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Report On

Application for Grant of Equipment Authorization of the
Nextivity Inc.
Cel-Fi GO Cellphone Signal Repeater

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

Report No.SD72121023-1016B **March 2017**

REPORT ON	EMC Evaluation of the Nextivity Inc. Cel-Fi GO Cellphone Signal Repeater
TEST REPORT NUMBER	SD72121023-1016B
TEST REPORT DATE	March 2017
PREPARED FOR	Nextivity Inc. 16550 West Bernardo Drive, Bldg 5, Suite 550 San Diego, CA 92127, USA
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PREPARED BY	Xiaoying Zhang **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Juan M. Gonzalez **Name** Authorized Signatory Title: EMC SL Manager Western Region
DATED	March 15, 2017

Revision History

SD72121023-1016B Nextivity Inc. M/N G32-2/4/5/12/13 Cel-Fi GO Cellphone Signal Repeater					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
03/15/17	Initial Release				Juan M Gonzalez

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Nextivity Inc.
Cel-Fi GO Cellphone Signal Repeater

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

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Nextivity Inc. Cel-Fi GO Cellphone Signal Repeater 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	Nextivity Inc.
Model Name	Cel-Fi GO
Model Number(s)	G32-2/4/5/12/13
FCC ID	YETG32-2451213
IC Number	9298A-G322451213
FCC Classification	Low power Communications device Transmitter (DTS)
Serial Number(s)	346648000065
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.247 (October 1, 2016). • 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	February 01, 2017
Finish of Test	February 6, 2017
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• KDB 558074 D01 (DTS Meas Guidance v03r05, April 08, 2016). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247. • Supporting documents for EUT certification are separate exhibits.

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	
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-247 5.2(1)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	RSS-247 5.5	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	RSS-247 5.5	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	RSS-247 5.5	Radiated Spurious Emissions	Compliant	
-	-	RSS-Gen 7.1	Receiver Spurious Emissions	N/A	
2.8	§15.247(d)	RSS-247 5.5	Radiated Band Edge Measurements and Restricted Bands	Compliant	
2.9	§15.247(e)	RSS-247 5.2(2)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A *Not required as per RSS-Gen 5.3. The EUT however already shows compliance to FCC Subpart B/ICES-003.*

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Nextivity Inc. Cel-Fi GO Cellphone Signal Repeater. The EUT is a WCDMA/LTE Signal Booster to improve voice and data cellular performance in a variety of mobile (e.g. Vehicle and Marine), Fix (e.g. Home/office and Nomadic), Indoor and Outdoor environments. Both Fix and Mobile Versions are identical except the allowed maximum system gains which are set by firmware during production. The model tested in this report was the Fix sample as the representative unit. The unit includes Bluetooth LE connectivity. With the use of Nextivity smartphone application, it allows user to register the product, update software, capture / display details metrics of the system. Only the BT Low Energy function of the EUT was verified in this test report.

1.3.2 EUT General Description

EUT Description	Cellphone Signal Repeater
Model Name	Cel-Fi GO
Model Number(s)	G32-2/4/5/12/13
Rated Voltage	15V DC via external AC/DC adapter (Fix Unit) 12V DC via CLA (Cigarette Lighter Adaptor) (Mobile Unit)
Mode Verified	BT LE
Capability	WCDMA (Band 2 and 5), LTE (Band 2, 5, 12, 13 and 4) and BT LE
Primary Unit (EUT)	☐ Production ☐ Pre-Production ☒ Engineering
Manufacturer Declared Temperature Range	0°C to 65°C
Antenna Type	External Antenna
Manufacturer	N/A
Antenna Model	N/A
Maximum Antenna Gain	N/A (Supplied by customer)

1.3.3 Maximum Conducted Output Power

Bluetooth Low Energy (LE)	Frequency Range (MHz)	Avg Output Power (dBm)	Avg Output Power (mW)	Peak Output Power (dBm)	Peak Output Power (mW)
	2402-2480	-0.43	0.91	3.15	2.07

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	The EUT is connected to a support laptop running Nextivity Cel-Fi Conformance Test Software. Test configuration files can be uploaded to the EUT using this application. The manufacturer provided test files to make the EUT work in Transmit mode covering Low, Mid and High channels. For Conducted tests, the antenna port was connected to the Spectrum Analyser or Power Meter when used. For Radiated tests, the antenna port was connected to a load when testing.

1.4.2 EUT Exercise Software

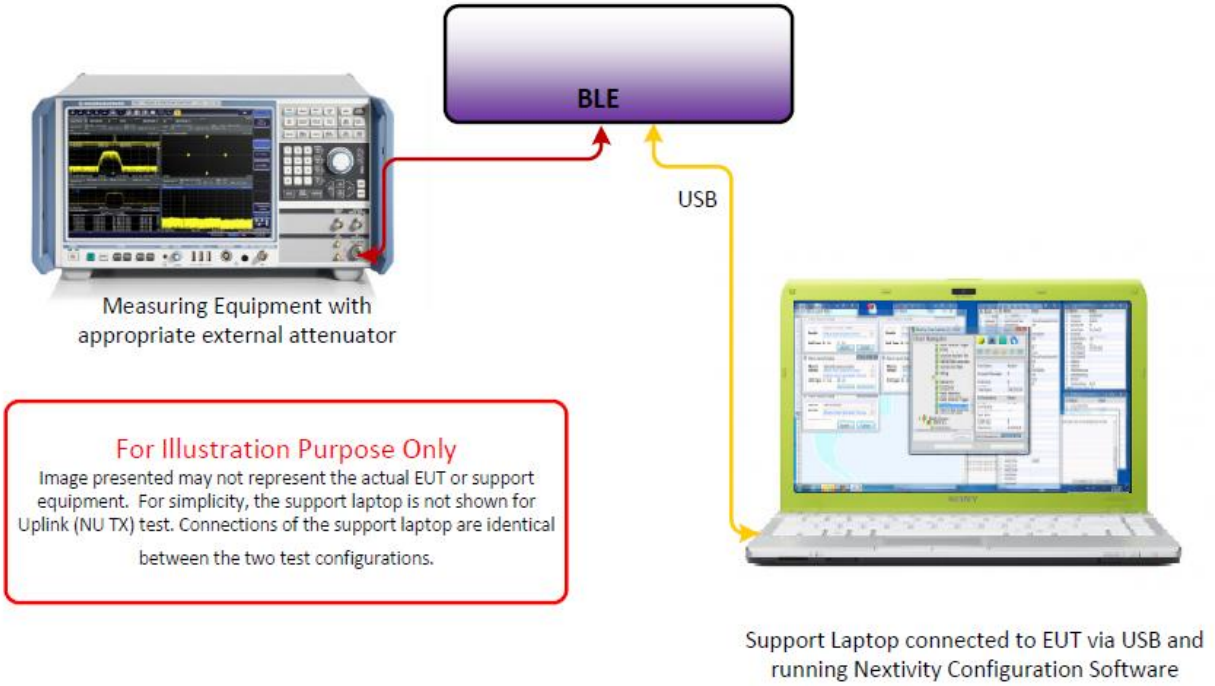
Manufacturer provided a configuration software (ConformanceTest.exe) running from a support laptop where EUT is connected via USB.

1.4.3 Support Equipment and I/O cables

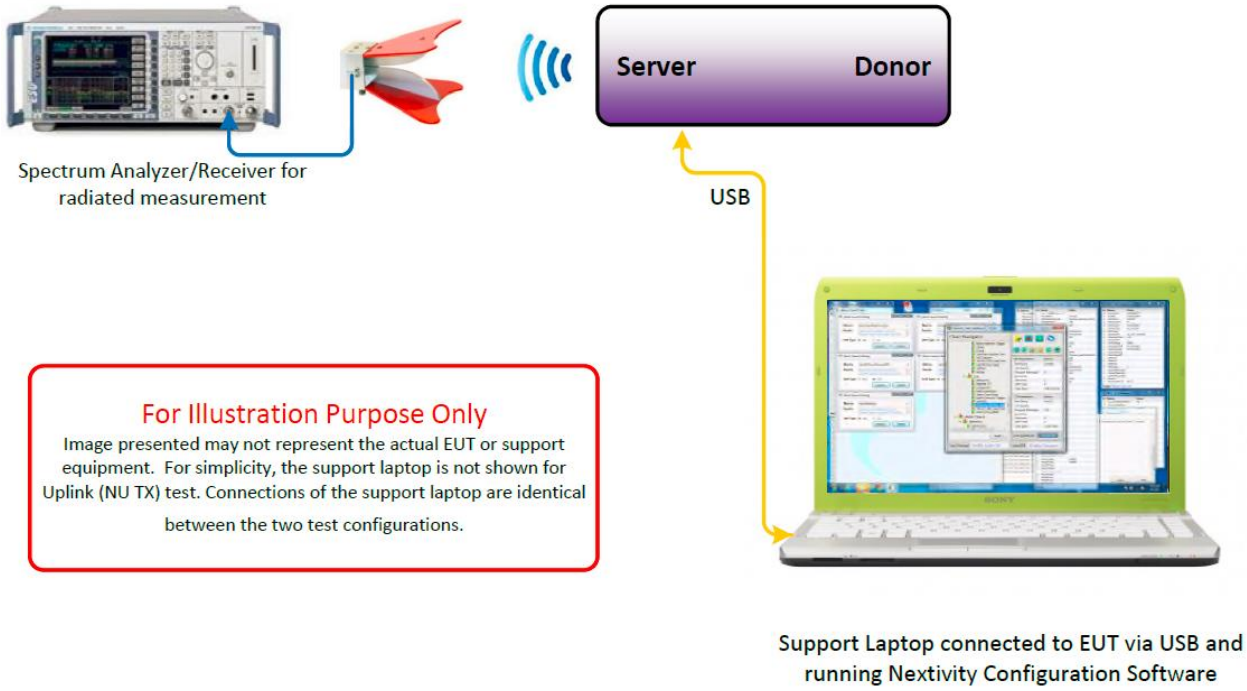
Manufacturer	Equipment/Cable	Description
HON-KWANG	I.T.E Power Supply	Model: HK-AY-150A160-US S/N: GB0000007 Input: 100-240V, 50/60Hz, 0.8A; Output: 15 VDC 1.6A
-	Cigarette Lighter Adaptor (CLA)	Model: 290N035-001 Input: 12.6 – 14.7VDC; Output: 12VDC
Nextivity	Support USB cable	Custom 1.0 meter shielded USB Type A to Type A cable
Nextivity	USB / Interface Box	Unshielded with “Tag-Connect” interface
API Technologies Corp.	DC Block	M/N: 8037
Lenovo	Support Laptop	M/N: 2912-3VU, S/N: R9-92MH0 10/11
Lenovo	Support Laptop AC Adapter	M/N: 42T4430 S/N: 11S42T4430Z1ZGWE27AA9X

1.4.4 Simplified Test Configuration Diagram

Antenna Conducted Port Test Configuration



Radiated Test Configuration

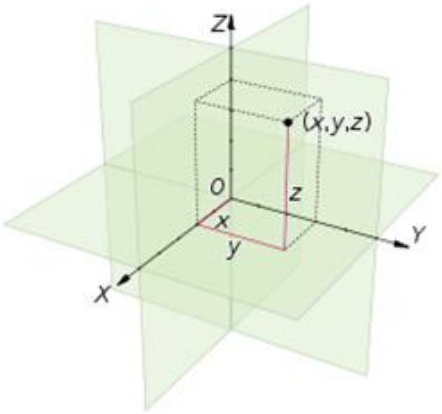


1.4.5 Worst Case Configuration

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

Mode	Channel	Data Rate
Bluetooth LE	17 (Middle Channel)	1Mbps

EUT is a mobile device. Final installation position is unknown at the time of verification. For radiated measurements X, Y and Z orientations were verified. No major variation in emissions observed between the three (3) orientations. Verifications performed using “Y” configuration.



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: 346648000065		
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 C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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 C63.10-2013. 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)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678-1400 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 Innovation, Science and Economic Development Canada Registration No.: 3067A

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

SECTION 2

TEST DETAILS

Radio Testing of the
Nextivity Inc.
Cel-Fi GO Cellphone Signal Repeater

2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFRPart 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: 346648000065 / Default Test Configuration

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

February 01, 2017/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	23.7°C
Relative Humidity	40.5%
ATM Pressure	98.9kPa

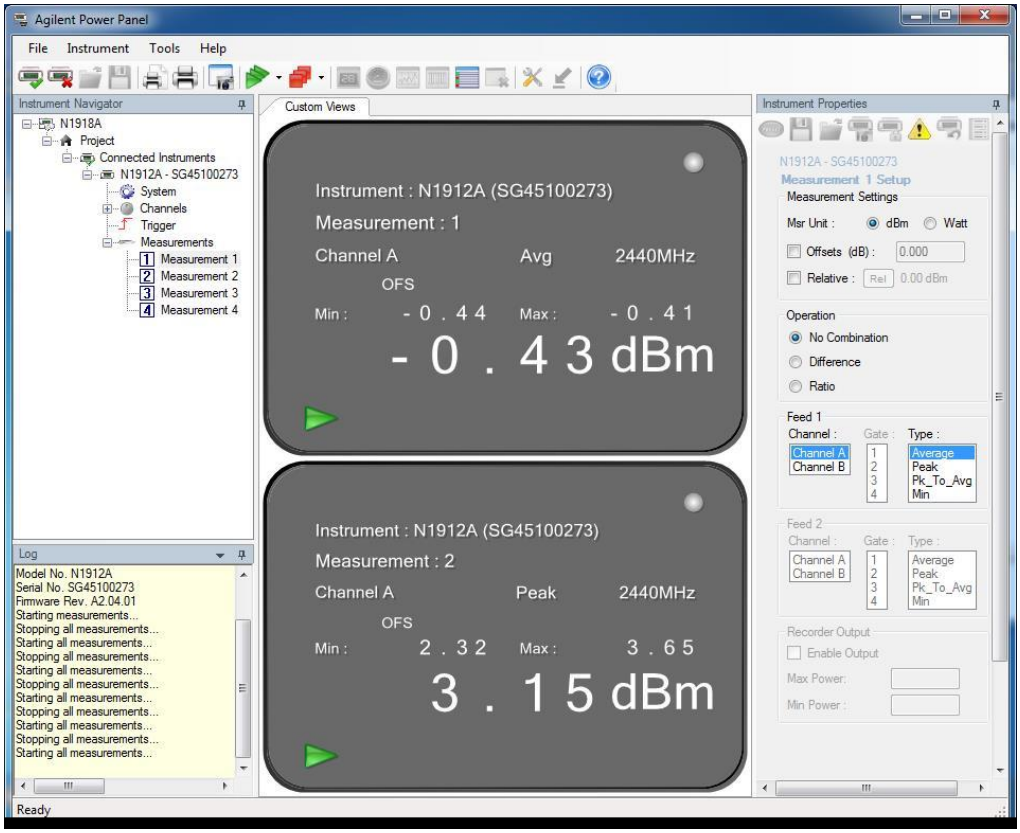
2.1.7 Additional Observations

- This is a conducted test (Maximum conducted [average] output power) using direct connection to a power meter.
- The path loss was measured and entered as a level offset.
- Test methodology is per Clause 9.2.3.1 of KDB 558074 D01 (DTS Meas Guidance v03r05, April 08, 2016). 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	-1.27	2.86
	17 (2440 MHz)		**-0.43**	**3.15**
	39 (2480 MHz)		-2.38	1.33

2.1.9 Sample Test Display



Bluetooth LE. Mid Channel 1Mbps

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.207(a)
RSS-GEN, Clause 8.8

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: 346648000065 / Default Test Configuration

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

February 06, 2017/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

Ambient Temperature	24.0°C
Relative Humidity	41.0%
ATM Pressure	99.4kPa

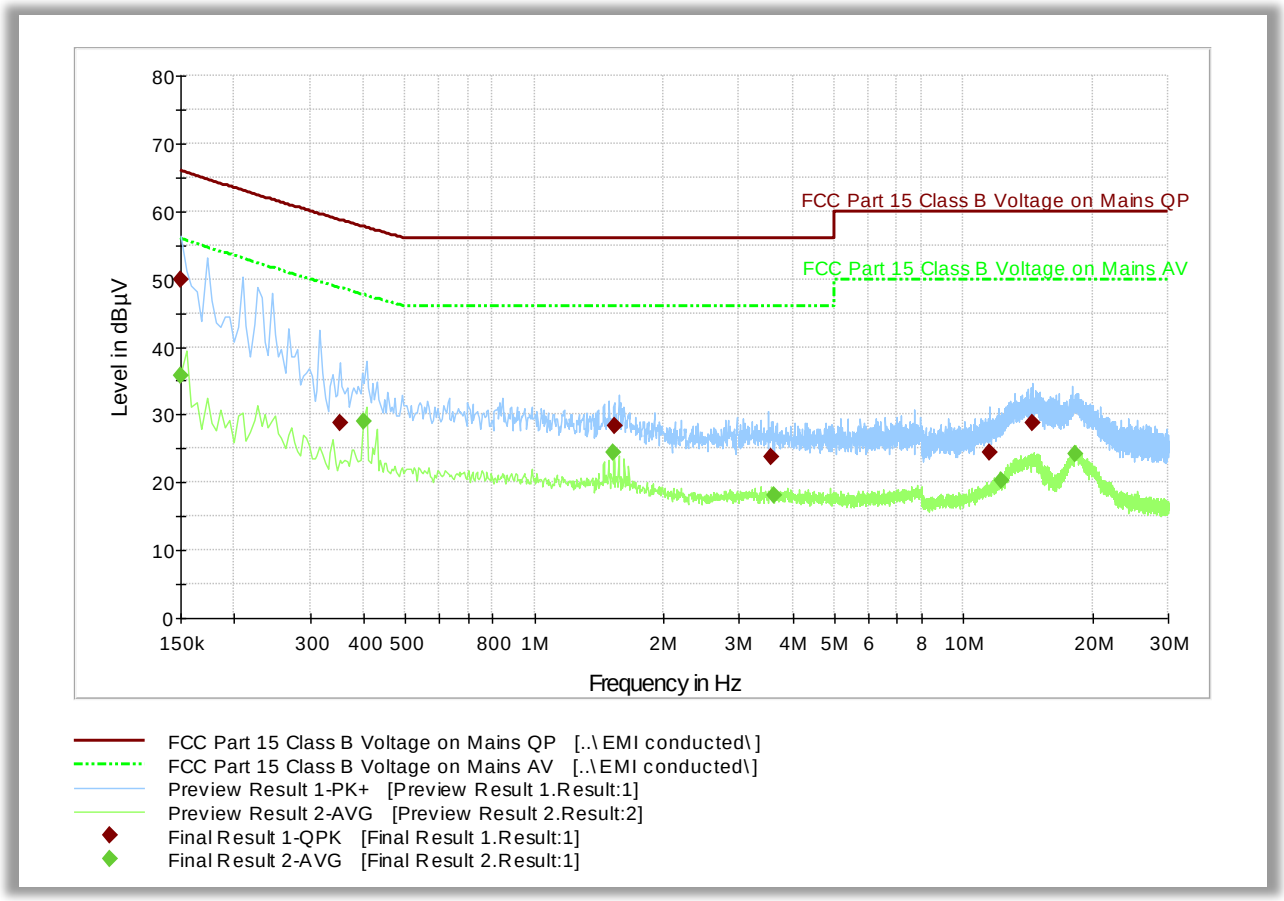
2.2.7 Additional Observations

- The EUT was verified using AC adapter supplied by the manufacturer.
- EUT verified using input voltage of 120VAC 60Hz.
- There are no significant variations in test results between each operating modes. Only the normal operation mode observed is presented.
- 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 2.2.8 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# 7567 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

2.2.9 Test Results - Conducted Emissions Line 1 – Hot



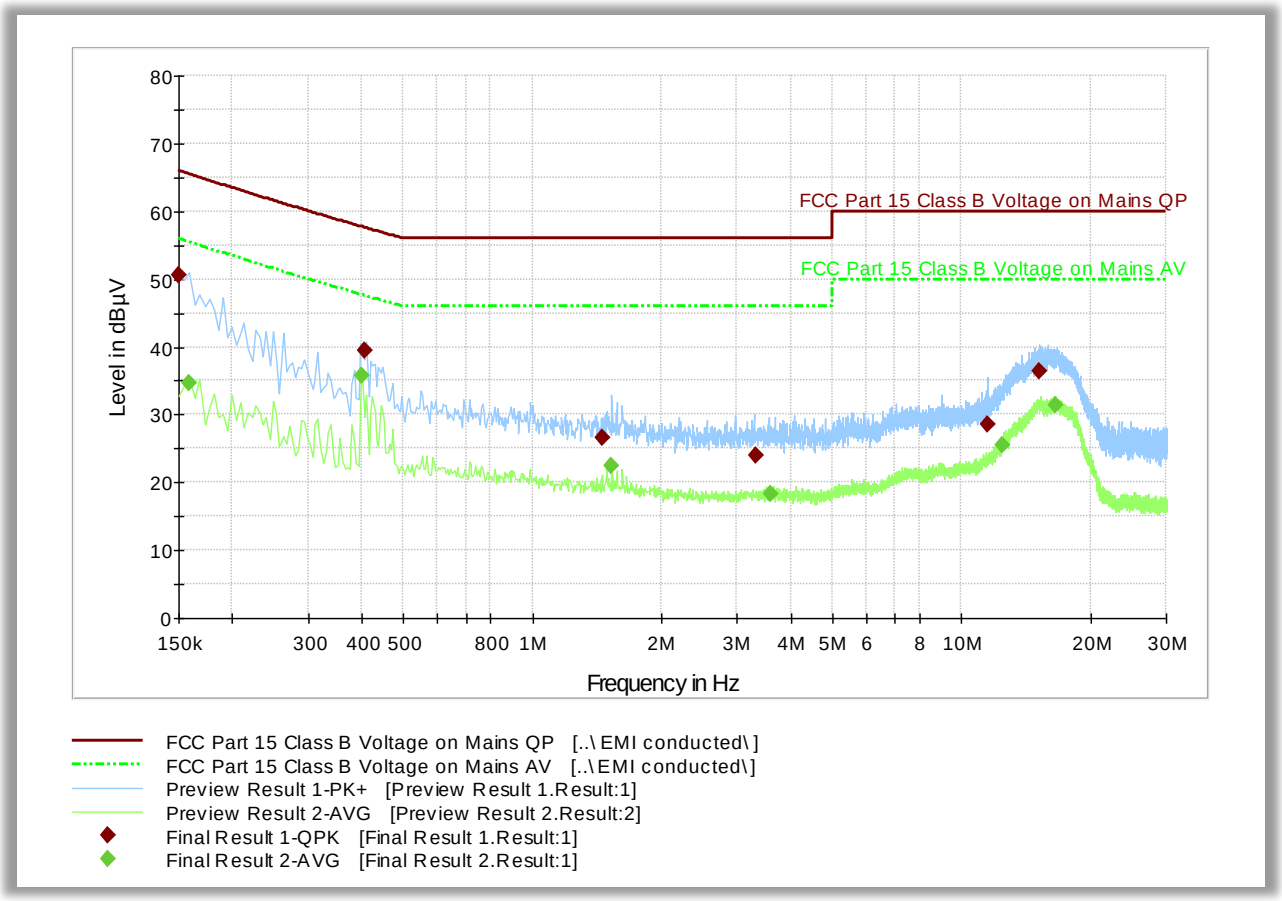
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	50.0	1000.0	9.000	Off	L1	20.2	16.0	66.0
0.352500	28.7	1000.0	9.000	Off	L1	20.0	30.0	58.7
1.536000	28.4	1000.0	9.000	Off	L1	20.0	27.6	56.0
3.565500	23.8	1000.0	9.000	Off	L1	20.1	32.2	56.0
11.490000	24.4	1000.0	9.000	Off	L1	20.2	35.6	60.0
14.446500	28.7	1000.0	9.000	Off	L1	20.3	31.3	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.150000	35.8	1000.0	9.000	Off	L1	20.2	20.2	56.0
0.402000	29.0	1000.0	9.000	Off	L1	20.0	18.7	47.7
1.531500	24.4	1000.0	9.000	Off	L1	20.0	21.6	46.0
3.624000	18.2	1000.0	9.000	Off	L1	20.1	27.8	46.0
12.273000	20.3	1000.0	9.000	Off	L1	20.2	29.7	50.0
18.258000	24.1	1000.0	9.000	Off	L1	20.4	25.9	50.0

2.2.10 FCC Conducted Emissions Line 2 – Neutral



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	50.6	1000.0	9.000	Off	N	20.2	15.4	66.0
0.406500	39.5	1000.0	9.000	Off	N	20.0	18.1	57.6
1.450500	26.5	1000.0	9.000	Off	N	20.0	29.5	56.0
3.322500	23.9	1000.0	9.000	Off	N	20.1	32.1	56.0
11.503500	28.6	1000.0	9.000	Off	N	20.2	31.4	60.0
15.184500	36.5	1000.0	9.000	Off	N	20.3	23.5	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.159000	34.7	1000.0	9.000	Off	N	20.2	20.8	55.5
0.402000	35.7	1000.0	9.000	Off	N	20.0	11.9	47.7
1.531500	22.4	1000.0	9.000	Off	N	20.0	23.6	46.0
3.592500	18.3	1000.0	9.000	Off	N	20.1	27.7	46.0
12.417000	25.4	1000.0	9.000	Off	N	20.2	24.6	50.0
16.503000	31.5	1000.0	9.000	Off	N	20.3	18.5	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: 346648000065 / Default Test Configuration

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

February 01, 2017/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

Ambient Temperature	23.7°C
Relative Humidity	40.5%
ATM Pressure	98.9kPa

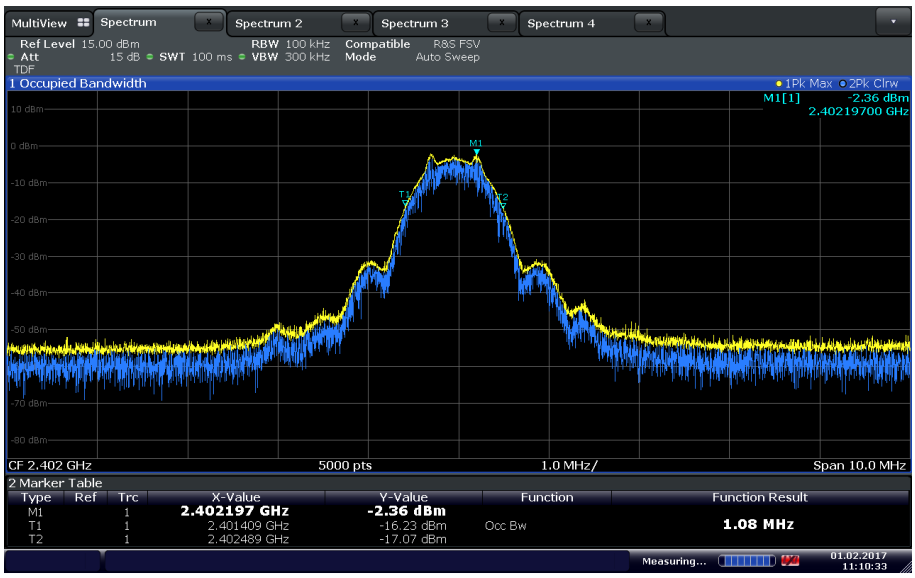
2.3.7 Additional Observations

- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is 100 kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Trace mode is max hold.
- 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 (For reporting purposes only)

Mode	Channel	Measured 99% Bandwidth (MHz)
Bluetooth LE	37 (2402 MHz)	1.08
	17 (2440 MHz)	1.082
	39 (2480 MHz)	1.074

2.3.9 Test Results Plots



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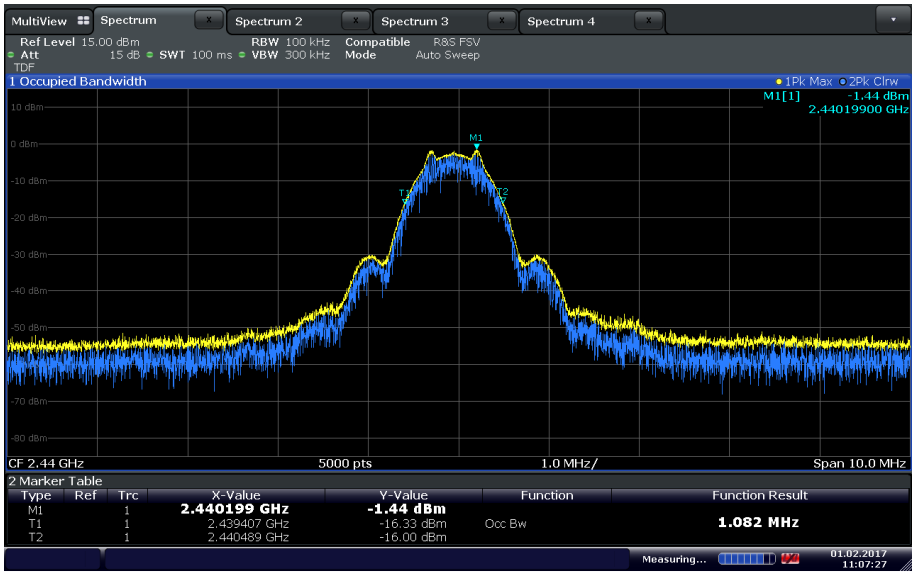
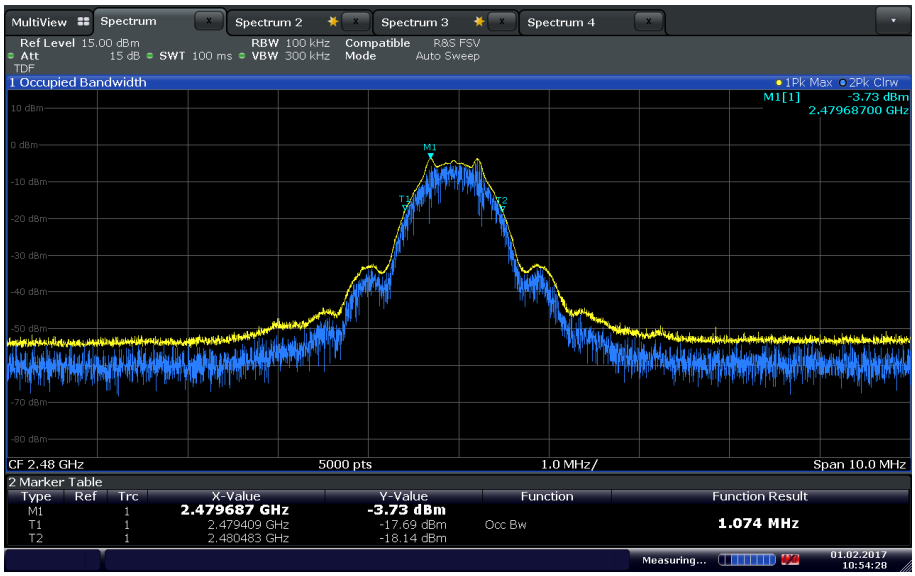
Bluetooth LE Low Channel



Date: 1.FEB.2017 11:07:28

Bluetooth LE Mid Channel



Date: 1.FEB.2017 10:54:28

Bluetooth LE High Channel

2.4 MINIMUM 6 dB RF BANDWIDTH

2.4.1 Specification Reference

FCC 47 CFR Part 15, Clause 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: 346648000065 / Default Test Configuration

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

February 01, 2017/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	23.7°C
Relative Humidity	40.5%
ATM Pressure	98.9kPa

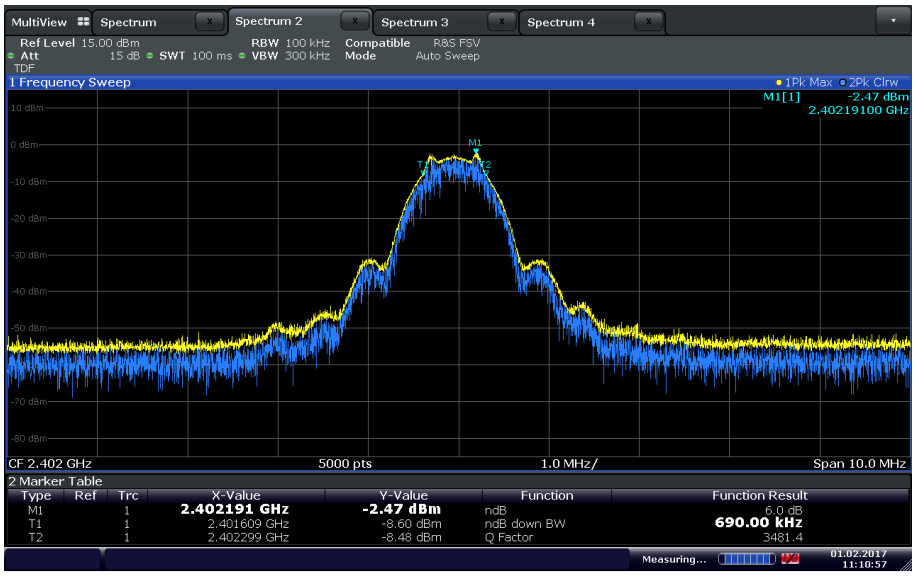
2.4.7 Additional Observations

- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used.
- 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.
- Trace is maxhold.
- The “n” dB down marker function of the spectrum analyser was used for this test.

2.4.8 Test Results

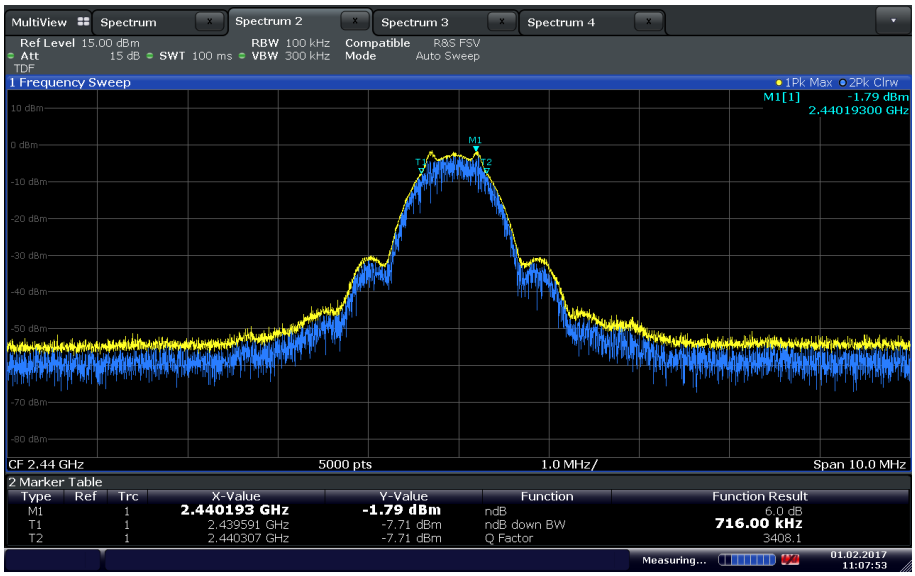
Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
Bluetooth LE	37 (2402 MHz)	0.690	0.500	Complies
	17 (2440 MHz)	0.716	0.500	Complies
	39 (2480 MHz)	0.714	0.500	Complies

2.4.9 Test Results Plots



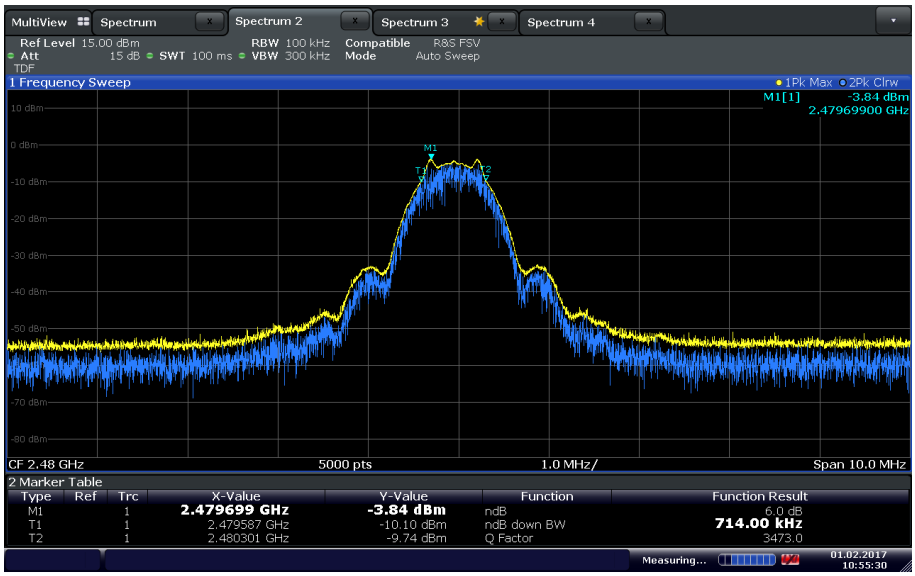
Date: 1.FEB.2017 11:10:57

Bluetooth LE Low Channel



Date: 1.FEB.2017 11:07:53

Bluetooth LE Mid Channel



Date: 1.FEB.2017 10:55:30

Bluetooth LE High Channel

2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

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: 346648000065 / Default Test Configuration

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

February 01, 2017/XYZ

2.5.5 Test Equipment Used

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

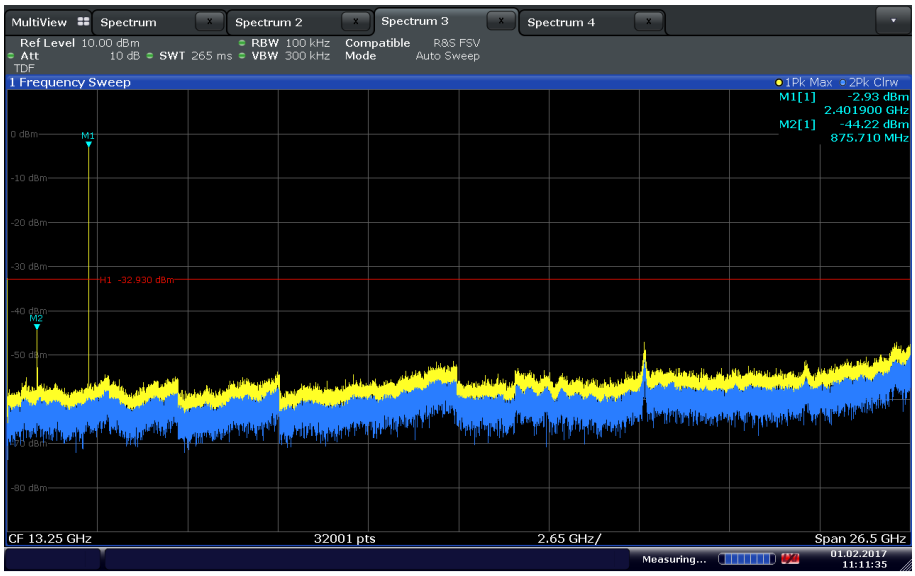
2.5.6 Environmental Conditions

Ambient Temperature	23.7°C
Relative Humidity	40.5%
ATM Pressure	98.9kPa

2.5.7 Additional Observations

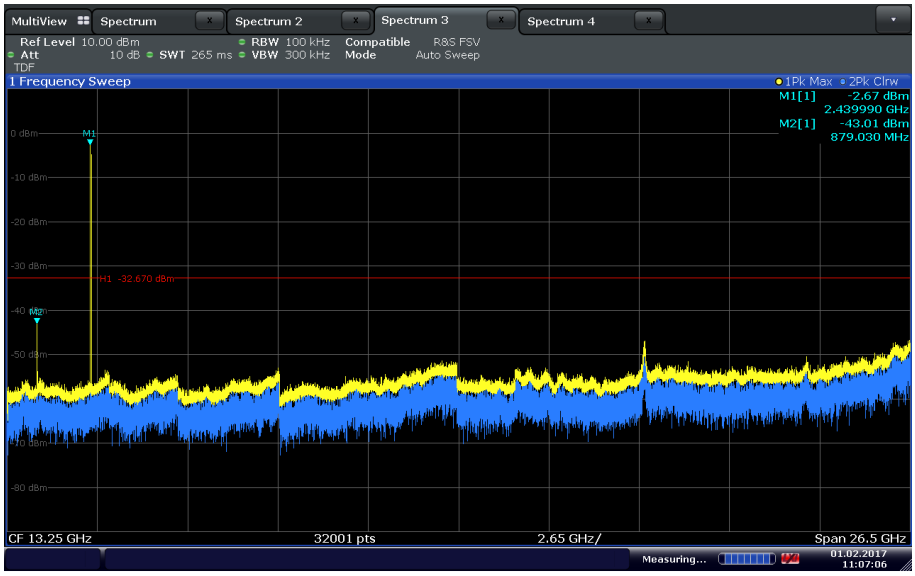
- This is a conducted test.
- TDF (Transducer Factor) was used to compensate for the external attenuator and cable used.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Initial scan was performed to determine the highest level of the desired power within the band. Limit (display line) was drawn 30dB below this level.
- Spectrum was searched from 9 kHz up to 26.5GHz.

2.5.8 Test Results Plots



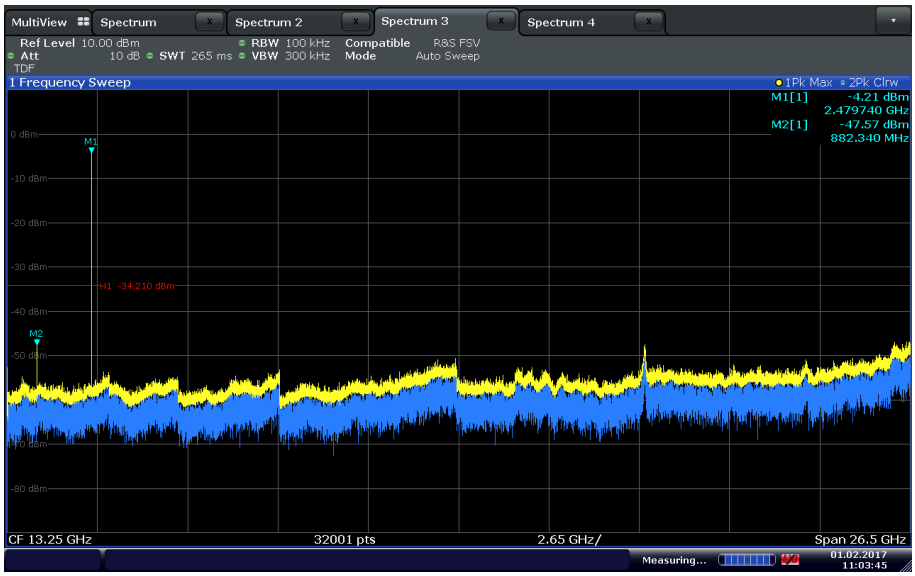
Date: 1.FEB.2017 11:11:35

Bluetooth LE Low Channel



Date: 1.FEB.2017 11:07:06

Bluetooth LE Mid Channel



Date: 1.FEB.2017 11:03:46

Bluetooth LE High Channel

2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED 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: 346648000065 / Default Test Configuration

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

February 01, 2017/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

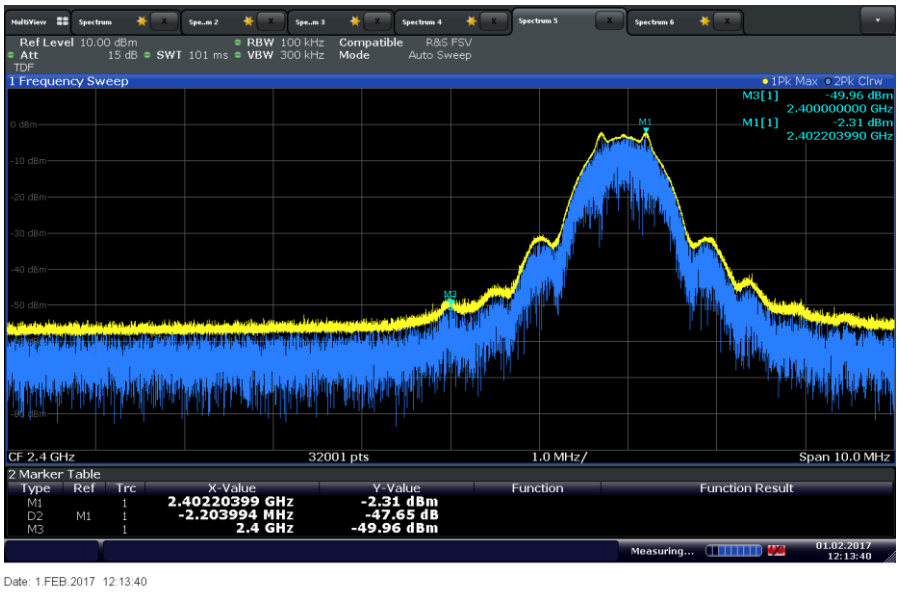
Ambient Temperature	23.7°C
Relative Humidity	40.5%
ATM Pressure	98.9kPa

2.6.7 Additional Observations

- This is a conducted test.
- The path loss for 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.
- Trace was centered on the band-edge frequency.
- Span was set to encompass the band-edge frequency and the peak of the emission.
- Using Marker function, peak of the emission was determined and the delta to the band-edge frequency measured (for EUT OBW edge not within 2MHz of the authorized band edge).

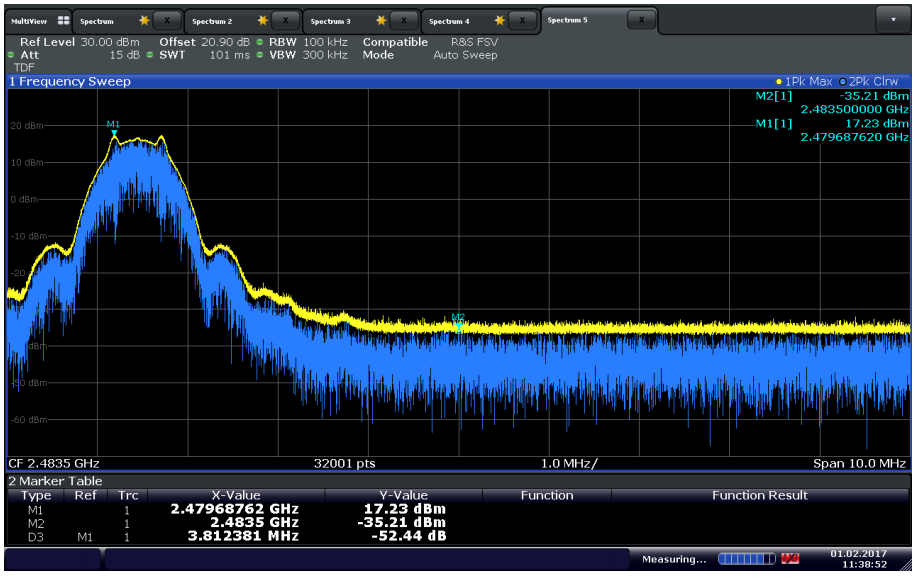
2.6.8 Test Results

Complies. See attached plots.



Date: 1.FEB.2017 12:13:40

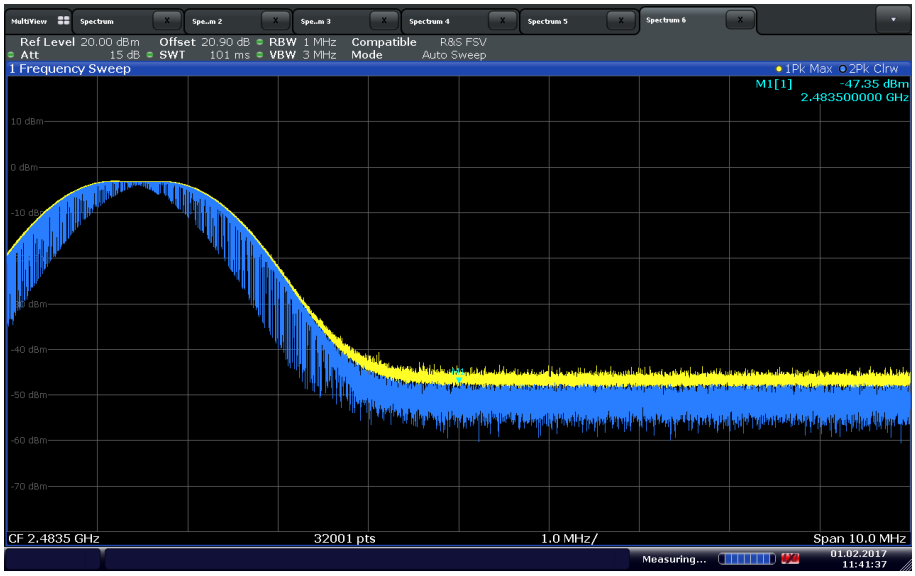
Bluetooth LE Low Channel (2402 MHz)



Date: 1.FEB.2017 11:38:51

Bluetooth LE High Channel (2480 MHz)

2.6.9 Band Edge Verification in the Restricted Band (Conducted Method)



Date: 1.FEB.2017 11:41:37

Upper Band Edge (in Restricted Band) measurement using Peak Power measurement procedure as per Clause 12.2.4 of KDB558074

Measured Peak = -47.35 dBm, since antenna gain is -5dBi then EIRP is -52.35. Using the formula:

$$E = EIRP - 20\log D + 104.8$$

Where: E = electric field strength in dBµV/m
EIRP = equivalent isotropic radiated power in dBm
D = specific measurement distance in meters

E is therefore = -52.35 dBm – (20log 3 meters) + 104.8
= 42.91 dBµV/m @ 3 meters

Since the peak detected amplitude (42.91 dBµV/m) complies with the average limit (54 dBµV/m), then it's not necessary to perform a separate average measurement. EUT complies restricted band @ 2483.5 MHz.

2.7 RADIATED SPURIOUS EMISSIONS

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: 346648000065 / Default Test Configuration

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

February 02 and 03, 2017/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	23.3 – 23.4°C
Relative Humidity	27.9 – 33.6%
ATM Pressure	99.4 – 99.5kPa

2.7.7 Additional Observations

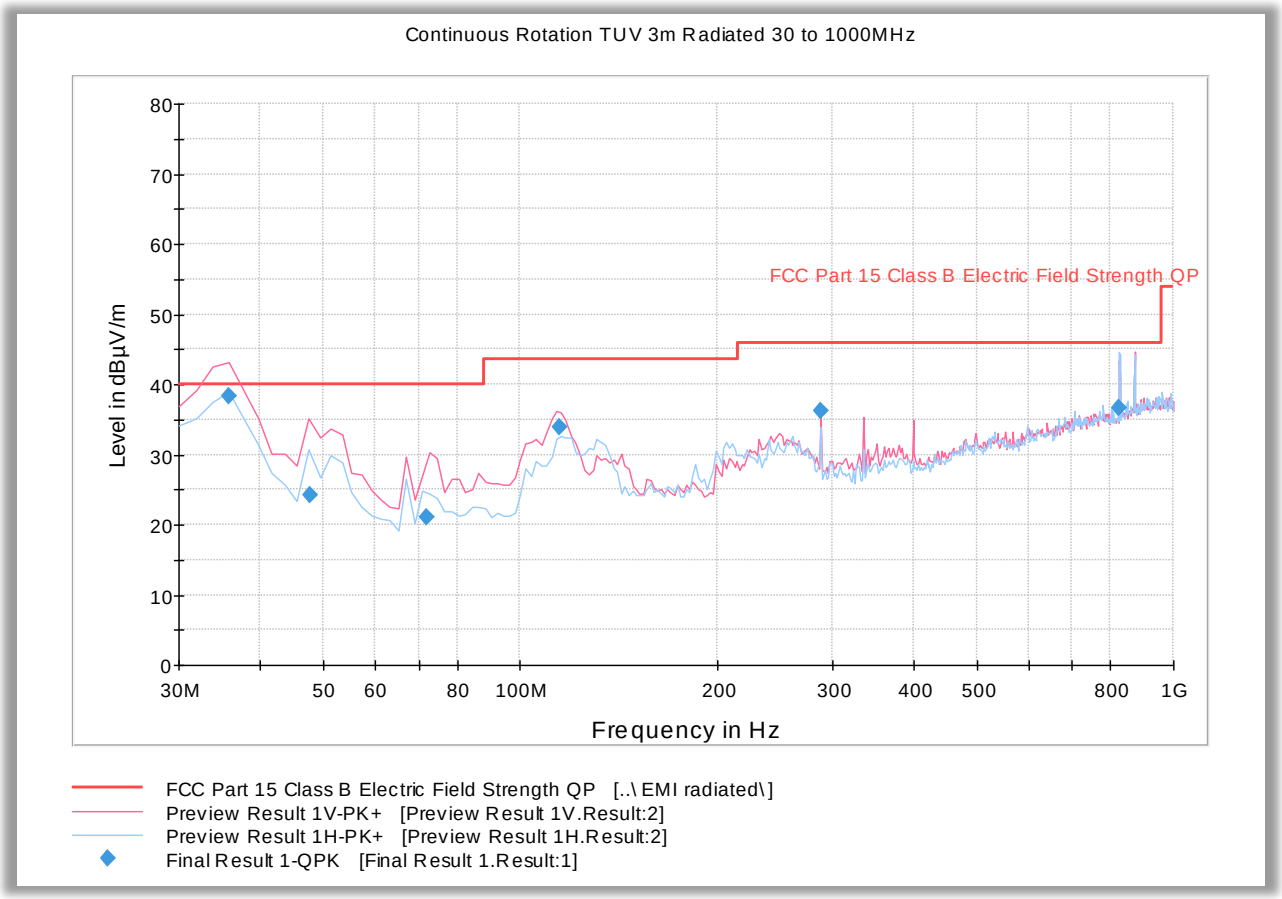
- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- Test Methodology is per Clause 12.2.7 of KDB558074 D01 DTS Meas Guidance v03r05.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Only the worst case BLE (Middle Channel) presented for radiated emissions below 1GHz. There are no significant differences in emissions between all channels 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.

2.7.8 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**

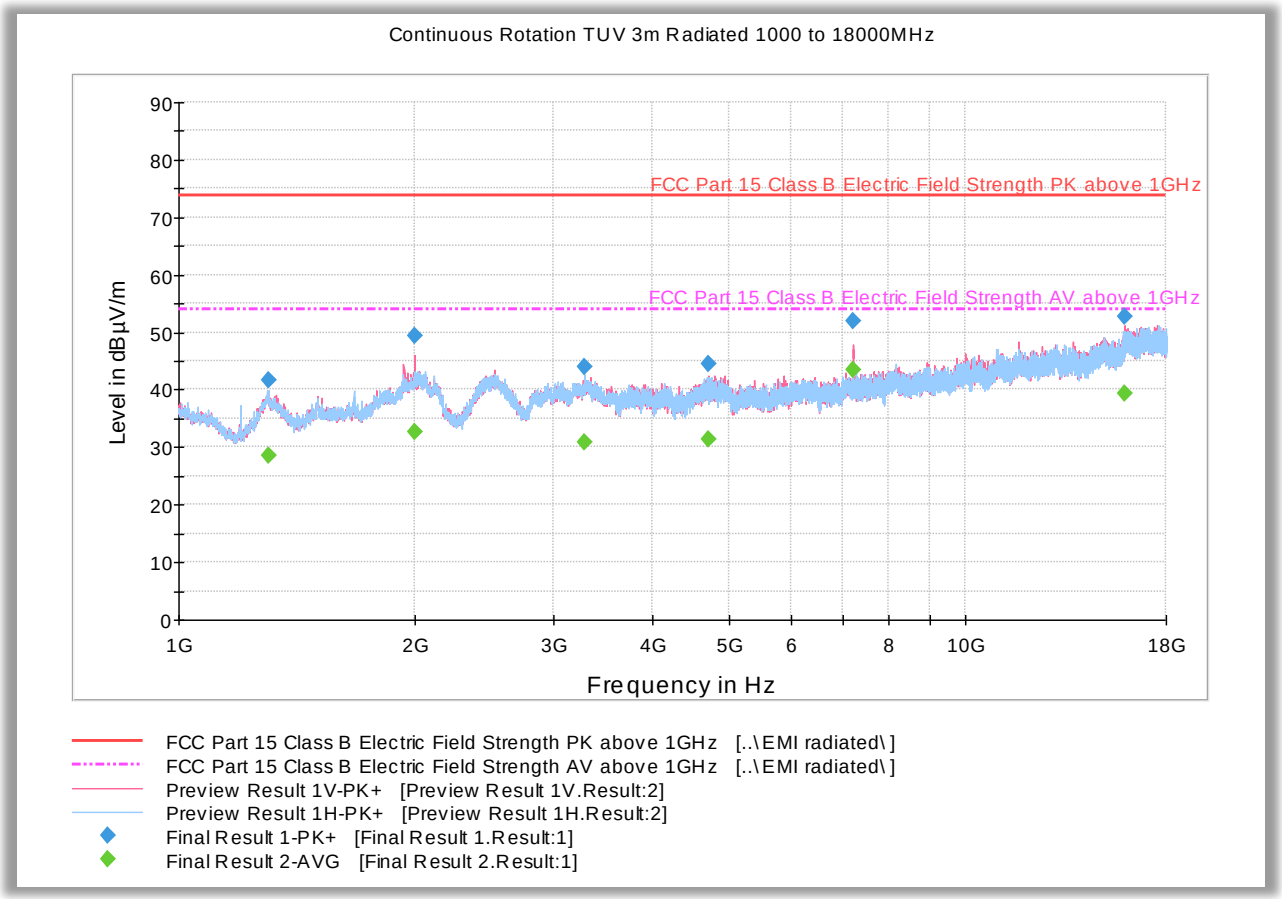
2.7.9 Test Results - Below 1GHz (Worst Case Channel)



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)
35.831663	38.4	1000.0	120.000	109.0	V	279.0	-11.9	1.6	40.0
47.654990	24.1	1000.0	120.000	171.0	V	31.0	-15.6	15.9	40.0
71.965531	21.0	1000.0	120.000	108.0	V	236.0	-18.3	19.0	40.0
114.907174	33.9	1000.0	120.000	109.0	V	5.0	-17.3	9.6	43.5
287.977074	36.2	1000.0	120.000	150.0	V	286.0	-10.4	9.8	46.0
826.233988	36.7	1000.0	120.000	122.0	H	34.0	8.6	9.3	46.0

2.7.10 Test Results Above 1GHz (Low Channel)



Peak Data

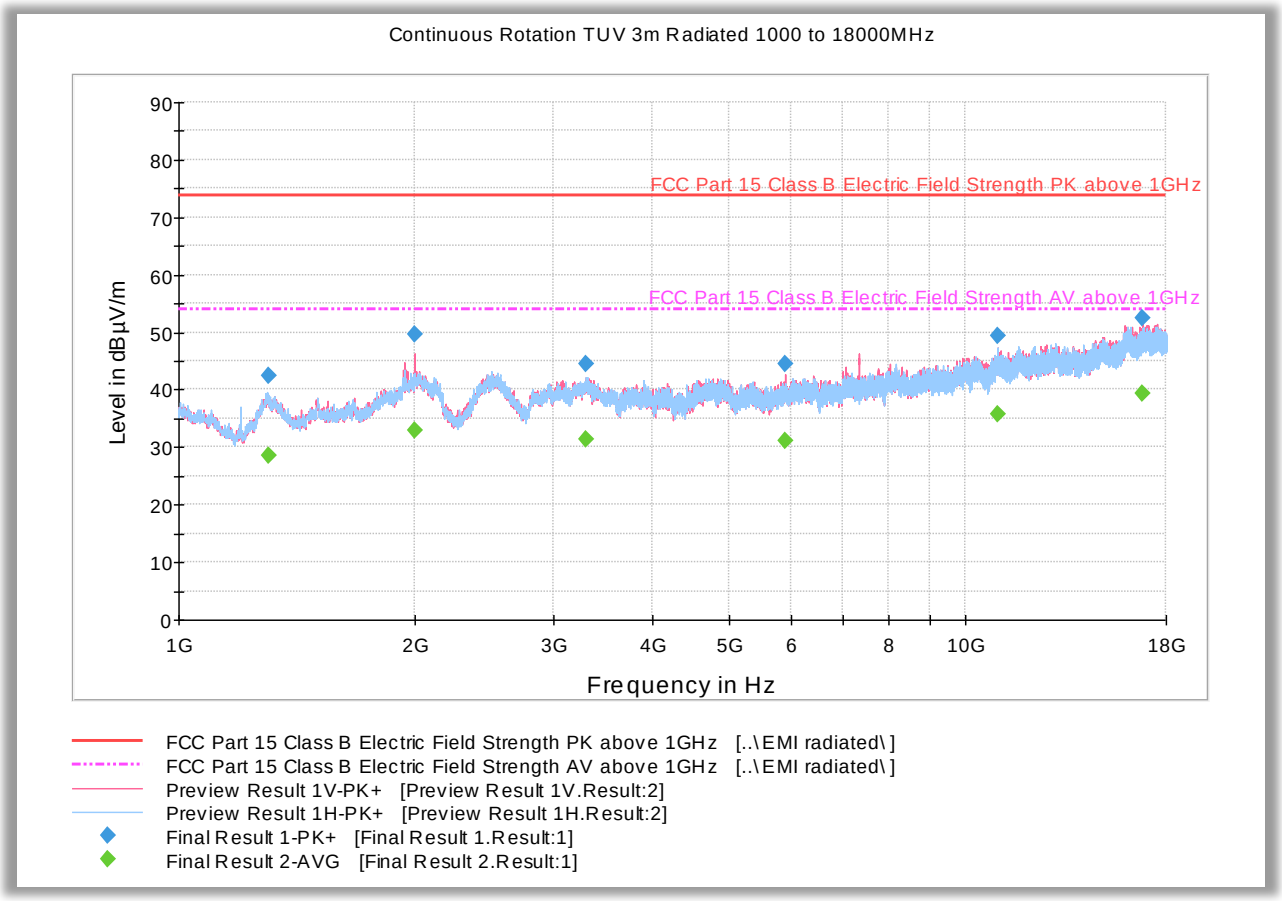
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1299.900000	41.7	1000.0	1000.000	344.1	H	186.0	-4.4	32.2	73.9
1992.933333	49.4	1000.0	1000.000	143.7	V	288.0	-0.2	24.6	73.9
3279.100000	44.0	1000.0	1000.000	112.7	H	305.0	0.7	29.9	73.9
4708.400000	44.4	1000.0	1000.000	116.7	V	152.0	2.8	29.5	73.9
7205.200000	52.0	1000.0	1000.000	327.2	V	288.0	7.2	21.9	73.9
15975.70000	52.8	1000.0	1000.000	152.2	V	20.0	18.5	21.1	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)
1299.900000	28.6	1000.0	1000.000	344.1	H	186.0	-4.4	25.3	53.9
1992.933333	32.6	1000.0	1000.000	143.7	V	288.0	-0.2	21.3	53.9
3279.100000	30.9	1000.0	1000.000	112.7	H	305.0	0.7	23.0	53.9
4708.400000	31.3	1000.0	1000.000	116.7	V	152.0	2.8	22.6	53.9
7205.200000	43.4	1000.0	1000.000	327.2	V	288.0	7.2	10.5	53.9
15975.70000	39.3	1000.0	1000.000	152.2	V	20.0	18.5	14.6	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.

2.7.11 Test Results Above 1GHz (Middle Channel)



Peak Data

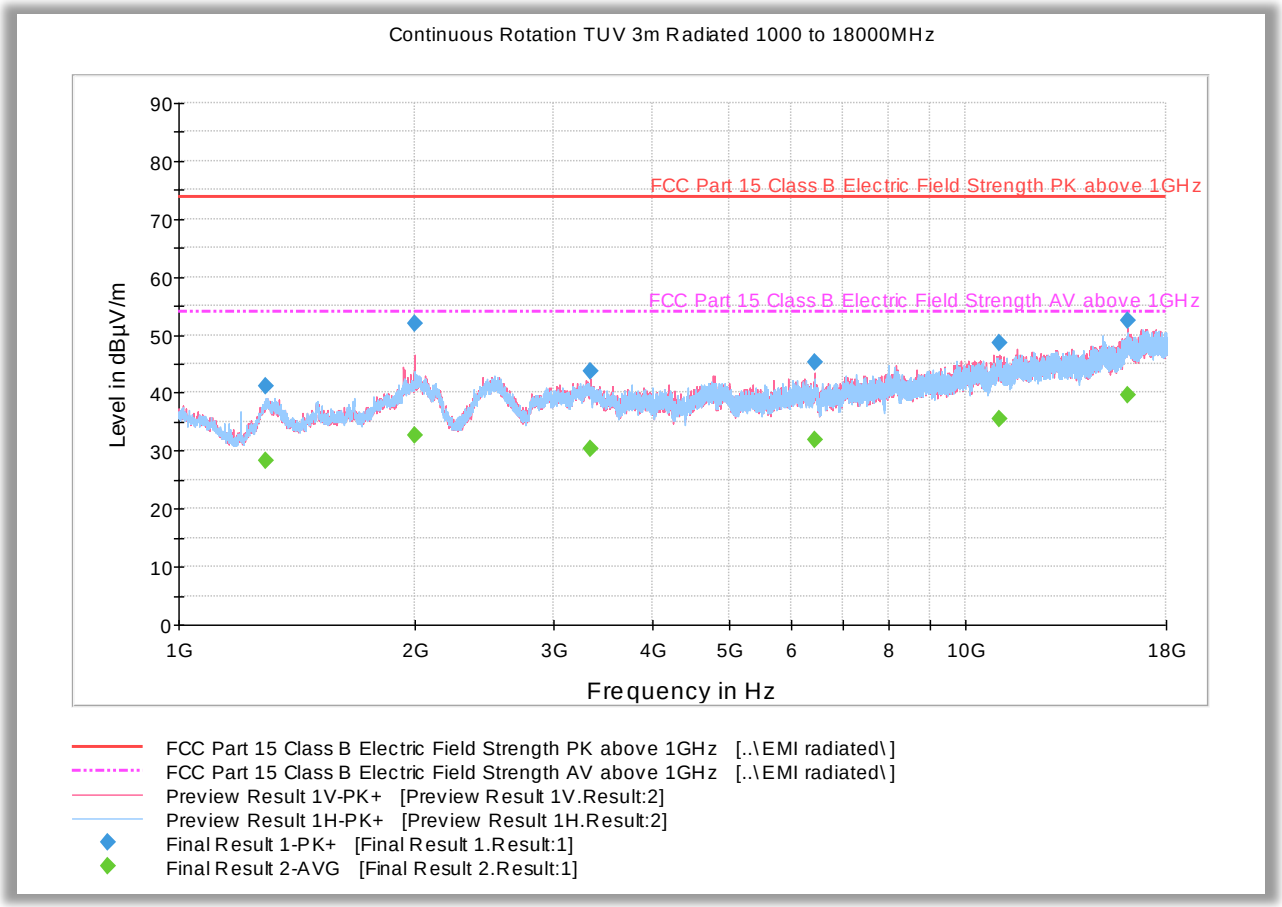
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1299.033333	42.4	1000.0	1000.000	152.6	H	246.0	-4.5	31.5	73.9
1993.200000	49.6	1000.0	1000.000	204.5	V	268.0	-0.2	24.3	73.9
3301.066667	44.6	1000.0	1000.000	139.7	V	143.0	0.8	29.3	73.9
5898.266667	44.4	1000.0	1000.000	116.7	V	320.0	4.9	29.5	73.9
11003.933333	49.3	1000.0	1000.000	311.2	V	-1.0	12.7	24.6	73.9
16778.266667	52.4	1000.0	1000.000	152.2	V	54.0	20.0	21.5	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)
1299.033333	28.6	1000.0	1000.000	152.6	H	246.0	-4.5	25.3	53.9
1993.200000	32.8	1000.0	1000.000	204.5	V	268.0	-0.2	21.1	53.9
3301.066667	31.3	1000.0	1000.000	139.7	V	143.0	0.8	22.6	53.9
5898.266667	31.1	1000.0	1000.000	116.7	V	320.0	4.9	22.8	53.9
11003.933333	35.6	1000.0	1000.000	311.2	V	-1.0	12.7	18.3	53.9
16778.266667	39.4	1000.0	1000.000	152.2	V	54.0	20.0	14.5	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.

2.7.12 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)
1287.666667	41.1	1000.0	1000.000	280.2	H	339.0	-4.8	32.8	73.9
1993.966667	51.9	1000.0	1000.000	178.6	V	54.0	-0.1	22.0	73.9
3342.033333	43.6	1000.0	1000.000	339.1	V	115.0	0.8	30.3	73.9
6433.733333	45.4	1000.0	1000.000	120.7	V	53.0	6.0	28.5	73.9
11039.600000	48.7	1000.0	1000.000	352.7	V	17.0	12.8	25.2	73.9
16088.266667	52.5	1000.0	1000.000	128.7	V	194.0	18.9	21.4	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)
1287.666667	28.2	1000.0	1000.000	280.2	H	339.0	-4.8	25.7	53.9
1993.966667	32.6	1000.0	1000.000	178.6	V	54.0	-0.1	21.3	53.9
3342.033333	30.3	1000.0	1000.000	339.1	V	115.0	0.8	23.6	53.9
6433.733333	31.9	1000.0	1000.000	120.7	V	53.0	6.0	22.0	53.9
11039.600000	35.4	1000.0	1000.000	352.7	V	17.0	12.8	18.5	53.9
16088.266667	39.7	1000.0	1000.000	128.7	V	194.0	18.9	14.2	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.

2.8 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: 346648000065 / Default Test Configuration

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

February 01, 2017/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	23.7°C
Relative Humidity	40.5%
ATM Pressure	98.9kPa

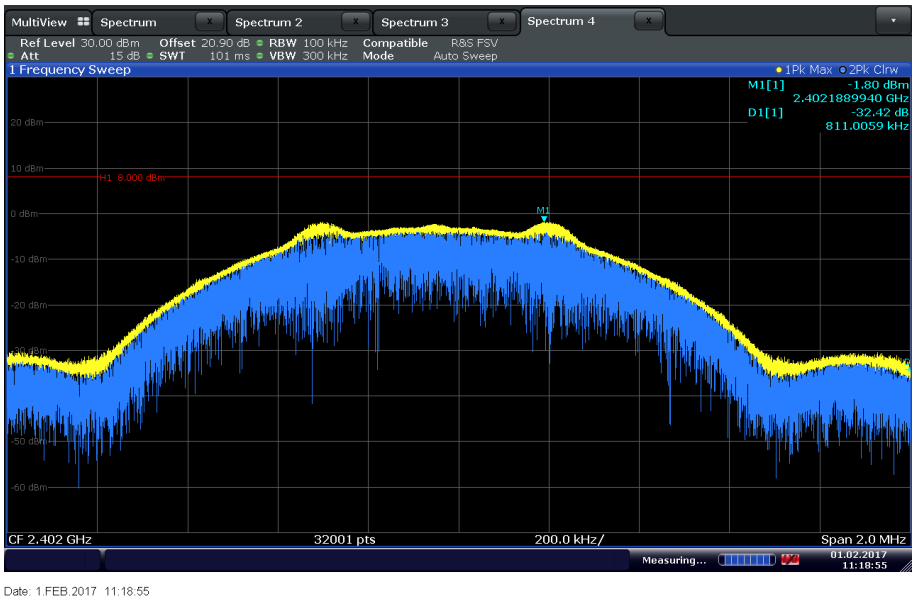
2.8.7 Additional Observations

- This is a conducted test.
- Test procedure is per Section10.3 of KDB 558074 D01 (DTS Meas Guidance v03r05, April 08, 2016).
- The path loss for was measured and entered as a level offset
- Detector is RMS power averaging.
- Trace averaging mode over 100 traces.
- Span ≥ 1.5 x OBW
- Sweep time is Auto.
- EUT complies with 100 kHz RBW.

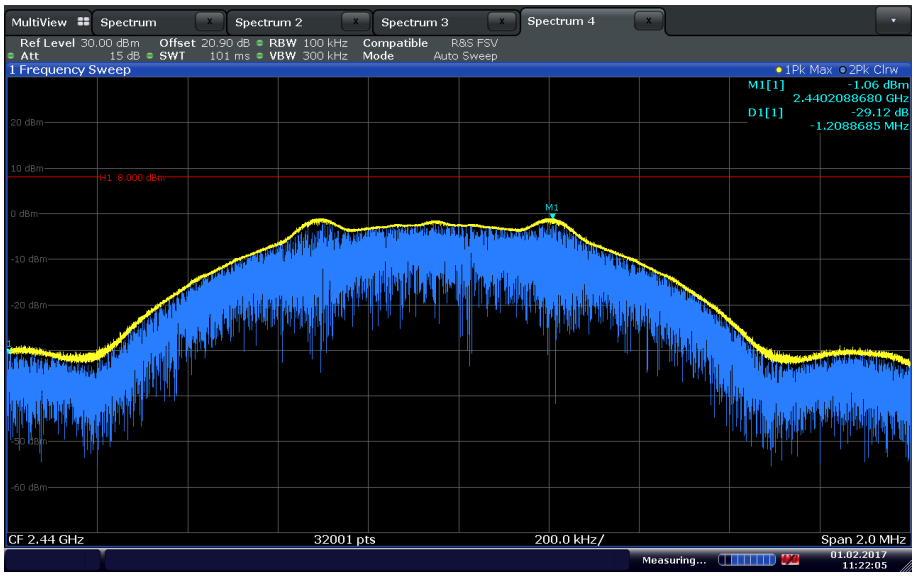
2.8.8 Test Results Summary

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	-1.8	8	9.8	Complies
	17 (2440 MHz)	GFSK @ 1Mbps	-1.06	8	9.06	Complies
	39 (2480 MHz)	GFSK @ 1Mbps	-3.21	8	11.21	Complies

2.8.9 Test Results Plots

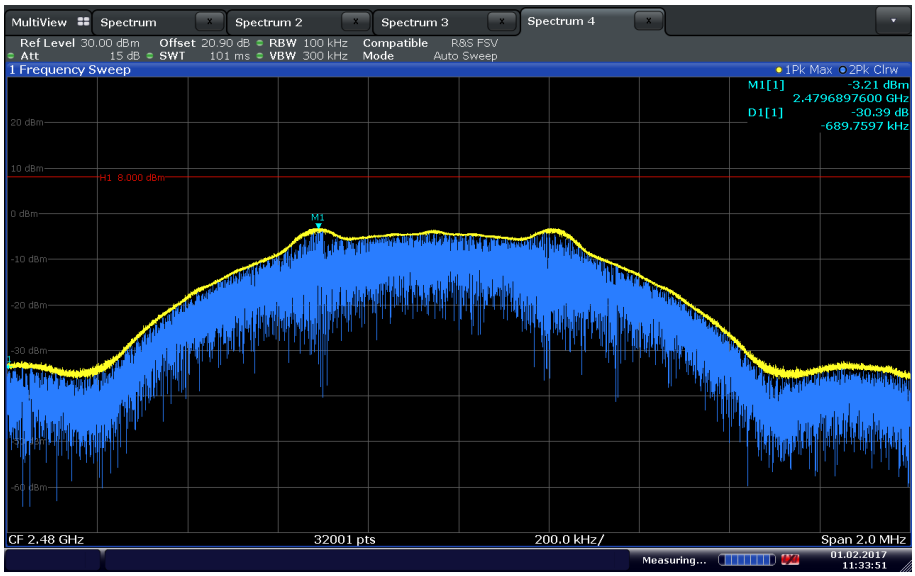


Bluetooth LE Low Channel



Date: 1.FEB.2017 11:22:05

Bluetooth LE Middle Channel



Date: 1.FEB.2017 11:33:52

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						
7604	P-Series Power Meter	N1912A	SG45100273	Agilent	07/27/16	07/27/17
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/19/16	04/19/17
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/26/16	10/26/17
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/02/16	09/02/17
8871	20dB Attenuator	18N10W-20dB	-	INMET	Verified by 7582 and 7608	
Radiated Test Setup						
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/26/16	10/26/17
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/02/16	09/02/17
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/06/15	11/06/17
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	05/12/16	05/12/17
1016	Pre-amplifier	PAM-0202	187	PAM	10/17/16	10/17/17
1040	EMI Test Receiver	ESU	100133	Rhode & Schwarz	10/07/16	10/07/17
1016	Pre-amplifier	PAM-0202	187	PAM	10/17/16	10/17/17
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	Verified by 7582 and 7608	
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7582 and 7608	
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	Verified by 7582 and 7608	
8816	2.4GHz to 2.5GHz Notch Filter	BRM50702	133	MICRO-TRONICS	Verified by 7582 and 7608	
Conducted Emissions						
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/09/16	09/09/17
6837	LISN	FCC-LISN-50-25-2	5025	Fischer Custom Comm.	03/29/16	03/29/17
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/29/16	08/29/17
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	08/22/16	08/22/17
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.1 MEASUREMENT UNCERTAINTY

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

3.1.1 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

3.1.2 Radiated 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	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.78
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.57

3.1.3 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	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.78
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.56

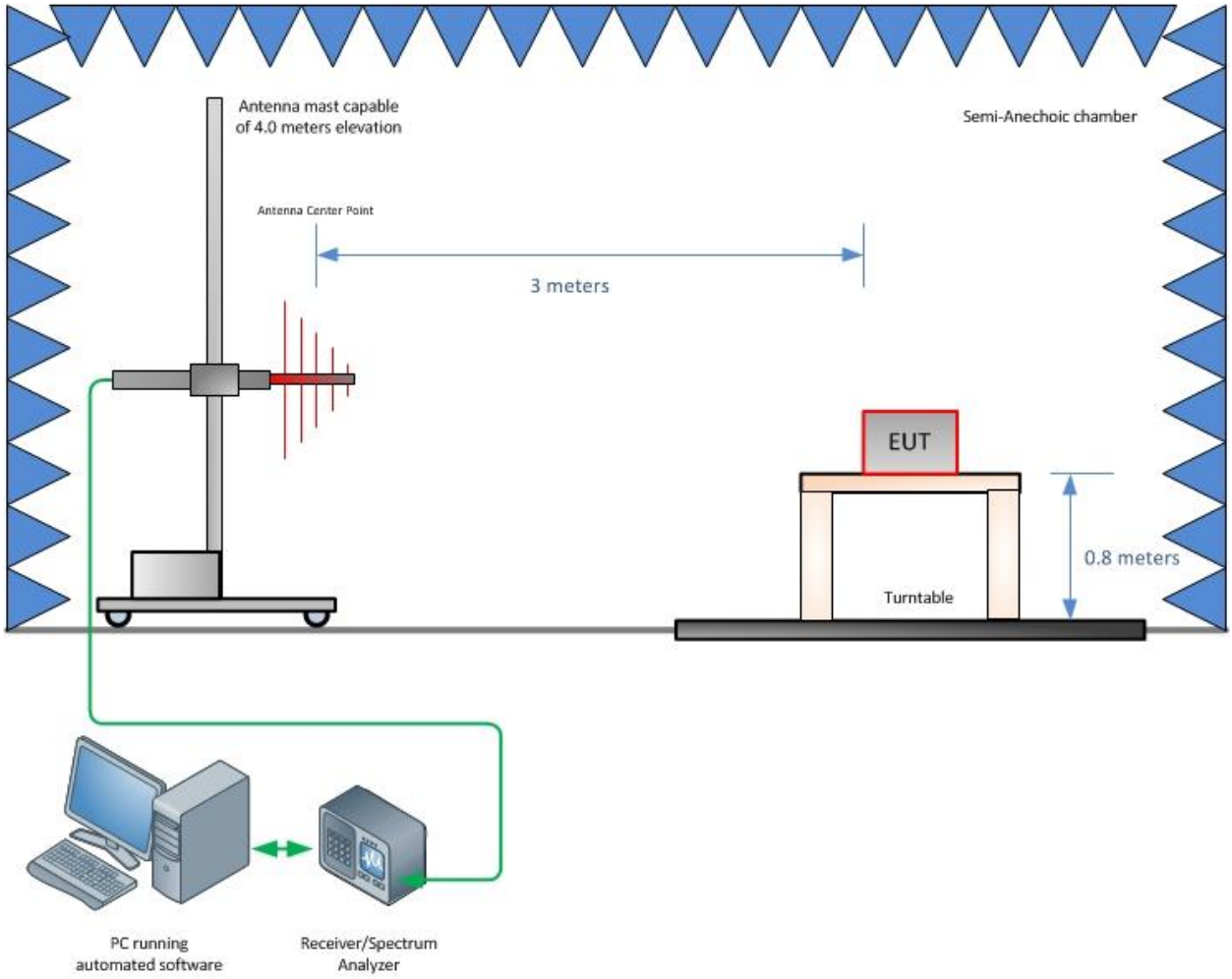
3.1.4 Conducted Antenna Port Measurement

	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

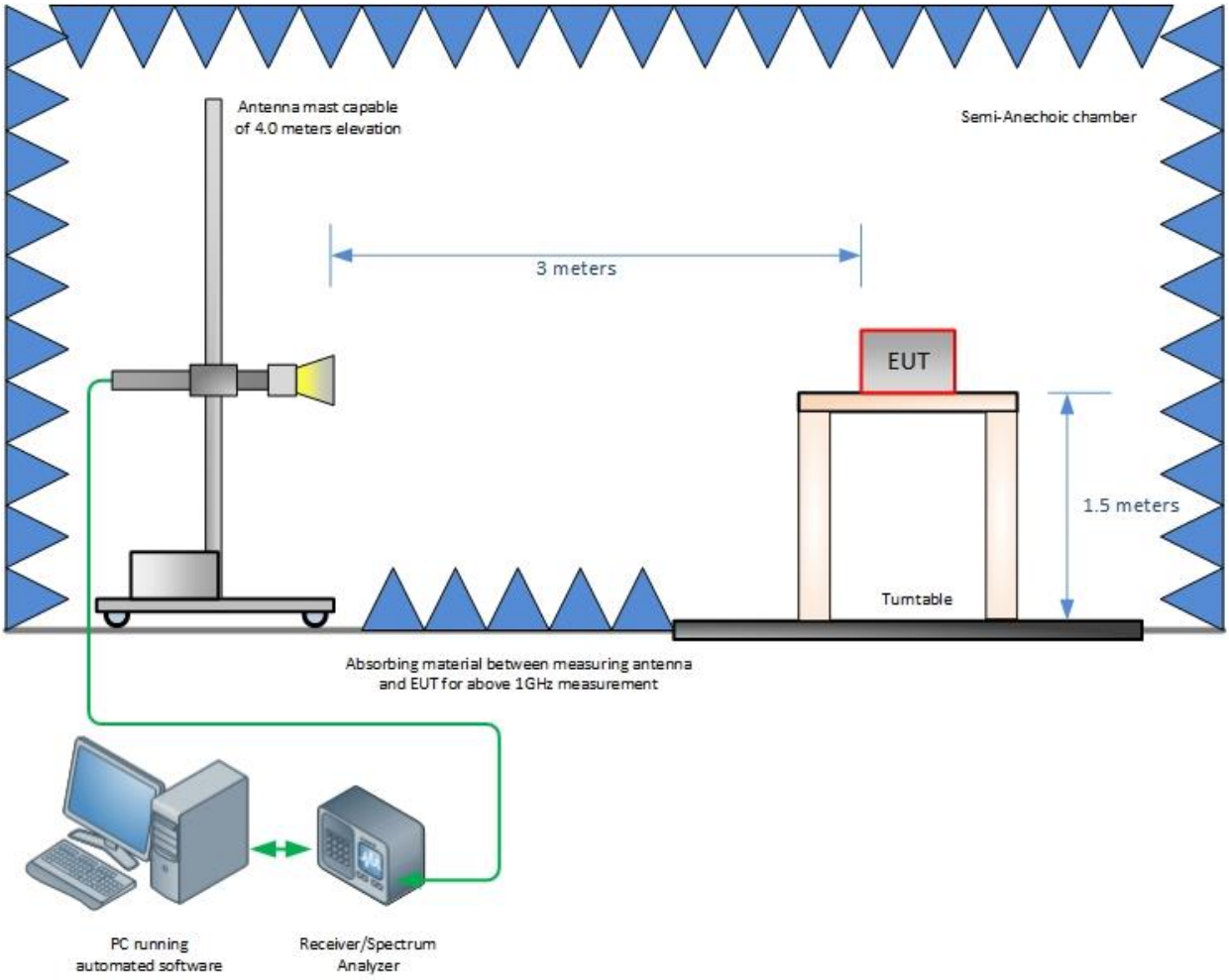
SECTION 4

DIAGRAM OF TEST SETUP

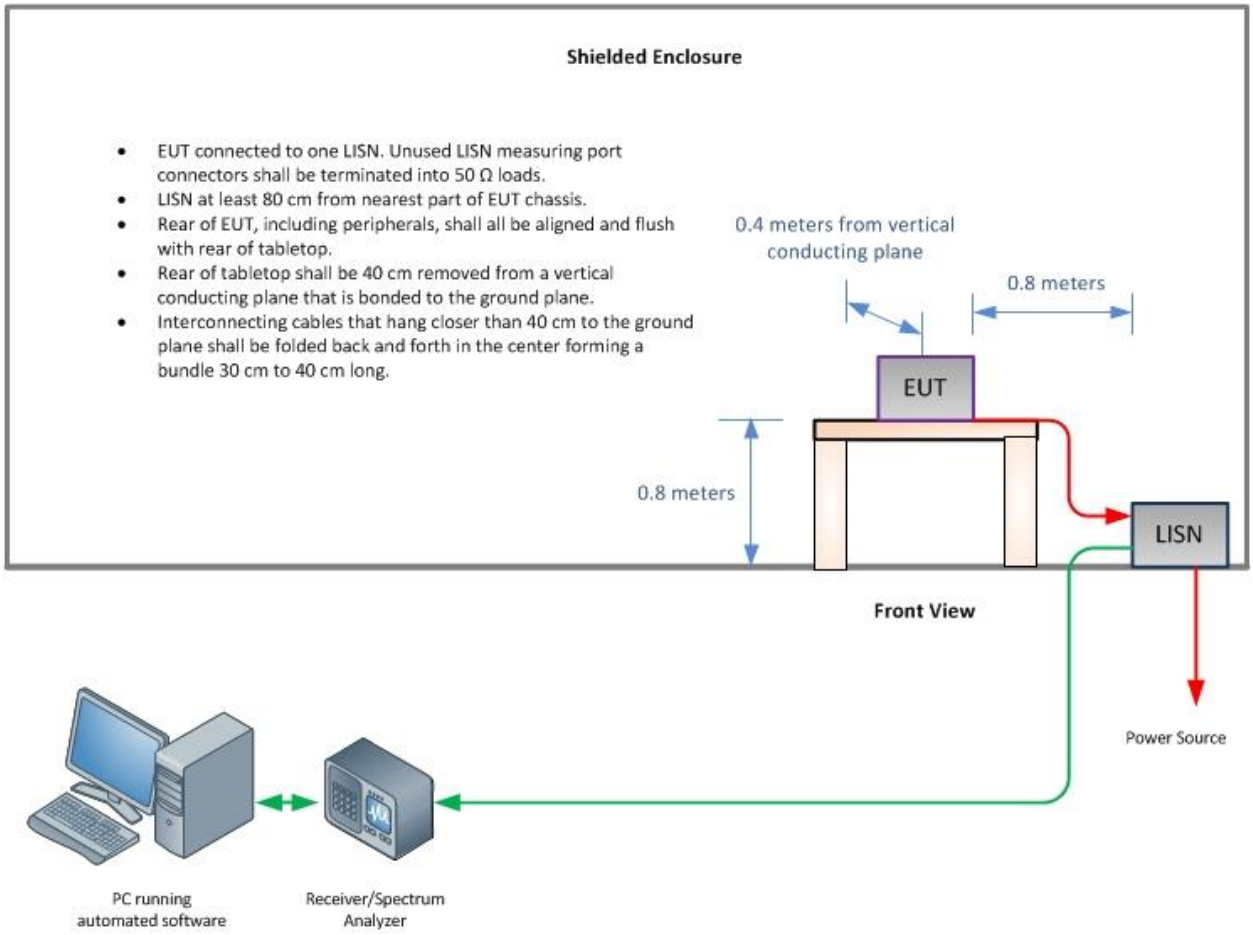
4.1 TEST SETUP DIAGRAM



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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