FCC RF Test Report

APPLICANT	:	Amtran Technology Co., Ltd.
EQUIPMENT	:	Bluetooth USB Module
BRAND NAME	:	AMTRAN
MODEL NAME	:	BTU2050-D113
FCC ID	:	MDZ-BTU2050
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was received on Dec. 13, 2012 and completely tested on Jan. 05, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the 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:

Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2D1304B	Rev. 01	Initial issue of report	Jan. 10, 2013
FR2D1304B	Rev. 02	Update report for adding fixture information at section 2.4	Jan. 11, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	≤ 30dBm	Pass	-
3.5	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	≤ 8dBm	Pass	-
0	15.247(d)	RSS-210 A8.5	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 7.58 dB at 4962.000 MHz
3.6	15.207	RSS-210 Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 15.40 dB at 0.198 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Amtran Technology Co., Ltd.
17F., No. 268, Lien Chen Rd., Chung Ho City, Taipei County 235 Taiwan

1.2 Manufacturer

1. **Askey Computer Corp.**
   10F., No. 119, Chienkang Rd., Chung-Ho, Taiwan, R.O.C.

2. **ASKEY TECHNOLOGY (JIANG SU) LTD.**
   No. 1388, Jiao Tong Road, Wujiang Economic-Technological Development Area, Jiangsu Province, P.R. China

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Bluetooth USB Module
Brand Name	AMTRAN
Model Name	BTU2050-D113
FCC ID	MDZ-BTU2050
EUT supports Radios application	Bluetooth 2.1/4.0
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

Product Specification subjective to this standard	
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 : 2.16 dBm (0.0016 W)
Antenna Type	Chip Antenna type with gain 0.60 dBi
Type of Modulation	Bluetooth 4.0 - LE : GFSK

1.5 Testing Site

Test Site	SPORTON INTERNATIONAL INC.			
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978			
Test Site No.	Sporton Site No.			FCC/IC Registration No.
	TH02-HY	CO05-HY	03CH06-HY	722060/4086B-1

1.6 Applied 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 v02
- ANSI C63.4-2003 and 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. 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 4.0 – LE RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	1.94 dBm
Ch19	2440MHz	**2.16** dBm
Ch39	2480MHz	1.27 dBm

a. The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and ANSI C63.10-2009 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).

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

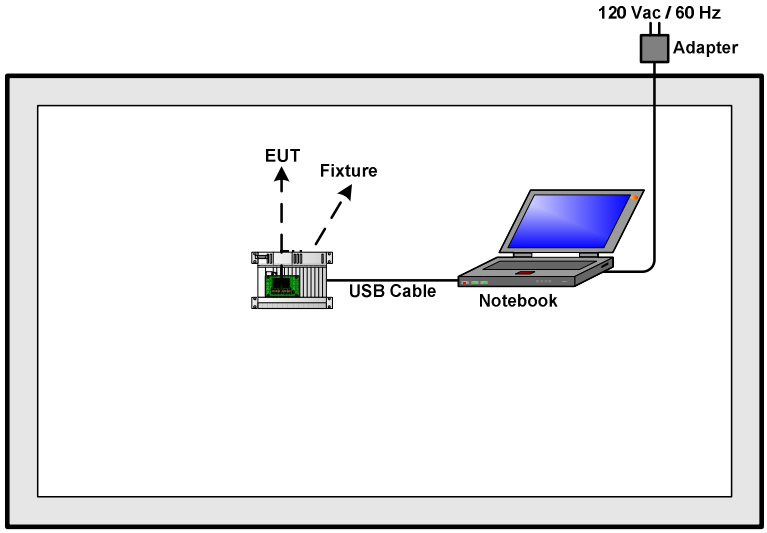
2.2 Test Mode

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

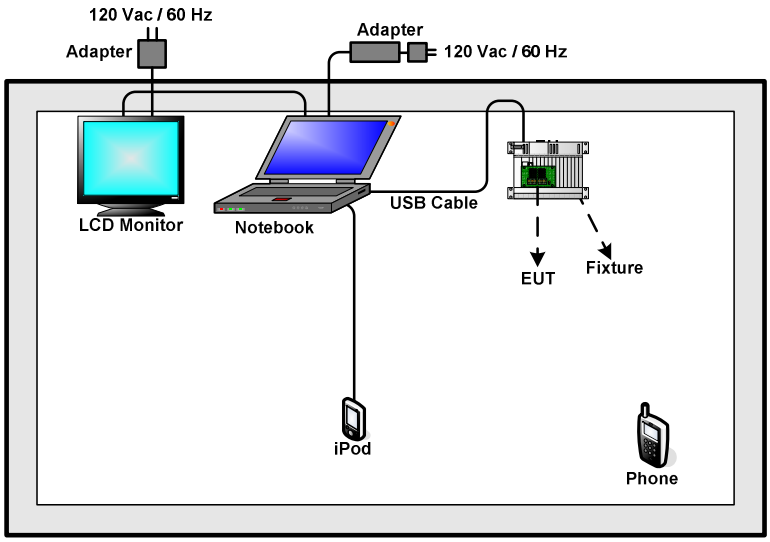
Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth 4.0 – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth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

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.	Phone	SonyEricsson	S312	N/A	N/A	N/A
2.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
3.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	LCD Monitor	Dell	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	SD Card	Transcend	4G	N/A	N/A	N/A
7.	Fixture	ASKEY	BTU2050-D113-EVB	N/A	N/A	N/A

2.5 Description of RF Function Operation Test Setup

For Bluetooth function, programmed RF utility, “Blue Test3 Tool” installed in the notebook make the EUT provides functions like channel selection and power level for continuous 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.

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.

Example :

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

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.

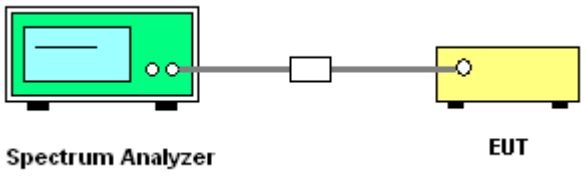
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02.
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

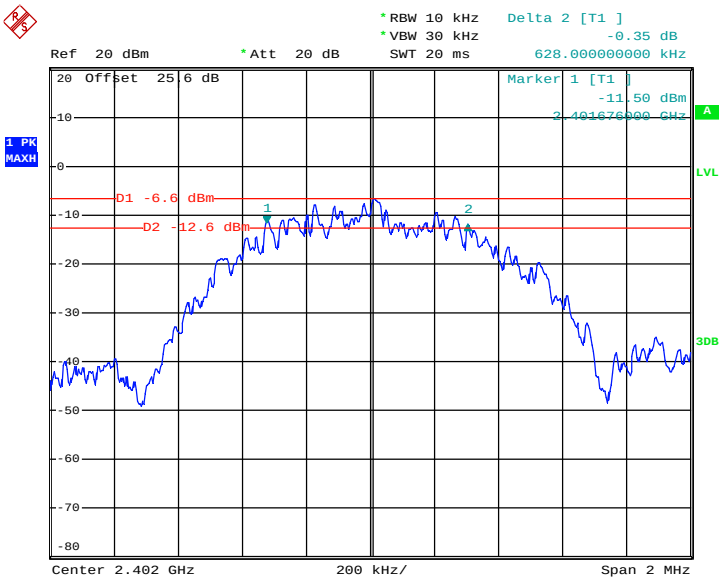


3.1.5 Test Result of 6dB Bandwidth

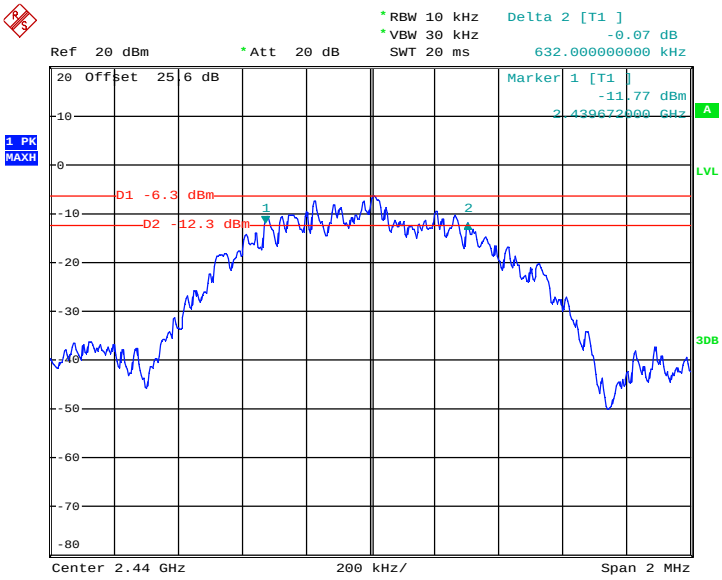
Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	58~61%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)
00	2402	0.628
19	2440	0.632
39	2480	0.632

6 dB Bandwidth Plot on Channel 00



6 dB Bandwidth Plot on Channel 19



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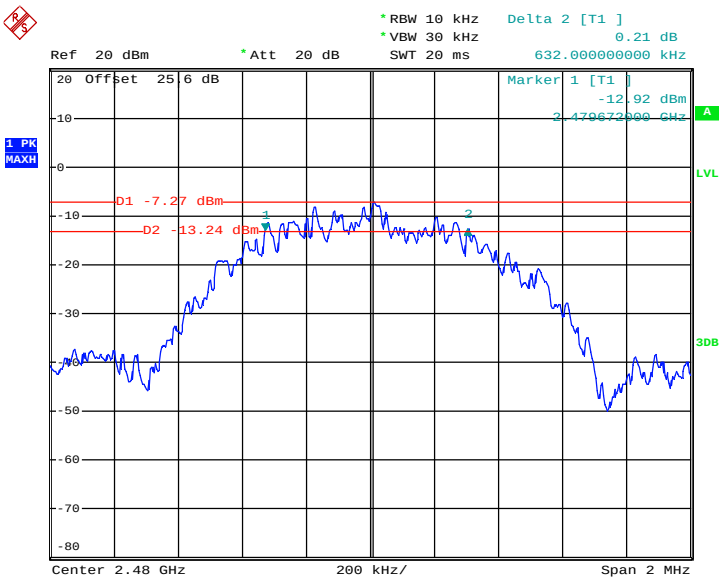
6 dB Bandwidth Plot on Channel 39



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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

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v02.
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. Measure the conducted output power and record the results in the test report.

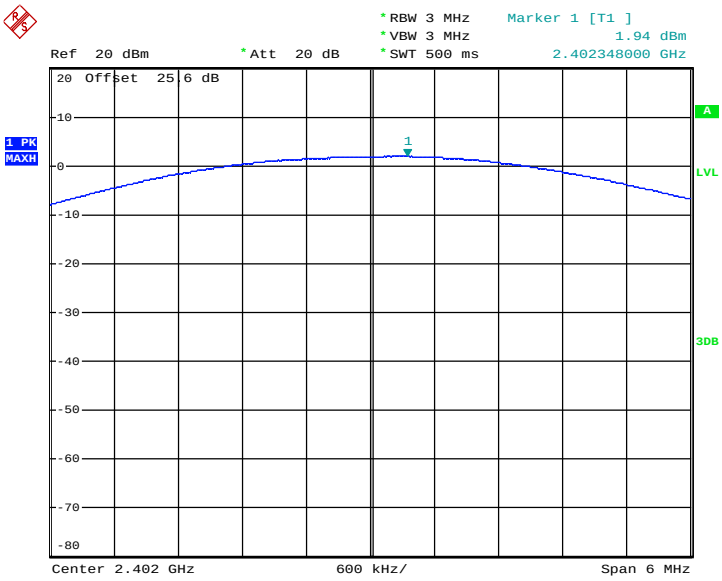
3.2.4 Test Setup

3.2.5 Test Result of Peak Output Power

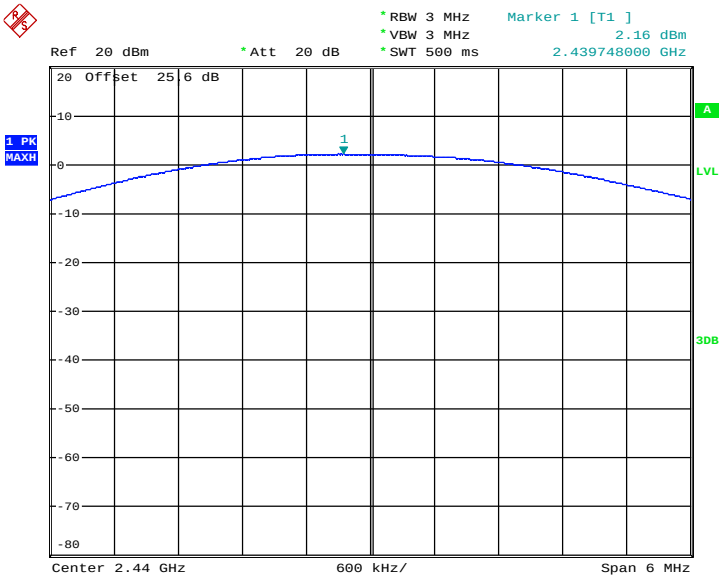
Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	58~61%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	1.94	30.00	Pass
19	2440	2.16	30.00	Pass
39	2480	1.27	30.00	Pass

Peak Output Power Plot on Channel 00



Peak Output Power Plot on Channel 19



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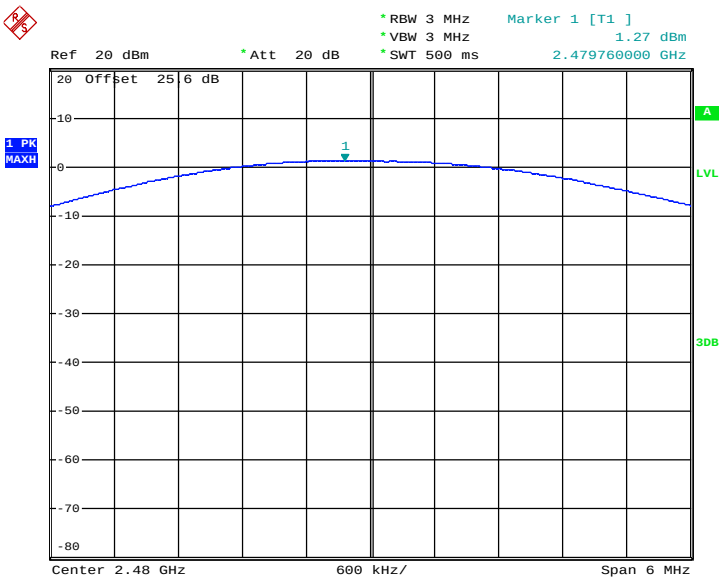
Peak Output Power Plot on Channel 39



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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.

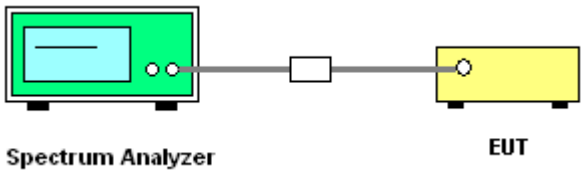
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 9.1 Option 1 of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02
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 Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	58~61%

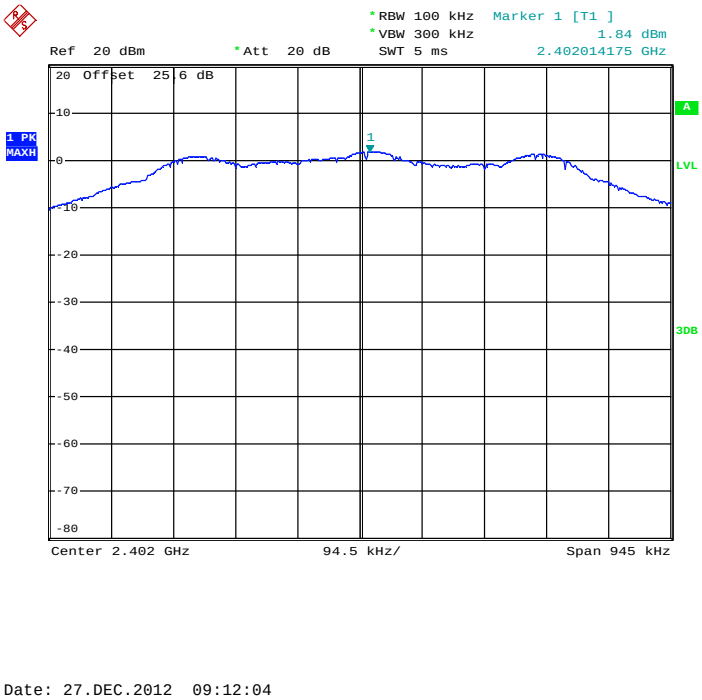
Channel	Frequency (MHz)	Power Density		Max. Limits (dBm/3KHz)	Pass/Fail
		PSD/100KHz (dBm)	PSD/3KHz (dBm)		
00	2402	1.84	-13.78	8	Pass
19	2440	2.06	-13.60	8	Pass
39	2480	1.11	-14.49	8	Pass

Note:

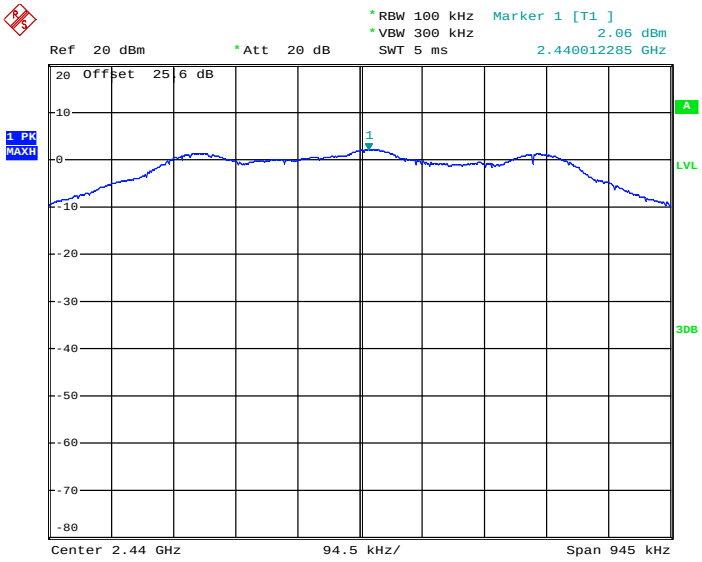
1. *Measured power density (dBm) has offset with cable loss.*
2. *The Measured power density (dBm)/ 100KHz is reference level and used as 20dBc down for Conducted Band Edges and Conducted Spurious Emission limit line.*

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

PSD 100kHz Plot on Channel 00



PSD 100kHz Plot on Channel 19



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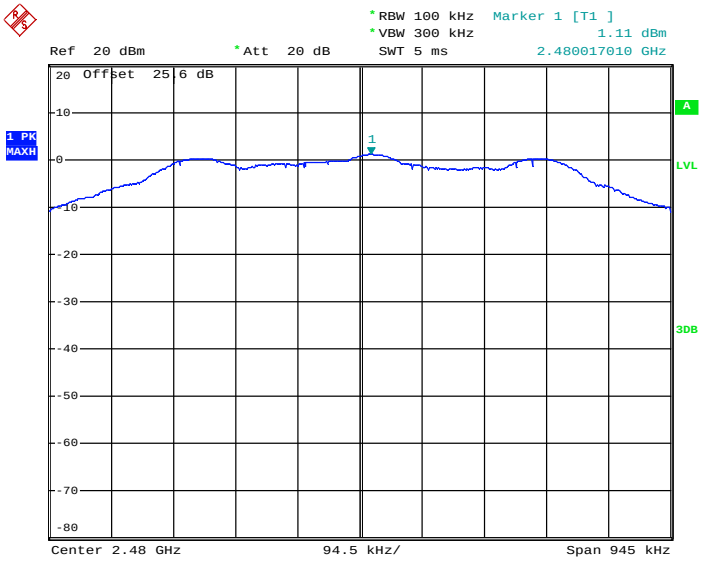
PSD 100kHz Plot on Channel 39



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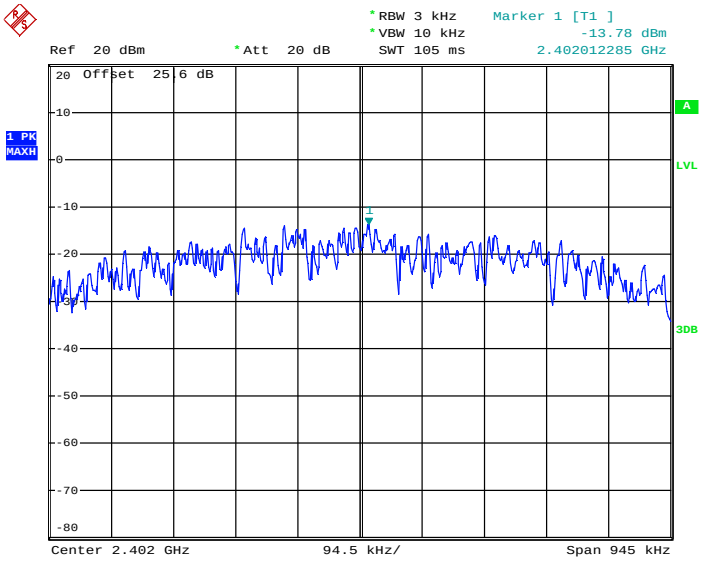
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on Channel 00



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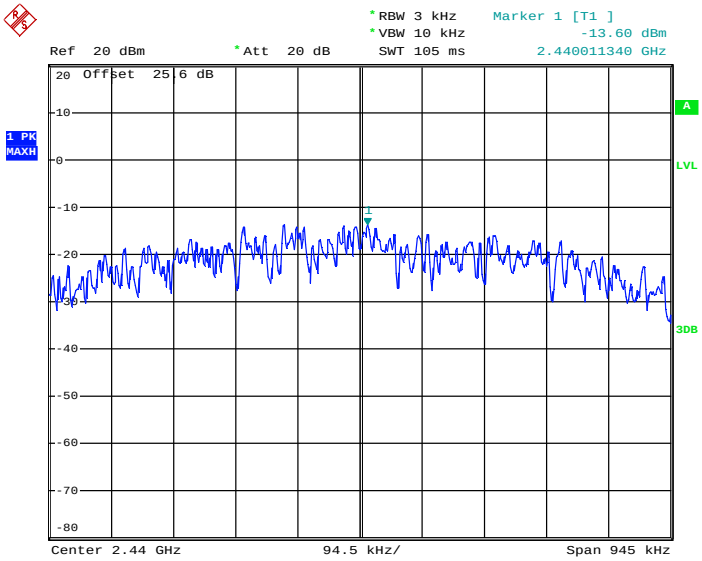
PSD 3kHz Plot on Channel 19



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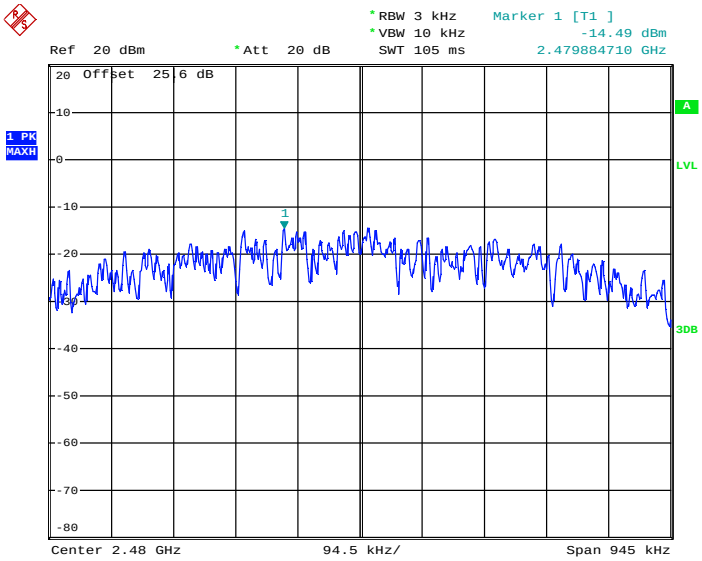
PSD 3kHz Plot on Channel 39



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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.

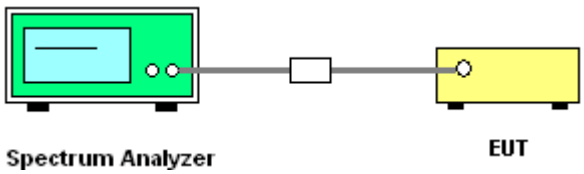
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02.
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.

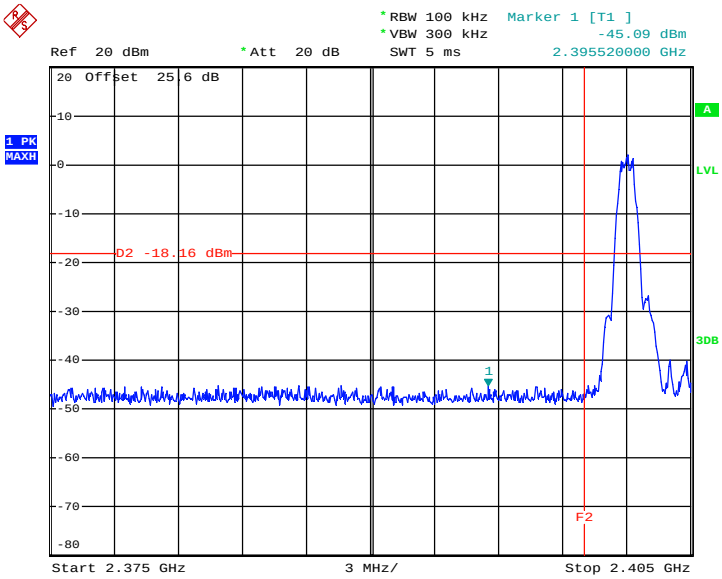
3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Channel :	00 and 39	Relative Humidity :	58~61%
		Test Engineer :	Coyote Lin

Low Band Edge Plot on Channel 00



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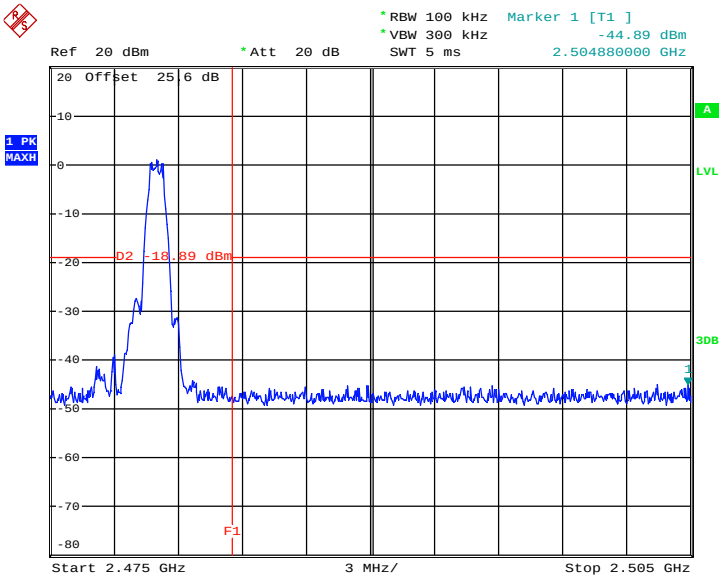
High Band Edge Plot on Channel 39



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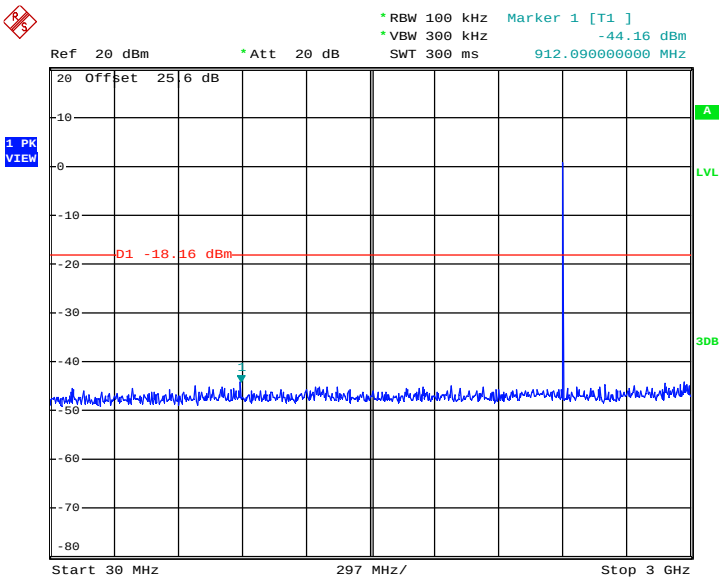
3.4.6 Test Result of Conducted Spurious Emission

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	58~61%
		Test Engineer :	Coyote Lin

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00



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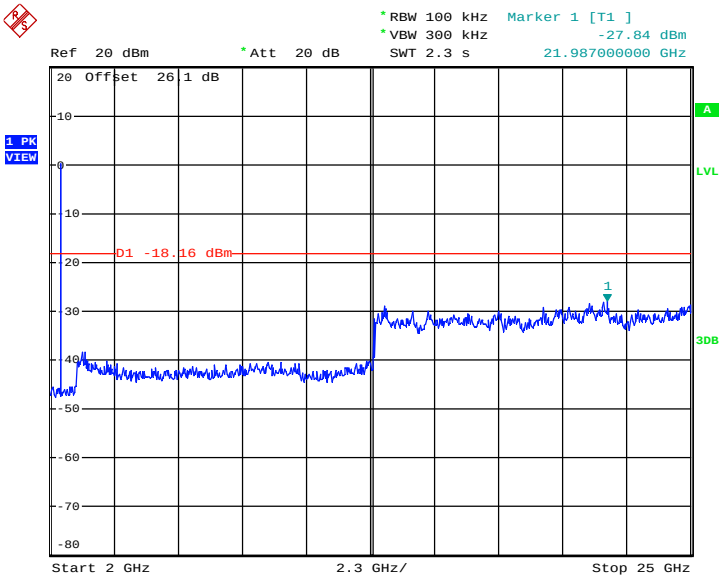
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00



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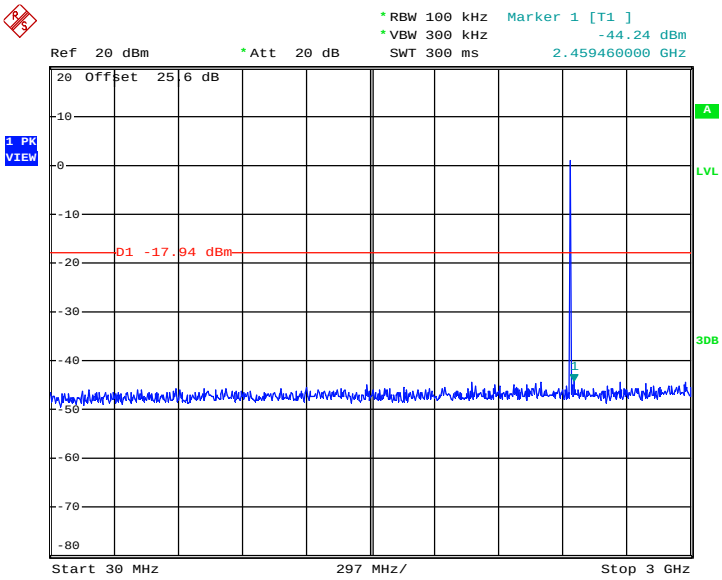
Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Channel :	19	Relative Humidity :	58~61%
		Test Engineer :	Coyote Lin

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19



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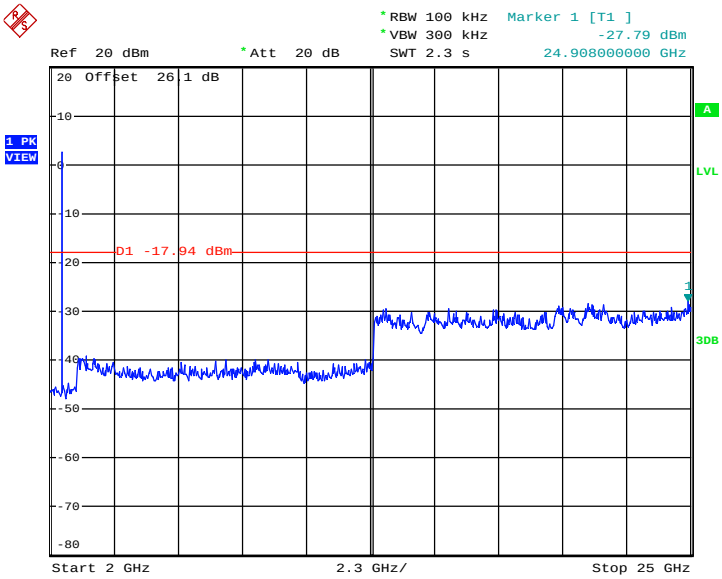
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19



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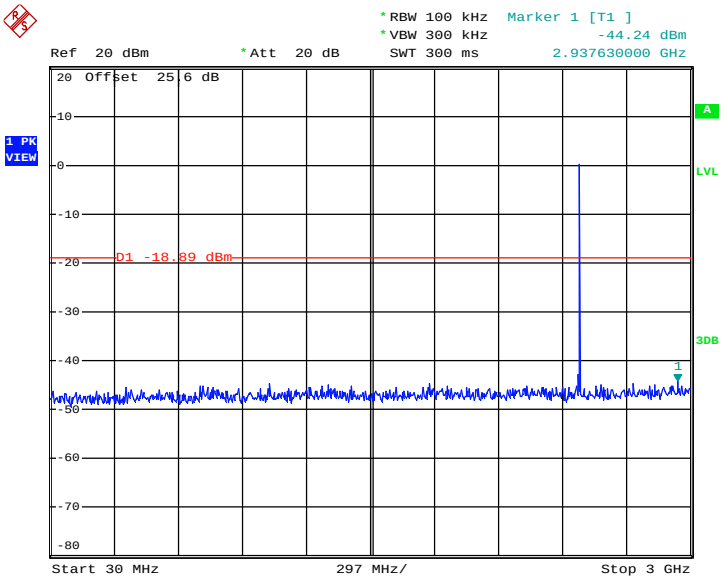
Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26℃
Test Channel :	39	Relative Humidity :	58~61%
		Test Engineer :	Coyote Lin

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



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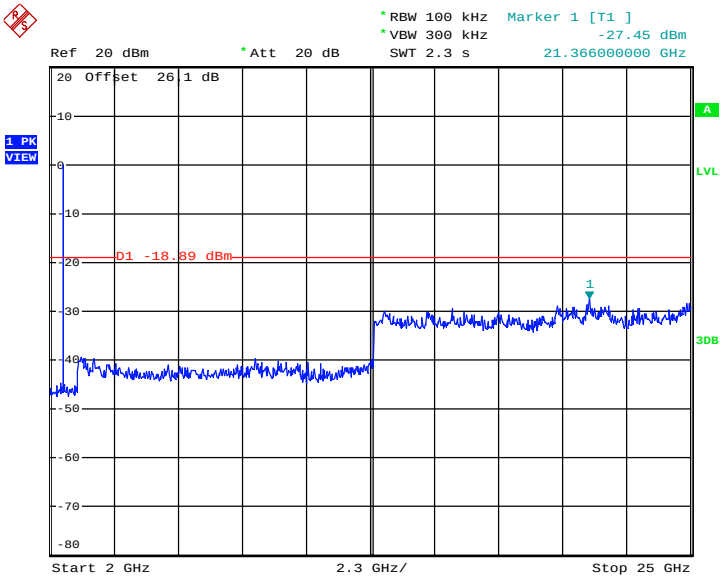
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



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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

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.10-2009 and ANSI C63.4-2003 test site requirement.
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 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 ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 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(us)	1/T(KHz)	VBW Setting
Bluetooth 4.0 - LE	67.68	444.000	2.25	3kHz

Note: For average measurement with duty cycle < 98%, use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.

Marker-Delta method：

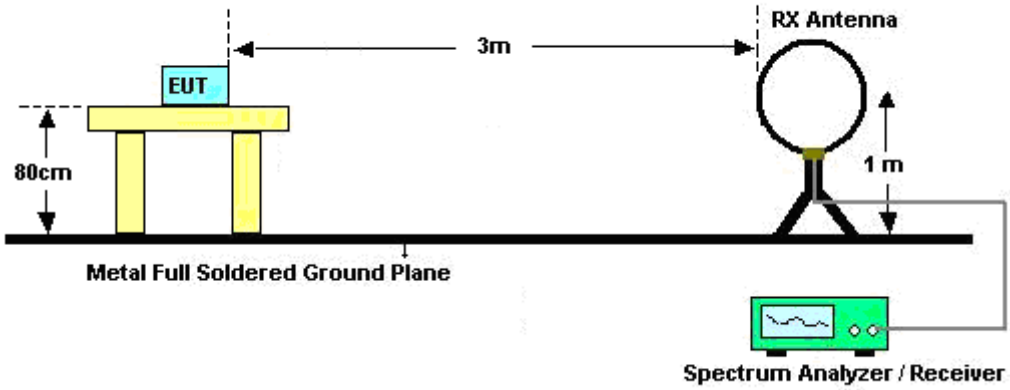
(1) Set RBW = 1 MHz, VBW = 3 MHz, peak detector.
Repeat the measurement with an average detector, use RBW = 1MHz
VBW = 10 Hz, when duty cycle is no less than 98 percent.
VBW ≥ 1/T, when duty cycle is less than 98 percent

(2) Set span = 10MHz, that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set RBW = 100KHz, 1% of the total span. Set VBW = 100KHz >= RBW.

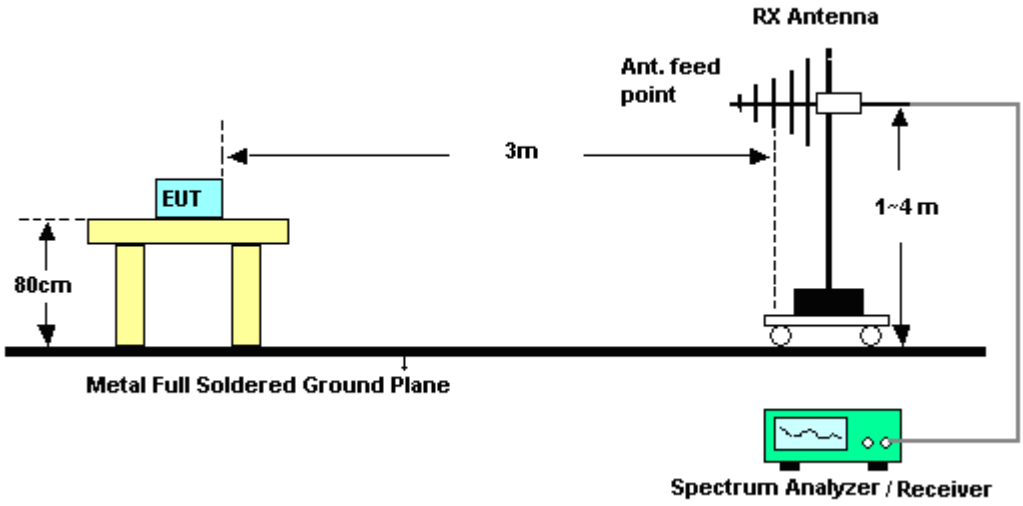
(3) Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (peak/average) are then used to determine band-edge compliance as required by Section 15.205.

3.5.4 Test Setup

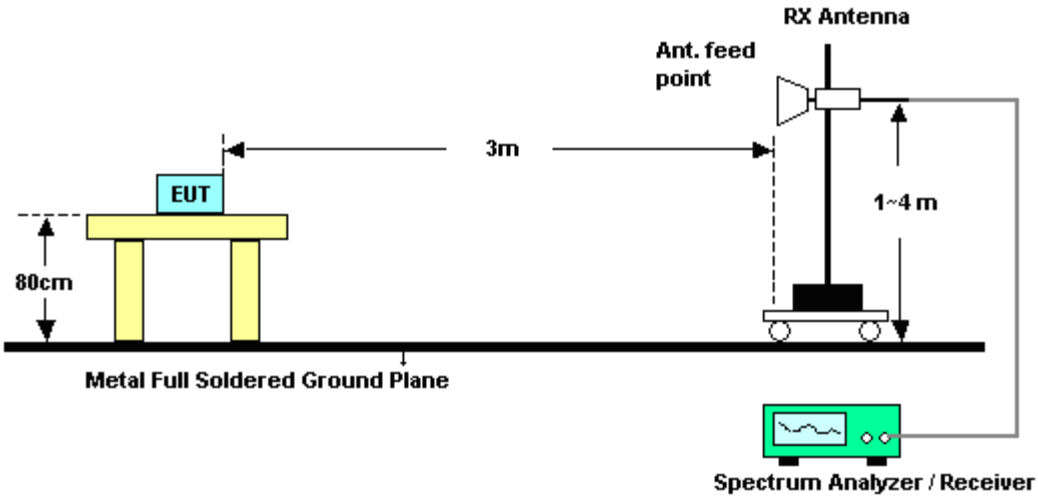
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated 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 Band Edges

Test Mode :	Mode 1	Temperature :	23~25℃
Test Channel :	00	Relative Humidity :	53~55%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2349.78	50.86	-23.14	74	46.76	32.28	6.38	34.56	112	9	Peak
2349.96	40.71	-13.29	54	36.61	32.28	6.38	34.56	112	9	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2323.32	49.76	-24.24	74	45.72	32.26	6.35	34.57	180	2	Peak
2349.96	38.77	-15.23	54	34.67	32.28	6.38	34.56	180	2	Average

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.53	58.22	-15.78	74	53.7	32.48	6.59	34.55	114	352	Peak
2483.5	52.72	*-1.28	54	48.2	32.48	6.59	34.55	114	352	Average
2483.53	43.83	-30.17	74	-	-	-	-	-	-	Peak
2483.5	43.08	-10.92	54	-	-	-	-	-	-	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Measurement Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
Peak	99.44	55.61	43.83	74	-30.17	Pass
Average	98.69	55.61	43.08	54	-10.92	Pass

Note : Measurement result = Maximum field strength – Delta result

*Delta-Marker Method is used for the 2483.5MHz average measurement as described in the test procedure of this report and the test result is under 10.92dB

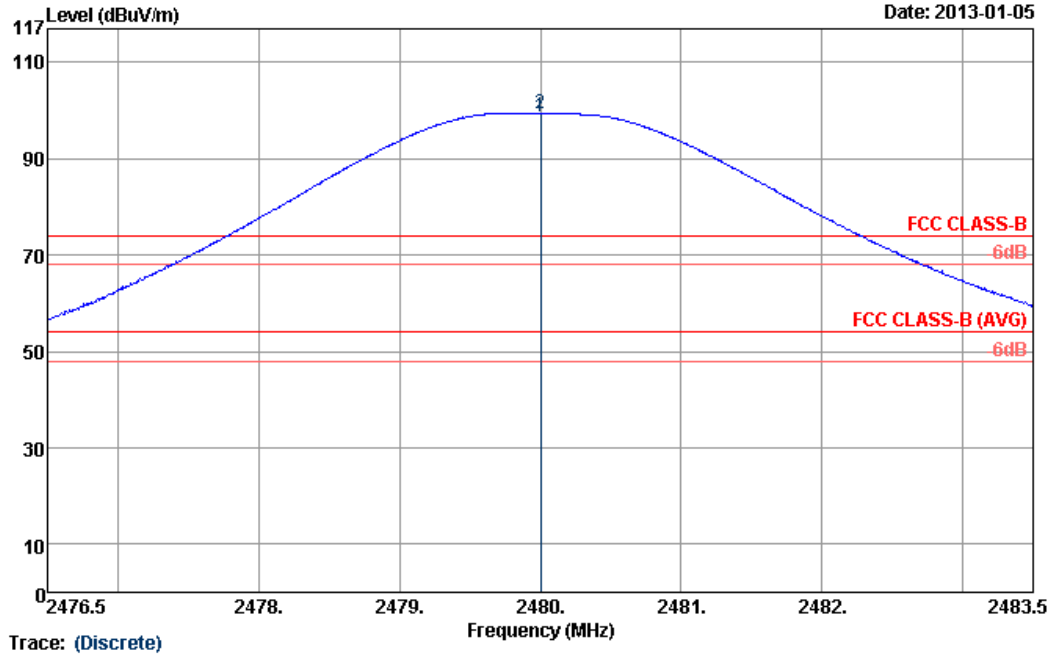
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	53.7	-20.3	74	49.18	32.48	6.59	34.55	171	1	Peak
2483.5	47.45	-6.55	54	42.93	32.48	6.59	34.55	171	1	Average
2483.5	44.15	-29.85	74	-	-	-	-	-	-	Peak
2483.5	44.04	-9.96	54	-	-	-	-	-	-	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Measurement Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
Peak	93.13	48.98	44.15	74	-29.85	Pass
Average	93.02	48.98	44.04	54	-9.96	Pass

Note : Measurement result = Maximum field strength – Delta result

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Horizontal



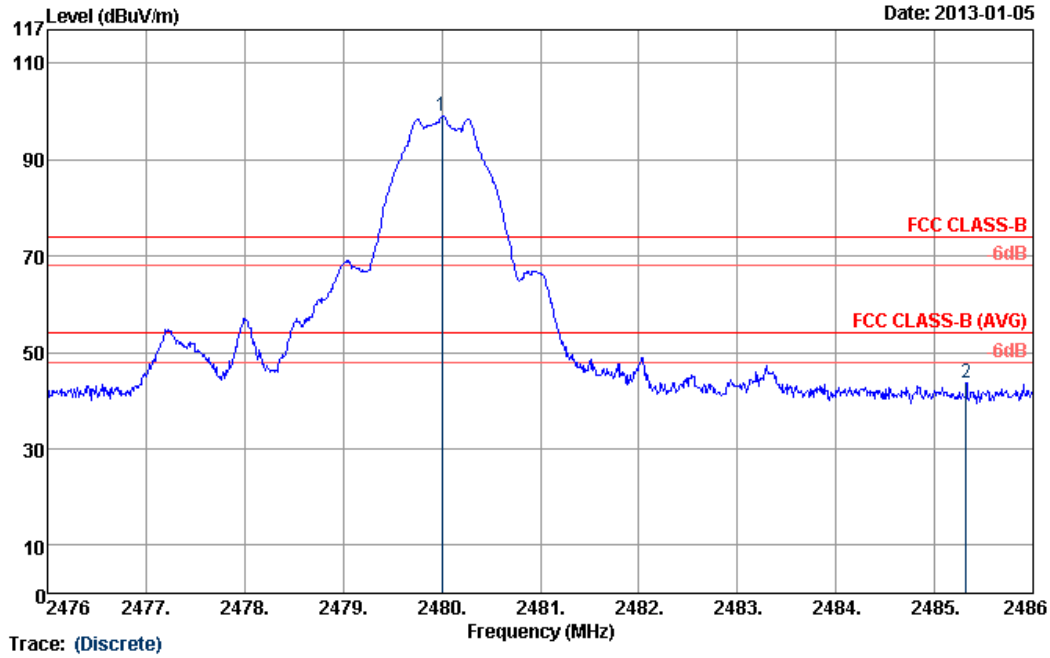
Site : 03CH06-HY
Condition : FCC CLASS-B 3m HF-ANT_120801 HORIZONTAL
: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

Detector : Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	98.69	44.69	54.00	94.17	32.48	6.59	34.55	114	352	Average
2 *	2480.00	99.44	25.44	74.00	94.92	32.48	6.59	34.55	114	352	Peak

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Horizontal



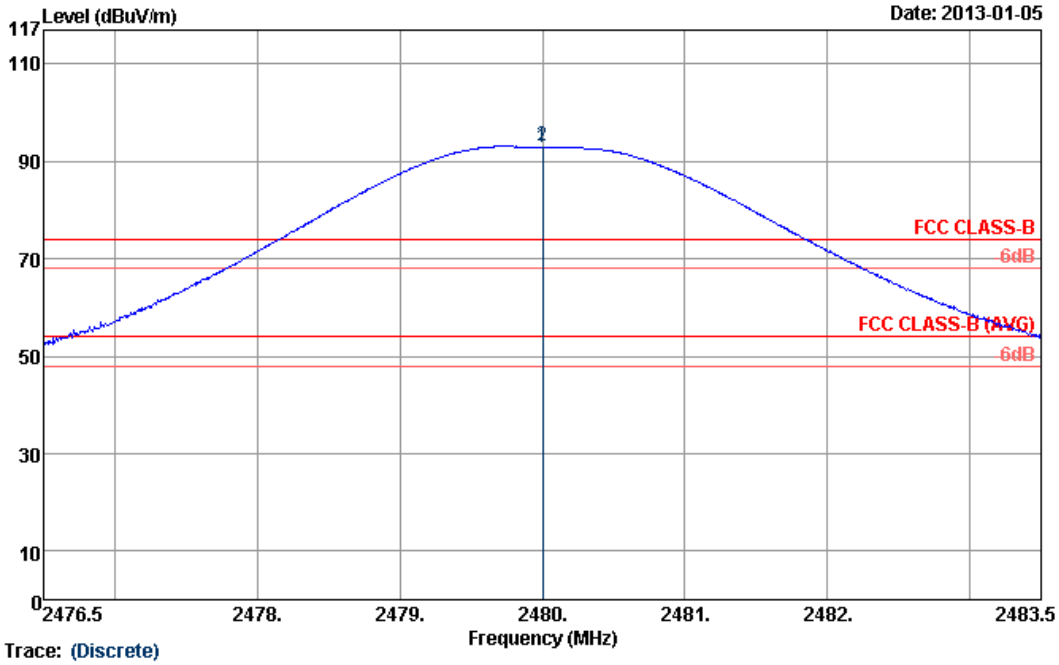
Site : 03CH06-HY
Condition : FCC CLASS-B 3m HF-ANT_120801 HORIZONTAL
: RBW:100.000KHz VBW:300.000KHz SWT:Auto

Detector : Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	99.19	25.19	74.00	94.67	32.48	6.59	34.55	114	352	Peak
2	2485.32	43.58	-30.42	74.00	39.06	32.48	6.59	34.55	114	352	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 55.61 dB , single carrier Mode

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Vertical



Trace: (Discrete)

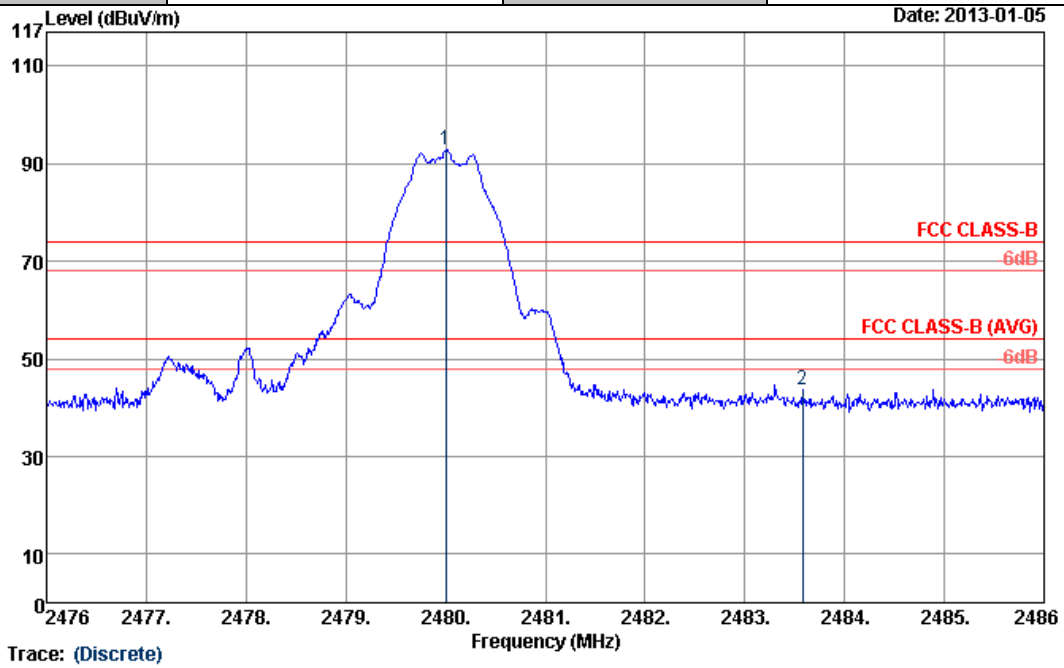
Site : 03CH06-HY
Condition : FCC CLASS-B 3m HF-ANT_120801 VERTICAL
: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

Detector : Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	93.02	39.02	54.00	88.50	32.48	6.59	34.55	171	1	Average
2 *	2480.00	93.13	19.13	74.00	88.61	32.48	6.59	34.55	171	1	Peak

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Vertical



Site : 03CH06-HY
Condition : FCC CLASS-B 3m HF-ANT_120801 VERTICAL
: RBW:100.000KHz VBW:300.000KHz SWT:Auto

Detector : Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	2480.00	92.78	18.78	74.00	88.26	32.48	6.59	34.55	171	1	Peak
2	2483.58	43.80	-30.20	74.00	39.28	32.48	6.59	34.55	171	1	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 48.98 dB , single carrier Mode

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

Test Mode :	Mode 1	**Temperature :**	23~25℃
Test Channel :	00	**Relative Humidity :**	53~55%
Test Engineer :	Kai Wang	**Polarization :**	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 2399MHz and 3327 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 100.57 dBuV/m - 20dB = 80.57dBuV/m. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2399	61.98	-18.59	80.57	57.73	32.36	6.45	34.56	112	9	Peak
2402	99.7	-	-	95.45	32.36	6.45	34.56	112	9	Average
2402	100.57	-	-	96.32	32.36	6.45	34.56	112	9	Peak
3327	48.11	-32.46	80.57	61.2	33.1	7.88	54.07	100	0	Peak
4806	48.3	-25.7	74	58.81	34.88	10.17	55.56	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 1	Temperature :	23~25℃
Test Channel :	00	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 2399 MHz, 3327 MHz, and 3597 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2399	57.69	-17.67	75.36	53.44	32.36	6.45	34.56	180	2	Peak
2402	94.9	-	-	90.65	32.36	6.45	34.56	180	2	Average
2402	95.36	-	-	91.11	32.36	6.45	34.56	180	2	Peak
3327	49	-26.36	75.36	62.09	33.1	7.88	54.07	100	0	Peak
3597	49.18	-26.18	75.36	62.01	33.24	8.2	54.27	100	0	Peak
4806	46.15	-7.85	54	56.66	34.88	10.17	55.56	110	219	Average
4806	51.5	-22.5	74	62.01	34.88	10.17	55.56	110	219	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	**Temperature :**	23~25℃
Test Channel :	19	**Relative Humidity :**	53~55%
Test Engineer :	Kai Wang	**Polarization :**	Horizontal
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. 3318 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2440	99.19	-	-	94.8	32.43	6.52	34.56	110	11	Average
2440	100.14	-	-	95.75	32.43	6.52	34.56	110	11	Peak
3318	50.03	-30.11	80.14	63.11	33.1	7.88	54.06	100	0	Peak
4881	49.85	-24.15	74	60.49	34.85	10.19	55.68	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	Temperature :	23~25℃
Test Channel :	19	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. 3318 MHz and 3588MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2440	92.8	-	-	88.41	32.43	6.52	34.56	178	1	Average
2440	93.59	-	-	89.2	32.43	6.52	34.56	178	1	Peak
3318	49.98	-23.61	73.59	63.06	33.1	7.88	54.06	100	0	Peak
3588	50.29	-23.3	73.59	63.11	33.22	8.2	54.24	100	0	Peak
4881	46.2	-7.8	54	56.84	34.85	10.19	55.68	108	229	Average
4881	51.55	-22.45	74	62.19	34.85	10.19	55.68	108	229	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 3327 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
161.22	31.92	-11.58	43.5	51.73	10	1.45	31.26	-	-	Peak
207.12	32.39	-11.11	43.5	52.95	9.15	1.61	31.32	-	-	Peak
276.24	34.96	-11.04	46	51.42	12.84	1.83	31.13	-	-	Peak
344.8	40.36	-5.64	46	55.26	14.05	2.04	30.99	109	46	Peak
796.3	36.52	-9.48	46	45.51	19.8	3.09	31.88	-	-	Peak
831.3	38.02	-7.98	46	45.87	20.11	3.17	31.13	-	-	Peak
2480	98.69	-	-	94.17	32.48	6.59	34.55	114	352	Average
2480	99.47	-	-	94.95	32.48	6.59	34.55	114	352	Peak
3327	50.15	-29.32	79.47	63.24	33.1	7.88	54.07	100	0	Peak
4962	48.68	-25.32	74	59.5	34.81	10.21	55.84	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 3	Temperature :	23~25℃
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 3327 MHz and 3588 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
35.13	31.2	-8.8	40	46.57	15.5	0.64	31.51	-	-	Peak
160.95	32.57	-10.93	43.5	52.38	10	1.45	31.26	-	-	Peak
185.52	33.37	-10.13	43.5	53.96	9.1	1.53	31.22	-	-	Peak
552.7	40.16	-5.84	46	49.59	19.07	2.61	31.11	-	-	Peak
620.6	42.24	-3.76	46	52	19.11	2.75	31.62	100	283	Peak
831.3	38.49	-7.51	46	46.34	20.11	3.17	31.13	-	-	Peak
2480	92.08	-	-	87.56	32.48	6.59	34.55	171	1	Average
2480	93.02	-	-	88.5	32.48	6.59	34.55	171	1	Peak
3327	49.81	-23.21	73.02	62.9	33.1	7.88	54.07	100	0	Peak
3588	50.6	-22.42	73.02	63.42	33.22	8.2	54.24	100	0	Peak
4962	46.42	-7.58	54	57.24	34.81	10.21	55.84	109	218	Average
4962	51.77	-22.23	74	62.59	34.81	10.21	55.84	109	218	Peak

Note: Other harmonics are lower than background noise.

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 (dBuV)	
	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.

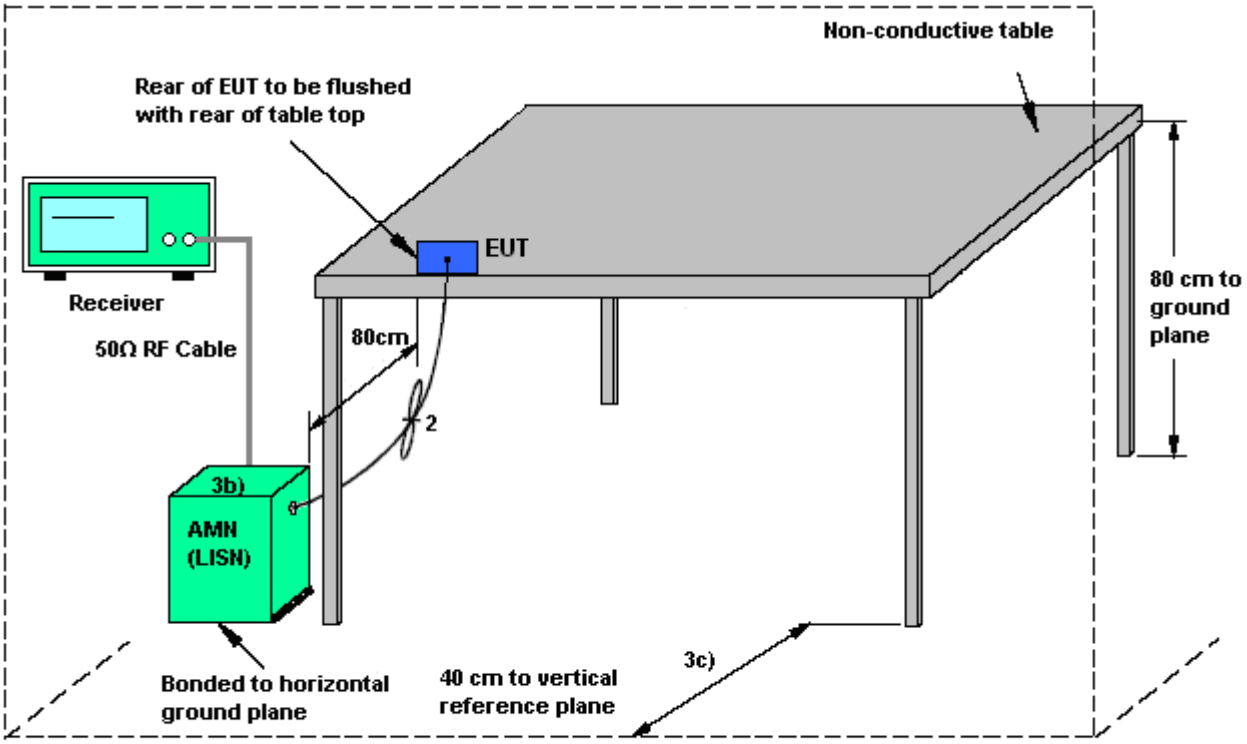
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.10-2009 and ANSI C63.4-2003 test site requirement.
2. 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.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

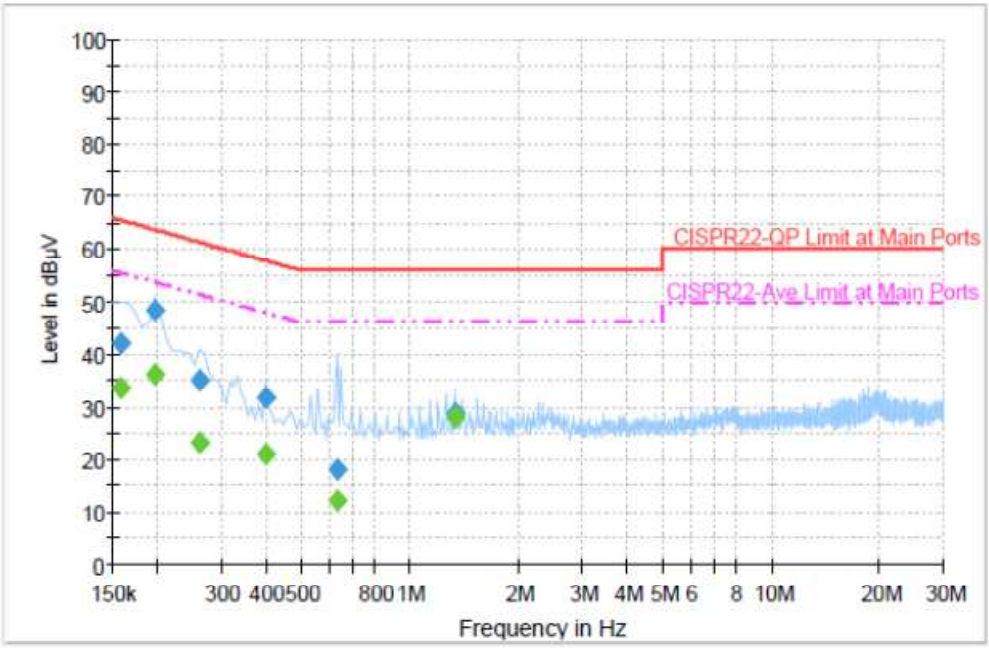
3.6.4 Test Setup



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

Test Mode :	Mode 1	**Temperature :**	20~22℃
Test Engineer :	Slash Huang	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	Bluetooth Link + USB Cable (Charging with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



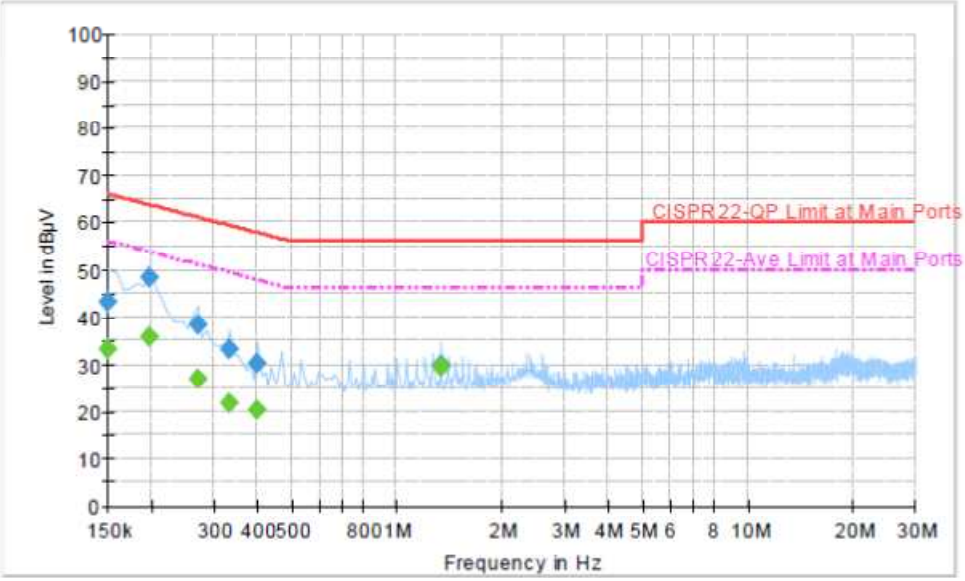
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	42.2	Off	L1	19.4	23.4	65.6
0.198000	48.3	Off	L1	19.4	15.4	63.7
0.262000	35.0	Off	L1	19.4	26.4	61.4
0.398000	31.6	Off	L1	19.5	26.3	57.9
0.630000	18.0	Off	L1	19.5	38.0	56.0
1.334000	28.6	Off	L1	19.4	27.4	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	33.6	Off	L1	19.4	22.0	55.6
0.198000	36.0	Off	L1	19.4	17.7	53.7
0.262000	23.4	Off	L1	19.4	28.0	51.4
0.398000	20.9	Off	L1	19.5	27.0	47.9
0.630000	12.0	Off	L1	19.5	34.0	46.0
1.334000	28.0	Off	L1	19.4	18.0	46.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + USB Cable (Charging with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	43.3	Off	N	19.4	22.7	66.0
0.198000	48.5	Off	N	19.4	15.2	63.7
0.270000	38.3	Off	N	19.4	22.8	61.1
0.334000	33.1	Off	N	19.3	26.3	59.4
0.398000	30.2	Off	N	19.5	27.7	57.9
1.334000	30.0	Off	N	19.5	26.0	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	33.3	Off	N	19.4	22.7	56.0
0.198000	35.9	Off	N	19.4	17.8	53.7
0.270000	26.9	Off	N	19.4	24.2	51.1
0.334000	21.6	Off	N	19.3	27.8	49.4
0.398000	20.5	Off	N	19.5	27.4	47.9
1.334000	29.5	Off	N	19.5	16.5	46.0

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 Connected Construction

Non-standard connector 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	FSP40	100055	9kHz~40GHz	Jun. 06, 2012	Dec. 27, 2012	Jun. 05, 2013	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9KHz – 2.75GHz	Nov. 13, 2012	Dec. 25, 2012	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100081	9KHz ~ 30MHz	Dec. 12, 2012	Dec. 25, 2012	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9KHz ~ 30MHz	Dec. 06, 2012	Dec. 25, 2012	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Dec. 25, 2012	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz~30GHz	Nov. 07, 2012	Jan. 05, 2013	Nov. 06, 2013	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz ~ 26.5GHz	Nov. 26, 2012	Jan. 05, 2013	Nov. 25, 2013	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 04, 2012	Jan. 05, 2013	May 03, 2013	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 06, 2012	Jan. 05, 2013	Oct. 05, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Jan. 05, 2013	Jul. 31, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	COM-POWER	AH-118	071025	1GHz~18GHz	Aug. 09, 2012	Jan. 05, 2013	Aug. 08, 2013	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz ~ 40GHz	Sep. 28, 2012	Jan. 05, 2013	Sep. 27, 2013	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A01917	1GHz ~ 26.5GHz	Apr. 13, 2012	Jan. 05, 2013	Apr. 12, 2013	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz ~ 1GHz	Apr. 11, 2012	Jan. 05, 2013	Apr. 10, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 21, 2012	Jan. 05, 2013	Jul. 20, 2013	Radiation (03CH06-HY)
Pre Amplifier	MITEQ	AMF-7D-00101800-30-10P	159087	1GHz~18GHz	Feb. 27, 2012	Jan. 05, 2013	Feb. 26, 2013	Radiation (03CH06-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9KHz ~ 30MHz	Jul. 03, 2012	Jan. 05, 2013	Jul. 02, 2014	Radiation (03CH06-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**

Appendix A. Photographs of EUT

Please refer to Sporton report number EP2D1304 as below.