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TEST REPORT

Report Number: 16070823HKG-003

Application
for
Original Grant of 47 CFR Part 15 Certification

Bluetooth Speaker

FCC ID: VIXAWSHRTLD

Prepared and Checked by:

Signed on File
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Testing Services
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Assistant Supervisor
August 28, 2016

GENERAL INFORMATION

Applicant Name:	Voxx Accessories Corporation
Applicant Address:	3502 Woodview Trace, Suite 220 Indianapolis, IN 46268 USA
Contact Person:	Milan Phillabaum
FCC Specification Standard:	FCC Part 15, 2014 Edition
FCC ID:	VIXAWSHRTLD
FCC Model(s):	AWSHRTLD
Type of EUT:	2.4GHz Frequency Hopping Spread Spectrum Transmitter
Description of EUT:	Bluetooth Speaker
Serial Number:	N/A
Sample Receipt Date:	July 14, 2016
Date of Test:	July 14, 2016 to August 26, 2016
Report Date:	August 28, 2016
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

Table of Contents

1.0 Test Results Summary & Statement of Compliance 4
1.1 Summary of Test Results 4
1.2 Statement of Compliance 4

2.0 General Description 6
2.1 Product Description 6
2.2 Test Methodology 6
2.3 Test Facility 6

3.0 System Test Configuration 8
3.1 Justification 8
3.2 EUT Exercising Software 9
3.3 Details of EUT and Description of Accessories 10
3.4 Measurement Uncertainty 10

4.0 Test Results 12
4.1 Maximum Conducted (peak) Output Power at Antenna Terminals 12
4.2 Maximum 20 dB RF Bandwidth 15
4.3 Minimum Number of Hopping Frequencies 18
4.4 Minimum Hopping Channel Carrier Frequency Separation 21
4.5 Average Channel Occupancy Time 23
4.6 Out of Band Conducted Emissions 26
4.7 Field Strength Calculation 31
4.8 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions 32
4.8.1 Radiated Emission Configuration Photograph 33
4.8.2 Radiated Emission Data 33
4.8.3 Transmitter Duty Cycle Calculation 39
4.9 AC Power Line Conducted Emission 40
4.9.1 AC Power Line Conducted Emission Configuration Photograph 40
4.9.2 AC Power Line Conducted Emission Data 40

5.0 Equipment List 45

EXHIBIT 1
TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

1.0 Test Results Summary & Statement of Compliance

1.1 Summary of Test Results

Test Items	FCC Part 15 Section	Results	Details see section
Antenna Requirement	15.203	Pass	2.1
Max. Conducted Output Power	15.247(b)(1)	Pass	4.1
Max. 20dB RF Bandwidth	15.247(a)(1)(iii)	Pass	4.2
Min. No. of Hopping Frequencies	15.247(a)(1)(iii)	Pass	4.3
Min. Hopping Channel Carrier Frequency Separation	15.247(a)(1)	Pass	4.4
Average Time of Occupancy	15.247(a)(1)(iii)	Pass	4.5
Out of Band Antenna Conducted Emission	15.247(d)	Pass	4.6
Radiated Emission in Restricted Bands and Spurious Emissions	15.247(d) & 15.109	Pass	4.8
AC Power Line Conducted Emission	15.207 & 15.107	Pass	4.9

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

1.2 Statement of Compliance

The equipment under test is found to be complying with the following standards:

FCC Part 15, 2014 Edition

EXHIBIT 2
GENERAL DESCRIPTION

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Bluetooth Speaker which equips a 2.4GHz Frequency Hopping Spread Spectrum Transceiver (Bluetooth 2.1). It operates at frequency range of 2402MHz to 2480MHz. There are total 79 channels with 1MHz channel spacing. The EUT can accept analog audio (AUX-in) and wireless audio when paired with a Bluetooth devices. The audio signal is amplified and driving internal loudspeaker. The EUT is powered by a 3.7V internal rechargeable battery. The internal battery can be charged via USB port. USB charging cable is supplied in the final product for end-user. But no AC/DC adaptor will be included in the product package.

Model: AWSHRTLD may come in color variations but are electrically and mechanically the same. The only difference is the color.

The antenna used in the EUT is integral, integrated.

The circuit description and frequency hopping algorithm are saved with filename: descri.pdf.

2.2 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in Open Area Test Sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and FCC Public Notice DA 00-705 (30-Mar-2000).

2.3 Test Facility

The radiated emission test site and antenna port conducted measurement facility used to collect the radiated data and conductive data are at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

EXHIBIT 3
SYSTEM TEST CONFIGURATION

3.0 **System Test Configuration**

3.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit / receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT can be powered by internal battery (3.7VDC) and/or USB port (5VDC). The powering conditions: EUT standalone (Internal battery only), USB port powered by Notebook and USB port powered by AC/DC adaptor (adaptor provided by applicant) had been considered. Two types of internal battery supplied by applicant were tested (Great Power ICR18650 2200mAh and TongLi Yuan CLICR18650C-2200mAh). Only data of worse case condition (charging internal battery Great Power ICR18650 2200mAh by USB port that powered by Notebook) is presented in this report.

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable. If the base unit attached to peripherals, they were connected and operational (as typical as possible). The parent unit was remotely located as far from the antenna and the base as possible to ensure full power transmission from the baby unit. Else, the base was wired to transmit full power with modulation.

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For any intentional radiator powered by AC power line, measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

For transmitter radiated measurement, the spectrum analyzer resolution bandwidth was 100 kHz for frequencies below 1000 MHz. The resolution bandwidth was 1 MHz for frequencies above 1000 MHz.

Radiated emission measurement for transmitter were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.1 Justification - Cont'd

Emission that are directly caused by digital circuits in the transmit path and transmitter portion were measured, and the limit are according to FCC Part 15 Section 15.209. Digital circuitries used to control additional functions other than the operation of the transmitter are subject to FCC Part 15 Section 15.109Limits.

Detector function for radiated emissions was in peak mode. Average readings, when required, were taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.8.3.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF.* The effective period (Teff) was referred to Exhibit 4.8.3. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

For AC line conducted emission test, the EUT along with its peripherals were placed on a 1.0m(W)x1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

All setting of data rate for Bluetooth mode had been considered, and worst case test data are shown on this test report.

3.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

3.3 Details of EUT and Description of Accessories

Details of EUT:

(1) The EUT is powered by 3.7VDC and/or USB port (5VDC)

Description of Accessories:

1. AC/DC Adaptor (Model: TPKB00500200-A0)
2. USB cable of 1m long
   (Provided by applicant)
3. HP Notebook Computer
4. LAN cable of 2m long
   (Provided by Intertek)

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test at a level of confidence of 95% has been considered. The values of the Measurement uncertainty for radiated emission test and RF conducted measurement test are ± 5.3dB and ±0.99dB respectively. The value of the Measurement uncertainty for conducted emission test is ±4.2dB.

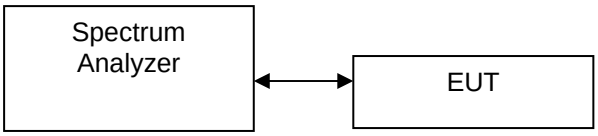
Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

EXHIBIT 4
TEST RESULTS

4.0 **Test Results**

RF Conduct measurement Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

☐ The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

☒ The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW>20dB bandwidth and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyser.

Antenna Gain = 0dBi			
Frequency (MHz)		Output in dBm	Output in mW
Low Channel:	2402	-0.76	0.84
Middle Channel:	2442	-1.95	0.64
High Channel:	2480	-1.98	0.63

Cable loss: 0.5 dB External Attenuation: 0 dB

Cable loss, external attenuation: ☒ included in OFFSET function
☐ added to SA raw reading

dBm max. output level = -0.76 dBm (0.84mW)

Limits:
☒ 0.125W (21dBm) for antennas with gains of 6dBi or less

☐ 0.25W (24dBm) for antennas with gains of 6dBi or less

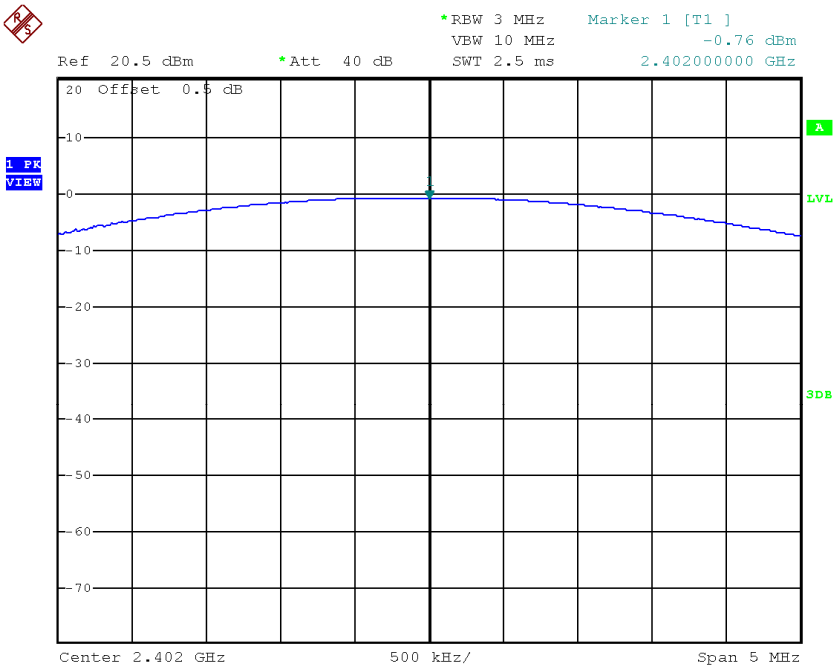
☐ 1W (30dBm) for antennas with gains of 6dBi or less

☐ ___W (___dBm) for antennas with gains more than 6dBi

The plots of conducted output power are saved as below.

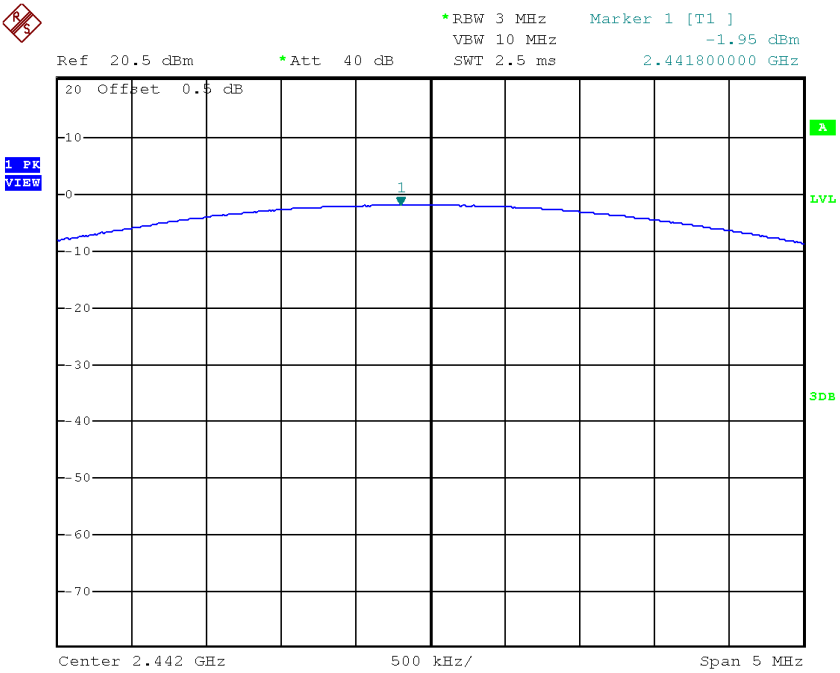
Plots of conducted output power

Lowest Channel



Date: 8.AUG.2016 09:18:47

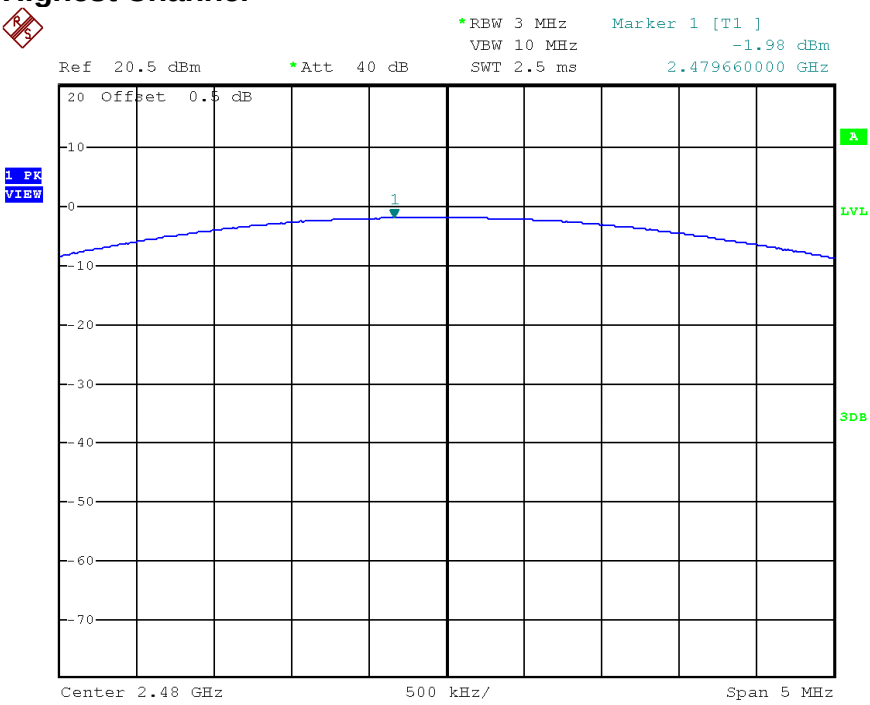
Middle Channel



Date: 8.AUG.2016 09:16:51

Plots of conducted output power

Highest Channel



Date: 8.AUG.2016 09:17:56

4.2 Maximum 20 dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)		20 dB Bandwidth (kHz)
Low Channel:	2402	1050
Middle Channel:	2442	1044
High Channel:	2480	1050

Limits

☐ ≤500kHz for 902-928MHz

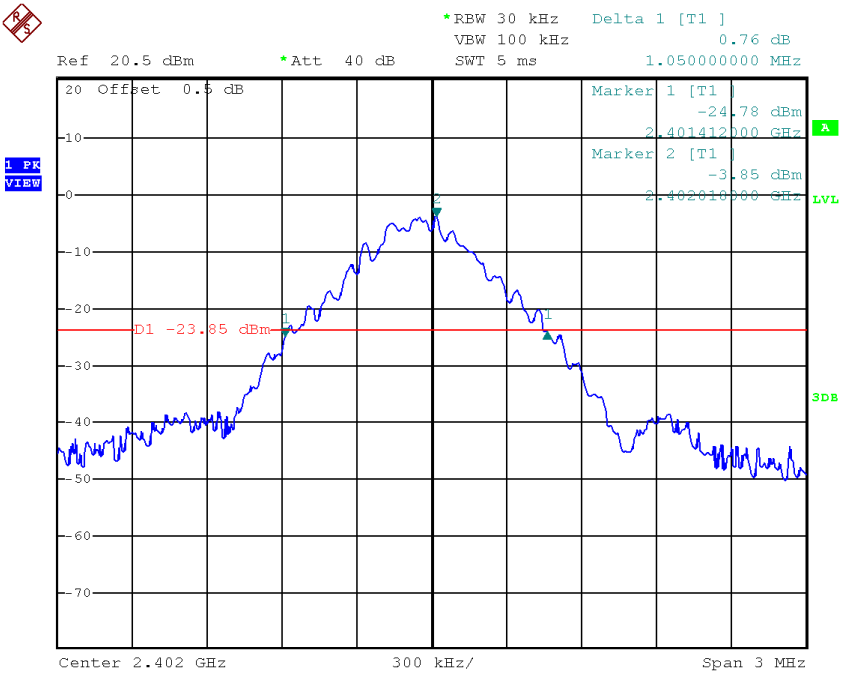
☒ N/A for 2400-2483.5MHz

☐ ≤1MHz for 5725-5850MHz

The plots of 20dB RF bandwidth and occupied bandwidth are saved as below.

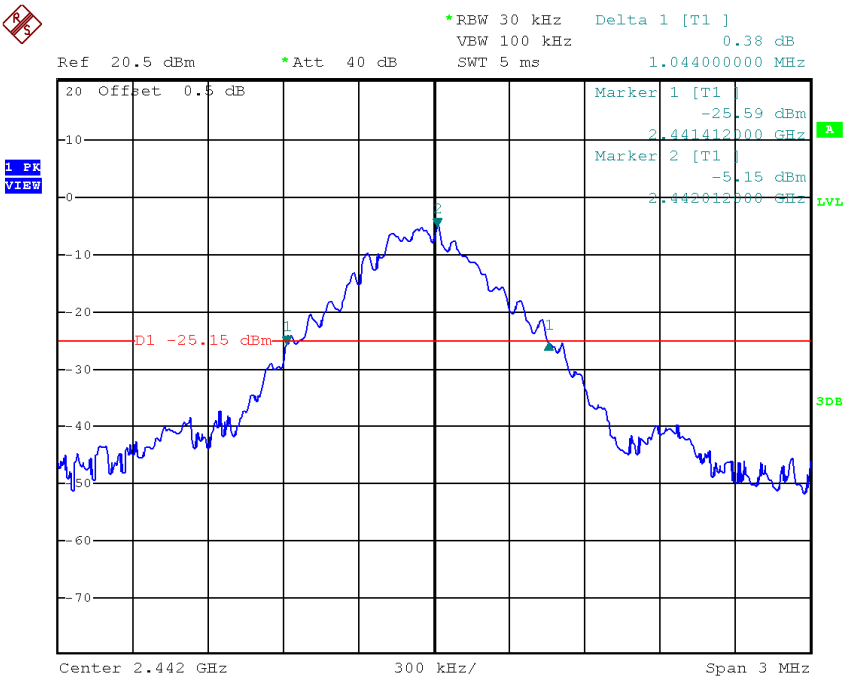
Plots of 20dB RF bandwidth

Lowest Channel



Date: 8.AUG.2016 09:39:49

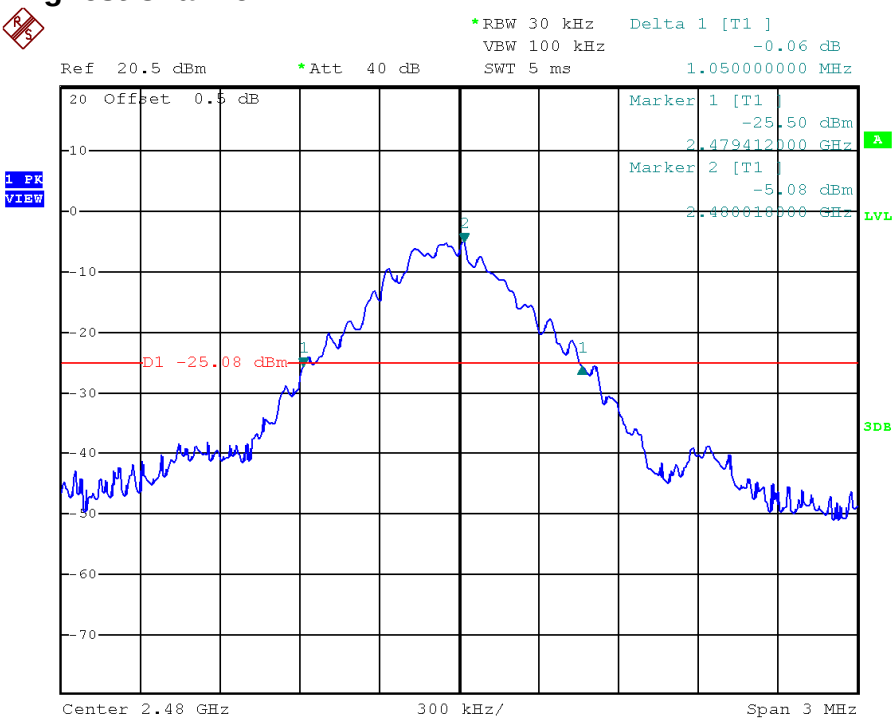
Middle Channel



Date: 8.AUG.2016 09:36:08

Plots of 20dB RF bandwidth

Highest Channel



Date: 8.AUG.2016 09:32:27

4.3 Minimum Number of Hopping Frequencies

With the analyzer set to MAX HOLD readings were taken for 2-3 minutes in each band. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

No. of hopping channels	79

Minimum Requirements:

☐ at least 50 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel < 250kHz)

☐ at least 25 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel ≥ 250kHz)

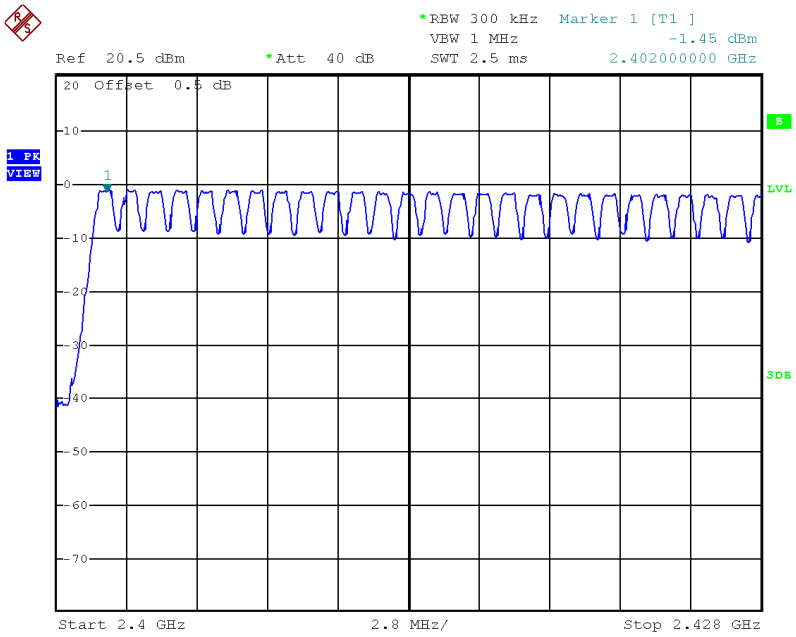
☒ at least 15 hopping channels for 2400MHz-2483.5MHz.

☐ at least 75 hopping channels for 5725MHz-5850MHz.

The plots of number of hopping frequencies are saved as below.

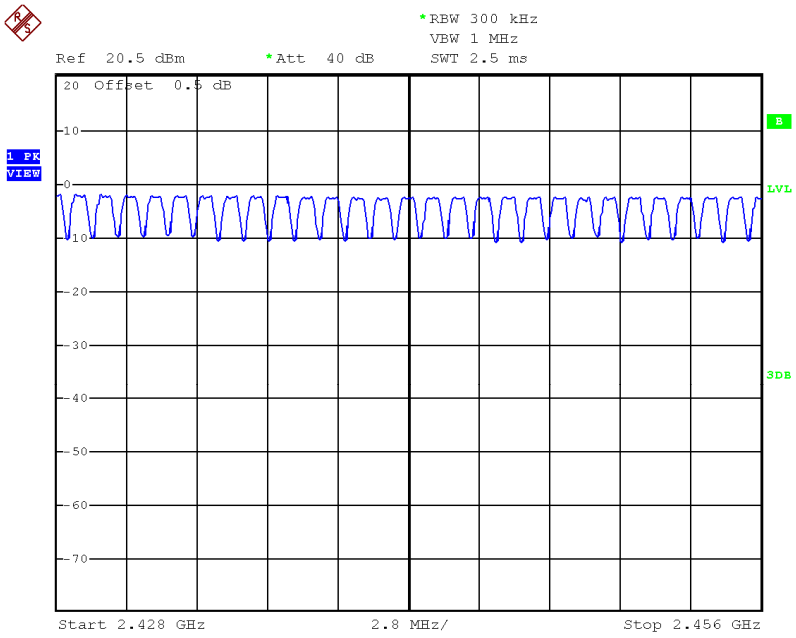
Plots of number of hopping frequencies

Lowest Channel



Date: 8.AUG.2016 09:43:35

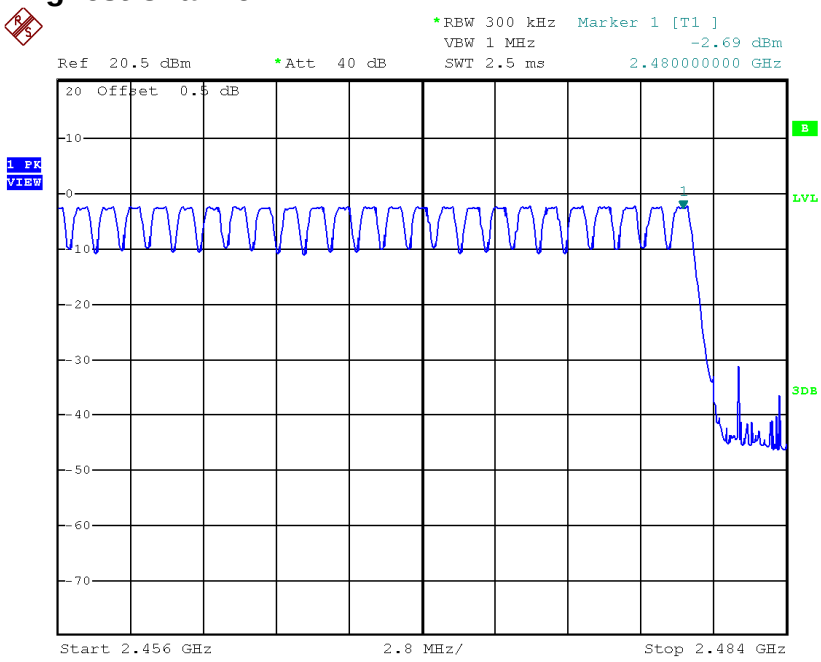
Middle Channel



Date: 8.AUG.2016 09:44:46

Plots of number of hopping frequencies

Highest Channel



Date: 8.AUG.2016 09:46:08

4.4 Minimum Hopping Channel Carrier Frequency Separation

Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and met the requirement.

Channel Separation (Channel 40 and Channel 41)	1000 kHz

Limits:
The channel separation must be larger than:

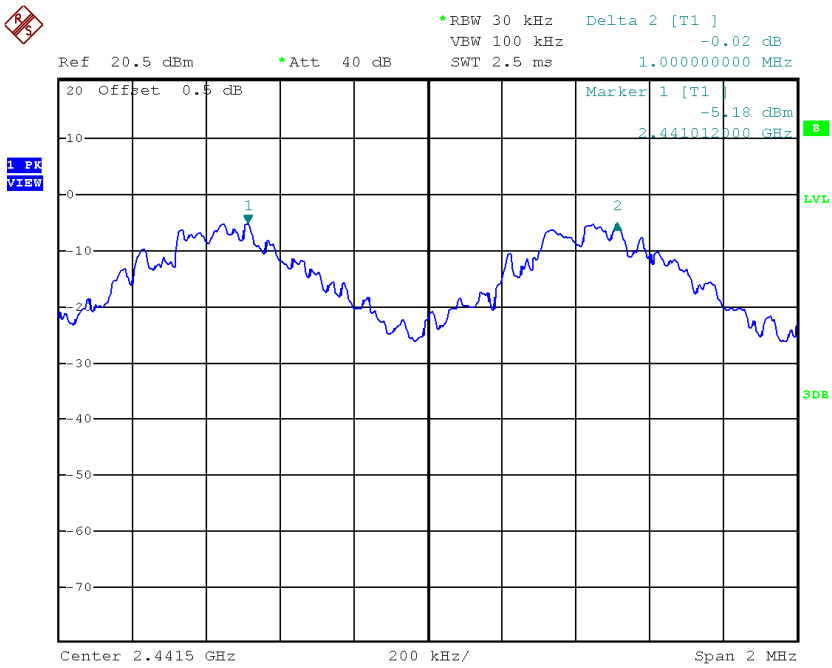
☐ 25 kHz

☐ 20 dB bandwidth of hopping channel: ___Hz

☒ 2/3 of 20dB bandwidth of hopping channel: 700kHz

The plot(s) of hopping channel carrier frequency separation is saved as below.

Plots of hopping channel carrier frequency separation



Date: 8.AUG.2016 09:56:44

4.5 Average Channel Occupancy Time

The spectrum analyzer center frequency was set to one of the known hopping channels. The SWEEP was set to 10ms, the SPAN was set to ZERO SPAN, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

The SWEEP was then set to the time required by the regulation (20 seconds for 902-928 MHz devices, if the 20dB bandwidth is less than 250kHz, 10 seconds for 902-928 MHz if the 20dB bandwidth is or greater than 250kHz, "0.4 seconds x Number of hopping channels employed" seconds for 2400-2483.5 MHz, 30 seconds for 5725-5850 MHz). The analyzer was set to SINGLE SWEEP, the total ON time was added and compared against the limit (0.4 seconds).

Average Occupancy Time	
Number of hops in 3.16s = 11 Total number of hops in 31.6s = 11 X 10 = 110 Single pulse width = 2.94ms Average Occupancy Time = 2.94ms X 110	Average Occupancy Time = 0.3234s

Limits:
Average 0.4 seconds maximum occupancy in:

☒ 31.6 seconds (0.4 sec. x 79) for 2400MHz-2483.5MHz

☐ 20 seconds for 902MHz-928MHz ≥ 50 hopping channels

☐ 10 seconds for 902MHz-928MHz ≥ 25 hopping channels

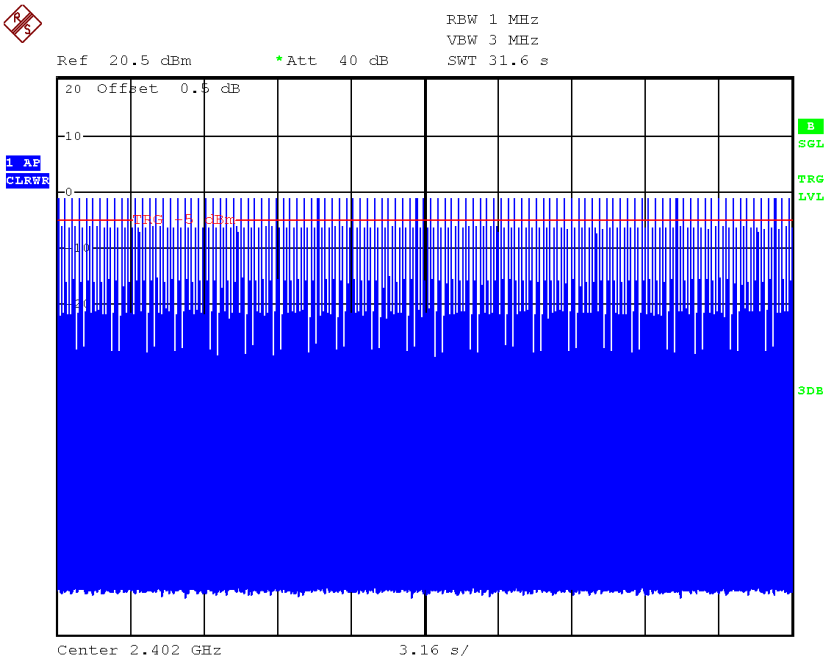
☐ 30 seconds for 5725-5850MHz

The plots of average channel occupancy time are saved as below.

Plots of average channel occupancy time

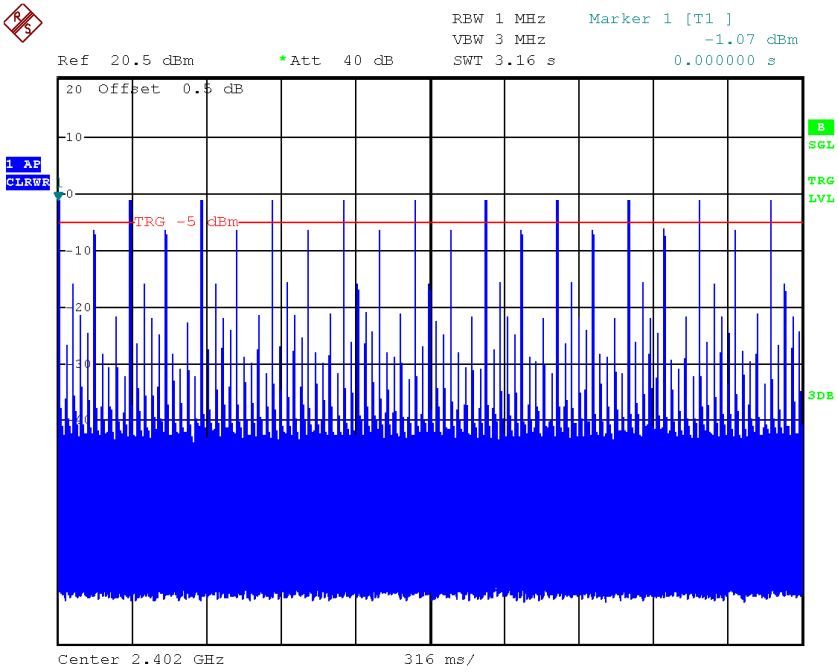
(hopping mode)

Plot A



Date: 8.AUG.2016 10:18:02

Plot B

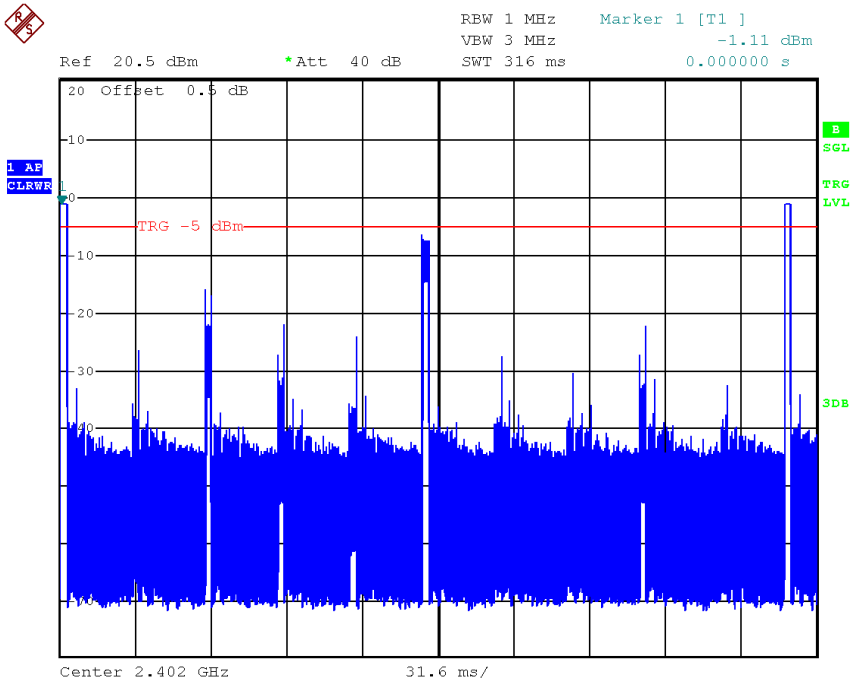


Date: 8.AUG.2016 10:19:42

Plots of average channel occupancy time

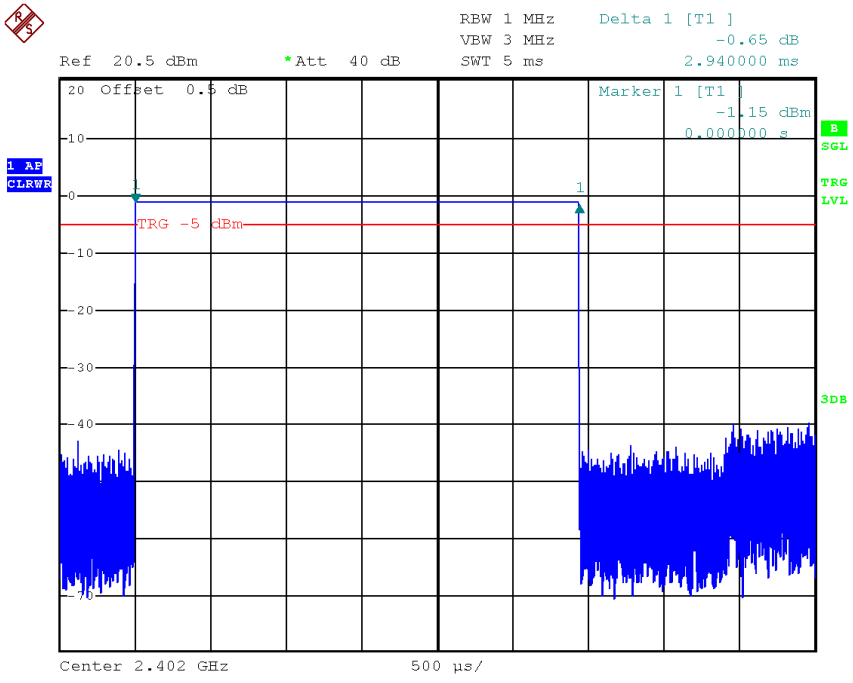
(hopping mode)

Plot C



Date: 8.AUG.2016 10:20:45

Plot D



Date: 8.AUG.2016 10:11:14

4.6 Out of Band Conducted Emissions

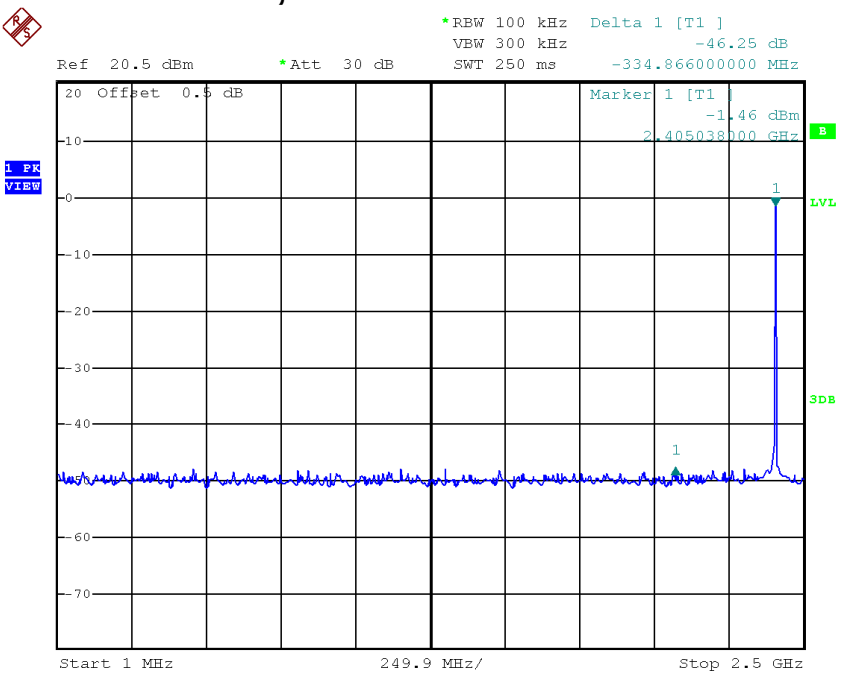
In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

The plot(s) of bandedge compliance is shown the worst-case which has been already considered between enable and disable the hopping function of the EUT.

Limits:
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

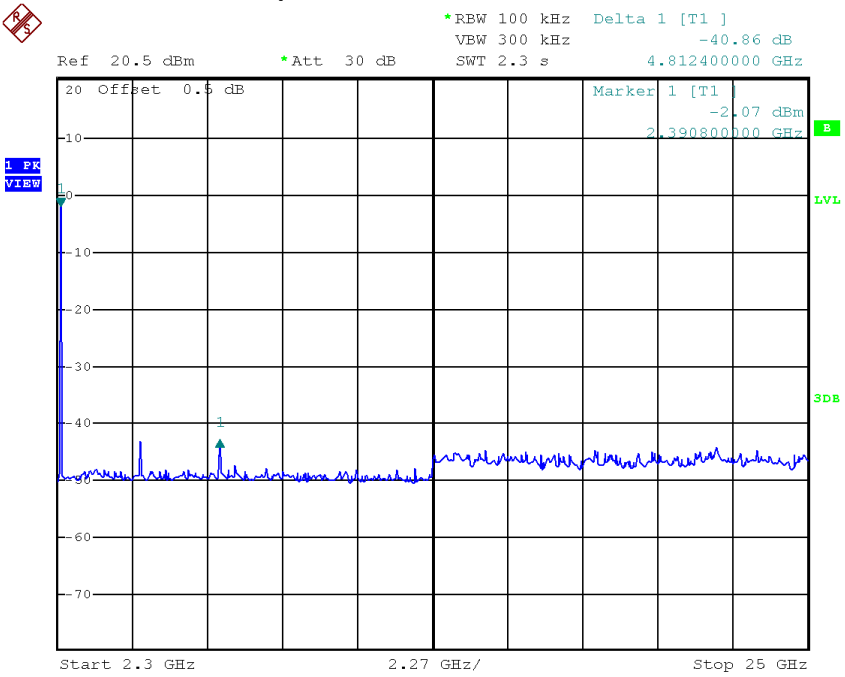
The plots of out of band conducted emissions and bandedge are saved as below.

Plots of out of band conducted emissions
Lowest channel, Plot 1



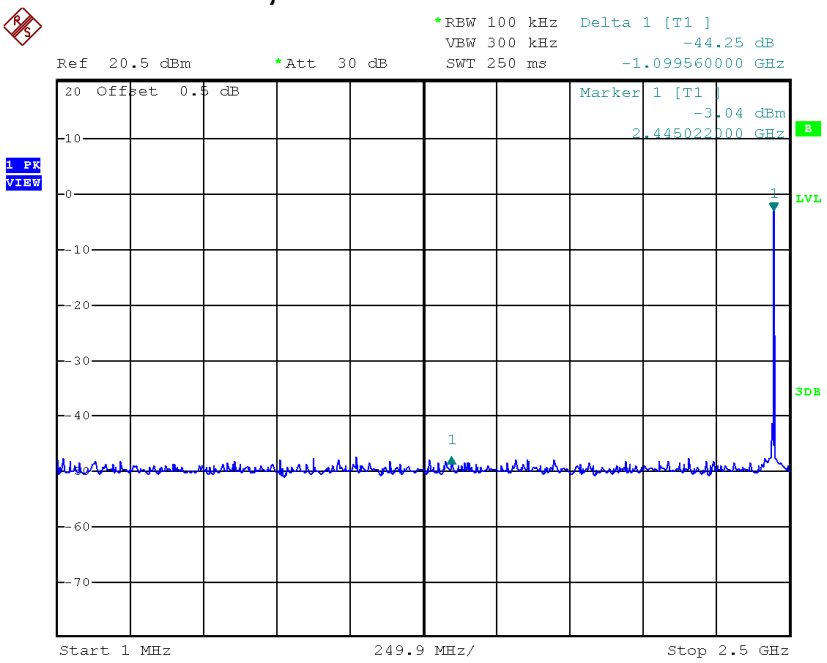
Date: 8.AUG.2016 10:39:20

Lowest channel, Plot 2



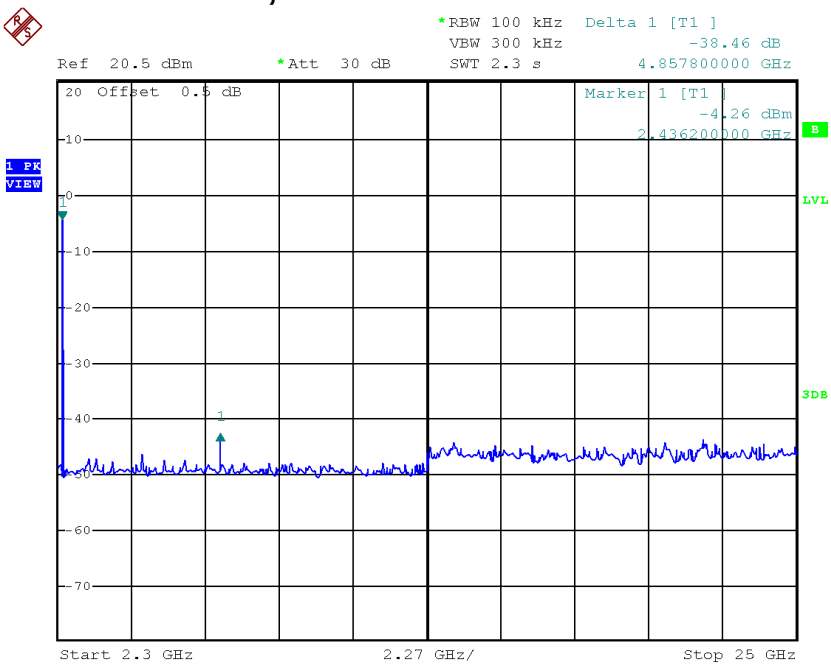
Date: 8.AUG.2016 10:44:17

Plots of out of band conducted emissions
Middle channel, Plot 1



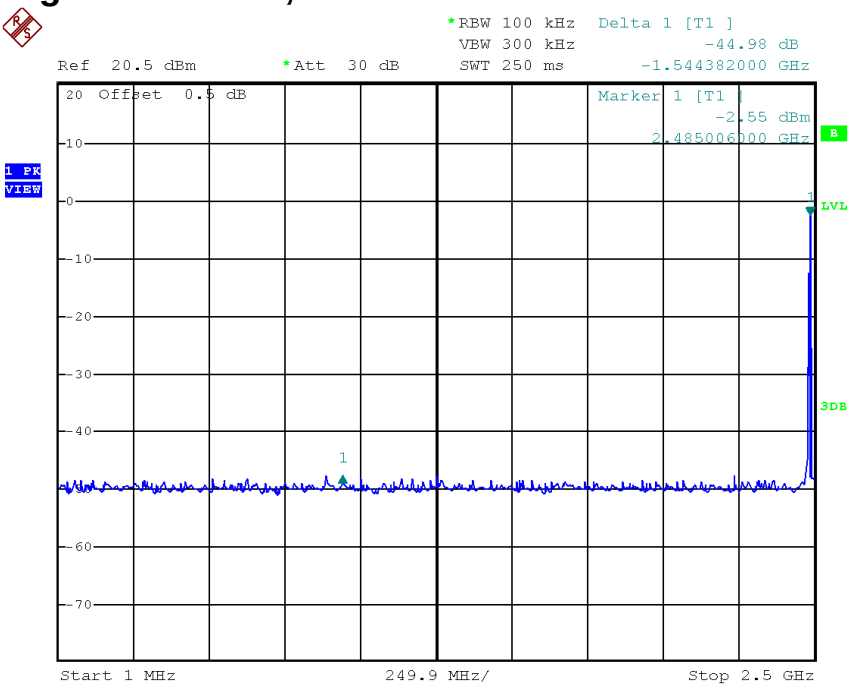
Date: 8.AUG.2016 10:38:11

Middle channel, Plot 2



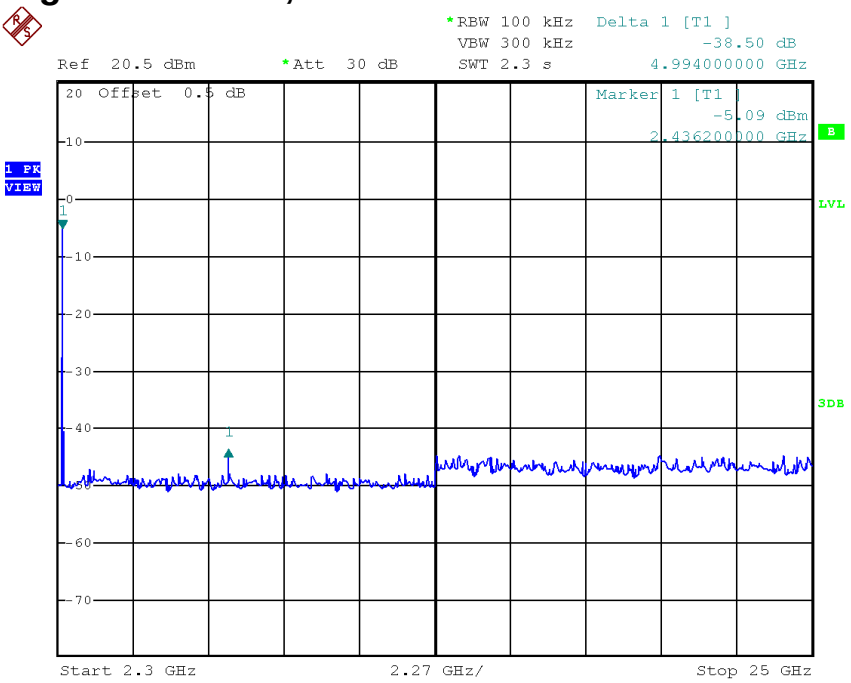
Date: 8.AUG.2016 10:42:53

Plots of out of band conducted emissions
Highest channel, Plot 1



Date: 8.AUG.2016 10:41:06

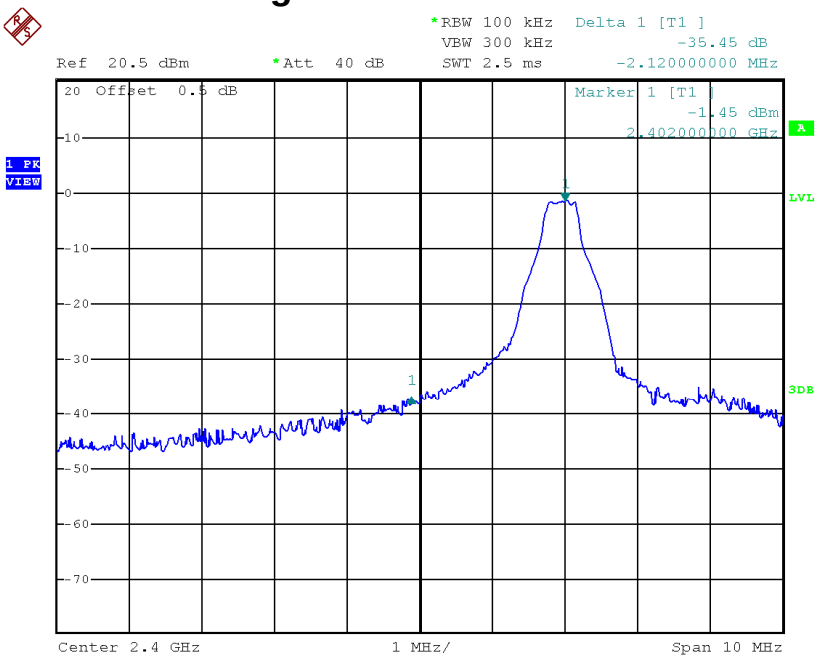
Highest channel, Plot 2



Date: 8.AUG.2016 10:42:02

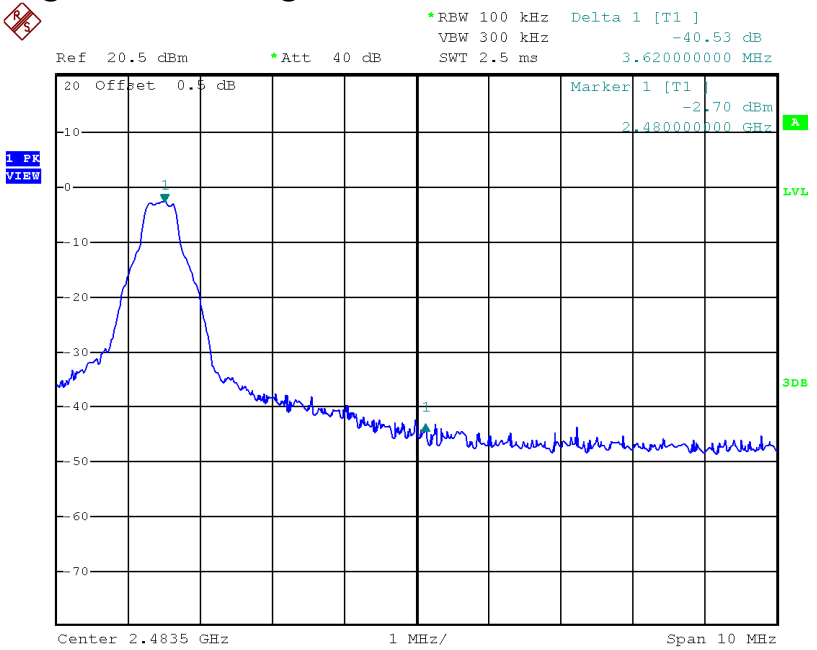
Plots of bandedge

Lowest bandedge



Date: 8.AUG.2016 10:47:08

Highest bandedge



Date: 8.AUG.2016 10:51:43

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflects the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD +AV

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 +1.6 -29 +0 + (-10) = 32 dBμV/m

Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

4.8 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

4.8.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

63.708 MHz

The worst case radiated emission configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.8.2 Radiated Emission Data

The data in tables 1-5 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 0.6 dB margin compare with peak limit

Mode: TX-Channel (Lowest)
Date of Test: August 26, 2016

Table 1

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***2390.000***	***54.4***	***33***	***29.4***	***50.8***	***24***	***26.8***	***54.0***	***-27.2***
V	***4804.000***	***45.8***	***33***	***34.9***	***47.7***	***24***	***23.7***	***54.0***	***-30.3***
V	***12010.000***	***43.3***	***33***	***40.5***	***50.8***	***24***	***26.8***	***54.0***	***-27.2***

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	***2390.000***	***54.4***	***33***	***29.4***	***50.8***	***74.0***	***-23.2***
V	***4804.000***	***45.8***	***33***	***34.9***	***47.7***	***74.0***	***-26.3***
V	***12010.000***	***43.3***	***33***	***40.5***	***50.8***	***74.0***	***-23.2***

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
7. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

Mode: TX-Channel (Middle)
Date of Test: August 26, 2016

Table 2

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***4884.000***	***46.0***	***33***	***34.9***	***47.9***	***24***	***23.9***	***54.0***	***-30.1***
V	***7326.000***	***48.2***	***33***	***37.9***	***53.1***	***24***	***29.1***	***54.0***	***-24.9***
V	***12210.000***	***42.8***	***33***	***40.5***	***50.3***	***24***	***26.3***	***54.0***	***-27.7***

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	***4884.000***	***46.0***	***33***	***34.9***	***47.9***	***74.0***	***-26.1***
V	***7326.000***	***48.2***	***33***	***37.9***	***53.1***	***74.0***	***-20.9***
V	***12210.000***	***42.8***	***33***	***40.5***	***50.3***	***74.0***	***-23.7***

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
7. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

Mode: TX-Channel (Highest)
Date of Test: August 26, 2016

Table 3

Radiated Emission Data

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***2483.500***	***54.4***	***33***	***29.4***	***50.8***	***24***	***26.8***	***54.0***	***-27.2***
V	***4960.000***	***46.1***	***33***	***34.9***	***48.0***	***24***	***24.0***	***54.0***	***-30.0***
V	***7440.000***	***47.2***	***33***	***37.9***	***52.1***	***24***	***28.1***	***54.0***	***-25.9***
V	***12400.000***	***42.9***	***33***	***40.5***	***50.4***	***24***	***26.4***	***54.0***	***-27.6***

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	***2483.500***	***54.4***	***33***	***29.4***	***50.8***	***74.0***	***-23.2***
V	***4960.000***	***46.1***	***33***	***34.9***	***48.0***	***74.0***	***-26.0***
V	***7440.000***	***47.2***	***33***	***37.9***	***52.1***	***74.0***	***-21.9***
V	***12400.000***	***42.9***	***33***	***40.5***	***50.4***	***74.0***	***-23.6***

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
7. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

Worst Case: Bluetooth Audio playing, Light ON with charging
Date of Test: August 26, 2016

Table 4

Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	63.708	46.4	16	9.0	39.4	40.0	-0.6
V	***167.983***	***34.2***	***16***	***18.0***	***36.2***	***43.5***	***-7.3***
V	***282.321***	***20.4***	***16***	***22.0***	***26.4***	***46.0***	***-19.6***
V	362.831	26.8	16	24.0	34.8	46.0	-11.2
V	***402.359***	***26.2***	***16***	***24.0***	***34.2***	***46.0***	***-11.8***
V	442.978	16.6	16	26.0	26.6	46.0	-19.5

NOTES: 1. Quasi-Peak detector is used for the emission measurement.

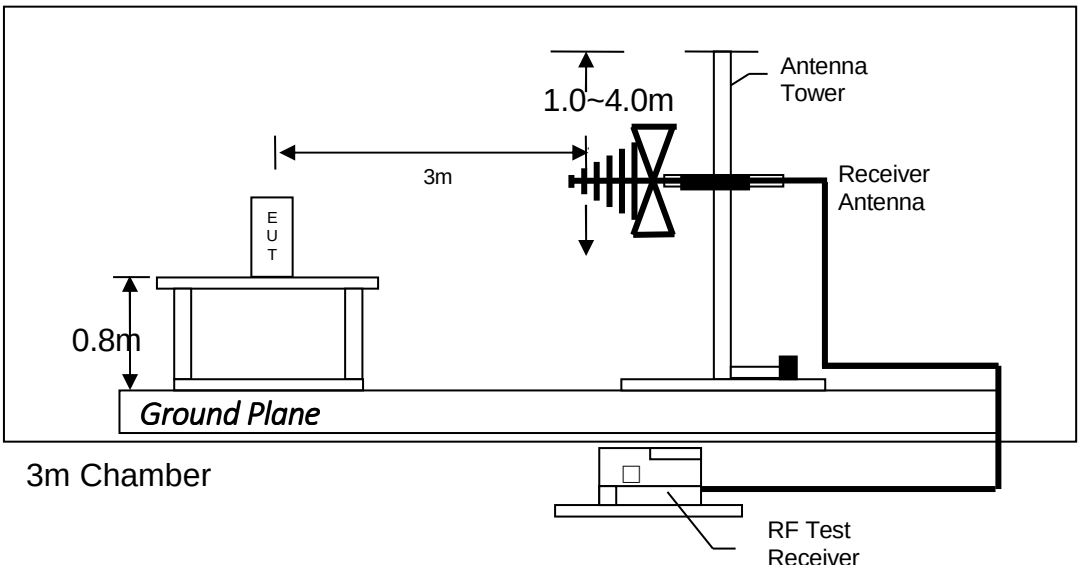
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

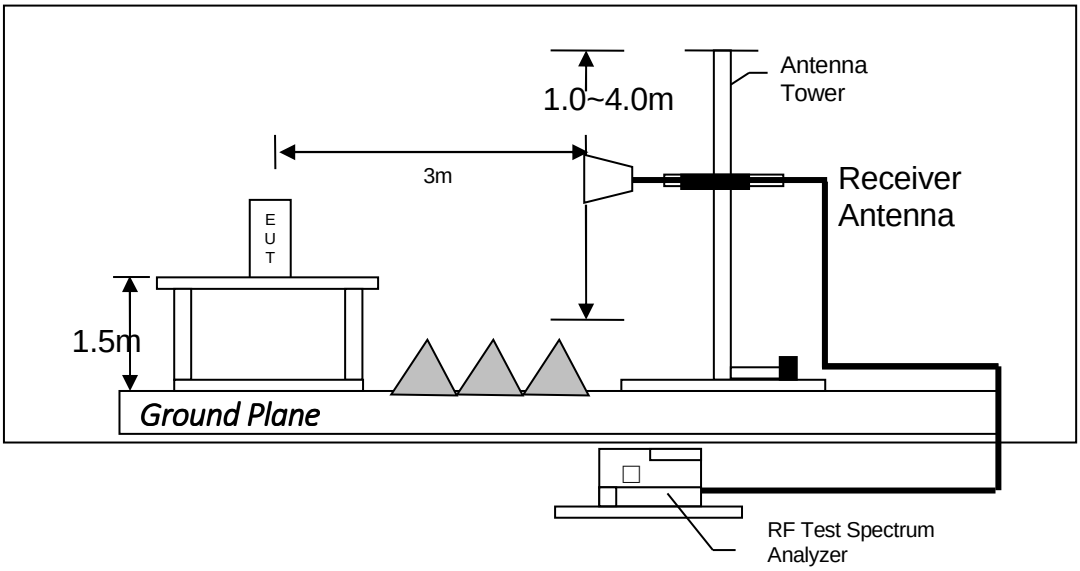
4. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

4.8.3 Transmitter Duty Cycle Calculation

Based on the Bluetooth Specification Version 2.1 + EDR, the transmitter ON time for each timeslot of Bluetooth is 625µs. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take (5+1) x 625µs = 3.75ms. For one period for a pseudo-random hopping through at least 20 RF channels in adaptive mode (worse case), it take: 20 x 3.75ms = 75ms.

The dwell time for DH5 is 5 x 625µs = 3.125ms.

For the worst case calculation, there are two transmissions might occur in 100ms. Therefore,

Duty Cycle (DC) = Maximum On time in 100ms/100ms
= 3.125ms x 2/100ms
= 0.0625

Average Factor (AF) of Bluetooth in dB = 20 log10 (0.0625)
= -24 dB

4.9 AC Power Line Conducted Emission

☐ Not applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

4.9.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

0.497 MHz

The worst case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.9.2 AC Power Line Conducted Emission Data

The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 7.5 dB

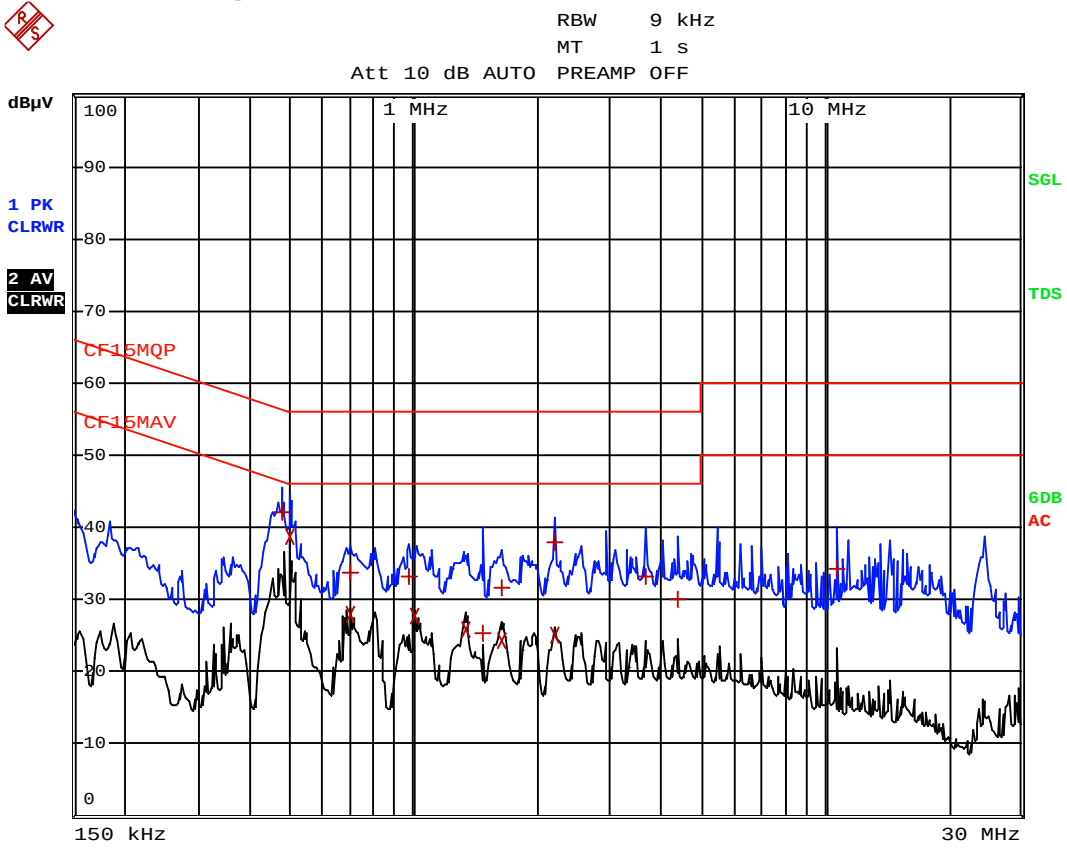
Worst Case: Bluetooth Audio playing, Light ON with charging
Date of Test: August 26, 2016

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	478.5 kHz	42.18	L1	-14.17
2	CISPR Average	496.5 kHz	38.58	L1	-7.47
2	CISPR Average	699 kHz	27.88	N	-18.11
1	Quasi Peak	703.5 kHz	33.63	N	-22.36
1	Quasi Peak	978 kHz	33.16	L1	-22.84
2	CISPR Average	1.0095 MHz	27.68	N	-18.31
2	CISPR Average	1.338 MHz	25.93	N	-20.06
1	Quasi Peak	1.4775 MHz	25.31	L1	-30.68
1	Quasi Peak	1.6485 MHz	31.74	L1	-24.25
2	CISPR Average	1.6485 MHz	24.16	L1	-21.84
1	Quasi Peak	2.211 MHz	37.86	N	-18.13
2	CISPR Average	2.211 MHz	25.14	N	-20.85
1	Quasi Peak	3.687 MHz	33.17	N	-22.82
1	Quasi Peak	4.425 MHz	30.17	N	-25.82
1	Quasi Peak	10.689 MHz	34.22	L1	-25.77

Worst Case: Bluetooth Audio playing, Light ON with charging
Date of Test: August 26, 2016



Conducted Emission Test Setup

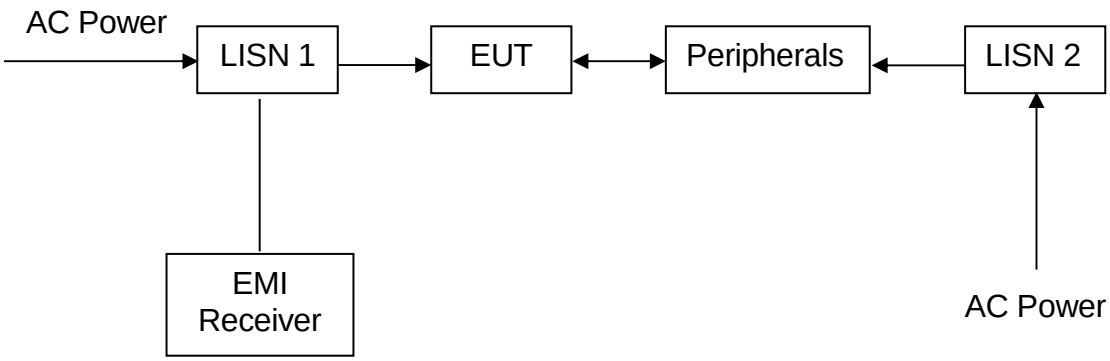


EXHIBIT 5
EQUIPMENT LIST

5.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3156	EW-2249	EW-0571
Manufacturer	R&S	R&S	EMCO
Model No.	ESR26	FSP30	3104C
Calibration Date	Nov. 03, 2015	Nov. 27, 2015	Jun. 23, 2015
Calibration Due Date	Nov. 03, 2016	Nov. 27, 2016	Dec. 23, 2016

Equipment	Pyramidal Horn Antenna	Double Ridged Guide Antenna	Log Periodic Antenna
Registration No.	EW-0905	EW-1133	EW-0447
Manufacturer	EMCO	EMCO	EMCO
Model No.	3160-09	3115	3146
Calibration Date	Feb. 12, 2016	Nov. 05, 2015	Mar. 16, 2015
Calibration Due Date	Aug. 12, 2017	May 05, 2017	Sep. 16, 2016

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2500	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI	ENV-216
Calibration Date	Jan. 28, 2016	Jan. 28, 2016
Calibration Due Date	Jan. 28, 2017	Jan. 28, 2017

3) Bandedge/Bandwidth Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Nov. 27, 2015
Calibration Due Date	Nov. 27, 2016

END OF TEST REPORT