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Report On

Application for Grant of Equipment Authorization of the
Novatel Wireless Inc.

MiFi5580 Personal Wireless Router

FCC CFR 47 Part 2 and Part 27

IC RSS-Gen and RSS-139

* This Report only covers the Radiated portion of the above requirements and the conducted port measurements were performed by Novatel Wireless Inc. and can be found attached to this report in Novatel Report No.: NVTLTR0047-03.

Report No. SC1303824C_REV1.0

July 2013

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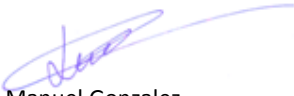


REPORT ON Radio Testing of the
Novatel Wireless Inc.
Personal Wireless Router


TEST REPORT NUMBER SC1303824C_REV1.0

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DATED _____
July 11, 2013



Revision History

SC1303824C_REV1.0 Novatel Wireless Inc. MiFi5580 Personal Wireless Router					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
05/28/13	Initial Release				Juan M Glez.
07/11/13	Initial Release	Rev 1.0	Update references and limits	8, 16 ,17 ,18 ,20 & 21.	Juan M Glez.



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SECTION 1

REPORT SUMMARY

Radio Testing of the
Novatel Wireless Inc.
Personal Wireless Router



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Novatel Wireless Inc. Personal Wireless Router to the requirements of the following:

- FCC CFR 47 Part 2 and Part 27
- IC RSS-Gen and RSS-139.

Note .- This Report only covers the Radiated portion of the above requirements and the conducted port measurements were performed by Novatel Wireless Inc. and will be presented in a different exhibit.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Novatel Wireless Inc.
Model Number(s)	MiFi5580
FCC ID Number	PKRNVWMIFI5580
IC Number	N/A
Serial Number(s)	Engineering Sample
Number of Samples Tested	1
Test Specification/Issue/Date	<ul style="list-style-type: none">• FCC CFR 47 Part 2 and Part 27 (October 1, 2011).• RSS-139 - Advanced Wireless Services Equipment Operating in the Bands 1710-1755 MHz and 2110-2155 MHz (Issue 2, February 2009).• RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 3, December 2010).
Start of Test	May 07, 2013
Finish of Test	May 20, 2013
Name of Engineer(s)	Juan Manuel Gonzalez
Related Document(s)	<ul style="list-style-type: none">• RF Exposure Lab Certificate Of Compliance SAR Evaluation Test Report Number: SAR.20130402• Supporting documents for EUT certification are separate exhibits.• Conducted port Measurements will be presented in a different report/ exhibit by Novatel Wireless Inc.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2 and Part 27 with cross-reference to the corresponding IC RSS standard is shown below.

Section	FCC Part Sections(s)	RSS Section(s)	Test Description	Result
2.1	2.1046 and 27.50 (h)(2)	RSS-139(6.4)	Equivalent Isotropic Radiated Power	Compliant
2.2	2.1046, 27.50 (b) (10) and (12)		Effective Radiated Power	Compliant
2.3	2.1053, 27.53(m) (4)	RSS-139(6.5)	Field Strength Of Spurious Radiation	Compliant
2.4		RSS-139(6.6)	Receiver Spurious Emissions	Compliant
2.5		RSS-Gen 7.2.4	Powerline Conducted Emissions	Compliant

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was a Novatel Wireless Inc. MiFi5580 Personal Wireless Router. The EUT creates a personal Wi-Fi cloud, capable of sharing high-speed 4G LTE and 3G Mobile Broadband Internet connectivity with up to 10 Wi-Fi-enabled devices simultaneously. The EUT comes with an AC adapter Novatel Wireless model: SSW-2001PI-U.

1.3.2 EUT General Description

EUT Description	MiFi5580 Personal Wireless Router
Model Number(s)	MiFi 5792
FCC Classification	PCB - PCS Licensed Transmitter
Rated Voltage	3.7VDC Nominal Voltage
Mode	CDMA 1xRTT/1xEV-DO/4G-LTE
Capability	800/1900 CDMA2000 1xRTT and 1xEV-DO Release 0 Revision A, Band 25, 26 and 41 LTE, 802.11 b/g/n WLAN
Primary Unit (EUT)	<input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
Antenna Details	WLAN – Antenna 5: 802.11 b/g/n Manufacturer: NVTL Part Number: N/A Type: Monopole (Etched onto PCB) Antenna Gain: <ul style="list-style-type: none">• 802.11 b/g/n 2450MHz : 1.03 dBi WWAN –EVDO/ LTE Band 25, 26, Manufacturer: Ethertronics Part Number: NVTL Part #: 01019835 Type: Monopole Antenna Gain: <ul style="list-style-type: none">• CDMA BC0 - 850MHz : -0.21 dBi• CDMA BC1 - 1880MHz : 2.45 dBi• CDMA BC10 – 850MHz : -0.21 dBi• LTE B25 - 1880MHz : 2.45 dBi• LTE B26 - 850MHz : -0.21 dBi WWAN – LTE Band 41 Manufacturer: NVTL Part Number: N/A Type: Monopole (Etched onto PCB) Antenna Gain: LTE B41 - 2600MHz : 0.81 dBi

1.3.3 Transmit Frequency Table

LTE Band 41			
Bandwidth (MHz)	Tx Frequency (MHz)	EIRP	
		Max. Power (W)	Max. Power (dBm)
10.0	2501-2685	0.301	24.8
15.0	2503.5-2682.5	0.297	24.73
20.0	2506-2680	0.300	24.78

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted Emission test setup. EUT powered by USB AC adapter/charger. EUT transmitting max. power.
B	Radiated Emission test setup. Fresh batteries installed before each test. EUT transmitting max. power unless in Receive mode. .
C	Receive Mode. EUT powered via battery and USB connected to supplied AC adapter.

1.4.2 EUT Exercise Software

None. The firmware installed in the EUT allows direct connection with the call box. All test configuration parameters are configured using the call box (CMW500).

1.4.3 Support Equipment and I/O cables

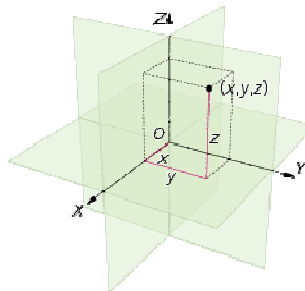
Manufacturer	Equipment/Cable	Description
Dell	Support Laptop	Novatel Wireless Test Configuration Support Laptop
LUXSHARE-ICT	USB cable	Shielded Type A to Micro USB (0.912 meter) USB Revision 2.

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report provided by Novatel wireless inc and based from MiFi5580_TxPout Conducted_SY16413700029.doc

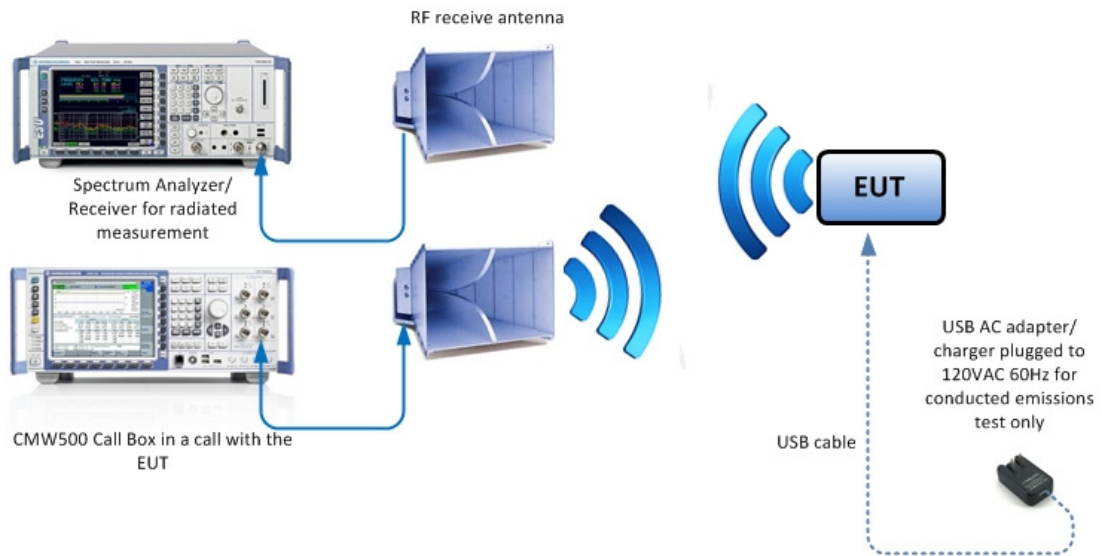
Band	Channel BW	Modulation	RB Size/Offset
LTE Band 41	10MHz	QPSK	1/0

EUT is a portable device. For radiated measurements X, Y and Z orientations were verified. Worst case position is "X".



1.4.5 Simplified Test Configuration Diagram

Radiated Test Configuration/Conducted Emissions Test Configuration



For Illustration Purpose Only
Image presented may not represent the
actual EUT or support equipment

1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number Engineering Sample		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements by Substitution method were conducted according to ANSI/TIA/EIA-603-C-2004, August 17,2004. Land Mobile FM or PM -Communications Equipment -Measurement and Performance Standards.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US5296

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US5296.

1.8.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego), has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

1.9 SAMPLE CALCULATIONS

1.9.1 LTE Emission Designator (QPSK)

Emission Designator = 4M51G7D
 G = Phase Modulation
 7= Quantized/Digital Info
 D = Combination (Audio/Data)

1.9.2 LTE Emission Designator (16QAM)

Emission Designator = 4M50W7D
 W = Frequency Modulation
 7= Quantized/Digital Info
 D = Combination (Audio/Data)

1.9.3 Spurious Radiated Emission (below 1GHz)

Measuring equipment raw measurement (dBµV/m) @ 30 MHz		24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3
	Asset# 1172 (cable)	0.3
	Asset# 1016 (preamplifier)	-30.7
	Asset# 1175(cable)	0.3
	Asset# 1002 (antenna)	17.2
Reported QuasiPeak Final Measurement (dBµV/m) @ 30MHz		11.8

1.9.4 Spurious Radiated Emission – Substitution Method

Example = 84dBµV/m @ 1413 MHz (numerical sample only)

The field strength reading of 84dBµV/m @ 1413 MHz (2nd Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dBµV/m level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is -18dBm, then we have the following for both EIRP and ERP as required:

$$\begin{aligned}
 P_{EIRP} &= -18 \text{ dBm} + 7.8 \text{ dBi} - 1 \text{ dB} \\
 &= 11.2 \text{ dBm} \\
 P_{ERP} &= P_{EIRP} - 2.15 \text{ dB} \\
 &= 11.2 \text{ dBm} - 2.15 \text{ dB} \\
 &= 9.05 \text{ dBm}
 \end{aligned}$$

SECTION 2

TEST DETAILS

Radio Testing of the
Novatel Wireless Inc.
Personal Wireless Router

2.1 EQUIVALENT ISOTROPIC RADIATED POWER

2.1.1 Specification Reference

Part 27 Subpart C §27.50 (h)(2), Part 2.1046, RSS-139 Issue 2 (6.4)

2.1.2 Standard Applicable

(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

2.1.3 Equipment Under Test and Modification State

Serial No: Engineering Sample

2.1.4 Date of Test/Initial of test personnel who performed the test

May 28, 2013/JMG (Data computed from Conducted Port Measurements from Novatell Wireless Inc.)

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Additional Observations

- EIRP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\mathbf{EIRP = P_T + G_T - L_C}$$

Where:

P_T = transmitter conducted output power dBm (Measured by Novatel Wireless Inc.)

G_T = gain of the transmitting antenna, in dBi (EIRP);

L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT uses integral antenna, this value is negligible).

2.1.7 Test Results

See attached table.

Band 41 QPSK								
Bandwidth	RB Size	RB Offset	Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
10.0 MHz	1	0	39700	2501	22.94	0.81	23.75	33.0
			40620	2593	23.65	0.81	24.46	33.0
			41540	2685	23.99	0.81	24.8	33.0
Band 41 16QAM								
Bandwidth	RB Size	RB Offset	Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
10.0 MHz	1	0	39700	2501.0	20.57	0.81	21.38	33.0
			40620	2593.0	22.7	0.81	23.51	33.0
			41540	2685.0	23.06	0.81	23.87	33.0

2.2 FIELD STRENGTH OF SPURIOUS RADIATION

2.2.1 Specification Reference

Part 27 Subpart C §27.53(m) and Part 2.1053, RSS-139 Issue 2(6.5)

2.2.2 Standard Applicable

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(4) For mobile digital stations, the attenuation factor shall be not less than $43 + 10 \log (P)$ dB at the channel edge and $55 + 10 \log (P)$ dB at 5.5 megahertz from the channel edges. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

2.2.3 Equipment Under Test and Modification State

Serial No: Engineering Sample
/ Test Configuration B

2.2.4 Date of Test/Initial of test personnel who performed the test

May 20 & May 21, 2013/JMG

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions

Ambient Temperature	22.7 °C
Relative Humidity	53.9 %
ATM Pressure	99.5 kPa

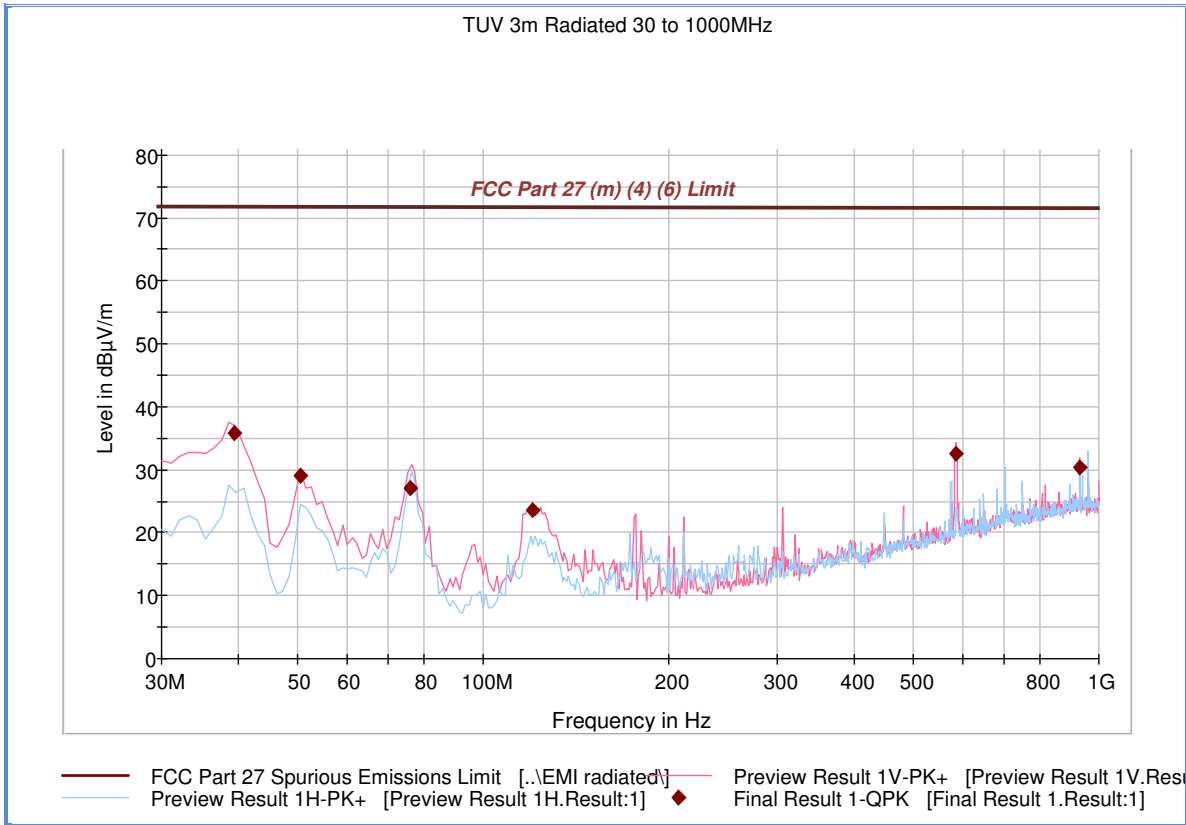
2.2.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.
- Only the worst case configuration presented in this test report.

2.2.8 Test Results

Complies, See attached plots.

2.2.9 Test Results Below 1GHz- Worst Case-

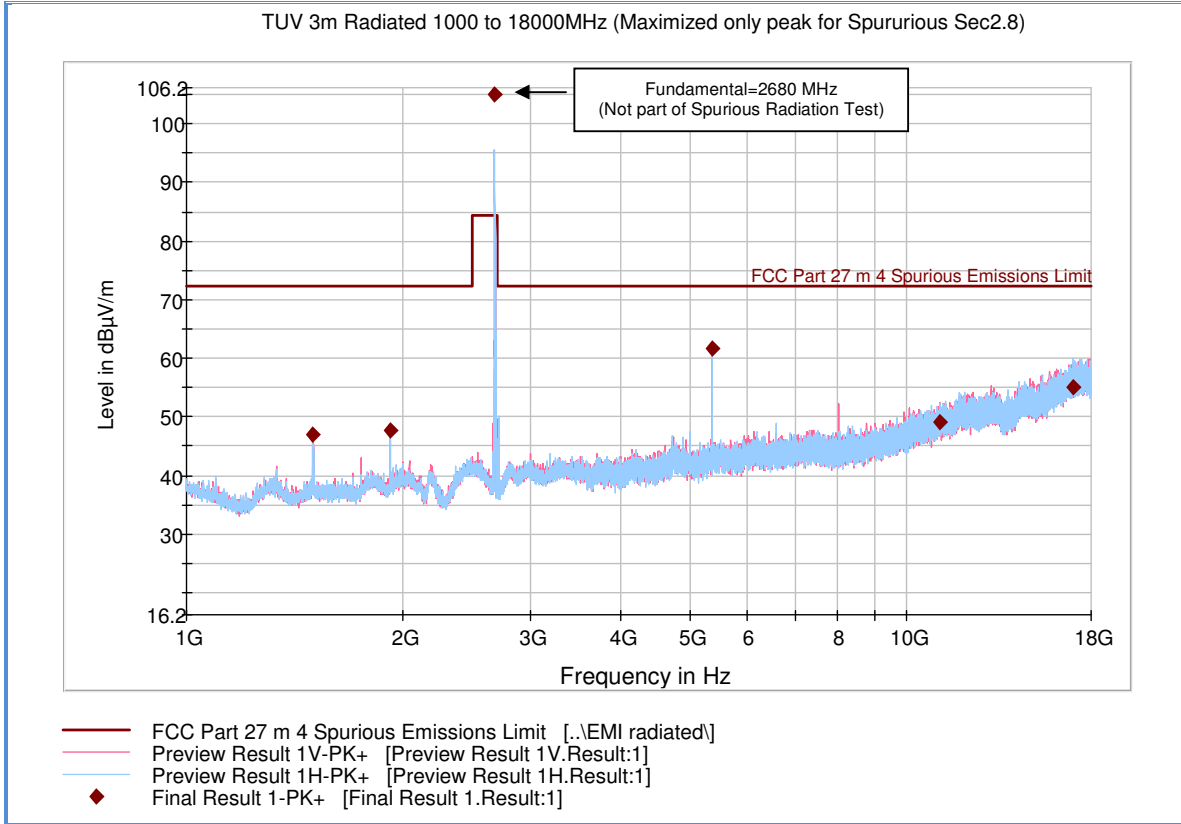


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.462222	35.8	1000.0	120.000	103.0	V	21.0	-17.9	36.58	72.38
50.437778	29.0	1000.0	120.000	103.0	V	318.0	-21.6	43.38	72.38
75.944444	27.1	1000.0	120.000	103.0	V	4.0	-24.3	45.28	72.38
120.013333	23.6	1000.0	120.000	103.0	V	5.0	-23.0	48.78	72.38
585.933333	32.5	1000.0	120.000	103.0	V	176.0	-10.0	39.88	72.38
929.662222	30.4	1000.0	120.000	103.0	V	-1.0	-5.2	41.98	72.38

Test Notes: Emissions within 20dB of the limit are proven by substitution method. However no such emission observed.

2.2.10 Test Results Above 1GHz (High Channel - Worst Case Configuration Band 41)



Peak Data

Frequency (MHz)	MaxPeak-MaxHold (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1499.980000	46.9	176.7	V	242.0	-5.1	25.5	72.4
1920.000000	47.7	112.8	V	176.0	-2.1	24.7	72.4
2680.546667	105.0	105.9	H	72.0	0.6	Fundamental	
5361.206667	61.8	161.7	V	16.0	6.6	10.6	72.4
11083.48666	49.0	167.7	H	267.0	14.6	23.3	72.4
17005.48000	55.0	102.9	H	275.0	22.1	17.4	72.4

Substitution Data

Frequency (MHz)	Field Strength @ 3 meters (dBµV/m)	Cable Loss (dB)	Substitution Antenna Gain (dBi)	Signal Generator Level (dBm)	Substitution Data SGL+AG-CL (dBm)	Limit (dBm)	Margin(dBm)
5361.206667	61.8	-5.5	10.902	-38.83	-33.43	-25	8.43
17005.48000	55.0	-16	13.802	-38.0308	-40.23	-25	15.23

Test Notes: Worst case channel presented for spurious emissions above 1GHz in Band 41. Substitution data not required for 1499.980000MHz, 1920.000000MHz & 11083.486667MHz since margin is >20dB compared to the -25dBm limit (converted to field strength @ 3 meters).

2.3 RECEIVER SPURIOUS EMISSIONS

2.3.1 Specification Reference

RSS-139(6.6) and RSS-GEN Issue 3

2.3.2 Standard Applicable

Receiver spurious emissions shall comply with the limits specified in RSS-Gen.

2.3.3 Equipment Under Test and Modification State

Serial No: Engineering Sample
/ Test Configuration B

2.3.4 Date of Test/Initial of test personnel who performed the test

May 07 & May 20, 2013/JMG

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions

Ambient Temperature	22.7 °C
Relative Humidity	53.9 %
ATM Pressure	99.5 kPa

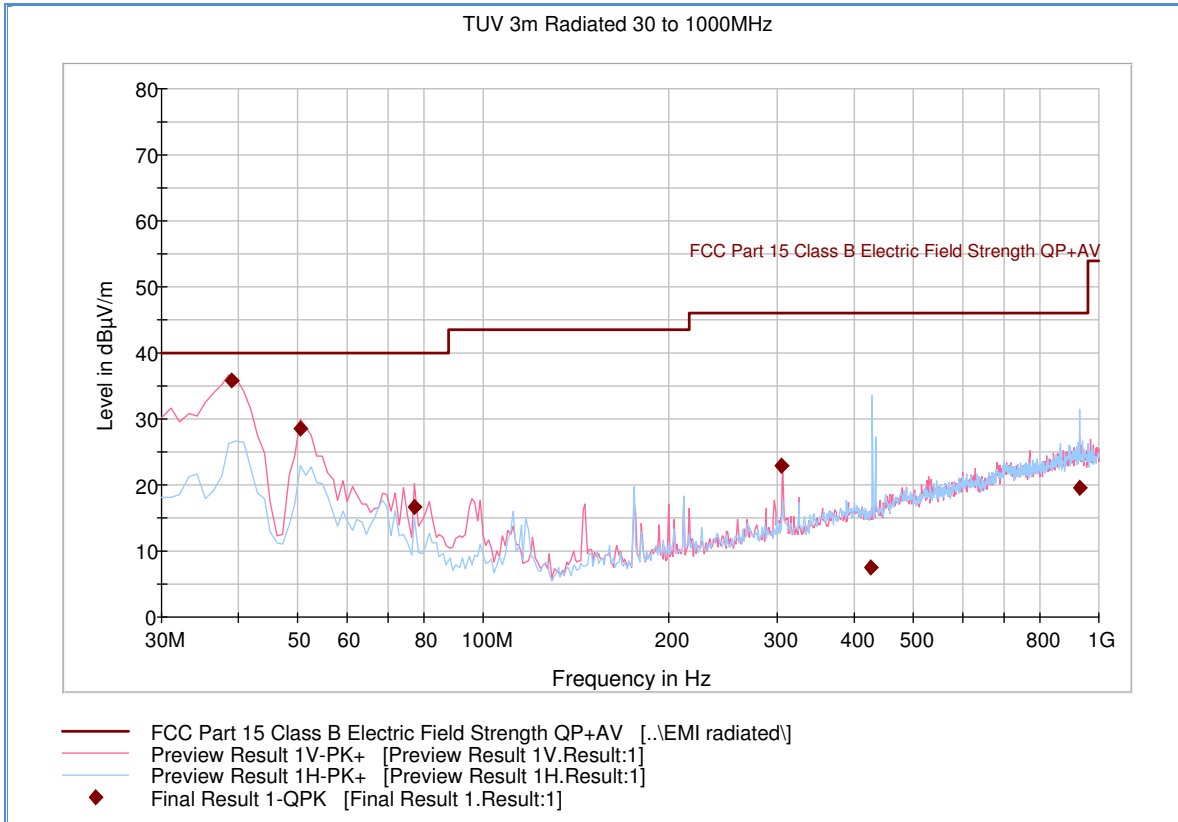
2.3.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 18GHz (6GHz as per requirement).
- Limit used is from FCC §15.209 which is identical to RSS-Gen limits.
- All emissions observed above 1GHz are noise floor measurements.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.3.8 Test Results

Complies, See attached plots.

2.3.9 Test Results Below 1GHz

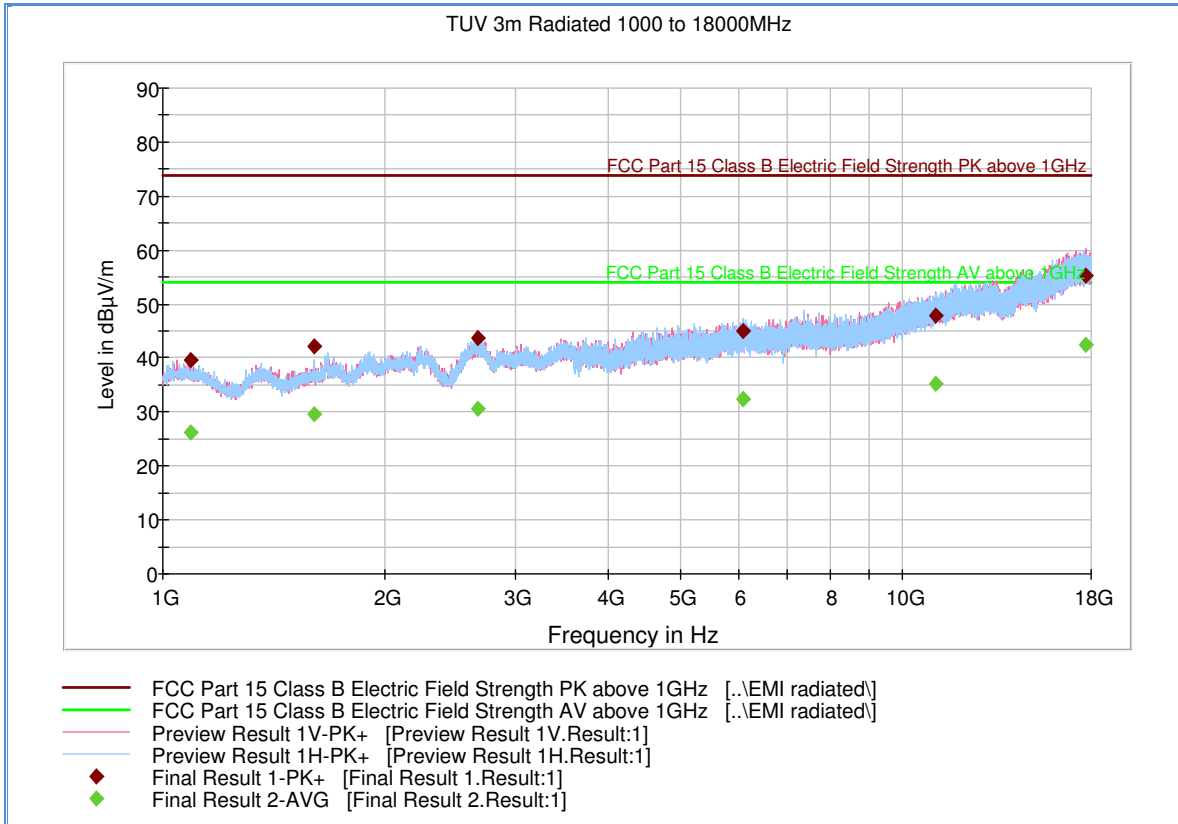


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.942222	35.8	1000.0	120.000	103.0	V	37.0	-17.7	4.2	40.0
50.437778	28.4	1000.0	120.000	103.0	V	258.0	-21.6	11.6	40.0
77.222222	16.7	1000.0	120.000	103.0	V	37.0	-24.2	23.3	40.0
305.431111	22.9	1000.0	120.000	103.0	V	1.0	-16.1	23.1	46.0
426.217778	7.4	1000.0	120.000	106.0	H	248.0	-13.9	38.6	46.0
929.662222	19.6	1000.0	120.000	106.0	H	37.0	-5.2	26.4	46.0

Test Notes: Only worst case channel/configuration presented for spurious emissions below 1GHz. There are no significant emissions variations between modes and configuration when the EUT is on receive mode.

2.3.10 Test Results Above 1GHz



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1087.926667	39.7	1000.0	1000.000	174.7	V	133.0	-5.8	34.2	73.9
1600.000000	42.1	1000.0	1000.000	220.5	H	302.0	-4.3	31.8	73.9
2667.073333	43.6	1000.0	1000.000	361.2	V	265.0	0.6	30.3	73.9
6083.993333	44.9	1000.0	1000.000	354.2	H	45.0	8.0	29.0	73.9
11098.873333	47.9	1000.0	1000.000	398.1	V	155.0	14.6	26.0	73.9
17681.666667	55.3	1000.0	1000.000	133.8	V	309.0	22.1	18.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1087.926667	26.3	1000.0	1000.000	174.7	V	133.0	-5.8	27.6	53.9
1600.000000	29.6	1000.0	1000.000	220.5	H	302.0	-4.3	24.3	53.9
2667.073333	30.7	1000.0	1000.000	361.2	V	265.0	0.6	23.2	53.9
6083.993333	32.4	1000.0	1000.000	354.2	H	45.0	8.0	21.5	53.9
11098.873333	35.1	1000.0	1000.000	398.1	V	155.0	14.6	18.8	53.9
17681.666667	42.3	1000.0	1000.000	133.8	V	309.0	22.1	11.6	53.9

Test Notes: Only worst case channel/configuration presented for spurious emissions above 1GHz. There are no significant emissions variations between modes and configuration when the EUT is on receive mode.

2.4 POWER LINE CONDUCTED EMISSIONS

2.4.1 Specification Reference

RSS-Gen 7.2.4

2.4.2 Standard Applicable

Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

**Decreases with the logarithm of the frequency.*

2.4.3 Equipment Under Test and Modification State

Serial No: Engineering Sample
/ Test Configuration A

2.4.4 Date of Test/Initial of test personnel who performed the test

May 21, 2013/JMG

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions

Ambient Temperature 24.8°C
Relative Humidity 49.8%
ATM Pressure 99.9 kPa

2.4.7 Additional Observations

- The EUT is a battery powered device however with provision to connect to public AC mains via supplied AC adapter/charger.

- The EUT was verified using worst case configuration (worst case channel/mode). The EUT was set to transmit max. power while plugged into the AC adapter.
- EUT verified using input voltage of 120VAC 60Hz.
- Limit used is from FCC §15.207 which is identical to RSS-Gen limits.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.11.8 for sample computation.

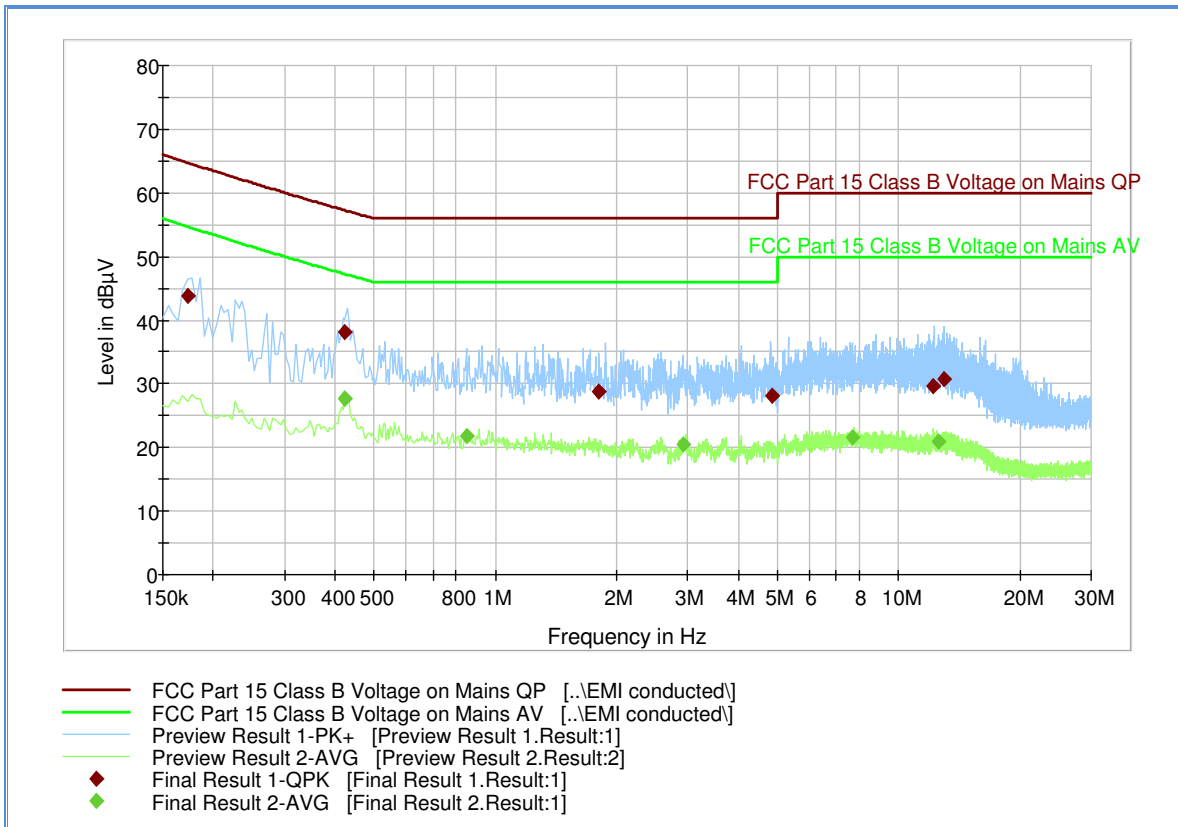
2.4.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (db μ V) @ 150kHz		5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9
	Asset# 1177 (cable)	0.15
	Asset# 1176 (cable)	0.35
	Asset# 7567 (LISN)	0.30
Reported QuasiPeak Final Measurement (db μ V) @ 150kHz		26.2

2.4.9 Test Results

Compliant. See attached plots and tables.

2.4.10 Line 1 (Hot) LTE Band 41



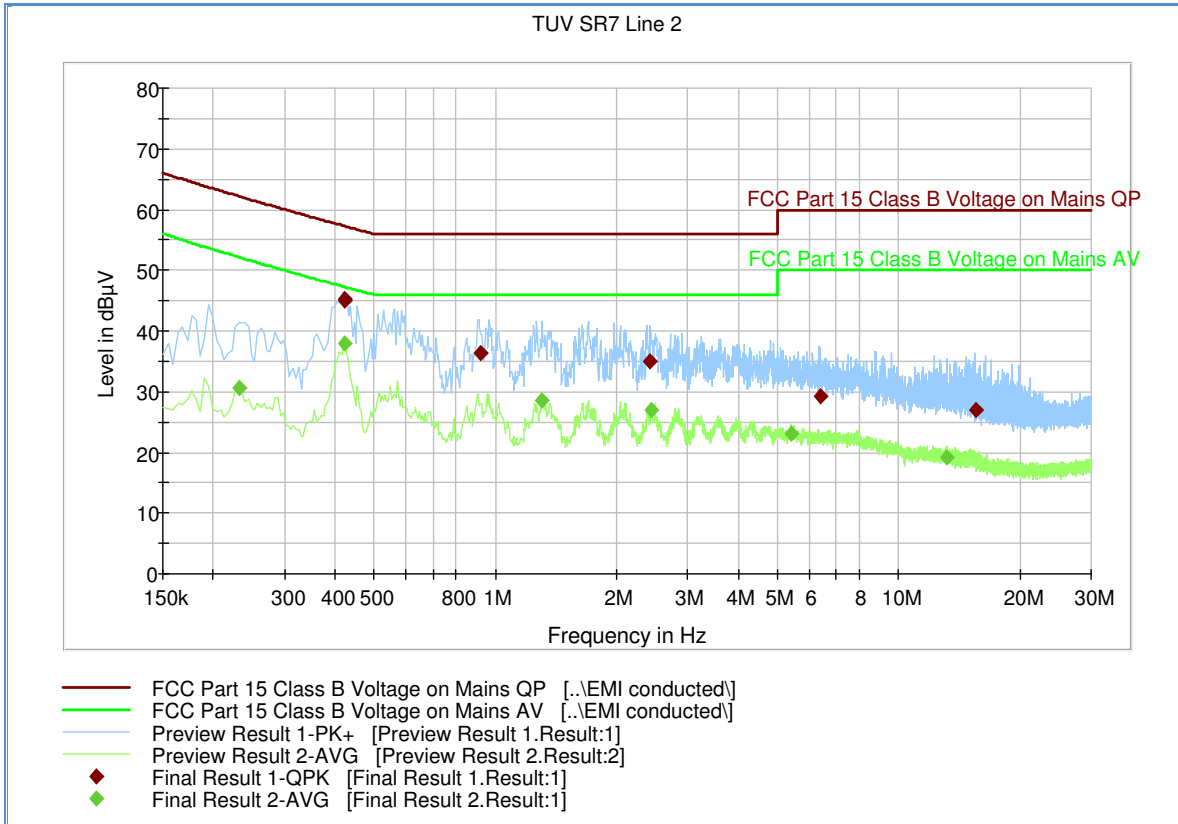
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.172500	43.7	1000.0	9.000	Off	L1	20.4	21.0	64.8
0.424500	38.2	1000.0	9.000	Off	L1	20.2	19.0	57.3
1.810500	28.7	1000.0	9.000	Off	L1	20.3	27.3	56.0
4.843500	28.2	1000.0	9.000	Off	L1	20.4	27.8	56.0
12.210000	29.7	1000.0	9.000	Off	L1	20.5	30.3	60.0
12.921000	30.7	1000.0	9.000	Off	L1	20.6	29.3	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.424500	27.7	1000.0	9.000	Off	L1	20.2	19.5	47.2
0.424500	27.7	1000.0	9.000	Off	L1	20.2	19.5	47.2
0.852000	21.9	1000.0	9.000	Off	L1	20.2	24.1	46.0
2.913000	20.5	1000.0	9.000	Off	L1	20.3	25.5	46.0
7.696500	21.5	1000.0	9.000	Off	L1	20.4	28.5	50.0
12.525000	21.0	1000.0	9.000	Off	L1	20.6	29.0	50.0

2.4.11 Line 2 (Neutral) LTE Band 41



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.424500	45.1	1000.0	9.000	Off	N	21.1	12.2	57.3
0.424500	45.2	1000.0	9.000	Off	N	21.1	12.1	57.3
0.919500	36.3	1000.0	9.000	Off	N	21.1	19.7	56.0
2.427000	35.0	1000.0	9.000	Off	N	21.1	21.0	56.0
6.396000	29.3	1000.0	9.000	Off	N	21.2	30.7	60.0
15.549000	27.0	1000.0	9.000	Off	N	21.5	33.0	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.231000	30.7	1000.0	9.000	Off	N	21.1	21.5	52.2
0.424500	37.9	1000.0	9.000	Off	N	21.1	9.4	47.2
1.306500	28.5	1000.0	9.000	Off	N	21.1	17.5	46.0
2.445000	27.1	1000.0	9.000	Off	N	21.1	18.9	46.0
5.442000	23.1	1000.0	9.000	Off	N	21.2	26.9	50.0
13.155000	19.3	1000.0	9.000	Off	N	21.4	30.7	50.0

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Conducted Emissions Test Setup						
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	06/13/12	06/13/13
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	05/24/12	05/24/13
8607	20dB Attenuator	CAT-20	N/A	MCL HAT-20	08/21/12	08/21/13
8609	20dB Attenuator	CAT-20	N/A	MCL HAT-20	08/21/12	08/21/13
7571	Wideband Radio Communication Tester	CMW 500	1201.0002k50/103829	Rhode & Schwarz	Verified 04/04/13	
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	05/23/12	05/23/13
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	03/25/13	03/25/14
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/21/12	09/21/13
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/21/12	09/21/13
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/10/12	08/10/13
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	06/13/12	06/13/13
1016	Pre-amplifier	PAM-0202	187	PAM	09/24/12	09/24/13
777	900MHz High Pass Filter	FF6549	004	Sage	Verified by 1040	
7571	Wideband Radio Communication Tester	CMW 500	1201.0002k50/103829	Rhode & Schwarz	Verified 04/04/13	
Miscellaneous						
7560	Barometer/Temperature /Humidity Transmitter	iBTHX-W	1240476	Omega	08/12/12	08/12/13
6452	Multimeter	3478A	2911A52177	Hewlett Packard	07/16/12	07/16/13
	Test Software	EMC32	V8.52	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.41
Coverage Factor (k):					2
Expanded Uncertainty:					4.82

3.2.2 Radiated Emission Measurements (Above 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.40
Coverage Factor (k):					2
Expanded Uncertainty:					4.81

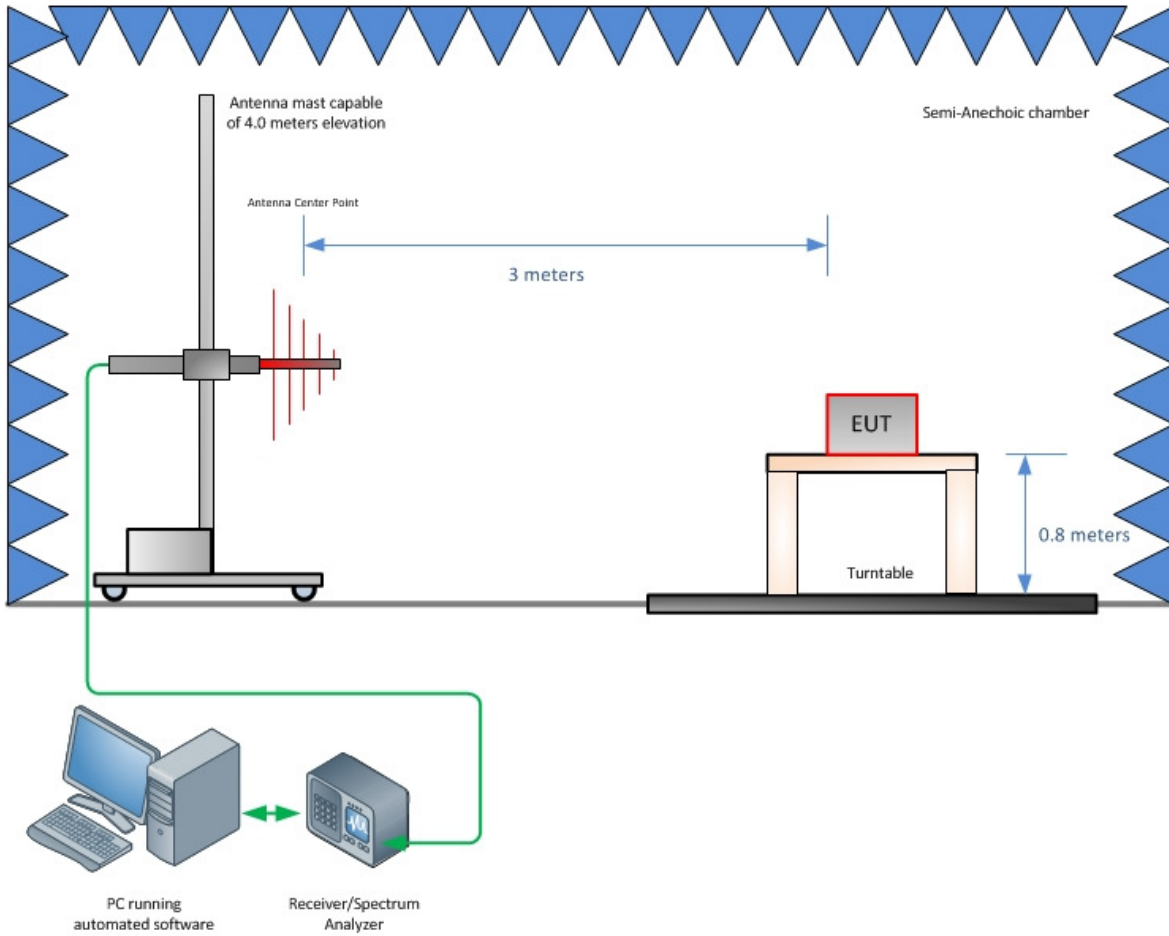
3.2.3 AC Mains Conducted Emissions Measurement

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					0.80
Coverage Factor (k):					2
Expanded Uncertainty:					1.59

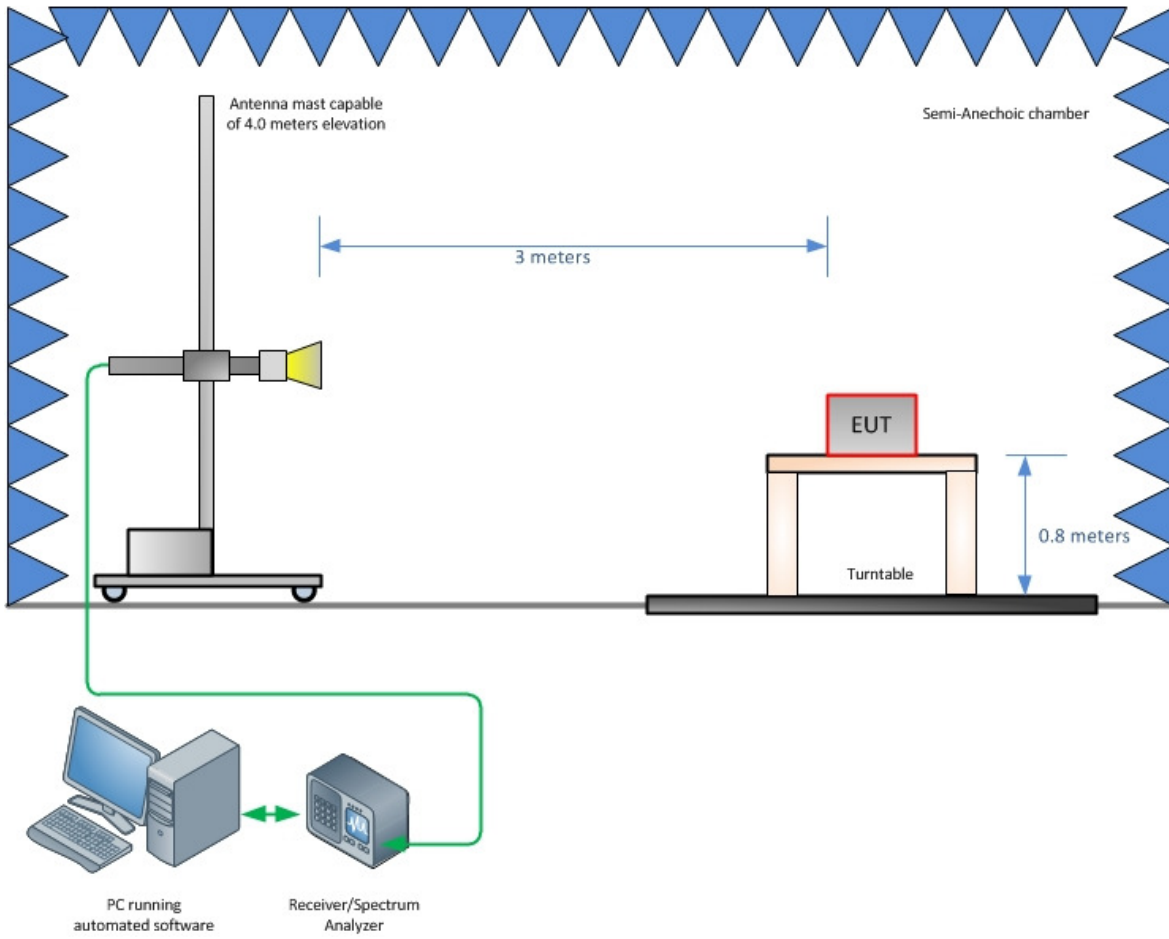
SECTION 4

DIAGRAM OF TEST SETUP

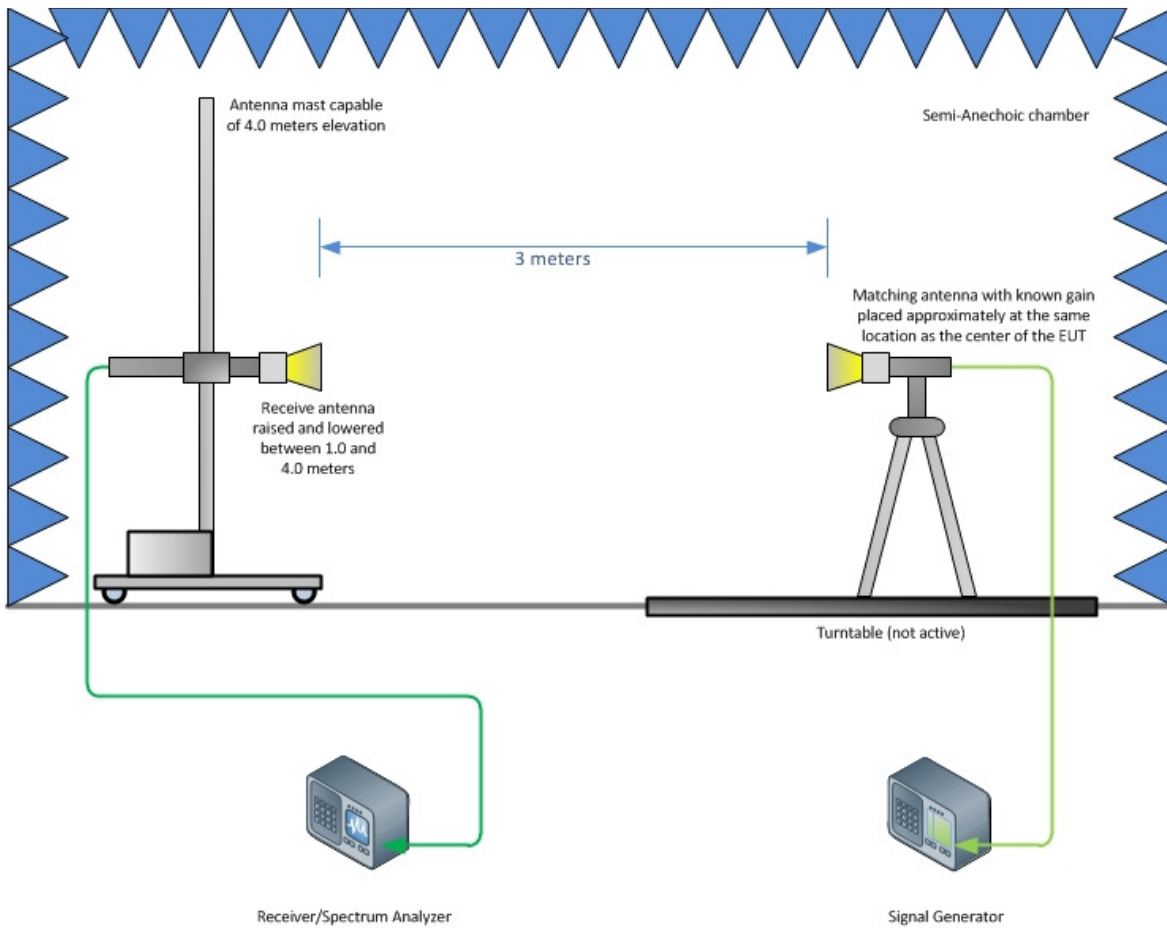
4.1 TEST SETUP DIAGRAM



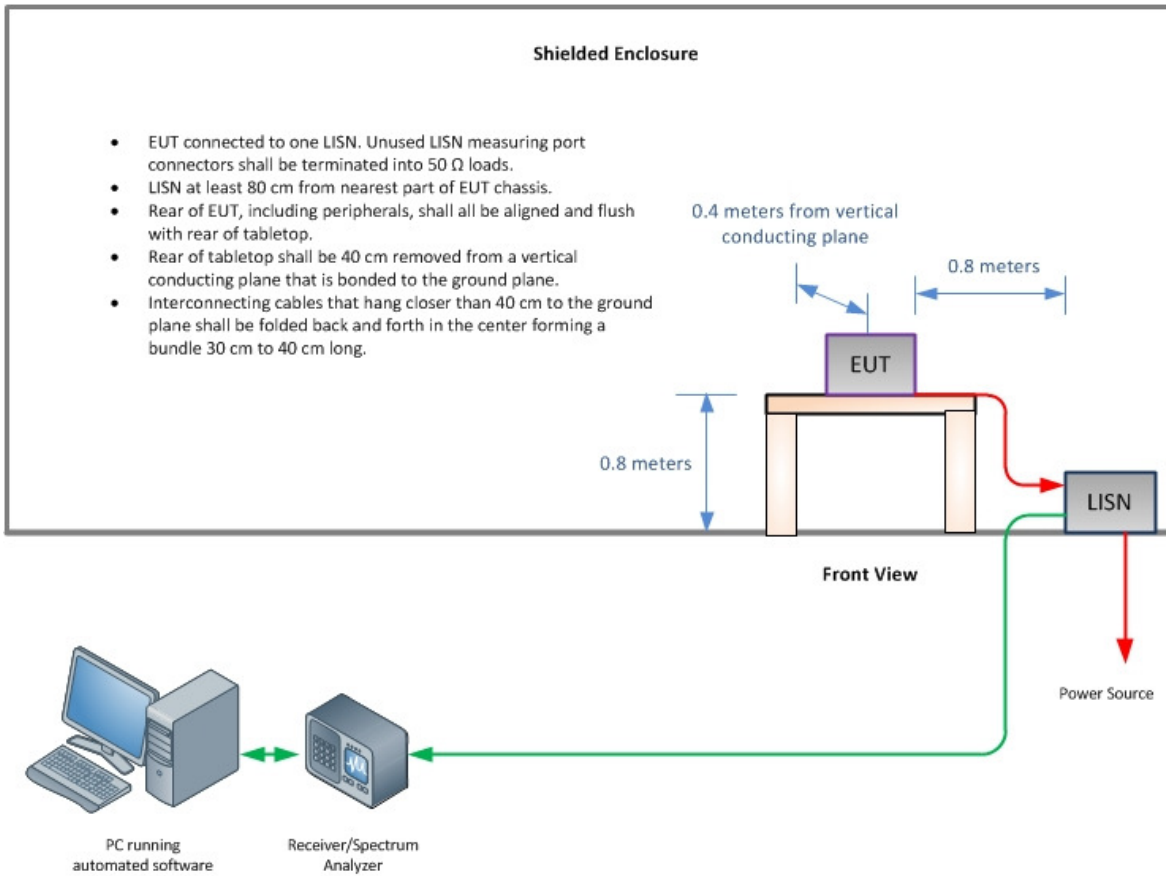
Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz)



Conducted Emissions Test Configuration

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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Certificate Number: 3228.01

Novatel Wireless, Inc.

Test Report EMC Conducted Certification



NOVATEL WIRELESSTM

FCC CFR47 Part 27 SUBPART C

Model Number: MiFi5580

FCC ID: PKRNVWMIFI5580

Report No.: NVTLTR0047-03 Rev C

Date: 07/12/2013




“Amendment to Test Report NVTLTR0047-03 Rev B”

“(replaces NVTLTR0047-03 Rev B)”

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<h2 style="margin: 0;">Test Report</h2> <h3 style="margin: 0;">EMC Conducted Certification</h3>
<p>Prepared For: Novatel Wireless Inc. 9645 Scranton Road San Diego CA 92121</p> <p>Device Type: Model: MiFi5580 FID: SY16413700015</p> <p>Performed By: Novatel Wireless RPT Lab Novatel Wireless Inc. 9645 Scranton Road San Diego, CA 92121</p>

	Name	Date
Prepared by:	Roman Olmos Hardware Engineer II	07/12/2013
Signature:		
Approved by:	Roman Olmos Hardware Engineer II	07/12/2013
Signature:		
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1 Introduction

1.1 Purpose

To determine Equipment Under Test (EUT) is compliant with the Test Specification set forth in the Section 1.2 Test Methodology. Complaint/Non-Complaint indications in this report are opinions expressed by Novatel Wireless, Inc based on interpretations and/or observations of test results.

1.2 Test Methodology and Standards

All measurements documented in this report were performed in accordance with:

- ANSI/TIA-603-C Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
- ANSI C63.4-2009 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
- The equipment under test (EUT) was configured to measure its highest possible conducted emissions level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009.
- FCC CFR47 Part §2 Subpart J and §27 Subpart C

1.3 Results Summary of Standards

Section	FCC Part	Conducted Test Description	Result	Comments
4.1	§2.1046	Transmitter Conducted Output Power	Compliant	N/A
4.2	§2.1046	Peak-Average Ratio	Compliant	N/A
4.3	§2.1047	Modulation Characteristics	Compliant	N/A
4.4	§2.1049	Occupied Bandwidth	Compliant	N/A
4.5	§2.1051 §27.53(m)(4) §27.53(m)(6)	Band Edge	Compliant	N/A
4.6	§2.1051 §27.53(m)(4) §27.53(m)(6)	Conducted Spurious Emissions	Compliant	N/A
4.7	§2.1055 §27.54	Frequency Stability	Compliant	N/A

1.4 Deviation from Standards

Line Item	FCC Part	Radiated Test Description	Comments:
1	§27.50(c)(10)(11) §2.1046	Effective Radiated Power	Not performed. Outside lab scope of accreditation.
2	§24.232(c) §2.1046	Equivalent Isotropic Radiated Power	Not performed. Outside lab scope of accreditation.
3	§2.1053 §27.53(g)&(h)	Field Strength Of Spurious Radiation	Not performed. Outside lab scope of accreditation.

2 Equipment Under Test (EUT)

2.1 EUT Information

Date of Measurements:	06/16-18/2013, 06/25/2013		
Date of Device Receipt:	5/20/2013		
Device Manufacturer:	Novatel Wireless		
Device Model:	MiFi5580		
Device Description/Type:	Mobile Hot Spot		
Device S/N:	FID: SY16413700015		
Device Modes:	3G-CDMA/4G-LTE/802.11bgn		
Device Band Capability:	800MHz/1900MHz/2.4GHz/2.6GHz		
Device HW Revision:	1.5		
Device SW Revision:	4.26		
FCC ID:	PKRNVWMIFI5580		
Rated Voltage:	+3.7Vdc Nominal Voltage		
Modes Verified:	LTE Band 41 (QPSK and 16QAM Modulations) Supported Bandwidths = 10MHz, 15MHz, 20MHz		
EUT Functional Condition:	<input type="checkbox"/> Production	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Engineering
Comments:	Novatel Wireless Inc. Equipment Under Test (EUT) MiFi5580 is a Personal Wireless Router. The EUT creates a personal Wi-Fi cloud capable of sharing high-speed 3G and 4G Mobile Broadband Internet Connectivity with up to 10 Wi-Fi enabled devices simultaneously. The EUT comes with an AC Adapter Novatel Wireless Model: SSW-2423.		
Results of tests relate only to item tested.			

Antenna Manufacturer:	Novatel Wireless	
Antenna Part#:	N/A	
Antenna Type:	Monopole (Etched on PCB)	
Frequency Band	Frequency Range (MHz)	Antenna Peak Gain (dBi)
LTE B41	2500-2600MHz	0.81 dBi

2.2 Transmit Frequency Table

LTE B41				
Bandwidth	Tx Frequency	Emissions Designator	EIRP	
			Max Power	Max Power
(MHz)	(MHz)	(#)	(dBm)	(W)
10	2500-2685	9M024G7D	24.80	0.301
10	2500-2685	9M024W7D	23.87	0.243
15	2500-2685	13M54G7D	24.73	0.297
15	2500-2685	13M54W7D	23.85	0.242
20	2500-2685	18M04G7D	24.78	0.300
20	2500-2685	18M04W7D	23.79	0.239

2.3 EUT Support Equipment

Note: Customer provided hardware and/or software to support EUT testing.	
Item#	Description
1	EUT Software: EUT was configured using Qualcomm Radio Control Toolkit Version 3.0.11.0. Diagnostic Software allows configuration of channels, mode + data rate and power level. Power level is set according to the manufacturer's specification for each mode.
2	Dell Configuration Support Laptop (Qty.1)
3	USB Cable : <ul style="list-style-type: none"> Manufacturer: LUXSHARE-ICT Shielded Type A to Micro USB (0.912 Meter) USB Revision 2

3 Measurement System Information

3.1 Test Equipment & Calibration

The test equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturer's specification and ISO-17025 accredited calibration. Calibration data is traceable to the recognized national standards.

3.2 Test Equipment List

Equipment	Manufacturer	Model	S/N	Current Calibration Date	Next Calibration Date
Wireless Communication Test Set	Anritsu	MT8820C	6201144478	07/17/2012	07/17/2014
PSA Series Spectrum Analyzer 3Hz-44GHz	Agilent	E4446A	MY46180178	02/28/2012	02/28/2014
Power Meter	Anritsu	ML2495A	1212001	04/13/2012	04/13/2014
Power Sensor	Anritsu	MA2411B	1126216	03/20/2012	03/20/2014
20dB Attenuator	N/A	N/A	20-1	Verified 06/21/2012	Next Verification 06/21/2013
20dB Attenuator	N/A	N/A	20-2	Verified 06/21/2012	Next Verification 06/21/2013
RF Shield Box Assembly	N/A	N/A	RF-C01	Verified 05/09/2013	Next Verification 08/09/2013
Temperature Chamber	Thermotron	S-83800	37279	03/13/2012	03/13/2014
Programmable Power Supply	Agilent	E3634A	MY52030075	02/14/2012	02/14/2014

Note: The verification date has been extended as the device was being used in a test process on 6/25.

3.3 Conducted Test Setup

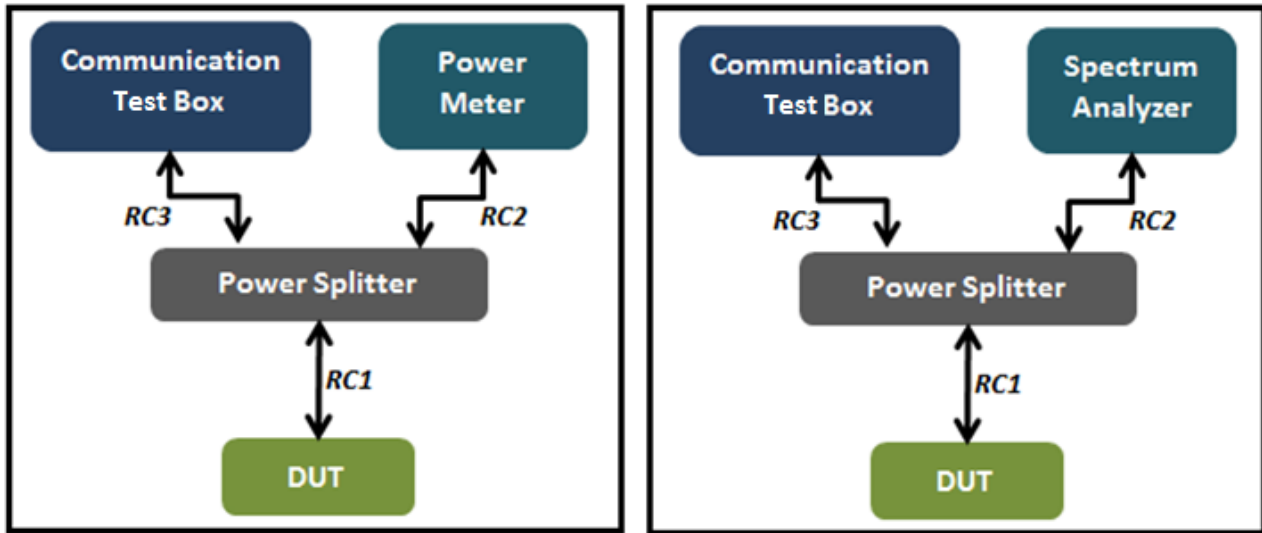


Figure 1: Conducted Transmitter Power & Emissions Test Setup

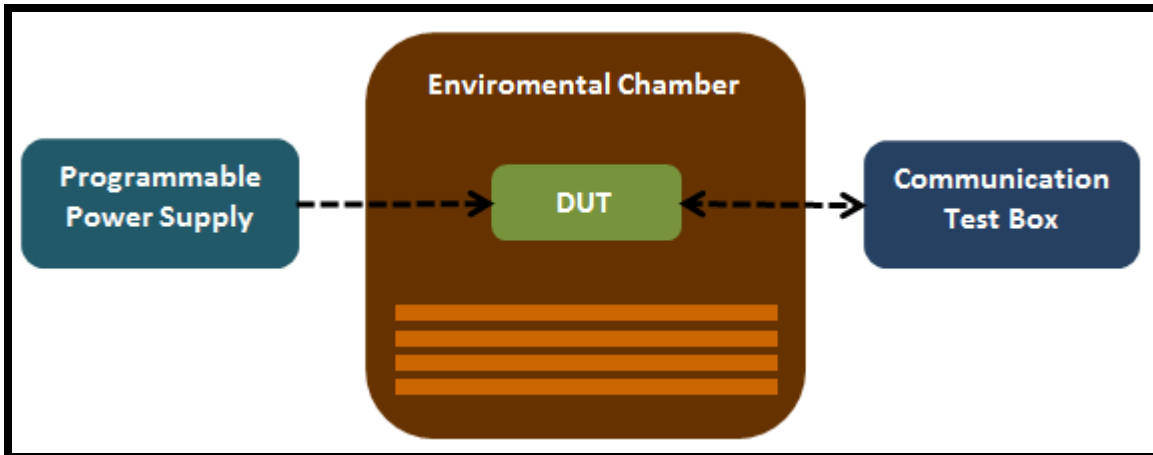


Figure 2: Conducted Transmitter Power & Emissions Test Setup

3.4 Conducted Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Discipline	MU
RF Power Output:	±1.26dB
Occupied Bandwidth:	±8.84kHz
Peak-Average Ratio:	±1.01dB
Conducted Spurious Emissions:	±2.87dB
Band Edge:	±1.01dB
Frequency Stability:	±179.70Hz

4 Conducted Test Results

4.1 Transmitter Output Power – RF Power Verification

4.1.1 Standard Reference

FCC Part §2.1046

4.1.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/16/2013	Humidity	38.0%	38.0 %
		Temperature	23.9°C	24.0°C
		Barometer	1007 mbar	1006 mbar

4.1.3 Test Conditions

- Measurement is made using a broadband power meter while EUT is operating in transmission mode at the appropriate frequencies.
- Average results recorded
- The TX measurements were conducted using the Anritsu MT8820C in Uplink/Downlink Configuration 6 and Special Frame Configuration 1. This configuration set the transmit duty cycle to 50% during the measurement.
- An offset of 24.9dB used to compensate for external setup losses

4.1.4 LTE Test Results

Band	BW	RB Size	RB Offset	UL Ch.	f(MHz)	QPSK (dBm)	16QAM (dBm)	
LTE Band 41	10 MHz	1	0	39700	2501.0	23.98	23.13	
				40620	2593.0	23.66	22.71	
				41540	2685.0	24.05	23.12	
		1	24	39700	2501.0	24.22	23.21	
				40620	2593.0	24.38	23.56	
				41540	2685.0	24.36	23.50	
		1	49	39700	2501.0	23.92	22.99	
				40620	2593.0	23.90	23.02	
				41540	2685.0	24.40	23.48	
		25	0	39700	2501.0	23.27	22.18	
				40620	2593.0	23.08	22.03	
				41540	2685.0	23.26	22.02	
		25	12	39700	2501.0	23.11	22.07	
				40620	2593.0	23.33	22.28	
				41540	2685.0	23.35	22.22	
		25	25	39700	2501.0	22.93	21.97	
				40620	2593.0	23.06	21.99	
				41540	2685.0	23.61	22.43	
		50	0	39700	2501.0	22.93	21.97	
				40620	2593.0	23.24	22.29	
				41540	2685.0	23.25	22.23	
		15 MHz	1	0	39725	2503.5	24.08	23.27
					40620	2593.0	23.51	22.52
					41515	2682.5	23.39	22.52
	37			39725	2503.5	24.08	23.18	
				40620	2593.0	24.34	23.54	
				41515	2682.5	24.11	23.29	
	74			39725	2503.5	23.42	22.56	
				40620	2593.0	23.56	22.73	
				41515	2682.5	24.31	23.55	
	36		0	39725	2503.5	23.03	21.97	
				40620	2593.0	22.69	21.70	
41515				2682.5	22.62	21.55		
36	19		39725	2503.5	22.81	21.70		
			40620	2593.0	23.35	22.12		
			41515	2682.5	22.98	21.86		
36	39		39725	2503.5	22.59	21.48		

				40620	2593.0	22.81	21.81	
				41515	2682.5	23.30	22.16	
	75	0		39725	2503.5	22.77	21.75	
				40620	2593.0	23.21	22.08	
				41515	2682.5	23.00	21.85	
				39750	2506.0	24.12	23.23	
				40620	2593.0	23.04	22.18	
20 MHz	1	0		41490	2680.0	23.42	22.56	
				39750	2506.0	23.86	22.97	
				40620	2593.0	24.38	23.54	
	1	49			41490	2680.0	24.04	23.00
					39750	2506.0	23.42	22.62
					40620	2593.0	23.41	22.55
	1	99			41490	2680.0	24.35	23.65
					39750	2506.0	22.89	21.94
					40620	2593.0	22.56	21.65
	50	0			41490	2680.0	22.37	21.32
					39750	2506.0	22.72	21.65
					40620	2593.0	23.29	22.23
	50	25			41490	2680.0	22.81	21.88
					39750	2506.0	22.30	21.22
					40620	2593.0	22.71	21.71
50	50			41490	2680.0	23.08	22.13	
				39750	2506.0	22.70	21.83	
				40620	2593.0	22.97	22.00	
100	0			41490	2680.0	22.81	21.87	

4.2 Peak-to-Average Ratio

4.2.1 Standard Reference

FCC Part §2.1046,
KDB971168 D01 Power Meas License Digital Systems v02r01 (June 7, 2013)

4.2.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/18/2013	Humidity	36.4%	35.9%
		Temperature	23.6°C	24.1°C
		Barometer	1002mbar	1004mbar

4.2.3 Test Conditions

- Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$\text{PAPR (dB)} = \text{PPk (dBm)} - \text{PAvg (dBm)}.$$

- Power Meter used to collect test results.
- An offset of 24.9dB used to compensate for external setup losses
- 20dB Attenuator used

4.2.4 Test Result

Channel Bandwidth	RB Size	RB Offset	Channel	Frequency (MHz)	PAR/QPSK (dB)	PAR/16QAM (dB)	Limit (dB)
10MHz BW	1	0	39700	2501.0	3.75	3.87	13.00
			40620	2593.0	4.64	5.20	13.00
			41540	2685.0	3.84	3.98	13.00
	1	49	39700	2501.0	3.73	4.41	13.00
			40620	2593.0	3.81	4.79	13.00
			41540	2685.0	2.90	3.82	13.00
	25	12	39700	2501.0	4.24	5.18	13.00
			40620	2593.0	4.66	5.54	13.00
			41540	2685.0	4.29	5.23	13.00
	50	0	39700	2501.0	4.48	5.10	13.00
			40620	2593.0	4.77	5.44	13.00
			41540	2685.0	4.36	5.13	13.00
15MHz BW	1	0	39725	2503.5	3.33	3.80	13.00
			40620	2593.0	4.52	5.27	13.00
			41515	2682.5	3.73	4.25	13.00
	1	74	39725	2503.5	4.15	4.76	13.00
			40620	2593.0	4.33	4.94	13.00
			41515	2682.5	3.38	3.87	13.00
	36	19	39725	2503.5	4.55	5.45	13.00
			40620	2593.0	4.64	5.65	13.00
			41515	2682.5	4.43	5.38	13.00
	75	0	39725	2503.5	4.51	5.51	13.00
			40620	2593.0	4.65	5.69	13.00
			41515	2682.5	4.38	5.51	13.00
20MHz BW	1	0	39750	2506.0	2.89	3.82	13.00
			40620	2593.0	4.47	5.48	13.00
			41490	2680.0	3.12	4.01	13.00
	1	99	39750	2506.0	4.24	4.81	13.00
			40620	2593.0	4.45	5.05	13.00
			41490	2680.0	3.47	4.06	13.00
	50	25	39750	2506.0	4.75	5.40	13.00
			40620	2593.0	4.86	5.50	13.00
			41490	2680.0	4.55	5.19	13.00
	100	0	39750	2506.0	4.73	5.35	13.00
			40620	2593.0	4.96	5.63	13.00
			41490	2680.0	4.53	5.40	13.00

4.3 Modulation Characteristics

4.3.1 Standard Reference

FCC Part §2.1047

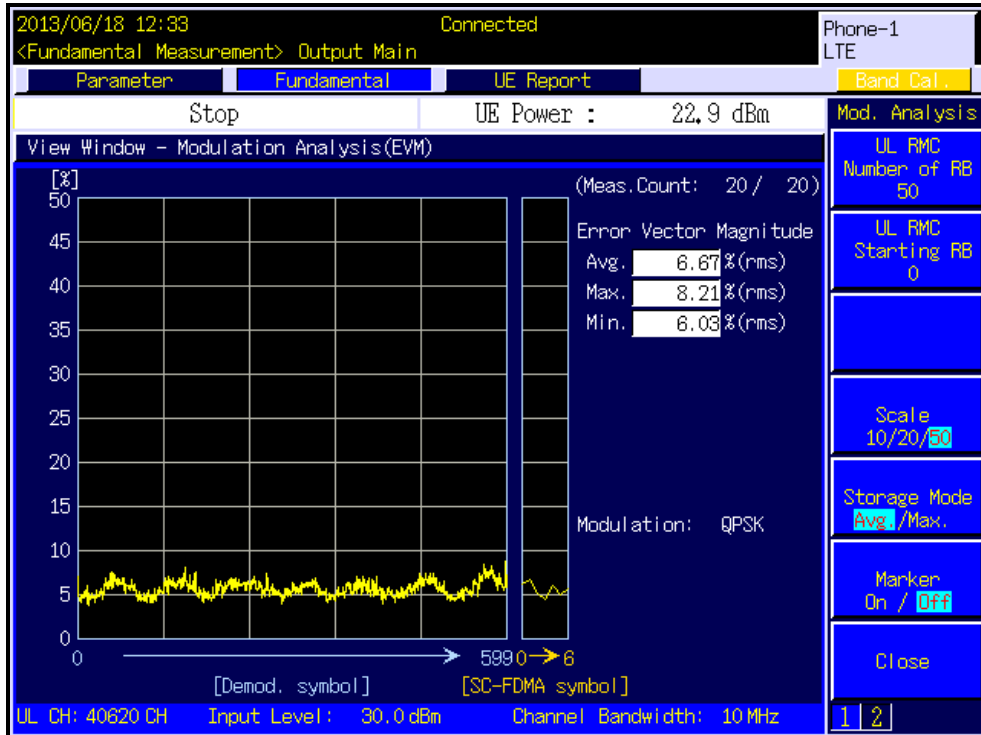
4.3.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/17/2013	Humidity	38.4%	37.9%
		Temperature	23.0°C	23.7°C
		Barometer	1003mbar	1004mbar
RO	06/18/2013	Humidity	35.9%	32.3%
		Temperature	24.5°C	25.3°C
		Barometer	1000mbar	1001mbar

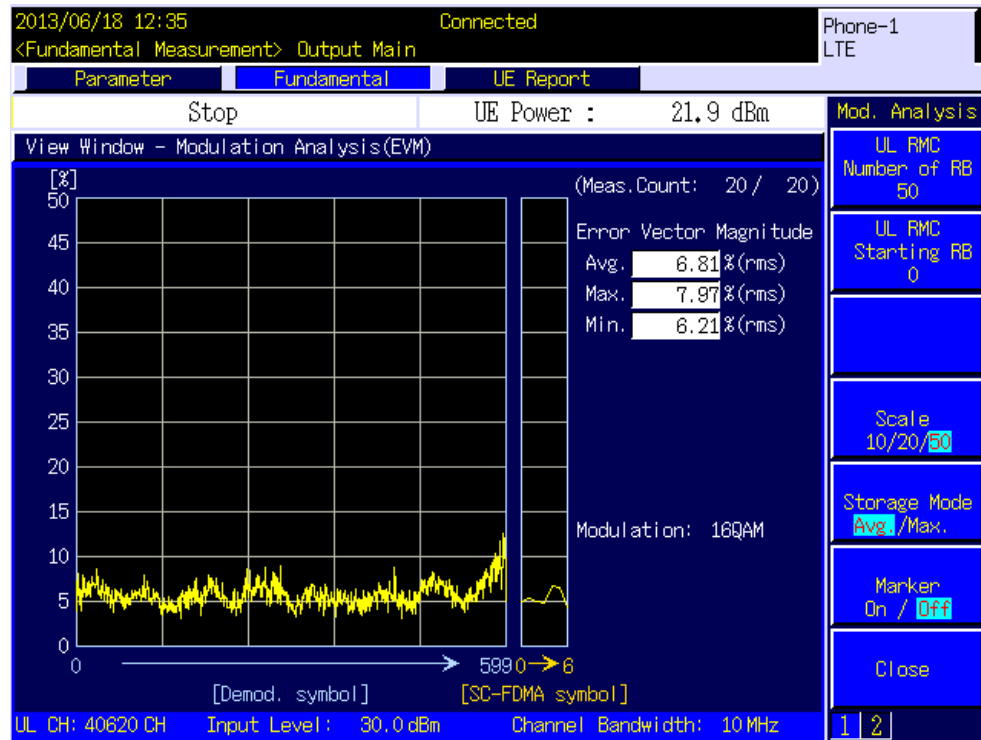
4.3.3 Test Conditions

- Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
- Communication Test Set used to collect test results.
- An offset of 24.9dB used to compensate for external setup losses
- Measurement Analysis (EVM) Function set
- Set Measurement Count to 20

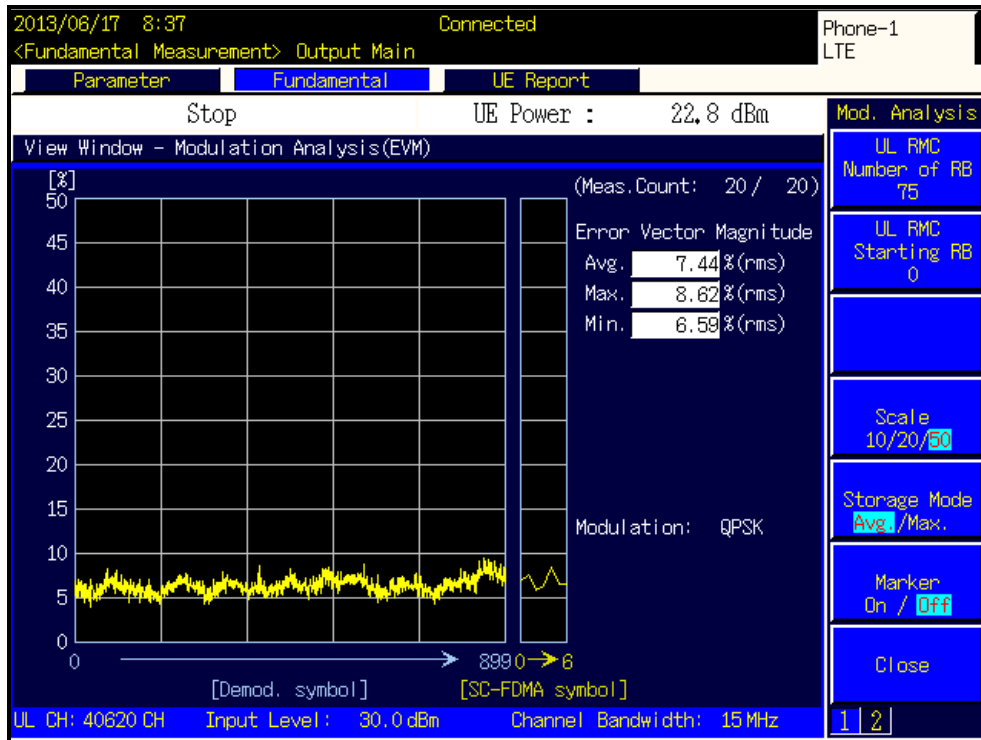
4.3.4 Test Result Plots



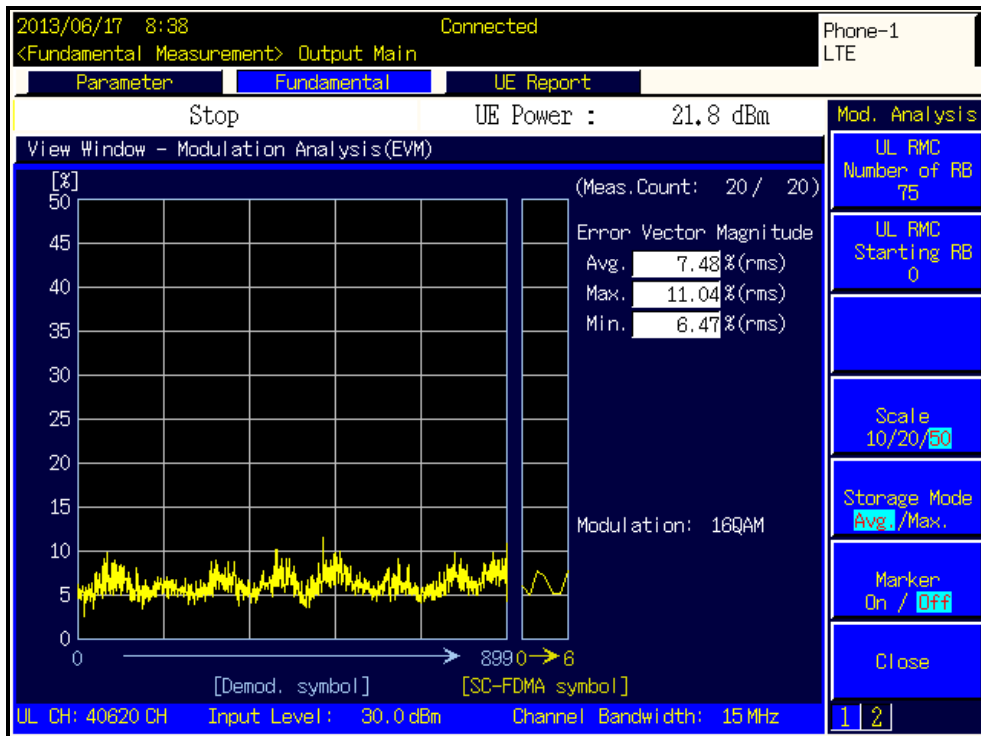
Mid Ch.40620 10MHz BW (QPSK)



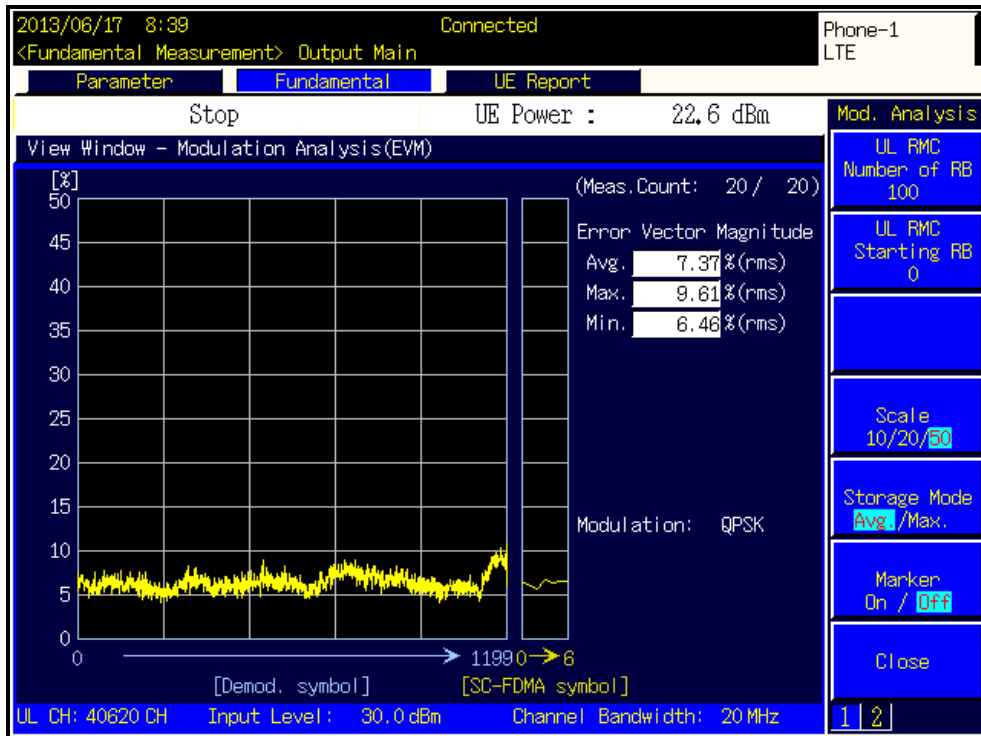
Mid Ch.40620 10MHz BW (16QAM)



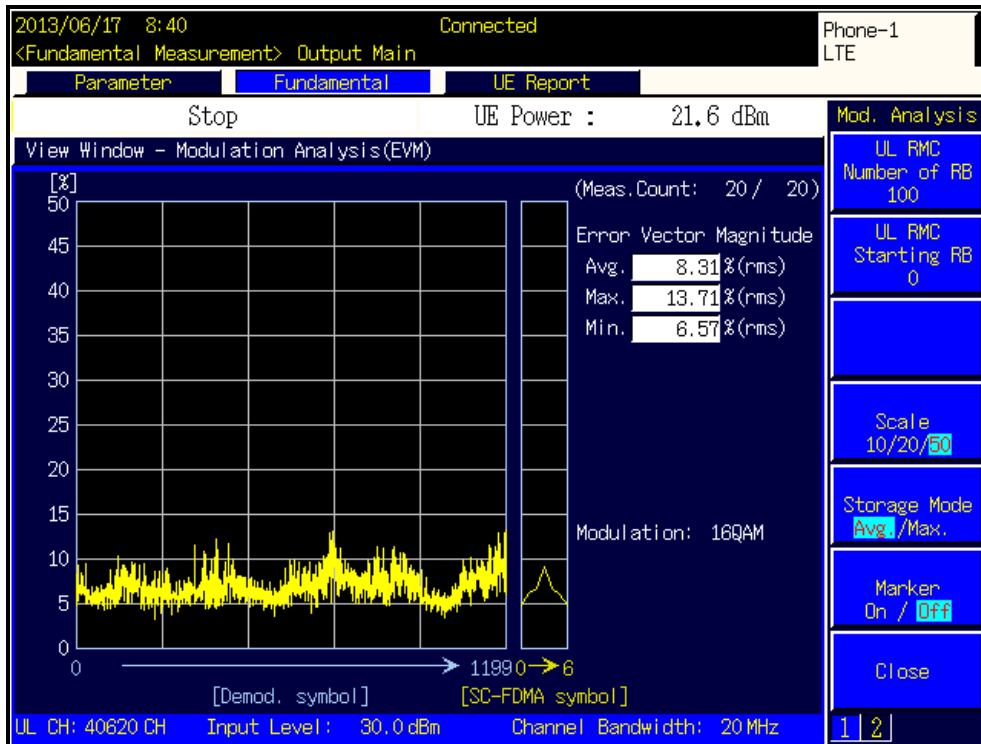
Mid Ch.40620 15MHz BW (QPSK)



Mid Ch.40620 15MHz BW (16QAM)



Mid Ch.40620 20MHz BW (QPSK)



Mid Ch.40620 20MHz BW (16QAM)

4.4 Occupied Bandwidth

4.4.1 Standard Reference

FCC Part §2.1049

4.4.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/25/2013	Humidity	32.7%	32.1%
		Temperature	18.2°C	19.5°C
		Barometer	1005mbar	1004mbar

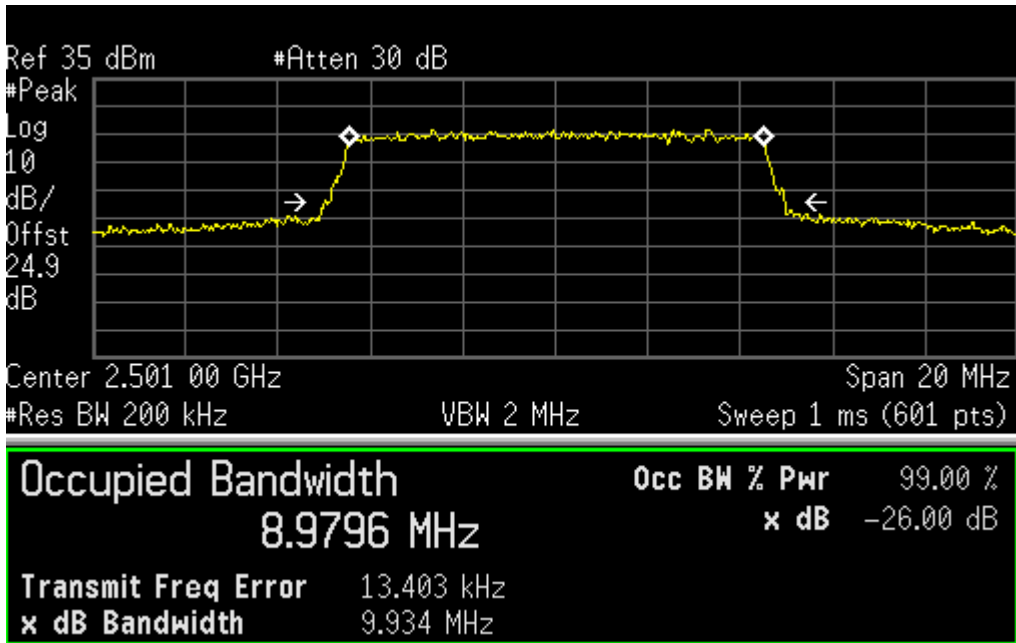
4.4.3 Test Conditions

- The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- Spectrum Analyzer used to collect test results.
- An offset of 24.9dB used to compensate for external setup losses
- 20dB Attenuator used
- Channel Bandwidth Measurement Function set
- Power Bandwidth set to 99% (default)
- Detector set to Peak
- Span is wide enough to capture the channel transmission
- RBW is 1% of the span
- VBW is 3x RBW
- Sweep set to Auto Couple

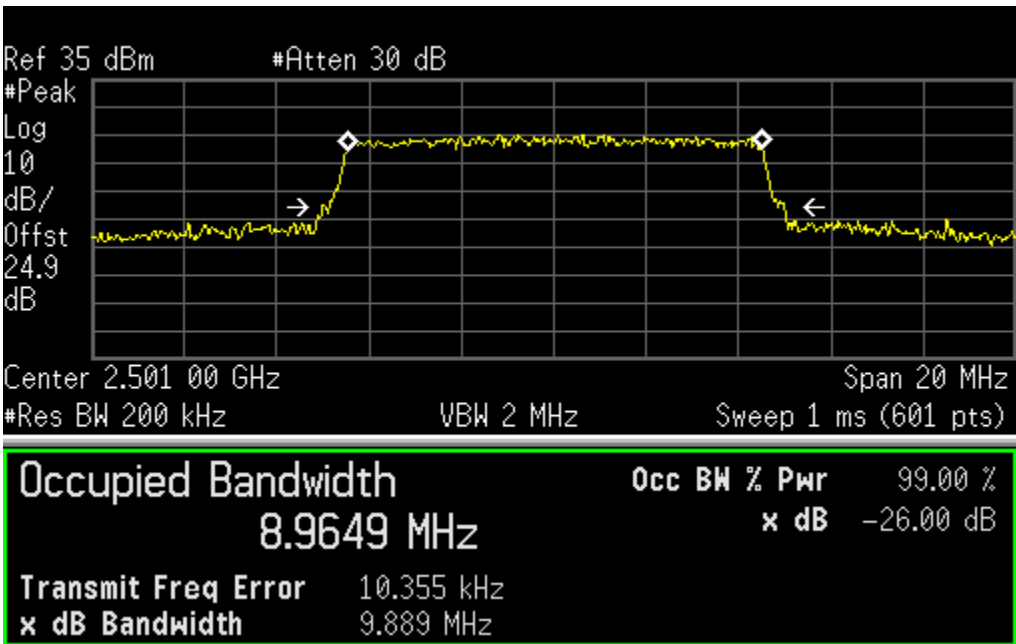
4.4.4 Test Results

BW	Channel	Frequency	Modulation	OBW
(MHz)	(#)	(MHz)	(Type)	(MHz)
10	39700	2501.0	QPSK	8.9796
			16QAM	8.9649
10	40620	2593.0	QPSK	8.946
			16QAM	8.9317
10	41540	2685.0	QPSK	8.9832
			16QAM	8.9881
15	39725	2503.5	QPSK	13.5924
			16QAM	13.5503
15	40620	2593.0	QPSK	13.6195
			16QAM	13.5822
15	41515	2682.5	QPSK	13.5741
			16QAM	13.5092
20	39750	2506.0	QPSK	18.0544
			16QAM	17.9332
20	40620	2593.0	QPSK	18.0117
			16QAM	17.9163
20	41490	2680.0	QPSK	17.9532
			16QAM	17.9982

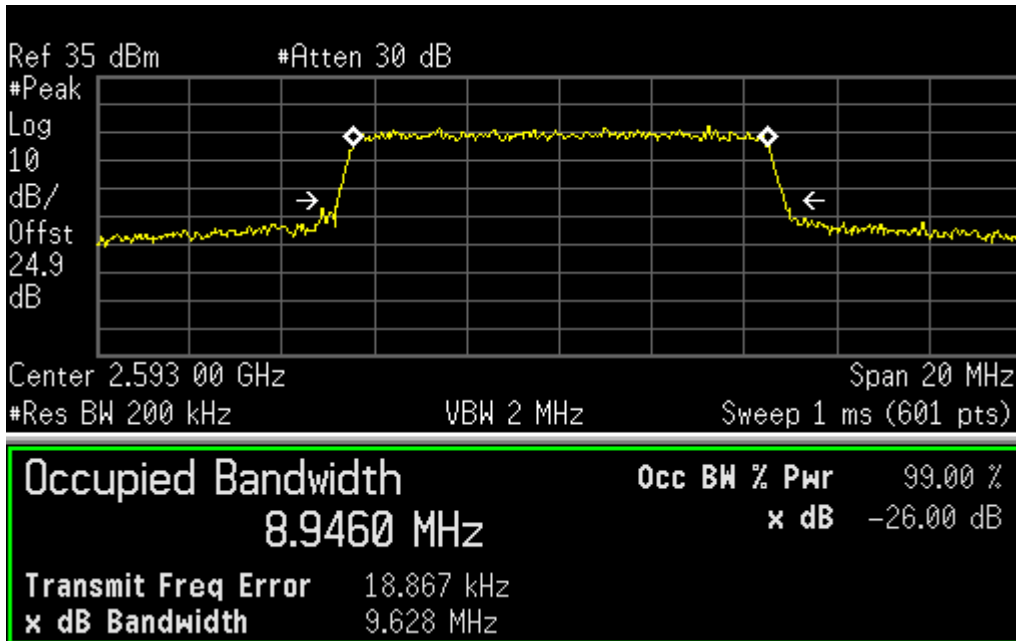
4.1.1 Test Result Plots



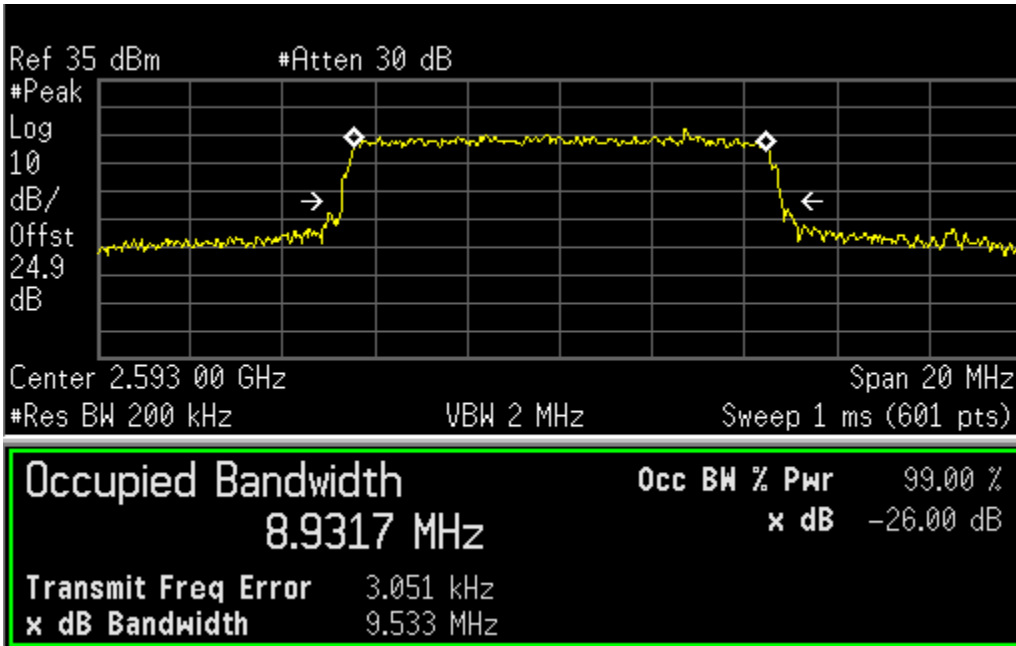
LTE B41 Low Ch.39700 10MHz BW (QPSK) RB50-0 -26dB BW/99% OBW



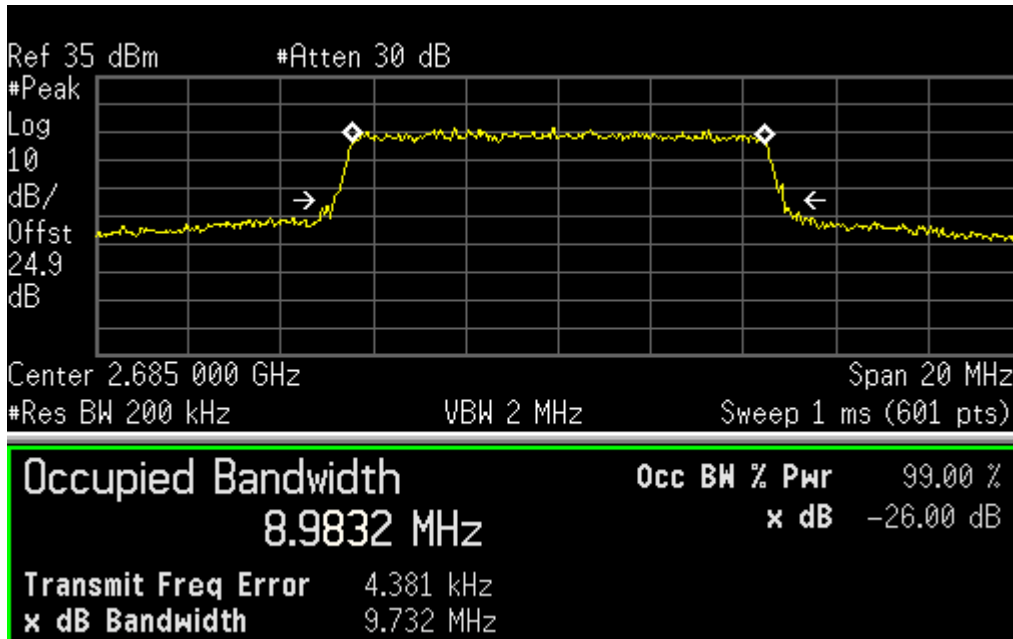
LTE B41 Low Ch.39700 10MHz BW (16QAM) RB50-0 -26dB BW/99% OBW



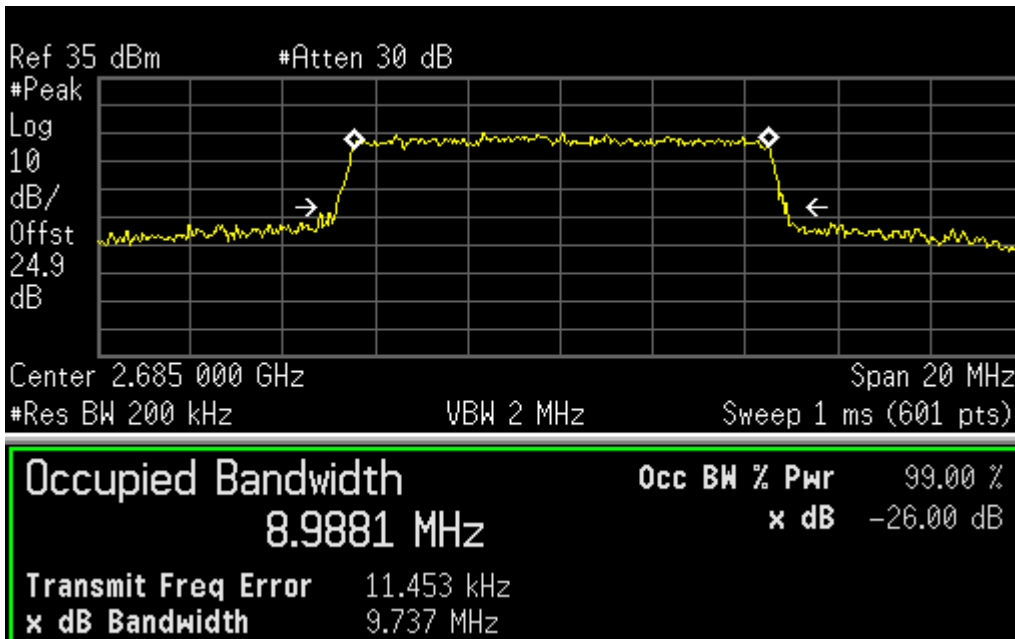
LTE B41 Middle Ch.40620 10MHz BW (QPSK) RB50-0 -26dB BW/99% OBW



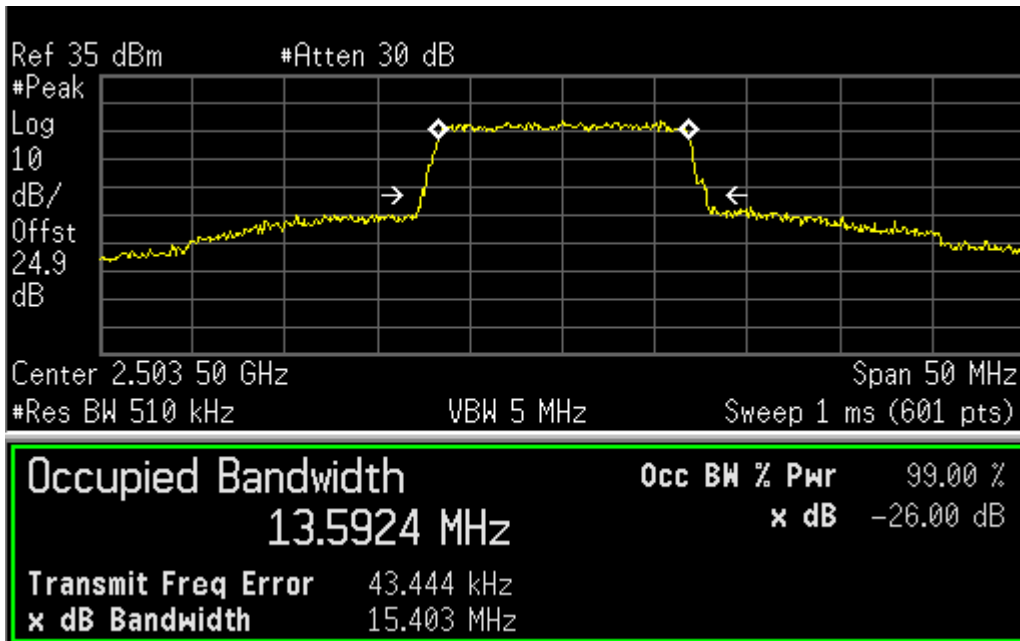
LTE B41 Middle Ch.40620 10MHz BW (16QAM) RB50-0 -26dB BW/99% OBW



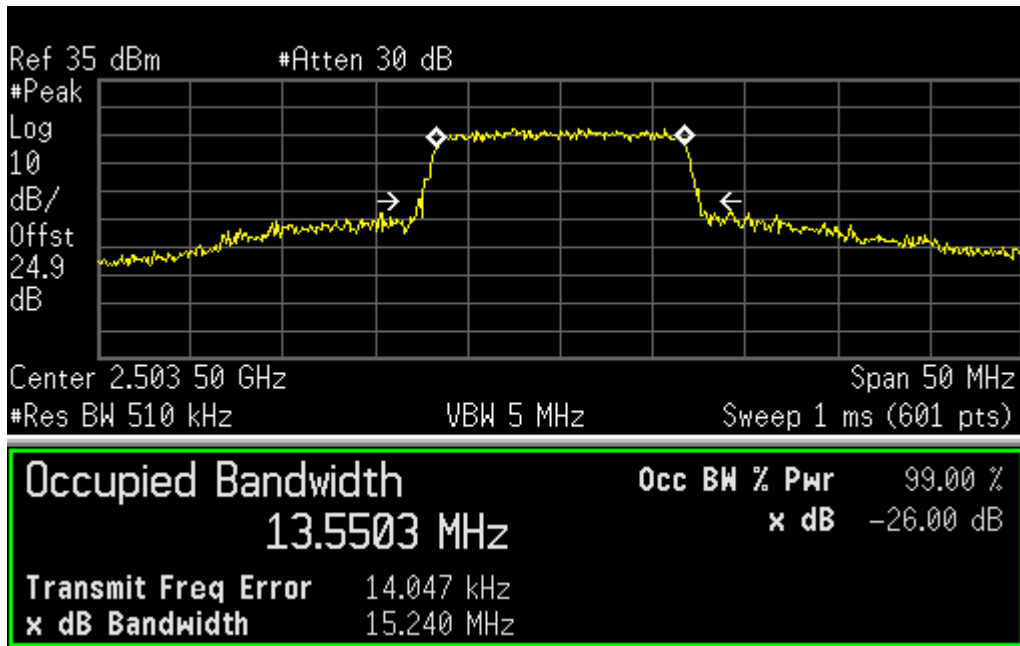
LTE B41 High Ch.41540 10MHz BW (QPSK) RB50-0 -26dB BW/99% OBW



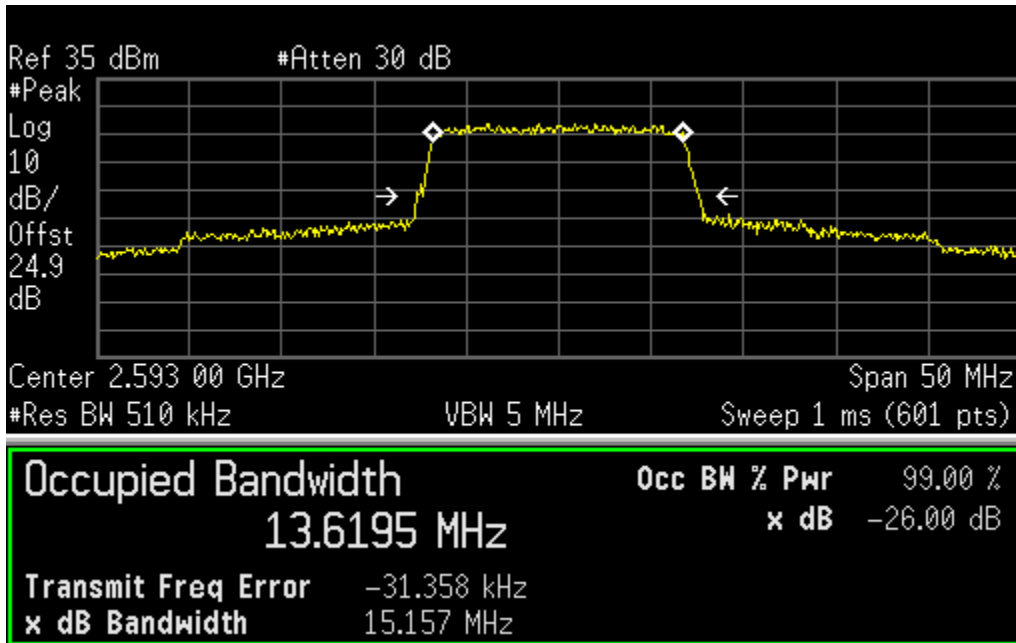
LTE B41 High Ch.41540 10MHz BW (16QAM) RB50-0 -26dB BW/99% OBW



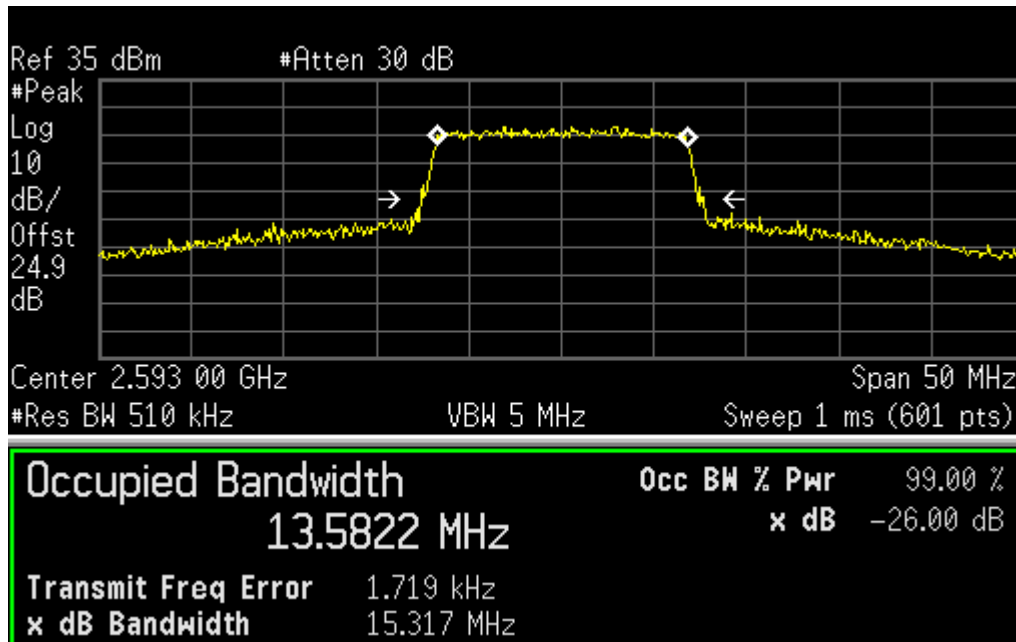
LTE B41 Low Ch.39725 15MHz BW (QPSK) RB75-0 -26dB BW/99% OBW



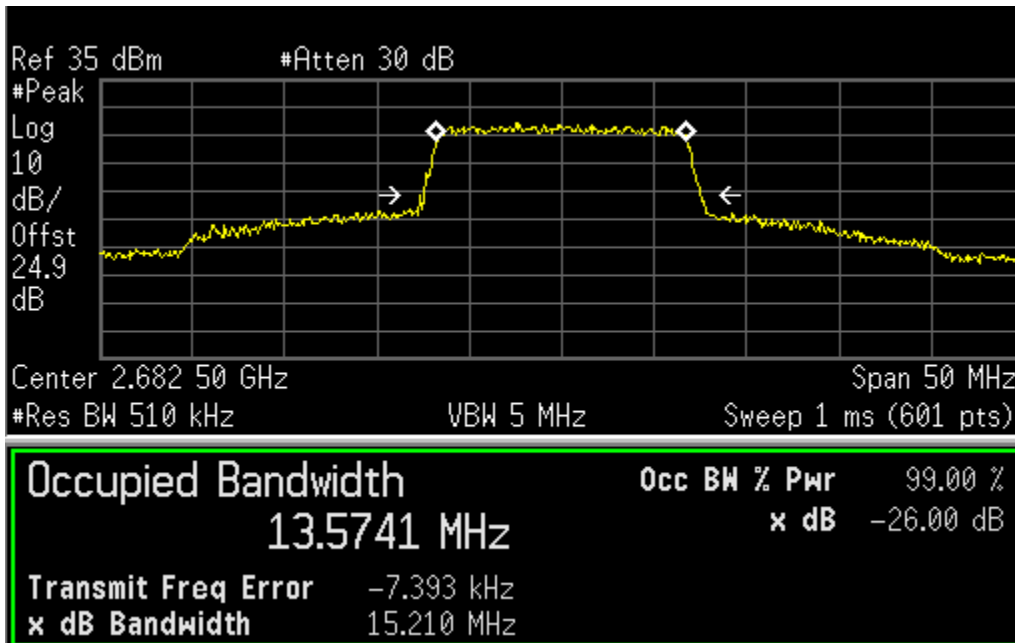
LTE B41 Low Ch.39725 15MHz BW (16QAM) RB75-0 -26dB BW/99% OBW



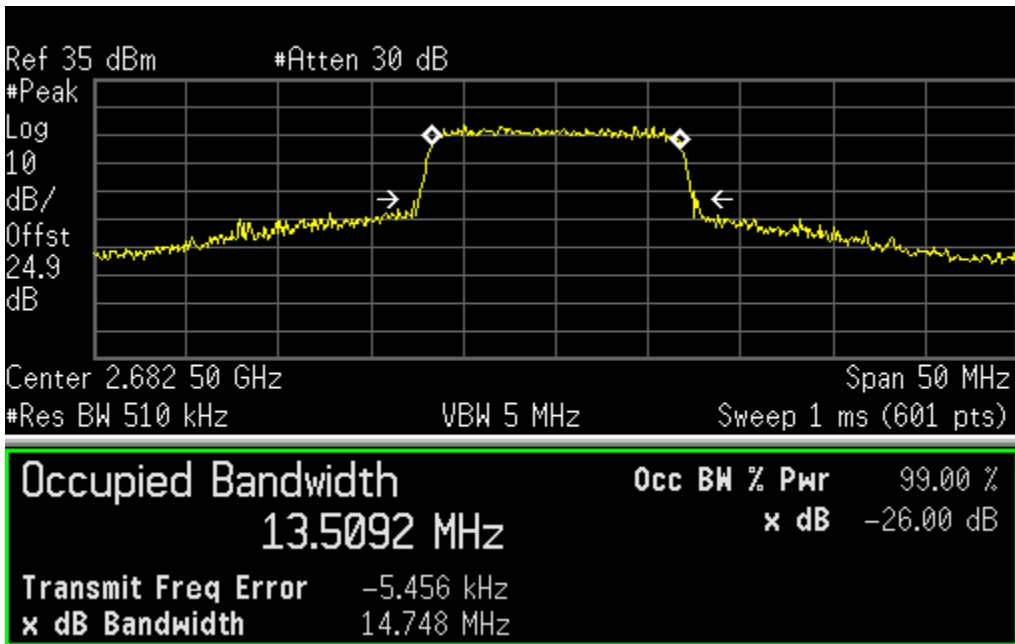
LTE B41 Middle Ch.40620 15MHz BW (QPSK) RB75-0 -26dB BW/99% OBW



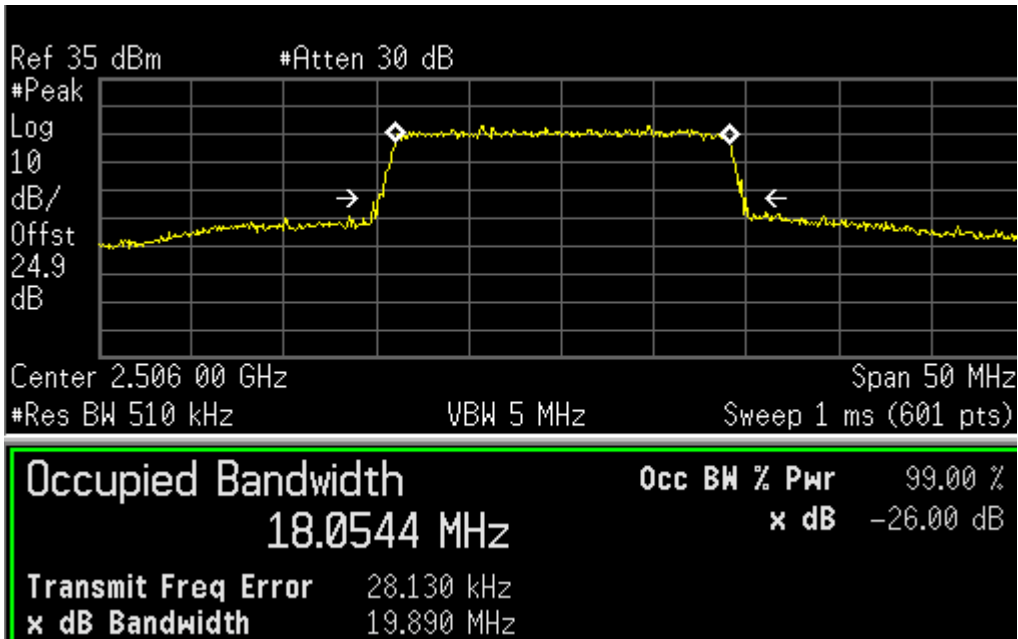
LTE B41 Middle Ch.40620 15MHz BW (16QAM) RB75-0 -26dB BW/99% OBW



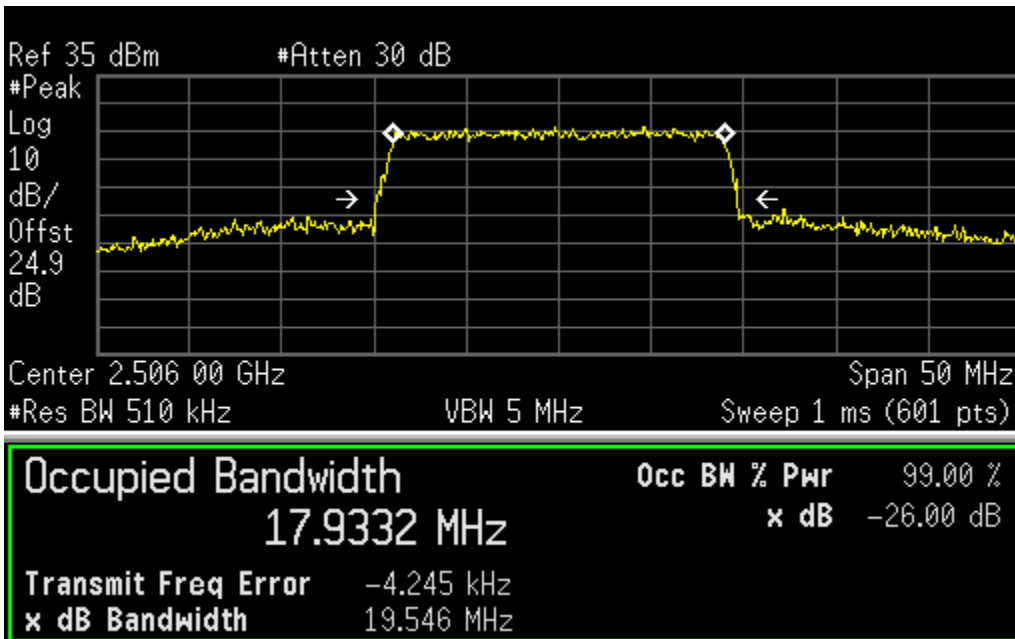
LTE B41 High Ch.41515 15MHz BW (QPSK) RB75-0 -26dB BW/99% OBW



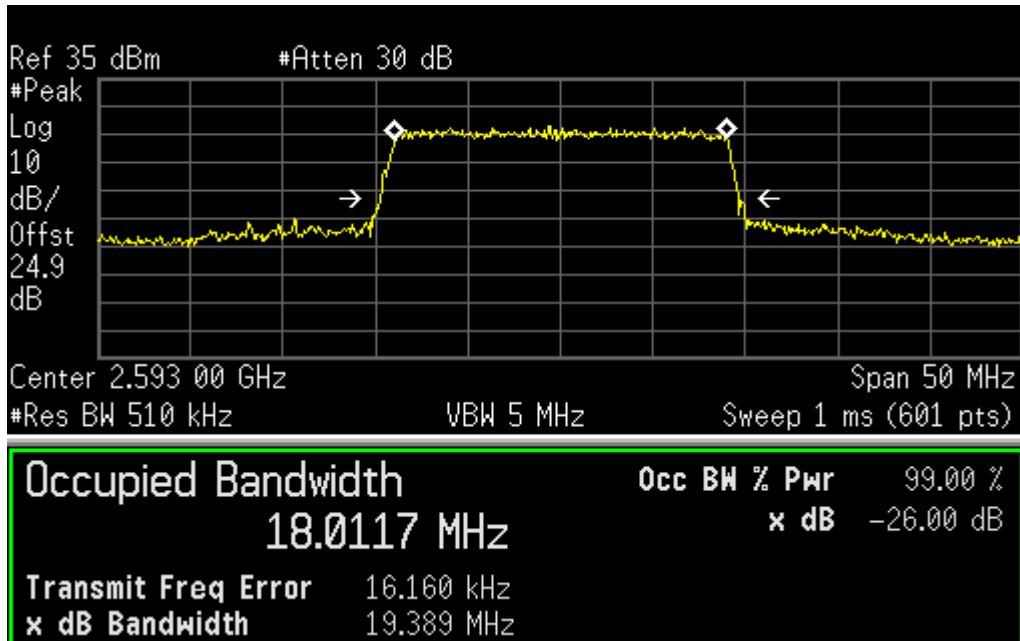
LTE B41 High Ch.41515 15MHz BW (16QAM) RB75-0 -26dB BW/99% OBW



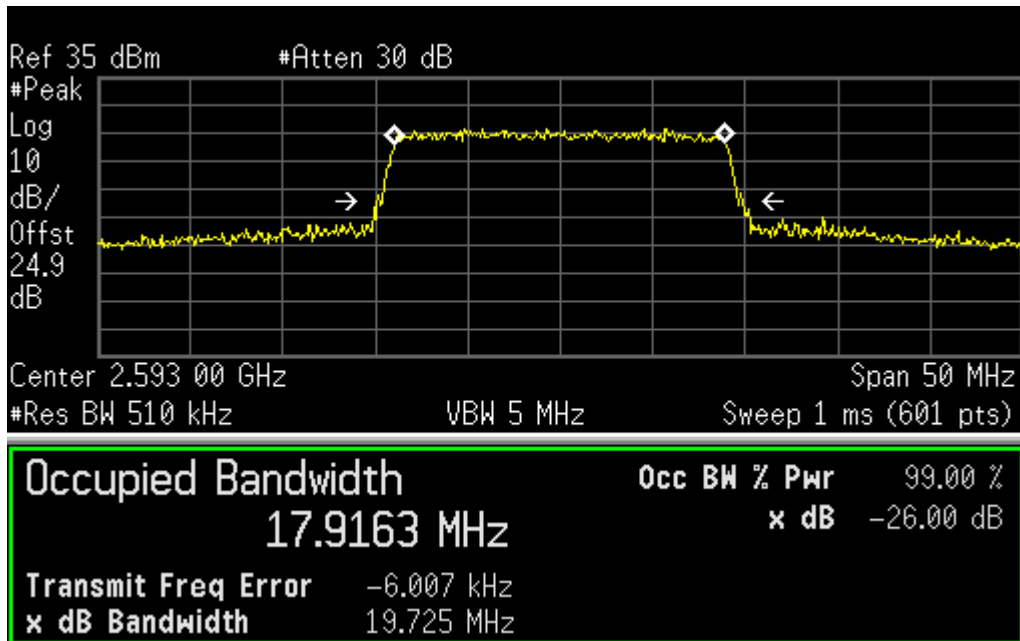
LTE B41 Low Ch.39750 20MHz BW (QPSK) RB100-0 -26dB BW/99% OBW



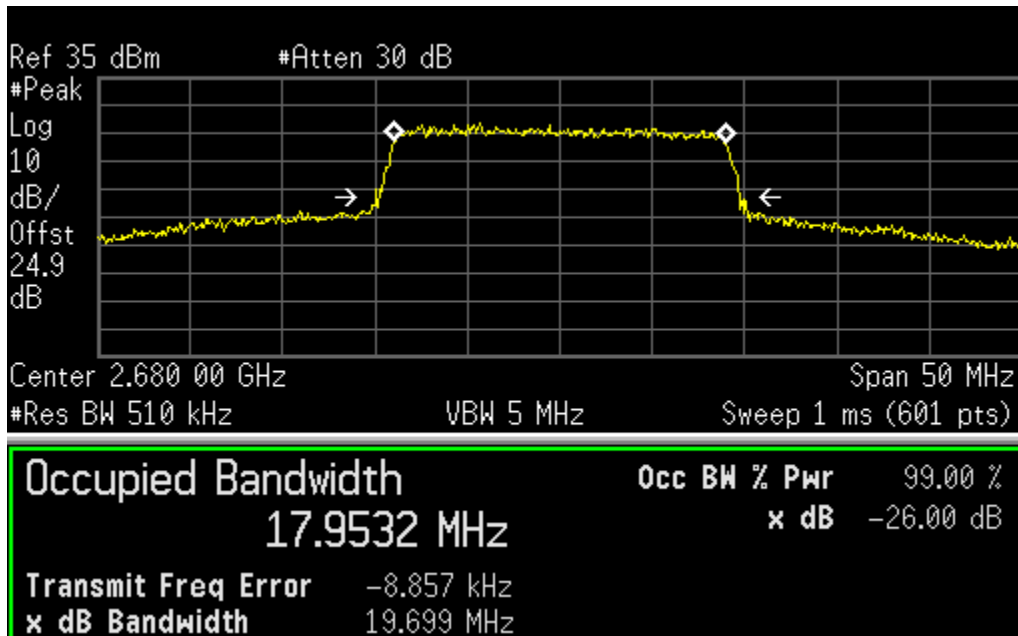
LTE B41 Low Ch.39750 20MHz BW (16QAM) RB100-0 -26dB BW/99% OBW



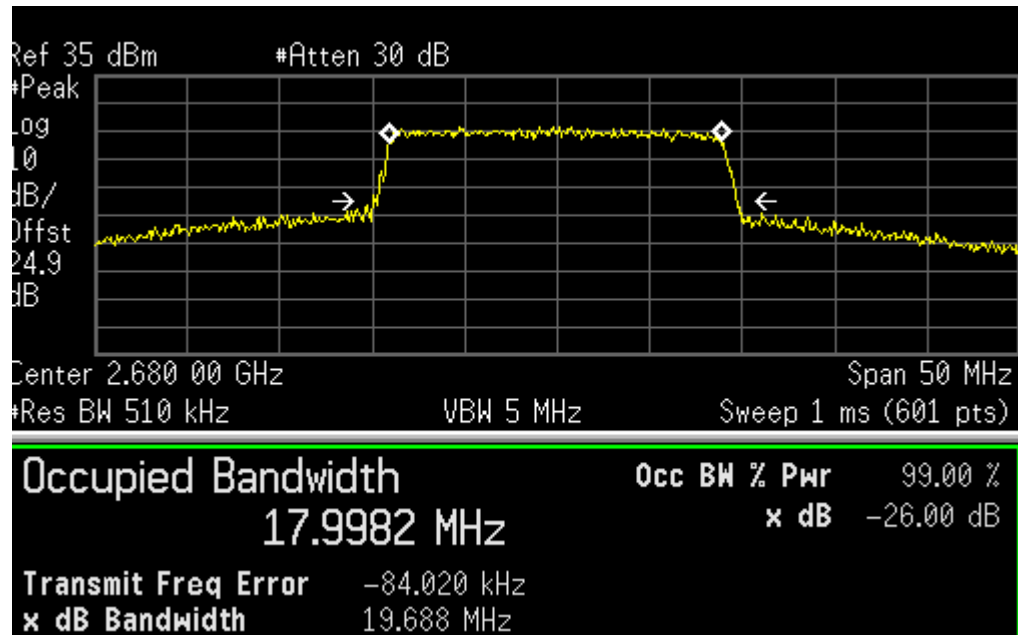
LTE B41 Middle Ch.40620 20MHz BW (QPSK) RB100-0 -26dB BW/99% OBW



LTE B41 Middle Ch.40620 20MHz BW (16QAM) RB100-0 -26dB BW/99% OBW



LTE B41 High Ch.41490 20MHz BW (QPSK) RB100-0 -26dB BW/99% OBW



LTE B41 High Ch.41490 20MHz BW (16QAM) RB100-0 -26dB BW/99% OBW

4.5 Band-Edge

4.5.1 Standard Reference

FCC Part §2.1051, §27.53(m)

4.5.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/25/2013	Humidity	32.1%	34.6%
		Temperature	19.5°C	20.7°C
		Barometer	1004mbar	1004mbar

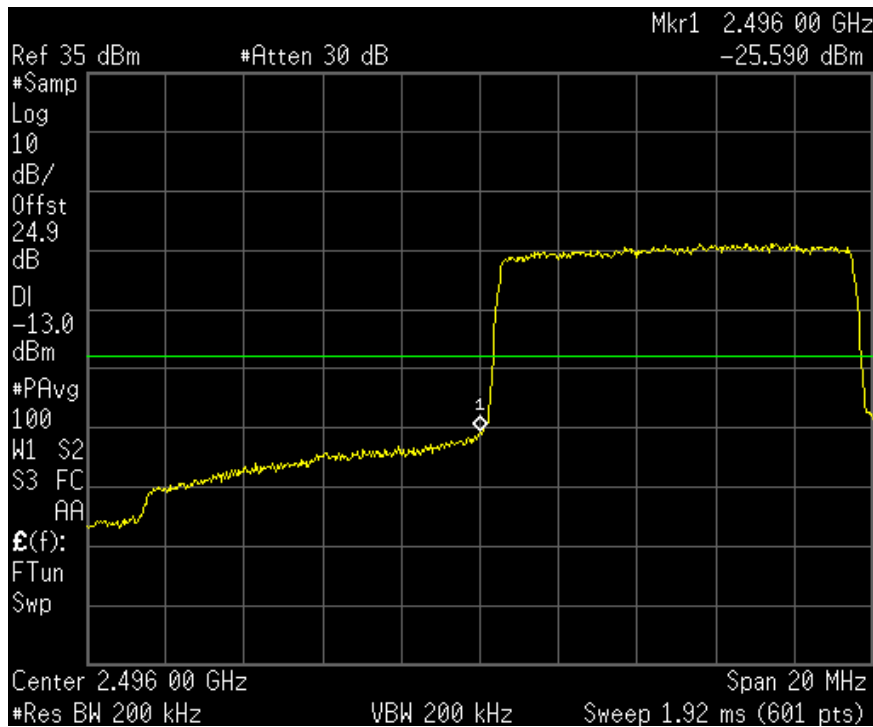
4.5.3 Test Conditions

- (m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.
- (4) For mobile digital stations, the attenuation factor shall be not less than $43 + 10 \log (P)$ dB at the channel edge and $55 + 10 \log (P)$ dB at 5.5 megahertz from the channel edges. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.
- Note: Band-Edge measured against "Worse-Case" Limit $-13\text{dBm} [43 + 10 \log (P) \text{ dB}]$ though clearly in "Compliance" to -25dBm Limit $[55 + 10 \log (P) \text{ dB}]$
- Spectrum Analyser centered on the band-edge frequency while setting the EUT to the corresponding transmit channel (i.e. Low Channel for lower band-edge)
- Spectrum Analyzer used to collect test results.
- An offset of 24.9dB used to compensate for external setup losses
- 20dB Attenuator used
- Detector set to Peak
- RBW is 100KHz
- VBW is 3x RBW
- Sweep set to Auto Couple
- Trace is Average

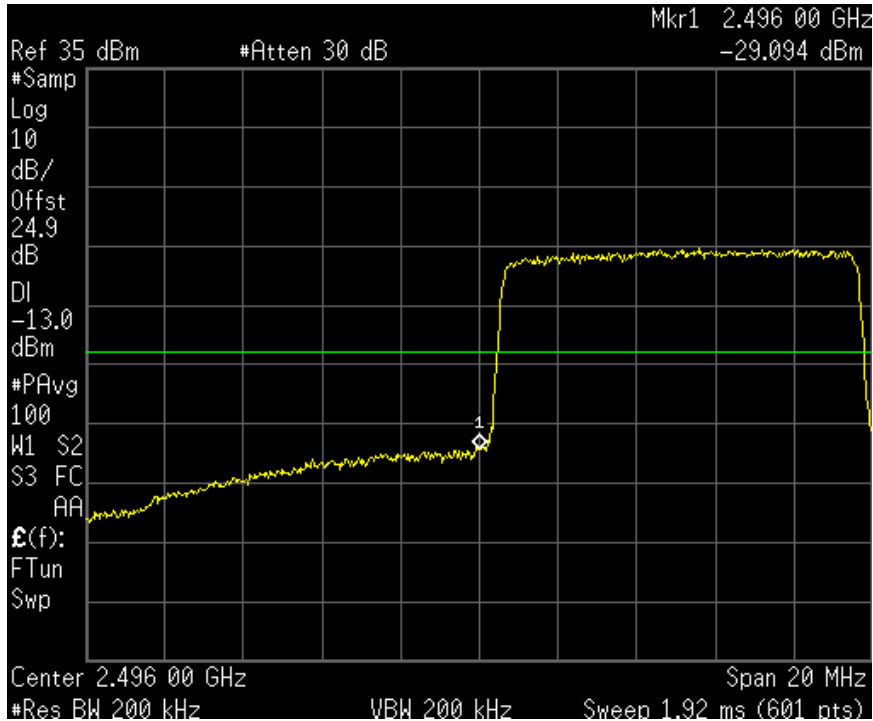
4.5.4 Test Result

Channel	Edge	BW	Modulation	RB	Frequency Emission	Level	Limit	Complies
(#)	(H/L)	(MHz)		(#)	(MHz)	(dBm)	(dBm)	(Y or N)
39700	Low	10MHz	QPSK	50-0	2496	-25.59	-25	Y
41540	High				2690	-25.05	-25	Y
39700	Low	10MHz	16QAM	50-0	2496	-29.09	-25	Y
41540	High				2690	-30.32	-25	Y
39725	Low	15MHz	QPSK	75-0	2496	-29.87	-25	Y
41515	High				2690	-30.88	-25	Y
39725	Low	15MHz	16QAM	75-0	2496	-32.31	-25	Y
41515	High				2690	-32.42	-25	Y
39750	Low	20MHz	QPSK	100-0	2496	-33.27	-25	Y
41490	High				2690	-29.95	-25	Y
39750	Low	20MHz	16QAM	100-0	2496	-34.45	-25	Y
41490	High				2690	-33.87	-25	Y

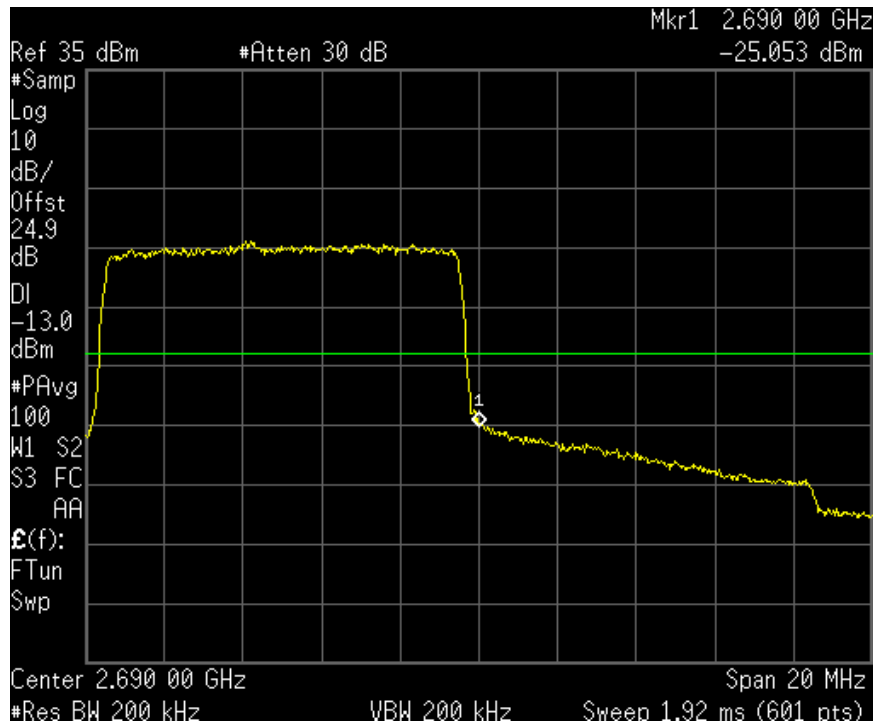
4.5.5 Test Result Plots



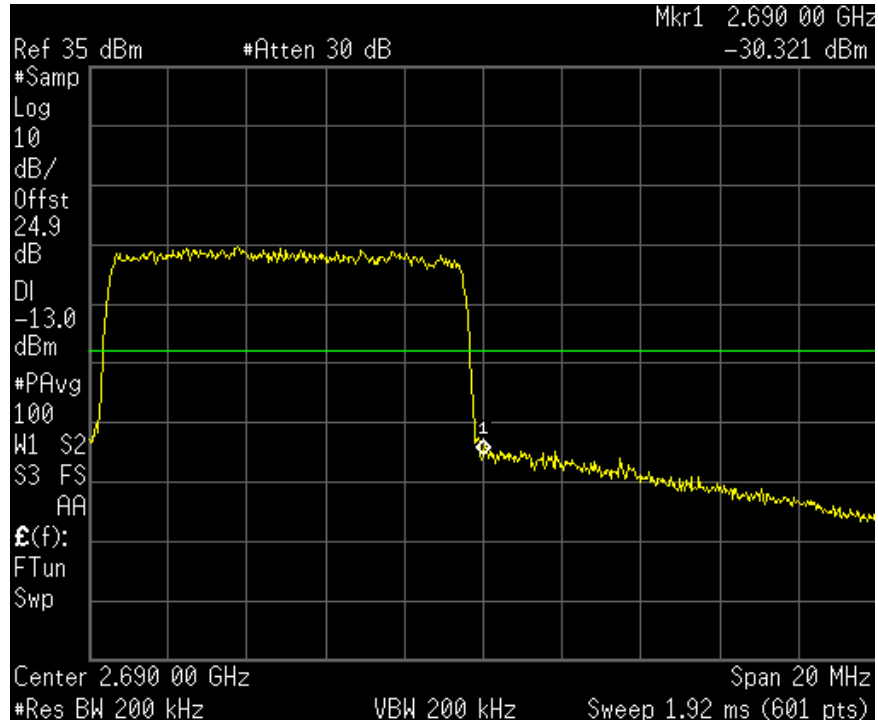
LTE B41 10MHz BW Low Ch.39700 (QPSK) RB 50-0 Band Edge



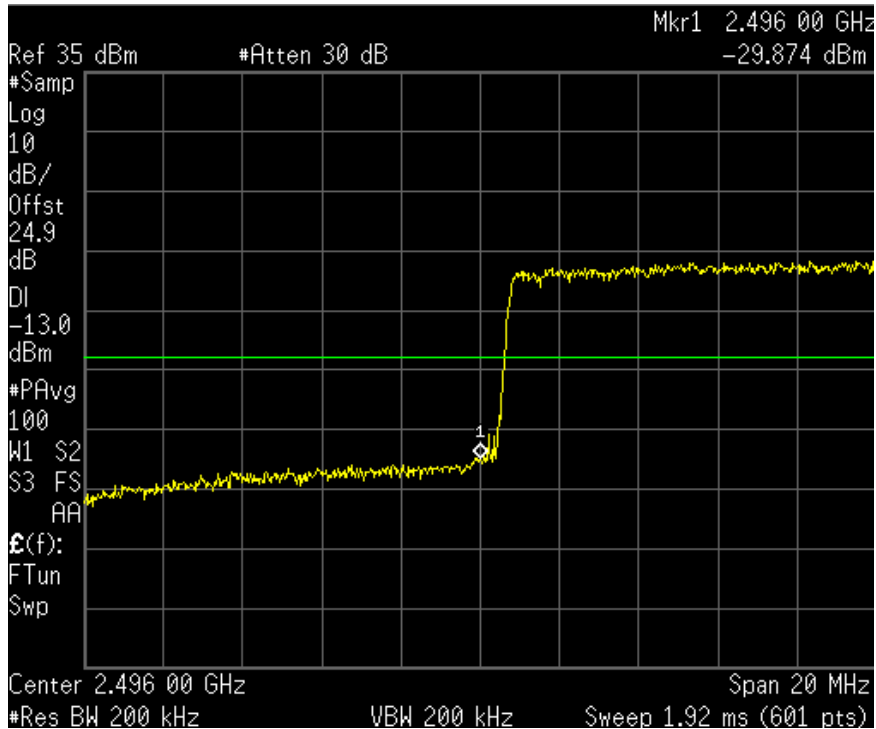
LTE B41 10MHz BW Low Ch.39700 (16QAM) RB 50-0 Band Edge



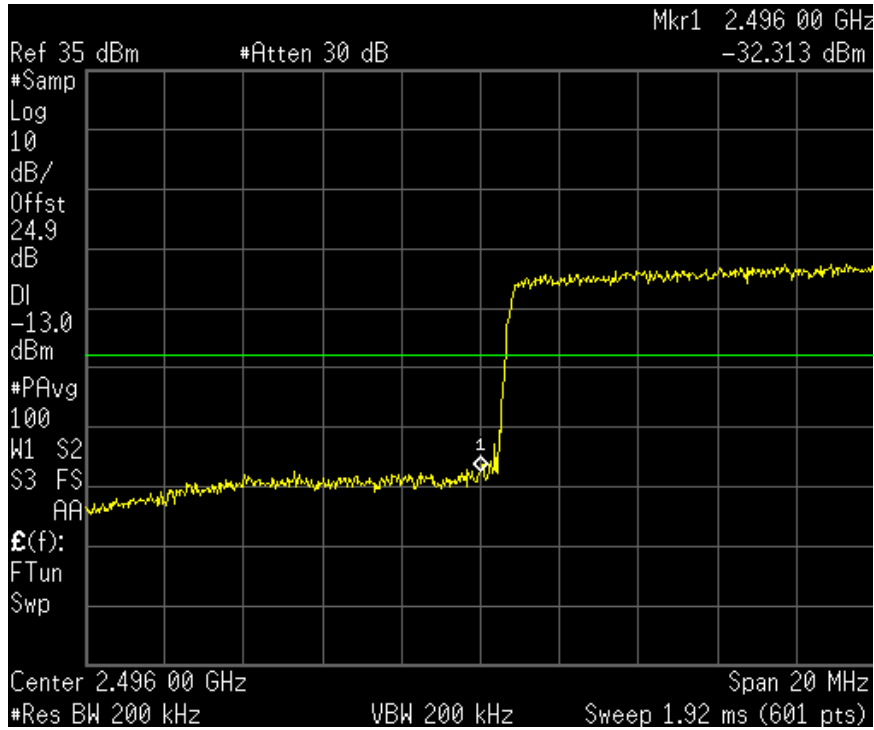
LTE B41 10MHz BW High Ch.41540 (QPSK) RB 50-0 Band Edge



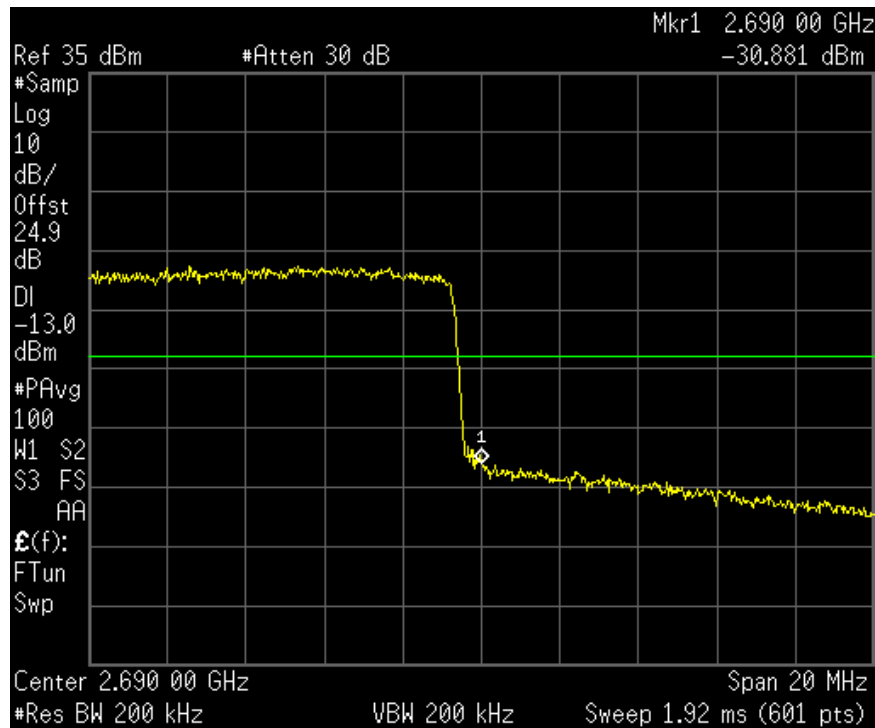
LTE B41 10MHz BW High Ch.41540 (16QAM) RB 50-0 Band Edge



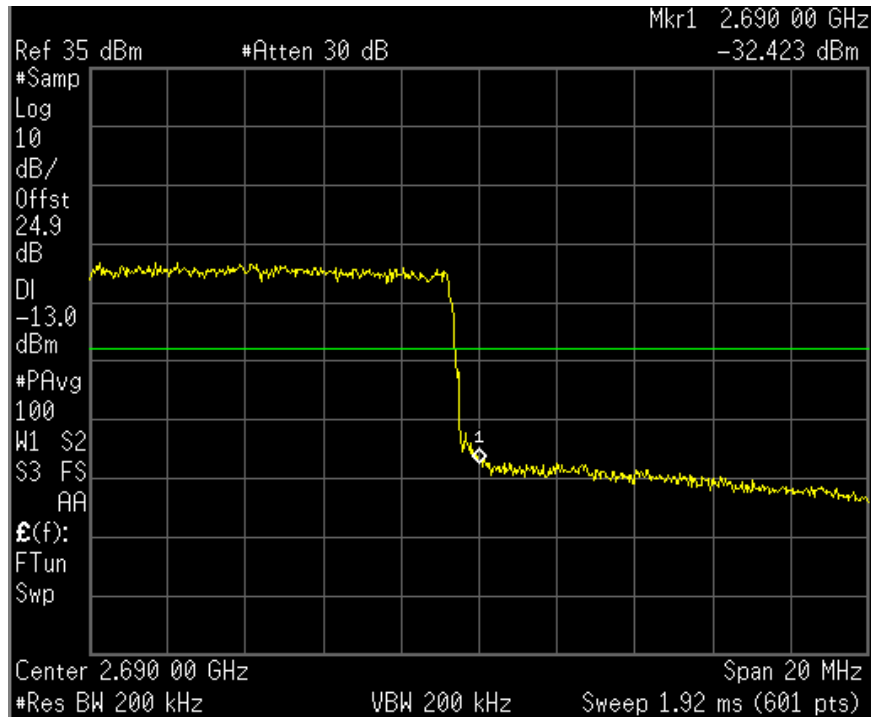
LTE B41 15MHz BW Low Ch.39725 (QPSK) RB 75-0 Band Edge



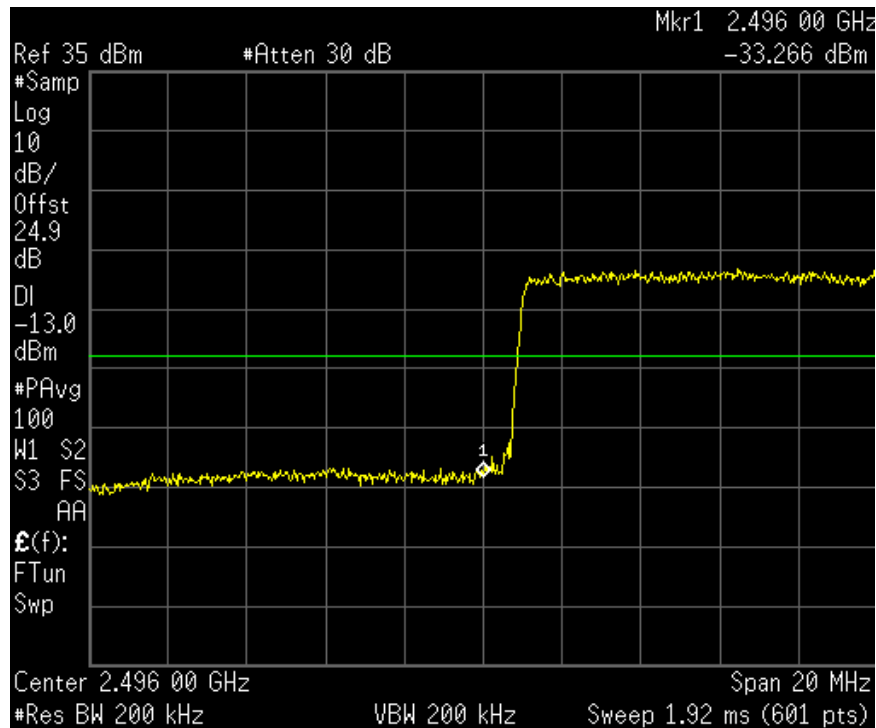
LTE B41 15MHz BW Low Ch.39725 (16QAM) RB 75-0 Band Edge



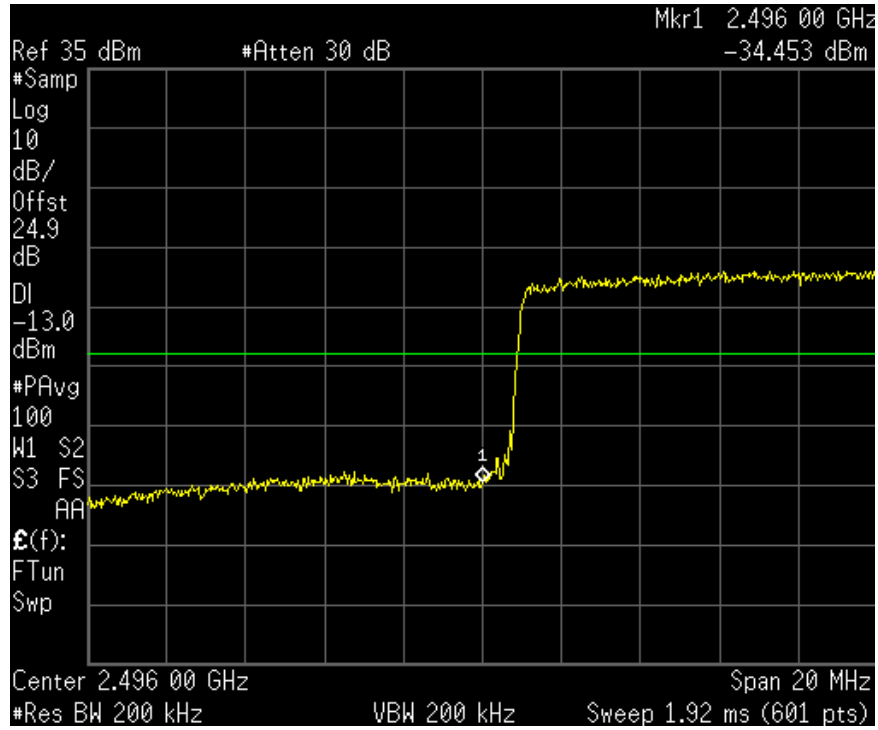
LTE B41 15MHz BW High Ch.41515 (QPSK) RB 75-0 Band Edge



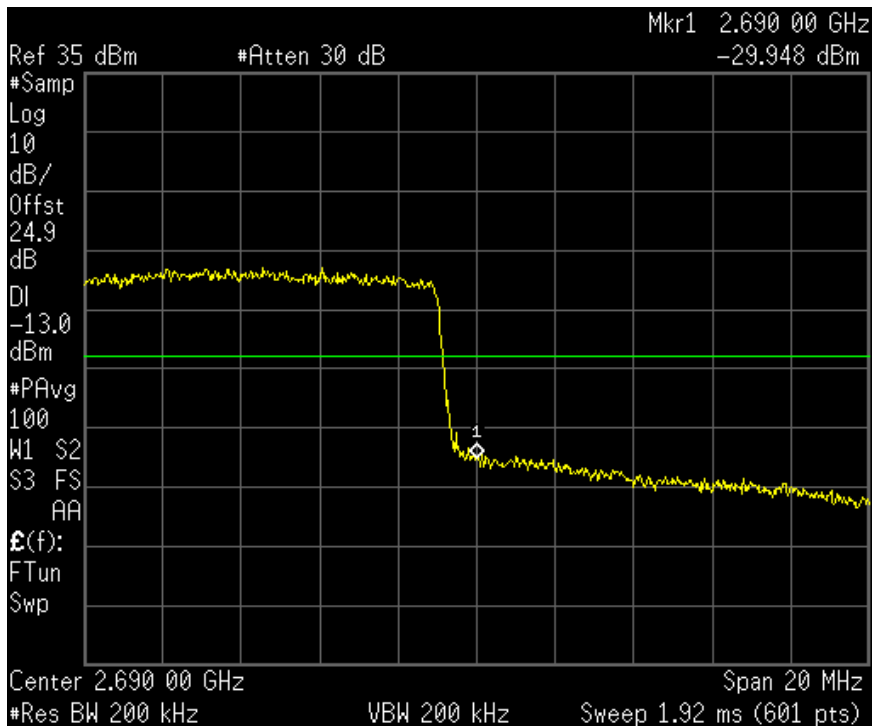
LTE B41 15MHz BW High Ch.41515 (16QAM) RB 75-0 Band Edge



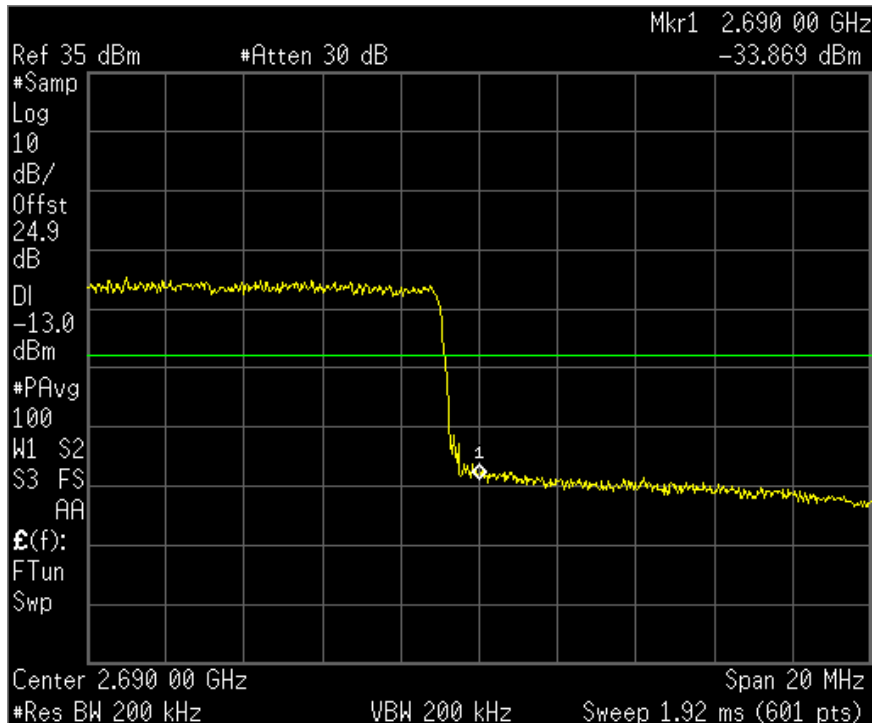
LTE B41 20MHz BW Low Ch.39750 (QPSK) RB 100-0 Band Edge



LTE B41 20MHz BW Low Ch.39750 (16QAM) RB 100-0 Band Edge



LTE B41 20MHz BW High Ch.41490 (QPSK) RB 100-0 Band Edge



LTE B41 20MHz BW High Ch.41490 (16QAM) RB 100-0 Band Edge

4.6 Conducted Spurious Emissions

4.6.1 Standard Reference

FCC Part §2.1051, §27.53(m)

4.6.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/18/2013	Humidity	37.9%	36.4%
		Temperature	23.6°C	23.7°C
		Barometer	1002mbar	1002mbar

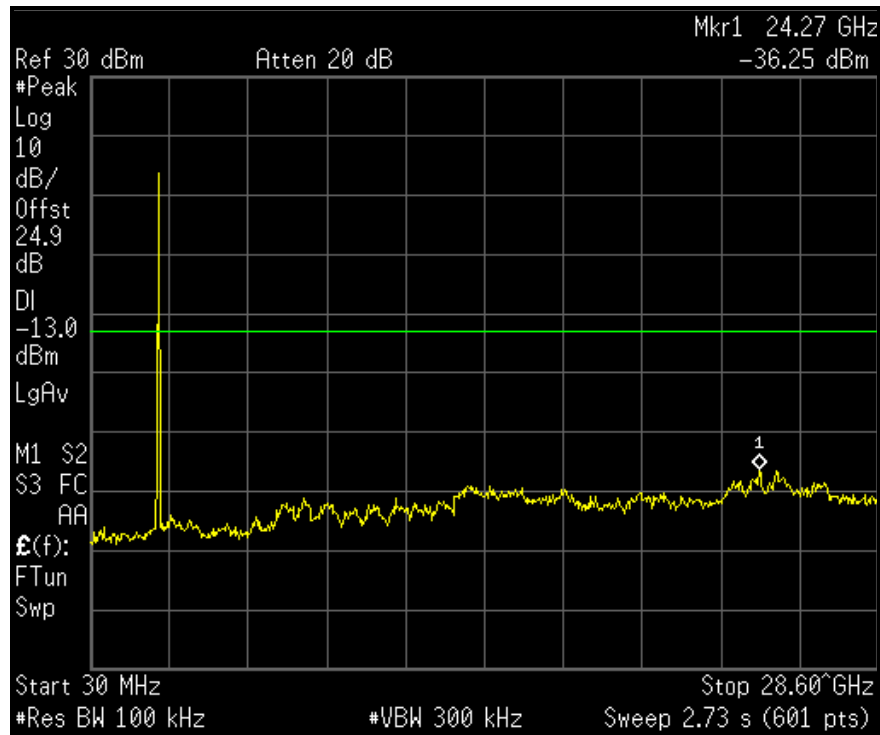
4.6.3 Test Conditions

- For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.
- For mobile digital stations, the attenuation factor shall be not less than $43 + 10 \log (P)$ dB at the channel edge and $55 + 10 \log (P)$ dB at 5.5 megahertz from the channel edges. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.
- Note: Band-Edge measured against "Worse-Case" Limit $-13\text{dBm} [43 + 10 \log (P) \text{ dB}]$ though clearly in "Compliance" to -25dBm Limit $[55 + 10 \log (P) \text{ dB}]$
- Spectrum was evaluated from 30MHz to the 10th Harmonic for Band 41
- Spectrum Analyzer used to collect test results.
- An offset of 24.9dB used to compensate for external setup losses
- 20dB Attenuator used
- Detector set to Peak
- RBW is 100KHz
- VBW is 3x RBW
- Sweep set to Auto Couple
- Trace is Max Hold

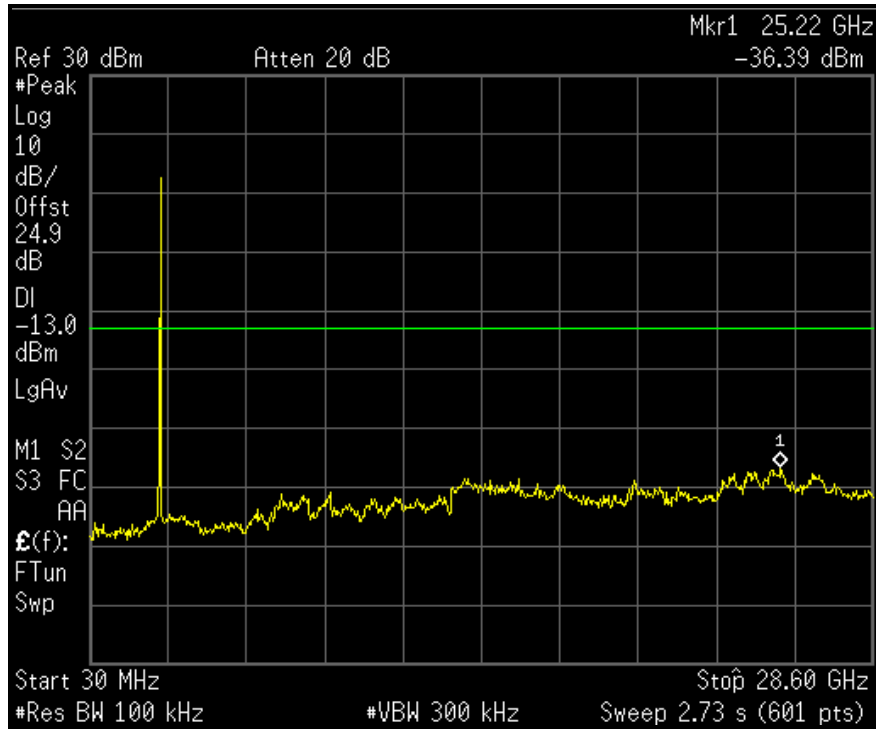
4.6.4 Test Result

Channel (#)	BW (MHz)	Modulation	RB (#)	Level (dBm)	Limit (dBm)	Complies (Y or N)
39700	10MHz	QPSK	50-0	-36.25	-25	Y
40620				-36.39	-25	Y
41540				-36.69	-25	Y
39725	15MHz	QPSK	75-0	-36.00	-25	Y
40620				-36.29	-25	Y
41515				-36.49	-25	Y
39750	20MHz	QPSK	100-0	-36.88	-25	Y
40620				-36.22	-25	Y
41490				-37.47	-25	Y

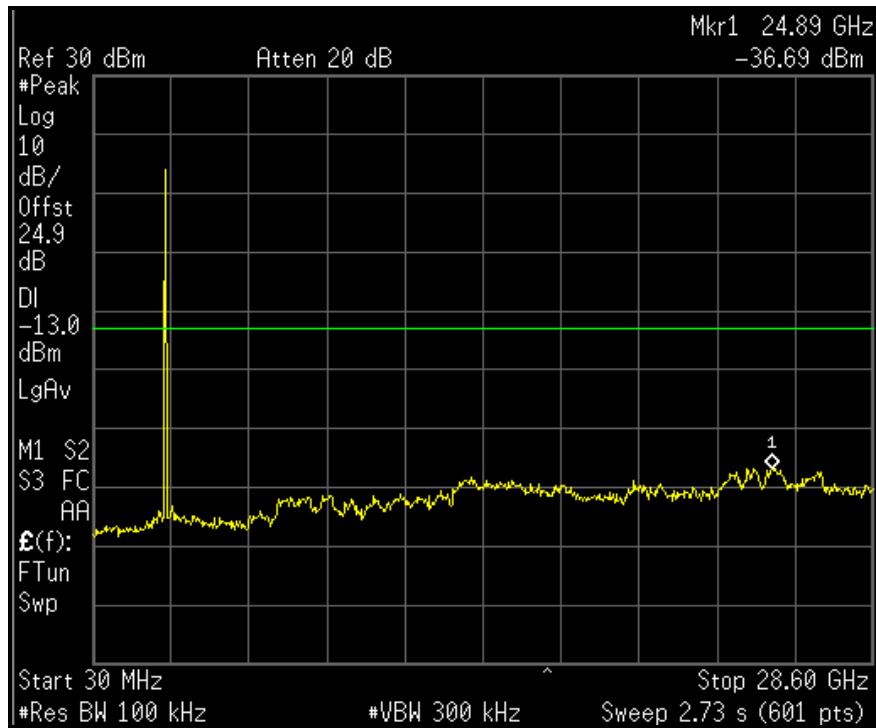
4.6.5 Test Result Plots



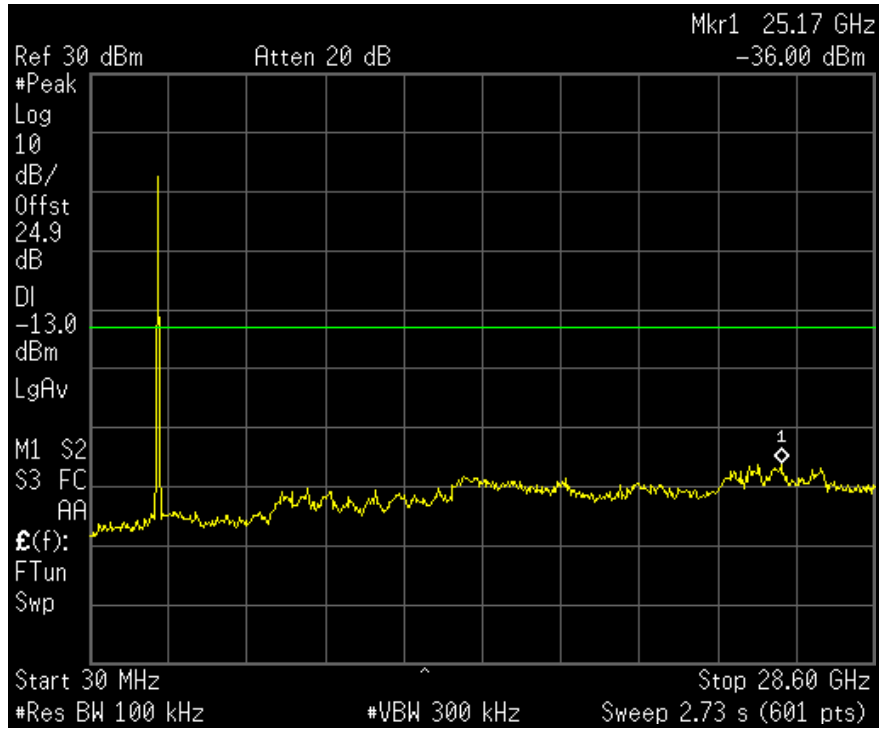
10MHz BW_Low Channel_QPSK/Full RBs (30MHz to 28.6GHz)



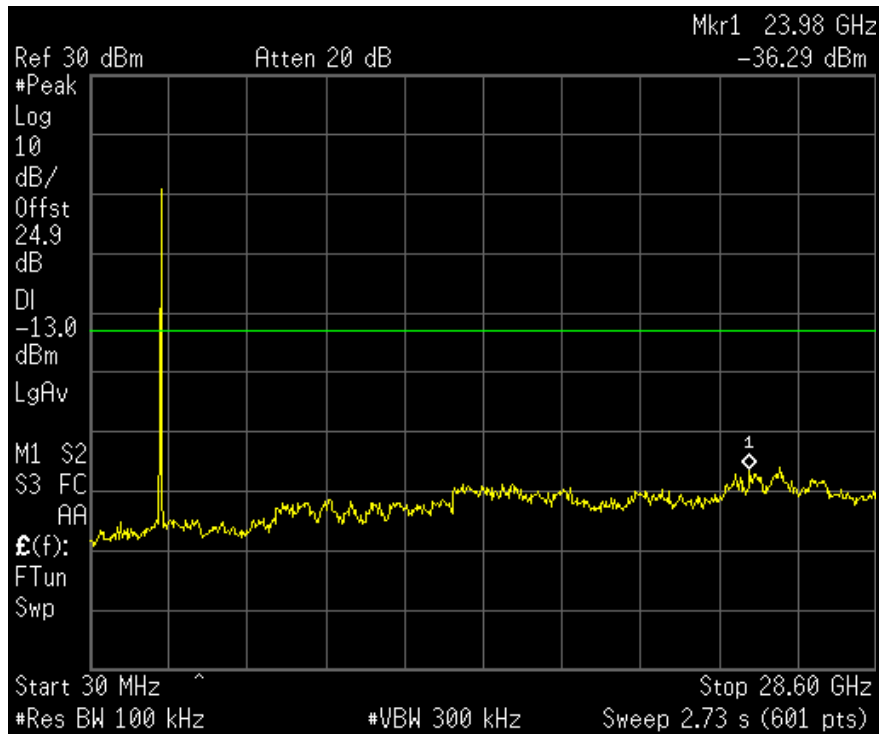
10MHz BW_Mid Channel_QPSK/Full RBs (30MHz to 28.6GHz)



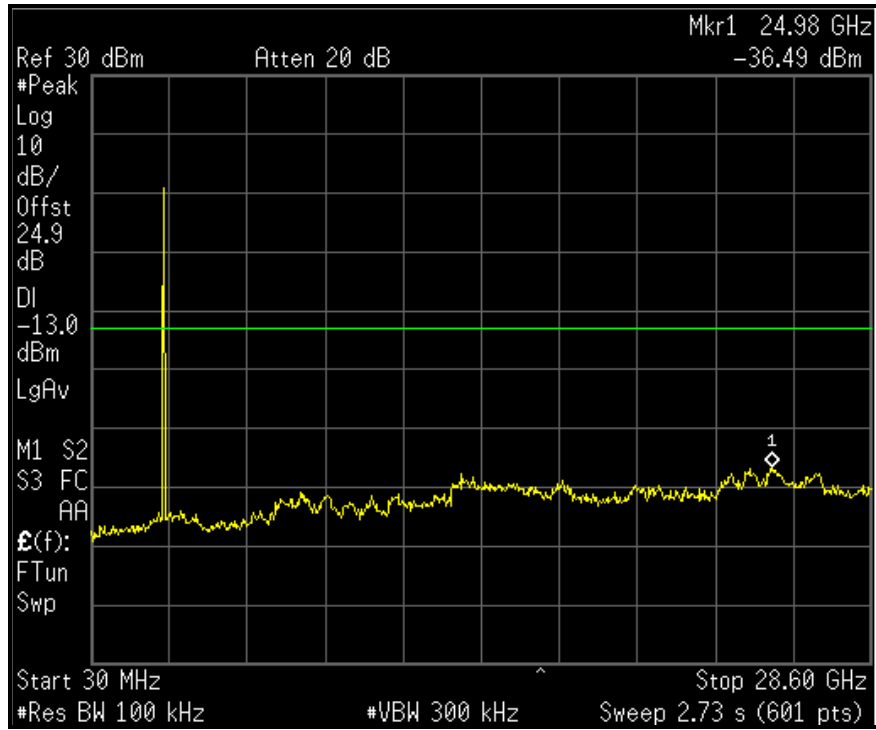
10MHz BW_High Channel_QPSK/Full RBs (30MHz to 28.6GHz)



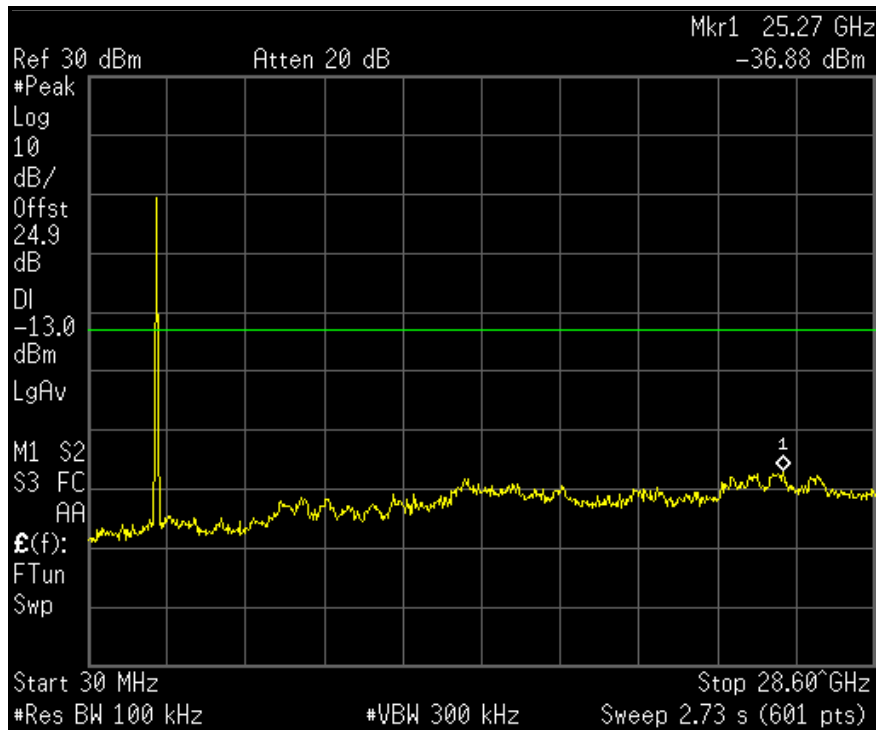
15MHz BW_Low Channel_QPSK/Full RBs (30MHz to 28.6GHz)



15MHz BW_Mid Channel_QPSK/Full RBs (30MHz to 28.6GHz)



15MHz BW_High Channel_QPSK/Full RBs (30MHz to 28.6GHz)



20MHz BW_Low Channel_QPSK/Full RBs (30MHz to 28.6GHz)

4.7 Frequency Stability

4.7.1 Standard Reference

FCC Part §2.1055(a)(1), §27.54

4.7.2 Environmental Conditions

Environmental Conditions				
Initials	Date	Description	Start	Stop
RO	06/18/2013	Humidity	36.4%	36.4%
		Temperature	23.7°C	23.7°C
		Barometer	1002mbar	1002mbar

4.7.3 Test Conditions

- The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.
- EUT was operated at +3.7VDC using the battery eliminator unit for testing and was placed in the temperature chamber for this evaluation.
- To determine worst case configuration for this test, the worst case test results of the conducted band edge were used (refer to Section 4.5).
- Communication Test Set used to collect test frequency error results.
- An offset of 24.9dB used to compensate for external setup losses
- Measurement Analysis (EVM) Function set

4.7.4 Test Results

Voltage (%)	Voltage (Vdc)	Temperature (°C)	Frequency Deviation (Hz)	Limit (ppm)
100	+3.7	-30	3.9	±2.5
100		-20	1.4	±2.5
100		-10	2.6	±2.5
100		0	3.6	±2.5
100		+10	1.1	±2.5
100		+20	10.5	±2.5
100		+30	6.11	±2.5
100		+40	7.1	±2.5
100		+50	13.0	±2.5
115		+4.2	+20	5.0
85	+3.1	+20	-2.4	±2.5

5 Conclusion

The data and/or results collected are in reference to only the test sample(s) listed in this test report under the conditions and modes of operation described. This Test Report shows MiFi5580 PKRNVWMIFI5580 is in compliance with:

- Federal Communications Commission CRF47 Part 15.247 SUBPART C Rules

6 Test Facility and Accreditations

- The test site and/or measurement facility used to collect the data results in this test report is located at 9645 Scranton Road, San Diego CA, USA.
- Novatel Wireless RPT Lab is accredited by A2LA ISO-17025, Laboratory ID #3228.01.
- The Full Scope of Accreditation for this lab can be viewed at <http://www.a2la.org/scopepdf>

7 Disclaimers and Copyright

- It is the manufacturer’s responsibility to assure the continued compliance of production units of this model.
- Novatel Wireless RPT Lab shall have no liability for any alteration of this document not carried out by Novatel Wireless RPT Lab. Such actions will constitute fraud nullify the document.
- This test report must not be used by the client to claim product certification, approval, or endorsement by A2LA ISO17025 and/or any federal government agency.

8 Report Modifications

Record of Modification		
Issue	Date	Modifications/Pages changed
NVTLTR0047-03	06/20/2013	Released Version
NVTLTR0047-03 Rev A	06/25/2013	Updated Occupied BW and Band Edge Plots
NVTLTR0047-03 Rev B	06/25/2013	Statement included in Section 3.2 Equipment List Table
NVTLTR0047-03 Rev C	07/12/2013	Updated Section 4.1.5 Band-Edge Test Conditions Updated Section 4.2.3 Spurious Emissions Test Conditions Updated Section 1.3 Results Summary of Standards

End of Report