



America

**Choose certainty.
Add value.**

Report On

Application for Grant of Equipment Authorization of the
Dexcom Inc.

G6 Continuous Glucose Monitoring System
(G6 Transmitter)

FCC Part 15 Subpart C §15.247 (DTS)
RSS-247 Issue 2 February 2017

Report No. FB72126754-0417B

June 2017



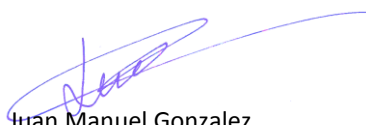
REPORT ON Radio Testing of the
Dexcom Inc.
G6 Continuous Glucose Monitoring System (G6 Transmitter)

TEST REPORT NUMBER FB72126754-0417B

PREPARED FOR Dexcom Inc.
6340 Sequence Dr.
San Diego, CA 92121-4356
USA

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

PREPARED BY 
Alex Chang
Name
Authorized Signatory
Title: EMC/Wireless Test Engineer

APPROVED BY 
Juan Manuel Gonzalez
Name
Authorized Signatory
Title: EMC SL Manager Western Region

DATED June 20, 2017



Revision History

FB72126754-0417B Dexcom Inc. G6 Continuous Glucose Monitoring System (G6 Transmitter)					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
06/20/2017	Initial Release				Juan M. Gonzalez



CONTENTS

Section		Page No
1	REPORT SUMMARY	5
1.1	Introduction	6
1.2	Brief Summary Of Results	7
1.3	Product Information	8
1.4	EUT Test Configuration	10
1.5	Deviations From The Standard	12
1.6	Modification Record	12
1.7	Test Methodology	12
1.8	Test Facility Location	12
1.9	Test Facility Registration	12
2	TEST DETAILS	14
2.1	Peak Output Power	15
2.2	Conducted Emissions	18
2.3	99% Emission Bandwidth	19
2.4	Minimum 6 dB RF Bandwidth	22
2.5	Out-Of-Band Emissions - Conducted	25
2.6	Band-Edge Compliance Of RF Conducted Emissions	28
2.7	Spurious Radiated Emissions	33
2.8	Power Spectral Density	37
3	TEST EQUIPMENT USED	40
3.1	Test Equipment Used	41
3.2	Measurement Uncertainty	42
4	DIAGRAM OF TEST SETUP	43
4.1	Test Setup Diagram	44
5	ACCREDITATION, DISCLAIMERS AND COPYRIGHT	46
5.1	Accreditation, Disclaimers And Copyright	47



SECTION 1

REPORT SUMMARY

Radio Testing of the
Dexcom Inc.
G6 Continuous Glucose Monitoring System
(G6 Transmitter)



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Dexcom Inc. G6 Continuous Glucose Monitoring System (G6 Transmitter) to the requirements of FCC Part 15 Subpart C §15.247 and RSS-247 Issue 2 February 2017.

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)	9445-02
FCC ID Number	PH29588
Serial Number(s)	8040ME (Conducted sample) 8041L6 (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 1, 2016).• RSS-247 Issue 2 February 2017 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.• RSS-Gen Issue 4 November 2014 – General Requirements for Compliance of Radio Apparatus.• 558074 D01 DTS Meas Guidance v04, (April 05, 2017) Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247• ANSI C63.10-2013. American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Start of Test	April 17, 2017
Finish of Test	April 17, 2017
Name of Engineer(s)	Alex Chang
Related Document(s)	None. 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 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(d)	Peak Output Power	Compliant	
2.2	§15.207(a)	RSS-Gen 8.8	Conducted Emissions	N/A	
2.3	—	RSS-Gen 6.6	99% Emission Bandwidth	Compliant	
2.4	§15.247(a)(2)	RSS-247 5.2(a)	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-Gen 8.9 and 8.10	Spurious Radiated Emissions	Compliant	
2.8	§15.247(e)	RSS-247 5.2(b)	Power Spectral Density for Digitally Modulated Device	Compliant	

N/A *Not performed. EUT is a battery powered device.*



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was an Dexcom Inc. G6 Continuous Glucose Monitoring System (G6 Transmitter) as shown in the photograph below. The Dexcom G6 Transmitter is a small body-worn device that is part of the G6 Continuous Glucose Monitoring (CGM) System. The G6 Transmitter interfaces with a glucose sensor and calculates a glucose level. The G6 Transmitter communicates every 5 minutes over a Bluetooth Low Energy wireless link with a G6 Receiver and/or a Smart Device with a Dexcom G6 CGM App. The G6 Transmitter is powered by a single lithium manganese dioxide non-rechargeable battery.



1.3.2 EUT General Description

EUT Description	G6 Continuous Glucose Monitoring System
Model Name	G6 Transmitter
Model Number(s)	9445-02
Rated Voltage	3 VDC (internal lithium manganese dioxide primary coin cell battery – Part number CR1632 from Maxell manufacturer)
Mode Verified	Bluetooth Low Energy (BT LE)
Capability	Bluetooth Low Energy (BT LE)
Primary Unit (EUT)	<input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
Antenna Type	SMD
Antenna Manufacturer	Antenova
Antenna Model Number	A10192
Antenna Dimensions	4.0mm x 3.0mm x 1.1mm
Antenna Gain	0.8 dBi (Peak) -1.9 dBi (Average)

1.3.3 Maximum Peak Conducted Output Power

Mode	Frequency Range (MHz)	Average Output Power (dBm)	Average Output Power (mW)
Bluetooth LE	2402-2480	0.40	1.09

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Test firmware loaded which allows the EUT to transmit at 100% duty cycle. A manual control on the EUT to set it transmit in Low, Mid and High channels for evaluation.

1.4.2 EUT Exercise Software

None. No special software was used to exercise the EUT. A firmware “SW11075 V1.0.0.0” was loaded during evaluation.

1.4.3 Support Equipment and I/O cables

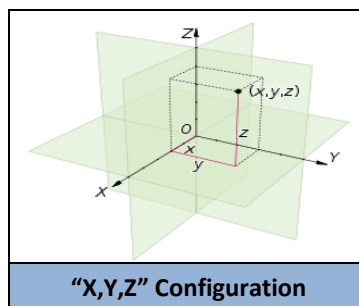
Manufacturer	Equipment/Cable	Description
—	—	—

1.4.4 Worst Case Configuration

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

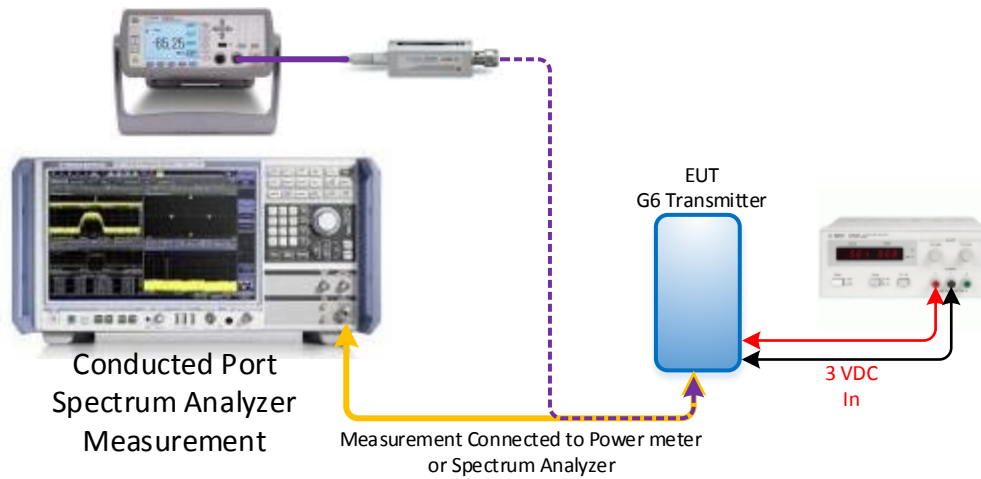
Mode	Channel	Data Rate
Bluetooth LE	Low Channel	1Mbps

EUT is a portable device. For radiated measurements, all three axes were verified to determine worst case axis to be used during testing. “X” axis was verified to be the worst axis for radiated emissions.



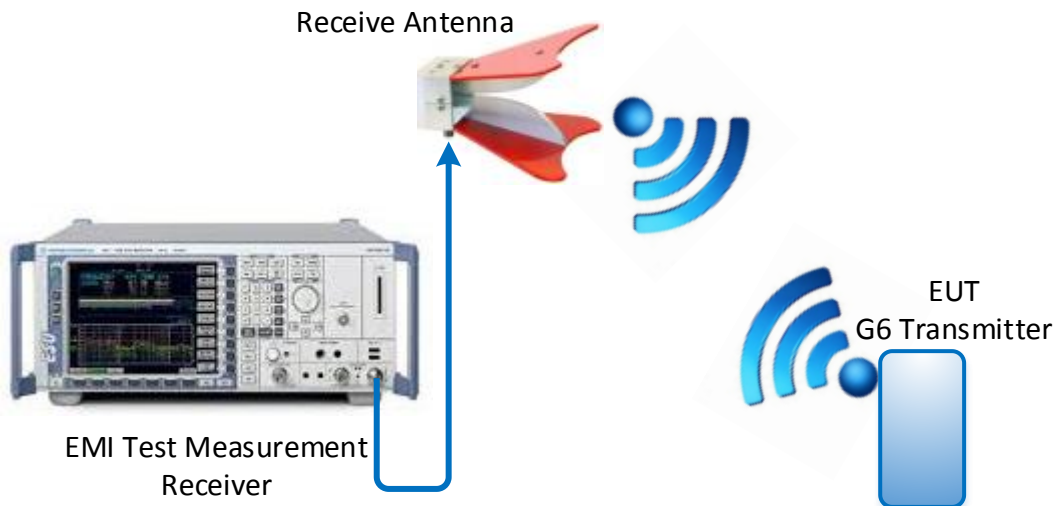
1.4.5 Simplified Test Configuration Diagram

Temporary Antenna Conducted Port Measurement Setup Configuration



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

Radiated Measurement Setup 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: 8040ME and 8041L6.		
None	—	—

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 C63.4-2014. 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)

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 (ISED) 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 (ISED) for radio equipment testing with Registration No. 3067A.



SECTION 2

TEST DETAILS

Radio Testing of the
Dexcom Inc.
G6 Continuous Glucose Monitoring System
(G6 Transmitter)



2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

Part 15 Subpart C §15.247(b)(3) and RSS-247 5.4(d)

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: 8040ME / Default Test Configuration

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

April 17, 2017 / AC

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	25.2 °C
Relative Humidity	40.9 %
ATM Pressure	99.5 kPa

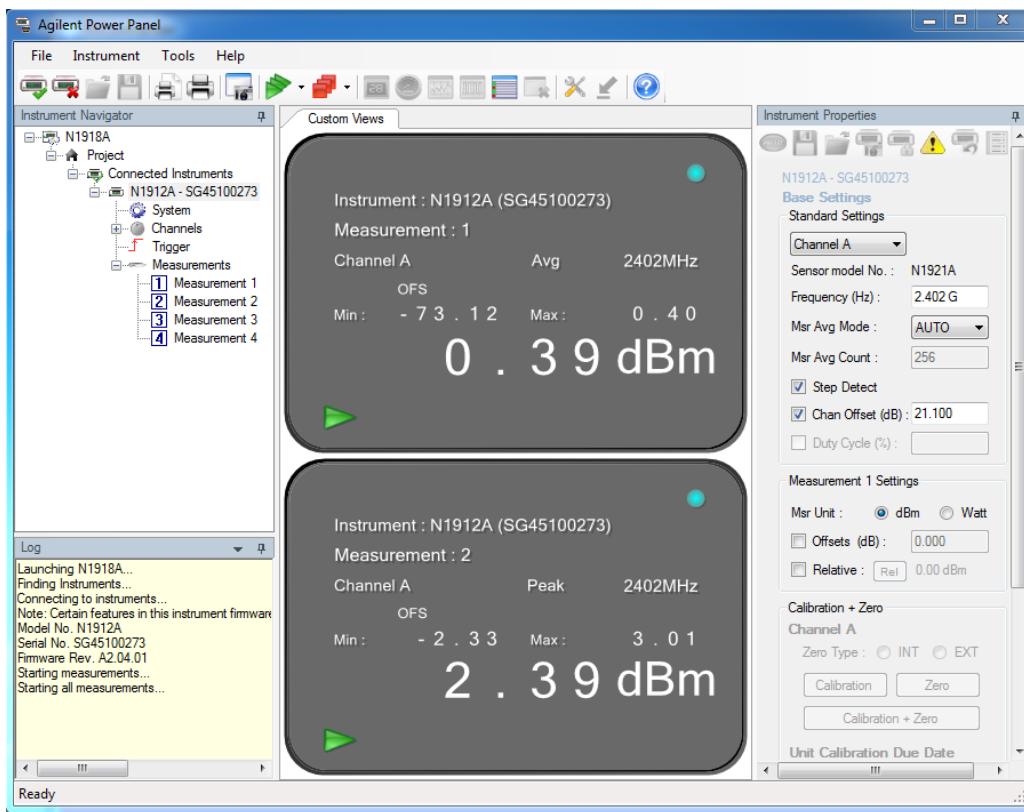
2.1.7 Additional Observations

- This is a conducted test (Maximum peak conducted output power) using direct connection to a power meter.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the power meter.
- Test methodology is per Clause 9.1.2 of KDB 558074 D01 DTS Meas Guidance v04 (April 05, 2017).
- Both Peak and Average measurements were recorded.

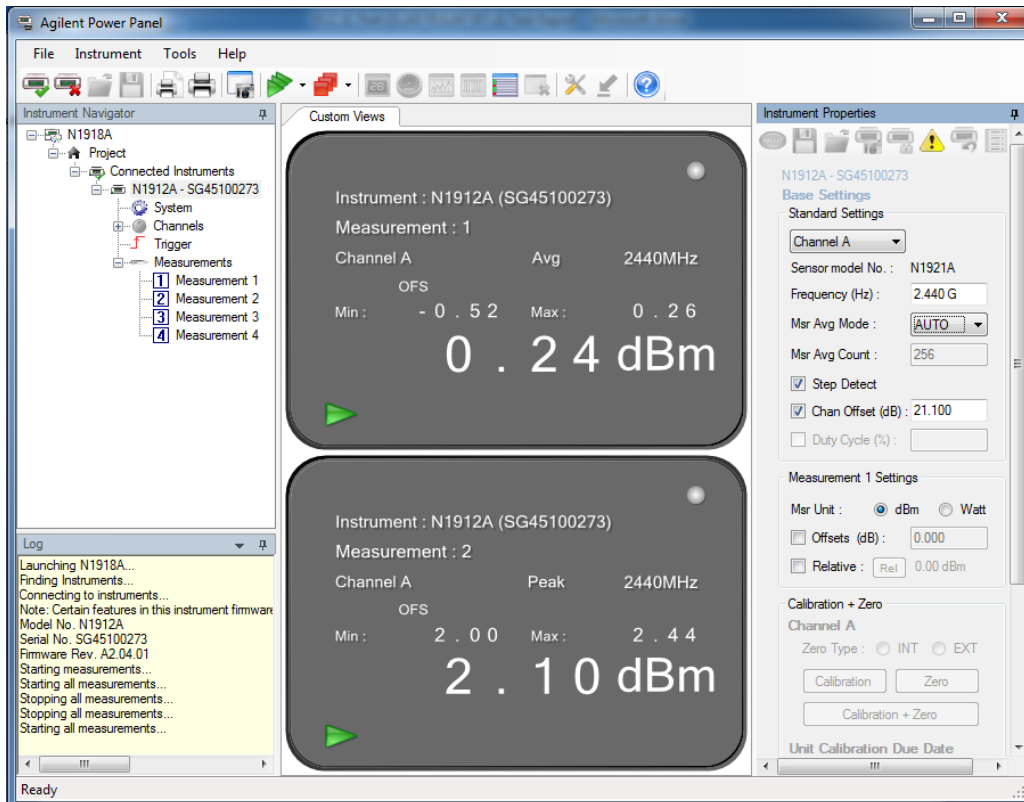
2.1.8 Test Results

Bluetooth Low Energy (LE)	Channel	Modulation	Measured Average Power (dBm)	Measured Peak Power (dBm)
	2402 MHz	GFSK	0.40	3.01
	2440 MHz		0.26	2.44
	2480 MHz		-0.24	2.24

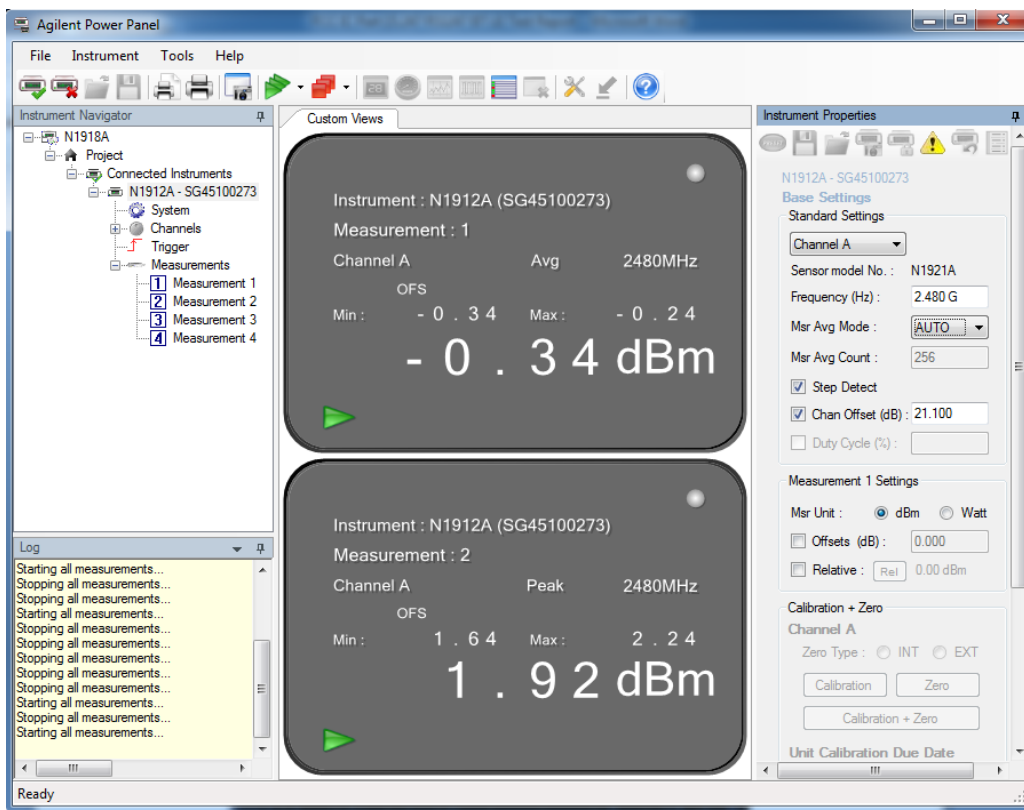
2.1.9 Test Plots



Bluetooth LE Low Channel



Bluetooth LE Mid Channel



Bluetooth LE High Channel



2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

Part 15 Subpart C §15.207(a) and RSS-Gen 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 μ H/50 ohms line impedance stabilization network (LISN).

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

**Decreases with the logarithm of the frequency.*

2.2.3 Equipment Under Test and Modification State

EUT is a battery powered device. Test not applicable.



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: 8040ME / Default Test Configuration

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

April 17, 2017 / AC

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	24.6 °C
Relative Humidity	43.8.%
ATM Pressure	99.3 kPa



2.3.7 Additional Observations

- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- The % Power Bandwidth setting in the spectrum analyzer was set to 99% (default).
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.

2.3.8 Test Results (For reporting purposes only)

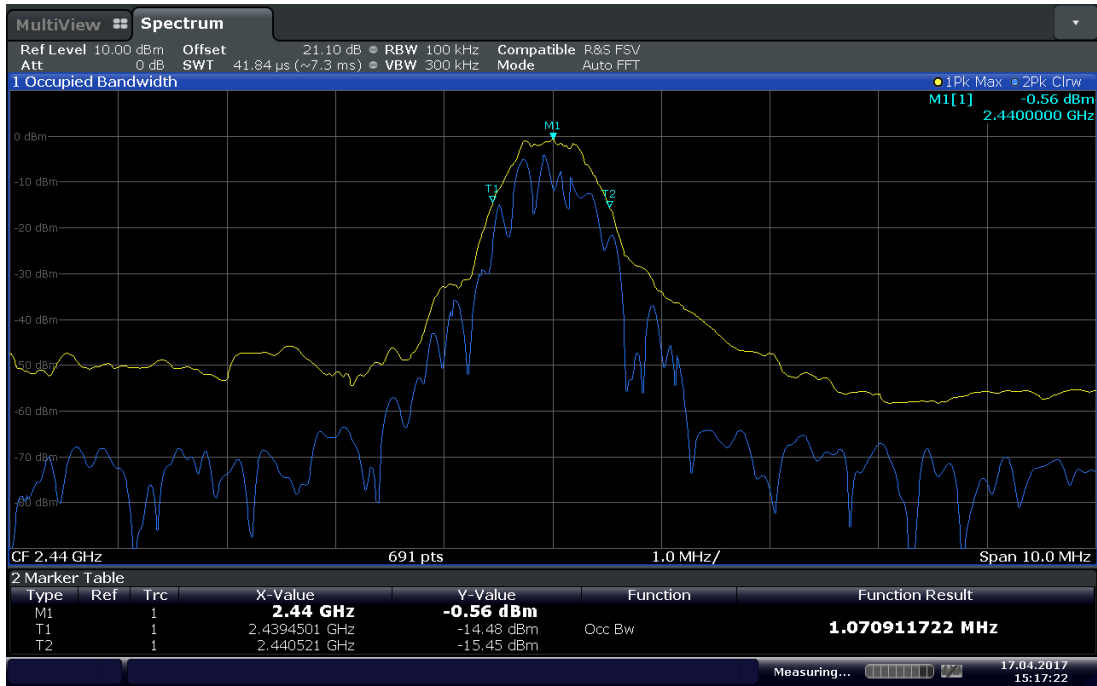
Mode	Channel	Measured 99% Bandwidth (MHz)
Bluetooth LE	2402 MHz	1.085
	2440 MHz	1.071
	2480 MHz	1.056

2.3.9 Test Results Plots



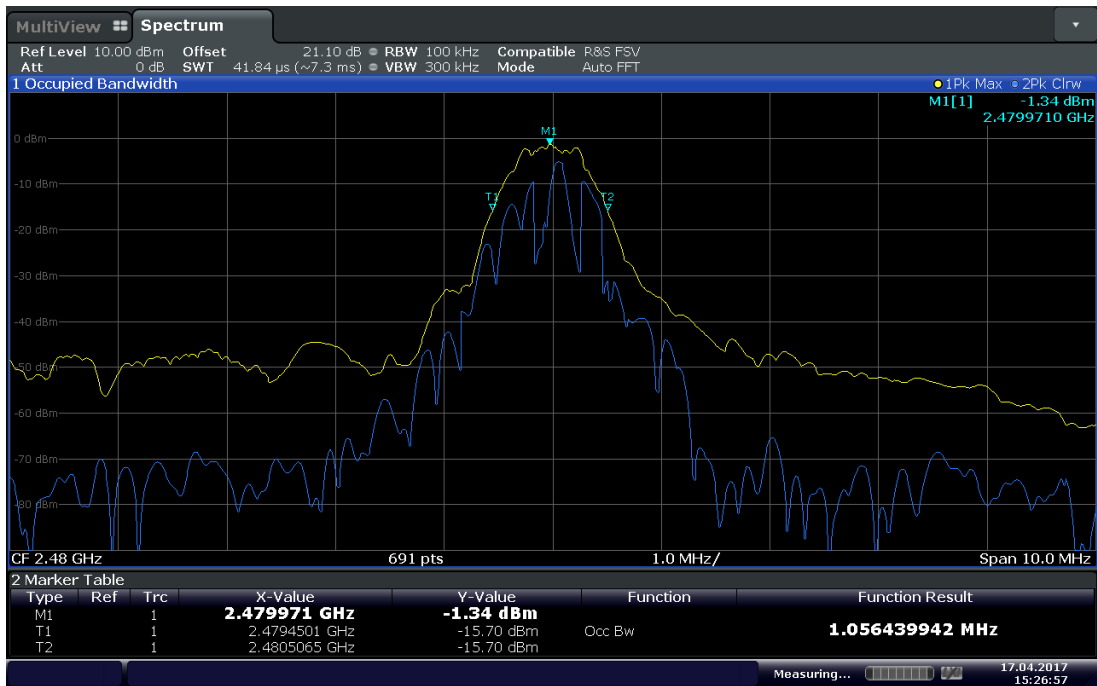
Date: 17.APR.2017 14:45:38

Bluetooth LE Low Channel



Date: 17.APR.2017 15:17:21

Bluetooth LE Mid Channel



Date: 17.APR.2017 15:26:56

Bluetooth LE High Channel



2.4 MINIMUM 6 dB RF BANDWIDTH

2.4.1 Specification Reference

Part 15 Subpart C §15.247(a)(2) and RSS-247 5.2(a)

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: 8040ME / Default Test Configuration

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

April 17, 2017 / AC

2.4.5 Test Equipment Used

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

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 24.6 °C
 Relative Humidity 43.8.%
 ATM Pressure 99.3 kPa

2.4.7 Additional Observations

- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- Span is wide enough to capture the channel transmission.
- RBW was set to 100 kHz while VBW is $\geq 3X$ RBW.
- Sweep is auto while Detector used is peak.
- The “n” dB down marker function of the spectrum analyzer was used for this test.

2.4.8 Test Results

Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
Bluetooth LE	2402 MHz	0.738	0.500	Complies
	2440 MHz	0.724	0.500	Complies
	2480 MHz	0.738	0.500	Complies

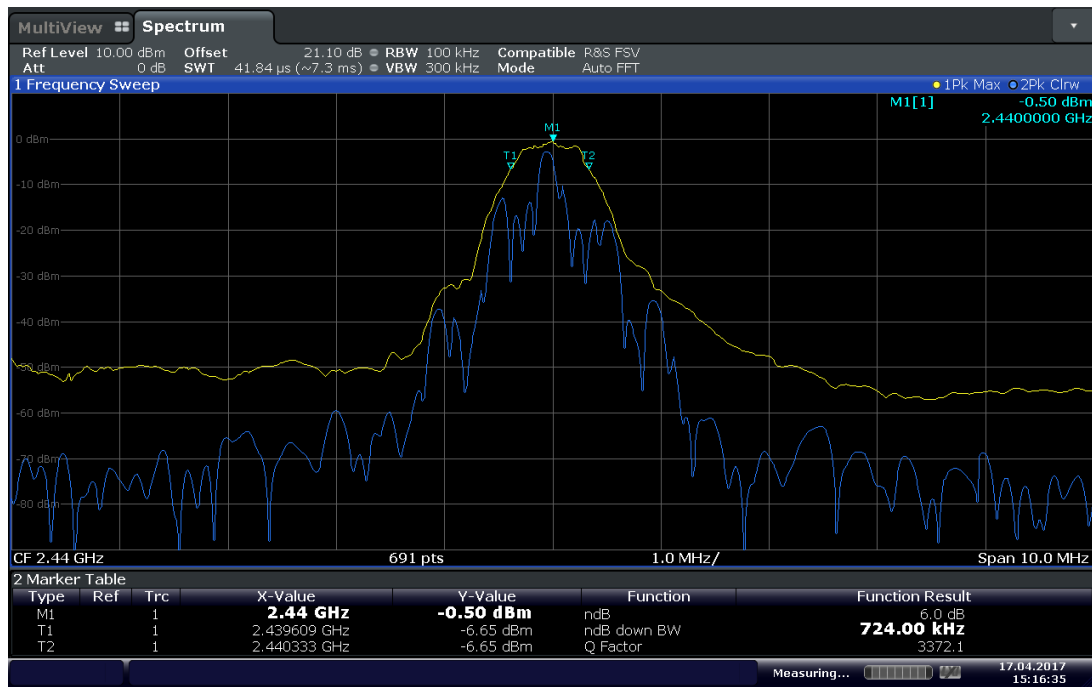


2.4.9 Test Results Plots



Date: 17.APR.2017 14:46:37

Bluetooth LE Low Channel



Date: 17.APR.2017 15:16:35

Bluetooth LE Mid Channel



Date: 17.APR.2017 15:27:35

Bluetooth LE High Channel



2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

2.5.1 Specification Reference

Part 15 Subpart C §15.247(d) and RSS-247 5.5

2.5.2 Standard Applicable

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

2.5.3 Equipment Under Test and Modification State

Serial No: 8040ME / Default Test Configuration

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

April 17, 2017 / AC

2.5.5 Test Equipment Used

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

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

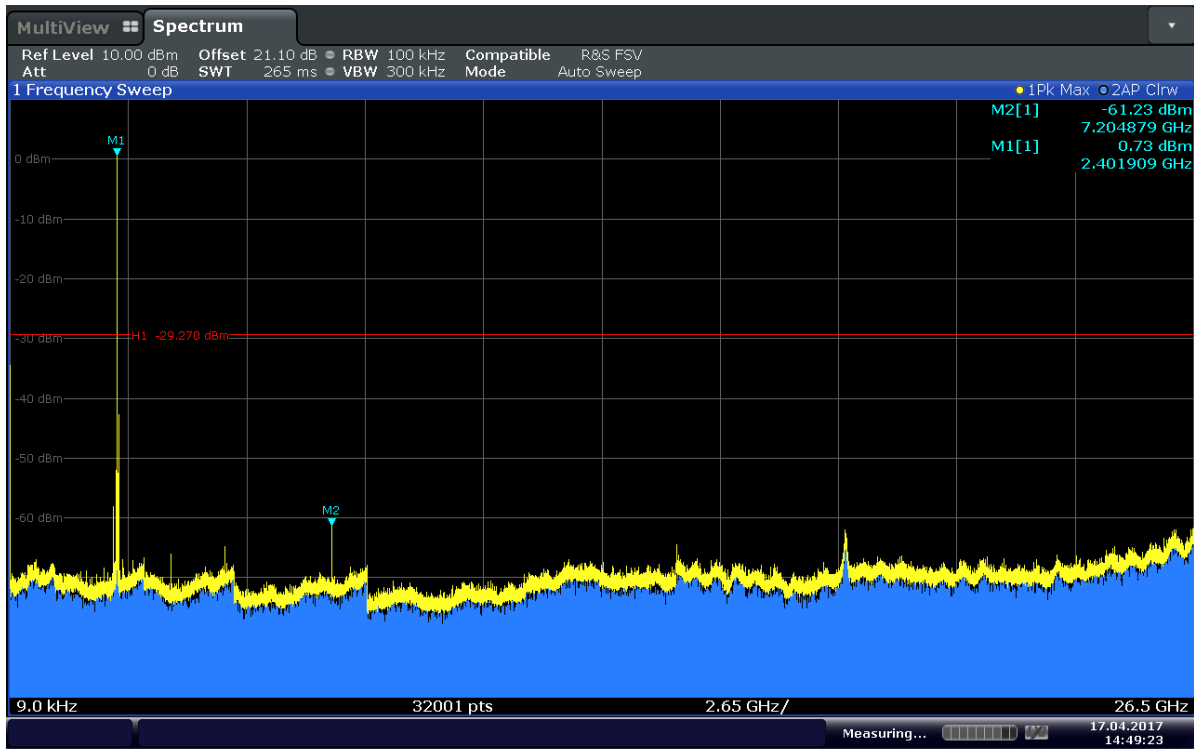
Ambient Temperature	24.6 °C
Relative Humidity	43.8.%
ATM Pressure	99.3 kPa

2.5.7 Additional Observations

- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- 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 (worst case).
- Spectrum was searched from 9 kHz up to 26.5GHz.

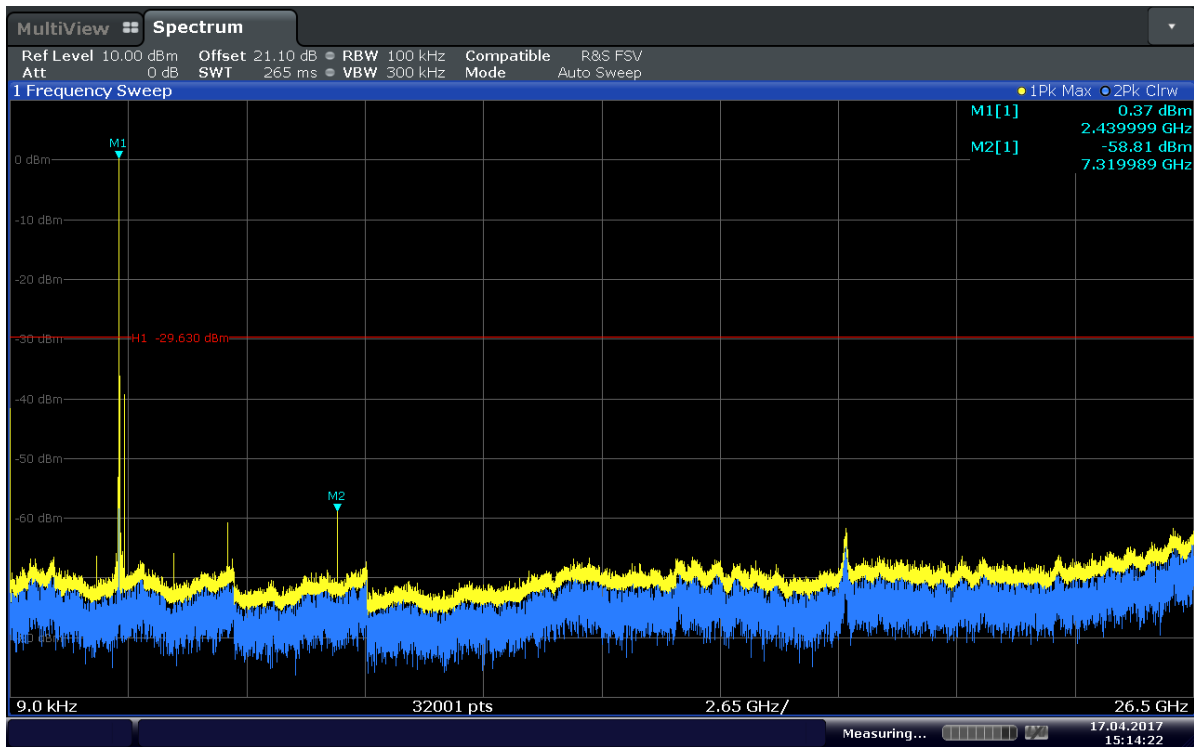


2.5.8 Test Results Plots



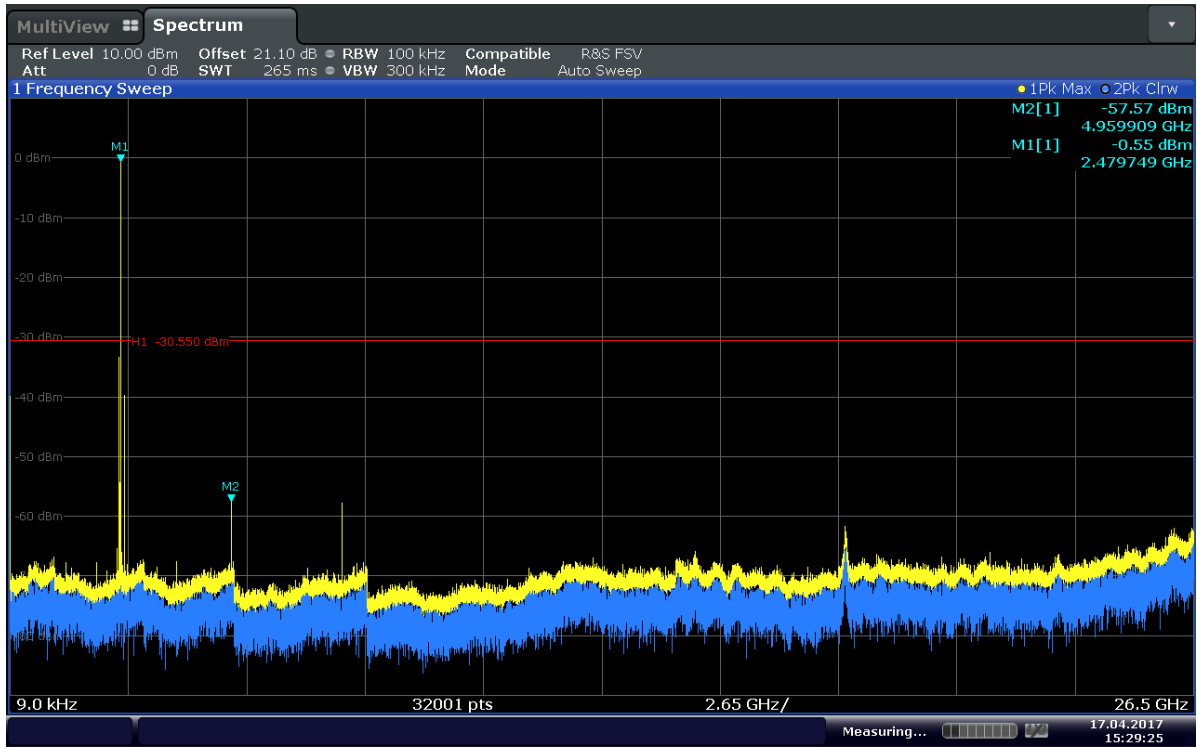
Date: 17.APR.2017 14:49:23

Bluetooth LE Low Channel



Date: 17.APR.2017 15:14:22

Bluetooth LE Mid Channel



Date: 17 APR 2017 15:29:24

Bluetooth LE High Channel



2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d) and RSS-247 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: 8040ME / Default Test Configuration

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

April 17, 2107 / AC

2.6.5 Test Equipment Used

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

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.6 °C
Relative Humidity	43.8.%
ATM Pressure	99.3 kPa

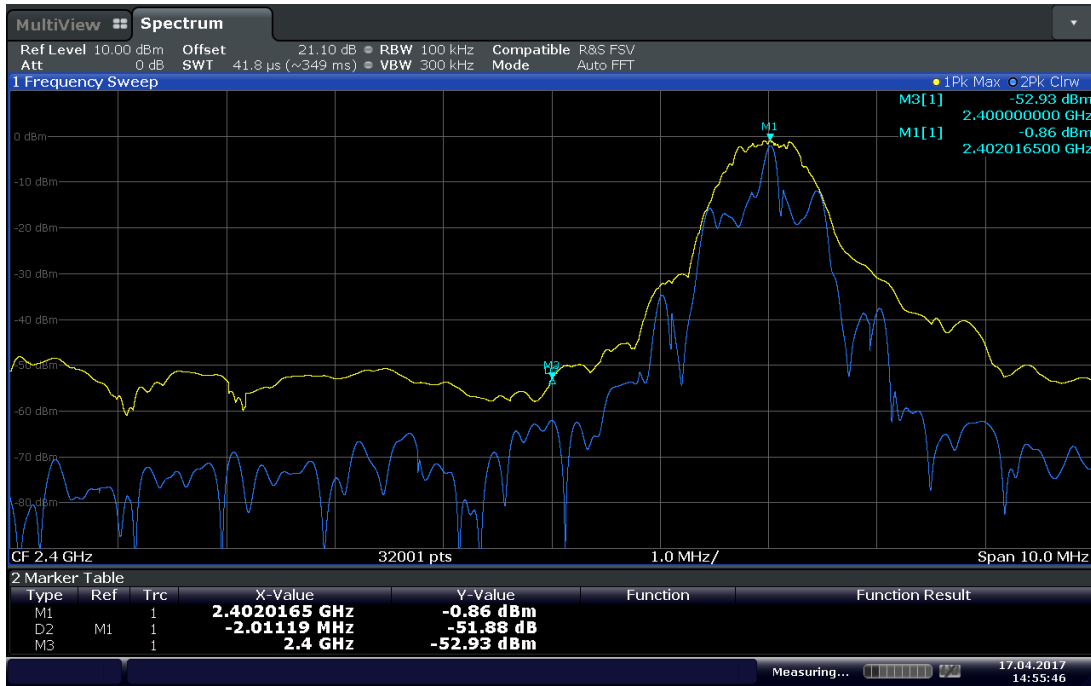
2.6.7 Additional Observations

- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- 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.



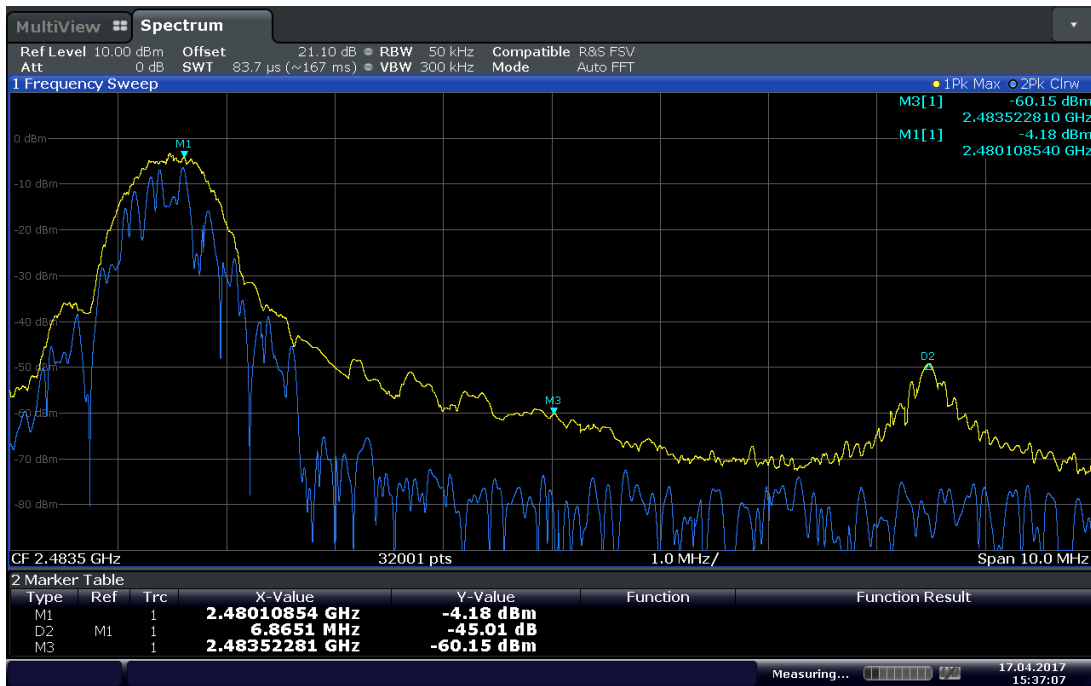
2.6.8 Test Results

Complies. See attached plots.



Date: 17. APR. 2017 14:55:46

Bluetooth LE Lower Band-edge

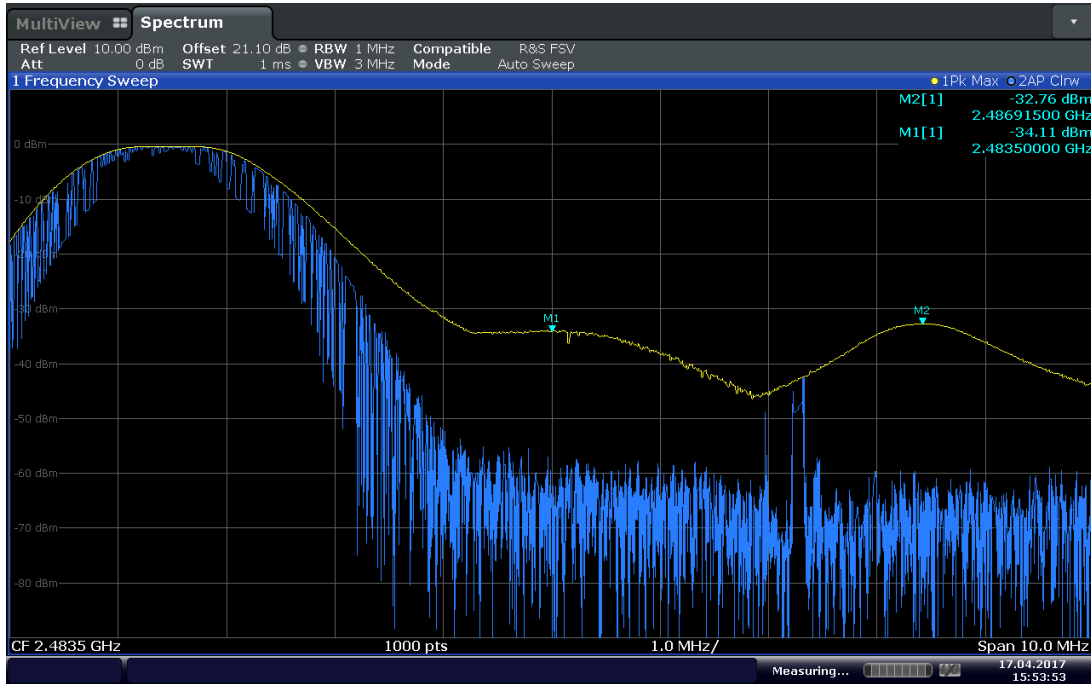


Date: 17. APR. 2017 15:37:07

Bluetooth LE Upper Band-edge



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



Date: 17.APR.2017 15:53:53

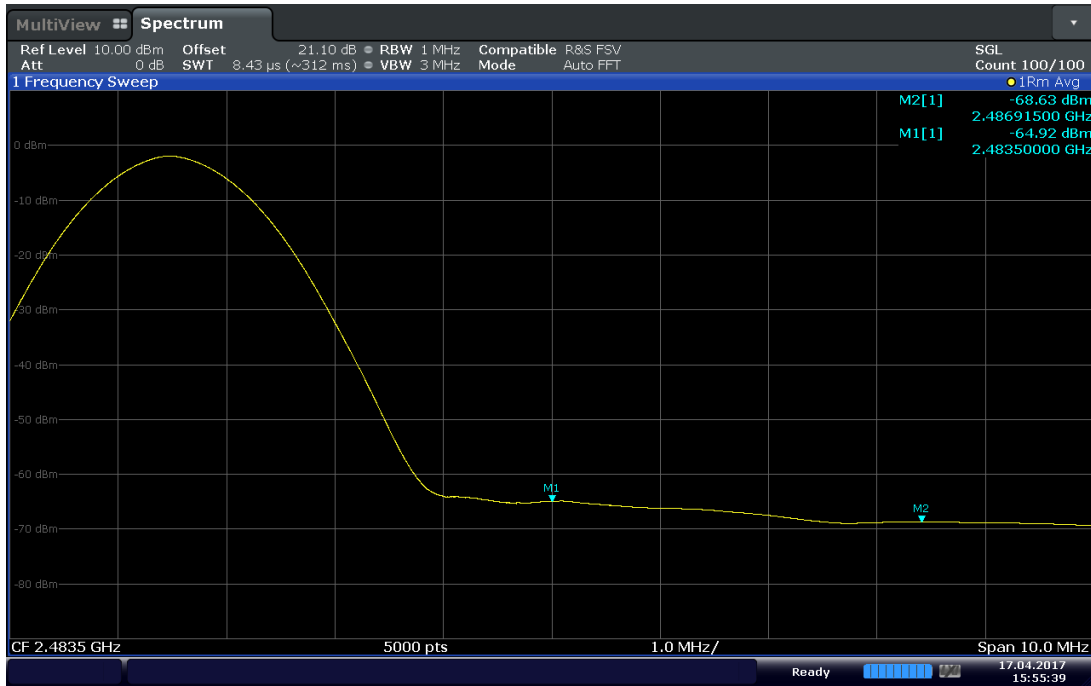
Upper Band Edge (in Restricted Band) measurement using Peak Power measurement procedure as per Clause 12.2.4 of KDB558074

$$\begin{aligned} \text{Measured Peak} &= -34.11 \text{ dBm} + \text{Antenna Gain (0.8dBi)} \\ &= -34.11 \text{ dBm} + 0.8 \text{ dBi} \\ &= -33.31 \text{ dBm (EIRP)} \end{aligned}$$

$$E = \text{EIRP} - 20\log D + 104.8$$

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

$$\begin{aligned} E \text{ is therefore} &= -33.31 \text{ dBm} - (20\log 3 \text{ meters}) + 104.8 \\ &= 61.95 \text{ dB}\mu\text{V/m @ 3 meters (Peak measurement complies with the limit of 74 dB}\mu\text{V/m)} \end{aligned}$$



Date: 17.APR.2017 15:55:39

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

$$\begin{aligned}
 \text{Measured Peak} &= -64.92 \text{ dBm} + \text{Antenna Gain } (-1.9\text{dBi}) \\
 &= -64.92 \text{ dBm} + (-1.9)\text{dBi} \\
 &= -66.82 \text{ dBm (EIRP)}
 \end{aligned}$$

$$E = \text{EIRP} - 20\log D + 104.8$$

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

$$\begin{aligned}
 E \text{ is therefore} &= -66.82 \text{ dBm} - (20\log 3 \text{ meters}) + 104.8 \\
 &= 28.44 \text{ dB}\mu\text{V/m @ 3 meters (Average measurement complies with the limit of 54 dB}\mu\text{V/m)}
 \end{aligned}$$



2.7 SPURIOUS RADIATED EMISSIONS

2.7.1 Specification Reference

Part 15 Subpart C §15.247(d) and RSS-Gen 8.9 and 8.10

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: 8041L6 / Default Test Configuration

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

April 17, 2017 / AC

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	25.8 °C
Relative Humidity	36.6 %
ATM Pressure	99.3 kPa

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 v04 (April 05, 2017).
- 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 channel presented. EUT has an integrated antenna and can't be terminated for this test (cabinet spurious emissions).



- 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)

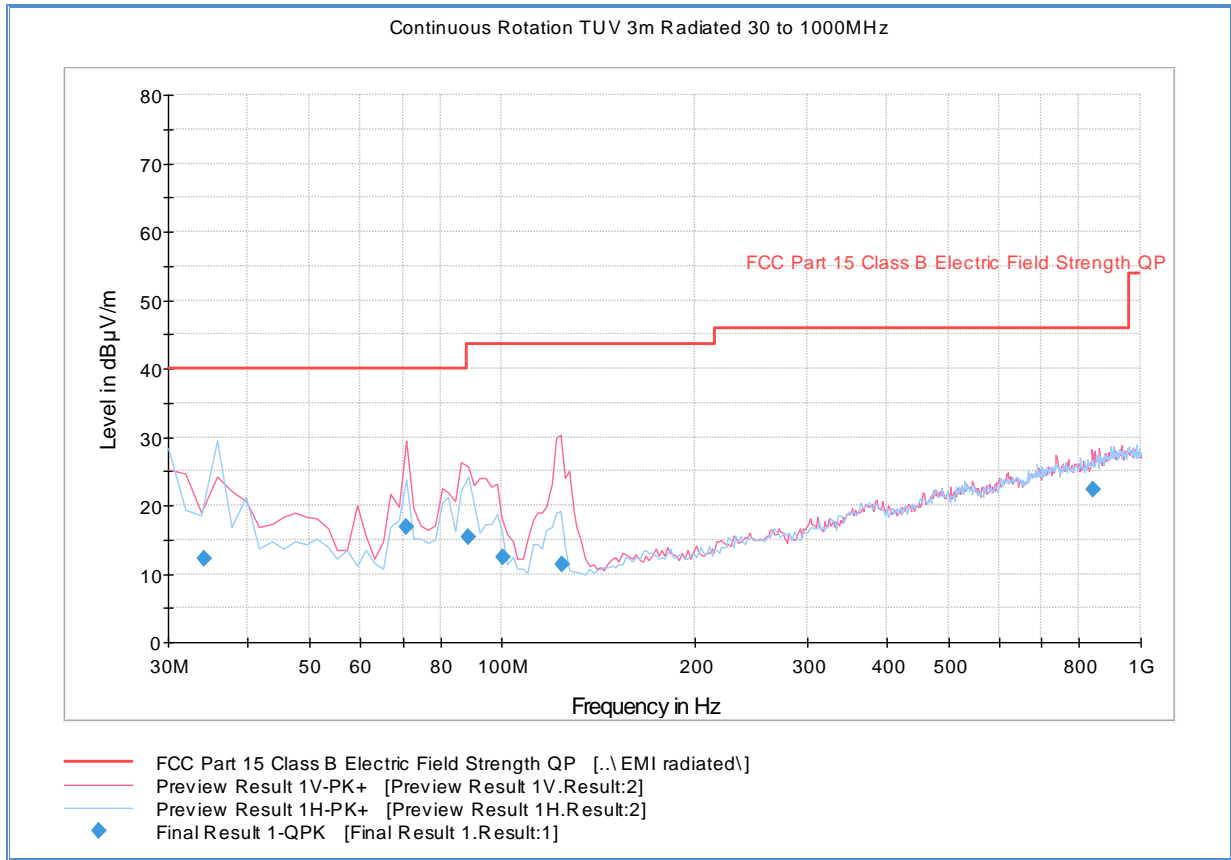
Measuring equipment raw measurement (db μ V) @ 30 MHz		24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3
	Asset# 1172 (cable)	0.3
	Asset# 1016 (preamplifier)	-30.7
	Asset# 1175(cable)	0.3
	Asset# 1002 (antenna)	17.2
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz		11.8

2.7.9 Test Results

See attached plots.



2.7.10 Test Results Below 1GHz (Worst Case Channel – Low Channel)



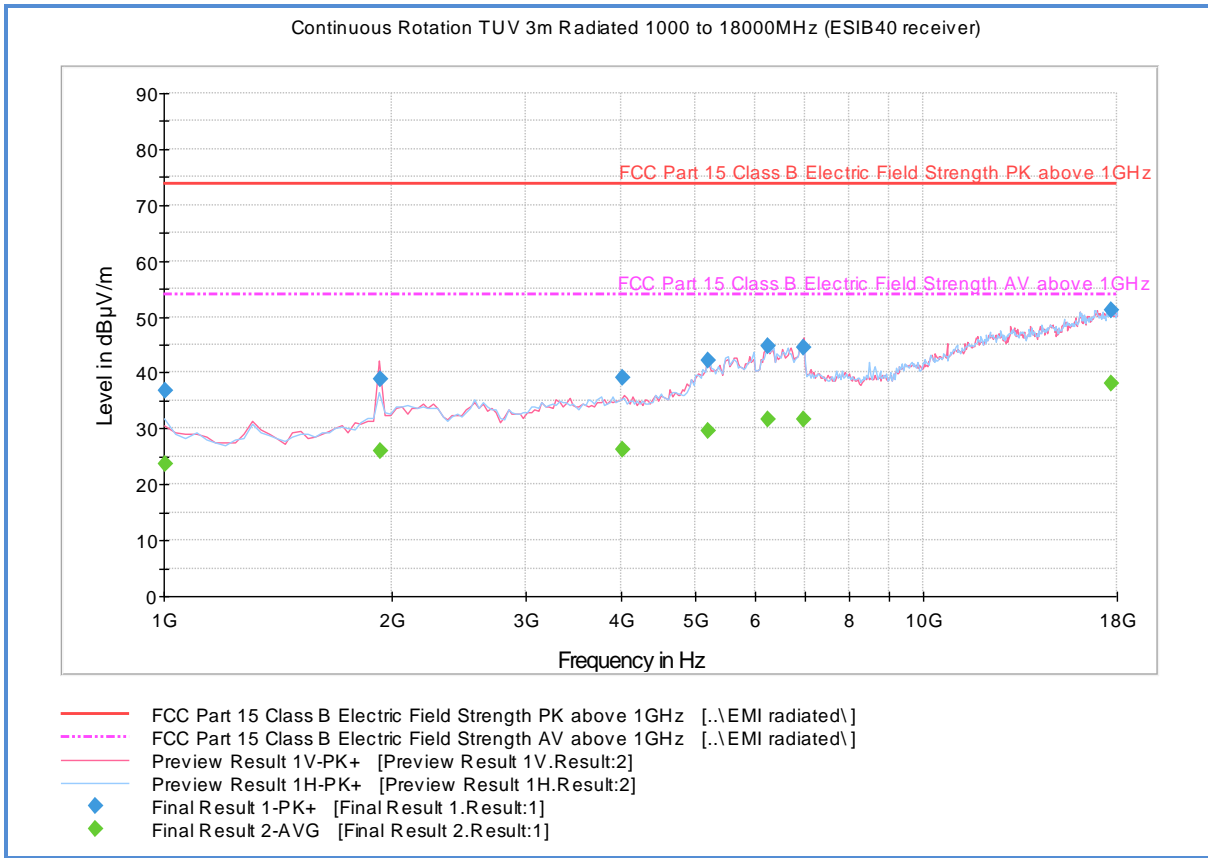
Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
34.191663	12.2	1000.0	120.000	400.0	H	55.0	-10.0	27.8	40.0
70.941643	16.9	1000.0	120.000	300.0	V	-12.0	-17.7	23.1	40.0
88.412745	15.4	1000.0	120.000	300.0	V	7.0	-17.0	28.1	43.5
100.276072	12.5	1000.0	120.000	127.0	V	3.0	-15.4	31.0	43.5
124.066613	11.4	1000.0	120.000	100.0	V	18.0	-16.8	32.1	43.5
840.497315	22.3	1000.0	120.000	225.0	V	115.0	4.3	23.7	46.0

Test Notes: Only worst case channel presented for cabinet spurious emissions.



2.7.11 Test Results Above 1GHz (Worst Case Channel – 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)
1002.900000	36.7	1000.0	1000.000	337.1	H	202.0	-7.4	37.2	73.9
1925.539679	38.8	1000.0	1000.000	271.3	V	76.0	-2.2	35.1	73.9
4025.364128	39.1	1000.0	1000.000	103.7	V	276.0	2.4	34.8	73.9
5219.348898	42.2	1000.0	1000.000	314.2	H	21.0	4.0	31.7	73.9
6244.192986	44.8	1000.0	1000.000	183.5	V	84.0	6.0	29.1	73.9
6962.023848	44.5	1000.0	1000.000	201.5	V	242.0	6.3	29.4	73.9
17693.086774	51.3	1000.0	1000.000	103.7	V	69.0	19.8	22.6	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)
1002.900000	23.8	1000.0	1000.000	337.1	H	202.0	-7.4	30.1	53.9
1925.539679	25.8	1000.0	1000.000	271.3	V	76.0	-2.2	28.1	53.9
4025.364128	26.2	1000.0	1000.000	103.7	V	276.0	2.4	27.7	53.9
5219.348898	29.5	1000.0	1000.000	314.2	H	21.0	4.0	24.4	53.9
6244.192986	31.7	1000.0	1000.000	183.5	V	84.0	6.0	22.2	53.9
6962.023848	31.6	1000.0	1000.000	201.5	V	242.0	6.3	22.3	53.9
17693.086774	38.2	1000.0	1000.000	103.7	V	69.0	19.8	15.7	53.9

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



2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

Part 15 Subpart C §15.247(e) and RSS-247 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: 8040ME / Default Test Configuration

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

April 17, 2017 / AC

2.8.5 Test Equipment Used

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

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.6 °C
Relative Humidity	43.8.%
ATM Pressure	99.3 kPa

2.8.7 Additional Observations

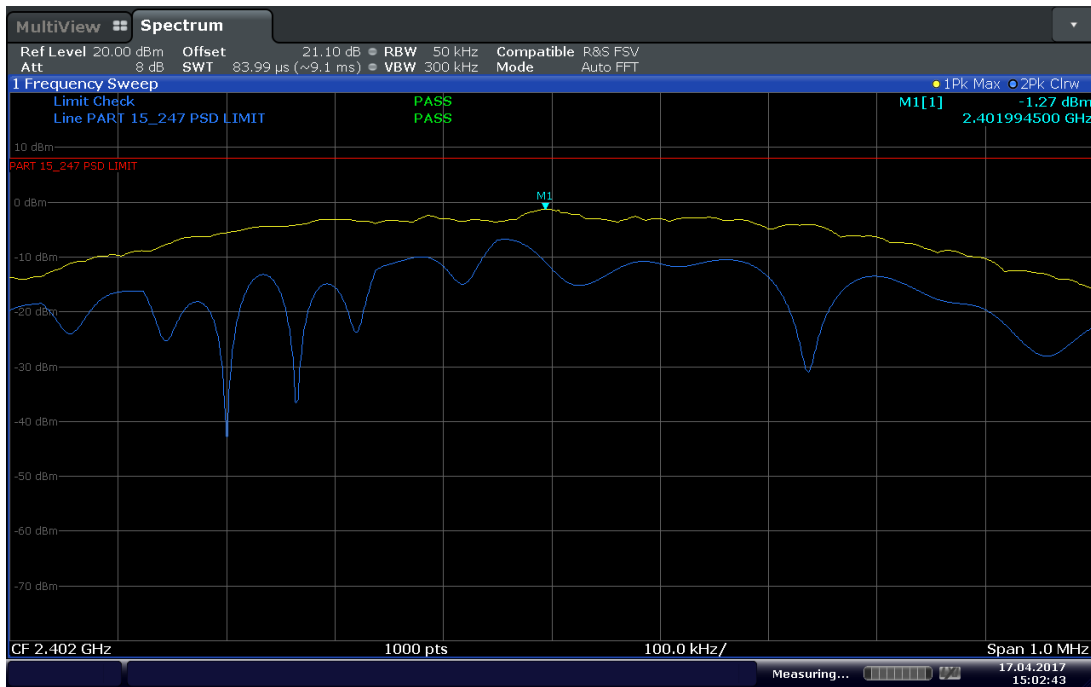
- This is a conducted test.
- Test procedure is per Section 10.2 of KDB 558074 D01 DTS Meas Guidance v04 (April 05, 2017).
- Span is 1.5 times the DTS bandwidth.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the spectrum analyzer.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- Set the VBW $\geq 3 \times \text{RBW}$
- Detector is Peak
- Sweep time is Auto Couple.
- Trace mode is max hold
- Trace allowed to fully stabilize.
- EUT complies with 50 kHz RBW.



2.8.8 Test Results Summary

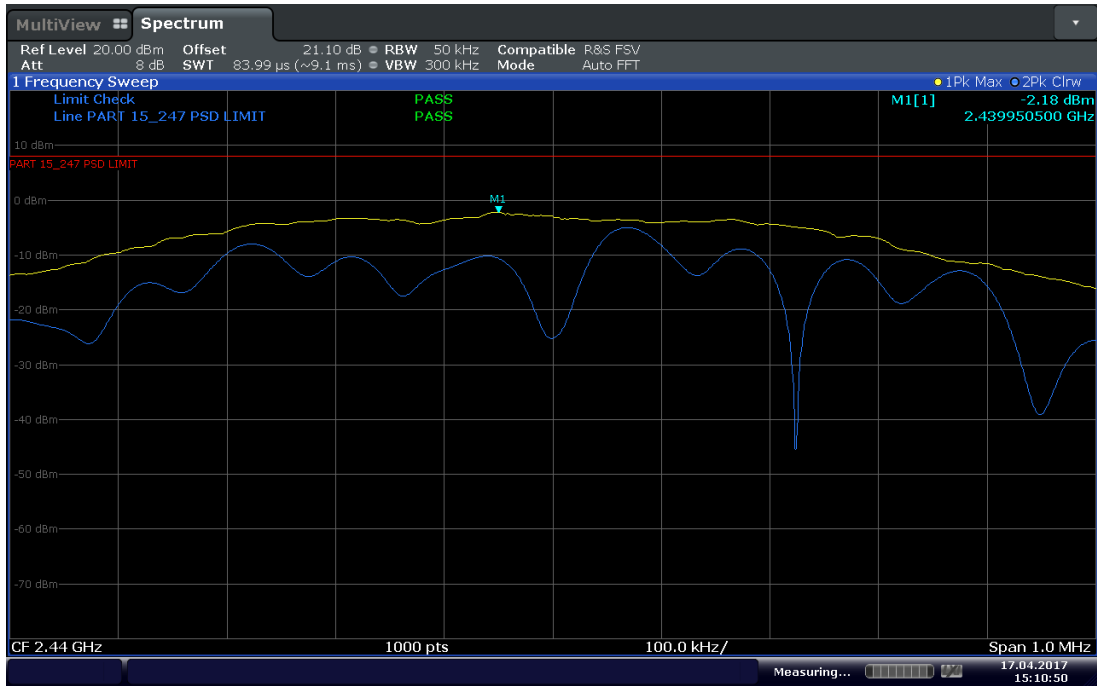
Mode	Channel	Marker Reading using 50 kHz RBW (dBm)	PSD Limit (dBm)	Margin (dB)	Compliance
Bluetooth LE	2402 MHz	-1.27	8	9.27	Complies
	2440 MHz	-2.18	8	10.18	Complies
	2480 MHz	-3.55	8	11.55	Complies

2.8.9 Test Results Plots



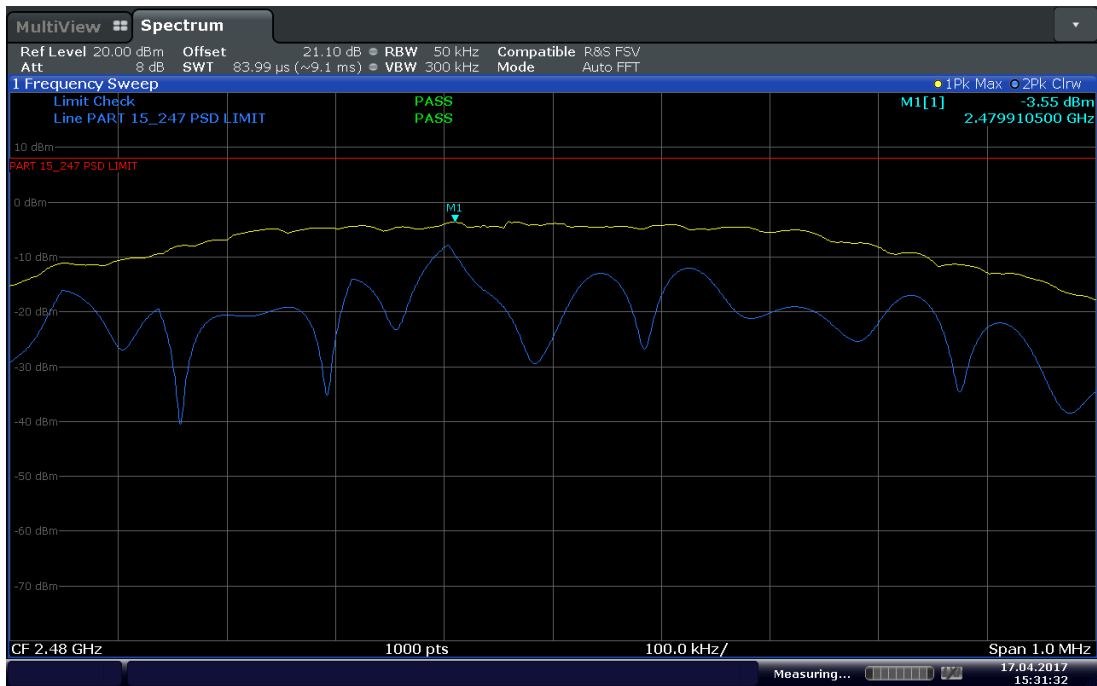
Date: 17.APR.2017 15:02:43

Bluetooth LE Low Channel



Date: 17.APR.2017 15:10:50

Bluetooth LE Mid Channel



Date: 17.APR.2017 15:31:32

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 Setup						
7604	P-Series Power Meter	N1912A	SG45100273	Agilent	07/27/16	07/27/17
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/26/16	10/26/17
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7582 and 7608	
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/02/16	09/02/17
Radiated Test Setup						
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/07/16	10/07/17
1033	Bilog Antenna	3142C	00044556	EMCO	10/11/16	10/11/18
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	05/12/16	05/12/17
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	02/09/17	02/09/18
1016	Pre-amplifier	PAM-0202	187	PAM	02/09/17	02/09/18
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1040	
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/29/16	08/29/17
1123	DC Power Supply	E3631A	N/A	Hewlett Packard	Verified by 6592	
7619	Barometer/Temperature/Humidity Transmitter	iBTHX-W	15250268	Omega	12/21/16	12/21/17
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	



3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 Radiated 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	3.52	1.44	2.07
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.68
Coverage Factor (k):					2
Expanded Uncertainty:					3.36

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	3.00	1.22	1.50
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.49
Coverage Factor (k):					2
Expanded Uncertainty:					2.99

3.2.3 Conducted Antenna Port Measurement

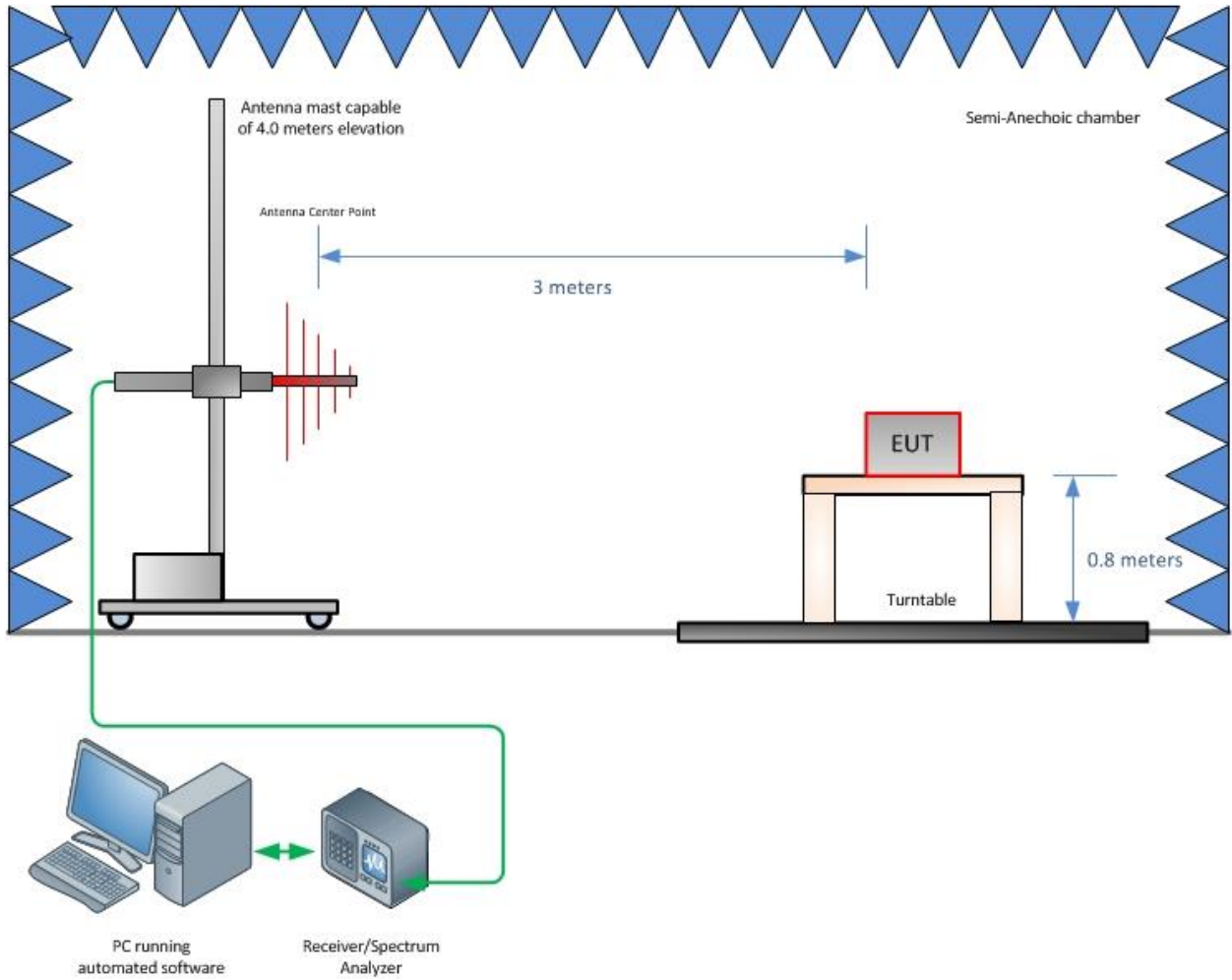
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.08	0.05	0.00
2	Cables	Rectangular	0.30	0.17	0.03
3	EUT Setup	Rectangular	0.50	0.29	0.08
Combined Uncertainty (u_c):					0.34
Coverage Factor (k):					1.96
Expanded Uncertainty:					0.67



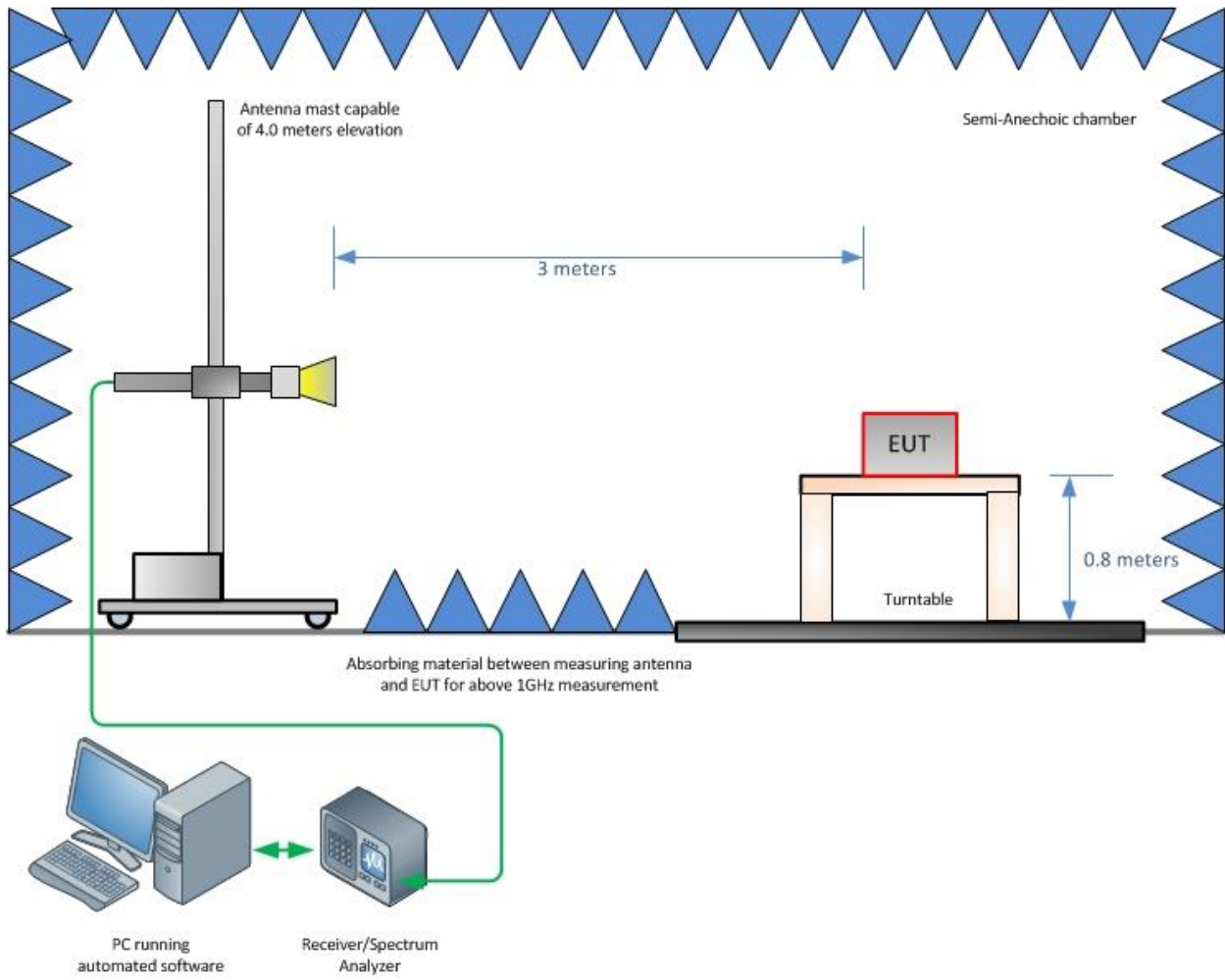
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and TÜV SÜD America, Inc., extracts from the test report shall not be reproduced, except in full without TÜV SÜD America, Inc.'s written approval.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

TÜV SÜD America, Inc. and its professional staff hold government and professional organization certifications for AAMI, ACIL, AEA, ANSI, IEEE, A2LA, NIST and VCCI.



A2LA Cert. No. 2955.13

