



# FCC RF Test Report

**APPLICANT** : Sony Mobile Communications Inc.  
**EQUIPMENT** : GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII  
a/b/g/n/ac, ANT+, and NFC  
**BRAND NAME** : Sony  
**FCC ID** : PY7-PM0911  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was received on Jul. 16, 2015 and testing was completed on Sep. 13, 2015. We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL INC.**  
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### APPENDIX A. CONDUCTED TEST RESULTS

### APPENDIX B. TEST RESULT OF RADIATED EMISSION

### APPENDIX C. RADIATED SPURIOUS EMISSION PLOTS



# REVISION HISTORY



## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)(1)	Peak Output Power	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm/3kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 8.07 dB at 30.000 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 22.30 dB at 0.622 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

**Note:** The FCC ID: PY7-PM0910 and FCC ID: PY7-PM0911 is similar device, in this report only conducted test result is referred to PY7-PM0910, Sporton Report No: FR571620B.



## 1 General Description

### 1.1 Applicant

**Sony Mobile Communications Inc.**  
Nya Vattentornet, 22188 Lund, Sweden

### 1.2 Manufacturer

**Sony Mobile Communications Inc.**  
1-8-15 Konan, Minato-ku, Tokyo, 108-0075, Japan

### 1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, DTS/UNII a/b/g/n/ac, ANT+, NFC and GPS

Product Specification subjective to this standard	
Antenna Type/Gain	Monopole Antenna type with gain -4.2 dBi

EUT Information List				
IMEI	HW Version	SW Version	S/N	Performed Test Item
004402541724518	A	32.0.B.0.233	CB5A27RL7B	RF conducted measurement
004402455444947		32.0.A.0.323	CB5A27SPN1	Radiated Spurious Emission
004402455447593			CB5A27SPLZ	Conducted Emission



Accessory List	
AC Adapter	Model No. : UCH20
	Type No. : AC-0061-US
	S/N : 5815W22500089 (for radiated spurious emission) 5815W22500112 (for conducted emission)
Earphone	Model No. : MDR-NC750
	Type No. : AG-0020
USB Cable	Model No. : UCB11
	Type No. : AI-0120
	S/N : 1015W02400014C (for radiated spurious emission) 1522A7370000074 (for conducted emission)

**Note:**

1. Above EUT list and accessory list used are electrically identical per declared by manufacturer.
2. Above the accessories list are used to exercise the EUT during test.
3. For other wireless features of this EUT, test report will be issued separately.

## 1.4 Modification of EUT

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

## 1.5 Testing Location

Sportun Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.		
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
<b>Test Site No.</b>	<b>Sportun Site No.</b>		
	TH05-HY	CO05-HY	03CH07-HY

**Note:** The test site complies with ANSI C63.4 2009 requirement.



## 1.6 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 v03r03
- ANSI C63.10-2009

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table as an alternative in C63.10-2013 through inquiry tracking number 961829.



## 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 4.0 – LE RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	7.24 dBm
Ch19	2440MHz	7.99 dBm
Ch39	2480MHz	7.43 dBm

- 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 (Y plane as worst plane) from all possible combinations.
- AC power line Conducted Emission was tested under maximum output power.

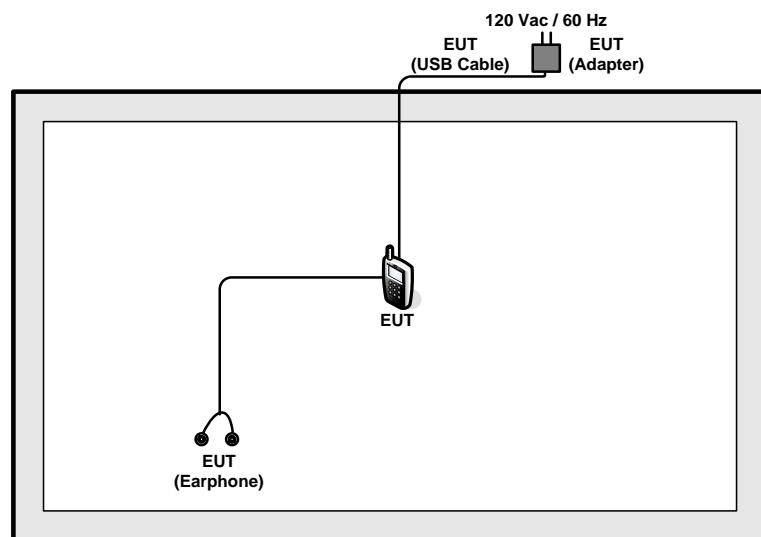
### 2.2 Test Mode

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

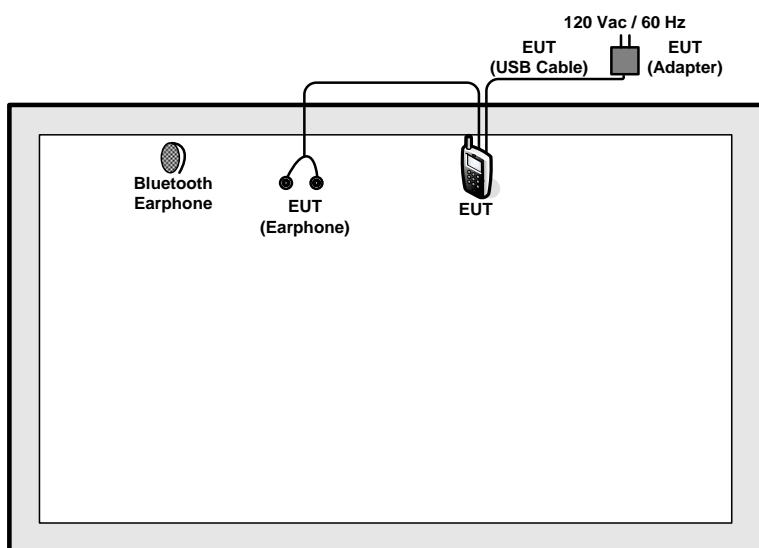
Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.0 – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx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

## 2.3 Connection Diagram of Test System

### <Bluetooth 4.0 – LE Tx Mode>



### <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.	Bluetooth Earphone	Sony	SBH20	PY7-RD0010	Unshielded, 0.75m	N/A
2.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

## 2.5 EUT Operation Test Setup

For Bluetooth function test items, an engineering test program was provided and enabled to make EUT transmitting and receiving signals.

## 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 and attenuator factor 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 and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 6dB Bandwidth Measurement

##### 3.1.1 Limit of 6dB Bandwidth

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

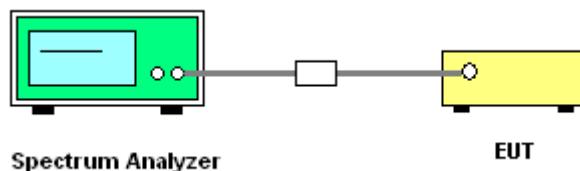
##### 3.1.2 Measuring Instruments

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 v03r03.
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. Measure and record the results in the test report.

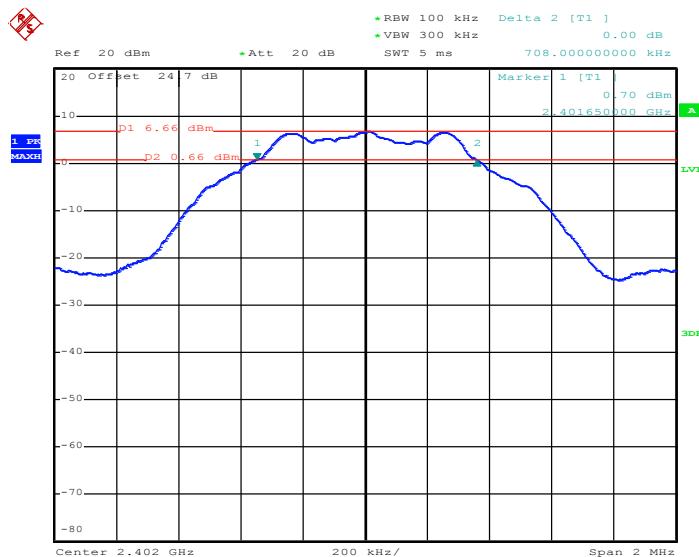
##### 3.1.4 Test Setup



### 3.1.5 Test Result of 6dB Bandwidth

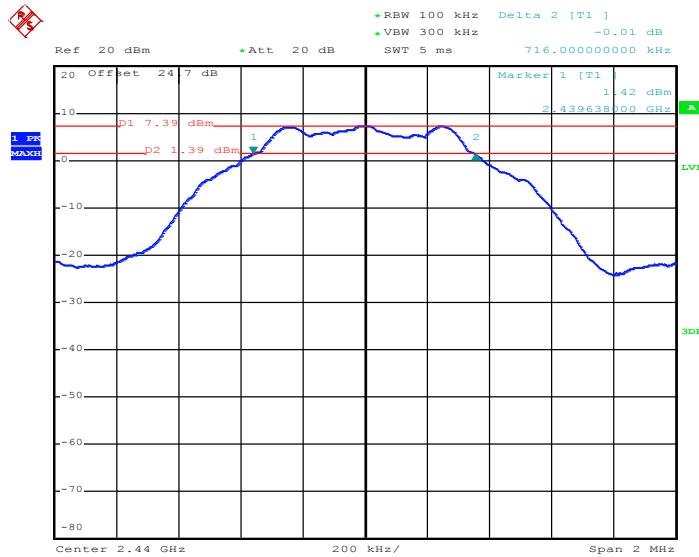
Test data refer to Appendix A.

#### 6 dB Bandwidth Plot on Channel 00



Date: 1.SEP.2015 01:15:41

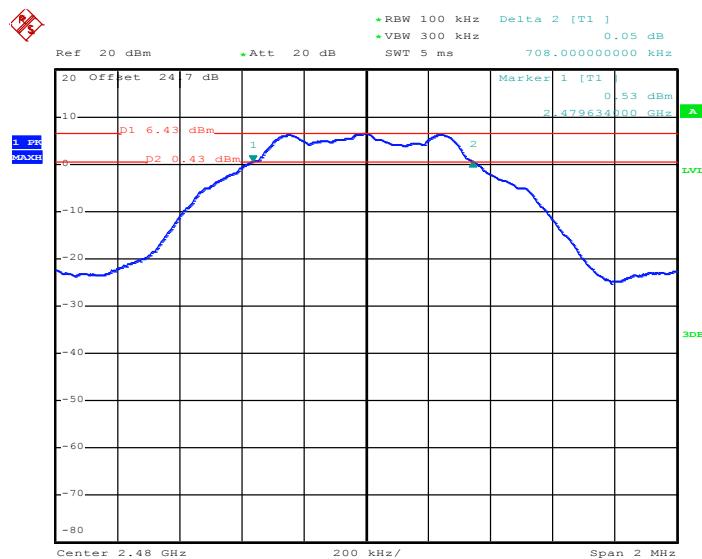
#### 6 dB Bandwidth Plot on Channel 19



Date: 1.SEP.2015 01:26:00



## 6 dB Bandwidth Plot on Channel 39



Date: 1.SEP.2015 01:29:55

## 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.

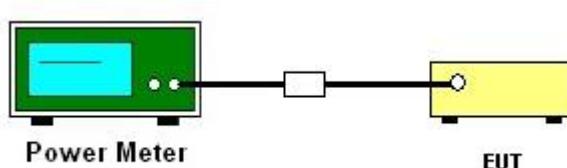
### 3.2.2 Measuring Instruments

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 v03r03 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.

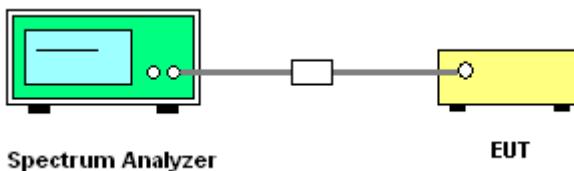
#### 3.3.2 Measuring Instruments

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 v03r03
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

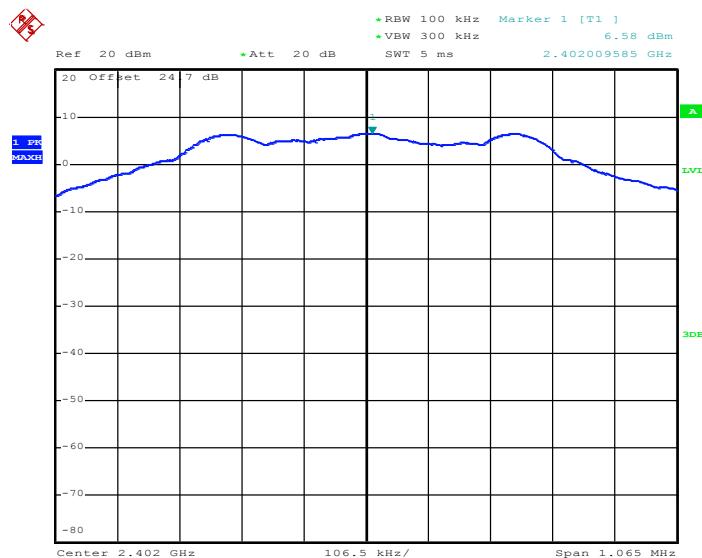


### 3.3.5 Test Result of Power Spectral Density

Test data refers to Appendix A.

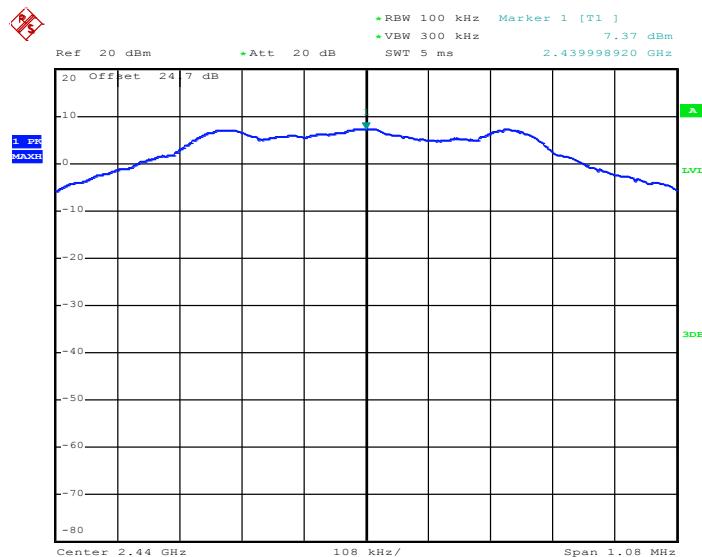
### 3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on Channel 00



Date: 1.SEP.2015 01:18:32

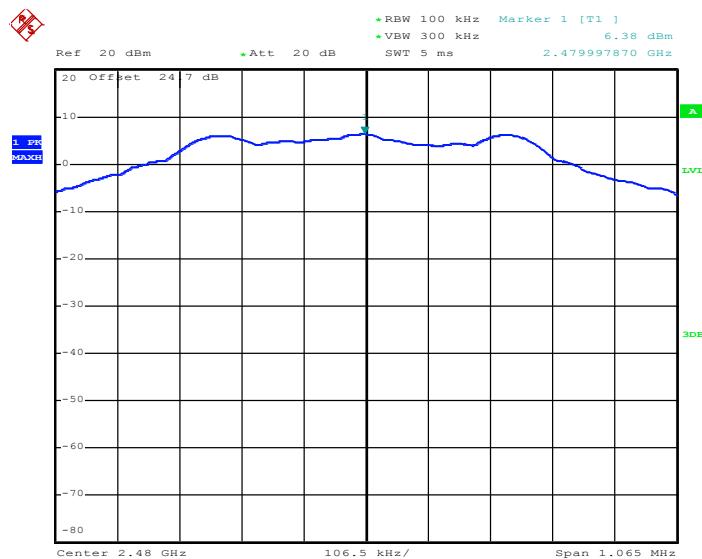
PSD 100kHz Plot on Channel 19



Date: 1.SEP.2015 01:27:38



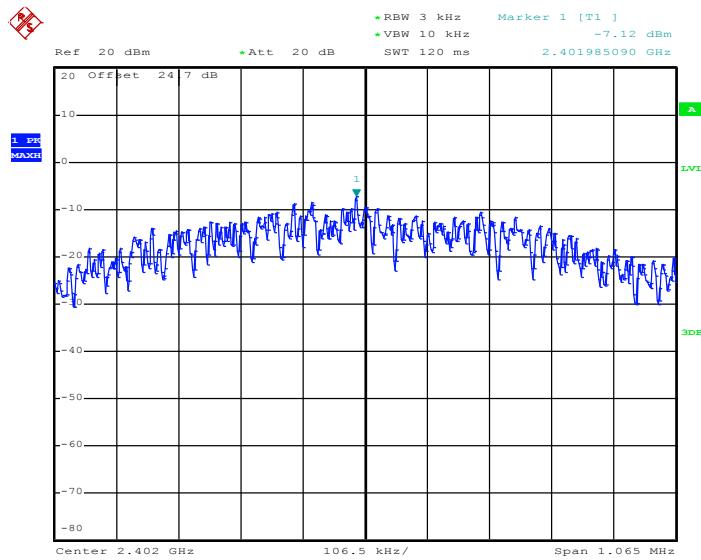
## PSD 100kHz Plot on Channel 39



Date: 1.SEP.2015 01:32:50

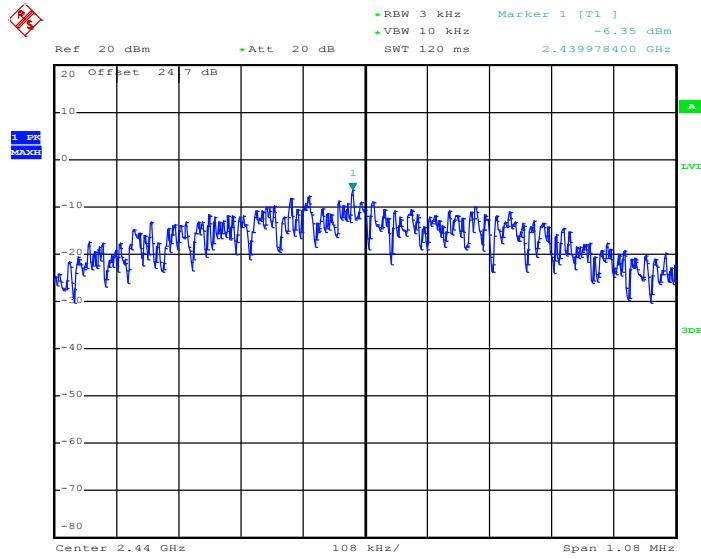
### 3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on Channel 00



Date: 1.SEP.2015 01:17:19

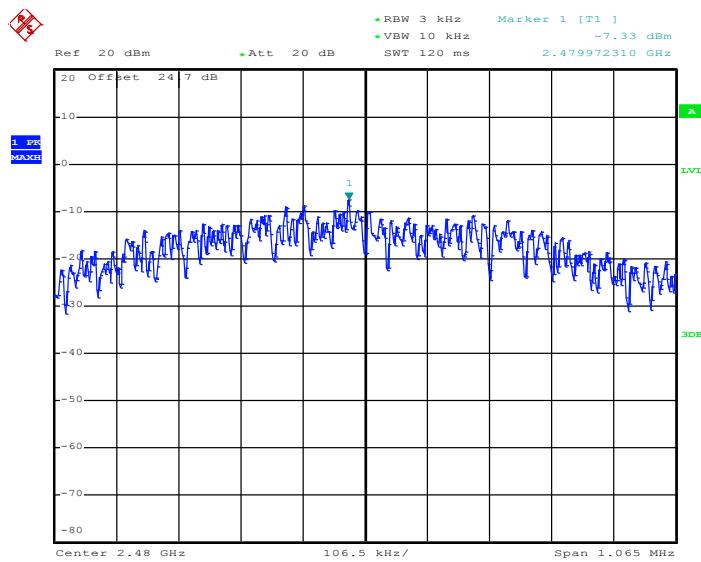
PSD 3kHz Plot on Channel 19



Date: 1.SEP.2015 01:27:26



## PSD 3kHz Plot on Channel 39



Date: 1.SEP.2015 01:30:06

## 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.

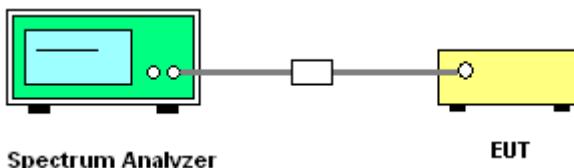
### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedure

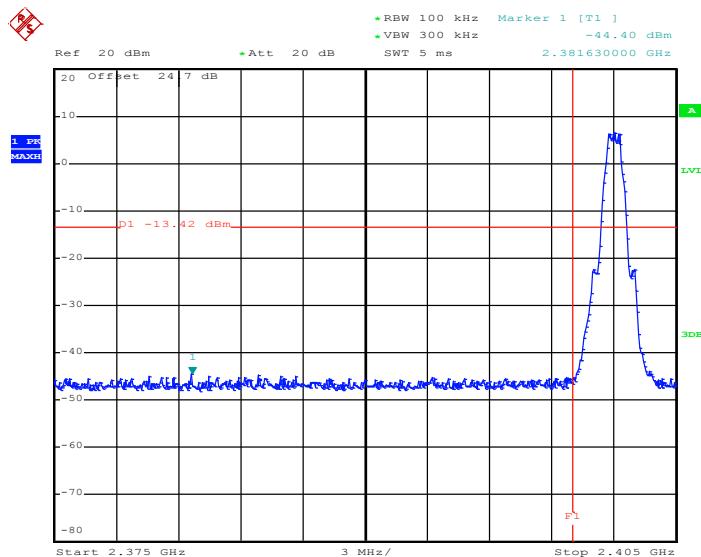
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r03.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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



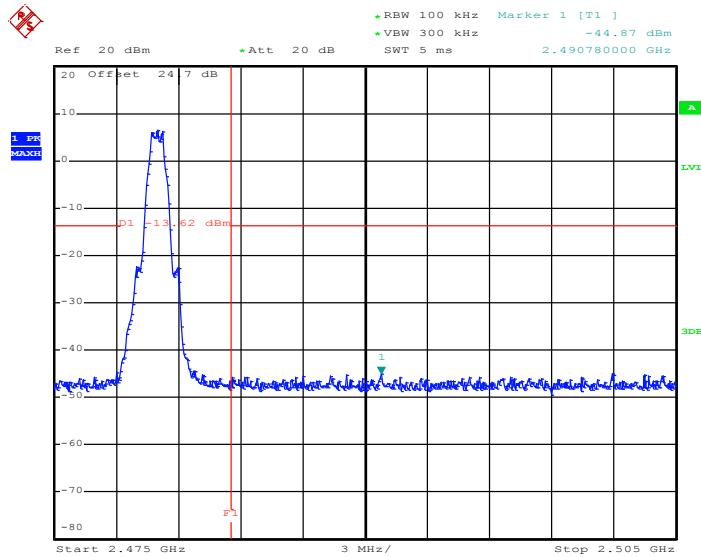
### 3.4.5 Test Result of Conducted Band Edges Plots

#### Low Band Edge Plot on Channel 00



Date: 1.SEP.2015 01:23:41

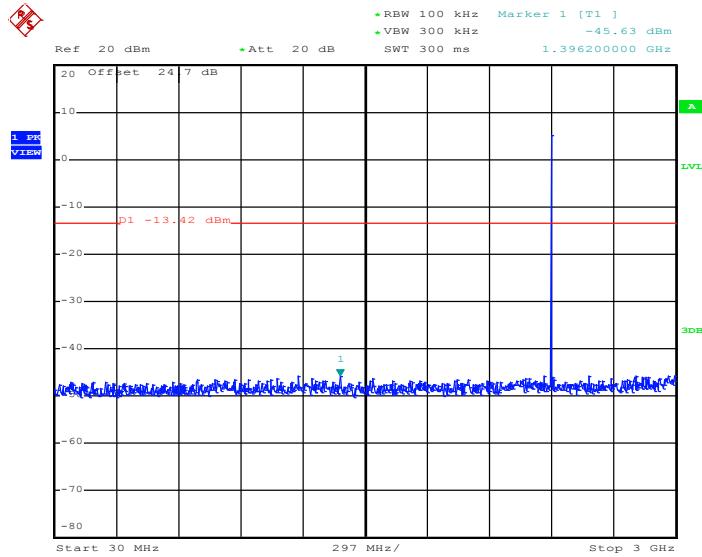
#### High Band Edge Plot on Channel 39



Date: 1.SEP.2015 01:33:41

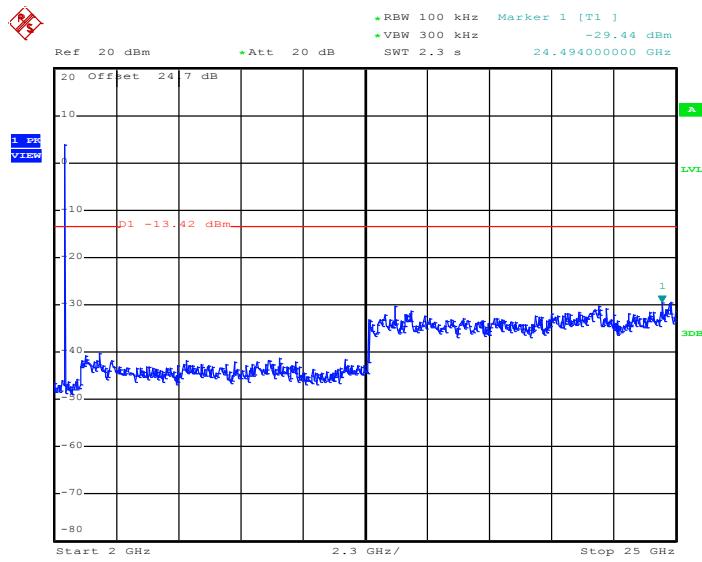
### 3.4.6 Test Result of Conducted Spurious Emission Plots

#### Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 1.SEP.2015 01:24:20

#### Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00

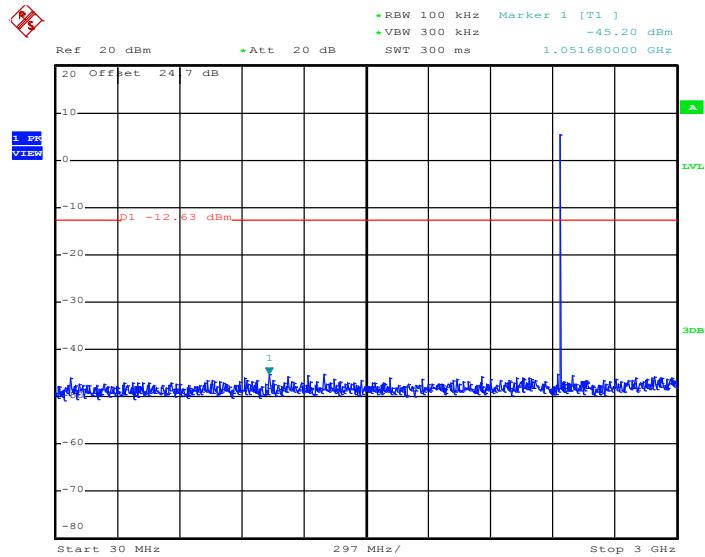


Date: 1.SEP.2015 01:24:28



## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

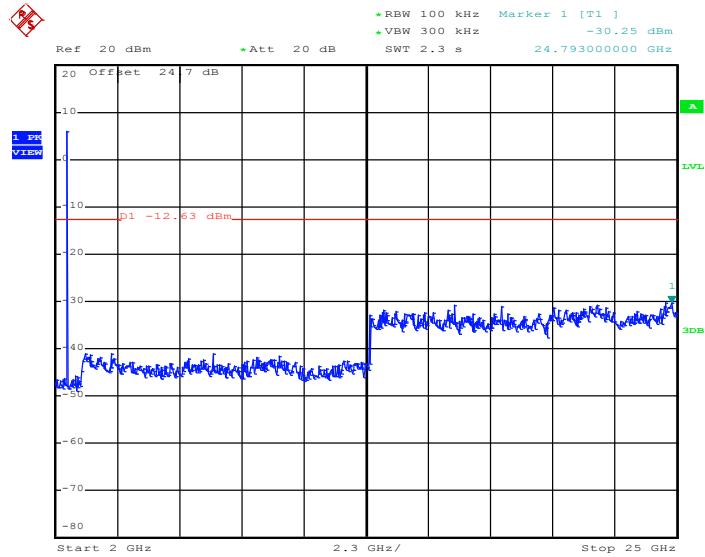
## GFSK Channel 19



Date: 1.SEP.2015 01:27:52

## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

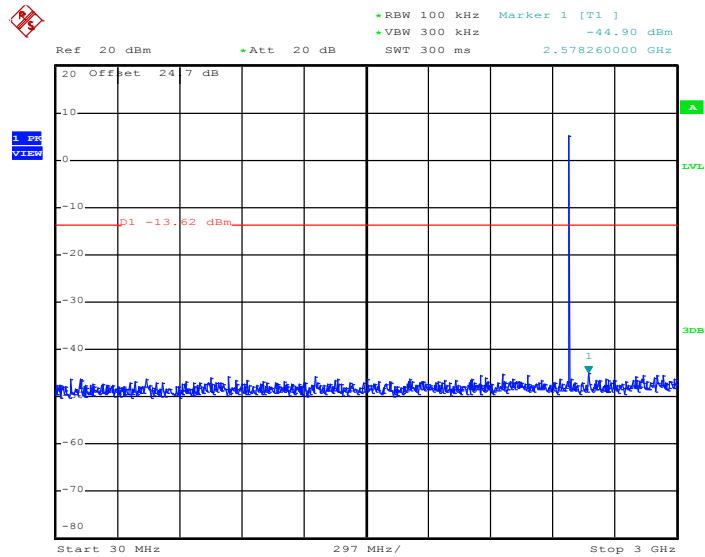
## GFSK Channel 19



Date: 1.SEP.2015 01:28:01

## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

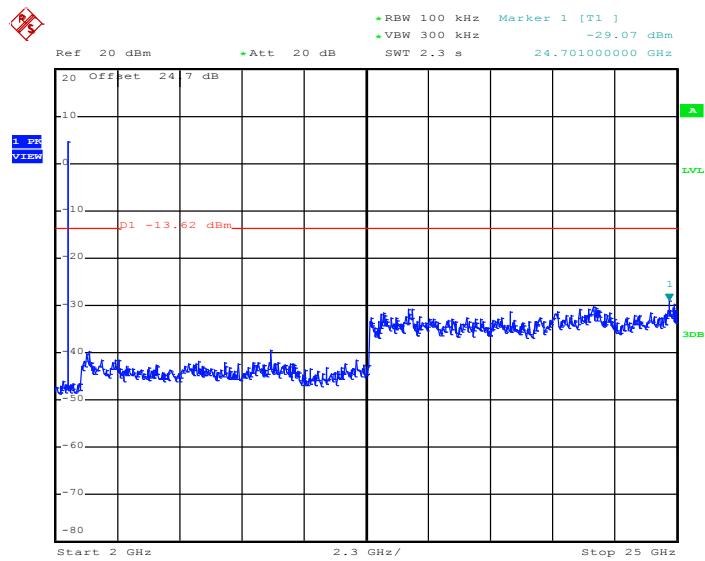
## GFSK Channel 39



Date: 1.SEP.2015 01:34:32

## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

## GFSK Channel 39



Date: 1.SEP.2015 01:34:41



### 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 v03r03.
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.

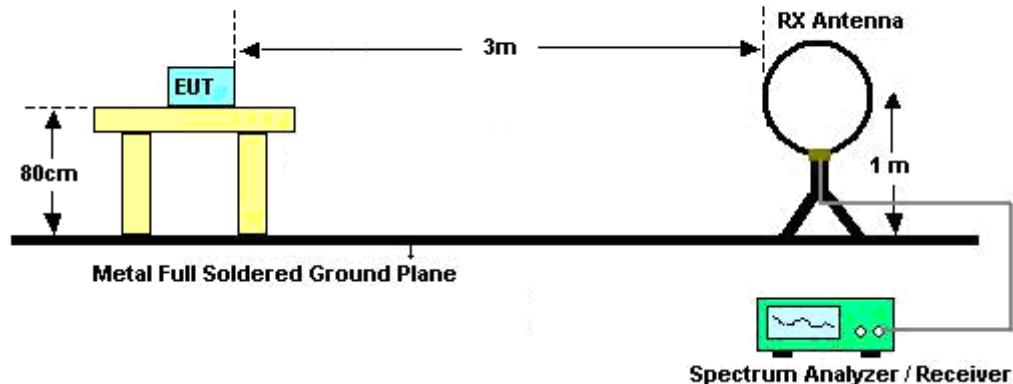
For average measurement:

- 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.

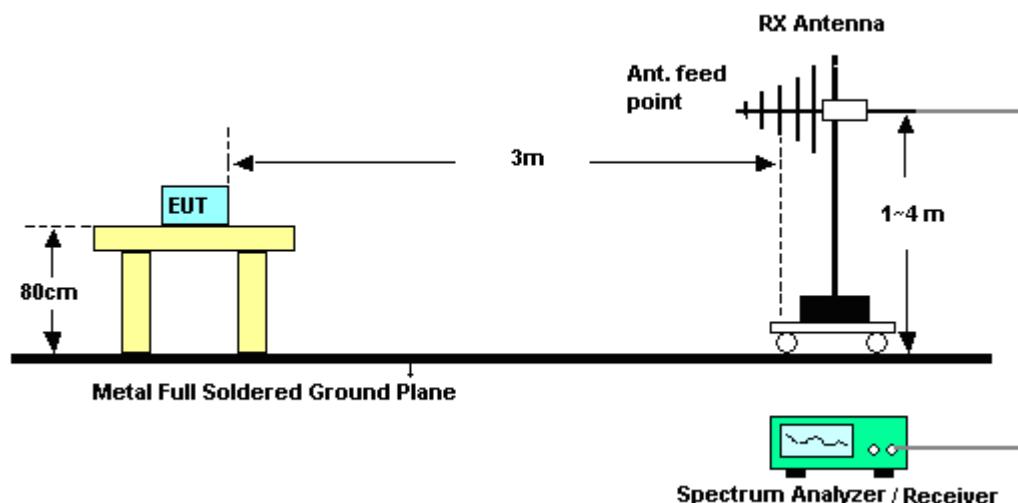
Band	Duty Cycle(%)	T(μs)	1/T(kHz)	VBW Setting
Bluetooth 4.0 - LE	61.54	384	2.60	3kHz

### 3.5.4 Test Setup

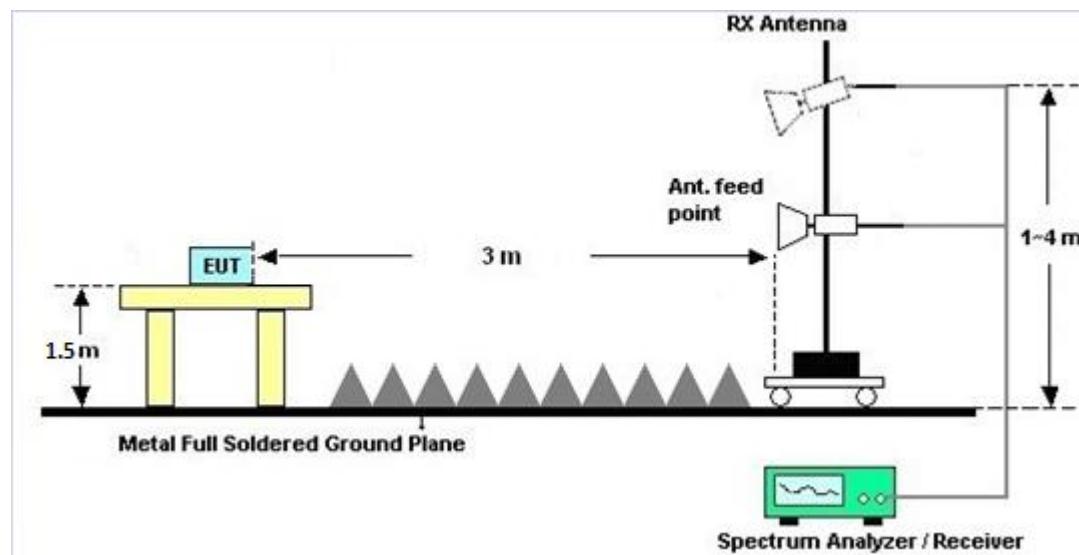
For radiated emissions below 30MHz



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 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> 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 $\mu$ 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.

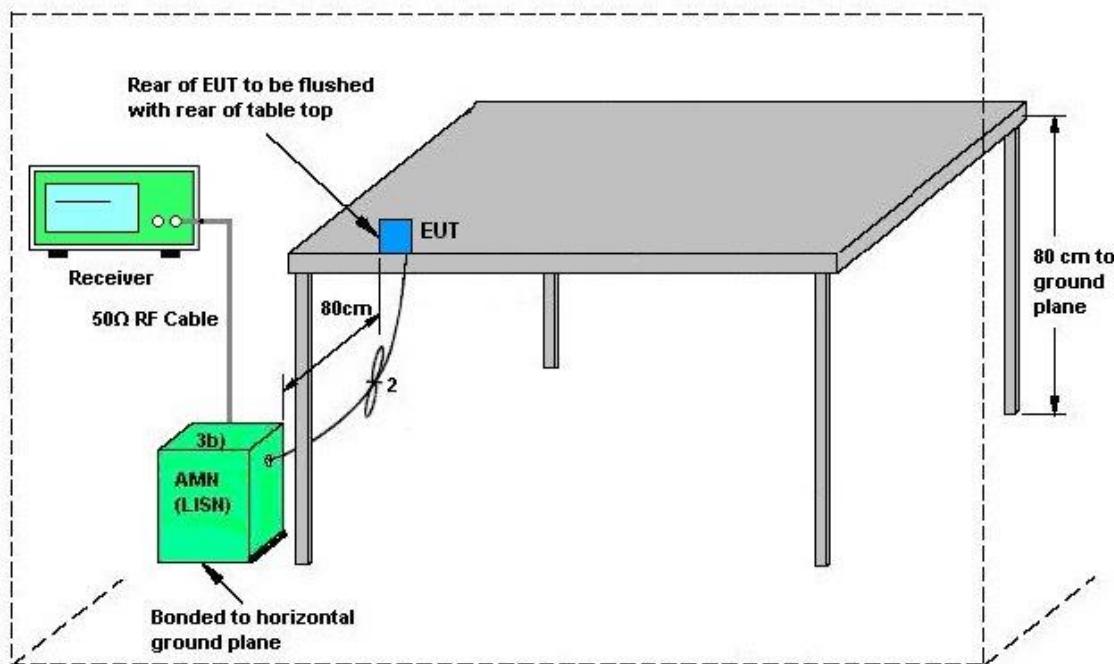
### 3.6.2 Measuring Instruments

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



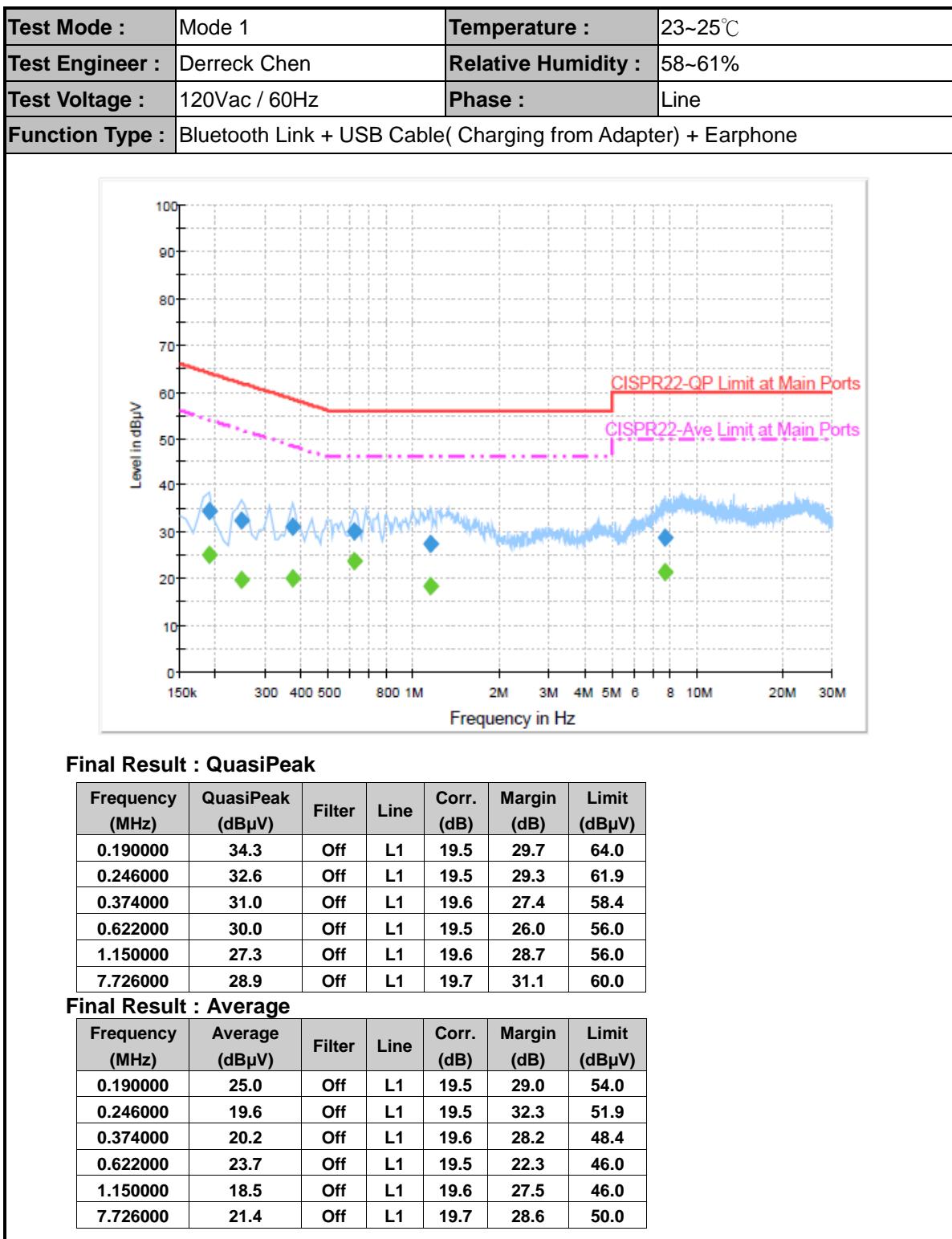
AMN = Artificial mains network (LISN)

AE = Associated equipment

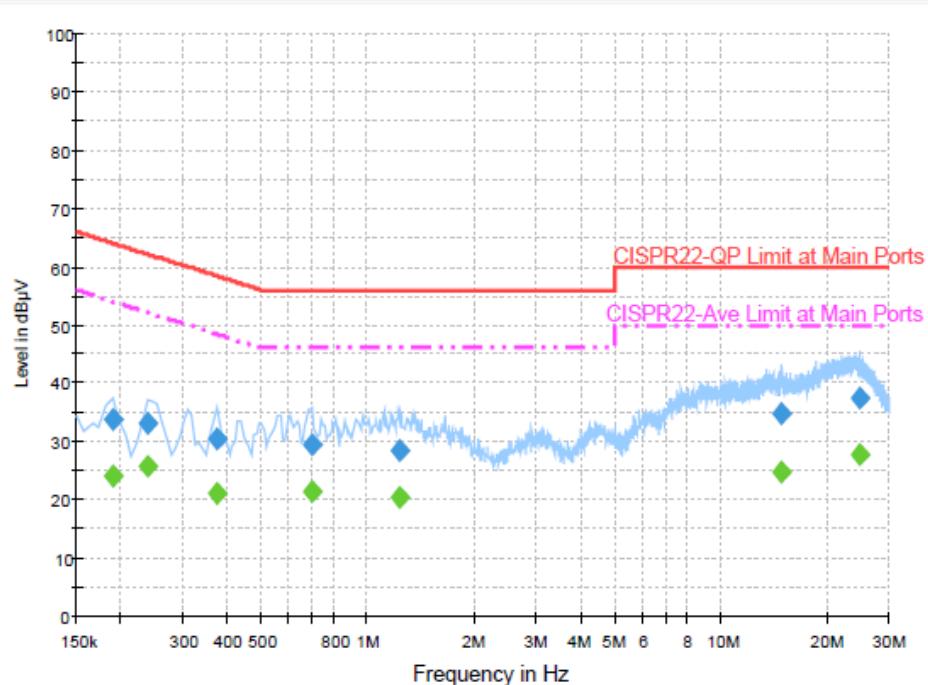
EUT = Equipment under test

ISN = Impedance stabilization network

### 3.6.5 Test Result of AC Conducted Emission



<b>Test Mode :</b>	Mode 1	<b>Temperature :</b>	23~25°C
<b>Test Engineer :</b>	Derreck Chen	<b>Relative Humidity :</b>	58~61%
<b>Test Voltage :</b>	120Vac / 60Hz	<b>Phase :</b>	Neutral
<b>Function Type :</b> Bluetooth Link + USB Cable( Charging from Adapter) + Earphone			

**Final Result : QuasiPeak**

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	33.9	Off	N	19.5	30.1	64.0
0.238000	33.1	Off	N	19.5	29.1	62.2
0.374000	30.6	Off	N	19.6	27.8	58.4
0.694000	29.3	Off	N	19.6	26.7	56.0
1.238000	28.5	Off	N	19.6	27.5	56.0
14.942000	34.8	Off	N	19.9	25.2	60.0
24.694000	37.5	Off	N	20.1	22.5	60.0

**Final Result : Average**

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	24.1	Off	N	19.5	29.9	54.0
0.238000	25.7	Off	N	19.5	26.5	52.2
0.374000	21.0	Off	N	19.6	27.4	48.4
0.694000	21.3	Off	N	19.6	24.7	46.0
1.238000	20.3	Off	N	19.6	25.7	46.0
14.942000	24.7	Off	N	19.9	25.3	50.0
24.694000	27.6	Off	N	20.1	22.4	50.0



## 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.

### 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
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Jan. 14, 2015	Aug. 23, 2015 ~ Sep. 01, 2015	Jan. 13, 2016	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Jan. 14, 2015	Aug. 23, 2015 ~ Sep. 01, 2015	Jan. 13, 2016	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jun. 18, 2015	Aug. 23, 2015 ~ Sep. 01, 2015	Jun. 17, 2016	Conducted (TH05-HY)
Hygrometer	Testo	608-H1	34897199	N/A	May 04, 2015	Aug. 23, 2015 ~ Sep. 01, 2015	May 03, 2016	Conducted (TH05-HY)
RF Cable	HARBOUR INDUSTRIES	LL142	Infinet CA3601-360 1-DLL	0.1MHz~40GHz	Mar. 06, 2015	Aug. 23, 2015 ~ Sep. 01, 2015	Mar. 05, 2016	Conducted (TH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Sep. 27, 2014	Sep. 09, 2015 ~ Sep. 13, 2015	Sep. 26, 2015	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 21, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Aug. 20, 2016	Radiation (03CH07-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	Feb. 02, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Feb. 01, 2016	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 25, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Aug. 24, 2016	Radiation (03CH07-HY)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA91705 84	18GHz- 40GHz	Nov. 03, 2014	Sep. 09, 2015 ~ Sep. 13, 2015	Nov. 02, 2015	Radiation (03CH07-HY)
Hygrometer	Testo	608-H1	34897197	N/A	May 04, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	May 03, 2016	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz ~ 18GHz	Apr. 20, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Apr. 19, 2016	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1000MHz	Mar. 12, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Mar. 11, 2016	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Oct. 21, 2014	Sep. 09, 2015 ~ Sep. 13, 2015	Oct. 20, 2015	Radiation (03CH07-HY)
Signal Analyzer	Rohde & Schwarz	FSV 30	101749	10Hz~30GHz	Mar. 10, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Mar. 09, 2016	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY84209521	1GHz~40GHz	Dec. 04, 2014	Sep. 09, 2015 ~ Sep. 13, 2015	Dec. 03, 2015	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY84209521	9KHz~1GHz	Dec. 04, 2014	Sep. 09, 2015 ~ Sep. 13, 2015	Dec. 03, 2015	Radiation (03CH07-HY)
Controller	ChainTek	Chaintek 3000	N/A	Control Turn table	N/A	Sep. 09, 2015 ~ Sep. 13, 2015	N/A	Radiation (03CH07-HY)
Controller	Max-Full	MF7802	MF78020836 8	Control Ant Mast	N/A	Sep. 09, 2015 ~ Sep. 13, 2015	N/A	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Sep. 09, 2015 ~ Sep. 13, 2015	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 degree	N/A	Sep. 09, 2015 ~ Sep. 13, 2015	N/A	Radiation (03CH07-HY)
Preamplifier	MITEQ	JS44-180040 00-33-8P	1840917	18GHz ~ 40GHz	Jun. 02, 2015	Sep. 09, 2015 ~ Sep. 13, 2015	Jun. 01, 2016	Radiation (03CH07-HY)
Test Software	Audix	E3	6.2009-8-24	N/A	N/A	Sep. 09, 2015 ~ Sep. 13, 2015	N/A	Radiation (03CH07-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz – 2.75GHz	Dec. 01, 2014	Sep. 08, 2015	Nov. 30, 2015	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Apr. 20, 2015	Sep. 08, 2015	Apr. 19, 2016	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 02, 2014	Sep. 08, 2015	Dec. 01, 2015	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Sep. 08, 2015	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 07, 2015	Sep. 08, 2015	Jan. 06, 2016	Conduction (CO05-HY)
Test Software	N/A	EMC32	8.40.0	N/A	N/A	Sep. 08, 2015	N/A	Conduction (CO05-HY)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_{C(y)}$ )	2.26
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_{C(y)}$ )	4.80
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## **Appendix A. Conducted Test Results**

**Bluetooth Low Energy**

Test Engineer:	Derek Hsu / Luffy Lin	Temperature:	21~25	°C
Test Date:	2015/08/23~2015/09/01	Relative Humidity:	51~54	%

**TEST RESULTS DATA**  
**6dB Occupied Bandwidth**

Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	0.71	0.50	Pass
BLE	1Mbps	1	19	2440	0.72	0.50	Pass
BLE	1Mbps	1	39	2480	0.71	0.50	Pass

**TEST RESULTS DATA**  
**Peak Power Table**

Mod.	Data Rate	N <sub>TX</sub>	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	7.24	30.00	-4.20	3.04	36.00	Pass
BLE	1Mbps	1	19	2440	7.99	30.00	-4.20	3.79	36.00	Pass
BLE	1Mbps	1	39	2480	7.43	30.00	-4.20	3.23	36.00	Pass

**TEST RESULTS DATA**  
**Average Power Table**  
**(Reporting Only)**

Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	2.11	6.99
BLE	1Mbps	1	19	2440	2.11	7.73
BLE	1Mbps	1	39	2480	2.11	7.08

**TEST RESULTS DATA**  
**Peak Power Density**

Mod.	Data Rate	N <sub>TX</sub>	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	6.58	-7.12	-4.20	8.00	Pass
BLE	1Mbps	1	19	2440	7.37	-6.35	-4.20	8.00	Pass
BLE	1Mbps	1	39	2480	6.38	-7.33	-4.20	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

Test Engineer :	Wei Chen, James Chiu and Ken Wu	Temperature :		21~23°C	
		Relative Humidity :		41~42%	

15C 2.4GHz 2400~2483.5MHz

### BLE (Band Edge @ 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 $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
BLE CH 00 2402MHz		2356.62	47.33	-26.67	74	41.77	32.13	7.68	34.25	200	35	P	H
		2332.59	33	-21	54	27.53	32.09	7.6	34.22	200	35	A	H
	*	2402	101.26	-	-	95.63	32.18	7.75	34.3	200	35	P	H
	*	2402	76.08	-	-	70.45	32.18	7.75	34.3	200	35	A	H
													H
													H
		2345.1	47.02	-26.98	74	41.48	32.11	7.68	34.25	100	74	P	V
		2367.24	33.01	-20.99	54	27.47	32.13	7.68	34.27	100	74	A	V
	*	2401.75	91.93	-	-	86.3	32.18	7.75	34.3	100	74	P	V
	*	2401.92	69.89	-	-	64.26	32.18	7.75	34.3	100	74	A	V
BLE CH 19 2440MHz													V
		2332.77	47.25	-26.75	74	41.78	32.09	7.6	34.22	200	37	P	H
		2367.33	32.99	-21.01	54	27.45	32.13	7.68	34.27	200	37	A	H
	*	2440	102.31	-	-	96.59	32.24	7.83	34.35	200	37	P	H
	*	2440	76.77	-	-	71.05	32.24	7.83	34.35	200	37	A	H
		2484.96	47.4	-26.6	74	41.64	32.28	7.91	34.43	200	37	P	H
		2492.04	33.16	-20.84	54	27.43	32.3	7.91	34.48	200	37	A	H
		2352.39	47.13	-26.87	74	41.57	32.13	7.68	34.25	104	72	P	V
		2365.26	33	-21	54	27.46	32.13	7.68	34.27	104	72	A	V
	*	2440	93.32	-	-	87.6	32.24	7.83	34.35	104	72	P	V
	*	2440	70.77	-	-	65.05	32.24	7.83	34.35	104	72	A	V
		2499.4	47.11	-26.89	74	41.38	32.3	7.91	34.48	104	72	P	V
		2491	33.17	-20.83	54	27.39	32.3	7.91	34.43	104	72	A	V



BLE CH 39 2480MHz	*	2480	102.79	-	-	97.03	32.28	7.91	34.43	198	36	P	H
	*	2480	76.39	-	-	70.63	32.28	7.91	34.43	198	36	A	H
		2490.4	47.51	-26.49	74	41.73	32.3	7.91	34.43	198	36	P	H
		2483.52	33.57	-20.43	54	27.81	32.28	7.91	34.43	198	36	A	H
													H
													H
	*	2480	93.6	-	-	87.84	32.28	7.91	34.43	105	49	P	V
	*	2480	70.93	-	-	65.17	32.28	7.91	34.43	105	49	A	V
		2487.64	46.92	-27.08	74	41.14	32.3	7.91	34.43	105	49	P	V
		2491.2	33.19	-20.81	54	27.41	32.3	7.91	34.43	105	49	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C 2.4GHz 2400~2483.5MHz

## BLE (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 $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
BLE CH 00 2402MHz		4804	41.17	-32.83	74	55.48	34.25	11.11	59.67	100	0	P	H
													H
													H
													H
		4804	40.65	-33.35	74	54.96	34.25	11.11	59.67	100	0	P	V
													V
													V
													V
BLE CH 19 2440MHz		4880	40.55	-33.45	74	54.61	34.3	11.21	59.57	100	0	P	H
		7320	42.15	-31.85	74	49.96	35.6	15.08	58.49	100	0	P	H
													H
													H
		4880	41.44	-32.56	74	55.5	34.3	11.21	59.57	100	0	P	V
		7320	43.64	-30.36	74	51.45	35.6	15.08	58.49	100	0	P	V
													V
													V
BLE CH 39 2480MHz		4960	41.97	-32.03	74	55.73	34.37	11.32	59.45	100	0	P	H
		7440	41.93	-32.07	74	49.84	35.6	15.13	58.64	100	0	P	H
													H
													H
		4960	40.79	-33.21	74	54.55	34.37	11.32	59.45	100	0	P	V
		7440	41.78	-32.22	74	49.69	35.6	15.13	58.64	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 15C Emission below 1GHz

## 2.4GHz BLE (LF)

**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency per 15.209(c).
!	Test result is <b>over limit</b> line.
P/A	<b>Peak or Average</b>
H/V	<b>Horizontal or Vertical</b>



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(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. Level(dB $\mu$ V/m) =

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

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

**For Peak Limit @ 2390MHz:**

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

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

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

= 55.45 (dB $\mu$ V/m)

2. Over Limit(dB)

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

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

= -18.55(dB)

**For Average Limit @ 2390MHz:**

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

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

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

= 43.54 (dB $\mu$ V/m)

2. Over Limit(dB)

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

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

= -10.46(dB)

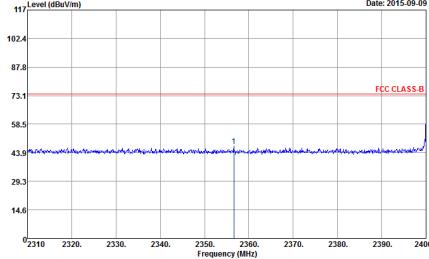
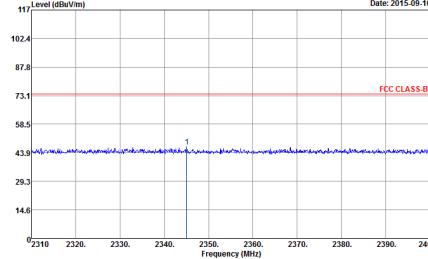
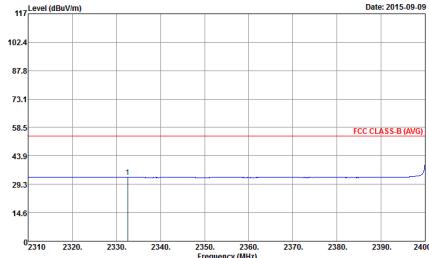
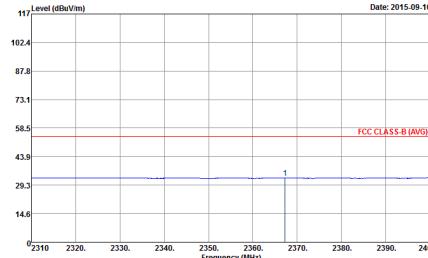
**Both peak and average measured complies with the limit line, so test result is "PASS".**



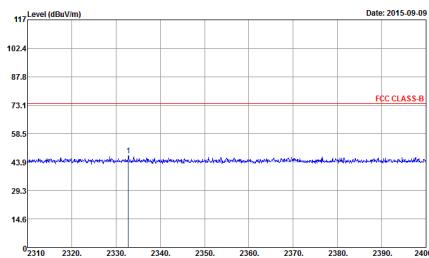
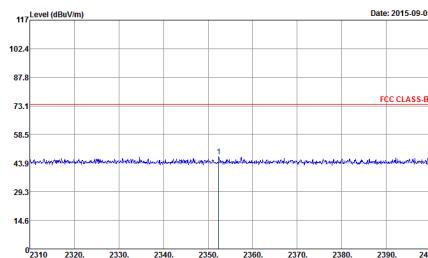
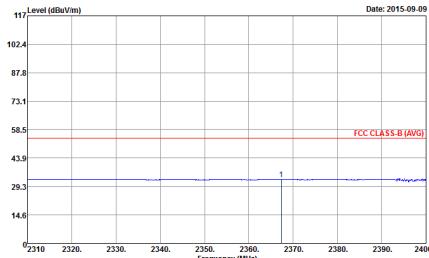
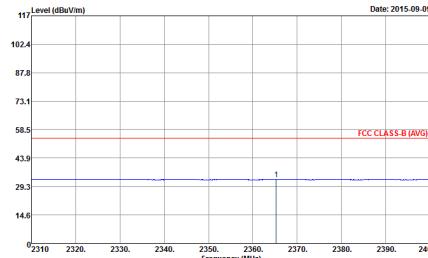
## Appendix C. Radiated Spurious Emission

### 2.4GHz 2400~2483.5MHz

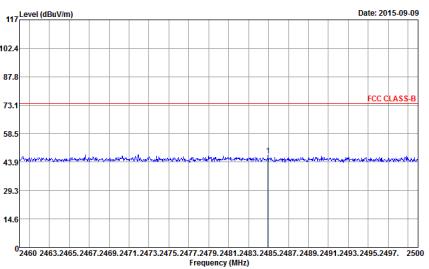
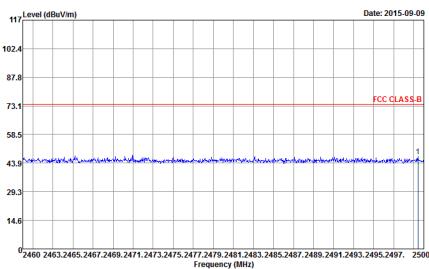
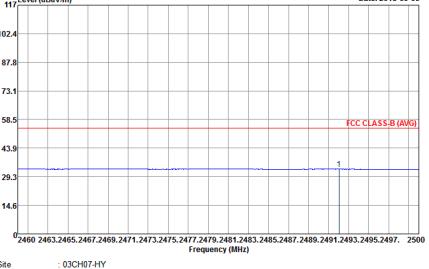
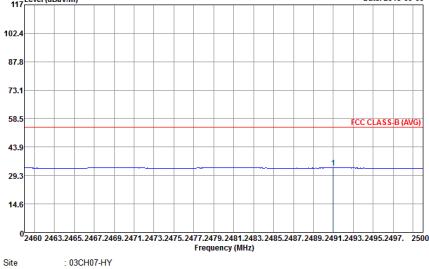
#### BLE (Band Edge @ 3m)

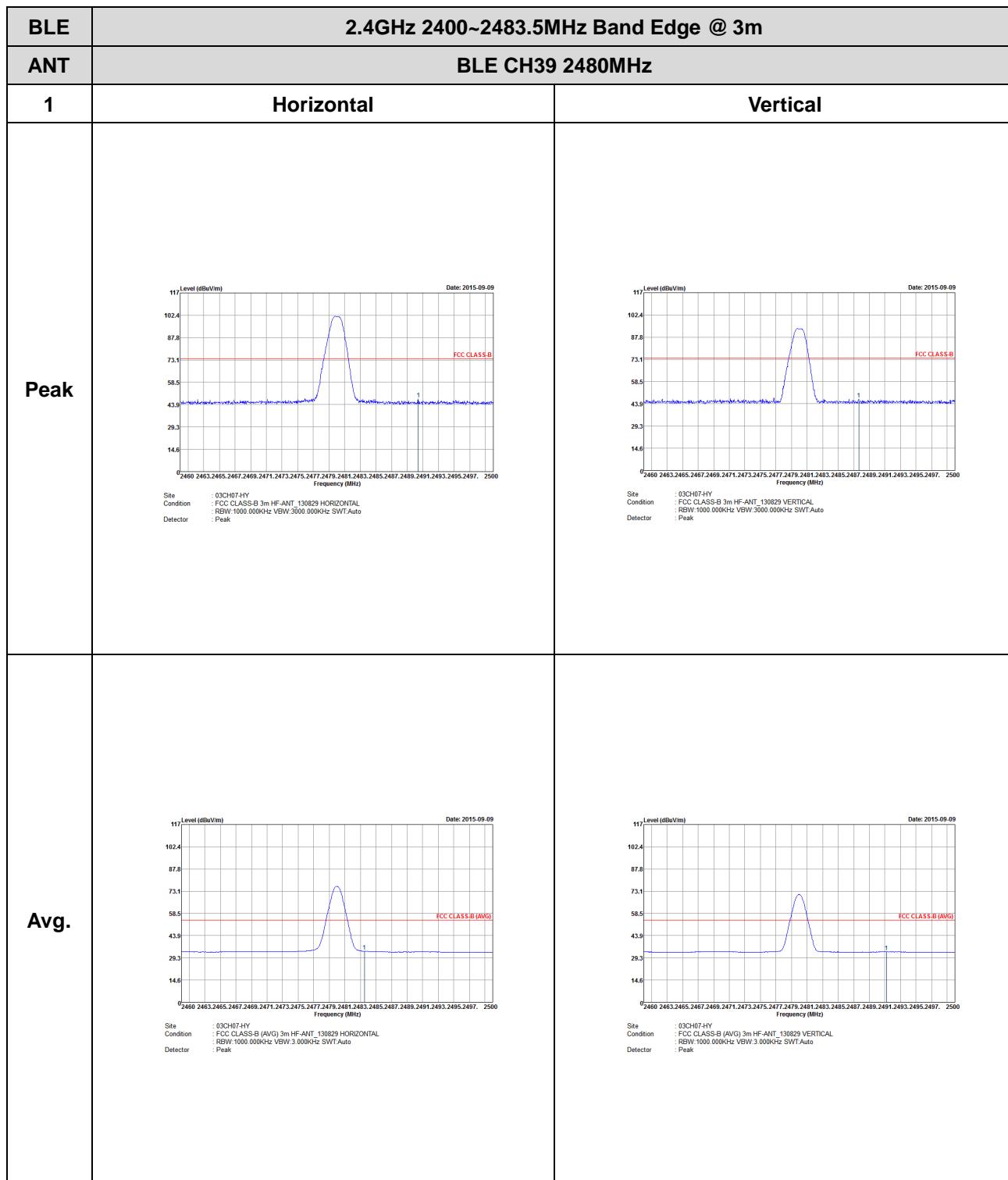
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
Peak	 <p>Level (dBuV/m)</p> <p>Date: 2015-09-09</p> <p>117 102.4 87.8 73.1 58.5 43.9 29.3 14.6 0</p> <p>2310 2320. 2330. 2340. 2350. 2360. 2370. 2380. 2390. 2400</p> <p>Frequency (MHz)</p> <p>Site : 00CH07-HY Condition : FCC CLASS-B 3m HF-ANT_130829 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWF:Auto Detector : Peak</p>	 <p>Level (dBuV/m)</p> <p>Date: 2015-09-10</p> <p>117 102.4 87.8 73.1 58.5 43.9 29.3 14.6 0</p> <p>2310 2320. 2330. 2340. 2350. 2360. 2370. 2380. 2390. 2400</p> <p>Frequency (MHz)</p> <p>Site : 00CH07-HY Condition : FCC CLASS-B 3m HF-ANT_130829 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWF:Auto Detector : Peak</p>
Avg.	 <p>Level (dBuV/m)</p> <p>Date: 2015-09-09</p> <p>117 102.4 87.8 73.1 58.5 43.9 29.3 14.6 0</p> <p>2310 2320. 2330. 2340. 2350. 2360. 2370. 2380. 2390. 2400</p> <p>Frequency (MHz)</p> <p>Site : 00CH07-HY Condition : FCC CLASS-B (AVG) 3m HF-ANT_130829 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWF:Auto Detector : Peak</p>	 <p>Level (dBuV/m)</p> <p>Date: 2015-09-10</p> <p>117 102.4 87.8 73.1 58.5 43.9 29.3 14.6 0</p> <p>2310 2320. 2330. 2340. 2350. 2360. 2370. 2380. 2390. 2400</p> <p>Frequency (MHz)</p> <p>Site : 00CH07-HY Condition : FCC CLASS-B (AVG) 3m HF-ANT_130829 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWF:Auto Detector : Peak</p>



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - Low channel location	
1	Horizontal	Vertical
Peak	 <p>Site : 03CH07HY Condition : FCC CLASS-B 3m HF-ANT_130829 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWF:Auto Detector : Peak</p>	 <p>Site : 03CH07HY Condition : FCC CLASS-B 3m HF-ANT_130829 VERTICAL RBW:1000.000KHz VBW:3.000.000KHz SWF:Auto Detector : Peak</p>
Avg.	 <p>Site : 03CH07HY Condition : FCC CLASS-B (AVG) 3m HF-ANT_130829 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWF:Auto Detector : Peak</p>	 <p>Site : 03CH07HY Condition : FCC CLASS-B (AVG) 3m HF-ANT_130829 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWF:Auto Detector : Peak</p>



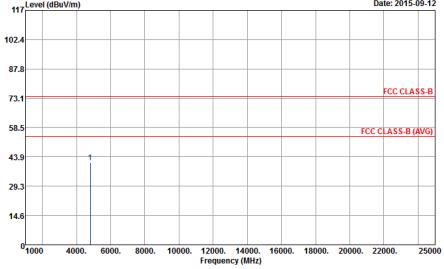
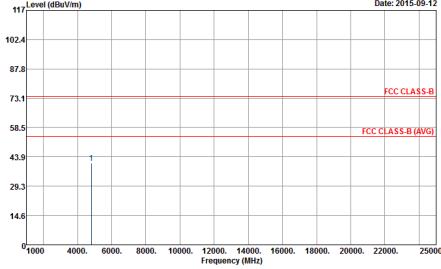
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - High channel location	
1	Horizontal	Vertical
Peak	 <p>Site : 03CH07.HY Condition : FCC CLASS-B 3m HF-ANT_130829 HORIZONTAL Detector : Peak</p>	 <p>Site : 03CH07.HY Condition : FCC CLASS-B 3m HF-ANT_130829 VERTICAL Detector : Peak</p>
Avg.	 <p>Site : 03CH07.HY Condition : FCC CLASS-B (AVG) 3m HF-ANT_130829 HORIZONTAL Detector : Peak</p>	 <p>Site : 03CH07.HY Condition : FCC CLASS-B (AVG) 3m HF-ANT_130829 VERTICAL Detector : Peak</p>

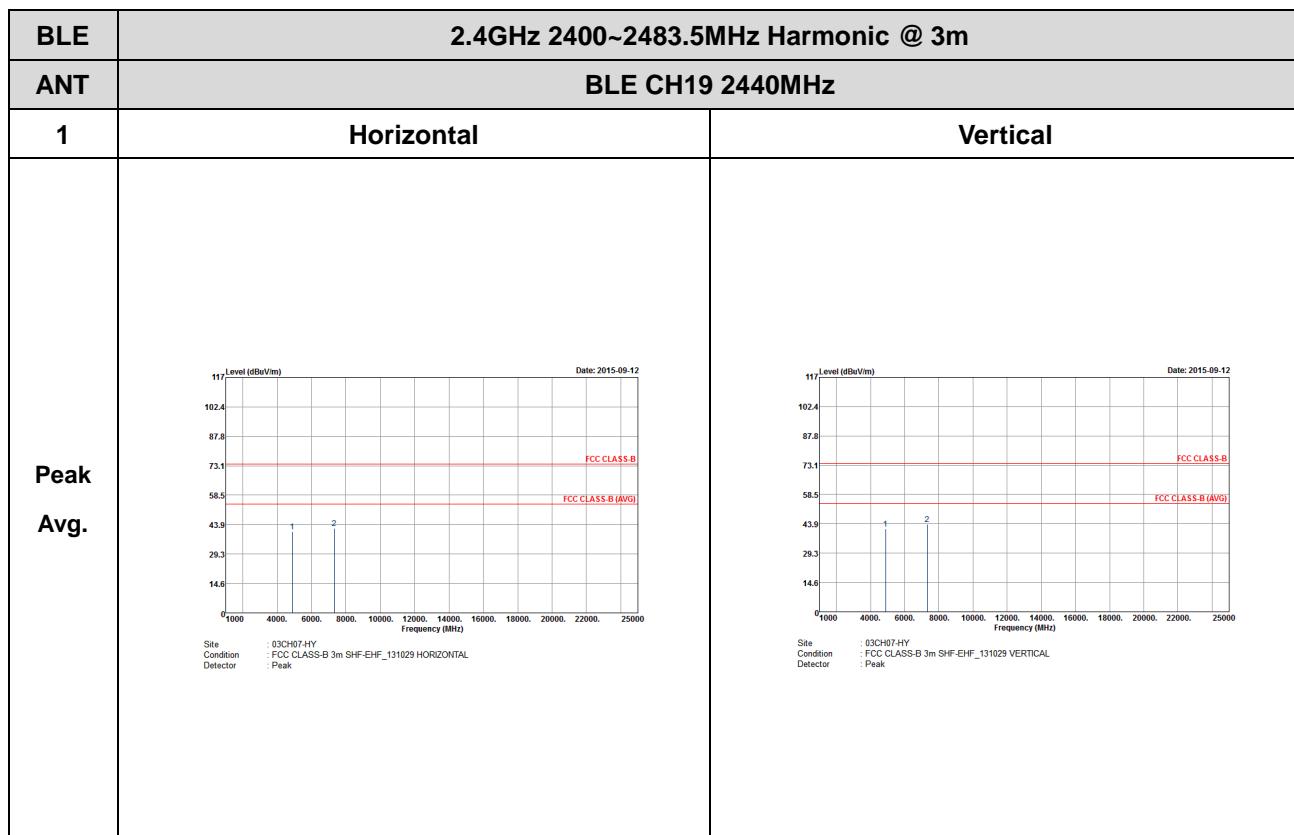


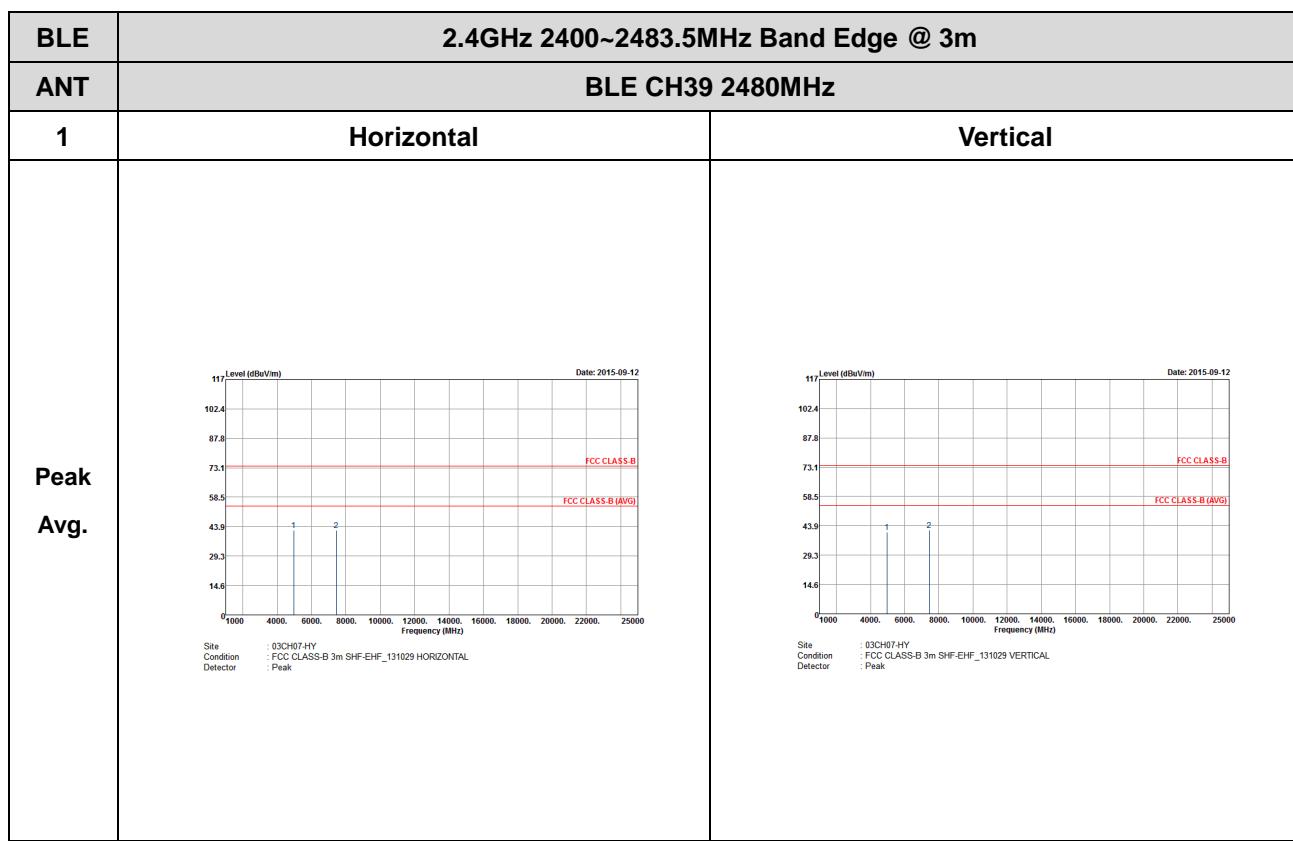


## 2.4GHz 2400~2483.5MHz

## BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
Peak		
Avg.		







## Emission below 1GHz

## 2.4GHz BLE (LF)

