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Report On

Radio Testing of the
On-Ramp Wireless Inc.
microNode-2 NODE102 2.4GHz Wireless transceiver module

FCC Part 15 Subpart C §15.247
IC RSS-210 Issue 8 December 2010

Report No. SD72102616Rev2.0-0215C **September 2015**

REPORT ON	Radio Testing of the On-Ramp Wireless Inc microNode-2 NODE102
TEST REPORT NUMBER	SD72102616Rev2.0-0215C
REPORT DATE	September 2015
PREPARED FOR	On-Ramp Wireless Inc 10920 Via Frontera #200 San Diego, CA 92127
CONTACT PERSON	Alain Charles (858) 592-6008 alain.charles@onrampwireless.com Hardware Engineer
PREPARED BY	Kathy MacKenzie **Name** Title: EMC/Wireless Test Technician
APPROVED BY	Juan Manuel Gonzalez **Name** Authorized Signatory Title: Commercial/ Wireless EMC Lab Manager
DATED	15 September 2015

Revision History

SD72102616Rev1.0-0215C On-Ramp Wireless microNode-2 NODE102 2.4GHz Wireless Transceiver Module					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
08/07/2015	Initial Release				Juan M. Gonzalez
08/27/2015	Initial Release	Rev1.0	Correction of Antenna Gain value from 2.1dBi to 9.0dBi (Section 1.3.2)	9	Juan M. Gonzalez
09/15/2015	REV 1.0	Rev2.0	Add a note from customer explaining that power reduction will be used along with this new (9dBi Antenna) and Attestation letter (Annex A)	9,16	Juan M. Gonzalez

CONTENTS

SECTION 1

REPORT SUMMARY

Radio Testing of the
On-Ramp Wireless
2.4GHz Wireless Transceiver Module

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the On-Ramp Wireless Inc. microNode-2 NODE102 2.4GHz Wireless transceiver module to the requirements of FCC Part 15 Subpart C §15.247 and IC RSS-210 Issue 8 December 2010.

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	On-Ramp Wireless Inc
Model Name(s)	microNode-2
FCC ID Number	XTE-NODE102
IC Number	8655A-NODE102
Serial Number(s)	S/N: 610C005F
Number of Samples Tested	1
Test Specification/Issue/Date	• microNode-2 NODE102 2.4GHz Wireless transceiver module • • • • FCC Part 15 Subpart C §15.247 (October 1, 2013). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014). • 558074 D01 DTS Meas Guidance v03r02,(June 5, 2014) Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.
Start of Test	February 16, 2015
Finish of Test	March 5, 2015
Name of Engineer(s)	Kathy MacKenzie Ivan Retana
Related Document(s)	- Supporting documents for EUT certification are separate exhibits. -Max Power Antenna Attestation Letter (Attached in this report as Annex A)

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.247 with cross-reference to the corresponding IC RSS standard is shown below.

Section	§15.247 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
2.1	§15.247(b)(3)	RSS-210 A8.4 (4)	Peak Output Power	Compliant	
2.2	§15.207(a)	RSS-Gen 8.8	Conducted Emissions	Compliant	
2.3		RSS-Gen 6.6	99% Emission Bandwidth	Compliant	
2.4	§15.247(a)(2)	RSS-210 A8.2(a)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	RSS-210 A8.5	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	RSS-210 A8.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	RSS-210 A8.5	Spurious Radiated Emissions	Compliant	
2.7		RSS-Gen 7.1	Receiver Spurious Emissions	Compliant	
2.8	§15.247(d)	RSS-210 A8.5	Radiated Band Edge Measurements	Compliant	
2.9	§15.247(e)	RSS-210 A8.2(b)	Power Spectral Density for Digitally Modulated Device	Compliant	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was an On-Ramp Wireless microNode-2 RF transceiver Module. The EUT can be used in smart grid remote monitoring and control applications. Typical install requires soldering the module onto a host PCB. For testing purposes, the EUT was installed on the reference design host board. This board provides command and control interface, regulated power and MMCX antenna ports. The module has a single antenna port and a binary antenna control signal that is used to switch between two possible antennas on the host board for diversity. At any time only one antenna is active using half-duplex communication.

1.3.2 EUT General Description

EUT Description	2.4GHz Wireless Transceiver Module
Model Name	microNode-2
Model Number(s)	NODE102
Rated Voltage	5.0VDC Nominal voltage
Output Power	177.82 mW
Frequency Range	2402 MHz to 2475.63 MHz
Number of Operating Frequencies	38
Channels Verified	Channel 1 (Low Channel 2402 MHz) Channel 20 (Mid Channel 2439.81 MHz) Channel 38 (High Channel 2475.63 MHz)
Antenna Type (used during evaluation)	2.4GHz Dipole Antenna
Antenna Gain	9.0 dBi *
	*Per customer declaration power reduction will be used along with this new (9dBi Antenna). See Annex A at the end of this report.

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power AV. (dBm)	Output Power (mW)
CH 38 (2475.63MHz)	2402-2480	**22.50**	177.82

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	EUT transmitting max power through the test antenna.
B	EUT transmitting max power, antenna port connected to the spectrum analyzer through a 10dB external attenuator.

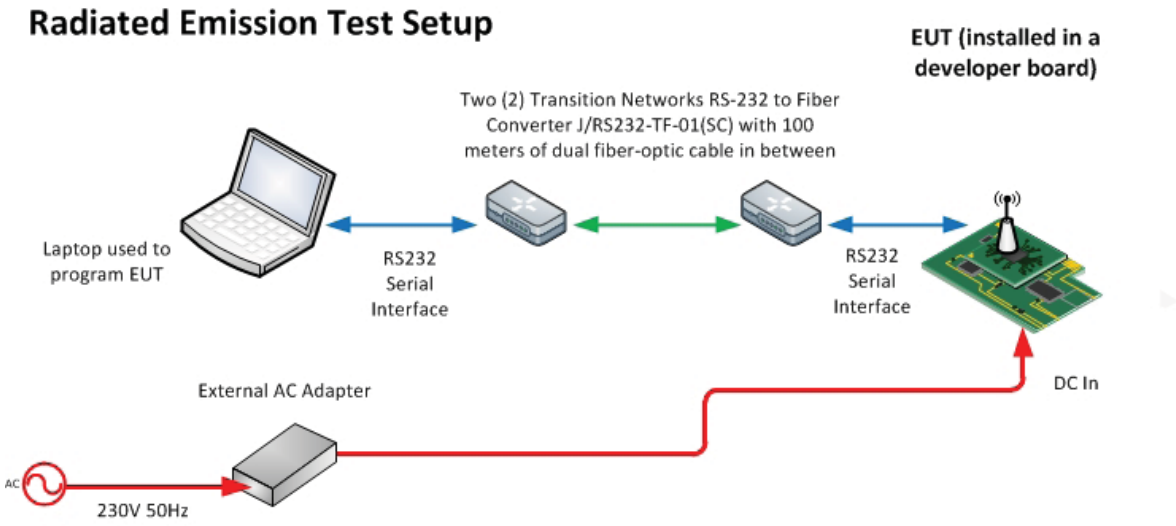
1.4.2 EUT Exercise Software

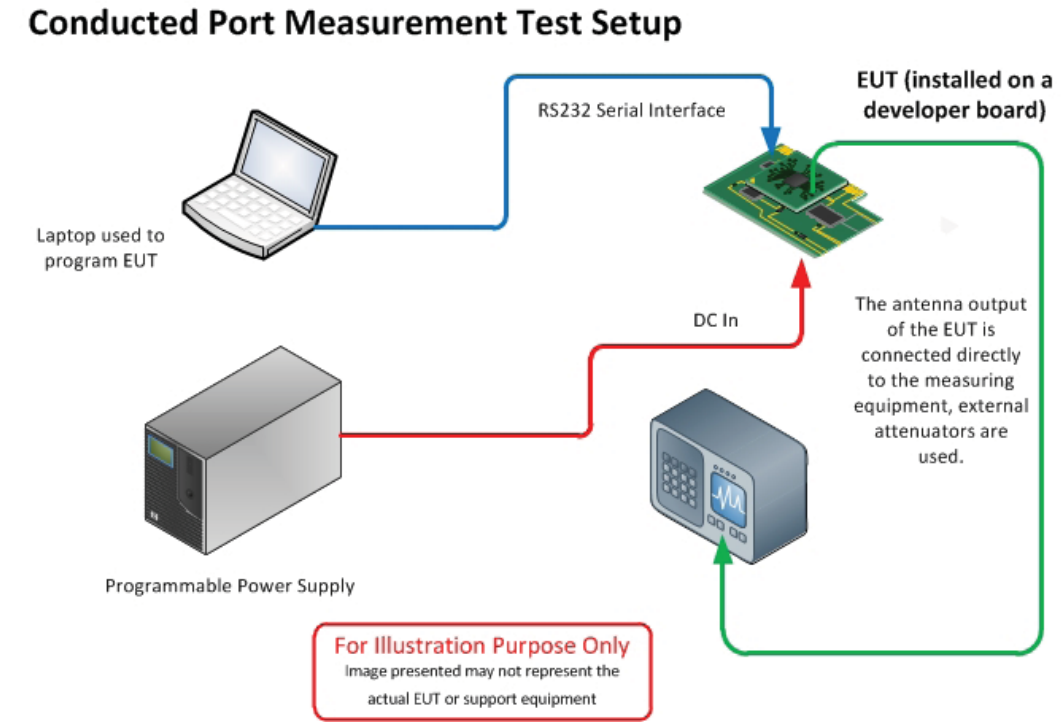
emc_tool.exe, Version.0.4.3

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Hewlett Packard	DC Power Supply	Model # E3612A, S/N KR83008834
Dell	Support Laptop	OnRamp Asset # 0336
Transition Networks	Support Serial RS232 to Fiber media Converter (2X)	J/RS232-TF-01(SC)
-	Fiber Optic Cable Assembly	100 meters Ready-To-Use Duplex (SC) Fiber Optic Cable Assemby
-	Crossover serial cable (Between eHost and Support PC)	1.8m, standard RS232 serial cable

1.4.4 Simplified Test Configuration Diagram





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 N/A		
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.
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 LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

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 US1146.

1.9.2 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.

SECTION 2

TEST DETAILS

Radio Testing of the
On-Ramp Wireless Inc
2.4GHz Wireless transceiver module

2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

Part 15 Subpart C §15.247(b)(3)

2.1.2 Standard Applicable

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

2.1.3 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration B

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

February 20, 2015/KAM

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 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4°C
Relative Humidity	39.3%
ATM Pressure	99.6 kPa

2.1.7 Additional Observations

- This is a conducted test (Maximum conducted [average] output power) using direct connection to a power meter.
- An offset of 12.91dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- Test methodology is per Clause 9.2.3.1 of KDB 558074 D01 (DTS Meas Guidance v03r02, June 05, 2014). All conditions under this Clause are satisfied.
- Both Peak and Average measurements were recorded.

2.1.8 Test Results

See attached table

Channel	Measured Average Power (dBm)	Measured Peak Power (dBm)
1 (2402.0MHz)	22.44	23.29
20 (2439.81MHz)	22.43	23.29
38 (2475.63MHz)	**22.50**	23.41

Note.- Per customer declaration power reduction will be used along with this new (9dBi Antenna). See Annex "A" at the end of this report,

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.2.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.*

2.2.3 Equipment Under Test and Modification State

Serial No: 610C005F / Test Configuration A

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

February 24, 2015/KAM

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/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4°C
Relative Humidity	39.3%
ATM Pressure	99.6 kPa

2.2.7 Additional Observations

- The EUT is a RF module and is not AC powered.
- To show general compliance to the present requirement, the test was performed at the AC mains of the AD-Dc power supply and verified.
- The EUT was verified using worst case configuration. The EUT was set to transmit max. power while plugged into the AC adapter. Only the worst channel presented.

- Measurement was done using EMC32 V8.52 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 2.2.8 for sample computation.

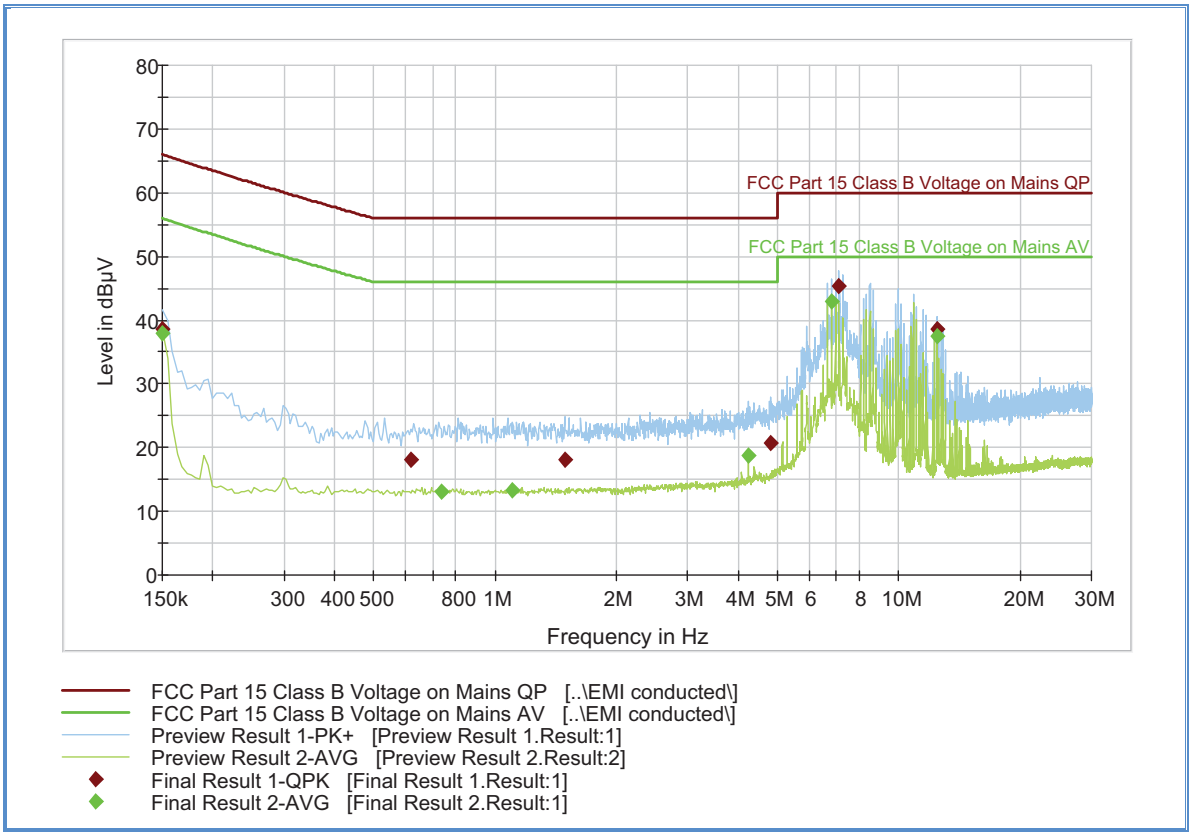
2.2.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (dbµV) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 1171 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

2.2.9 Test Results

Compliant. See attached plots and tables.

2.2.10 Line 1



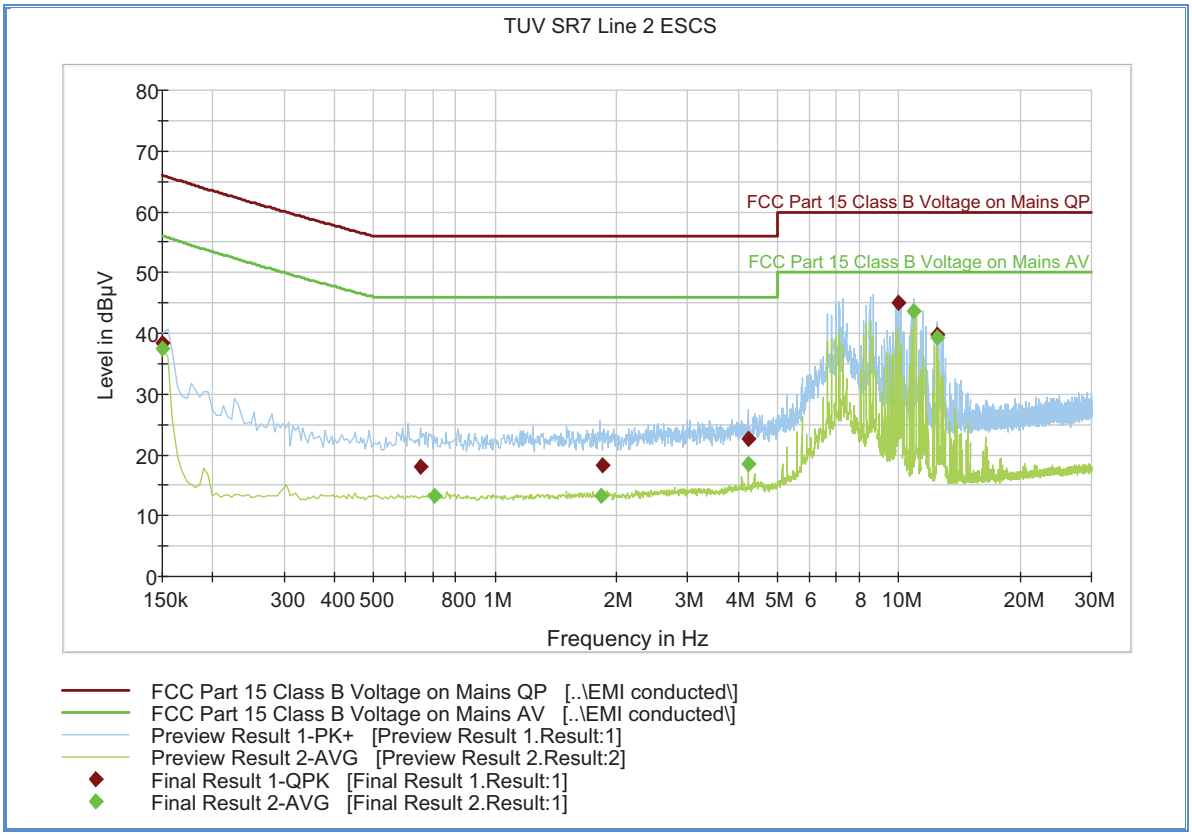
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	38.7	1000.0	9.000	Off	L1	20.1	27.3	66.0
0.618000	18.1	1000.0	9.000	Off	L1	20.2	37.9	56.0
1.491000	18.1	1000.0	9.000	Off	L1	20.1	37.9	56.0
4.825500	20.8	1000.0	9.000	Off	L1	20.6	35.2	56.0
7.125000	45.3	1000.0	9.000	Off	L1	20.6	14.7	60.0
12.430500	38.6	1000.0	9.000	Off	L1	20.8	21.4	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit – Ave (dBµV)
0.150000	37.9	1000.0	9.000	Off	L1	20.1	18.1	56.0
0.739500	13.2	1000.0	9.000	Off	L1	20.1	32.8	46.0
1.099500	13.3	1000.0	9.000	Off	L1	20.3	32.7	46.0
4.245000	18.8	1000.0	9.000	Off	L1	20.5	27.2	46.0
6.819000	42.9	1000.0	9.000	Off	L1	20.7	7.1	50.0
12.430500	37.6	1000.0	9.000	Off	L1	20.8	12.4	50.0

2.2.11 Line 2



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	38.5	1000.0	9.000	Off	N	20.1	27.5	66.0
0.654000	18.0	1000.0	9.000	Off	N	20.2	38.0	56.0
1.846500	18.3	1000.0	9.000	Off	N	20.2	37.7	56.0
4.245000	22.6	1000.0	9.000	Off	N	20.5	33.4	56.0
10.005000	45.1	1000.0	9.000	Off	N	20.6	14.9	60.0
12.430500	39.8	1000.0	9.000	Off	N	20.7	20.2	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit – Ave (dBµV)
0.150000	37.5	1000.0	9.000	Off	N	20.1	18.5	56.0
0.708000	13.3	1000.0	9.000	Off	N	20.2	32.7	46.0
1.828500	13.3	1000.0	9.000	Off	N	20.2	32.7	46.0
4.245000	18.5	1000.0	9.000	Off	N	20.5	27.5	46.0
10.914000	43.7	1000.0	9.000	Off	N	20.7	6.3	50.0
12.430500	39.4	1000.0	9.000	Off	N	20.7	10.6	50.0

2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 6.6

2.3.2 Standard Applicable

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.
When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- • The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- • The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

Note: Video averaging is not permitted.
A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.
The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.
The difference between the two recorded frequencies is the 99% occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Serial No: 610C005F / Test Configuration B

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

January 25, 2015/KAM

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/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

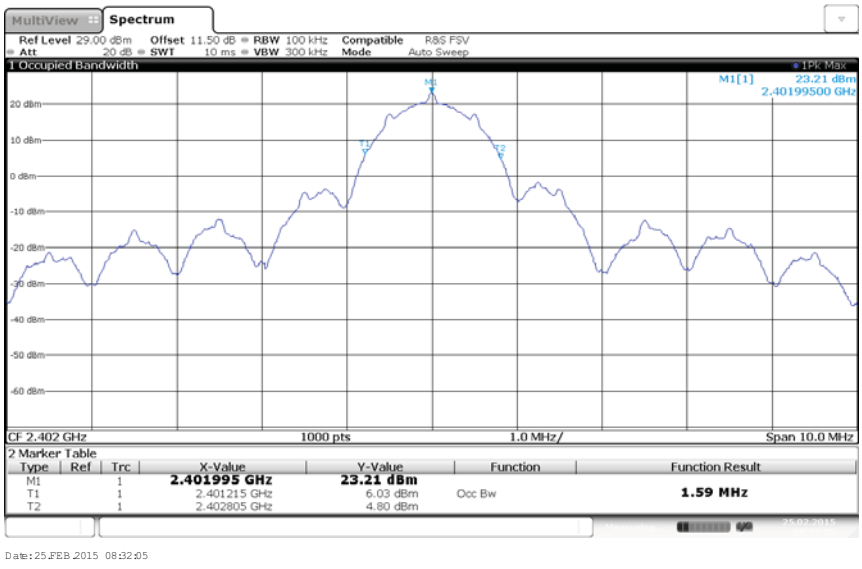
Ambient Temperature	23.4°C
Relative Humidity	49.3%
ATM Pressure	99.6 kPa

2.3.7 Additional Observations

- This is a conducted test.
- An offset of 11.5dB was added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- The % Power Bandwidth setting in the spectrum analyzer was set to 99% (default).
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.

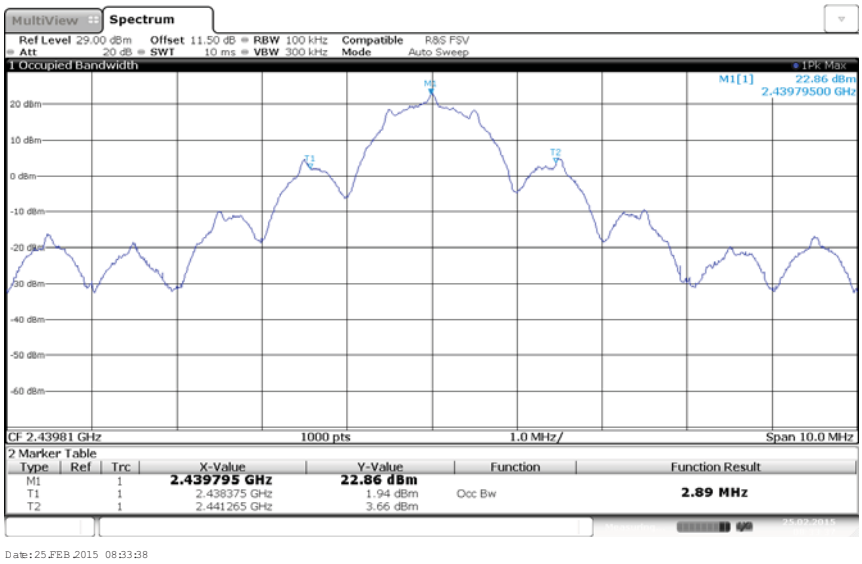
2.3.8 Test Results

Low Channel (2402 MHz)	Mid Channel (2439.81 MHz)	High Channel (2475.63 MHz)
1.59MHz	2.89 MHz	2.66 MHz

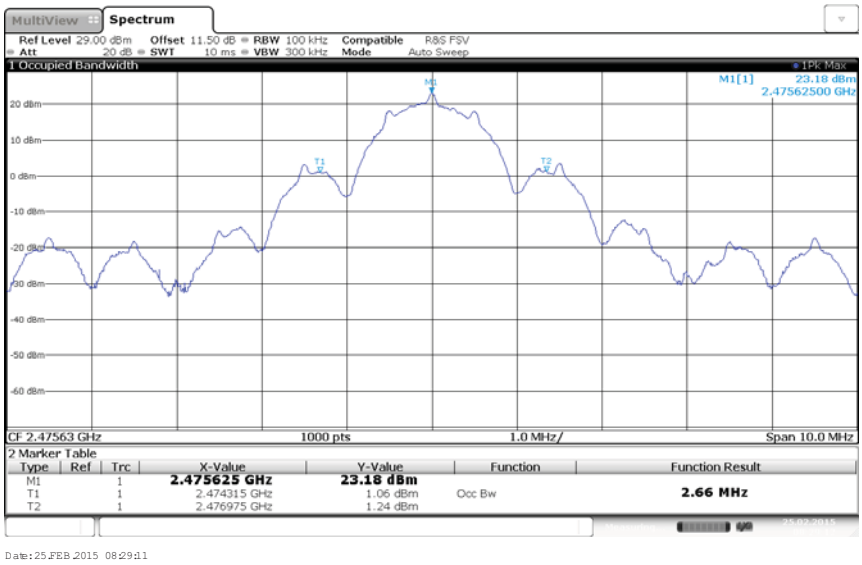


Low Channel

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364



Mid Channel



High Channel

2.4 MINIMUM 6 dB RF BANDWIDTH

2.4.1 Specification Reference

Part 15 Subpart C §15.247(a)(2)

2.4.2 Standard Applicable

(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.4.3 Equipment Under Test and Modification State

Serial No: 610C005F / Test Configuration B

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

February 23, 2015/KAM

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/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4°C
Relative Humidity	49.3%
ATM Pressure	99.6 kPa

2.4.7 Additional Observations

- This is a conducted test.
- An offset of 11.5dB was added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is 100kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Trace is max hold.
- The “n” dB down marker function of the spectrum analyzer was used for this test.

2.4.8 Test Results

Low Channel (2402 MHz)	Mid Channel (2439.81 MHz)	High Channel (2475.63 MHz)
0.738 MHz	0.767 MHz	0.753 MHz

Date: 23.FEB.2015 14:38:59

Low Channel

Date: 23.FEB.2015 14:41:48

Mid Channel

Date: 23.FEB.2015 14:50:38

High Channel

2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

2.5.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.5.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.5.3 Equipment Under Test and Modification State

Serial No: 610C005F / Test Configuration B

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

February 19, 2015/KAM

2.5.5 Test Equipment Used

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

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

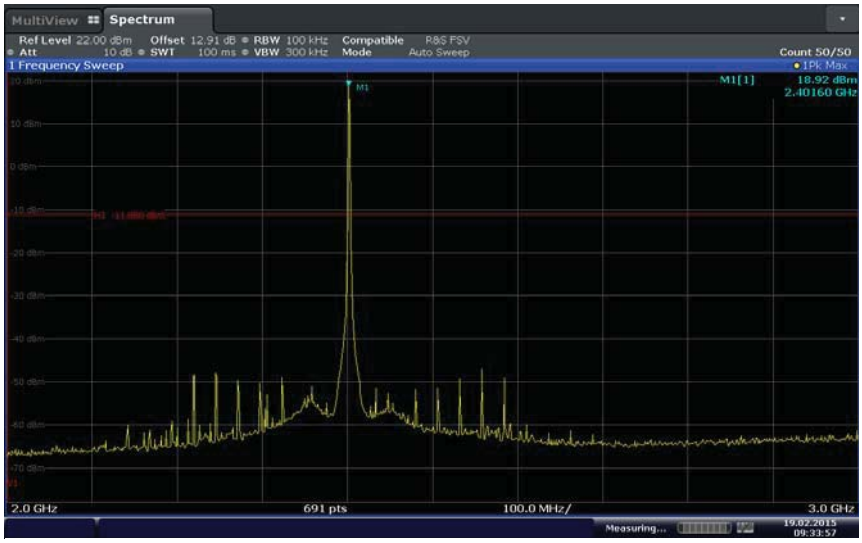
Ambient Temperature	23.2°C
Relative Humidity	36.4%
ATM Pressure	99.6 kPa

2.5.7 Additional Observations

- This is a conducted test.
- An offset of 12.91dB was added to compensate for the external attenuator and cable used.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Initial scan was performed to determine the highest level of the desired power within the band. Limit (display line) was drawn 30dB below this level.
- Spectrum was searched from 30MHz up to 26.5GHz.

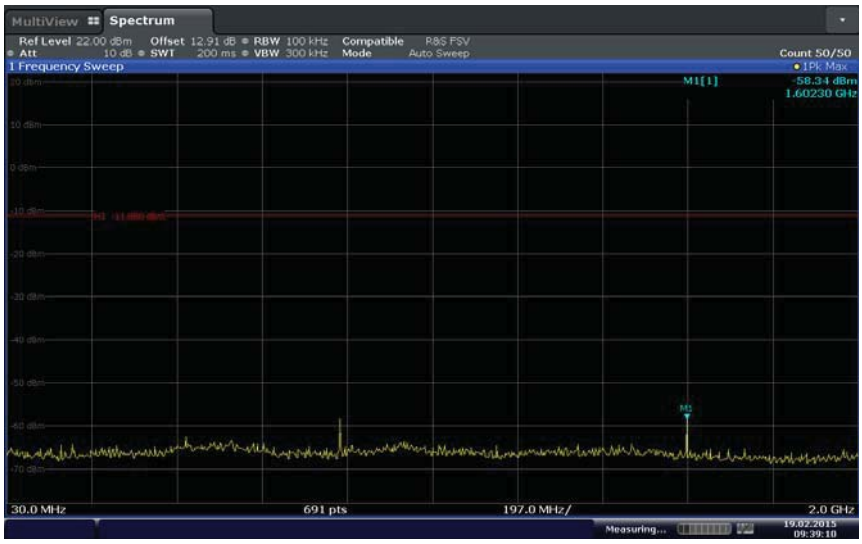
2.5.8 Test Results

See attached plots.



Date: 19.FEB.2015 09:33:58

Low Channel (2 to 3GHz)

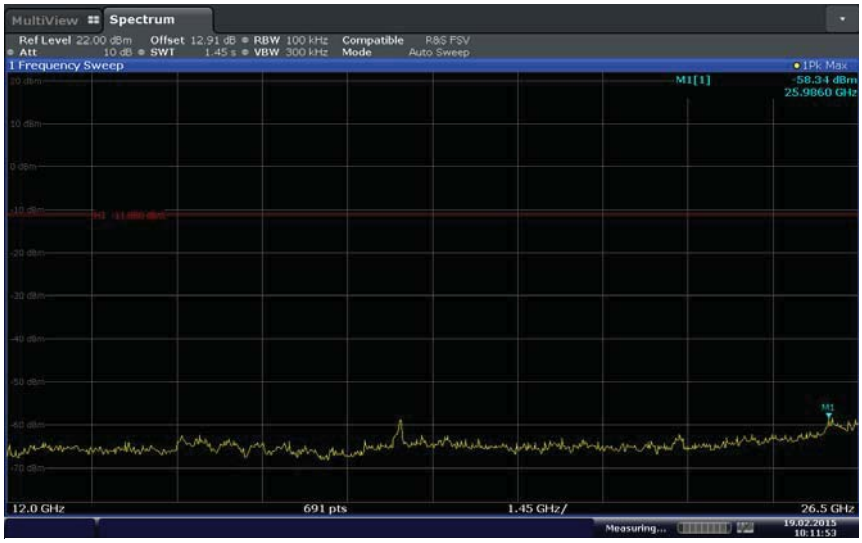


Date: 19.FEB.2015 09:39:10

Low Channel (30MHz to 2GHz)

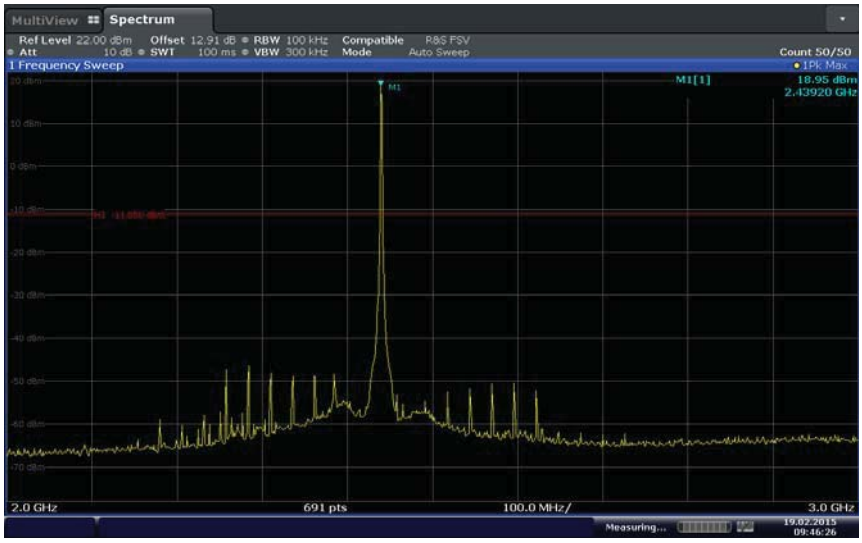
Date: 19.FEB.2015 10:13:12

Low Channel (3GHz to 12GHz)



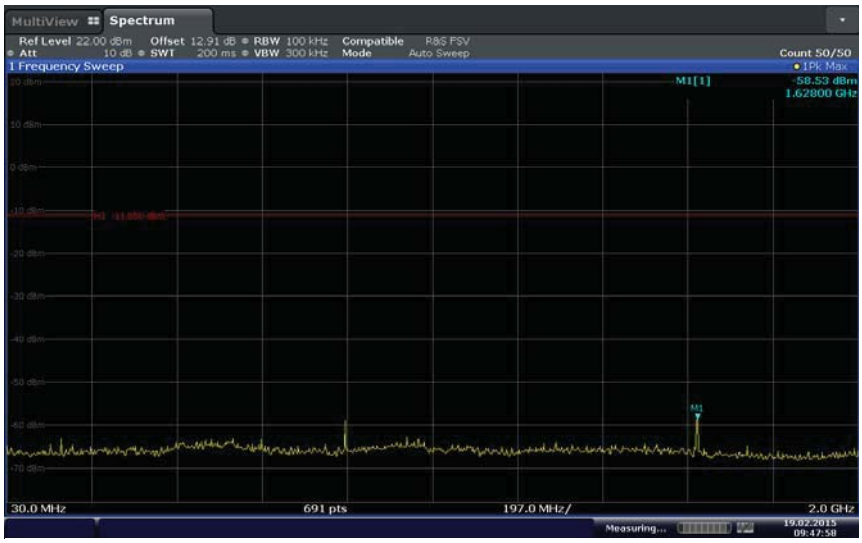
Date: 19.FEB.2015 10:11:53

Low Channel (12GHz to 26.5GHz)



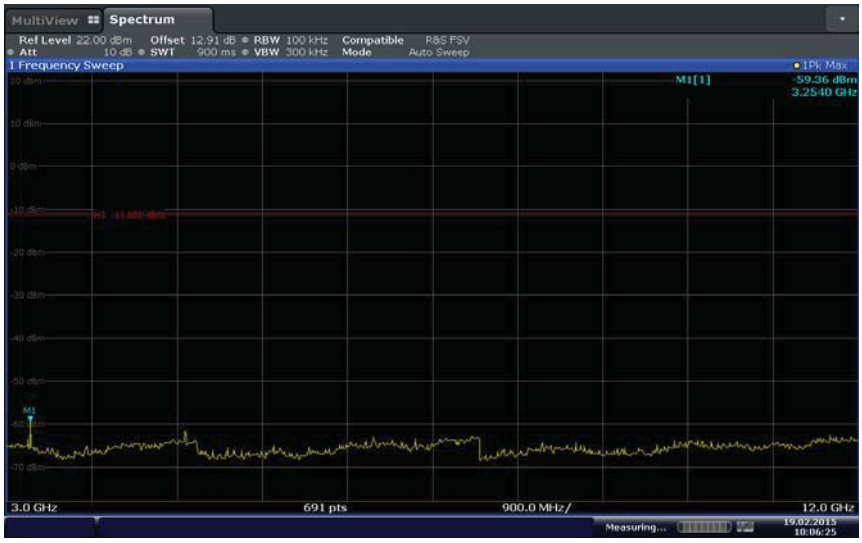
Date:19.FEB.2015 09:46:26

Mid Channel (2GHz to 3GHz)



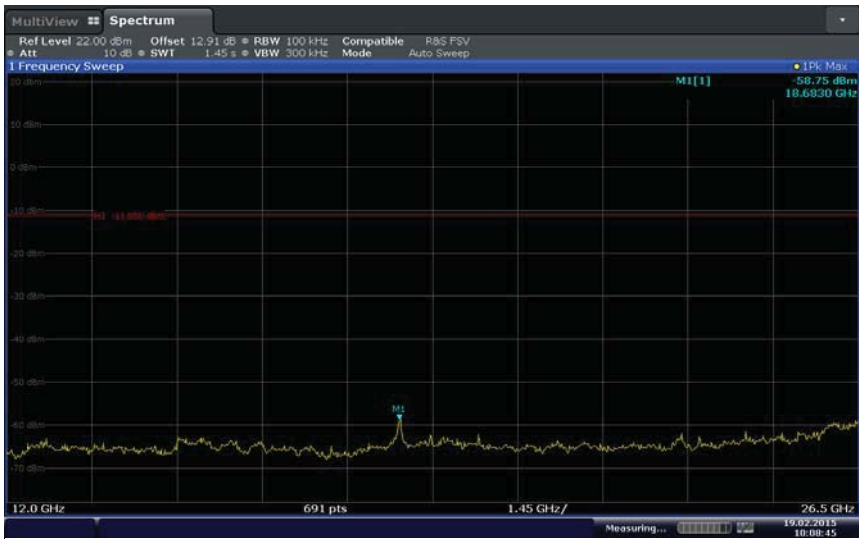
Date:19.FEB.2015 09:47:58

Mid Channel (30MHz to 2GHz)



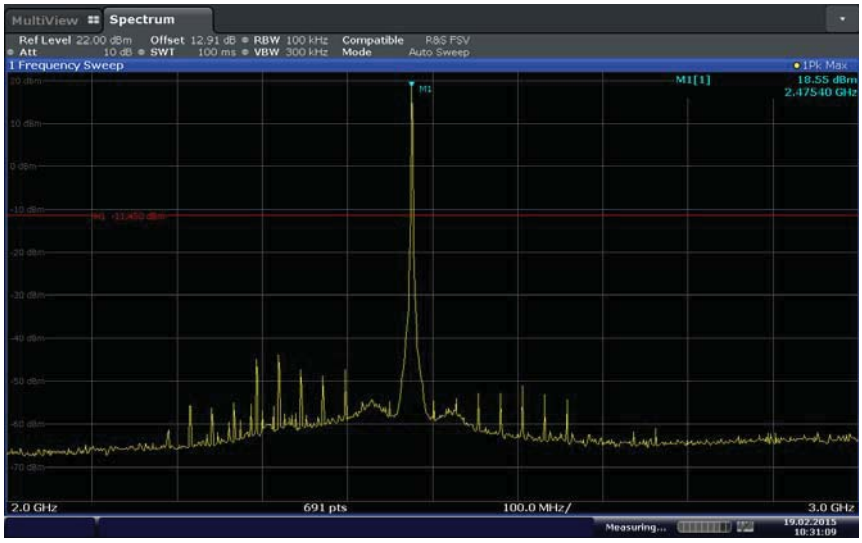
Date: 19.FEB.2015 10:06:25

Mid Channel (3GHz to 12GHz)



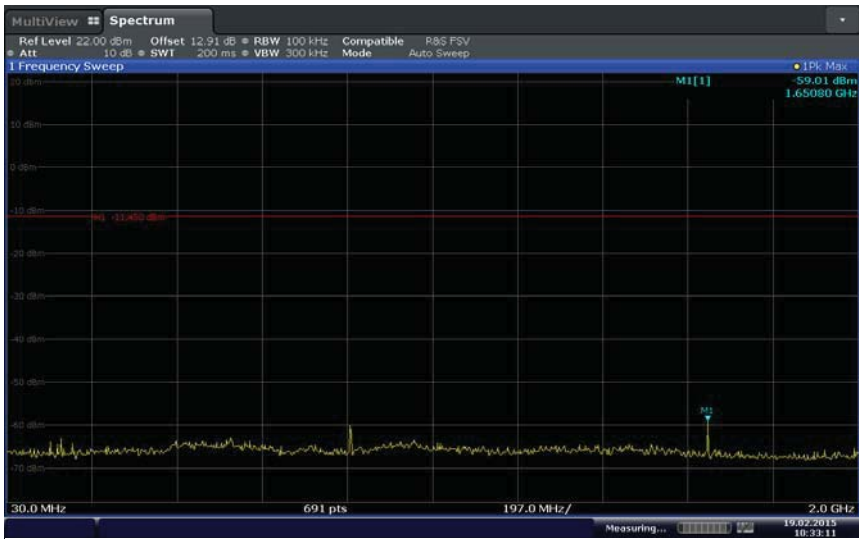
Date: 19.FEB.2015 10:08:45

Mid Channel (12GHz to 26.5GHz)



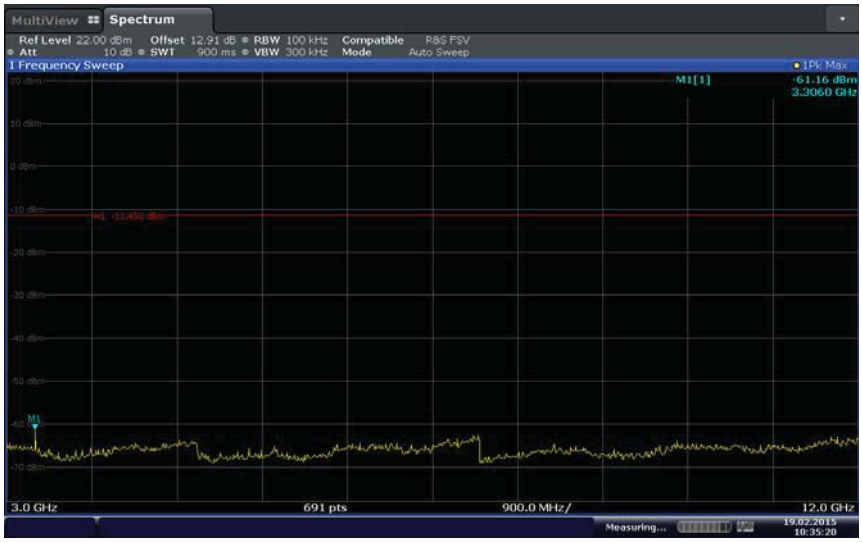
Date: 19.FEB.2015 10:31:09

High Channel (2GHz to 3GHz)



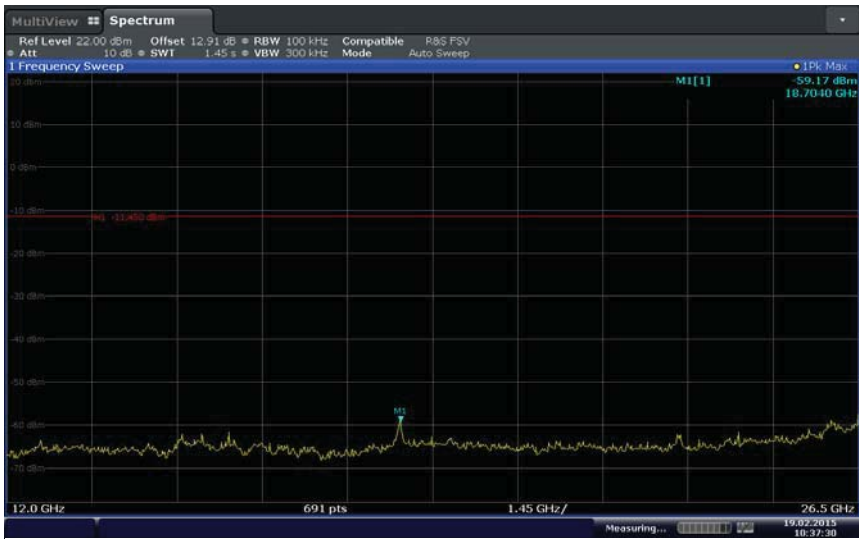
Date: 19.FEB.2015 10:33:12

High Channel (30MHz to 2GHz)



Date: 19.FEB.2015 10:35:20

High Channel (3GHz to 12GHz)



Date: 19.FEB.2015 10:37:30

High Channel (12GHz to 26.5GHz)

2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.6.2 Standard Applicable

See previous test.

2.6.3 Equipment Under Test and Modification State

Serial No: 610C005F/ Test Configuration B

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

February 23, 2015/KAM

2.6.5 Test Equipment Used

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

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

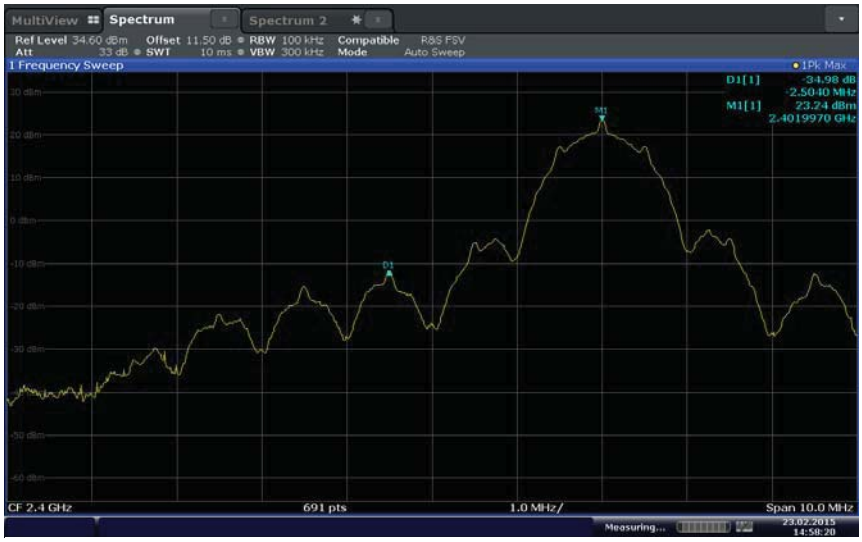
Ambient Temperature	23.4°C
Relative Humidity	49.3%
ATM Pressure	99.6 kPa

2.6.7 Additional Observations

- Setup is identical to “Out-of-Band Emissions – Conducted“ test (previous test).
- Band-edge (2400MHz and 2483.5MHz) emissions were verified in this test.
- The spectrum analyzer was centred on the band-edge frequency while setting the EUT to the corresponding transmit channel (i.e. Low Channel for lower band-edge).
- Limit is 30dB below the highest level of the desired power within the band.

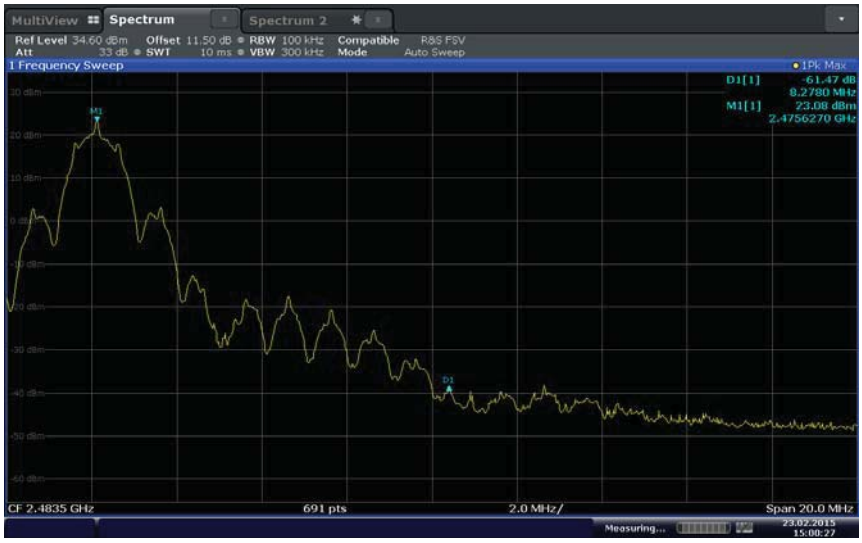
2.6.8 Test Results

Complies. See attached plots.



Date: 23.FEB.2015 14:58:20

Lower Band-Edge



Date: 23.FEB.2015 15:00:27

Higher Band-Edge

2.7 SPURIOUS RADIATED EMISSIONS

2.7.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.7.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.7.3 Equipment Under Test and Modification State

Serial No: 610C005F / Test Configuration A

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

February 20-March 5, 2015/IR/KM

2.7.5 Test Equipment Used

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

2.7.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4°C
Relative Humidity	34.3%
ATM Pressure	99.6 kPa

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (25GHz).
- Only noise floor measurements observed above 18GHz.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Measurement was done using EMC32 V8.52 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 2.8.8 for sample computation.

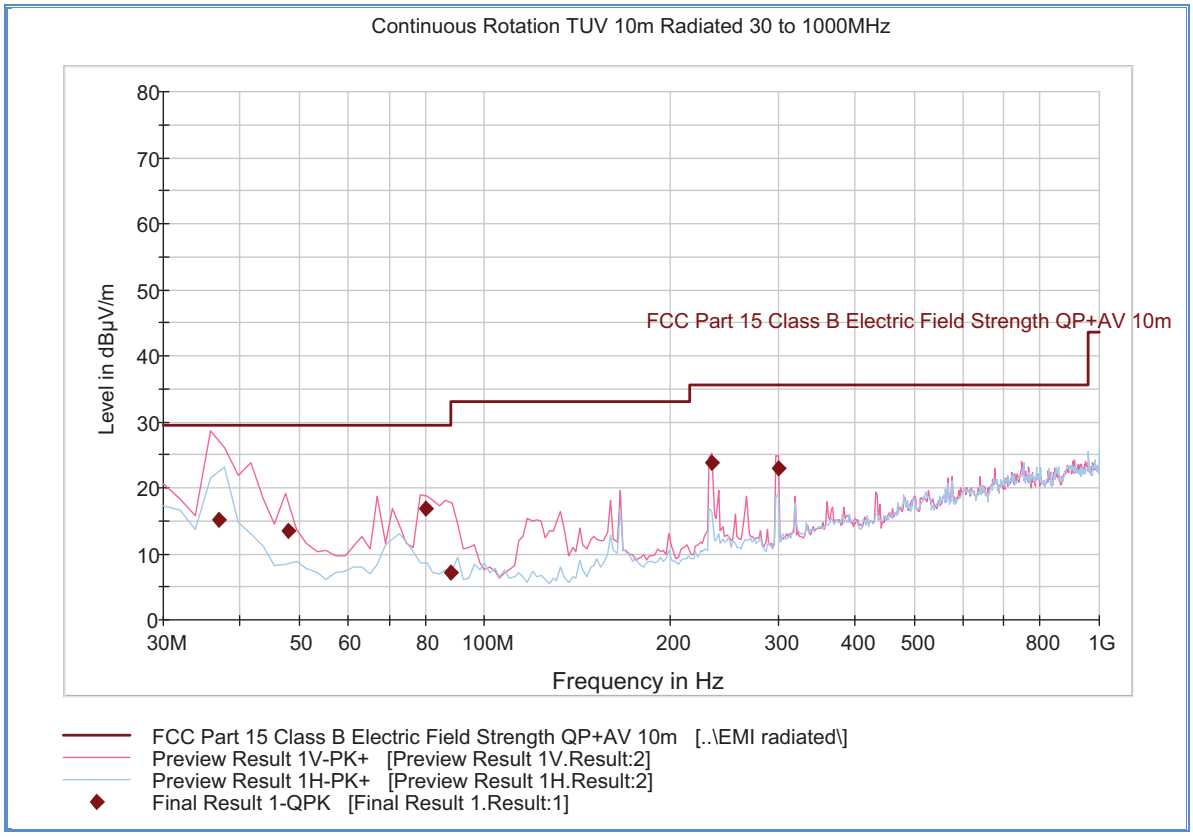
2.7.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	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**

2.7.9 Test Results

See attached plots.

2.7.10 Test Results Below 1GHz (Receive Mode)



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)
36.991663	15.2	1000.0	120.000	150.0	V	159.0	-16.4	14.3	29.5
47.974990	13.4	1000.0	120.000	188.0	V	234.0	-20.8	16.1	29.5
79.997194	16.9	1000.0	120.000	170.0	V	110.0	-23.2	12.6	29.5
88.092745	7.2	1000.0	120.000	200.0	V	343.0	-22.2	25.8	33.0
233.828216	23.7	1000.0	120.000	105.0	V	177.0	-16.0	11.9	35.6
300.656513	23.0	1000.0	120.000	100.0	V	129.0	-14.7	12.6	35.6

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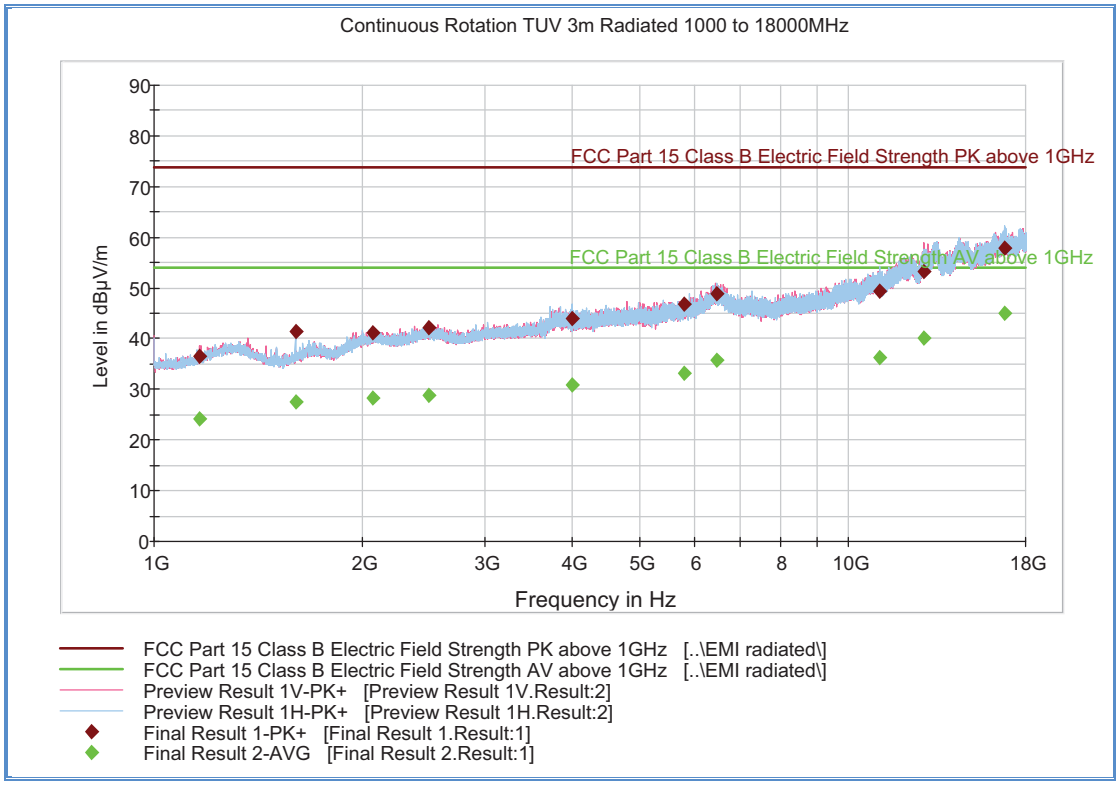
2.7.11 Test Results Above 1GHz (Receive Mode)



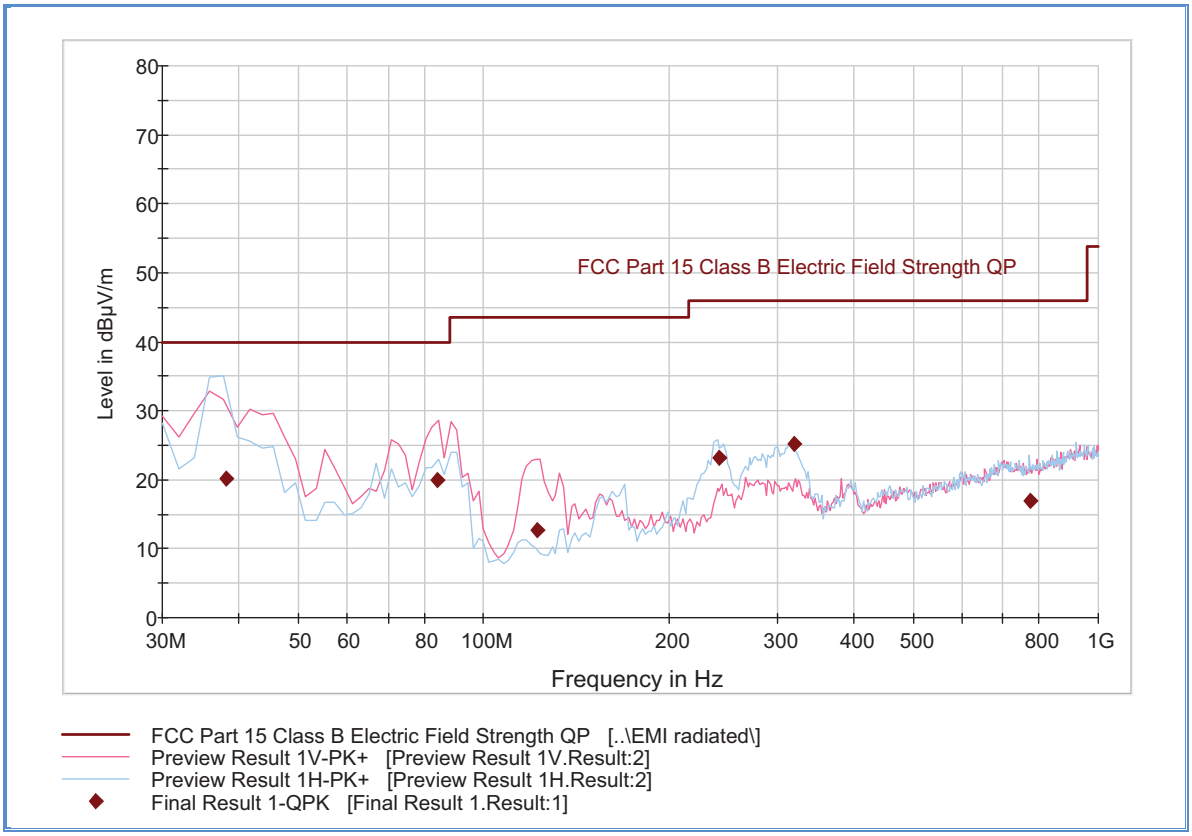
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1162.266667	36.6	1000.0	1000.000	157.6	V	322.0	-6.6	37.3	73.9
1599.000000	41.3	1000.0	1000.000	198.5	H	20.0	-5.5	32.6	73.9
2062.366667	41.2	1000.0	1000.000	132.7	H	263.0	-1.6	32.7	73.9
2485.366667	42.1	1000.0	1000.000	191.5	V	101.0	-0.1	31.8	73.9
3995.766667	43.9	1000.0	1000.000	280.2	H	142.0	4.7	30.0	73.9
5810.800000	46.7	1000.0	1000.000	408.1	H	25.0	8.4	27.2	73.9
6459.666667	48.8	1000.0	1000.000	123.7	H	20.0	11.1	25.1	73.9
11102.90000	49.3	1000.0	1000.000	131.7	H	322.0	14.5	24.6	73.9
12874.16666	53.3	1000.0	1000.000	367.1	V	283.0	18.1	20.6	73.9
16779.40000	57.9	1000.0	1000.000	331.1	H	3.0	23.6	16.0	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)
1162.266667	24.2	1000.0	1000.000	157.6	V	322.0	-6.6	29.7	53.9
1599.000000	27.5	1000.0	1000.000	198.5	H	20.0	-5.5	26.4	53.9
2062.366667	28.2	1000.0	1000.000	132.7	H	263.0	-1.6	25.7	53.9
2485.366667	28.9	1000.0	1000.000	191.5	V	101.0	-0.1	25.0	53.9
3995.766667	30.9	1000.0	1000.000	280.2	H	142.0	4.7	23.0	53.9
5810.800000	33.1	1000.0	1000.000	408.1	H	25.0	8.4	20.8	53.9
6459.666667	35.8	1000.0	1000.000	123.7	H	20.0	11.1	18.1	53.9
11102.90000	36.4	1000.0	1000.000	131.7	H	322.0	14.5	17.5	53.9
12874.16666	40.1	1000.0	1000.000	367.1	V	283.0	18.1	13.8	53.9
16779.40000	45.1	1000.0	1000.000	331.1	H	3.0	23.6	8.8	53.9

2.7.12 Test Results Below 1GHz (Mid Channel – Worst Case Configuration)

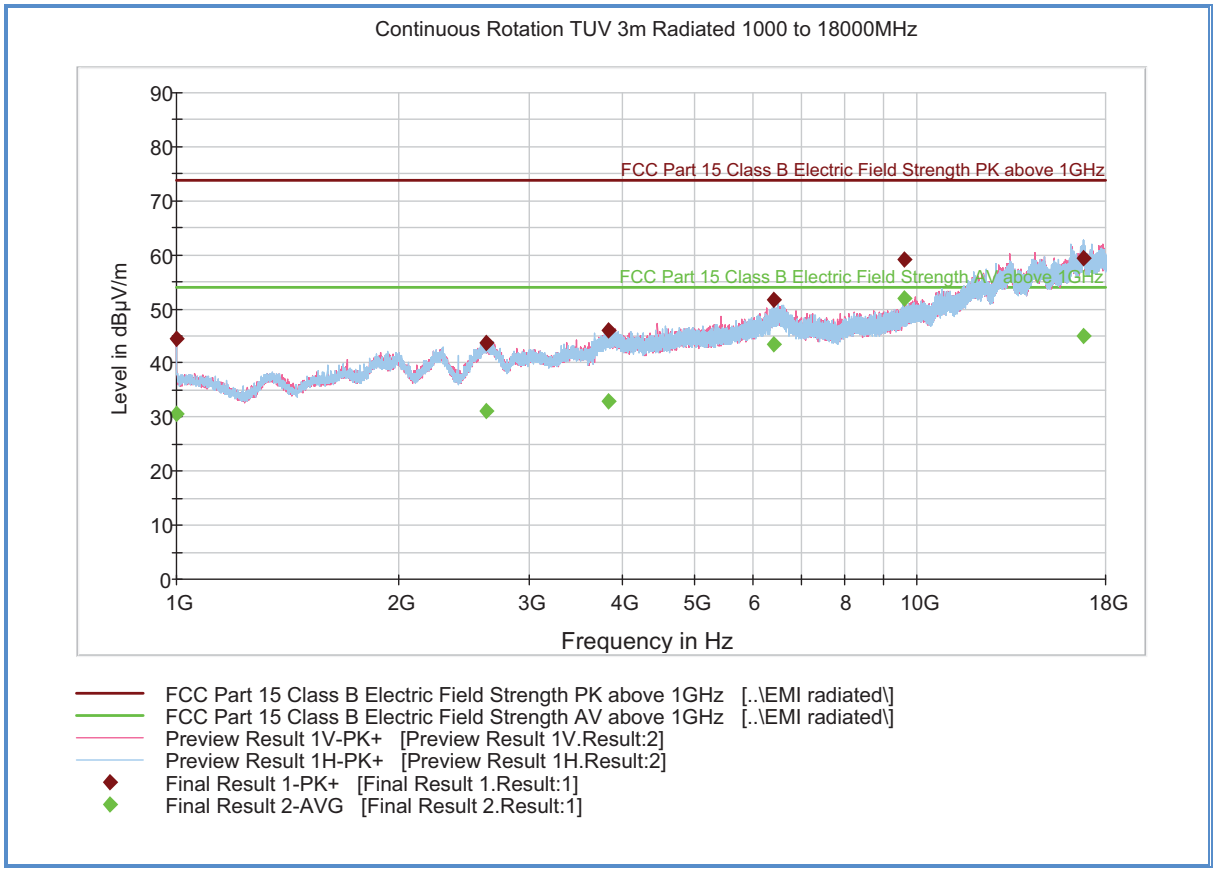


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.095551	20.1	1000.0	120.000	370.0	H	312.0	-15.3	19.9	40.0
83.828858	20.0	1000.0	120.000	105.0	V	-11.0	-21.4	20.0	40.0
121.978838	12.7	1000.0	120.000	100.0	V	14.0	-20.1	30.8	43.5
241.939880	23.2	1000.0	120.000	106.0	H	297.0	-14.3	22.8	46.0
319.999279	25.1	1000.0	120.000	100.0	H	312.0	-11.5	20.9	46.0
774.165130	16.9	1000.0	120.000	350.0	H	233.0	-1.4	29.1	46.0

Test Notes: Only worst case channel presented for spurious emissions below 1GHz.

2.7.13 Test Results Above 1GHz (Low Channel)



Peak Data

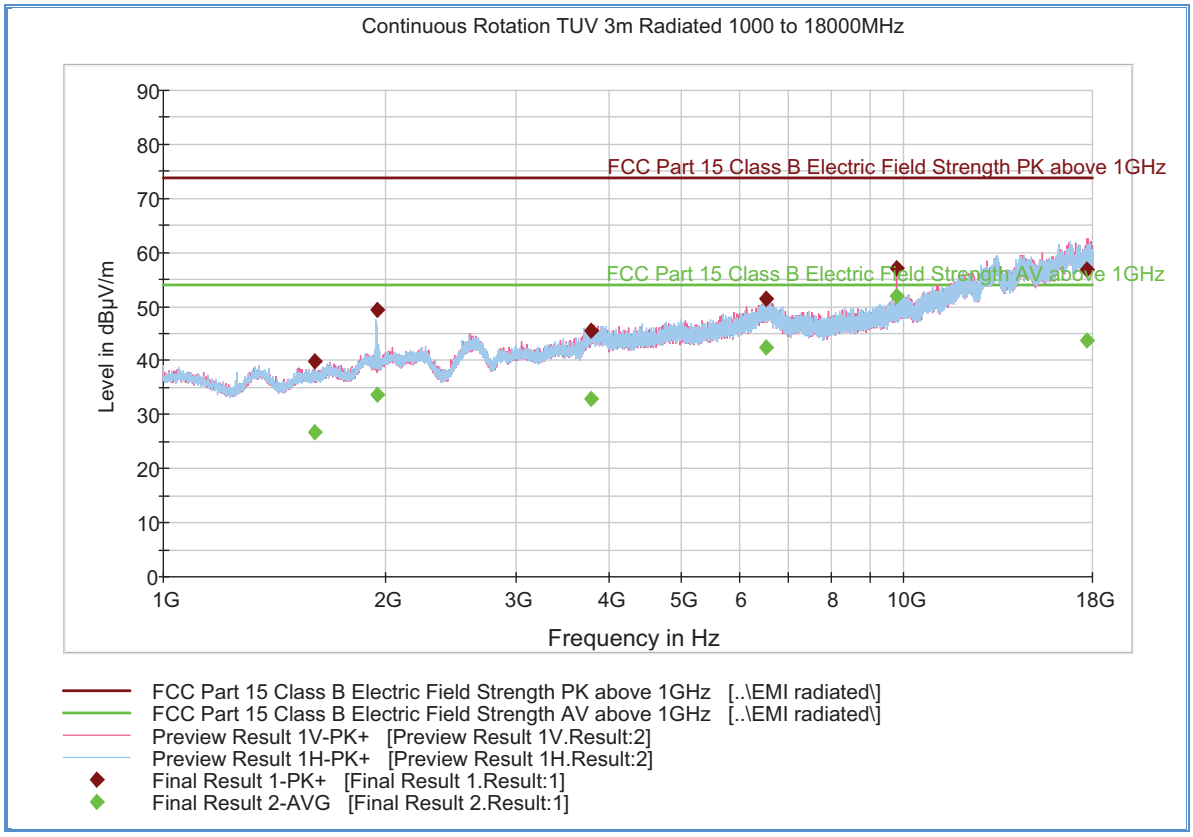
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	44.6	1000.0	1000.000	225.4	V	-16.0	-7.4	29.3	73.9
2621.466667	43.7	1000.0	1000.000	311.2	H	93.0	0.0	30.2	73.9
3829.900000	46.1	1000.0	1000.000	390.1	V	166.0	4.9	27.8	73.9
6405.266667	51.8	1000.0	1000.000	103.7	V	116.0	11.2	22.1	73.9
9607.866667	59.0	1000.0	1000.000	113.7	V	138.0	11.9	14.9	73.9
16799.366667	59.5	1000.0	1000.000	103.7	H	250.0	23.7	14.4	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)
1000.400000	30.6	1000.0	1000.000	225.4	V	-16.0	-7.4	23.3	53.9
2621.466667	31.1	1000.0	1000.000	311.2	H	93.0	0.0	22.8	53.9
3829.900000	32.9	1000.0	1000.000	390.1	V	166.0	4.9	21.0	53.9
6405.266667	43.5	1000.0	1000.000	103.7	V	116.0	11.2	10.4	53.9
9607.866667	51.9	1000.0	1000.000	113.7	V	138.0	11.9	2.0	53.9
16799.366667	45.0	1000.0	1000.000	103.7	H	250.0	23.7	8.9	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. Band edge measurements were performed with the notch filter removed.

2.7.14 Test Results Above 1GHz (Mid Channel)



Peak Data

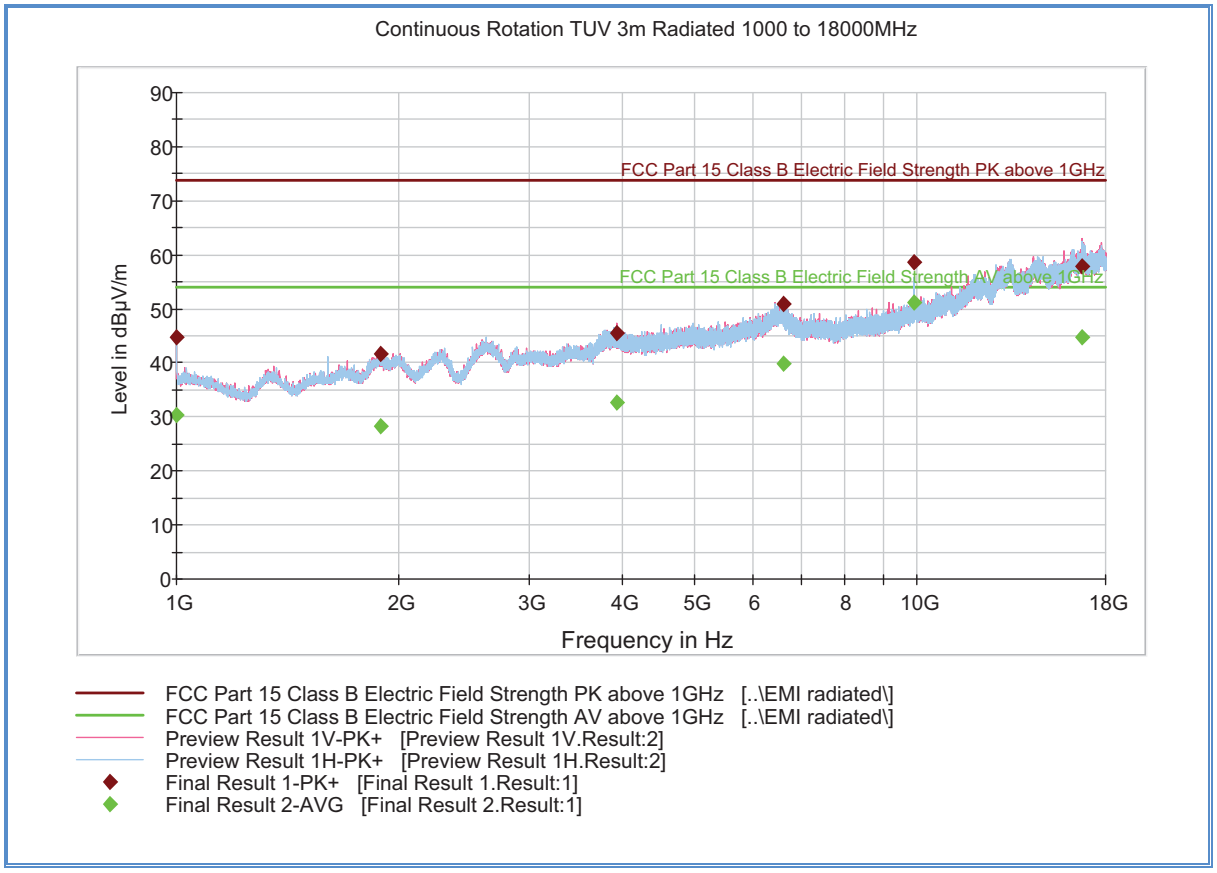
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1599.733333	39.8	1000.	1000.000	164.0	H	229.0	-5.5	34.1	73.9
1941.066667	49.4	1000.	1000.000	410.0	H	331.0	-1.9	24.5	73.9
3791.200000	45.5	1000.	1000.000	220.0	V	223.0	4.8	28.4	73.9
6533.133333	51.4	1000.	1000.000	152.0	V	20.0	11.2	22.5	73.9
9799.966667	57.1	1000.	1000.000	178.0	V	115.0	12.0	16.8	73.9
17701.20000	56.9	1000.	1000.000	180.0	V	206.0	23.0	17.0	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)
1599.733333	26.8	1000.0	1000.000	164.0	H	229.0	-5.5	27.1	53.9
1941.066667	33.6	1000.0	1000.000	410.0	H	331.0	-1.9	20.3	53.9
3791.200000	32.8	1000.0	1000.000	220.0	V	223.0	4.8	21.1	53.9
6533.133333	42.3	1000.0	1000.000	152.0	V	20.0	11.2	11.6	53.9
9799.966667	52.0	1000.0	1000.000	178.0	V	115.0	12.0	1.9	53.9
17701.200000	43.7	1000.0	1000.000	180.0	V	206.0	23.0	10.2	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. Band edge measurements were performed with the notch filter removed.

2.7.15 Test Results Above 1GHz (High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	44.7	1000.0	1000.000	236.4	H	47.0	-7.4	29.2	73.9
1885.933333	41.7	1000.0	1000.000	202.3	V	-3.0	-2.3	32.2	73.9
3931.166667	45.6	1000.0	1000.000	369.1	V	333.0	4.9	28.3	73.9
6601.933333	50.9	1000.0	1000.000	333.1	H	140.0	11.2	23.0	73.9
9902.533333	58.5	1000.0	1000.000	301.2	V	3.0	12.4	15.4	73.9
16754.700000	57.9	1000.0	1000.000	154.6	V	16.0	23.4	16.0	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)
1000.400000	30.4	1000.0	1000.000	236.4	H	47.0	-7.4	23.5	53.9
1885.933333	28.2	1000.0	1000.000	202.3	V	-3.0	-2.3	25.7	53.9
3931.166667	32.6	1000.0	1000.000	369.1	V	333.0	4.9	21.3	53.9
6601.933333	39.9	1000.0	1000.000	333.1	H	140.0	11.2	14.0	53.9
9902.533333	51.2	1000.0	1000.000	301.2	V	3.0	12.4	2.7	53.9
16754.700000	44.7	1000.0	1000.000	154.6	V	16.0	23.4	9.2	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. Band edge measurements were performed with the notch filter removed.

2.8 RADIATED BAND EDGE MEASUREMENTS AND IMMEDIATE RESTRICTED BANDS

2.8.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.8.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.8.3 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration A

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

March 05, 2015/KM

2.8.5 Test Equipment Used

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

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.6 °C
Relative Humidity	38.2.%
ATM Pressure	99.6 kPa

2.8.7 Additional Observations

- This is a radiated test. The spectrum was searched from 2310MHz to 2390MHz for lower immediate restricted band and 2483.5MHz to 2500MHz for the upper immediate restricted band.
- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- 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 2.8.8 for sample computation.

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

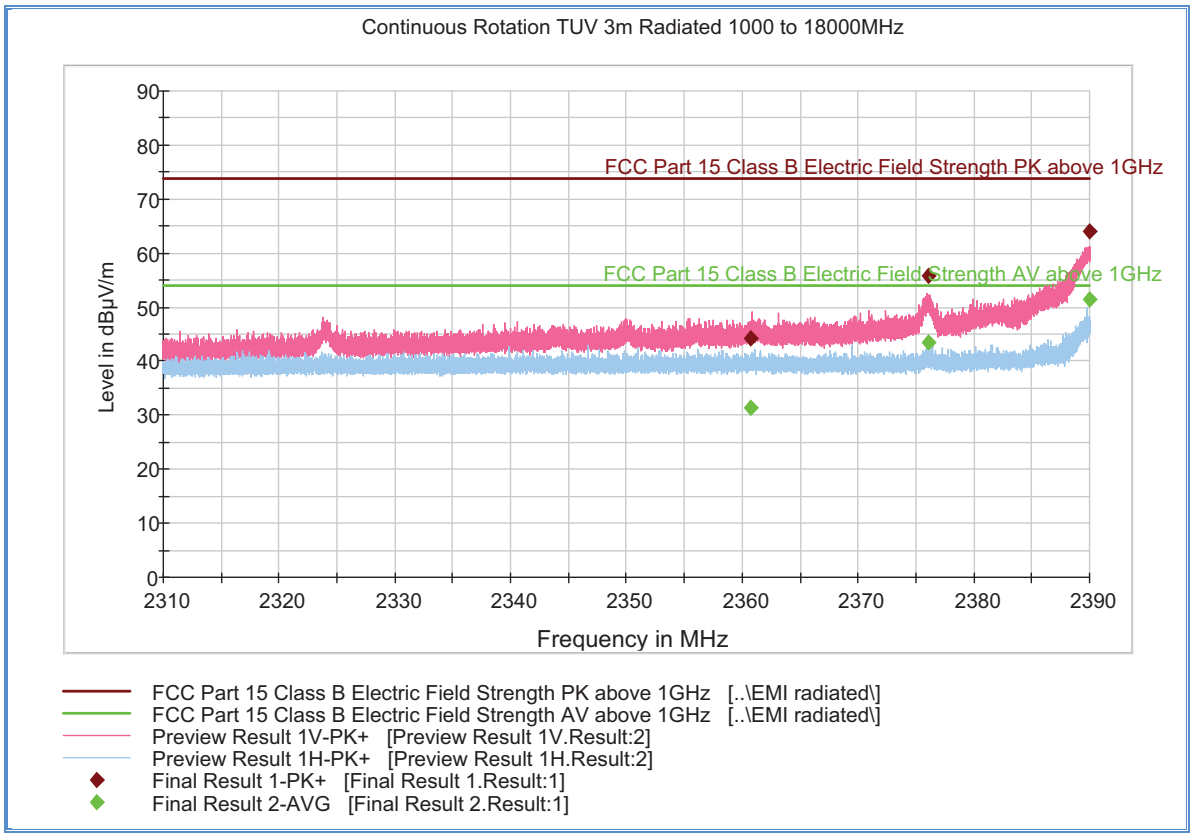
2.8.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 2400 MHz			53.9
Correction Factor (dB)	Asset# 1153 (cable)	3.4	-0.4
	Asset# 8628(preamplifier)	-36.5	
	Asset#7575 (antenna)	32.7	
Reported Max Peak Final Measurement (dbµV/m) @ 2400 MHz			**53.5**

2.8.9 Test Results

See attached plots.

2.8.10 Test Results Restricted Band 2310MHz to 2490MHz (Low Channel)



Peak Data

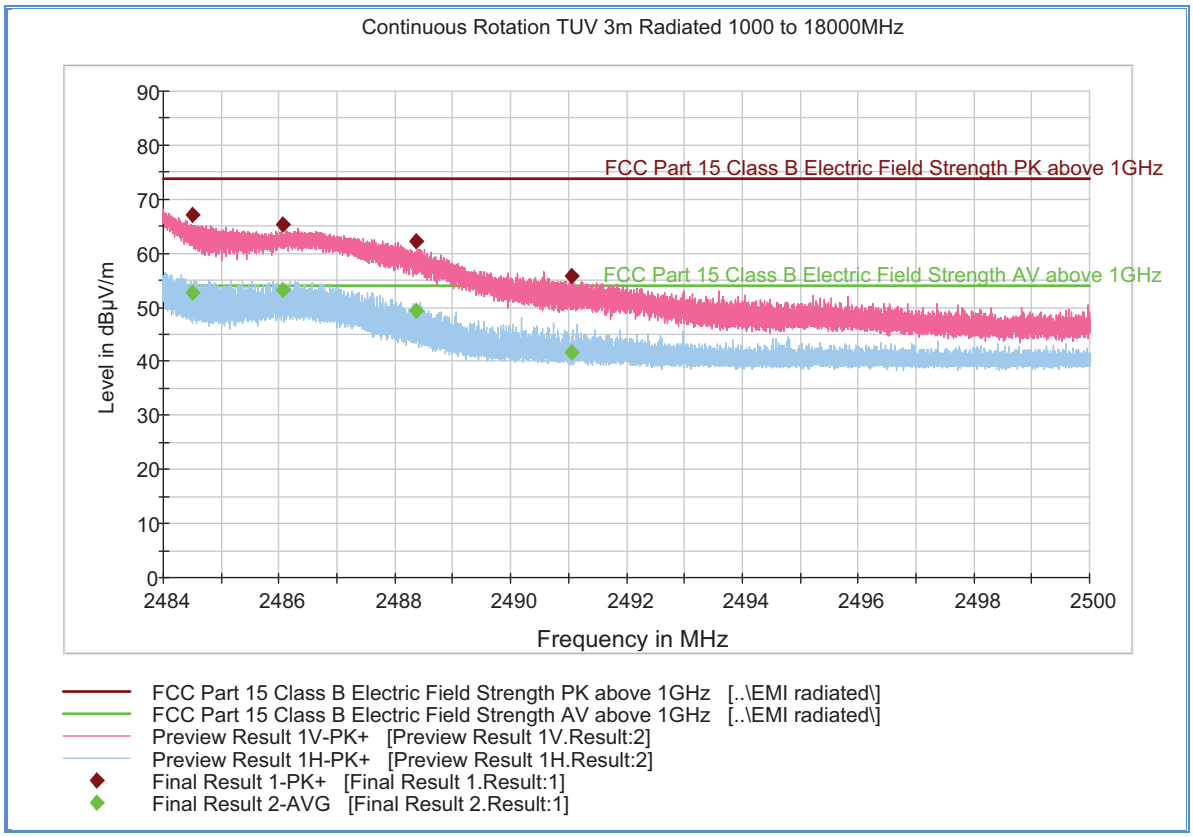
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2360.682667	44.3	1000.0	1000.000	116.7	V	132.0	-0.8	29.6	73.9
2376.138667	55.7	1000.0	1000.000	123.7	V	85.0	-0.7	18.2	73.9
2390.000000	64.0	1000.0	1000.000	102.7	V	100.0	-0.6	9.9	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)
2360.682667	31.4	1000.0	1000.000	116.7	V	132.0	-0.8	22.5	53.9
2376.138667	43.5	1000.0	1000.000	123.7	V	85.0	-0.7	10.4	53.9
2390.000000	51.3	1000.0	1000.000	102.7	V	100.0	-0.6	2.6	53.9

Test Notes:

2.8.11 Test Results Restricted Band 2483.5MHz to 2500MHz (High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.500000	67.0	1000.0	1000.000	102.7	V	111.0	-0.1	6.9	73.9
2486.059733	65.4	1000.0	1000.000	103.7	V	128.0	-0.1	8.5	73.9
2488.372800	62.3	1000.0	1000.000	101.7	V	105.0	-0.1	11.6	73.9
2491.041067	55.8	1000.0	1000.000	113.7	V	220.0	-0.1	18.1	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)
2484.500000	52.6	1000.0	1000.000	102.7	V	111.0	-0.1	1.3	53.9
2486.059733	53.2	1000.0	1000.000	103.7	V	128.0	-0.1	0.7	53.9
2488.372800	49.5	1000.0	1000.000	101.7	V	105.0	-0.1	4.4	53.9
2491.041067	41.5	1000.0	1000.000	113.7	V	220.0	-0.1	12.4	53.9

Test Notes:

2.9 POWER SPECTRAL DENSITY

2.9.1 Specification Reference

Part 15 Subpart C §15.247(e)

2.9.2 Standard Applicable

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.9.3 Equipment Under Test and Modification State

Serial No: N/A / Test Configuration B

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

February 25, 2015/KAM

2.9.5 Test Equipment Used

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

2.9.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.4°C
Relative Humidity	39.3%
ATM Pressure	99.6 kPa

2.9.7 Additional Observations

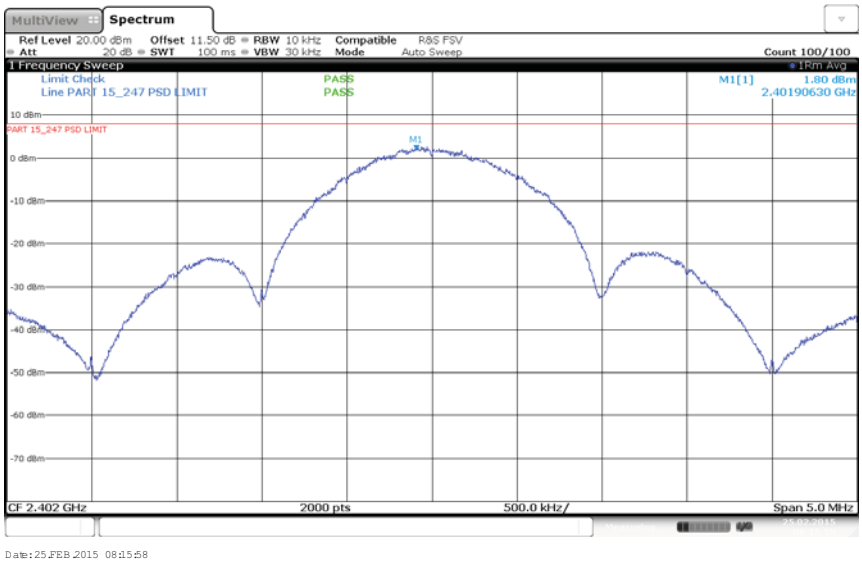
- This is a conducted test.
- Test procedure is per Section 10.3 of KDB 558074 (June 5, 2014).
- A transducer factor (TDF) was added to compensate for the external attenuator and cable used.
- Detector is RMS power averaging.
- Trace averaging mode over 100 traces.
- Sweep time is Auto Couple.
- EUT complies with 10 kHz RBW.

2.9.8 Test Results

See attached table and plots.

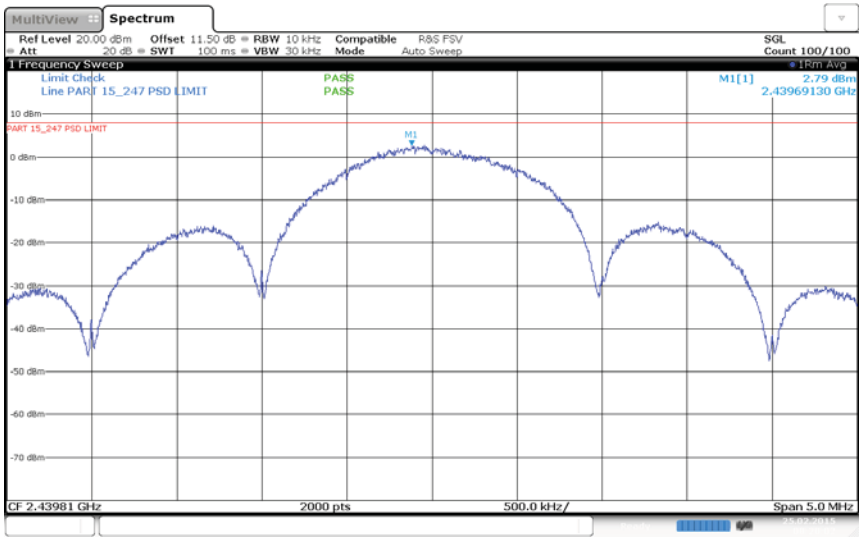
Channel Frequency (MHz)	RF Power Spectral Density (dBm)	Limit (dBm)	Margin (dB)	Compliance
2402.00	1.80	8	6.20	Complies
2439.81	2.79	8	5.21	Complies
2475.63	2.75	8	5.25	Complies

2.9.9 Test Plots

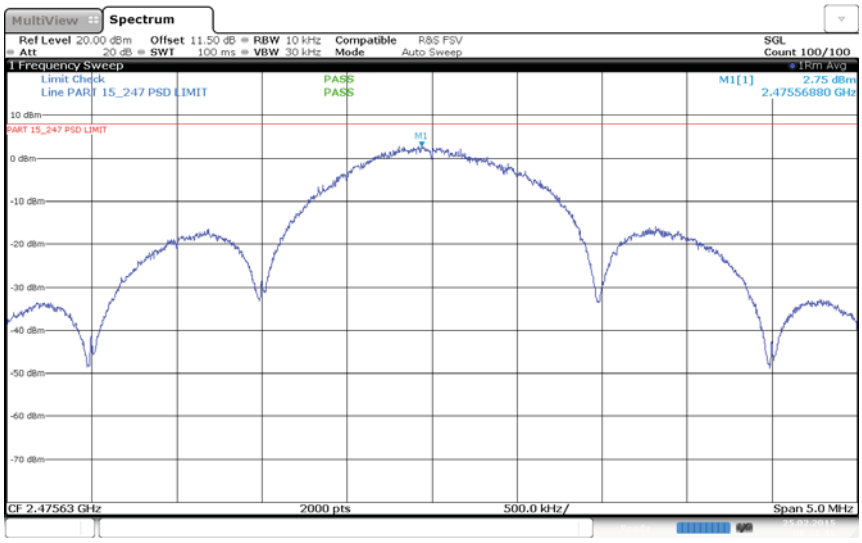


Low Channel

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364



Mid Channel



High Channel

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
Antenna Conducted Port Setup						
7569	Series Power Meter	N1911A P-	MY45100625	Agilent	04/22/14	04/22/15
7570	50MHz-18GHz Wideband Power Sensor	N1921A	MY45240588	Agilent	04/09/14	04/09/15
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	12/22/14	12/22/15
1189	Signal Generator	8648C	3623A03059	Hewlett Packard	10/14/14	10/14/15
8772	10dB Attenuator	606-10-1F4/DR	N/A	Meca	Verified by 1189 and 7582	
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	04/05/14	04/05/15
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	07/01/14	07/01/15
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	09/02/14	09/02/15
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/20/15	02/20/16
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/20/15	02/20/16
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	04/08/14	04/08/15
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	04/03/14	04/03/15
1150	Horn antenna	3160-09	012054-004	ETS	04/26/13	04/26/15
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	02/28/14	02/28/16
8760	Pre-amplifier	ZKL-2	1001	Mini-Circuits	09/04/14	09/04/15
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	04/03/14	04/03/15
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/04/14	09/04/15
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/29/14	08/29/15
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/17/14	03/17/15
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1189 and 7582	
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/12/14	08/12/15
7554	Barometer/Temperature /Humidity Transmitter	iBTHX-W	0400706	Omega	04/17/14	04/17/15
1123	DC Power Supply	E3631A	N/A	Hewlett Packard	Verified by 6792	
	Test Software	EMC32	V8.53	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

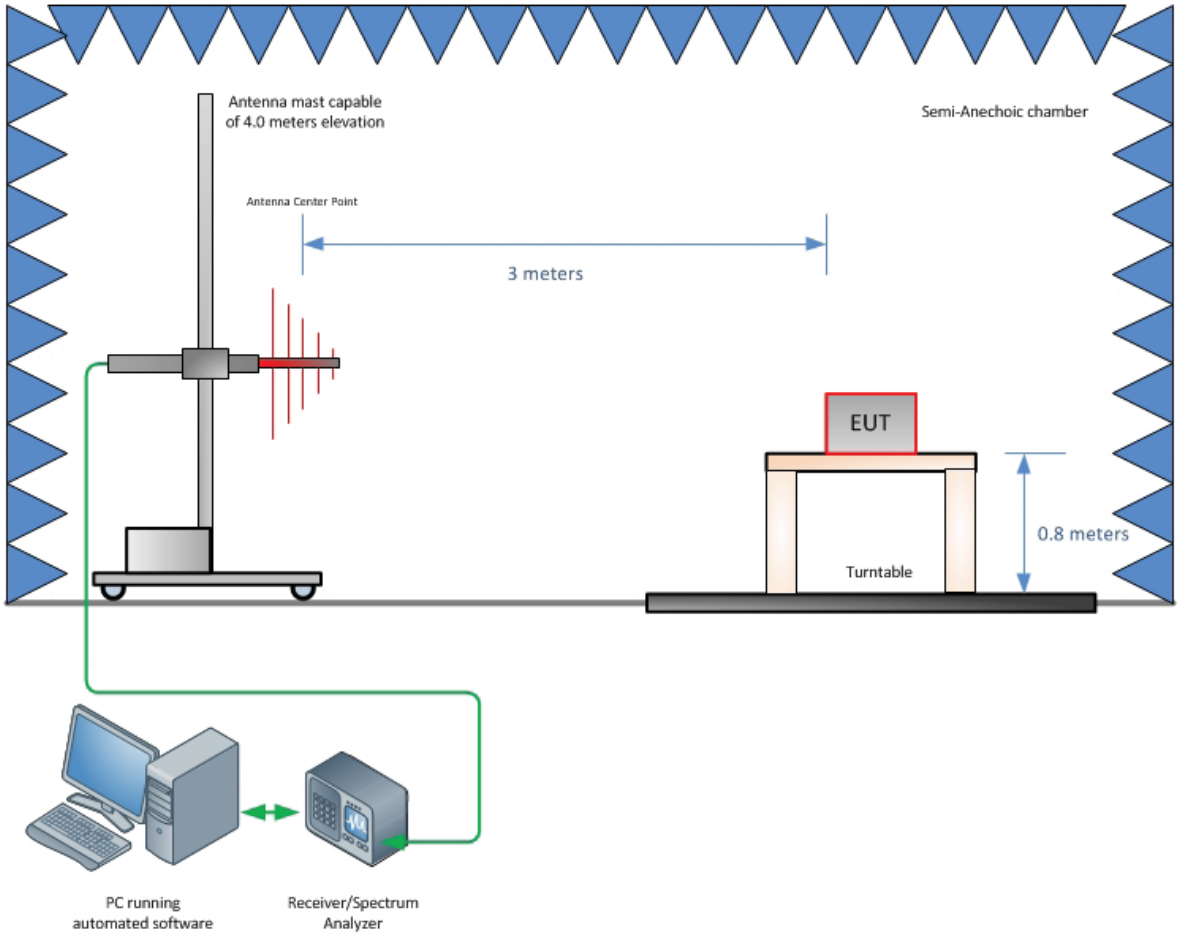
3.2.3 Conducted Antenna Port Measurement

	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	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.72
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.45

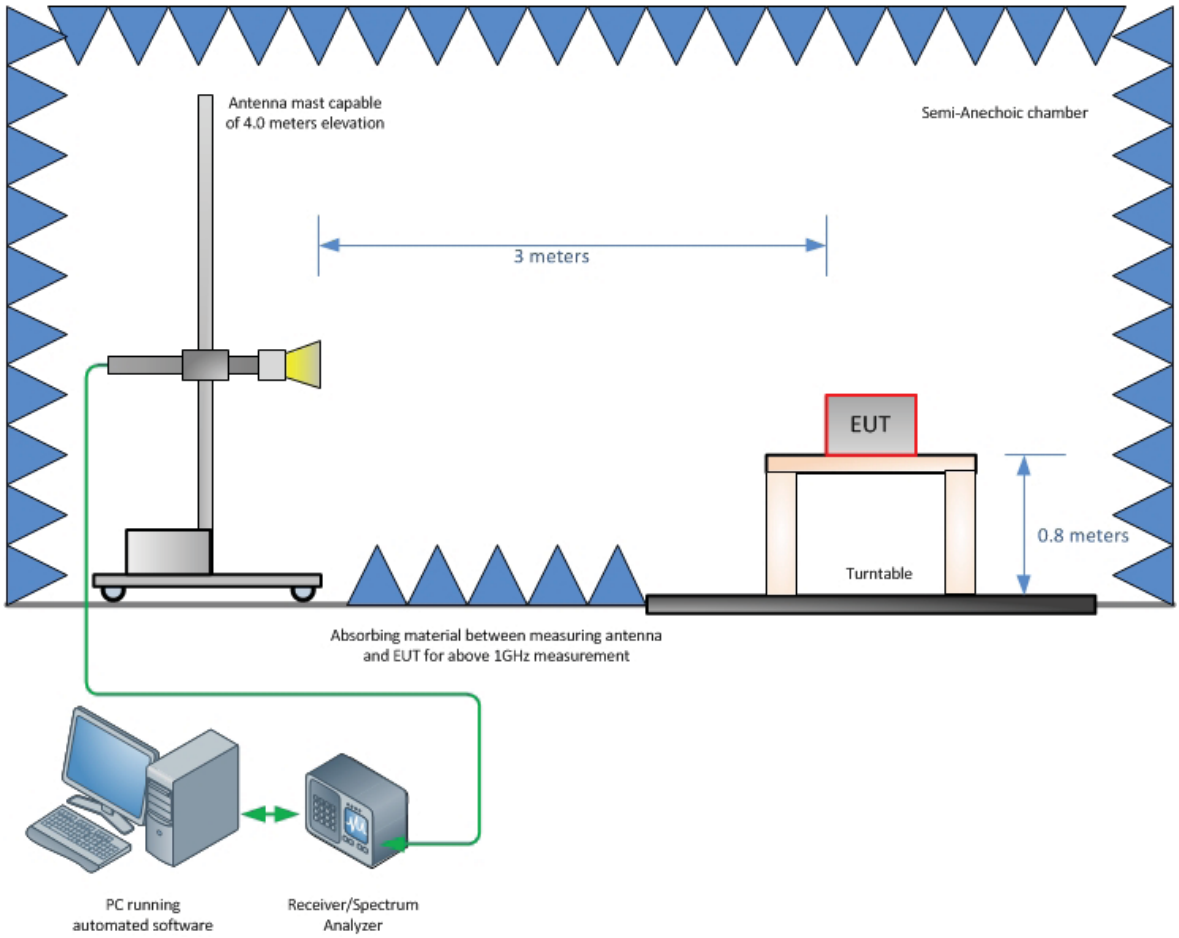
SECTION 4

DIAGRAM OF TEST SETUP

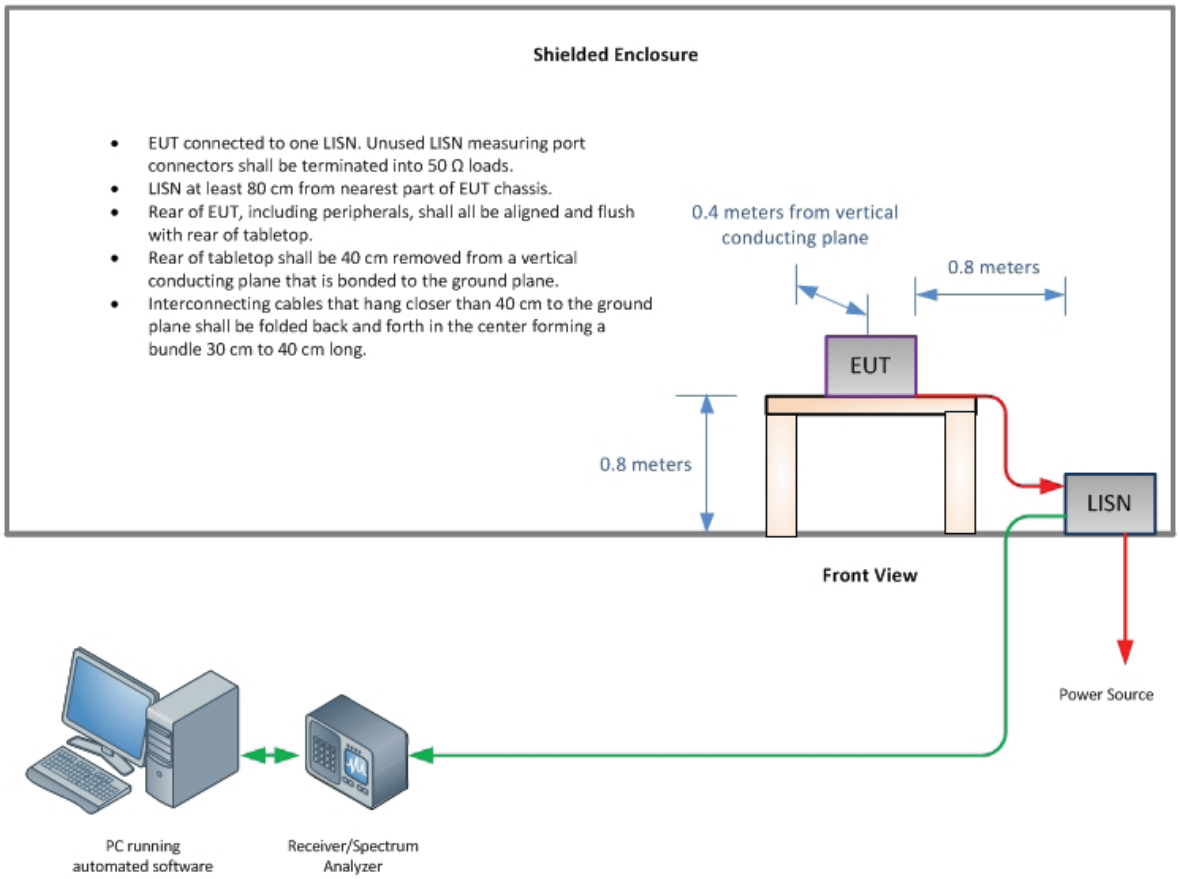
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Conducted Emission Test Setup

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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and professional organization certifications for
AAMI, ACIL, AEA, ANSI, IEEE, A2LA, NIST and VCCI.

A2LA Cert. No. 2955.13

Annex “A”

Max Power-Antenna Attestation Letter

On-Ramp Wireless, Inc
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+1 858 592 6008 : phone
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info@onrampwireless.com
www.onrampwireless.com

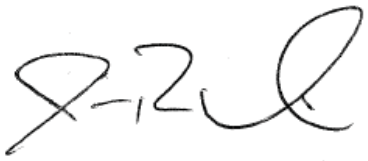
April 17, 2015

BABT FCB
Forsyth House,
Churchfield Road,
Walton-on-Thames,
Surrey, KT12 2TD

Attention: Reviewing Agency or TCB
FCC ID: XTE-NODE102

On behalf of On-Ramp Wireless, Inc., I certify that the microNode2 module is programed at the factory to a maximum antenna port power, $P_{max}(dBm)$, such that $P_{max} = 30 - G$. G is the antenna gain in dB, not to exceed 9dBi, based on the application's antenna selection. Furthermore, the module is designed to be operated with a single antenna or with dual antennas for spatial diversity. Only one of the two antennas is used at any given time when operated with antenna diversity.

Dated this _____17th_____day of __April___, 2015.



Jason Wilson
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