FCC RF Test Report

APPLICANT	**:**	**Joyous LLC**
EQUIPMENT	**:**	**Mobile Phone**
MODEL NAME	**:**	**SD4930UR**
FCC ID	**:**	**ZWH-1210**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	**:**	**(DTS) Digital Transmission System**

The testing completed on Dec. 06, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown to be compliant 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

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
FR372301-01B	Rev. 01	Initial issue of report	Mar. 18, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)(1)	Peak Output Power	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 9.69 dB at 30.000 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 8.20 dB at 0.150 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Joyous LLC
1090 Vermont Avenue NW Suite 430
Washington, DC 20005

1.2 Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Model Name	SD4930UR
FCC ID	ZWH-1210
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/ WLAN 11b/g/n (HT20) WLAN 11a/n (HT20/HT40) WLAN 11ac (VHT20/VHT40/VHT80) Bluetooth v3.0 + EDR Bluetooth v4.0 + LE NFC

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

1.3 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	2.39 dBm (0.0017 W)
Antenna Type	Fixed Internal Antenna type with gain -1.42 dBi
Type of Modulation	Bluetooth 4.0 - LE : GFSK

1.4 Modification of EUT

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

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 Registration No.
	TH02-HY	CO05-HY	03CH08-HY	636805

Note: The test site complies with ANSI C63.4 2003 requirement.

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 v03r01
- ANSI C63.4-2003

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	1.37 dBm
Ch19	2440MHz	**2.39 dBm**
Ch39	2480MHz	0.91 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 (Z plane as worst plane) from all possible combinations.

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

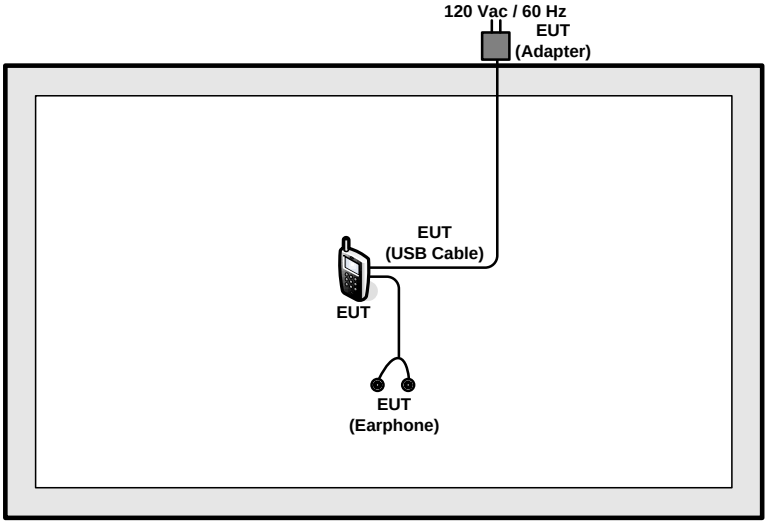
2.2 Test Mode

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

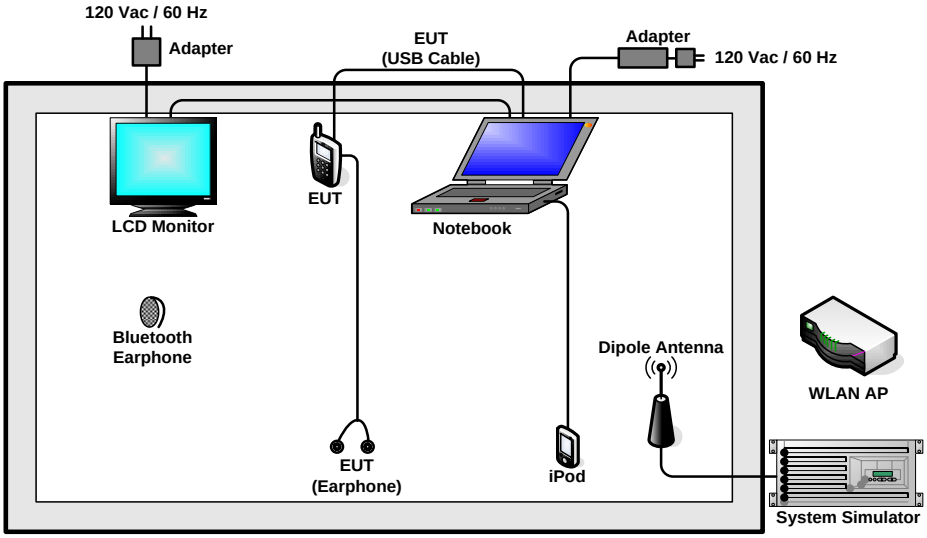
Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth 4.0 – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1 : WCDMA Band II Idle + WLAN (2.4GHz) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + NFC On Mode 2 : WCDMA Band II Idle + WLAN (5GHz) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + NFC On Mode 3 : GSM850 Idle + WLAN (2.4GHz, 802.11n HT20, Ch06, MCS0) SISO Tx + Earphone + USB Cable (Charging from Adapter) + H-Pattern Mode 4 : GSM850 Idle + WLAN (5GHz, 802.11a, Ch165, 6Mbps) SISO Tx + Earphone + USB Cable (Charging from Adapter) + H-Pattern
Remark: The worst case of conducted emission is mode 2; only the test data of it was reported.	

2.3 Connection Diagram of Test System

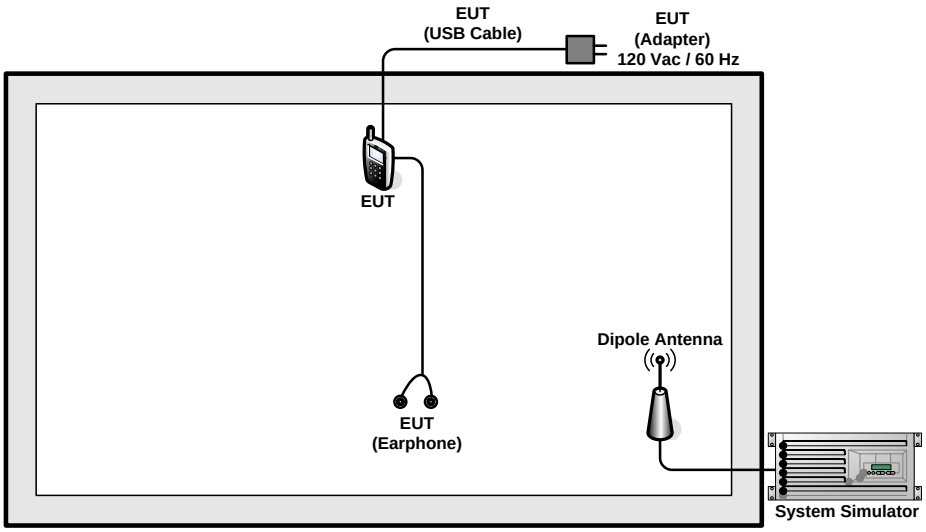
<Bluetooth 4.0 – LE Tx Mode>



<EUT with USB Cable (Link with Notebook) for AC Conducted Emission Mode 1 and 2>



<EUT with Adapter Mode for AC Conducted Emission Mode 3 and 4>



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	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude E6320	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	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, programmed RF utility, “QRCT” installed in the notebook make the EUT provide 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.

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.

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.

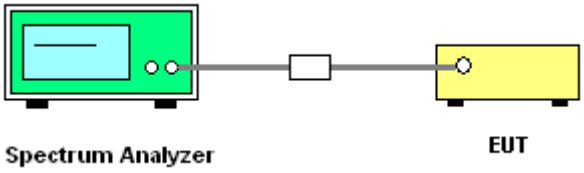
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
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

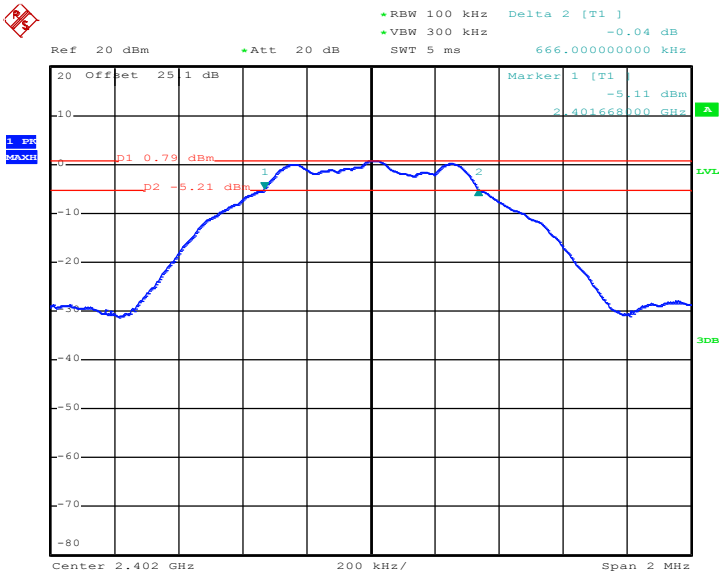


3.1.5 Test Result of 6dB Bandwidth

Test Mode :	Bluetooth 4.0 - LE	Temperature :	22~25℃
Test Engineer :	Stuart Lin	Relative Humidity :	51~55%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
00	2402	0.666	0.5	Pass
19	2440	0.662	0.5	Pass
39	2480	0.664	0.5	Pass

6 dB Bandwidth Plot on Channel 00



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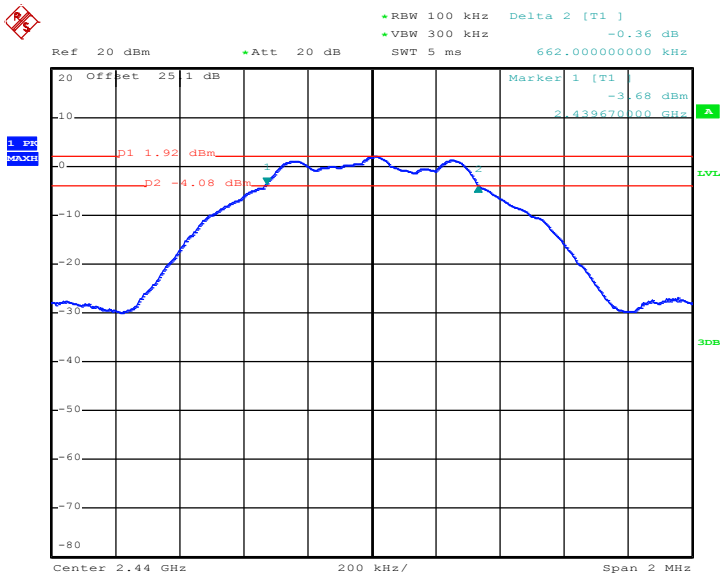
6 dB Bandwidth Plot on Channel 19



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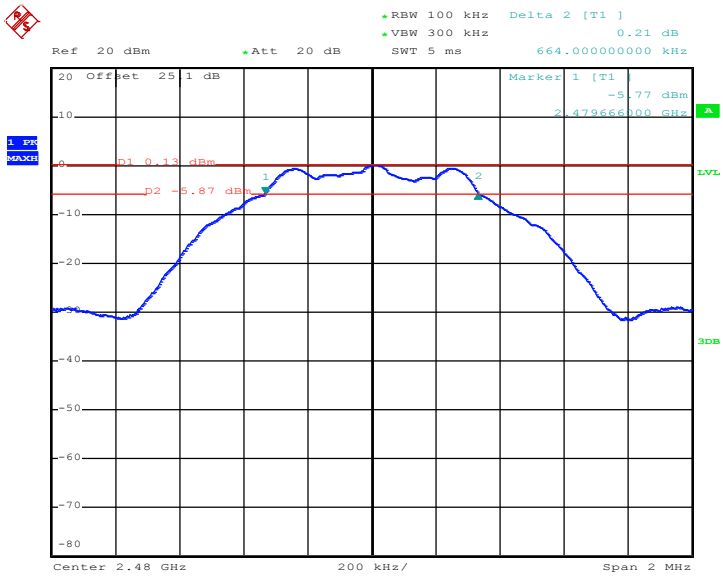
6 dB Bandwidth Plot on Channel 39



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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.

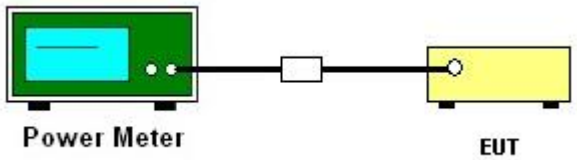
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 v03r01.
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 Mode :	Bluetooth 4.0 - LE	**Temperature :**	22~25℃
Test Engineer :	Stuart Lin	**Relative Humidity :**	51~55%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	1.37	30.00	Pass
19	2440	2.39	30.00	Pass
39	2480	0.91	30.00	Pass

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.

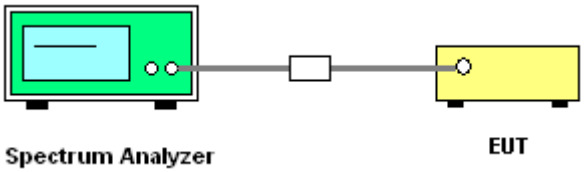
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

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 v03r01
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 :	22~25℃
Test Engineer :	Stuart Lin	Relative Humidity :	51~55%

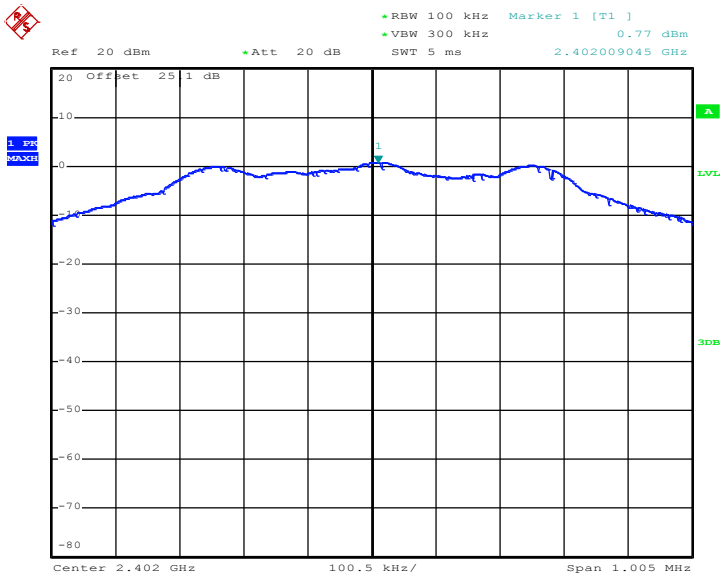
Channel	Frequency (MHz)	Power Density		Max. Limits (dBm/3kHz)	Pass/Fail
		PSD/100kHz (dBm)	PSD/3kHz (dBm)		
00	2402	0.77	-14.41	8	Pass
19	2440	1.91	-13.22	8	Pass
39	2480	0.12	-15.03	8	Pass

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



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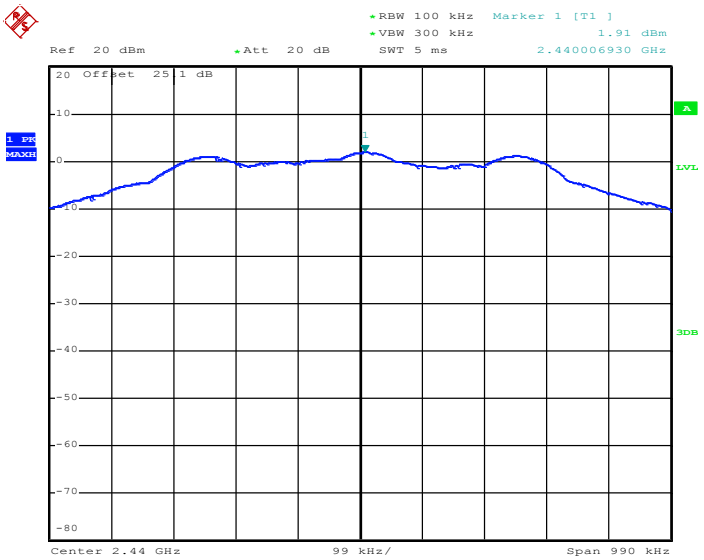
PSD 100kHz Plot on Channel 19



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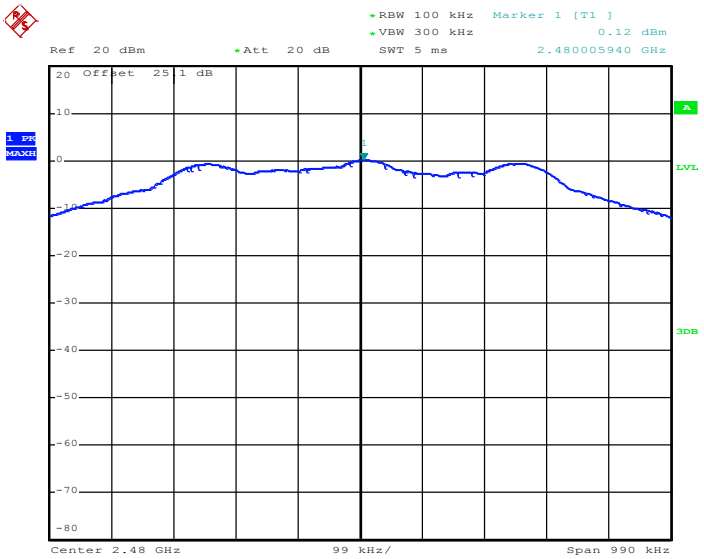
PSD 100kHz Plot on Channel 39



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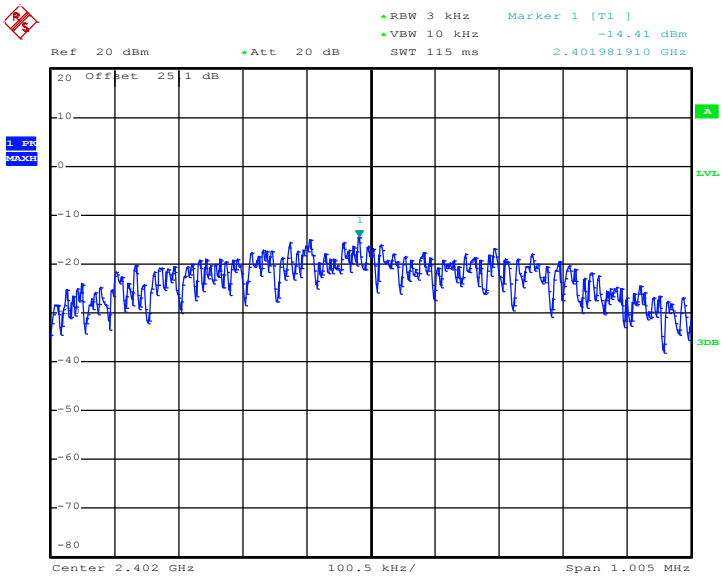
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on Channel 00



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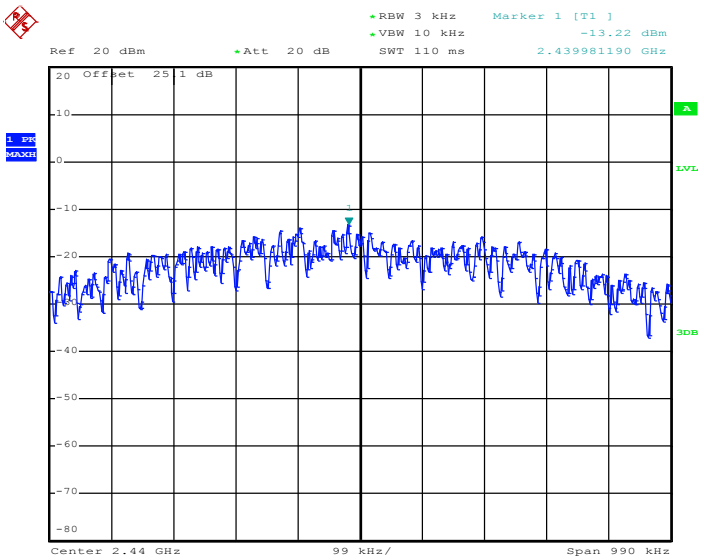
PSD 3kHz Plot on Channel 19



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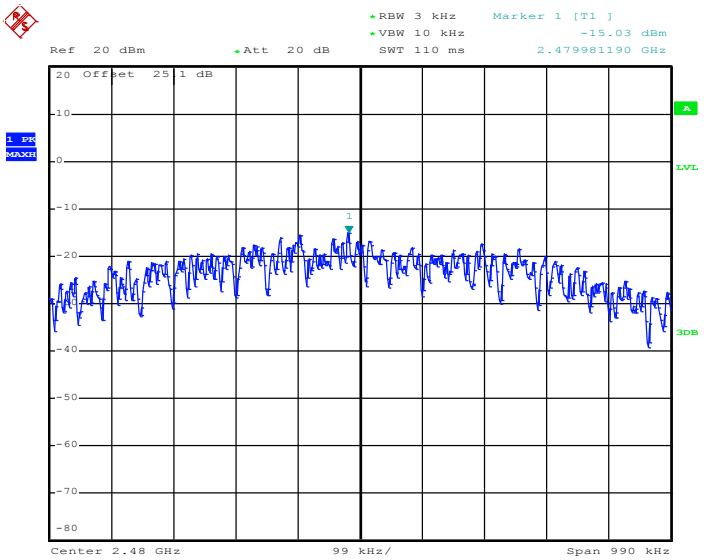
PSD 3kHz Plot on Channel 39



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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.

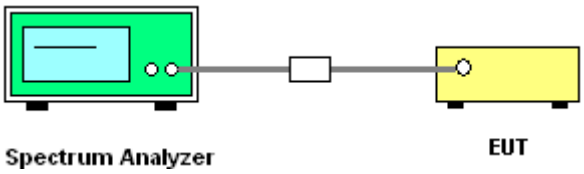
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
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.

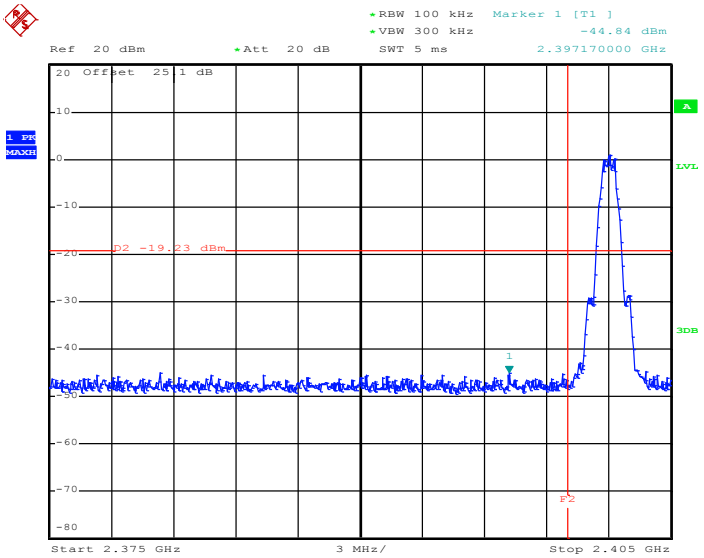
3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges

Test Mode :	Bluetooth 4.0 - LE	**Temperature :**	22~25℃
Test Channel :	00 and 39	**Relative Humidity :**	51~55%
		Test Engineer :	Stuart Lin

Low Band Edge Plot on Channel 00



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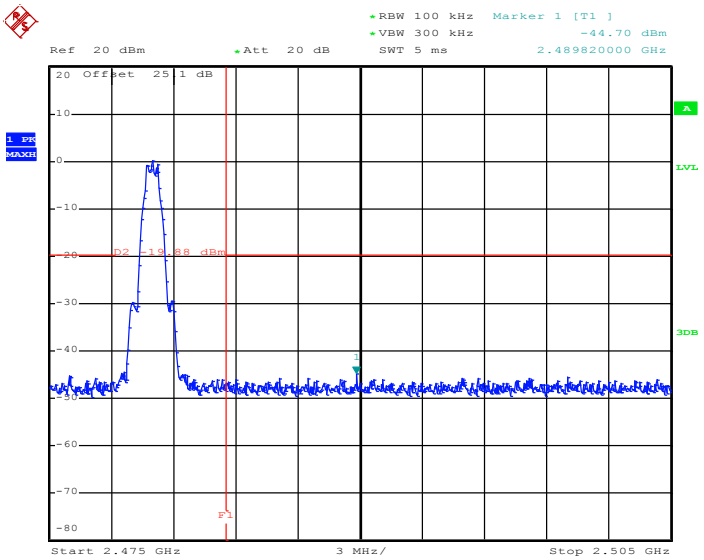
High Band Edge Plot on Channel 39



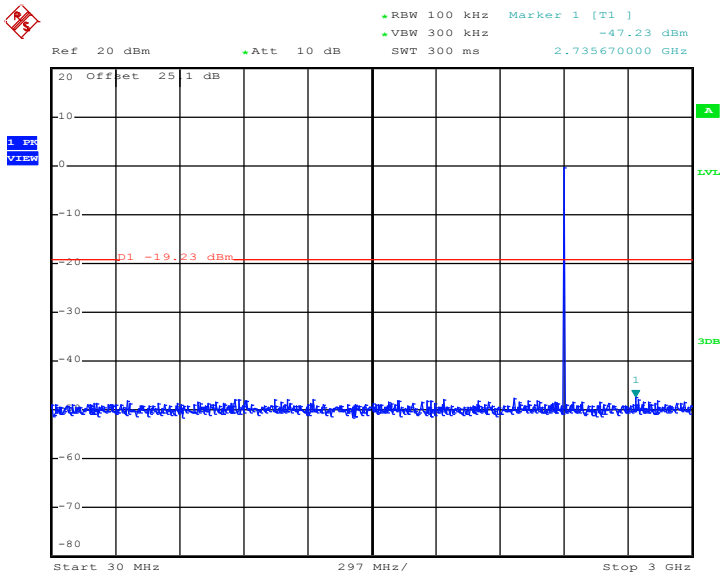
Date: 29.NOV.2013 09:26:22

3.4.6 Test Result of Conducted Spurious Emission

Test Mode :	Bluetooth 4.0 - LE	**Temperature :**	22~25℃
Test Channel :	00	**Relative Humidity :**	51~55%
		Test Engineer :	Stuart Lin

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00



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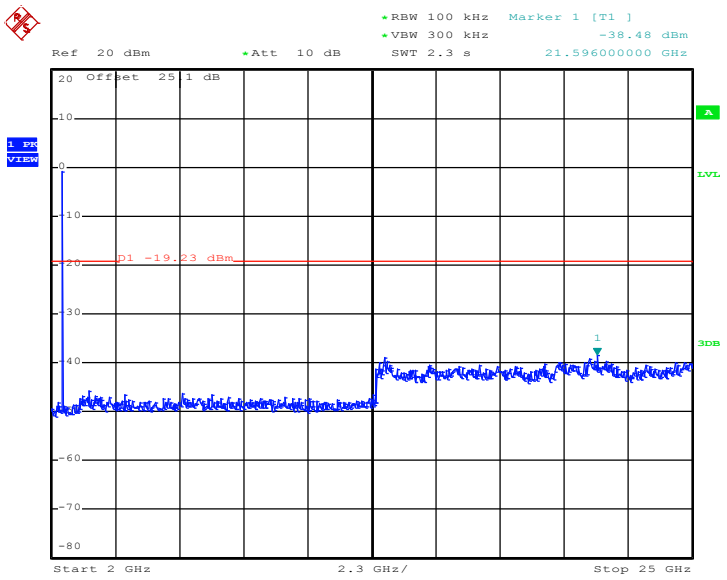
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



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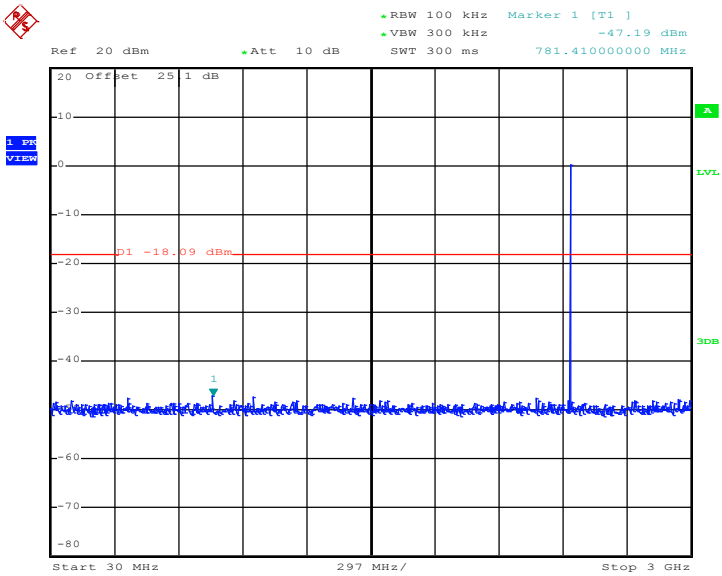
Test Mode :	Bluetooth 4.0 - LE	**Temperature :**	22~25℃
Test Channel :	19	**Relative Humidity :**	51~55%
		Test Engineer :	Stuart Lin

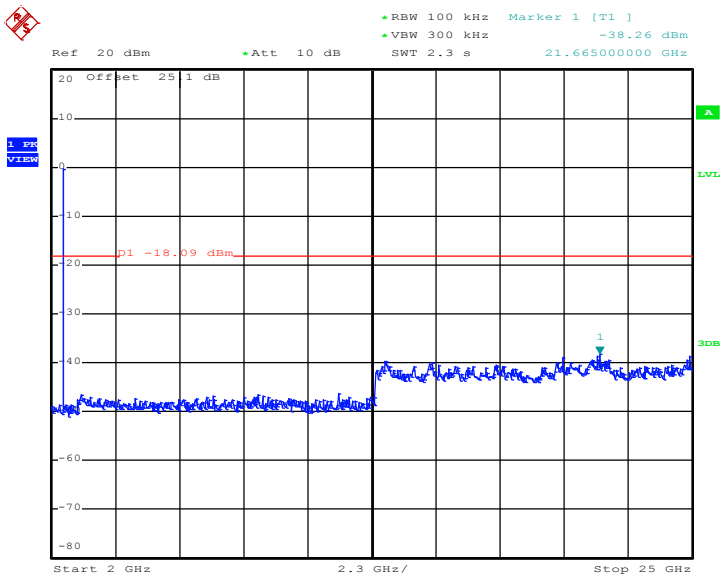
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19



Date: 29.NOV.2013 09:22:49

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19

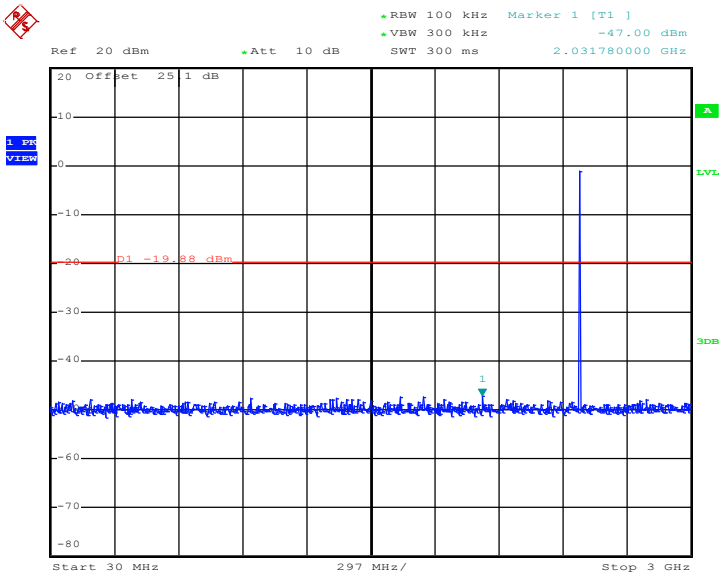


Date: 29.NOV.2013 09:23:07

Test Mode :	Bluetooth 4.0 - LE	Temperature :	22~25℃
Test Channel :	39	Relative Humidity :	51~55%
		Test Engineer :	Stuart Lin

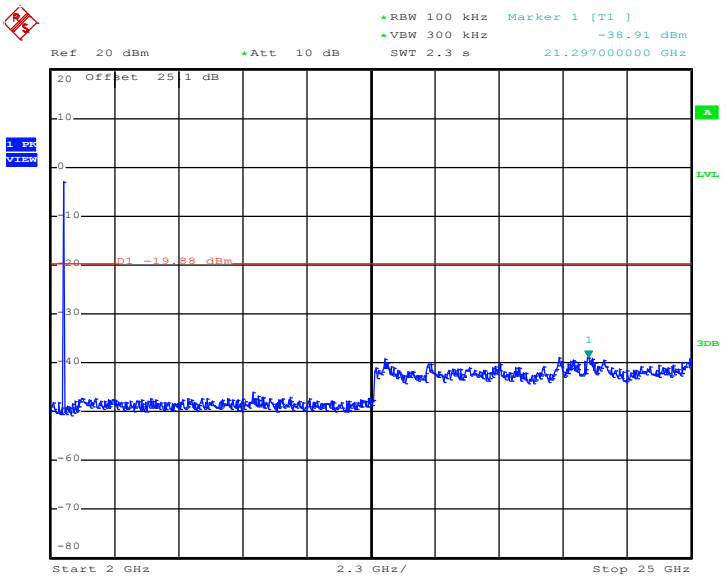
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



Date: 29.NOV.2013 09:27:12

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

The measuring equipment is listed in the section 4 of this test report.

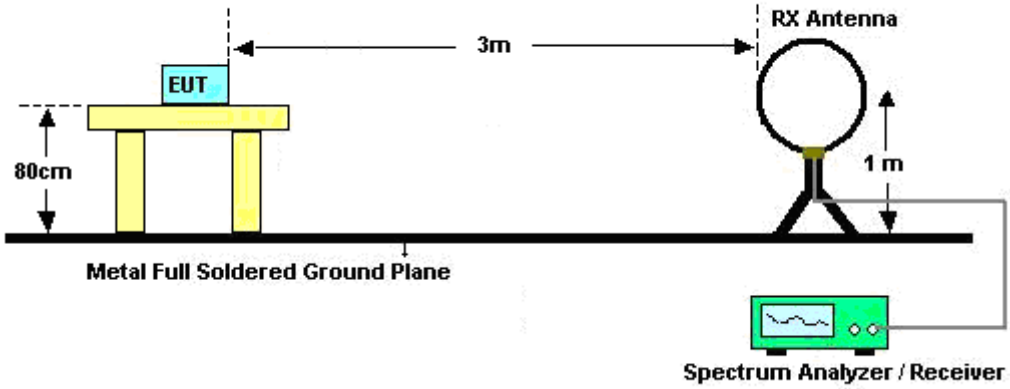
3.5.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
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.

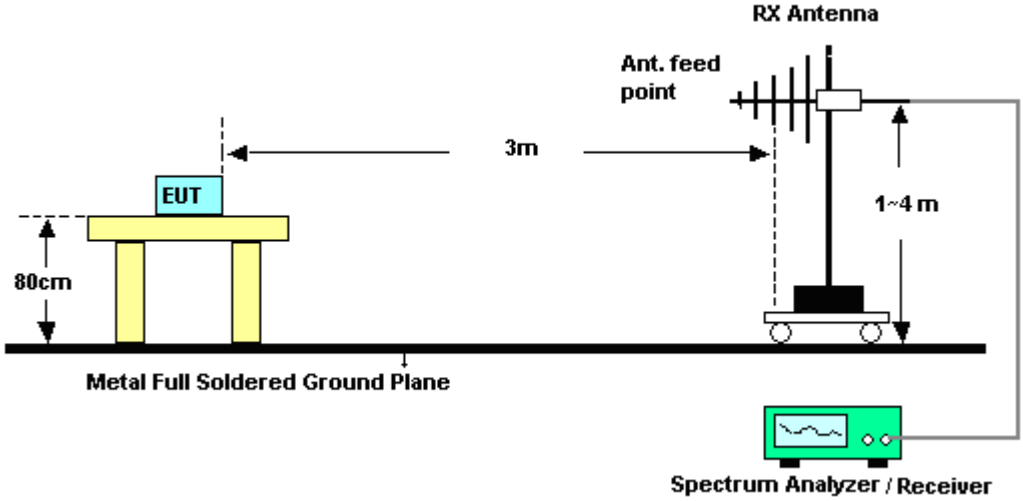
Band	Duty Cycle(%)	T(μs)	1/T(kHz)	VBW Setting
Bluetooth 4.0 - LE	62.66	396.00	2.53	3kHz

3.5.4 Test Setup

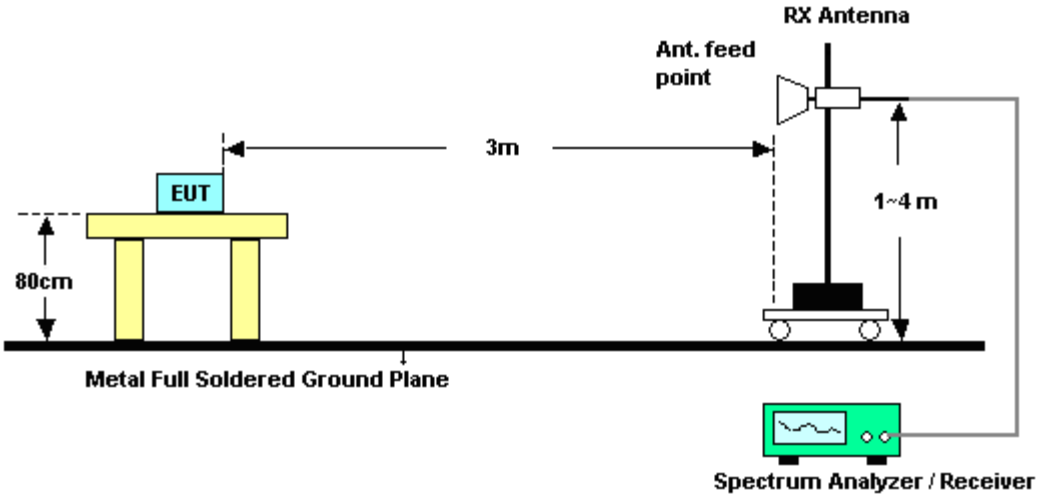
For radiated emissions below 30MHz



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

Test Mode :	Mode 1	**Temperature :**	20~21°C
Test Channel :	00	**Relative Humidity :**	50~54%
		Test Engineer :	Jet Lui

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
2346.9	50.61	-23.39	74	48.31	32.06	6.19	35.95	192	243	Peak
2365.53	39.52	-14.48	54	37.1	32.13	6.21	35.92	192	243	Average

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
2359.95	50.41	-23.59	74	48.31	31.84	6.21	35.95	107	258	Peak
2369.85	39.37	-14.63	54	37.13	31.95	6.21	35.92	107	258	Average

Test Mode :	Mode 3	**Temperature :**	20~21°C
Test Channel :	39	**Relative Humidity :**	50~54%
		Test Engineer :	Jet Lui

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
2483.56	51.76	-22.24	74	48.51	32.63	6.45	35.83	100	240	Peak
2485.63	40.31	-13.69	54	37.06	32.63	6.45	35.83	100	240	Average

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
2496.04	51.58	-22.42	74	48.23	32.7	6.45	35.8	151	260	Peak
2493.67	40.35	-13.65	54	37	32.7	6.45	35.8	151	260	Average

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

Note: Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

Test Mode :	Mode 1	**Temperature :**	20~21°C
Test Channel :	00	**Relative Humidity :**	50~54%
Test Engineer :	Jet Lui	**Polarization :**	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit. 3. No spurious emissions are detected other than listed points as below.		

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
2402	94.68	-	-	92.09	32.27	6.22	35.9	192	243	Average
2402	95.9	-	-	93.31	32.27	6.22	35.9	192	243	Peak
4803	39.99	-34.01	54	56.5	34.46	8	58.97	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 1	**Temperature :**	20~21°C
Test Channel :	00	**Relative Humidity :**	50~54%
Test Engineer :	Jet Lui	**Polarization :**	Vertical
Remark :	1. 2404 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit. 3. No spurious emissions are detected other than listed points as below.		

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
2404	92.38	-	-	89.9	32.16	6.22	35.9	107	258	Average
2404	93.53	-	-	91.05	32.16	6.22	35.9	107	258	Peak
4803	38.14	-35.86	54	54.65	34.46	8	58.97	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	**Temperature :**	20~21°C
Test Channel :	19	**Relative Humidity :**	50~54%
Test Engineer :	Jet Lui	**Polarization :**	Horizontal
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit. 3. No spurious emissions are detected other than listed points as below.		

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
2440	96.23	-	-	93.28	32.49	6.34	35.88	100	248	Average
2440	97.36	-	-	94.41	32.49	6.34	35.88	100	248	Peak
4880	37.37	-36.63	54	53.69	34.4	8.15	58.87	100	0	Peak
7323	40.44	-33.56	54	52.83	35.63	10.47	58.49	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	**Temperature :**	20~21°C
Test Channel :	19	**Relative Humidity :**	50~54%
Test Engineer :	Jet Lui	**Polarization :**	Vertical
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit. 3. No spurious emissions are detected other than listed points as below.		

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
2440	95.45	-	-	92.61	32.38	6.34	35.88	125	262	Average
2440	96.57	-	-	93.73	32.38	6.34	35.88	125	262	Peak
4880	37.69	-36.31	54	54.01	34.4	8.15	58.87	100	0	Peak
7323	41.55	-32.45	54	54.03	35.54	10.47	58.49	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 3	**Temperature :**	20~21°C
Test Channel :	39	**Relative Humidity :**	50~54%
Test Engineer :	Jet Lui	**Polarization :**	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit. 3. No spurious emissions are detected other than listed points as below.		

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
95.88	27.04	-16.46	43.5	48.29	9.57	1.14	31.96	102	168	Peak
134.22	21.63	-21.87	43.5	40.81	11.31	1.35	31.84	-	-	Peak
249.78	23.86	-22.14	46	41.79	11.99	1.83	31.75	-	-	Peak
364.4	23.06	-22.94	46	37.76	14.79	2.2	31.69	-	-	Peak
496	22.34	-23.66	46	33.95	16.98	2.58	31.17	-	-	Peak
893.6	21.93	-24.07	46	28.39	20.69	3.48	30.63	-	-	Peak
2480	95.82	-	-	92.57	32.63	6.45	35.83	100	240	Average
2480	96.93	-	-	93.68	32.63	6.45	35.83	100	240	Peak
4959	39.43	-34.57	54	55.59	34.33	8.26	58.75	100	0	Peak
7440	40.33	-33.67	54	52.89	35.68	10.47	58.71	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 3	**Temperature :**	20~21°C
Test Channel :	39	**Relative Humidity :**	50~54%
Test Engineer :	Jet Lui	**Polarization :**	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit. 3. No spurious emissions are detected other than listed points as below.		

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
30	30.31	-9.69	40	40.07	21.66	0.64	32.06	100	190	Peak
39.45	28.75	-11.25	40	47.89	12.13	0.74	32.01	-	-	Peak
94.26	29.68	-13.82	43.5	50.92	9.57	1.13	31.94	-	-	Peak
550.6	24.53	-21.47	46	35.1	18	2.72	31.29	-	-	Peak
673.1	23.08	-22.92	46	32.21	18.87	2.99	30.99	-	-	Peak
907.6	31.93	-14.07	46	38.32	20.71	3.5	30.6	-	-	Peak
2480	93.91	-	-	90.7	32.59	6.45	35.83	151	260	Average
2480	95.09	-	-	91.88	32.59	6.45	35.83	151	260	Peak
4959	39.39	-34.61	54	55.55	34.33	8.26	58.75	100	0	Peak
7440	40.69	-33.31	54	53.49	35.44	10.47	58.71	100	0	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 (dBμV)	
	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.

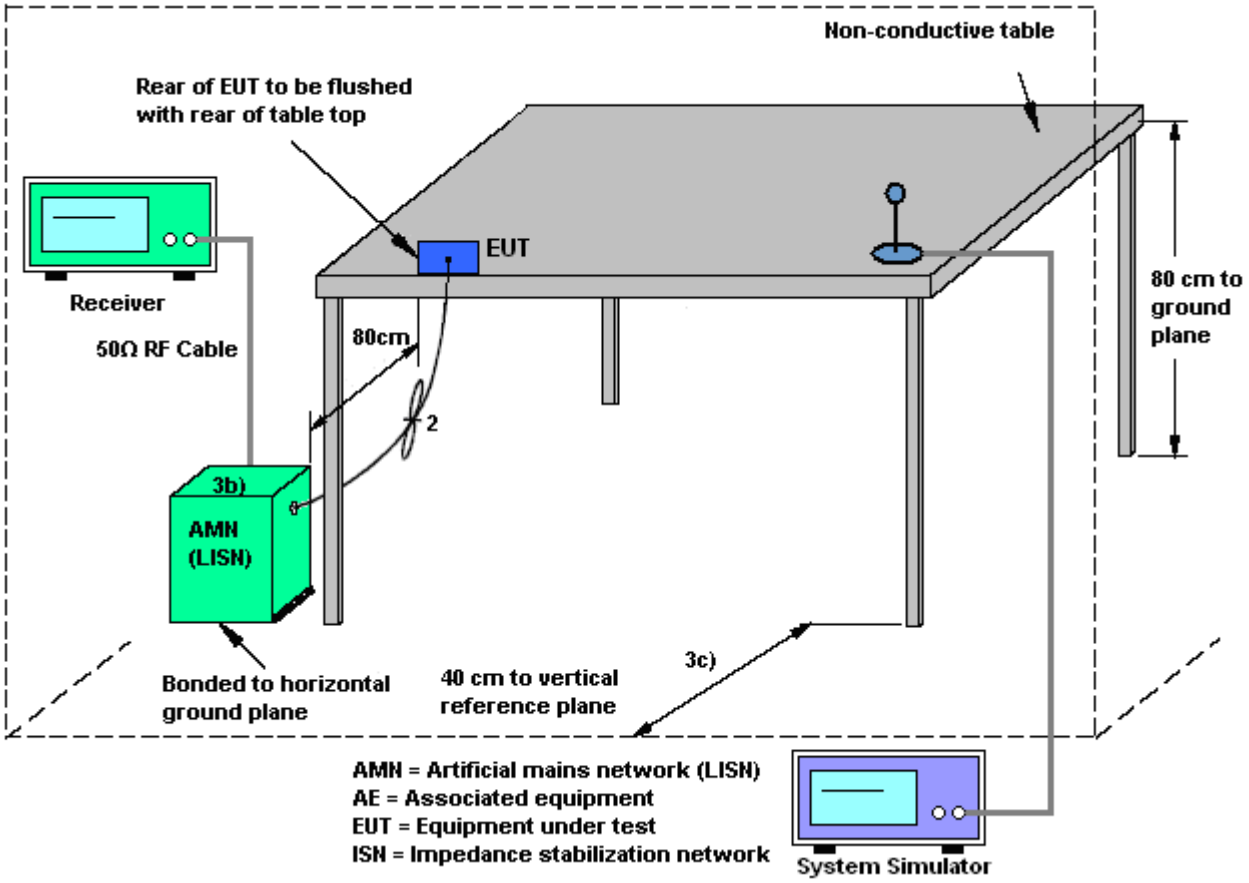
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

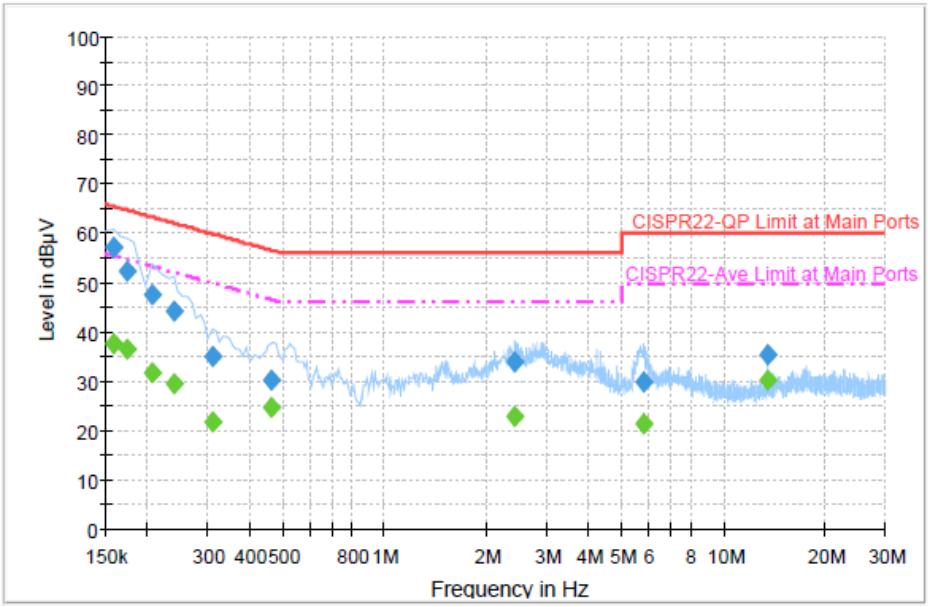
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	46~48%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WCDMA Band II Idle + WLAN (5GHz) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + NFC On		



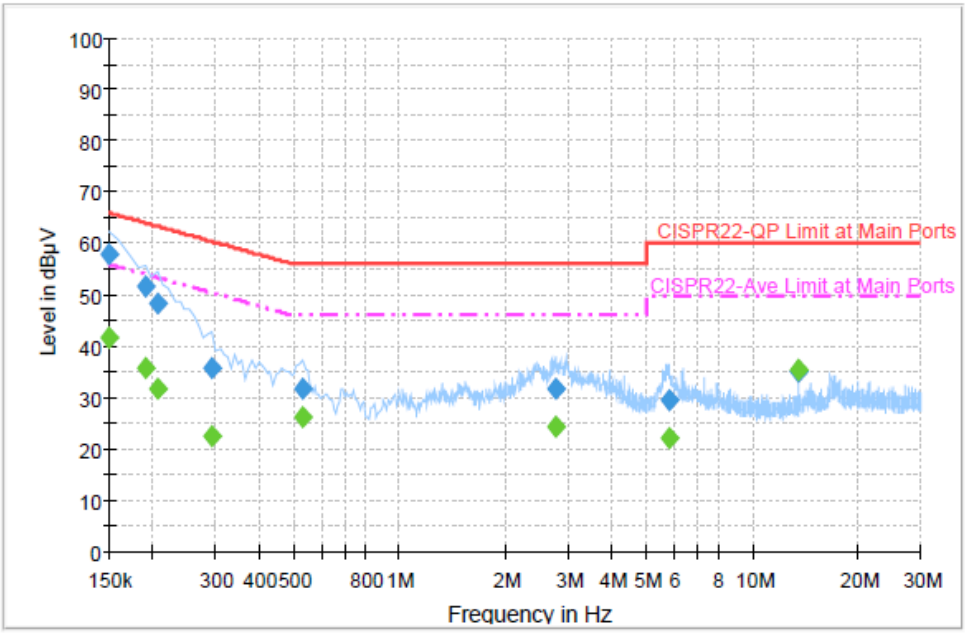
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	57.1	Off	L1	19.3	8.5	65.6
0.174000	52.6	Off	L1	19.4	12.2	64.8
0.206000	47.4	Off	L1	19.4	16.0	63.4
0.238000	44.4	Off	L1	19.5	17.8	62.2
0.310000	35.0	Off	L1	19.4	25.0	60.0
0.462000	30.4	Off	L1	19.3	26.3	56.7
2.414000	34.1	Off	L1	19.6	21.9	56.0
5.790000	29.7	Off	L1	19.6	30.3	60.0
13.558000	35.6	Off	L1	19.8	24.4	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	37.7	Off	L1	19.3	17.9	55.6
0.174000	36.5	Off	L1	19.4	18.3	54.8
0.206000	31.7	Off	L1	19.4	21.7	53.4
0.238000	29.5	Off	L1	19.5	22.7	52.2
0.310000	21.8	Off	L1	19.4	28.2	50.0
0.462000	24.7	Off	L1	19.3	22.0	46.7
2.414000	23.0	Off	L1	19.6	23.0	46.0
5.790000	21.2	Off	L1	19.6	28.8	50.0
13.558000	30.4	Off	L1	19.8	19.6	50.0

Test Mode :	Mode 2	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	46~48%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	WCDMA Band II Idle + WLAN (5GHz) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + NFC On		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	57.8	Off	N	19.4	8.2	66.0
0.190000	51.5	Off	N	19.4	12.5	64.0
0.206000	48.3	Off	N	19.4	15.1	63.4
0.294000	35.7	Off	N	19.4	24.7	60.4
0.534000	31.7	Off	N	19.4	24.3	56.0
2.758000	31.8	Off	N	19.6	24.2	56.0
5.782000	29.3	Off	N	19.6	30.7	60.0
13.558000	34.9	Off	N	19.9	25.1	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	41.8	Off	N	19.4	14.2	56.0
0.190000	35.7	Off	N	19.4	18.3	54.0
0.206000	31.7	Off	N	19.4	21.7	53.4
0.294000	22.4	Off	N	19.4	28.0	50.4
0.534000	26.2	Off	N	19.4	19.8	46.0
2.758000	24.5	Off	N	19.6	21.5	46.0
5.782000	22.0	Off	N	19.6	28.0	50.0
13.558000	35.4	Off	N	19.9	14.6	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
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 07, 2013	Nov. 25, 2013 ~ Nov. 29, 2013	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Feb. 05, 2013	Nov. 25, 2013 ~ Nov. 29, 2013	Feb. 04, 2014	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Feb. 05, 2013	Nov. 25, 2013 ~ Nov. 29, 2013	Feb. 04, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz – 26.5GHz	Jan. 23, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	Jan. 22, 2014	Radiation (03CH08-HY)
Bilog Antenna	Teseq GmbH	CBL6112D	35379	30MHz~2GHz	Oct. 10, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	Oct. 09, 2014	Radiation (03CH08-HY)
Horn Antenna	ESCO	3117	000143261	1GHz~18GHz	Jan. 08, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	Jan. 07, 2014	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz~40GHz	Oct. 03, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	Oct. 02, 2014	Radiation (03CH08-HY)
Amplifier	SONOMA	310N	187231	9kHz~1GHz	May 15, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	May 14, 2014	Radiation (03CH08-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	1GHz~18GHz	Jul. 09, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	Jul. 08, 2014	Radiation (03CH08-HY)
Pre Amplifier	Agilent	8449B	3008A02665	1GHz~26.5GHz	Sep. 04, 2013	Dec. 03, 2013 ~ Dec. 06, 2013	Sep. 03, 2014	Radiation (03CH08-HY)
Turn Table	Chaintek	Chaintek 3000	N/A	0~360 Degree	N/A	Dec. 03, 2013 ~ Dec. 06, 2013	N/A	Radiation (03CH08-HY)
Antenna Mast	MF	MFA520BS	N/A	1m~4m	N/A	Dec. 03, 2013 ~ Dec. 06, 2013	N/A	Radiation (03CH08-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MhZ	Jul. 03, 2012	Dec. 03, 2013 ~ Dec. 06, 2013	Jul. 03, 2014	Radiation (03CH08-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 15, 2013	Nov. 30, 2013	Nov. 14, 2014	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Nov. 30, 2013	Dec. 11, 2013	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Nov. 30, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 30, 2013	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 = 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))	**4.30**