

Partial FCC RF Test Report

APPLICANT : DT Research Inc.
EQUIPMENT : WLAN Module
BRAND NAME : DT Research Inc.
MODEL NAME : 600B
FCC ID : YE3600B
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DSS) Spread Spectrum Transmitter

This is a partial report which is included the Peak Output Power Measurement and AC Conducted Emission test item. The product was received on Dec. 15, 2012 and completely tested on Dec. 20, 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:



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FCC ID : YE3600B

Page Number : 1 of 23

Report Issued Date : Jan. 17, 2013

Report Version : Rev. 01



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2D0508-01A	Rev. 01	Initial issue of report	Jan. 17, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	$\leq 1\text{ W}$ for 1Mbps $\leq 125\text{ mW}$ for 2, 3Mbps	Pass	-
3.2	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 9.30 dB at 0.198 MHz
3.3	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

DT Research Inc.

6F., NO. 1, NingPo E. St., Taipei, 100 Taiwan, R.O.C.

1.2 Manufacturer

DT Research Inc.

6F., NO. 1, NingPo E. St., Taipei, 100 Taiwan, R.O.C.

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	WLAN Module
Brand Name	DT Research Inc.
Model Name	600B
FCC ID	YE3600B
Installed into Mobile POS Tablet	Brand Name: DT Research Inc. Model Name: DT395 FCC ID: YE3800A
EUT supports Radios application	CDMA WLAN 11abgn / Bluetooth 2.1/3.0/4.0
EUT Stage	Production Unit

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	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth (1Mbps) : 5.50 dBm (0.0035 W) Bluetooth EDR (2Mbps) : 4.07 dBm (0.0026 W) Bluetooth EDR (3Mbps) : 4.43 dBm (0.0028 W)
Antenna Type	PIFA Antenna type with gain 2.27 dBi
Type of Modulation	Bluetooth 2.1 BDR (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK Bluetooth 3.0 BDR (1Mbps) : GFSK Bluetooth 3.0 EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth 3.0 EDR (3Mbps) : 8-DPSK

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.	
	TH02-HY	CO05-HY

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 Public Notice DA 00-705
- ♦ ANSI C63.4-2003 and ANSI C63.10-2009

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	$\pi/4$ -DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	5.25 dBm	3.18 dBm	3.67 dBm
Ch39	2441MHz	5.48 dBm	3.76 dBm	4.19 dBm
Ch78	2480MHz	5.50 dBm	4.07 dBm	4.43 dBm

Remark:

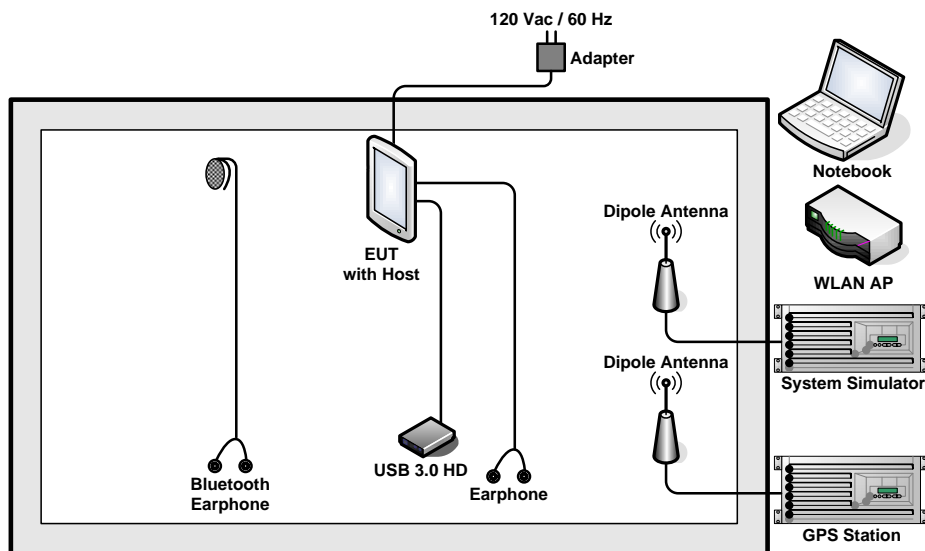
1. All the test data for each data rate were verified, but only the worst case was reported.
 2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and ANSI C63.10-2009 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 KHz to 30 MHz).
 - 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 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
AC Conducted Emission	Mode 1 :CDMA2000 BC0 Idle + WLAN (2.4G) Link + Bluetooth Link + GPS Rx + Camera + MPEG4 + H Pattern + TC Mode 2 :CDMA2000 BC1 Idle + WLAN (5G) Link + Bluetooth Link + GPS Rx + Camera + MPEG4 + H Pattern + TC		
Remark: 1. The worst case of conducted emission is mode 1; only the test data of it was reported. 2. TC stands for Test Configuration, and consists of USB Link with USB3.0 HD, Adapter, SD Card, Earphone, and ID Card.			

2.3 Connection Diagram of Test System



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.	GPS Station	T&E	GS-50	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
5.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	USB3.0 HD	WD	WDBPCK5000A BK-PESN	FCC DoC	Shielded, 0.5 m	N/A
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

3 Test Result

3.1 Peak Output Power Measurement

3.1.1 Limit of Peak Output Power

Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts. The power limit for 1Mbps is 1watt, and for 2Mbps, 3Mbps and AFH are 0.125 watts.

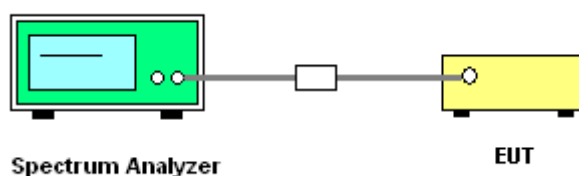
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
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 with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.1.4 Test Setup



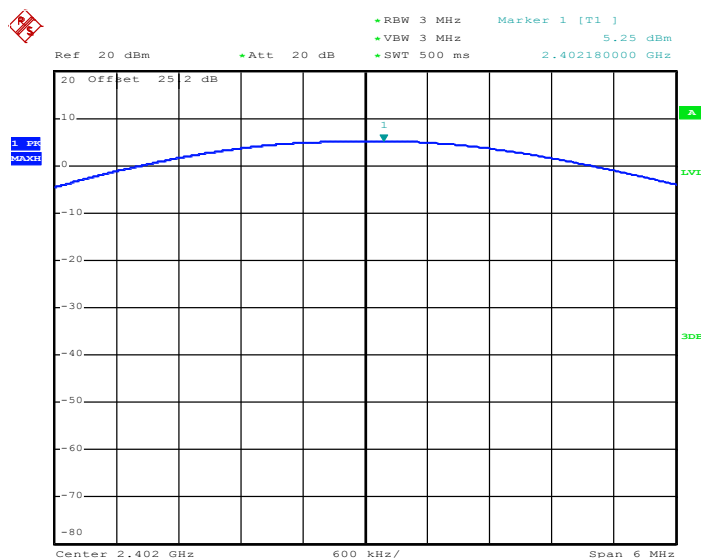
3.1.5 Test Result of Peak Output Power

Test Mode :	1Mbps	Temperature :	24~26 °C
Test Engineer :	Reece Li	Relative Humidity :	58~61 %

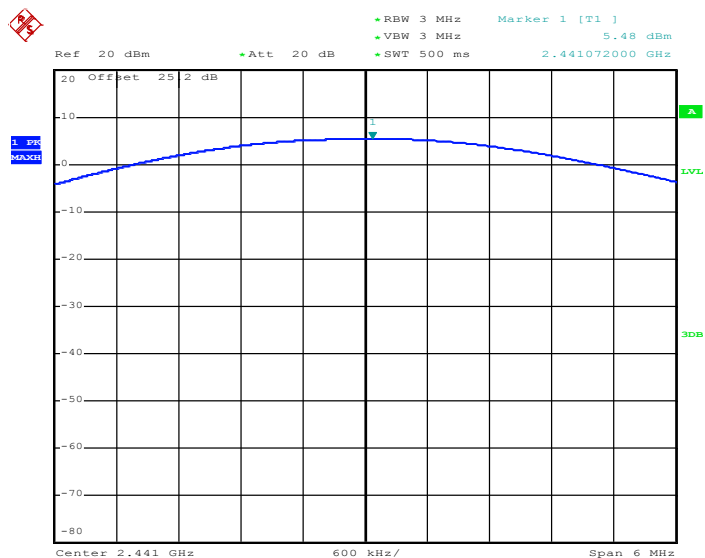
Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	5.25	20.97	Pass
39	2441	5.48	20.97	Pass
78	2480	5.5	20.97	Pass

Note: For AFH mode using 20 hopping channels, the maximum output power limit is 20.97dBm.

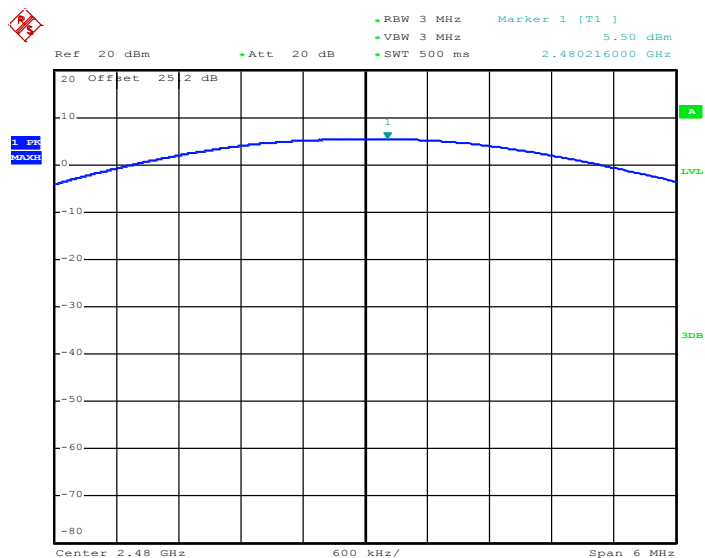
Peak Output Power Plot on Channel 00



Date: 20.DEC.2012 18:04:15

Peak Output Power Plot on Channel 39


Date: 20.DEC.2012 18:05:09

Peak Output Power Plot on Channel 78


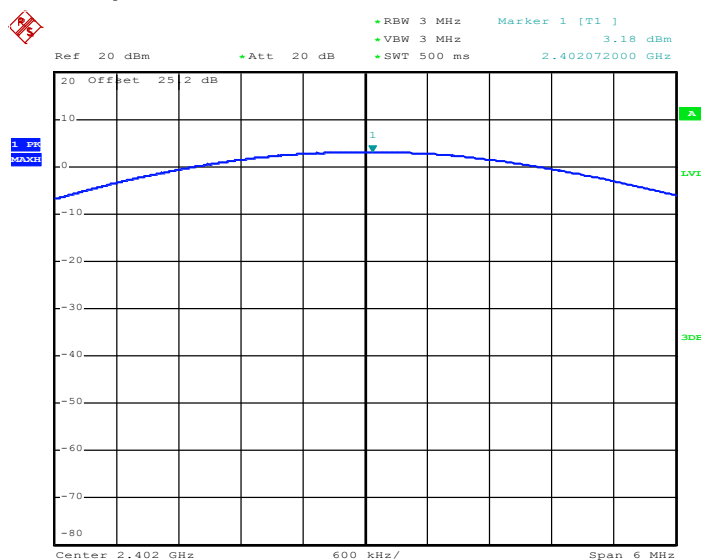
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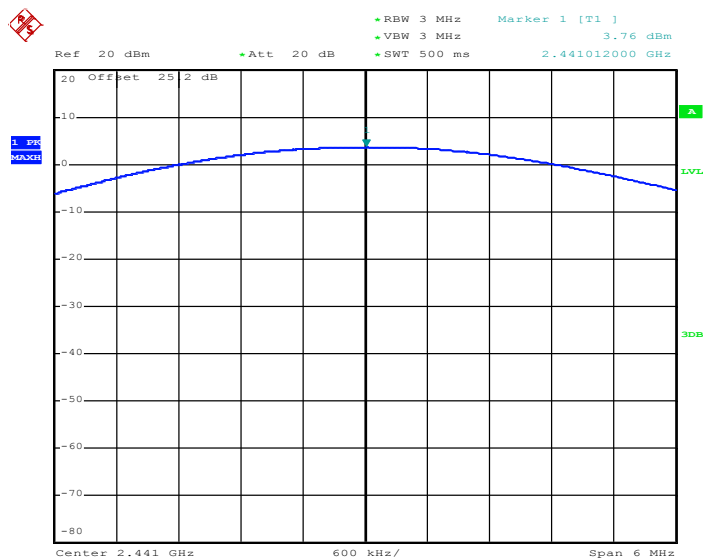
Test Mode :	2Mbps	Temperature :	24~26 °C
Test Engineer :	Reece Li	Relative Humidity :	58~61 %

Channel	Frequency (MHz)	RF Power (dBm)		
		$\pi/4$ -DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	3.18	20.97	Pass
39	2441	3.76	20.97	Pass
78	2480	4.07	20.97	Pass

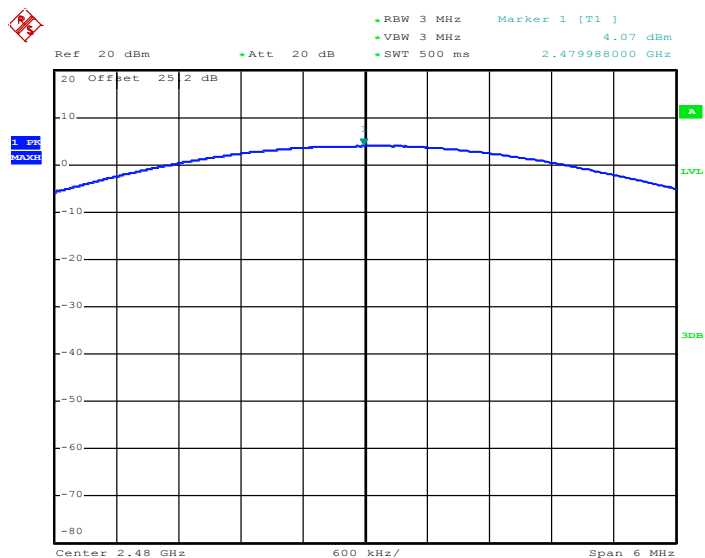
Peak Output Power Plot on Channel 00



Date: 20.DEC.2012 18:14:44

Peak Output Power Plot on Channel 39


Date: 20.DEC.2012 18:14:12

Peak Output Power Plot on Channel 78


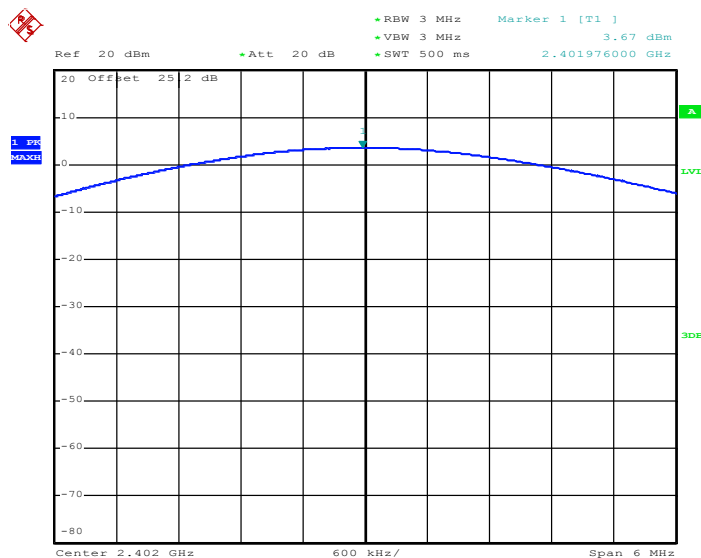
Date: 20.DEC.2012 18:13:24



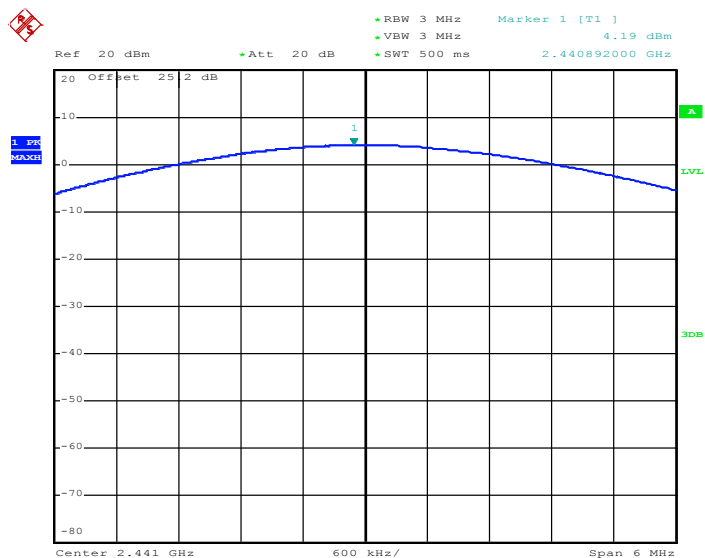
Test Mode :	3Mbps	Temperature :	24~26 °C
Test Engineer :	Reece Li	Relative Humidity :	58~61 %

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	3.67	20.97	Pass
39	2441	4.19	20.97	Pass
78	2480	4.43	20.97	Pass

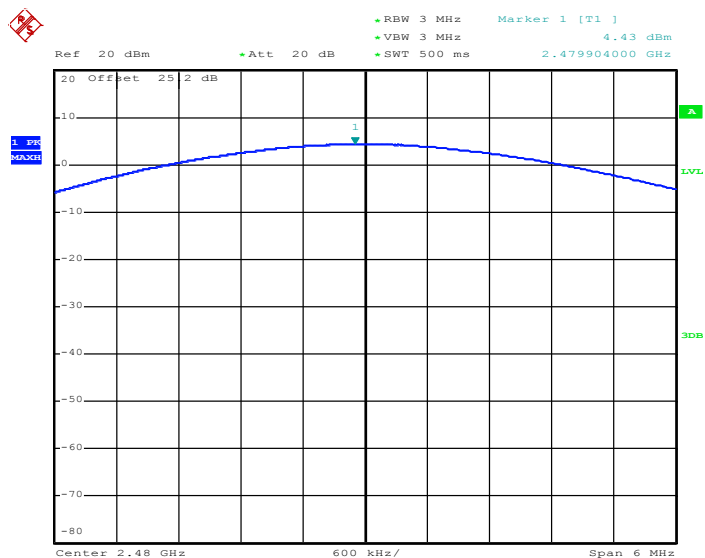
Peak Output Power Plot on Channel 00



Date: 20.DEC.2012 18:15:04

Peak Output Power Plot on Channel 39


Date: 20.DEC.2012 18:16:38

Peak Output Power Plot on Channel 78


Date: 20.DEC.2012 18:18:42

3.2 AC Conducted Emission Measurement

3.2.1 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.

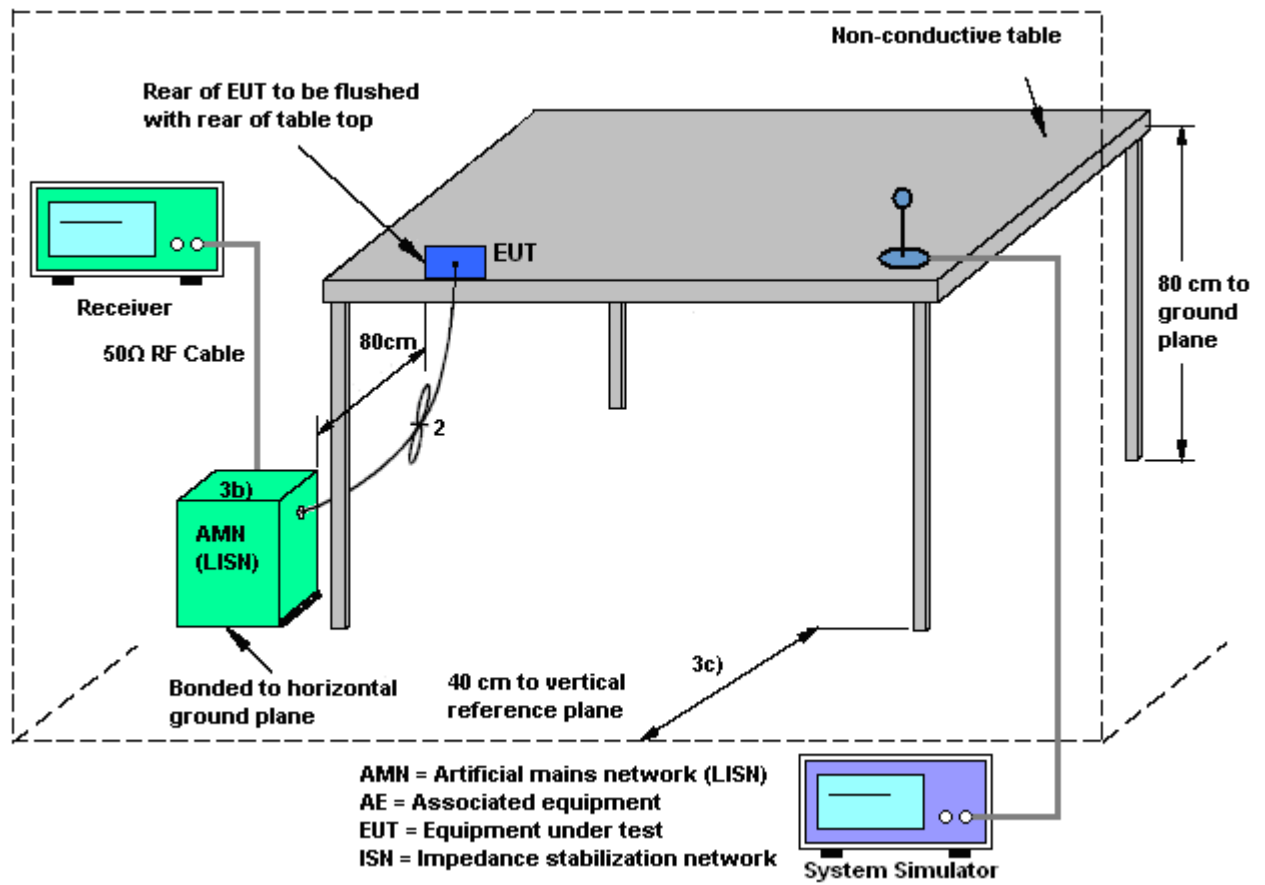
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

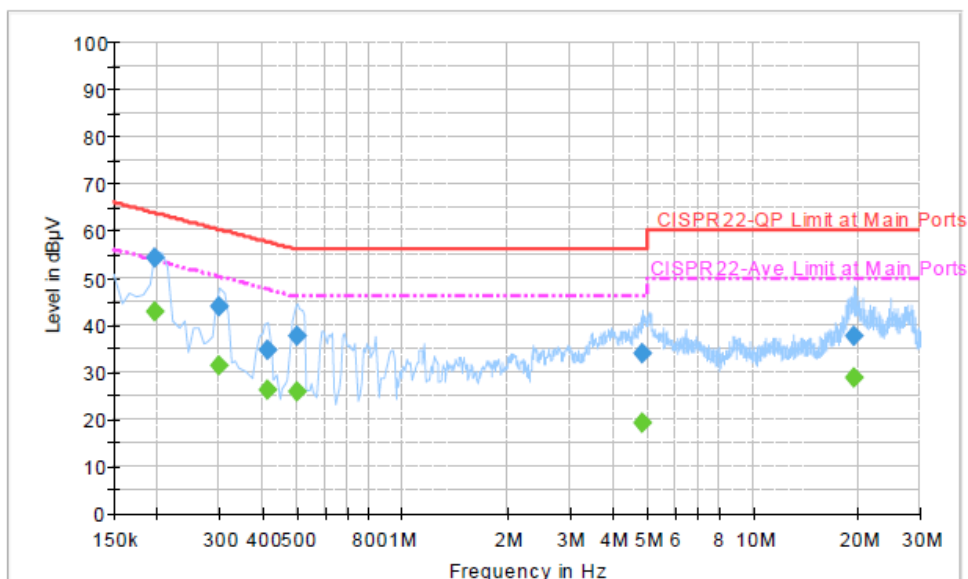
1. The test follows the guidelines in ANSI C63.4-2003 and ANSI C63.10-2009 test site requirement.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 KHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.2.4 Test Setup



3.2.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	CDMA2000 BC0 Idle + WLAN (2.4G) Link + Bluetooth Link + GPS Rx + Camera + MPEG4 + H Pattern + TC		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



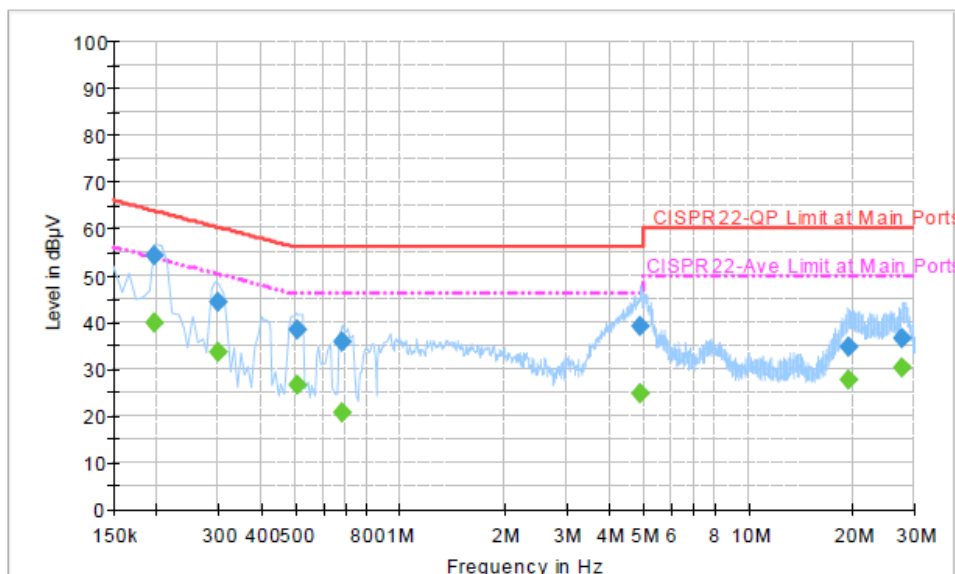
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	54.4	Off	L1	19.4	9.3	63.7
0.302000	43.9	Off	L1	19.3	16.3	60.2
0.414000	34.6	Off	L1	19.4	23.0	57.6
0.502000	37.8	Off	L1	19.4	18.2	56.0
4.830000	34.0	Off	L1	19.6	22.0	56.0
19.350000	37.8	Off	L1	19.7	22.2	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	42.8	Off	L1	19.4	10.9	53.7
0.302000	31.2	Off	L1	19.3	19.0	50.2
0.414000	26.3	Off	L1	19.4	21.3	47.6
0.502000	25.8	Off	L1	19.4	20.2	46.0
4.830000	19.2	Off	L1	19.6	26.8	46.0
19.350000	28.8	Off	L1	19.7	21.2	50.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	CDMA2000 BC0 Idle + WLAN (2.4G) Link + Bluetooth Link + GPS Rx + Camera + MPEG4 + H Pattern + TC		
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)
0.198000	54.3	Off	N	19.4	9.4	63.7
0.302000	44.3	Off	N	19.4	15.9	60.2
0.510000	38.5	Off	N	19.4	17.5	56.0
0.686000	35.8	Off	N	19.5	20.2	56.0
4.926000	39.1	Off	N	19.6	16.9	56.0
19.566000	34.8	Off	N	19.8	25.2	60.0
27.790000	36.4	Off	N	20.0	23.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	39.7	Off	N	19.4	14.0	53.7
0.302000	33.6	Off	N	19.4	16.6	50.2
0.510000	26.7	Off	N	19.4	19.3	46.0
0.686000	20.7	Off	N	19.5	25.3	46.0
4.926000	24.7	Off	N	19.6	21.3	46.0
19.566000	27.7	Off	N	19.8	22.3	50.0
27.790000	30.2	Off	N	20.0	19.8	50.0

3.3 Antenna Requirements

3.3.1 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.

3.3.2 Antenna Connected Construction

Non-standard connector used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 06, 2012	Dec. 20, 2012	Jun. 05, 2013	Conducted (TH02-HY)
Bluetooth Base Station	R&S	CBT32	100519	N/A	Jun. 05, 2012	Dec. 20, 2012	Jun. 04, 2013	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9KHz – 2.75GHz	Nov. 13, 2012	Dec. 11, 2012	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9KHz ~ 30MHz	Dec. 06, 2012	Dec. 11, 2012	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Dec. 11, 2012	N/A	Conduction (CO05-HY)
System Simulator	R&S	CMU200	117995	N/A	Jul. 28, 2011	Dec. 11, 2012	Jul. 27, 2013	Conduction (CO05-HY)
GPS Station	T&E	GS-50	N/A	N/A	N/A	Dec. 11, 2012	N/A	Conduction (CO05-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP2D0508-01 as below.