



FCC RF Test Report

APPLICANT : BlackBerry Ltd.
EQUIPMENT : GSM Quad-band/HSPA-UMTS Penta-band/
LTE Deca-band mobile phone
BRAND NAME : BlackBerry
MODEL NAME : BBA100-1
MARKETING NAME : DTEK60
FCC ID : L6ABBA1001
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jul. 20, 2016 and testing was completed on Aug. 17, 2016. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

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SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China





TABLE OF CONTENTS

SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION.....	5
1.1 Applicant	5
1.2 Manufacturer.....	5
1.3 Product Feature of Equipment Under Test.....	5
1.4 Product Specification of Equipment Under Test.....	6
1.5 Specification of Accessory.....	6
1.6 Modification of EUT	6
1.7 Testing Location	7
1.8 Applicable Standards.....	7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST.....	8
2.1 Descriptions of Test Mode	8
2.2 Test Mode.....	9
2.3 Connection Diagram of Test System.....	10
2.4 Support Unit used in test configuration and system	11
2.5 EUT Operation Test Setup	11
2.6 Measurement Results Explanation Example.....	12
3 TEST RESULT	13
3.1 6dB and 99% Bandwidth Measurement	13
3.2 Peak Output Power Measurement	22
3.3 Power Spectral Density Measurement	23
3.4 Conducted Band Edges and Spurious Emission Measurement	32
3.5 Radiated Band Edges and Spurious Emission Measurement	49
3.6 AC Conducted Emission Measurement.....	53
3.7 Antenna Requirements	59
4 LIST OF MEASURING EQUIPMENT.....	60
5 UNCERTAINTY OF EVALUATION.....	61
APPENDIX A. CONDUCTED TEST RESULTS	
APPENDIX B. RADIATED TEST RESULTS	
APPENDIX C. DUTY CYCLE PLOTS	
APPENDIX D. SETUP PHOTOGRAPHS	



REVISION HISTORY



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-247 5.2(1)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 6.6	99% Bandwidth	-	Pass	-
3.2	15.247(b)(3)	RSS-247 A5.4(4)	Peak Output Power	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-247 5.2(2)	Power Spectral Density	$\leq 8\text{dBm/3kHz}$	Pass	-
3.4	15.247(d)	RSS-247 5.5	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	-
3.5	15.247(d)	RSS-247 5.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.33 dB at 2489.000 MHz
3.6	15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 6.02 dB at 15.970 MHz
3.7	15.203 & 15.247(b)	N/A	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

BlackBerry Ltd.

2200 University Ave E., Waterloo, ON, CAN. N2K0A7

1.2 Manufacturer

TCL Communication Ltd.

5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	GSM Quad-band/HSPA-UMTS Penta-band/ LTE Deca-band mobile phone
Brand Name	BlackBerry
Model Name	BBA100-1
Marketing Name	DTEK60
FCC ID	L6ABBA1001
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/HSPA+(16QAM uplink is not supported)/LTE/NFC/WLAN 2.4GHz 802.11b/g/n HT20/WLAN 5GHz 802.11a/n HT20/HT40/WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/Bluetooth v3.0+EDR/ Bluetooth v4.0 LE/Bluetooth v4.2 LE
IMEI Code	Conducted: 004402243144338 Conduction: 004402243144106 Radiation: 004402243143991/004402243144411
HW Version	PIO
SW Version	AAF884
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	Bluetooth 4.0 LE: 0.94 dBm (0.0012 W) Bluetooth 4.2 LE: 1.21 dBm (0.0013 W)
99% Occupied Bandwidth	Bluetooth 4.0 LE: 1.051MHz Bluetooth 4.2 LE: 1.049MHz
Antenna Type / Gain	LDS Antenna with gain 0.30 dBi
Type of Modulation	Bluetooth LE : GFSK

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter 1	Brand Name	N/A	Model Name	QC10US
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5Vdc, 2000mA/9Vdc, 1670mA		
	Manufacturer	BYD	S/N	CBA0060AGHC1
AC Adapter 2	Brand Name	N/A	Model Name	QC10EU
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5Vdc, 2000mA/9Vdc, 1670mA		
	Manufacturer	BYD	S/N	CBA0060AAHC1
AC Adapter 3	Brand Name	N/A	Model Name	QC10UK
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5Vdc, 2000mA/9Vdc, 1670mA		
	Manufacturer	BYD	S/N	CBA0060ABHC1
AC Adapter 4	Brand Name	N/A	Model Name	QC10AU
	Power Rating	I/P: 100-240Vac, 500mA, O/P: 5Vdc, 2000mA/9Vdc, 1670mA		
	Manufacturer	BYD	S/N	CBA0060ACHC1
Battery 1	Brand Name	N/A	Model Name	TLp030F2
	Power Rating	3.84Vdc, 3000mAh		
	Manufacturer	SCUD	S/N	CAC3000027C2
Battery 2	Brand Name	N/A	Model Name	TLp030F1
	Power Rating	3.84Vdc, 3000mAh		
	Manufacturer	BYD	S/N	CAC3000026C1
USB Cable	Brand Name	N/A	Model Name	CDA0000078CF
Earphone	Signal Line Type	1.00m shielded without core		
	Brand Name	N/A	Model Name	CCB0045A16C3
	Signal Line Type	1.24m non-shielded without core		

1.6 Modification of EUT

No modifications are made to the EUT during all test items.



1.7 Testing Location

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-3273456 FAX: +886-3-3284978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	03CH07-HY	TW1022/4086B

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.	
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958	
Test Site No.	Sporton Site No.	
	TH01-KS	CO01-KS

Note: The test site complies with ANSI C63.4 2014 requirement.

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
- ANSI C63.10-2013
- IC RSS-247 Issue 1
- IC RSS-Gen Issue 4

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

The RF output power was recorded in the following table:

Channel	Frequency	Bluetooth LE RF Output Power	
		Data Rate / Modulation	
		GFSK	
		v4.0	v4.2
Ch00	2402MHz	0.67 dBm	0.77 dBm
Ch39	2441MHz	0.94 dBm	1.21 dBm
Ch78	2480MHz	0.80 dBm	0.83 dBm

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration from all possible combinations.

- b. AC power line Conducted Emission was tested under maximum output power.



2.2 Test Mode

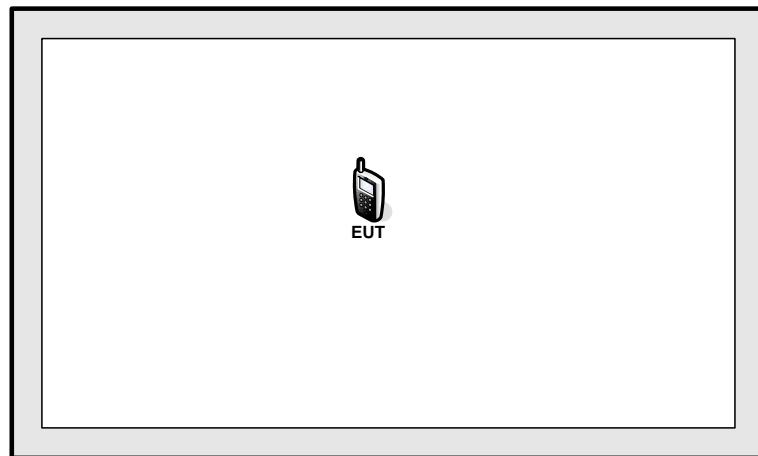
The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.0 LE/ Bluetooth 4.2 LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + Battery 1 + USB Cable (Charging from Adapter)

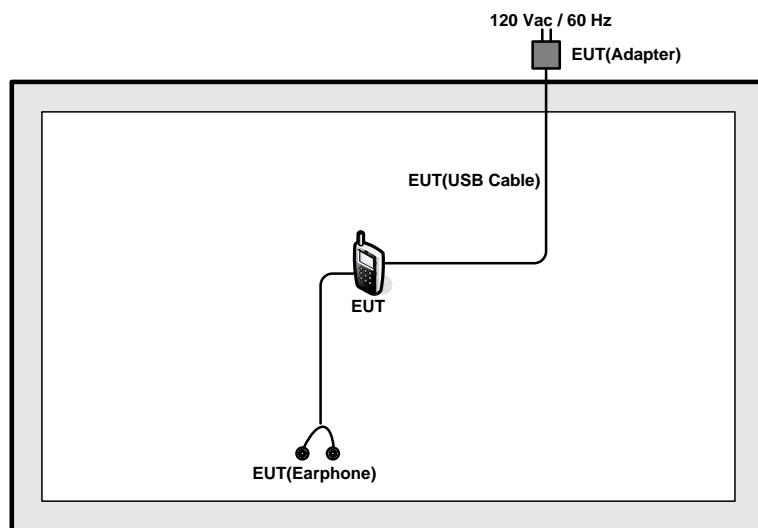
Remark: For Radiated Test Cases, The tests were performed with Battery 1; And adapter, Earphone, Battery 2 and USB Cable only verified the worst case of Battery 1.

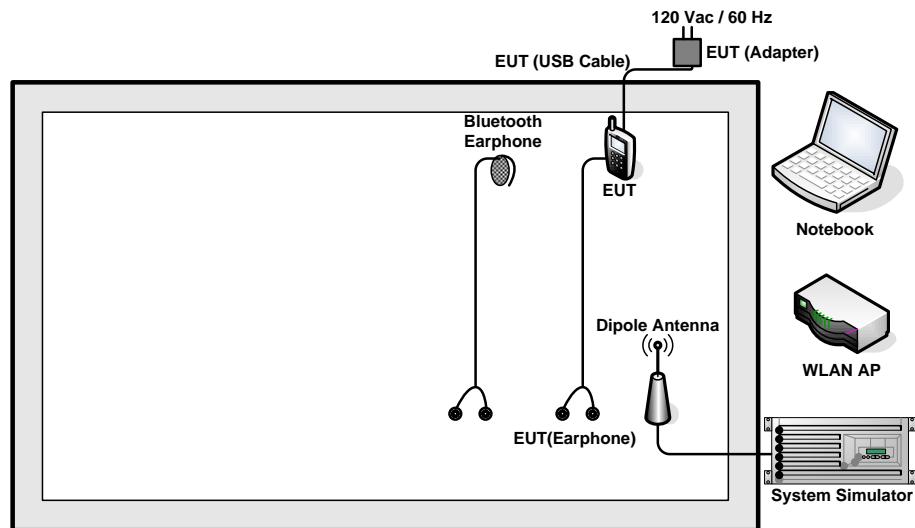
2.3 Connection Diagram of Test System

<Bluetooth LE Tx Mode: Battery 1>



<Bluetooth LE Tx Mode: Battery 2>



<AC Conducted Emission Mode>**2.4 Support Unit used in test configuration and system**

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritus	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Nokia	BH-106	QTLBH-106	Unshielded, 0.5 m	N/A

2.5 EUT Operation Test Setup

For Bluetooth LE function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.



2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 5.5 dB.

Offset(dB) = RF cable loss(dB).

= 5.5 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

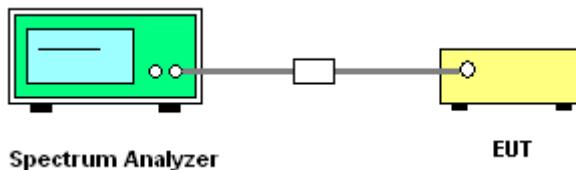
3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz.
6. Measure and record the results in the test report.

3.1.4 Test Setup

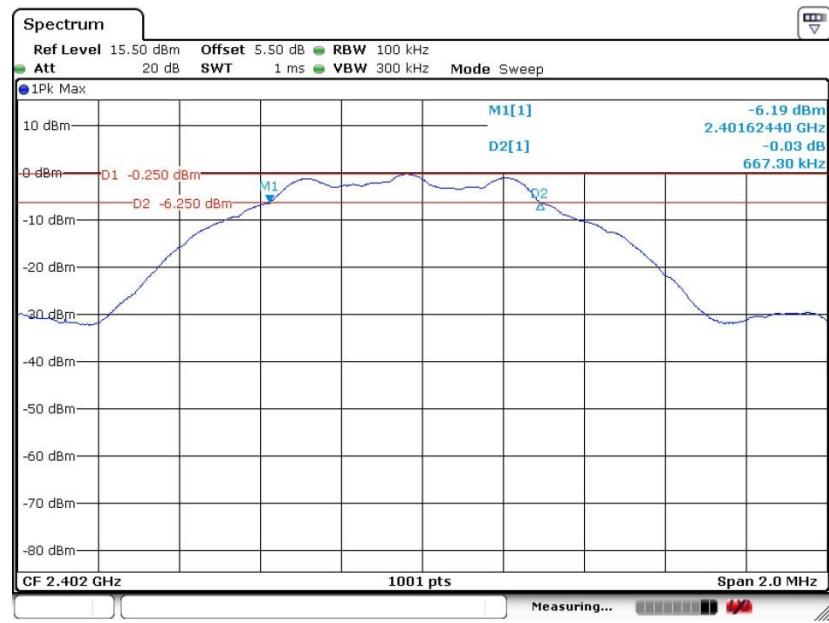


3.1.5 Test Result of 6dB Bandwidth

Test data refer to Appendix A.

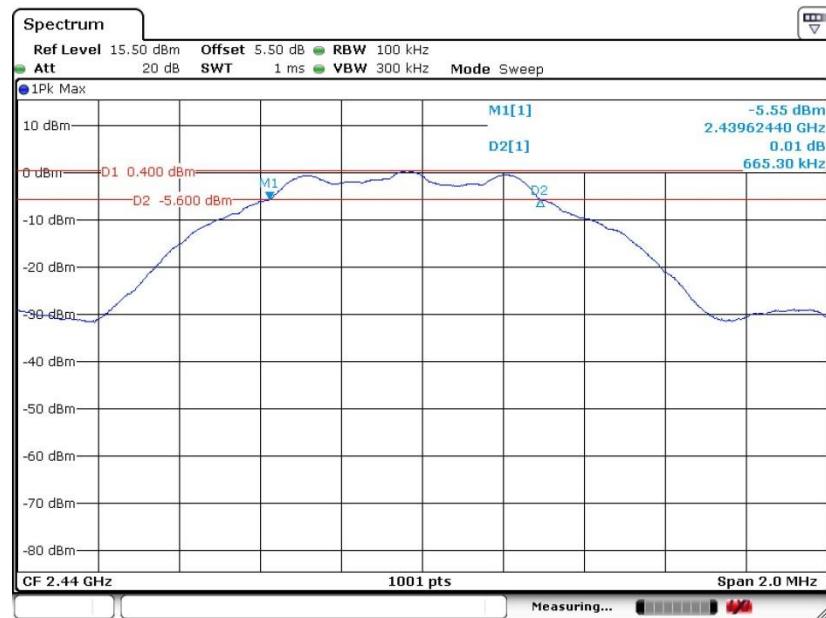
Bluetooth v4.0 LE

6 dB Bandwidth Plot on Channel 00



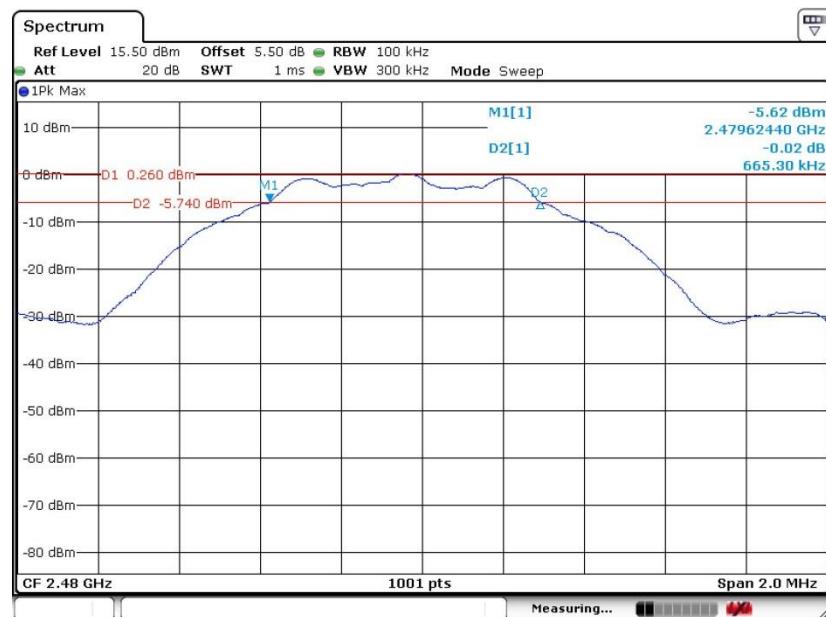


6 dB Bandwidth Plot on Channel 19



Date: 10.AUG.2016 23:41:37

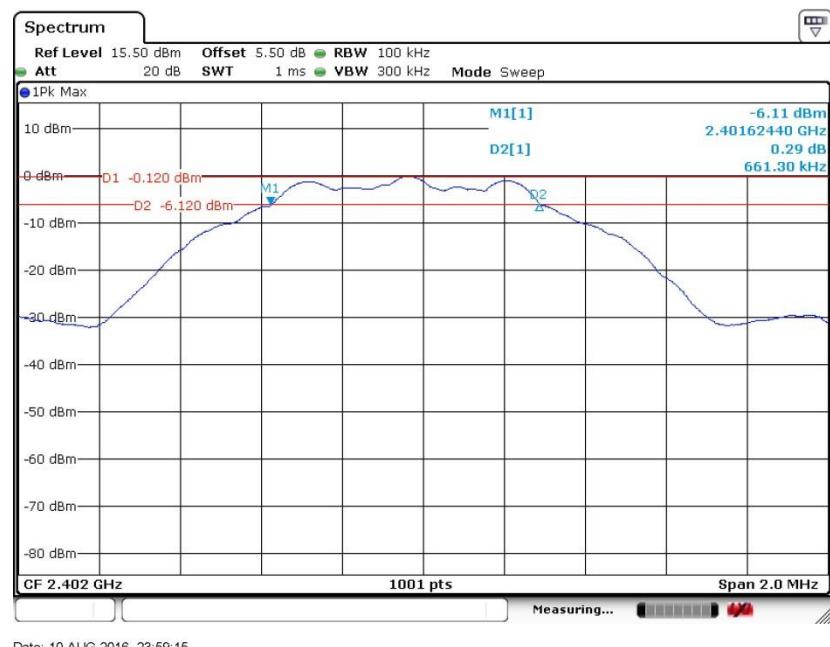
6 dB Bandwidth Plot on Channel 39



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Bluetooth v4.2 LE

6 dB Bandwidth Plot on Channel 00

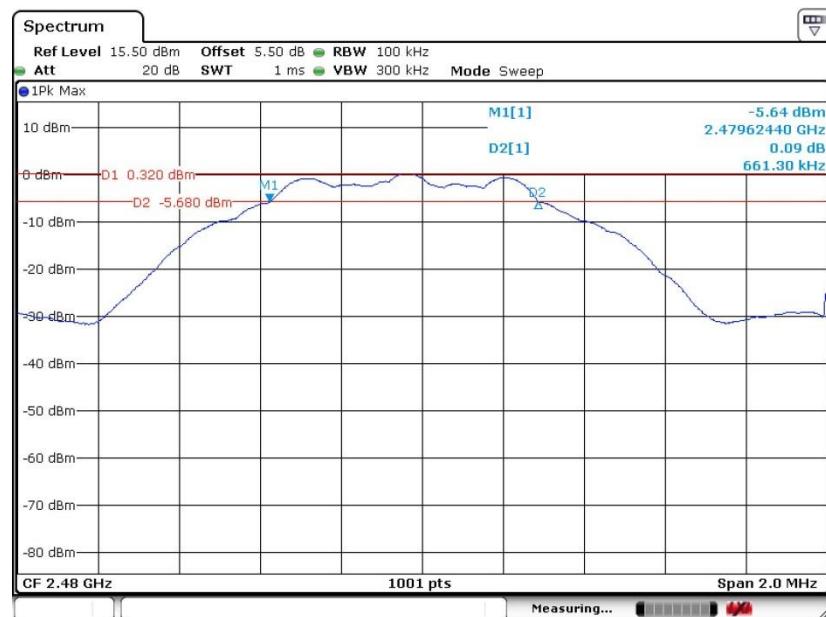


6 dB Bandwidth Plot on Channel 19



Date: 11.AUG.2016 00:02:14

6 dB Bandwidth Plot on Channel 39



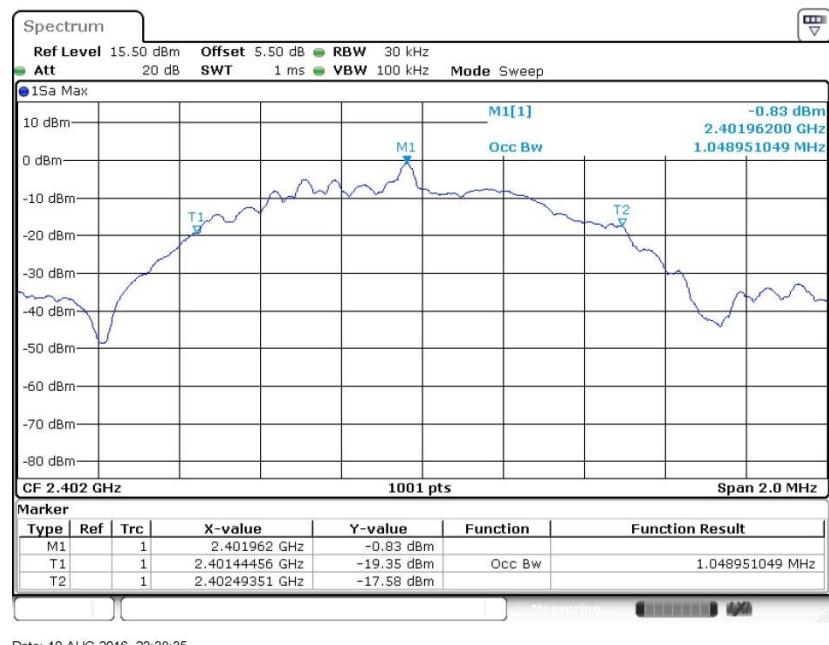
Date: 11.AUG.2016 00:04:35

3.1.6 Test Result of 99% Occupied Bandwidth

Test data refer to Appendix A.

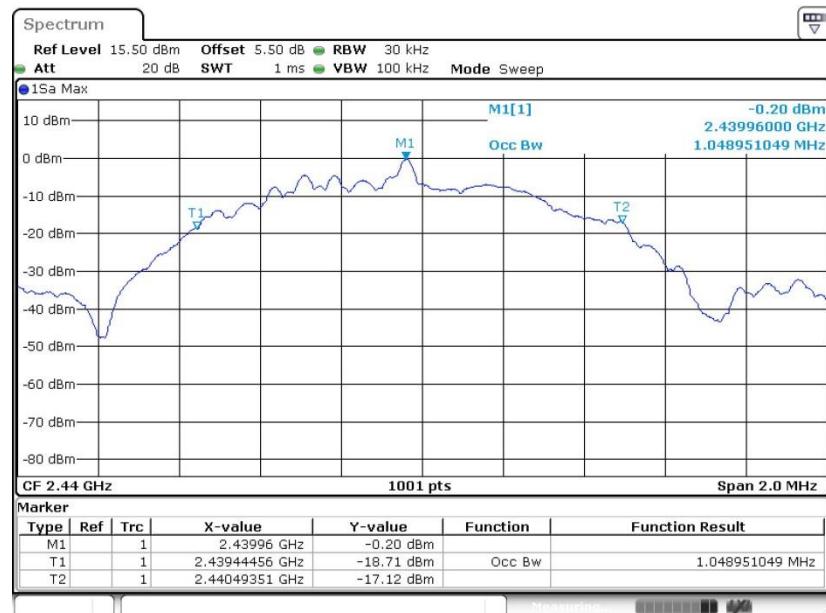
Bluetooth v4.0 LE

99% Bandwidth Plot on Channel 00

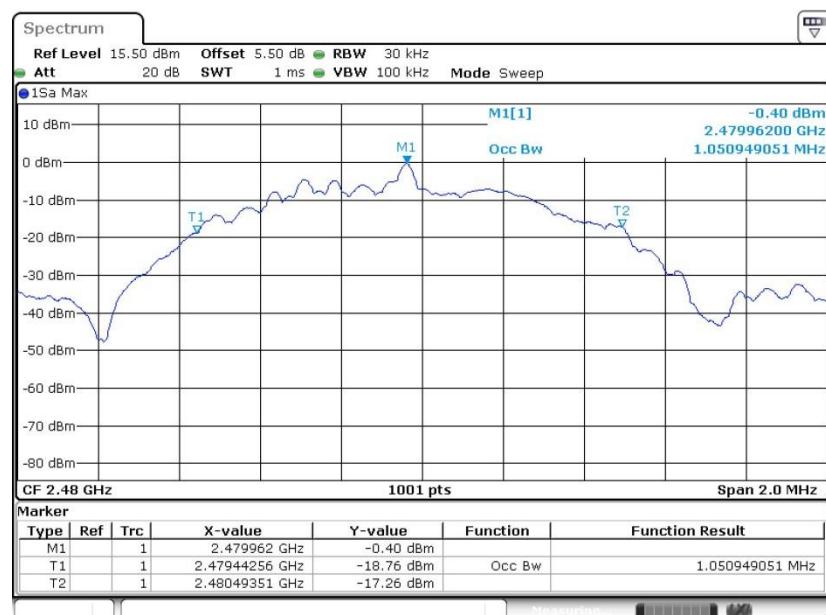




99% Occupied Bandwidth Plot on Channel 19



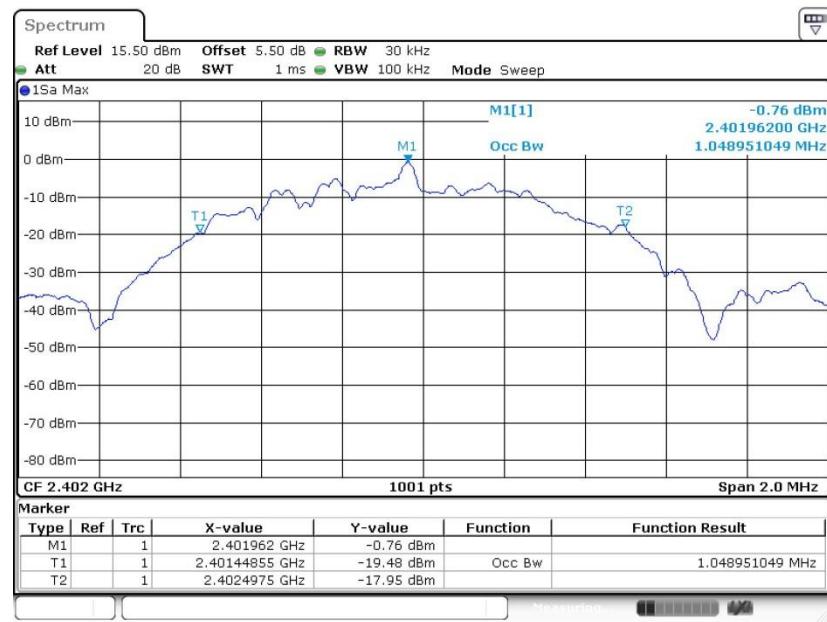
99% Occupied Bandwidth Plot on Channel 39





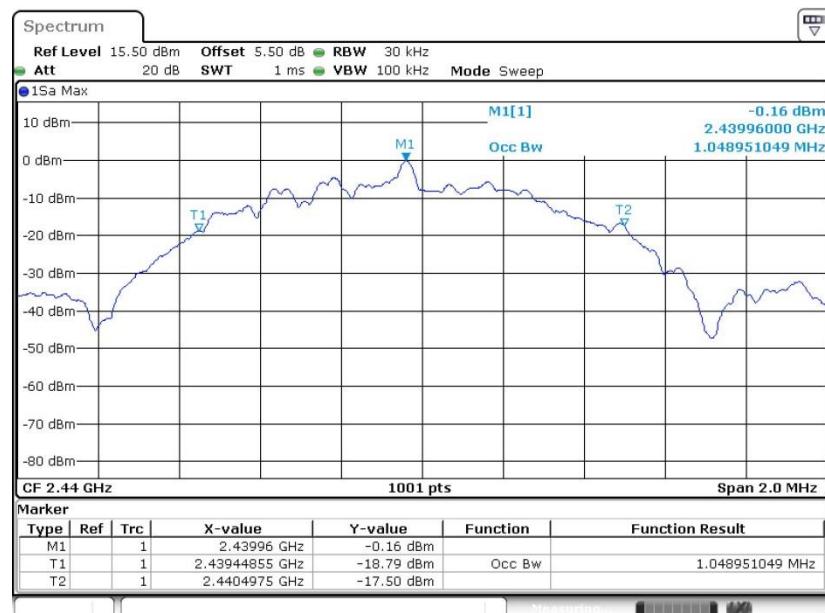
Bluetooth v4.2 LE

99% Bandwidth Plot on Channel 00



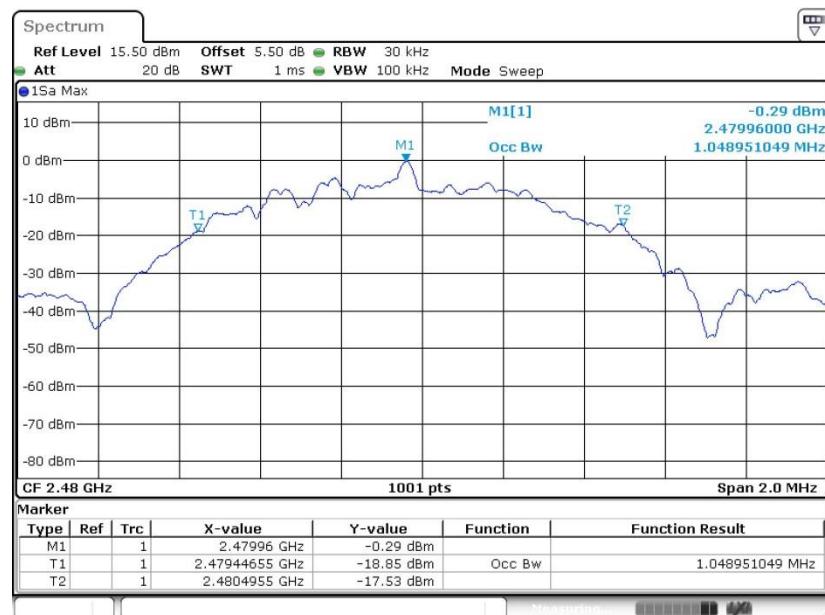


99% Occupied Bandwidth Plot on Channel 19



Date: 11.AUG.2016 00:03:13

99% Occupied Bandwidth Plot on Channel 39



Date: 11.AUG.2016 00:08:04

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Peak Output Power Measurement

3.2.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

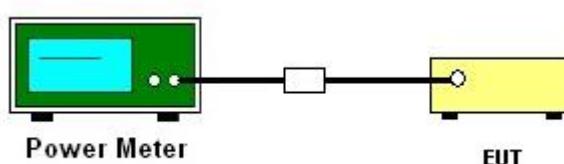
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r05 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Test data refers to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

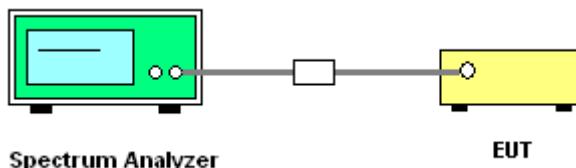
3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



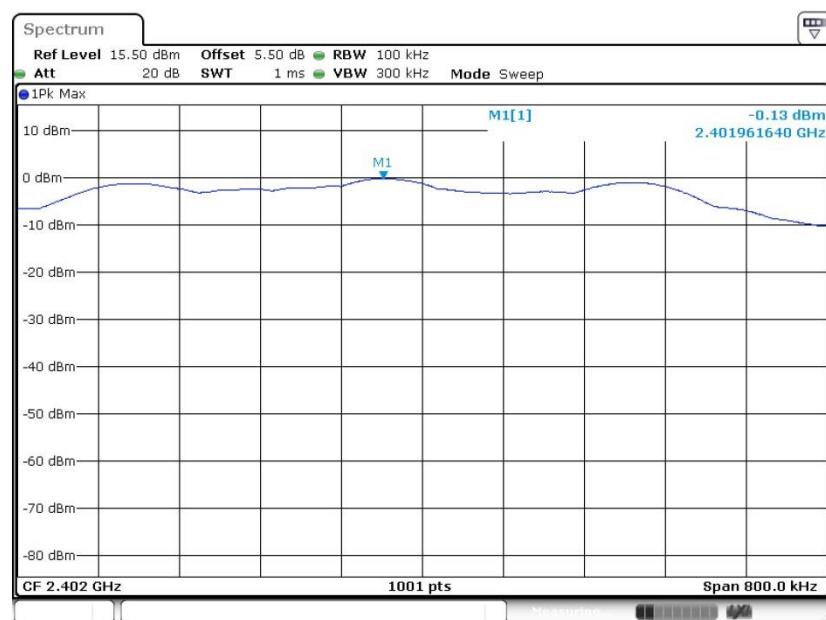
3.3.5 Test Result of Power Spectral Density

Test data refers to Appendix A.

3.3.6 Test Result of Power Spectral Density Plots (100kHz)

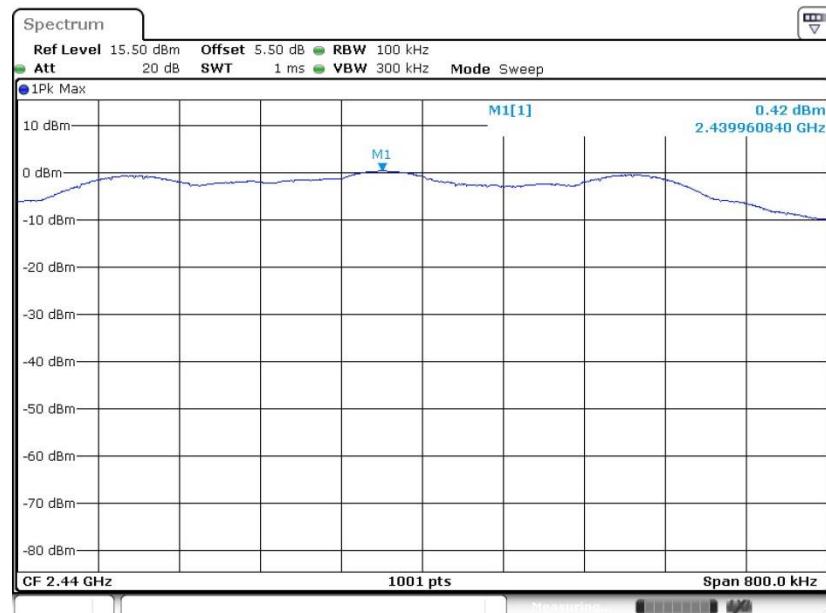
Bluetooth v4.0 LE

PSD 100kHz Plot on Channel 00



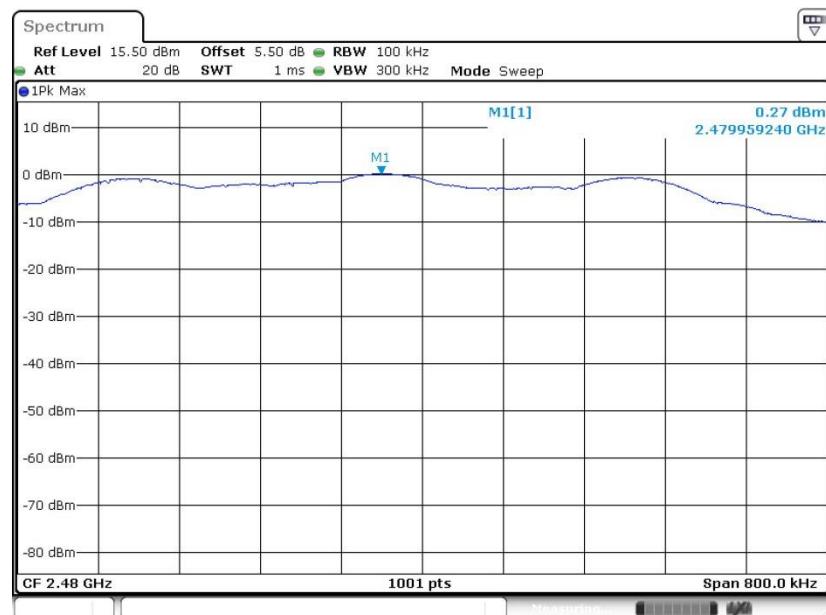


PSD 100kHz Plot on Channel 19



Date: 10 AUG 2016 23:42:12

PSD 100kHz Plot on Channel 39

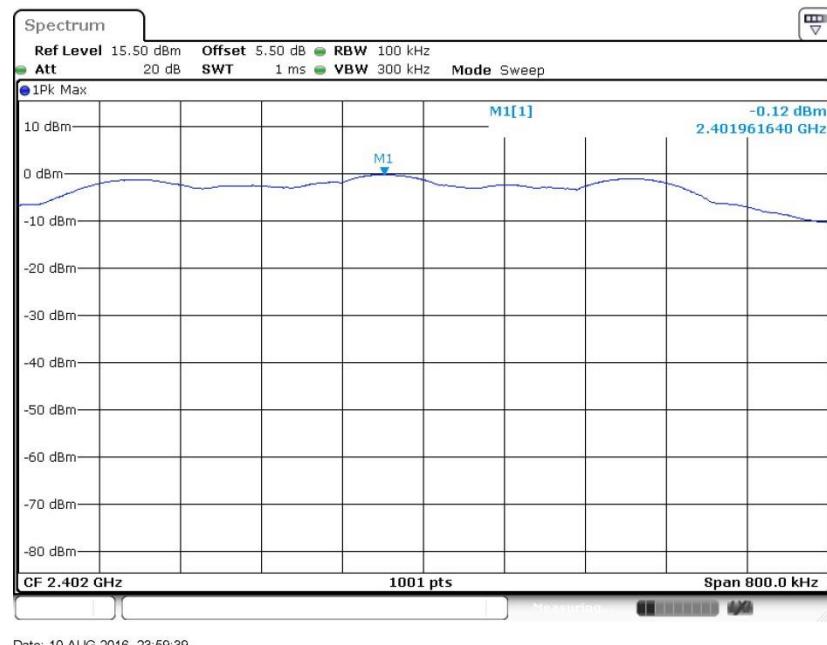


Date: 10 AUG 2016 23:45:23



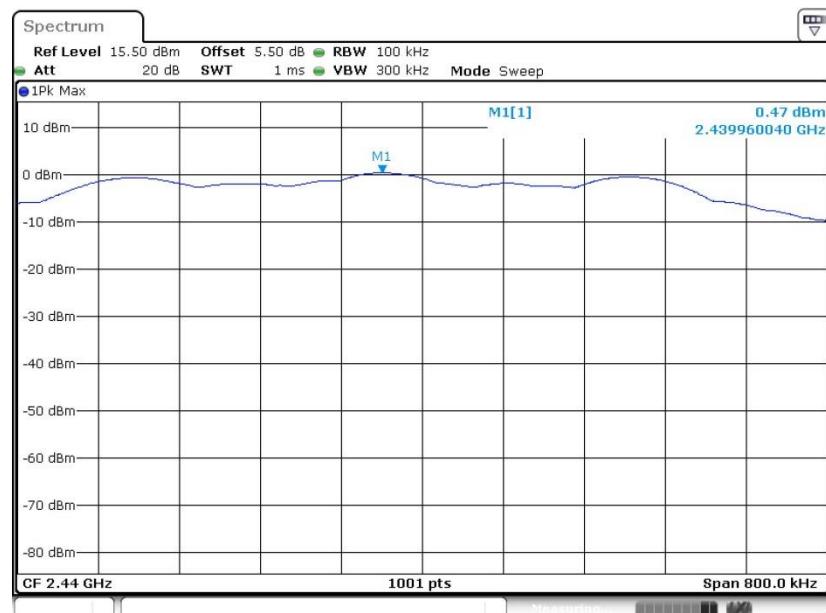
Bluetooth v4.2 LE

PSD 100kHz Plot on Channel 00



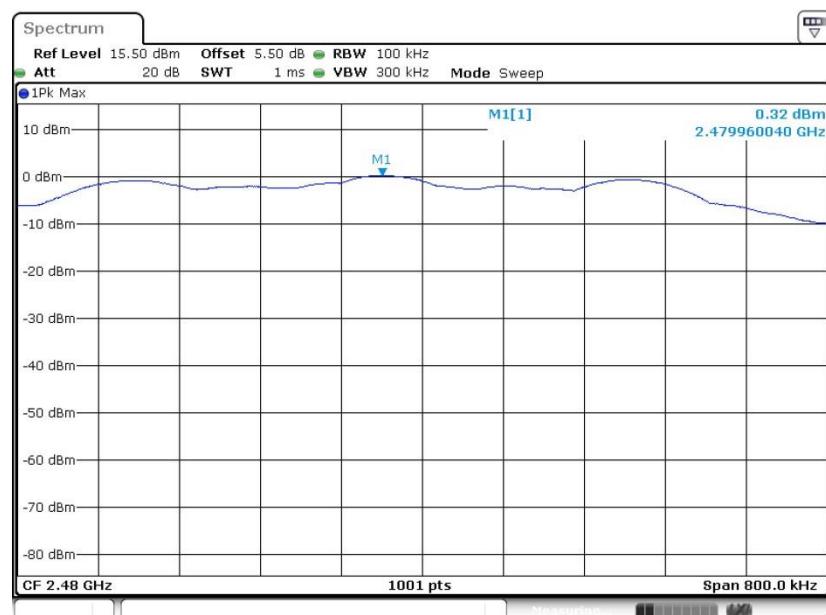


PSD 100kHz Plot on Channel 19



Date: 11.AUG.2016 00:02:46

PSD 100kHz Plot on Channel 39



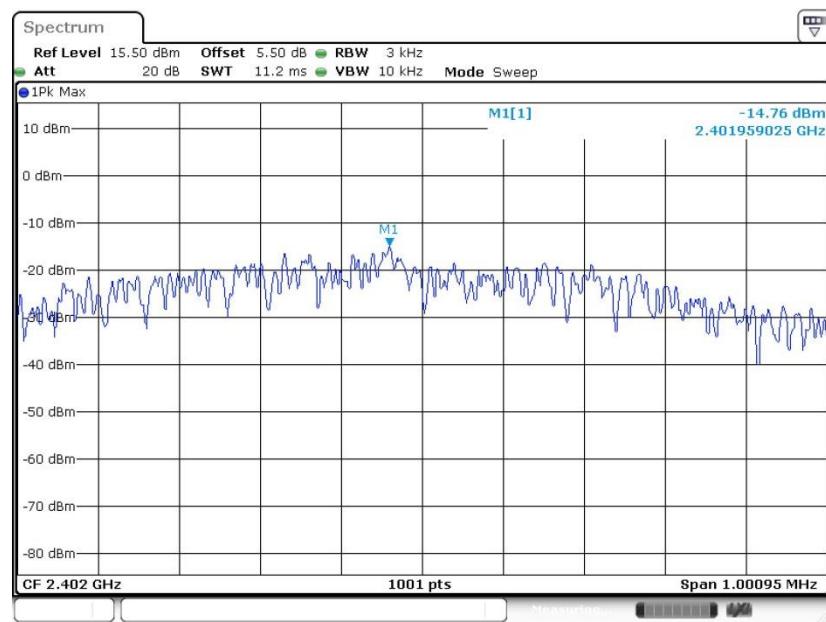
Date: 11.AUG.2016 00:05:02



3.3.7 Test Result of Power Spectral Density Plots (3kHz)

Bluetooth v4.0 LE

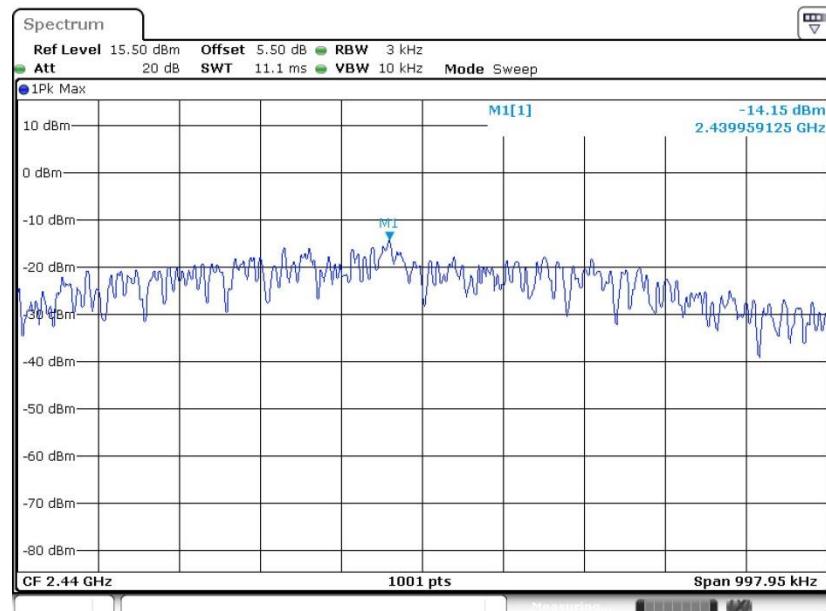
PSD 3kHz Plot on Channel 00



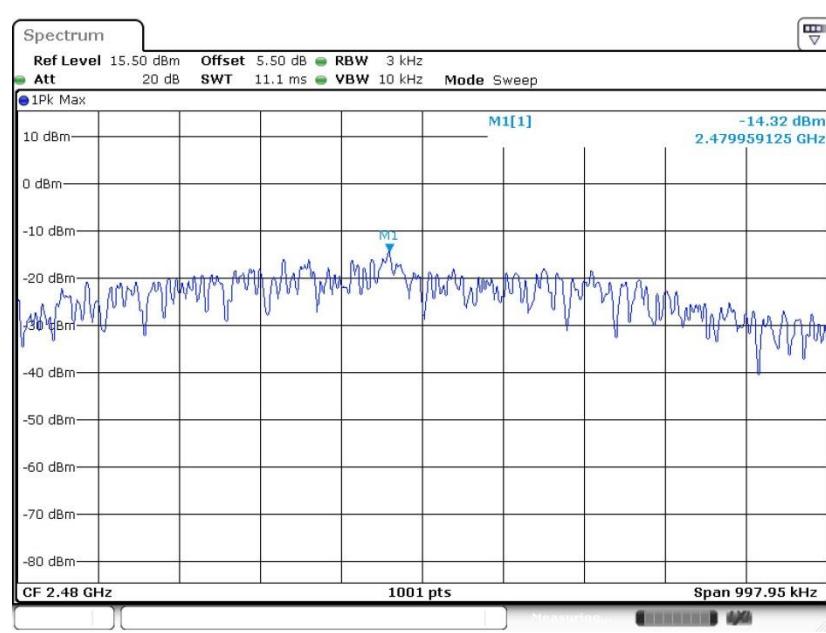
Date: 10 AUG 2016 23:37:49



PSD 3kHz Plot on Channel 19



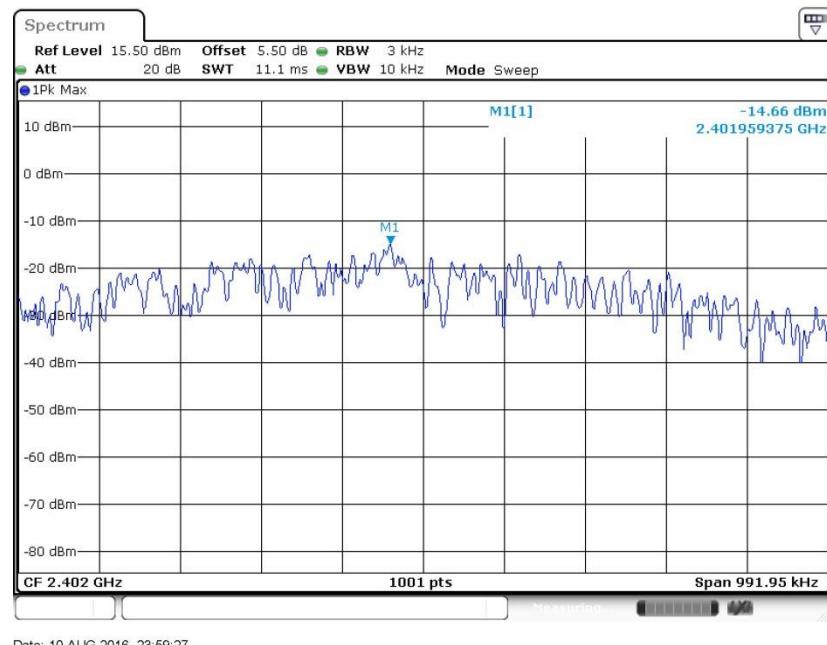
PSD 3kHz Plot on Channel 39





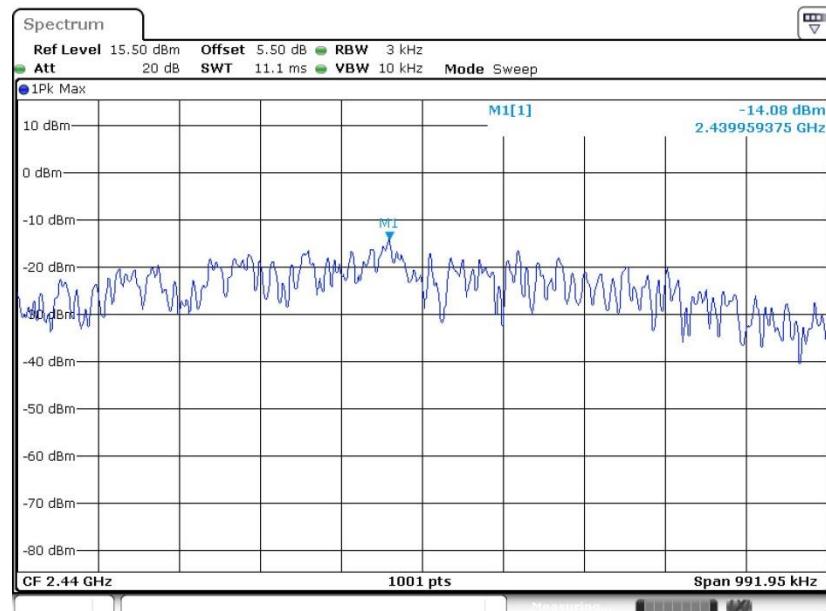
Bluetooth v4.2 LE

PSD 3kHz Plot on Channel 00



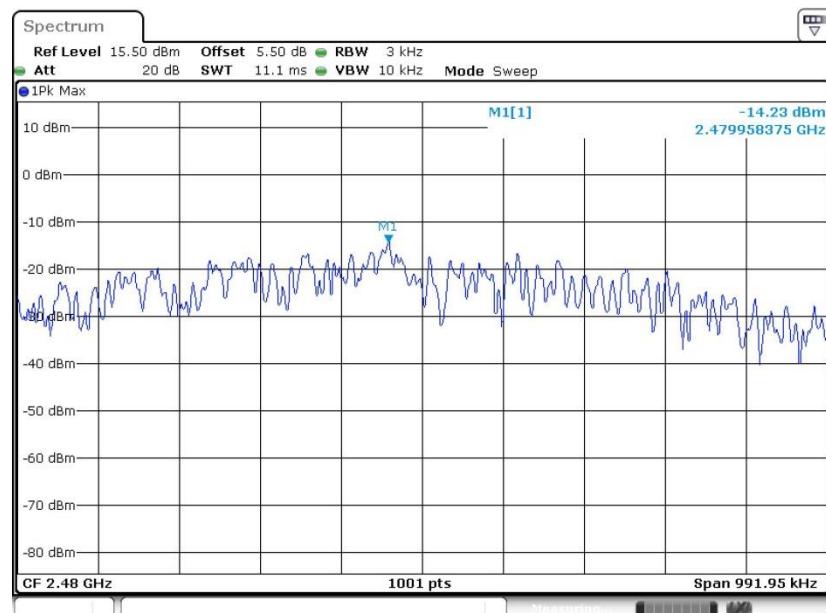


PSD 3kHz Plot on Channel 19



Date: 11.AUG.2016 00:02:35

PSD 3kHz Plot on Channel 39



Date: 11.AUG.2016 00:04:52

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

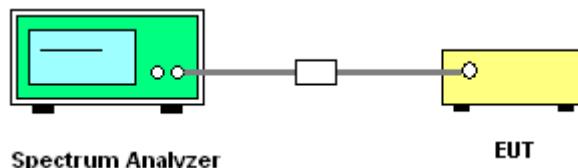
3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

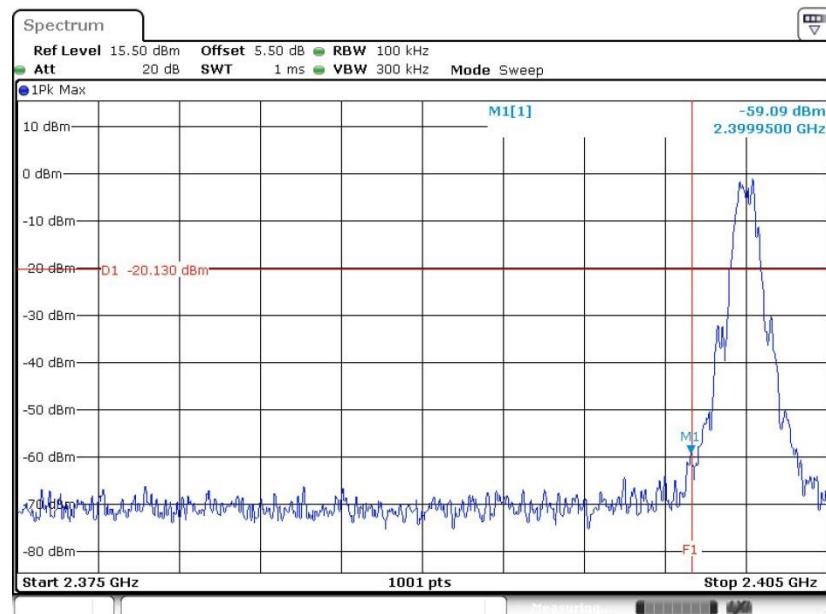
3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges Plots

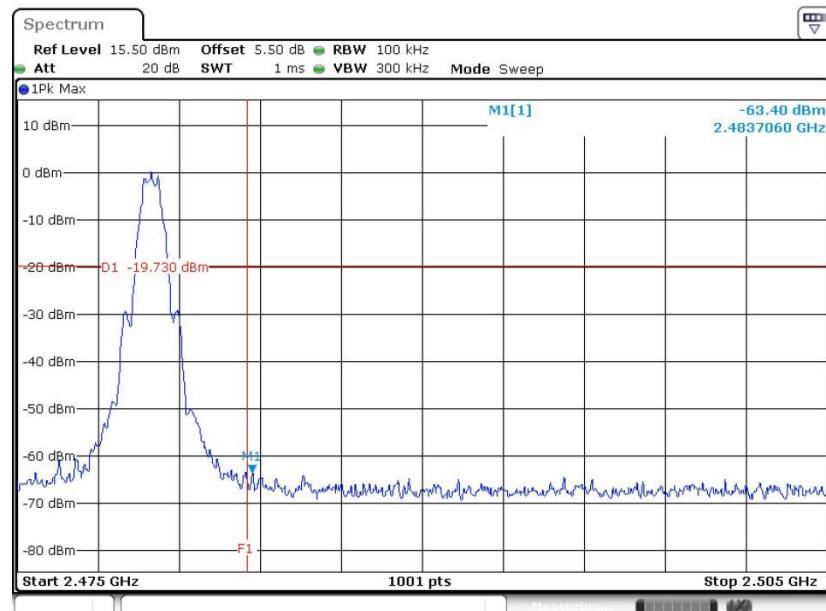
Bluetooth v4.0 LE

Low Band Edge Plot on Channel 00





High Band Edge Plot on Channel 39

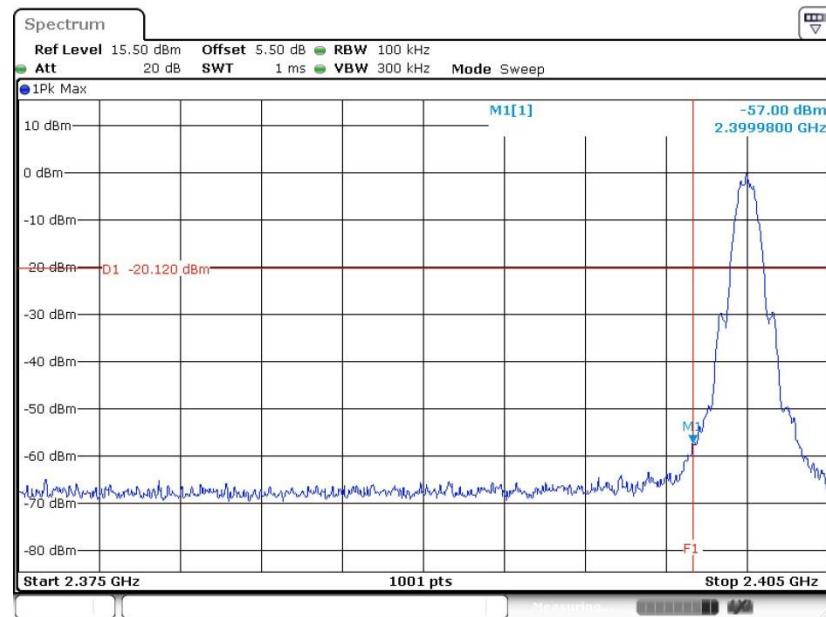


Date: 10 AUG 2016 23:45:30



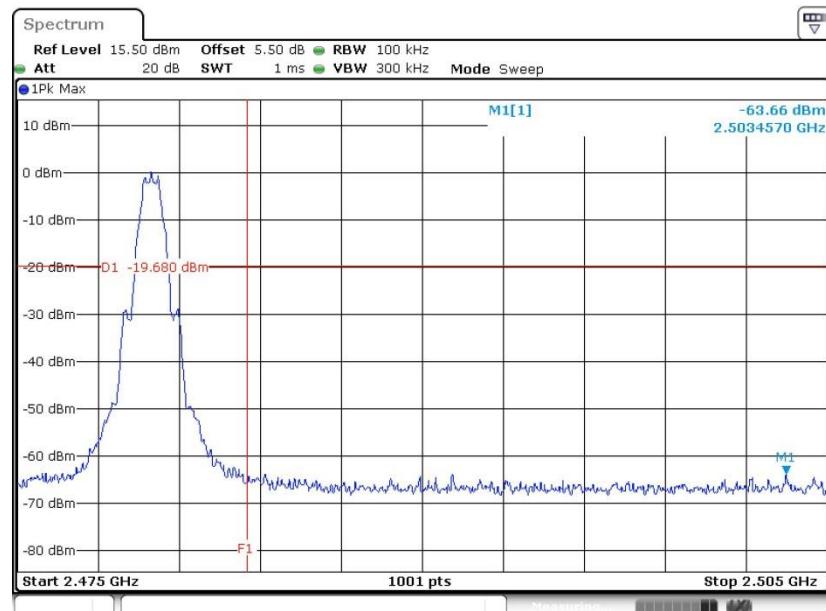
Bluetooth v4.2 LE

Low Band Edge Plot on Channel 00





High Band Edge Plot on Channel 39



Date: 11.AUG.2016 00:07:35

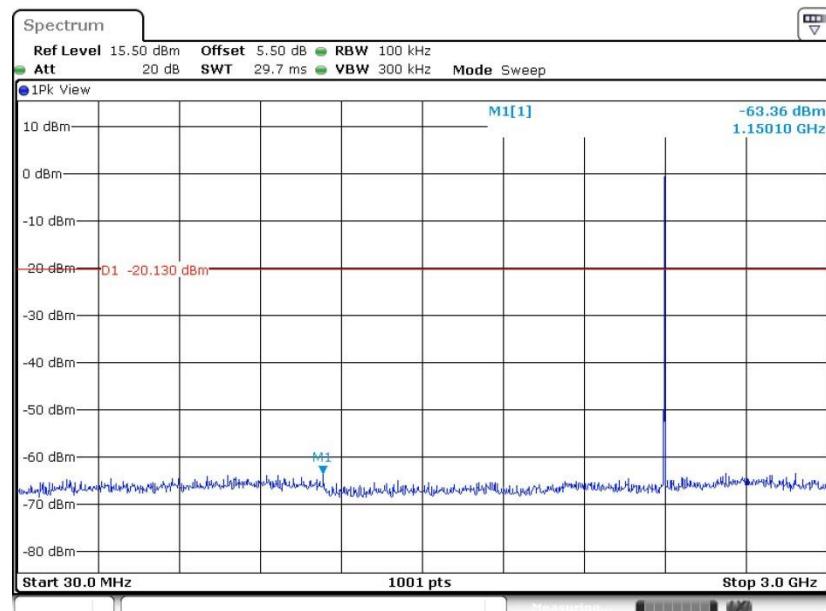


3.4.6 Test Result of Conducted Spurious Emission Plots

Bluetooth v4.0 LE

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00

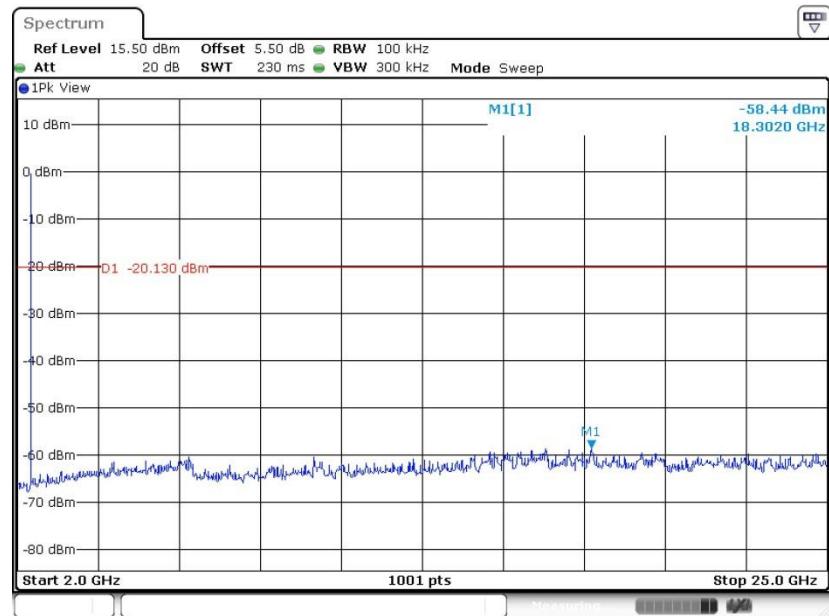


Date: 10.AUG.2016 23:47:58



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00

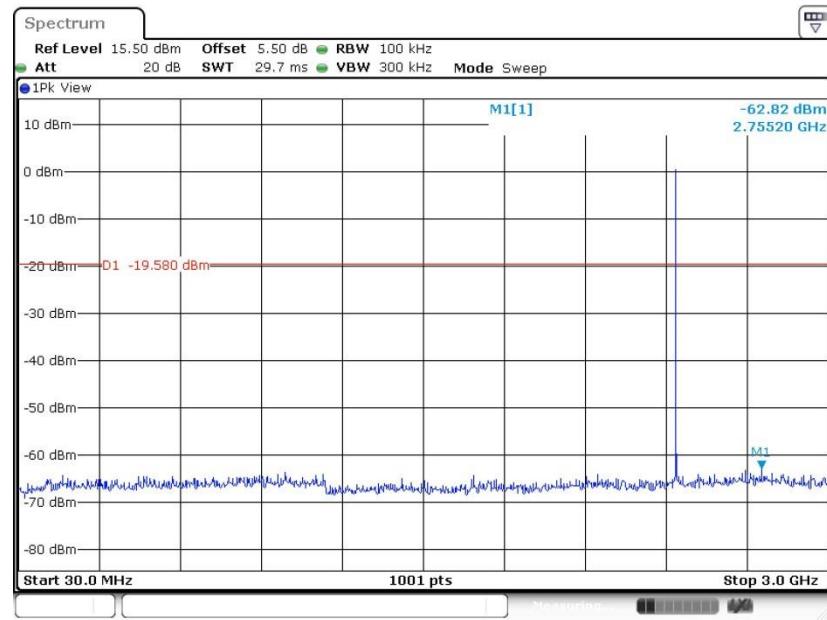


Date: 10 AUG 2016 23:48:06



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

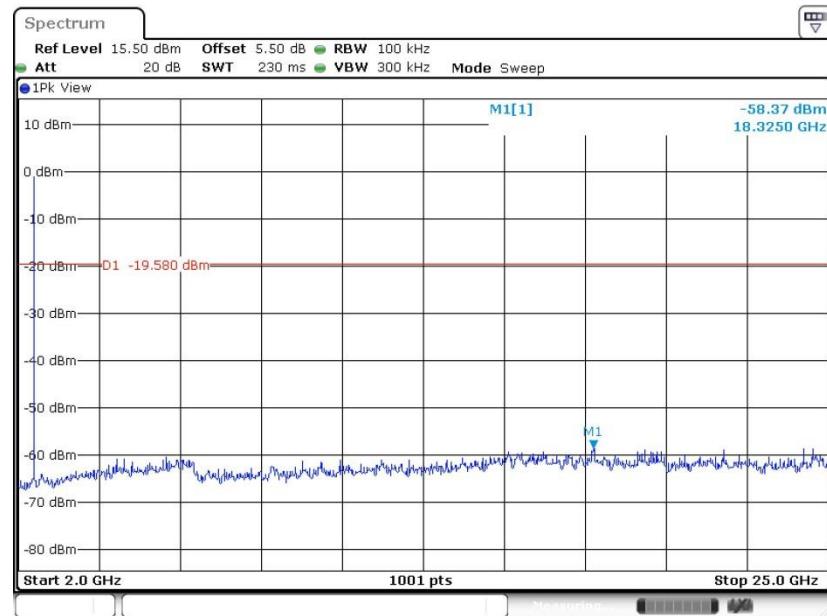
GFSK Channel 19





Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19

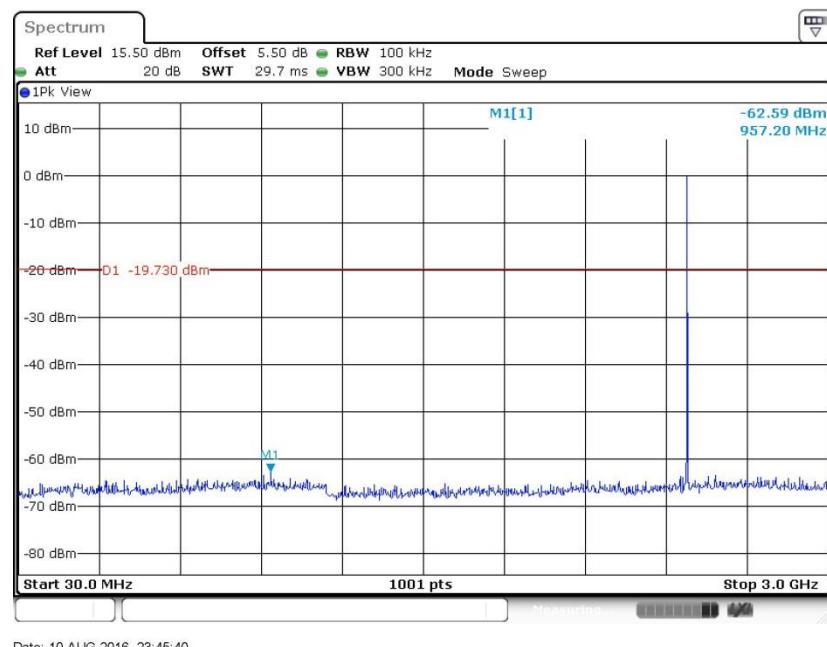


Date: 10 AUG 2016 23:42:30



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

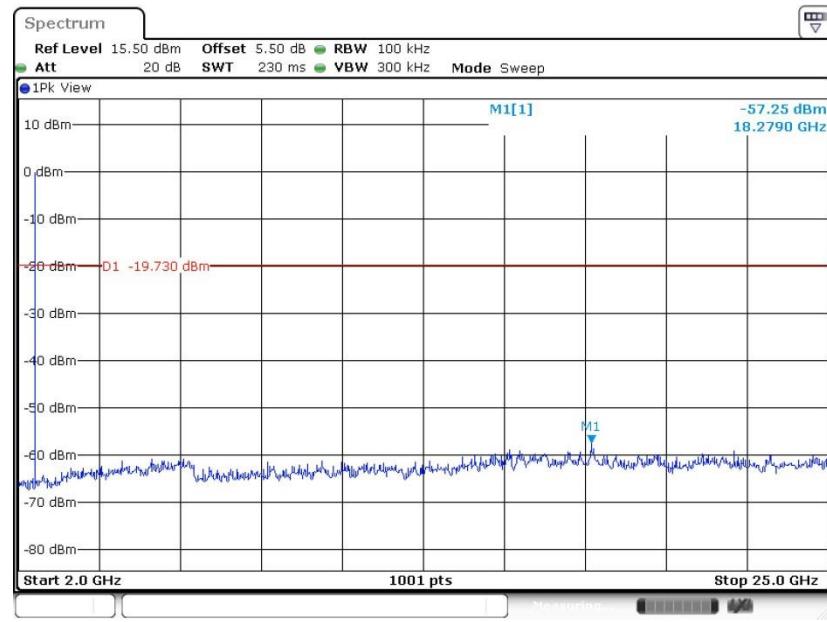
GFSK Channel 39





Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



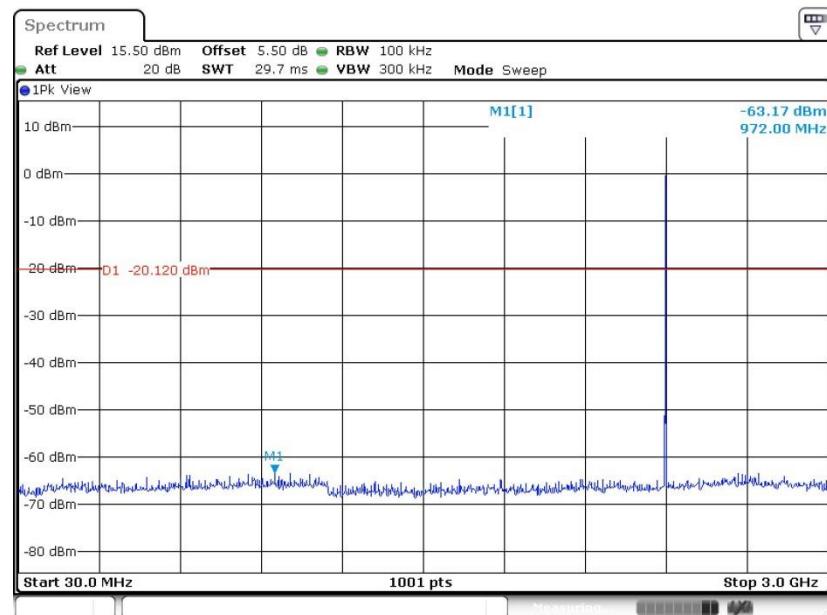
Date: 10 AUG 2016 23:45:49



Bluetooth v4.2 LE

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

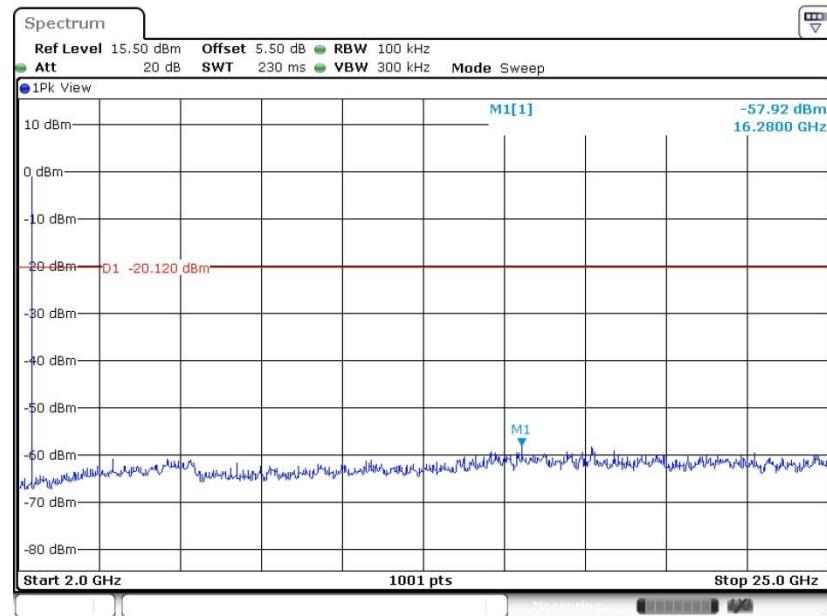
GFSK Channel 00





Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00

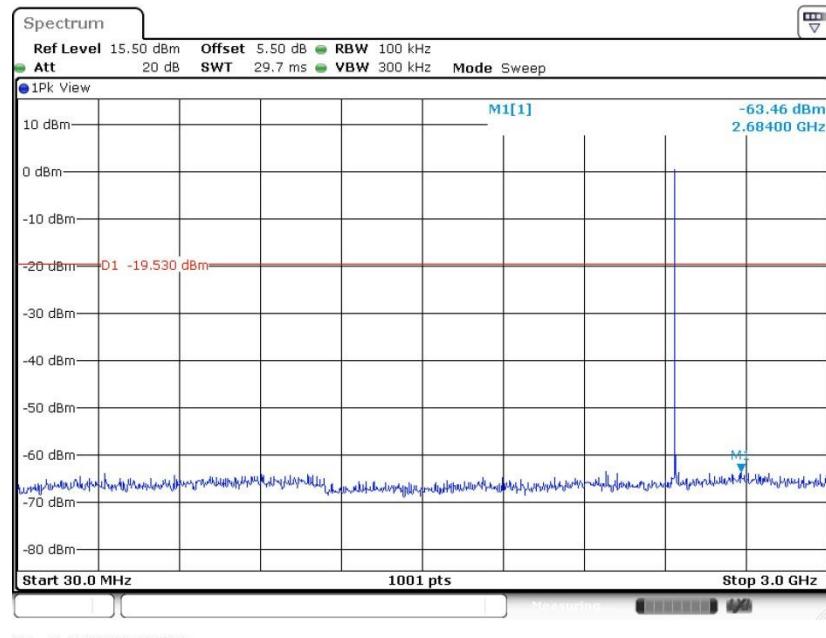


Date: 11.AUG.2016 00:00:26



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

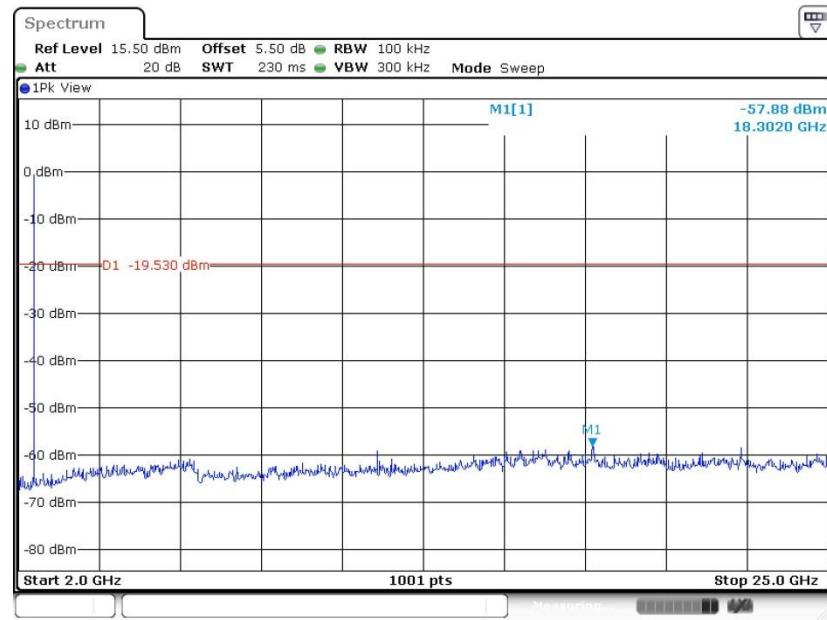
GFSK Channel 19





Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19

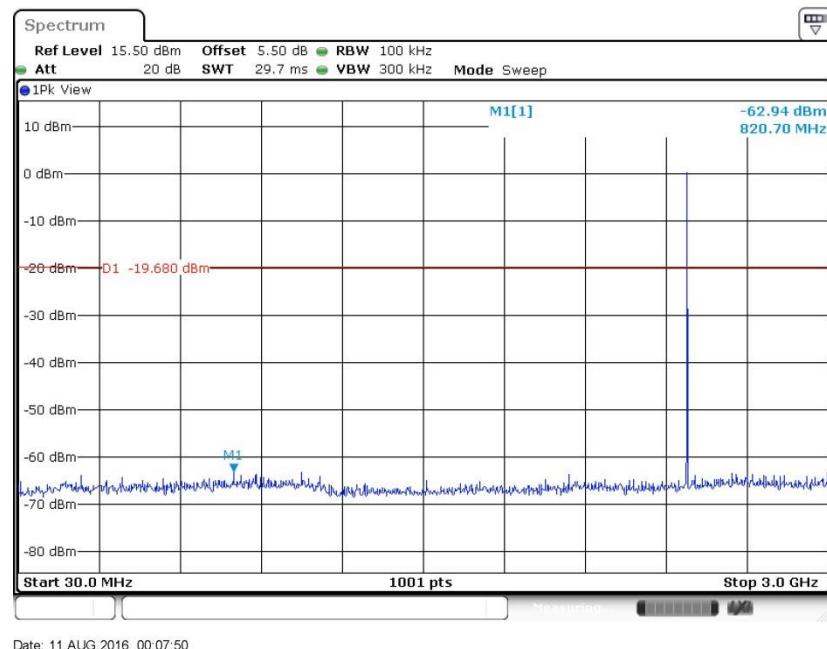


Date: 11.AUG.2016 00:03:04



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

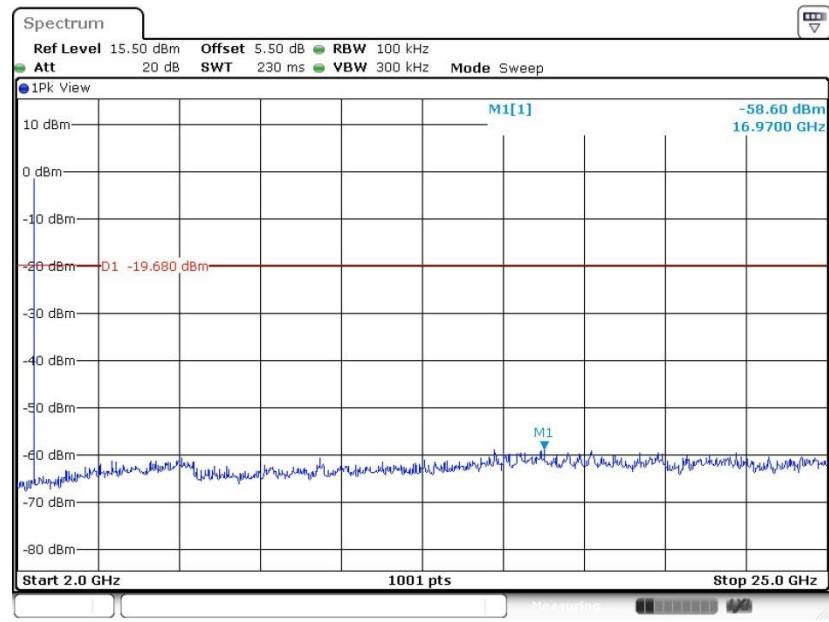
GFSK Channel 39





Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39





3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.



3.5.3 Test Procedures

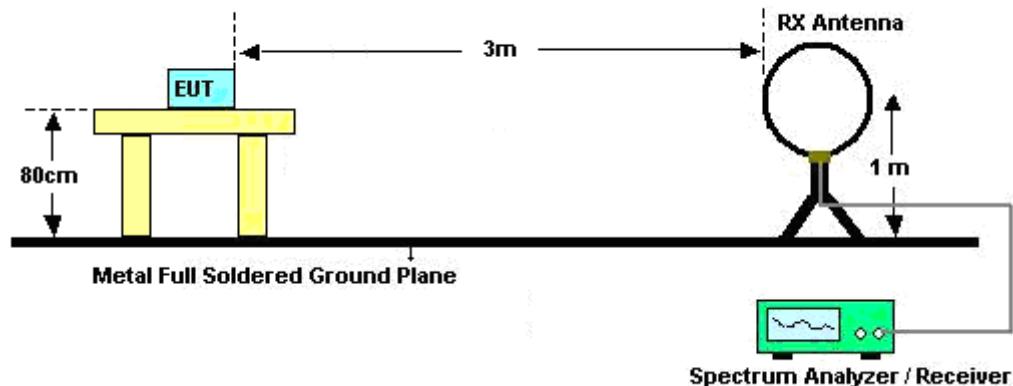
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

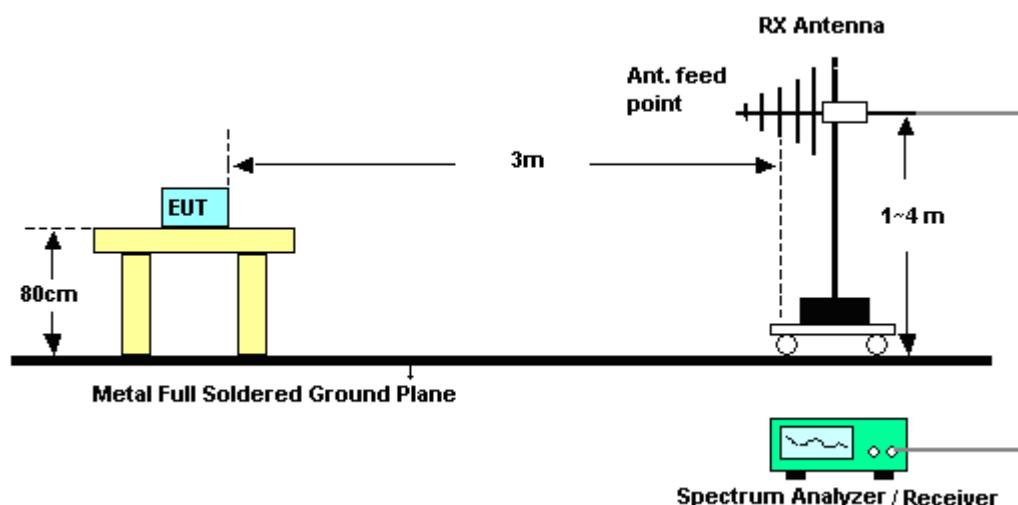
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

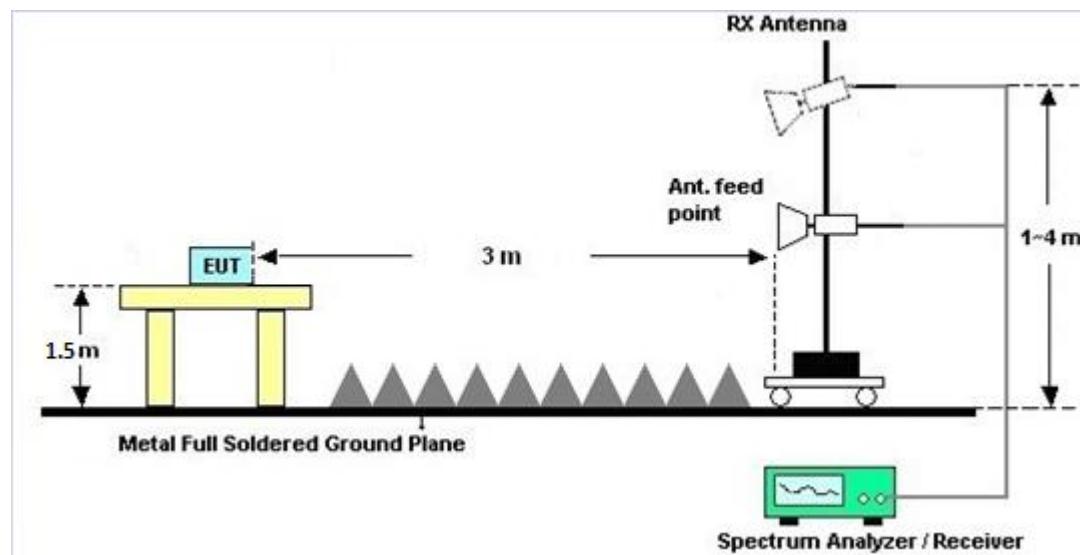
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.5.7 Duty Cycle

Please refer to Appendix C.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.



3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment 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.

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.

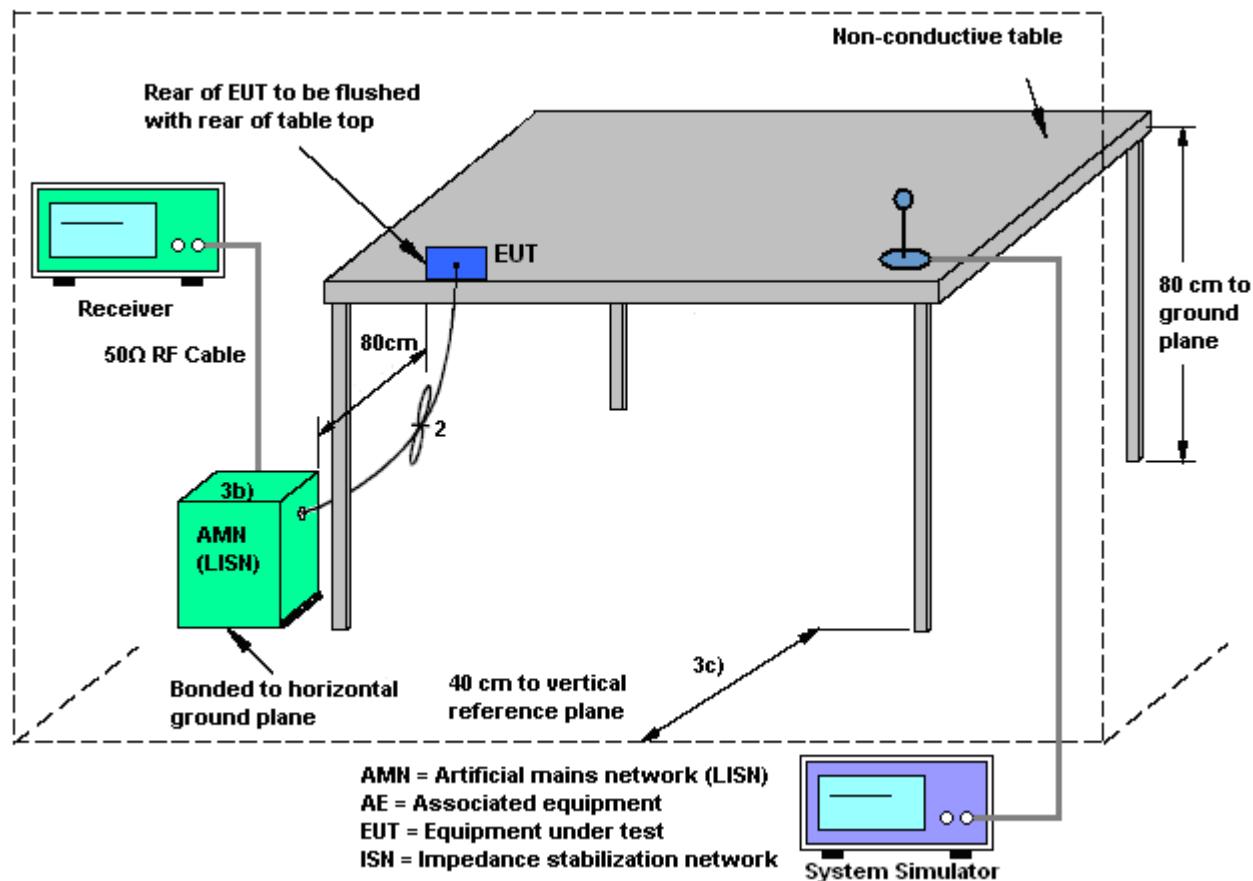
3.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.6.3 Test Procedures

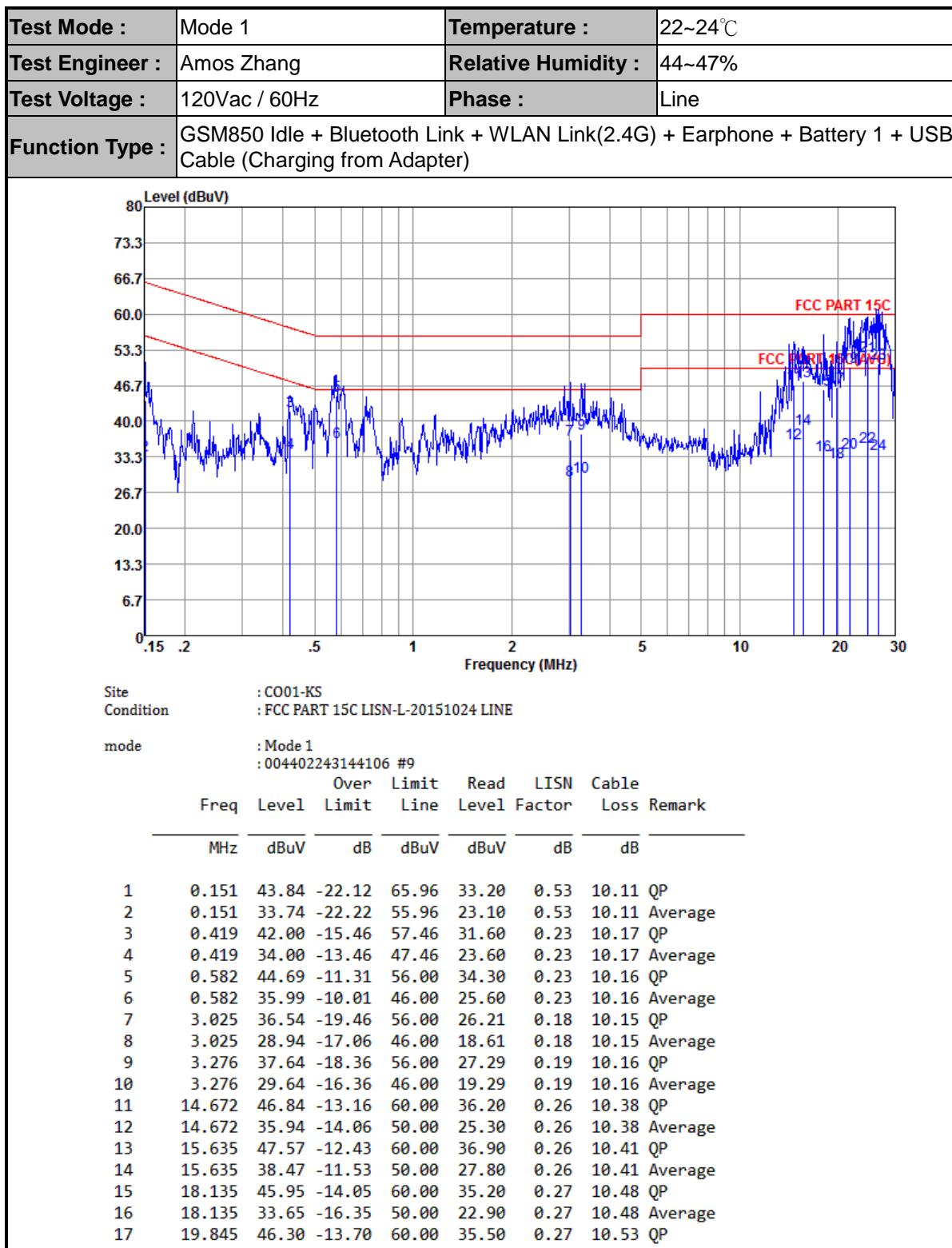
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

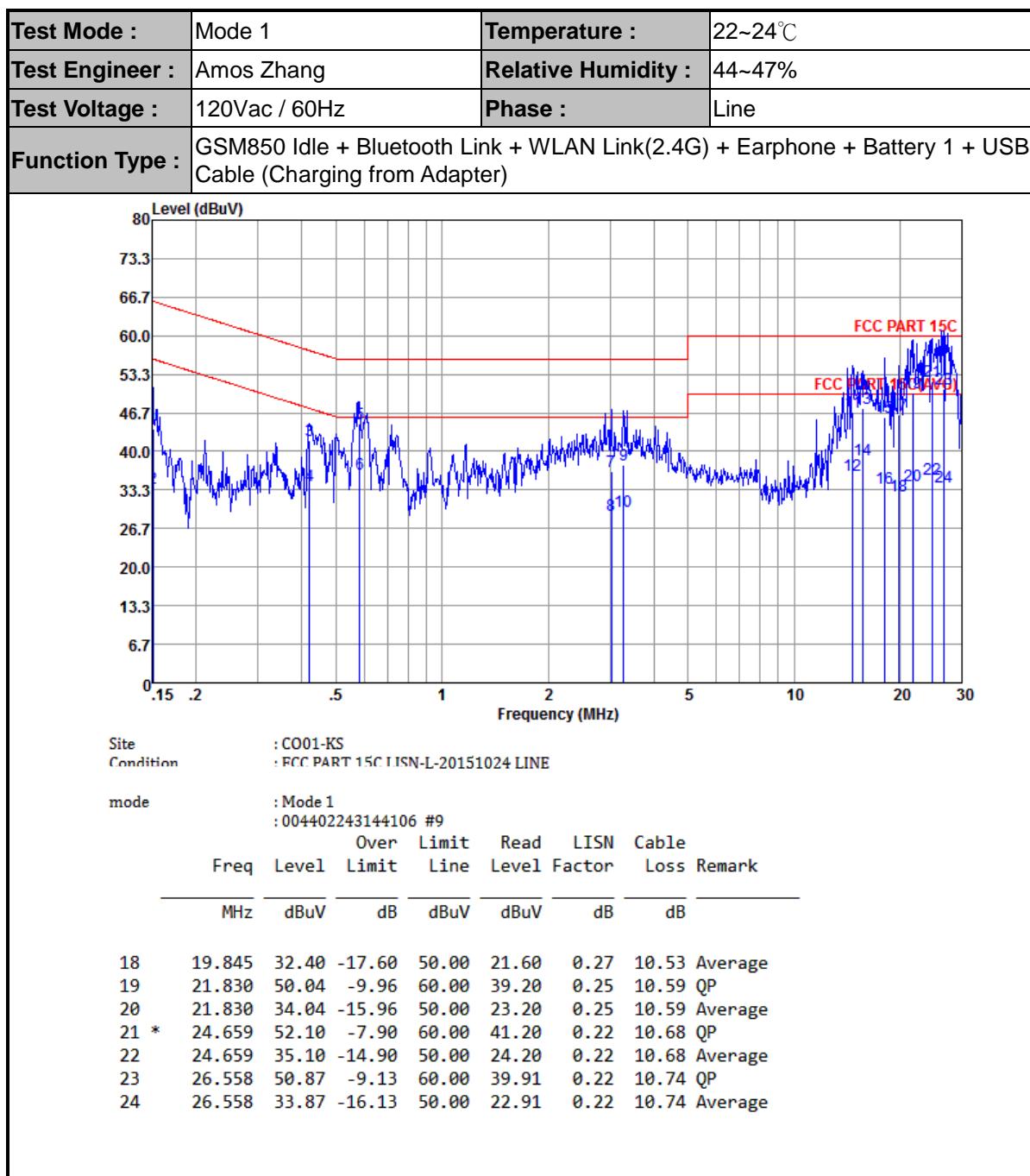
3.6.4 Test Setup

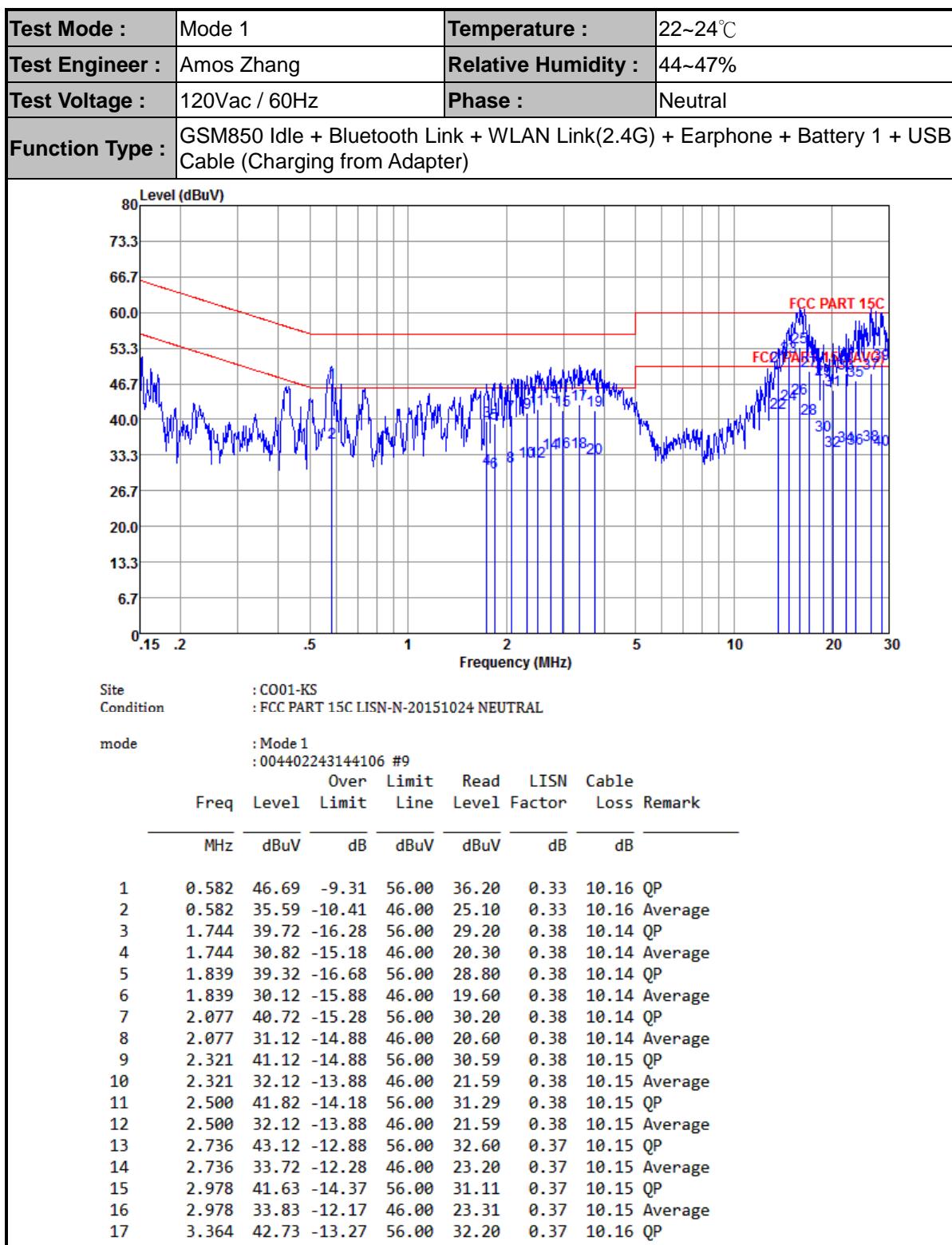




3.6.5 Test Result of AC Conducted Emission









Test Mode :	Mode 1	Temperature :	22~24°C																							
Test Engineer :	Amos Zhang	Relative Humidity :	44~47%																							
Test Voltage :	120Vac / 60Hz	Phase :	Neutral																							
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + Battery 1 + USB Cable (Charging from Adapter)																									
Site : CO01-KS Condition : FCC PART 15C LISN-N-20151024 NEUTRAL																										
mode : Mode 1 : 004402243144106 #9																										
<table border="1"> <thead> <tr> <th rowspan="2">Freq</th> <th colspan="2">Over Limit</th> <th>Read</th> <th>LISN</th> <th>Cable</th> <th rowspan="2">Remark</th> </tr> <tr> <th>Freq</th> <th>Level</th> <th>Limit</th> <th>Line</th> <th>Level</th> <th>Factor</th> <th>Loss</th> </tr> </thead> <tbody> <tr> <td>MHz</td> <td>dBuV</td> <td>dB</td> <td>dBuV</td> <td>dBuV</td> <td>dB</td> <td></td> </tr> </tbody> </table>						Freq	Over Limit		Read	LISN	Cable	Remark	Freq	Level	Limit	Line	Level	Factor	Loss	MHz	dBuV	dB	dBuV	dBuV	dB	
Freq	Over Limit		Read	LISN	Cable		Remark																			
	Freq	Level	Limit	Line	Level	Factor		Loss																		
MHz	dBuV	dB	dBuV	dBuV	dB																					
18	3.364	33.83	-12.17	46.00	23.30	0.37	10.16 Average																			
19	3.759	41.63	-14.37	56.00	31.10	0.37	10.16 QP																			
20	3.759	32.83	-13.17	46.00	22.30	0.37	10.16 Average																			
21	13.695	49.93	-10.07	60.00	39.30	0.27	10.36 QP																			
22	13.695	41.23	-8.77	50.00	30.60	0.27	10.36 Average																			
23	14.750	51.75	-8.25	60.00	41.10	0.27	10.38 QP																			
24	14.750	42.85	-7.15	50.00	32.20	0.27	10.38 Average																			
25	15.970	53.58	-6.42	60.00	42.89	0.27	10.42 QP																			
26 *	15.970	43.98	-6.02	50.00	33.29	0.27	10.42 Average																			
27	17.018	49.01	-10.99	60.00	38.30	0.26	10.45 QP																			
28	17.018	40.21	-9.79	50.00	29.50	0.26	10.45 Average																			
29	18.820	47.35	-12.65	60.00	36.60	0.25	10.50 QP																			
30	18.820	36.95	-13.05	50.00	26.20	0.25	10.50 Average																			
31	20.270	45.39	-14.61	60.00	34.60	0.25	10.54 QP																			
32	20.270	34.09	-15.91	50.00	23.30	0.25	10.54 Average																			
33	22.180	48.65	-11.35	60.00	37.80	0.25	10.60 QP																			
34	22.180	34.95	-15.05	50.00	24.10	0.25	10.60 Average																			
35	23.636	47.19	-12.81	60.00	36.30	0.24	10.65 QP																			
36	23.636	34.49	-15.51	50.00	23.60	0.24	10.65 Average																			
37	26.418	48.58	-11.42	60.00	37.60	0.24	10.74 QP																			
38	26.418	35.18	-14.82	50.00	24.20	0.24	10.74 Average																			
39	28.603	50.26	-9.74	60.00	39.20	0.24	10.82 QP																			
40	28.603	34.36	-15.64	50.00	23.30	0.24	10.82 Average																			

 | | |



3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

Non-standard antenna connector is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Sep. 10, 2015	Aug. 08, 2016~ Aug. 11, 2016	Sep. 09, 2016	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 20, 2016	Aug. 08, 2016~ Aug. 11, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 20, 2016	Aug. 08, 2016~ Aug. 11, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Aug. 08, 2016~ Aug. 15, 2016	Sep. 01, 2016	Radiation (03CH07-HY)
Bilog Antenna	TESEQ	CBL 6111D	35419	30MHz to 1GHz	Jan. 13, 2016	Aug. 08, 2016~ Aug. 15, 2016	Jan. 12, 2017	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 21, 2015	Aug. 08, 2016~ Aug. 15, 2016	Aug. 20, 2016	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	584	18GHz- 40GHz	Nov. 02, 2015	Aug. 08, 2016~ Aug. 15, 2016	Nov. 01, 2016	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1GHz	Mar. 18, 2016	Aug. 08, 2016~ Aug. 15, 2016	Mar. 17, 2017	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010	1800-30-10P	1GHz ~ 18GHz	Apr. 15, 2016	Aug. 08, 2016~ Aug. 15, 2016	Apr. 14, 2017	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A023	1GHz~ 26.5GHz	Oct. 19, 2015	Aug. 08, 2016~ Aug. 15, 2016	Oct. 18, 2016	Radiation (03CH07-HY)
Preamplifier	MITEQ	JS44-180040	00-33-8P	18GHz ~ 40GHz	Jun. 14, 2016	Aug. 08, 2016~ Aug. 15, 2016	Jun. 13, 2017	Radiation (03CH07-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY541300	20Hz ~ 8.4GHz	Nov. 04, 2015	Aug. 08, 2016~ Aug. 15, 2016	Nov. 03, 2016	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9010A	MY534701	10Hz~44GHz	Feb. 27, 2016	Aug. 08, 2016~ Aug. 15, 2016	Feb. 26, 2017	Radiation (03CH07-HY)
Controller	Max-Full	MF7802	MF780208	Control Ant Mast	NCR	Aug. 08, 2016~ Aug. 15, 2016	NCR	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	NCR	Aug. 08, 2016~ Aug. 15, 2016	NCR	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	NCR	Aug. 08, 2016~ Aug. 15, 2016	NCR	Radiation (03CH07-HY)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 10, 2015	Aug. 17, 2016	Sep. 09, 2016	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Aug. 17, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Aug. 17, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Aug. 17, 2016	Oct. 23, 2016	Conduction (CO01-KS)

NCR: No Calibration Required



5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	2.3dB
---	-------

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	5.7dB
---	-------

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	5.5dB
---	-------

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_{C(y)}$)	5.2dB
---	-------



Appendix A. Conducted Test Results

Bluetooth Low Energy v4.0

Test Engineer:	Ivan Chen	Temperature:	24~25	°C
Test Date:	2016/8/8 ~ 2016/8/11	Relative Humidity:	54~55	%

TEST RESULTS DATA <u>6dB and 99% Occupied Bandwidth</u>								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.05	0.67	0.50	Pass
BLE	1Mbps	1	19	2440	1.05	0.67	0.50	Pass
BLE	1Mbps	1	39	2480	1.05	0.67	0.50	Pass

TEST RESULTS DATA <u>Peak Power Table</u>										
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	0.67	30.00	0.30	0.97	36.00	Pass
BLE	1Mbps	1	19	2440	0.94	30.00	0.30	1.24	36.00	Pass
BLE	1Mbps	1	39	2480	0.80	30.00	0.30	1.10	36.00	Pass

TEST RESULTS DATA <u>Average Power Table</u> <u>(Reporting Only)</u>							
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	
BLE	1Mbps	1	0	2402	1.88	0.53	
BLE	1Mbps	1	19	2440	1.88	0.88	
BLE	1Mbps	1	39	2480	1.88	0.73	

TEST RESULTS DATA <u>Peak Power Density</u>									
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	-0.13	-14.76	0.30	8.00	Pass
BLE	1Mbps	1	19	2440	0.42	-14.15	0.30	8.00	Pass
BLE	1Mbps	1	39	2480	0.27	-14.32	0.30	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.

Bluetooth Low Energy v4.2

Test Engineer:	Ivan Chen	Temperature:	24~25	°C
Test Date:	2016/8/8~ 2016/8/11	Relative Humidity:	54~55	%

TEST RESULTS DATA <u>6dB and 99% Occupied Bandwidth</u>								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.05	0.66	0.50	Pass
BLE	1Mbps	1	19	2440	1.05	0.66	0.50	Pass
BLE	1Mbps	1	39	2480	1.05	0.66	0.50	Pass

TEST RESULTS DATA <u>Peak Power Table</u>										
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	0.77	30.00	0.30	1.07	36.00	Pass
BLE	1Mbps	1	19	2440	1.21	30.00	0.30	1.51	36.00	Pass
BLE	1Mbps	1	39	2480	0.83	30.00	0.30	1.13	36.00	Pass

TEST RESULTS DATA <u>Average Power Table</u> <u>(Reporting Only)</u>							
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	
BLE	1Mbps	1	0	2402	3.05	0.60	
BLE	1Mbps	1	19	2440	3.05	0.99	
BLE	1Mbps	1	39	2480	3.05	0.68	

TEST RESULTS DATA <u>Peak Power Density</u>									
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	-0.12	-14.66	0.30	8.00	Pass
BLE	1Mbps	1	19	2440	0.47	-14.08	0.30	8.00	Pass
BLE	1Mbps	1	39	2480	0.32	-14.23	0.30	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.



Appendix B. Radiated Spurious Emission

For Battery 1

2.4GHz 2400~2483.5MHz

BLE v4.0 (Band Edge @ 3m)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 00 2402MHz		2336.67	55.74	-18.26	74	51.18	31.8	7.18	34.42	251	124	P	H
		2387.7	46.25	-7.75	54	41.35	31.93	7.31	34.34	251	124	A	H
	*	2402	97.33	-	-	92.4	31.93	7.31	34.31	251	124	P	H
	*	2402	96.72	-	-	91.79	31.93	7.31	34.31	251	124	A	H
		2341.5	55.18	-18.82	74	50.55	31.8	7.24	34.41	335	189	P	V
		2386.02	46.04	-7.96	54	41.14	31.93	7.31	34.34	335	189	A	V
	*	2402	96.15	-	-	91.22	31.93	7.31	34.31	335	189	P	V
	*	2402	95.47	-	-	90.54	31.93	7.31	34.31	335	189	A	V
BLE CH 19 2440MHz		2380.42	54.98	-19.02	74	50.13	31.89	7.31	34.35	312	126	P	H
		2389.24	46.12	-7.88	54	41.21	31.93	7.31	34.33	312	126	A	H
	*	2440	94.74	-	-	89.56	32.07	7.36	34.25	312	126	P	H
	*	2440	93.87	-	-	88.69	32.07	7.36	34.25	312	126	A	H
		2484.74	56.53	-17.47	74	51.15	32.16	7.4	34.18	312	126	P	H
		2489.57	45.86	-8.14	54	40.43	32.2	7.4	34.17	312	126	A	H
		2338	54.88	-19.12	74	50.32	31.8	7.18	34.42	300	265	P	V
		2378.6	46.2	-7.8	54	41.42	31.89	7.24	34.35	300	265	A	V
	*	2440	95.37	-	-	90.19	32.07	7.36	34.25	300	265	P	V
	*	2440	93.81	-	-	88.63	32.07	7.36	34.25	300	265	A	V
		2486.42	55.36	-18.64	74	49.97	32.16	7.4	34.17	300	265	P	V
		2497.41	45.84	-8.16	54	40.39	32.2	7.4	34.15	300	265	A	V



BLE CH 39 2480MHz	*	2480	95.18	-	-	89.8	32.16	7.4	34.18	300	134	P	H
	*	2480	94.61	-	-	89.23	32.16	7.4	34.18	300	134	A	H
		2490.44	56.87	-17.13	74	51.44	32.2	7.4	34.17	300	134	P	H
		2499.92	46.75	-7.25	54	41.3	32.2	7.4	34.15	300	134	A	H
	*	2480	96.37	-	-	90.99	32.16	7.4	34.18	300	332	P	V
	*	2480	95.04	-	-	89.66	32.16	7.4	34.18	300	332	A	V
		2487.84	56.46	-17.54	74	51.03	32.2	7.4	34.17	300	332	P	V
		2496.72	46.83	-7.17	54	41.39	32.2	7.4	34.16	300	332	A	V
	Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.											



2.4GHz 2400~2483.5MHz

BLE v4.0 (Harmonic @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
BLE CH 00 2402MHz		4806	41	-33	74	54.06	34.19	11.83	59.08	100	0	P	H	
		4806	40.86	-33.14	74	53.92	34.19	11.83	59.08	100	0	P	V	
BLE CH 19 2440MHz		4878	39.75	-34.25	74	52.93	34.23	11.53	58.94	100	0	P	H	
		7320	39.79	-34.21	74	48.34	35.6	13.81	57.96	100	0	P	H	
		4878	40.16	-33.84	74	53.34	34.23	11.53	58.94	100	0	P	V	
		7320	40.19	-33.81	74	48.74	35.6	13.81	57.96	100	0	P	V	
BLE CH 39 2480MHz		4962	40.5	-33.5	74	53.77	34.28	11.22	58.77	100	0	P	H	
		7440	40.81	-33.19	74	49.29	35.6	14.05	58.13	100	0	P	H	
		4962	41.26	-32.74	74	54.53	34.28	11.22	58.77	100	0	P	V	
		7440	40.53	-33.47	74	49.01	35.6	14.05	58.13	100	0	P	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission below 1GHz

2.4GHz BLE v4.0 (LF)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz BLE LF		30.27	28.24	-11.76	40	32.52	26	1.07	31.35	100	0	P	H
		138	25.06	-18.44	43.5	36.95	18.06	1.55	31.5	-	-	P	H
		193.08	24.32	-19.18	43.5	38.28	15.65	1.87	31.48	-	-	P	H
		430.2	25.39	-20.61	46	30.8	22.83	2.89	31.13	-	-	P	H
		660.5	29.78	-16.22	46	30.88	26.01	3.65	30.76	-	-	P	H
		934.2	33.2	-12.8	46	29.79	29.82	4.12	30.53	-	-	P	H
		30	29.39	-10.61	40	33.67	26	1.07	31.35	100	0	P	V
		49.44	24.78	-15.22	40	39.79	15.52	1.07	31.6	-	-	P	V
		196.05	28.05	-15.45	43.5	41.86	15.8	1.87	31.48	-	-	P	V
		826.4	31.83	-14.17	46	30.08	28.23	4.1	30.58	-	-	P	V
		838.3	33.5	-12.5	46	31.51	28.46	4.1	30.57	-	-	P	V
		913.9	33.06	-12.94	46	30.15	29.33	4.12	30.54	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



2.4GHz 2400~2483.5MHz

BLE v4.2 (Band Edge @ 3m)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 00 2402MHz		2333.73	55.5	-18.5	74	51	31.75	7.18	34.43	360	330	P	H
		2384.55	47.74	-6.26	54	42.88	31.89	7.31	34.34	360	330	A	H
	*	2402	97.13	-	-	92.2	31.93	7.31	34.31	360	330	P	H
	*	2402	96.73	-	-	91.8	31.93	7.31	34.31	360	330	A	H
		2334.675	55.48	-18.52	74	50.92	31.8	7.18	34.42	374	37	P	V
		2366.595	47.96	-6.04	54	43.25	31.84	7.24	34.37	374	37	A	V
	*	2402	97.72	-	-	92.79	31.93	7.31	34.31	374	37	P	V
	*	2402	97.26	-	-	92.33	31.93	7.31	34.31	374	37	A	V
BLE CH 19 2440MHz		2382.94	55.44	-18.56	74	50.58	31.89	7.31	34.34	304	290	P	H
		2369.5	47.58	-6.42	54	42.82	31.89	7.24	34.37	304	290	A	H
	*	2440	95.43	-	-	90.25	32.07	7.36	34.25	304	290	P	H
	*	2440	94.96	-	-	89.78	32.07	7.36	34.25	304	290	A	H
		2497.55	55.59	-18.41	74	50.14	32.2	7.4	34.15	304	290	P	H
		2491.39	48.01	-5.99	54	42.57	32.2	7.4	34.16	304	290	A	H
		2316.44	55.21	-18.79	74	50.77	31.71	7.18	34.45	353	39	P	V
		2360.26	47.54	-6.46	54	42.84	31.84	7.24	34.38	353	39	A	V
	*	2440	97.48	-	-	92.3	32.07	7.36	34.25	353	39	P	V
	*	2440	97.07	-	-	91.89	32.07	7.36	34.25	353	39	A	V
		2490.62	56.01	-17.99	74	50.58	32.2	7.4	34.17	353	39	P	V
		2486.07	48.37	-5.63	54	42.98	32.16	7.4	34.17	353	39	A	V



BLE CH 39 2480MHz	*	2480	97.42	-	-	92.04	32.16	7.4	34.18	376	330	P	H
	*	2480	97.13	-	-	91.75	32.16	7.4	34.18	376	330	A	H
		2496.12	56.29	-17.71	74	50.85	32.2	7.4	34.16	376	330	P	H
		2485.68	48.35	-5.65	54	42.96	32.16	7.4	34.17	376	330	A	H
	*	2480	97.38	-	-	92	32.16	7.4	34.18	380	62	P	V
	*	2480	96.8	-	-	91.42	32.16	7.4	34.18	380	62	A	V
		2497.2	56	-18	74	50.55	32.2	7.4	34.15	380	62	P	V
		2489	48.67	-5.33	54	43.24	32.2	7.4	34.17	380	62	A	V
	Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.											



2.4GHz 2400~2483.5MHz

BLE v4.2 (Harmonic @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
				(MHz)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V)	(dB/m)	(dB)	(dB)	(cm)	(deg)
BLE CH 00 2402MHz		4806	41	-33	74	54.06	34.19	11.83	59.08	100	0	P	H
		4806	40.86	-33.14	74	53.92	34.19	11.83	59.08	100	0	P	V
BLE CH 19 2440MHz		4880	39.76	-34.24	74	52.94	34.23	11.53	58.94	100	0	P	H
		7320	39.42	-34.58	74	47.97	35.6	13.81	57.96	100	0	P	H
		4880	40.82	-33.18	74	54	34.23	11.53	58.94	100	0	P	V
		7320	42.12	-31.88	74	50.67	35.6	13.81	57.96	100	0	P	V
BLE CH 39 2480MHz		4960	38.75	-35.25	74	52.02	34.28	11.22	58.77	100	0	P	H
		7440	39.15	-34.85	74	47.63	35.6	14.05	58.13	100	0	P	H
		4960	41.53	-32.47	74	54.8	34.28	11.22	58.77	100	0	P	V
		7440	42.64	-31.36	74	51.12	35.6	14.05	58.13	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BLE v4.2 (LF)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz BLE LF		30.54	28.87	-11.13	40	33.7	25.46	1.07	31.36	100	12	P	H
		138.81	30.13	-13.37	43.5	42.05	18.03	1.55	31.5	-	-	P	H
		214.68	24.67	-18.83	43.5	37.91	16.34	1.87	31.45	-	-	P	H
		716.5	29.47	-16.53	46	29.76	26.67	3.74	30.7	-	-	P	H
		761.3	30.96	-15.04	46	30.46	27.32	3.82	30.64	-	-	P	H
		856.5	32.27	-13.73	46	29.99	28.74	4.1	30.56	-	-	P	H
		30	29.66	-10.34	40	33.94	26	1.07	31.35	100	296	P	V
		158.79	23.9	-19.6	43.5	36.55	17.07	1.78	31.5	-	-	P	V
		194.7	28.11	-15.39	43.5	41.97	15.75	1.87	31.48	-	-	P	V
		878.9	31.46	-14.54	46	28.97	28.87	4.17	30.55	-	-	P	V
		914.6	30.73	-15.27	46	27.8	29.35	4.12	30.54	-	-	P	V
		950.3	31.33	-14.67	46	27.59	30.2	4.07	30.53	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



For Battery 2

2.4GHz 2400~2483.5MHz

BLE v4.2 (Band Edge @ 3m)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 39 2480MHz		2480	92.98	-	-	87.6	32.16	7.4	34.18	296	129	P	H
		2480	92.04	-	-	86.66	32.16	7.4	34.18	296	129	A	H
	*	2488.16	55.86	-18.14	74	50.43	32.2	7.4	34.17	296	129	P	H
	*	2499.12	48.02	-5.98	54	42.57	32.2	7.4	34.15	296	129	A	H
		2480	90.82	-	-	85.44	32.16	7.4	34.18	340	54	P	V
		2480	90.25	-	-	84.87	32.16	7.4	34.18	340	54	A	V
	*	2486.64	55.72	-18.28	74	50.33	32.16	7.4	34.17	340	54	P	V
	*	2497.28	48.29	-5.71	54	42.84	32.2	7.4	34.15	340	54	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BLE v4.2 (Harmonic @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
														Avg.
		(MHz)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BLE CH 39 2480MHz		4960	40.24	-33.76	74	53.51	34.28	11.22	58.77	100	0	P	H	
		7440	40.54	-33.46	74	49.02	35.6	14.05	58.13	100	0	P	H	
		4960	41.18	-32.82	74	54.45	34.28	11.22	58.77	100	0	P	V	
		7440	41.87	-32.13	74	50.35	35.6	14.05	58.13	100	0	P	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission below 1GHz

2.4GHz BLE v4.2 (LF)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
2.4GHz BLE LF		30	28.92	-11.08	40	33.2	26	1.07	31.35	100	19	P	H
		137.73	24.71	-18.79	43.5	36.6	18.06	1.55	31.5	-	-	P	H
		196.86	26.96	-16.54	43.5	40.72	15.85	1.87	31.48	-	-	P	H
		864.2	31.8	-14.2	46	29.4	28.79	4.17	30.56	-	-	P	H
		897.8	32.24	-13.76	46	29.62	28.99	4.17	30.54	-	-	P	H
		932.8	33.5	-12.5	46	30.11	29.8	4.12	30.53	-	-	P	H
		30	29.4	-10.6	40	33.68	26	1.07	31.35	100	61	P	V
		194.43	27.7	-15.8	43.5	41.56	15.75	1.87	31.48	-	-	P	V
		211.17	26.7	-16.8	43.5	39.98	16.31	1.87	31.46	-	-	P	V
		852.3	31.43	-14.57	46	29.17	28.72	4.1	30.56	-	-	P	V
		893.6	32.51	-13.49	46	29.92	28.96	4.17	30.54	-	-	P	V
		937	32.93	-13.07	46	29.45	29.89	4.12	30.53	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak (P/A)	Avg. (H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

$$1. \text{ Level(dB}\mu\text{V/m)} =$$

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dB}\mu\text{V)} - \text{Preamp Factor(dB)}$$

$$2. \text{ Over Limit(dB)} = \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

For Peak Limit @ 2390MHz:

$$1. \text{ Level(dB}\mu\text{V/m)}$$

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dB}\mu\text{V)} - \text{Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 54.51(\text{dB}\mu\text{V}) - 35.86 (\text{dB})$$

$$= 55.45 (\text{dB}\mu\text{V/m})$$

$$2. \text{ Over Limit(dB)}$$

$$= \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

$$= 55.45(\text{dB}\mu\text{V/m}) - 74(\text{dB}\mu\text{V/m})$$

$$= -18.55(\text{dB})$$

For Average Limit @ 2390MHz:

$$1. \text{ Level(dB}\mu\text{V/m)}$$

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dB}\mu\text{V)} - \text{Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 42.6(\text{dB}\mu\text{V}) - 35.86 (\text{dB})$$

$$= 43.54 (\text{dB}\mu\text{V/m})$$

$$2. \text{ Over Limit(dB)}$$

$$= \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

$$= 43.54(\text{dB}\mu\text{V/m}) - 54(\text{dB}\mu\text{V/m})$$

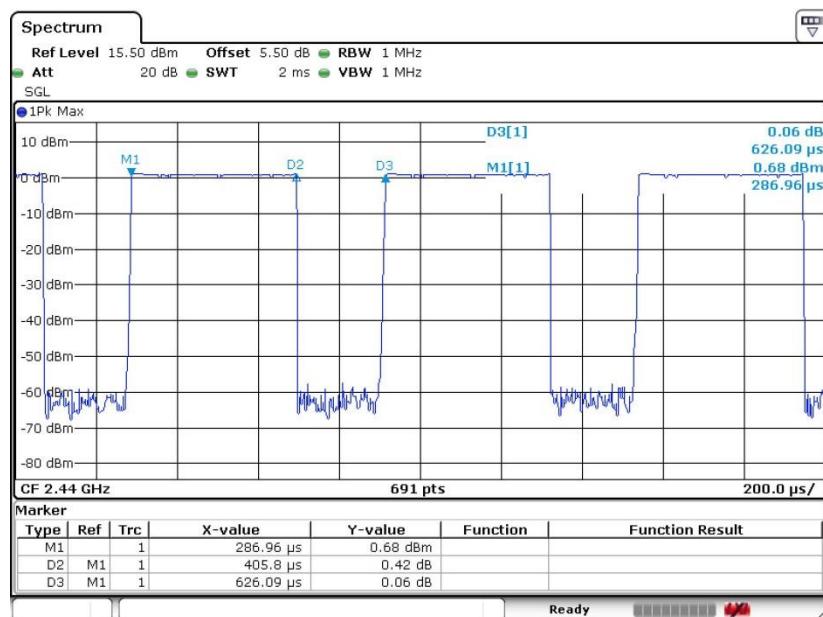
$$= -10.46(\text{dB})$$

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth 4.0 LE	64.81	0.41	2.44	3kHz
Bluetooth 4.2 LE	49.54	0.31	3.22	10kHz

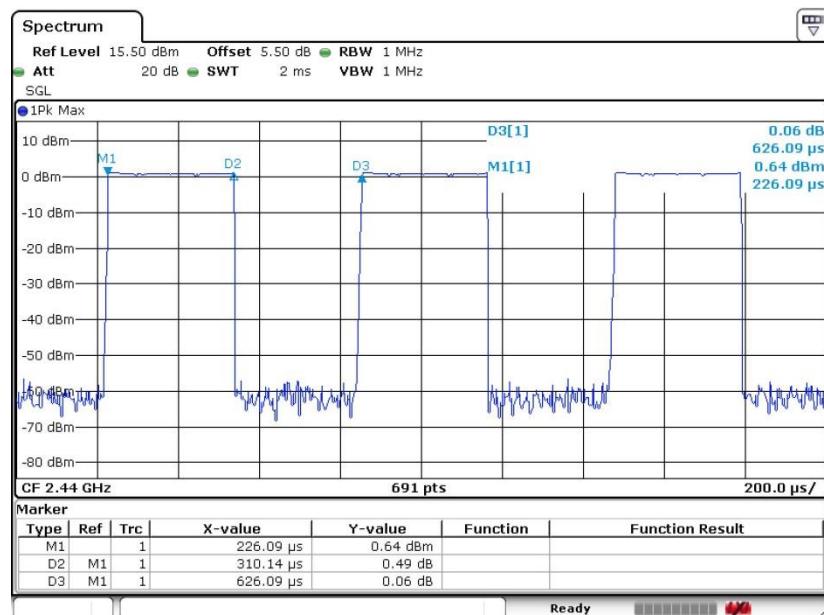
Bluetooth 4.0 LE



Date: 8.AUG.2016 01:30:28



Bluetooth 4.2 LE



Date: 9.AUG.2016 11:27:20