

FCC RF Test Report

APPLICANT : Toshiba Corporation
EQUIPMENT : Notebook PC and Tablet
BRAND NAME : TOSHIBA
MODEL NAME : Satellite U820, Satellite U825, Satellite U920t,
Satellite U925t and dynabook R822
FCC ID : CJ6UPSUL1PC1
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jul. 27, 2012 and completely tested on Aug. 22, 2012. 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



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
FR272716-02B	Rev. 01	Initial issue of report	Aug. 23, 2012

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)(1)	A8.1(b)	Peak Output Power	$\leq 30\text{dBm}$	Pass	-
3.5	15.247(e)	A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Pass	-
3.4	15.247(d)	A8.5	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	-
3.5	15.247(d)	A8.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.69 dB at 2483.50 MHz
3.6	15.207	Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 9.30 dB at 0.182 MHz
3.7	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Toshiba Corporation

Digital Products & Services Company 2-9, Suehiro-cho, Ome-shi Tokyo 198-8710 Japan

1.2 Manufacturer

Toshiba Information Equipment (Hangzhou) Co., Ltd.

M12-19-1 Hangzhou Export Processing Zone of Zhengjiang Hangzhou Zhejiang 310018

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Notebook PC and Tablet
Brand Name	TOSHIBA
Model Name	Satellite U820, Satellite U825, Satellite U920t, Satellite U925t and dynabook R822
FCC ID	CJ6UPSUL1PC1
EUT supports Radios application	WLAN 11bgn / Bluetooth / Bluetooth 4.0 – LE
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.

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 : 6.57 dBm (0.0045 W)
99% Occupied Bandwidth	Bluetooth 4.0 - LE : 3.45MHz
Antenna Type	PIFA Antenna with gain 2.90 dBi
Type of Modulation	Bluetooth 4.0 - LE : GFSK

1.4 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	03CH07-HY	722060/4086B-1

1.5 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 v01
- FCC TCB Workshop 2012, April
- ANSI C63.4-2003 and ANSI C63.10-2009
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3

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.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	GPS Station	T&E	GS-50	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
4.	iPod Earphone	Apple	N/A	FCC DoC	Unshielded, 1.0 m	N/A
5.	USB3.0 HD	WD	WDBPCK5000ABK-PESN	FCC DoC	Unshielded, 0.5 m	N/A
6.	LCD Monitor	Dell	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m

2 Test Configuration of Equipment Under Test

2.1 RF Output Power

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	5.97 dBm
Ch19	2440MHz	6.57 dBm
Ch39	2480MHz	6.06 dBm

2.2 Test Mode

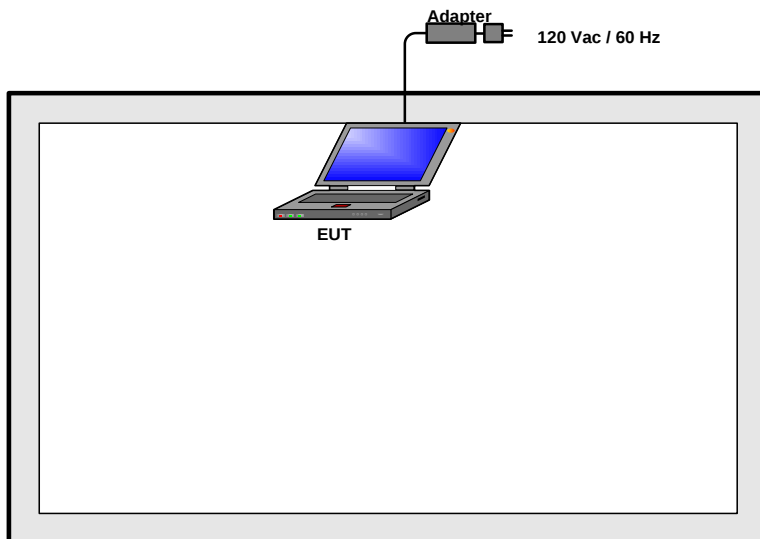
The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and ANSI C63.10-2009 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following tables are showing the test modes as the worst cases and recorded in this report.

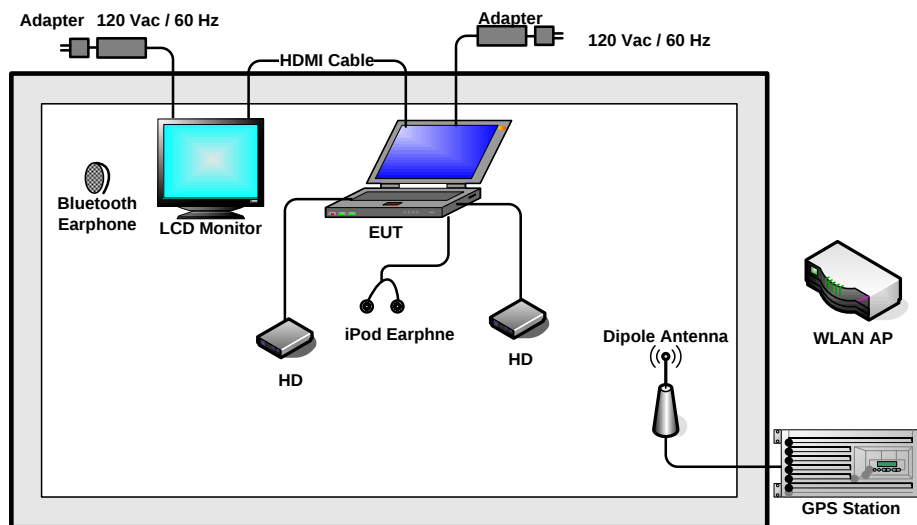
Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.0 - LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1 :Bluetooth Link + WLAN Link + Adapter + HDMI Cable + SD Card + Camera + iPod Earphone + H Pattern + MPEG4 + GPS Rx + USB 3.0 HD

2.3 Connection Diagram of Test System

<Bluetooth 4.0 - LE Tx Mode>



<AC Conducted Emission Mode>



2.4 RF Utility

For Bluetooth function, programmed RF utility, "DRTU" installed in the EUT to provide functions like channel selection and power level for continuous transmitting and receiving signals.

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

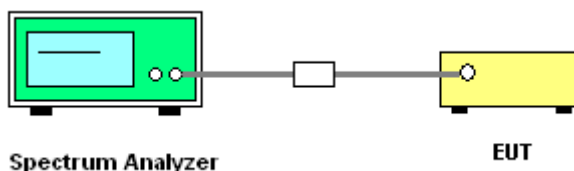
3.1.2 Measuring Instruments

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 v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. 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.

3.1.4 Test Setup

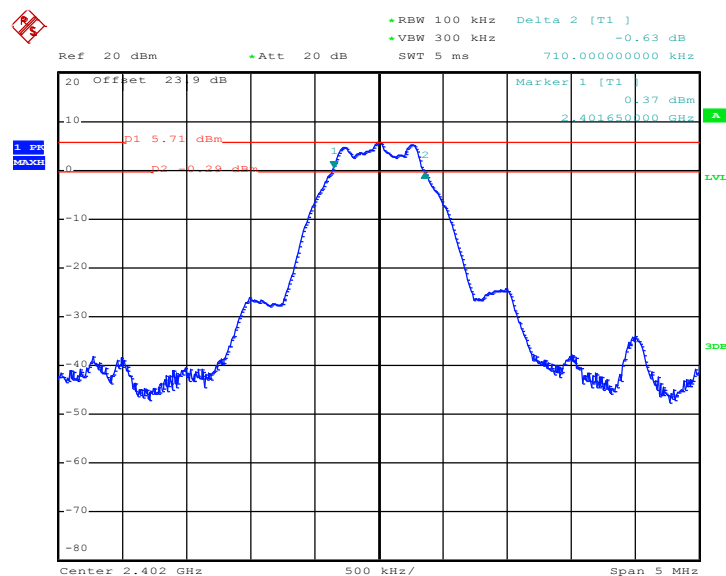


3.1.5 Test Result of 6dB Bandwidth

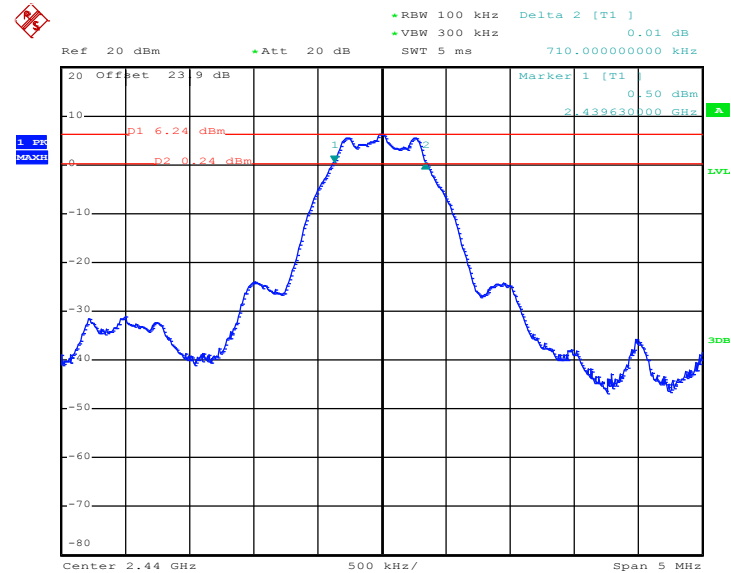
Test Mode :	Bluetooth 4.0 - LE 1Mbps GFSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Kenny Chen	Relative Humidity :	58~61%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)
00	2402	0.71
19	2440	0.71
39	2480	0.72

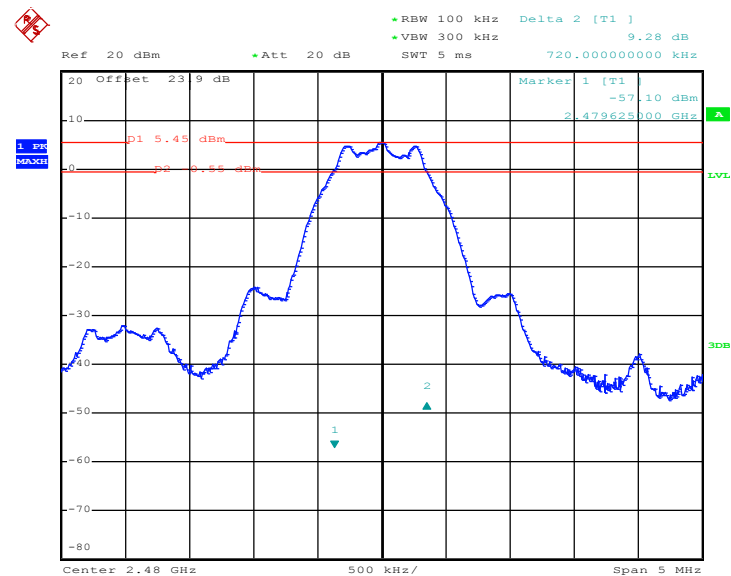
6 dB Bandwidth Plot on Channel 00



Date: 10.AUG.2012 18:26:35

6 dB Bandwidth Plot on Channel 19


Date: 10.AUG.2012 19:07:48

6 dB Bandwidth Plot on Channel 39


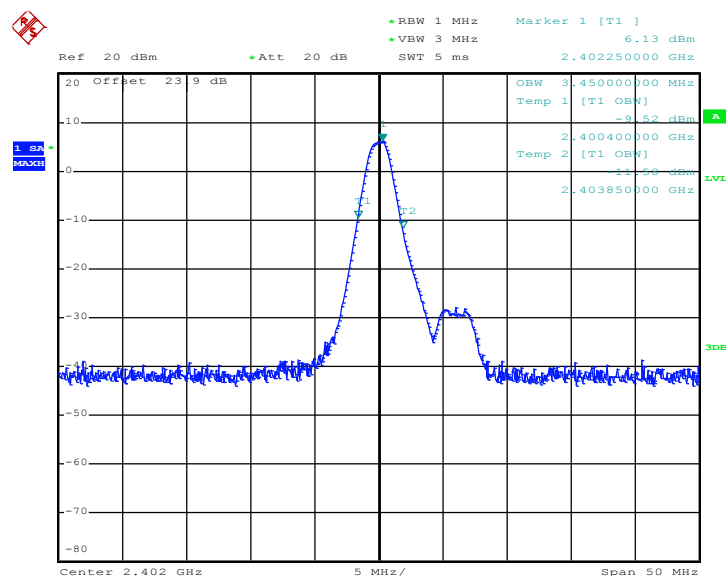
Date: 10.AUG.2012 19:11:06

3.1.6 Test Result of 99% Occupied Bandwidth

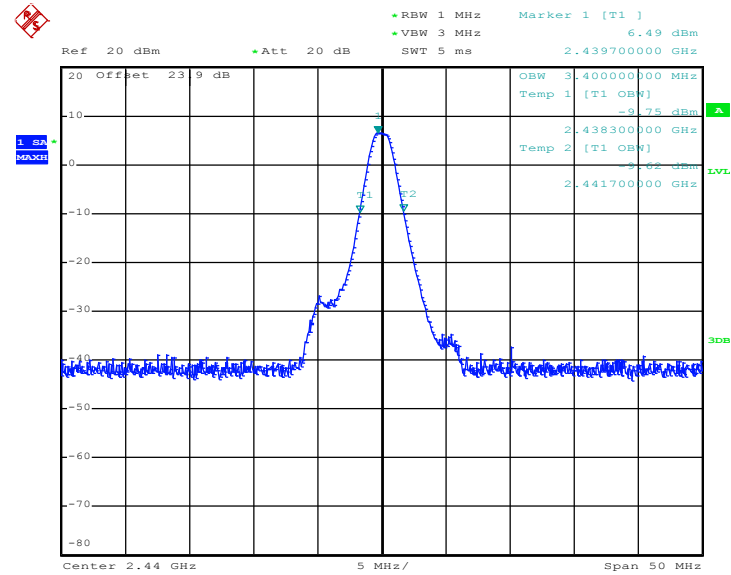
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Kenny Chen	Relative Humidity :	58~61%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	3.45
19	2440	3.40
39	2480	3.40

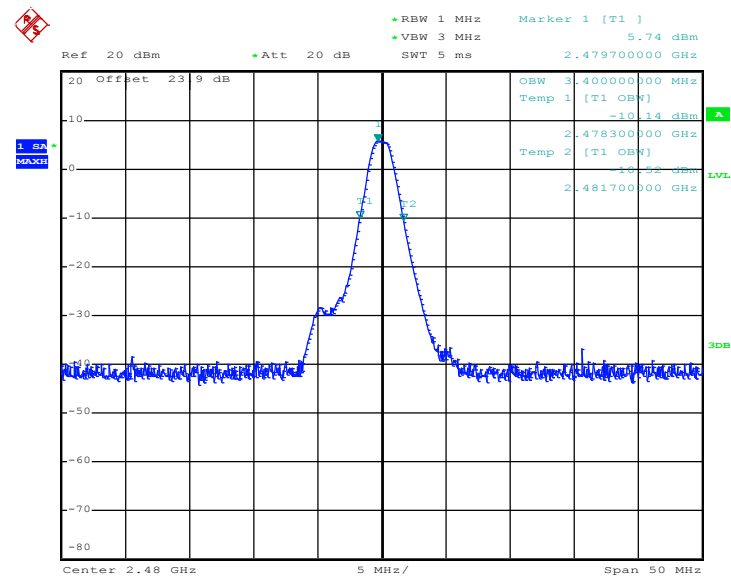
99% Bandwidth Plot on Channel 00



Date: 10.AUG.2012 19:06:13

99% Occupied Bandwidth Plot on Channel 19


Date: 10.AUG.2012 19:09:12

99% Occupied Bandwidth Plot on Channel 39


Date: 10.AUG.2012 19:14:11

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 are 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.

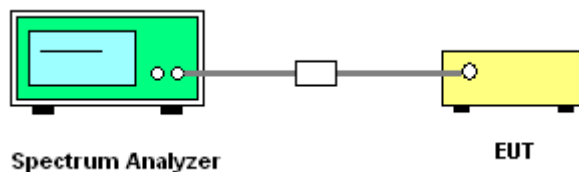
3.2.2 Measuring Instruments

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 and TCB Workshop 2012, April.
2. The RF output of EUT was connected to the power meter by a low loss cable
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

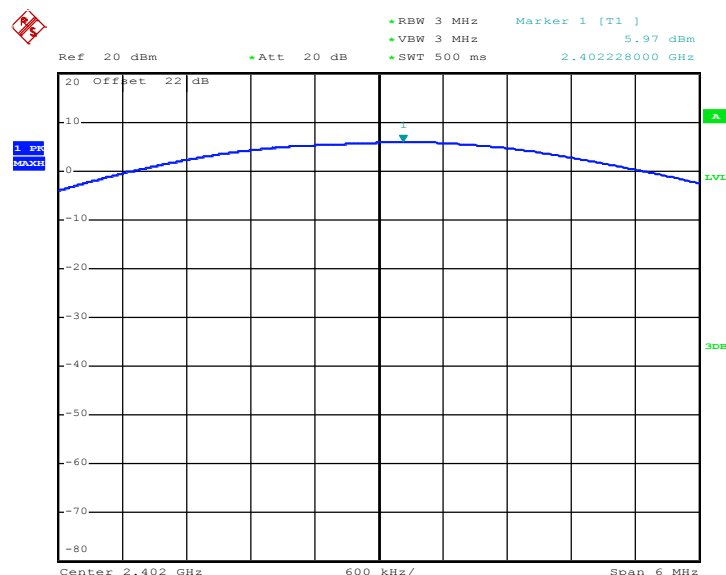


3.2.5 Test Result of Peak Output Power

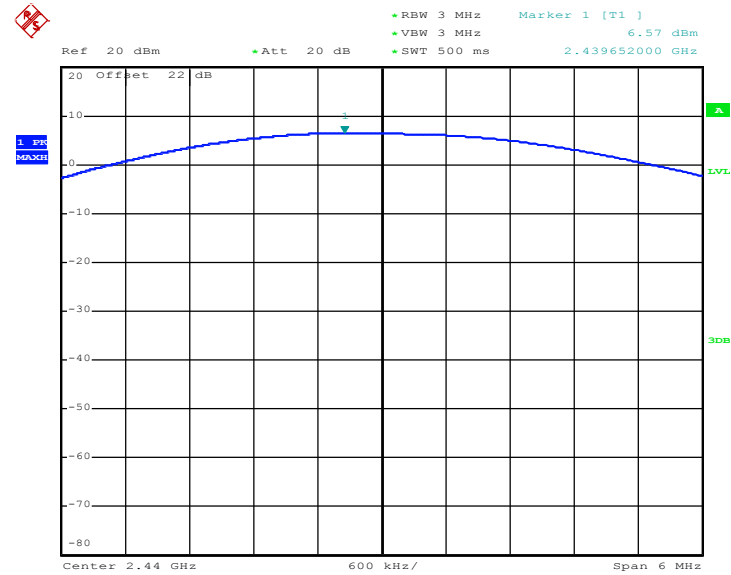
Test Mode :	Bluetooth 4.0-LE 1Mbps GFSK L/M/H channel	Temperature :	24~26°C
Test Engineer :	Kenny Chen	Relative Humidity :	58~61%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits	Pass/Fail
		1 Mbps	(dBm)	
00	2402	5.97	30.00	Pass
19	2440	6.57	30.00	Pass
39	2480	6.06	30.00	Pass

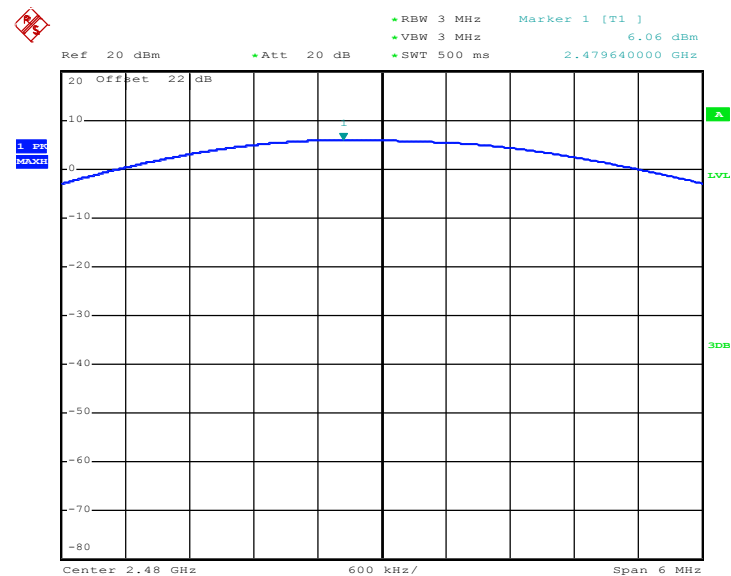
Peak Output Power Plot on Channel 00



Date: 5.AUG.2012 07:50:58

Peak Output Power Plot on Channel 19


Date: 5.AUG.2012 07:53:08

Peak Output Power Plot on Channel 39


Date: 5.AUG.2012 07:53:41

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.

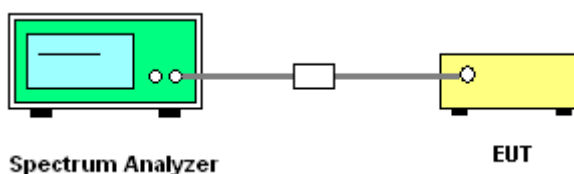
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. 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. Video bandwidth (VBW) $\geq$ 300 KHz In order to make an accurate measurement, set the span to 5-30% greater than Emission Bandwidth (EBW)
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 in any 100 kHz band segment within the fundamental EBW.
6. Record the measurement data derived from spectrum analyzer.
7. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3\text{ kHz}/100\text{ kHz}) = -15.2\text{ dB}$.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

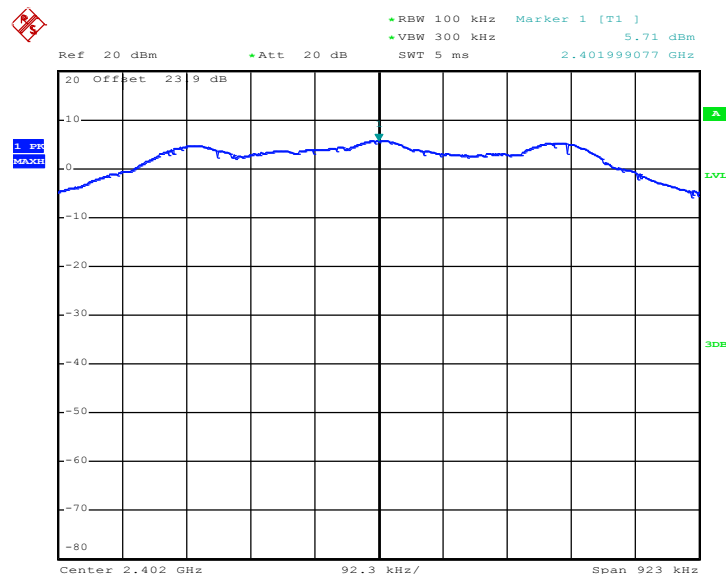
Test Mode :	Bluetooth 4.0 - LE 1Mbps	Temperature :	24~26℃
Test Engineer :	Kenny Chen	Relative Humidity :	58~61%

Channel	Frequency (MHz)	Power Density		Max. Limits (dBm)	Pass/Fail
		Measured PSD/100KHz (dBm)	PSD/3KHz (dBm)		
00	2402	5.71	-9.49	8	Pass
19	2440	6.21	-8.99	8	Pass
39	2480	5.44	-9.76	8	Pass

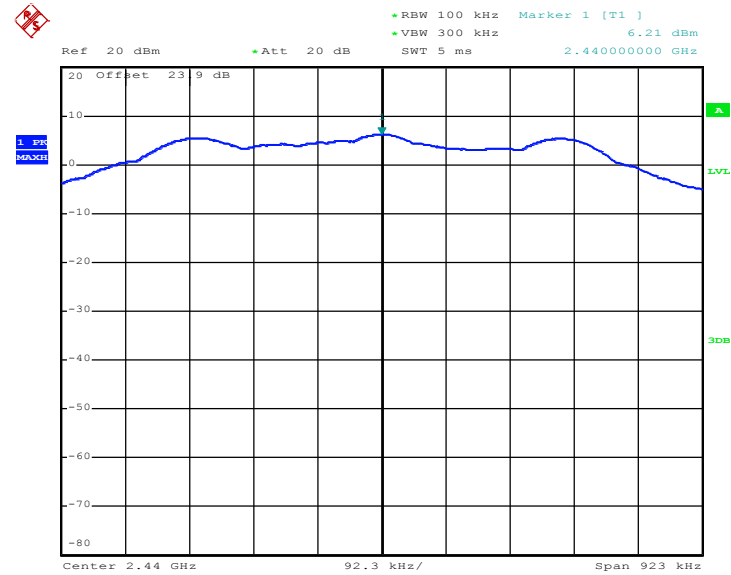
Note:

1. Measured power density (dBm) has offset with cable loss.
2. $BWCF (dB) = 10 \log (3k/100k) = -15.2 \text{ dB}$
3. $\text{Power Density/ 3kHz (dBm)} = \text{Measured power density/ 100KHz (dBm)} + BWCF (dB)$

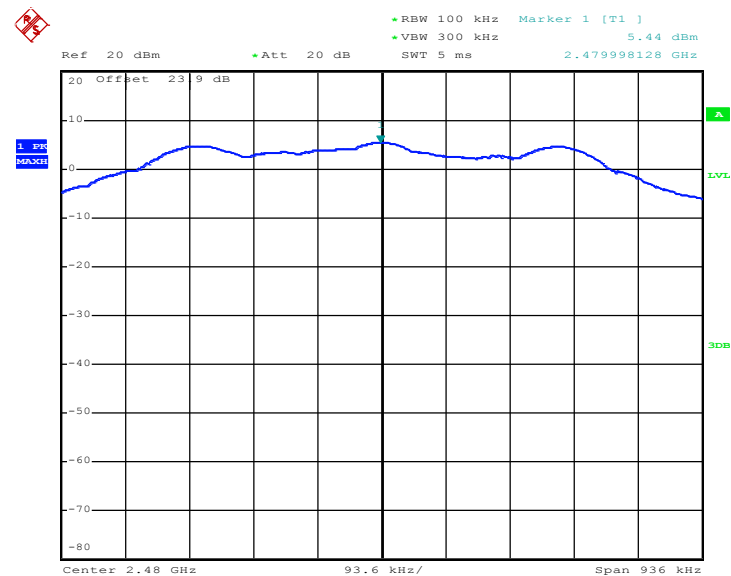
PSD Plot on Channel 00



Date: 10.AUG.2012 18:28:09

PSD Plot on Channel 19


Date: 10.AUG.2012 19:08:15

PSD Plot on Channel 39


Date: 10.AUG.2012 19:11:27

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.

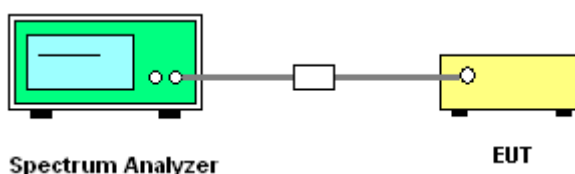
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedure

1. The testing follows the guidelines in ANSI C63. 4-2003 and the Measurement Procedure of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. The transmitter output was connected to the spectrum analyzer via a low lose cable.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 KHz, Video bandwidth (VBW) $\geq$ RBW. Out of the authorized frequency band emissions must be at least 20 dB lower than the highest emission level within the authorized band as measured with a 100 KHz RBW. 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).

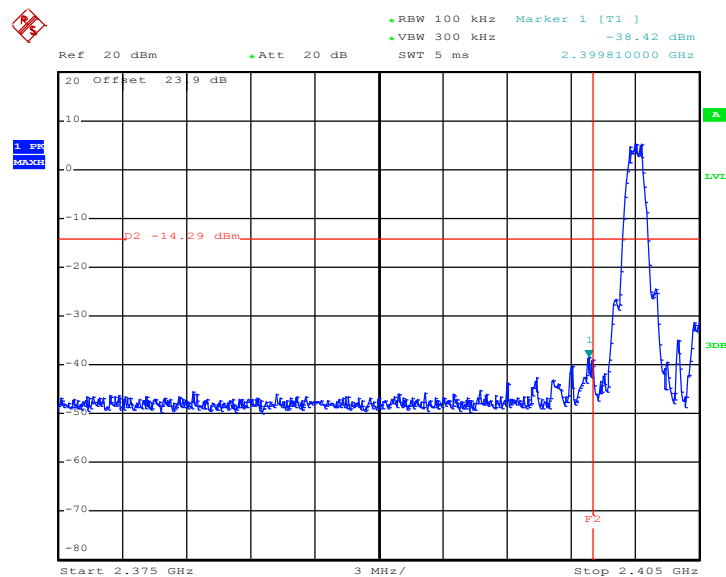
3.4.4 Test Setup



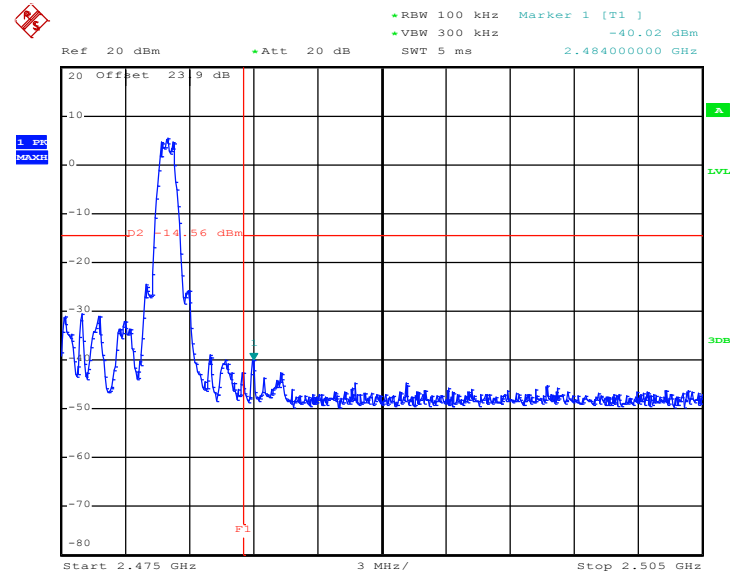
3.4.5 Test Result of Conducted Band Edges

Test Mode :	Bluetooth 4.0 - LE 1Mbps GFSK Low/High channel	Temperature :	24~26°C
Test Channel :	00 and 39	Relative Humidity :	58~61%
		Test Engineer :	Kenny Chen

Low Band Edge Plot on Channel 00



Date: 10.AUG.2012 18:28:31

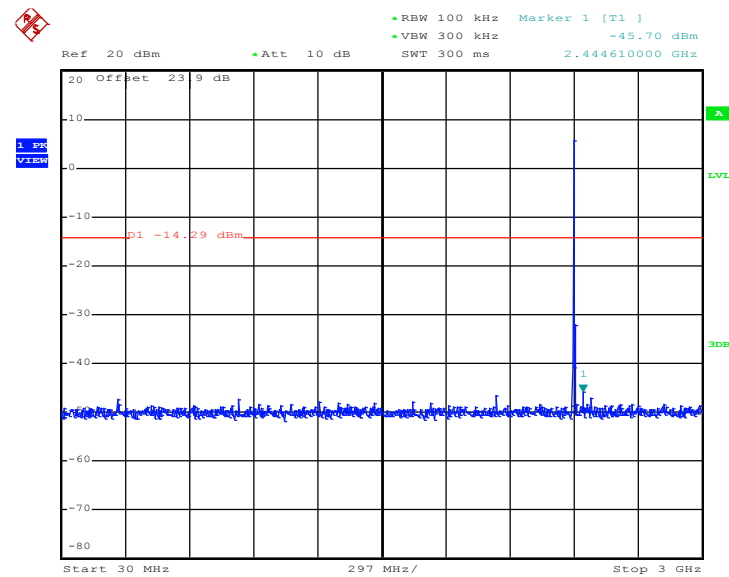
High Band Edge Plot on Channel 39


Date: 10.AUG.2012 19:12:52

3.4.6 Test Result of Conducted Spurious Emission

Test Mode :	Bluetooth 4.0 - LE 1Mbps GFSK Low channel	Temperature :	24~26°C
Test Channel :	00	Relative Humidity :	58~61%
		Test Engineer :	Kenny Chen

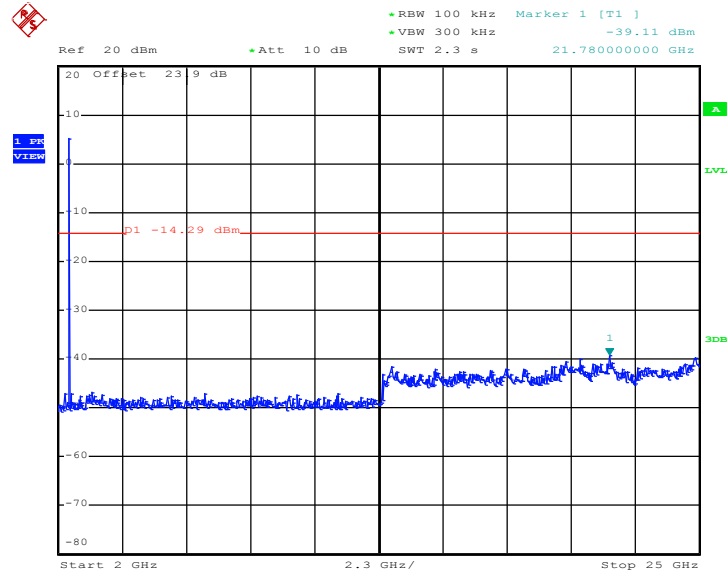
Conducted Spurious Emission Plot on Bluetooth 4.0 - LE 1Mbps GFSK Channel 00



Date: 10.AUG.2012 19:05:40



Conducted Spurious Emission Plot on Bluetooth 4.0 - LE 1Mbps
GFSK Channel 00

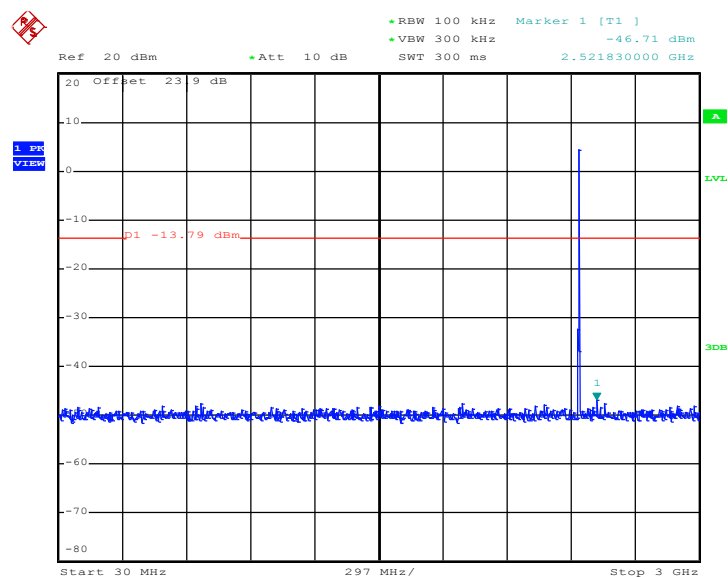


Date: 10.AUG.2012 19:05:58



Test Mode :	Bluetooth 4.0 - LE 1Mbps GFSK Middle channel	Temperature :	24~26℃
Test Channel :	19	Relative Humidity :	58~61%
		Test Engineer :	Kenny Chen

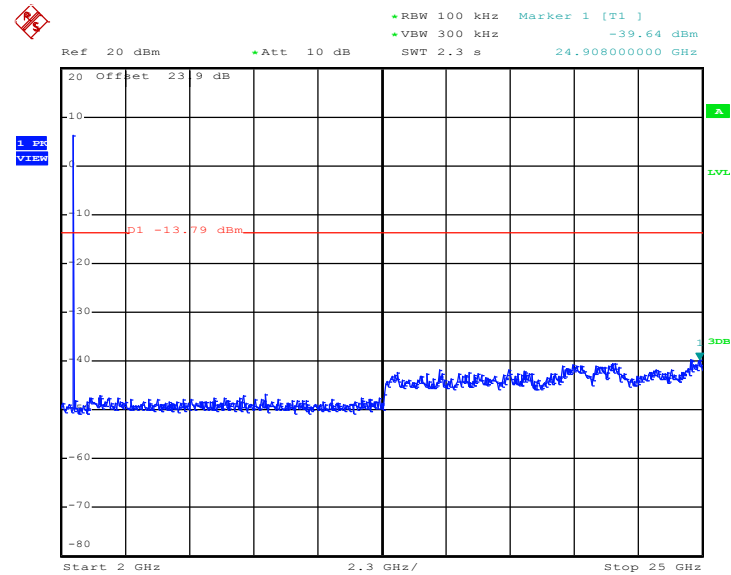
Conducted Spurious Emission Plot on Bluetooth 4.0 - LE 1Mbps
GFSK Channel 19



Date: 10.AUG.2012 19:08:42



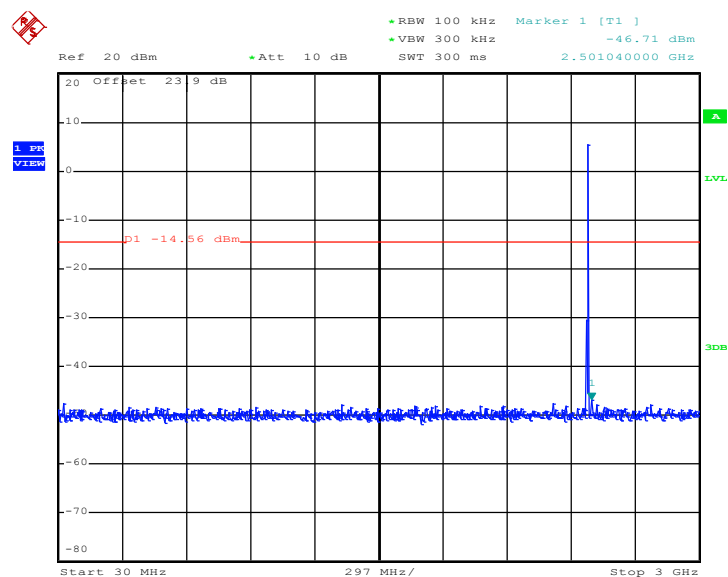
Conducted Spurious Emission Plot on Bluetooth 4.0 - LE 1Mbps
GFSK Channel 19



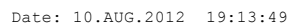
Date: 10.AUG.2012 19:09:00

Test Mode :	Bluetooth 4.0 - LE 1Mbps GFSK High channel	Temperature :	24~26℃
Test Channel :	39	Relative Humidity :	58~61%
		Test Engineer :	Kenny Chen

**Conducted Spurious Emission Plot on Bluetooth 4.0 - LE 1Mbps
GFSK Channel 39**



Date: 10.AUG.2012 19:13:32



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. 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

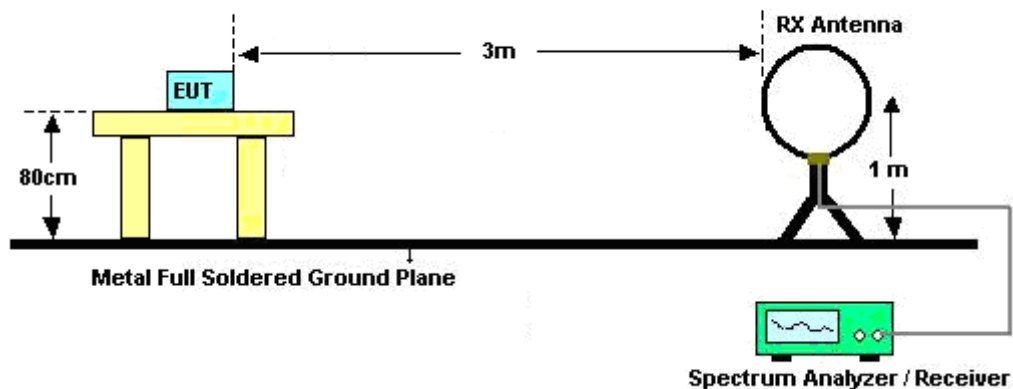
See list of measuring instruments of this test report.

3.5.3 Test Procedures

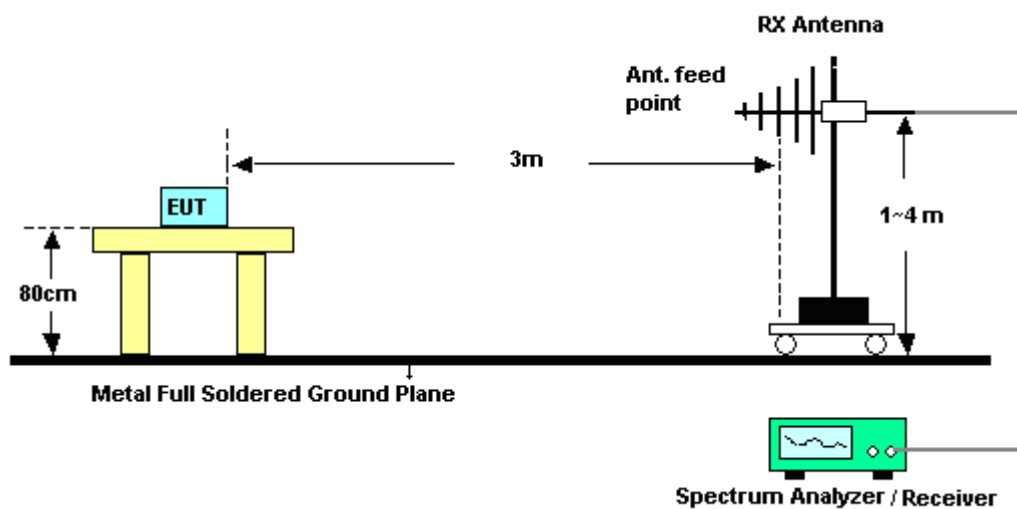
1. The testing follows TCB Workshop 2012, April and fulfills ANSI C63.4-2003 and the guidelines in ANSI C63.10-2009 test site requirement. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) 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 to comply with the guidelines.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving Antenna, which was mounted on the top of a variable height Antenna tower.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. 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, and then set VBW=10Hz, while maintaining all of the other instrument settings for Average measurement.
6. If the emission level of the EUT measured by the peak detector is more than 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be reported by using the quasi-peak detector.

3.5.4 Test Setup

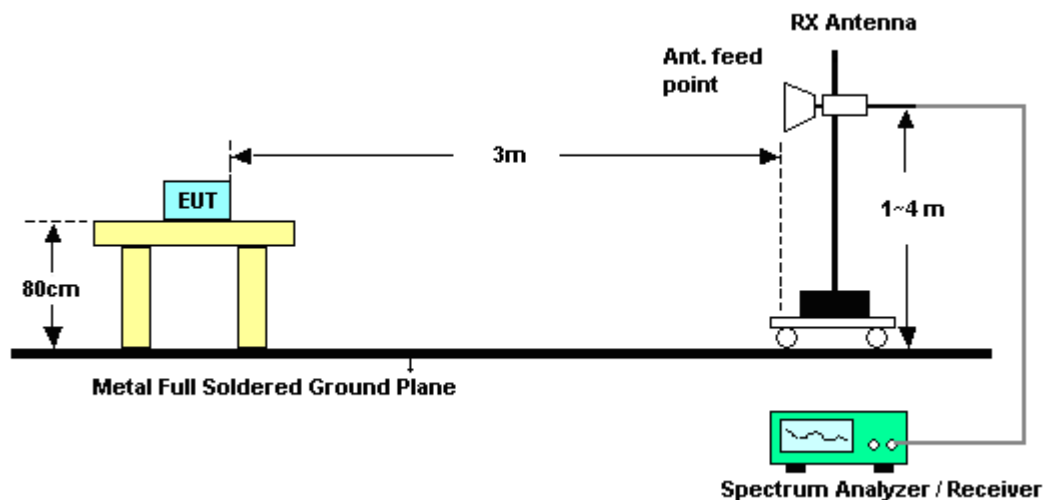
For radiated emissions below 30MHz



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 :	24~26°C
Test Channel :	00	Relative Humidity :	50~52%
		Test Engineer :	Gavin Wu

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
2322.24	49.51	-24.49	74	45.36	32.16	5.92	33.93	184	325	Peak
2321.97	39.98	-14.02	54	35.83	32.16	5.92	33.93	184	325	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
2322.33	45.85	-28.15	74	41.7	32.16	5.92	33.93	173	287	Peak
2321.88	34.96	-19.04	54	30.81	32.16	5.92	33.93	173	287	Average

Test Mode :	Mode 3	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~52%
		Test Engineer :	Gavin Wu

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
2483.5	64.02	-9.98	74	59.55	32.29	6.18	34	172	56	Peak
2483.5	50.31	-3.69	54	45.84	32.29	6.18	34	172	56	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
2483.5	59.36	-14.64	74	54.89	32.29	6.18	34	170	244	Peak
2483.5	47.07	-6.93	54	42.6	32.29	6.18	34	170	244	Average

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

Test Mode :	Mode 1	Temperature :	24~26°C
Test Channel :	00	Relative Humidity :	50~52%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2402 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. For example, 102.32 dBuV/m - 20dB = 82.32 dBuV/m.		

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
2402	76.42	-	-	72.13	32.22	6.03	33.96	184	325	Average
2402	102.32	-	-	98.02	32.23	6.03	33.96	184	325	Peak
3195	45.2	-37.12	82.32	62.05	32.8	7.14	56.79	100	0	Peak

Test Mode :	Mode 1	Temperature :	24~26°C
Test Channel :	00	Relative Humidity :	50~52%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 3192 MHz is not within a restricted band.		

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
2402	72.41	-	-	68.12	32.22	6.03	33.96	173	287	Average
2402	96.5	-	-	92.2	32.23	6.03	33.96	173	287	Peak
3192	45.62	-30.88	76.5	62.47	32.8	7.14	56.79	100	0	Peak
4791	45.81	-28.19	74	59.43	34.74	9.11	57.47	100	0	Peak
12000	49.38	-24.62	74	55.87	38.9	13.41	58.8	100	0	Peak



Test Mode :	Mode 2	Temperature :	24~26°C
Test Channel :	19	Relative Humidity :	50~52%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	2440 MHz is fundamental signal which can be ignored.		

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
49.98	31.03	-8.97	40	53.84	8.1	0.7	31.61	100	167	Peak
188.22	26.49	-17.01	43.5	47.53	8.98	1.27	31.29	-	-	Peak
247.08	29.21	-16.79	46	46.45	12.4	1.53	31.17	-	-	Peak
321.7	30.19	-15.81	46	45.62	13.9	1.82	31.15	-	-	Peak
706.7	27	-19	46	33.84	20.7	2.96	30.5	-	-	Peak
799.8	33.54	-12.46	46	38.46	22.1	3.14	30.16	-	-	Peak
2440	77.3	-	-	72.91	32.26	6.11	33.98	118	331	Average
2440	103.54	-	-	99.15	32.26	6.11	33.98	118	331	Peak
4881	44.22	-29.78	74	58.46	34.1	9.14	57.48	100	0	Peak
12000	45.4	-28.6	74	51.89	38.9	13.41	58.8	100	0	Peak

Test Mode :	Mode 2	Temperature :	24~26°C
Test Channel :	19	Relative Humidity :	50~52%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2440 MHz is fundamental signal which can be ignored. 2. 3186 MHz is not within a restricted band.		

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
92.1	31.57	-11.93	43.5	53.43	8.84	0.96	31.66	100	30	Peak
183.63	29.09	-14.41	43.5	50.14	8.93	1.26	31.24	-	-	Peak
246.27	21.97	-24.03	46	39.29	12.33	1.53	31.18	-	-	Peak
339.9	22.75	-23.25	46	37.9	14.37	1.89	31.41	-	-	Peak
618.5	29.75	-16.25	46	37.52	19.95	2.75	30.47	-	-	Peak
785.8	30.23	-15.77	46	35.49	21.88	3.12	30.26	-	-	Peak
2440	71.18	-	-	66.79	32.26	6.11	33.98	102	9	Average
2440	94.41	-	-	90.02	32.26	6.11	33.98	102	9	Peak
3186	44.7	-29.71	74.41	61.61	32.74	7.14	56.79	100	0	Peak
12000	50.96	-23.04	74	57.45	38.9	13.41	58.8	100	0	Peak

Test Mode :	Mode 3	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~52%
Test Engineer :	Gavin Wu	Polarization :	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 3186 MHz is not within a restricted band.		

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
2480	76.72	-	-	72.25	32.29	6.18	34	172	56	Average
2480	102.29	-	-	97.82	32.29	6.18	34	172	56	Peak
3186	44.16	-38.13	82.29	61.01	32.8	7.14	56.79	100	0	Peak
4959	44.47	-29.53	74	58.09	34.71	9.16	57.49	100	0	Peak

Test Mode :	Mode 3	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~52%
Test Engineer :	Gavin Wu	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 3198 MHz is not within a restricted band.		

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
2480	73.47	-	-	69	32.29	6.18	34	170	244	Average
2480	97.3	-	-	92.83	32.29	6.18	34	170	244	Peak
3198	46.34	-30.96	77.3	63.14	32.8	7.19	56.79	100	0	Peak
4797	46.02	-27.98	74	59.64	34.74	9.11	57.47	100	0	Peak
12000	48.68	-25.32	74	55.17	38.9	13.41	58.8	100	0	Peak

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.

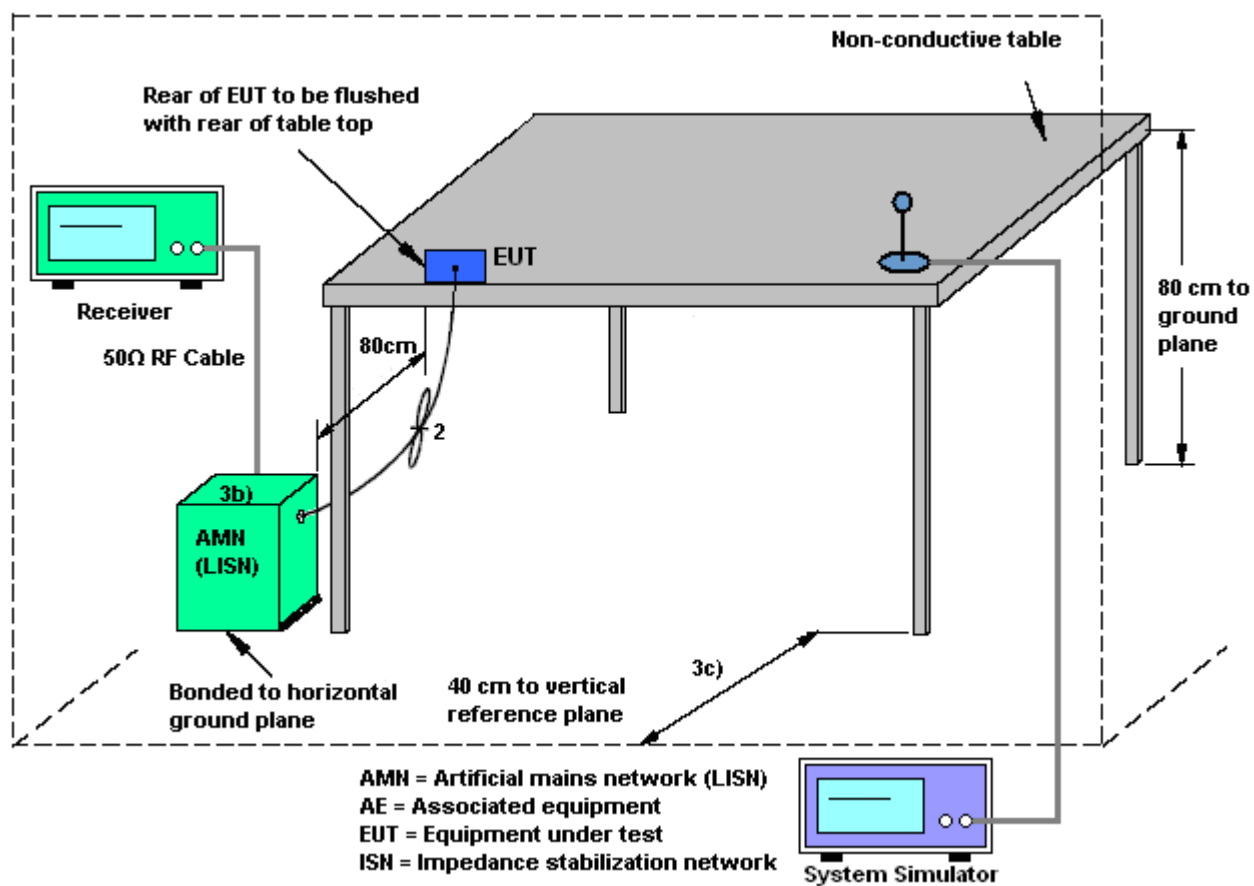
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

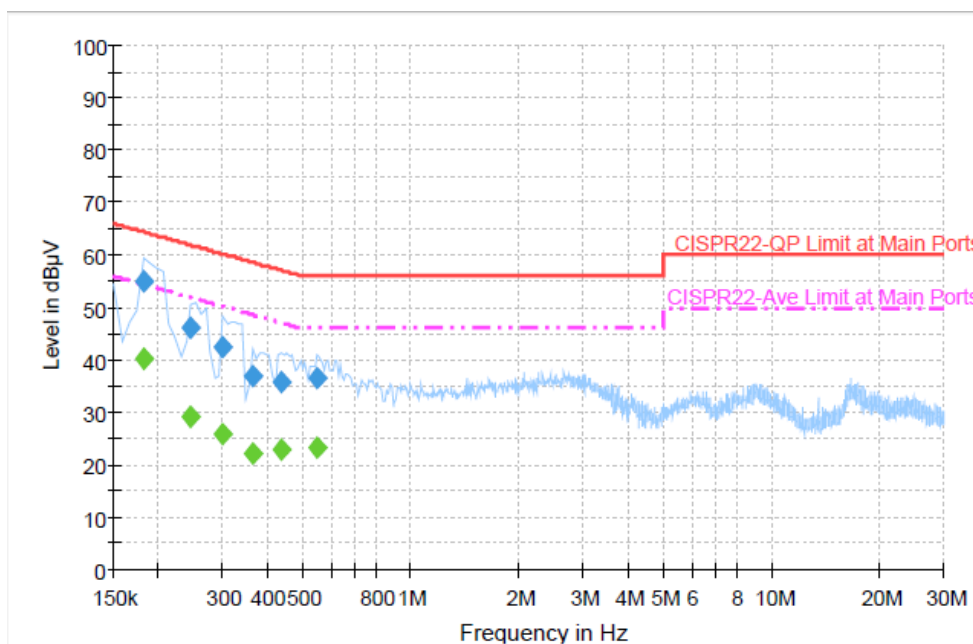
1. Please follow the guidelines in ANSI C63.4-2003
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
1. Connect EUT to the power mains through a line impedance stabilization network (LISN).
2. All the support units are connecting to the other LISN.
3. The LISN provides 50 ohm coupling impedance for the measuring instrument.
4. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. 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 1	Temperature :	20~21℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link + Adapter + HDMI Cable + SD Card + Camera + iPod Earphone + H Pattern + MPEG4 + GPS Rx + USB 3.0 HD		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



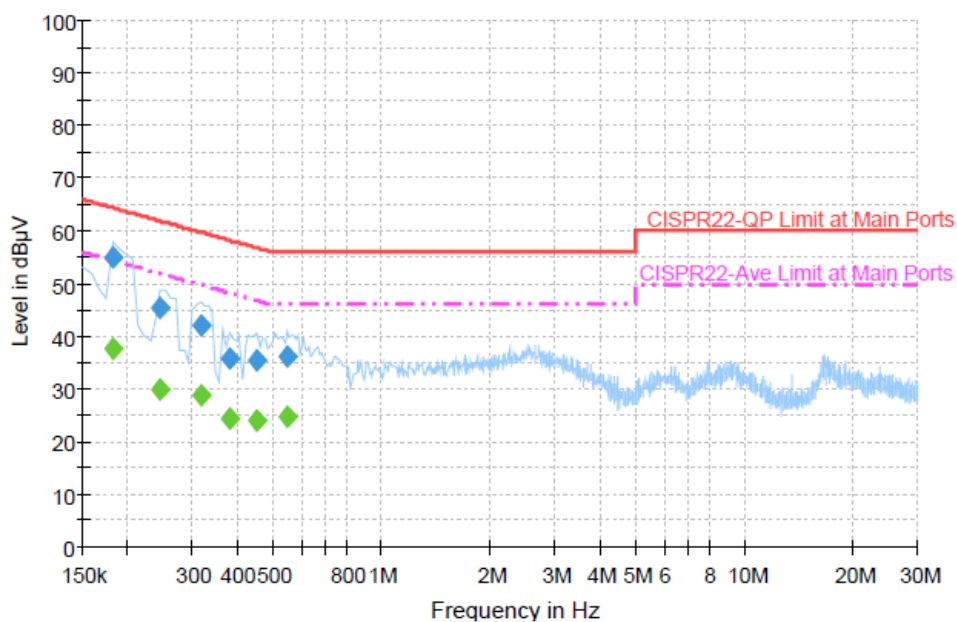
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.182000	55.0	Off	L1	19.4	9.4	64.4
0.246000	46.1	Off	L1	19.4	15.8	61.9
0.302000	42.4	Off	L1	19.4	17.8	60.2
0.366000	37.0	Off	L1	19.4	21.6	58.6
0.438000	35.8	Off	L1	19.4	21.3	57.1
0.550000	36.4	Off	L1	19.4	19.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.182000	40.1	Off	L1	19.4	14.3	54.4
0.246000	29.2	Off	L1	19.4	22.7	51.9
0.302000	25.8	Off	L1	19.4	24.4	50.2
0.366000	22.2	Off	L1	19.4	26.4	48.6
0.438000	22.7	Off	L1	19.4	24.4	47.1
0.550000	23.2	Off	L1	19.4	22.8	46.0

Test Mode :	Mode 1	Temperature :	20~21°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + Adapter + HDMI Cable + SD Card + Camera + iPod Earphone + H Pattern + MPEG4 + GPS Rx + USB 3.0 HD		
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)
0.182000	55.1	Off	N	19.4	9.3	64.4
0.246000	45.4	Off	N	19.4	16.5	61.9
0.318000	42.2	Off	N	19.3	17.6	59.8
0.382000	35.8	Off	N	19.4	22.4	58.2
0.454000	35.6	Off	N	19.4	21.2	56.8
0.550000	36.3	Off	N	19.4	19.7	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.182000	37.7	Off	N	19.4	16.7	54.4
0.246000	29.9	Off	N	19.4	22.0	51.9
0.318000	28.6	Off	N	19.3	21.2	49.8
0.382000	24.4	Off	N	19.4	23.8	48.2
0.454000	23.9	Off	N	19.4	22.9	46.8
0.550000	24.8	Off	N	19.4	21.2	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	Aug. 05, 2012 ~ Aug. 10, 2012	Jun. 05, 2013	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 18, 2011	Aug. 05, 2012 ~ Aug. 10, 2012	Sep. 17, 2012	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 18, 2011	Aug. 05, 2012 ~ Aug. 10, 2012	Sep. 17, 2012	Conducted (TH02-HY)
EMI Test Receiver	R&S	ESCS 30	100356	9KHz ~ 2.75GHz	Oct. 27, 2011	Aug. 22, 2012	Oct. 26, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz ~ 30MHz	Dec. 09, 2011	Aug. 22, 2012	Dec. 08, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz ~ 30MHz	Dec. 06, 2011	Aug. 22, 2012	Dec. 05, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Aug. 22, 2012	N/A	Conduction (CO05-HY)
GPS Station	Pendulum	GSG-54	N/A	N/A	N/A	Aug. 22, 2012	N/A	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 22, 2011	Aug. 14, 2012	Oct. 21, 2012	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP30	101067	9KHz ~ 30GHz	Dec. 06, 2011	Aug. 14, 2012	Dec. 05, 2012	Radiation (03CH07-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Aug. 14, 2012	Jul. 31, 2013	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A023 62	1GHz ~ 26.5GHz	Dec. 05, 2011	Aug. 14, 2012	Dec. 04, 2012	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Feb. 27, 2012	Aug. 14, 2012	Feb. 26, 2013	Radiation (03CH07-HY)
EMI TEST RECEIVER	R&S	ESCI 7	100724	9kHz ~ 7GHz	Aug. 22, 2011	Aug. 14, 2012	Aug. 21, 2012	Radiation (03CH07-HY)
Pre Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	159088	1GHz ~ 18GHz	Mar. 10, 2012	Aug. 14, 2012	Mar. 09, 2013	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 251	15GHz ~ 40GHz	Oct. 21, 2011	Aug. 14, 2012	Oct. 20, 2012	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/00 1	9KHz ~ 30MHz	Jul. 03, 2012	Aug. 14, 2012	Jul. 02, 2014	Radiation (03CH07-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 EP272716-02 as below.