MOBILE DEVICES BUSINESS

PRODUCT SAFETY AND COMPLIANCE

EMC LABORATORY

EMC TEST REPORT

TEST REPORT NUMBER – 25403-1 LTE

The test results and statements contained herein relate only to the model(s) identified and tested. 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 5, 2013

2404

Table of Contents

Test Report Details

Tests Performed By:	ADR Testing Service Location Code: ADR LV Motorola Mobility LLC 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 LLC 600 North US Hwy 45 Libertyville, IL 60048
Product Type :	Portable Cellular Phone
Signaling Capability:	CDMA 800 /1900, LTE Band 04/Band 05/Band 12, CDMA EV-DO Release A/1X/LTE, aGPS , Bluetooth Class 2, Version 4.0 LE+EDR, 802.11b/802.11g/802.11a/802.11n/802.11ac, NFC
FCC ID:	IHDT56PB3
Serial Numbers:	LXWW1J0013, LXWW1J0010, LXWW1J0014, LXWW230010
Testing Complete Date:	April 12 – June 5, 2013

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 22
X Part 27

Applicable Standards: ANSI 63.4 2003, ANSI/TIA-603-C-2004, RSS-Gen Issue 3, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 2.

Summary of Testing

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

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, an external power supply was utilized.

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

Manufacturer	Equipment Type	Model No.	Serial Number	Calibration Due Date
Rohde & Schwarz	Receiver	ESIB40	100226	5/15/2013
Rohde & Schwarz	Receiver	ESIB26	838786/010	9/24/2013
Hewlett Packard	EMC Analyzer	E7405	US40240219	7/30/2013
Agilent	MXA Signal Analyzer	N9020A	US46470586	1/20/2014
Agilent	Signal Generator	83712A	3429A00286	4/10/2015
Agilent	Signal Generator	83623B	3844A00935	5/11/2014
ETS-Lindgren	Horn Antenna	3115	6222	7/26/2013
A. H. Systems	Horn Antenna	SAS 200/571	365	9/4/2013
ETS	Log-Periodic Antenna	3148	1188	9/6/2013
ETS	Biconical Antenna	3110B	3369	9/5/2013
TDK RF Solutions	Precision Log Periodic	PLP 3003C	130387	2/25/2014
Rohde & Schwarz	Wideband Communication Tester	CMW500	126211	7/27/2013
Attenuator	Weinschel	AS-6	6675	NCR
Attenuator	Weinschel	AS-6	6677	NCR
Thermotron	Environmental Chamber	S-4	31580	11/15/2013
Agilent	Power Meter	E4416A	GB41293258	7/15/2013
Agilent	Power Sensor	E9323A	US40412067	8/29/2013
Rohde & Schwarz	Amplifier	TS-PR18	100073	9/5/2013

Note that the Agilent power meter, the Signal Generator and the 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.

Measurement Procedures and Data

RADIATED POWER

§22.913 (a)(2), §27.50 (c) (10), §27.50 (d) (4)

Measurement Procedure

The equipment under test is placed inside the semi-anechoic chamber on a wooden table at the turntable center 3 meters from the receive antenna. 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 frequency, the antenna mast is raised and lowered from 1 to 4 meters to obtain the same 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 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.

An RMS detector was used for all measurements.

The EUT was tested in all configurations and the highest power level is reported.

The settings of the receiver were as follows:

Units	dBm
Divisions	5 dB
Resolution Bandwidth	1 MHz
Video Bandwidth (AVG)	3 MHz
Sweep Time	Auto

The EUT was tested under all configurations and modulations with the worst cases reported in the plots below.

Measurement Results

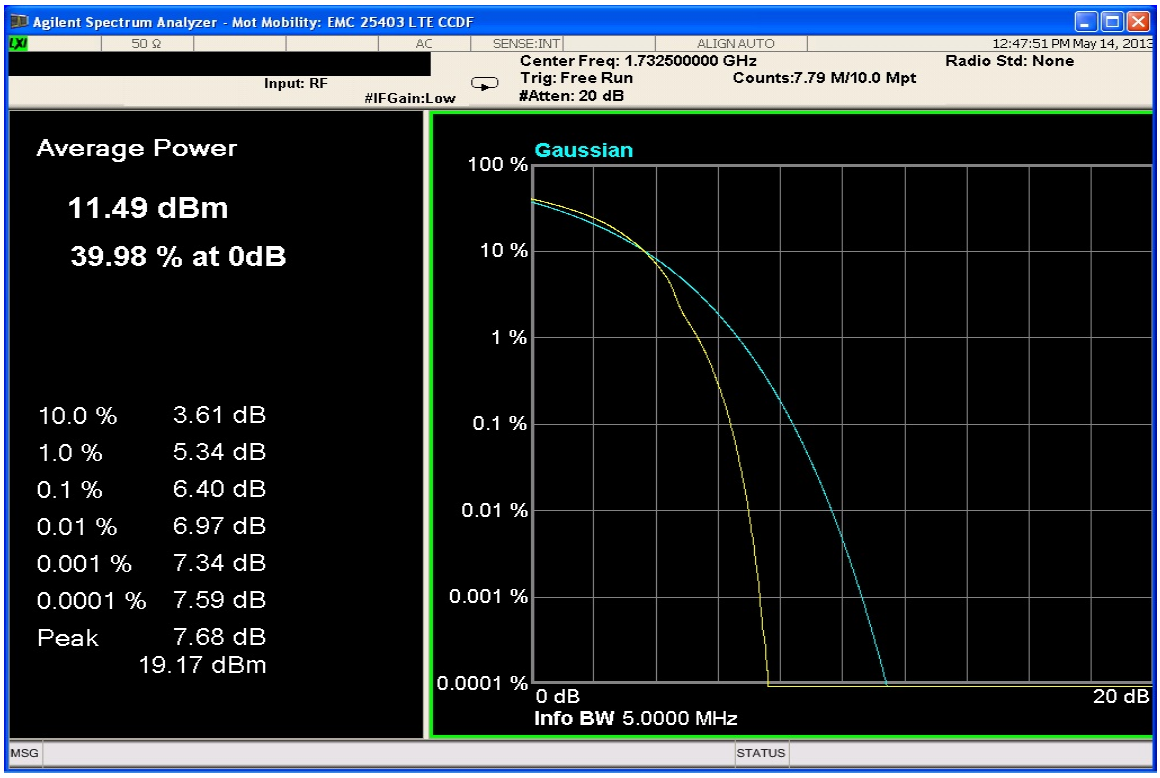
Band	BW	Modulation	RB Size/Offset	EIRP dBm	Limit dBm
Band 4	20	QPSK	1/50	25.36	30.00
	15	QPSK	1/37	25.13	30.00
	10	QPSK	1/25	25.13	30.00
	5	QPSK	1/12	25.12	30.00
	3	QPSK	1/7	25.38	30.00
	1.4	QPSK	1/3	25.51	30.00
	20	16 QAM	1/50	25.54	30.00
	15	16 QAM	1/37	25.02	30.00
	10	16 QAM	1/25	24.97	30.00
	5	16 QAM	1/12	24.93	30.00
	3	16 QAM	1/7	24.78	30.00
	1.4	16 QAM	1/3	24.70	30.00

Band	BW	Modulation	RB Size/Offset	ERP dBm	Limit dBm
Band 5	10	QPSK	1/25	22.34	38.45
	5	QPSK	1/12	22.84	38.45
	3	QPSK	1/7	23.24	38.45
	1.4	QPSK	1/3	23.27	38.45
	10	16 QAM	1/25	21.44	38.45
	5	16 QAM	1/12	22.14	38.45
	3	16 QAM	1/7	22.54	38.45
	1.4	16 QAM	1/3	22.51	38.45

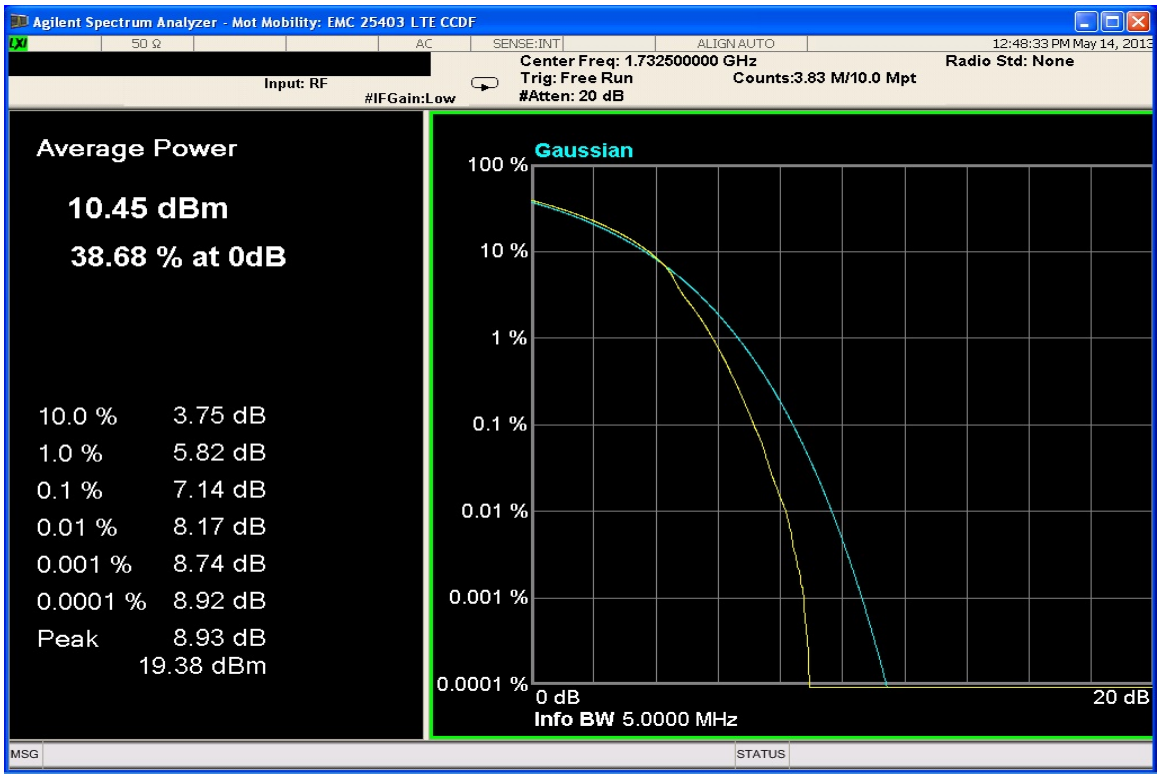
Band	BW	Modulation	RB Size/Offset	ERP dBm	Limit dBm
Band 12	10	QPSK	1/25	21.32	34.77
	5	QPSK	1/12	20.92	34.77
	3	QPSK	1/7	21.19	34.77
	1.4	QPSK	1/3	21.26	34.77
	10	16 QAM	1/25	20.32	34.77
	5	16 QAM	1/12	20.29	34.77
	3	16 QAM	1/7	20.79	34.77
	1.4	16 QAM	1/3	20.39	34.77

The CCDF plots are also shown below. The conducted port of the EUT is connected to the spectrum analyzer. The spectrum analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth.

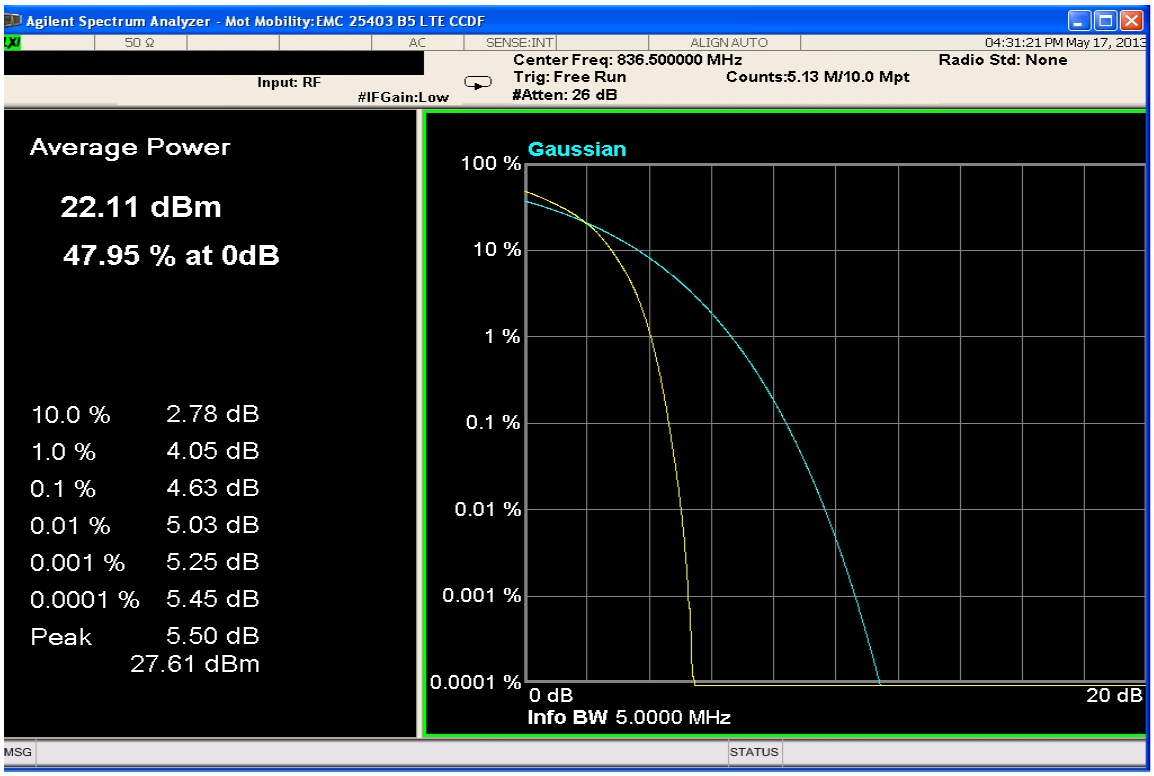
The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.



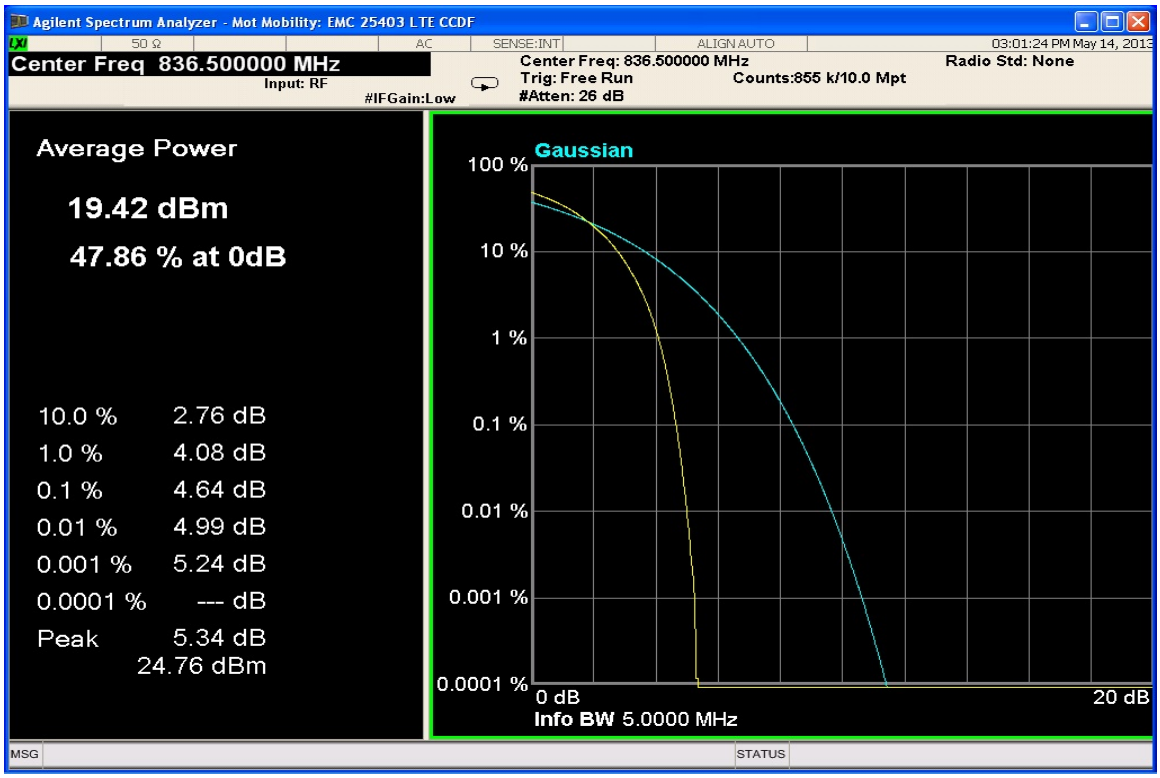
LTE Band 4 PAR Plot - 20 MHz BW, QPSK RB Size = 100 RB Start 0



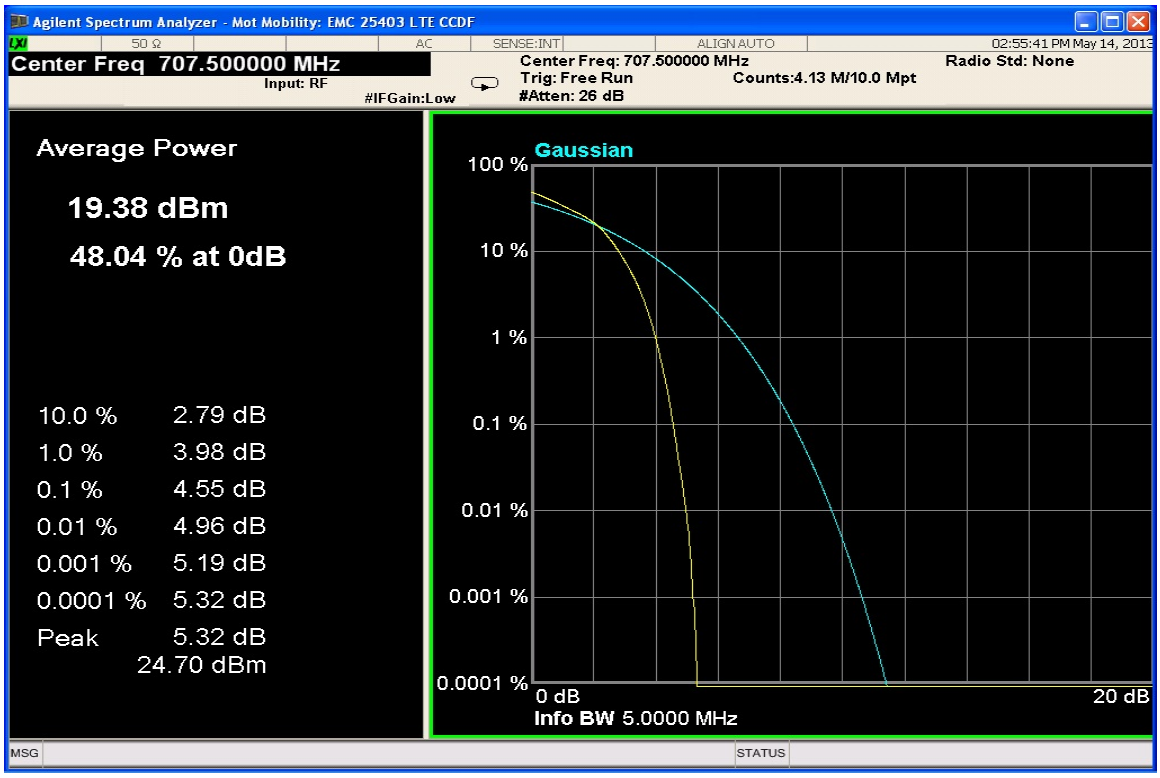
LTE Band 4 PAR Plot - 20 MHz BW, 16-QAM RB Size = 100 RB Start 0



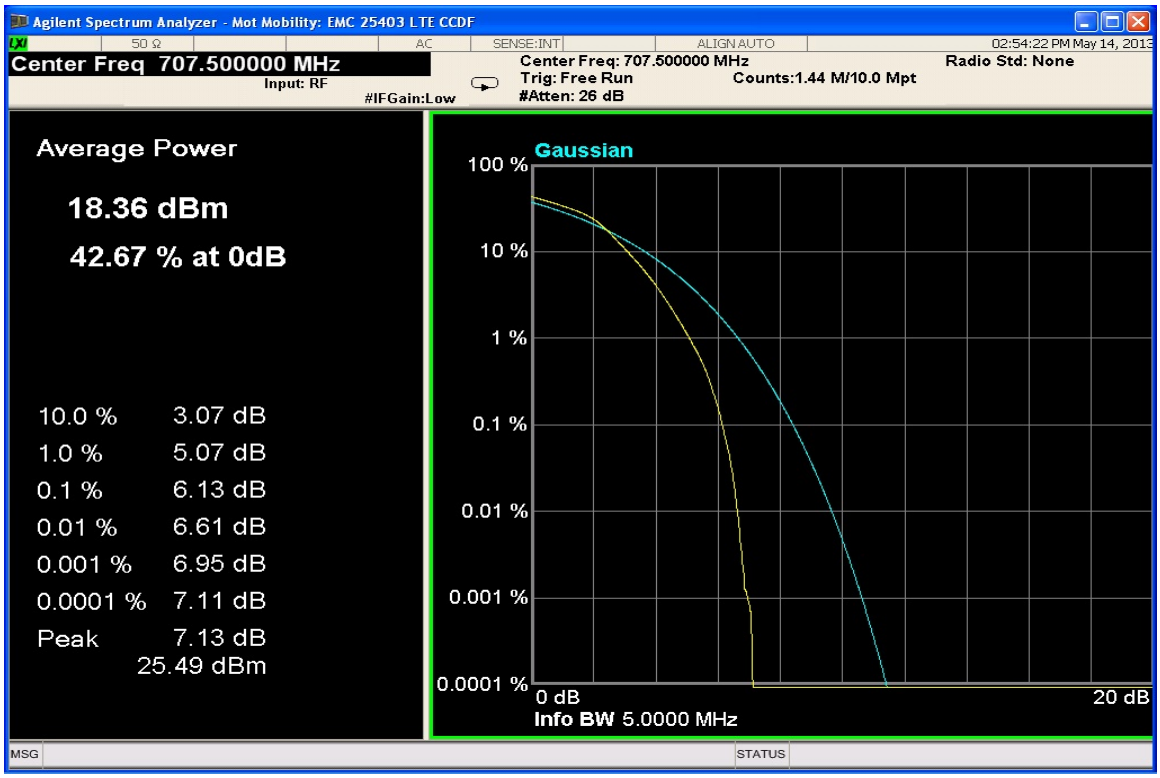
LTE Band 5 PAR Plot - 10 MHz BW, QPSK RB Size = 50 RB Start 0



LTE Band 5 PAR Plot - 10 MHz BW, 16-QAM RB Size = 50 RB Start 0



LTE Band 12 PAR Plot - 10 MHz BW, QPSK RB Size = 50 RB Start 0



LTE Band 12 PAR Plot - 10 MHz BW, 16-QAM RB Size = 50 RB Start 0

OCCUPIED BANDWIDTH
§ 2.1049

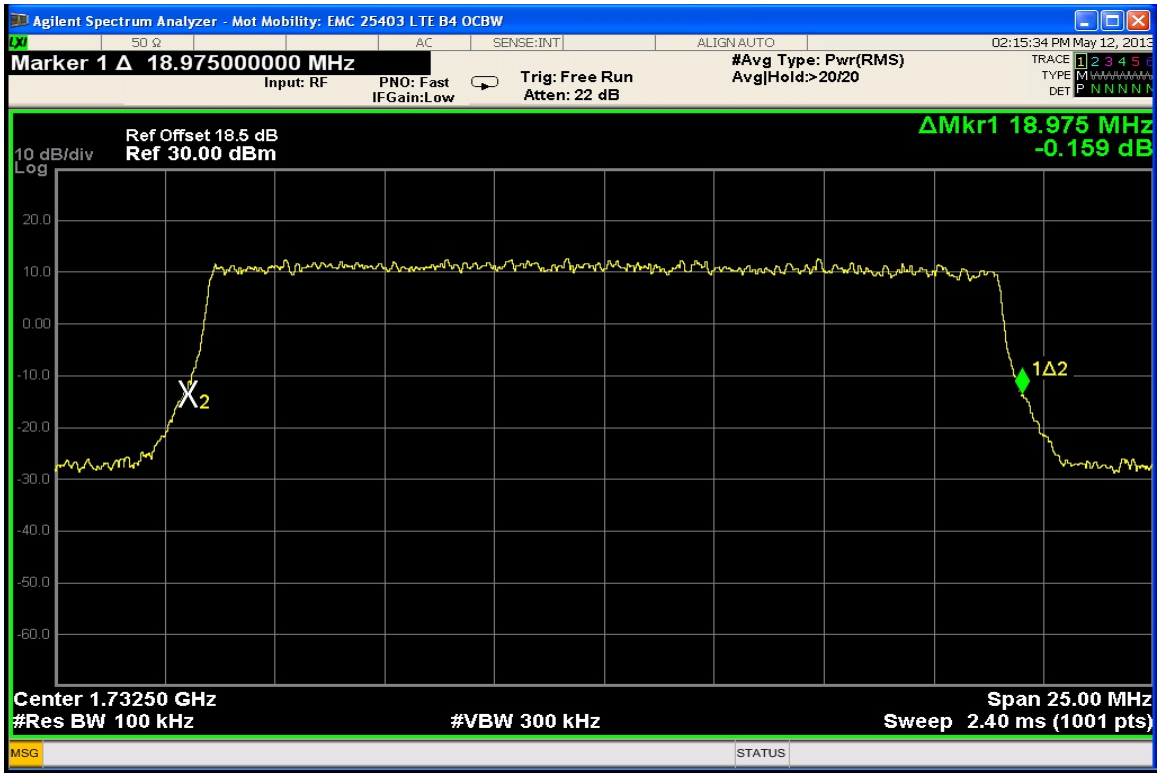
Measurement Procedure

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.

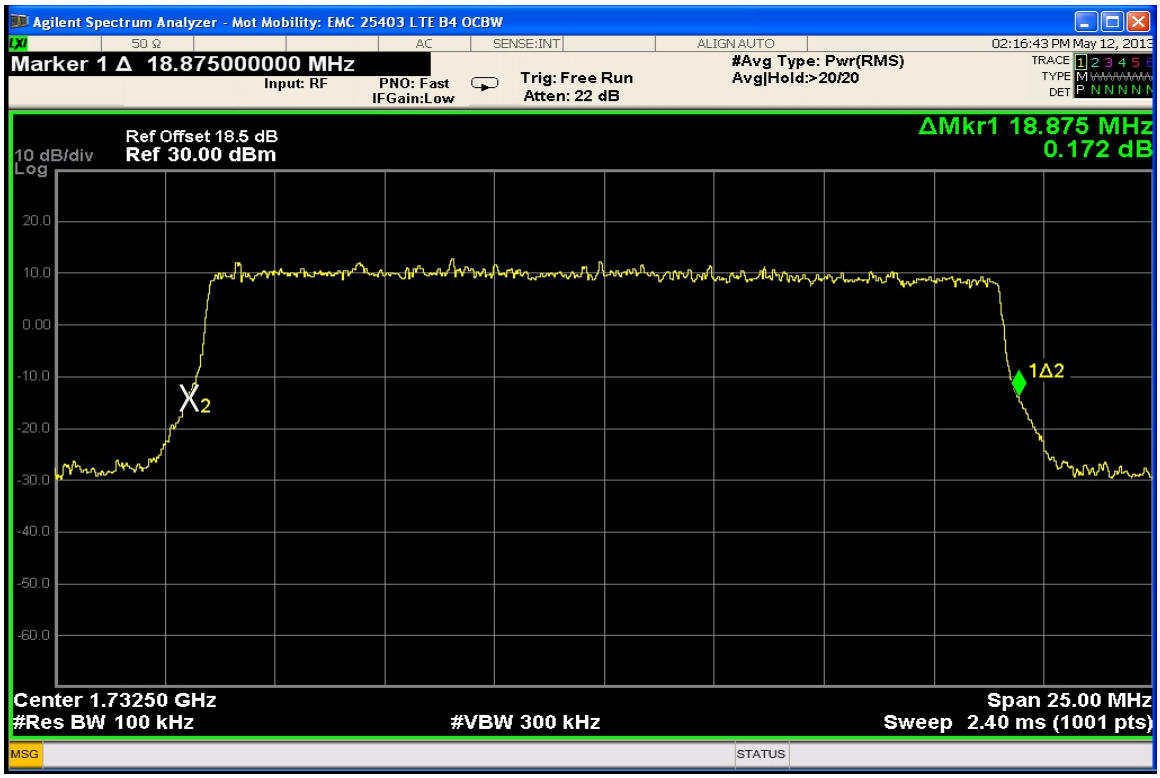
The EUT was tested under all configurations and modulations.

Measurement Results
Attached

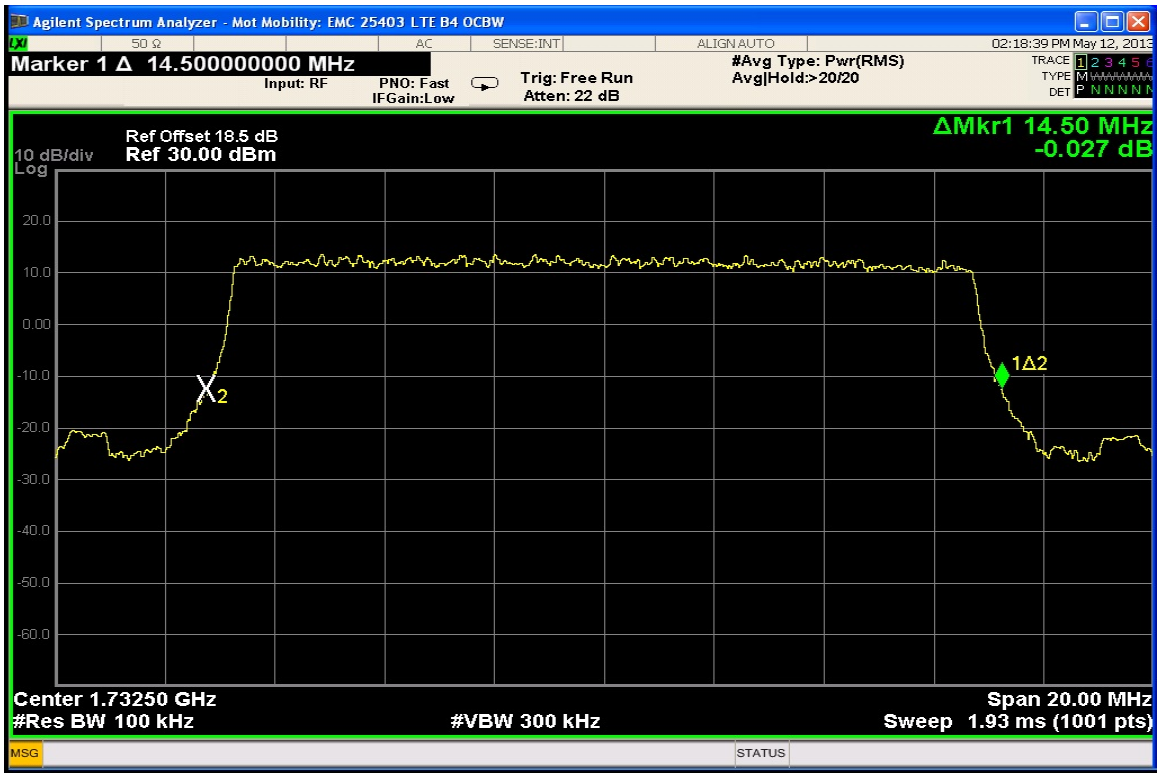
Measurement Results: LTE Band 4 QPSK & 16-QAM Occupied Bandwidth



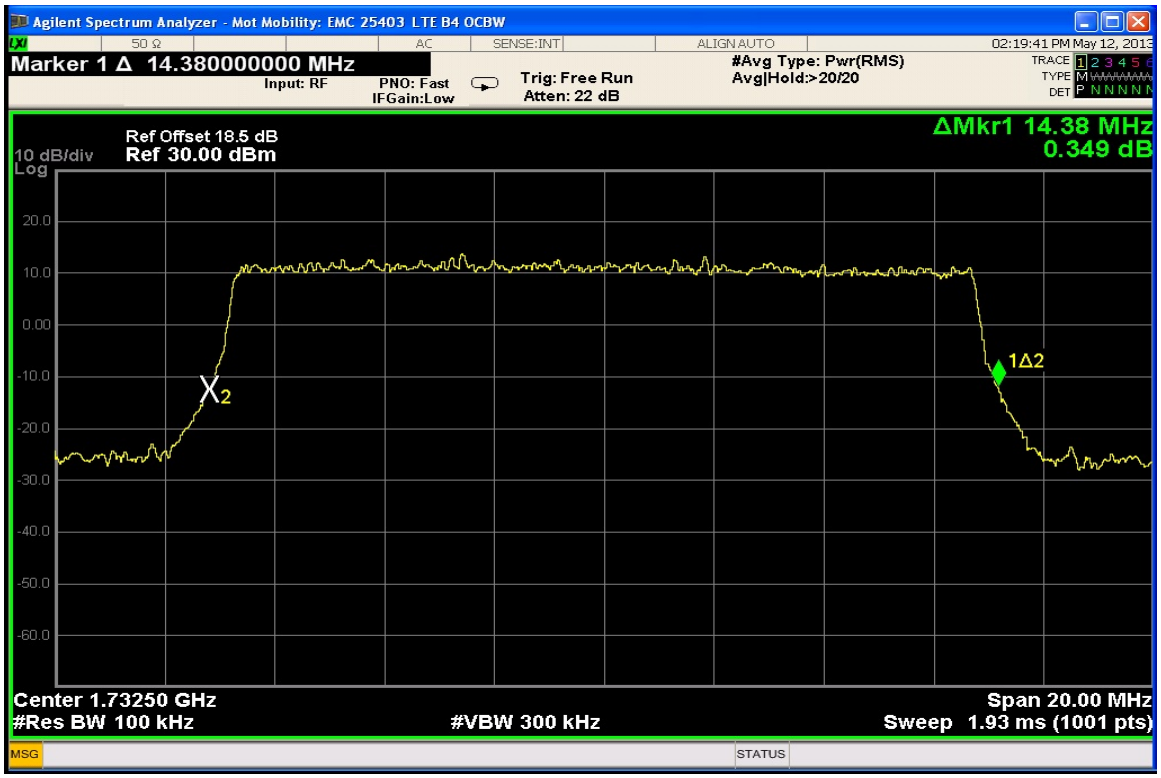
Band 4 LTE – 20 MHz BW, QPSK RB Size = 100 RB Start 0



Band 4 LTE – 20 MHz BW, 16-QAM RB Size = 100 RB Start 0

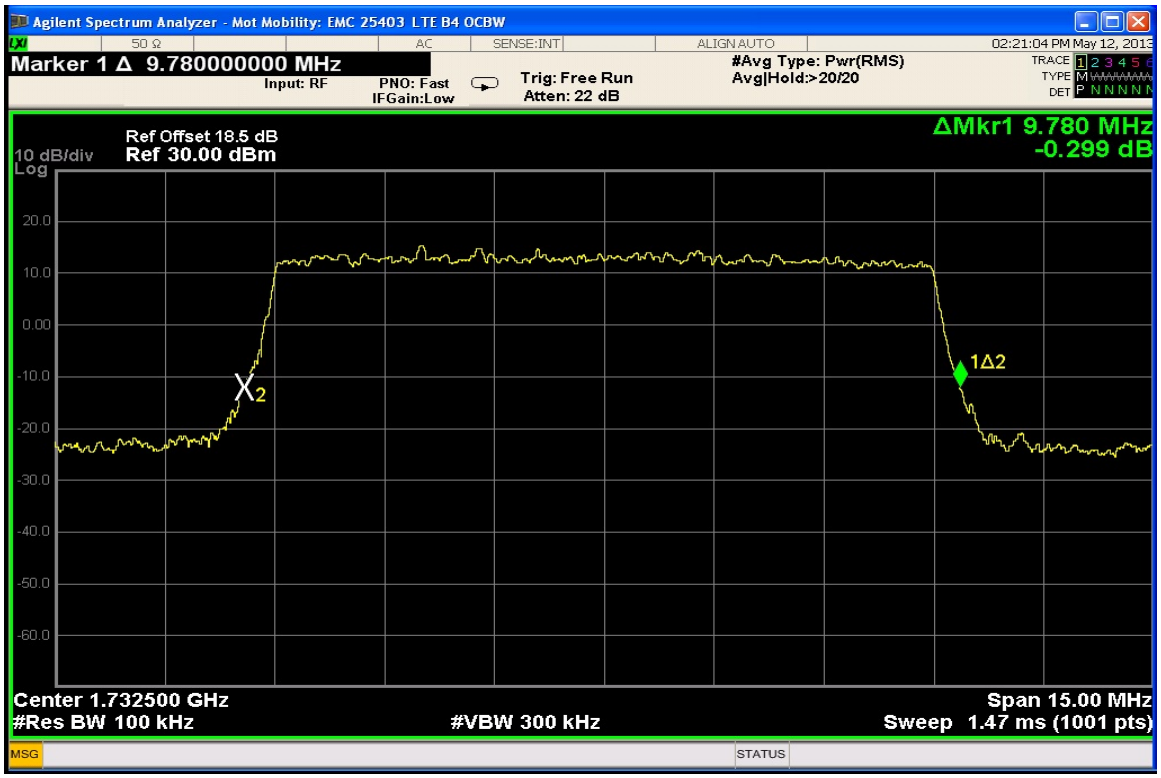


Band 4 LTE – 15 MHz BW, QPSK RB Size = 75 RB Start 0



Band 4 LTE – 15 MHz BW, 16QAM RB Size = 75 RB Start 0

Band 4 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0



Band 4 LTE – 10 MHz BW, 16QAM RB Size = 50 RB Start 0

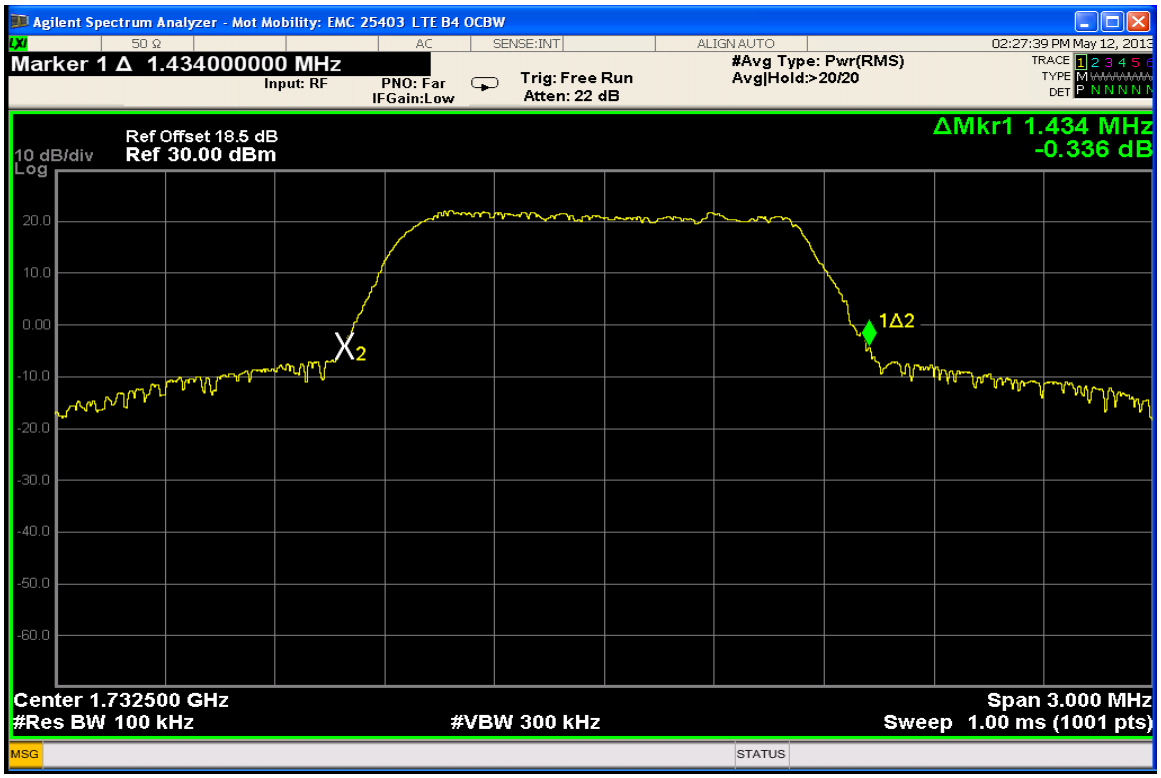
Band 4 LTE – 5 MHz BW, QPSK RB Size = 25 RB Start 0

Band 4 LTE – 5 MHz BW, 16QAM RB Size = 25 RB Start 0

Band 4 LTE – 3 MHz BW, QPSK RB Size = 15 RB Start 0

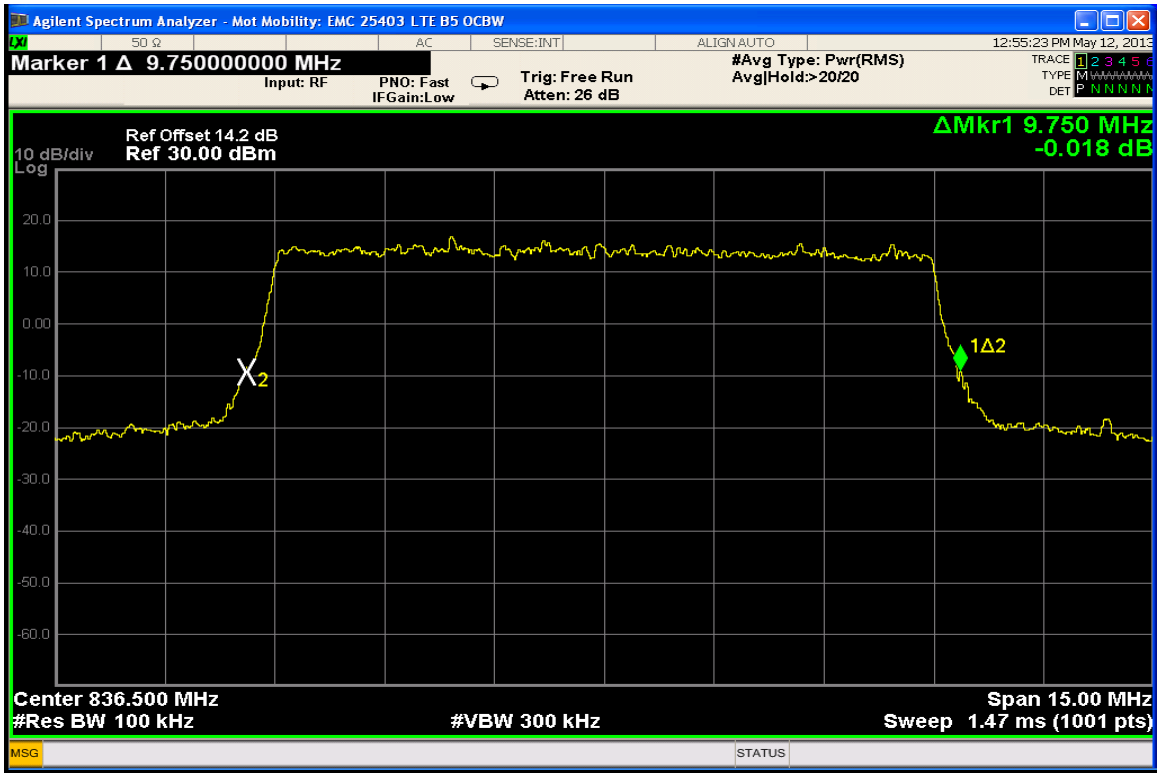
Band 4 LTE – 3 MHz BW, 16QAM RB Size = 15 RB Start 0

Band 4 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0

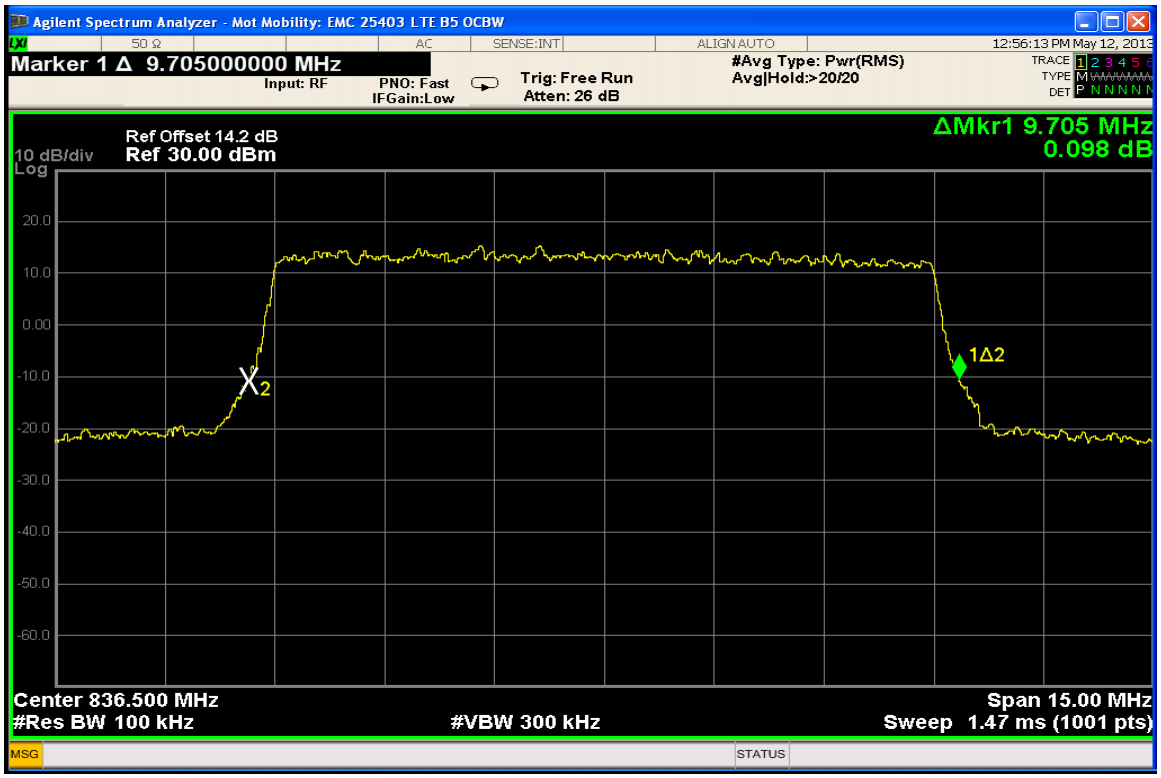


Band 4 LTE – 1.4 MHz BW, 16QAM RB Size = 6 RB Start 0

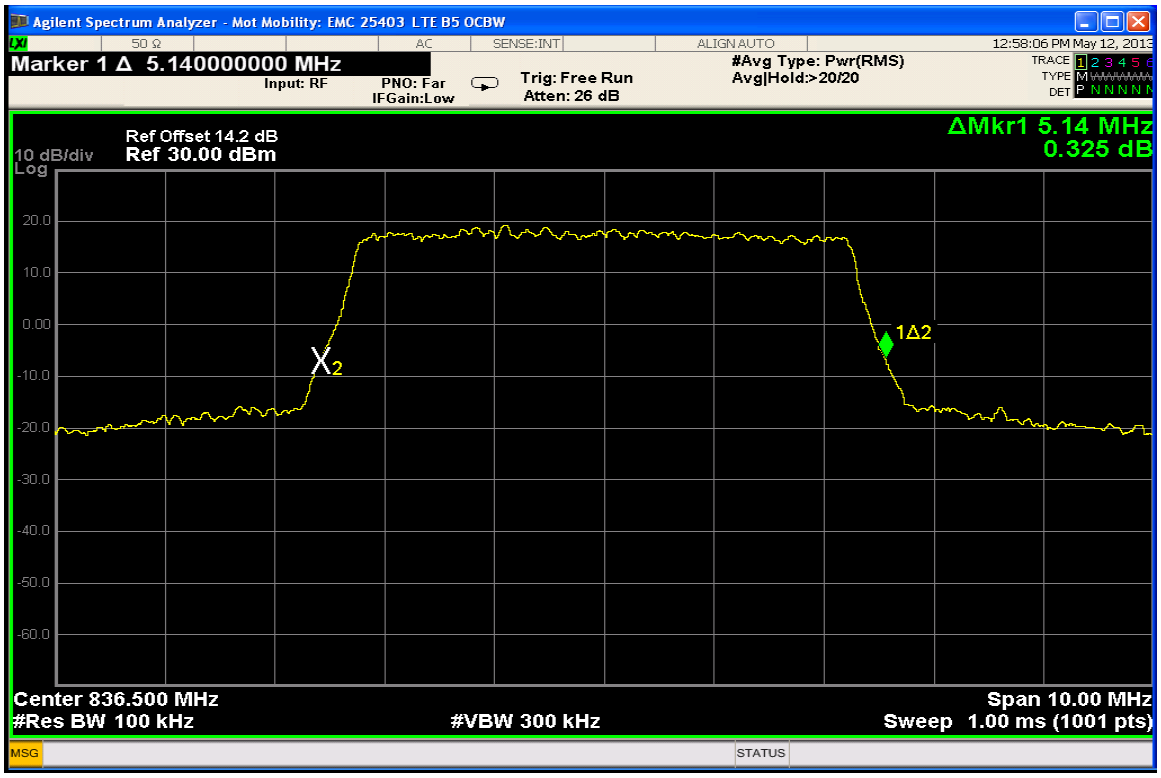
Measurement Results: LTE Band 5 QPSK & 16-QAM Occupied Bandwidth



Band 5 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0

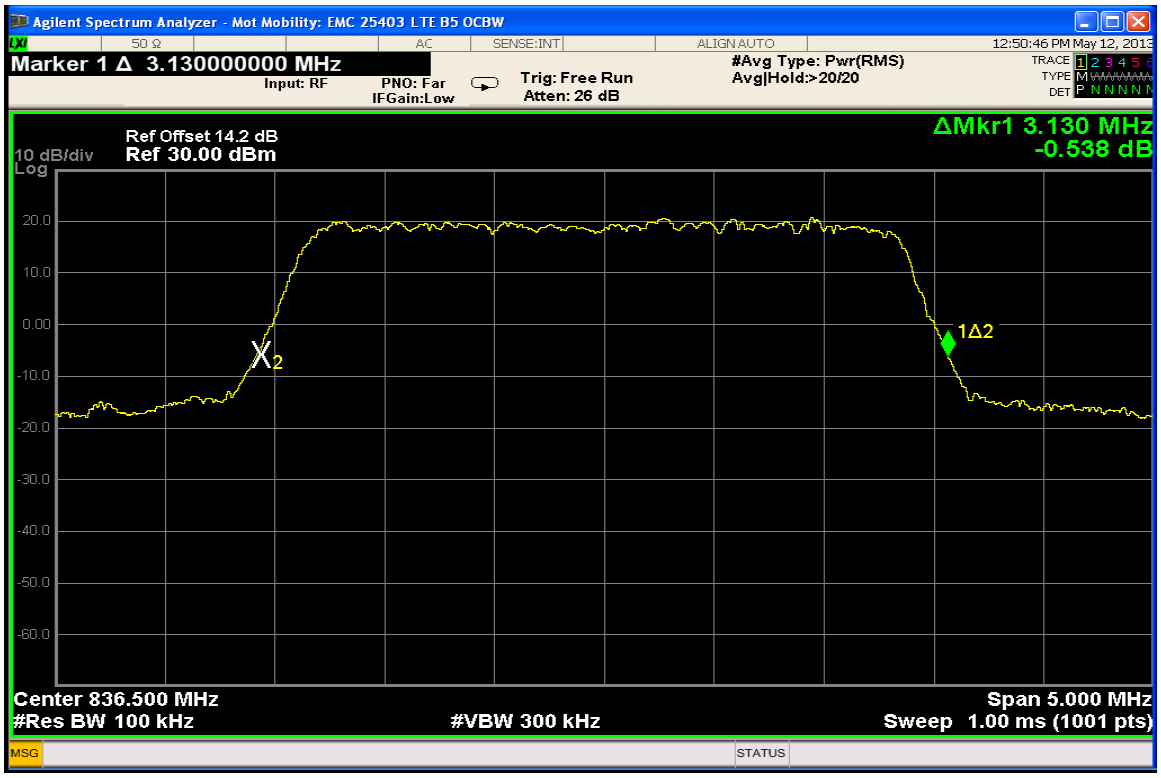


Band 5 LTE – 10 MHz BW, 16QAM RB Size = 50 RB Start 0



Band 5 LTE – 5 MHz BW, QPSK RB Size = 25 RB Start 0

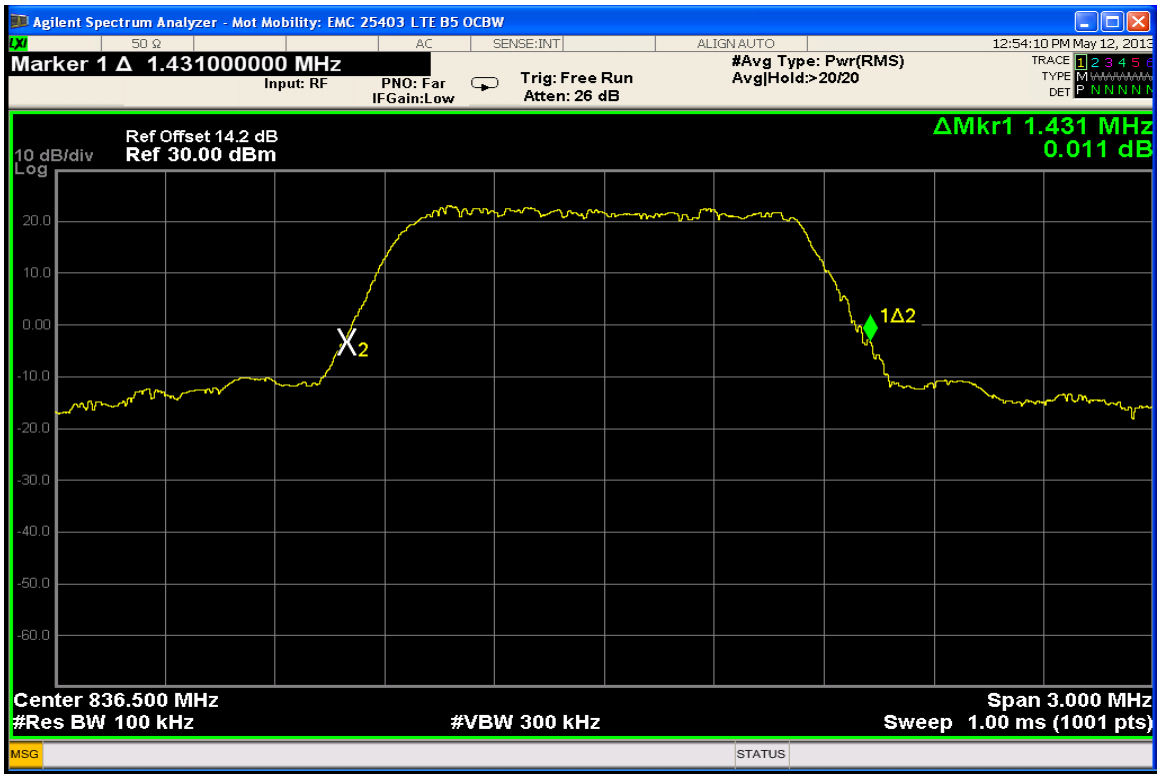
Band 5 LTE – 5 MHz BW, 16QAM RB Size = 25 RB Start 0



Band 5 LTE – 3 MHz BW, QPSK RB Size = 15 RB Start 0

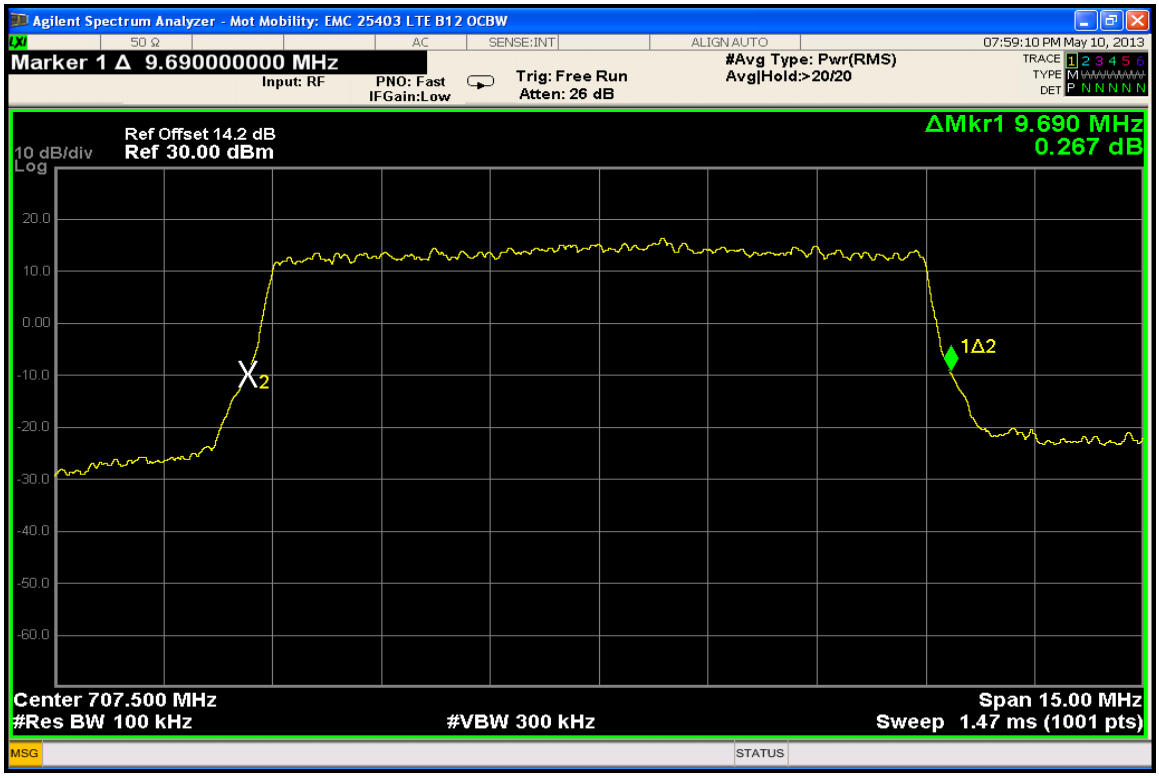
Band 5 LTE – 3 MHz BW, 16QAM RB Size = 15 RB Start 0

Band 5 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0

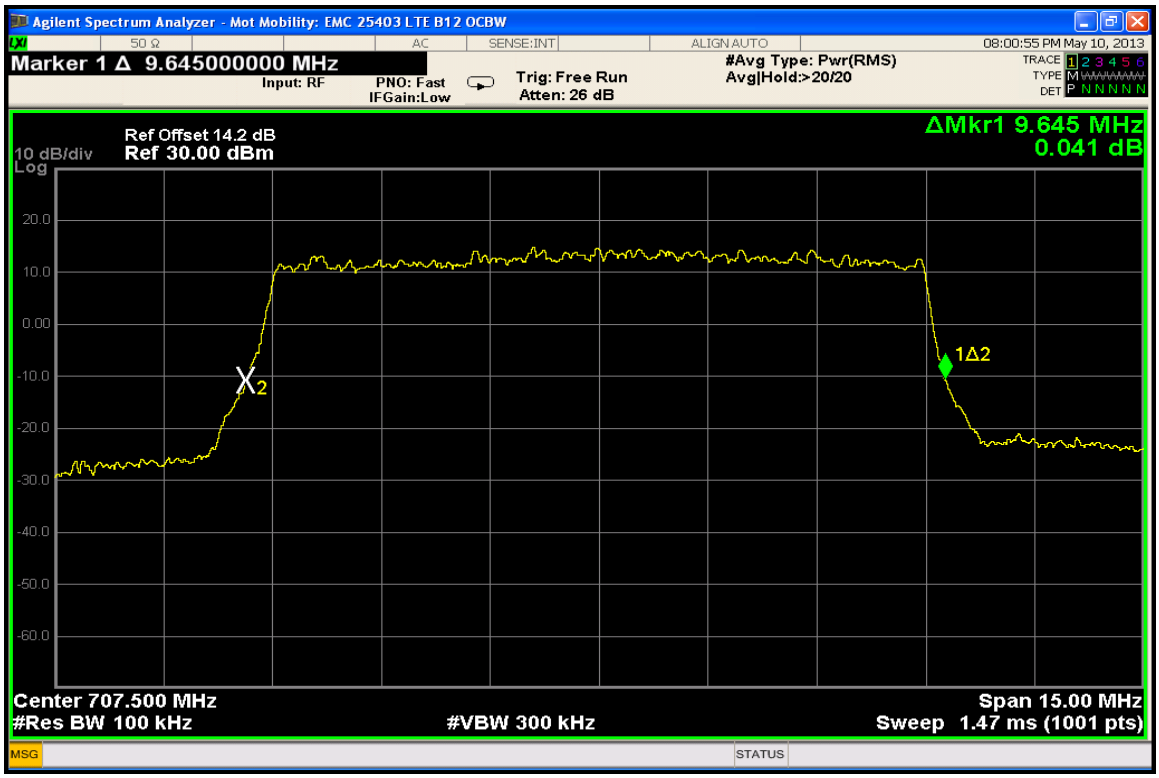


Band 5 LTE – 1.4 MHz BW, 16QAM RB Size = 6 RB Start 0

Measurement Results: LTE Band 12 QPSK & 16-QAM Occupied Bandwidth

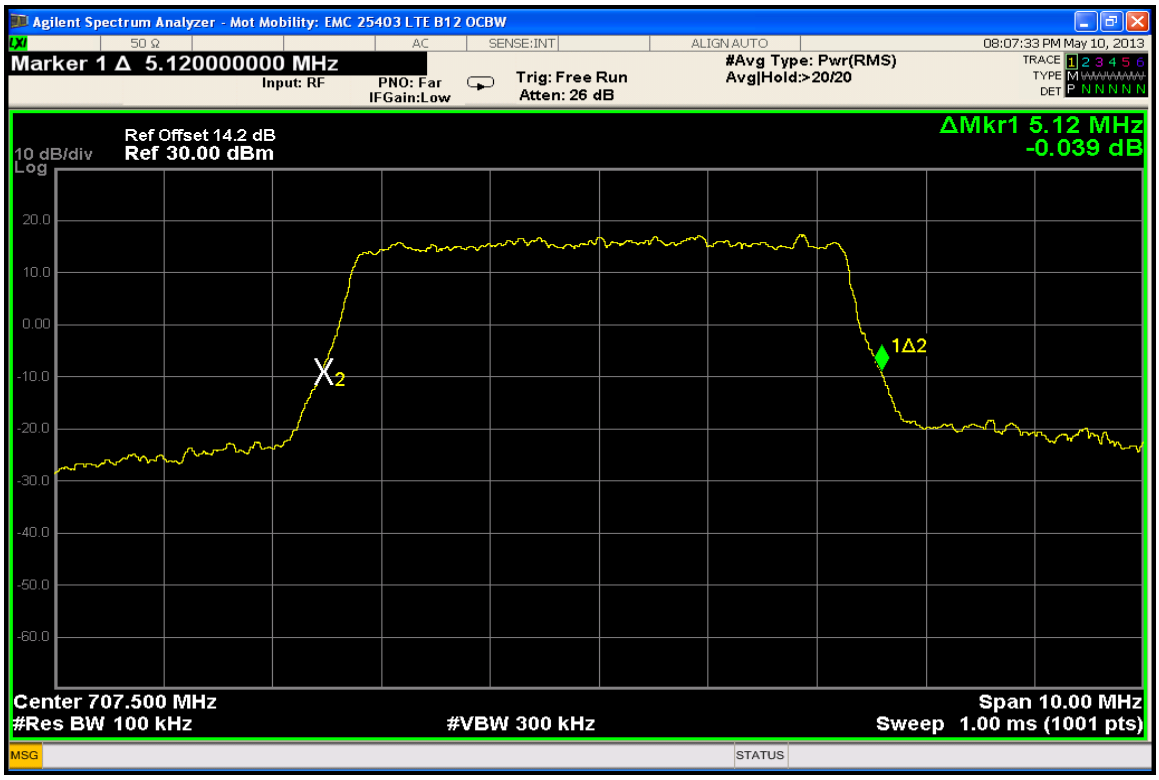


Band 12 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0



Band 12 LTE – 10 MHz BW, 16QAM RB Size = 50 RB Start 0

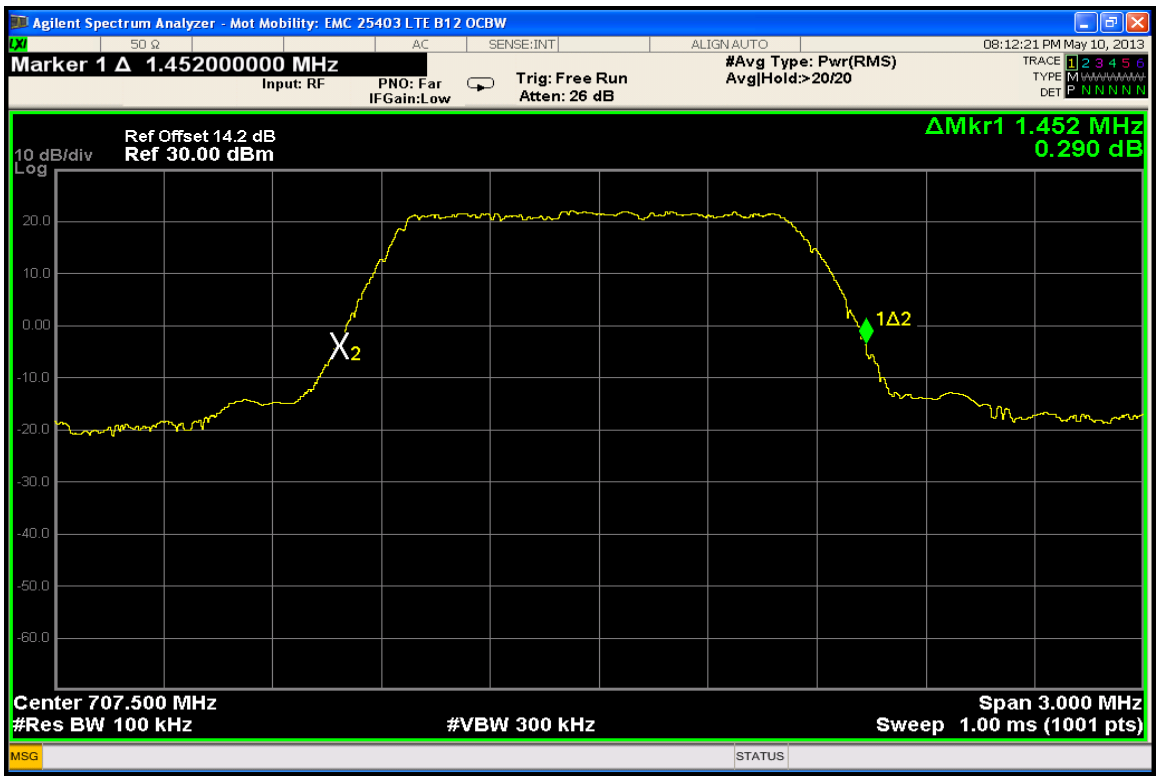
Band 12 LTE – 5 MHz BW, QPSK RB Size = 25 RB Start 0



Band 12 LTE – 5 MHz BW, 16QAM RB Size = 25 RB Start 0

Band 12 LTE – 3 MHz BW, QPSK RB Size = 15 RB Start 0

Band 12 LTE – 3 MHz BW, 16QAM RB Size = 15 RB Start 0



Band 12 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0

Band 12 LTE – 1.4 MHz BW, 16QAM RB Size = 6 RB Start 0

BAND EDGE MEASUREMENTS

§22.917 (a), §27.53 (g), §27.53 (h)

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.

§22.917 (a) 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.

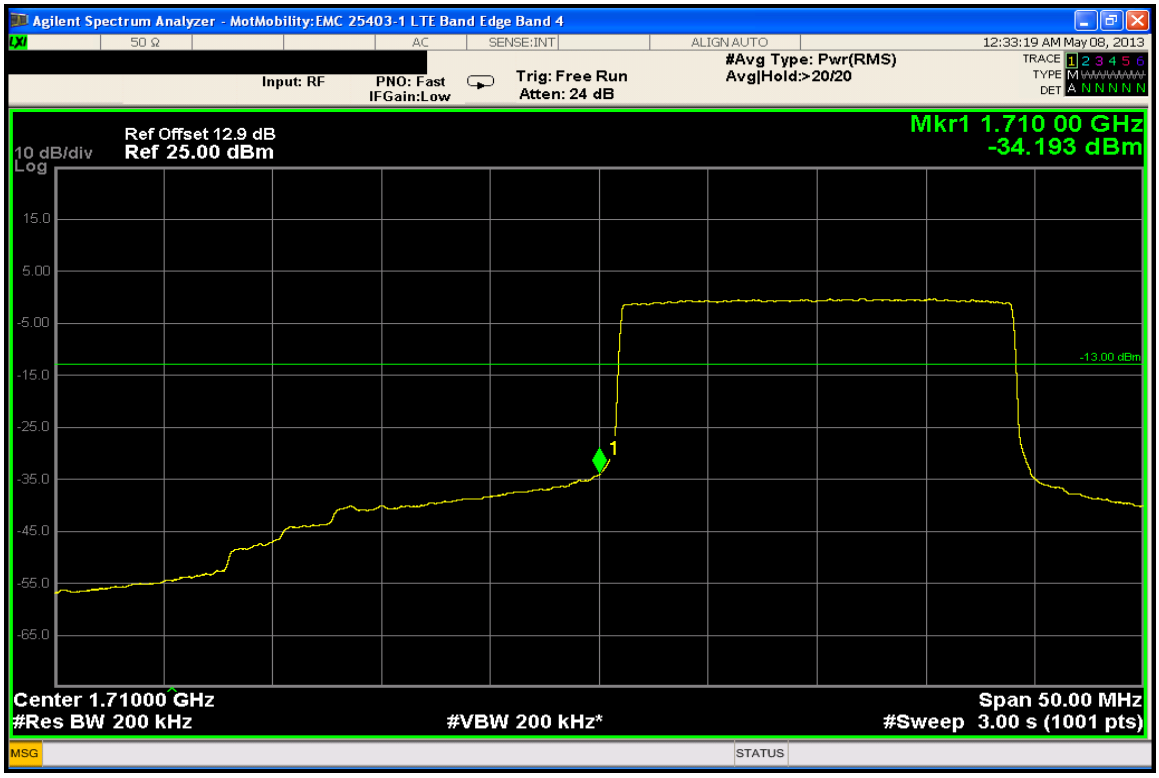
§27.53 (g) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

§27.53 (h) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

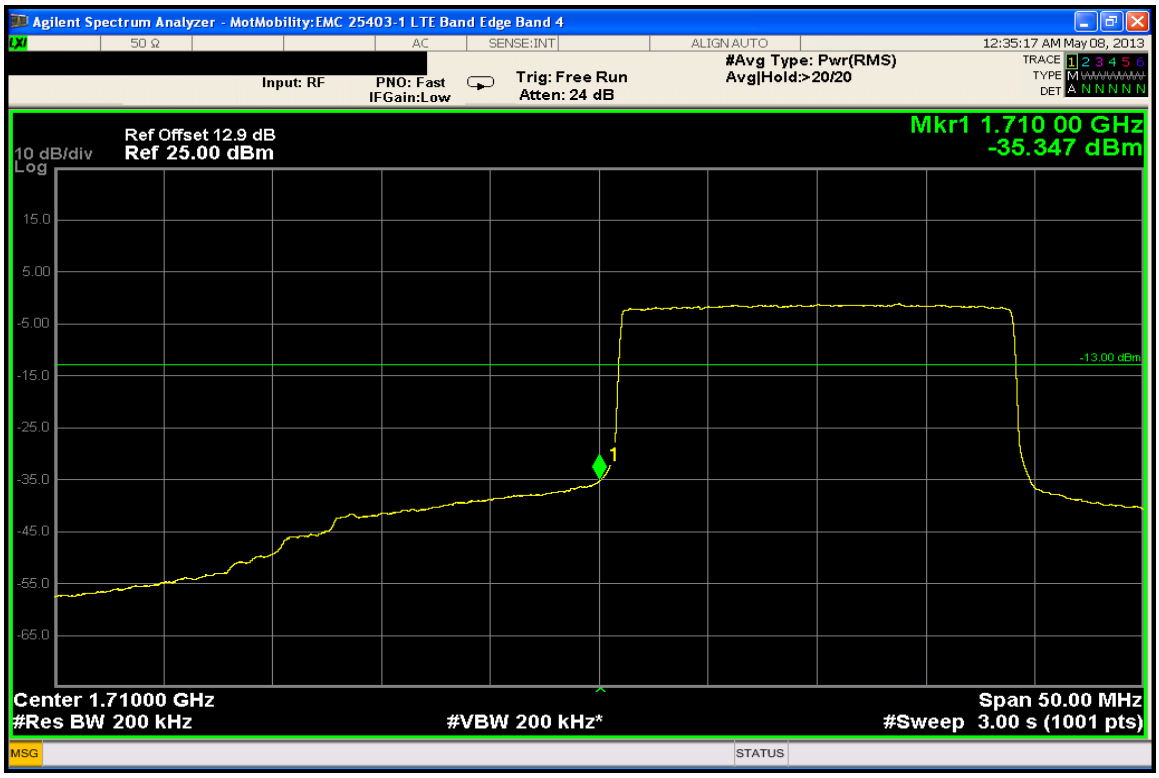
The EUT was tested in the all bandwidths and both modulations in each band and the worst case plots are reported below.

Measurement Results
Attached

Measurement Results: Band 4 Low and High Band Edge



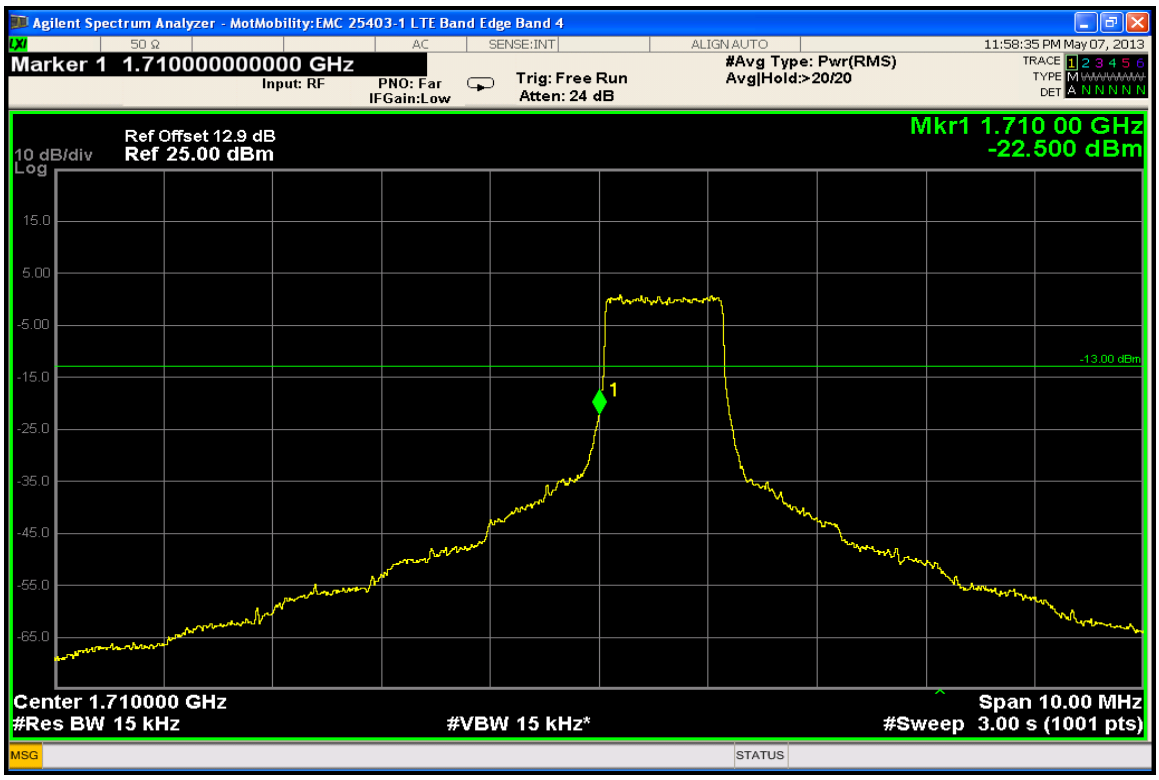
Band 4 LTE – 20 MHz BW, QPSK RB Size = 100 RB Start 0



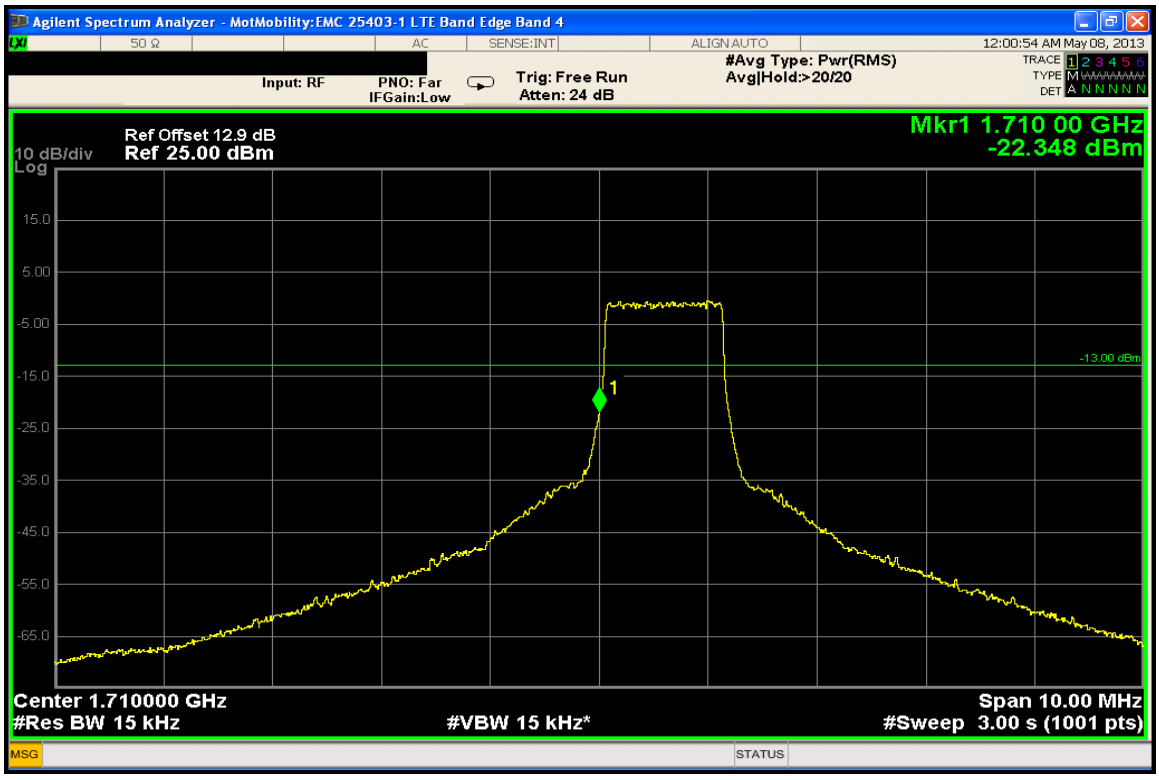
Band 4 LTE – 20 MHz BW, 16-QAM RB Size = 100 RB Start 0

Band 4 LTE – 20 MHz BW, QPSK RB Size = 100 RB Start 0

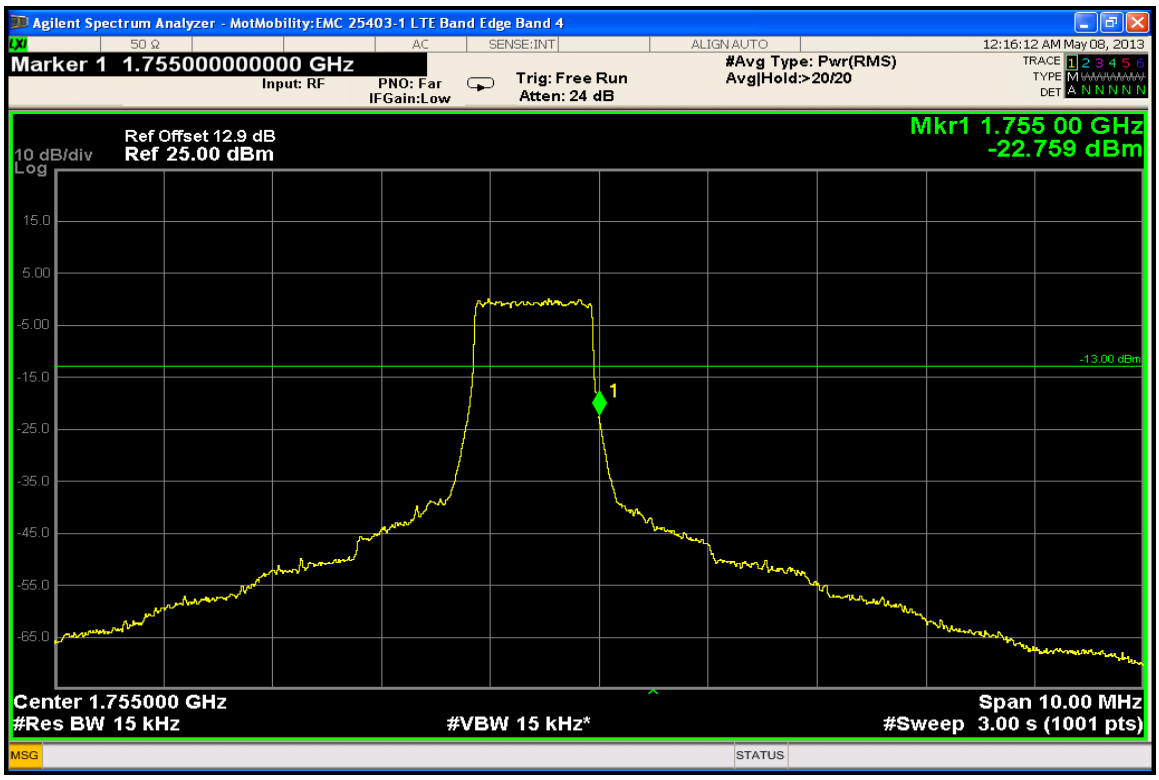
Band 4 LTE – 20 MHz BW, 16-QAM RB Size = 100 RB Start 0



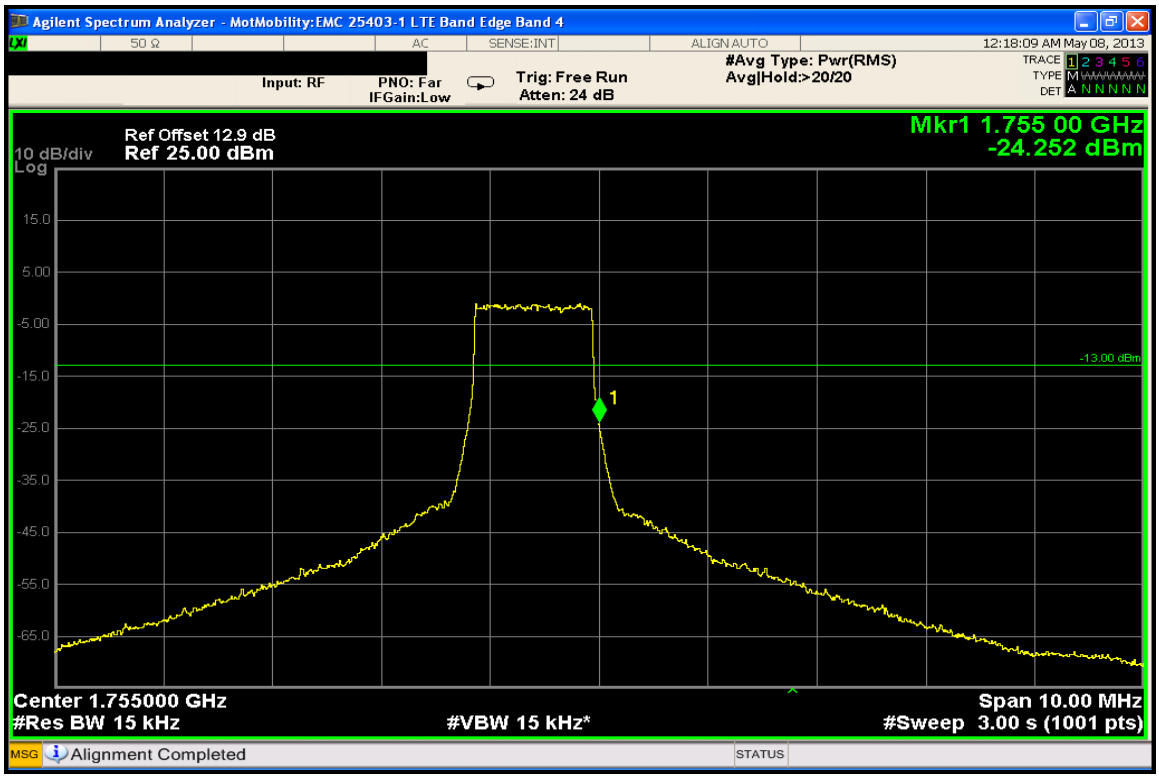
Band 4 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0



Band 4 LTE – 1.4 MHz BW, 16-QAM RB Size = 6 RB Start 0

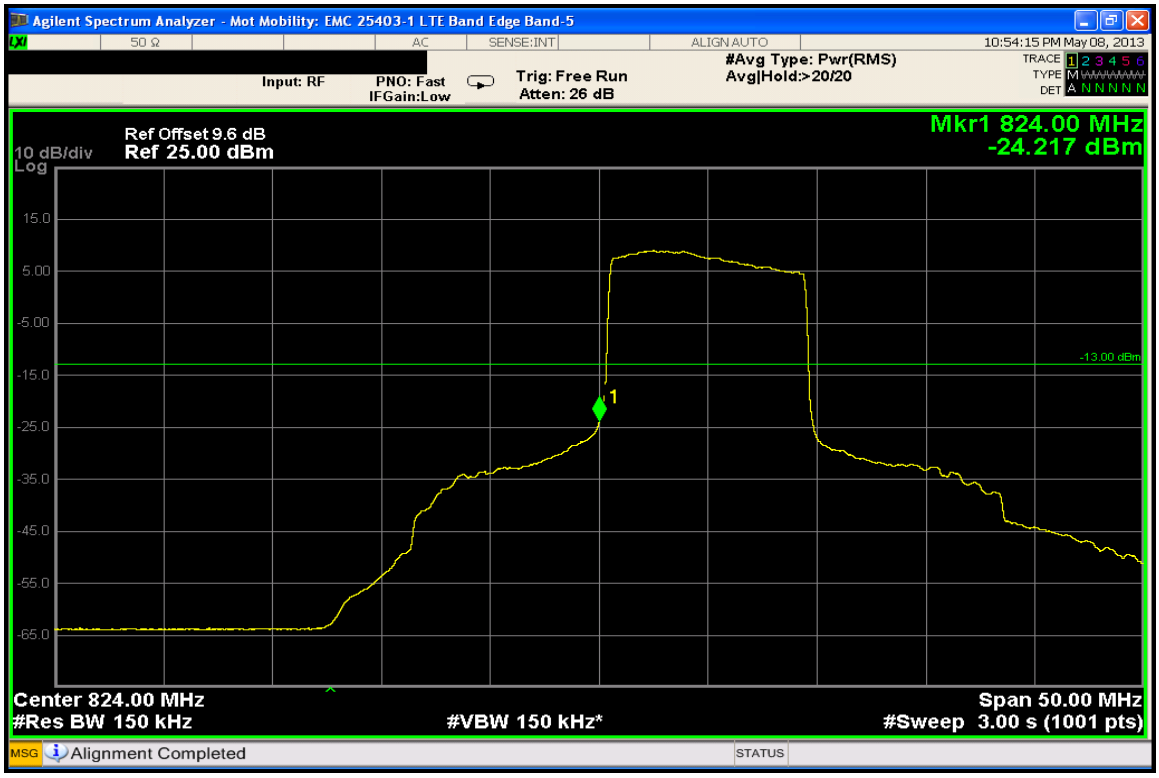


Band 4 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0



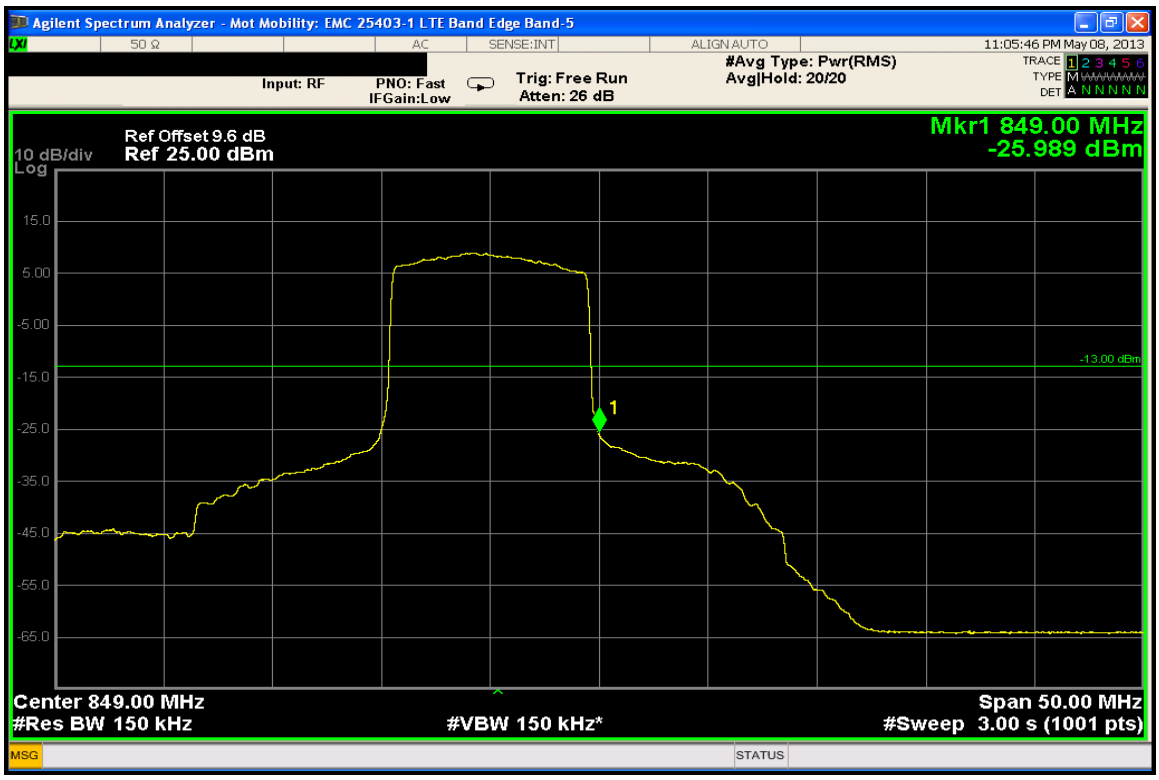
Band 4 LTE – 1.4 MHz BW, 16-QAM RB Size = 6 RB Start 0

Measurement Results: Band 5 Low and High Band Edge

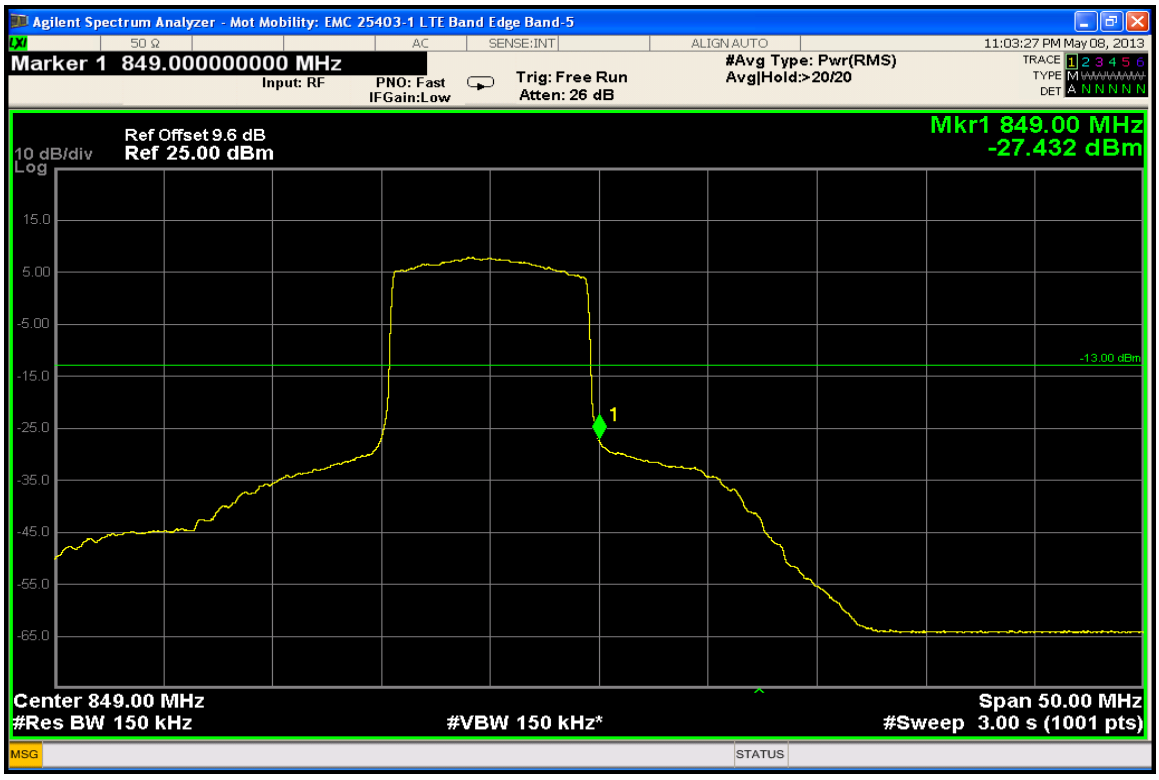


Band 5 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0

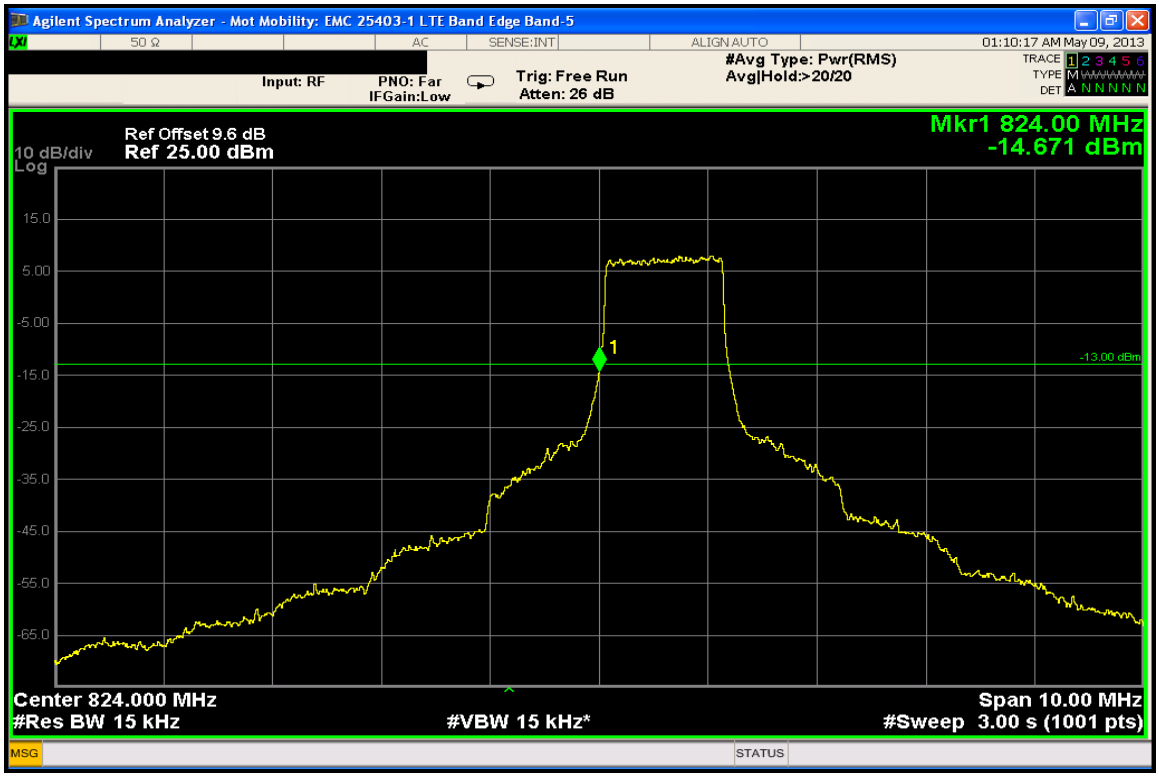
Band 5 LTE – 10 MHz BW, 16-QAM RB Size = 50 RB Start 0



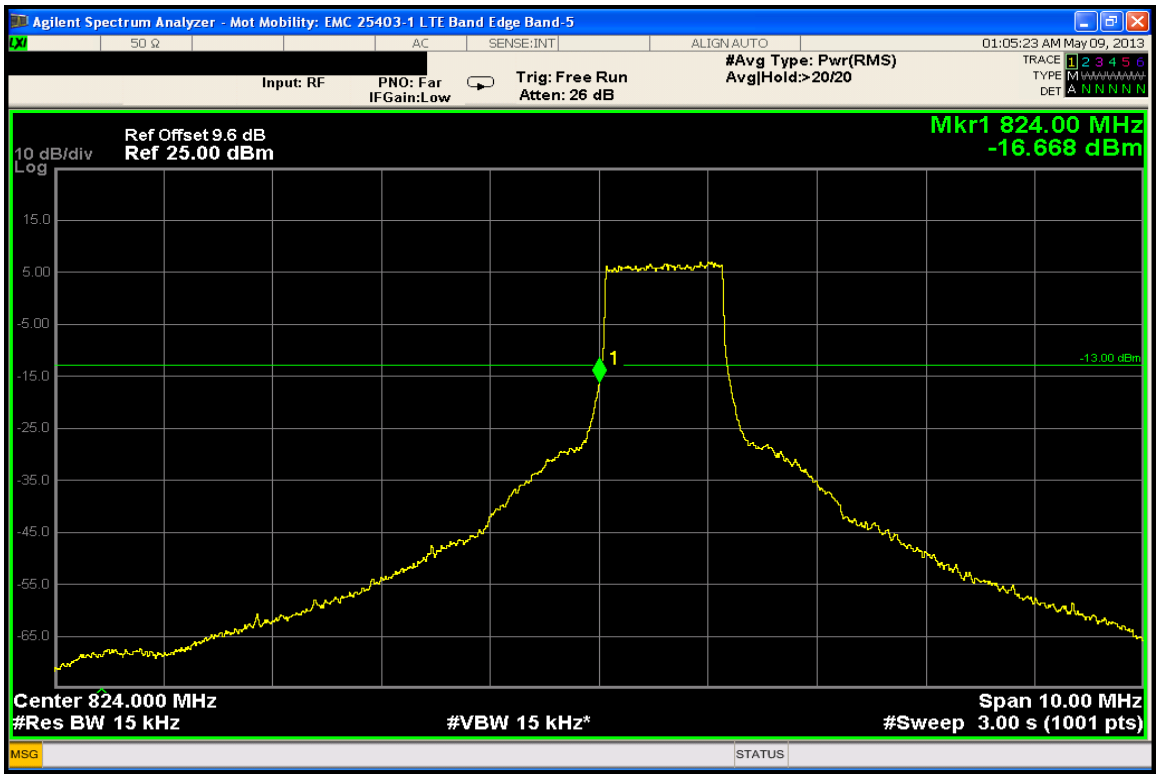
Band 5 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0



Band 5 LTE – 10 MHz BW, 16-QAM RB Size = 50 RB Start 0

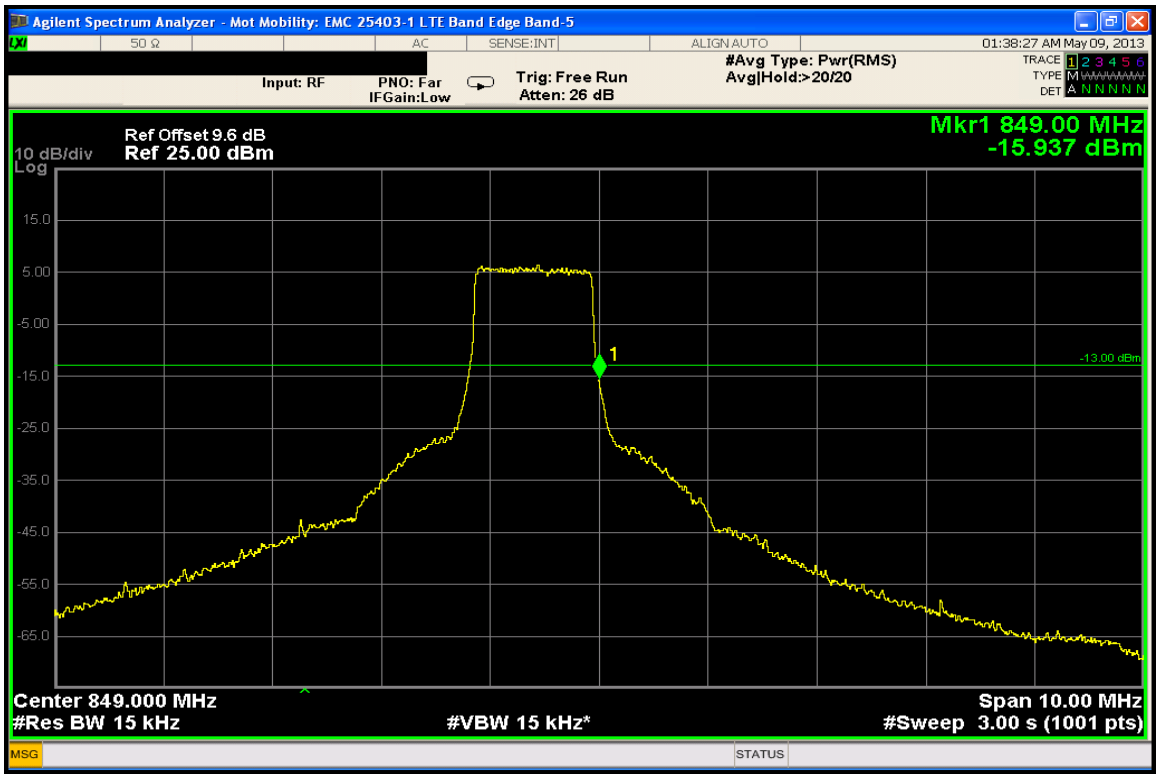


Band 5 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0



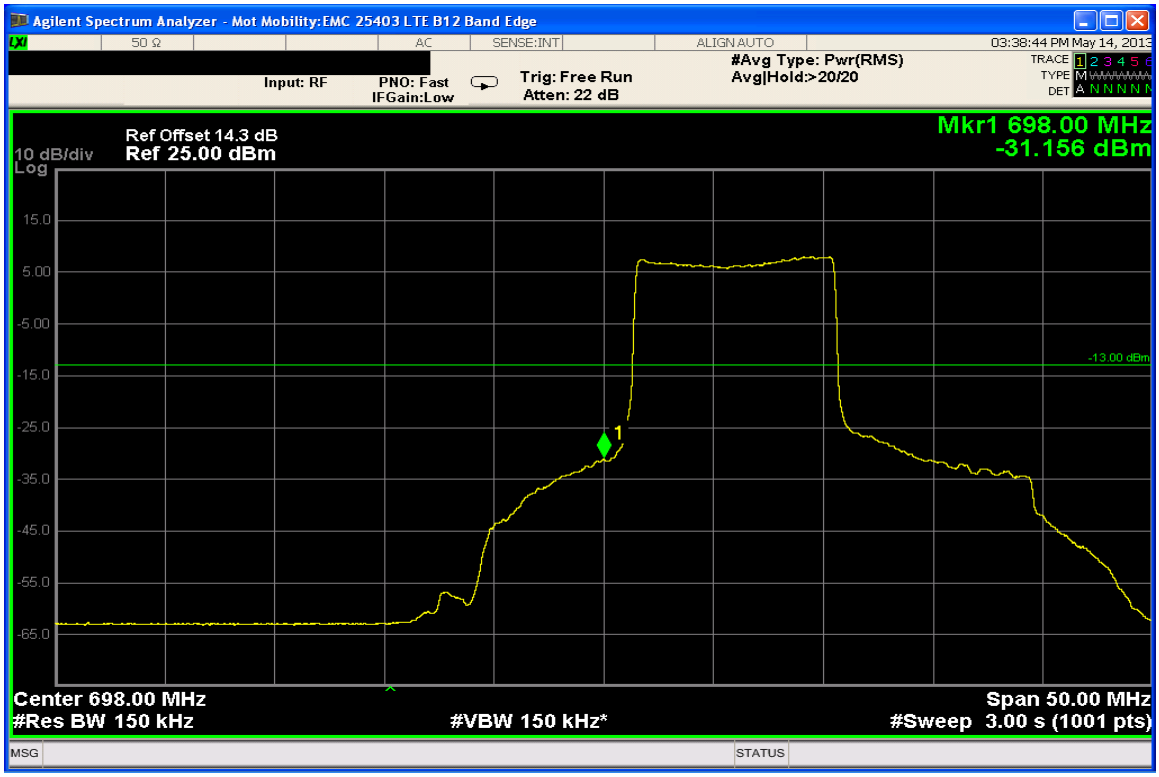
Band 5 LTE – 1.4 MHz BW, 16-QAM RB Size = 6 RB Start 0

Band 5 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0



Band 5 LTE – 1.4 MHz BW, 16-QAM RB Size = 6 RB Start 0

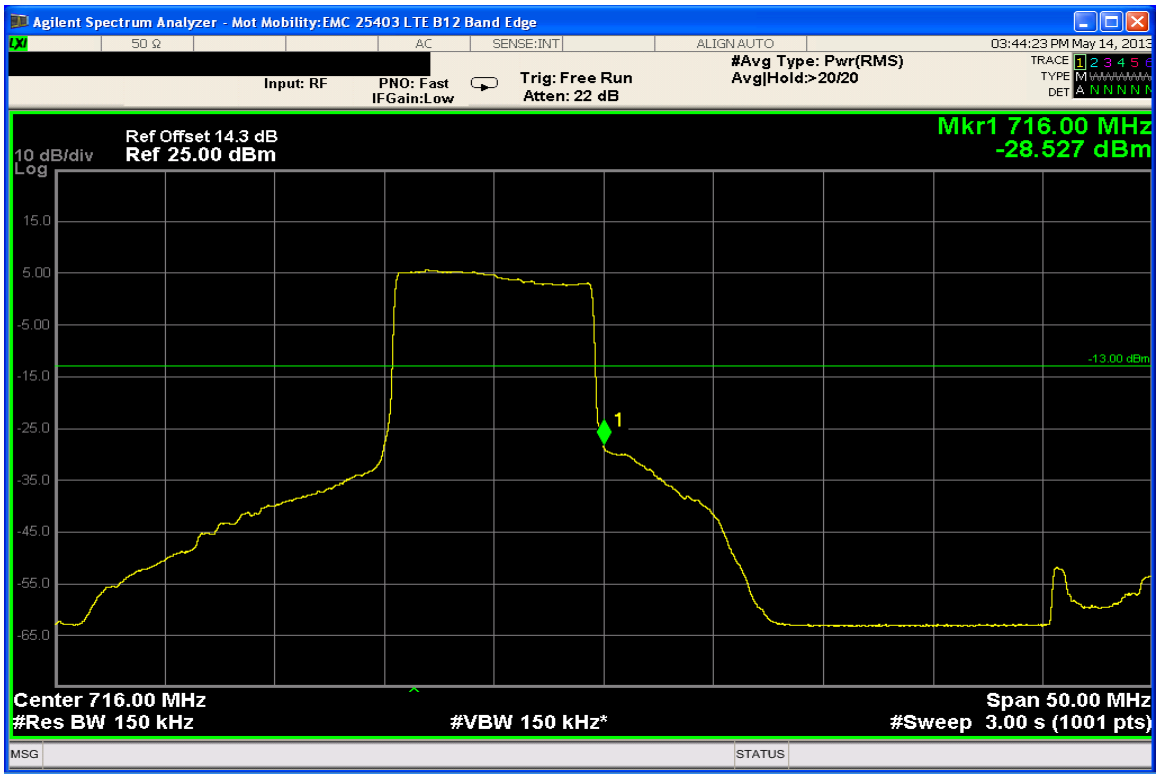
Measurement Results: Band 12 Low and High Band Edge



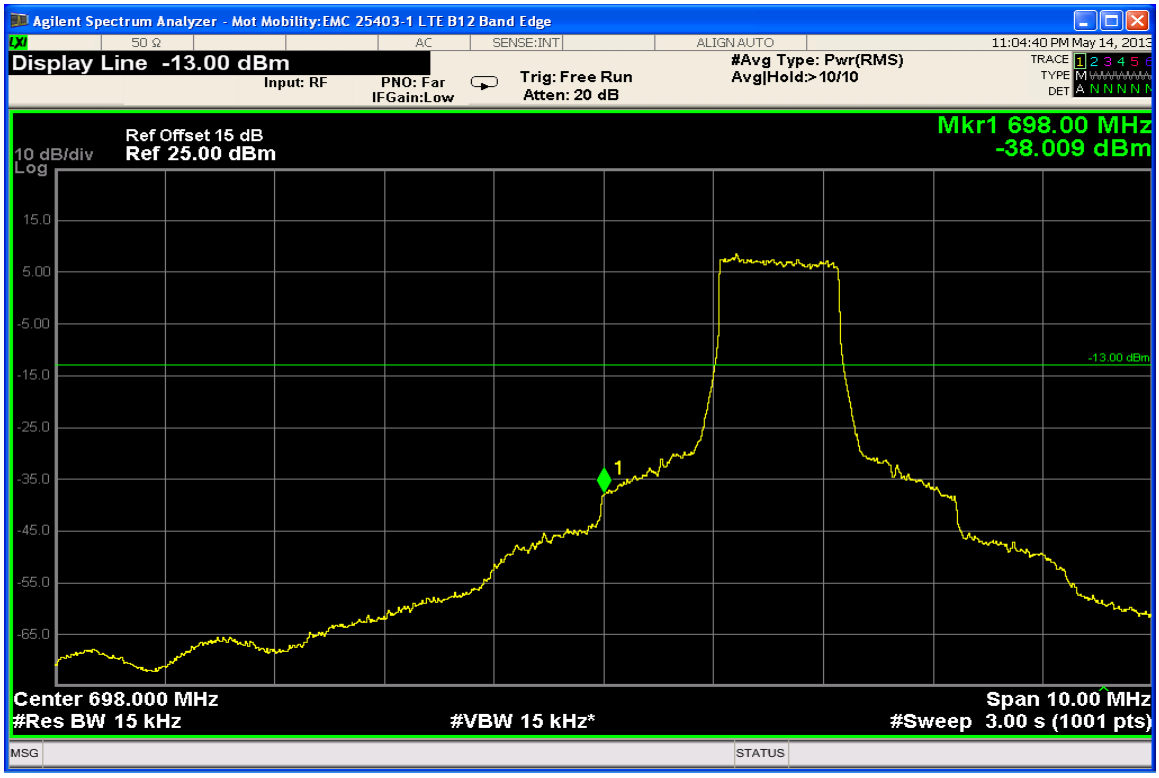
Band 12 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0

Band 12 LTE – 10 MHz BW, 16-QAM RB Size = 50 RB Start 0

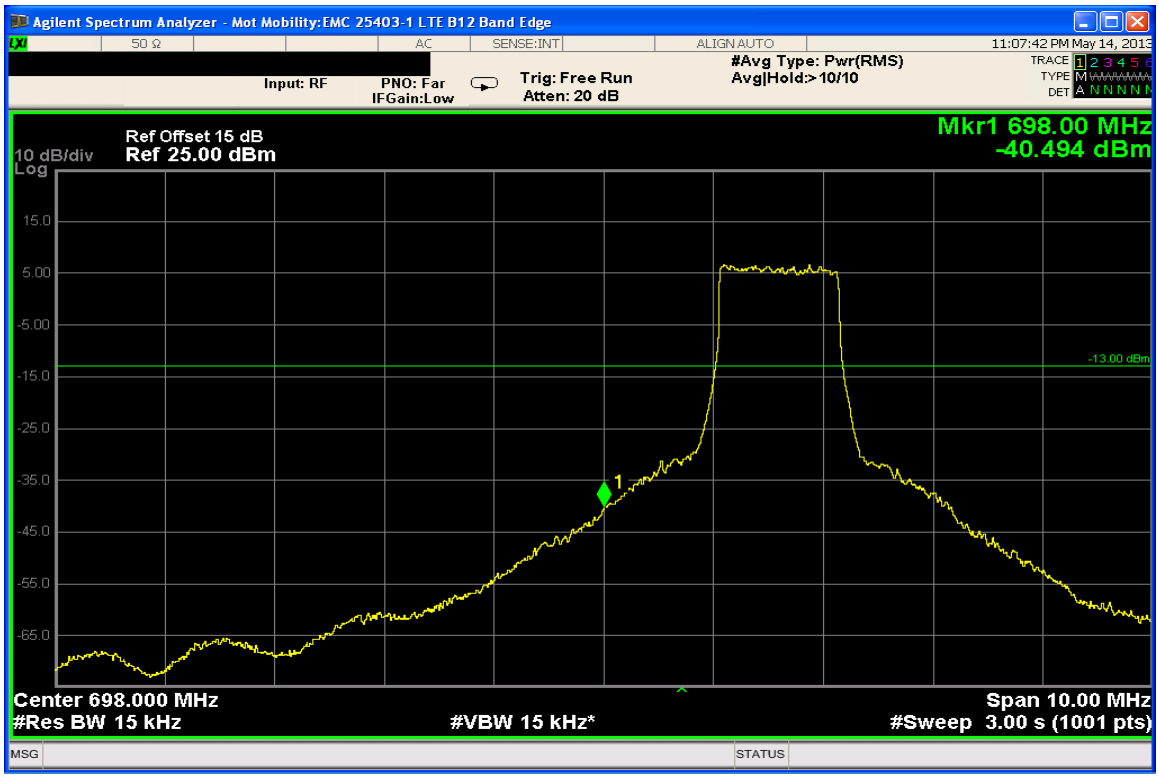
Band 12 LTE – 10 MHz BW, QPSK RB Size = 50 RB Start 0



Band 12 LTE – 10 MHz BW, 16-QAM RB Size = 50 RB Start 0

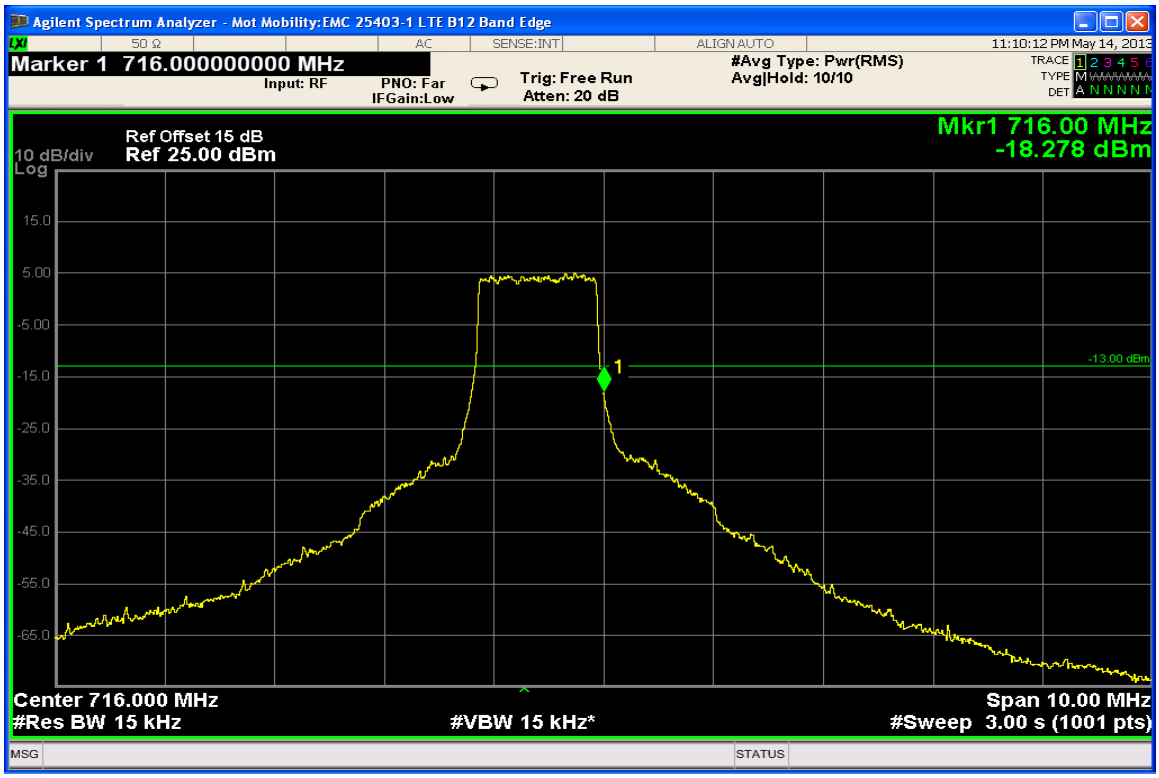


Band 12 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0



Band 12 LTE – 1.4 MHz BW, 16-QAM RB Size = 6 RB Start 0

Band 12 LTE – 1.4 MHz BW, QPSK RB Size = 6 RB Start 0



Band 12 LTE – 1.4 MHz BW, 16-QAM RB Size = 6 RB Start 0

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

§22.917 (a), §27.53 (g), §27.53 (h)

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.

§22.917 (a) 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.

§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.

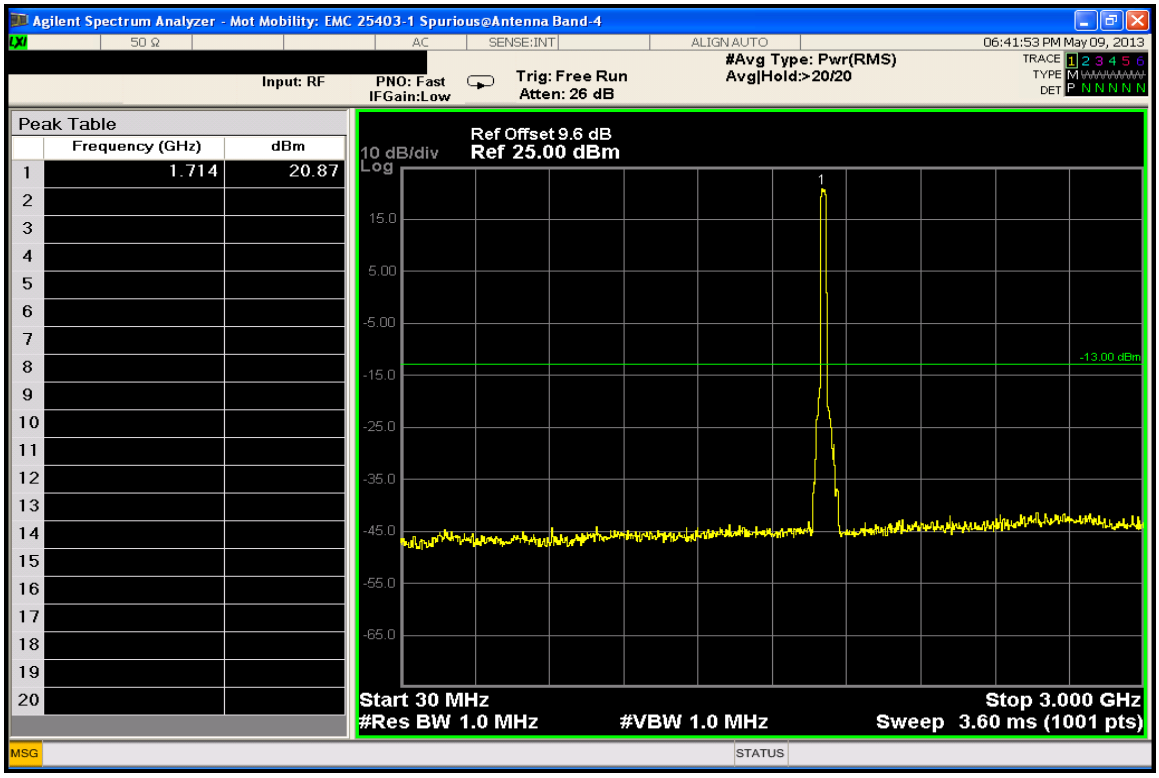
§27.53 (h) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

The spectrum analyzer settings were as follows:

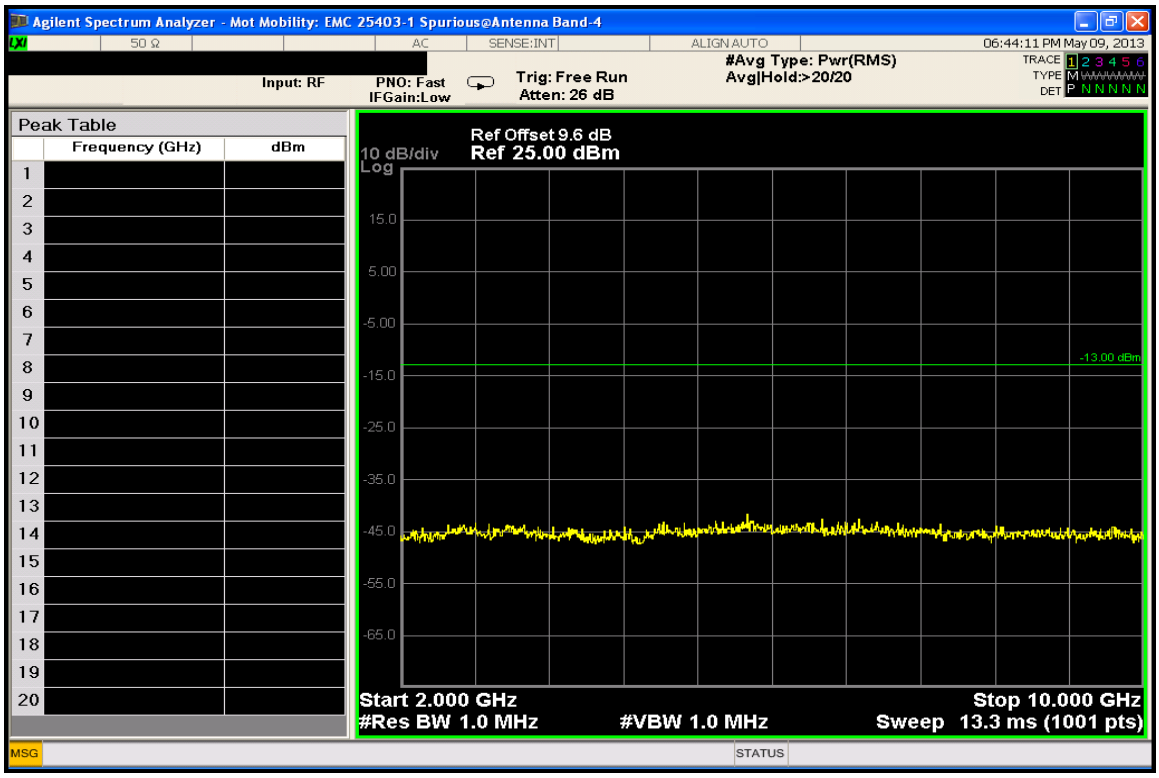
Units	dBm
Divisions	10 dB
Detector	Peak Detector
Resolution Bandwidth	1MHz
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

The EUT was tested in the highest bandwidth and both modulations in each band and the plots are reported below.

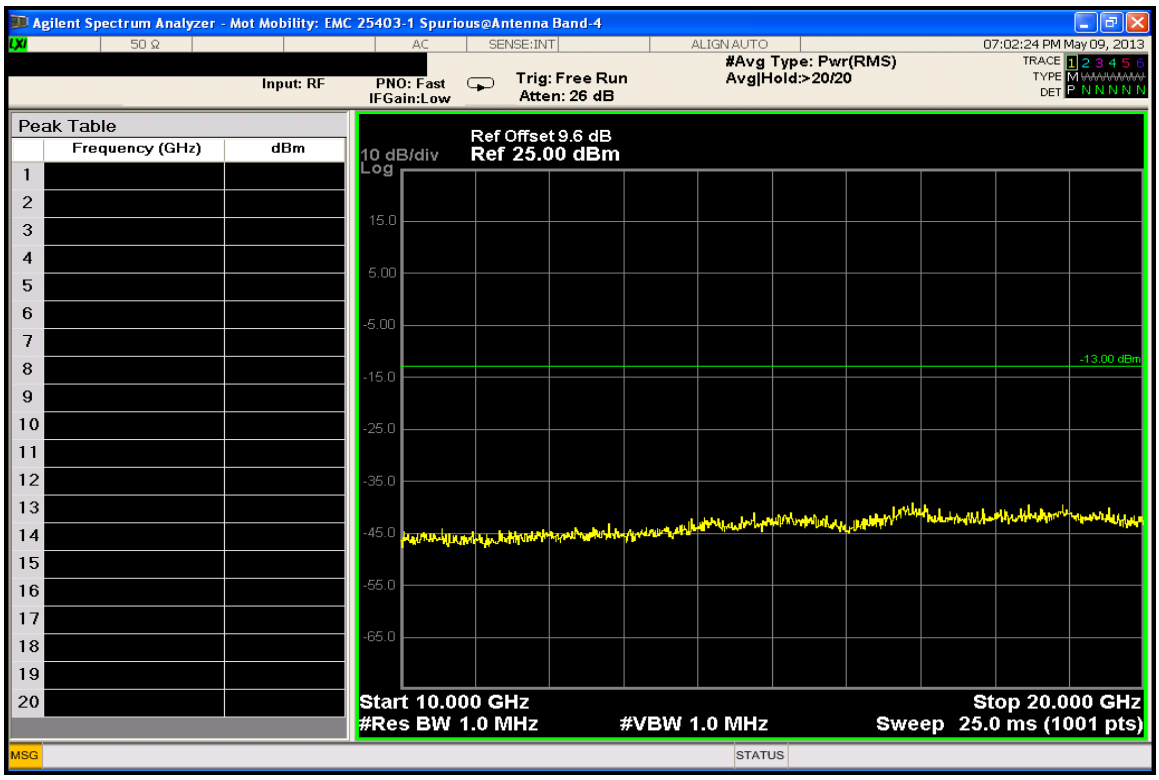
Measurement Results: LTE Band 4 QPSK Conducted Spurious Emissions



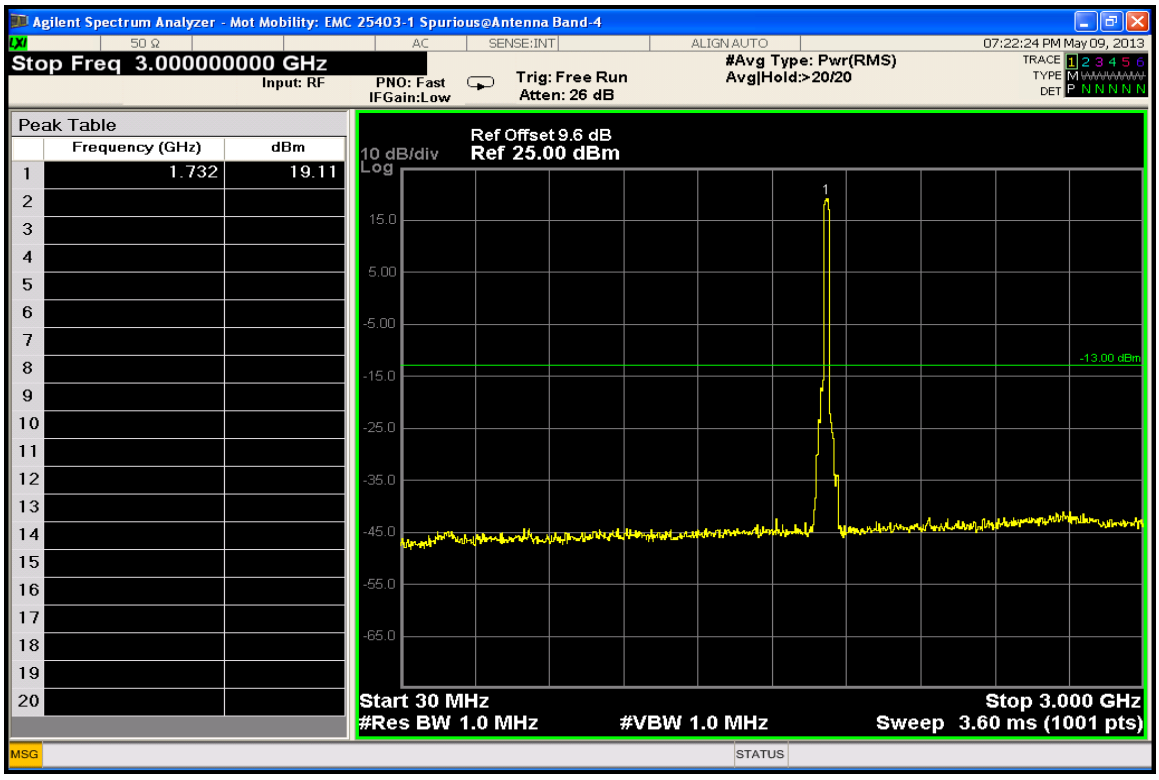
20 MHz BW, QPSK RB Size = 100RB Start 0, Low Channel



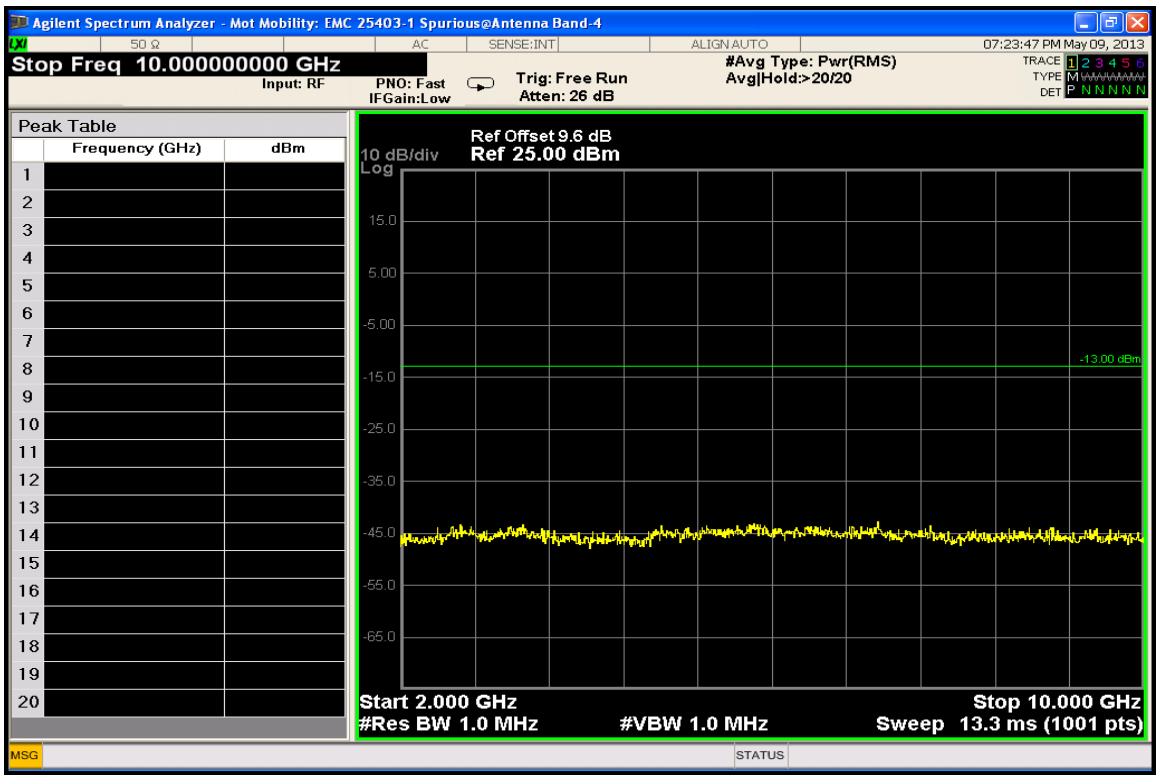
20 MHz BW, QPSK RB Size = 100RB Start 0, Low Channel



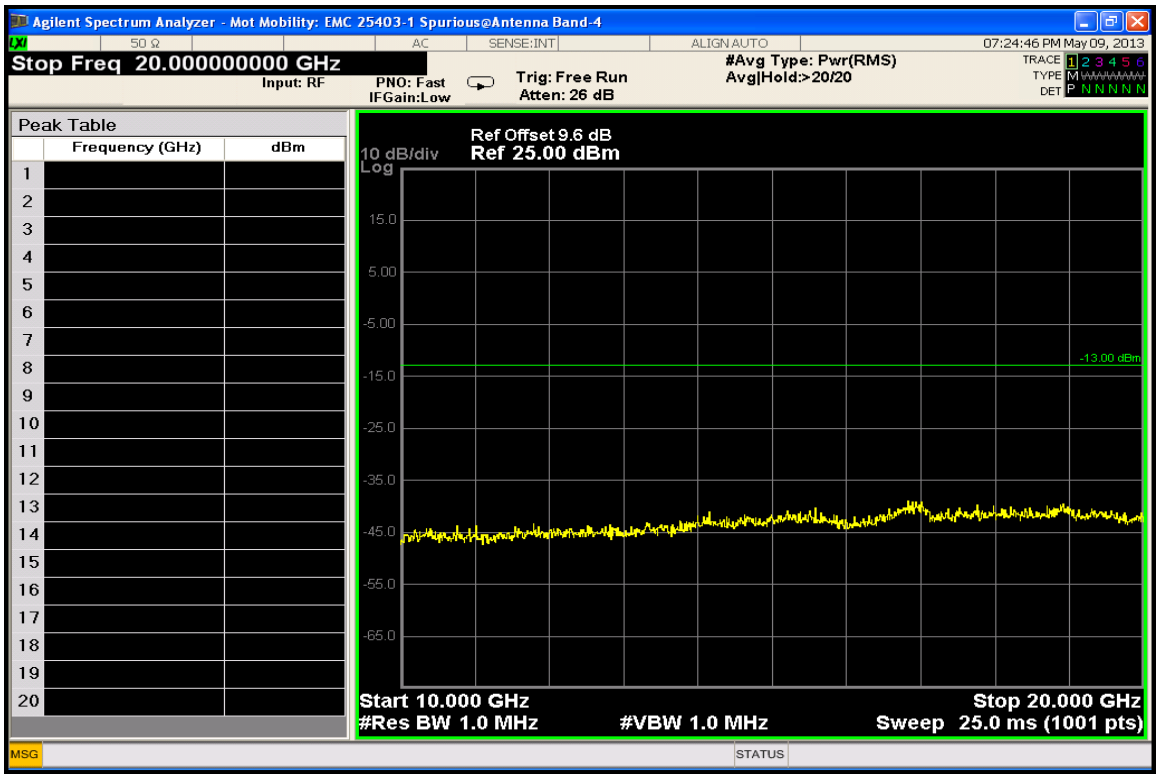
20 MHz BW, QPSK RB Size = 100RB Start 0, Low Channel



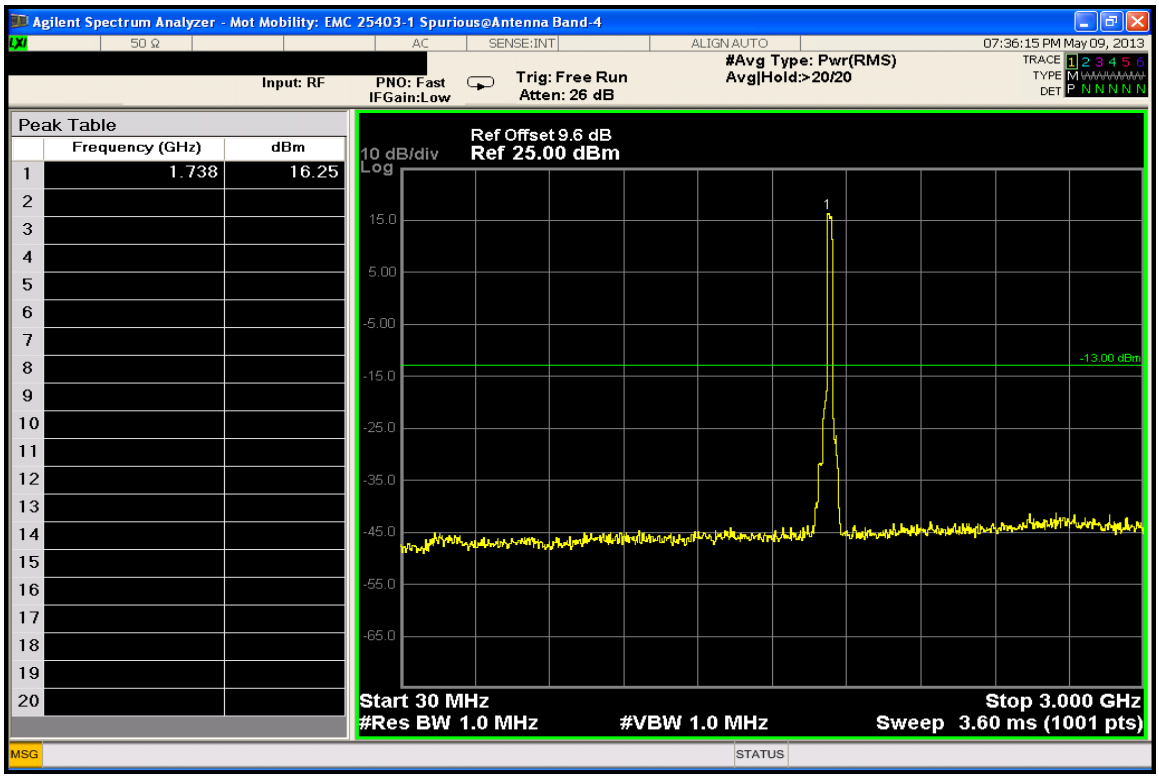
20 MHz BW, QPSK RB Size = 100RB Start 0, Mid Channel



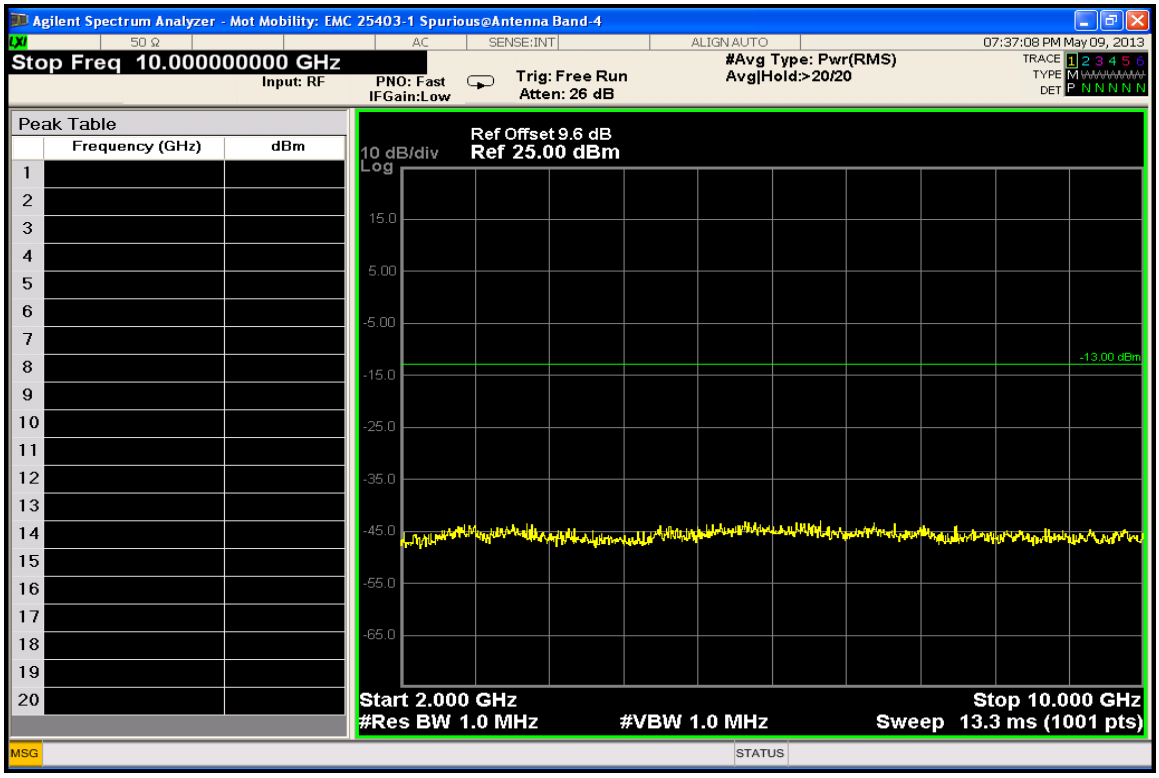
20 MHz BW, QPSK RB Size = 100RB Start 0, Mid Channel



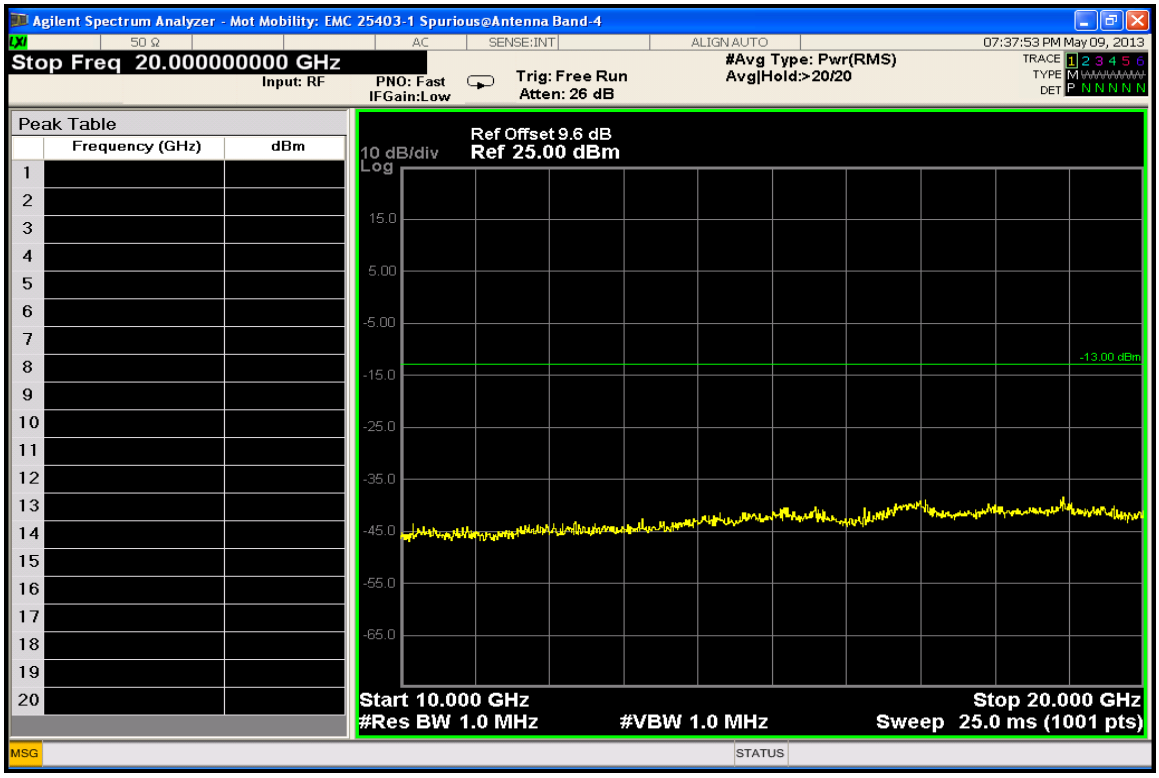
20 MHz BW, QPSK RB Size = 100RB Start 0, Mid Channel



20 MHz BW, QPSK RB Size = 100RB Start 0, High Channel

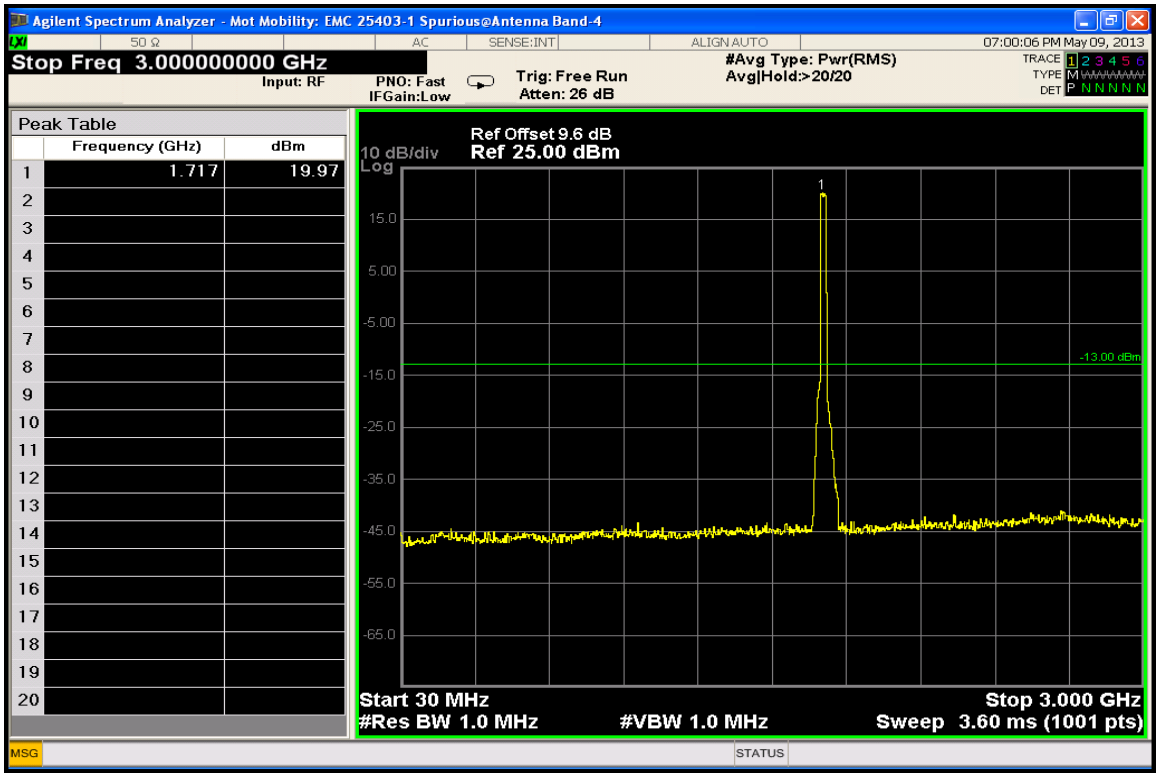


20 MHz BW, QPSK RB Size = 100RB Start 0, High Channel

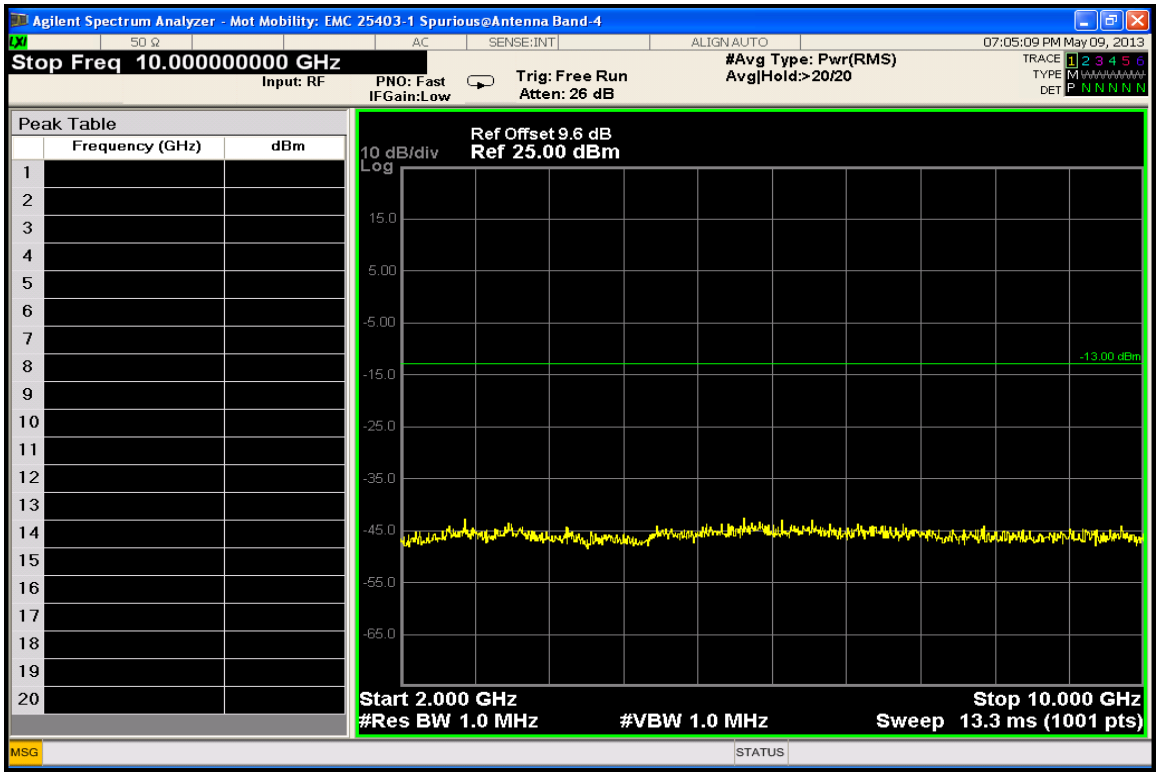


20 MHz BW, QPSK RB Size = 100RB Start 0, High Channel

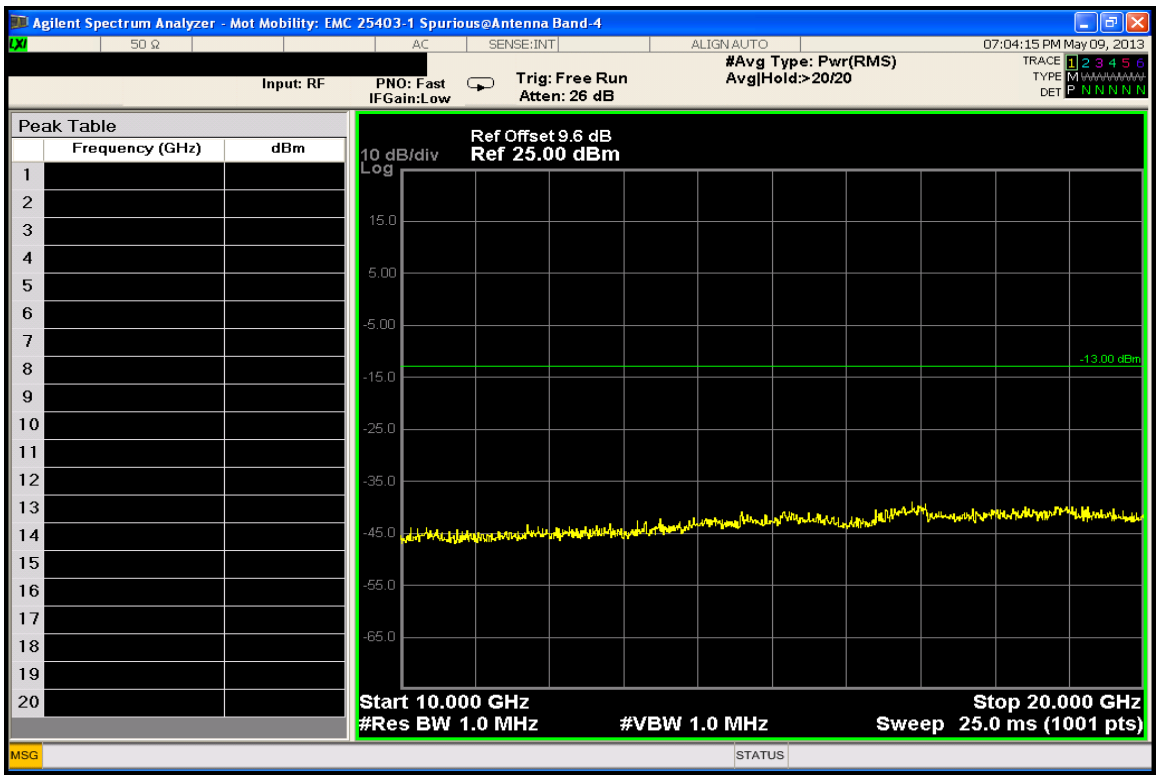
Measurement Results: LTE Band 4 16-QAM Conducted Spurious Emissions



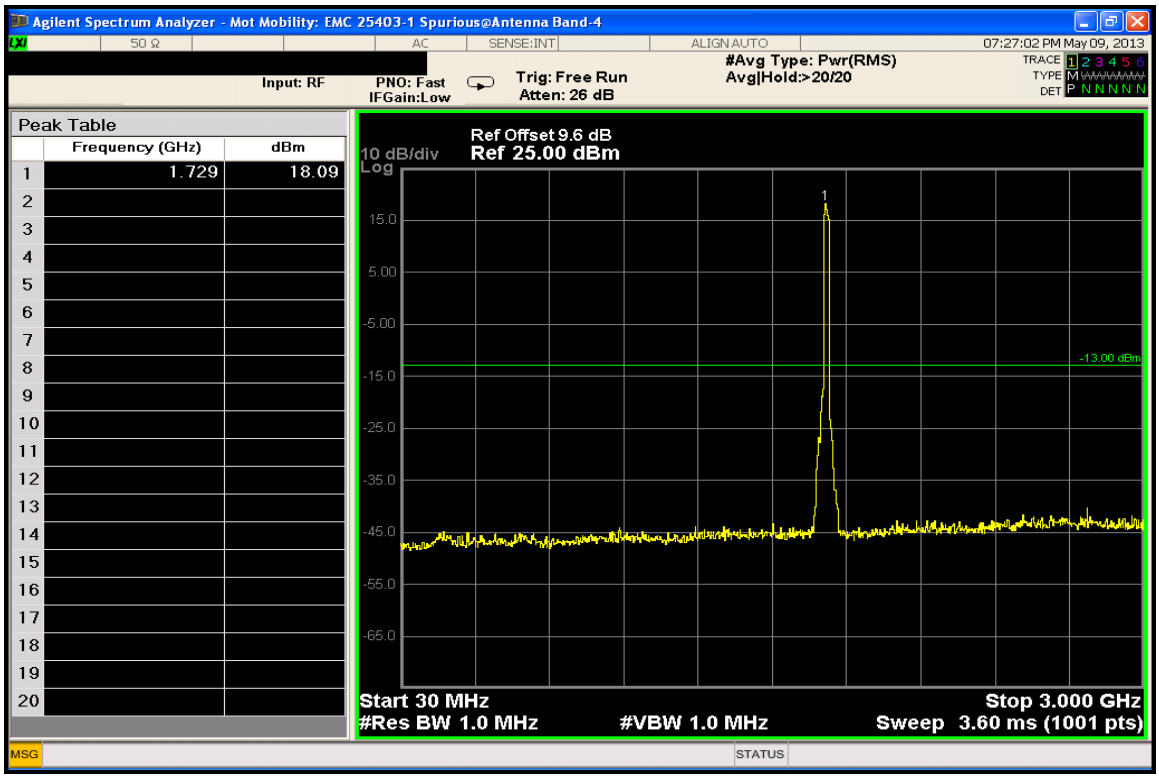
20 MHz BW, 16-QAM RB Size = 100RB Start 0, Low Channel



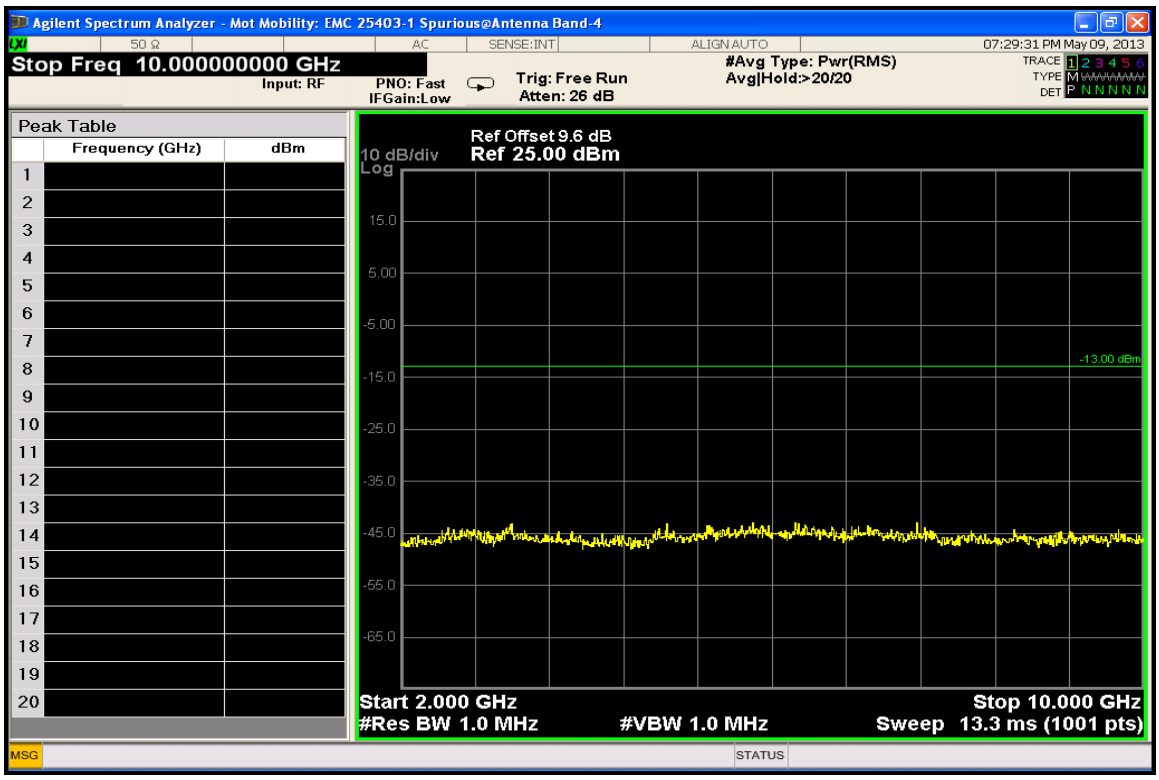
20 MHz BW, 16-QAM RB Size = 100RB Start 0, Low Channel



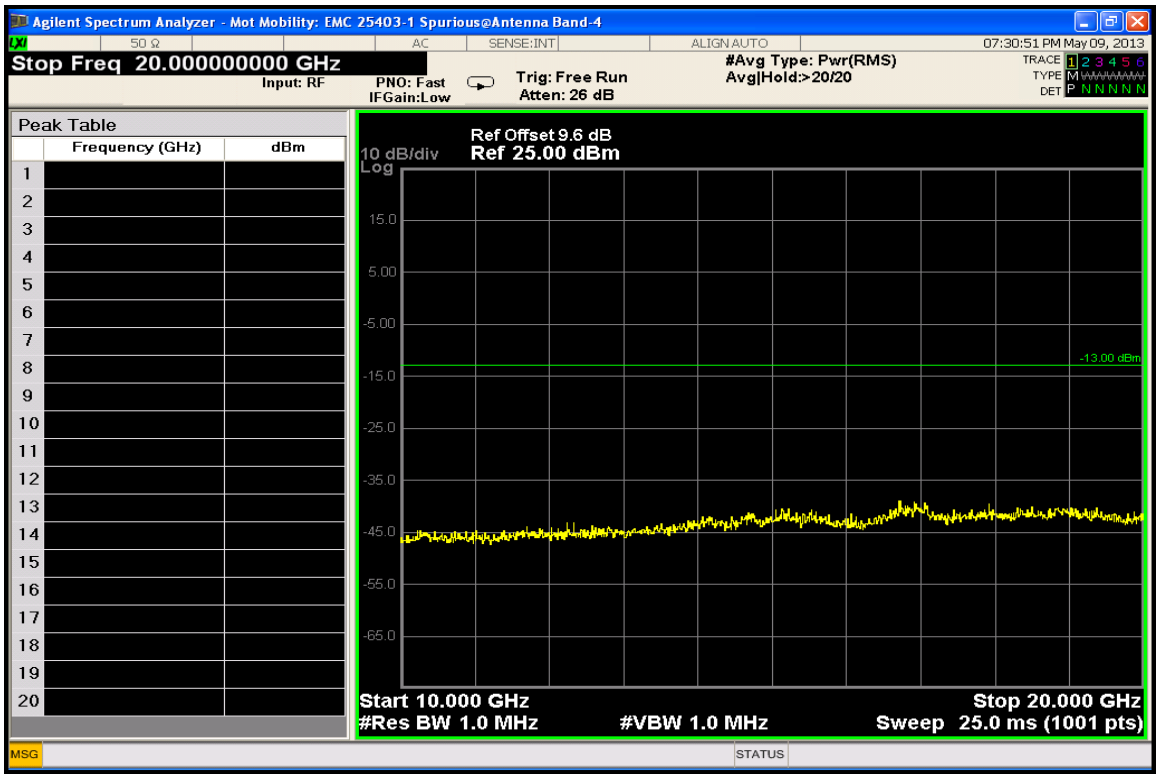
20 MHz BW, 16-QAM RB Size = 100RB Start 0, Low Channel



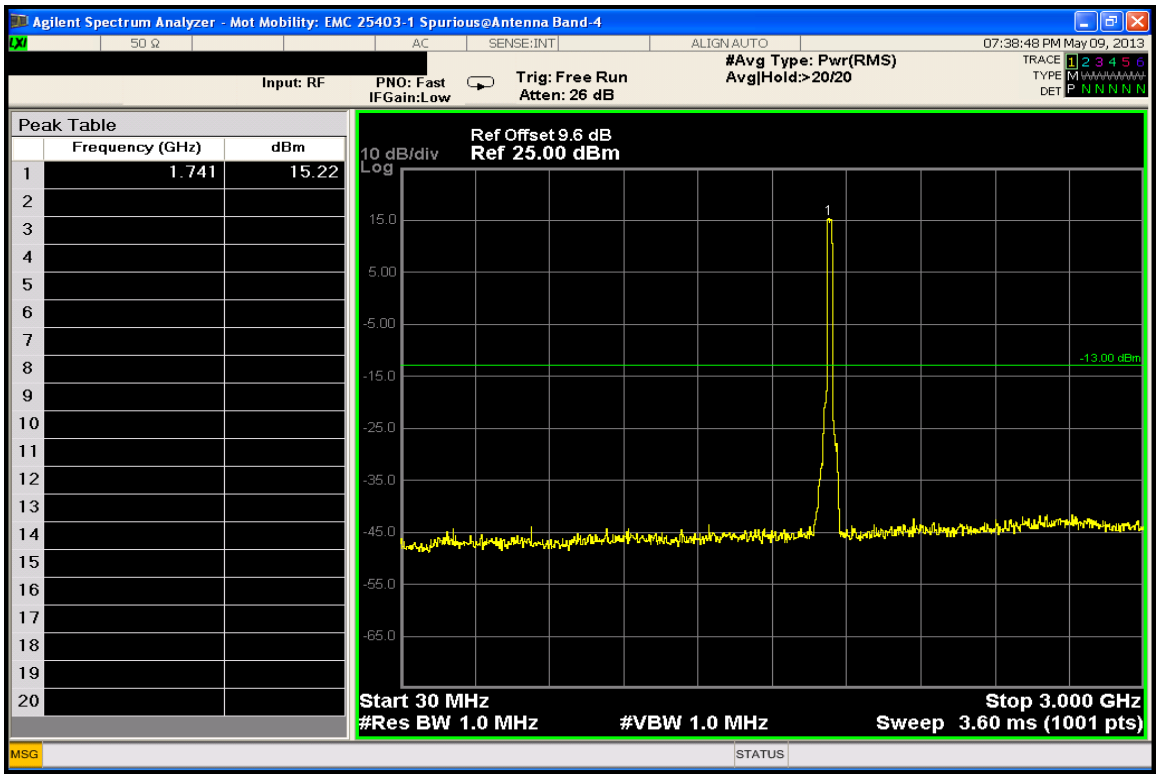
20 MHz BW, 16-QAM RB Size = 100RB Start 0, Mid Channel



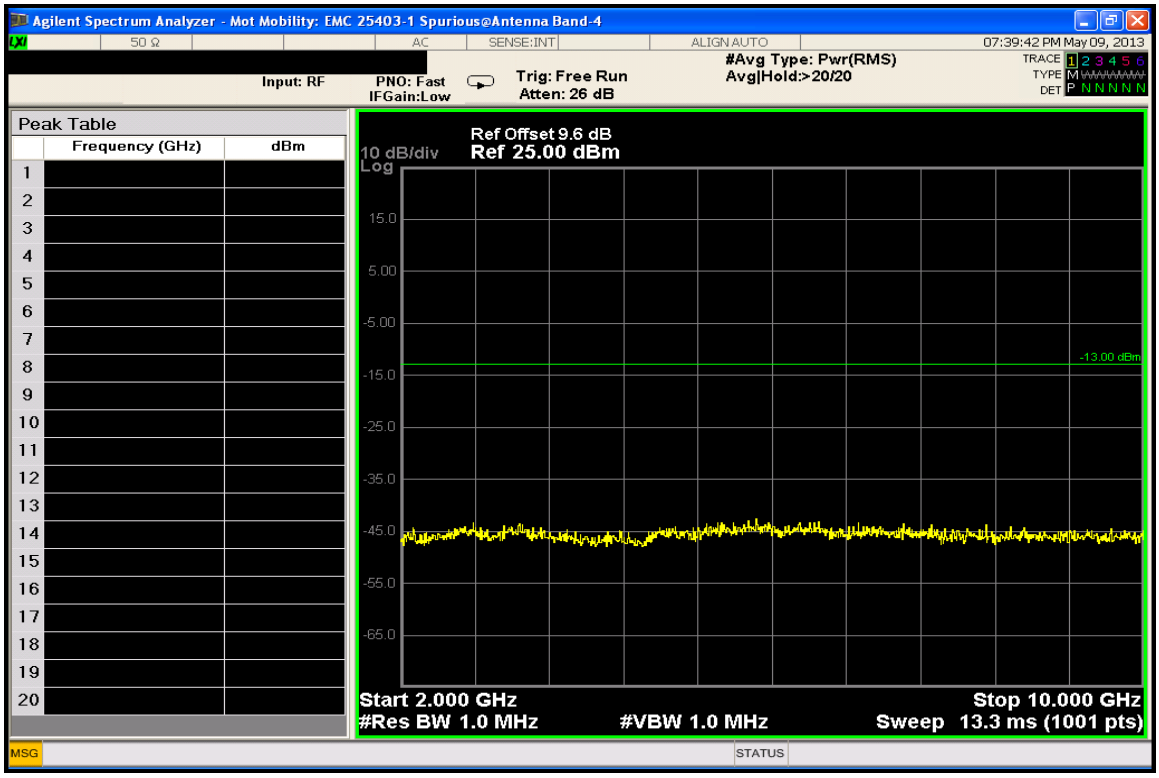
20 MHz BW, 16-QAM RB Size = 100RB Start 0, Mid Channel



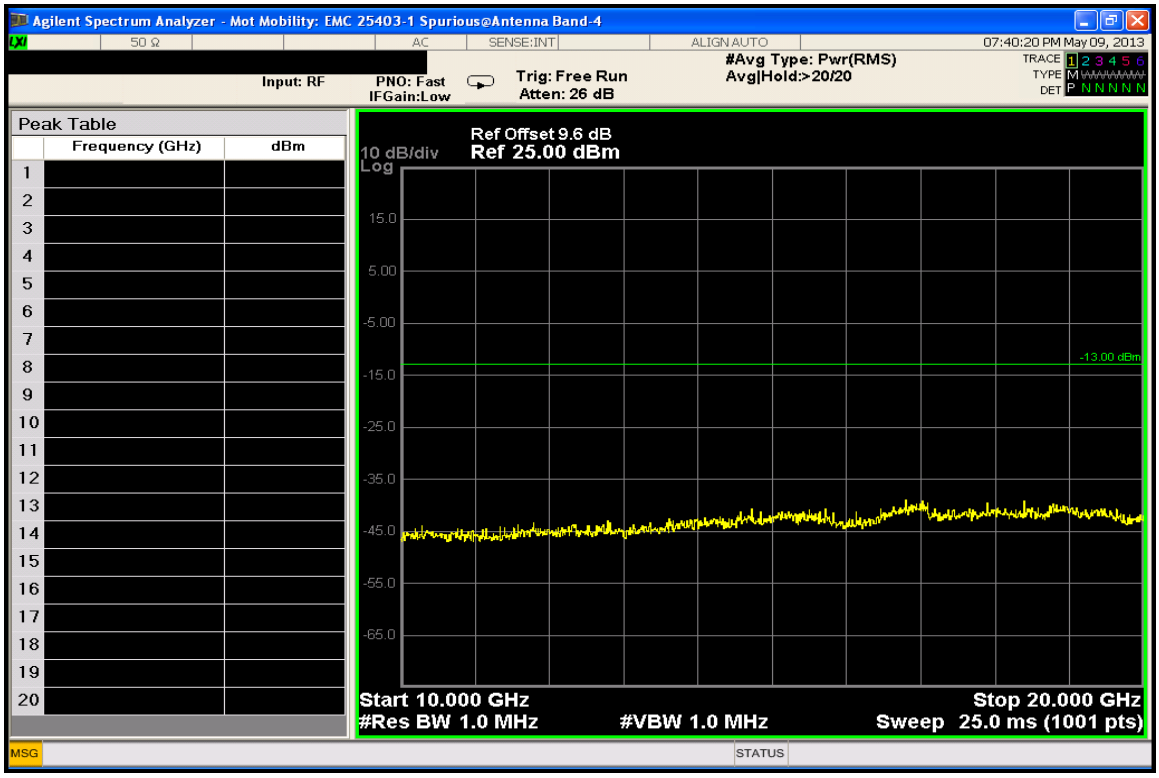
20 MHz BW, 16-QAM RB Size = 100RB Start 0, Mid Channel



20 MHz BW, 16-QAM RB Size = 100RB Start 0, High Channel

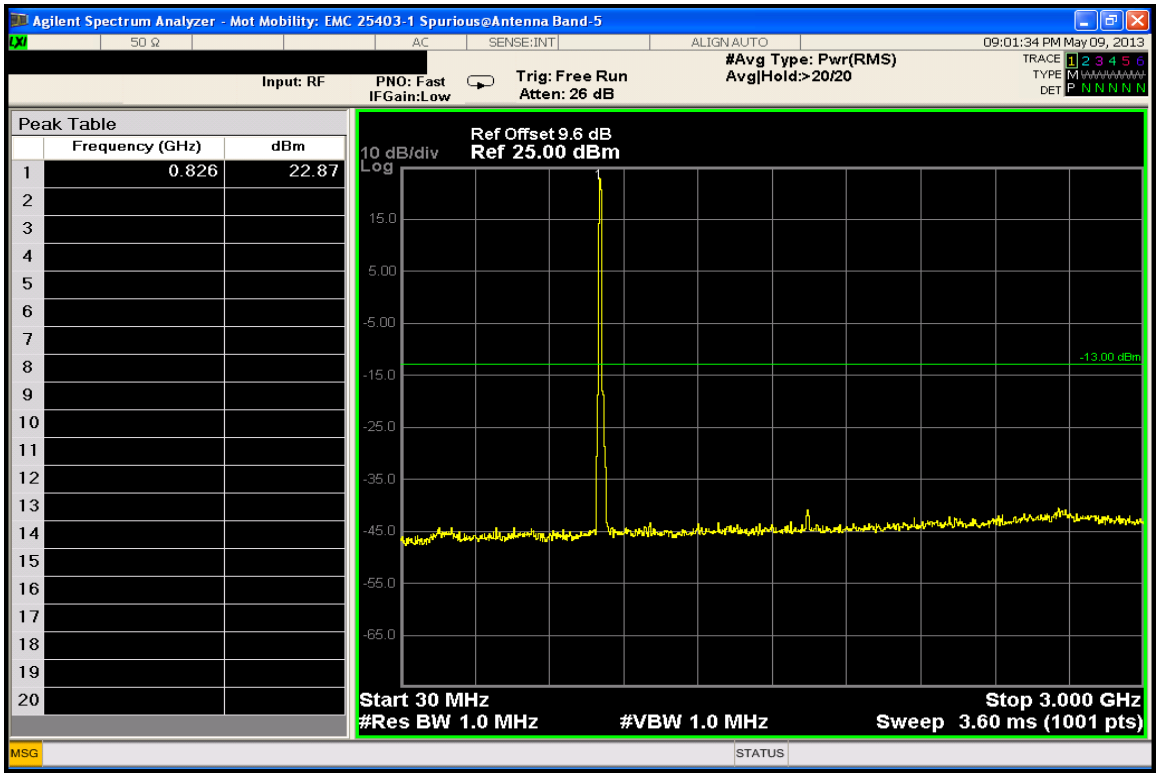


20 MHz BW, 16-QAM RB Size = 100RB Start 0, High Channel

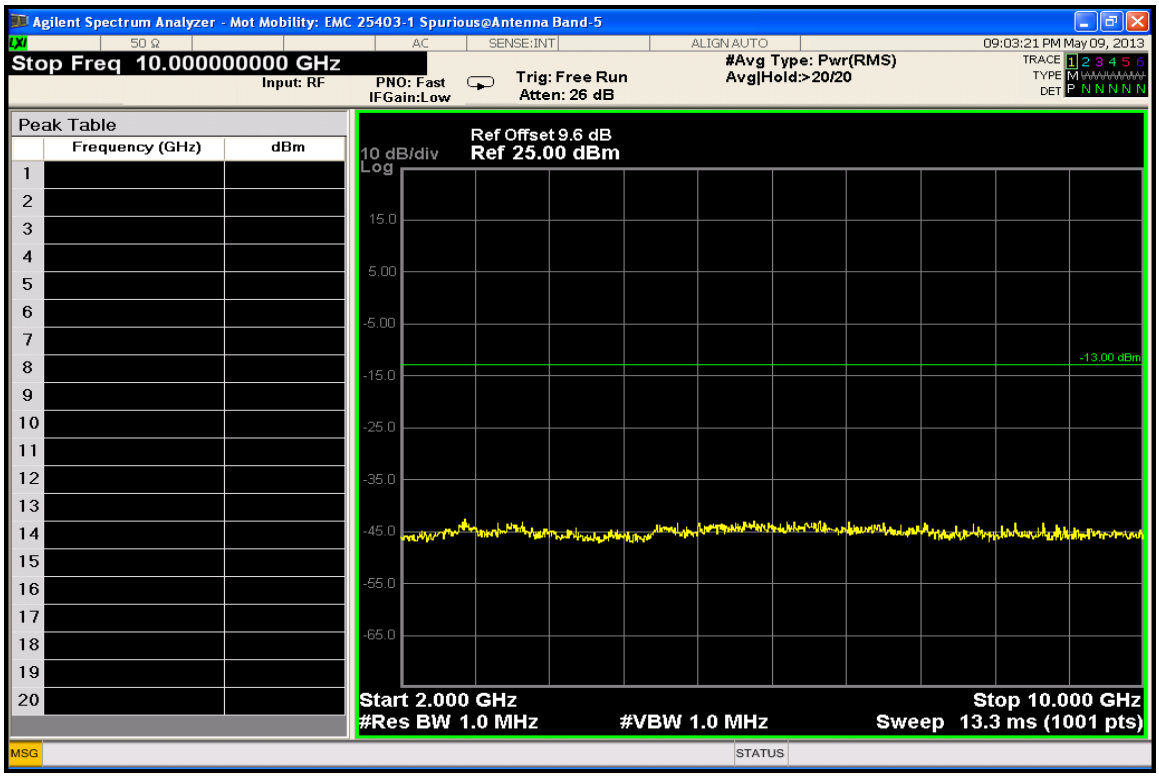


20 MHz BW, 16-QAM RB Size = 100RB Start 0, High Channel

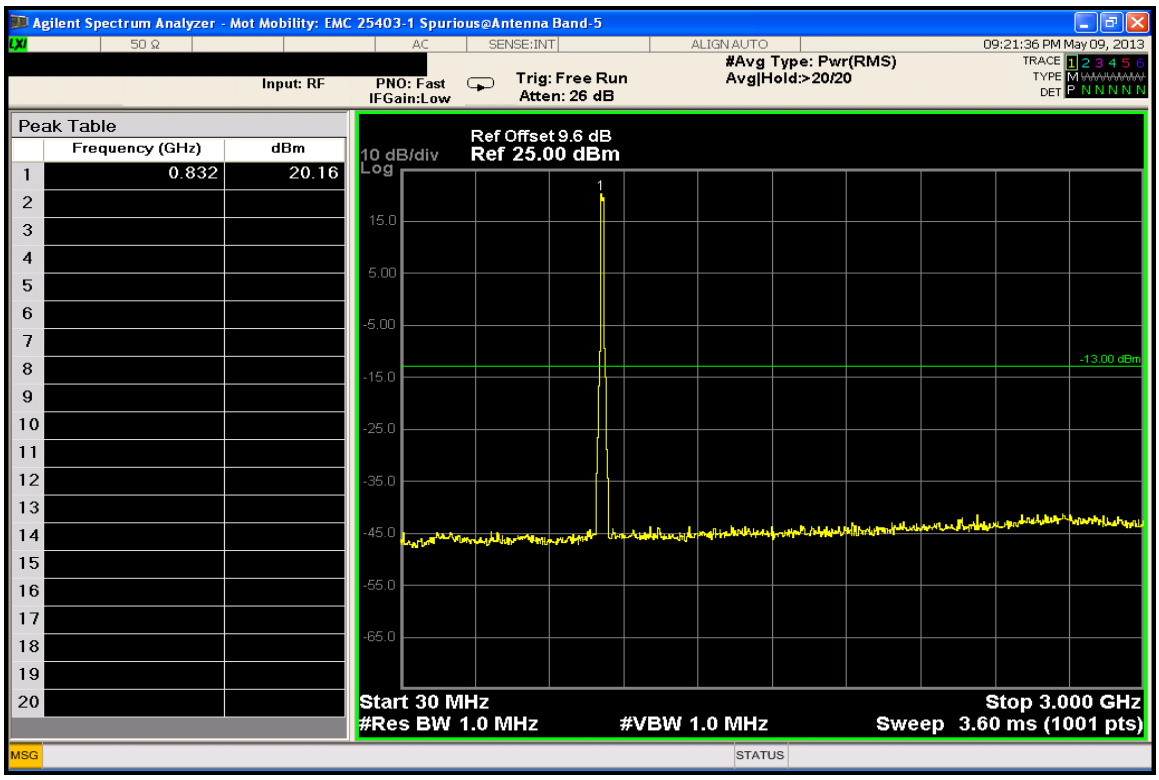
Measurement Results: LTE Band 5 QPSK Conducted Spurious Emissions



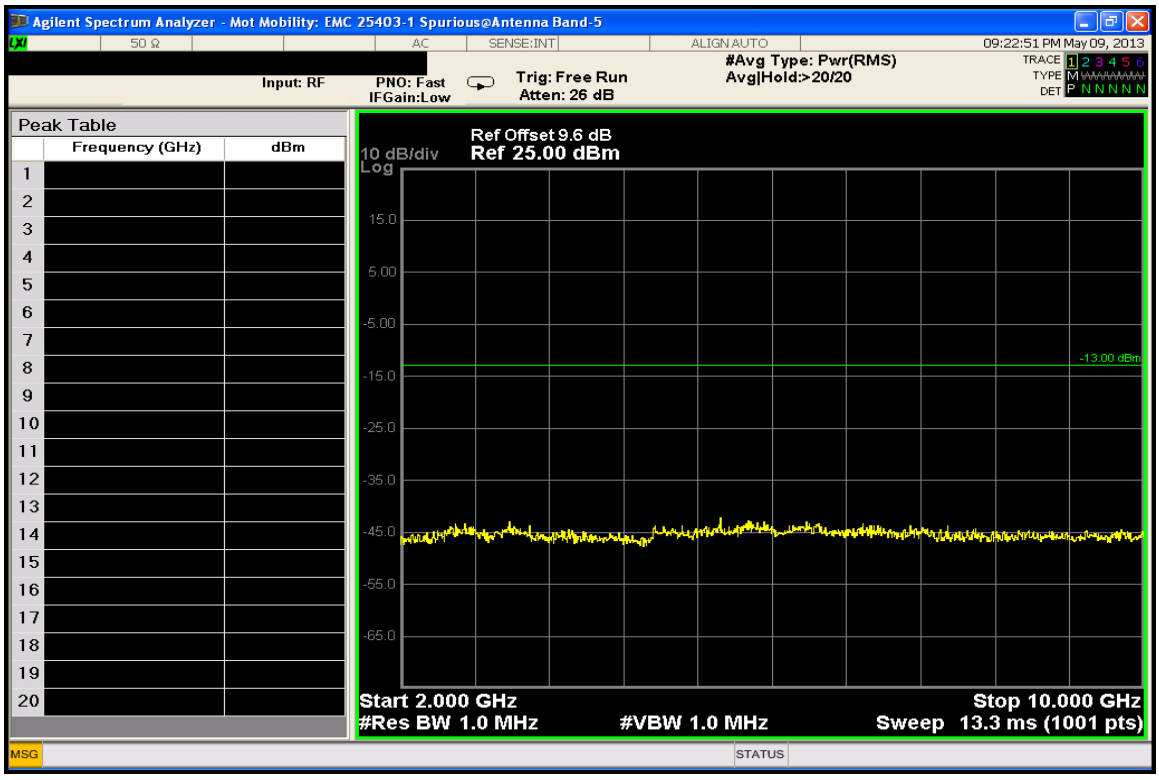
10 MHz BW, QPSK RB Size = 50RB Start 0, Low Channel



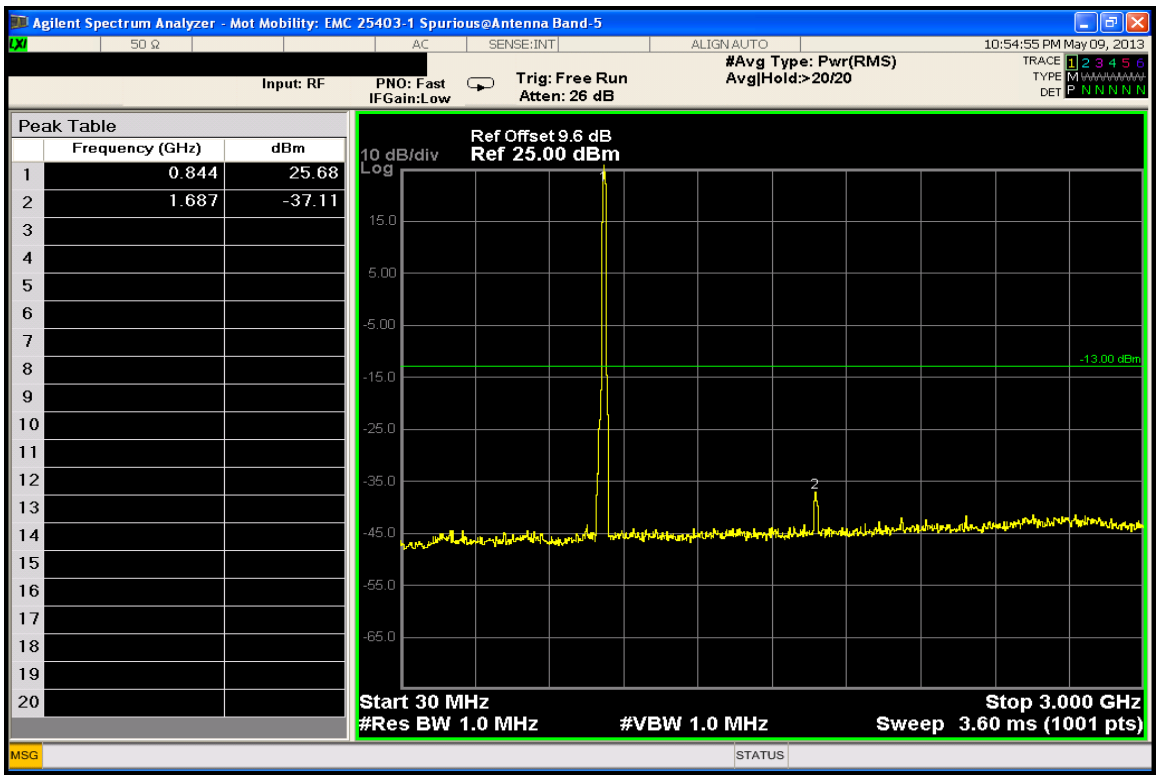
10 MHz BW, QPSK RB Size = 50RB Start 0, Low Channel



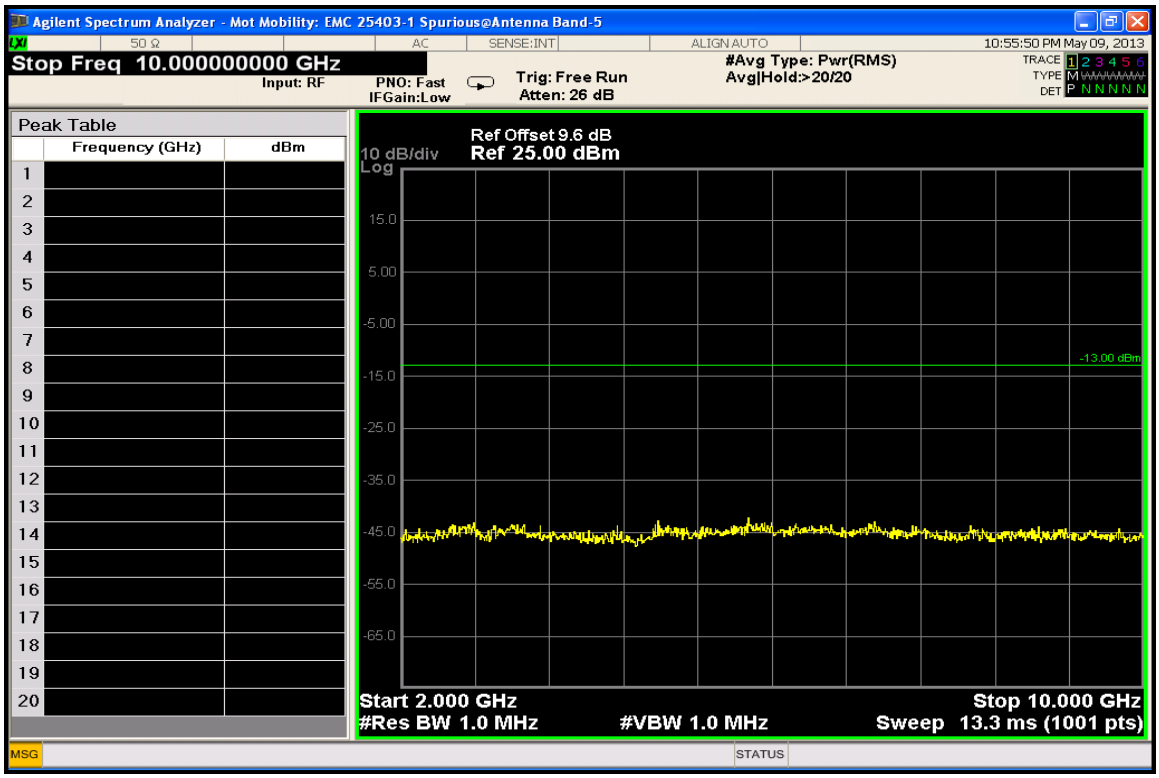
10 MHz BW, QPSK RB Size = 50RB Start 0, Mid Channel



10 MHz BW, QPSK RB Size = 50RB Start 0, Mid Channel

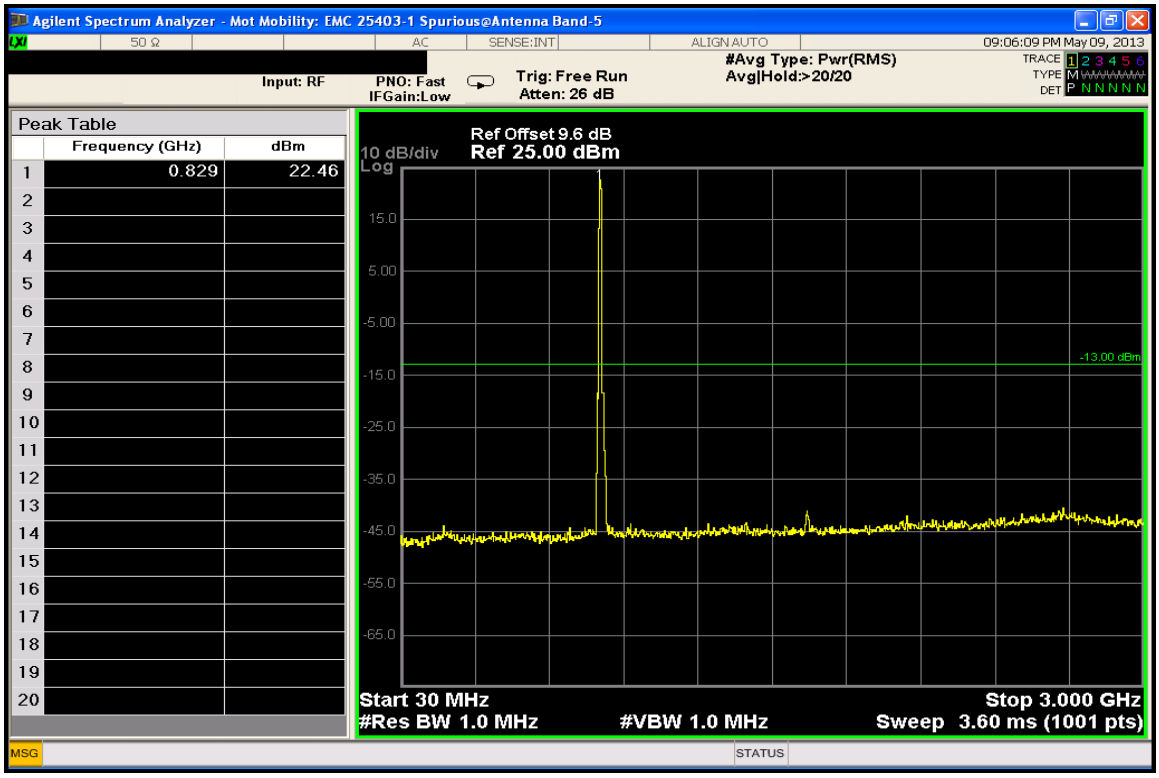


10 MHz BW, QPSK RB Size = 50RB Start 0, High Channel

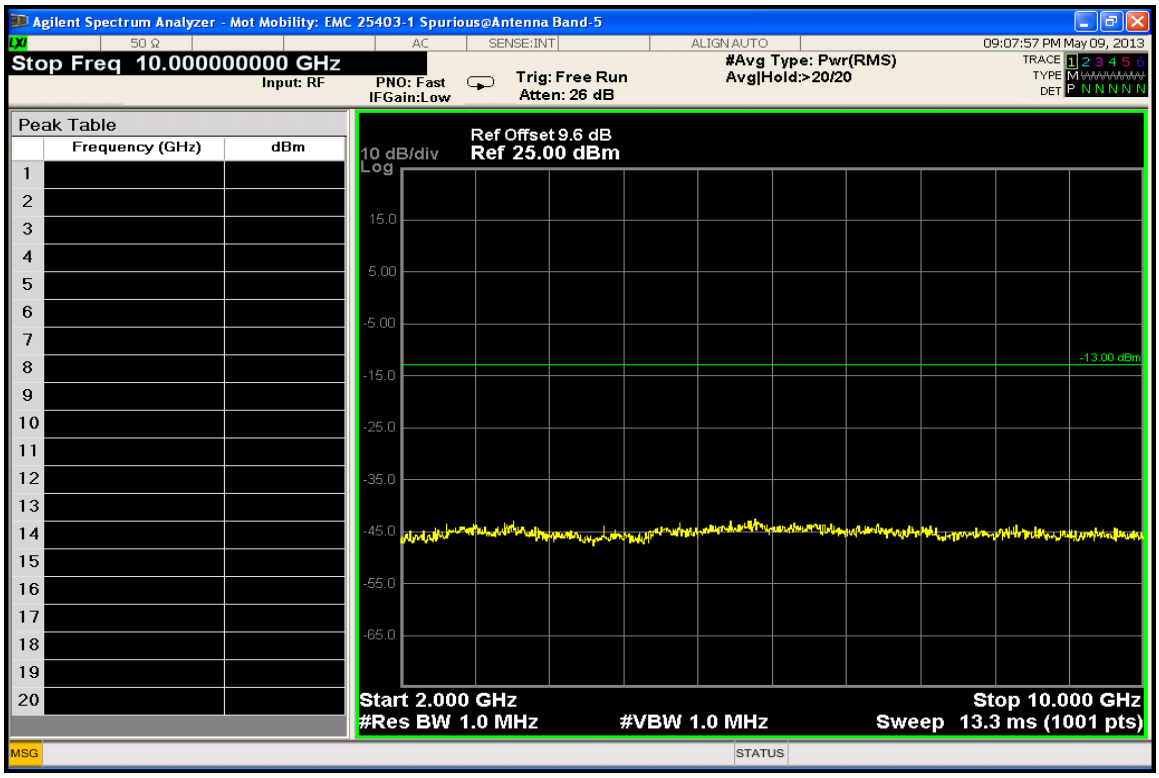


10 MHz BW, QPSK RB Size = 50RB Start 0, High Channel

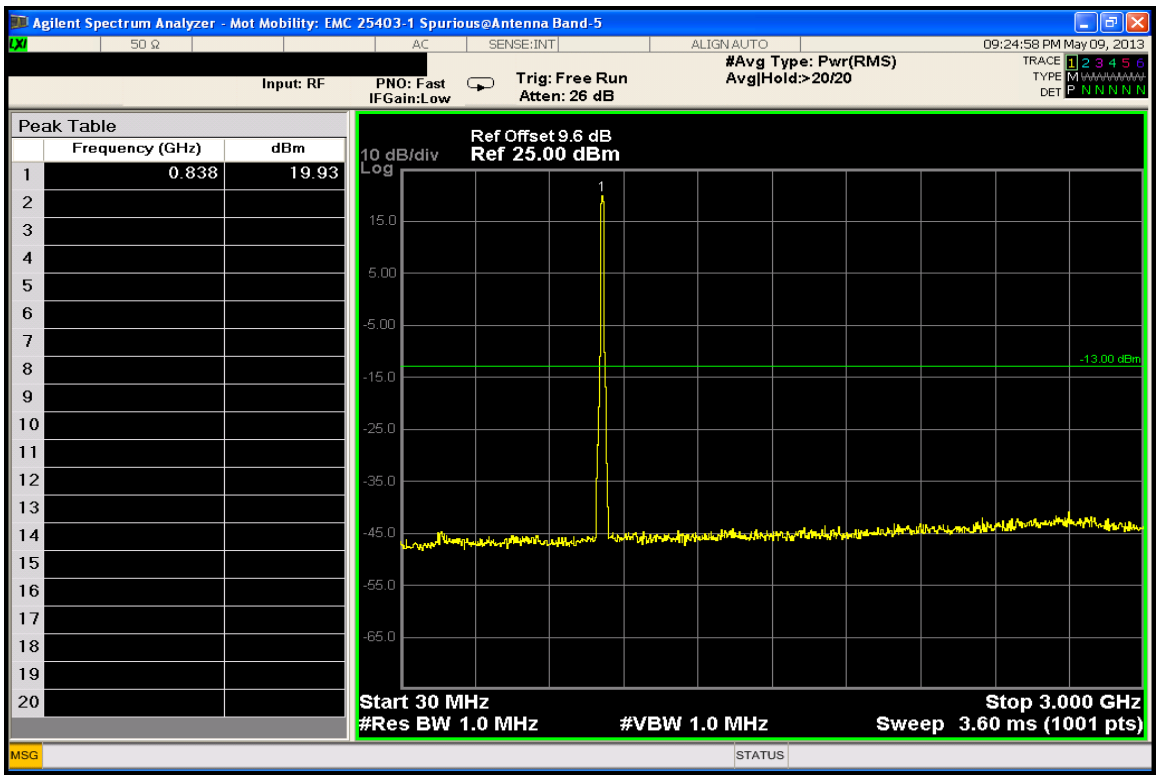
Measurement Results: LTE Band 5 16-QAM Conducted Spurious Emissions



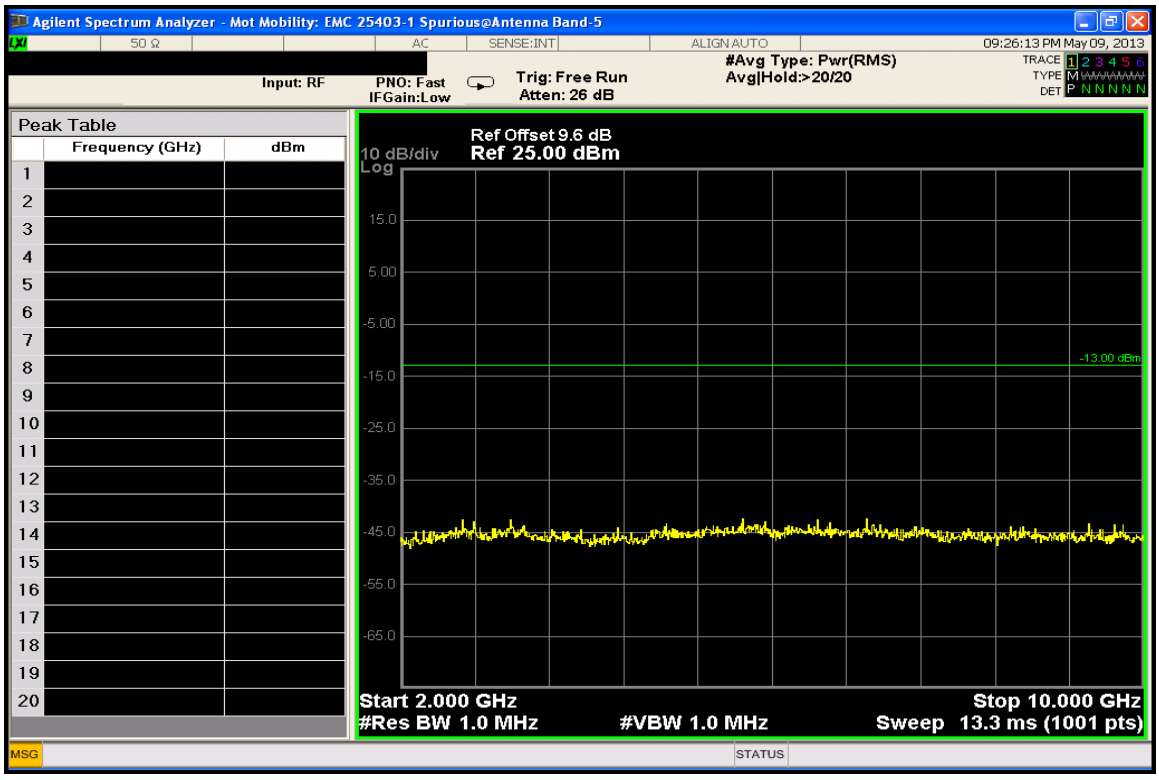
10 MHz BW, 16-QAM RB Size = 50RB Start 0, Low Channel



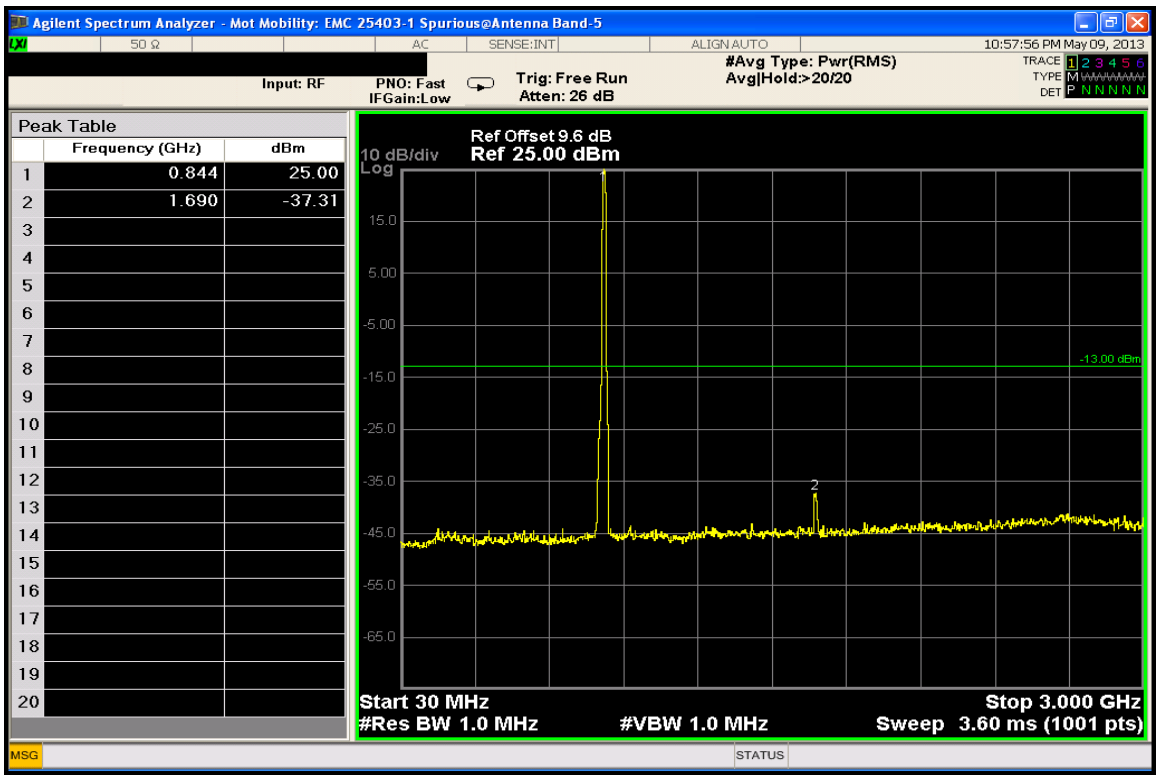
10 MHz BW, 16-QAM RB Size = 50RB Start 0, Low Channel



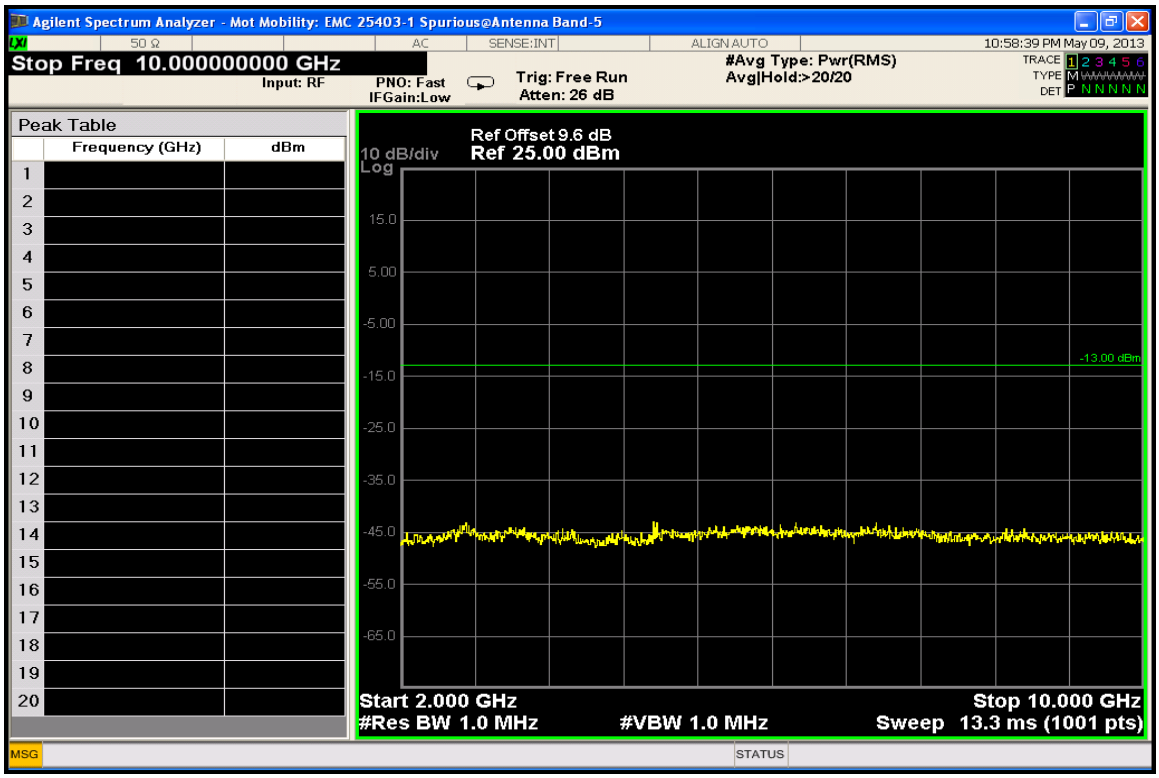
10 MHz BW, 16-QAM RB Size = 50RB Start 0, Mid Channel



10 MHz BW, 16-QAM RB Size = 50RB Start 0, Mid Channel

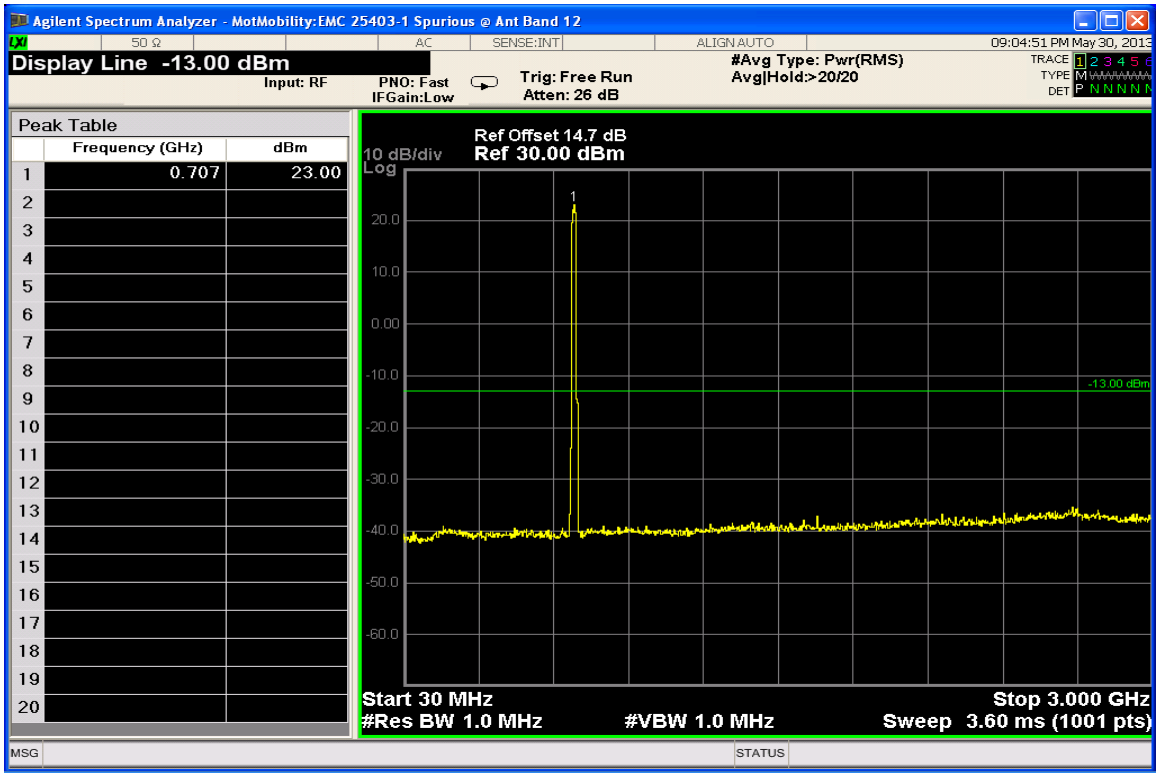


10 MHz BW, 16-QAM RB Size = 50RB Start 0, High Channel

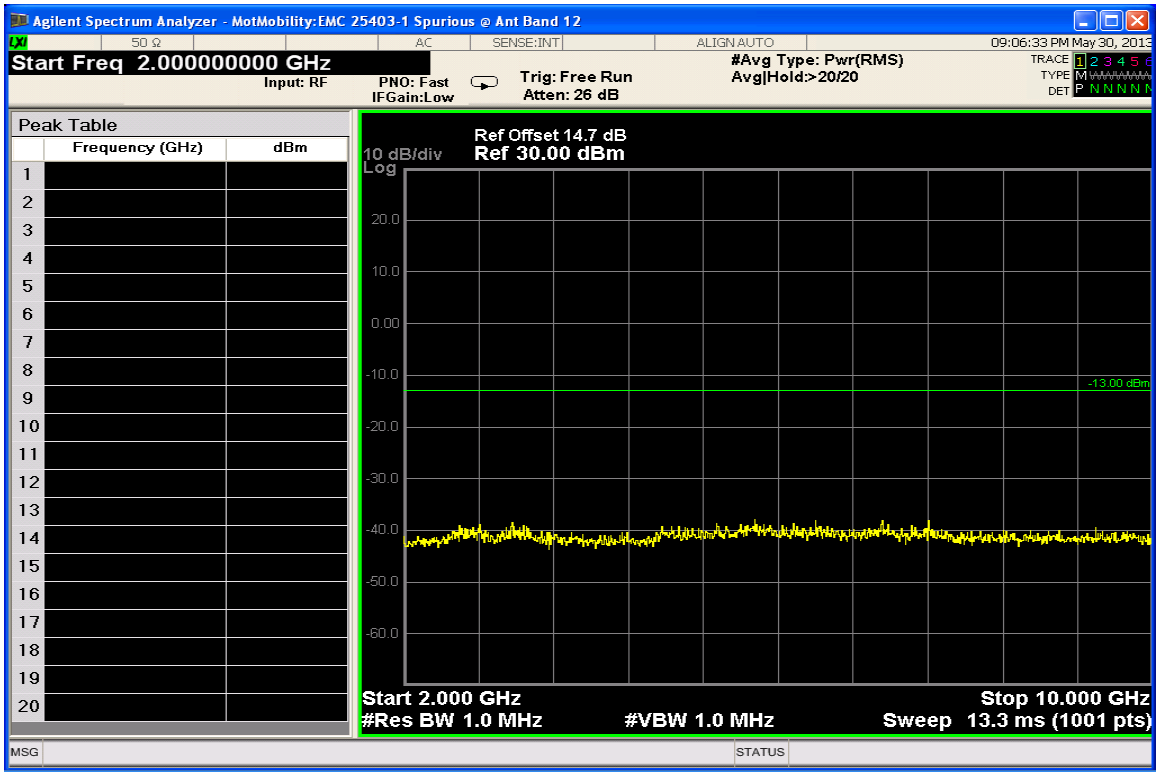


10 MHz BW, 16-QAM RB Size = 50RB Start 0, High Channel

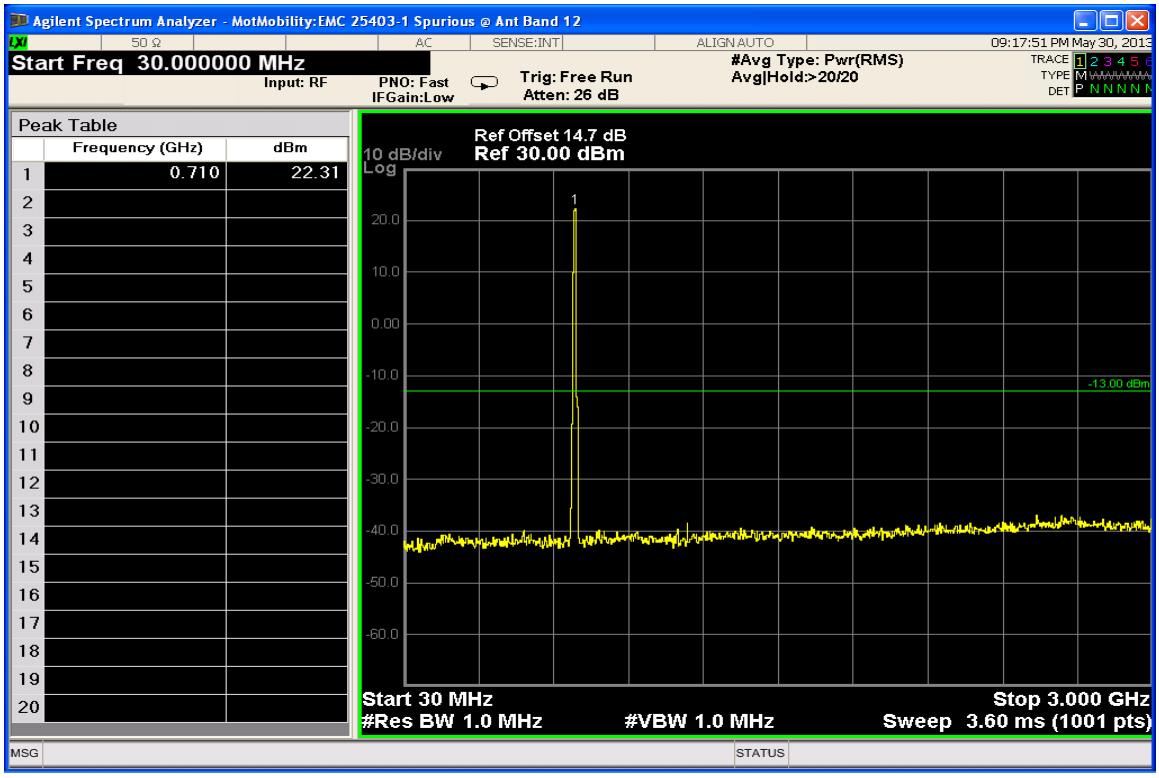
Measurement Results: LTE Band 12 QPSK Conducted Spurious Emissions



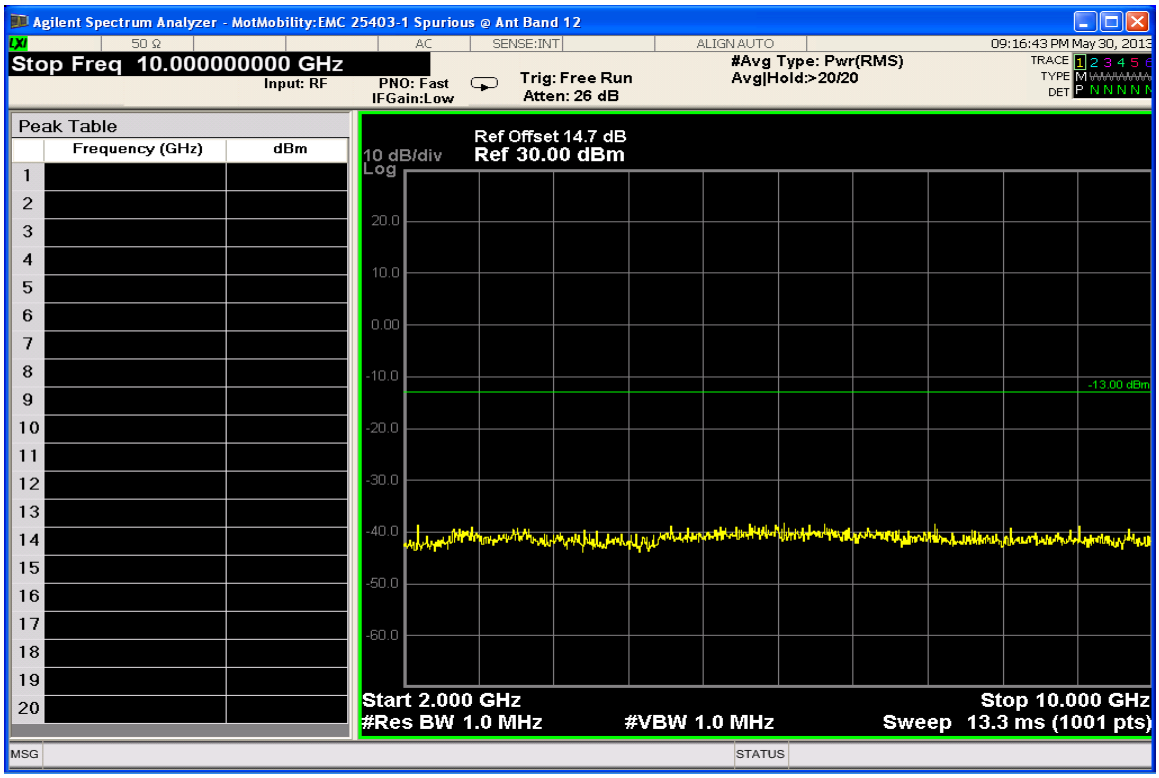
10 MHz BW, QPSK RB Size = 50RB Start 0, Low Channel



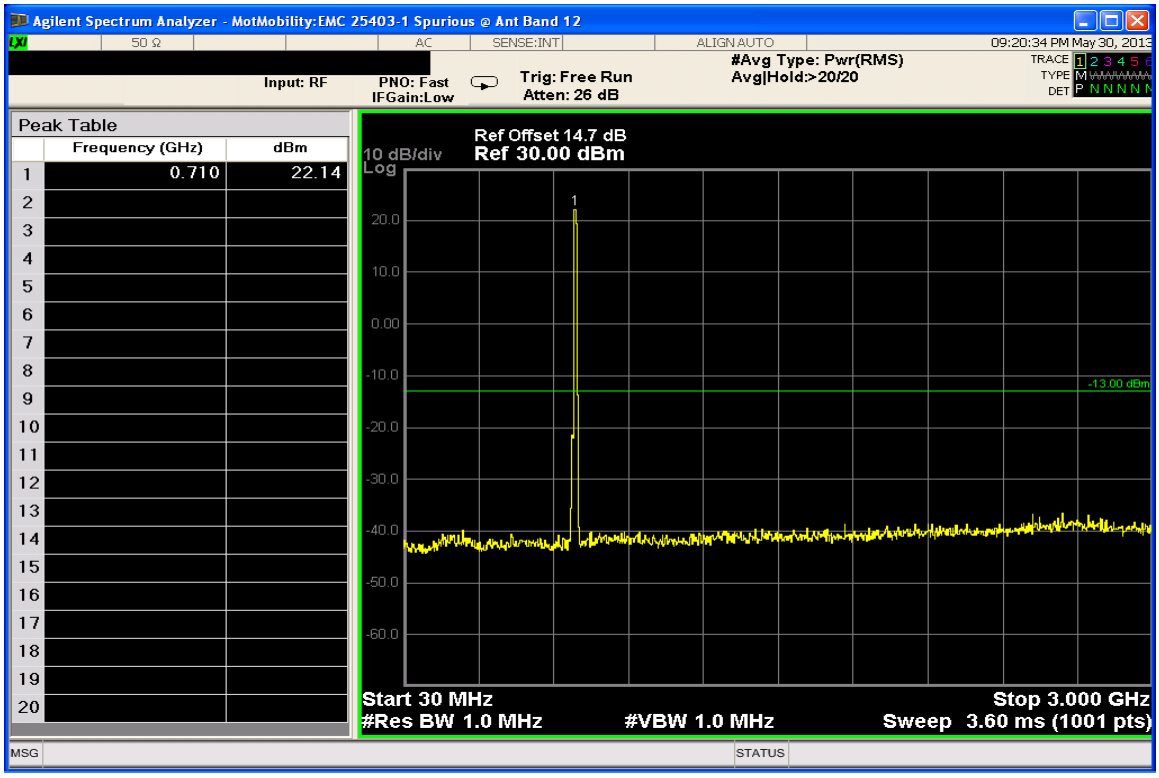
10 MHz BW, QPSK RB Size = 50RB Start 0, Low Channel



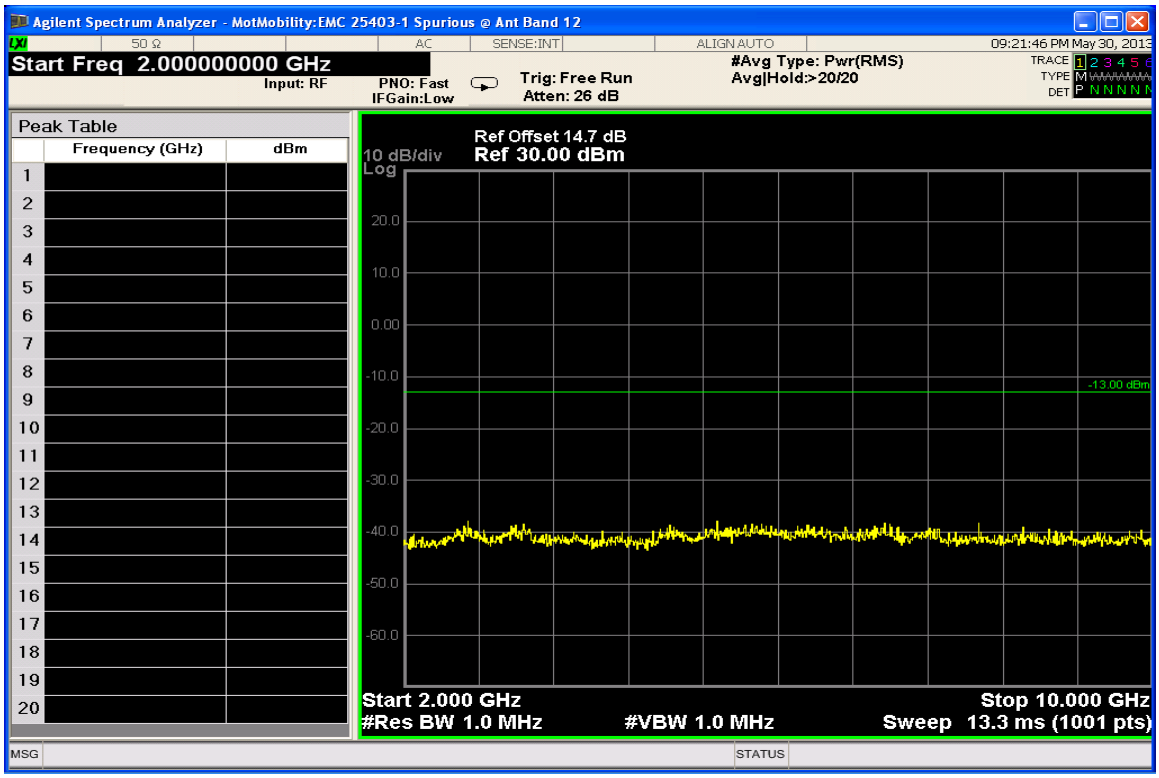
10 MHz BW, QPSK RB Size = 50RB Start 0, Mid Channel



10 MHz BW, QPSK RB Size = 50RB Start 0, Mid Channel

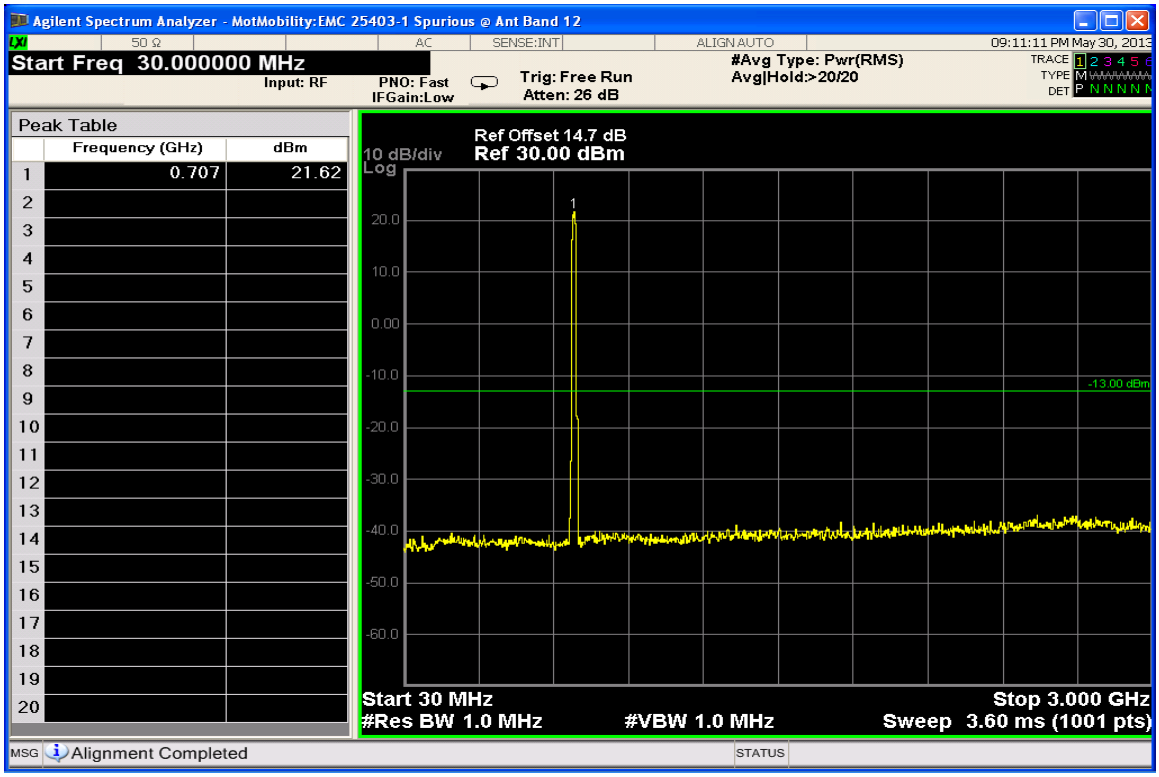


10 MHz BW, QPSK RB Size = 50RB Start 0, High Channel

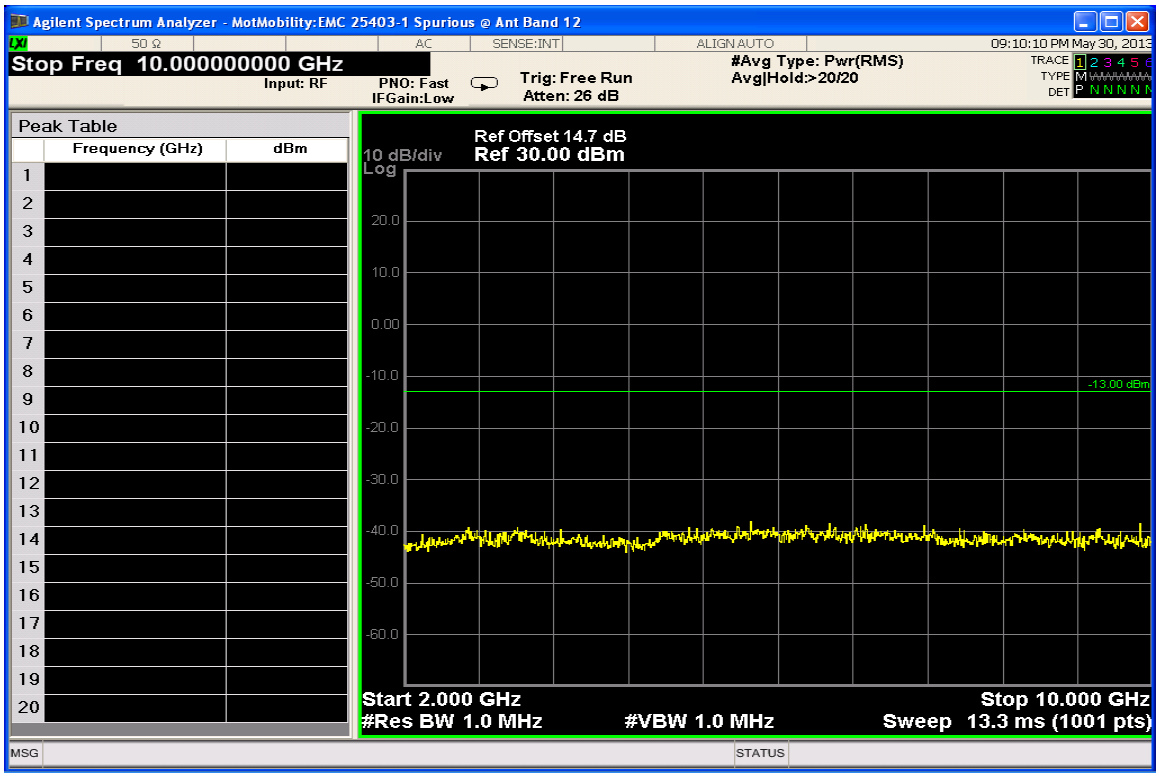


10 MHz BW, QPSK RB Size = 50RB Start 0, High Channel

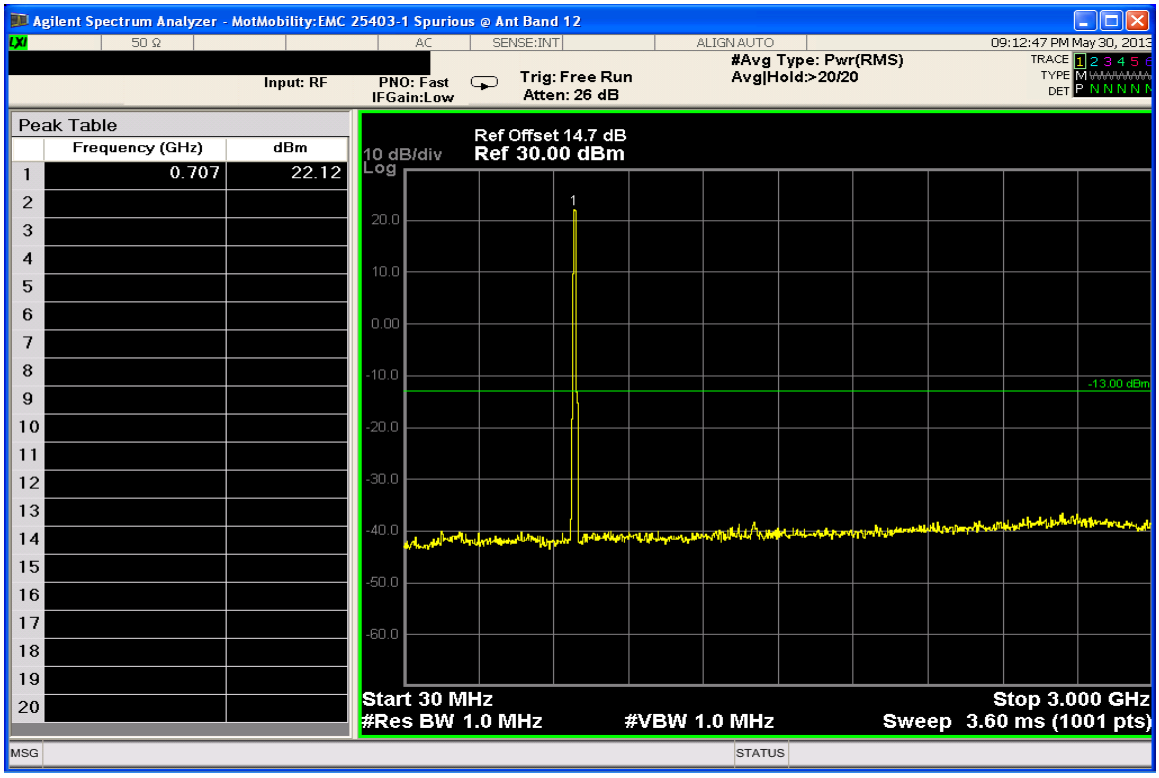
Measurement Results: LTE Band 12 16-QAM Conducted Spurious Emissions



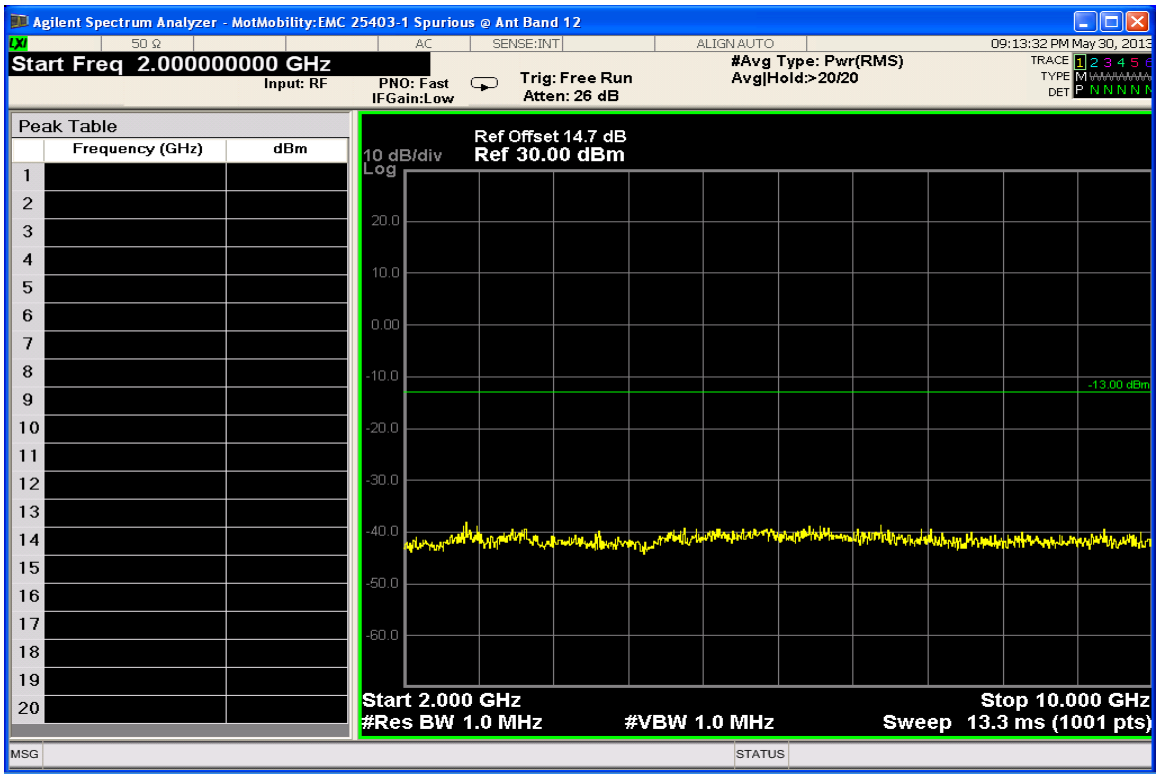
10 MHz BW, 16-QAM RB Size = 50RB Start 0, Low Channel



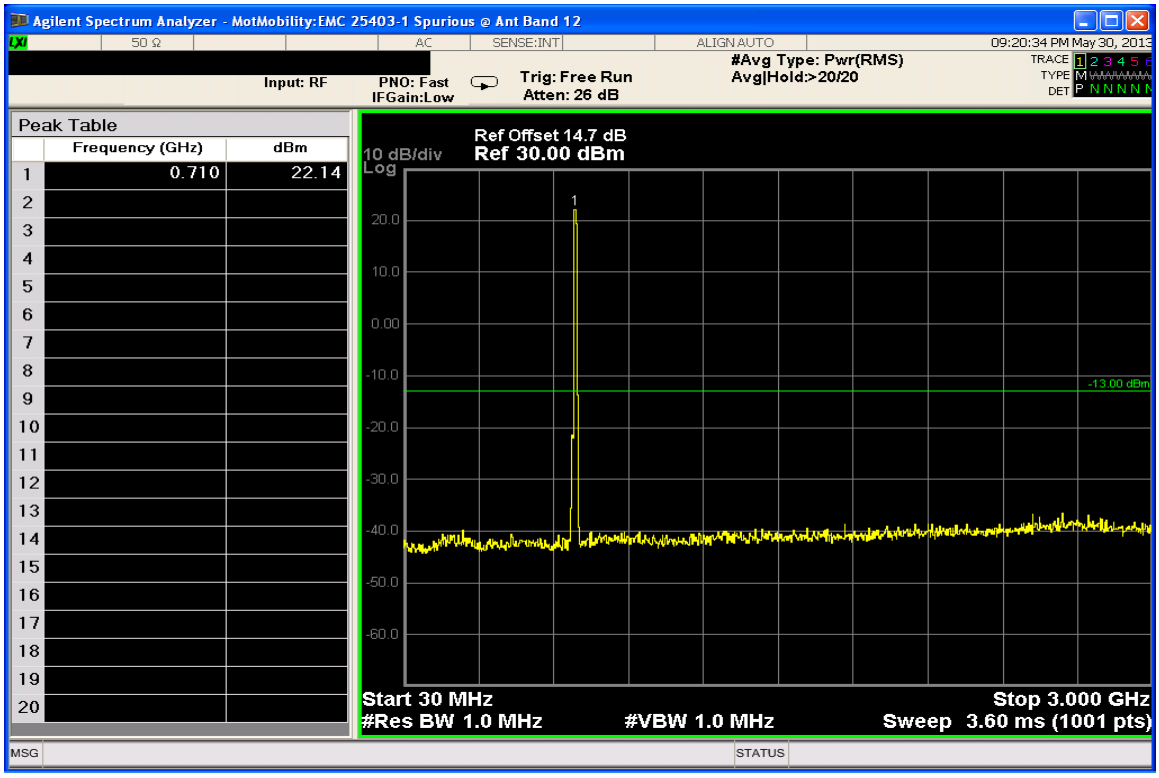
10 MHz BW, 16-QAM RB Size = 50RB Start 0, Low Channel



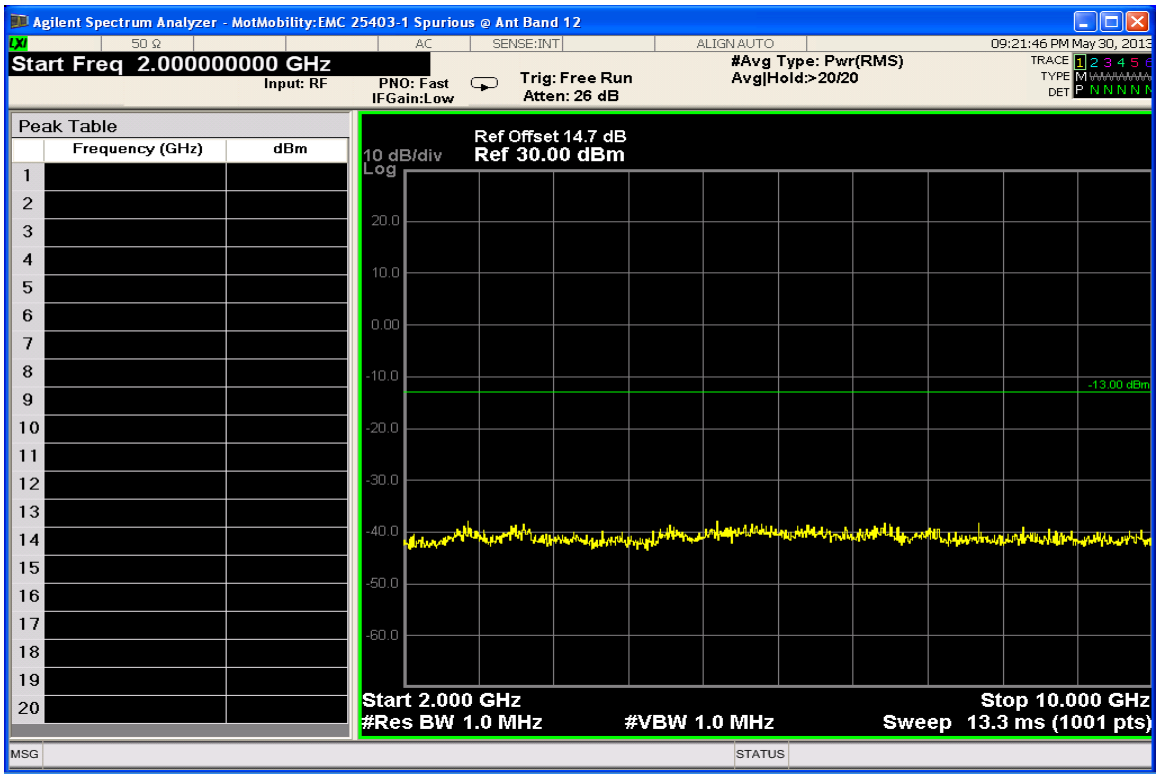
10 MHz BW, 16-QAM RB Size = 50RB Start 0, Mid Channel



10 MHz BW, 16-QAM RB Size = 50RB Start 0, Mid Channel



10 MHz BW, 16-QAM RB Size = 50RB Start 0, High Channel



10 MHz BW, 16-QAM RB Size = 50RB Start 0, High Channel

FIELD STRENGTH OF SPURIOUS EMISSIONS

§22.917 (a), §27.53 (g), §27.53 (h)

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 settings of the receiver were as follows:

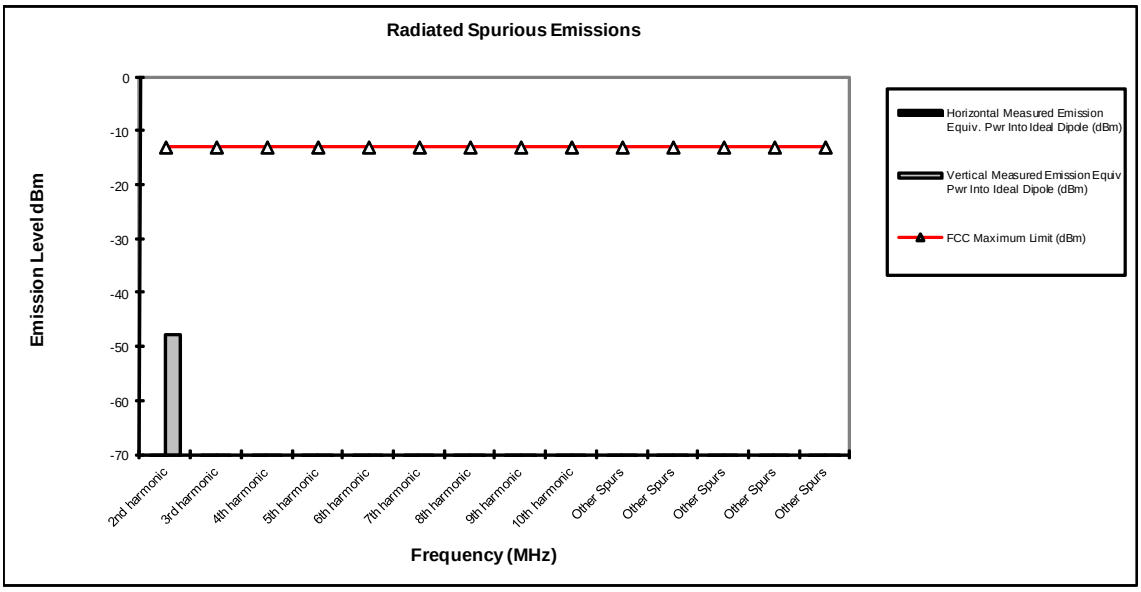
Units	dBm
Divisions	5 dB
Detector	Peak Detector
Resolution Bandwidth	1 MHz
Video Bandwidth (AVG)	3 MHz
Sweep Time	Auto

The EUT was tested under all configurations and modulations in the largest BW available in multiple RB configurations. The worst cases data is reported in the plots below.

Measurement Results

Band: LTE Band 4
Modulation: QPSK.
Channel: All Channels

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	*	-47.9
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	*	*

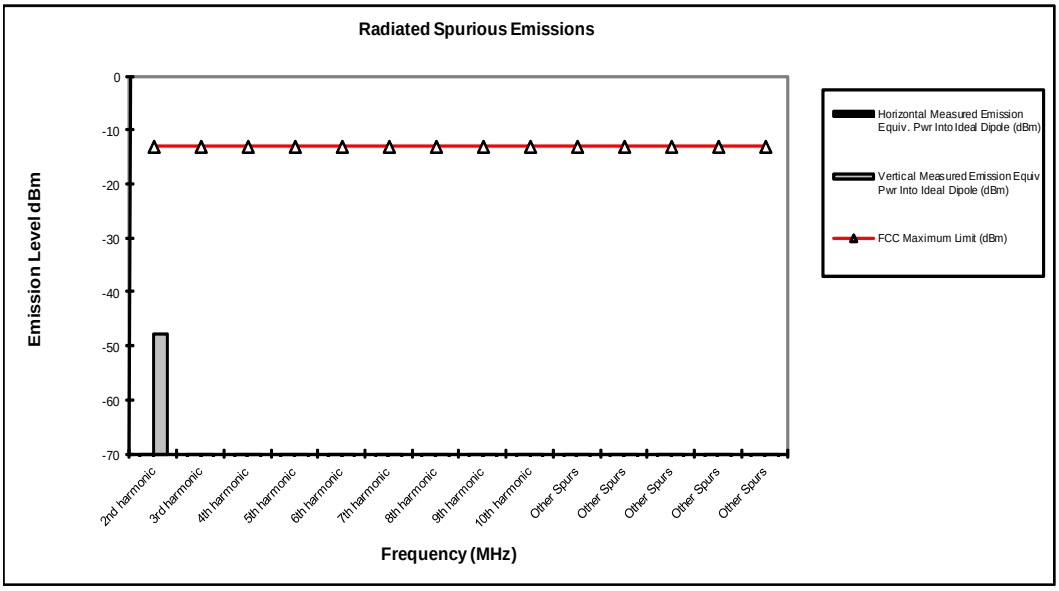


Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients or the emissions are lower than -33 dBm.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum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

Band: LTE Band 4
Modulation: 16-QAM.
Channel: All Channels

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	*	-48.0
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	*	*



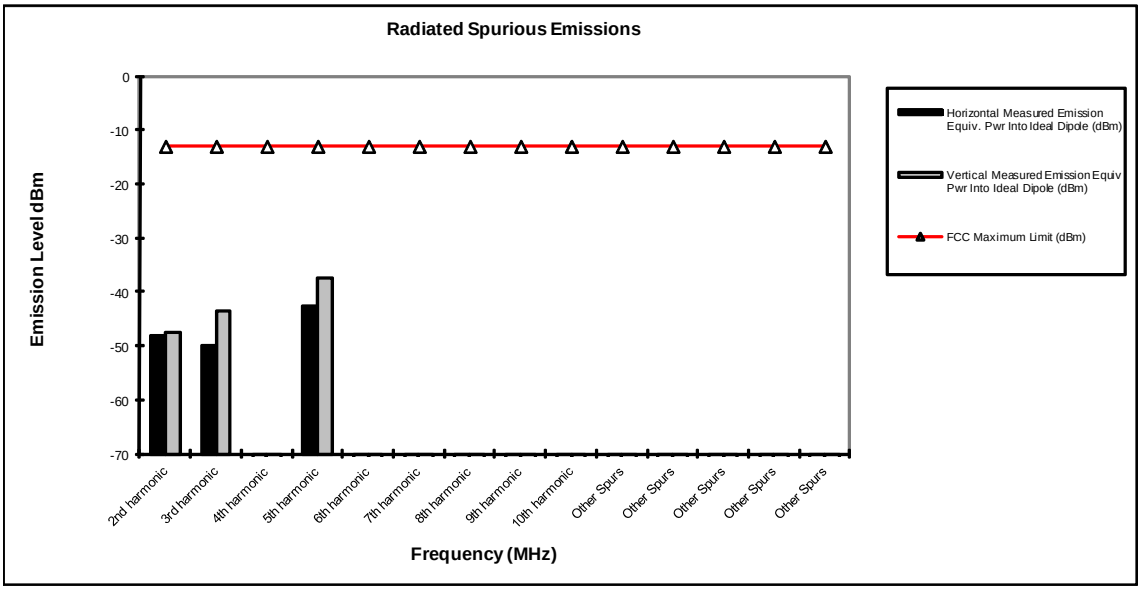
Notes:

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.

Band: LTE Band 5
Modulation: QPSK.
Channel: All Channels

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	-48.0	-47.4
3rd harmonic	-13	-50.0	-43.7
4th harmonic	-13	*	*
5th harmonic	-13	-42.5	-37.4
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	*	*

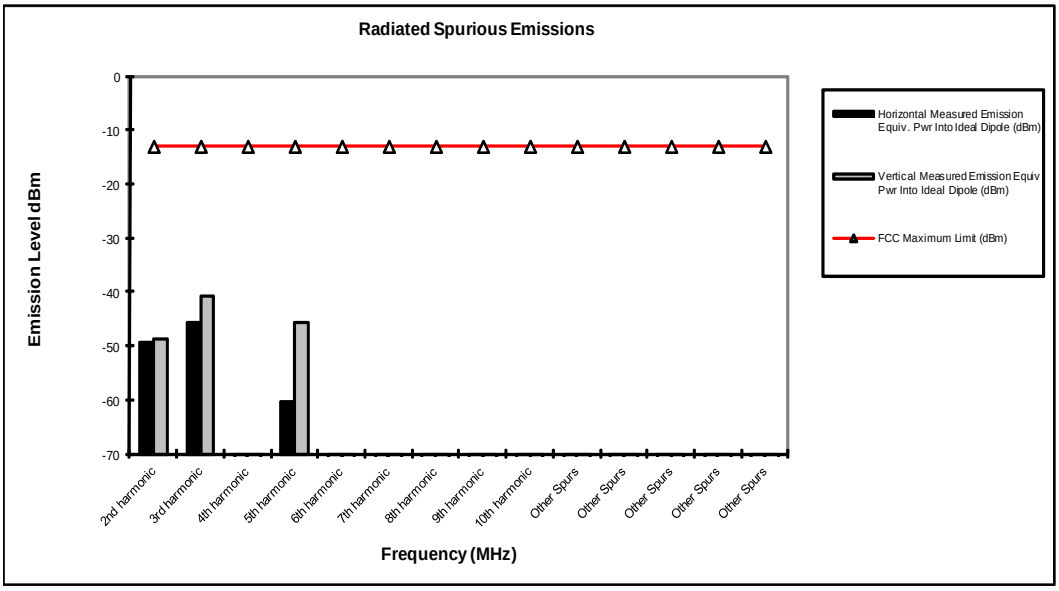


Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients or the emissions are lower than -33 dBm.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum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

Band: LTE Band 5
Modulation: 16-QAM.
Channel: All Channels

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	-49.5	-48.8
3rd harmonic	-13	-45.8	-41.0
4th harmonic	-13	*	*
5th harmonic	-13	-60.4	-45.5
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	*	*



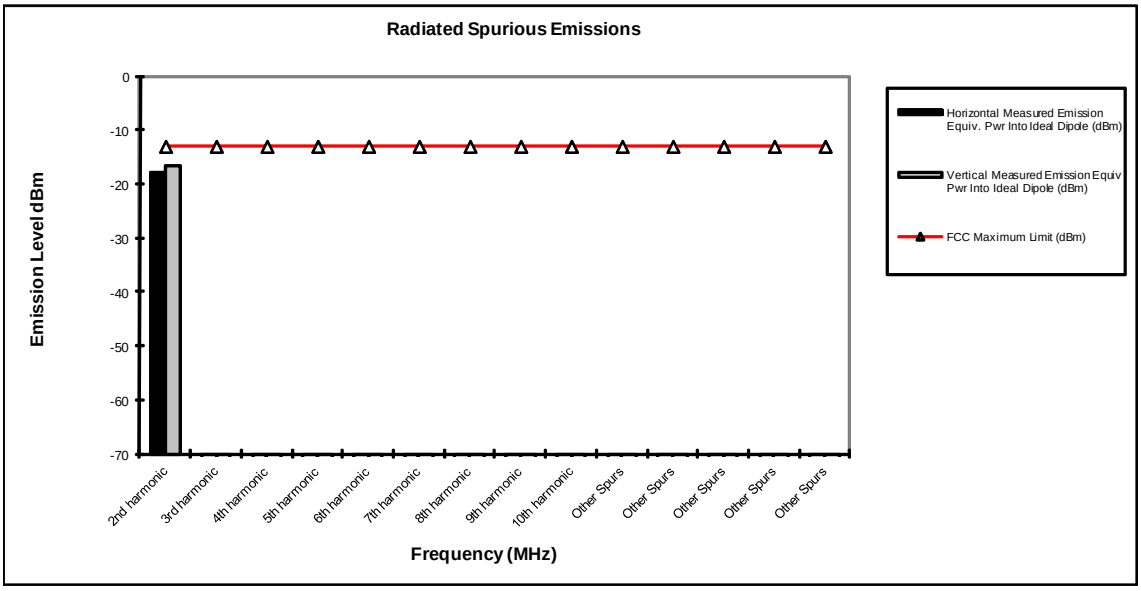
Notes:

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.

Band: LTE Band 12
Modulation: QPSK.
Channel: All Channels

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	-17.8	-16.8
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	*	*

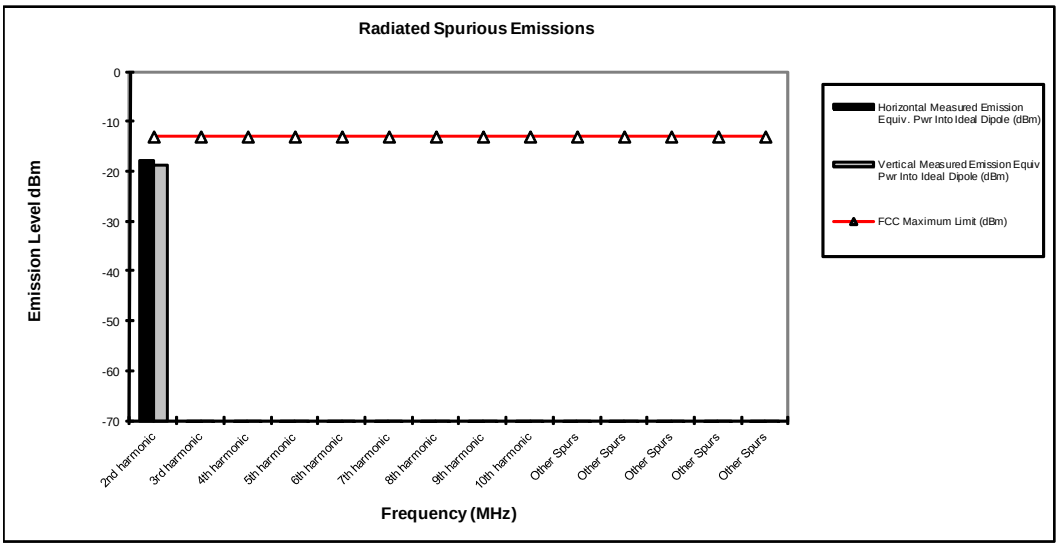


Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients or the emissions are lower than -33 dBm.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum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

Band: LTE Band 12
Modulation: 16-QAM.
Channel: All Channels

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	-18.0	-18.9
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.

FREQUENCY STABILITY

§Part 2.1055 (a), §Part 2.1055 (d), §Part 24.235, §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.

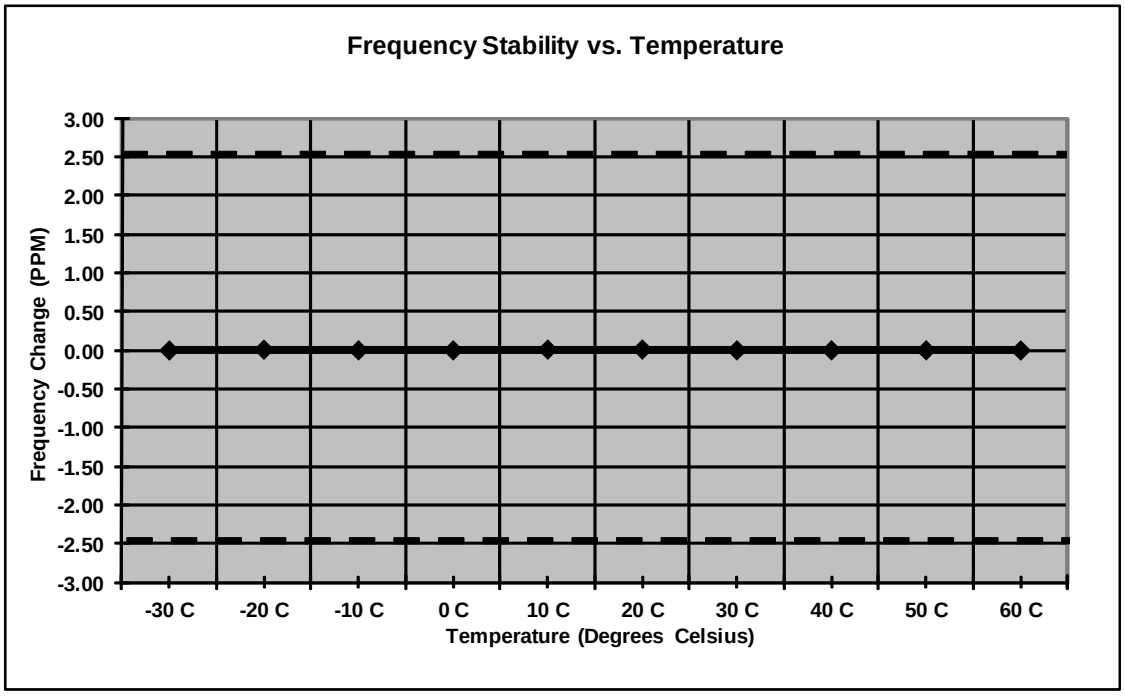
The EUT was tested in the highest bandwidth and both modulations in each band and the plots are reported below.

Measurement Results

Modulation: LTE Band 4 QPSK 20 MHz BW

Mode: LTE Band 4-20 MHz **Operating Frequency:** 1720 MHz
Channel: 20050 **Deviation Limit (PPM):** 2.5 ppm
100 RB QPSK

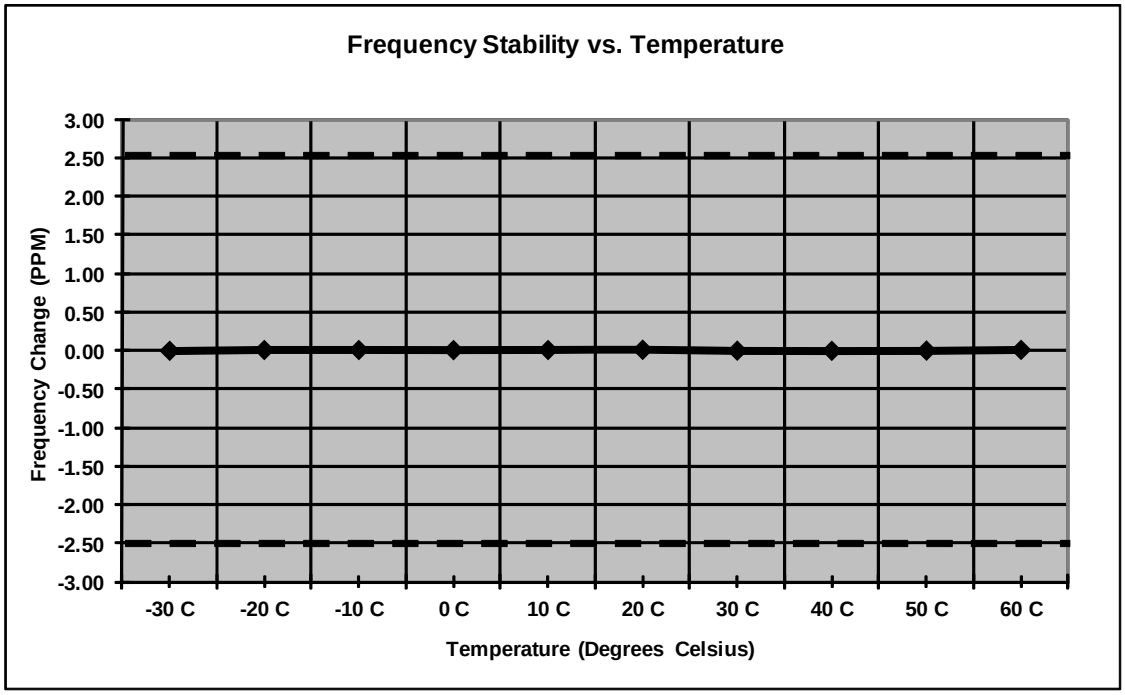
Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	Hz	(PPM)	(%)	(VDC)
-30 C	**-10.10**	**-0.006**	100%	3.80
-20 C	**7.81**	**0.005**	100%	3.80
-10 C	**-7.24**	**-0.004**	100%	3.80
0 C	**-7.08**	**-0.004**	100%	3.80
10 C	**10.57**	**0.006**	100%	3.80
20 C	**11.32**	**0.007**	100%	3.80
30 C	**-7.91**	**-0.005**	100%	3.80
40 C	**-8.25**	**-0.005**	100%	3.80
50 C	**-8.09**	**-0.005**	100%	3.80
60 C	**-9.01**	**-0.005**	100%	3.80
20 C	**11.46**	**0.007**	Battery Endpoint	3.42



Modulation: LTE Band 4 16-QAM 20 MHz BW

Mode: LTE Band 4-20 MHz **Operating Frequency:** 1720 MHz
Channel: 20050 **Deviation Limit (PPM):** 2.5 ppm
100 RB 16 QAM

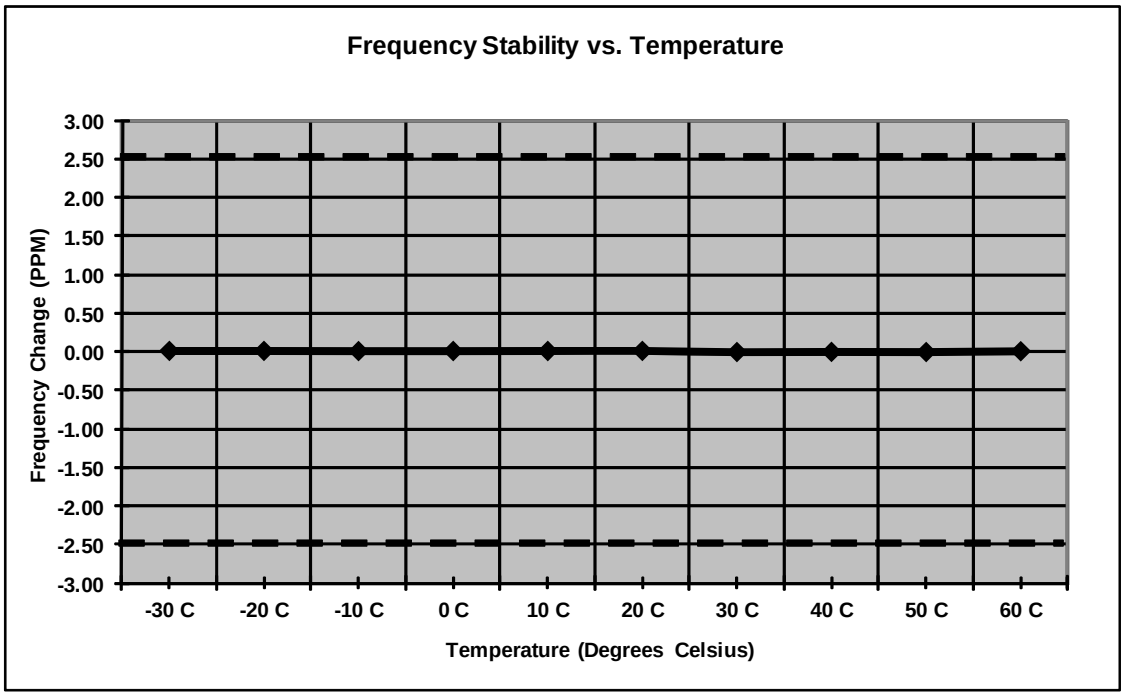
Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	Hz	(PPM)	(%)	(VDC)
-30 C	**-9.88**	**-0.006**	100%	3.80
-20 C	**7.20**	**0.004**	100%	3.80
-10 C	**6.88**	**0.004**	100%	3.80
0 C	**6.11**	**0.004**	100%	3.80
10 C	**8.31**	**0.005**	100%	3.80
20 C	**12.15**	**0.007**	100%	3.80
30 C	**-7.28**	**-0.004**	100%	3.80
40 C	**-10.20**	**-0.006**	100%	3.80
50 C	**-6.34**	**-0.004**	100%	3.80
60 C	**9.18**	**0.005**	100%	3.80
20 C	**11.83**	**0.007**	Battery Endpoint	3.42



Modulation: LTE Band 5 QPSK 10 MHz BW

Mode: LTE Band 5-10 MHz **Operating Frequency:** 829 MHz
Channel: 20450 **Deviation Limit (PPM):** 2.5 ppm
50 RB QPSK

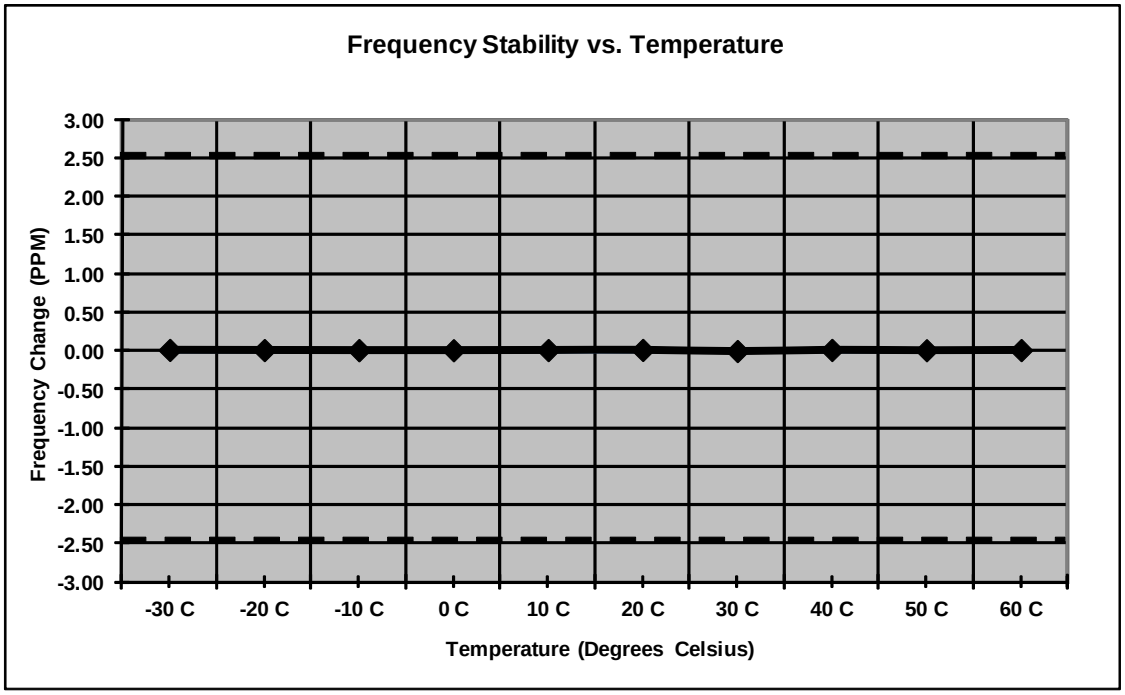
Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	Hz	(PPM)	(%)	(VDC)
-30 C	**7.01**	**0.008**	100%	3.80
-20 C	**6.74**	**0.008**	100%	3.80
-10 C	**4.68**	**0.006**	100%	3.80
0 C	**5.39**	**0.007**	100%	3.80
10 C	**6.25**	**0.008**	100%	3.80
20 C	**7.22**	**0.009**	100%	3.80
30 C	**-5.36**	**-0.006**	100%	3.80
40 C	**-3.46**	**-0.004**	100%	3.80
50 C	**-4.46**	**-0.005**	100%	3.80
60 C	**3.93**	**0.005**	100%	3.80
20 C	**8.74**	**0.011**	Battery Endpoint	3.42



Modulation: LTE Band 5 16-QAM 10 MHz BW

Mode: LTE Band 5-10 MHz **Operating Frequency:** 829 MHz
Channel: 20450 **Deviation Limit (PPM):** 2.5 ppm
50 RB 16 QAM

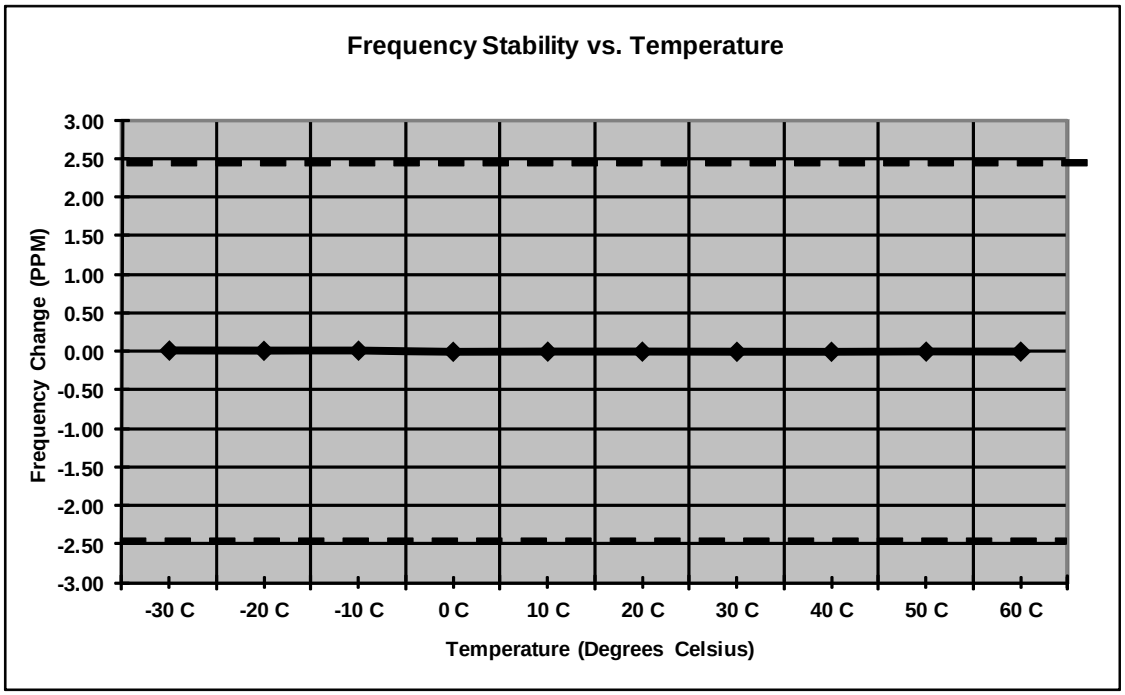
Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	Hz	(PPM)	(%)	(VDC)
-30 C	**7.65**	**0.009**	100%	3.80
-20 C	**5.87**	**0.007**	100%	3.80
-10 C	**4.82**	**0.006**	100%	3.80
0 C	**4.39**	**0.005**	100%	3.80
10 C	**6.47**	**0.008**	100%	3.80
20 C	**7.65**	**0.009**	100%	3.80
30 C	**-4.55**	**-0.005**	100%	3.80
40 C	**7.17**	**0.009**	100%	3.80
50 C	**4.12**	**0.005**	100%	3.80
60 C	**5.55**	**0.007**	100%	3.80
20 C	**6.79**	**0.008**	Battery Endpoint	3.42



Modulation: LTE Band 12 QPSK 10 MHz BW

Mode: LTE Band 12-10 MHz **Operating Frequency:** 704.0 Mhz
Channel: 23060 **Deviation Limit (PPM):** 2.5 ppm
50 RB QPSK

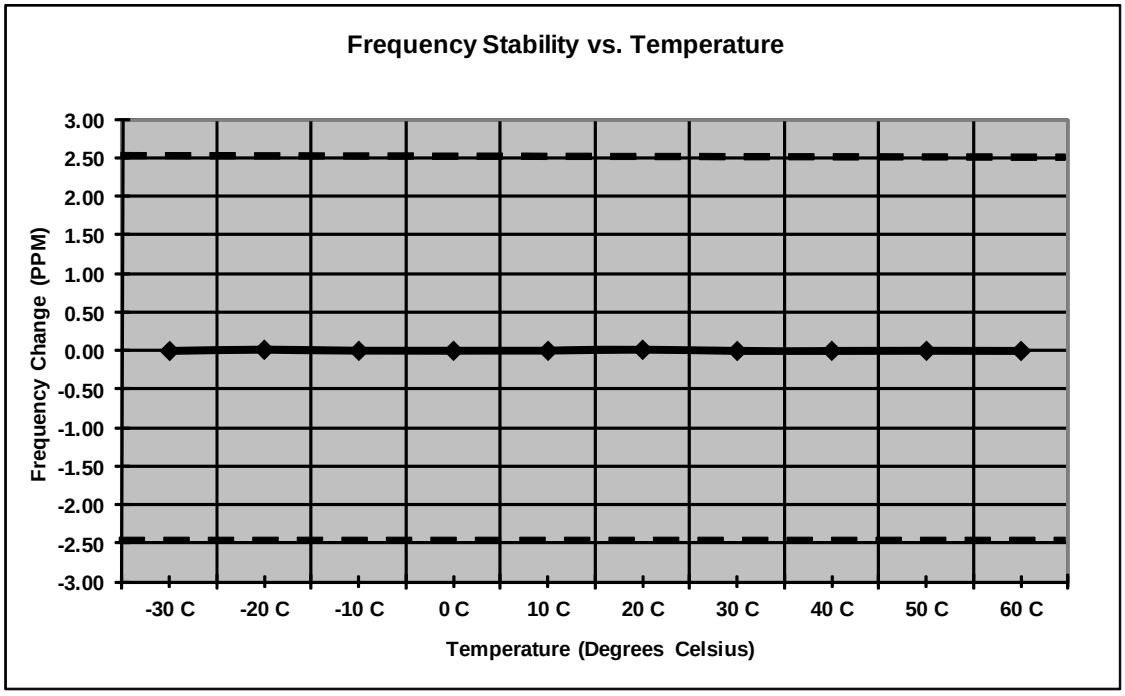
Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	Hz	(PPM)	(%)	(VDC)
-30 C	**4.99**	**0.007**	100%	3.80
-20 C	**3.59**	**0.005**	100%	3.80
-10 C	**4.23**	**0.006**	100%	3.80
0 C	**-5.85**	**-0.008**	100%	3.80
10 C	**-4.92**	**-0.007**	100%	3.80
20 C	**-4.62**	**-0.007**	100%	3.80
30 C	**-5.59**	**-0.008**	100%	3.80
40 C	**-6.22**	**-0.009**	100%	3.80
50 C	**-3.71**	**-0.005**	100%	3.80
60 C	**-4.26**	**-0.006**	100%	3.80
20 C	**-6.02**	**-0.008**	Battery Endpoint	3.42



Modulation: LTE Band 12 16-QAM 10 MHz BW

Mode: LTE Band 12-10 MHz **Operating Frequency:** 704.0 Mhz
Channel: 23060 **Deviation Limit (PPM):** 2.5 ppm
50 RB 16 QAM

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	Hz	(PPM)	(%)	(VDC)
-30 C	**-5.75**	**-0.008**	100%	3.80
-20 C	**5.19**	**0.007**	100%	3.80
-10 C	**-4.81**	**-0.007**	100%	3.80
0 C	**-3.73**	**-0.005**	100%	3.80
10 C	**-3.98**	**-0.006**	100%	3.80
20 C	**5.09**	**0.007**	100%	3.80
30 C	**-5.97**	**-0.008**	100%	3.80
40 C	**-5.45**	**-0.008**	100%	3.80
50 C	**-4.58**	**-0.006**	100%	3.80
60 C	**-6.01**	**-0.008**	100%	3.80
20 C	**-5.35**	**-0.008**	Battery Endpoint	3.42



End of Test Report