



MOBILE DEVICES BUSINESS

**PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY**

EMC TEST REPORT

Test Report Number – 25039-1 LTE

Report Date – August 22, 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: August 22, 2012

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



2404

Table of Contents

<u>Description</u>	<u>Page</u>
Test Report Details	3
Applicable Standards	4
Summary of Testing	4
General and Special Conditions	5
Equipment List	5
Measurement Procedures and Data	7
RF Power Output	7
Measurement results	7
Radiated Power	10
Measurement results	11
Occupied Bandwidth	15
Measurement results	15
Band Edge Measurement	21
Measurement results	21
Spurious Emissions at Antenna Terminals	32
Measurement results	33
Field Strength of Spurious Emissions	39
Measurement results	40
Frequency Stability	41
Measurement results	42

Test Report Details

All Tests, except Radiated Power, 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
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 LLC
600 North US Hwy 45
Libertyville, IL 60048

Product Type:

Cellular Phone

Signaling Capability:

WCDMA 850/1900, GSM 850/1900,
EDGE 850/1900, LTE Band 4/17, HSDPA,
HSUPA, GPRS, Bluetooth LE + EDR,
802.11a/b/g/n

FCC ID:

IHDT56NG9

Serial Numbers:

LVUC230032, LVUC230063, LVUC230043

Testing Complete Date:

July 24, 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

Applicable Standards: ANSI 63.4 2003, ANSI/TIA-603-C-2004, RSS-Gen Issue 3, RSS-132 Issue 2, RSS-133 Issue 5, RSS-139 Issue 2

LTE 700MHz is not operational in Canada.

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 GSM and WCDMA bands, the EUT operates on LTE Band 4 and LTE Band 17. The transmitting frequency range for LTE Band 4 is 1710MHz to 1755MHz and for LTE Band 17 is 704MHz to 716MHz. The EUT supports bandwidths of 5MHz, 10 MHz and 15MHz for LTE Band 4 and bandwidths of 5MHz and 10 MHz for LTE Band 17. The EUT supports both QPSK and 16 QAM modulation schemes.

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
Hewlett Packard	EMC Analyzer	E7405	US39440191	9/23/2012
Agilent	MXA Signal Analyzer	N9020A	US46470586	1/20/2014
Agilent	Signal Generator	83712A	3429A00286	3/26/2013
A. H. Systems	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
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	113924	9/21/2012
Agilent	Microwave Preamplifier	8449B	3008A01442	9/22/2012

Note that the 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
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/10/2012	Annual	7/10/2013	N/A
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/5/2012	Annual	4/5/2013	MY45470194
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/22/2011	Biennial	7/22/2013	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	10/1/2010	Biennial	10/1/2012	128337
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/25/2011	Annual	8/25/2012	100976
Rohde & Schwarz	ESU26	EMI Test Receiver	12/15/2011	Annual	12/15/2012	100342
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/14/2011	Biennial	11/14/2013	9105-2404

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

LTE Band 4 15MHz BW		Conducted power (dBm) for LTE modes			
		QPSK, Start RB: 0, RB Alloc: 1	QPSK, Start RB: 74, RB Alloc: 1	QPSK, Start RB: 18, RB Alloc: 38	QPSK, Start RB: 0, RB Alloc: 75
<i>Frequency</i>	<i>Channel</i>				
1717.5 MHz	20025	24.34	24.55	23.76	23.87
1732.5 MHz	20175	24.41	24.76	23.81	23.98
1747.5 MHz	20325	24.81	23.94	23.83	23.86

LTE Band 4 15MHz BW		Conducted power (dBm) for LTE modes			
		16-QAM, Start RB: 0, RB Alloc: 1	16-QAM, Start RB: 74, RB Alloc: 1	16-QAM, Start RB: 18, RB Alloc: 38	16-QAM, Start RB: 0, RB Alloc: 75
<i>Frequency</i>	<i>Channel</i>				
1717.5 MHz	20025	23.75	24.12	22.90	22.91
1732.5 MHz	20175	23.55	23.60	22.74	22.90
1747.5 MHz	20325	24.15	23.91	22.99	22.94

LTE Band 4 10MHz BW		Conducted power (dBm) for LTE modes			
		QPSK, Start RB: 0, RB Alloc: 1	QPSK, Start RB: 49, RB Alloc: 1	QPSK, Start RB: 12, RB Alloc: 25	QPSK, Start RB: 0, RB Alloc: 50
Frequency	Channel				
1715.0 MHz	20000	23.77	24.20	23.84	23.84
1732.5 MHz	20175	24.52	24.58	23.82	23.88
1750.0 MHz	20350	24.23	23.70	23.73	23.75

LTE Band 4 10MHz BW		Conducted power (dBm) for LTE modes			
		16-QAM, Start RB: 0, RB Alloc: 1	16-QAM, Start RB: 49, RB Alloc: 1	16-QAM, Start RB: 12, RB Alloc: 25	16-QAM, Start RB: 0, RB Alloc: 50
Frequency	Channel				
1715.0 MHz	20000	23.04	23.43	22.78	22.95
1732.5 MHz	20175	23.95	24.03	22.78	22.98
1750.0 MHz	20350	23.43	22.83	22.76	22.92

LTE Band 4 5MHz BW		Conducted power (dBm) for LTE modes			
		QPSK, Start RB: 0, RB Alloc: 1	QPSK, Start RB: 24, RB Alloc: 1	QPSK, Start RB: 6, RB Alloc: 13	QPSK, Start RB: 0, RB Alloc: 25
Frequency	Channel				
1712.5 MHz	19975	24.03	24.31	23.69	23.89
1732.5 MHz	20175	24.52	24.52	23.73	23.86
1752.5 MHz	20375	24.32	23.91	23.71	23.94

LTE Band 4 5MHz BW		Conducted power (dBm) for LTE modes			
		16-QAM, Start RB: 0, RB Alloc: 1	16-QAM, Start RB: 24, RB Alloc: 1	16-QAM, Start RB: 6, RB Alloc: 13	16-QAM, Start RB: 0, RB Alloc: 25
Frequency	Channel				
1712.5 MHz	19975	24.09	24.31	22.76	23.15
1732.5 MHz	20175	23.57	23.54	22.91	23.16
1752.5 MHz	20375	24.27	23.89	22.98	22.72

LTE Band 17 10MHz		Conducted power (dBm) for LTE modes			
		QPSK, Start RB: 0, RB Alloc: 1	QPSK, Start RB: 49, RB Alloc: 1	QPSK, Start RB: 12, RB Alloc: 25	QPSK, Start RB: 0, RB Alloc: 50
<i>Frequency</i>	<i>Channel</i>				
710.0 MHz	23790	25.07	24.53	23.72	23.79

LTE Band 17 10MHz		Conducted power (dBm) for LTE modes			
		16-QAM, Start RB: 0, RB Alloc: 1	16-QAM, Start RB: 49, RB Alloc: 1	16-QAM, Start RB: 12, RB Alloc: 25	16-QAM, Start RB: 0, RB Alloc: 50
<i>Frequency</i>	<i>Channel</i>				
710.0 MHz	23790	24.73	24.18	22.71	22.81

LTE Band 17 5MHz		Conducted power (dBm) for LTE modes			
		QPSK, Start RB: 0, RB Alloc: 1	QPSK, Start RB: 24, RB Alloc: 1	QPSK, Start RB: 6, RB Alloc: 13	QPSK, Start RB: 0, RB Alloc: 25
<i>Frequency</i>	<i>Channel</i>				
706.5 MHz	23755	24.80	24.38	23.82	23.70
713.5 MHz	23825	24.40	24.51	23.50	23.56

LTE Band 17 5MHz		Conducted power (dBm) for LTE modes			
		16-QAM, Start RB: 0, RB Alloc: 1	16-QAM, Start RB: 24, RB Alloc: 1	16-QAM, Start RB: 6, RB Alloc: 13	16-QAM, Start RB: 0, RB Alloc: 25
<i>Frequency</i>	<i>Channel</i>				
706.5 MHz	23755	24.41	24.11	23.04	22.67
713.5 MHz	23825	24.30	24.28	22.88	22.59

RADIATED POWER

§27.50 (c) (10), §27.50 (d) (4)

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.

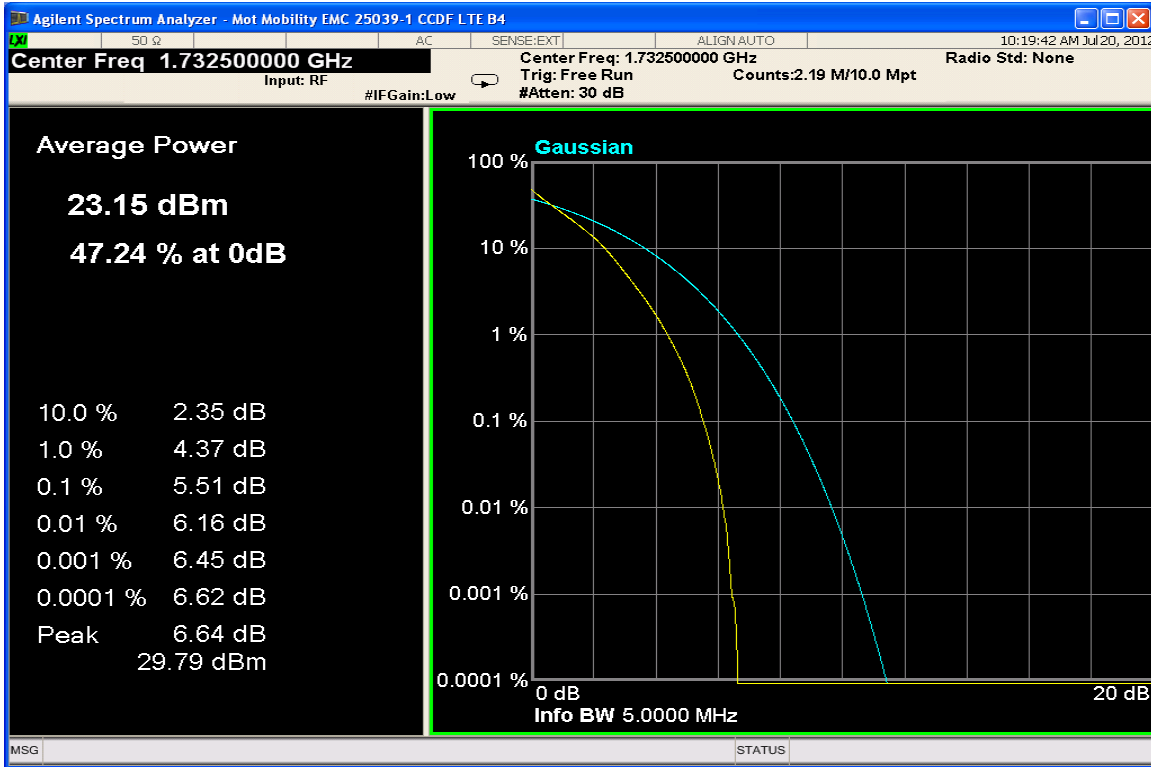
A half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously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

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

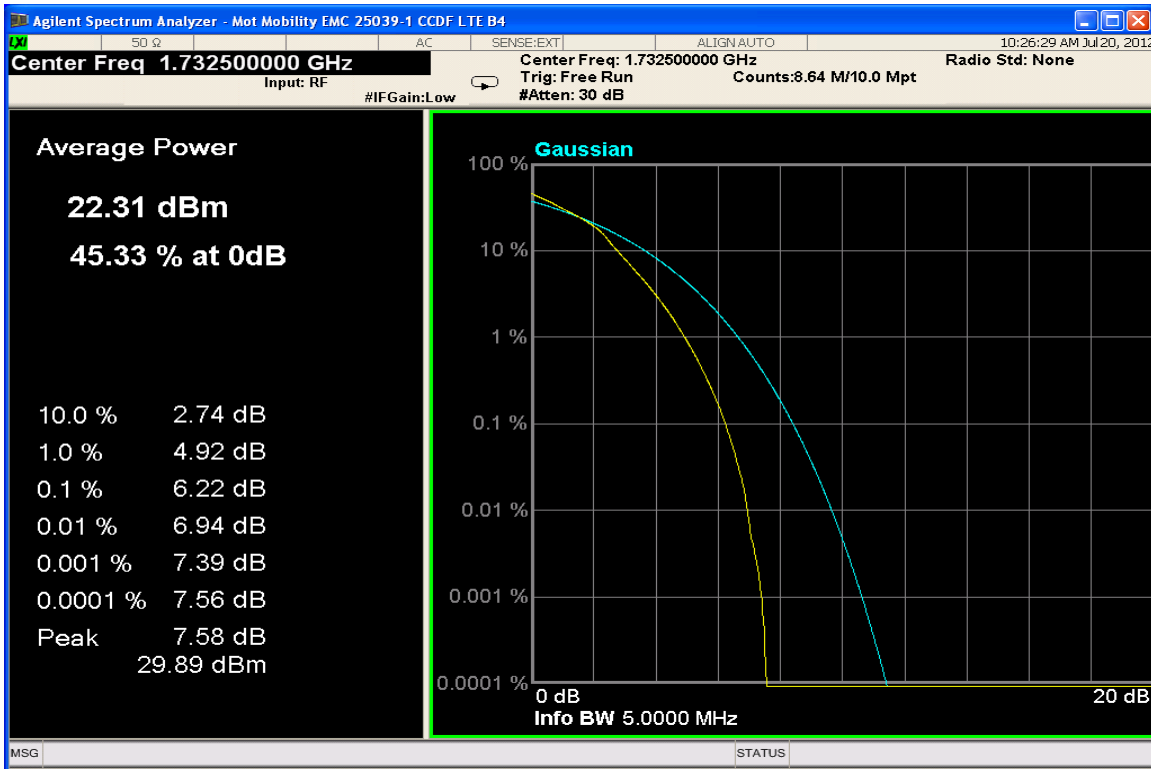
Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable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

Measurement Results

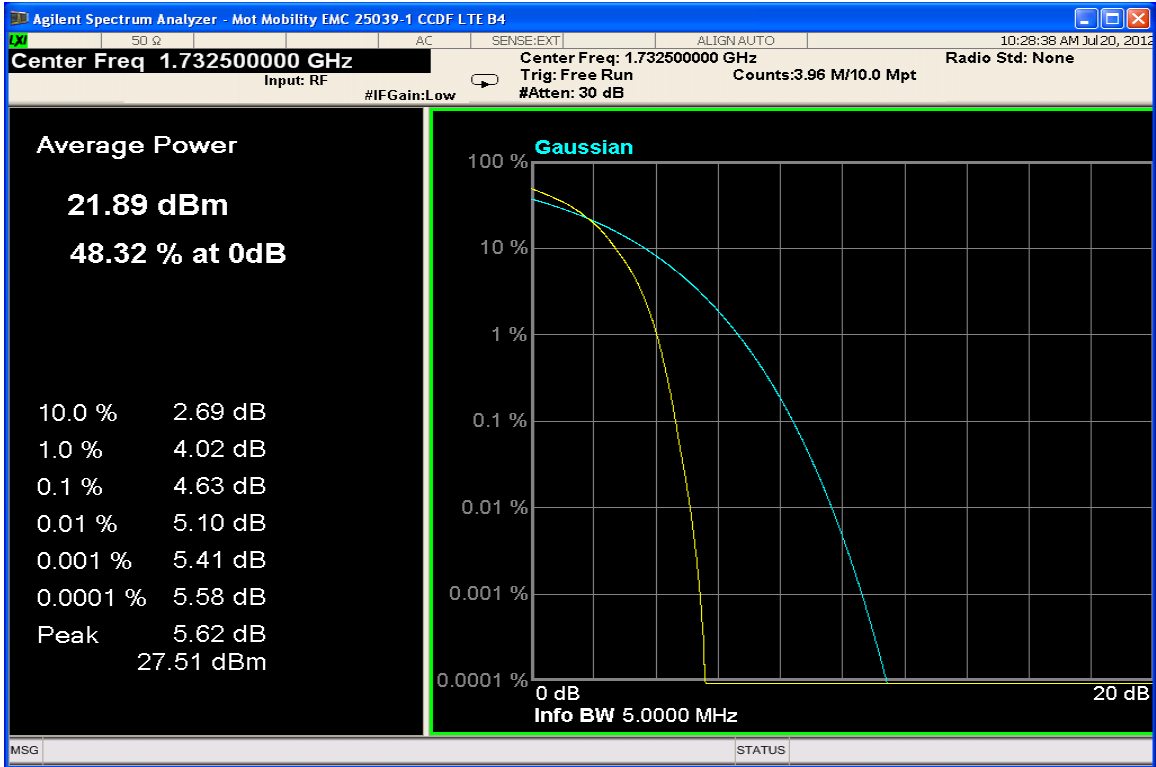
Band	Modulation	RB Size/Offset	EIRP dBm	ERP dBm
Band 4 5MHz	QPSK	1 / 24	24.99	22.89
Band 4 5MHz	16QAM	1 / 24	24.28	22.18
Band 4 10MHz	QPSK	1 / 49	24.92	22.82
Band 4 10MHz	16QAM	1 / 49	24.15	22.05
Band 4 15MHz	QPSK	1 / 74	24.73	22.63
Band 4 15MHz	16QAM	1 / 74	23.87	21.77
Band 17 5MHz	QPSK	1 / 0	20.45	18.35
Band 17 5MHz	16QAM	1 / 0	19.70	17.60
Band 17 10MHz	QPSK	1 / 0	20.97	18.87
Band 17 10MHz	16QAM	1 / 0	19.11	17.01



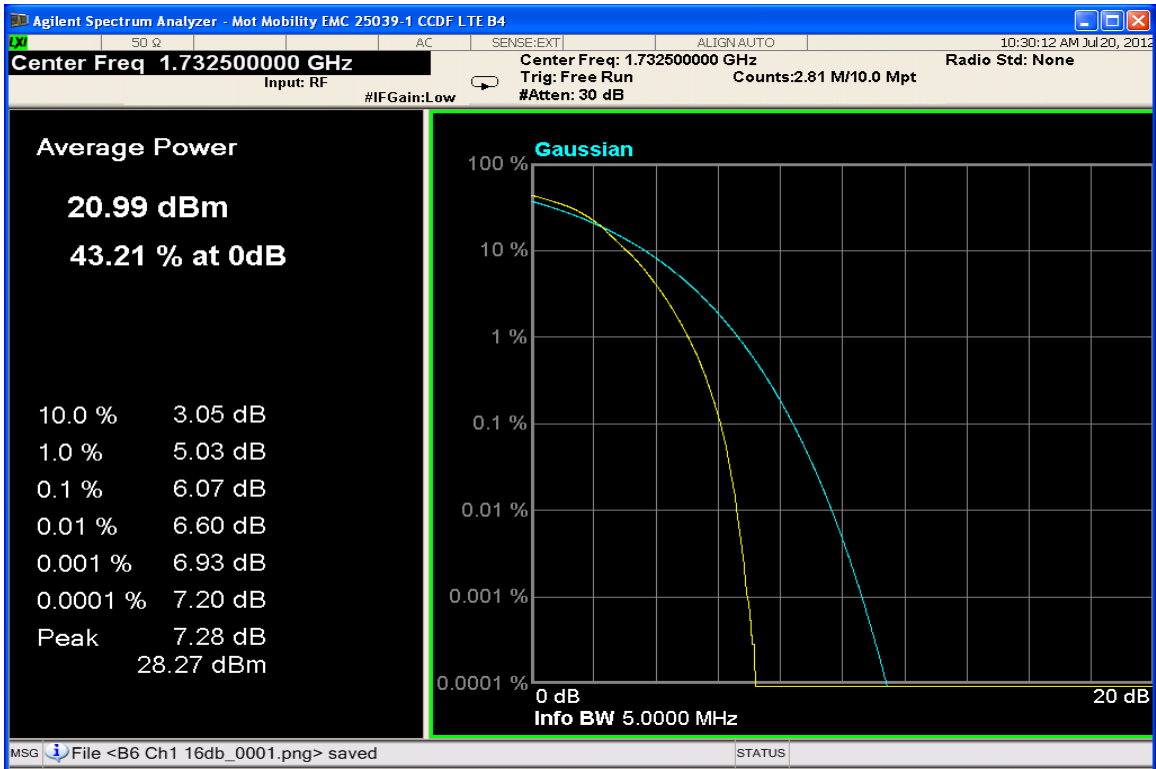
LTE Band 4 PAR Plot (5MHz BW, QPSK RB Size = 25 RB Start 0)



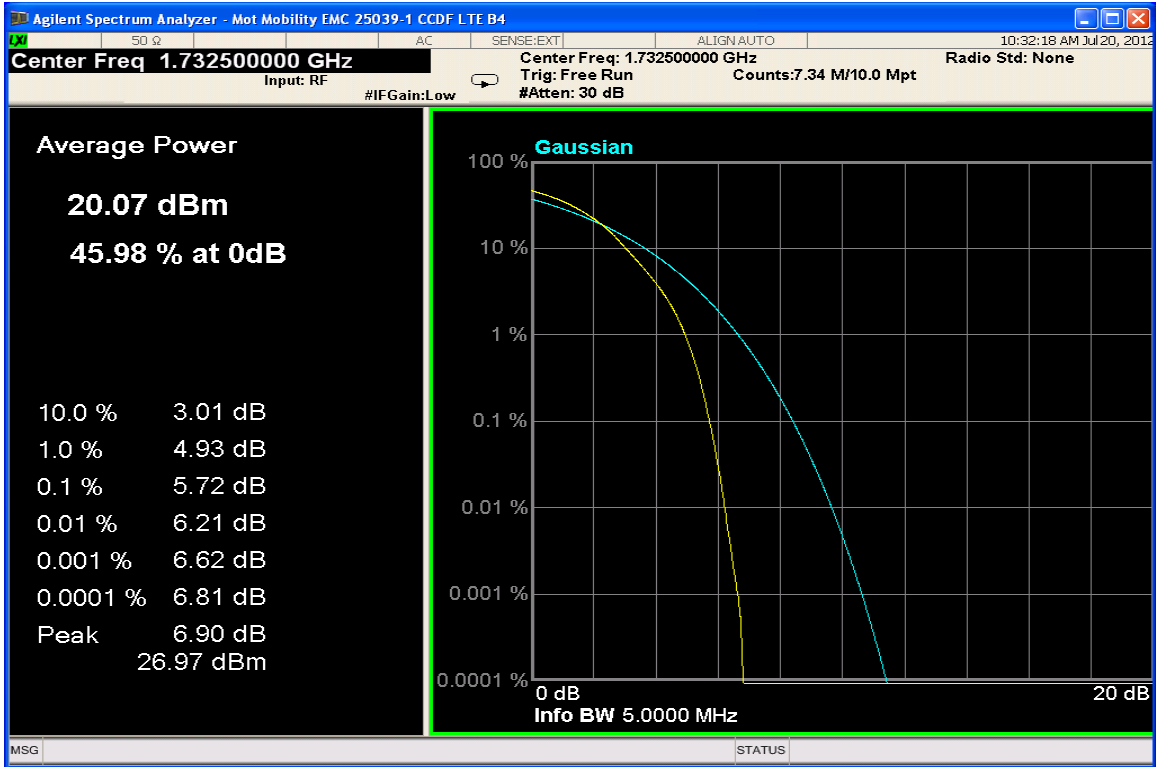
LTE Band 4 PAR Plot (5MHz BW, 16QAM RB Size = 25 RB Start 0)



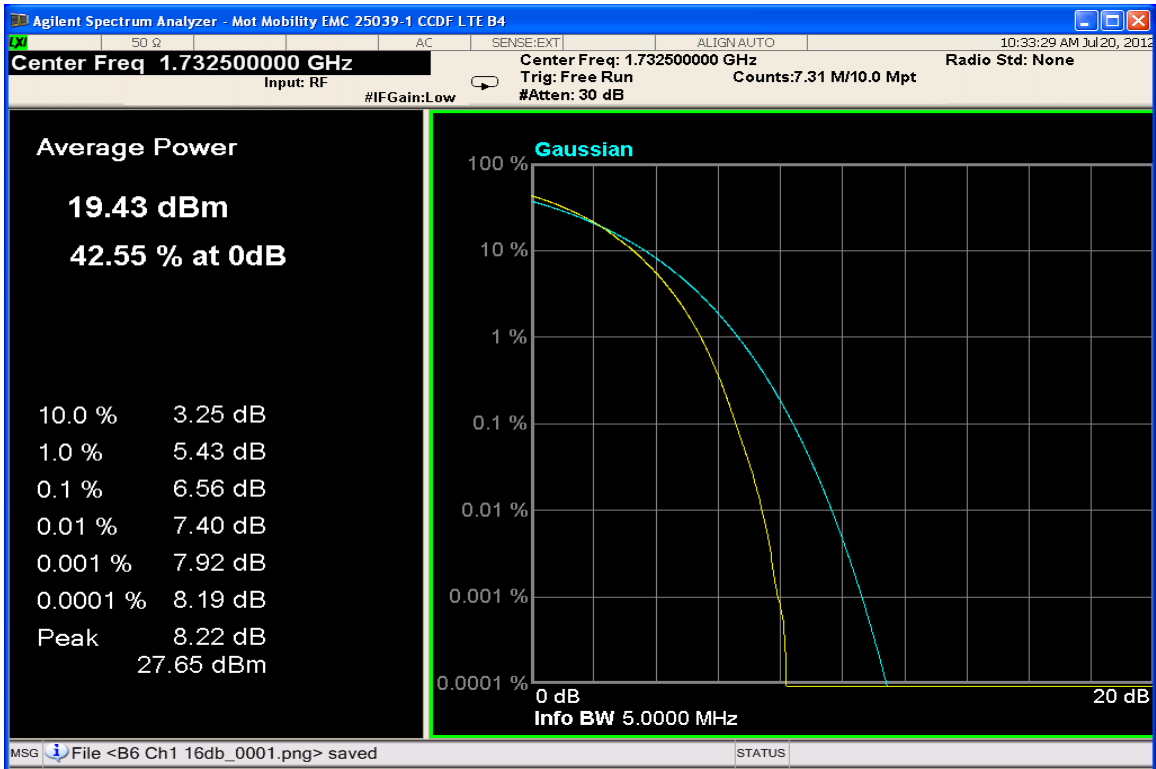
LTE Band 4 PAR Plot (10MHz BW, QPSK RB Size = 50 RB Start 0)



LTE Band 4 PAR Plot (10MHz BW, 16QAM RB Size = 50 RB Start 0)



LTE Band 4 PAR Plot (15MHz BW, QPSK RB Size = 75 RB Start 0)



LTE Band 4 PAR Plot (15MHz BW, 16QAM RB Size = 75 RB Start 0)

OCCUPIED BANDWIDTH

§ 2.1049

Measurement Procedure

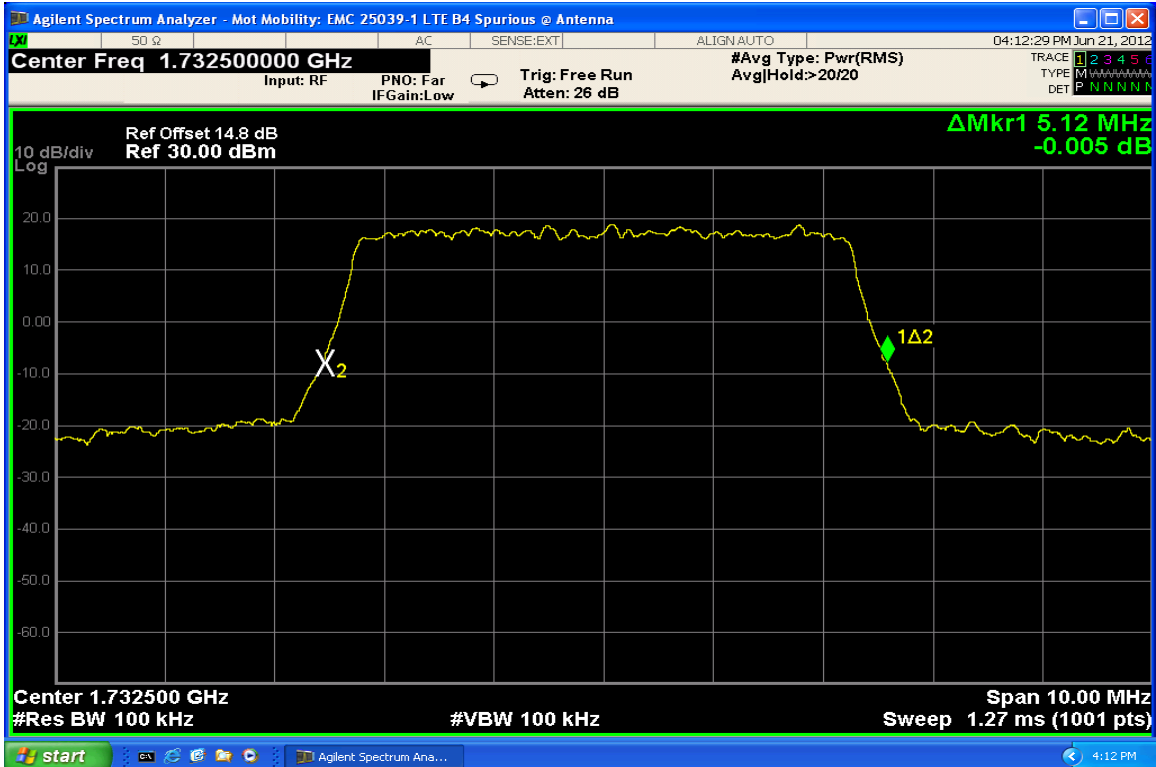
The RF output port of the EUT is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. The amplitude of the spectrum analyzer is corrected for the attenuator and any other applicable losses. The analyzer is set for Peak Detector and each trace 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 with the worst cases reported in the plots below.

Measurement Results

Attached

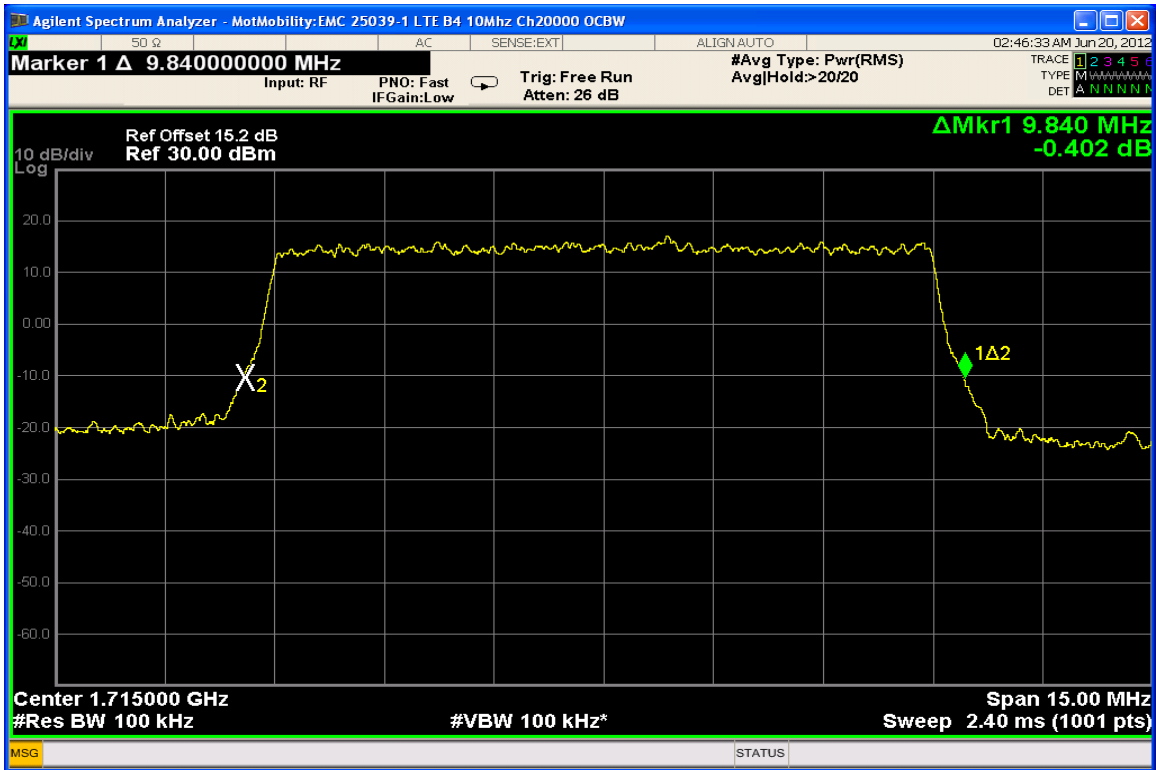
Measurement Results



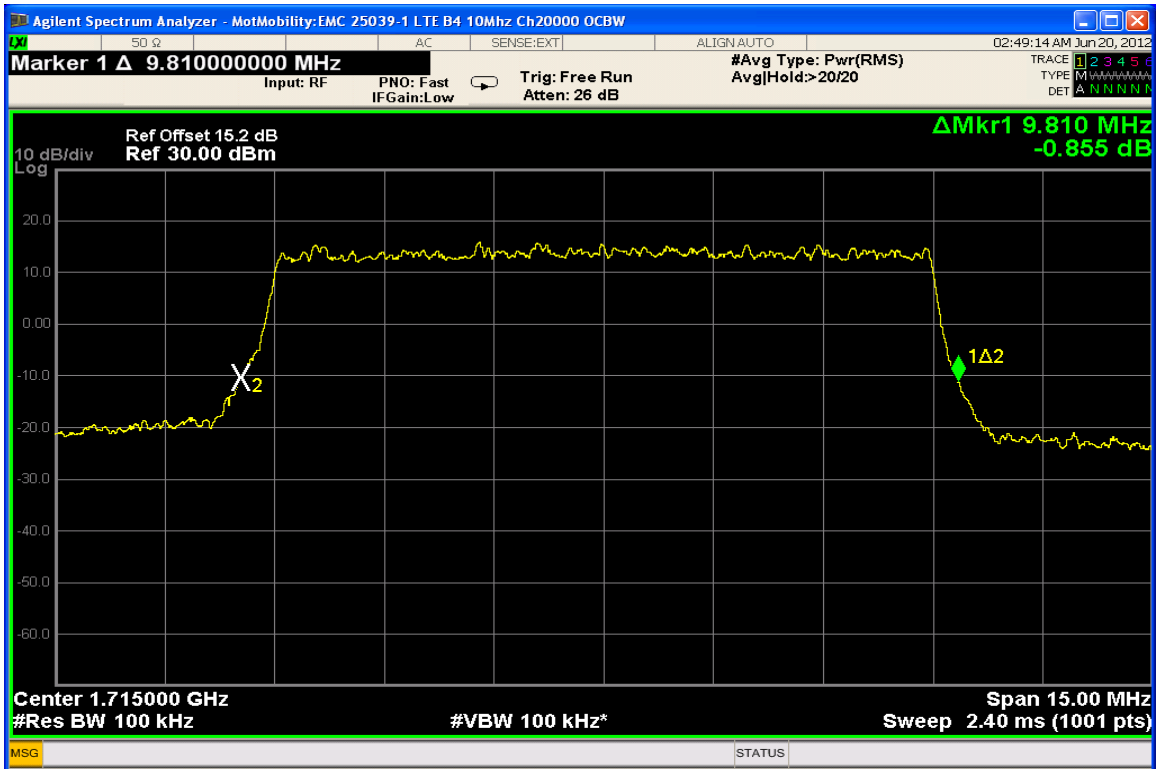
Band 4 LTE - 5MHz BW, QPSK RB Size = 25 RB Start 0



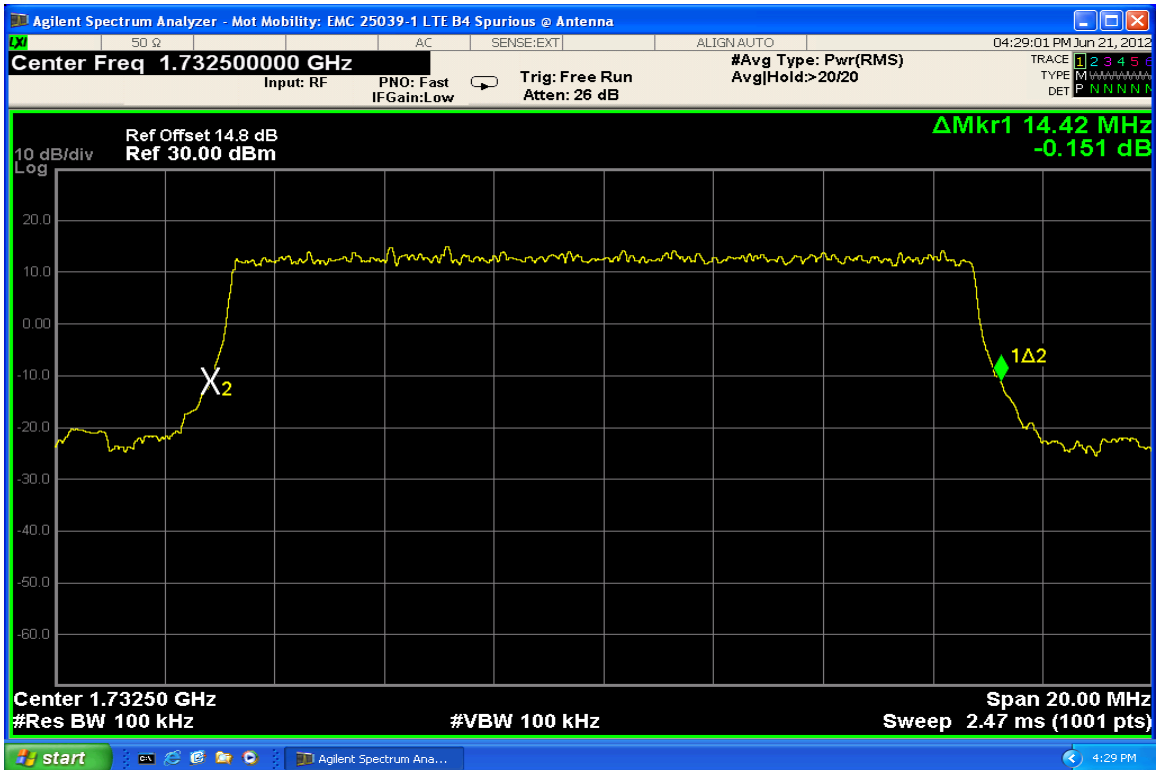
Band 4 LTE - 5MHz BW, 16QAM RB Size = 25 RB Start 0



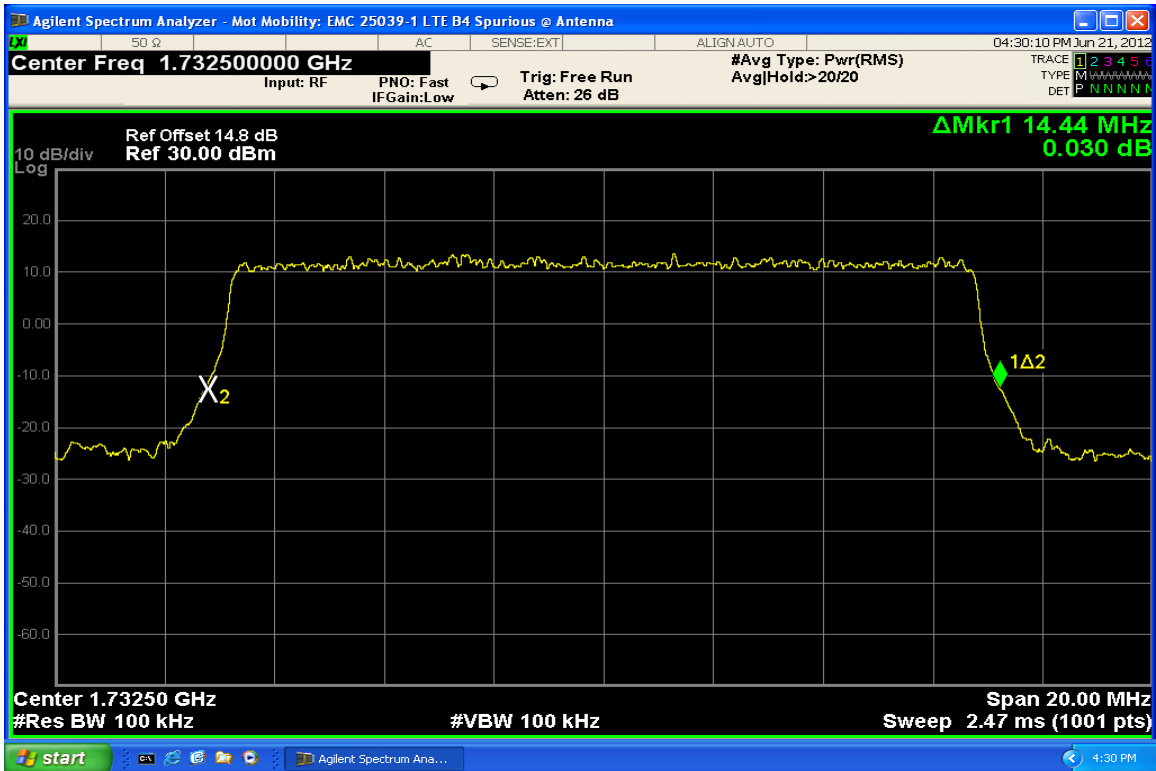
Band 4 LTE - 10MHz BW, QPSK RB Size = 50 RB Start 0



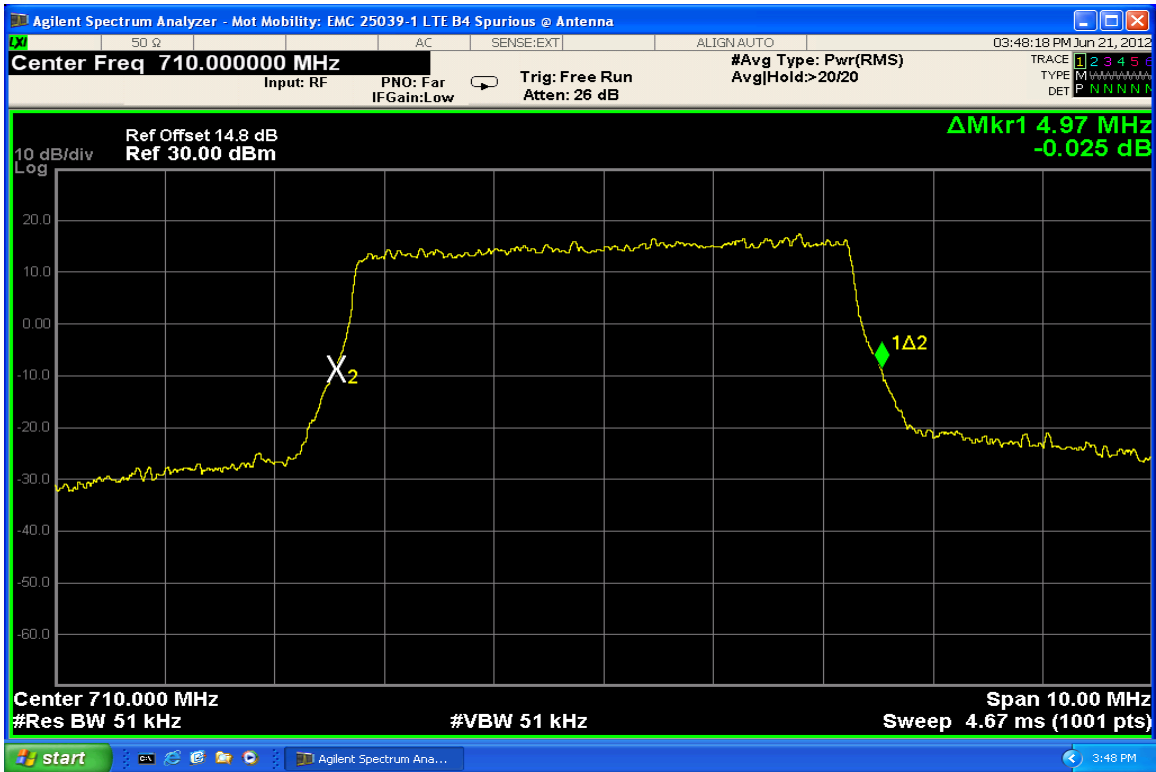
Band 4 LTE - 10MHz BW, 16QAM RB Size = 50 RB Start 0



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



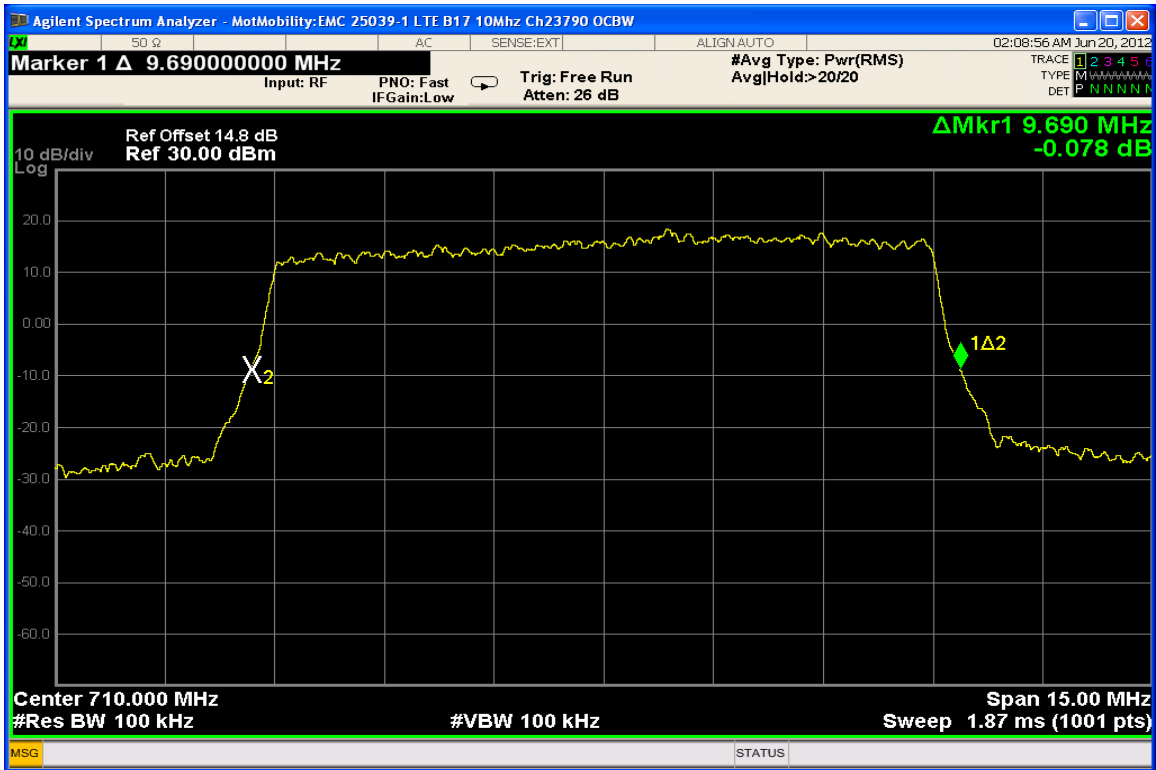
Band 4 LTE - 15MHz BW, 16QAM RB Size = 75 RB Start 0



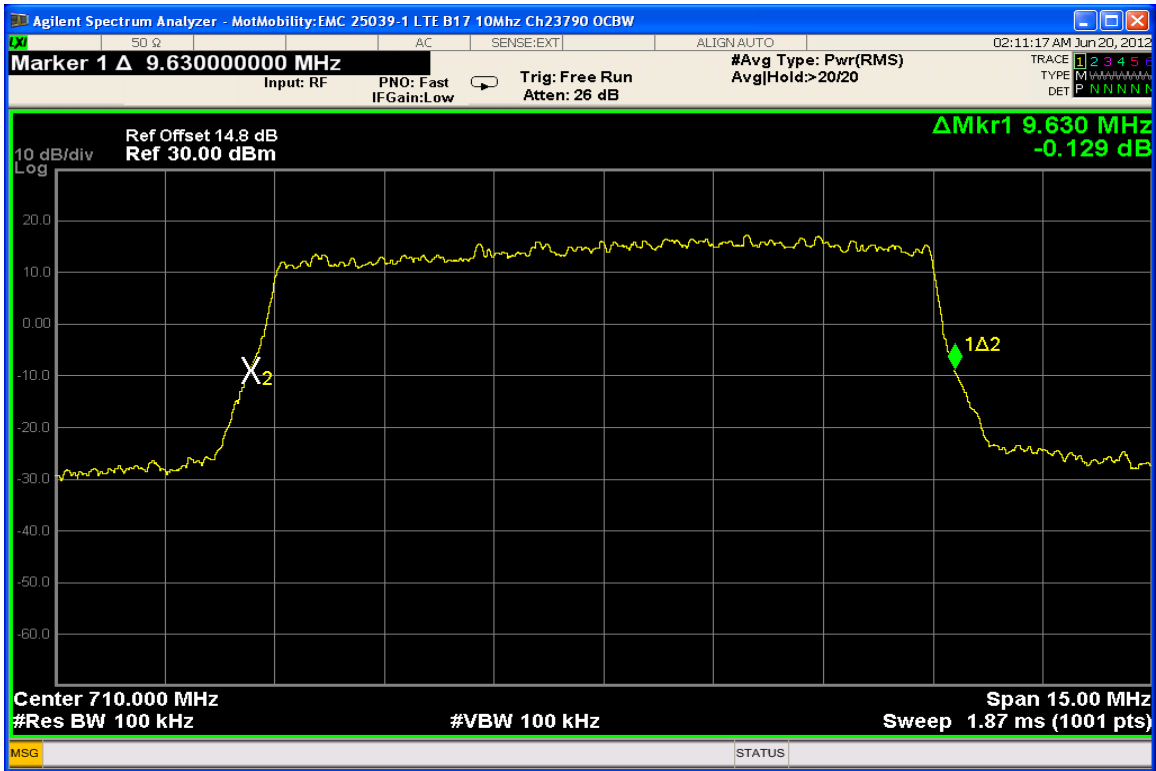
Band 17 LTE - 5MHz BW, QPSK RB Size = 25 RB Start 0



Band 17 LTE - 5MHz BW, 16QAM RB Size = 25 RB Start 0



Band 17 LTE - 10MHz BW, QPSK RB Size = 50 RB Start 0



Band 17 LTE - 10MHz BW, 16QAM RB Size = 50 RB Start 0

BAND EDGE MEASUREMENTS

§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 Peak Detector and each trace is set for Max Hold. The fully charged internal battery was used for the supply voltage.

(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.

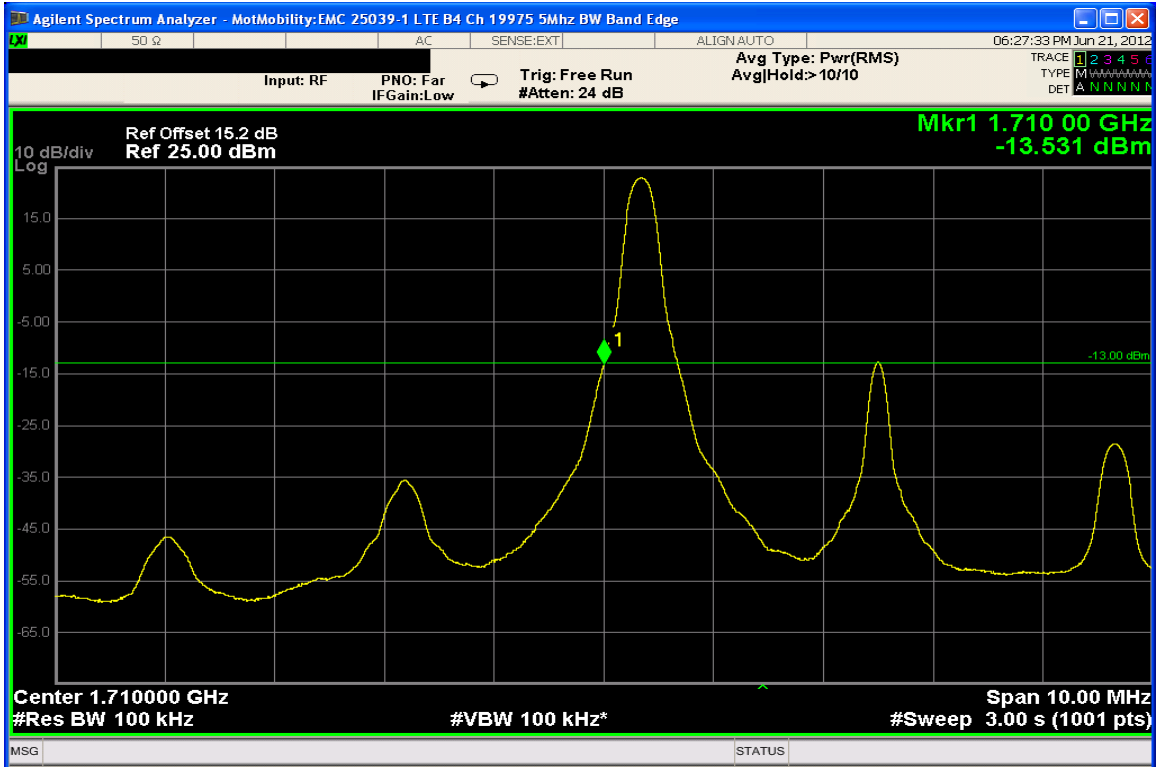
(h) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

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

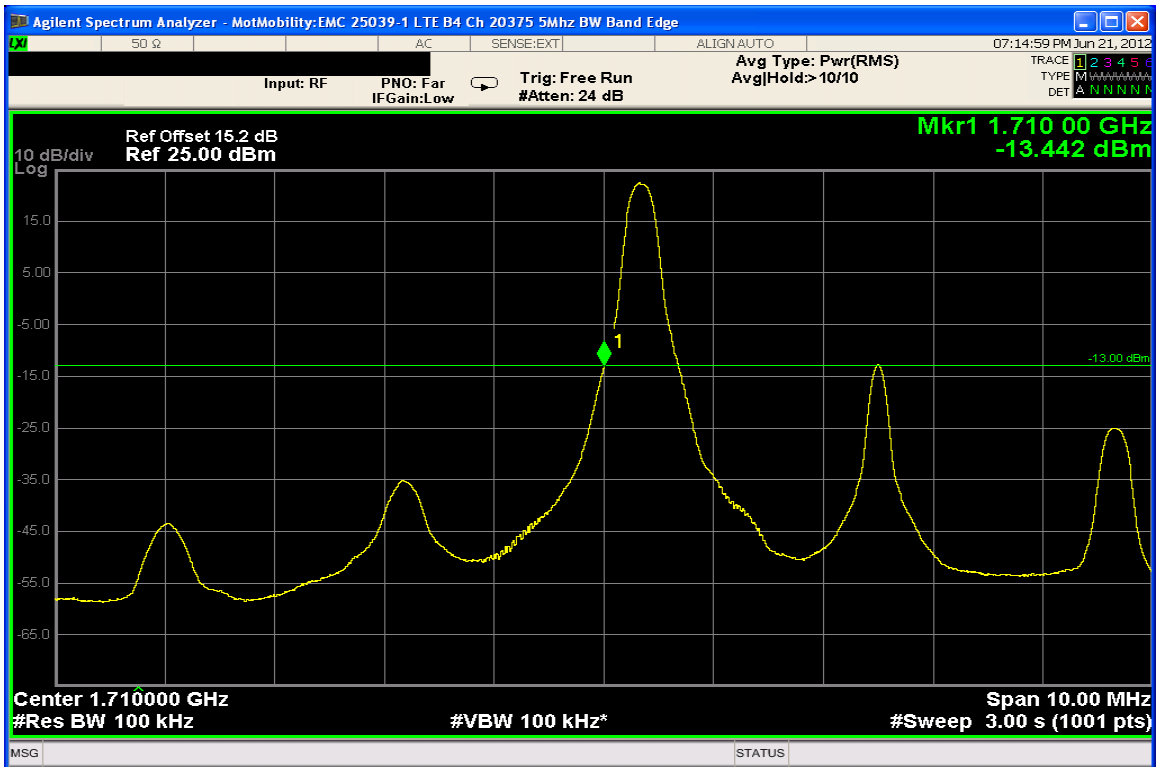
Measurement Results

Attached

Measurement Results: Band 4 Low Band Edge



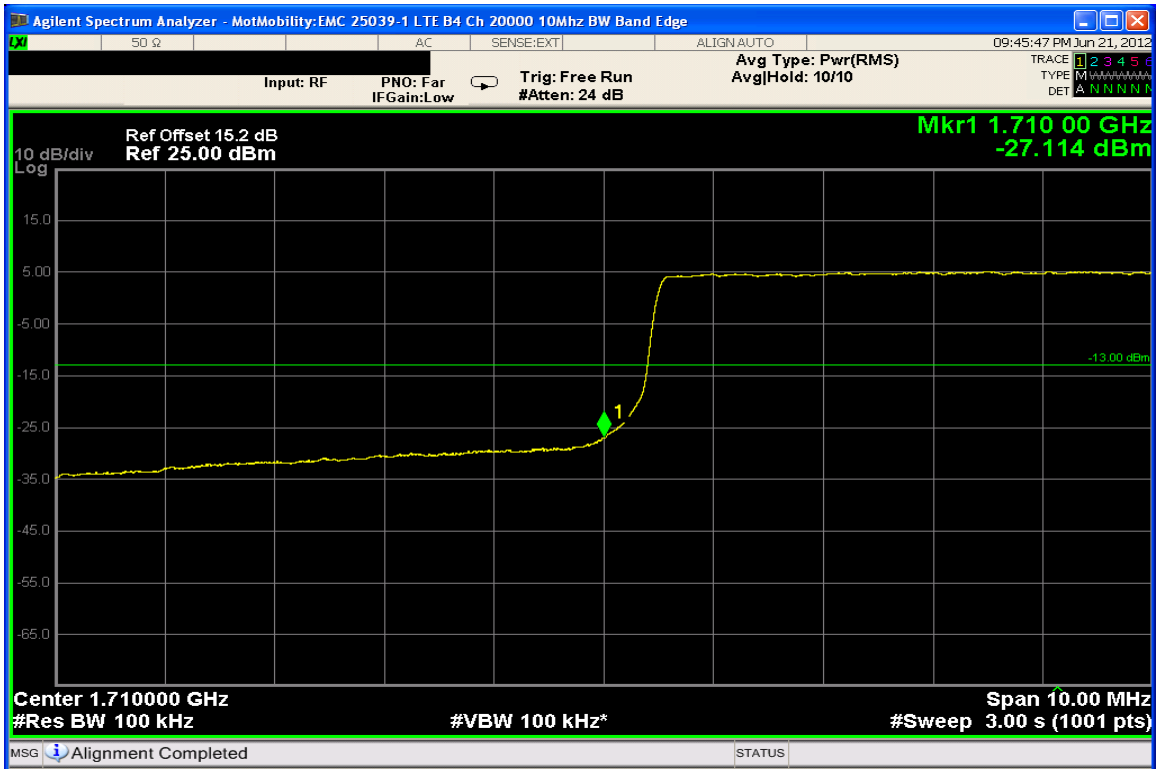
Band 4 LTE - 5MHz BW, QPSK RB Size = 1RB Start 0



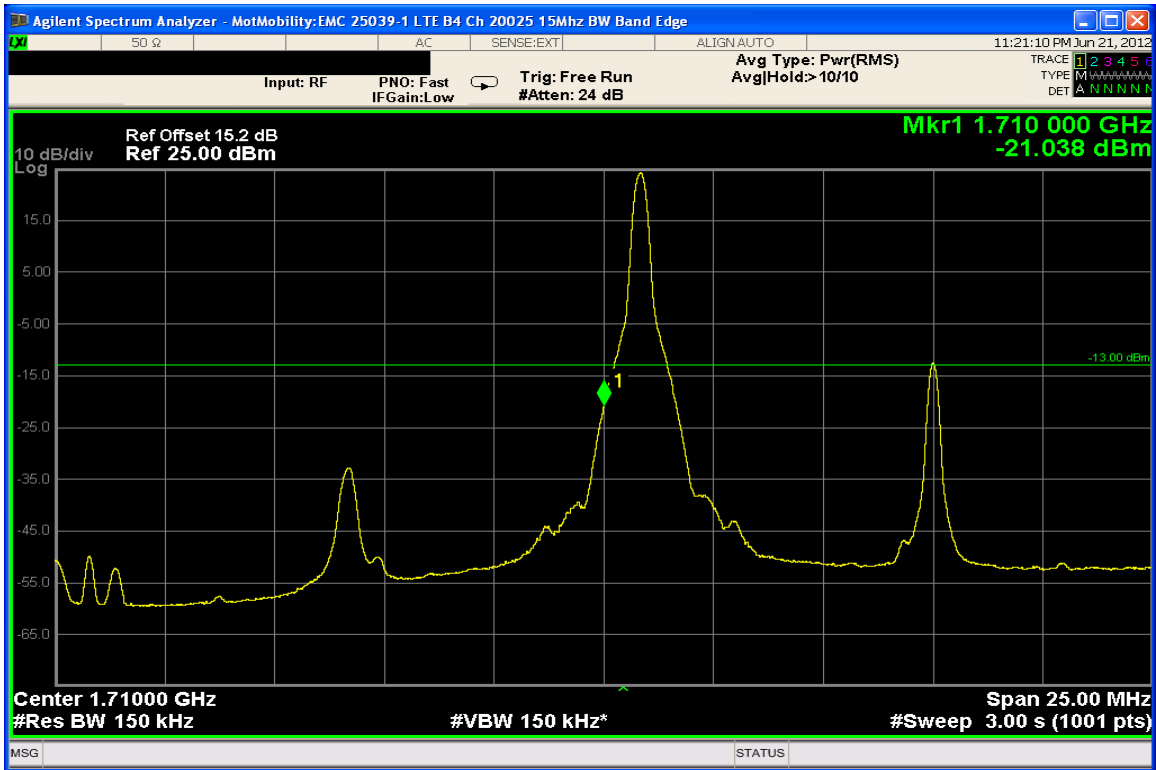
Band 4 LTE - 5MHz BW, 16QAM RB Size = 1RB Start 0



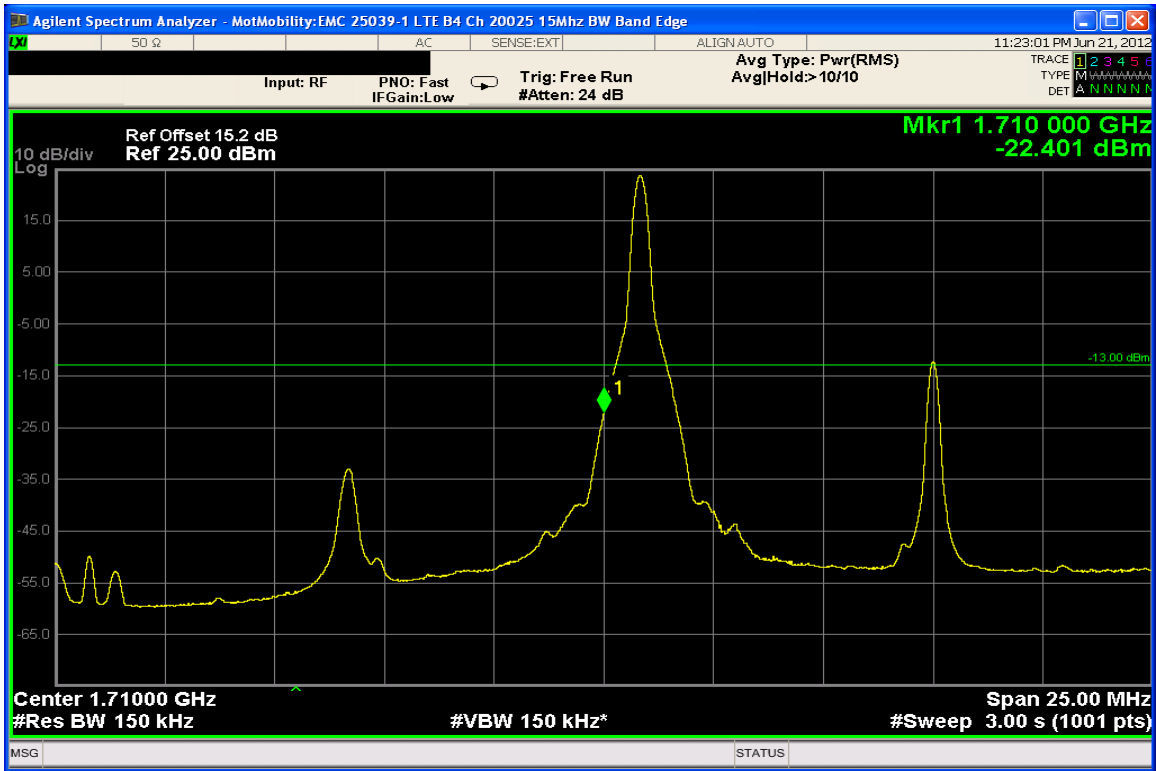
Band 4 LTE - 10MHz BW, QPSK RB Size = 50RB Start 0



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

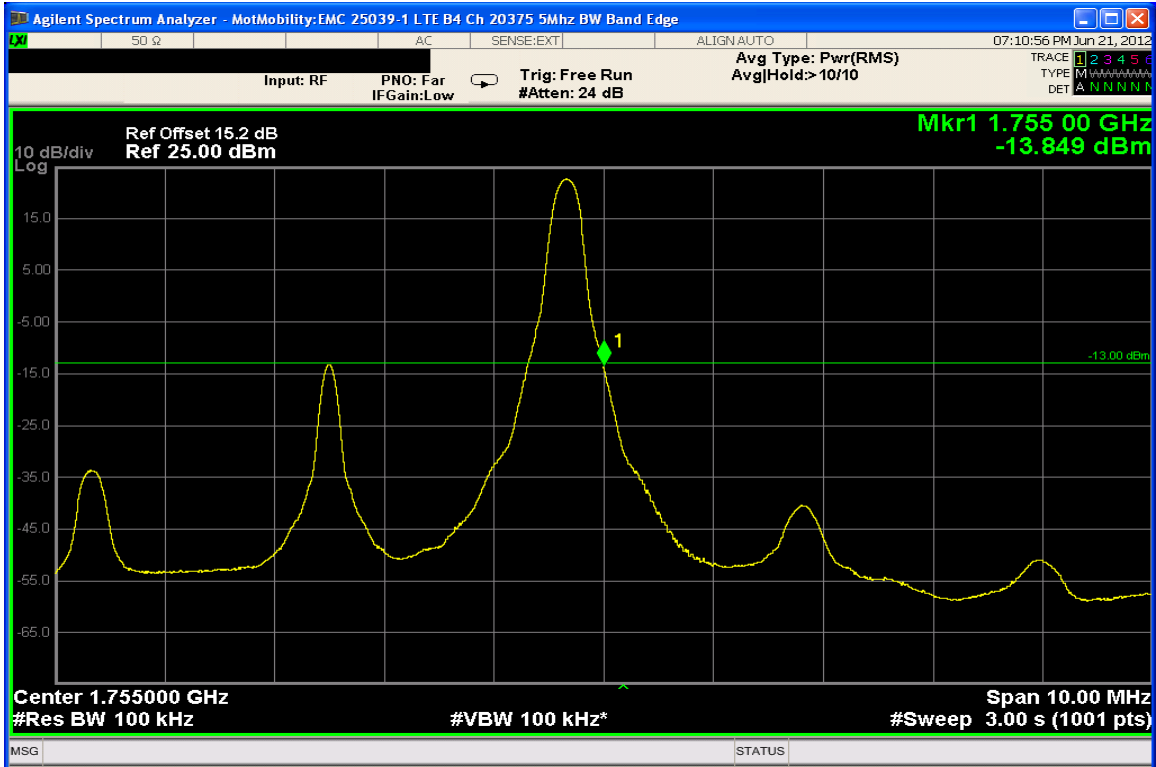


Band 4 LTE - 15MHz BW, QPSK RB Size = 1RB Start 0

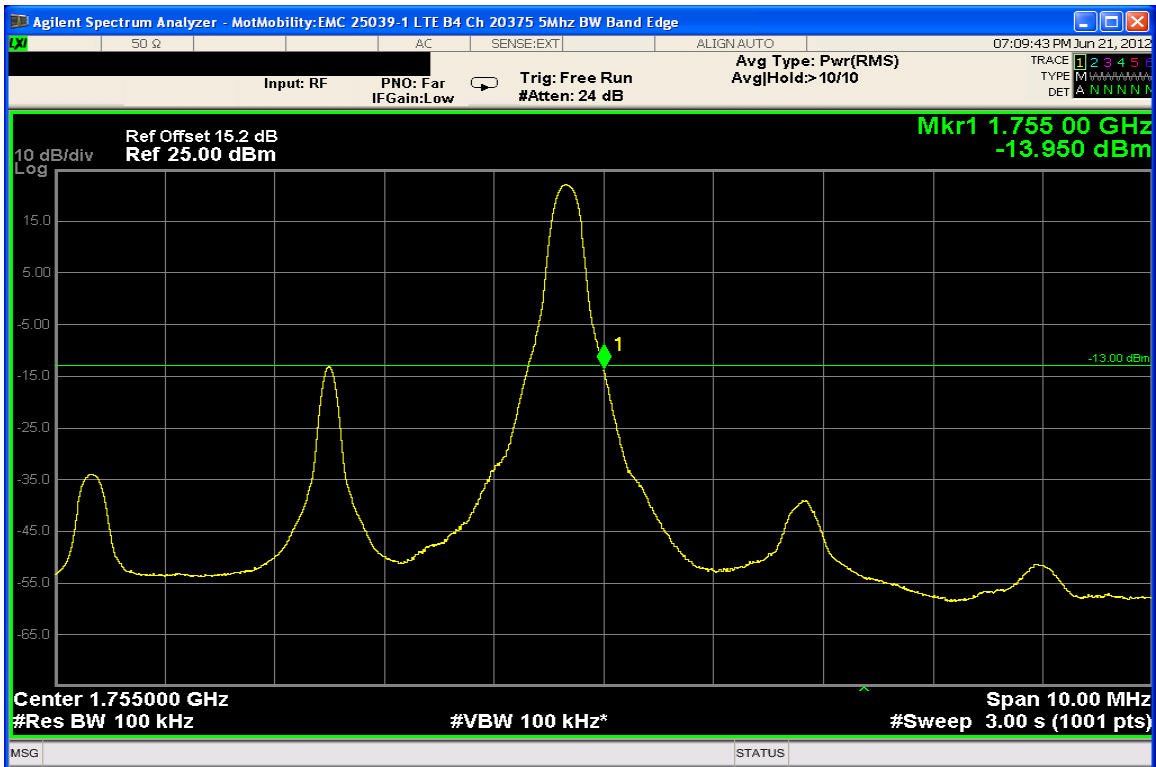


Band 4 LTE - 15MHz BW, 16QAM RB Size = 1RB Start 0

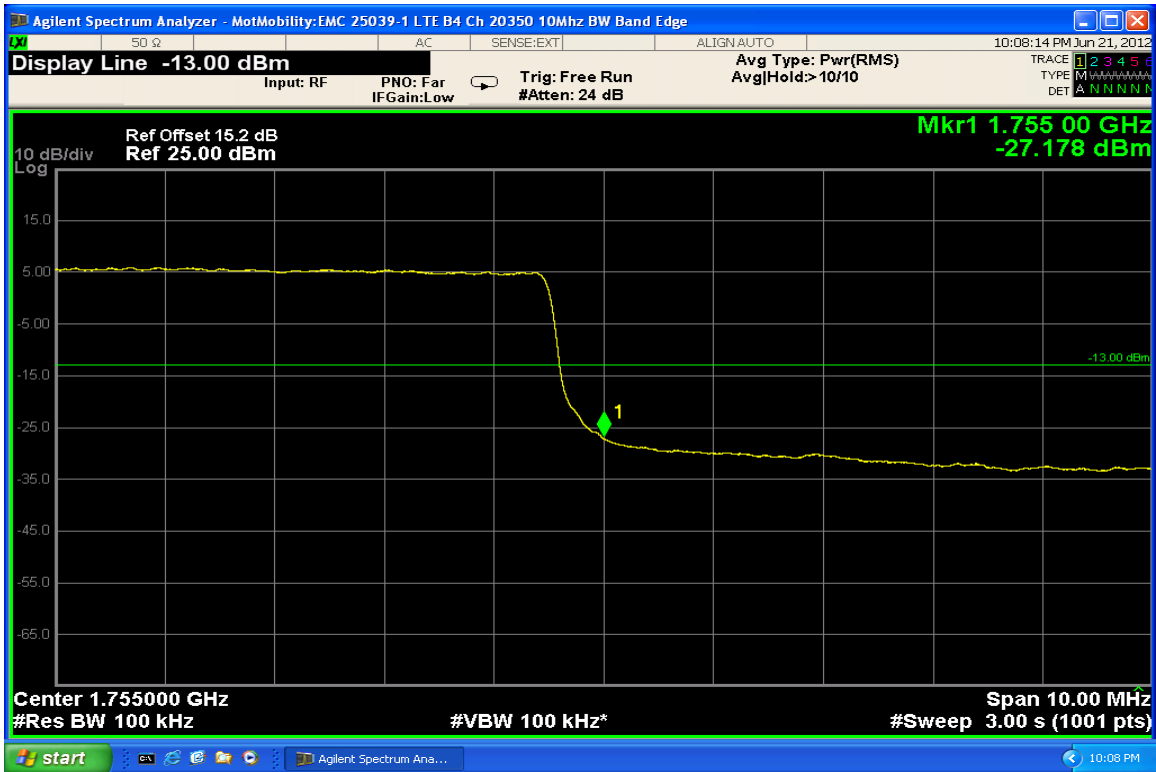
Measurement Results: LTE Band 4 High Band Edge



Band 4 LTE - 5MHz BW, QPSK RB Size = 1RB Start 24



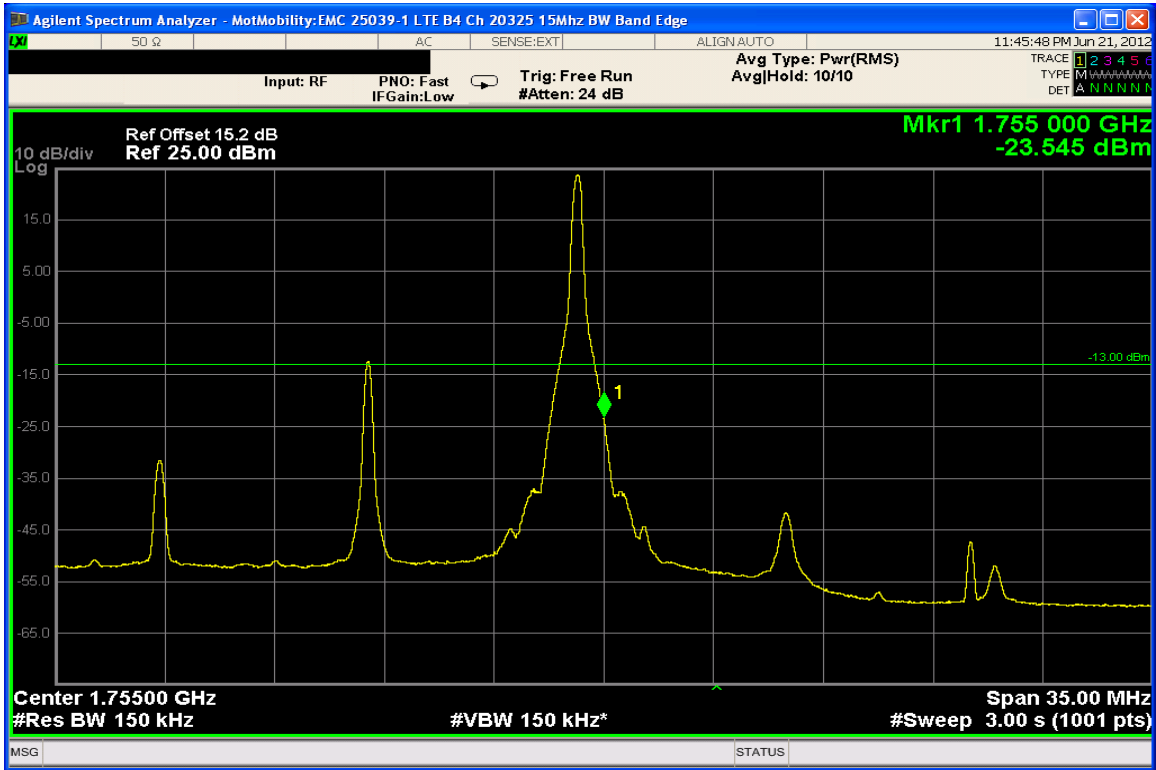
Band 4 LTE - 5MHz BW, 16QAM RB Size = 1RB Start 24



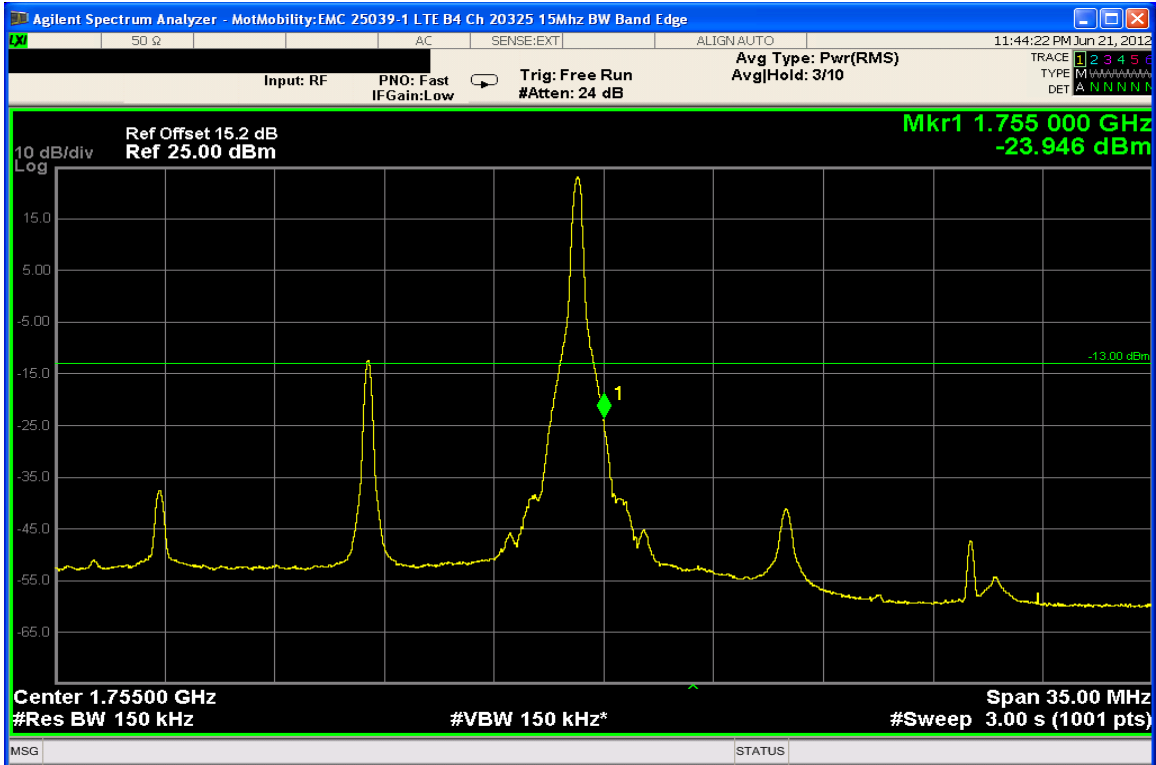
Band 4 LTE - 10MHz BW, QPSK RB Size = 50RB Start 0



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

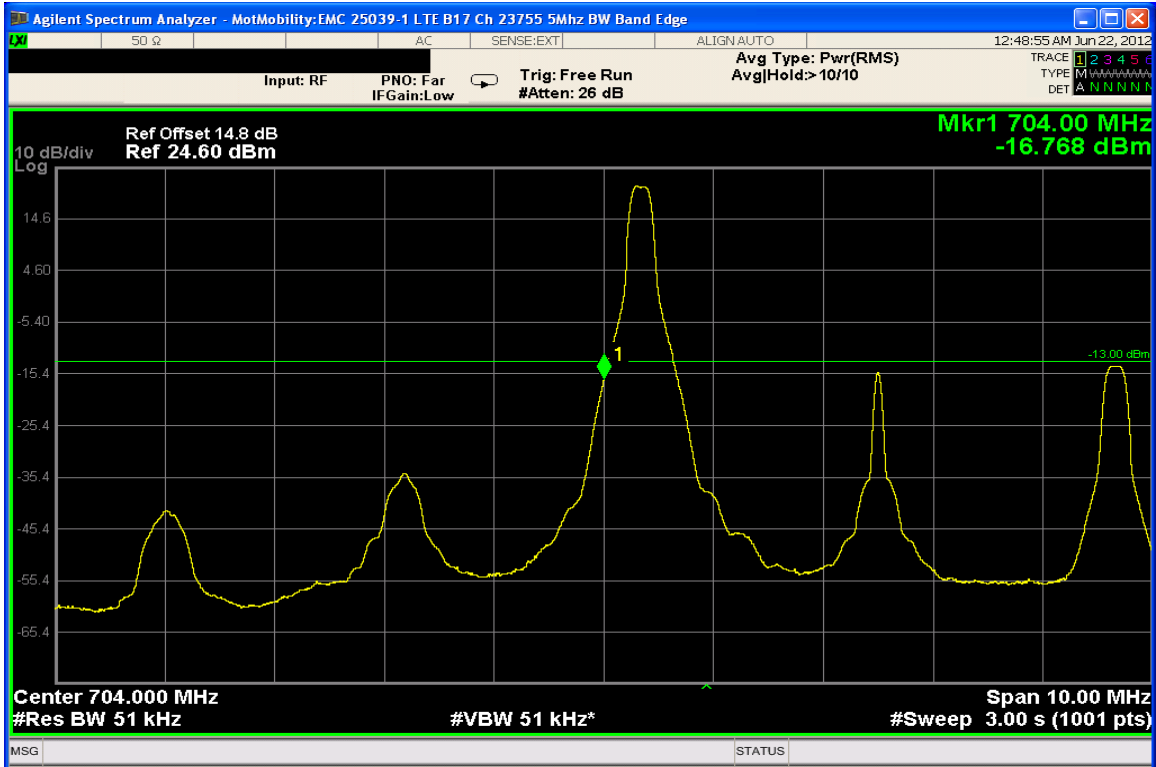


Band 4 LTE - 15MHz BW, QPSK RB Size = 1RB Start 74

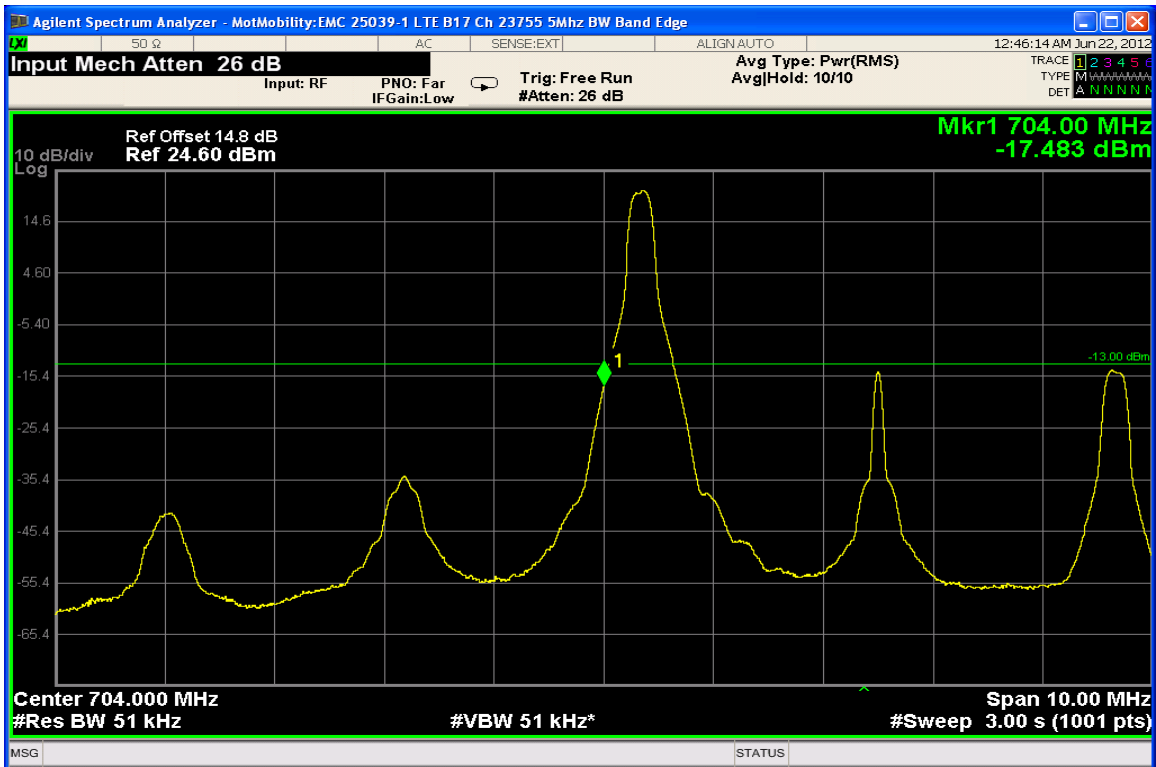


Band 4 LTE - 15MHz BW, 16QAM RB Size = 1RB Start 74

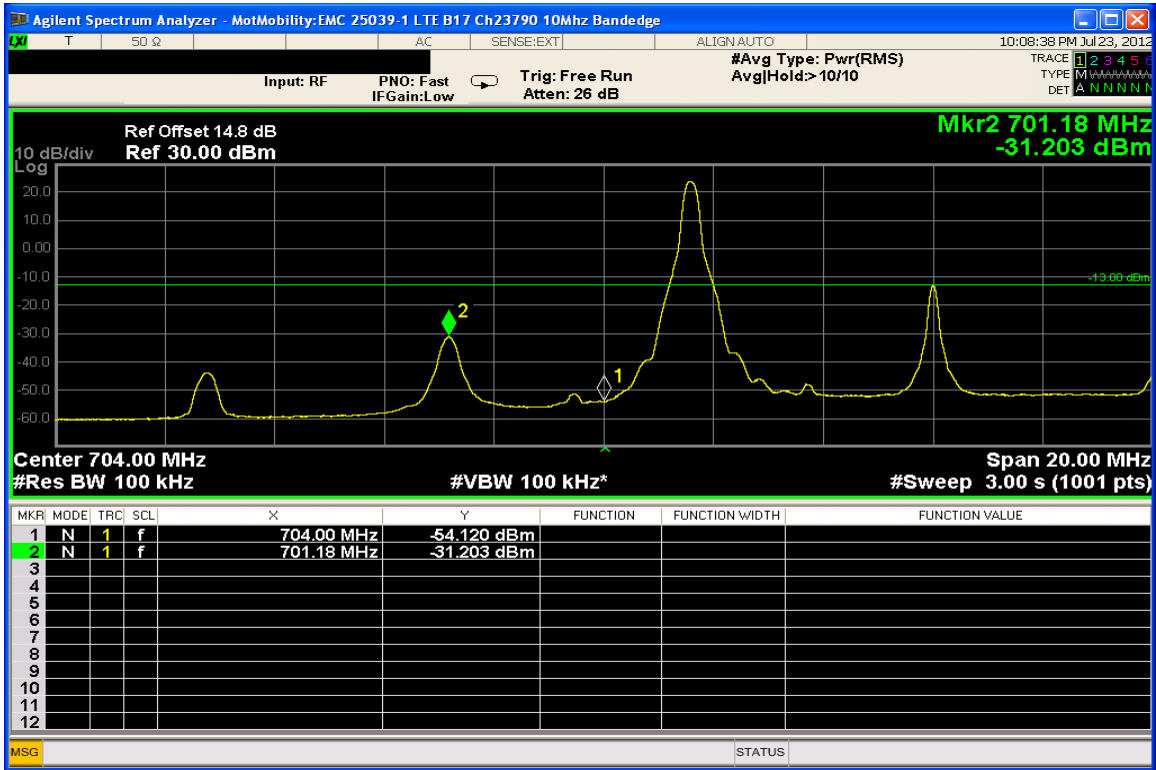
Measurement Results: Band 17 Low Band Edge



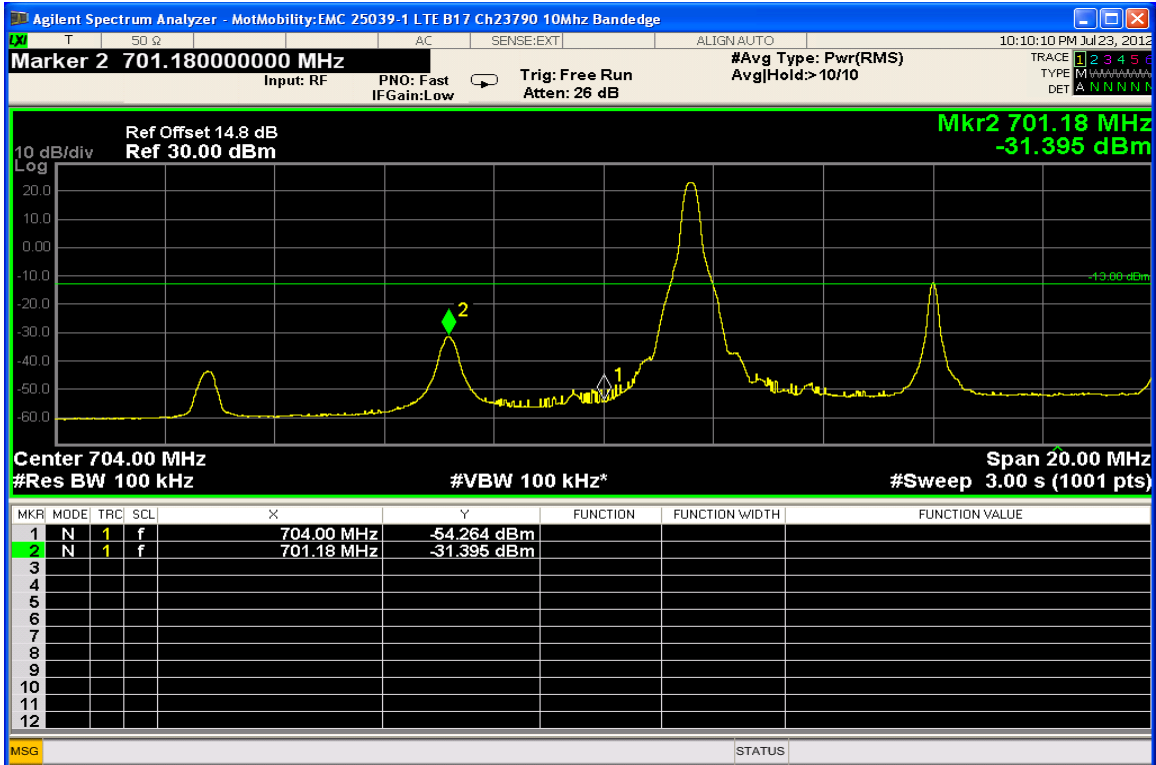
Band 17 LTE - 5MHz BW, QPSK RB Size = 1RB Start 0



Band 17 LTE - 5MHz BW, 16QAM RB Size = 1RB Start 0

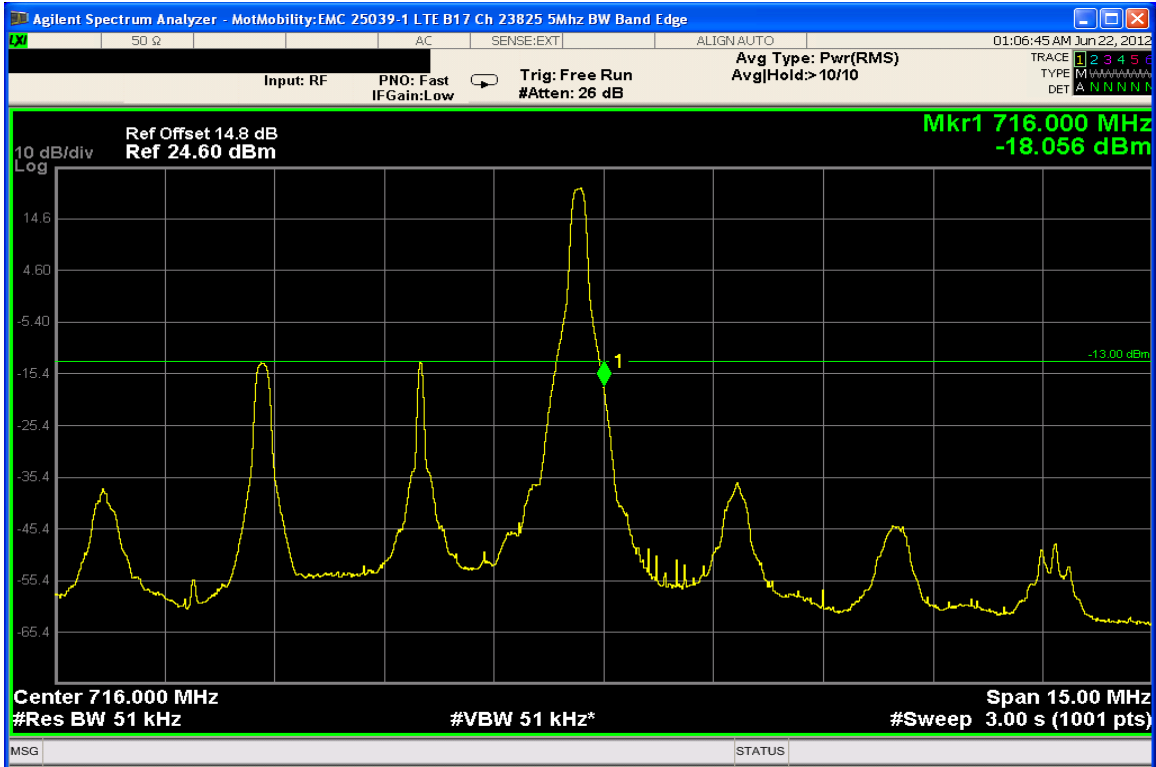


Band 17 LTE - 10MHz BW, QPSK RB Size = 1RB Start 0

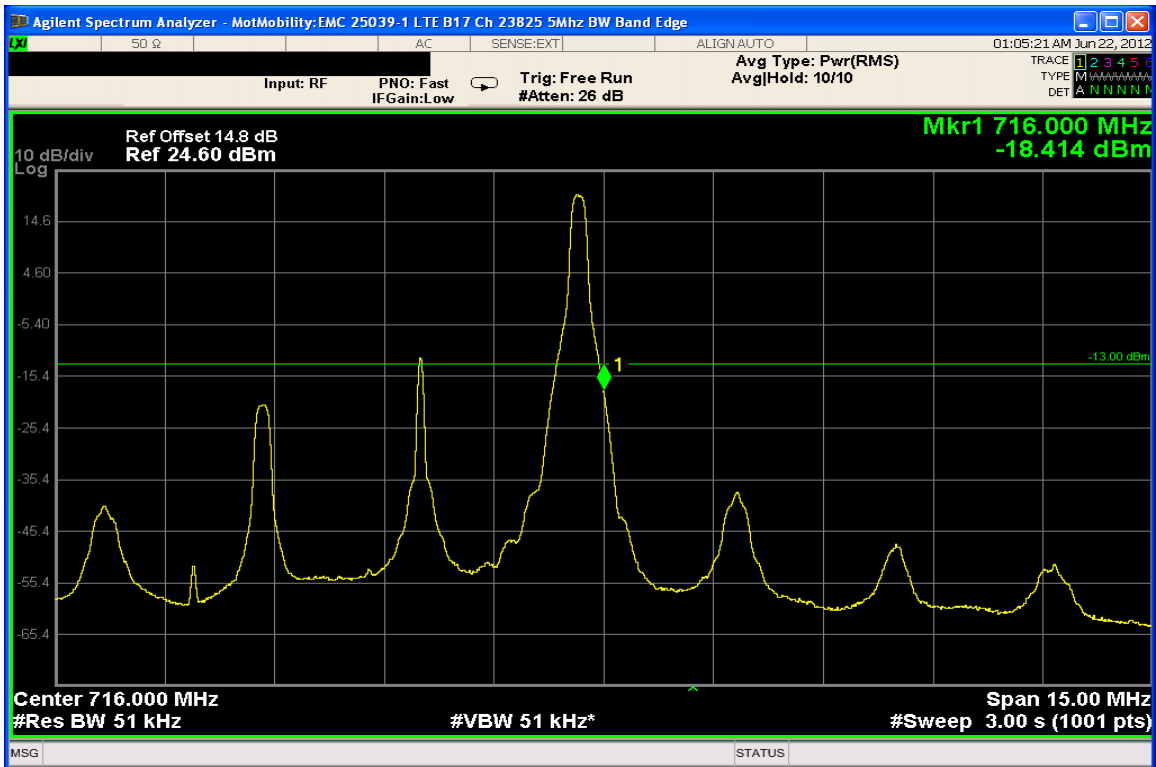


Band 17 LTE - 10MHz BW, 16QAM RB Size = 1RB Start 0

Measurement Results: Band 17 High Band Edge



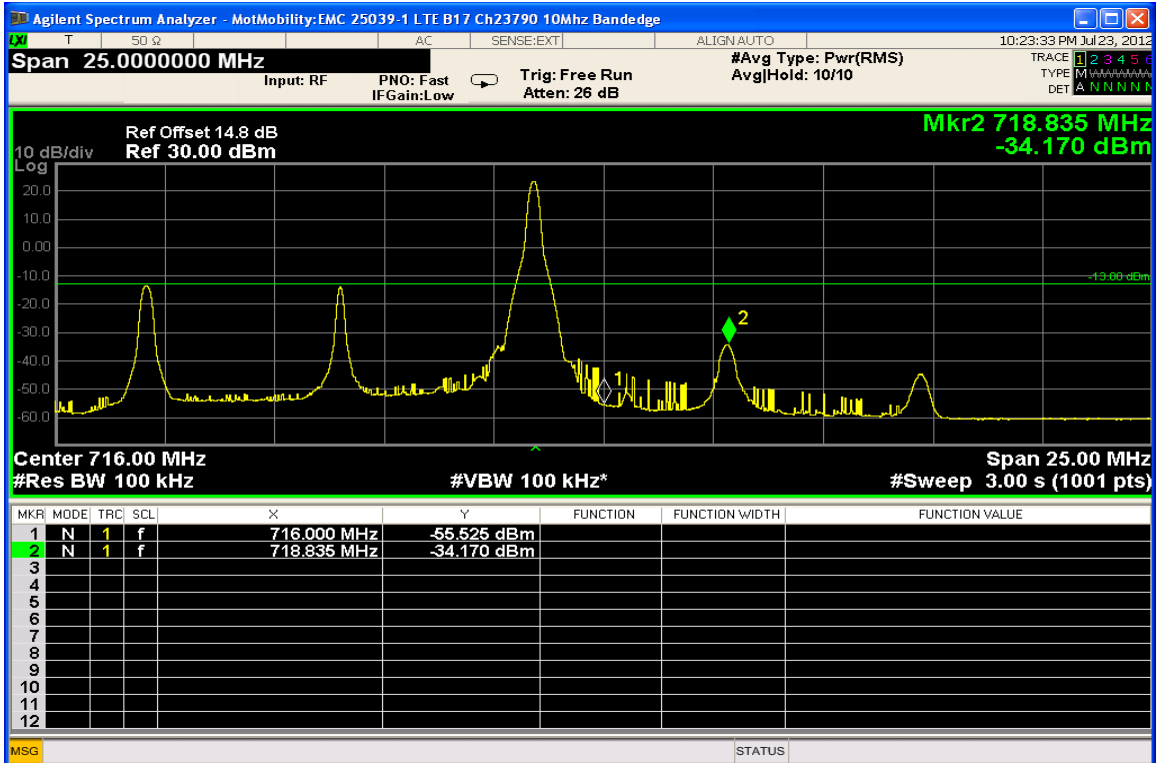
Band 17 LTE - 5MHz BW, QPSK RB Size = 1RB Start 24



Band 17 LTE - 5MHz BW, 16QAM RB Size = 1RB Start 24



Band 17 LTE - 10MHz BW, QPSK RB Size = 50RB Start 0



Band 17 LTE - 10MHz BW, 16QAM RB Size = 1RB Start 49

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

§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.

(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.

(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.

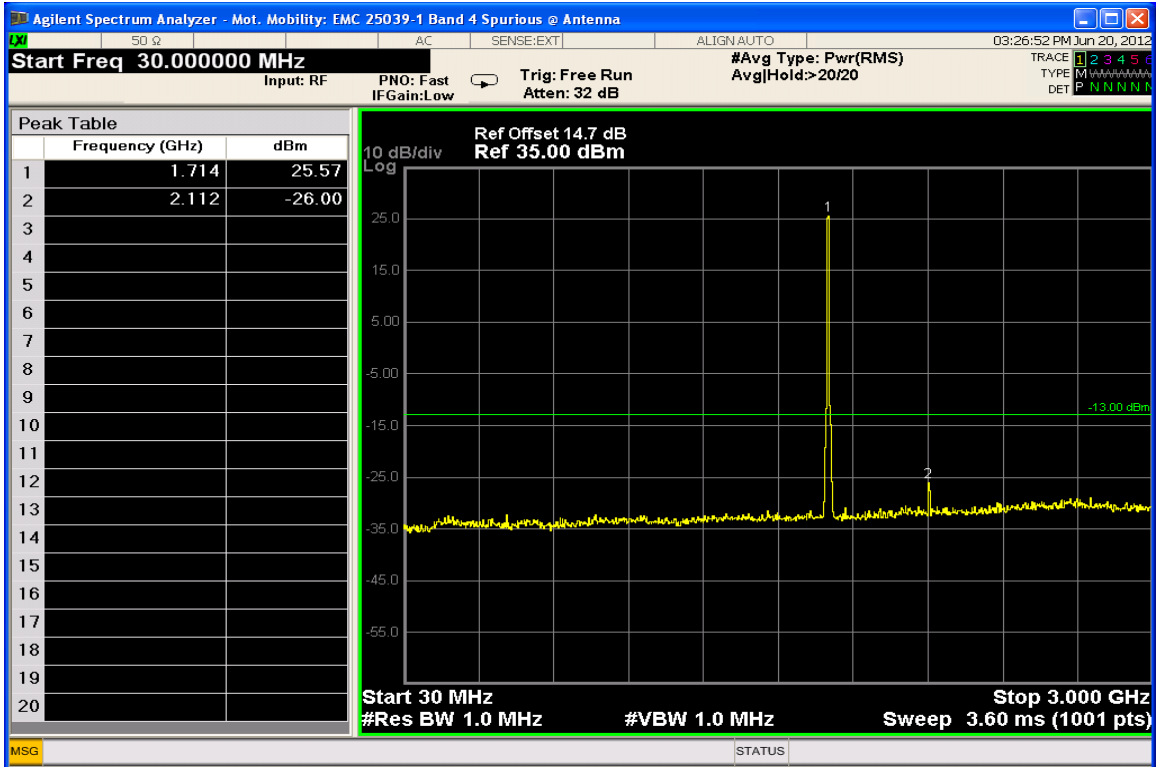
The limit line was set at -13 dBm for Band 4 and Band 17

The spectrum analyzer settings were as follows:

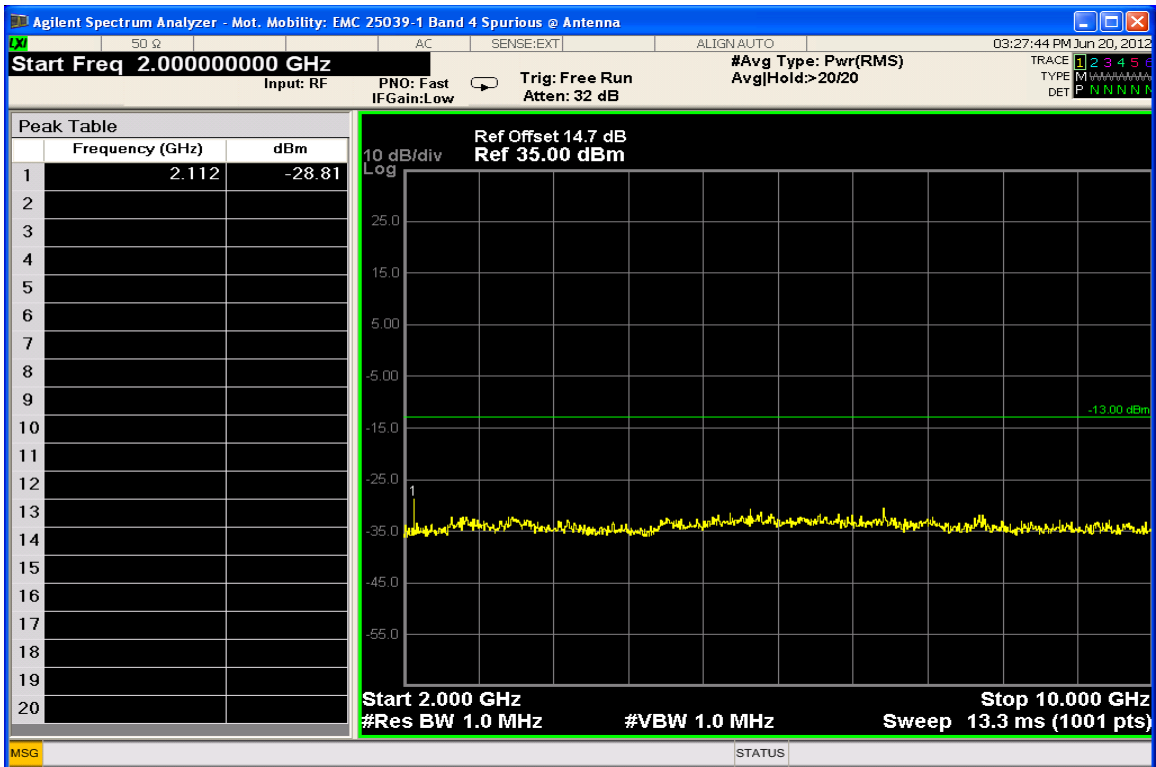
Units	dBm
Divisions	10 dB
Detector	Peak Detector
Resolution Bandwidth	1MHz for Band 4; 100kHz for Band 17
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

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

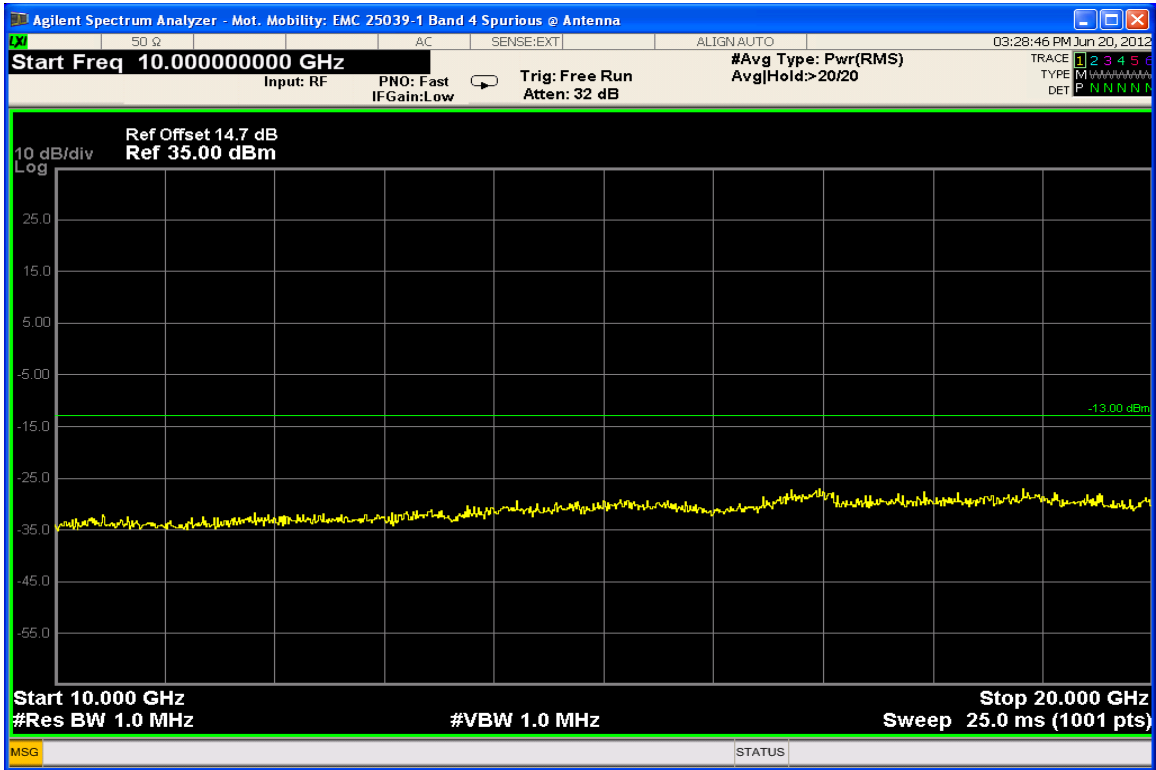
Measurement Results: LTE Band 4 Conducted Spurious Emissions



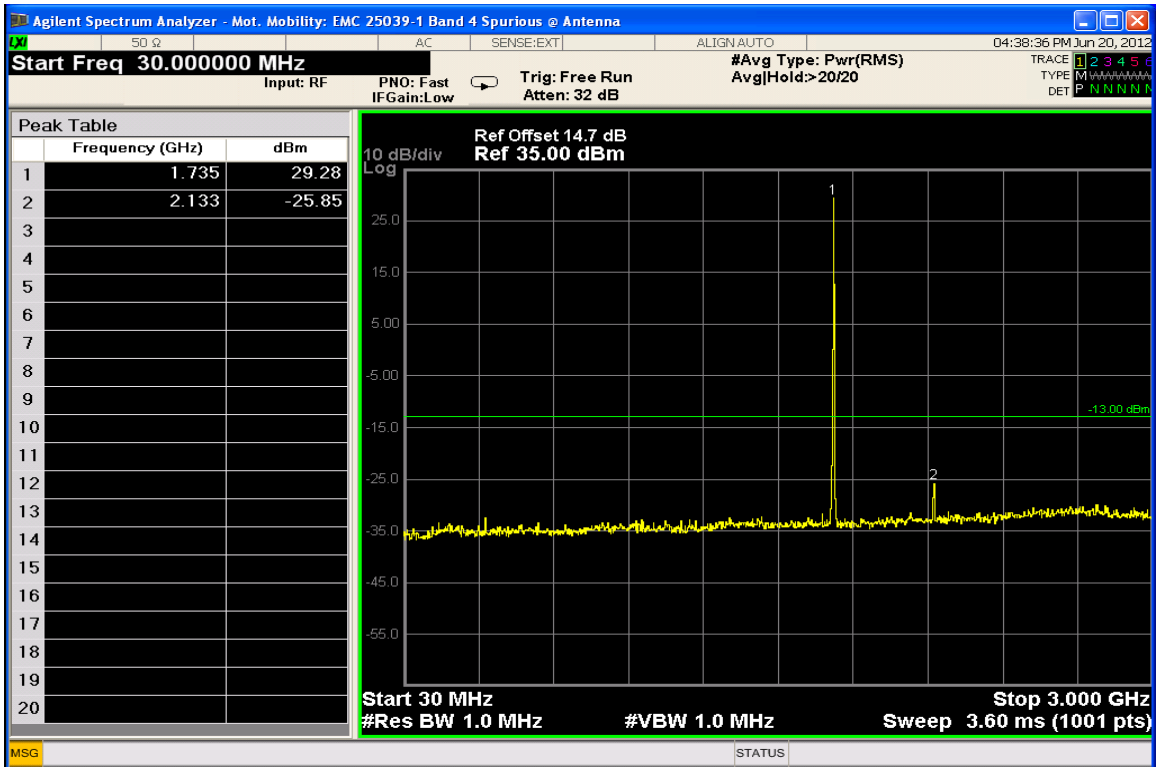
5MHz BW, 16QAM RB Size = 25RB Start 0, Low Channel



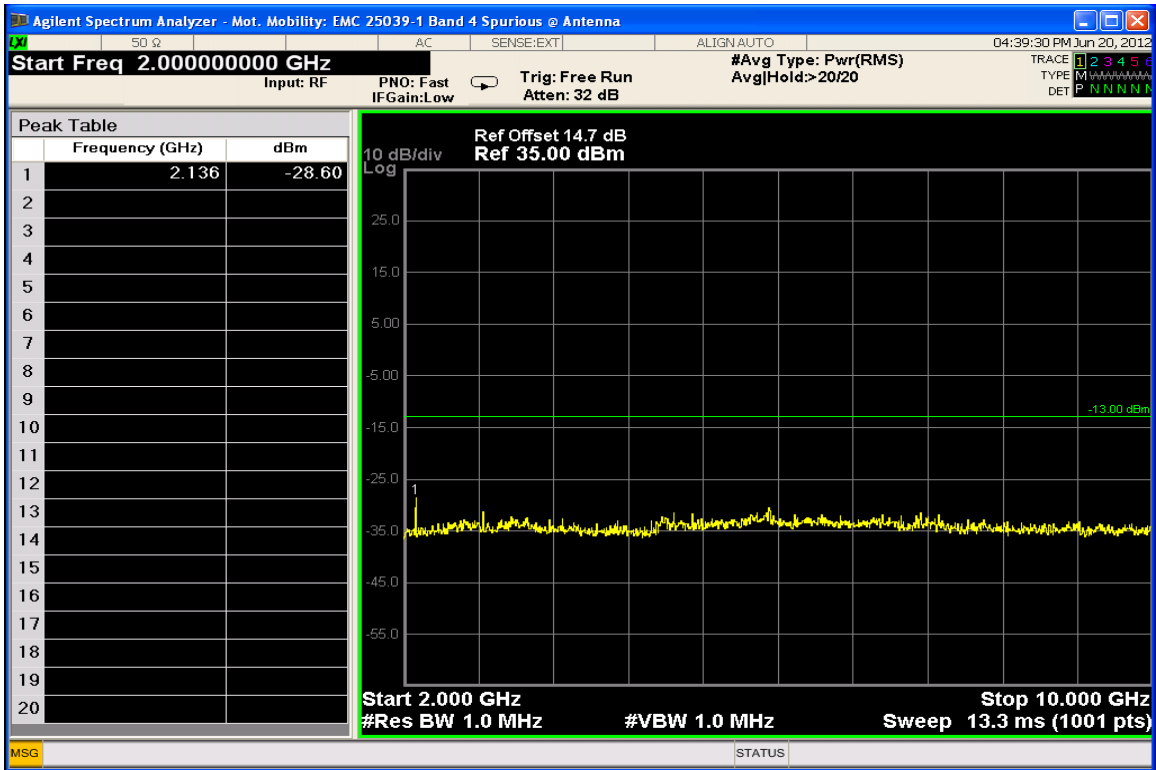
5MHz BW, 16QAM RB Size = 25RB Start 0, Low Channel



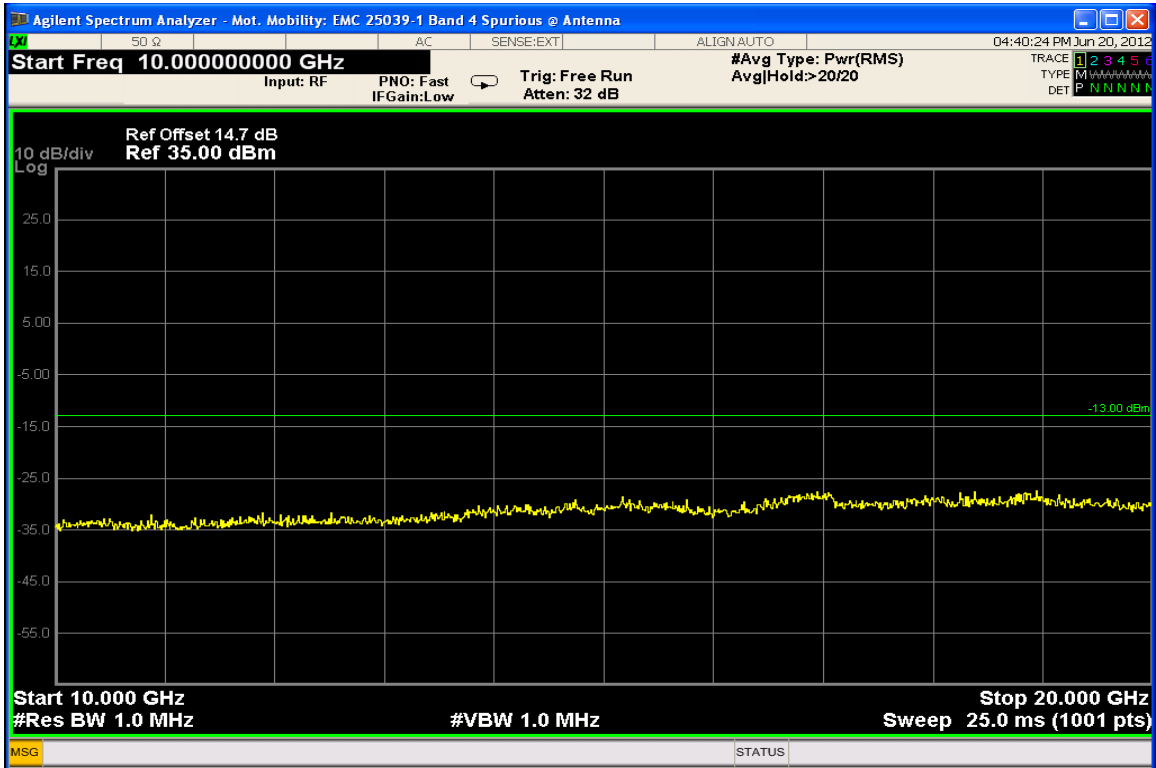
5MHz BW, 16QAM RB Size = 25RB Start 0, Low Channel



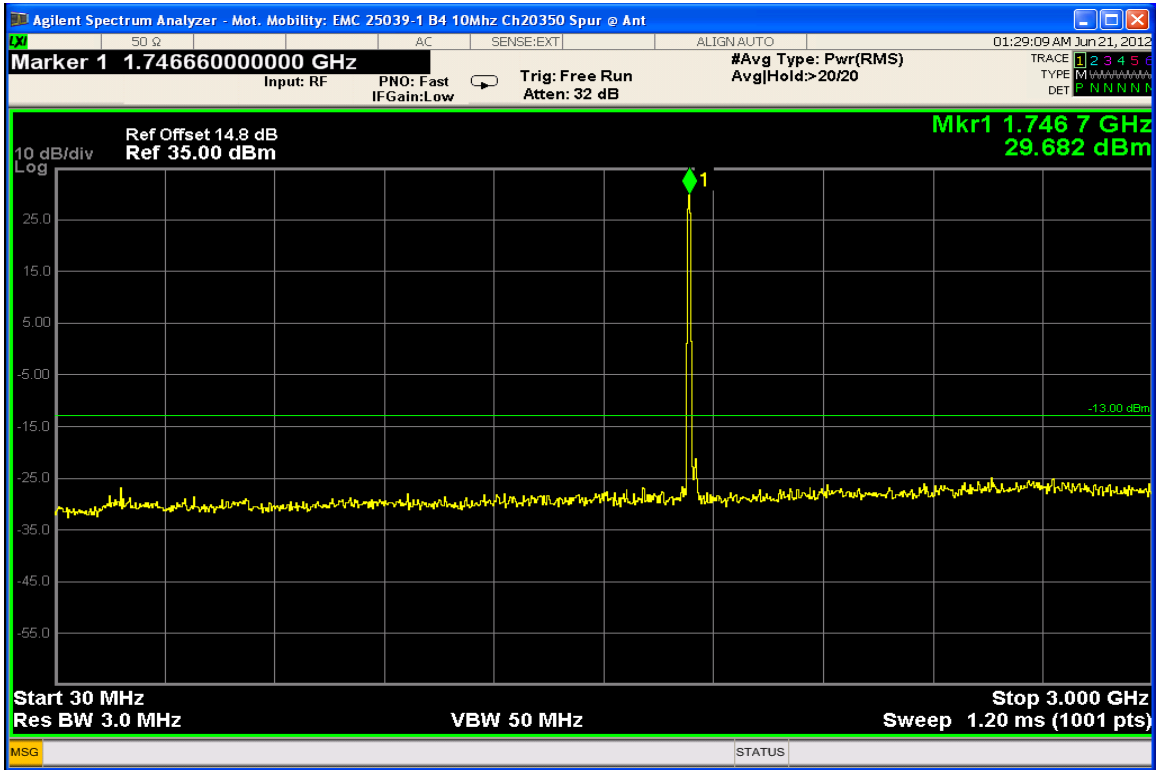
5MHz BW, QPSK RB Size = 1RB Start 24, Mid Channel



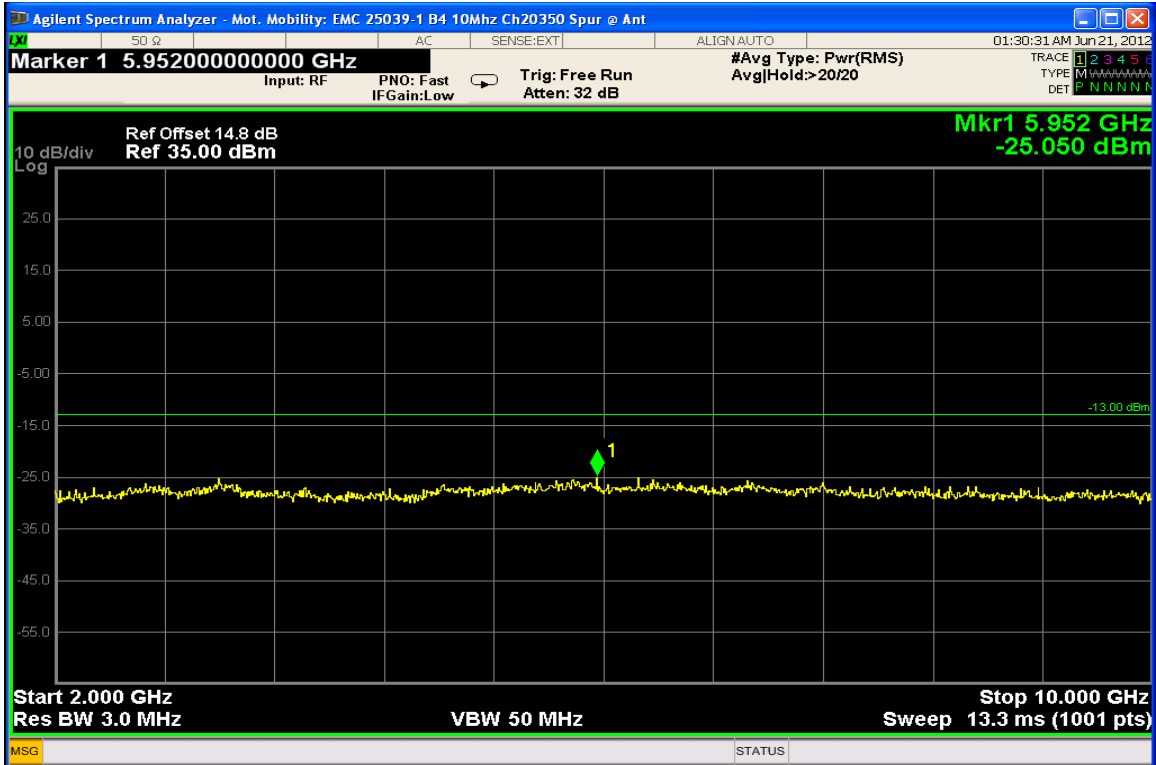
5MHz BW, QPSK RB Size = 1RB Start 24, Mid Channel



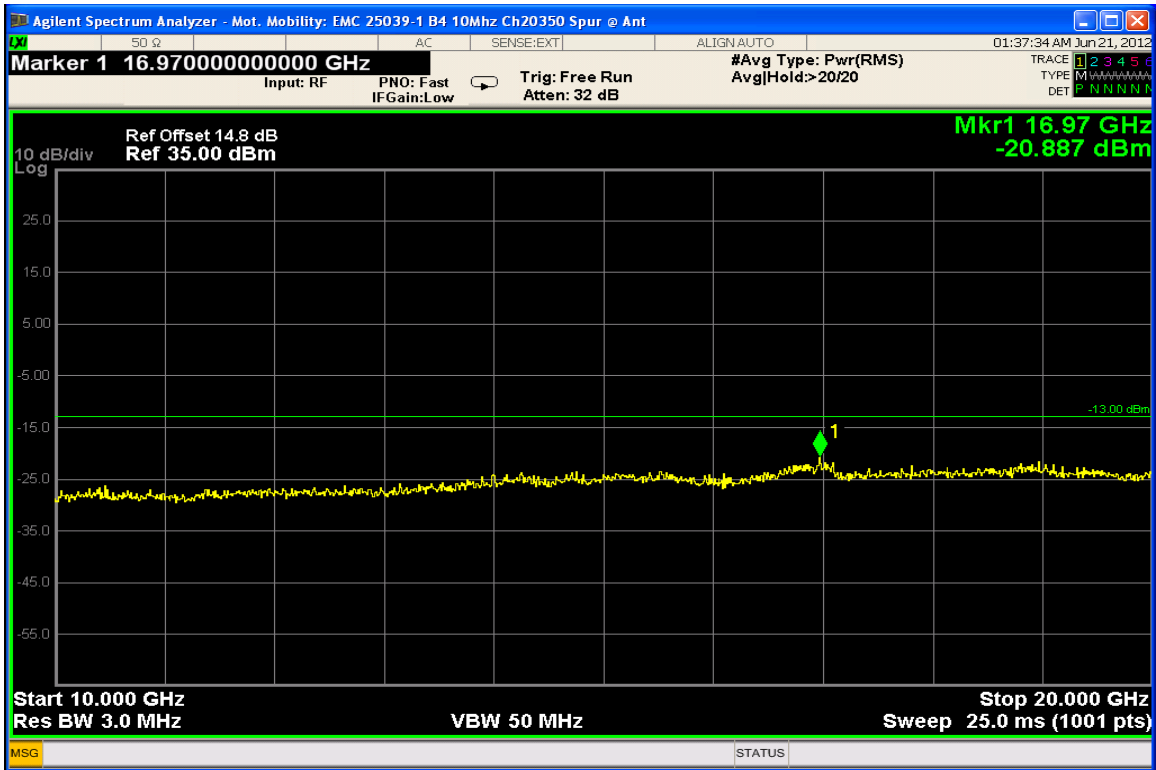
5MHz BW, QPSK RB Size = 1RB Start 24, Mid Channel



10MHz BW, 16QAM RB Size = 1RB Start 49, High Channel

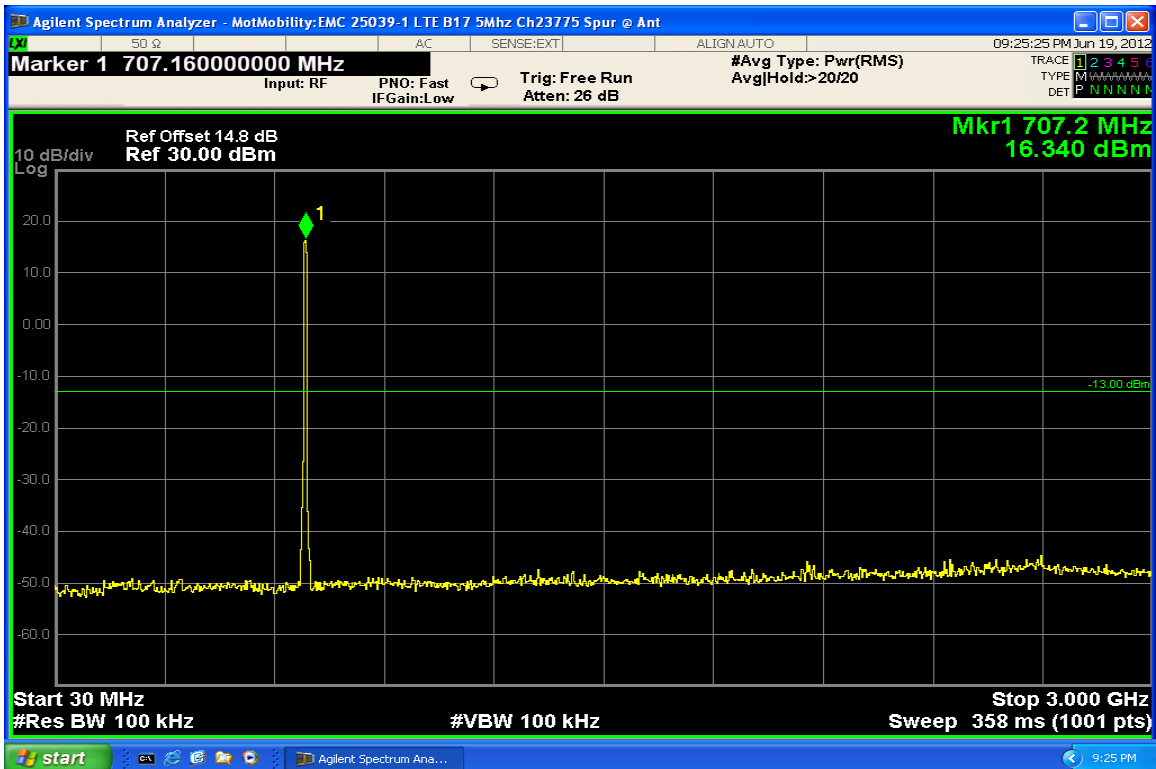


10MHz BW, 16QAM RB Size = 1RB Start 49, High Channel

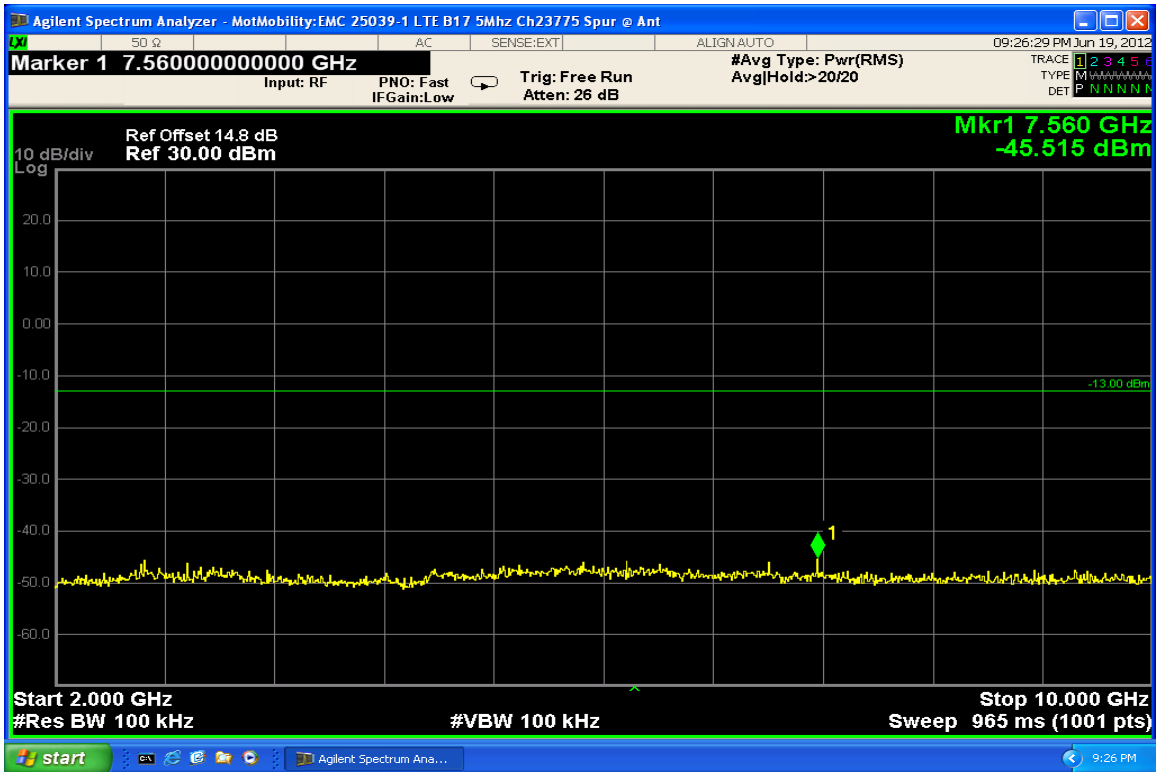


10MHz BW, 16QAM RB Size = 1RB Start 49, High Channel

Measurement Results: LTE Band 17 Conducted Spurious Emissions



5MHz BW, 16-Qam RB Size = 25 RB Start 0, Low Channel



5MHz BW, 16-Qam RB Size = 25 RB Start 0, Low Channel



5MHz BW, 16-Qam RB Size = 25 RB Start 0, Low Channel

FIELD STRENGTH OF SPURIOUS EMISSIONS

§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 worst case emission is reported for each tested mode.

(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.

(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 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

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

Measurement Results

Band: LTE Band 4 and LTE Band 17.

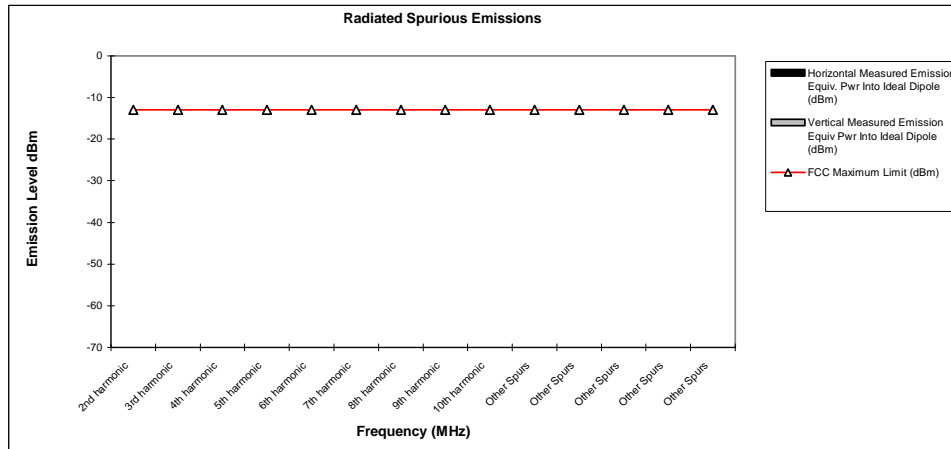
Modulation: QPSK and 16 QAM.

RB configuration: All RB configurations

Channel: All Channels

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.

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 -30°C to $+60^{\circ}\text{C}$ 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.

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

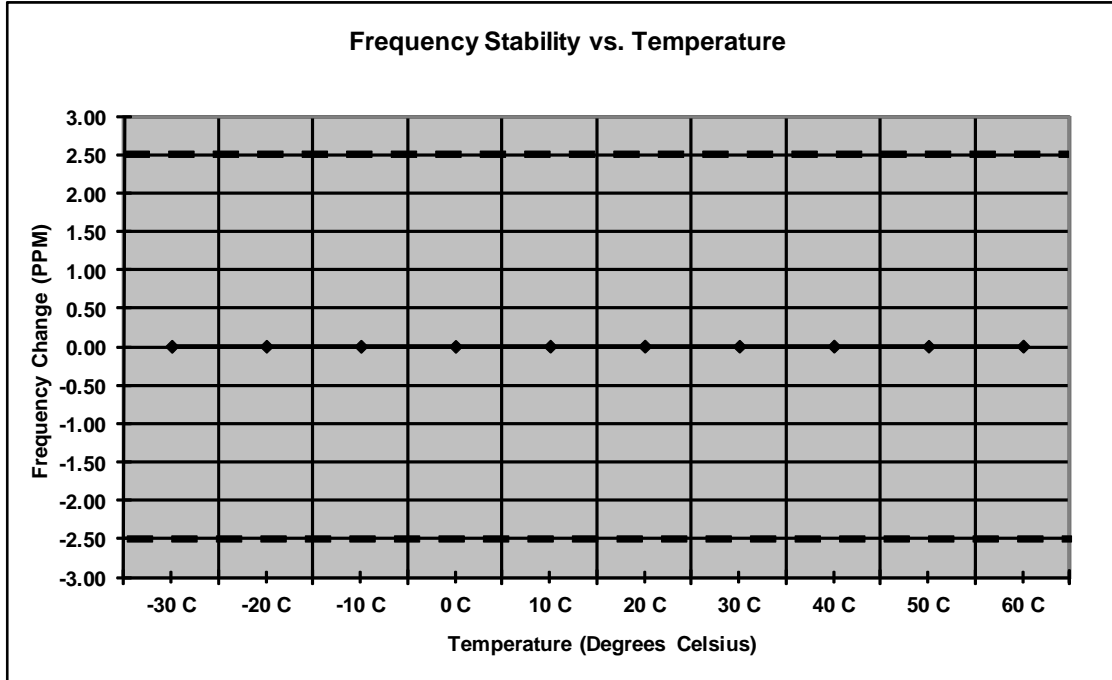
Measurement Results

Modulation: LTE Band 4 QPSK 15MHz BW

Frequency Stability

Mode: Band 4 LTE 15Mhz **Operating Frequency:** 1717.5
Channel: 20025 **Deviation Limit (PPM):** 2.5 ppm
 75RB low QPSK

Temperature C	Frequency Error HZ	Frequency Error (PPM)	Voltage (%)	Voltage (VDC)
-30 C	7.11	0.008	100%	3.80
-20 C	7.24	0.009	100%	3.80
-10 C	6.91	0.008	100%	3.80
0 C	6.68	0.008	100%	3.80
10 C	7.78	0.009	100%	3.80
20 C	8.01	0.010	100%	3.80
30 C	7.71	0.009	100%	3.80
40 C	8.04	0.010	100%	3.80
50 C	7.68	0.009	100%	3.80
60 C	7.98	0.010	100%	3.80
20 C	7.51	0.009	Battery Endpoint	3.20

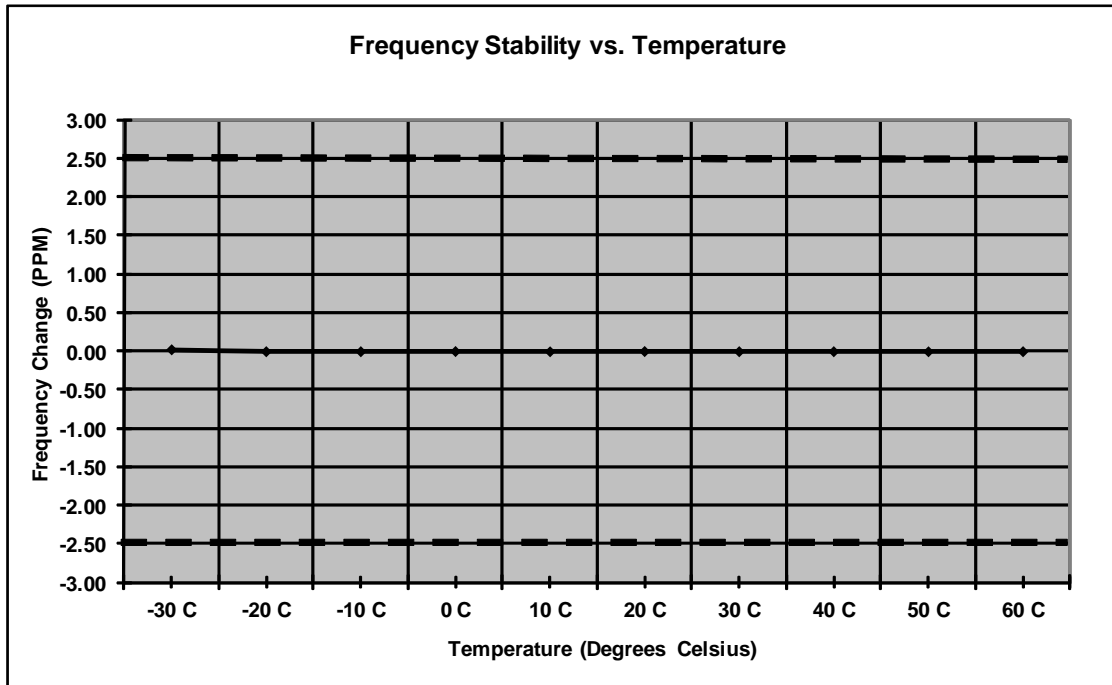


Modulation: LTE Band 17 QPSK 10MHz BW

Frequency Stability

Mode: Band 17 LTE 10Mhz **Operating Frequency:** 710.0 Mhz
Channel: 23790 **Deviation Limit (PPM):** 2.5ppm
 50RB low 16QAM

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	11.50	0.014	100%	3.80
-20 C	-9.03	-0.011	100%	3.80
-10 C	-8.85	-0.011	100%	3.80
0 C	-8.65	-0.010	100%	3.80
10 C	-9.90	-0.012	100%	3.80
20 C	-8.31	-0.010	100%	3.80
30 C	-9.01	-0.011	100%	3.80
40 C	-9.33	-0.011	100%	3.80
50 C	-10.03	-0.012	100%	3.80
60 C	-9.67	-0.012	100%	3.80
20 C	-8.34	-0.010	Battery Endpoint	3.42



End of Test Report