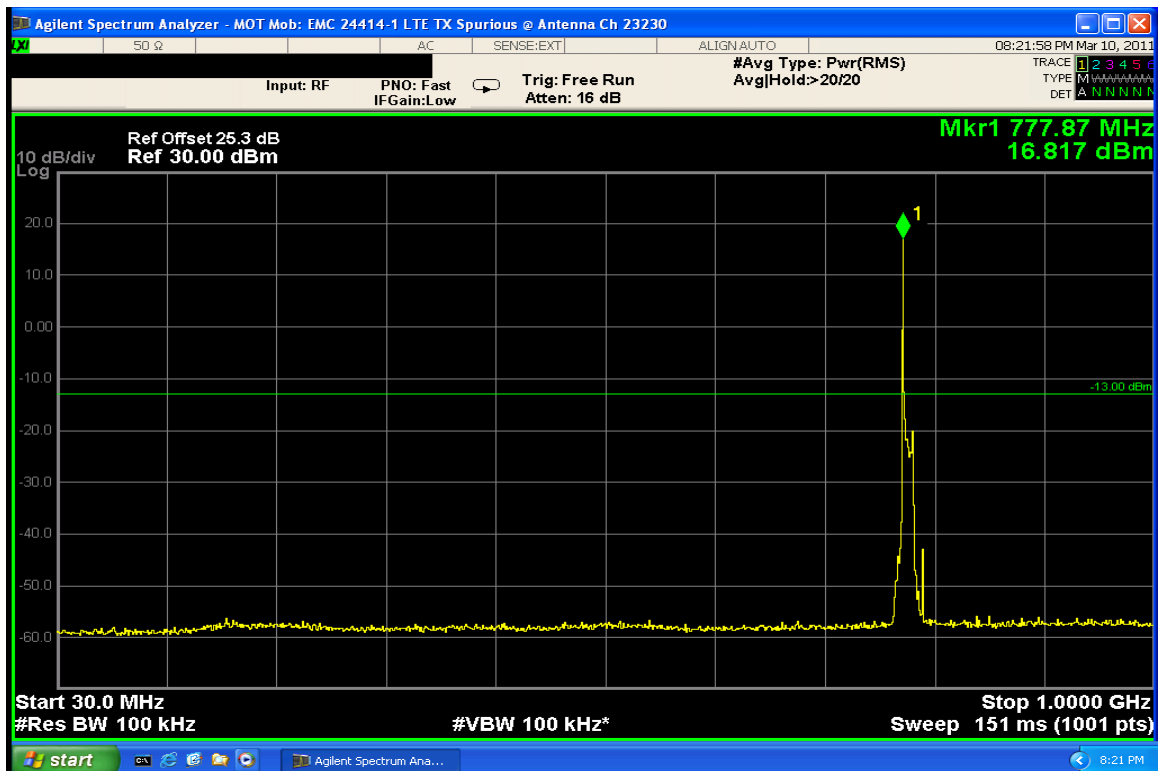


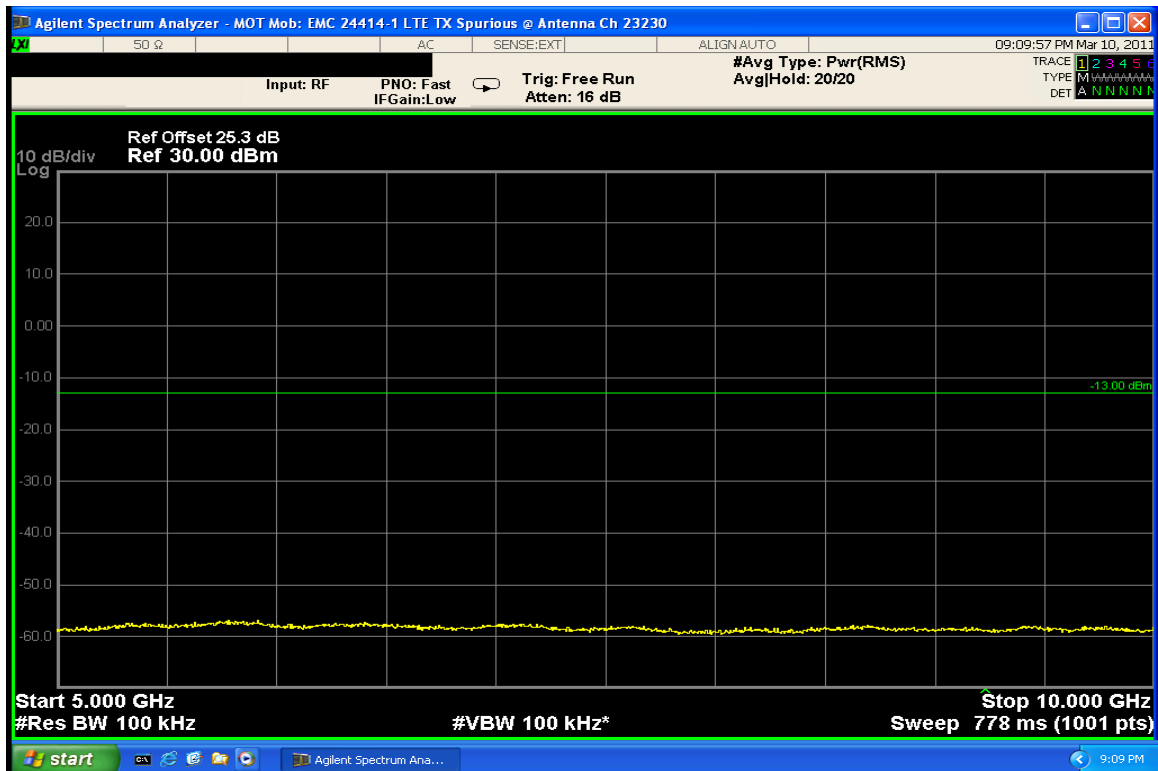
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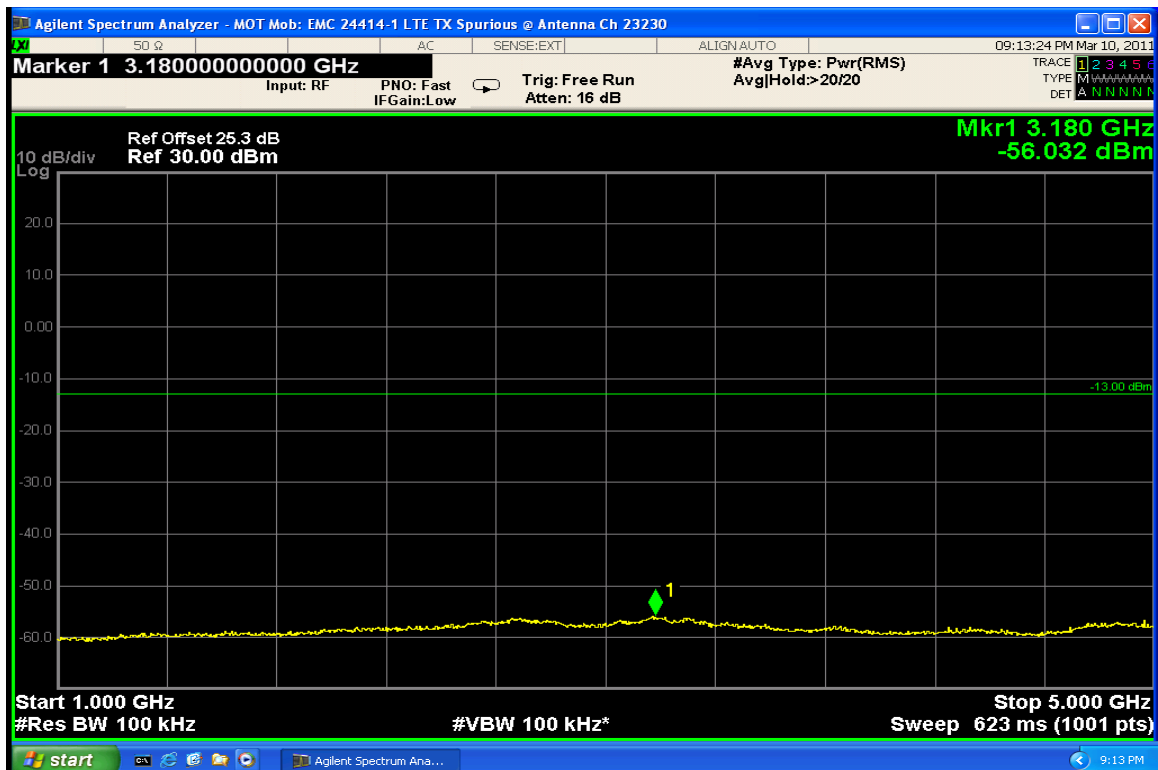
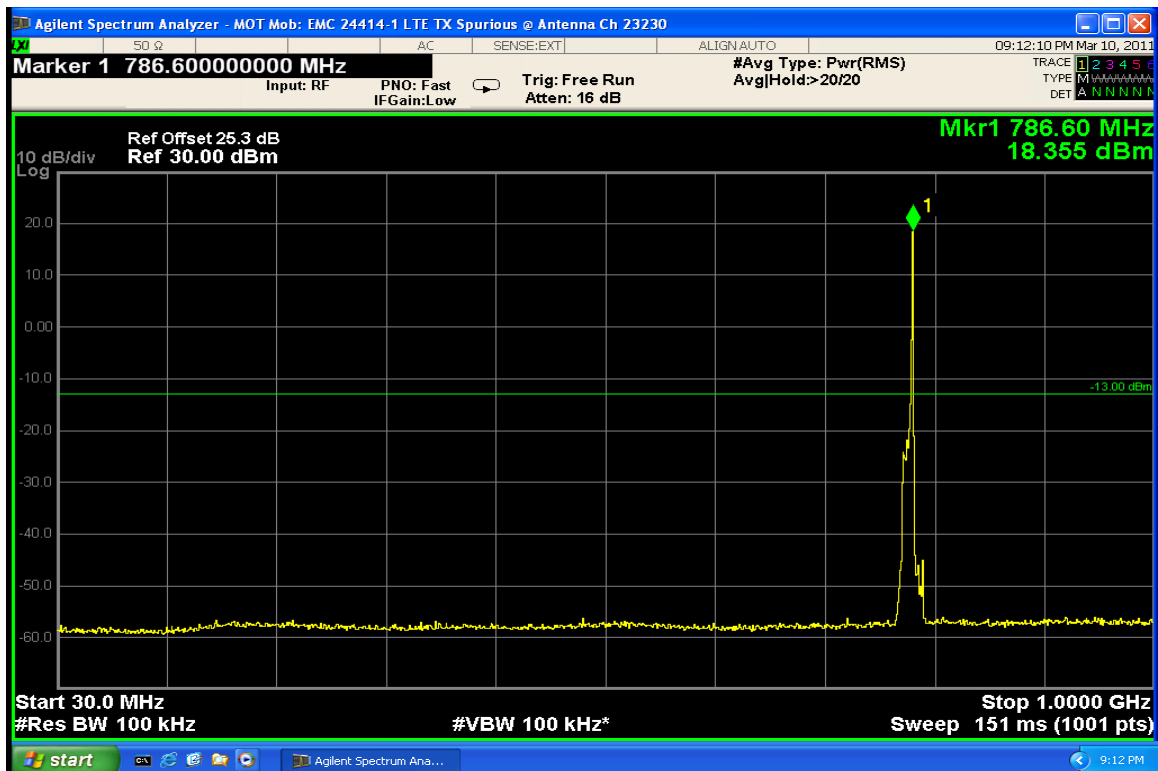


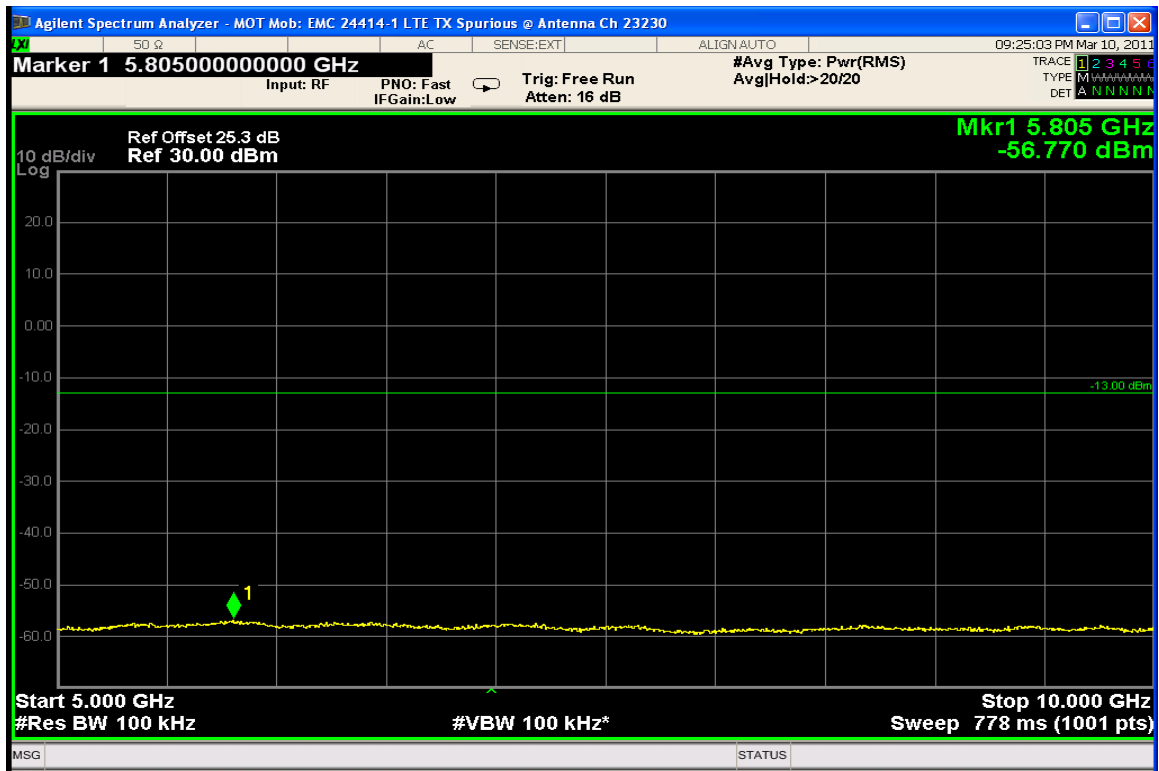
Mode: LTE – Band 13 - QPSK, Start RB: 0, 1RB@ low end



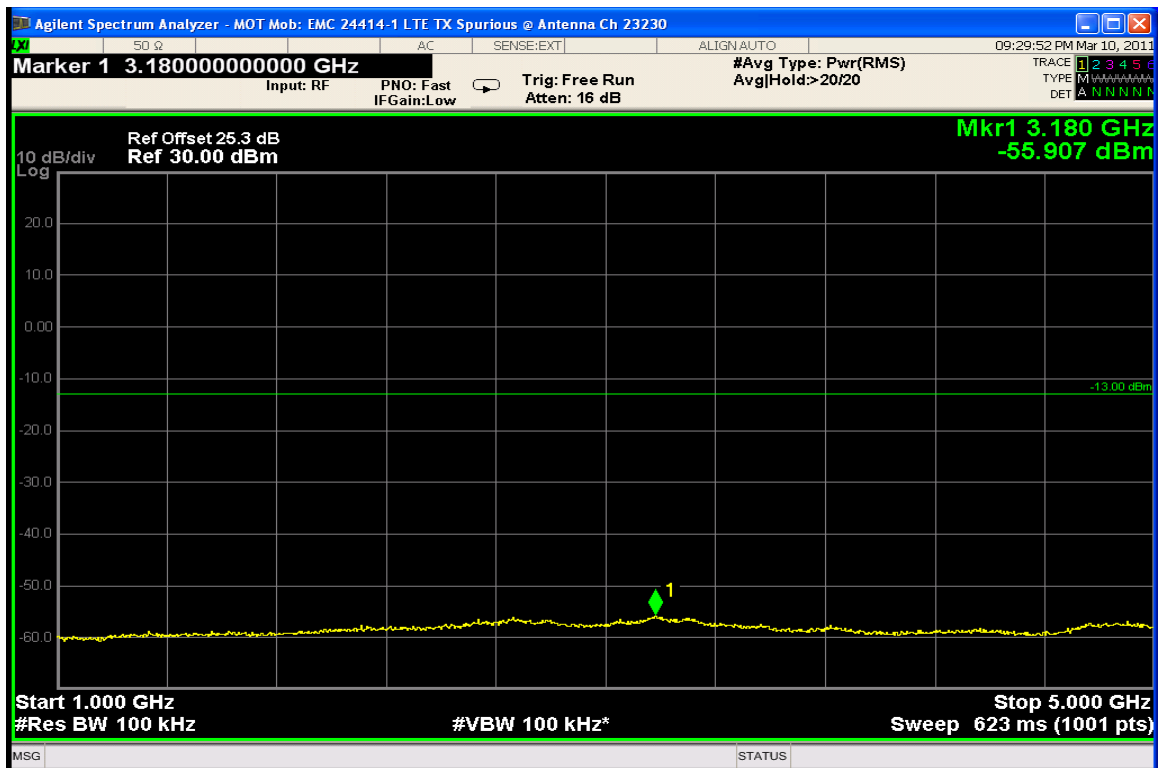
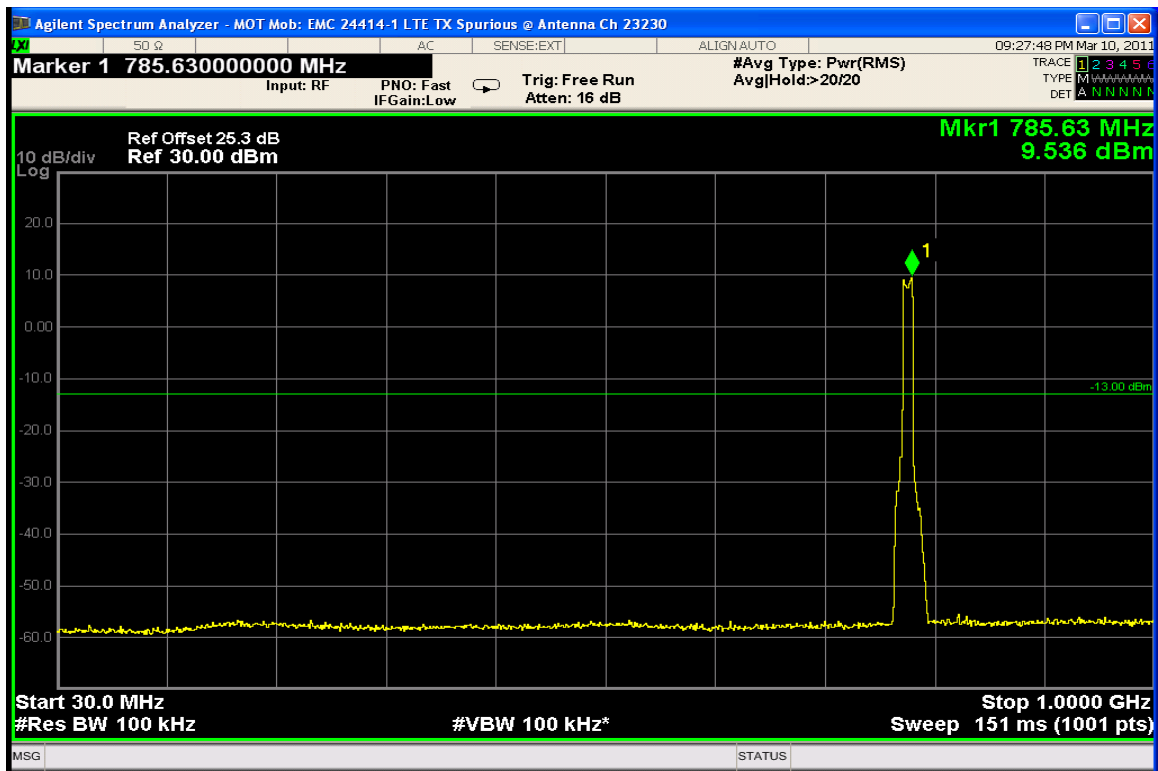


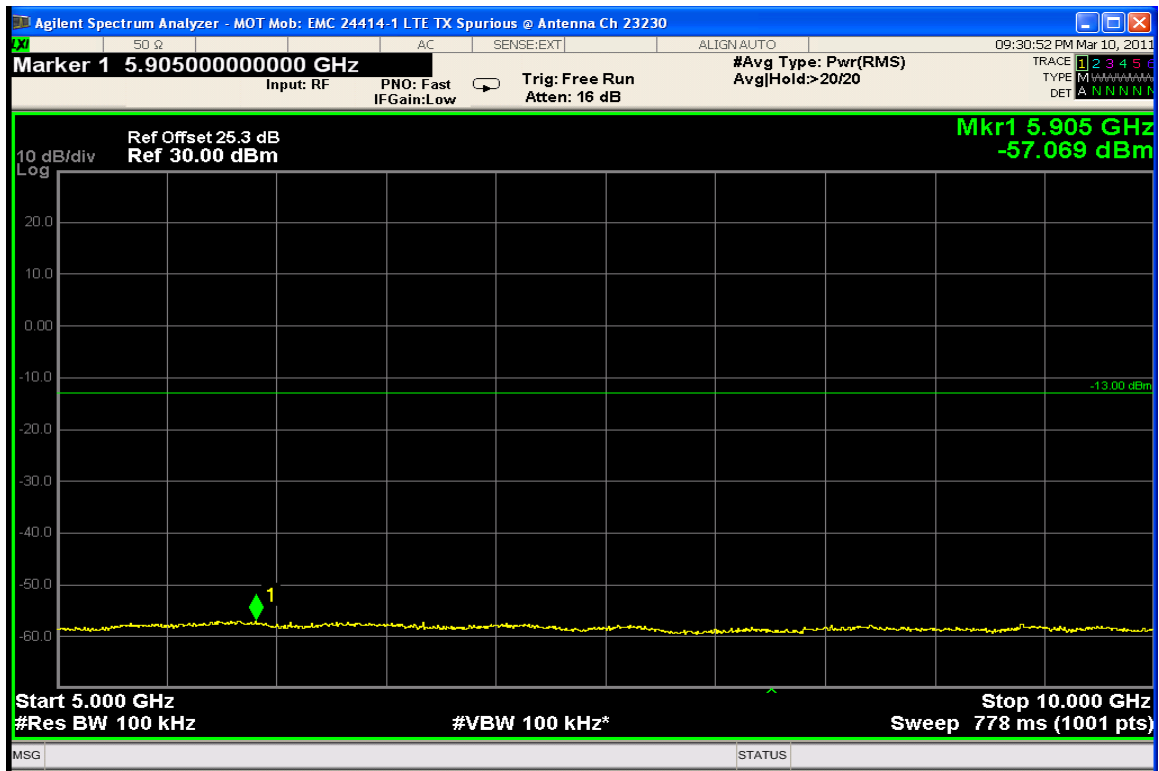
Mode: LTE – Band 13 - QPSK, Start RB: 0, 1RB@ high end



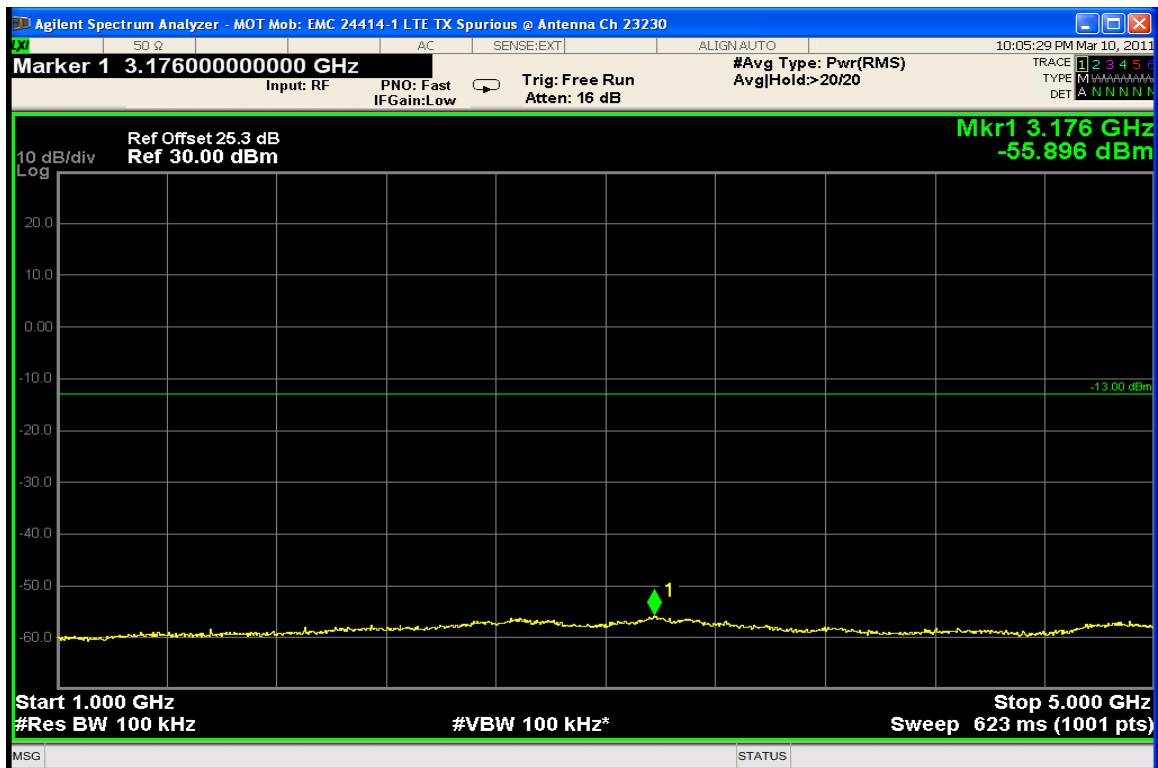
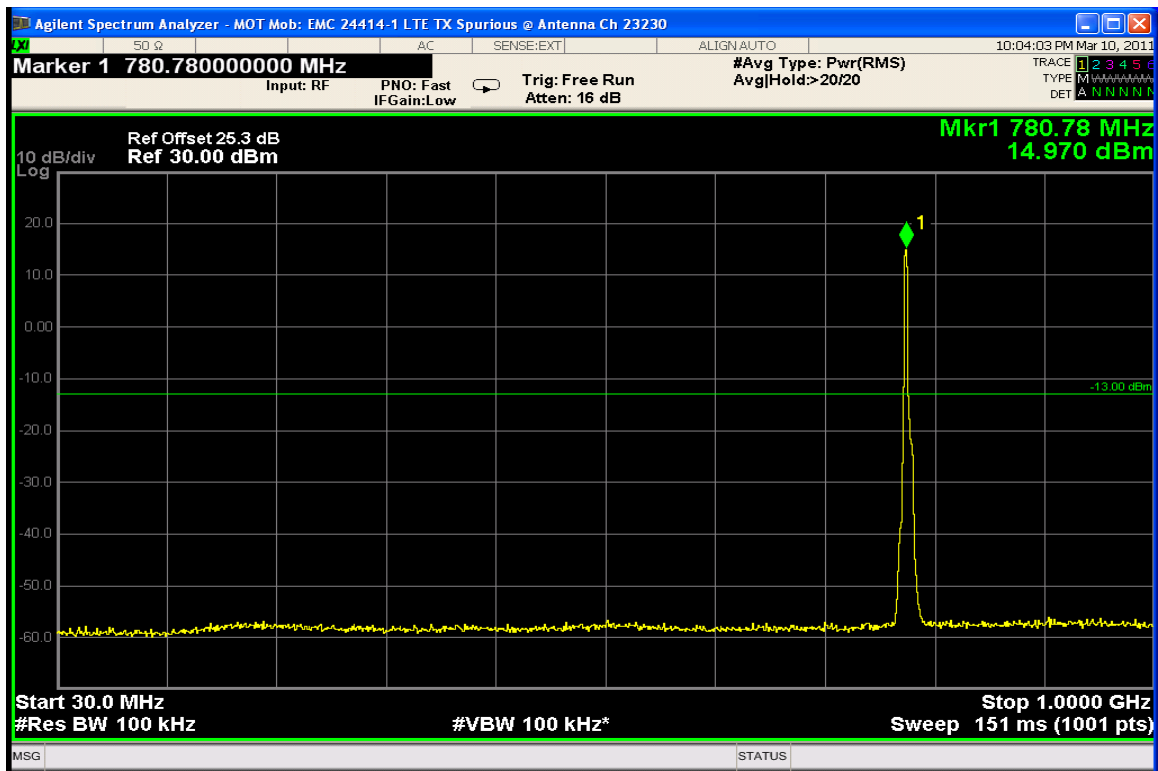


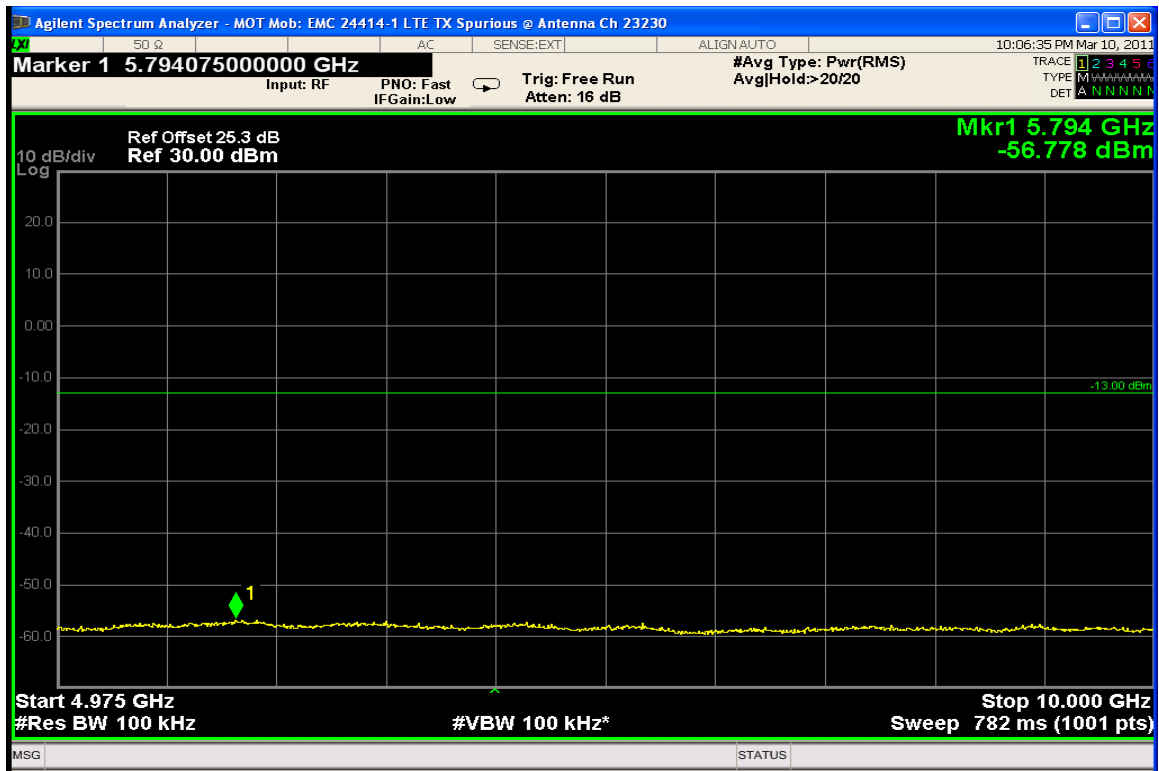
Mode: LTE – Band 13 - 16 QAM, Start RB: 0, RB Allocation 100%



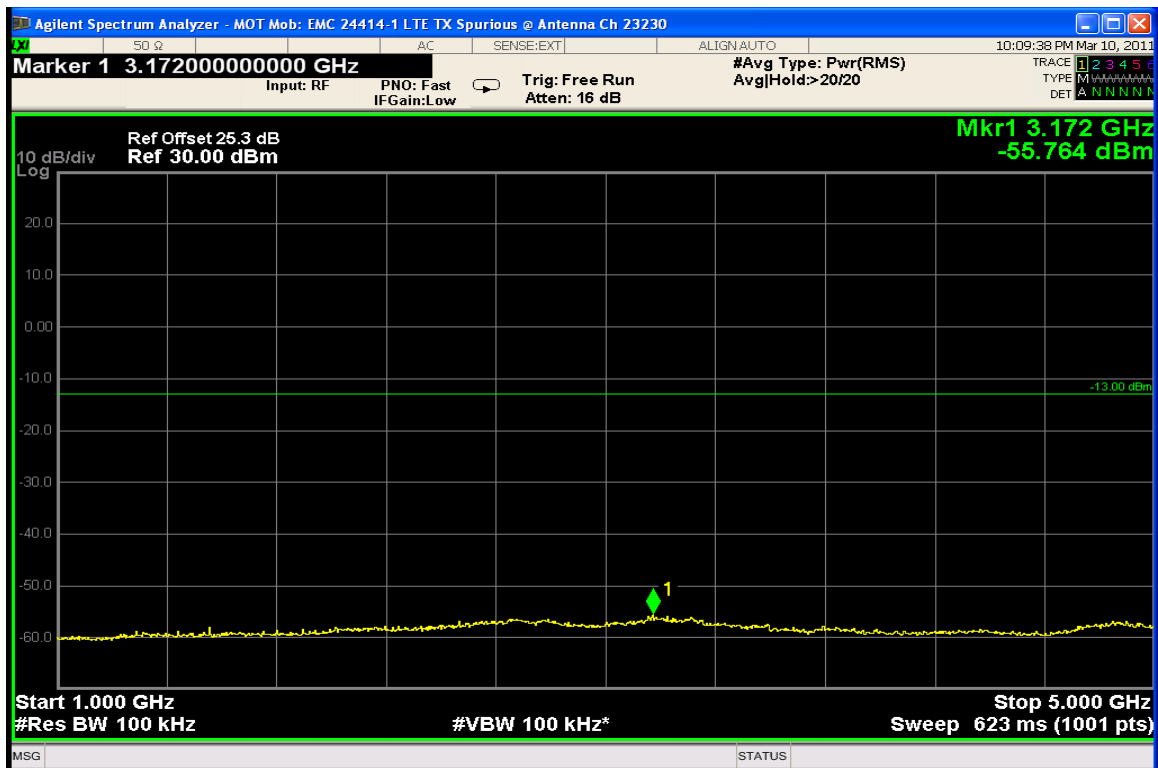
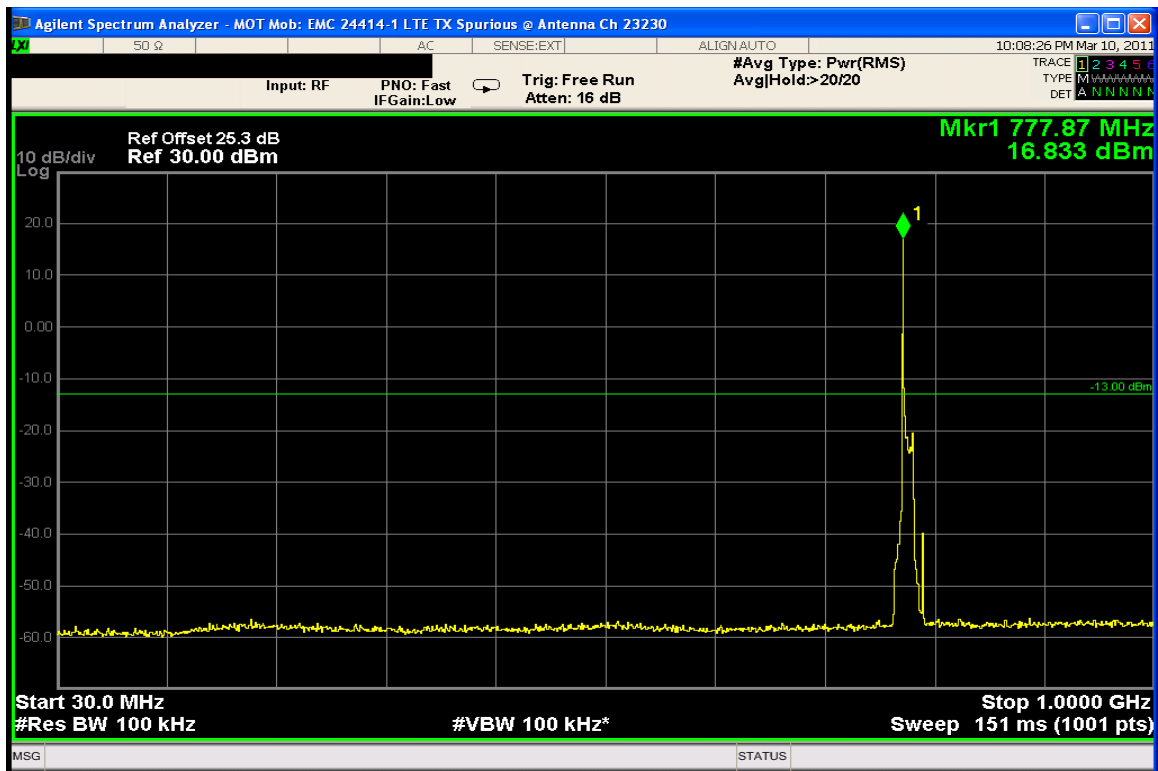


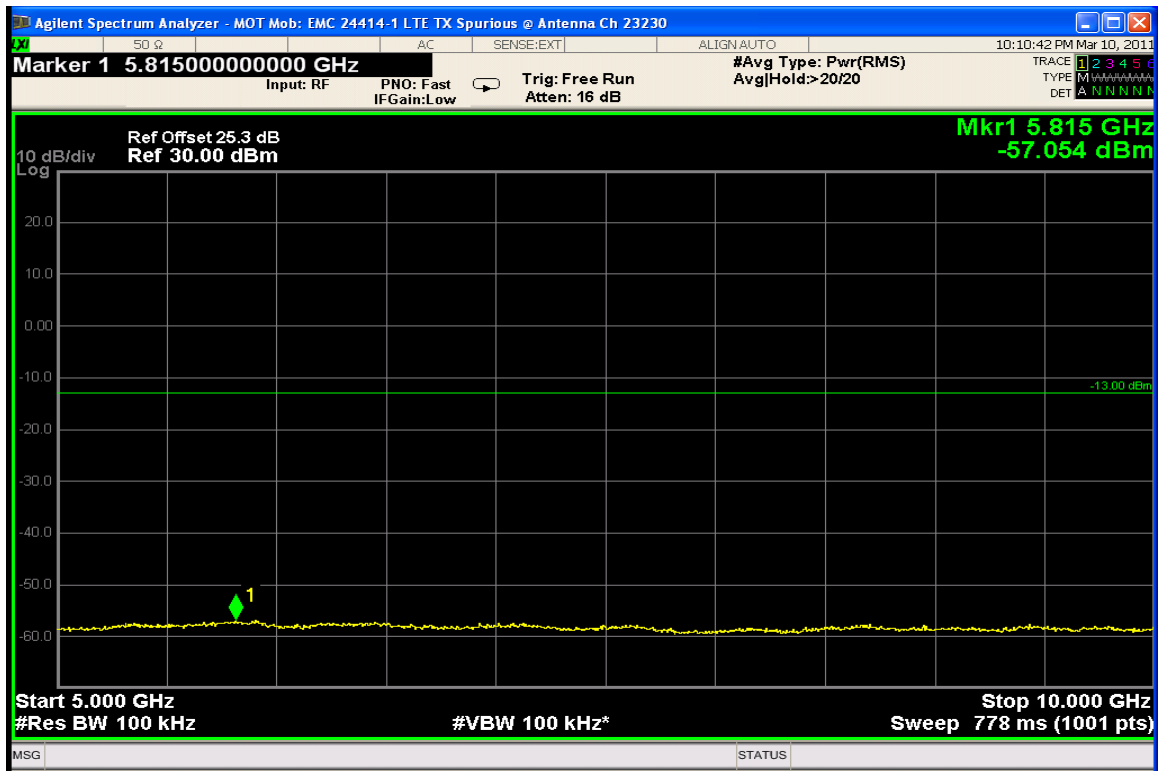
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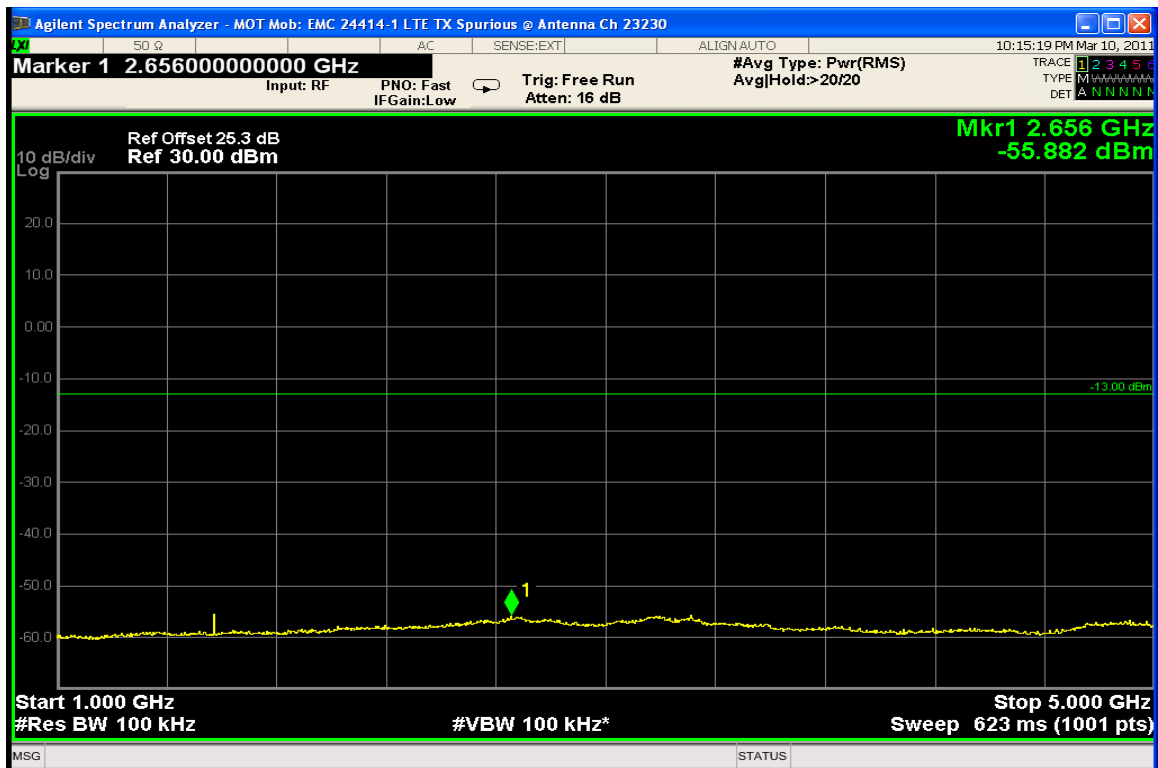
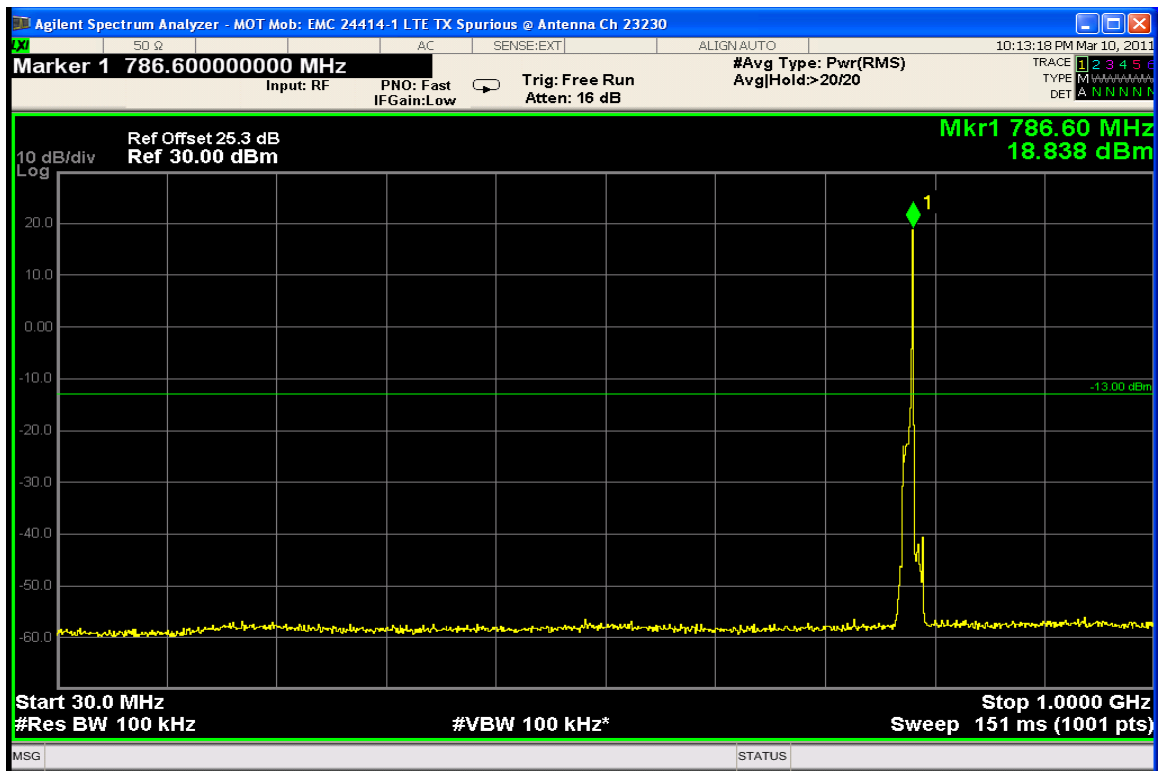


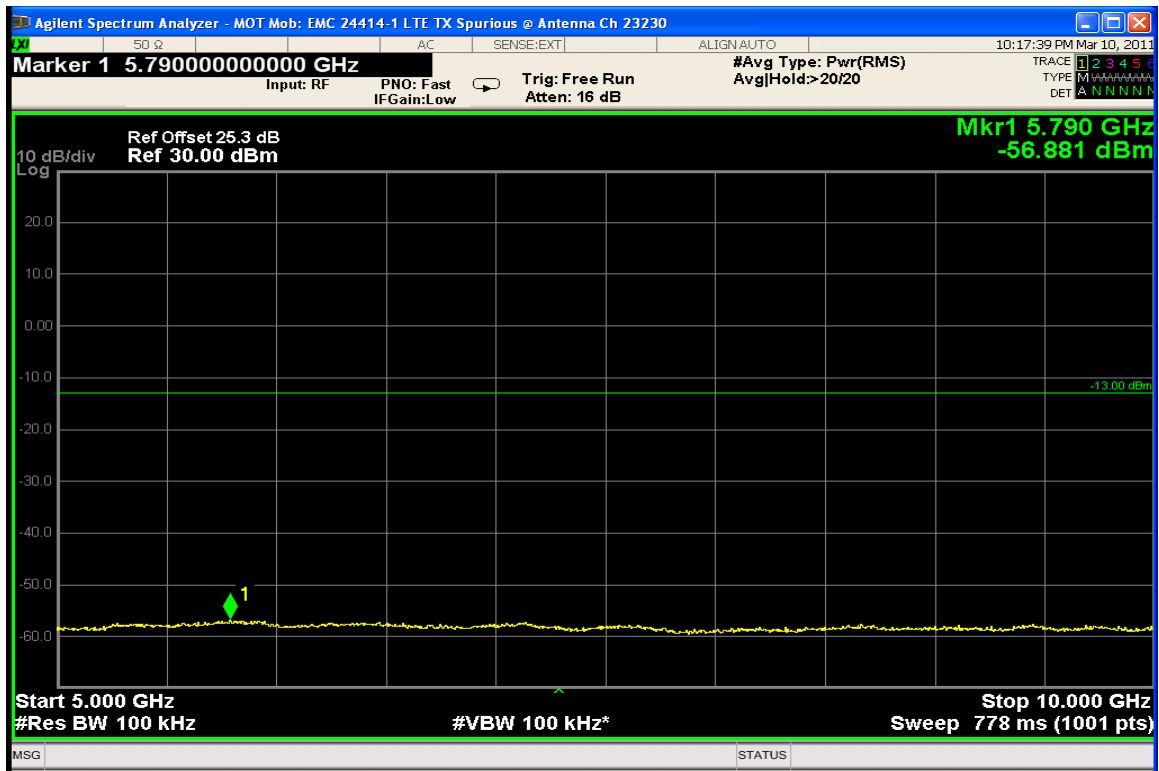
Mode: LTE – Band 13 - 16 QAM, Start RB: 0, 1RB@ low end





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





FIELD STRENGTH OF SPURIOUS EMISSIONS**§27.53 C (2)****Measurement Procedure**

The equipment under test 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 equipment under test 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.

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:

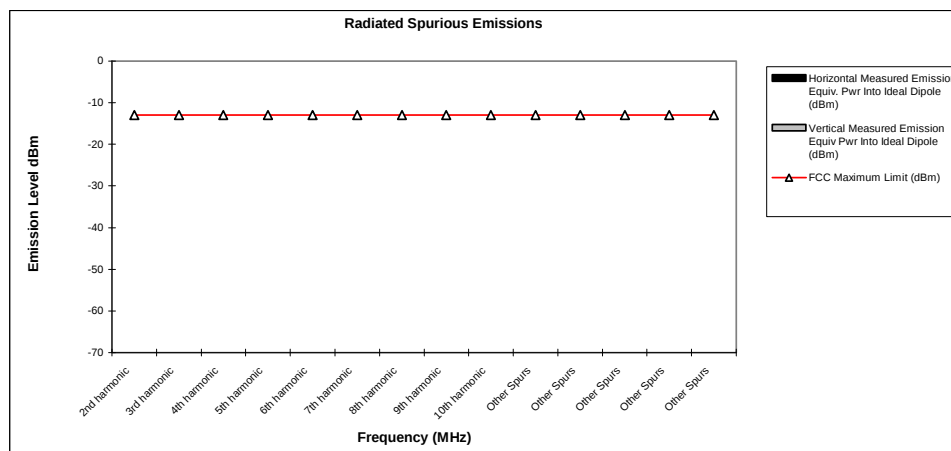
Units	dBm
Divisions	5 dB
Detector	Peak Detector
Resolution Bandwidth	1 MHz
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

Measurement Results

Attached

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 C (f)****Measurement Procedure**

The equipment under test 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 equipment under test 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.

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 Emissions
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

Measurement Results

Attached

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 equipment under test is placed in an environmental chamber. The antenna port of the Equipment Under Test 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 -30° C to +60° C and at intervals of 10° 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

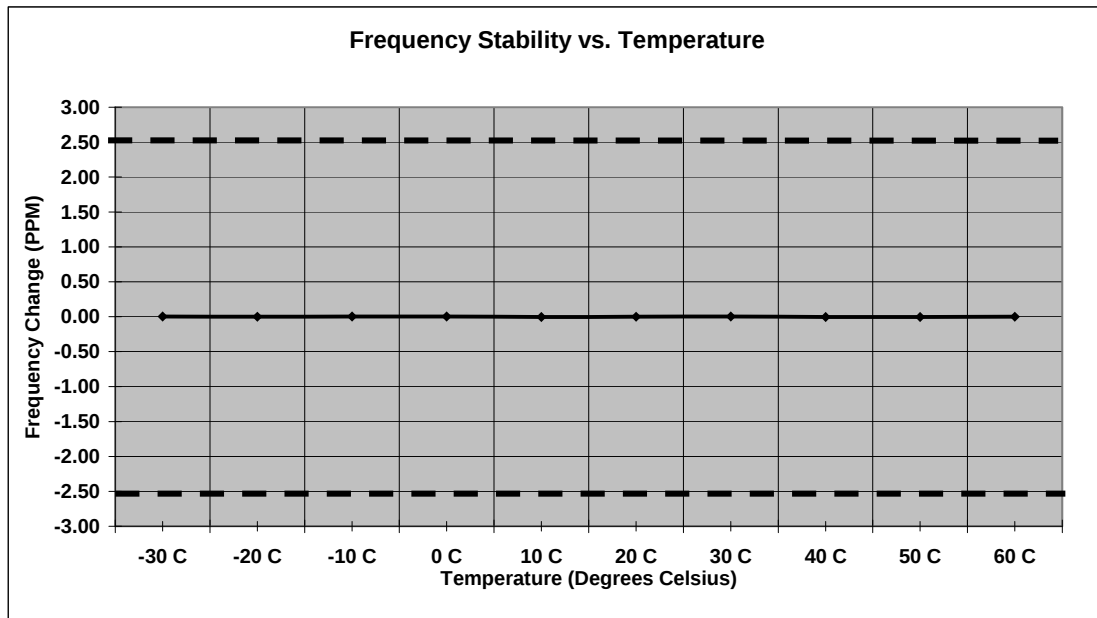
Attached

Modulation: LTE Band 13

Frequency Stability

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

Temperature C	Frequency Error HZ	Frequency Error (PPM)	Voltage (%)	Voltage (VDC)
-30 C	2.69	0.003	100%	3.78
-20 C	-0.19	0.000	100%	3.78
-10 C	1.75	0.002	100%	3.78
0 C	3.60	0.005	100%	3.78
10 C	-3.29	-0.004	100%	3.78
20 C	1.10	0.001	100%	3.78
30 C	2.42	0.003	100%	3.78
40 C	-1.37	-0.002	100%	3.78
50 C	-3.91	-0.005	100%	3.78
60 C	-1.23	-0.002	100%	3.78
20 C	-2.47	-0.003	Battery Endpoint	3.58



End of Test Report