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Report On

Application for Grant of Equipment Authorization of the
Escort, Inc.



SmartCord Live Vehicle Bluetooth LE Transceiver

FCC Part 15 Subpart C §15.247: 2014
IC RSS-247 Issue 1 May 2015

Report No.SD72109210-0815A

December 2015



REPORT ON	Radio Testing of the Escort, Inc. SmartCord Live Vehicle Bluetooth LE Transceiver
TEST REPORT NUMBER	SD72109210-0815A
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APPROVED BY	 Chip R. Fleury Name Authorized Signatory Title: West Coast EMC Manager
DATED	December 21, 2015



Revision History

SD72109210-0815A Escort, Inc. M/N: SCL1 SmartCord Live Vehicle Bluetooth LE Transceiver					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
12/21/2015	Initial Release				Chip R. Fleury



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SECTION 1

REPORT SUMMARY

Radio Testing of the
Escort, Inc.
SmartCord Live Vehicle Bluetooth LE Transceiver



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Escort, Inc. SmartCord Live Vehicle Bluetooth LE Transceiver to the requirements of the following:
FCC Part 15 Subpart C §15.247: 2014
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	Escort, Inc.
Model Name	SmartCord Live
Model Number(s)	SCL1
FCC ID Number	QKLSCL1
FCC Classification	Low power Communications device Transmitter (DTS)
IC Number	N/A (Manufacturer not seeking IC Certification at the time of verification)
Serial Number(s)	N/A (Sample #1) Conducted antenna service port testing sample, serial number not available due to temporary addition of an antenna port for testing / (Sample #2) and (Sample #3) (Radiated testing - Sample #2 and #3)
Number of Samples Tested	3
Test Specification/Issue/Date	<ul style="list-style-type: none">• FCC Part 15 Subpart C §15.247 (October 1, 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 for Compliance of Radio Apparatus (Issue 4, November 2014).
Start of Test	September 02, 2015
Finish of Test	November 04, 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: 2014 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	Radiated Spurious Emissions	Compliant	
—		RSS-Gen 7.1	Receiver Spurious Emissions	N/A**	See Note
2.7	§15.247(d)	RSS-247 5.5	Radiated Band Edge Measurements and Restricted Bands	Compliant	
2.8	§15.247(e)	RSS-247 5.2(2)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A: Not applicable. EUT is DC powered device.*

*N/A**: Not applicable. EUT has no Stand-alone receiver port.*



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Escort, Inc. SmartCord Live Vehicle Bluetooth LE Transceiver. The SmartCord Live SCL1 is a automobile accessory power cord designed to power ESCORT and Beltronics brand radar detectors. It uses Bluetooth Low Energy to communicate between the radar detector and a Bluetooth LE equipped smartphone. Only the Bluetooth LE functions were verified in this test report.



1.3.2 EUT General Description

EUT Description	Vehicle Bluetooth LE Transceiver
Model Name	SmartCord Live
Model Number(s)	SCL1
Rated Voltage	12VDC (Nominal)
Mode Verified	BT LE
Capability	Bluetooth 4.1
Primary Unit (EUT)	<input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
Antenna Type	linear omni-directional surface-mount ceramic multilayer antenna
Antenna Model	7836
Antenna Manufacturer	YAGEO
Antenna Gain Ant	Max. 4.1 dBi

1.3.3 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Avg Output Power (dBm)	Avg Output Power (mW)	Peak Output Power (dBm)	Peak Output Power (mW)
Bluetooth LE	2402-2480	-0.74	0.84	-0.33	0.93



1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antenna conducted port test configuration.
B	Radiated emissions test configuration. All I/Os are being exercised.

1.4.2 EUT Exercise Software

There are no other test software used during verification.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Model	Description
Protek	Laboratory DC Power Supply	M/N 35010M S/N D102007S	Protek
—	USB cable	Shielded, 0.7m generic USB cable	—



1.4.4 Worst Case Configuration

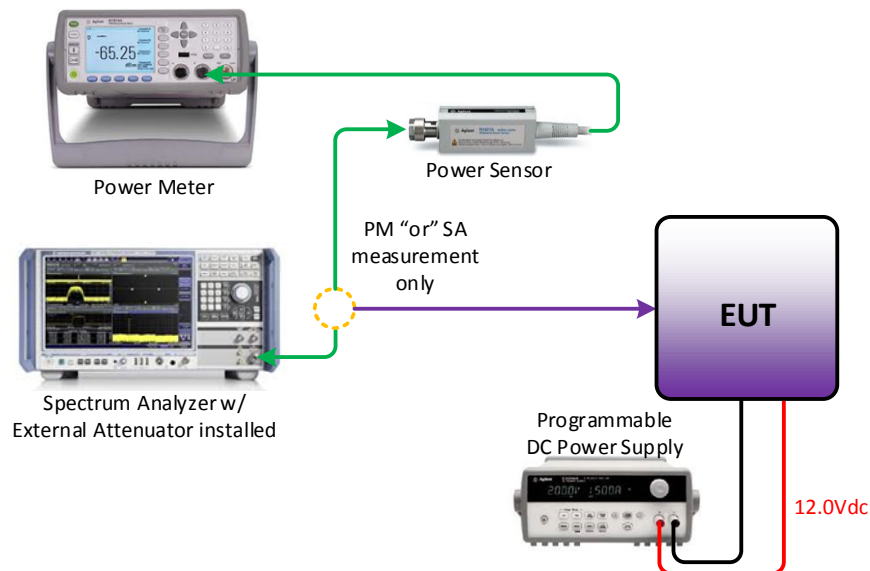
Worst-case configuration used in this test report as per Radiated Spurious Emission:

Mode	Channel	Data Rate
Bluetooth LE	37 (Low Channel)	1Mbps

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

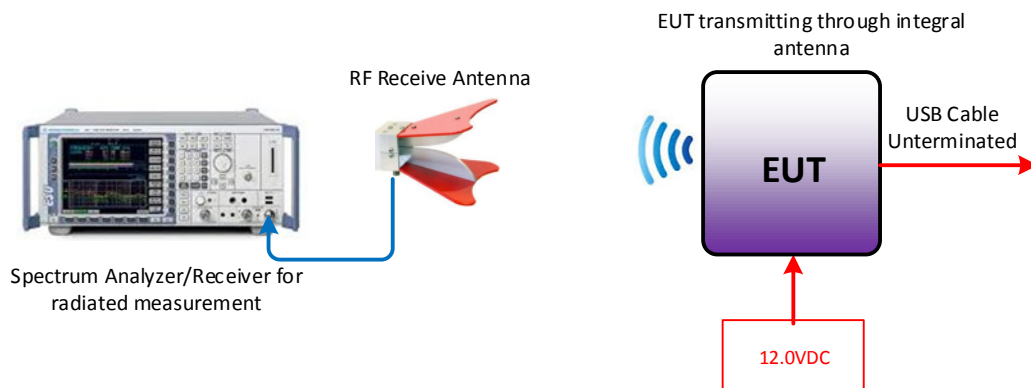
1.4.5 Simplified Test Configuration Diagram

Conducted (Antenna Port) Test Configuration



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

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: N/A (Sample #1) and (Sample #2) and (Sample #3)		
The client improved the layout and grounding of the main switching power supply (ISL85403) by increasing the 6.8uH inductor for the ISL85403 to handle more charging current before saturating the inductor. The client also improved the layout and added some additional capacitors around the USB jack to help reduce noise radiated out the USB jack and inserted cable. The changes done to the PCB had nothing to do with the layout of the Bluetooth related part of the design.	-	-

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

1.8.1 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.

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

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



SECTION 2

TEST DETAILS

Radio Testing of the
Escort, Inc.
SmartCord Live Vehicle Bluetooth LE Transceiver



2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.247(b)(3)
RSS-247, Clause 5.4 (4)

2.1.2 Standard Applicable

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands, the maximum peak conducted output shall not exceed 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 (Sample #1) / Test Configuration A

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

September 02, 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

Ambient Temperature	23.4°C
Relative Humidity	45.3%
ATM Pressure	98.9 kPa

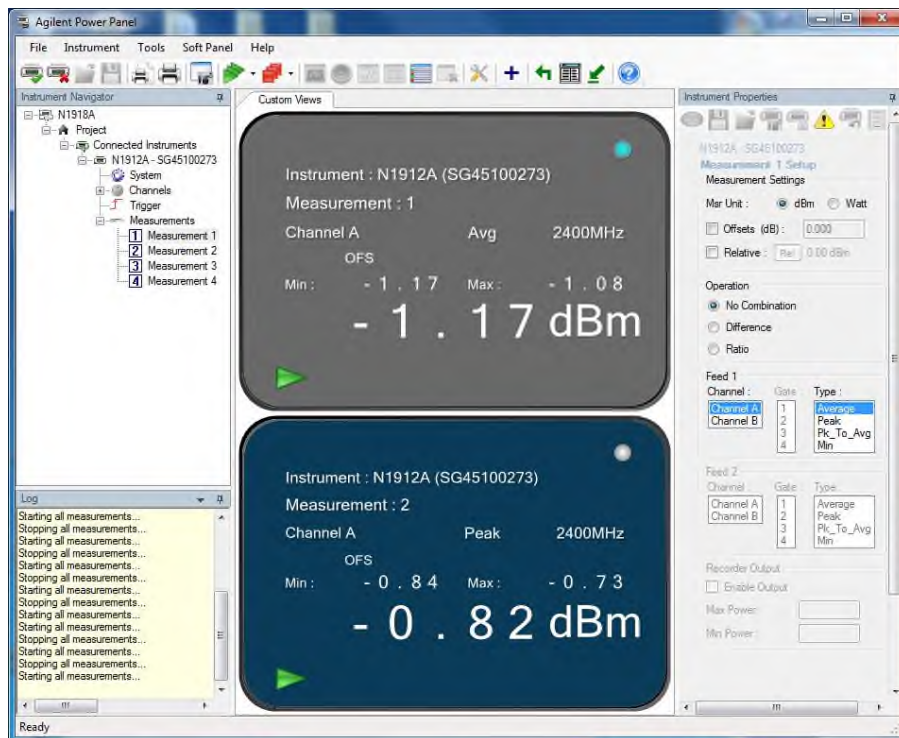
2.1.7 Additional Observations

- 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	-0.74	-0.33
	17 (2440 MHz)		-1.08	-0.73
	39 (2480 MHz)		-1.44	-0.97

2.1.9 Sample Test Display



Bluetooth LE. Mid Channel 1Mbps



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: N/A (Sample #1) / Test Configuration A

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

September 02, 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 Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4 °C
Relative Humidity	48.3. %
ATM Pressure	98.9 kPa

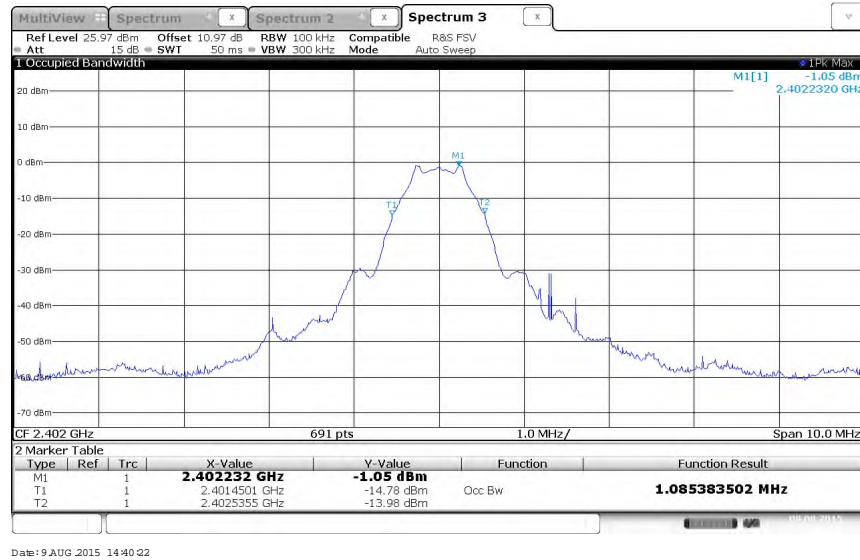
2.2.7 Additional Observations

- 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.

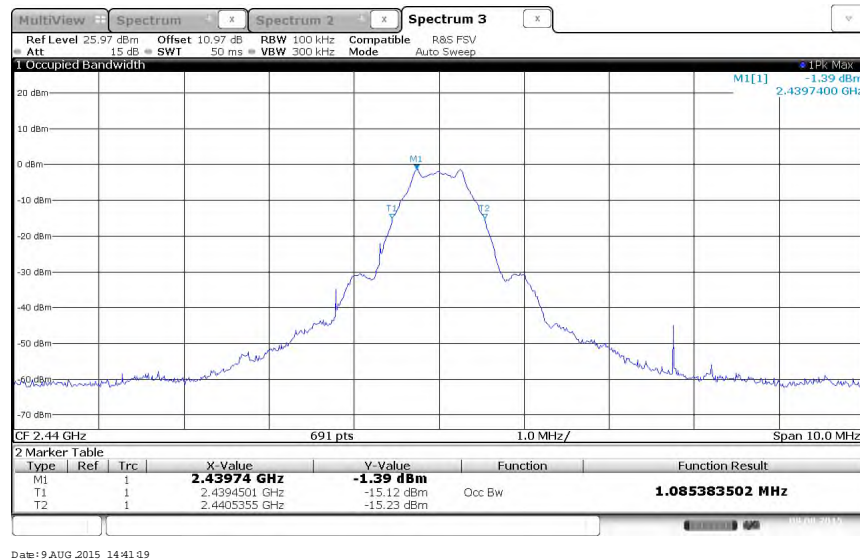
2.2.8 Test Results (For reporting purposes only)

Mode	Channel	Measured 99% Bandwidth (MHz)
Bluetooth LE	37 (2402 MHz)	1.085
	17 (2440 MHz)	1.085
	39 (2480 MHz)	1.085

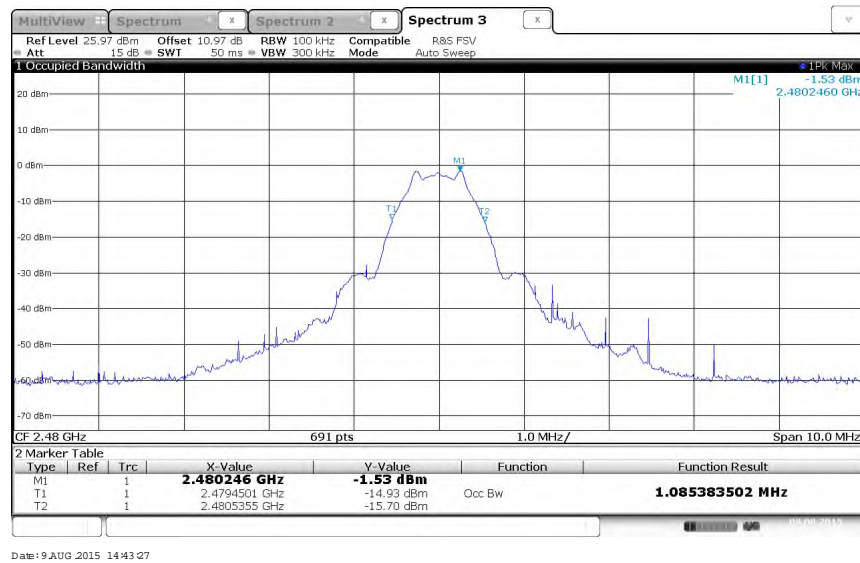
2.2.9 Test Results Plots



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: N/A (Sample #1) / Test Configuration A

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

September 02, 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 Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4 °C
Relative Humidity	48.3. %
ATM Pressure	98.9 kPa

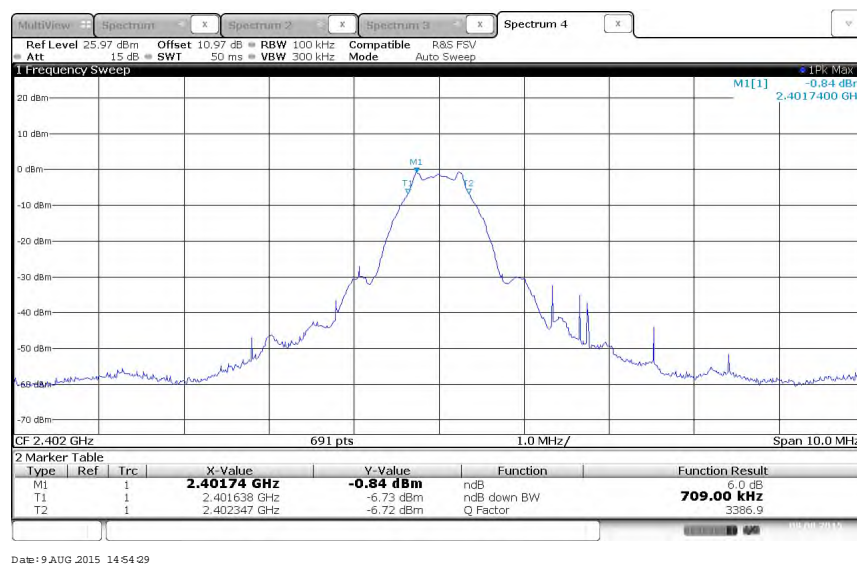
2.3.7 Additional Observations

- 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 $\geq 3X$ RBW.
- Sweep is auto.
- Detector is peak.
- The “n” dB down marker function of the spectrum analyzer was used for this test.

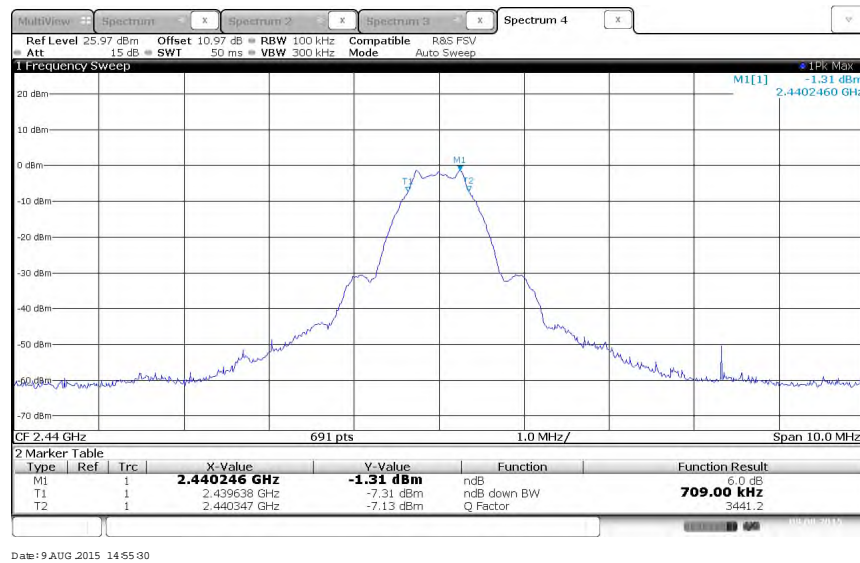
2.3.8 Test Results

Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
Bluetooth LE	37 (2402 MHz)	0.709	0.500	Complies
	17 (2440 MHz)	0.709	0.500	Complies
	39 (2480 MHz)	0.738	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

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: N/A (Sample #1) / Test Configuration A

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

September 03, 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.

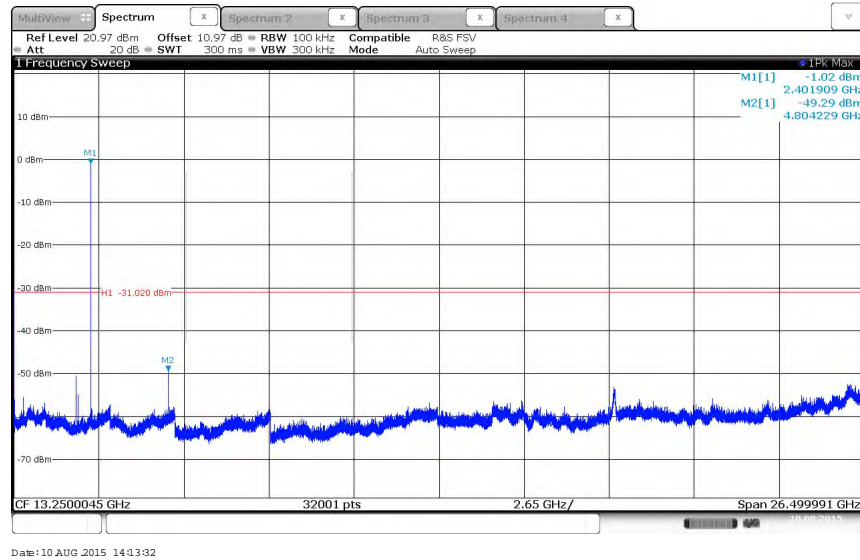
2.4.6 Environmental Conditions

Ambient Temperature	22.5°C
Relative Humidity	63.8%
ATM Pressure	98.8kPa

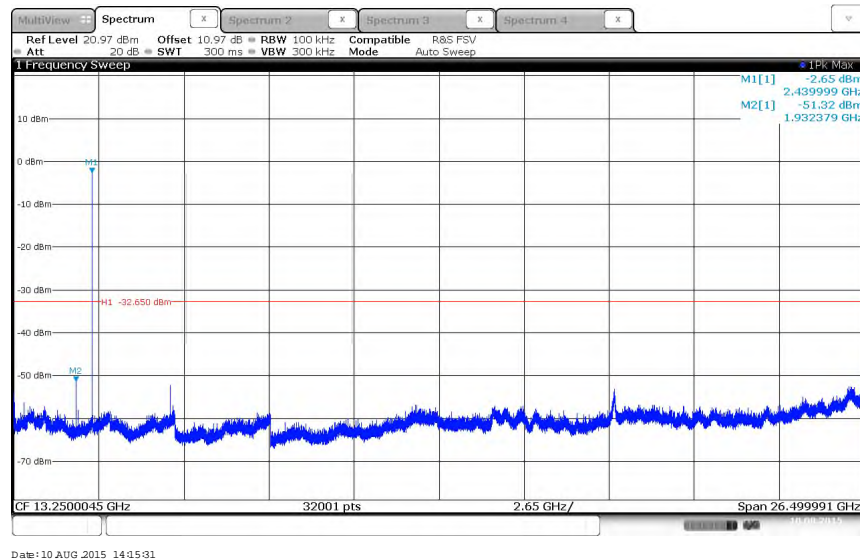
2.4.7 Additional Observations

- 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 26.5GH.
- Only noise floor measurements observed from 26.5GHz up to 40GHz.

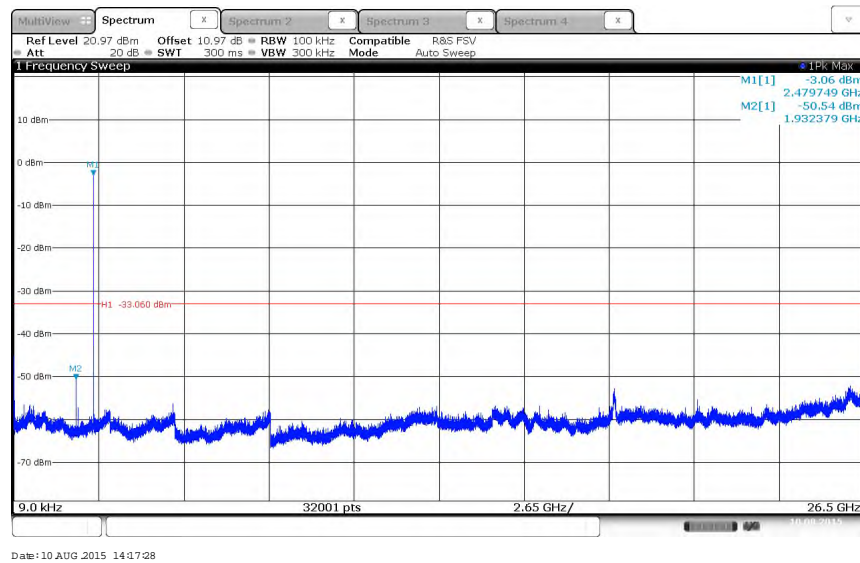
2.4.8 Test Results Plots



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: N/A (Sample #1) / Test Configuration A

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

September 02, 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.

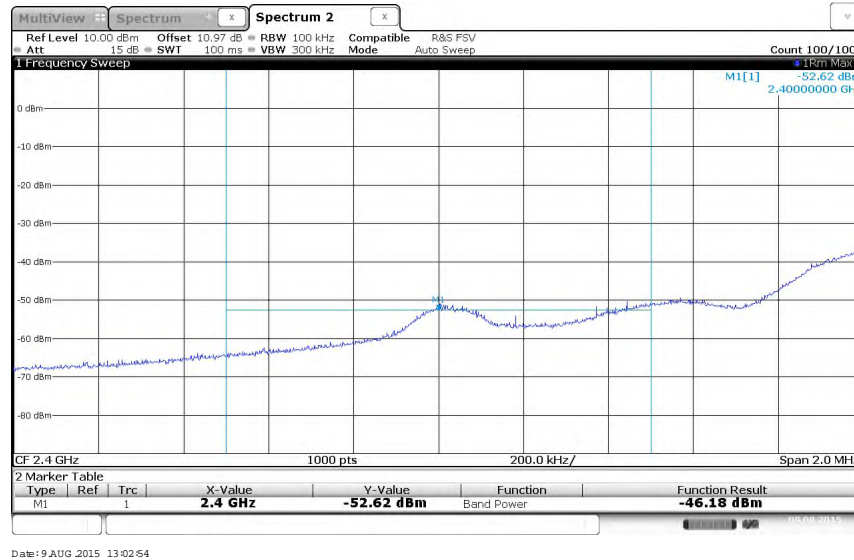
2.5.6 Environmental Conditions

Ambient Temperature	23.4°C
Relative Humidity	48.3%
ATM Pressure	98.9kPa

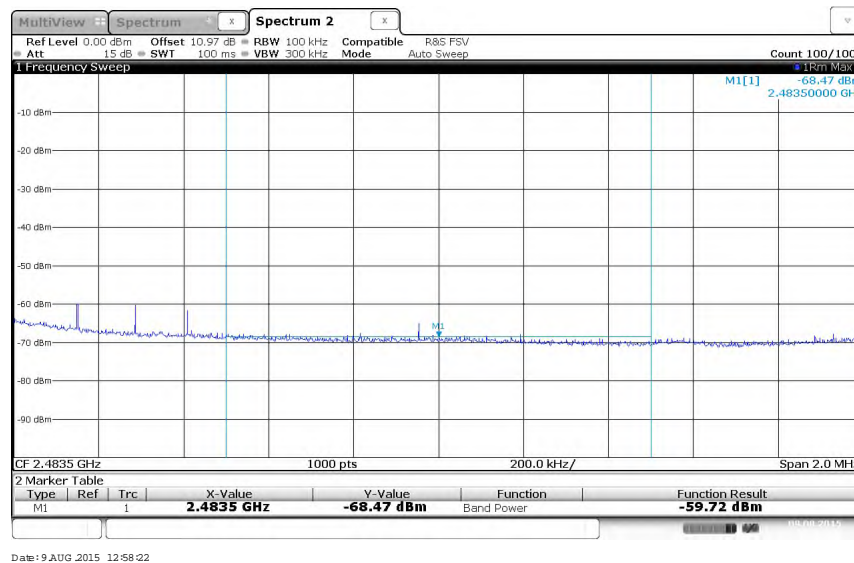
2.5.7 Additional Observations

- 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 -31.02 dBm. Margin is -15.16 dB.
(The highest level of the desired power in the 100 kHz bandwidth within the band is -1.02dBm)



Bluetooth LE High Channel (2480 MHz). Limit is -33.06 dBm. Margin is -31.4 dB.
(The highest level of the desired power in the 100 kHz bandwidth within the band is -3.06dBm)



2.6 RADIATED SPURIOUS 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

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: N/A (Sample #2) and (Sample #3) / Test Configuration B

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

Septemeber 03, 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

Ambient Temperature	22.5 °C
Relative Humidity	63.8 %
ATM Pressure	98.8 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 BT LE (High Channel) presented for radiated emissions below 1GHz. There are no significant differences in emissions between all modes below 1GHz.

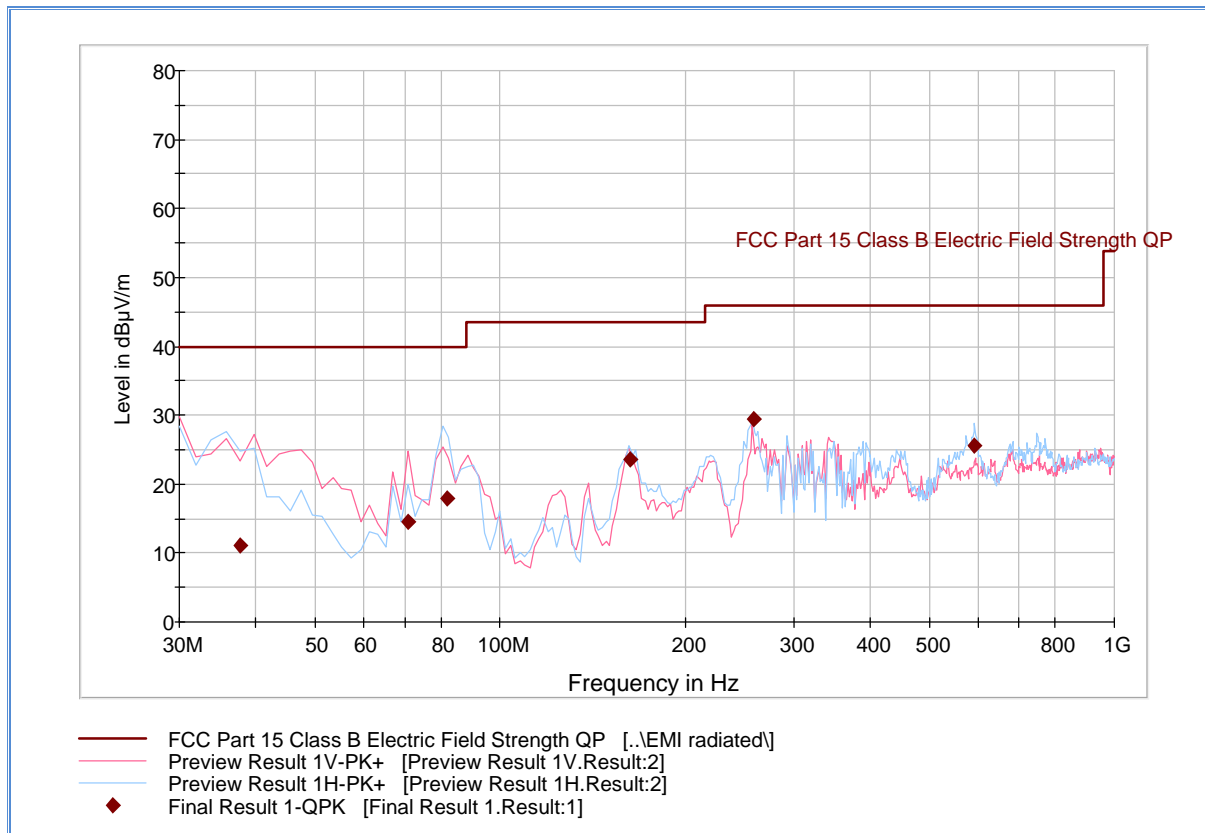


- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.4.8 for sample computation.

2.6.8 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

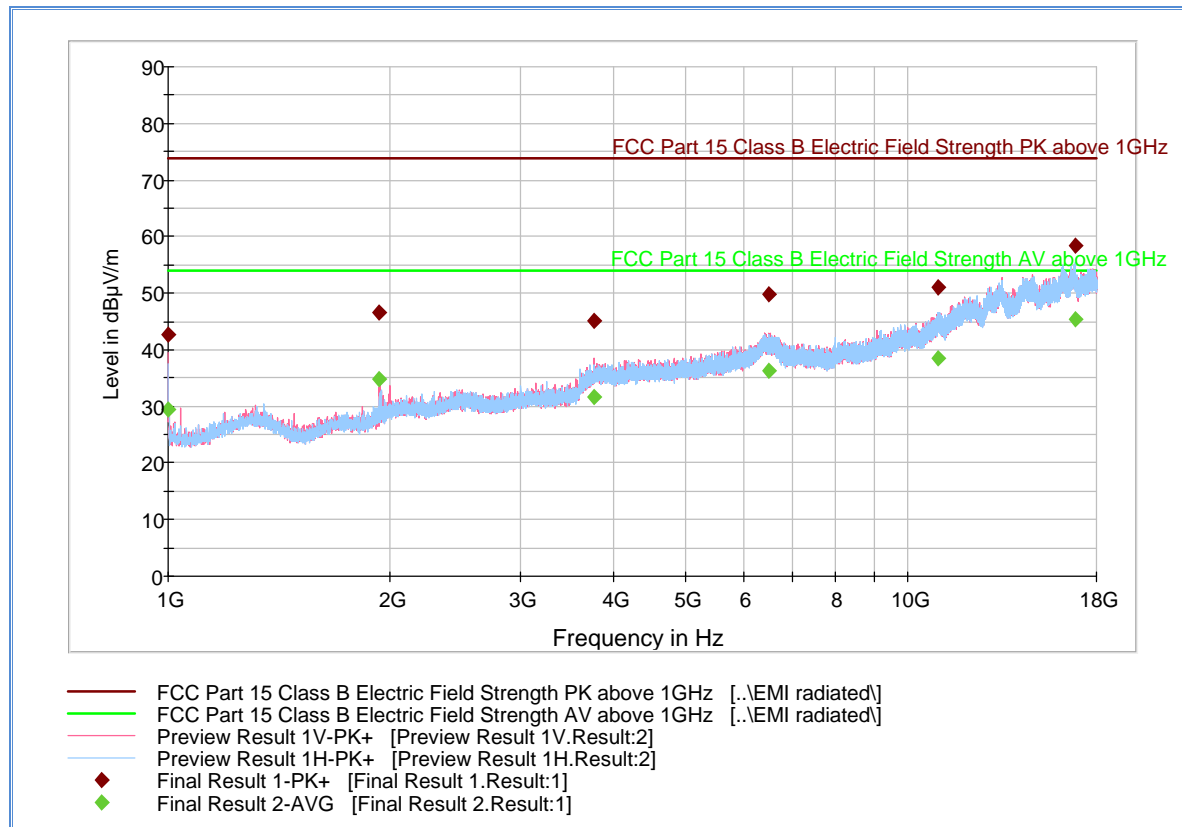
2.6.9 Test Results - Below 1GHz (Receive Mode)



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)
37.759439	11.0	1000.0	120.000	100.0	V	-15.0	-15.6	29.0	40.0
70.741643	14.6	1000.0	120.000	102.0	V	-4.0	-22.4	25.4	40.0
81.781082	17.9	1000.0	120.000	100.0	H	342.0	-21.9	22.1	40.0
162.944369	23.5	1000.0	120.000	206.0	H	169.0	-18.1	20.0	43.5
257.994870	29.3	1000.0	120.000	100.0	H	157.0	-14.2	16.7	46.0
590.543567	25.6	1000.0	120.000	106.0	H	319.0	-4.7	20.4	46.0

2.6.10 Test Results Above 1GHz (Receive Mode)



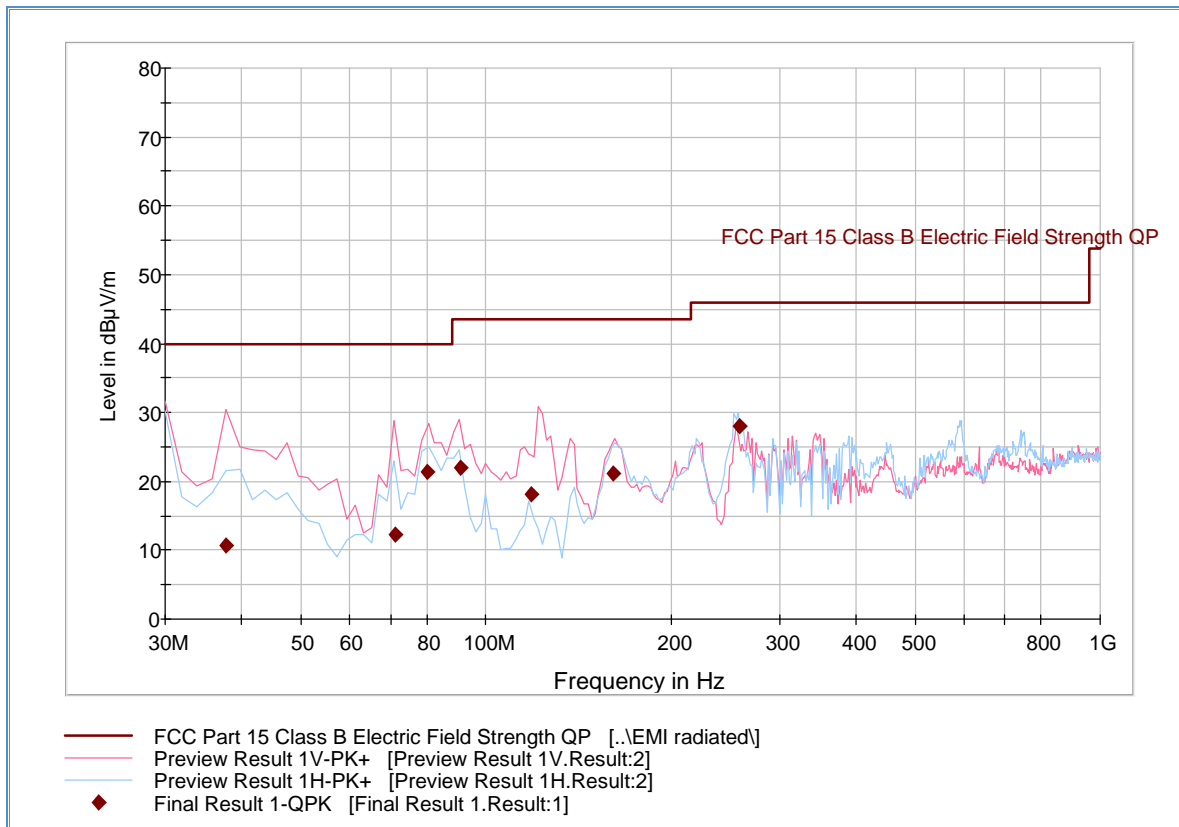
Peak Data

Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.000000	42.8	1000.0	1000.000	180.6	V	314.0	-7.2	31.1	73.9
1932.133333	46.6	1000.0	1000.000	290.2	V	326.0	-2.3	27.3	73.9
3771.566667	45.1	1000.0	1000.000	202.3	V	290.0	4.8	28.8	73.9
6505.166667	49.8	1000.0	1000.000	406.7	V	-20.0	11.5	24.1	73.9
11010.400000	51.0	1000.0	1000.000	391.1	H	79.0	15.6	22.9	73.9
16837.766666	58.5	1000.0	1000.000	164.6	H	20.0	24.2	15.4	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)
1000.000000	29.5	1000.0	1000.000	180.6	V	314.0	-7.2	24.4	53.9
1932.133333	34.8	1000.0	1000.000	290.2	V	326.0	-2.3	19.1	53.9
3771.566667	31.7	1000.0	1000.000	202.3	V	290.0	4.8	22.2	53.9
6505.166667	36.2	1000.0	1000.000	406.7	V	-20.0	11.5	17.7	53.9
11010.400000	38.5	1000.0	1000.000	391.1	H	79.0	15.6	15.4	53.9
16837.766666	45.4	1000.0	1000.000	164.6	H	20.0	24.2	8.5	53.9

2.6.11 Test Results Below 1GHz (Bluetooth LE worst Case Configuration - Low Channel)

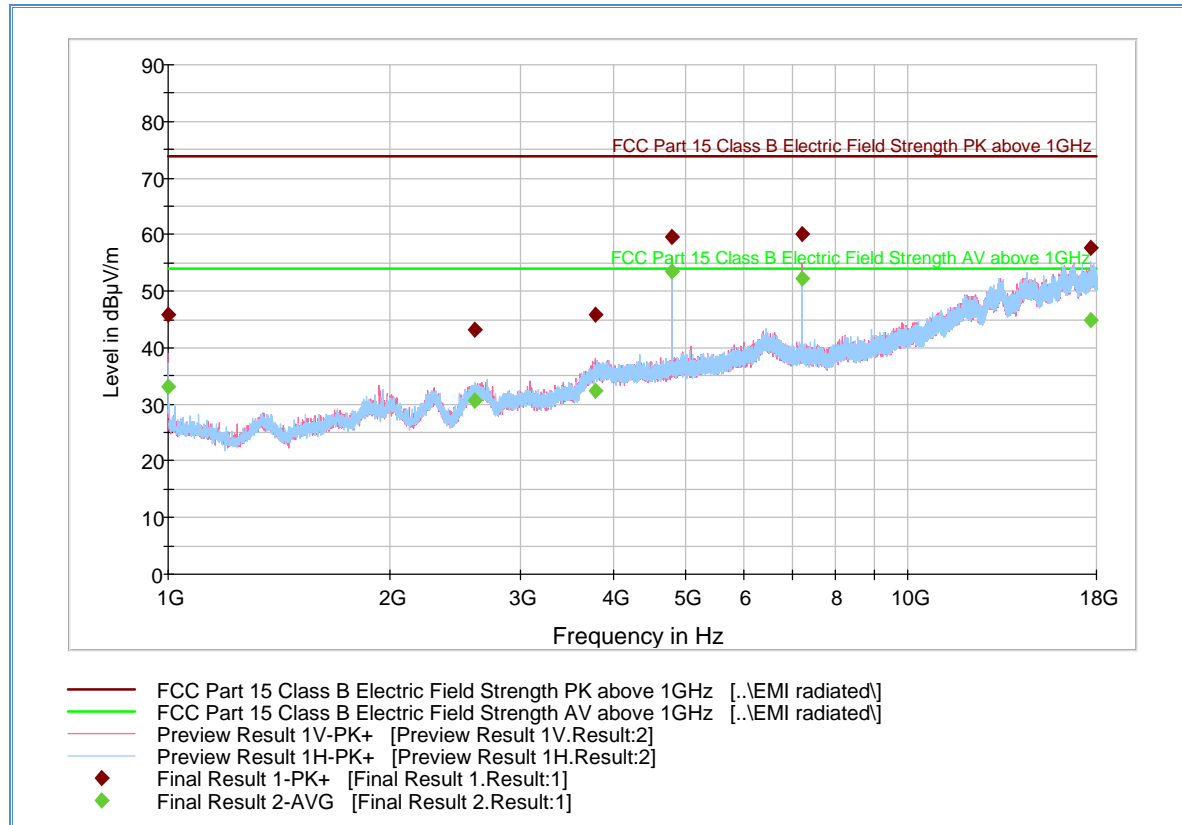


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
37.735551	10.6	1000.0	120.000	150.0	V	236.0	-15.6	29.4	40.0
71.021643	12.3	1000.0	120.000	100.0	V	216.0	-22.4	27.7	40.0
80.021082	21.3	1000.0	120.000	150.0	V	341.0	-22.0	18.7	40.0
91.060521	21.9	1000.0	120.000	152.0	V	0.0	-20.5	21.6	43.5
118.522725	18.1	1000.0	120.000	100.0	V	19.0	-20.3	25.4	43.5
161.424369	21.2	1000.0	120.000	106.0	V	231.0	-18.2	22.3	43.5
257.994870	27.9	1000.0	120.000	100.0	H	359.0	-14.2	18.1	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

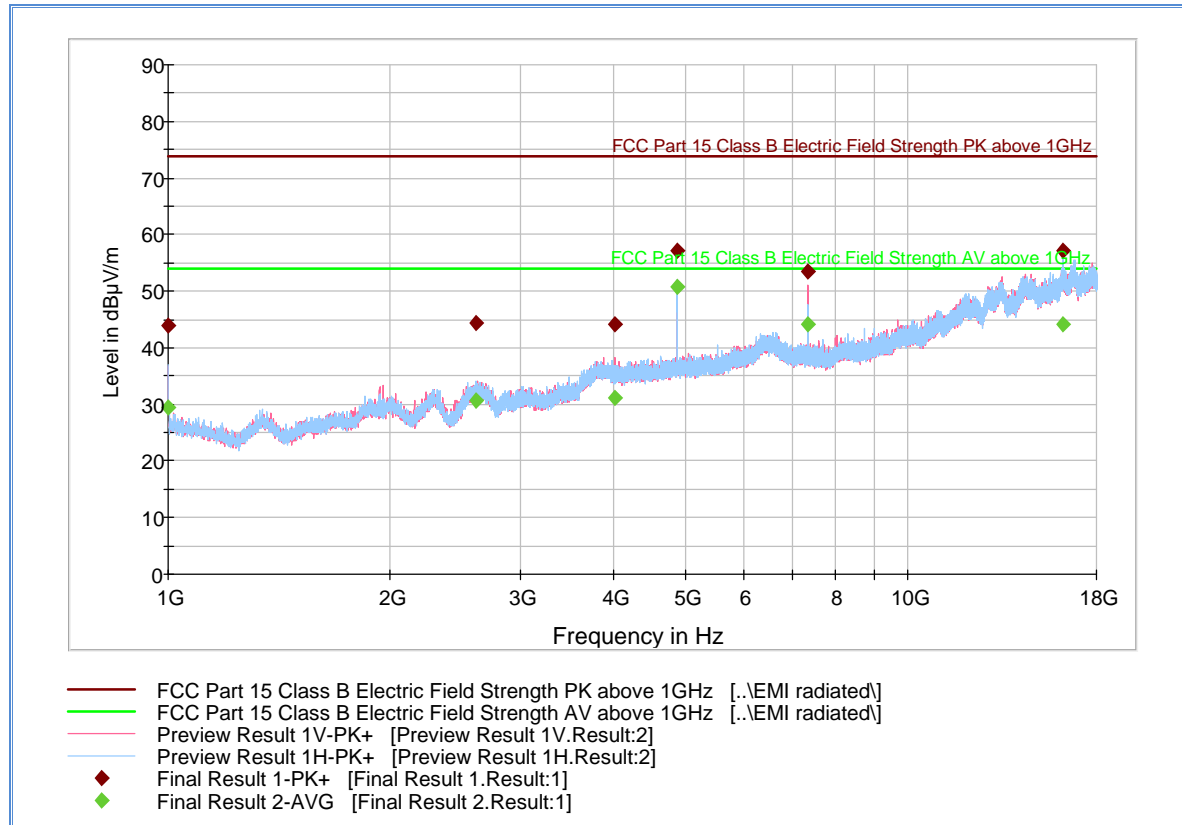
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	45.9	1000.0	1000.000	138.7	V	-20.0	-7.2	28.0	73.9
2601.066667	43.2	1000.0	1000.000	258.3	H	0.0	0.1	30.7	73.9
3788.200000	45.9	1000.0	1000.000	333.1	V	248.0	5.0	28.0	73.9
4803.666667	59.5	1000.0	1000.000	302.2	V	-9.0	5.8	14.4	73.9
7205.200000	60.0	1000.0	1000.000	393.0	V	291.0	10.0	13.9	73.9
17718.566667	57.5	1000.0	1000.000	125.7	H	222.0	23.8	16.4	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)
1000.000000	33.2	1000.0	1000.000	138.7	V	-20.0	-7.2	20.7	53.9
2601.066667	30.6	1000.0	1000.000	258.3	H	0.0	0.1	23.3	53.9
3788.200000	32.4	1000.0	1000.000	333.1	V	248.0	5.0	21.5	53.9
4803.666667	53.5	1000.0	1000.000	302.2	V	-9.0	5.8	0.4	53.9
7205.200000	52.2	1000.0	1000.000	393.0	V	291.0	10.0	1.7	53.9
17718.566667	45.0	1000.0	1000.000	125.7	H	222.0	23.8	8.9	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.

2.6.13 Test Results Above 1GHz (Bluetooth LE - Middle Channel)



Peak Data

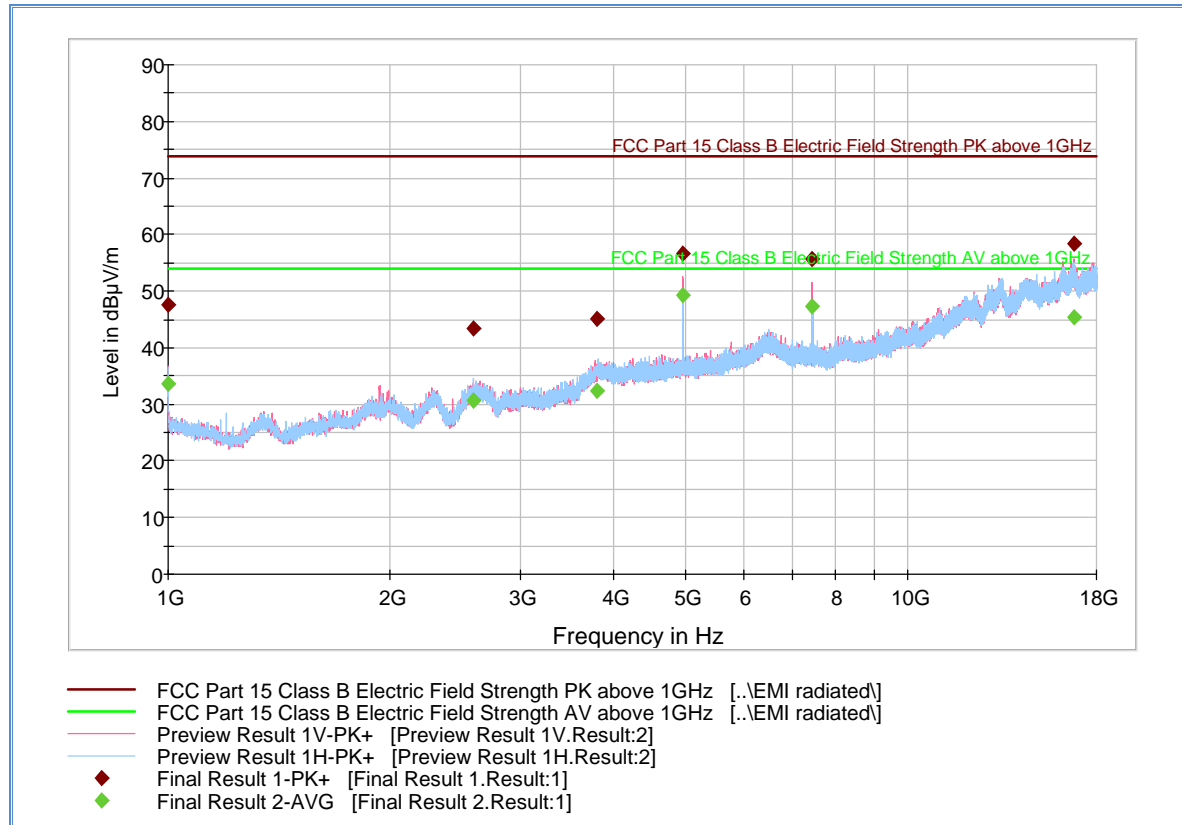
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.500000	43.8	1000.0	1000.000	228.4	H	121.0	-7.2	30.1	73.9
2606.333333	44.3	1000.0	1000.000	130.7	H	0.0	0.1	29.6	73.9
4021.466667	44.2	1000.0	1000.000	239.3	V	116.0	5.1	29.7	73.9
4879.600000	57.0	1000.0	1000.000	125.7	H	306.0	6.1	16.9	73.9
7319.100000	53.6	1000.0	1000.000	191.5	V	351.0	9.8	20.3	73.9
16215.366667	57.1	1000.0	1000.000	238.3	H	16.0	23.2	16.8	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)
1000.500000	29.5	1000.0	1000.000	228.4	H	121.0	-7.2	24.4	53.9
2606.333333	30.7	1000.0	1000.000	130.7	H	0.0	0.1	23.2	53.9
4021.466667	31.1	1000.0	1000.000	239.3	V	116.0	5.1	22.8	53.9
4879.600000	50.8	1000.0	1000.000	125.7	H	306.0	6.1	3.1	53.9
7319.100000	44.0	1000.0	1000.000	191.5	V	351.0	9.8	9.9	53.9
16215.366667	44.3	1000.0	1000.000	238.3	H	16.0	23.2	9.6	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. 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 (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	47.5	1000.0	1000.000	191.5	V	333.0	-7.2	26.4	73.9
2589.500000	43.5	1000.0	1000.000	407.6	H	62.0	0.1	30.4	73.9
3807.800000	45.2	1000.0	1000.000	407.6	H	-3.0	5.1	28.7	73.9
4959.500000	56.6	1000.0	1000.000	229.4	V	353.0	6.5	17.3	73.9
7439.233333	55.8	1000.0	1000.000	258.3	V	314.0	9.6	18.1	73.9
16792.400000	58.4	1000.0	1000.000	135.7	V	0.0	24.7	15.5	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	33.6	1000.0	1000.000	191.5	V	333.0	-7.2	20.3	53.9
2589.500000	30.6	1000.0	1000.000	407.6	H	62.0	0.1	23.3	53.9
3807.800000	32.4	1000.0	1000.000	407.6	H	-3.0	5.1	21.5	53.9
4959.500000	49.3	1000.0	1000.000	229.4	V	353.0	6.5	4.6	53.9
7439.233333	47.3	1000.0	1000.000	258.3	V	314.0	9.6	6.6	53.9
16792.400000	45.5	1000.0	1000.000	135.7	V	0.0	24.7	8.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.



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

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: NA/ (Sample #2) / Test Configuration B

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

Septemeber 03, 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

Ambient Temperature	22.5 °C
Relative Humidity	63.8 %
ATM Pressure	98.8 kPa

2.7.7 Additional Observations

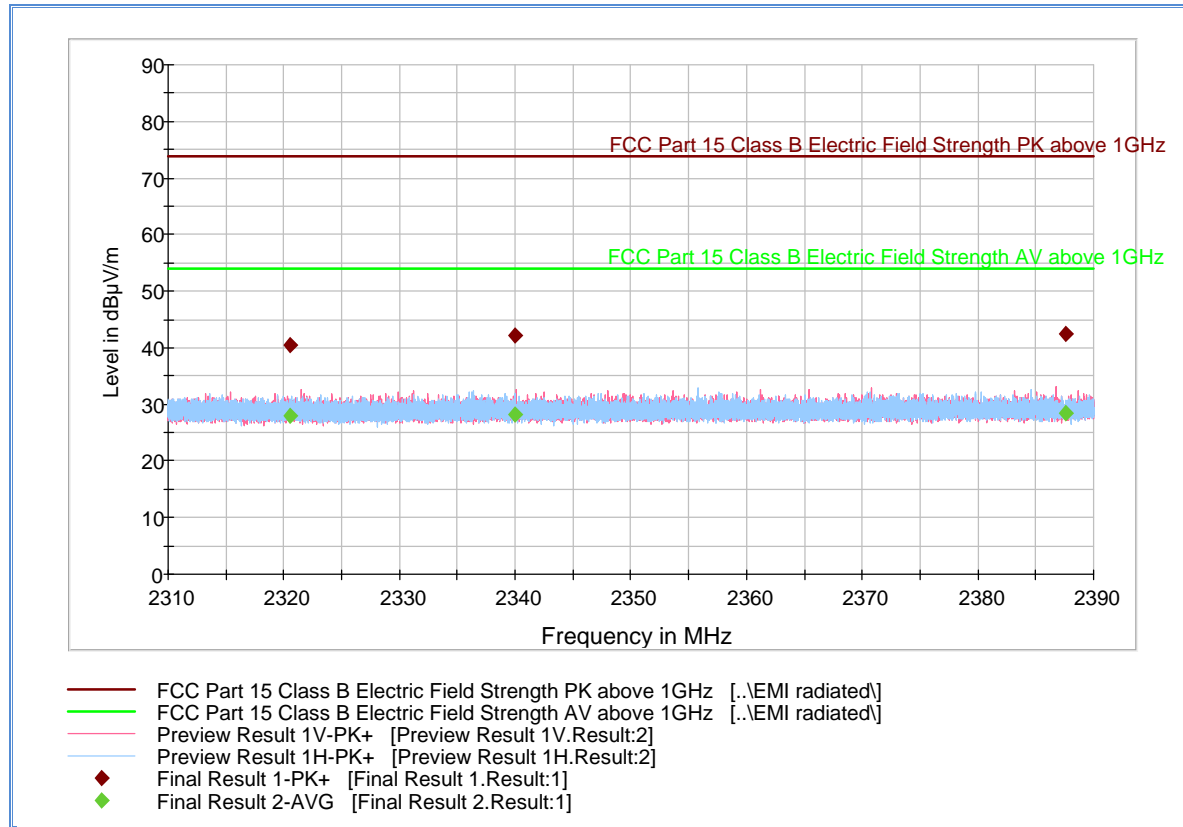
- This is a radiated test. The spectrum was searched from 2310MHz to 2390MHz for lower immediate restricted band and 2483.5MHz to 2500MHz for the upper immediate restricted band.
- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Measurement 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 2.6.8 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 Restricted Band 2310MHz to 2390MHz (Bluetooth LE Low Channel)



Peak Data

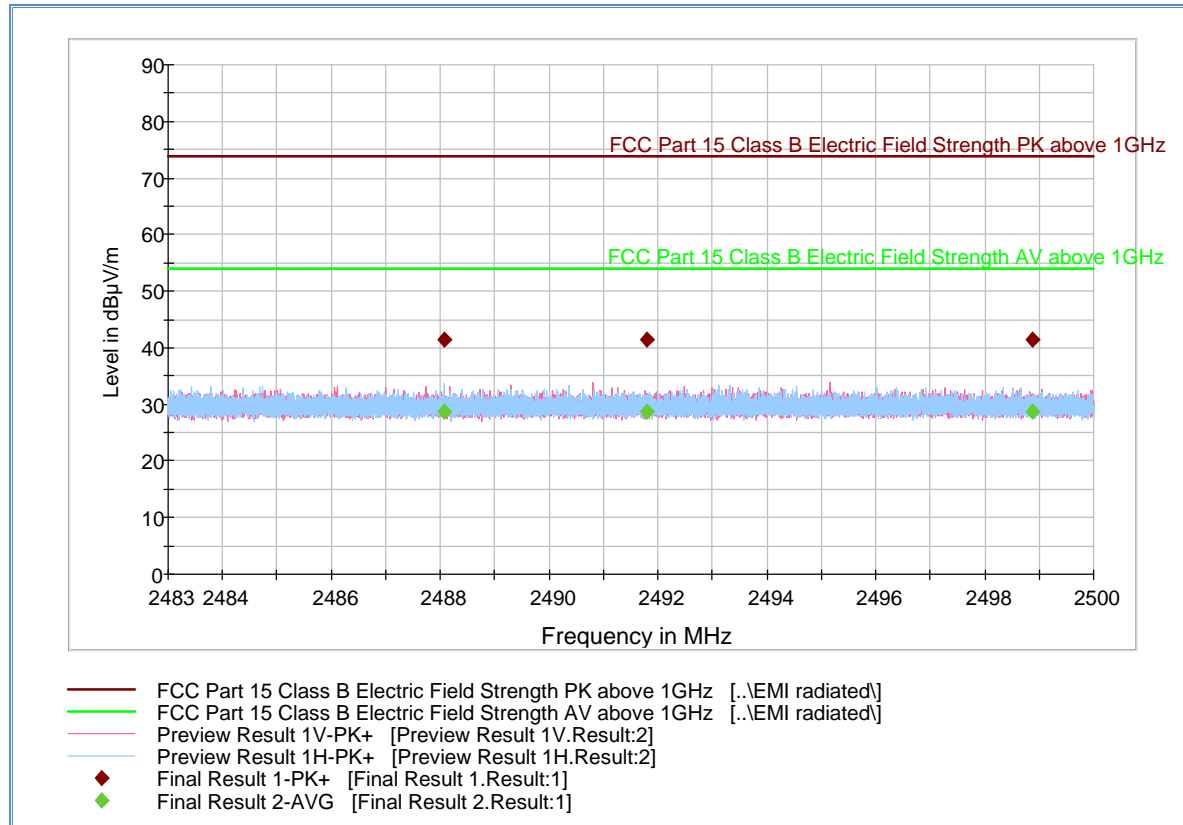
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2320.496000	40.5	1000.0	1000.000	372.1	V	129.0	-0.7	33.4	73.9
2339.925333	42.3	1000.0	1000.000	116.7	V	20.0	-0.7	31.6	73.9
2387.560000	42.3	1000.0	1000.000	300.6	V	204.0	-0.6	31.6	73.9

Average Data

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2320.496000	27.9	1000.0	1000.000	372.1	V	129.0	-0.7	26.0	53.9
2339.925333	28.1	1000.0	1000.000	116.7	V	20.0	-0.7	25.8	53.9
2387.560000	28.4	1000.0	1000.000	300.6	V	204.0	-0.6	25.5	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.10 Test Results Restricted Band 2483.5MHz to 2500MHz (Bluetooth LE 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)
2488.076200	41.3	1000.0	1000.000	357.1	H	291.0	0.0	32.6	73.9
2491.801300	41.6	1000.0	1000.000	301.6	V	50.0	0.0	32.3	73.9
2498.875700	41.4	1000.0	1000.000	407.6	H	159.0	0.0	32.5	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)
2488.076200	28.6	1000.0	1000.000	357.1	H	291.0	0.0	25.3	53.9
2491.801300	28.6	1000.0	1000.000	301.6	V	50.0	0.0	25.3	53.9
2498.875700	28.7	1000.0	1000.000	407.6	H	159.0	0.0	25.2	53.9

Test Notes: 2.4GHz notch filter removed for this test.

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

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: N/A (Sample #1) / Test Configuration A

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

September 02, 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

Ambient Temperature	23.4 °C
Relative Humidity	48.3 %
ATM Pressure	98.9 kPa

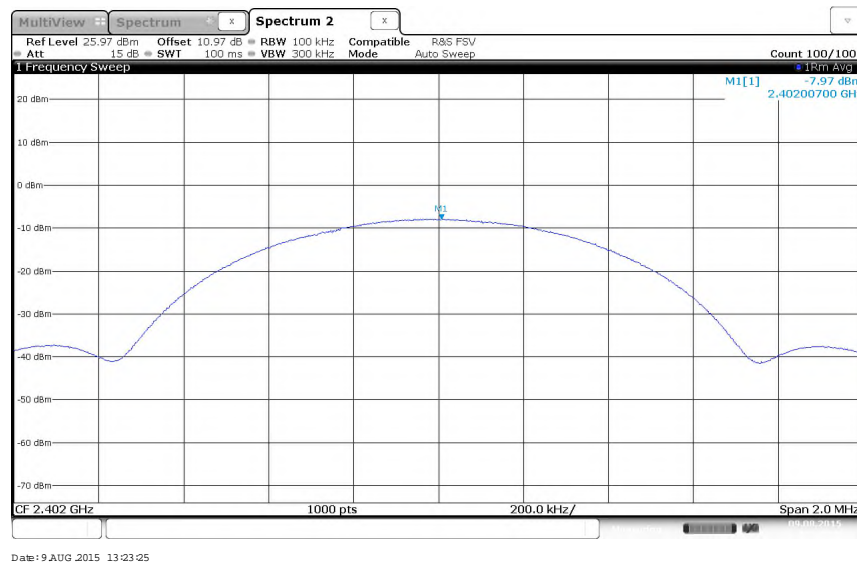
2.8.7 Additional Observations

- 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.

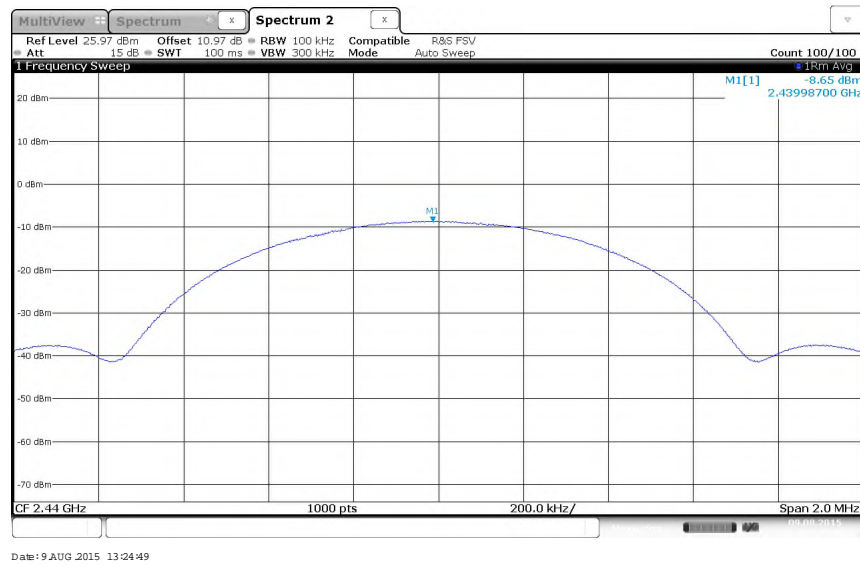
2.8.8 Test Results Summary

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	-7.97	8	15.97	Complies
	17 (2440 MHz)	GFSK @ 1Mbps	-8.65	8	16.65	Complies
	39 (2480 MHz)	GFSK @ 1Mbps	-9.12	8	17.12	Complies

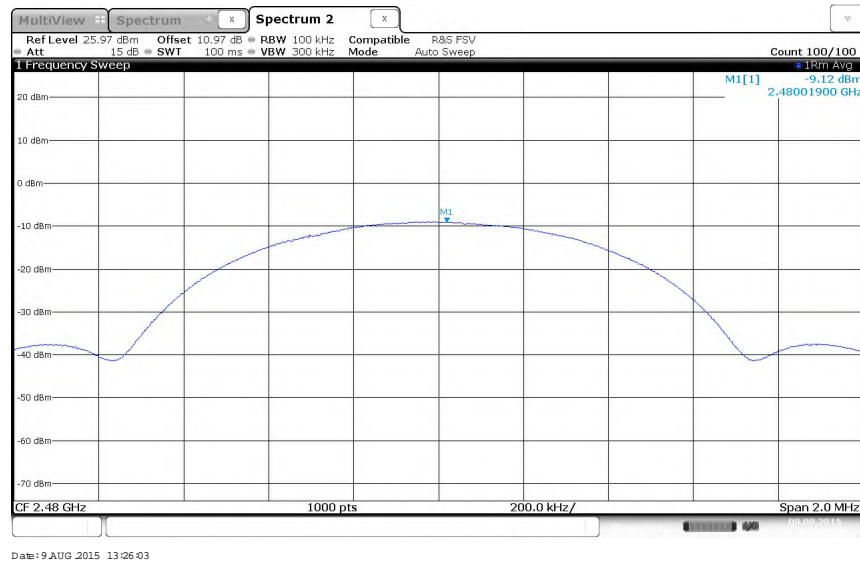
2.8.9 Test Results Plots



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
Conducted Port 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
7604	P-Series Power Meter	N1912A	SG45100273	Agilent	05/27/15	05/27/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/10/15	04/10/16
8772	10dB Attenuator	606-10-1F4/DR	-	MECA	Verified by 7608 and 7604	
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
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	12/15/15	12/15/16
8816	2.4GHz to 2.5GHz Notch Filter	BRM50702	133	MICRO-TRONICS	N/A	
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
9076	DC Power Supply	18020M	D802039	Protek	Verified by 6792	
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
7554	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	01/30/14	01/30/16

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

3.2.1 AC Conducted Emissions Measurements

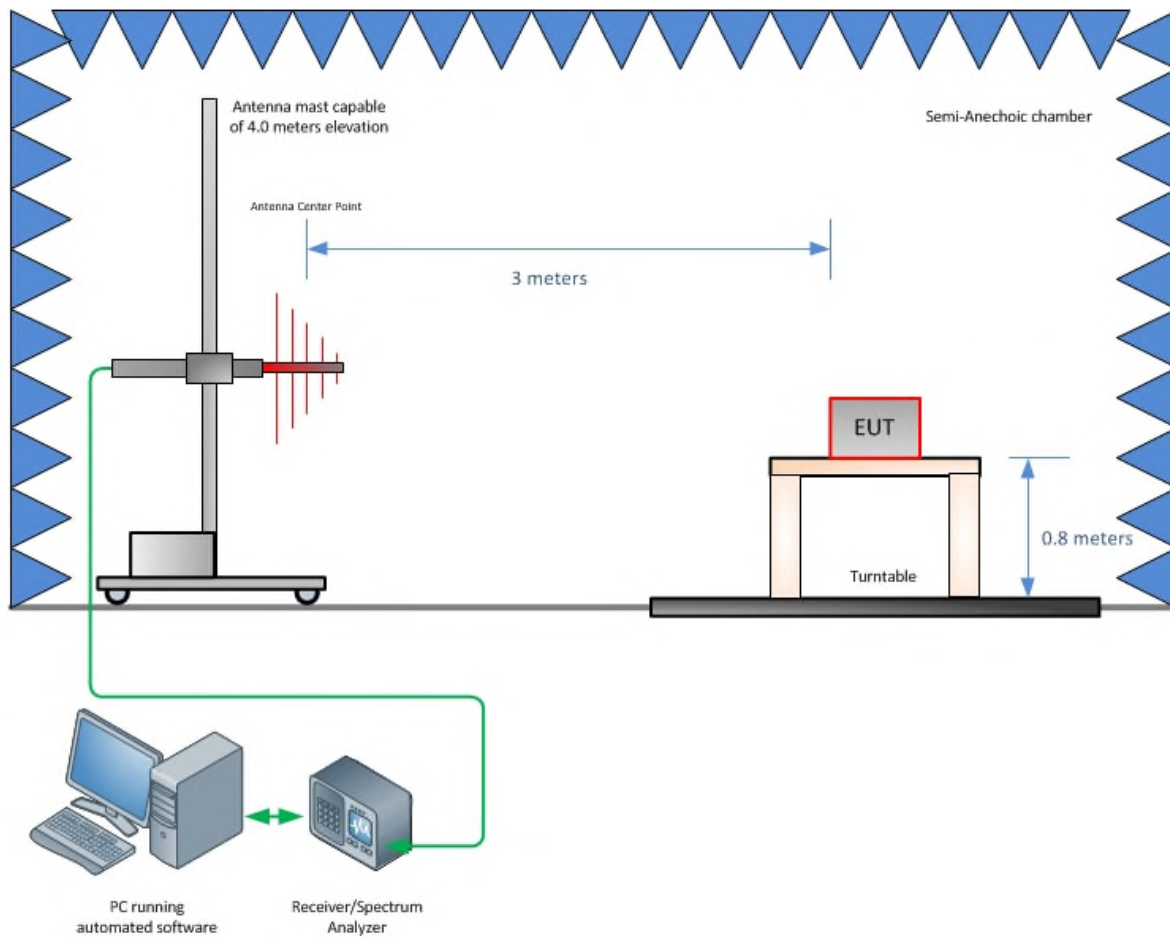
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular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



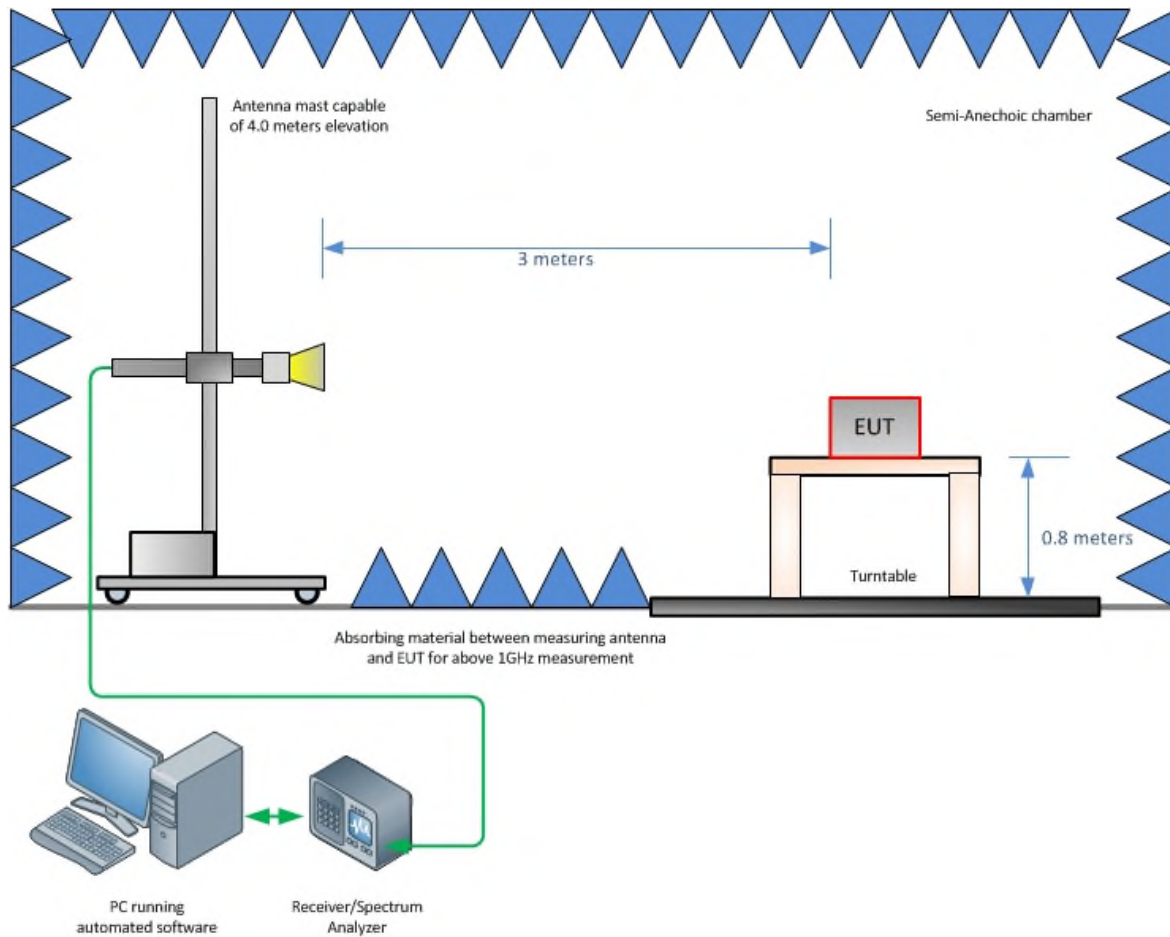
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM

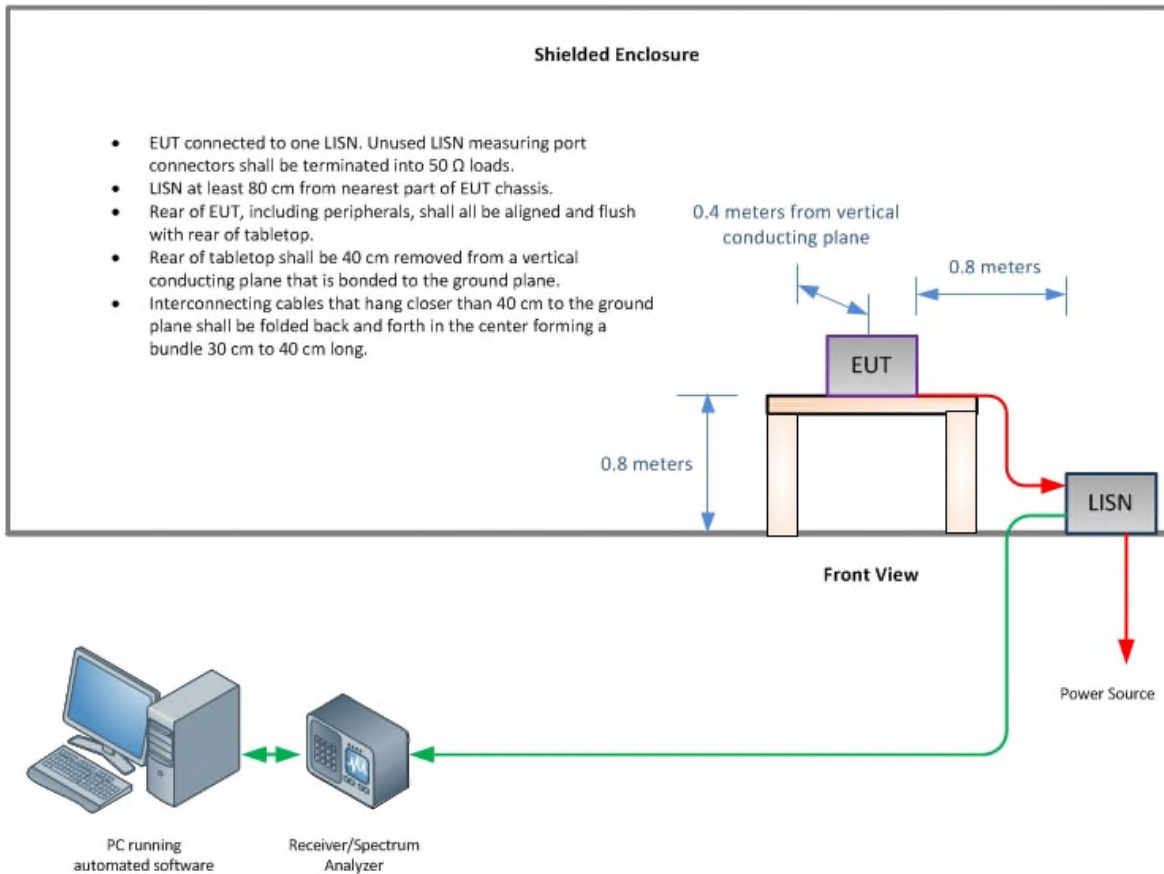


Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)

4.2 CONDUCTED EMISSION TEST SETUP





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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