

FCC RF Test Report

APPLICANT : HONEYWELL INTERNATIONAL INC.,
HONEYWELL SCANNING AND MOBILITY
EQUIPMENT : MINI COMPUTER, MOBILE COMPUTER
BRAND NAME : HONEYWELL
MODEL NAME : Optimus 5100LP , ScanPal 5100LP
FCC ID : HD55100LP
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Transmission System (DTS)

The product was received on Jul. 18, 2011 and completely tested on Aug. 18, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 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.



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer.....	5
1.3 Feature of Equipment Under Test	5
1.4 Testing Site.....	6
1.5 Applied Standards	6
1.6 Ancillary Equipment List	6
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	7
2.1 Pre-Scanned RF Power.....	7
2.2 Test Result of Average output Power (Reporting Only)	8
2.3 Test Mode.....	9
2.4 Connection Diagram of Test System.....	10
2.5 RF Utility	10
3 TEST RESULT.....	11
3.1 6dB Bandwidth Measurement	11
3.2 Output Power Measurement.....	16
3.3 Band Edges Measurement.....	18
3.4 Spurious Emission Measurement.....	24
3.5 Power Spectral Density Measurement	31
3.6 AC Conducted Emission Measurement.....	36
3.7 Radiated Emission Measurement.....	40
3.8 Antenna Requirements.....	55
4 LIST OF MEASURING EQUIPMENT	56
5 UNCERTAINTY OF EVALUATION.....	57
APPENDIX A. PHOTOGRAPHS OF EUT	
APPENDIX B. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR180802-02B	Rev. 01	Initial issue of report	Jul. 16, 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	-
3.2	15.247(b)	A8.4	Power Output	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(d)	A8.5	Frequency Band Edges	$\leq 20\text{dBc}$	Pass	-
3.4	15.247(d)	A8.5	Spurious Emission	$< 20\text{ dBc}$	Pass	-
3.5	15.247(e)	A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Pass	-
3.6	15.207	Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 13.4 dB at 0.190 MHz
3.7	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.53 dB at 2484.000 MHz
3.8	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

HONEYWELL INTERNATIONAL INC., HONEYWELL SCANNING AND MOBILITY
9680 OLD BAILES RD FORT MILL SC 29707 USA

1.2 Manufacturer

HONEYWELL INTERNATIONAL INC., HONEYWELL SCANNING AND MOBILITY
9680 OLD BAILES RD FORT MILL SC 29707 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	MINI COMPUTER, MOBILE COMPUTER
Brand Name	HONEYWELL
Model Name	Optimus 5100LP , SCANPAL 5100LP
FCC ID	HD55100LP
Tx/Rx Frequency Range	2412 MHz ~ 2462 MHz
Number of Channels	11
Carrier Frequency of Each Channel	2412+(n-1)*5 MHz; n=1~11
Channel Spacing	5 MHz
Maximum Output Power to Antenna	802.11b : 14.73 dBm (0.030 W) 802.11g : 21.92 dBm (0.156 W)
Antenna Type	PCB Antenna with gain -1.50 dBi
HW Version	OPTIMUS 5100 MAIN MP
SW Version	Windows CE5.0 Core
Type of Modulation	802.11b : DSSS (BPSK / QPSK / CCK) 802.11g : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Production Unit

Remark:

1. This test report recorded only product characteristics and test results of Digital Transmission System (DTS).
2. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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.
	CO05-HY	03CH06-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 (Measurement Guidelines of DTS)
- ANSI C63.4-2003
- IC RSS-210 Issue 8

Remark:

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

1.6 Ancillary Equipment List

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.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A

2 Test Configuration of Equipment Under Test

2.1 Pre-Scanned RF Power

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

Channel	Frequency	2.4GHz 802.11b Pre-Scanned RF Power (dBm)			
		DSSS Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	13.1	-	-	-
CH 06	2437 MHz	14.38	-	-	-
CH 11	2462 MHz	14.73	14.66	14.65	14.63

Channel	Frequency	2.4GHz 802.11g Pre-Scanned RF Power (dBm)							
		OFDM Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	21.04	-	-	-	-	-	-	-
CH 06	2437 MHz	21.62	-	-	-	-	-	-	-
CH 11	2462 MHz	21.92	21.35	21.6	21.53	21.82	21.65	21.33	21.55

Remark:

1. For WLAN RF power, the pre-scanned RF power was measured by power meter.
2. The data rates of WLAN 802.11b/g were set in 1Mbps for 802.11b and 6Mbps for 802.11g, for all the test cases due to the highest RF output power.
3. The EUT is programmed to transmit signals continuously for all testing.
4. Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports.

2.2 Test Result of Average output Power (Reporting Only)

Channel	Frequency	2.4GHz 802.11b Pre-Scanned Average Power (dBm)			
		DSSS Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	10.66	-	-	-
CH 06	2437 MHz	11.93	-	-	-
CH 11	2462 MHz	12.15	11.83	11.79	11.93

Channel	Frequency	2.4GHz 802.11g Pre-Scanned Average Power (dBm)							
		OFDM Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	11.24	-	-	-	-	-	-	-
CH 06	2437 MHz	12.01	-	-	-	-	-	-	-
CH 11	2462 MHz	12.12	12.17	12.02	12.29	12.11	12.04	12.07	12.04

2.3 Test Mode

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

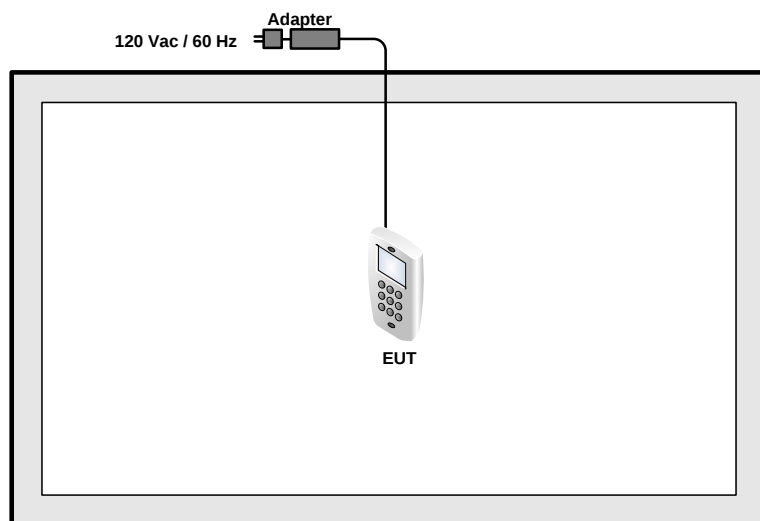
Pre-scanned tests, X, Y, Z in three orthogonal panels, were conducted to determine the final configuration from all possible combinations, laptop / tablet modes.

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

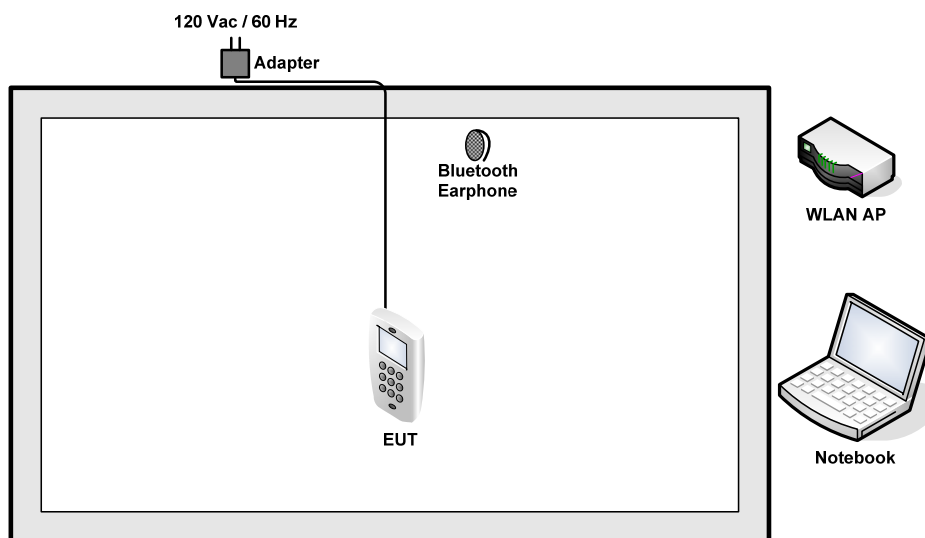
Test Cases		
Test Item	802.11b	802.11g
Conducted TCs	Mode 1 : 802.11b CH01_2412 MHz	Mode 4 : 802.11g CH01_2412 MHz
	Mode 2 : 802.11b CH06_2437 MHz	Mode 5 : 802.11g CH06_2437 MHz
	Mode 3 : 802.11b CH11_2462 MHz	Mode 6 : 802.11g CH11_2462 MHz
Radiated TCs	Mode 1 : 802.11b CH01_2412 MHz	Mode 4 : 802.11g CH01_2412 MHz
	Mode 2 : 802.11b CH06_2437 MHz	Mode 5 : 802.11g CH06_2437 MHz
	Mode 3 : 802.11b CH11_2462 MHz	Mode 6 : 802.11g CH11_2462 MHz
AC Conducted Emission	Mode 1 :WLAN Link + Bluetooth Link + Adapter	
Remark: The worst case of conducted emission is mode 1; only the test data of it was reported.		

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 RF Utility

The programmed RF utility, "MyLab Tool" 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.

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

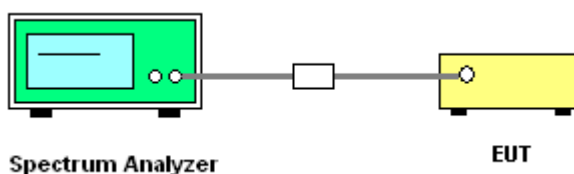
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz.
In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.
4. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

3.1.4 Test Setup

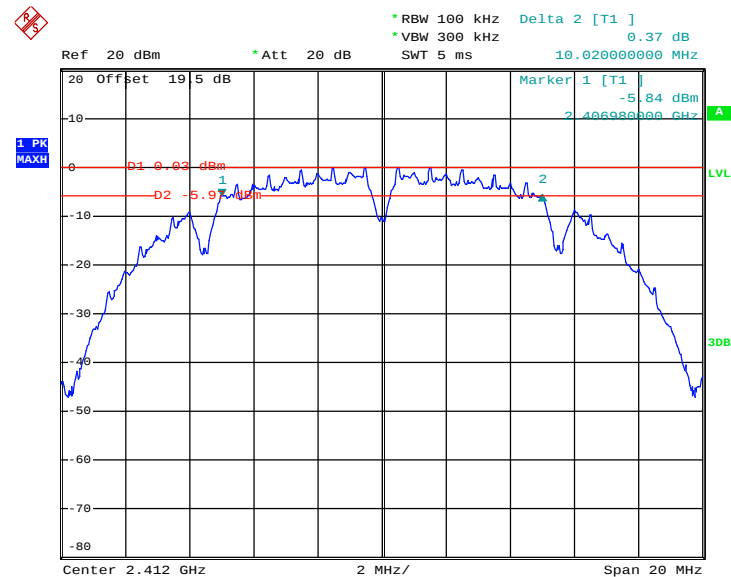


3.1.5 Test Result of 6dB Bandwidth

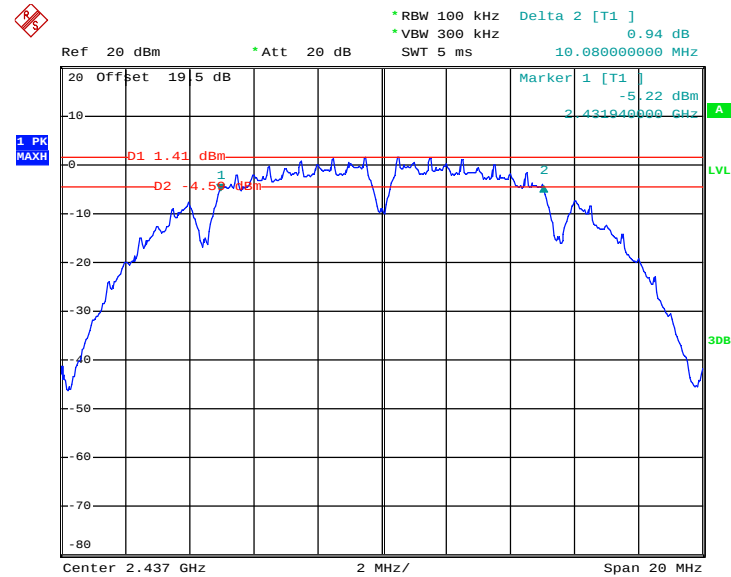
Test Mode :	Mode 1, 2, 3	Temperature :	24~26°C
Test Engineer :	Pinkston Tu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	10.02 MHz	0.5	Pass
06	2437	10.08 MHz	0.5	Pass
11	2462	10.04 MHz	0.5	Pass

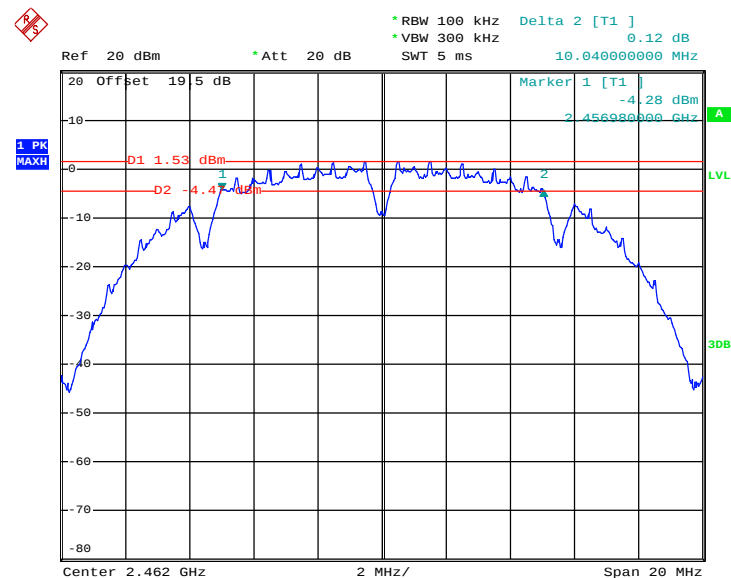
Mode 1 : 6 dB Bandwidth Plot on 802.11b Channel 01



Date: 11.AUG.2011 15:23:37

Mode 2 : 6 dB Bandwidth Plot on 802.11b Channel 06


Date: 11.AUG.2011 15:36:32

Mode 3 : 6 dB Bandwidth Plot on 802.11b Channel 11


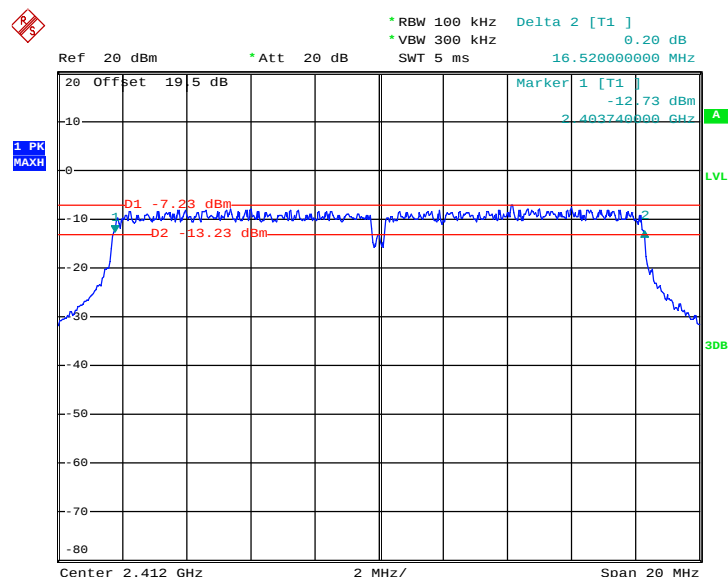
Date: 11.AUG.2011 15:53:02



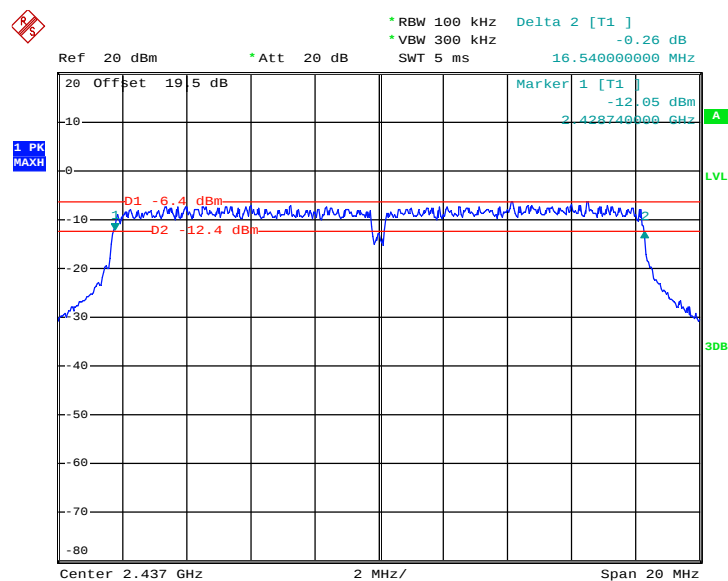
Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Pinkston Tu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	16.52 MHz	0.5	Pass
06	2437	16.54 MHz	0.5	Pass
11	2462	16.52 MHz	0.5	Pass

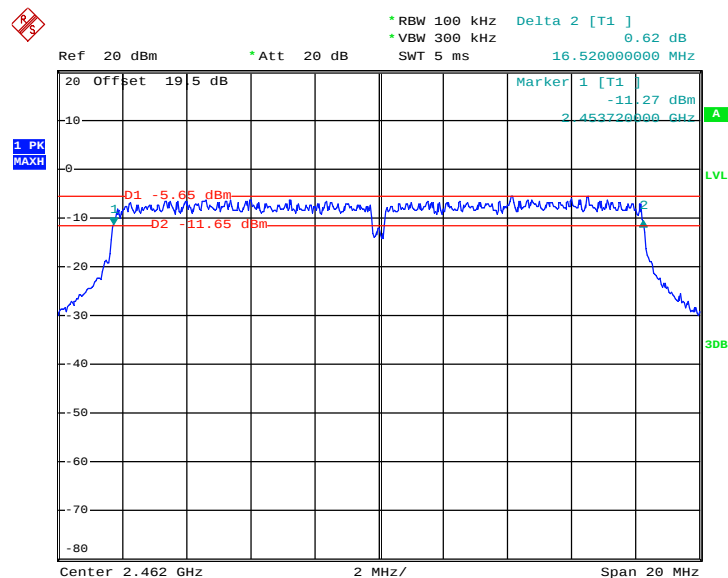
Mode 4 : 6 dB Bandwidth Plot on 802.11g Channel 01



Date: 11.AUG.2011 16:31:46

Mode 5 : 6 dB Bandwidth Plot on 802.11g Channel 06


Date: 11.AUG.2011 16:18:54

Mode 6 : 6 dB Bandwidth Plot on 802.11g Channel 11


Date: 11.AUG.2011 16:06:24

3.2 Output Power Measurement

3.2.1 Limit of 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.

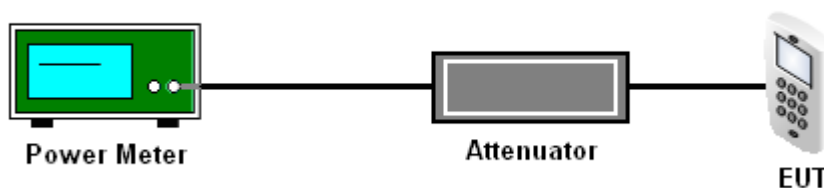
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the power meter by a low loss cable.
3. Measure the power by power meter.

3.2.4 Test Setup



3.2.5 Test Result of Output Power

Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Pinkston Tu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	13.1	30	Pass
06	2437	14.38	30	Pass
11	2462	14.73	30	Pass

Test Mode :	Mode 4, 5, 6	Temperature :	24~26℃
Test Engineer :	Pinkston Tu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11g Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	21.04	30	Pass
06	2437	21.62	30	Pass
11	2462	21.92	30	Pass

3.3 Band Edges Measurement

3.3.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. 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.

3.3.2 Measuring Instruments

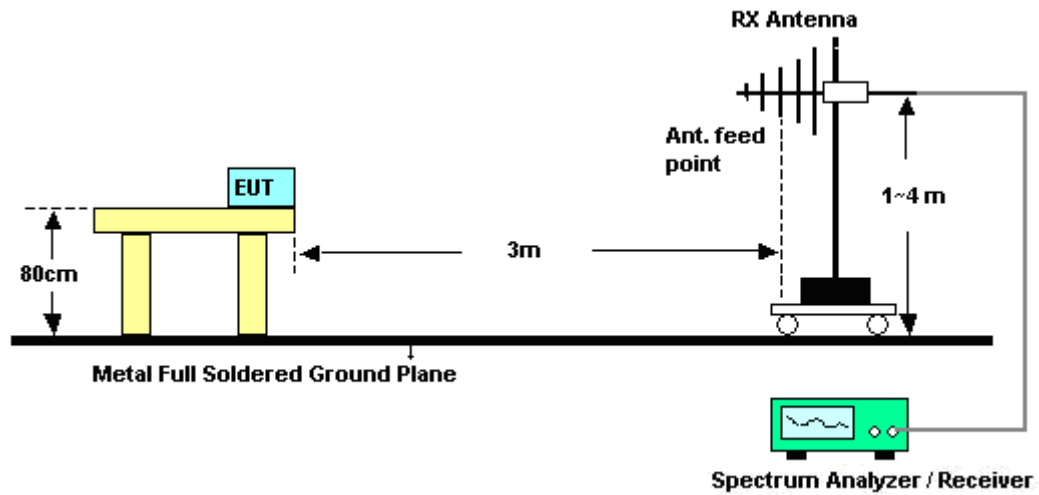
See list of measuring instruments of this test report.

3.3.3 Test Procedures

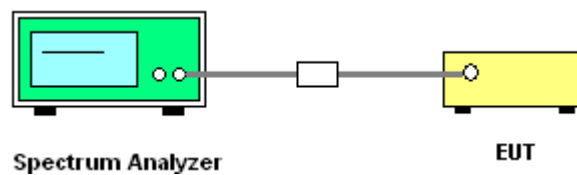
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Conducted emission test: Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Apply to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep=Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation as in FCC Section 15.35(b) and (c).

3.3.4 Test Setup

<Radiated Band Edges>



<Conducted Band Edges>



3.3.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1	Temperature :	24~25°C
Test Band :	802.11b	Relative Humidity :	50~51%
Test Channel :	01	Test Engineer :	Ivan Chiang/David Yang

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
2384.29	52.45	-21.55	74	48.07	32.2	6.03	33.85	118	270	Peak
2384.29	40.19	-13.81	54	35.81	32.2	6.03	33.85	118	270	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
2386.57	57.67	-16.33	74	53.27	32.22	6.03	33.85	100	45	Peak
2386.57	45.6	-8.4	54	41.2	32.22	6.03	33.85	100	45	Average

Test Mode :	Mode 3	Temperature :	24~25°C
Test Band :	802.11b	Relative Humidity :	50~51%
Test Channel :	11	Test Engineer :	Ivan Chiang/David Yang

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
2491.26	53.34	-20.66	74	48.76	32.3	6.18	33.9	104	46	Peak
2491.26	40.3	-13.7	54	35.72	32.3	6.18	33.9	104	46	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
2492.78	54.76	-19.24	74	50.18	32.3	6.18	33.9	100	324	Peak
2492.78	42.22	-11.78	54	37.64	32.3	6.18	33.9	100	324	Average



Test Mode :	Mode 4	Temperature :	24~25°C
Test Band :	802.11g	Relative Humidity :	50~51%
Test Channel :	01	Test Engineer :	Ivan Chiang/David Yang

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
2389.99	51.83	-22.17	74	47.43	32.22	6.03	33.85	118	57	Peak
2389.99	38.28	-15.72	54	33.88	32.22	6.03	33.85	118	57	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
2388.85	56.44	-17.56	74	52.04	32.22	6.03	33.85	100	28	Peak
2388.85	42.66	-11.34	54	38.26	32.22	6.03	33.85	100	28	Average

Test Mode :	Mode 6	Temperature :	24~25°C
Test Band :	802.11g	Relative Humidity :	50~51%
Test Channel :	11	Test Engineer :	Ivan Chiang/David Yang

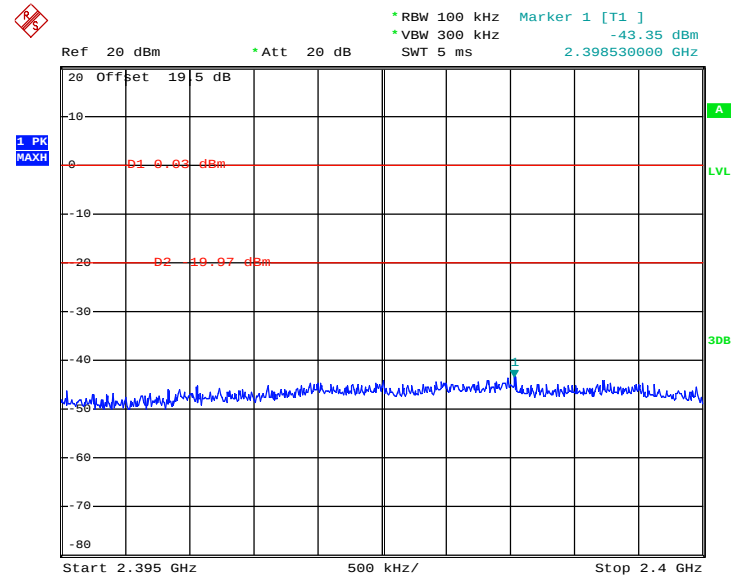
ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2498.86	49.39	-24.61	74	44.81	32.3	6.18	33.9	188	31	Peak
2498.86	36.93	-17.07	54	32.35	32.3	6.18	33.9	188	31	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
2485.18	56.87	-17.13	74	52.3	32.29	6.18	33.9	100	41	Peak
2485.18	43.98	-10.02	54	39.41	32.29	6.18	33.9	100	41	Average

3.3.6 Test Plots of Conducted Band Edges

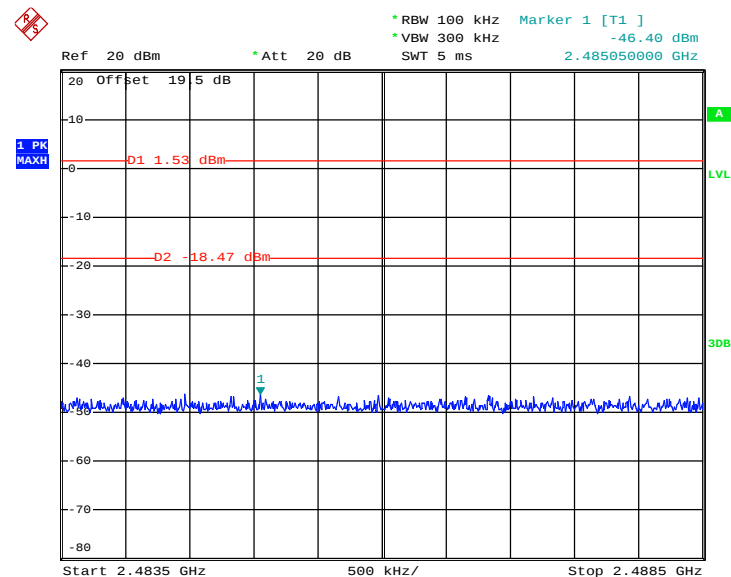
Test Mode :	Mode 1 and 3	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Pinkston Tu

Low Band Edge Plot on 802.11b Channel 01



Date: 11.AUG.2011 15:24:46

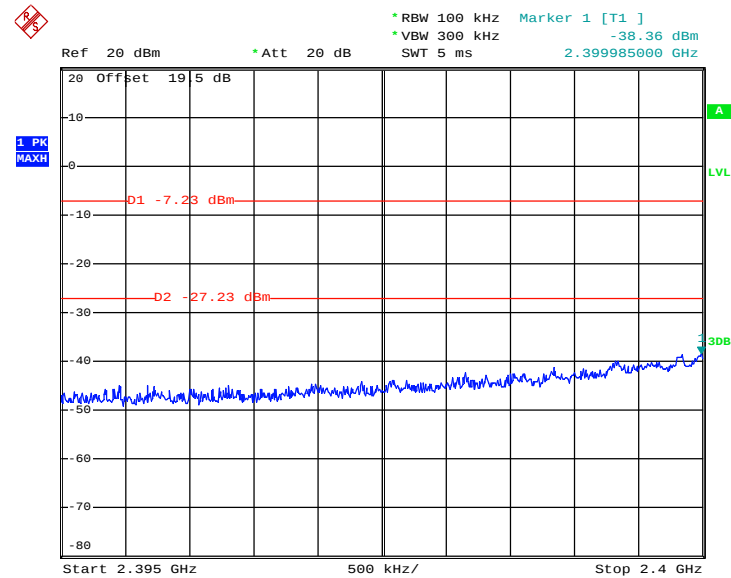
High Band Edge Plot on 802.11b Channel 11



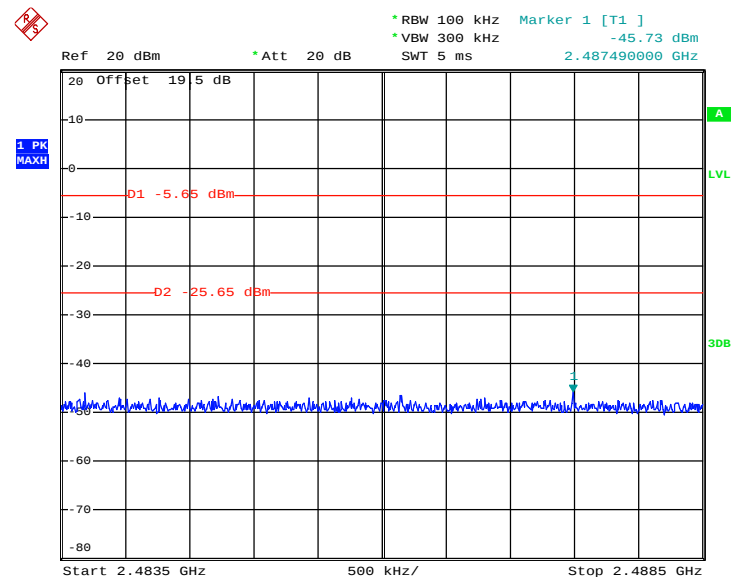
Date: 11.AUG.2011 15:53:49



Test Mode :	Mode 4 and 6	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Pinkston Tu

Low Band Edge Plot on 802.11g Channel 01

Date: 11.AUG.2011 16:32:55

High Band Edge Plot on 802.11g Channel 11

Date: 11.AUG.2011 16:07:11

3.4 Spurious Emission Measurement

3.4.1 Limit of Spurious Emission Measurement

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

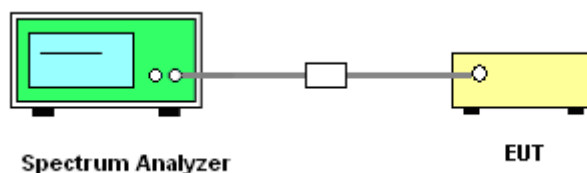
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

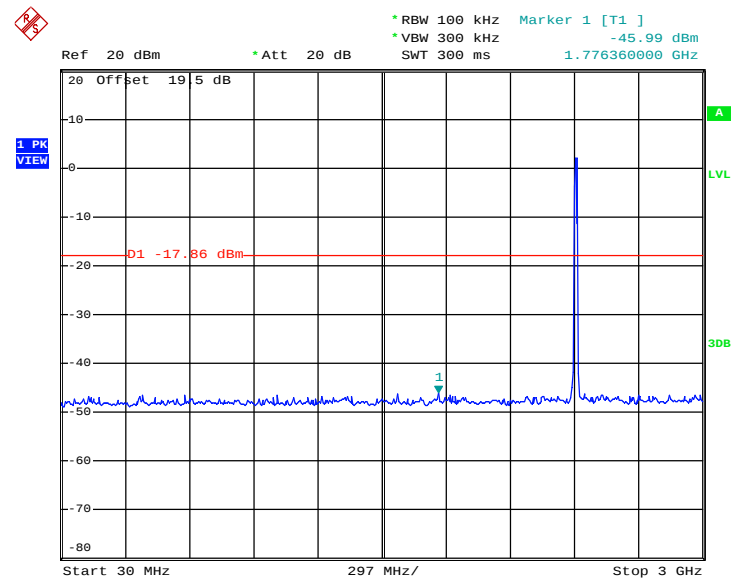
3.4.4 Test Setup



3.4.5 Test Plots of Spurious Emission

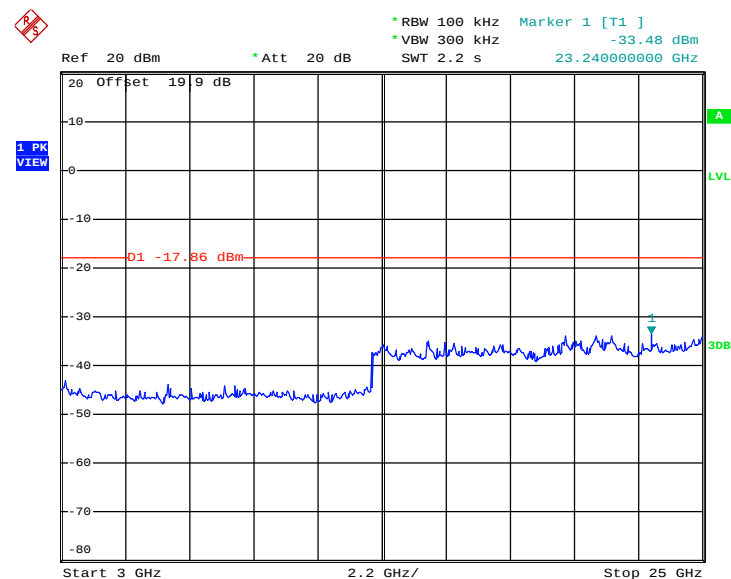
Test Mode :	Mode 1	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Pinkston Tu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 11.AUG.2011 21:44:07

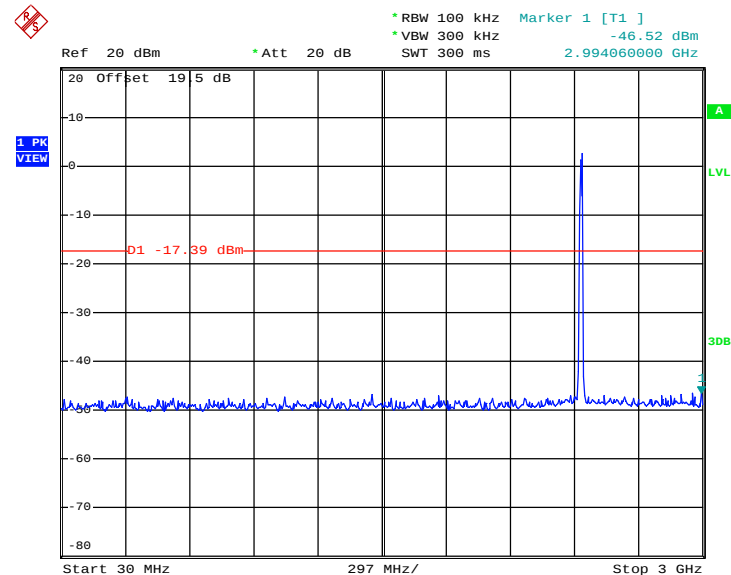
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz



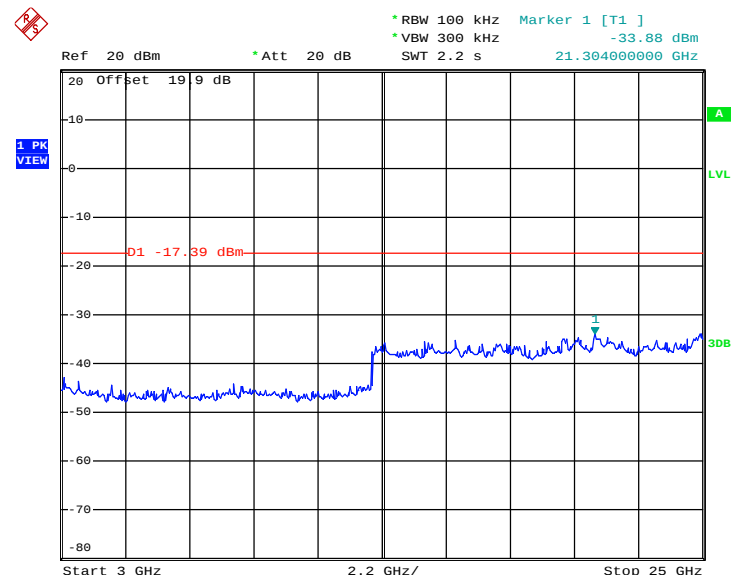
Date: 11.AUG.2011 21:47:57



Test Mode :	Mode 2	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Pinkston Tu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

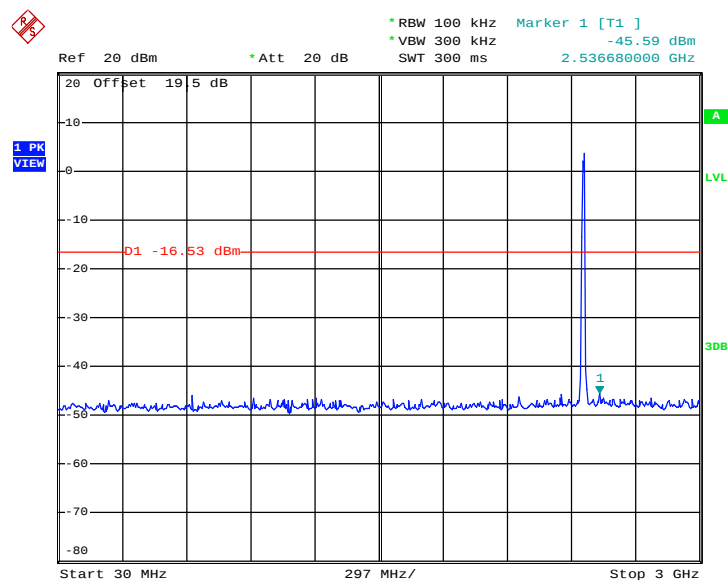
Date: 11.AUG.2011 21:57:44

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

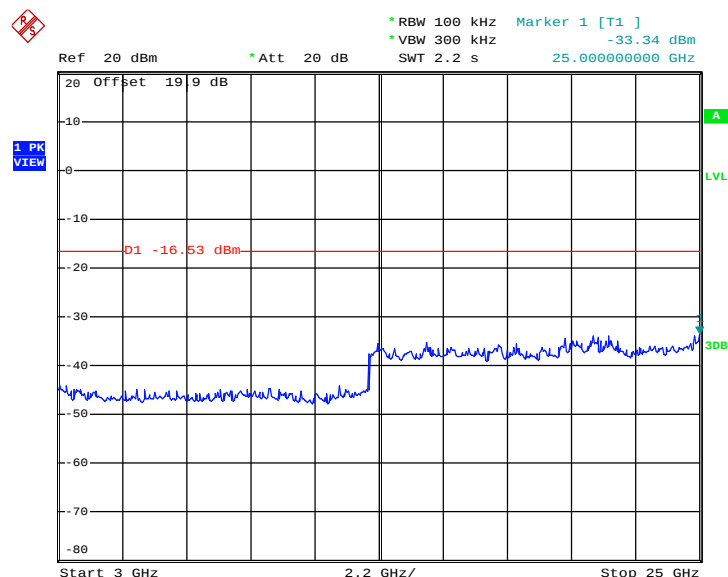
Date: 11.AUG.2011 22:00:02



Test Mode :	Mode 3	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Pinkston Tu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

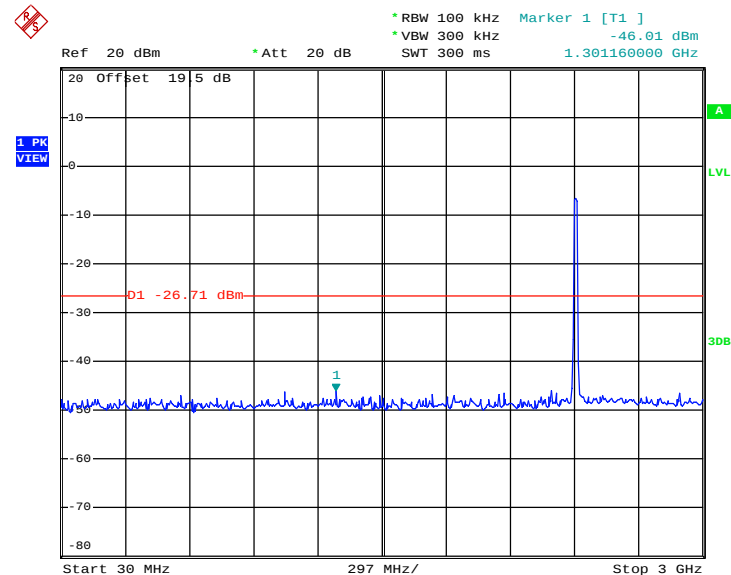
Date: 11.AUG.2011 21:53:20

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

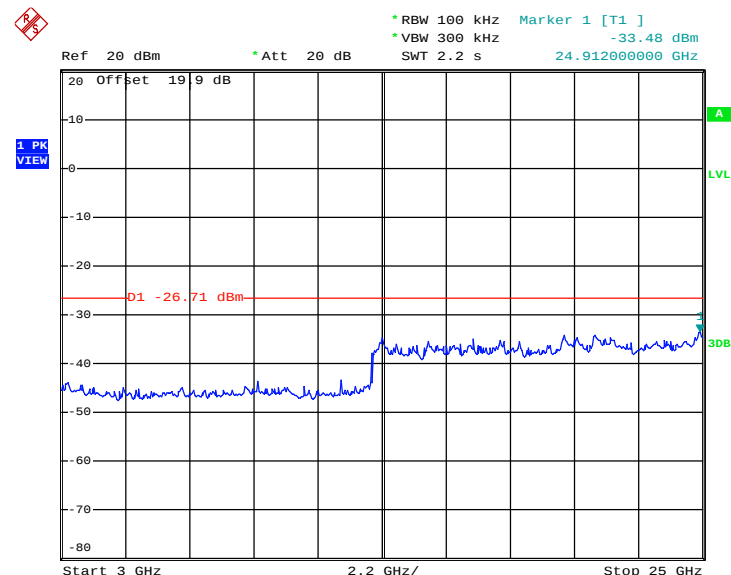
Date: 11.AUG.2011 21:54:23



Test Mode :	Mode 4	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Pinkston Tu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

Date: 11.AUG.2011 22:08:09

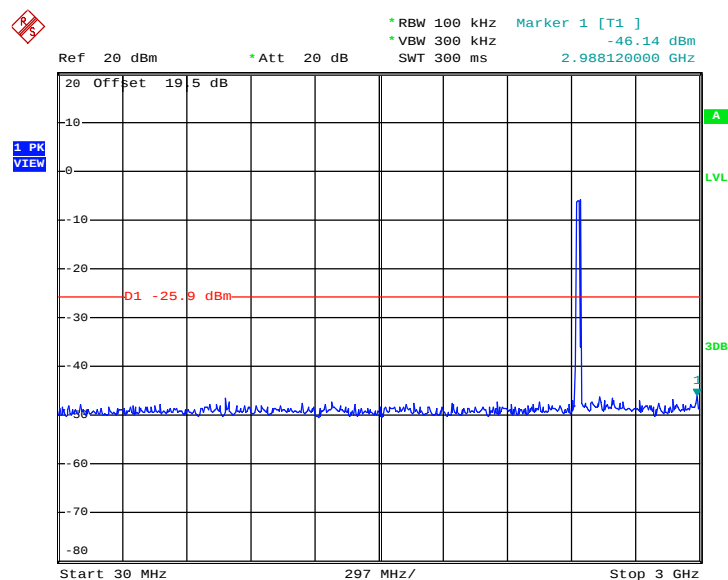
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

Date: 11.AUG.2011 22:09:19



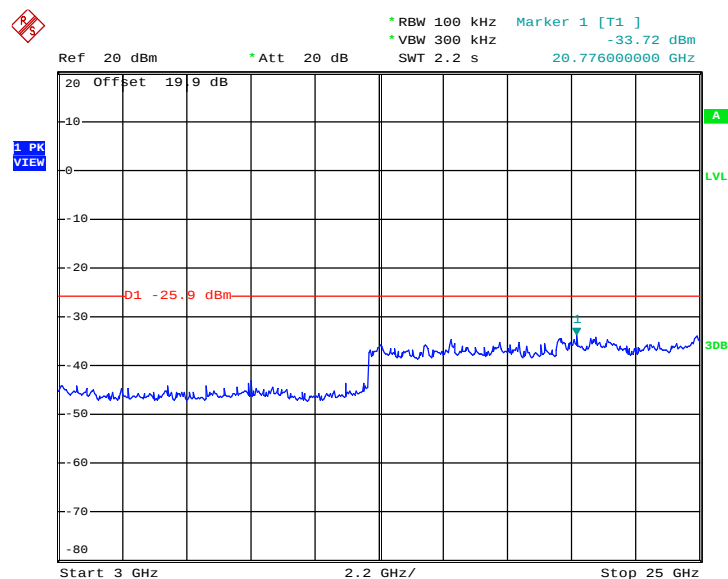
Test Mode :	Mode 5	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Pinkston Tu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 11.AUG.2011 22:02:52

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

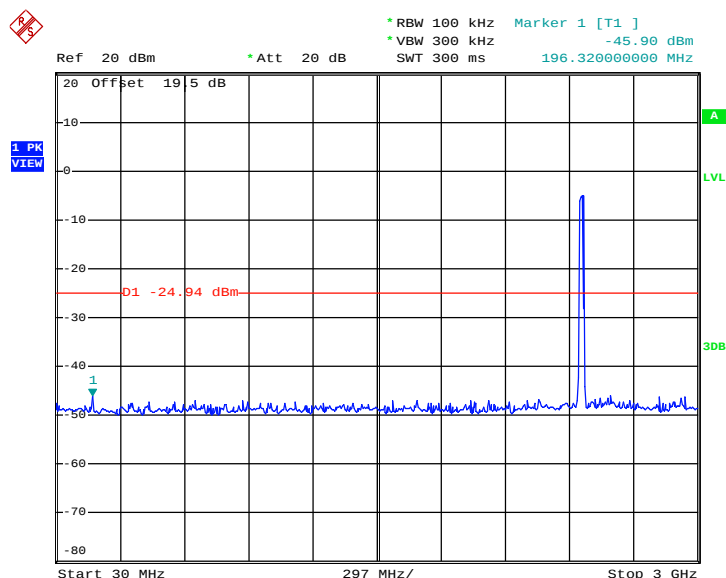


Date: 11.AUG.2011 22:04:28



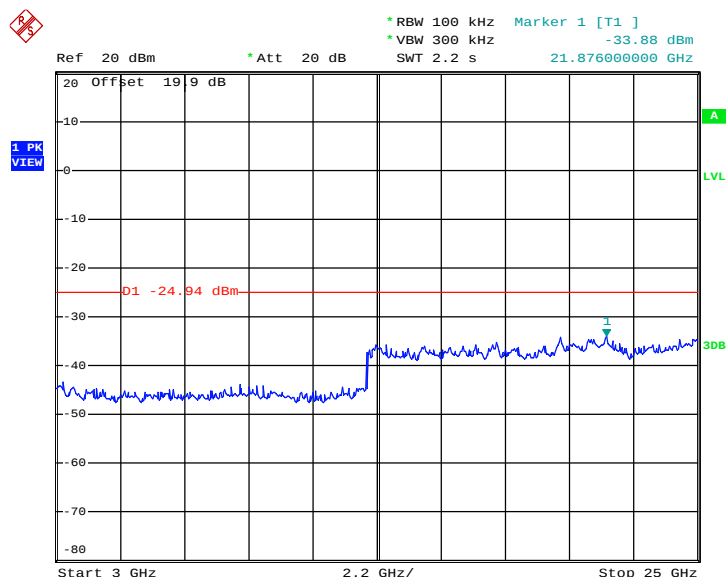
Test Mode :	Mode 6	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Pinkston Tu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 11.AUG.2011 22:11:40

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz



Date: 11.AUG.2011 22:13:15

3.5 Power Spectral Density Measurement

3.5.1 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.

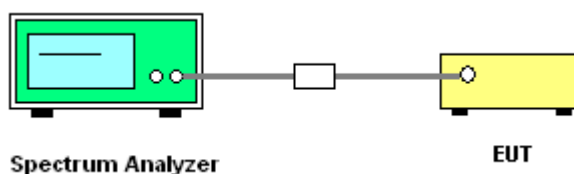
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The test follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Take the measured data from spectrum analyzer.

3.5.4 Test Setup

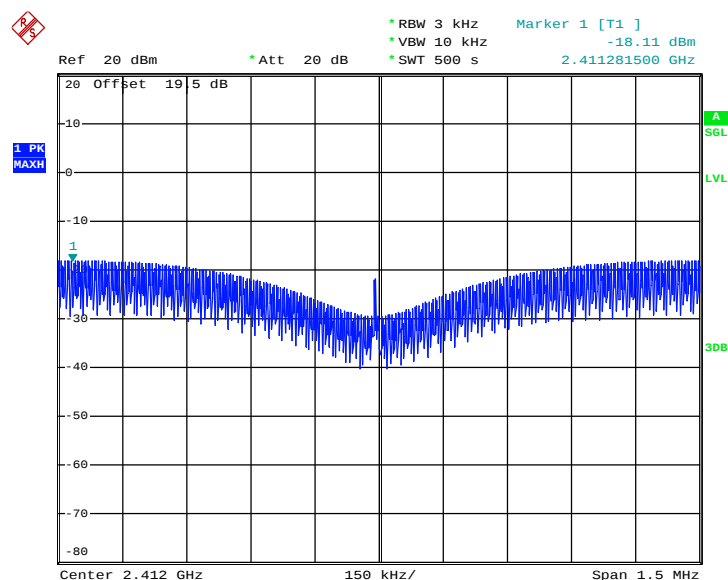


3.5.5 Test Result of Power Spectral Density

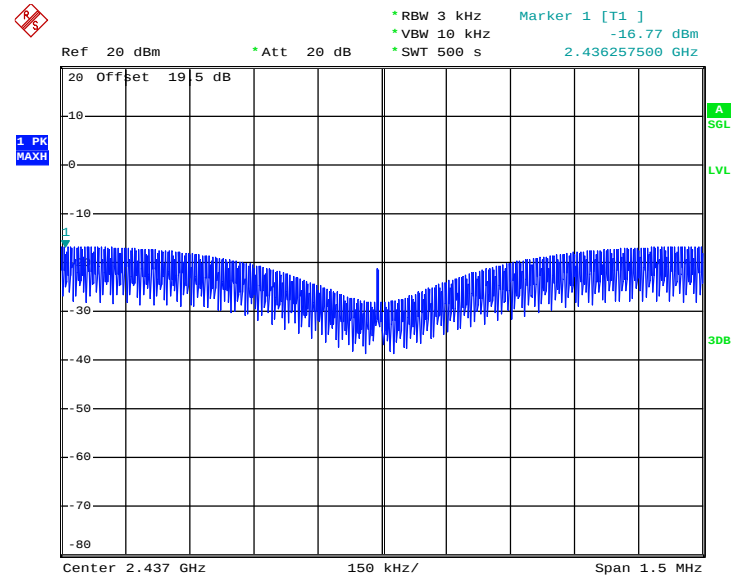
Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Pinkston Tu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-18.11	8	Pass
06	2437	-16.77	8	Pass
11	2462	-16.53	8	Pass

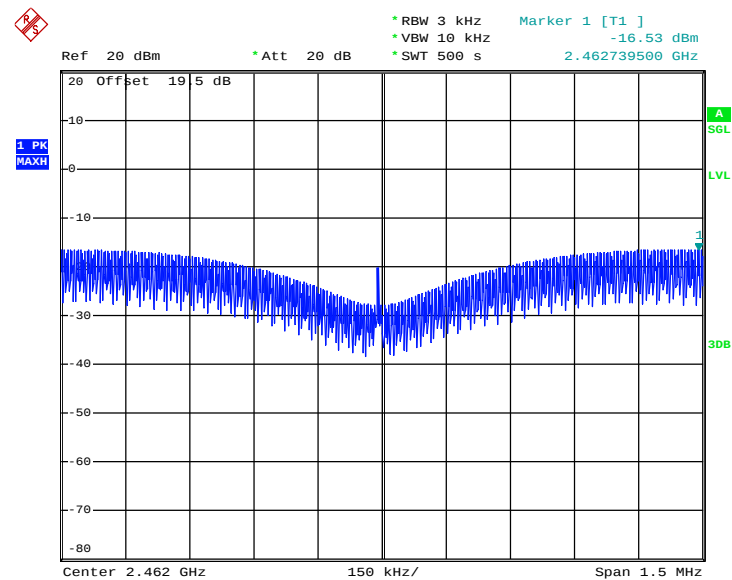
Mode 1 : PSD Plot on 802.11b Channel 01



Date: 11.AUG.2011 15:33:53

Mode 2 : PSD Plot on 802.11b Channel 06


Date: 11.AUG.2011 15:51:26

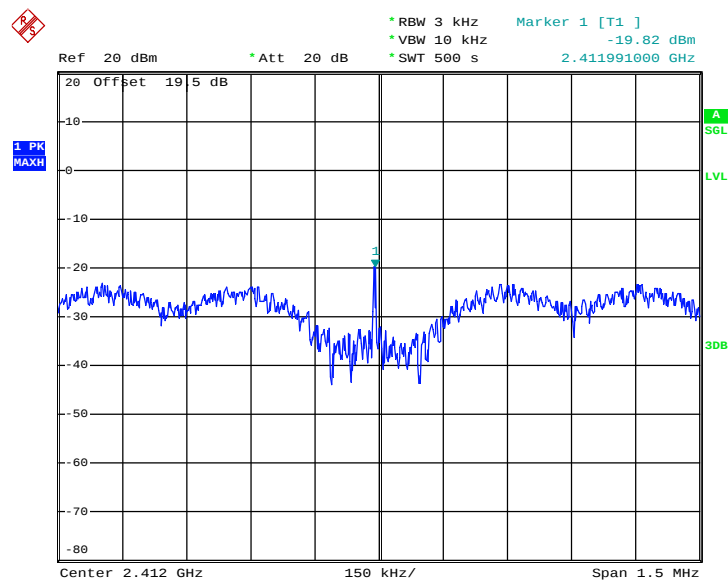
Mode 3 : PSD Plot on 802.11b Channel 11


Date: 11.AUG.2011 16:02:55

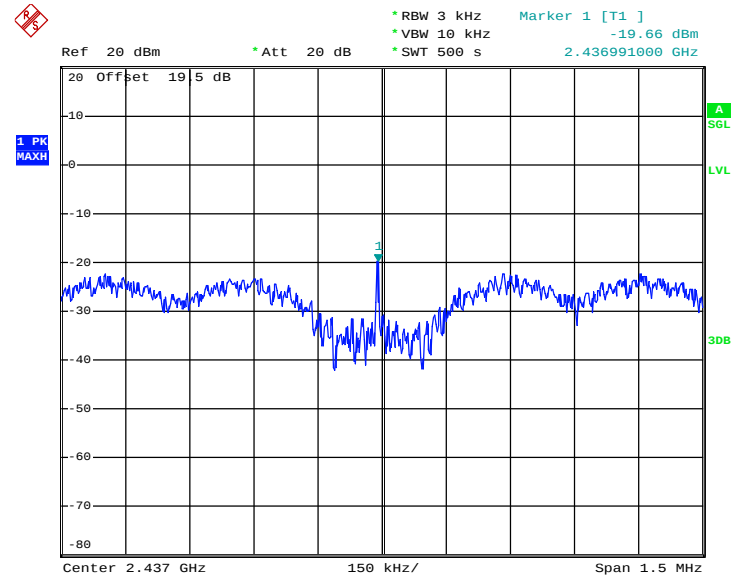


Test Mode :	Mode 4, 5, 6	Temperature :	24~26℃
Test Engineer :	Pinkston Tu	Relative Humidity :	50~53%

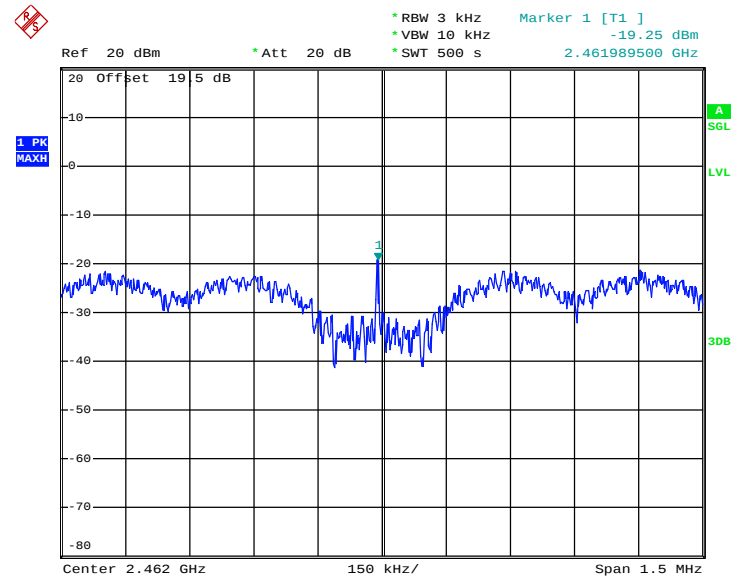
Channel	Frequency (MHz)	802.11g Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-19.82	8	Pass
06	2437	-19.66	8	Pass
11	2462	-19.25	8	Pass

Mode 4 : PSD Plot on 802.11g Channel 01

Date: 11.AUG.2011 16:42:04

Mode 5 : PSD Plot on 802.11g Channel 06


Date: 11.AUG.2011 16:27:56

Mode 6 : PSD Plot on 802.11g Channel 11


Date: 11.AUG.2011 16:16:24

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

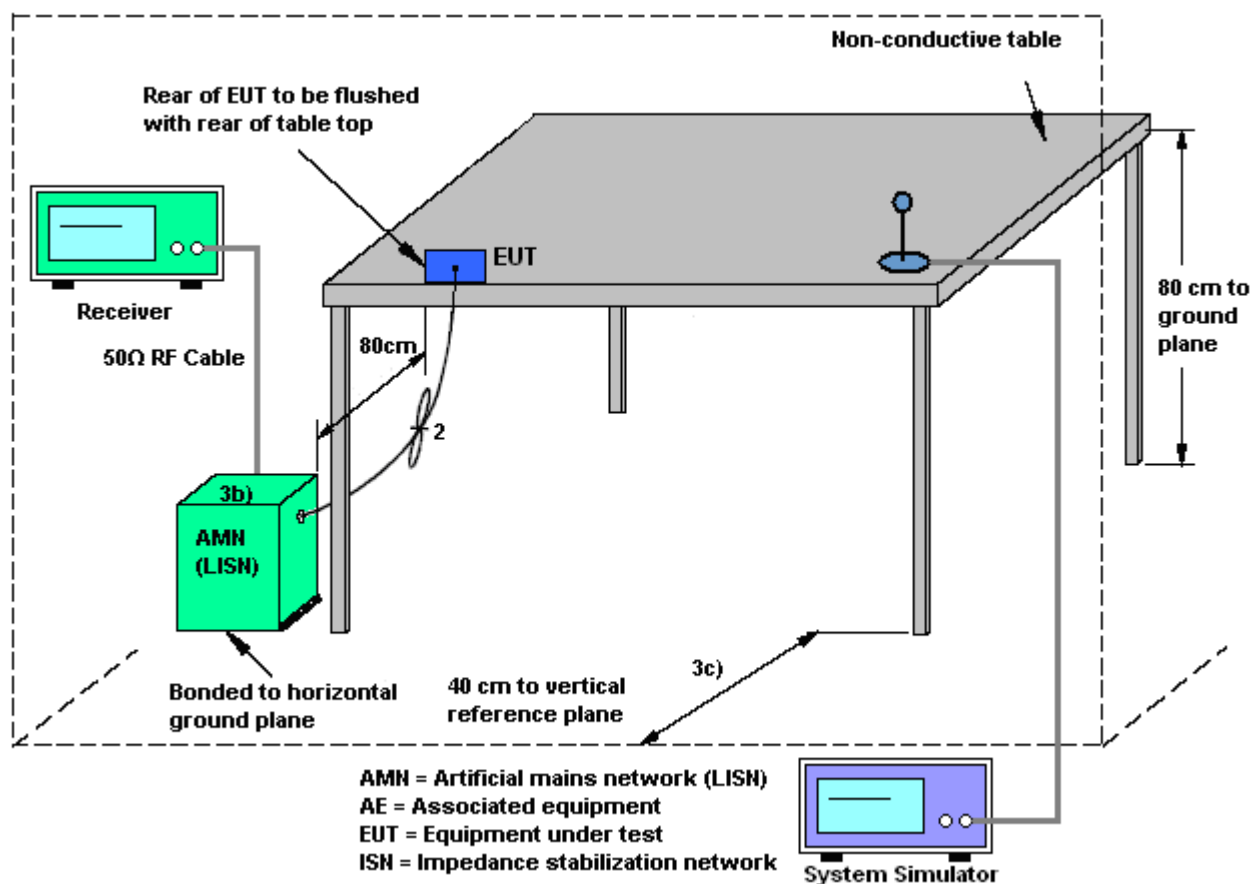
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

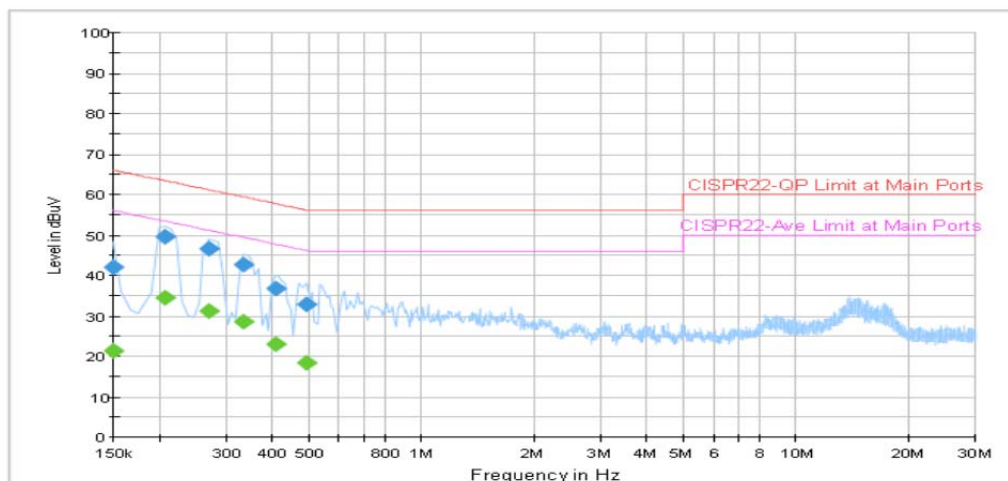
1. The testing follows the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (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 1	Temperature :	21~23℃
Test Engineer :	Kaichun Chu	Relative Humidity :	41~43%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN Link + Bluetooth Link + Adapter		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



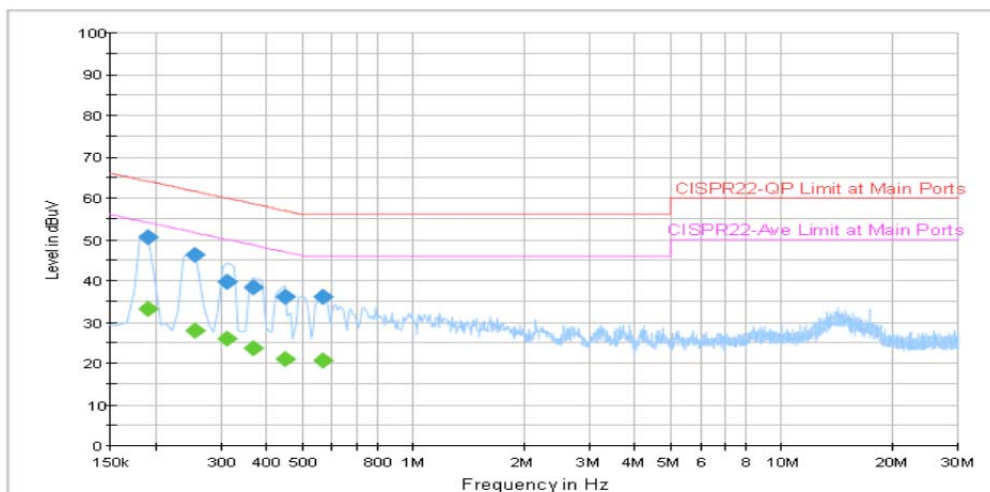
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	42.0	Off	L1	19.4	24.0	66.0
0.206000	49.4	Off	L1	19.4	14.0	63.4
0.270000	46.7	Off	L1	19.4	14.4	61.1
0.334000	42.5	Off	L1	19.4	16.9	59.4
0.406000	36.7	Off	L1	19.5	21.0	57.7
0.494000	32.8	Off	L1	19.4	23.2	56.1

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	21.2	Off	L1	19.4	34.8	56.0
0.206000	34.5	Off	L1	19.4	19.0	53.4
0.270000	31.0	Off	L1	19.4	20.1	51.1
0.334000	28.6	Off	L1	19.4	20.8	49.4
0.406000	22.8	Off	L1	19.5	24.9	47.7
0.494000	18.4	Off	L1	19.4	27.7	46.1

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Kaichun Chu	Relative Humidity :	41~43%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Link + Bluetooth Link + Adapter		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		


Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	50.6	Off	N	19.4	13.4	64.0
0.254000	46.1	Off	N	19.4	15.5	61.6
0.310000	39.7	Off	N	19.4	20.3	60.0
0.366000	38.4	Off	N	19.4	20.2	58.6
0.446000	36.0	Off	N	19.4	20.9	56.9
0.566000	36.2	Off	N	19.4	19.8	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	33.0	Off	N	19.4	21.0	54.0
0.254000	27.9	Off	N	19.4	23.7	51.6
0.310000	25.9	Off	N	19.4	24.1	50.0
0.366000	23.5	Off	N	19.4	25.1	48.6
0.446000	21.0	Off	N	19.4	25.9	46.9
0.566000	20.6	Off	N	19.4	25.4	46.0

3.7 Radiated Emission Measurement

3.7.1 Limit of Radiated 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

3.7.2 Measuring Instruments

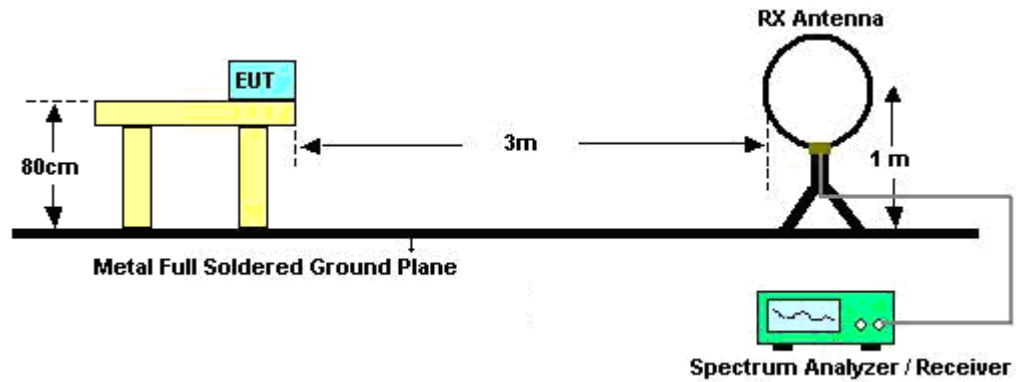
See list of measuring instruments of this test report.

3.7.3 Test Procedures

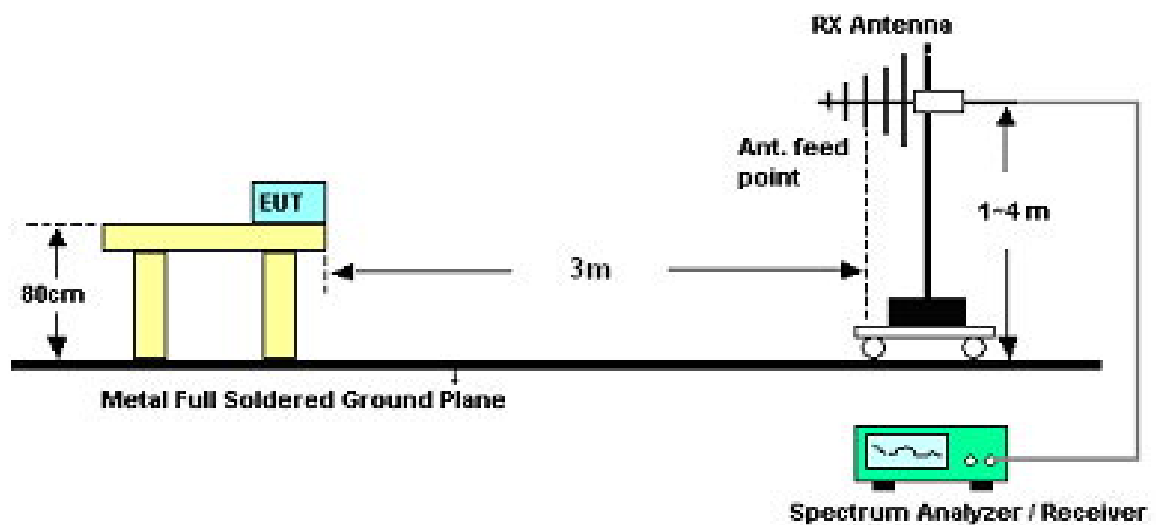
- The testing follows the guidelines in FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
- Use the following spectrum analyzer settings:
 - Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
 - Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.
Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB)
- Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.

3.7.4 Test Setup

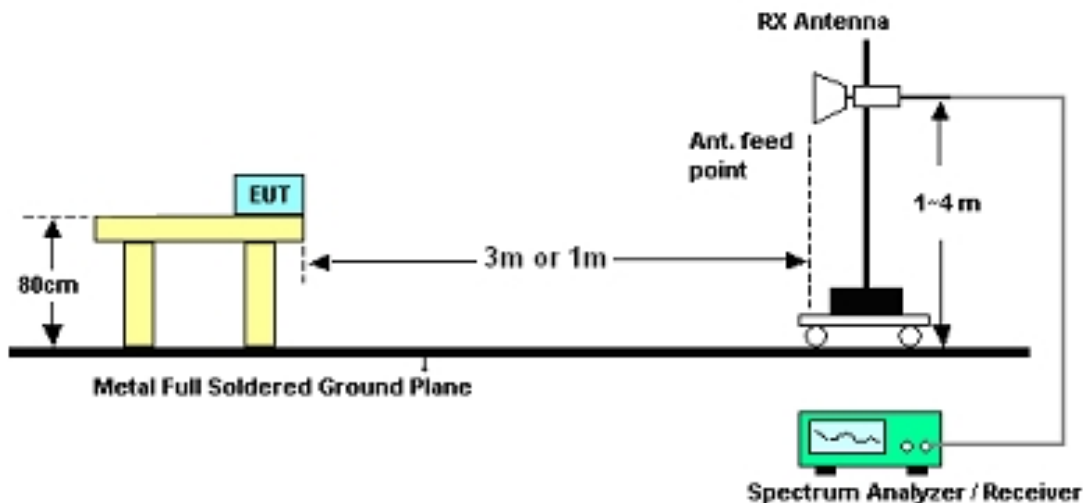
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.7.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

Test Engineer :	Ivan Chiang/David Yang	Temperature :	24~25℃	
		Relative Humidity :	50~51%	

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

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

Test Mode :	Mode 1	Temperature :	24~25°C
Test Channel :	01	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Horizontal
Remark :	2412 MHz is Fundamental Signals 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
33.78	19.1	-20.9	40	34.43	15.57	0.57	31.47	-	-	Peak
212.25	20.4	-23.1	43.5	40.51	9.99	1.37	31.47	-	-	Peak
282.18	24.35	-21.65	46	40.86	13.18	1.65	31.34	-	-	Peak
358.1	23.85	-22.15	46	37.81	15.27	2.04	31.27	-	-	Peak
682.9	22.22	-23.78	46	29.46	20.69	2.91	30.84	-	-	Peak
951	26.26	-19.74	46	29.1	24.27	3.46	30.57	100	281	Peak
2384.29	52.45	-21.55	74	48.07	32.2	6.03	33.85	118	270	Peak
2384.29	40.19	-13.81	54	35.81	32.2	6.03	33.85	118	270	Average
2412	102.61	-	-	98.18	32.23	6.07	33.87	118	270	Peak
2412	98.89	-	-	94.46	32.23	6.07	33.87	118	270	Average
2500	40.15	-13.85	54	35.57	32.3	6.18	33.9	118	270	Average
2500	52.28	-21.72	74	47.7	32.3	6.18	33.9	118	270	Peak
4824	47.55	-26.45	74	62.81	34.73	9.12	59.11	100	0	Peak



Test Mode :	Mode 1	Temperature :	24~25℃
Test Channel :	01	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Vertical
Remark :	2412 MHz is Fundamental Signals 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
30.81	24.05	-15.95	40	38.7	16.27	0.54	31.46	120	163	Peak
88.05	24.13	-19.37	43.5	46.34	8.39	0.93	31.53	-	-	Peak
290.82	22.21	-23.79	46	38.51	13.32	1.7	31.32	-	-	Peak
366.5	22.77	-23.23	46	36.42	15.54	2.07	31.26	-	-	Peak
545.7	22.91	-23.09	46	32.43	18.93	2.54	30.99	-	-	Peak
987.4	27.26	-26.74	54	29.61	24.73	3.5	30.58	-	-	Peak
2386.57	57.67	-16.33	74	53.27	32.22	6.03	33.85	100	45	Peak
2386.57	45.6	-8.4	54	41.2	32.22	6.03	33.85	100	45	Average
2412	108.89	-	-	104.46	32.23	6.07	33.87	100	45	Peak
2412	105.23	-	-	100.8	32.23	6.07	33.87	100	45	Average
2484	47.47	-6.53	54	42.9	32.29	6.18	33.9	100	45	Average
2484	59.14	-14.86	74	54.57	32.29	6.18	33.9	100	45	Peak
4824	44.53	-29.47	74	59.79	34.73	9.12	59.11	100	0	Peak

Test Mode :	Mode 2	Temperature :	24~25℃
Test Channel :	06	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Horizontal
Remark :	2437 MHz is Fundamental Signals 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
32.7	18.67	-21.33	40	33.78	15.8	0.56	31.47	-	-	Peak
142.05	29.45	-14.05	43.5	48.34	11.46	1.2	31.55	117	88	Peak
299.46	24.07	-21.93	46	40.17	13.46	1.77	31.33	-	-	Peak
315.4	23.67	-22.33	46	39.25	13.94	1.8	31.32	-	-	Peak
710.9	23.07	-22.93	46	29.83	21.06	2.97	30.79	-	-	Peak
974.1	26.55	-27.45	54	29.08	24.56	3.48	30.57	-	-	Peak
2358	50.77	-23.23	74	46.43	32.19	5.99	33.84	108	41	Peak
2358	38.15	-15.85	54	33.81	32.19	5.99	33.84	108	41	Average
2437	103.52	-	-	99.03	32.26	6.11	33.88	108	41	Peak
2437	99.86	-	-	95.37	32.26	6.11	33.88	108	41	Average
2486	50.98	-23.02	74	46.41	32.29	6.18	33.9	108	41	Peak
2486	37.67	-16.33	54	33.1	32.29	6.18	33.9	108	41	Average
4874	46.84	-27.16	74	62.03	34.72	9.13	59.04	100	0	Peak

Test Mode :	Mode 2	Temperature :	24~25℃
Test Channel :	06	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Vertical
Remark :	2437 MHz is Fundamental Signals 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
30.81	25.12	-14.88	40	39.77	16.27	0.54	31.46	100	129	Peak
235.74	24.74	-21.26	46	43.02	11.64	1.51	31.43	-	-	Peak
258.42	27.76	-18.24	46	44.81	12.79	1.58	31.42	-	-	Peak
368.6	22.79	-23.21	46	36.37	15.6	2.08	31.26	-	-	Peak
545.7	22.72	-23.28	46	32.24	18.93	2.54	30.99	-	-	Peak
775.3	24.27	-21.73	46	29.79	22.07	3.1	30.69	-	-	Peak
2366	55.49	-18.51	74	51.15	32.19	5.99	33.84	100	45	Peak
2366	42.29	-11.71	54	37.95	32.19	5.99	33.84	100	45	Average
2437	107.45	-	-	102.96	32.26	6.11	33.88	100	45	Peak
2437	103.84	-	-	99.35	32.26	6.11	33.88	100	45	Average
2500	55.79	-18.21	74	51.21	32.3	6.18	33.9	100	45	Peak
2500	43.1	-10.9	54	38.52	32.3	6.18	33.9	100	45	Average
4874	45.19	-28.81	74	60.38	34.72	9.13	59.04	100	0	Peak



Test Mode :	Mode 3	Temperature :	24~25℃
Test Channel :	11	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Horizontal
Remark :	2462 MHz is Fundamental Signals 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
30.81	19.51	-20.49	40	34.16	16.27	0.54	31.46	100	314	Peak
235.74	24.16	-21.84	46	42.44	11.64	1.51	31.43	-	-	Peak
299.46	24.4	-21.6	46	40.5	13.46	1.77	31.33	-	-	Peak
341.3	24.26	-21.74	46	38.91	14.75	1.9	31.3	-	-	Peak
671	23.34	-22.66	46	30.75	20.56	2.88	30.85	-	-	Peak
817.3	25.01	-20.99	46	29.85	22.67	3.19	30.7	-	-	Peak
2374	50.12	-23.88	74	45.77	32.2	5.99	33.84	104	46	Peak
2374	37.21	-16.79	54	32.86	32.2	5.99	33.84	104	46	Average
2462	104.08	-	-	99.56	32.27	6.14	33.89	104	46	Peak
2462	100.27	-	-	95.75	32.27	6.14	33.89	104	46	Average
2491.26	53.34	-20.66	74	48.76	32.3	6.18	33.9	104	46	Peak
2491.26	40.3	-13.7	54	35.72	32.3	6.18	33.9	104	46	Average
4924	47.41	-26.59	74	62.51	34.71	9.15	58.96	100	0	Peak

Test Mode :	Mode 3	Temperature :	24~25℃
Test Channel :	11	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Vertical
Remark :	2462 MHz is Fundamental Signals 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
30.81	24.93	-15.07	40	39.58	16.27	0.54	31.46	100	211	Peak
194.97	22.34	-21.16	43.5	43.44	9.09	1.3	31.49	-	-	Peak
236.01	26.65	-19.35	46	44.93	11.64	1.51	31.43	-	-	Peak
410.6	26.4	-19.6	46	38.65	16.74	2.18	31.17	-	-	Peak
545.7	23.43	-22.57	46	32.95	18.93	2.54	30.99	-	-	Peak
816.6	24.51	-21.49	46	29.37	22.66	3.18	30.7	-	-	Peak
2382	41.89	-12.11	54	37.51	32.2	6.03	33.85	100	324	Average
2382	53.95	-20.05	74	49.57	32.2	6.03	33.85	100	324	Peak
2462	107.85	-	-	103.33	32.27	6.14	33.89	100	324	Peak
2462	104.09	-	-	99.57	32.27	6.14	33.89	100	324	Average
2492.78	54.76	-19.24	74	50.18	32.3	6.18	33.9	100	324	Peak
2492.78	42.22	-11.78	54	37.64	32.3	6.18	33.9	100	324	Average
4924	45.31	-28.69	74	60.41	34.71	9.15	58.96	100	0	Peak

Test Mode :	Mode 4	Temperature :	24~25℃
Test Channel :	01	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Horizontal
Remark :	2412 MHz is Fundamental Signals 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
34.05	19.03	-20.97	40	34.36	15.57	0.57	31.47	-	-	Peak
220.89	23.3	-22.7	46	42.72	10.61	1.43	31.46	-	-	Peak
281.37	24.2	-21.8	46	40.74	13.17	1.64	31.35	-	-	Peak
341.3	25.42	-20.58	46	40.07	14.75	1.9	31.3	104	85	Peak
624.1	22.02	-23.98	46	30.13	20.03	2.76	30.9	-	-	Peak
996.5	26.6	-27.4	54	28.83	24.84	3.51	30.58	-	-	Peak
2389.99	51.83	-22.17	74	47.43	32.22	6.03	33.85	118	57	Peak
2389.99	38.28	-15.72	54	33.88	32.22	6.03	33.85	118	57	Average
2412	99.31	-	-	94.87	32.24	6.07	33.87	118	57	Peak
2412	89.99	-	-	85.56	32.23	6.07	33.87	118	57	Average
2500	35.64	-18.36	54	31.06	32.3	6.18	33.9	118	57	Average
2500	49.68	-24.32	74	45.1	32.3	6.18	33.9	118	57	Peak

Test Mode :	Mode 4	Temperature :	24~25℃
Test Channel :	01	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Vertical
Remark :	2412 MHz is Fundamental Signals 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
31.62	24.28	-15.72	40	39.15	16.04	0.55	31.46	100	202	Peak
177.69	22.05	-21.45	43.5	43.08	9.26	1.24	31.53	-	-	Peak
247.62	24.29	-21.71	46	41.71	12.46	1.53	31.41	-	-	Peak
341.3	21.82	-24.18	46	36.47	14.75	1.9	31.3	-	-	Peak
545.7	23.09	-22.91	46	32.61	18.93	2.54	30.99	-	-	Peak
990.9	27.03	-26.97	54	29.33	24.78	3.5	30.58	-	-	Peak
2388.85	56.44	-17.56	74	52.04	32.22	6.03	33.85	100	28	Peak
2388.85	42.66	-11.34	54	38.26	32.22	6.03	33.85	100	28	Average
2412	105.65	-	-	101.22	32.23	6.07	33.87	100	28	Peak
2412	96.5	-	-	92.07	32.23	6.07	33.87	100	28	Average
2486	43.15	-10.85	54	38.58	32.29	6.18	33.9	100	28	Average
2486	55.36	-18.64	74	50.79	32.29	6.18	33.9	100	28	Peak



Test Mode :	Mode 5	Temperature :	24~25℃
Test Channel :	06	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Horizontal
Remark :	2437 MHz is Fundamental Signals 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
31.89	18.73	-21.27	40	33.6	16.04	0.55	31.46	-	-	Peak
224.94	23.67	-22.33	46	42.78	10.89	1.45	31.45	-	-	Peak
282.18	23.59	-22.41	46	40.1	13.18	1.65	31.34	-	-	Peak
315.4	25.12	-20.88	46	40.7	13.94	1.8	31.32	-	-	Peak
416.2	22.6	-23.4	46	34.73	16.83	2.2	31.16	-	-	Peak
858.6	26.18	-19.82	46	30.47	23.15	3.28	30.72	110	254	Peak
2356	48.77	-25.23	74	44.46	32.19	5.95	33.83	100	205	Peak
2356	36.1	-17.9	54	31.79	32.19	5.95	33.83	100	205	Average
2437	98.1	-	-	93.61	32.26	6.11	33.88	100	205	Peak
2437	88.87	-	-	84.38	32.26	6.11	33.88	100	205	Average
2484	48.99	-25.01	74	44.42	32.29	6.18	33.9	100	205	Peak
2484	36.92	-17.08	54	32.35	32.29	6.18	33.9	100	205	Average
4874	44	-30	74	59.19	34.72	9.13	59.04	100	0	Peak

Test Mode :	Mode 5	Temperature :	24~25℃
Test Channel :	06	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Vertical
Remark :	2437 MHz is Fundamental Signals 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
31.62	24.64	-15.36	40	39.51	16.04	0.55	31.46	100	309	Peak
194.97	22.53	-20.97	43.5	43.63	9.09	1.3	31.49	-	-	Peak
259.77	23.6	-22.4	46	40.61	12.82	1.59	31.42	-	-	Peak
385.4	22.94	-23.06	46	35.94	16.11	2.11	31.22	-	-	Peak
545.7	23.1	-22.9	46	32.62	18.93	2.54	30.99	-	-	Peak
988.1	27.31	-26.69	54	29.65	24.74	3.5	30.58	-	-	Peak
2374	53.72	-20.28	74	49.37	32.2	5.99	33.84	100	24	Peak
2374	41.57	-12.43	54	37.22	32.2	5.99	33.84	100	24	Average
2437	95.55	-	-	91.06	32.26	6.11	33.88	100	24	Average
2437	104.88	-	-	100.39	32.26	6.11	33.88	100	24	Peak
2484	54.3	-19.7	74	49.73	32.29	6.18	33.9	100	24	Peak
2484	42.25	-11.75	54	37.68	32.29	6.18	33.9	100	24	Average

Test Mode :	Mode 6	Temperature :	24~25℃
Test Channel :	11	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Horizontal
Remark :	2462 MHz is Fundamental Signals 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
31.62	19.21	-20.79	40	34.08	16.04	0.55	31.46	-	-	Peak
238.17	23	-23	46	41.05	11.85	1.52	31.42	-	-	Peak
281.37	23.82	-22.18	46	40.36	13.17	1.64	31.35	-	-	Peak
332.9	27.1	-18.9	46	42.07	14.48	1.86	31.31	124	115	Peak
573.7	20.33	-25.67	46	29.29	19.37	2.62	30.95	-	-	Peak
729.8	23.66	-22.34	46	30.05	21.35	3.01	30.75	-	-	Peak
2388	47.27	-26.73	74	42.87	32.22	6.03	33.85	188	31	Peak
2388	35.34	-18.66	54	30.94	32.22	6.03	33.85	188	31	Average
2462	89.16	-	-	84.64	32.27	6.14	33.89	188	31	Average
2462	98.57	-	-	94.05	32.27	6.14	33.89	188	31	Peak
2498.86	49.39	-24.61	74	44.81	32.3	6.18	33.9	188	31	Peak
2498.86	36.93	-17.07	54	32.35	32.3	6.18	33.9	188	31	Average

Test Mode :	Mode 6	Temperature :	24~25℃
Test Channel :	11	Relative Humidity :	50~51%
Test Engineer :	Ivan Chiang/David Yang	Polarization :	Vertical
Remark :	2462 MHz is Fundamental Signals 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
30.81	24.44	-15.56	40	39.09	16.27	0.54	31.46	104	277	Peak
251.13	26.67	-19.33	46	43.85	12.69	1.54	31.41	-	-	Peak
264.09	26	-20	46	42.9	12.89	1.61	31.4	-	-	Peak
379.8	22.63	-23.37	46	35.81	15.96	2.1	31.24	-	-	Peak
545.7	24.79	-21.21	46	34.31	18.93	2.54	30.99	-	-	Peak
996.5	26.78	-27.22	54	29.01	24.84	3.51	30.58	-	-	Peak
2364	54.26	-19.74	74	49.92	32.19	5.99	33.84	100	41	Peak
2364	42.02	-11.98	54	37.68	32.19	5.99	33.84	100	41	Average
2462	105.99	-	-	101.47	32.27	6.14	33.89	100	41	Peak
2462	96.56	-	-	92.04	32.27	6.14	33.89	100	41	Average
2485.18	56.87	-17.13	74	52.3	32.29	6.18	33.9	100	41	Peak
2485.18	43.98	-10.02	54	39.41	32.29	6.18	33.9	100	41	Average
4924	44.2	-29.8	74	59.3	34.71	9.15	58.96	100	0	Peak

3.8 Antenna Requirements

3.8.1 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. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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.

3.8.2 Antenna Connected Construction

The antennas type used in this product is PCB Antenna without connector and it is considered to meet antenna requirement.

3.8.3 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	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Jun. 12, 2012	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 13, 2010	Sep. 12, 2011	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 14, 2010	Sep. 13, 2011	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCS 30	100356	9KHz – 2.75GHz	Aug. 15, 2011	Aug. 14, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz – 30MHz	Dec. 03, 2010	Dec. 02, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz – 30MHz	Dec. 01, 2010	Nov. 30, 2011	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP40	100057	9KHz-40GHz	Oct. 25, 2010	Oct. 24, 2011	Radiation (03CH06- HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz-1000MHz	May. 10, 2011	May. 09, 2012	Radiation (03CH06- HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Oct. 31, 2010	Oct. 31, 2011	Radiation (03CH06- HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Aug. 01, 2011	Jul. 31, 2012	Radiation (03CH06- HY)
Double Ridge Horn Antenna	Training Research	AH-0801	95119	8GHz~18GHz	Oct. 20, 2010	Oct. 19, 2011	Radiation (03CH06- HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH06- HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 14, 2011	Apr. 13, 2012	Radiation (03CH06- HY)
Amplifier	Agilent	310N	186713	9KHz~1GHz	Apr. 14, 2011	Apr. 13, 2012	Radiation (03CH06- HY)

5 Uncertainty of Evaluation

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty $U_c(y)$	1.13		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26		

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty $U_c(y)$	1.27		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54		

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

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	± 0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	± 1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	± 0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	± 2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	± 1.50	Rectangular	0.87	1	0.87
Site Imperfection	± 2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\log(1-\Gamma_1*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				



Appendix A. Photographs of EUT

Please refer to Sporton report number EP180802-02 as below.