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Report On

Application for Grant of Equipment Authorization of the
DexCom Inc.
G5x CGM System Continuous Glucose Monitor System

FCC Part 15 Subpart C §15.247
IC RSS-247 Issue 1 May 2015

Report No. SD72111778-115B

February 2016



REPORT ON Radio Testing of the
DexCom Inc.
Continuous Glucose Monitor System

TEST REPORT NUMBER SD72111778-115B

PREPARED FOR DexCom Inc.
6340 Sequence Drive
San Diego, CA 92121
USA

CONTACT PERSON Mark Dervaes
Principal Engineer
(858) 875-9420
mdervaes@dexcom.com

PREPARED BY Xiaoying Zhang
Name
Authorized Signatory
Title: EMC/Wireless Test Engineer

APPROVED BY Juan M. Gonzalez
Name
Authorized Signatory
Title: Commercial/Wireless EMC Lab Manager

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Report No. SD72111778-115B



Revision History

SD72111778-115B DexCom Inc. G5x CGM System					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
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SECTION 1

REPORT SUMMARY

Radio Testing of the
DexCom Inc.
Continuous Glucose Monitor System

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the DexCom Inc. G5x CGM System to the requirements of FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 1 May 2015.

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	DexCom Inc.
Model Number(s)	G5x Transmitter 9445-01
FCC ID Number	PH29588
IC Number	9290A-944501
Serial Number(s)	4Q00L6 (Conducted Sample) 4Q01BM (Radiated Sample)
Number of Samples Tested	2
Test Specification/Issue/Date	<ul style="list-style-type: none">• FCC Part 15 Subpart C §15.247 (October 01, 2014).• RSS-247 – Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices (Issue 1, May 2015).• RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 4, November 2014).
Start of Test	December 08, 2015
Finish of Test	December 15, 2015
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	<ul style="list-style-type: none">• KDB 558074 D01 (DTS Meas Guidance v03r03, June 09, 2015). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.247 and IC RSS-247 Issue 1 May 2015 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-247 5.4(4)	Peak Output Power	Compliant	
-	§15.207(a)	RSS-Gen 8.8	Conducted Emissions	N/A*	
2.2		RSS-Gen 6.6	99% Emission Bandwidth	Compliant	
2.3	§15.247(a)(2)	RSS-247 5.2(1)	Minimum 6 dB RF Bandwidth	Compliant	
2.4	§15.247(d)	RSS-247 5.5	Out-of-Band Emissions - Conducted	Compliant	
2.5	§15.247(d)	RSS-247 5.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.6	§15.247(d)	RSS-247 5.5	Spurious Radiated Emissions	Compliant	
-	-	RSS-Gen 7.1	Receiver Spurious Emissions	N/A**	
2.7	§15.247(d)	RSS-247 5.5	Radiated Band Edge Measurements	Compliant	
2.8	§15.247(e)	RSS-247 5.2(2)	Power Spectral Density for Digitally Modulated Device	Compliant	

* The EUT is a battery powered device

** The EUT has no dedicated receive only port

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Dexcom Inc. G5x CGM System Continuous Glucose Monitor (CGM) system. The system consists of a sensor (a resistor sensor simulator is used for EMC testing), a primary battery powered transmitter that is physically connected to the sensor. The G5x CGM System may also include an iPhone that has a Dexcom G5 Mobile iOS CGM App. In normal operation the G5x transmitter will exchange data with the G5 Mobile receiver and/or the iPhone once every 5 minutes over a Bluetooth Low Energy wireless link. The G5 Mobile Receiver and iPhone CGM App display (and record) glucose values and provide alerts and alarms.



Equipment Under Test

1.3.2 EUT General Description

EUT Description	Continuous Glucose Monitor System
Model Name	G5x CGM System
Model Number(s)	G5x Transmitter 9445-01
Rated Voltage	Internal lithium manganese battery 3.0VDC
Mode Verified	BT LE
Capability	BT LE only
Primary Unit (EUT)	<input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
Antenna Type	Fusca 2.4 GHz SMD Antenna
Manufacturer	Antenova m2m
Antenna Model	A10192
Antenna Gain	0.8dBi

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
Bluetooth LE	2402-2480	-9.04	0.12

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	SW10649 is used with the USB dongle to send configuration commands over the BLE wireless link to the G5x CGM System.

1.4.2 EUT Exercise Software

9445-01 G5x Transmitter:
Software: SW11075 v1.0.0.0

1.4.3 Support Equipment and I/O cables

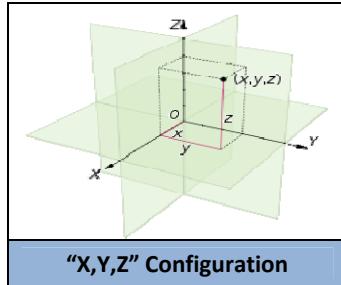
Manufacturer	Equipment/Cable	Description
Dell	Laptop	Latitude E5440
Nordic Semiconductor	USB Dongle	PCA10000
Antenova	2.4GHz Antenna with SMA	B4844-01

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report as per maximum conducted output power measurements:

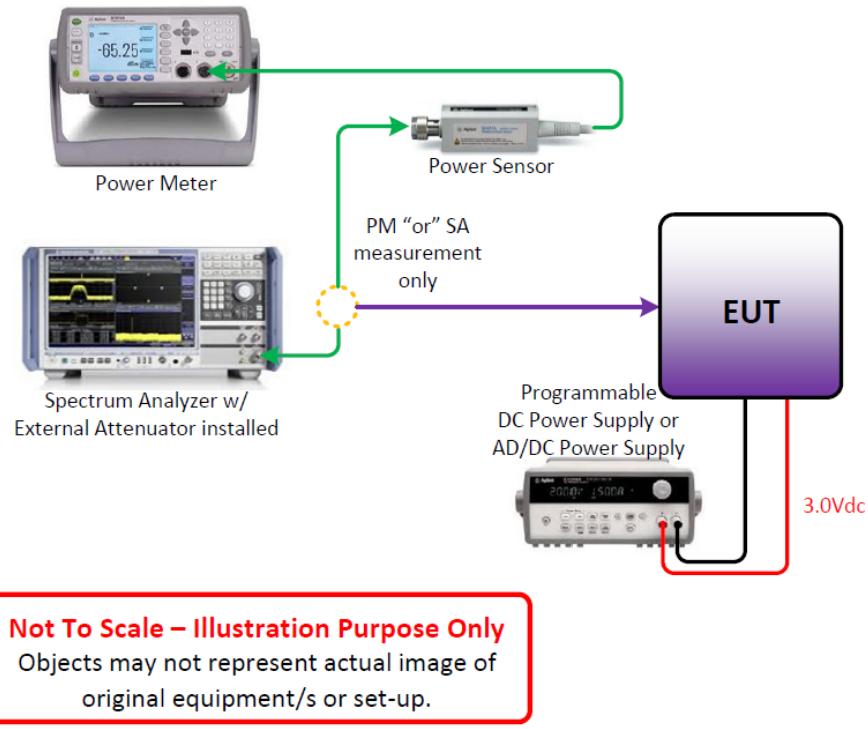
Mode	Channel	Data Rate
Bluetooth LE	39 (High Channel)	1Mbps

Both of the EUT's are mobile devices. For radiated measurements X, Y and Z orientations were verified. Worst case position is "X" for both the Transmitter and the Receiver.

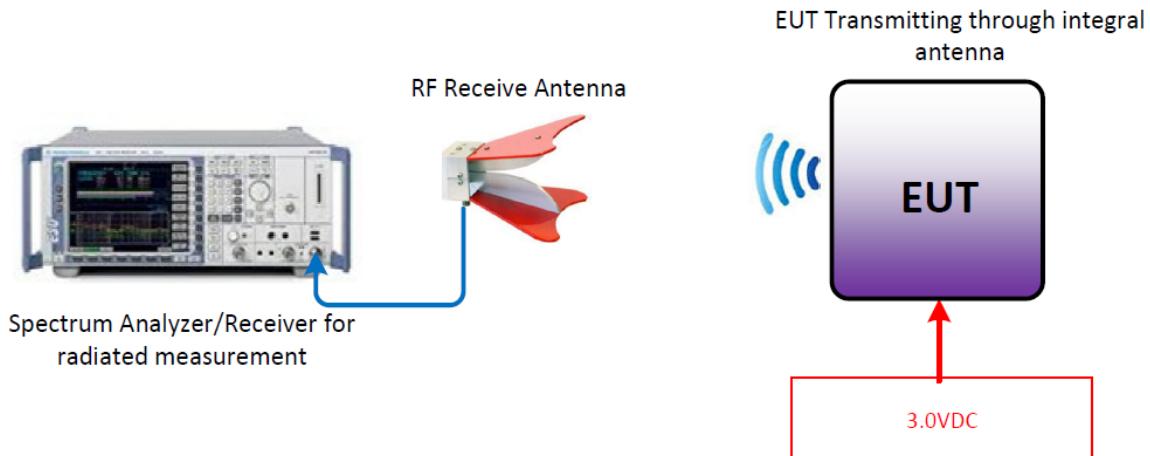


1.4.5 Simplified Test Configuration Diagram

Conducted (Antenna Port) Test Configuration



Radiated Test Configuration



Not To Scale – Illustration Purpose Only
Objects may not represent actual image of original equipment/s or set-up.

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 4Q00L6 (Conducted Sample) and 4Q01BM (Radiated 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 C63.4-2014, 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 C63.4-2014. 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 §2.948 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
DexCom Inc.
Continuous Glucose Monitor System

2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

Part 15 Subpart C §15.247(b)(3)
RSS-247, Clause 5.4 (4)

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: 4Q00L6 / Default Test Configuration

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

December 08, 2015/XYZ

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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.8°C
Relative Humidity	24.4%
ATM Pressure	99.8 kPa

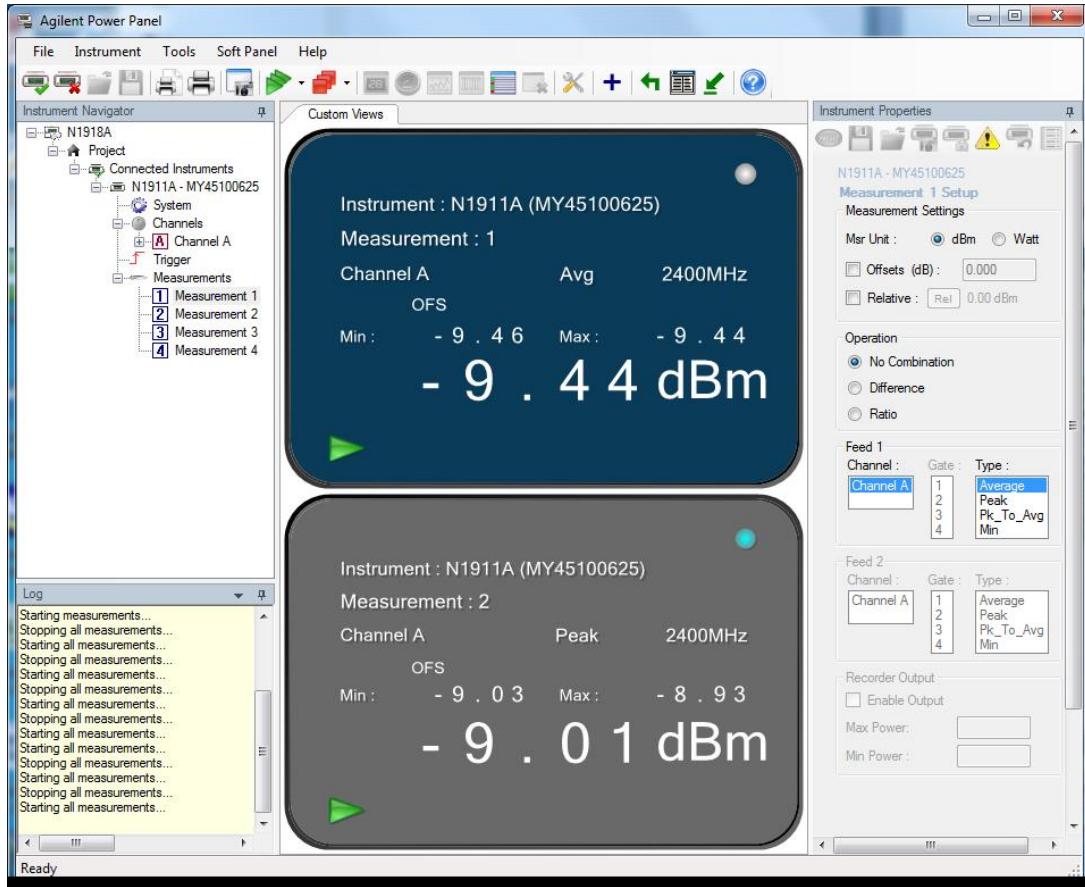
2.1.7 Additional Observations

- This is a conducted test (Maximum conducted [average] output power) using direct connection to a power meter.
- The path loss for was measured and entered as a level offset.
- Test methodology is per Clause 9.2.3.1 of KDB 558074 D01 (DTS Meas Guidance v03r03, June 09, 2015). All conditions under this Clause are satisfied.
- Both Peak and Average measurements were recorded.

2.1.8 Test Results

Bluetooth Low Energy (LE)	Channel	Modulation	Measured Average Power (dBm)	Measured Peak Power (dBm)
	37 (2402 MHz)	GFSK @ 1Mbps	-9.63	-9.10
	17 (2440 MHz)		-9.44	-9.01
	39 (2480 MHz)		-9.04	-8.61

2.1.9 Sample Test Display



2.2 99% EMISSION BANDWIDTH

2.2.1 Specification Reference

RSS-Gen Clause 6.6

2.2.2 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.

2.2.3 Equipment Under Test and Modification State

Serial No: 4Q00L6 / Default Test Configuration

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

December 08, 2015/XYZ

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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 24.8°C
Relative Humidity 24.4%
ATM Pressure 99.4 kPa

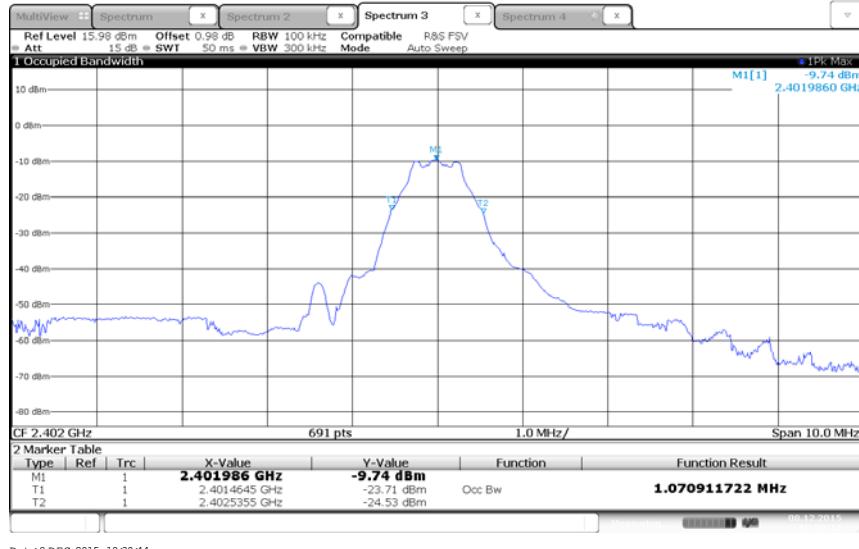
2.2.7 Additional Observations

- This is a conducted test.
- The path loss for was measured and entered as a level offset.
- 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.

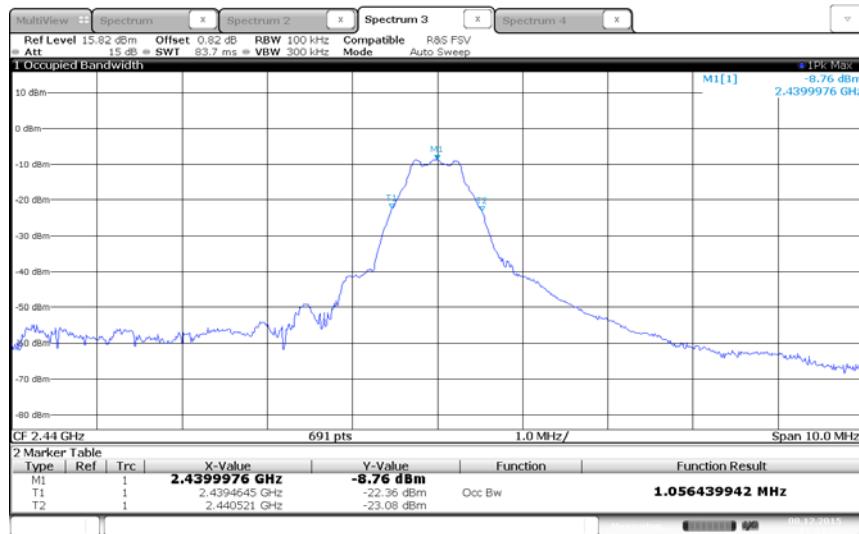
2.2.8 Test Results (For reporting purposes only)

Mode	Channel	Measured 99% Bandwidth (MHz)
Bluetooth LE	37 (2402 MHz)	1.071
	17 (2440 MHz)	1.056
	39 (2480 MHz)	1.056

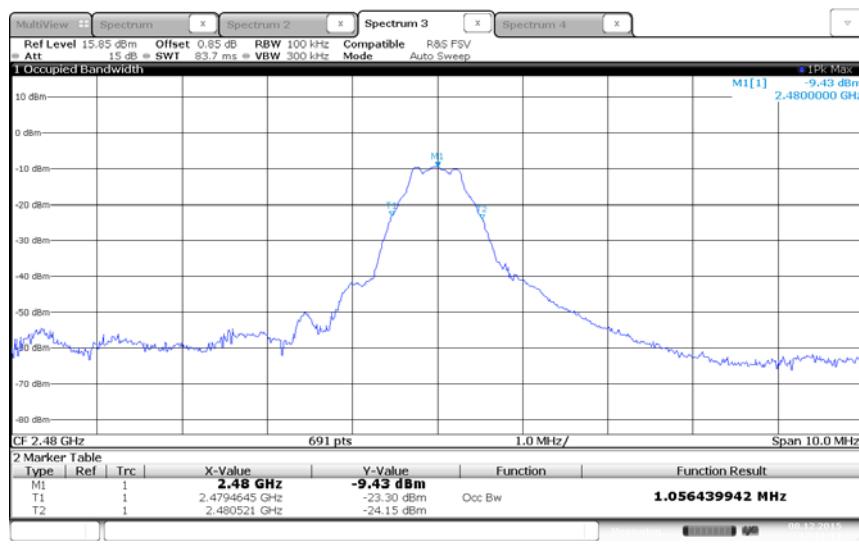
2.2.9 Test Results Plots



Bluetooth LE Low Channel



Bluetooth LE Mid Channel



Bluetooth LE High Channel

2.3 MINIMUM 6 dB RF BANDWIDTH

2.3.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(a)(2)
RSS-247, Clause 5.2(1)

2.3.2 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.

2.3.3 Equipment Under Test and Modification State

Serial No: 4Q00L6 / Default Test Configuration

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

December 08, 2015/XYZ

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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.8°C
Relative Humidity	24.4%
ATM Pressure	99.4 kPa

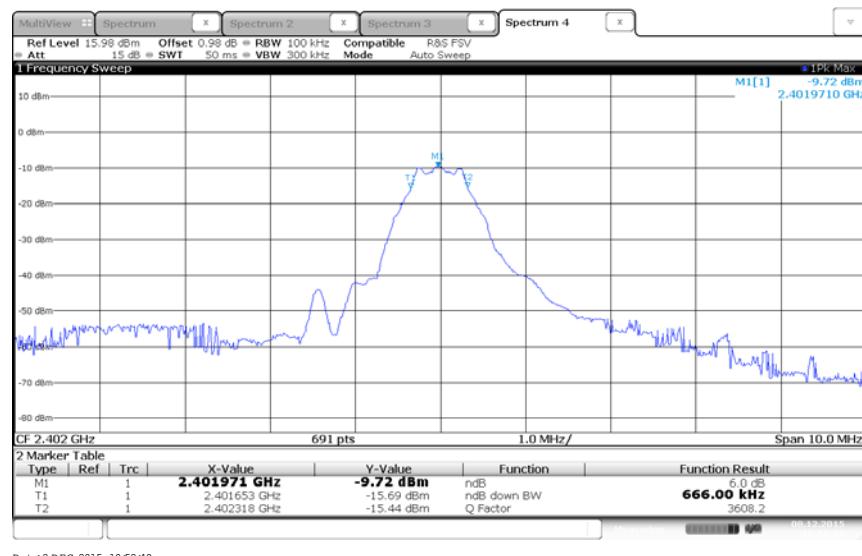
2.3.7 Additional Observations

- This is a conducted test.
- The path loss for was measured and entered as a level offset.
- Span is wide enough to capture the channel transmission.
- RBW is set to 100 kHz.
- VBW is ≥ 3 X RBW.
- Sweep is auto.
- Detector is peak.
- The “n” dB down marker function of the spectrum analyzer was used for this test.

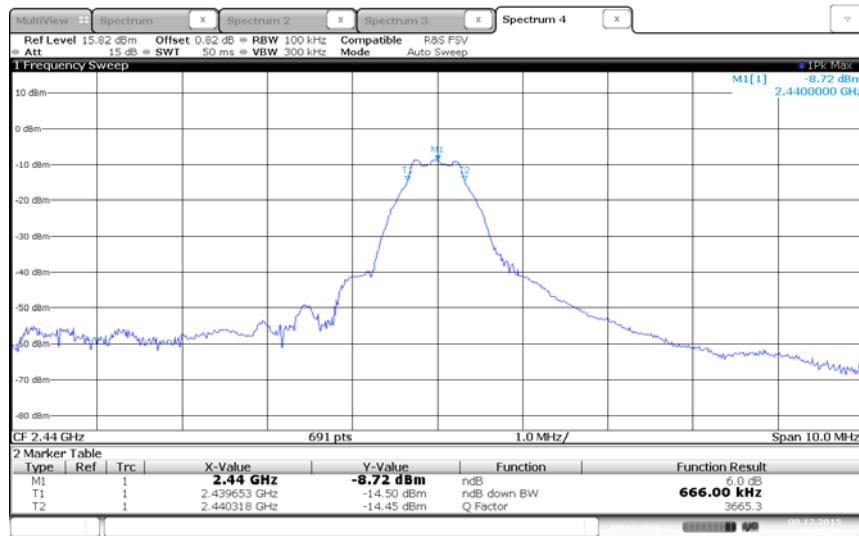
2.3.8 Test Results

Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
Bluetooth LE	37 (2402 MHz)	0.666	0.500	Complies
	17 (2440 MHz)	0.666	0.500	Complies
	39 (2480 MHz)	0.666	0.500	Complies

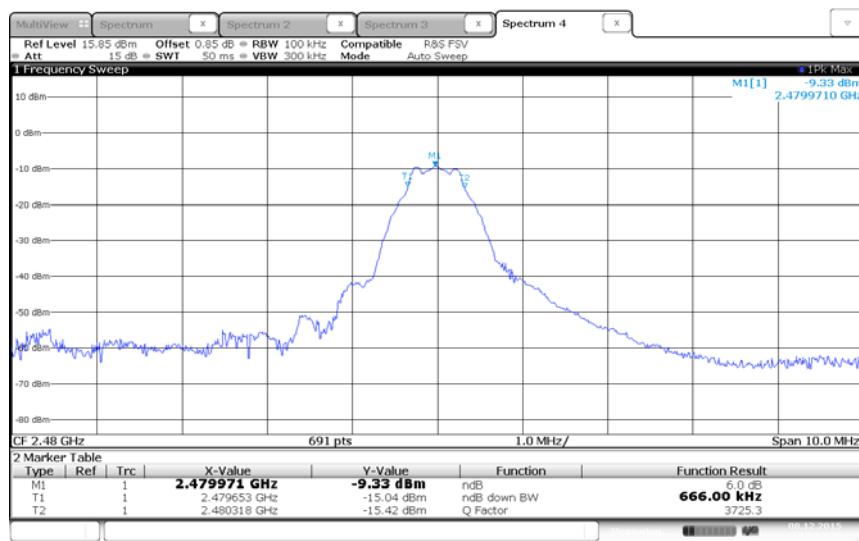
2.3.9 Test Results Plots



Bluetooth LE Low Channel



Bluetooth LE Mid Channel



Bluetooth LE High Channel

2.4 OUT-OF-BAND EMISSIONS - CONDUCTED

2.4.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Clause 5.5

2.4.2 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)).

2.4.3 Equipment Under Test and Modification State

Serial No: 4Q00L6 / Default Test Configuration

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

December 09, 2015/XYZ

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

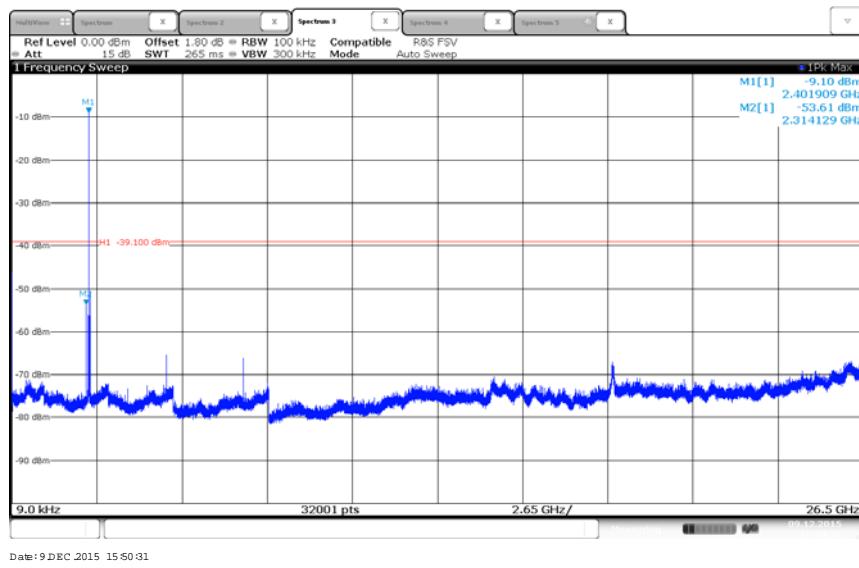
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.5 °C
Relative Humidity	26.6 %
ATM Pressure	99.1 kPa

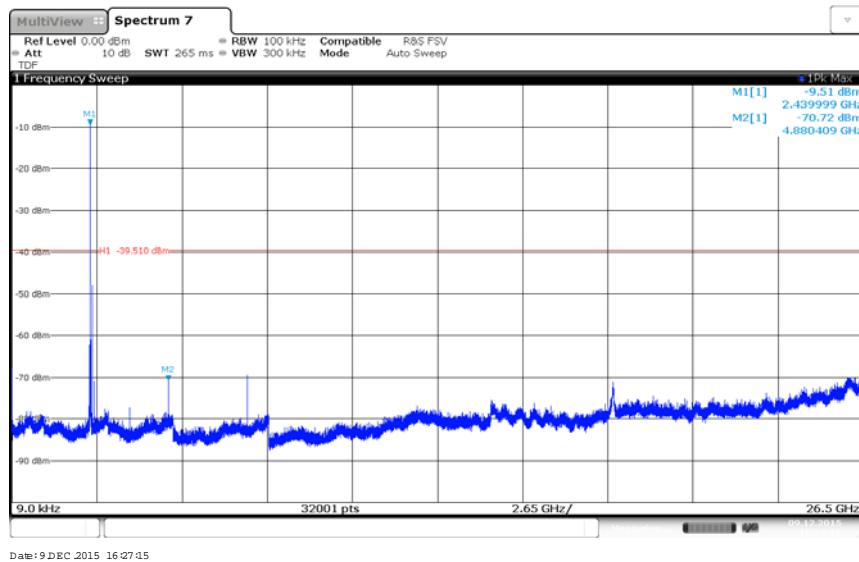
2.4.7 Additional Observations

- This is a conducted test.
- The path loss was measured and entered as a level offset
- 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 9 kHz up to 26.5GHz.
- Only noise floor measurements observed from 26.5GHz up to 40GHz.

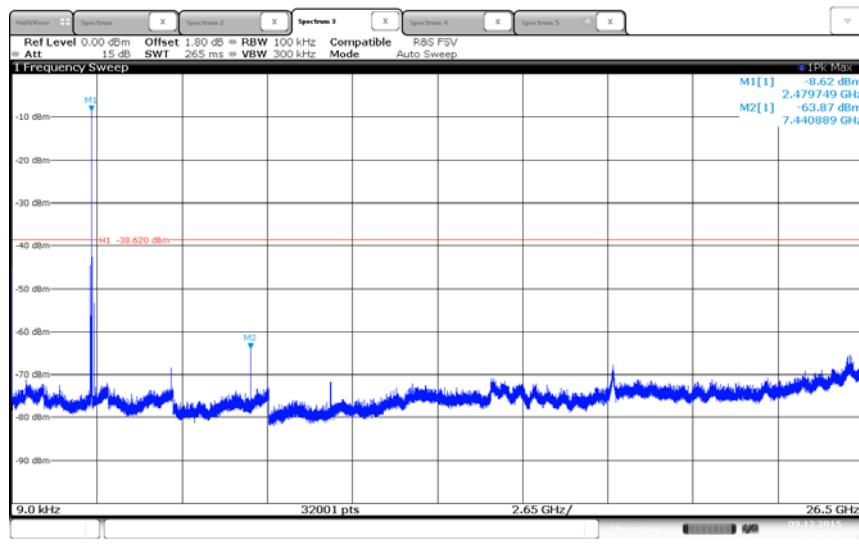
2.4.8 Test Results Plots



Bluetooth LE Low Channel



Bluetooth LE Mid Channel



Bluetooth LE High Channel

2.5 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.5.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Clause 5.5

2.5.2 Standard Applicable

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: 4Q00L6 / Default Test Configuration

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

December 08, 2015/XYZ

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

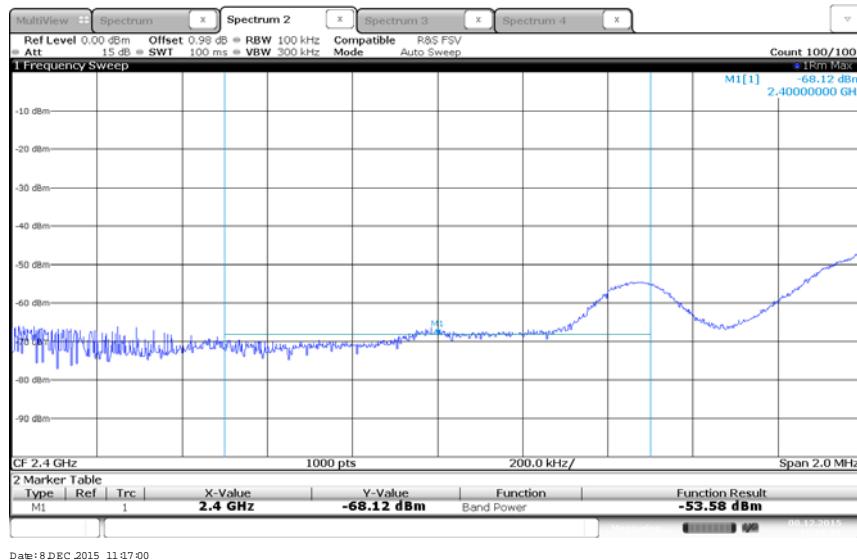
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.8°C
Relative Humidity	24.4%
ATM Pressure	99.4 kPa

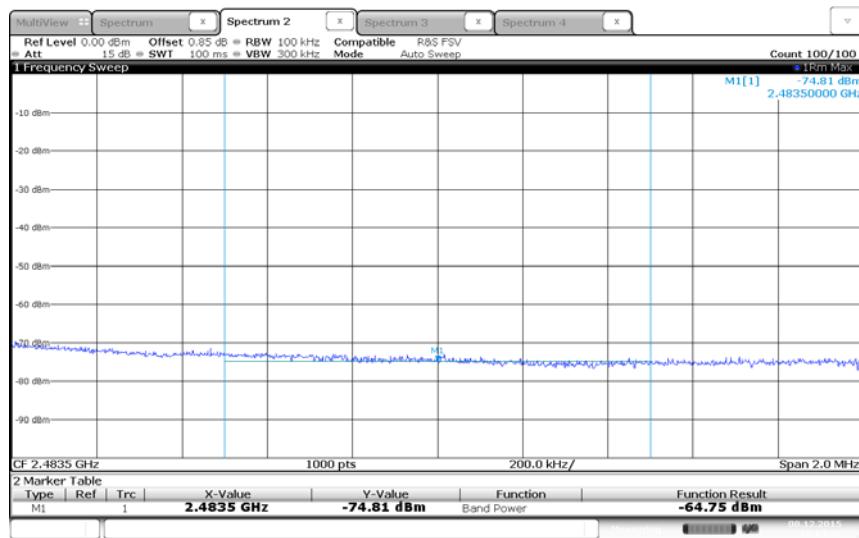
2.5.7 Additional Observations

- Setup is identical to “Out-of-Band Emissions – Conducted” test (previous test).
- The path loss was measured and entered as a level offset
- 2.4GHZ band-edge (2400MHz and 2483.5MHz) emissions were verified in this test.
- Test methodology is per Clause 13.3.1 of KDB 558074 D01 (DTS Meas Guidance v03r03, June 09, 2015); trace averaging with continuous EUT transmission at full power.
- The highest level of the desired power in the 100 kHz bandwidth within the band were tested , Limits are 30dBc from the highest level of the desired power within the band.

2.5.8 Test Results



Bluetooth LE Low Channel (2402 MHz). Limit is -39.96 dBm. Margin is -28.16 dB.
(The highest level of the desired power in the 100 kHz bandwidth within the band is -9.96dBm)



Bluetooth LE High Channel (2480 MHz). Limit is -39.33 dBm. Margin is -35.48 dB.
(The highest level of the desired power in the 100 kHz bandwidth within the band is -9.33dBm)

2.6 SPURIOUS RADIATED EMISSIONS

2.6.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Clause 5.5

2.6.2 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)).

2.6.3 Equipment Under Test and Modification State

Serial No: 4Q01BM / Default Test Configuration

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

November 23 and December 15, 2015/XYZ

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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	21.8-25.2 °C
Relative Humidity	28.7-25.0 %
ATM Pressure	98.8-99.8 kPa

2.6.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- 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).
- Only the considered worst case configuration presented for radiated emissions below 1GHz. There are no significant differences in emissions between all modes below 1GHz.

- Only noise floor measurements observed above 18GHz.
- 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 2.7.8 for sample computation.

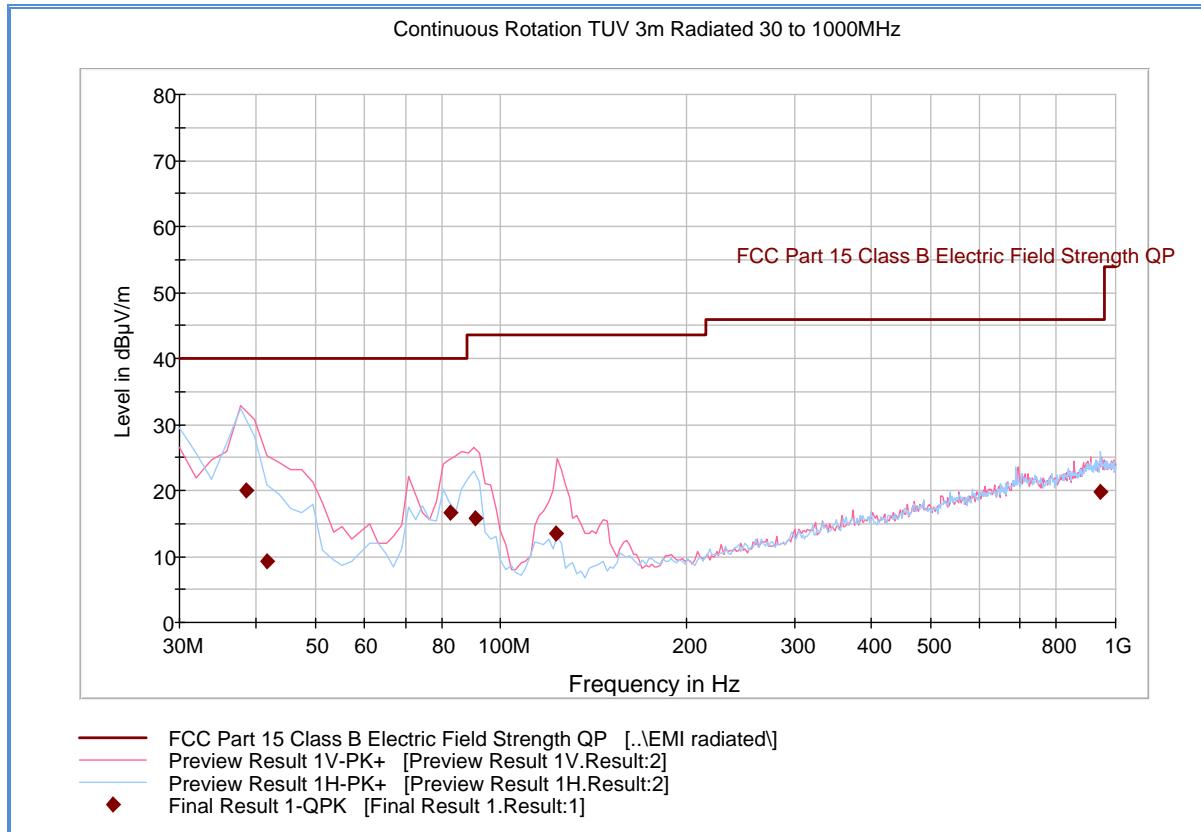
2.6.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 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 (db μ V/m) @ 30MHz			11.8

2.6.9 Test Results

See attached plots.

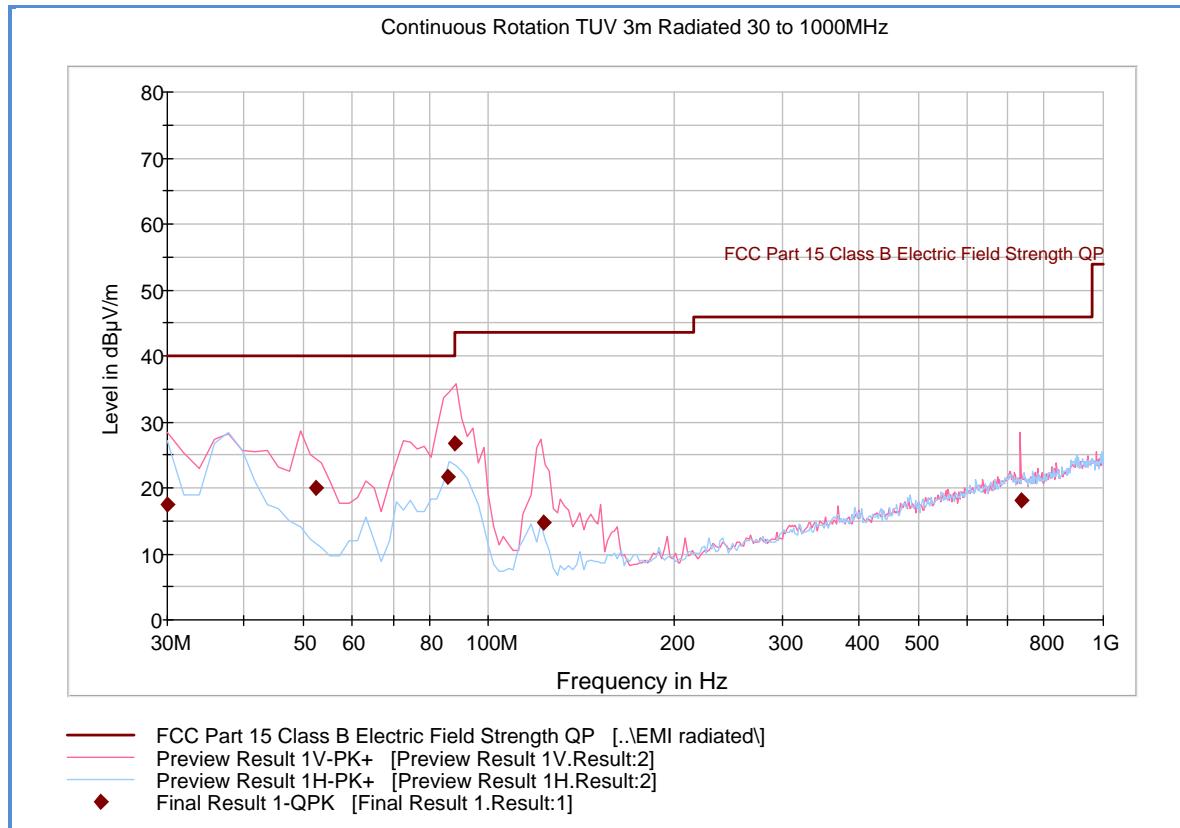
2.6.10 Test Results Below 1GHz (Receive Mode)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
38.495551	20.1	1000.0	120.000	153.0	V	12.0	-15.9	19.9	40.0
41.607214	9.3	1000.0	120.000	150.0	V	323.0	-17.3	30.7	40.0
82.892745	16.5	1000.0	120.000	300.0	V	-12.0	-21.7	23.5	40.0
90.980521	15.7	1000.0	120.000	300.0	V	-12.0	-20.6	27.8	43.5
122.746613	13.5	1000.0	120.000	100.0	V	18.0	-20.6	30.0	43.5
944.291142	19.8	1000.0	120.000	387.0	H	290.0	1.4	26.2	46.0

2.6.11 Test Results Below 1GHz (Bluetooth LE)

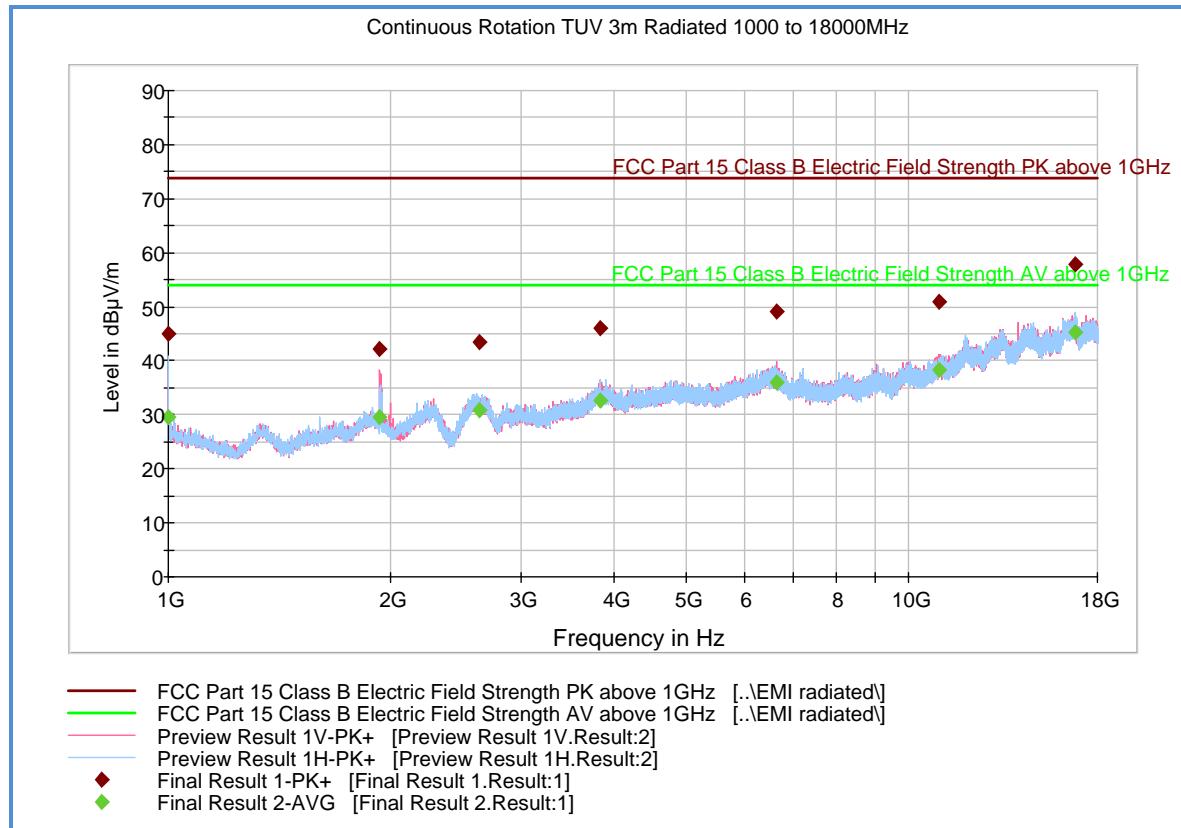


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
30.040000	17.5	1000.0	120.000	100.0	V	18.0	-11.6	22.5	40.0
52.398878	20.1	1000.0	120.000	100.0	V	15.0	-20.4	19.9	40.0
85.588858	21.6	1000.0	120.000	100.0	V	-12.0	-21.5	18.4	40.0
88.012745	26.7	1000.0	120.000	150.0	V	342.0	-21.2	16.8	43.5
122.626613	14.7	1000.0	120.000	100.0	V	208.0	-20.6	28.8	43.5
734.727375	18.1	1000.0	120.000	207.0	V	226.0	-1.8	27.9	46.0

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

2.6.12 Test Results Above 1GHz (Bluetooth LE Low Channel)



Peak Data

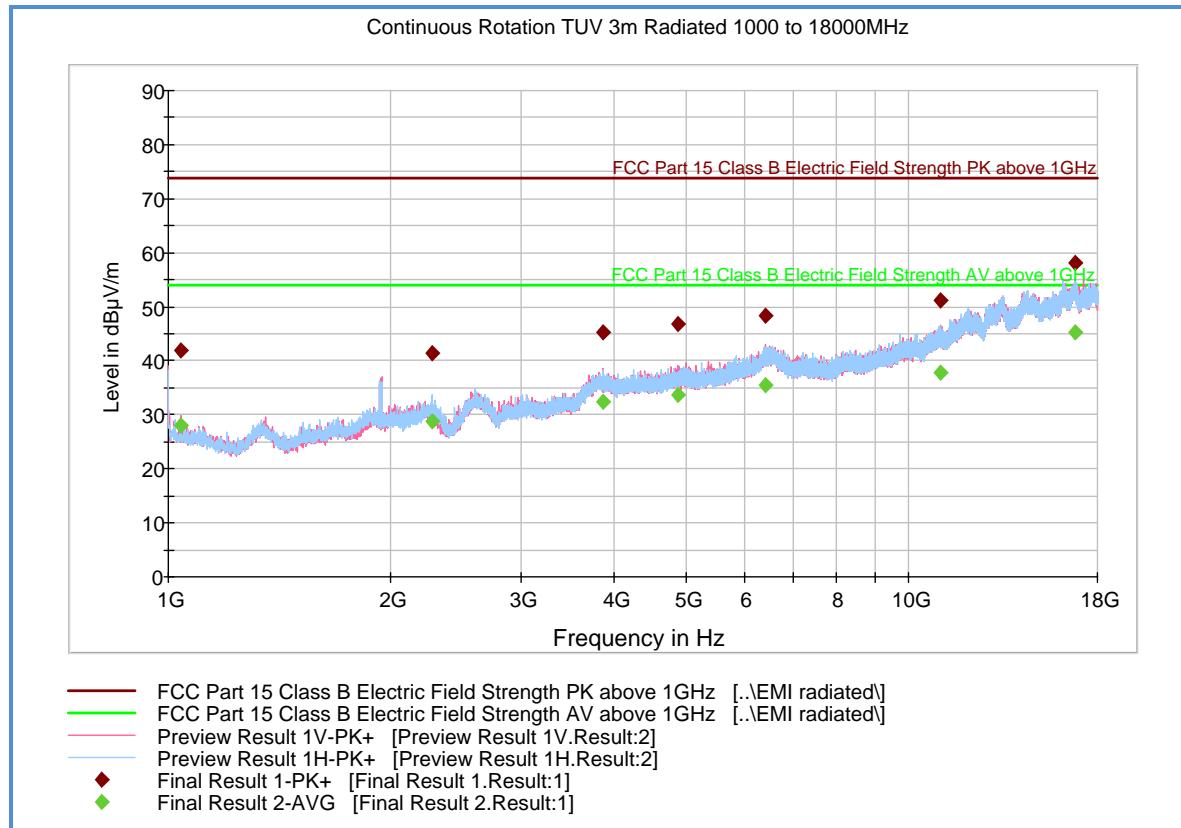
Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1000.400000	44.9	1000.0	1000.000	237.4	H	4.0	-7.2	29.0	73.9
1932.366667	42.3	1000.0	1000.000	208.5	V	120.0	-2.3	31.7	73.9
2627.500000	43.5	1000.0	1000.000	402.4	V	20.0	0.0	30.4	73.9
3829.900000	45.9	1000.0	1000.000	116.7	H	299.0	5.0	28.0	73.9
6621.866667	49.0	1000.0	1000.000	115.7	V	58.0	11.3	24.9	73.9
11005.633333	51.0	1000.0	1000.000	102.7	V	174.0	15.6	22.9	73.9
16785.666667	57.9	1000.0	1000.000	300.2	V	69.0	24.7	16.0	73.9

Average Data

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1000.400000	29.7	1000.0	1000.000	237.4	H	4.0	-7.2	24.2	53.9
1932.366667	29.7	1000.0	1000.000	208.5	V	120.0	-2.3	24.2	53.9
2627.500000	30.8	1000.0	1000.000	402.4	V	20.0	0.0	23.1	53.9
3829.900000	32.8	1000.0	1000.000	116.7	H	299.0	5.0	21.1	53.9
6621.866667	36.1	1000.0	1000.000	115.7	V	58.0	11.3	17.8	53.9
11005.633333	38.2	1000.0	1000.000	102.7	V	174.0	15.6	15.7	53.9
16785.666667	45.2	1000.0	1000.000	300.2	V	69.0	24.7	8.7	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.

2.6.13 Test Results Above 1GHz (Bluetooth LE Mid Channel)



Peak Data

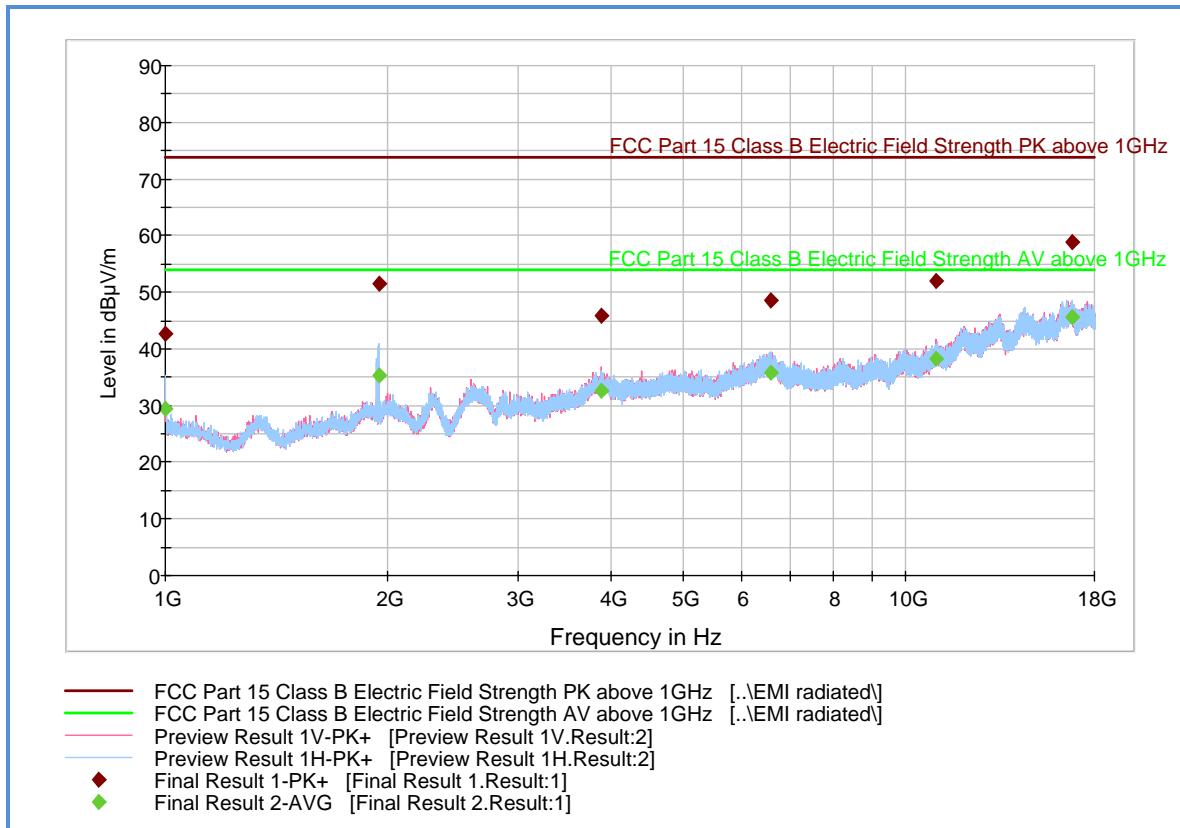
Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1040.066667	41.9	1000.0	1000.000	188.6	V	2.0	-7.7	32.0	73.9
2271.000000	41.4	1000.0	1000.000	296.3	H	108.0	-1.0	32.5	73.9
3867.166667	45.1	1000.0	1000.000	402.1	V	34.0	5.0	28.8	73.9
4879.533333	46.7	1000.0	1000.000	201.3	V	256.0	6.1	27.2	73.9
6405.266667	48.3	1000.0	1000.000	117.7	V	55.0	11.5	25.6	73.9
11031.933333	51.2	1000.0	1000.000	320.2	V	16.0	15.5	22.7	73.9
16822.666667	58.1	1000.0	1000.000	276.3	H	198.0	24.4	15.8	73.9

Average Data

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1040.066667	27.9	1000.0	1000.000	188.6	V	2.0	-7.7	26.0	53.9
2271.000000	28.8	1000.0	1000.000	296.3	H	108.0	-1.0	25.1	53.9
3867.166667	32.5	1000.0	1000.000	402.1	V	34.0	5.0	21.4	53.9
4879.533333	33.7	1000.0	1000.000	201.3	V	256.0	6.1	20.2	53.9
6405.266667	35.5	1000.0	1000.000	117.7	V	55.0	11.5	18.4	53.9
11031.933333	37.8	1000.0	1000.000	320.2	V	16.0	15.5	16.1	53.9
16822.666667	45.2	1000.0	1000.000	276.3	H	198.0	24.4	8.7	53.9

Test Notes: No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.

2.6.14 Test Results Above 1GHz (Bluetooth LE High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1000.000000	42.6	1000.0	1000.000	151.0	H	1.0	-7.2	31.3	73.9
1941.433333	51.6	1000.0	1000.000	403.1	H	265.0	-2.2	22.3	73.9
3885.300000	45.9	1000.0	1000.000	121.0	V	119.0	5.1	28.0	73.9
6567.700000	48.5	1000.0	1000.000	235.0	H	1.0	11.5	25.4	73.9
11012.10000	51.9	1000.0	1000.000	206.0	V	89.0	15.6	22.0	73.9
16785.66666	58.9	1000.0	1000.000	176.0	H	91.0	24.7	15.0	73.9

Average Data

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1000.000000	29.3	1000.0	1000.000	151.0	H	1.0	-7.2	24.6	53.9
1941.433333	35.2	1000.0	1000.000	403.1	H	265.0	-2.2	18.7	53.9
3885.300000	32.6	1000.0	1000.000	121.0	V	119.0	5.1	21.3	53.9
6567.700000	35.9	1000.0	1000.000	235.0	H	1.0	11.5	18.0	53.9
11012.10000	38.3	1000.0	1000.000	206.0	V	89.0	15.6	15.6	53.9
16785.66666	45.6	1000.0	1000.000	176.0	H	91.0	24.7	8.3	53.9

2.7 RADIATED BAND EDGE MEASUREMENTS AND IMMEDIATE RESTRICTED BANDS

2.7.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(d)
RSS-247, Clause 5.5

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: 4Q00L6 / Default Test Configuration

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

November 15, 2015/XYZ

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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	21.8 °C
Relative Humidity	28.6 %
ATM Pressure	99.2 kPa

2.7.7 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.

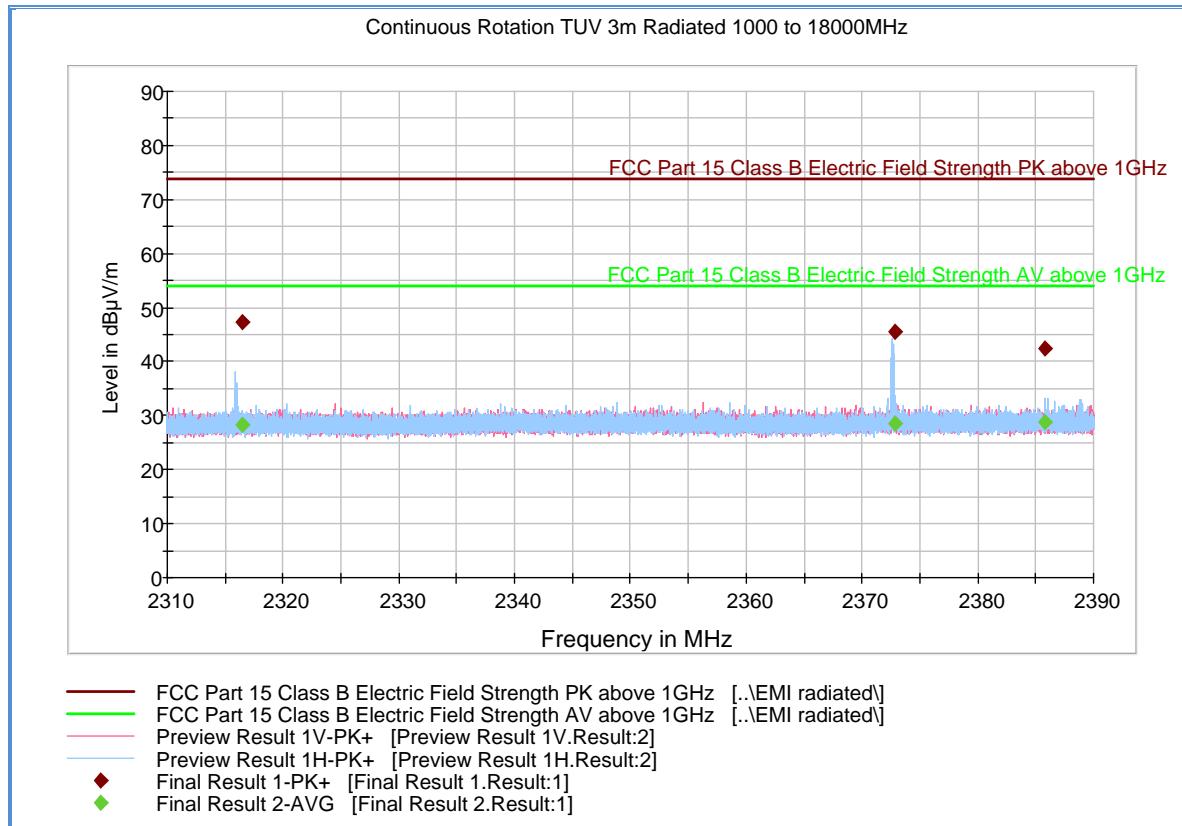
2.7.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 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 (db μ V/m) @ 2400 MHz			53.5

2.7.9 Test Results

See attached plots.

2.7.10 Test Results Restricted Band 2310MHz to 2390MHz (Bluetooth LE Low Channel)



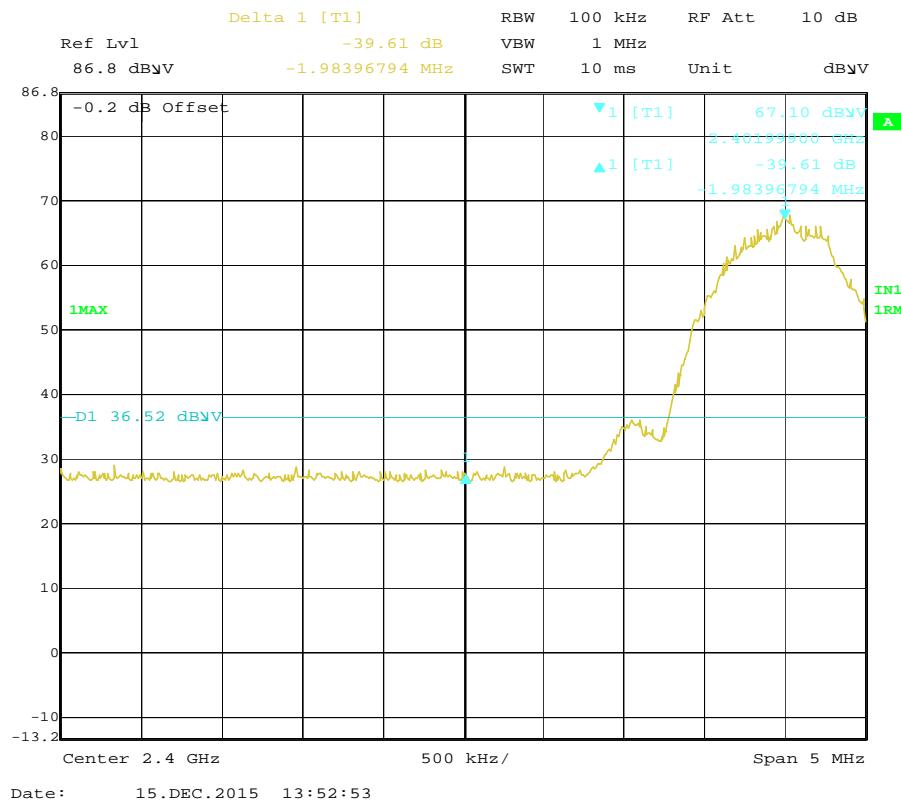
Peak Data

Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
2316.528000	47.3	1000.0	1000.000	173.6	H	139.0	-0.7	26.6	73.9
2372.802667	45.5	1000.0	1000.000	275.3	H	-20.0	-0.6	28.4	73.9
2385.861333	42.5	1000.0	1000.000	288.2	H	184.0	-0.6	31.4	73.9

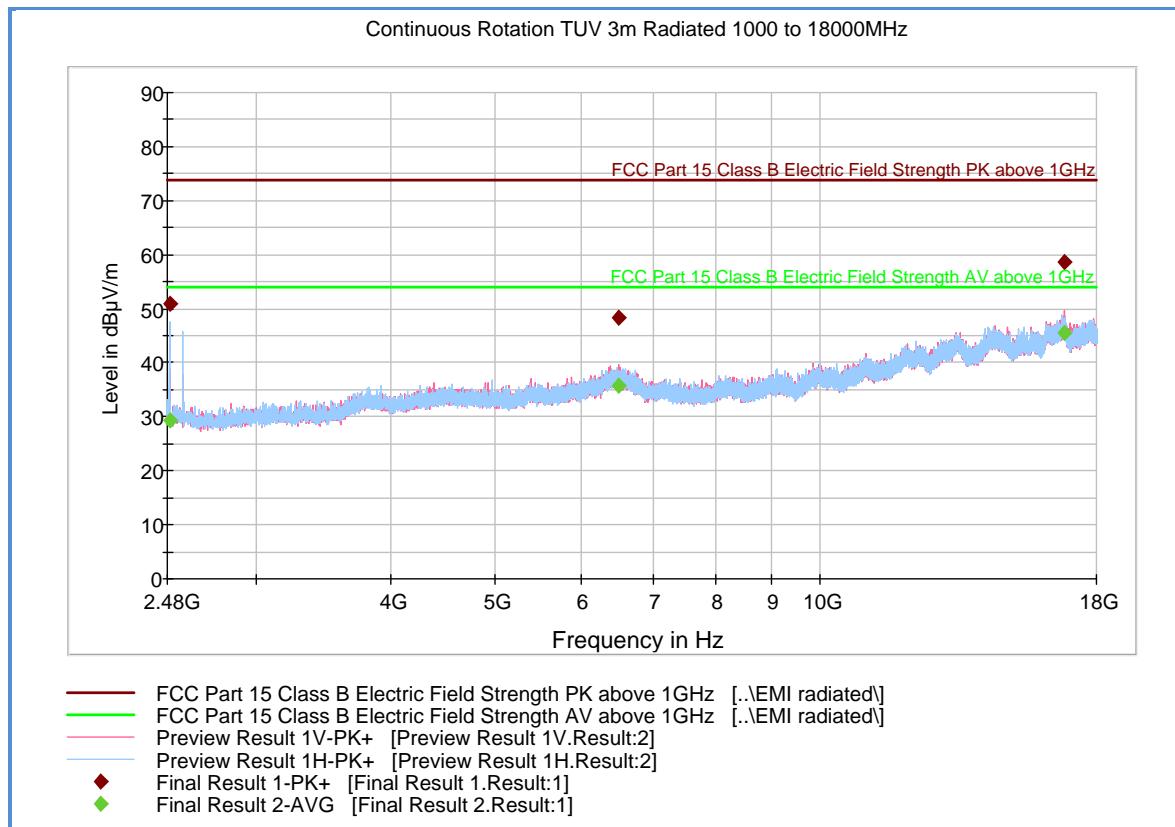
Average Data

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
2316.528000	28.3	1000.0	1000.000	173.6	H	139.0	-0.7	25.6	53.9
2372.802667	28.6	1000.0	1000.000	275.3	H	-20.0	-0.6	25.3	53.9
2385.861333	28.7	1000.0	1000.000	288.2	H	184.0	-0.6	25.2	53.9

2.7.11 Test Results Band Edge 2400MHz using 100kHz RBW (Bluetooth LE Low Channel)



2.7.12 Test Results Restricted Band 2483.5MHz to 2500MHz (Bluetooth LE High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
2495.978400	51.0	1000.0	1000.000	377.1	H	138.0	0.0	22.9	73.9
6492.734400	48.5	1000.0	1000.000	228.4	V	219.0	11.5	25.4	73.9
16799.344400	58.7	1000.0	1000.000	103.7	V	34.0	24.8	15.2	73.9

Average Data

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
2495.978400	29.3	1000.0	1000.000	377.1	H	138.0	0.0	24.6	53.9
6492.734400	35.9	1000.0	1000.000	228.4	V	219.0	11.5	18.0	53.9
16799.344400	45.6	1000.0	1000.000	103.7	V	34.0	24.8	8.3	53.9

2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(e)
RSS-247, Clause 5.2(2)

2.8.2 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.

2.8.3 Equipment Under Test and Modification State

Serial No: 4Q00L6 / Default Test Configuration

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

December 08, 2015/XYZ

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 performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.8°C
Relative Humidity	24.4%
ATM Pressure	99.4 kPa

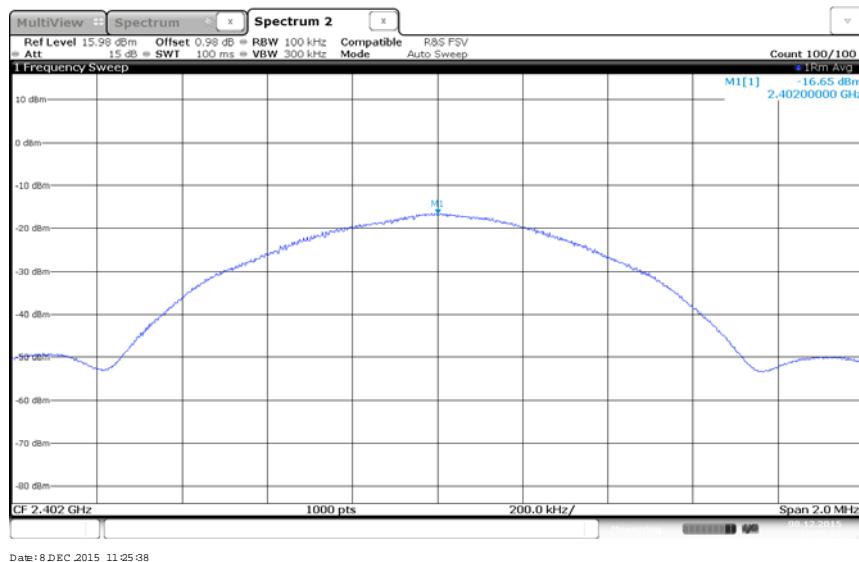
2.8.7 Additional Observations

- This is a conducted test.
- Test procedure is per Section 10.3 of KDB 558074 D01 (DTS Meas Guidance v03r03, June 09, 2015).
- The path loss for was measured and entered as a level offset
- Detector is RMS power averaging.
- Trace averaging mode over 100 traces.
- Sweep time is Auto.
- EUT complies with 100 kHz RBW.

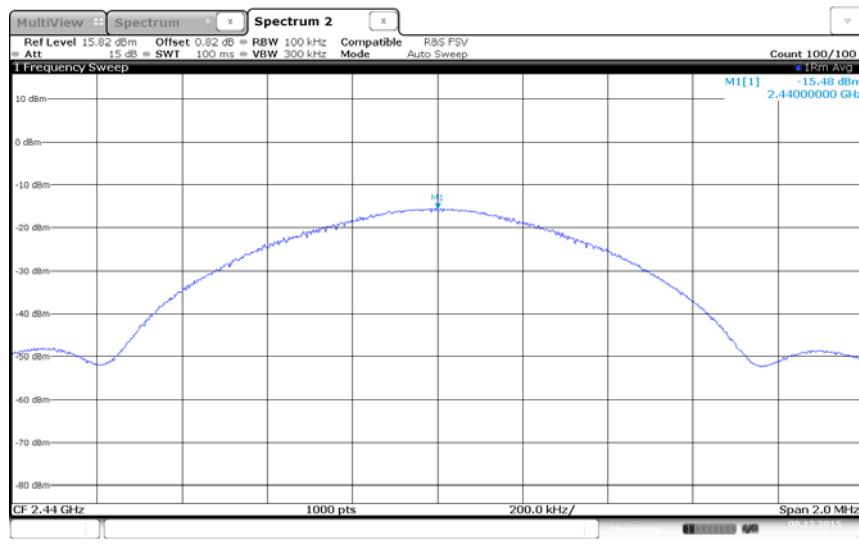
2.8.8 Test Results Summary

Mode	Channel	Data Rates (Mbps)	Marker Reading using 100 kHz RBW (dBm)	PSD Limit (dBm)	Margin (dB)	Compliance
Bluetooth LE	37 (2402 MHz)	GFSK @ 1Mbps	-16.65	8	24.65	Complies
	17 (2440 MHz)	GFSK @ 1Mbps	-15.48	8	23.48	Complies
	39 (2480 MHz)	GFSK @ 1Mbps	-16.26	8	24.26	Complies

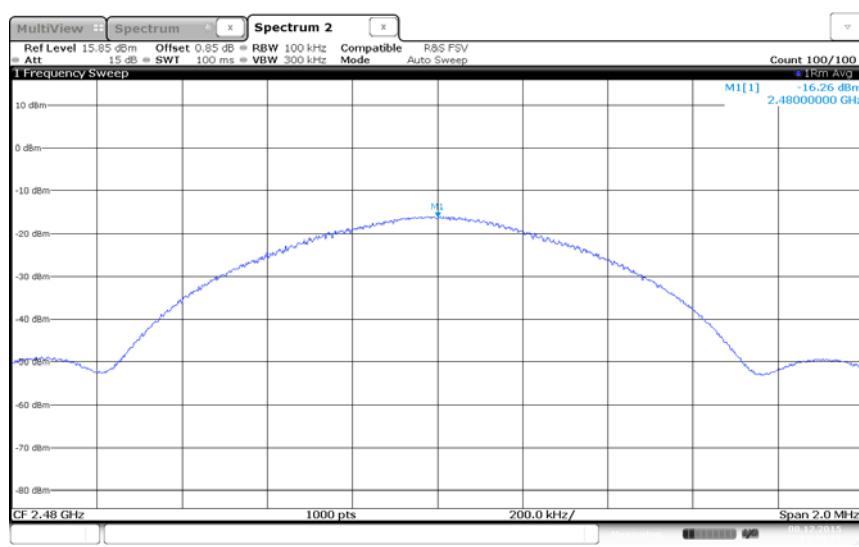
2.8.9 Test Results Plots



Bluetooth LE Low Channel



Bluetooth LE Mid Channel



Bluetooth LE 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 Test Setup						
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/05/15	10/05/16
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16
7569	Series Power Meter	N1911A P-	MY45100625	Agilent	06/19/15	06/19/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/10/15	04/10/16
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	04/27/15	04/27/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	04/03/15	04/03/16
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/03/15	09/03/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/15	09/29/16
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/11/15	03/11/16
1016	Pre-amplifier	PAM-0202	187	PAM	12/15/14	12/15/15
8816	2.4GHz to 2.5GHz Notch Filter	BRM50702	133	MICRO-TRONICS	N/A	
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	04/09/15	04/09/16
	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 Conducted Measurements

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

3.2.2 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

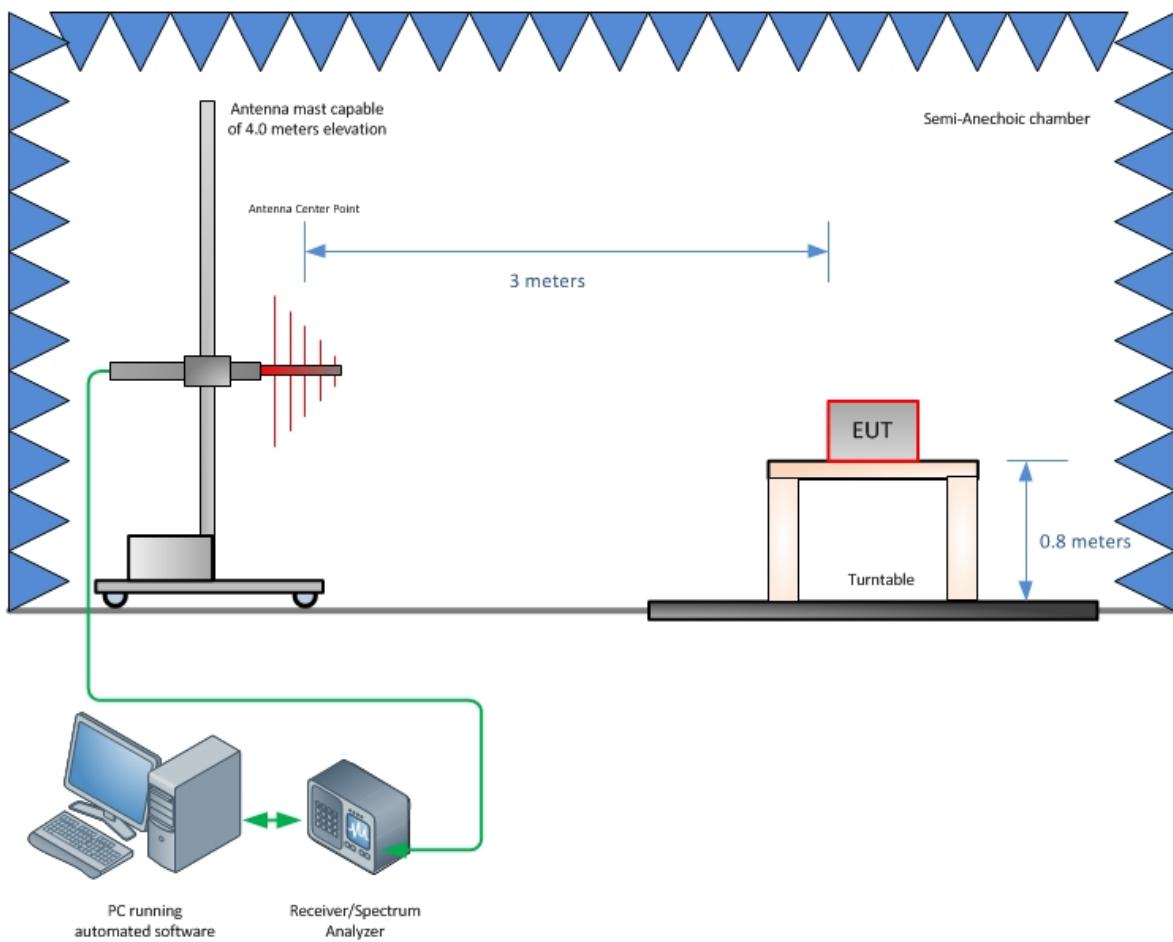
3.2.3 Radiated Emission Measurements (Above 1GHz)

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

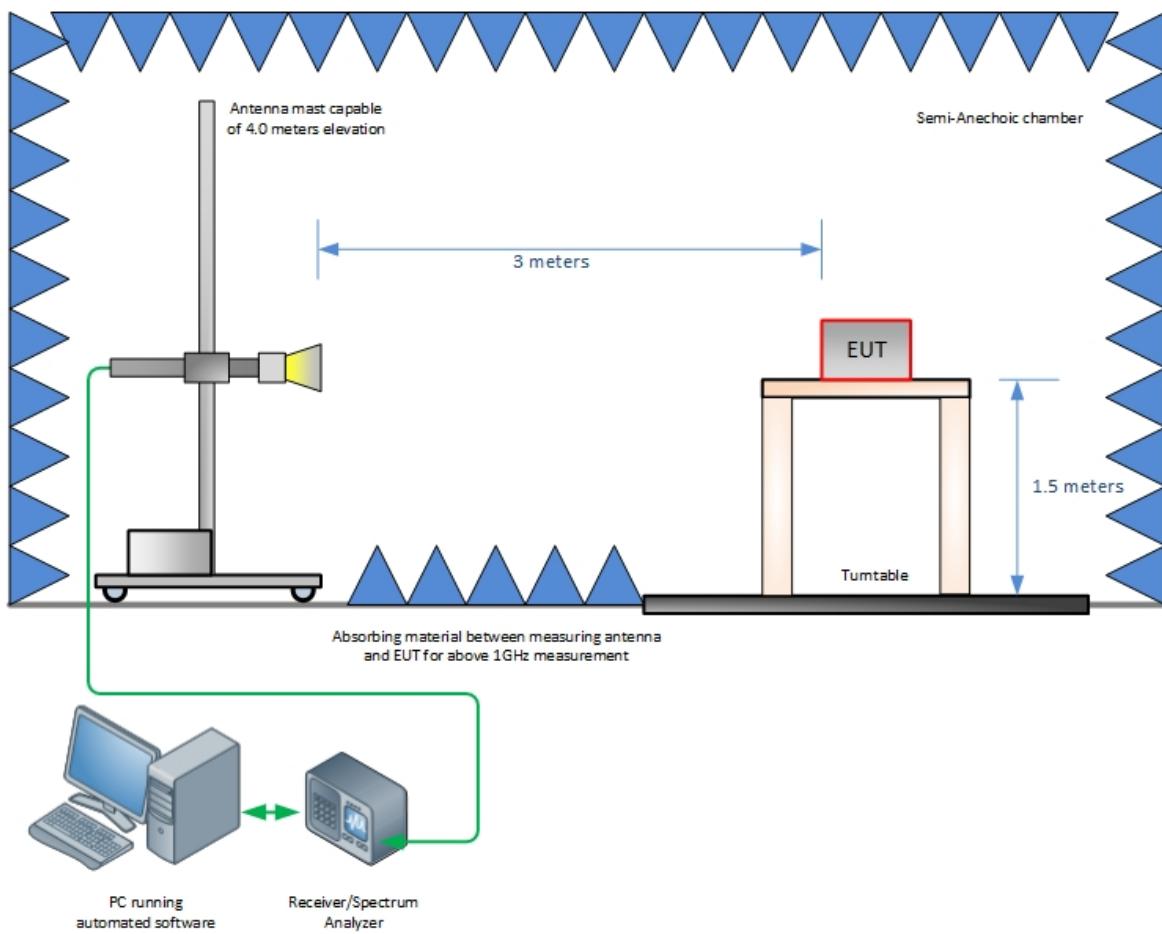
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM



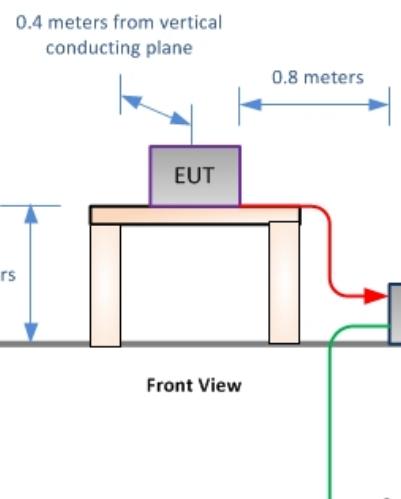
Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)

Shielded Enclosure

- EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated into 50Ω loads.
- LISN at least 80 cm from nearest part of EUT chassis.
- Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.



Conducted Emission Test Setup

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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