

FCC RF Test Report

APPLICANT : Sony Corporation
EQUIPMENT : Tablet device
BRAND NAME : VAIO
MODEL NAME : SVJ202B15L
FCC ID : AK8SVJ202B15L
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Feb. 20, 2013 and completely tested on Mar. 11, 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:



Joseph Lin / Supervisor

Reviewed by:



Jones Tsai / Manager



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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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	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	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 0.37 dB at 2483.500 MHz
3.6	15.207	RSS-210 Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 8.90 dB at 0.158 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Sony Corporation

1-7-1 Konan Minato-ku, Tokyo, 108-0075 JAPAN

1.2 Manufacturer

Foxconn

Foxconn Industrial District, Export Processing Zone, No. 50, Beijing Zhong Road, Yantai Economic And Technological Development Area, Shandong, P.R.China

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Tablet device
Brand Name	VAIO
Model Name	SVJ202B15L
Integrated Module	Brand Name: Intel Model Name: 6235ANHMW
FCC ID	AK8SVJ202B15L
EUT supports Radios application	WLAN 11abgn / Bluetooth 2.1/3.0/4.0/NFC
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 : 6.83 dBm (0.0048 W)
99% Occupied Bandwidth	Bluetooth 4.0 - LE : 1.032MHz
Antenna Type	PIFA Antenna type with gain 1.75 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 1 st 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

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 v02
- ♦ ANSI C63.10-2009
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 3
- ♦ NOTICE 2012-DRS0126

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. Per the section 2.2.3 of Notice of 2012-DRS0126, " Receivers Excluded from Industry Canada Requirements", only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

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	6.52 dBm
Ch19	2440MHz	6.83 dBm
Ch39	2480MHz	6.83 dBm

- a. The EUT has been associated with peripherals pursuant to 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). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (X plane as worst plane) from all possible combinations.

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

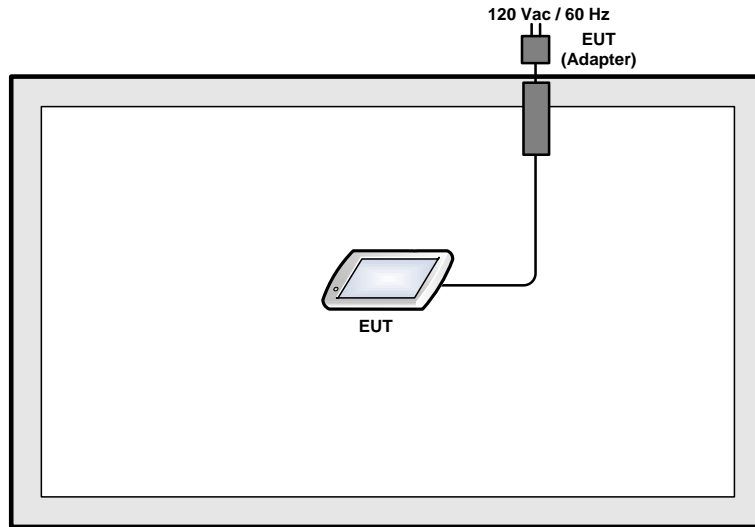
2.2 Test Mode

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

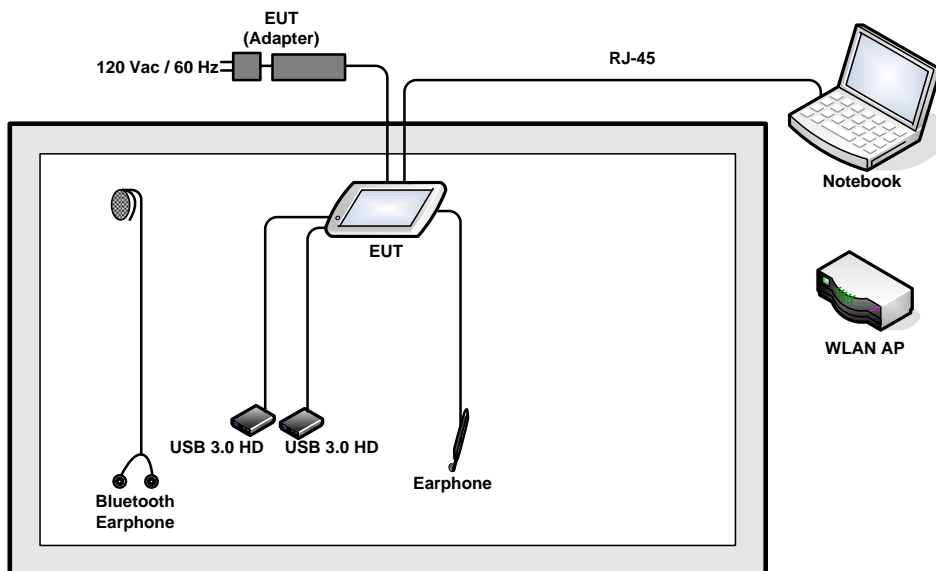
Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.0 – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1 :WLAN (2.4G) Link +Bluetooth Link + Camera + H Pattern + MPEG4 + Adapter + RJ-45 + USB 3.0 HD + SD Card + Earphpne Mode 2 :WLAN (5G) Link +Bluetooth Link + Camera + H Pattern + MPEG4 + Adapter + RJ-45 + USB 3.0 HD + SD Card + Earphpne
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>



<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.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
4.	Earphone	Ergotech	ET-E200	FCC DoC	Unshielded, 1.8 m	N/A
5.	USB 3.0 HD	WD	WDBPCK5000ABK-PESN	FCC DoC	Shielded, 0.5 m	N/A
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 Description of RF Function Operation Test Setup

The programmed RF utility "DRTU.exe", is installed in EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.



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 :

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

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

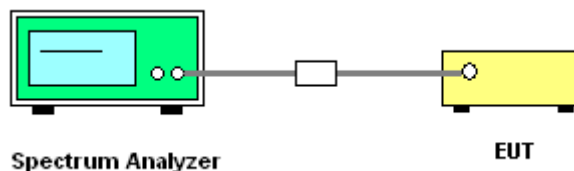
3.1.2 Measuring Instruments

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) = 10 kHz. Set the Video bandwidth (VBW) = 30 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 KHz.
5. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 10 kHz. Set the Video bandwidth (VBW) = 30 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 KHz.
6. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 10kHz and set the Video bandwidth (VBW) = 30kHz.
7. Measure and record the results in the test report.

3.1.4 Test Setup



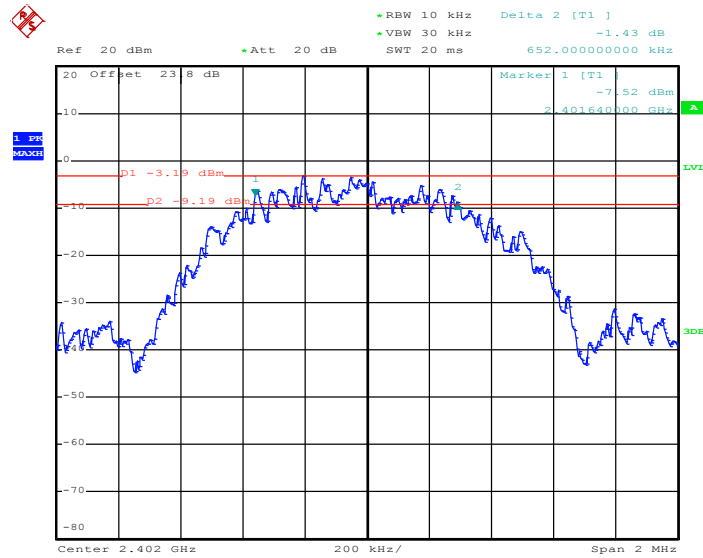


3.1.5 Test Result of 6dB Bandwidth

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Engineer :	Bill Kuo	Relative Humidity :	58~61%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
00	2402	0.65	0.5	Pass
19	2440	0.65	0.5	Pass
39	2480	0.66	0.5	Pass

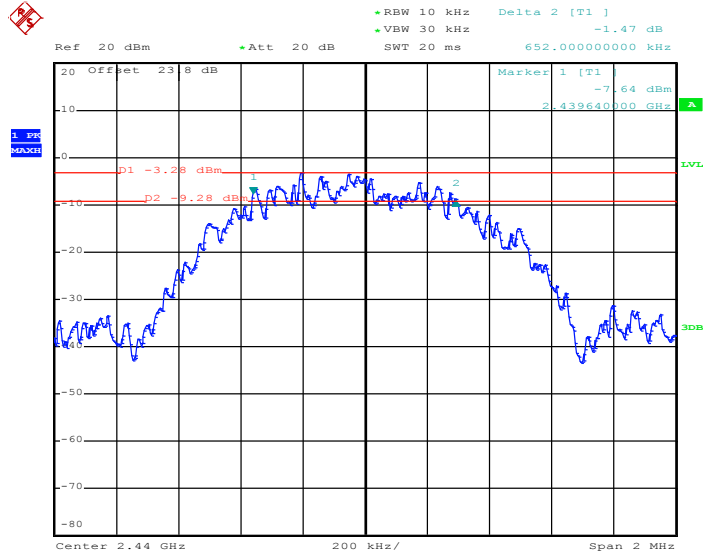
6 dB Bandwidth Plot on Channel 00



Date: 5.MAR.2013 01:22:47

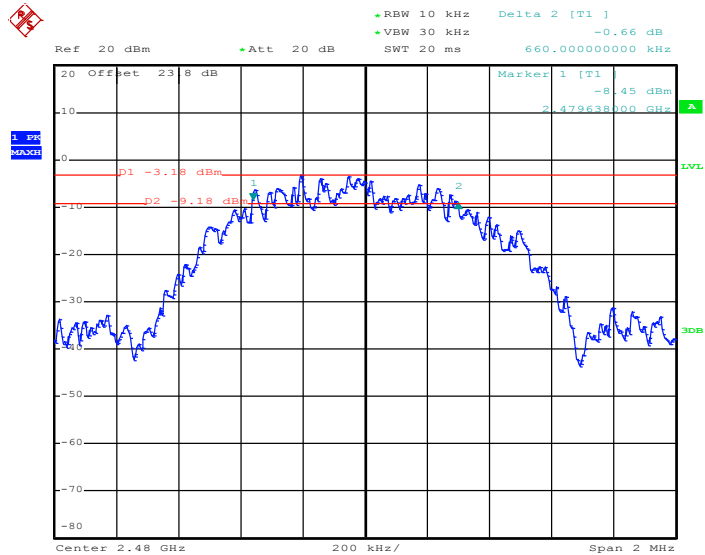


6 dB Bandwidth Plot on Channel 19



Date: 5.MAR.2013 01:26:03

6 dB Bandwidth Plot on Channel 39



Date: 5.MAR.2013 01:28:41

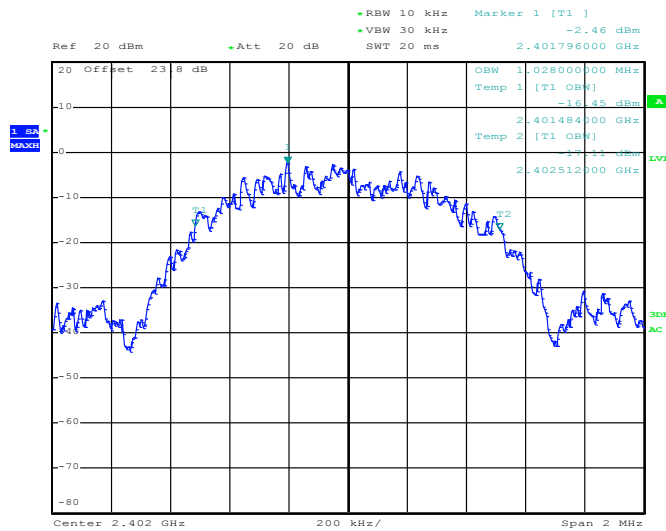


3.1.6 Test Result of 99% Occupied Bandwidth

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Engineer :	Bill Kuo	Relative Humidity :	58~61%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.028
19	2440	1.030
39	2480	1.028

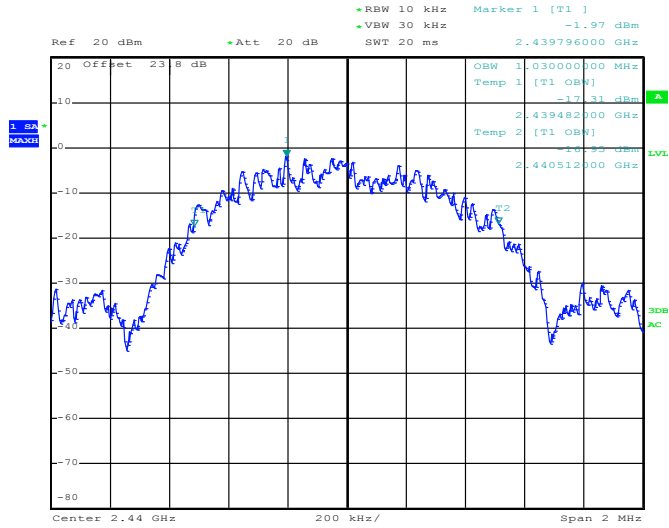
99% Bandwidth Plot on Channel 00



Date: 11.MAR.2013 19:45:32

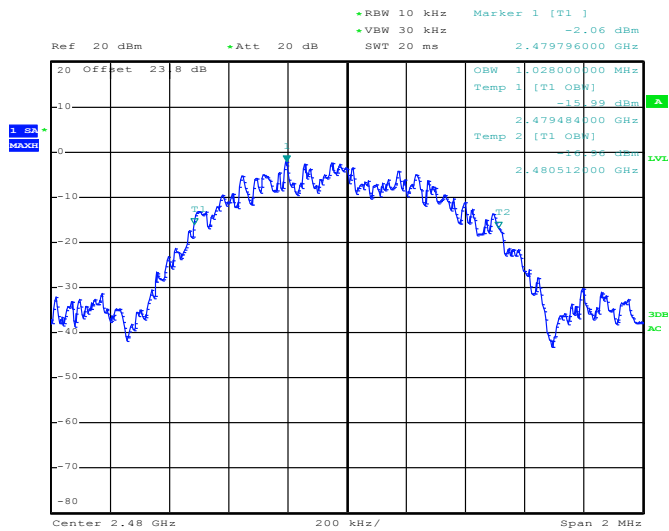


99% Occupied Bandwidth Plot on Channel 19



Date: 11.MAR.2013 19:46:53

99% Occupied Bandwidth Plot on Channel 39



Date: 11.MAR.2013 19:49:10

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.

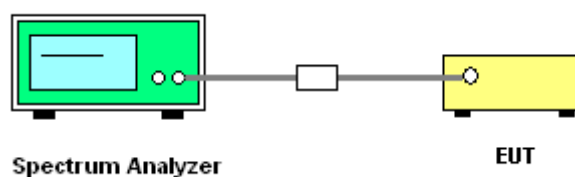
3.2.2 Measuring Instruments

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

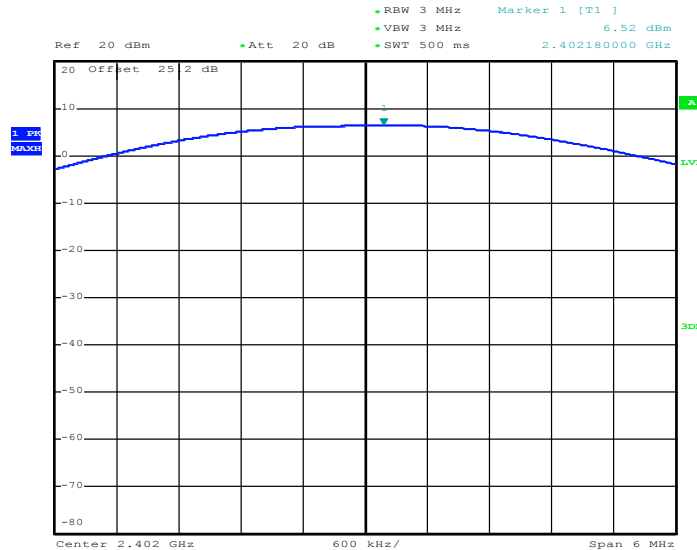


3.2.5 Test Result of Peak Output Power

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Engineer :	Bill Kuo	Relative Humidity :	58~61%

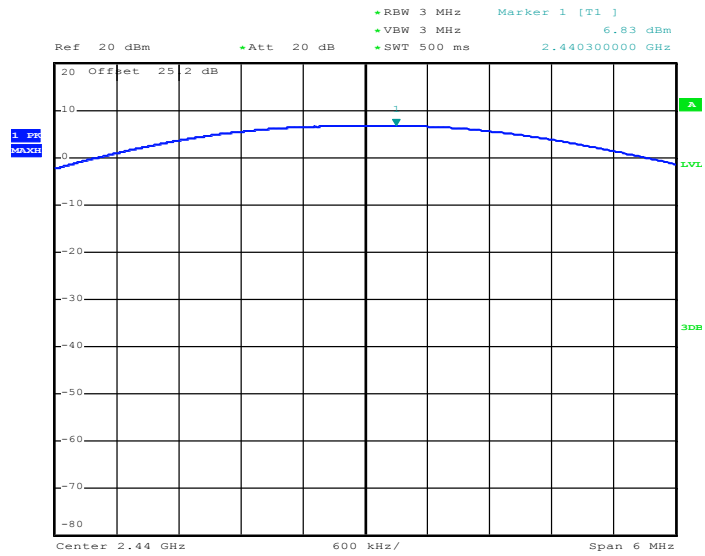
Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	6.52	30.00	Pass
19	2440	6.83	30.00	Pass
39	2480	6.83	30.00	Pass

Peak Output Power Plot on Channel 00

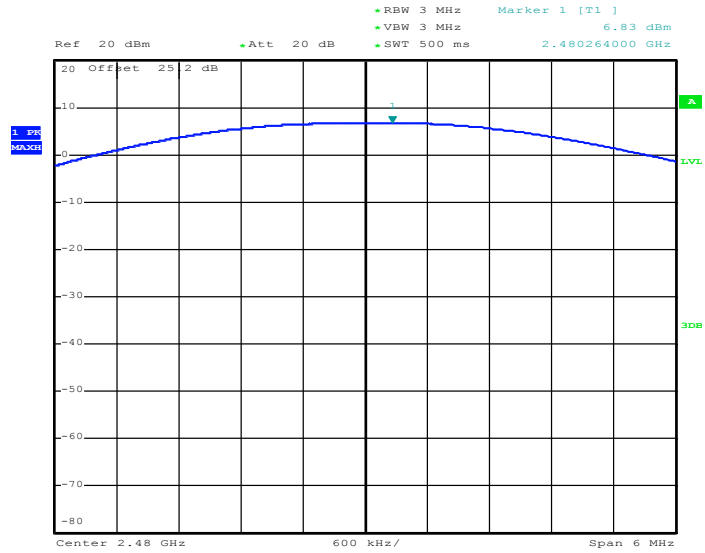




Peak Output Power Plot on Channel 19



Peak Output Power Plot on Channel 39



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.

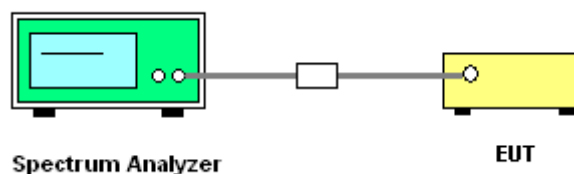
3.3.2 Measuring Instruments

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°C
Test Engineer :	Bill Kuo	Relative Humidity :	58~61%

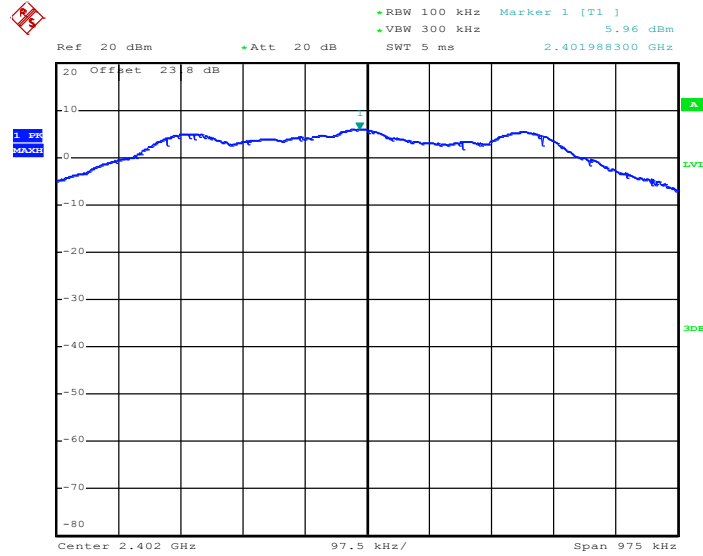
Channel	Frequency (MHz)	Power Density		Max. Limits (dBm/3kHz)	Pass/Fail
		PSD/100kHz (dBm)	PSD/3kHz (dBm)		
00	2402	5.96	-9.56	8	Pass
19	2440	5.95	-9.64	8	Pass
39	2480	5.92	-9.56	8	Pass

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.

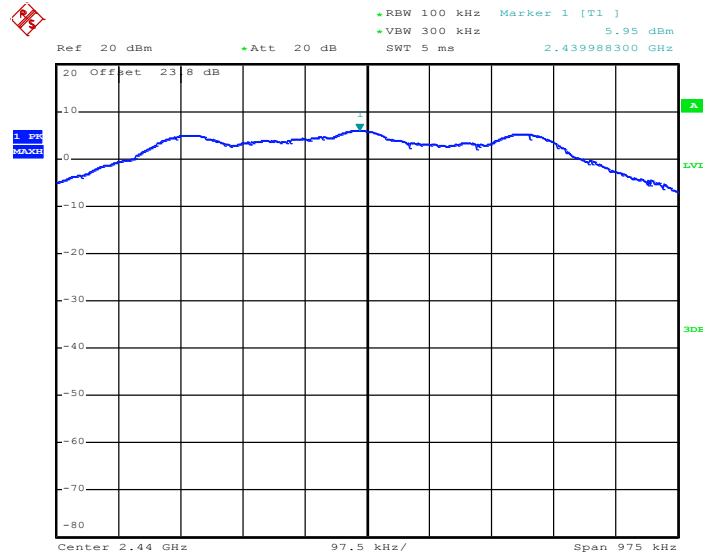
3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on Channel 00



Date: 5.MAR.2013 01:23:15

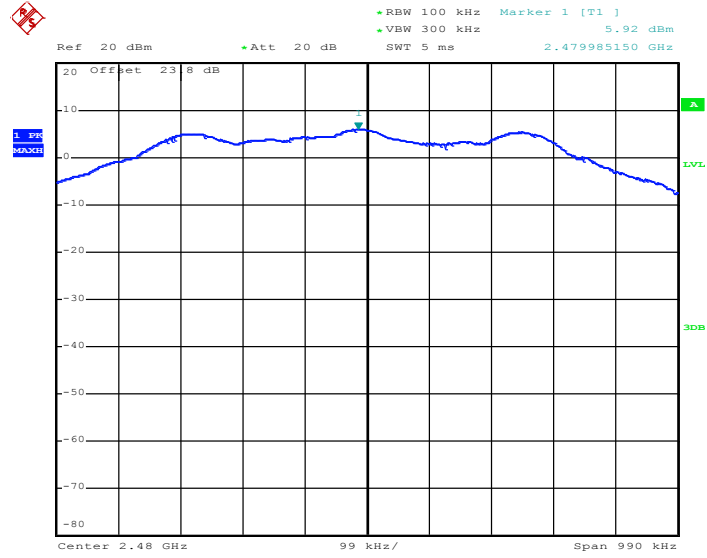
PSD 100kHz Plot on Channel 19



Date: 5.MAR.2013 01:26:31



PSD 100kHz Plot on Channel 39

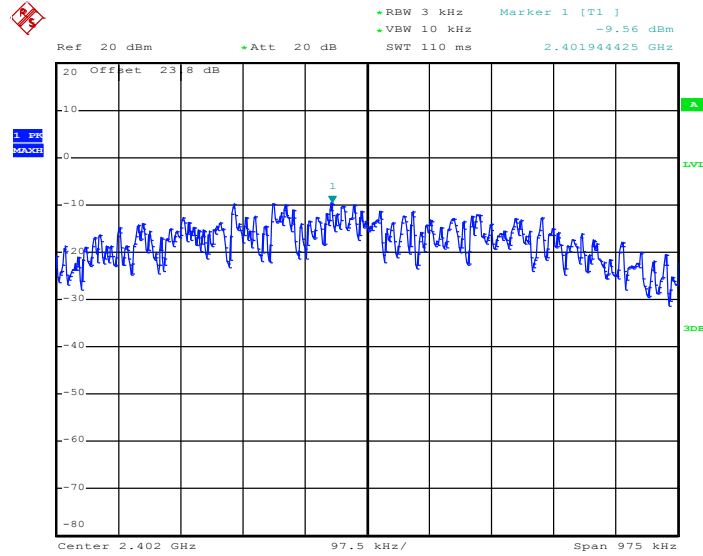


Date: 5.MAR.2013 01:29:09



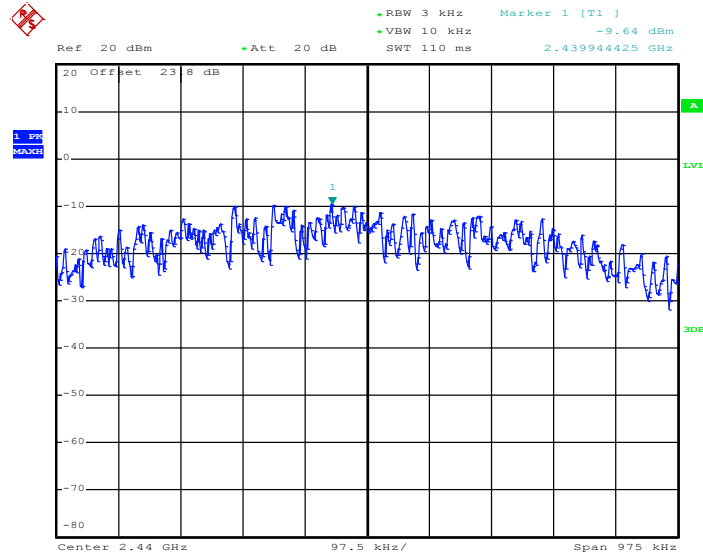
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on Channel 00



Date: 5.MAR.2013 01:23:07

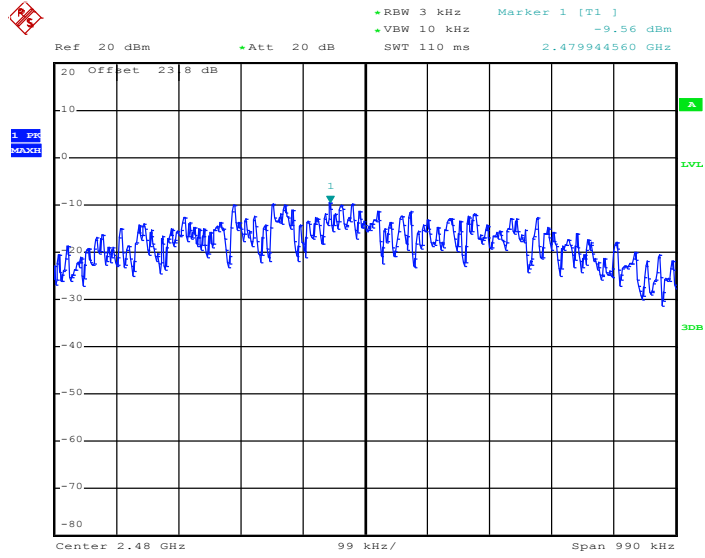
PSD 3kHz Plot on Channel 19



Date: 5.MAR.2013 01:26:22



PSD 3kHz Plot on Channel 39



Date: 5.MAR.2013 01:29:01

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.

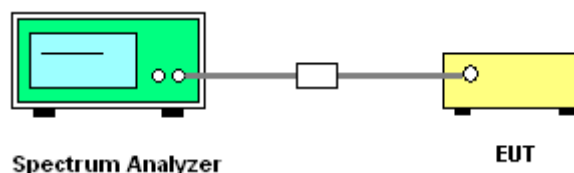
3.4.2 Measuring Instruments

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

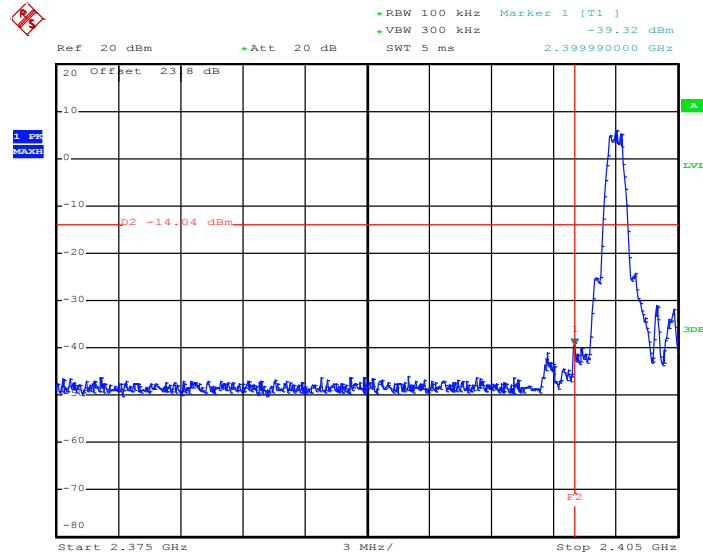




3.4.5 Test Result of Conducted Band Edges

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Channel :	00 and 39	Relative Humidity :	58~61%
		Test Engineer :	Bill Kuo

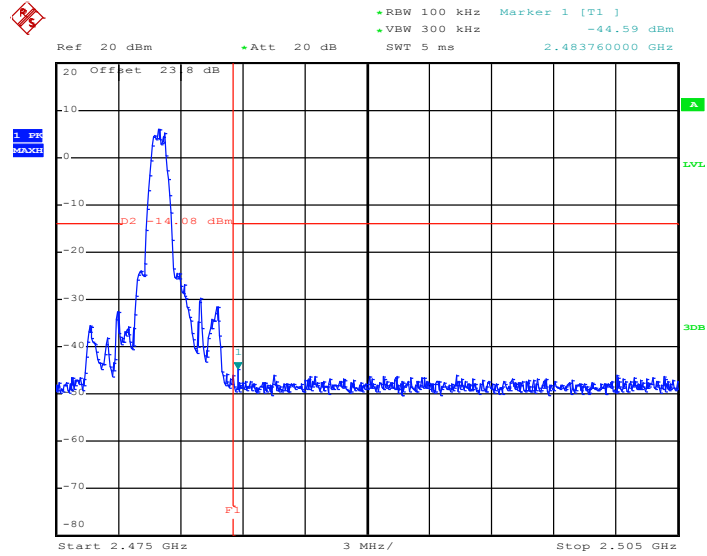
Low Band Edge Plot on Channel 00



Date: 5.MAR.2013 01:23:29



High Band Edge Plot on Channel 39

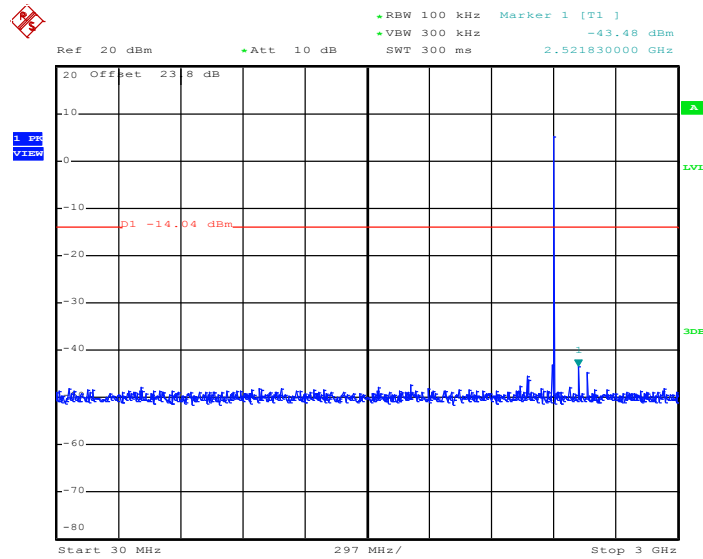


Date: 5.MAR.2013 01:29:23

3.4.6 Test Result of Conducted Spurious Emission

Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Channel :	00	Relative Humidity :	58~61%
		Test Engineer :	Bill Kuo

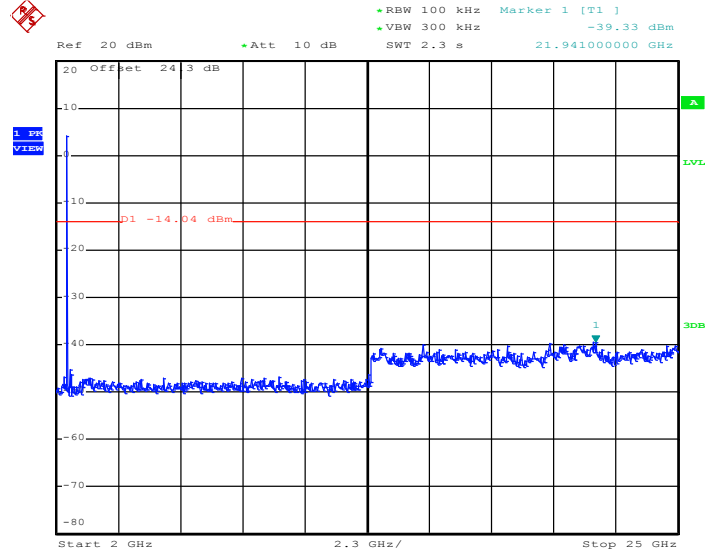
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 00



Date: 5.MAR.2013 01:24:44



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

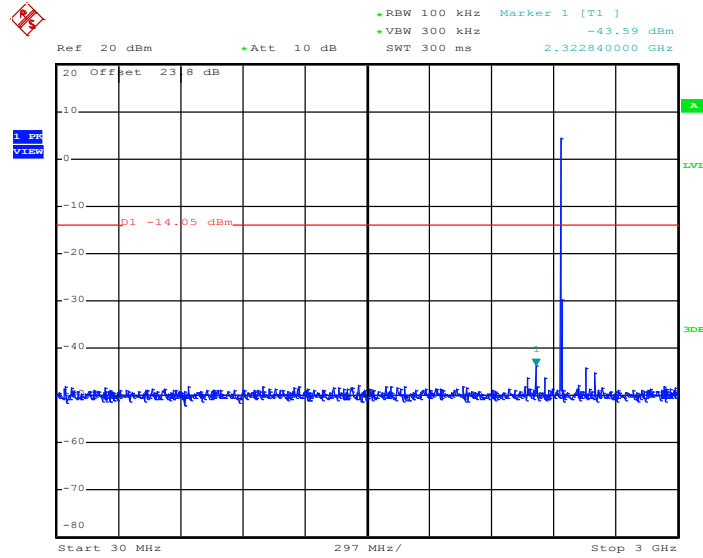


Date: 5.MAR.2013 01:25:03



Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Channel :	19	Relative Humidity :	58~61%
		Test Engineer :	Bill Kuo

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

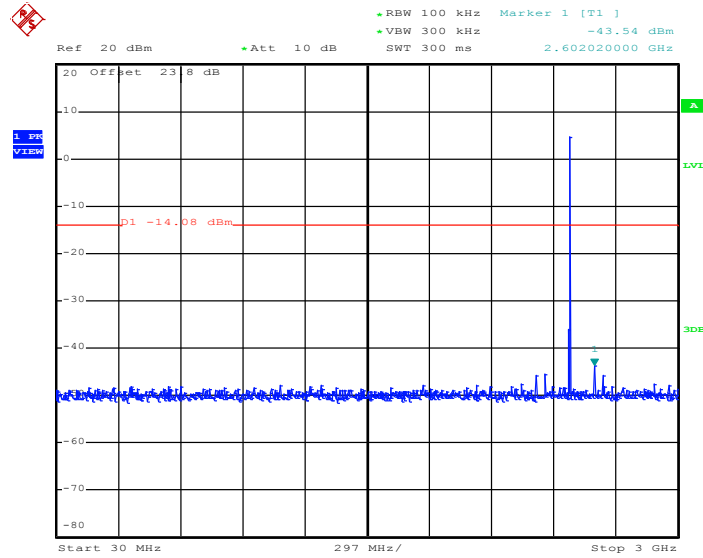


Date: 5.MAR.2013 01:26:51



Test Mode :	Bluetooth 4.0 - LE	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	58~61%
		Test Engineer :	Bill Kuo

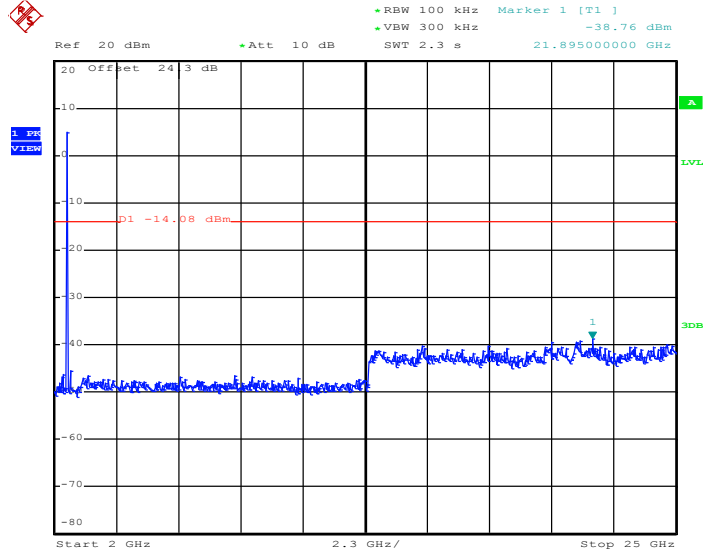
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 39



Date: 5.MAR.2013 01:29:42



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 39



Date: 5.MAR.2013 01:30:01

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

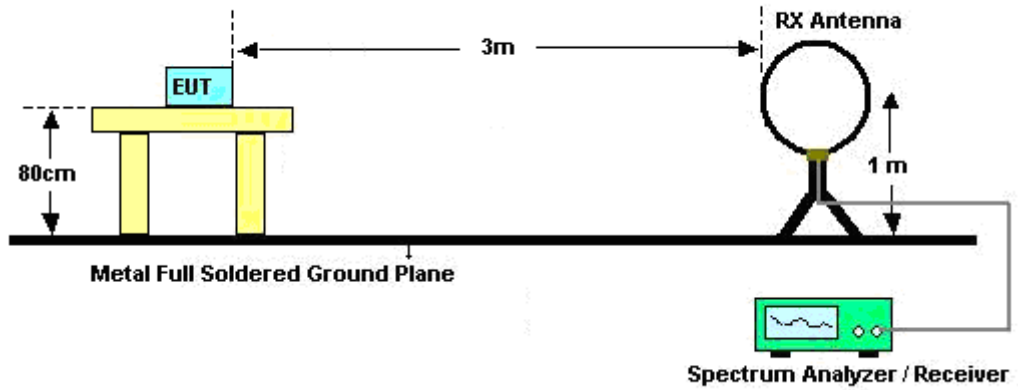
1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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; $VBW \geq RBW$; 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	67.07	440.000	2.273	3kHz

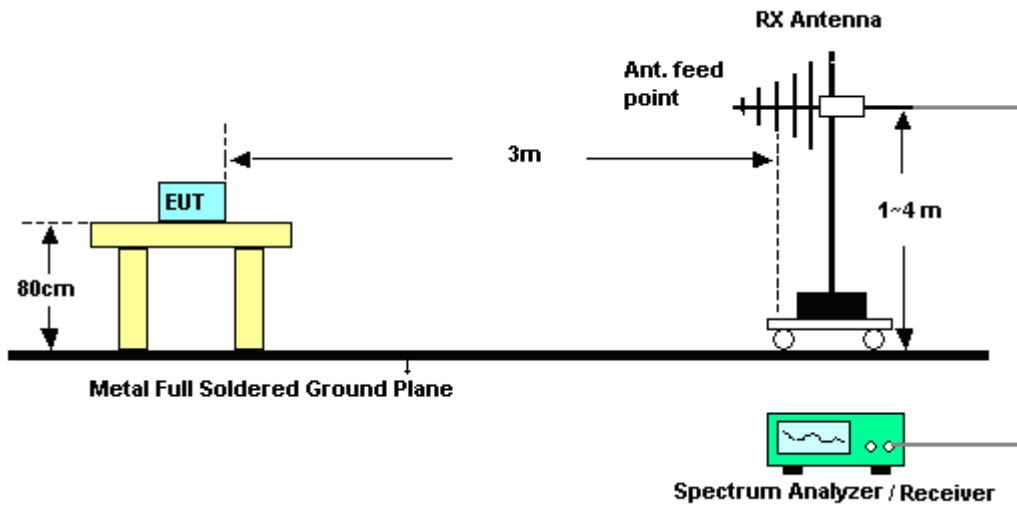
Note: For average measurement with duty cycle < 98%, use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.

3.5.4 Test Setup

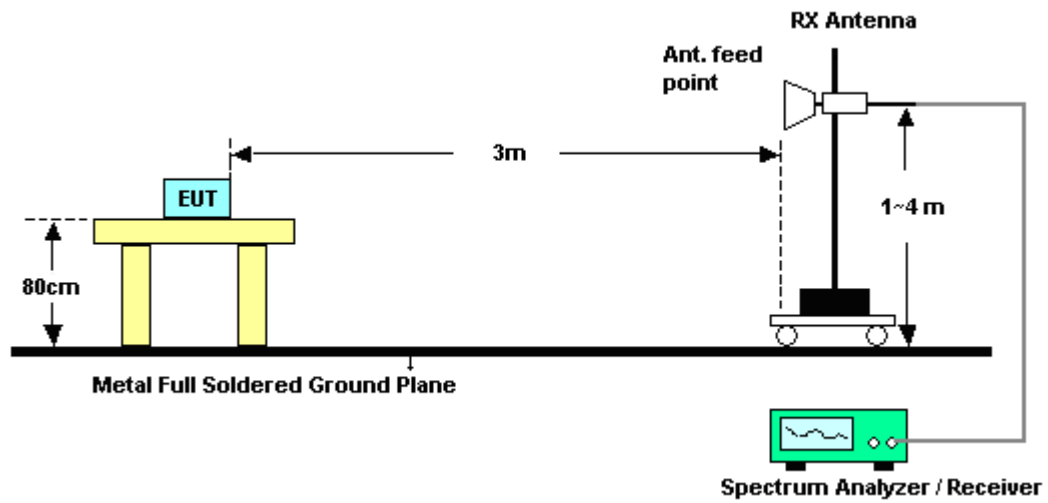
For radiated emissions below 30MHz



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 :	26~27°C
Test Channel :	00	Relative Humidity :	46~47%
		Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu

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
2355.27	49.33	-24.67	74	45.2	32.31	6.38	34.56	133	330	Peak
2322.06	40.02	-13.98	54	35.98	32.26	6.35	34.57	133	330	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
2389.83	49.91	-24.09	74	45.66	32.36	6.45	34.56	197	268	Peak
2321.79	38.59	-15.41	54	34.55	32.26	6.35	34.57	197	268	Average

Test Mode :	Mode 3	Temperature :	26~27°C
Test Channel :	39	Relative Humidity :	46~47%
		Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu

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
2483.5	59.34	-14.66	74	54.82	32.48	6.59	34.55	100	329	Peak
2483.5	53.63	-0.37	54	49.11	32.48	6.59	34.55	100	329	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
2483.5	58.09	-15.91	74	53.57	32.48	6.59	34.55	171	261	Peak
2483.5	52.14	-1.86	54	47.62	32.48	6.59	34.55	171	261	Average



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

Test Mode :	Mode 1	Temperature :	26~27°C
Test Channel :	00	Relative Humidity :	46~47%
Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu	Polarization :	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 3189 MHz and 7206 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 95.57 dB μ V/m - 20dB = 75.57 dB μ V/m. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1598	35.21	-18.79	54	36.55	28.6	4.95	34.89	133	330	Average
1598	51.76	-22.24	74	53.1	28.6	4.95	34.89	133	330	Peak
2402	94.74	-	-	90.49	32.36	6.45	34.56	133	330	Average
2402	95.57	-	-	91.32	32.36	6.45	34.56	133	330	Peak
3189	56.69	-18.88	75.57	69.87	33.1	7.76	54.04	100	0	Peak
4806	48	-26	74	58.51	34.88	10.17	55.56	100	0	Peak
7206	48.82	-26.75	75.57	58.18	36.16	10.97	56.49	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 1	Temperature :	26~27°C
Test Channel :	00	Relative Humidity :	46~47%
Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 3198 MHz and 7206 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 (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
1594	49.27	-24.73	74	50.61	28.6	4.95	34.89	197	268	Peak
2402	89.87	-	-	85.62	32.36	6.45	34.56	197	268	Average
2402	90.84	-	-	86.59	32.36	6.45	34.56	197	268	Peak
3198	57.77	-13.07	70.84	70.93	33.1	7.78	54.04	100	0	Peak
4806	50.92	-3.08	54	61.43	34.88	10.17	55.56	100	136	Average
4806	51.78	-22.22	74	62.29	34.88	10.17	55.56	100	136	Peak
7206	48.83	-22.01	70.84	58.19	36.16	10.97	56.49	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 2	Temperature :	26~27°C
Test Channel :	19	Relative Humidity :	46~47%
Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu	Polarization :	Horizontal
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. 3192 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 (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
1596	36.14	-17.86	54	37.48	28.6	4.95	34.89	100	328	Average
1596	53.08	-20.92	74	54.42	28.6	4.95	34.89	100	328	Peak
2440	95.5	-	-	91.11	32.43	6.52	34.56	100	328	Average
2440	96.41	-	-	92.02	32.43	6.52	34.56	100	328	Peak
3192	56.9	-19.51	76.41	70.08	33.1	7.76	54.04	100	0	Peak
4881	50.94	-23.06	74	61.58	34.85	10.19	55.68	100	0	Peak
7320	49.45	-24.55	74	58.62	36.13	10.94	56.24	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 2	Temperature :	26~27°C
Test Channel :	19	Relative Humidity :	46~47%
Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu	Polarization :	Vertical
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. 3195 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 (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
1594	35.49	-18.51	54	36.83	28.6	4.95	34.89	200	263	Average
1594	51.19	-22.81	74	52.53	28.6	4.95	34.89	200	263	Peak
2440	92.89	-	-	88.5	32.43	6.52	34.56	200	263	Average
2440	93.76	-	-	89.37	32.43	6.52	34.56	200	263	Peak
3195	59.45	-14.31	73.76	72.63	33.1	7.76	54.04	100	0	Peak
4881	50.88	-3.12	54	61.52	34.85	10.19	55.68	100	167	Average
4881	51.17	-22.83	74	61.81	34.85	10.19	55.68	100	167	Peak
7320	48.73	-25.27	74	57.9	36.13	10.94	56.24	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 3	Temperature :	26~27°C
Test Channel :	39	Relative Humidity :	46~47%
Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu	Polarization :	Horizontal
Remark :	1. 2482 MHz is fundamental signal which can be ignored. 2. 3186 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 (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	26.4	-17.1	43.5	46.95	10.04	1.08	31.67	-	-	Peak
238.98	37.02	-8.98	46	55.78	11.18	1.71	31.65	-	-	Peak
298.92	34.62	-11.38	46	51.21	13.18	1.9	31.67	-	-	Peak
309.1	36.34	-9.66	46	52.67	13.38	1.93	31.64	-	-	Peak
799.8	35.66	-10.34	46	44.73	19.8	3.1	31.97	-	-	Peak
862.1	37.27	-8.73	46	45.51	20.38	3.21	31.83	136	328	Peak
1592	35.72	-18.28	54	37.06	28.6	4.95	34.89	100	329	Average
1592	52.5	-21.5	74	53.84	28.6	4.95	34.89	100	329	Peak
2482	96.69	-	-	92.17	32.48	6.59	34.55	100	329	Average
2482	97.57	-	-	93.05	32.48	6.59	34.55	100	329	Peak
3186	58.82	-18.75	77.57	72	33.1	7.76	54.04	100	0	Peak
4959	50.02	-23.98	74	60.84	34.81	10.21	55.84	100	0	Peak
7440	49.05	-24.95	74	58.04	36.11	10.9	56	100	0	Peak

Note: Other harmonics are lower than background noise.



Test Mode :	Mode 3	Temperature :	26~27°C
Test Channel :	39	Relative Humidity :	46~47%
Test Engineer :	Kai Wang, Timberland Lin, and Hayden Wu	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 3195 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 (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	36.92	-3.08	40	49.14	18.9	0.6	31.72	100	136	Peak
162.3	30.04	-13.46	43.5	50.24	10	1.46	31.66	-	-	Peak
239.25	37.55	-8.45	46	56.19	11.3	1.71	31.65	-	-	Peak
538.7	36.16	-9.84	46	46.78	18.67	2.57	31.86	-	-	Peak
649.3	39.05	-6.95	46	49.02	19.2	2.8	31.97	-	-	Peak
757.8	37.79	-8.21	46	47.12	19.73	3.03	32.09	-	-	Peak
1594	50.67	-23.33	74	52.01	28.6	4.95	34.89	171	261	Peak
2480	95.55	-	-	91.03	32.48	6.59	34.55	171	261	Average
2480	96.59	-	-	92.07	32.48	6.59	34.55	171	261	Peak
3195	61.68	-14.91	76.59	74.86	33.1	7.76	54.04	100	0	Peak
4959	50.95	-3.05	54	61.77	34.81	10.21	55.84	100	135	Average
4959	52.26	-21.74	74	63.08	34.81	10.21	55.84	100	135	Peak
7440	49.9	-4.1	54	58.89	36.11	10.9	56	100	276	Average
7440	51.92	-22.08	74	60.91	36.11	10.9	56	100	276	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 (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

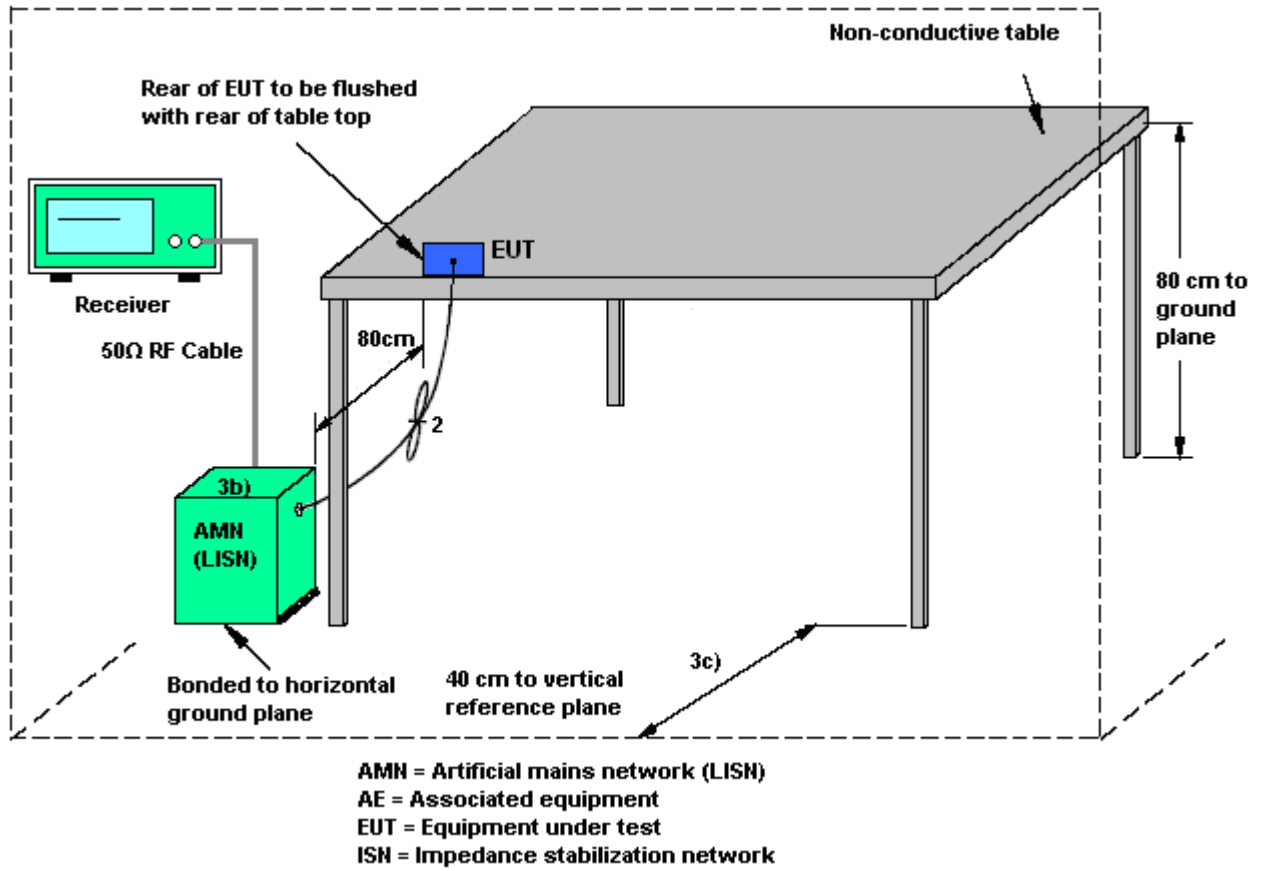
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

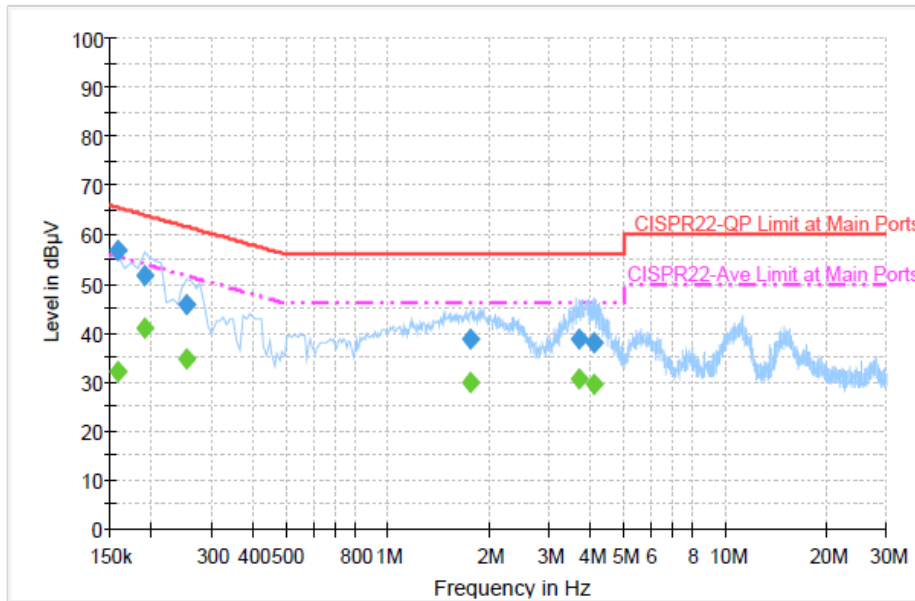
1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
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



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	Temperature :	20~22°C
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (5G) Link +Bluetooth Link + Camera + H Pattern + MPEG4 + Adapter + RJ-45 + USB 3.0 HD + SD Card + Earphne		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



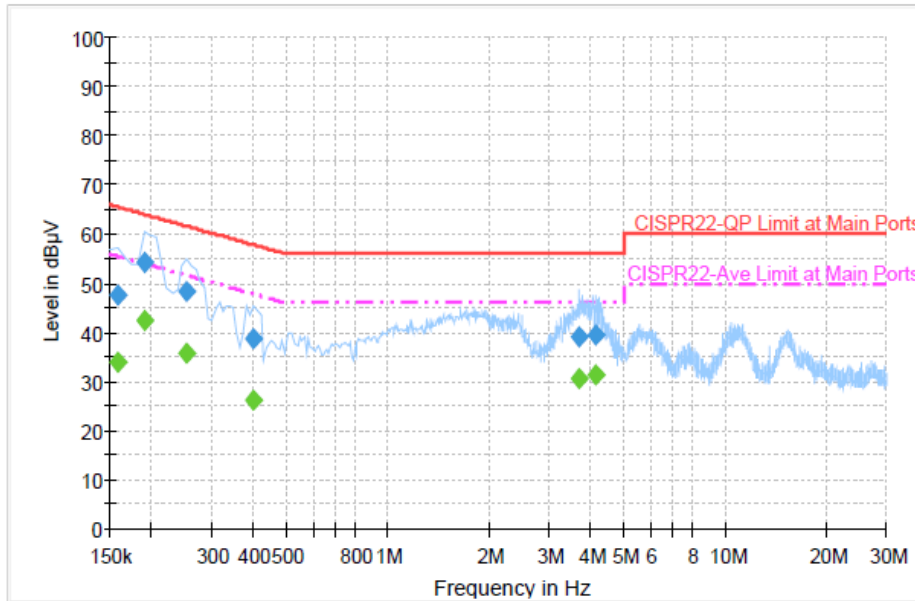
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	56.7	Off	L1	19.4	8.9	65.6
0.190000	51.7	Off	L1	19.4	12.3	64.0
0.254000	45.8	Off	L1	19.4	15.8	61.6
1.750000	38.9	Off	L1	19.5	17.1	56.0
3.678000	38.9	Off	L1	19.6	17.1	56.0
4.062000	37.9	Off	L1	19.6	18.1	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	32.0	Off	L1	19.4	23.6	55.6
0.190000	41.1	Off	L1	19.4	12.9	54.0
0.254000	34.8	Off	L1	19.4	16.8	51.6
1.750000	30.0	Off	L1	19.5	16.0	46.0
3.678000	30.6	Off	L1	19.6	15.4	46.0
4.062000	29.7	Off	L1	19.6	16.3	46.0

Test Mode :	Mode 2	Temperature :	20~22°C
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (5G) Link +Bluetooth Link + Camera + H Pattern + MPEG4 + Adapter + RJ-45 + USB 3.0 HD + SD Card + Earphpne		
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	47.6	Off	N	19.4	18.0	65.6
0.190000	54.4	Off	N	19.4	9.6	64.0
0.254000	48.3	Off	N	19.4	13.3	61.6
0.398000	38.6	Off	N	19.5	19.3	57.9
3.678000	39.0	Off	N	19.6	17.0	56.0
4.118000	39.4	Off	N	19.6	16.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	33.9	Off	N	19.4	21.7	55.6
0.190000	42.3	Off	N	19.4	11.7	54.0
0.254000	35.8	Off	N	19.4	15.8	51.6
0.398000	26.3	Off	N	19.5	21.6	47.9
3.678000	30.8	Off	N	19.6	15.2	46.0
4.118000	31.4	Off	N	19.6	14.6	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

IPX, Or equivalent 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	Feb. 21, 2013~ Mar. 11, 2013	Jun. 05, 2013	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Sep. 08, 2012	Feb. 21, 2013~ Mar. 11, 2013	Sep. 07, 2013	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Sep. 08, 2012	Feb. 21, 2013~ Mar. 11, 2013	Sep. 07, 2013	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz~30GHz	Nov. 07, 2012	Feb. 26, 2013~ Feb. 27, 2013	Nov. 06, 2013	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY442110 30	9KHz ~ 26.5GHz	Nov. 26, 2012	Feb. 26, 2013~ Feb. 27, 2013	Nov. 25, 2013	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/00 03	20MHz ~ 1000MHz	May 04, 2012	Feb. 26, 2013~ Feb. 27, 2013	May 03, 2013	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 06, 2012	Feb. 26, 2013~ Feb. 27, 2013	Oct. 05, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Feb. 26, 2013~ Feb. 27, 2013	Jul. 31, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	COM-POWER	AH-118	071025	1GHz~18GHz	Aug. 09, 2012	Feb. 26, 2013~ Feb. 27, 2013	Aug. 08, 2013	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 251	15GHz ~ 40GHz	Sep. 28, 2012	Feb. 26, 2013~ Feb. 27, 2013	Sep. 27, 2013	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A019 17	1GHz ~ 26.5GHz	Apr. 13, 2012	Feb. 26, 2013~ Feb. 27, 2013	Apr. 12, 2013	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz ~ 1GHz	Apr. 11, 2012	Feb. 26, 2013~ Feb. 27, 2013	Apr. 10, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 21, 2012	Feb. 26, 2013~ Feb. 27, 2013	Jul. 20, 2013	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	159087	1GHz~18GHz	Feb. 26, 2013	Feb. 26, 2013~ Feb. 27, 2013	Feb. 25, 2014	Radiation (03CH06-HY)
Loop Antenna	R&S	HFH2-Z2	860004/00 1	9KHz ~ 30MHz	Jul. 03, 2012	Feb. 26, 2013~ Feb. 27, 2013	Jul. 02, 2013	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9KHz ~ 2.75GHz	Nov. 13, 2012	Feb. 28, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100081	9KHz ~ 30MHz	Dec. 12, 2012	Feb. 28, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9KHz ~ 30MHz	Dec. 06, 2012	Feb. 28, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Feb. 28, 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
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.72
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP322001 as below.