

FCC RF Test Report

APPLICANT : Honeywell International Inc
EQUIPMENT : 99EX Mobile computer
BRAND NAME : Honeywell
MODEL NAME : 99EX
FCC ID : HD599EXL00
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Transmission System (DTS)

The product was received on Sep. 28, 2011 and completely tested on Oct. 13, 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.



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR0D0904-17	Rev. 01	Initial issue of report	Oct. 20, 2011
FR0D0904-17	Rev. 02	Update report for adding 5G Radiated Emission Measurement data	Oct. 24, 2011

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 Measurement	$\leq 30\text{dBm}$	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 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 16.30 dB at 0.318 MHz
3.7	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.52 dB at 171.21 MHz
3.8	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Honeywell International Inc

9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.2 Manufacturer

Honeywell International Inc

9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	99EX Mobile computer
Brand Name	Honeywell
Model Name	99EX
FCC ID	HD599EXL00
Tx/Rx Frequency Range	802.11b/g/n : 2400 MHz ~ 2483.5 MHz 802.11a/n : 5725 MHz ~ 5850 MHz
Channel Spacing	802.11b/g/n : 5 MHz 802.11a/n : 20 MHz
Maximum Output Power to Antenna	<2400 MHz ~ 2483.5 MHz> 802.11b : 20.55 dBm (0.1135 W) 802.11g : 24.03 dBm (0.2529 W) 802.11n (BW 20MHz) : 24.01 dBm (0.2581 W) <5725 MHz ~ 5850 MHz> 802.11a : 22.34 dBm (0.1714 W) 802.11n (BW 20MHz) : 22.25 dBm (0.1679 W)
Antenna Type	802.11b/g/n : PIFA Antenna with gain 2.5 dBi 802.11a/n : PIFA Antenna with gain 3.5 dBi
HW Version	5
SW Version	26.01
Type of Modulation	802.11b : DSSS (BPSK / QPSK / CCK) 802.11a/g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Production Unit

Remark:

1. For other wireless features of this EUT, test report will be issued separately.
2. This test report recorded only product characteristics and test results of Digital Transmission System (DTS).
3. 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	03CH06HY	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
- ♦ 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 (DoC), 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	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
5.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
6.	iPod	Apple	A1199	FCC DoC	Shielded, 1.0 m	N/A
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 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 RF Power (dBm)			
		DSSS Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	20.41	-	-	-
CH 06	2437 MHz	20.55	20.53	20.34	20.30
CH 11	2462 MHz	20.38	-	-	-

Channel	Frequency	2.4GHz 802.11g 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	21.72	-	-	-	-	-	-	-
CH 06	2437 MHz	24.03	24.00	23.98	23.89	23.75	23.56	22.58	22.68
CH 11	2462 MHz	21.68	-	-	-	-	-	-	-

Channel	Frequency	2.4GHz 802.11n (BW 20MHz) RF Power (dBm)							
		OFDM Data Rate							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412 MHz	21.34	-	-	-	-	-	-	-
CH 06	2437 MHz	24.01	23.88	23.90	23.59	23.48	23.16	22.66	21.83
CH 11	2462 MHz	21.63	-	-	-	-	-	-	-

Channel	Frequency	5GHz 802.11a RF Power (dBm)							
		OFDM Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH149	5745 MHz	22.33	-	-	-	-	-	-	-
CH157	5785 MHz	22.34	22.32	22.02	22.05	21.98	21.95	21.12	21.13
CH165	5825 MHz	22.21	-	-	-	-	-	-	-

Channel	Frequency	5GHz 802.11n (BW 20MHz) RF Power (dBm)							
		OFDM Data Rate							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH149	5745 MHz	22.23	-	-	-	-	-	-	-
CH157	5785 MHz	22.25	22.12	22.02	21.98	21.95	21.93	21.10	20.76
CH165	5825 MHz	22.13	-	-	-	-	-	-	-

Remark:

1. The EUT is programmed to transmit signals continuously for all testing.
2. The data rates of WLAN 802.11a/b/g/n were set in 1Mbps for 802.11b, 6Mbps for 802.11g, MCS0 for 802.11n (BW 20MHz), 6Mbps for 802.11a, and MCS0 for 802.11n (BW 20MHz) for all the test cases due to the highest RF output power.

2.2 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 were conducted to determine the final configuration from all possible combinations.

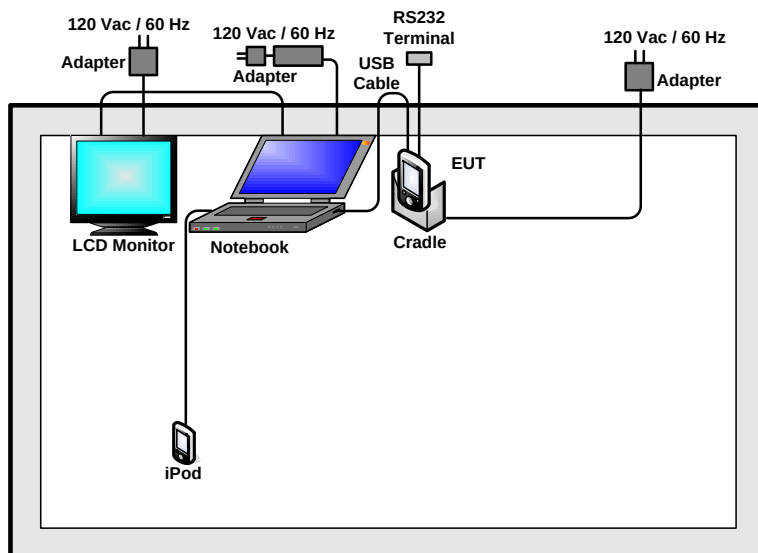
The following table is showing the total pre-scanned test modes, and the worst cases are recorded in this report only.

This report only.

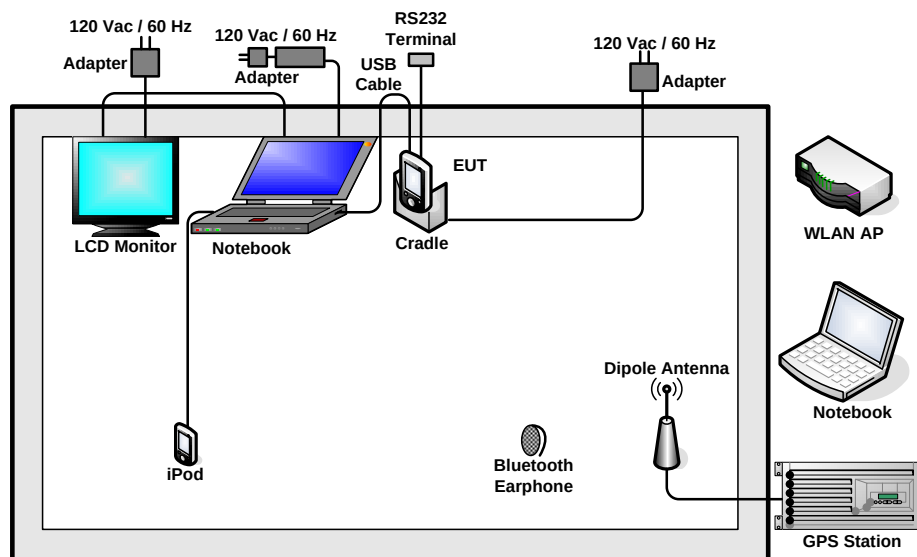
Test Cases		
Test Item	802.11b (Modulation : DSSS) 802.11g/n (Modulation : OFDM)	802.11a/n (Modulation : OFDM)
Conducted TCs	Mode 1: 802.11b_CH01_2412 MHz Mode 2: 802.11b_CH06_2437 MHz Mode 3: 802.11b_CH11_2462 MHz Mode 4: 802.11g_CH01_2412 MHz Mode 5: 802.11g_CH06_2437 MHz Mode 6: 802.11g_CH11_2462 MHz Mode 7: 802.11n_CH01_2412 MHz (BW 20M) Mode 8: 802.11n_CH06_2437 MHz (BW 20M) Mode 9: 802.11n_CH11_2462 MHz (BW 20M)	Mode 10: 802.11a_CH149_5745 MHz Mode 11: 802.11a_CH157_5785 MHz Mode 12: 802.11a_CH165_5825 MHz Mode 13: 802.11n_CH149_5745 MHz (BW 20M) Mode 14: 802.11n_CH157_5785 MHz (BW 20M) Mode 15: 802.11n_CH165_5825 MHz (BW 20M)
Radiated TCs	Mode 1: 802.11b_CH01_2412 MHz + TC Mode 2: 802.11b_CH06_2437 MHz + TC Mode 3: 802.11b_CH11_2462 MHz + TC Mode 4: 802.11n_CH01_2412 MHz (BW 20M) + TC Mode 5: 802.11a_CH157_5785 MHz + TC	
AC Conducted Emission	Mode 1: Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Data Link with Notebook)	
Remark: - TC stands for Test Configuration, and consists of USB cable, RS232 terminal, cradle, and adapter. - Link with Notebook means data application transferred mode between DUT and Notebook.		

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.4 RF Utility

The programmed RF utility "TI1273_FCC" 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.

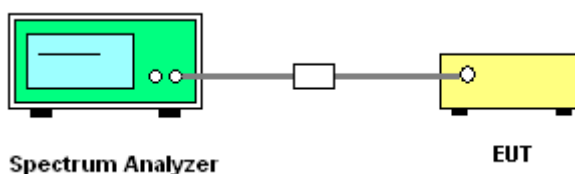
3.1.2 Measuring Instruments

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 :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	9.04	0.5	Pass
06	2437	9.04	0.5	Pass
11	2462	9.08	0.5	Pass

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

Channel	Frequency (MHz)	802.11g 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	15.64	0.5	Pass
06	2437	15.66	0.5	Pass
11	2462	15.66	0.5	Pass

Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11n (BW 20MHz) 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	15.80	0.5	Pass
06	2437	16.50	0.5	Pass
11	2462	15.32	0.5	Pass

Test Mode :	Mode 10, 11, 12	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11a 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
149	5745	15.65	0.5	Pass
157	5785	15.50	0.5	Pass
165	5825	15.30	0.5	Pass

Test Mode :	Mode 13, 14, 15	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11n (BW 20MHz) 6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
149	5745	15.30	0.5	Pass
157	5785	15.60	0.5	Pass
165	5825	15.15	0.5	Pass



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



Date: 14.OCT.2011 22:53:07



Date: 14.OCT.2011 22:48:06

Ref 20 dBm Att 20 dB RBW 100 kHz VSW 300 kHz SWT 20 ms Delta 1 [T1] -0.12 dB

Marker 1 [T1] -5.17 dBm 2.404120000 GHz

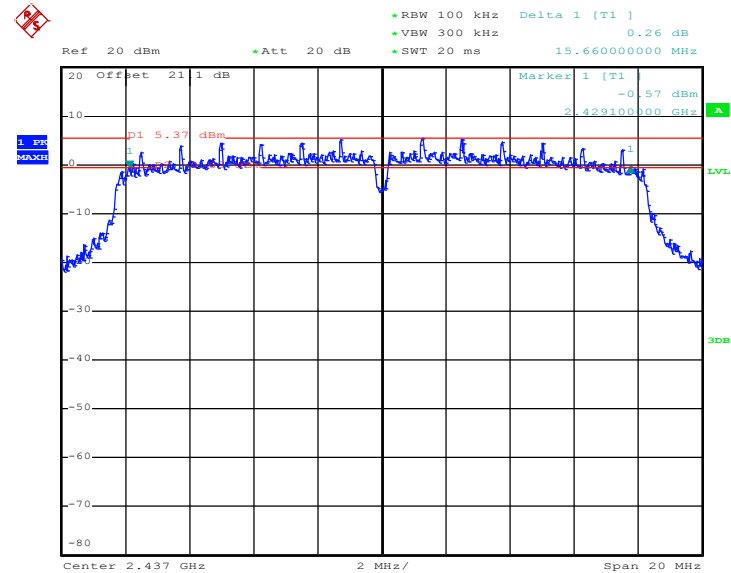
D1 0.3 dBm

Center 2.412 GHz 2 MHz/ Span 20 MHz

Date: 9.DEC.2010 11:59:48

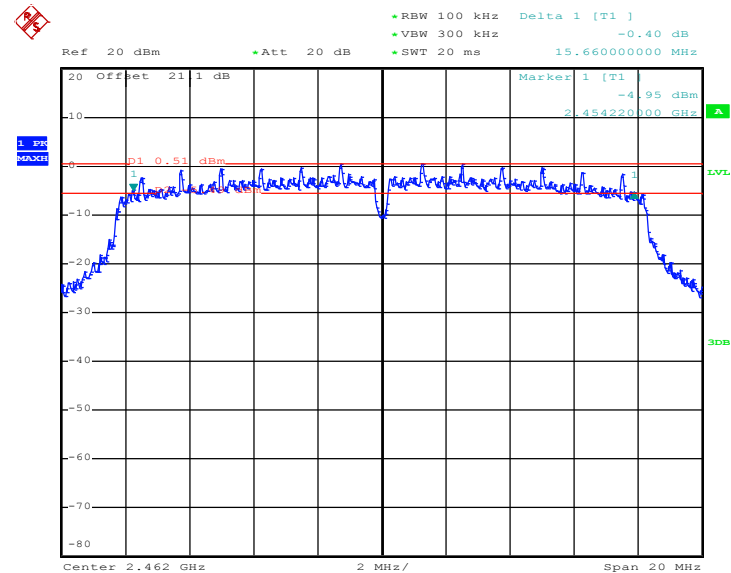


Mode 5 : 6 dB Bandwidth Plot on 802.11g Channel 06



Date: 9.DEC.2010 12:34:46

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



Date: 9.DEC.2010 14:30:36



Report No. : FR0D0904-17

Ref 20 dBm Att 20 dB Delta 1 [T1] 0.02 dB
 RBW 100 kHz VBW 300 kHz SWT 20 ms 15.800000000 MHz

Marker 1 [T1] -5.49 dBm
 2.404100000 GHz

1.56 MHz

0.38 dBm

Center 2.412 GHz 2 MHz/ Span 20 MHz

1.9%
NOISE

Ref 20 dBm Att 20 dB RBW 100 kHz Delta 1 [T1] VBW 300 kHz -0.04 dB SWT 20 ms 16.50000000 MHz

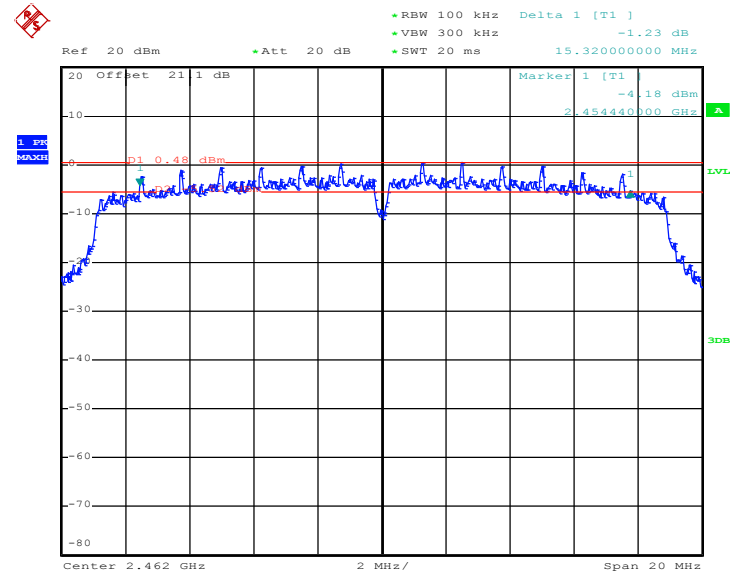
20 Off set 21 1 dB

Marker 1 [T1] -0.52 dBm 2.42862000 GHz

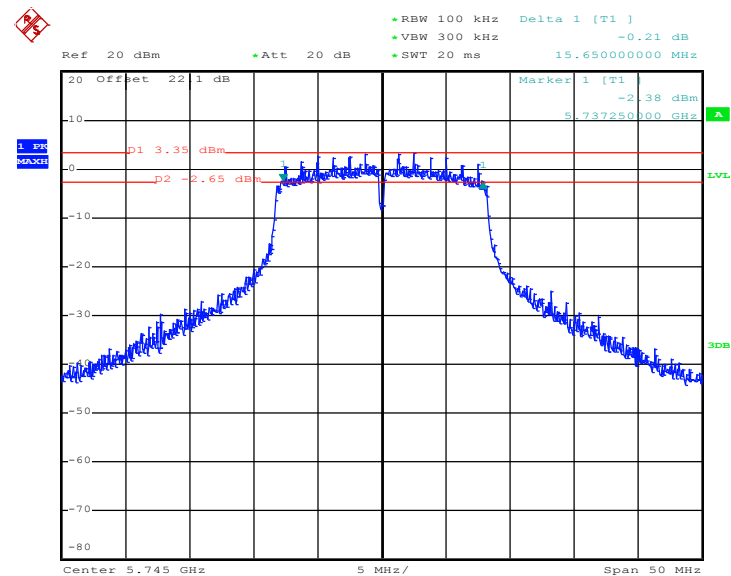
p1 5.34 dBm

Center 2.437 GHz 2 MHz/ Span 20 MHz

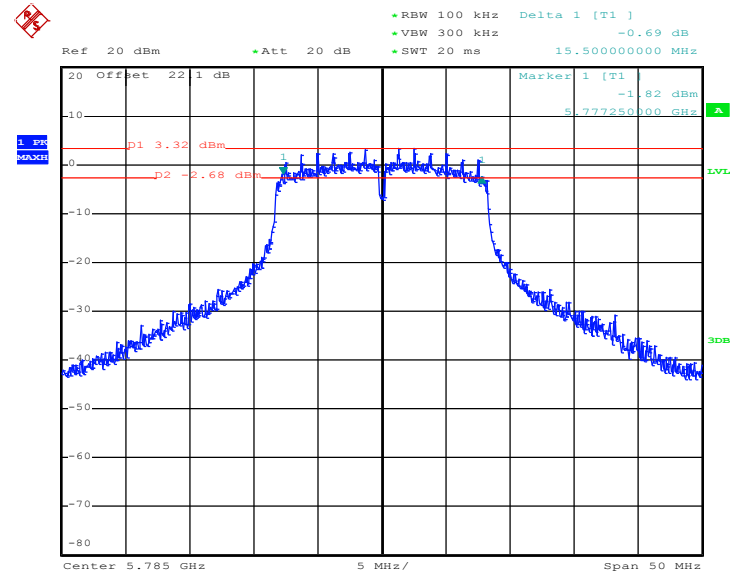
Date: 9.DEC.2010 14:03:13

Mode 9 : 6 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 11


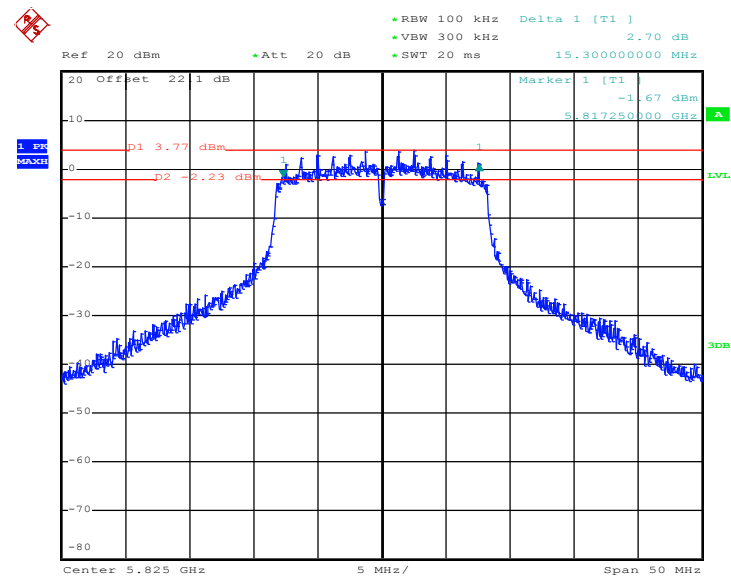
Date: 9.DEC.2010 14:10:52

Mode 10: 6 dB Bandwidth Plot on 802.11a Channel 149


Date: 9.DEC.2010 14:51:29

Mode 11: 6 dB Bandwidth Plot on 802.11a Channel 157


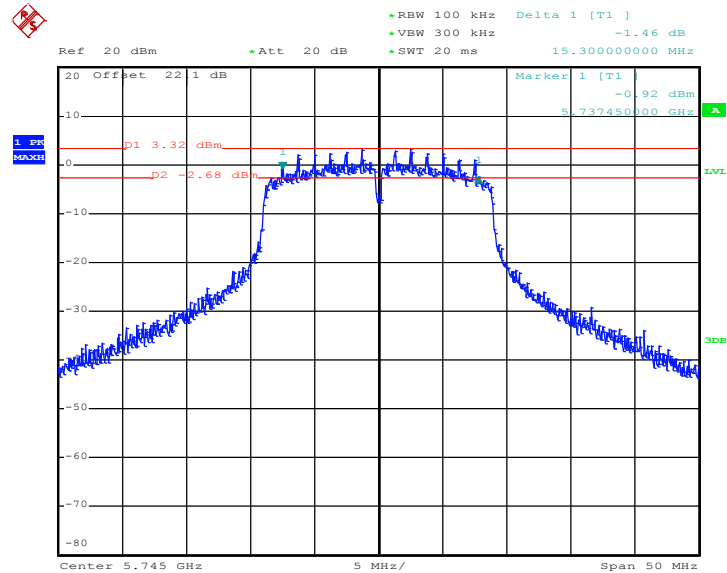
Date: 9.DEC.2010 15:13:36

Mode 12: 6 dB Bandwidth Plot on 802.11a Channel 165


Date: 9.DEC.2010 15:26:14

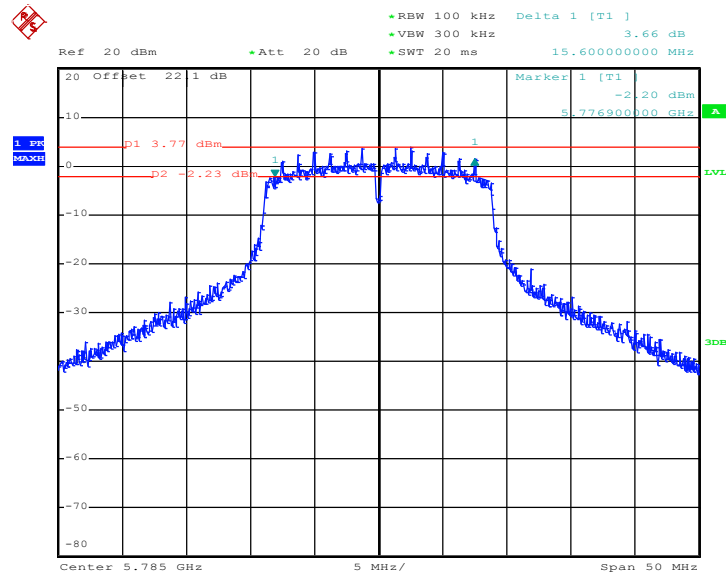


Mode 13: 6 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 149



Date: 9.DEC.2010 15:39:46

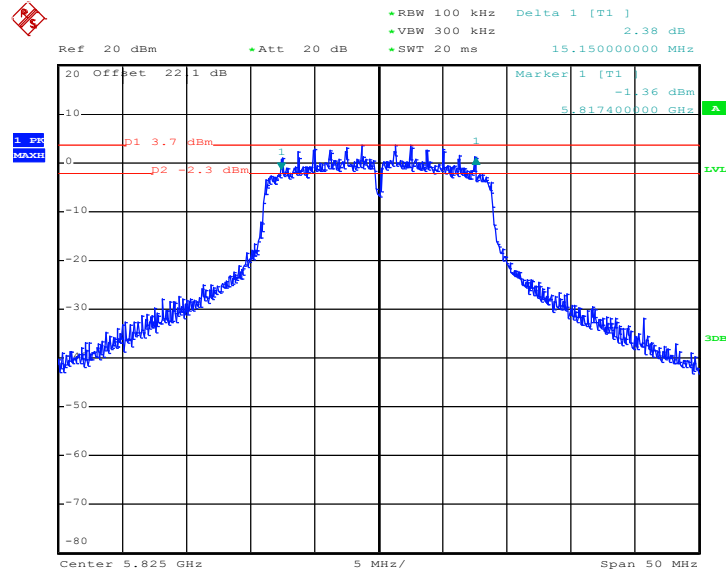
Mode 14: 6 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 157



Date: 9.DEC.2010 15:43:23



Mode 15: 6 dB Bandwidth Plot on 802.11n (BW 20MHz) Channel 165



Date: 9.DEC.2010 15:46:34

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz and 5725-5850MHz, 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.

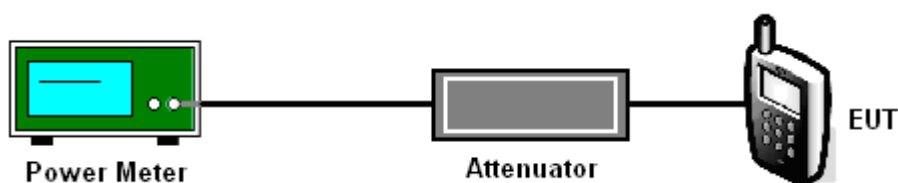
3.2.2 Measuring Instruments

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°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	20.41	30	Pass
06	2437	20.55	30	Pass
11	2462	20.38	30	Pass

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

Channel	Frequency (MHz)	802.11g Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	21.72	30	Pass
06	2437	24.03	30	Pass
11	2462	21.68	30	Pass

Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11n (BW 20MHz) Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	21.34	30	Pass
06	2437	24.01	30	Pass
11	2462	21.63	30	Pass

Test Mode :	Mode 10, 11, 12	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11a Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
149	5745	22.33	30	Pass
157	5785	22.34	30	Pass
165	5825	22.21	30	Pass

Test Mode :	Mode 13, 14, 15	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11n (BW 20MHz) Measured Output Power (dBm)	Max. Limits (dBm)	Pass/Fail
149	5745	22.23	30	Pass
157	5785	22.25	30	Pass
165	5825	22.13	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

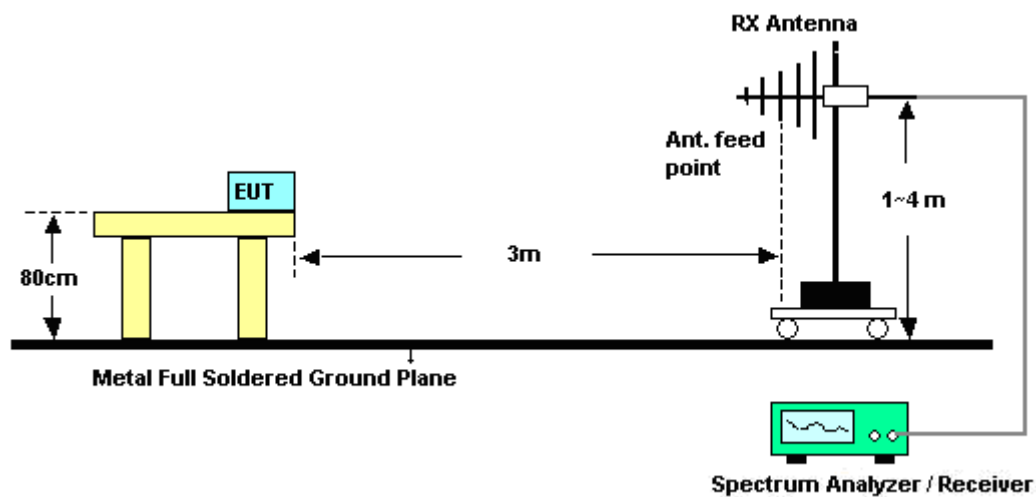
See list of measuring instruments of this test report.

3.3.3 Test Procedures

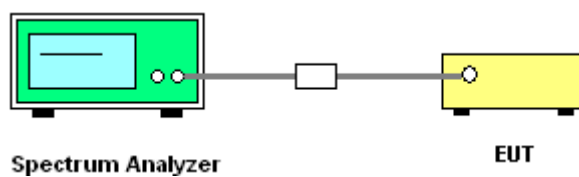
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Conducted emission test: Set RBW = 100 kHz, Video bandwidth (VBW) > RBW. Band edge emissions must be at least 20 dB below the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the output power of this device was measured by power meter, 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 :	24~26°C
Test Band :	802.11b	Relative Humidity :	41~43%
Test Channel :	01	Test Engineer :	Elvis Chen

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
2386.38	55.09	-18.91	74	52.18	31.9	5.4	34.39	100	310	Peak
2386.38	44.64	-9.36	54	41.73	31.9	5.4	34.39	100	310	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
2389.61	48.39	-25.61	74	45.48	31.9	5.4	34.39	119	0	Peak
2389.61	38.84	-15.16	54	35.93	31.9	5.4	34.39	119	0	Average

Test Mode :	Mode 3	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	41~43%
Test Channel :	11	Test Engineer :	Elvis Chen

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
2483.85	53.26	-20.74	74	50.13	31.98	5.52	34.37	100	303	Peak
2483.85	42.01	-11.99	54	38.88	31.98	5.52	34.37	100	303	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
2488.98	48.68	-25.32	74	45.53	32	5.52	34.37	100	11	Peak
2488.98	38.83	-15.17	54	35.68	32	5.52	34.37	100	11	Average



Test Mode :	Mode 4	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	41~43%
Test Channel :	01	Test Engineer :	Elvis Chen

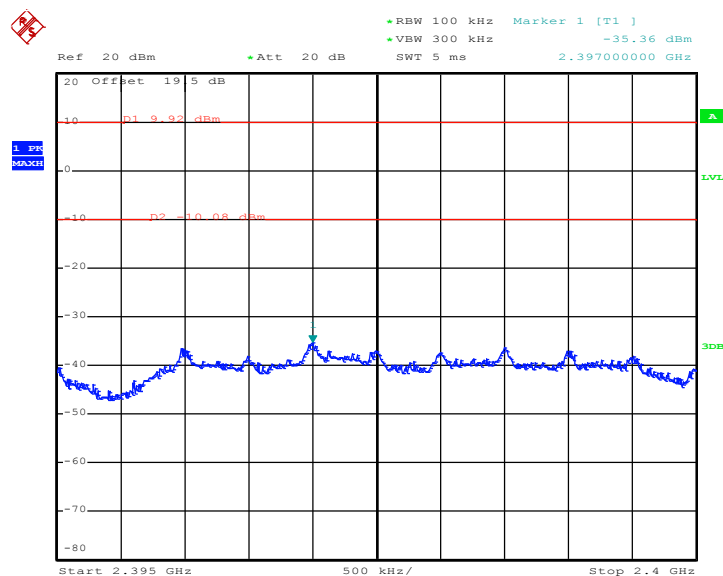
ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.99	61.15	-12.85	74	58.24	31.9	5.4	34.39	102	60	Peak
2389.99	44.44	-9.56	54	41.53	31.9	5.4	34.39	102	60	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
2389.99	51.19	-22.81	74	48.28	31.9	5.4	34.39	100	0	Peak
2389.99	38.94	-15.06	54	36.03	31.9	5.4	34.39	100	0	Average

3.3.6 Test Result of Conducted Band Edges

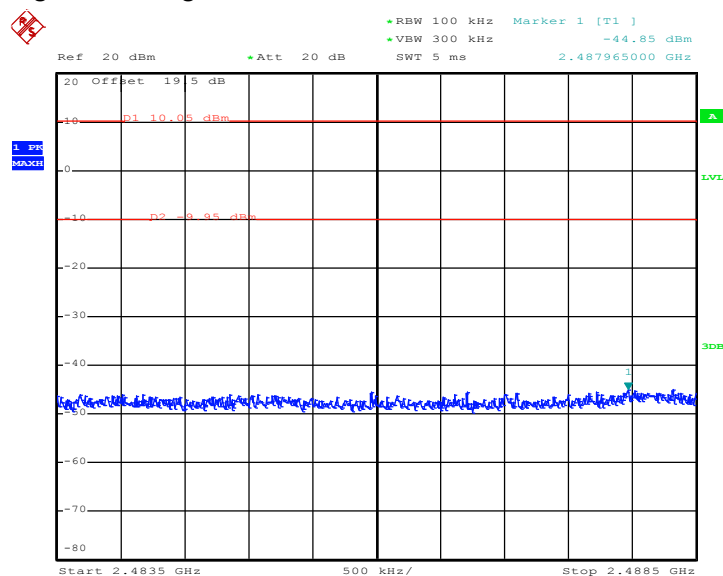
Test Mode :	Mode 1 and 3	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Alan Liu

Low Band Edge Plot on 802.11b Channel 01



Date: 14.OCT.2011 22:06:35

High Band Edge Plot on 802.11b Channel 11

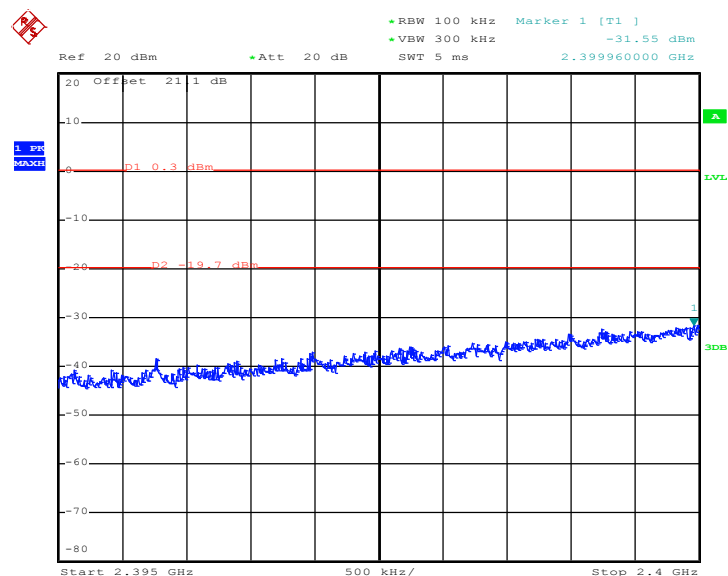


Date: 14.OCT.2011 22:49:34



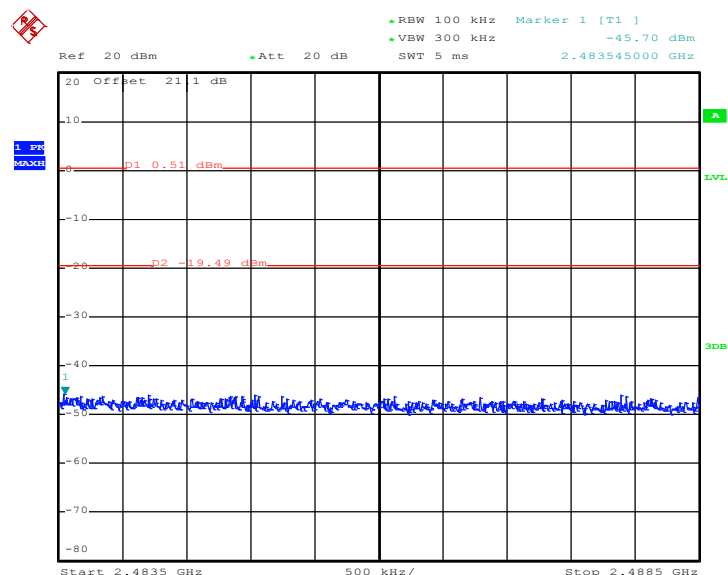
Test Mode :	Mode 4 and 6	Temperature :	24~26°C
Test Band :	802.11g	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Alan Liu

Low Band Edge Plot on 802.11g Channel 01



Date: 9.DEC.2010 12:01:13

High Band Edge Plot on 802.11g Channel 11

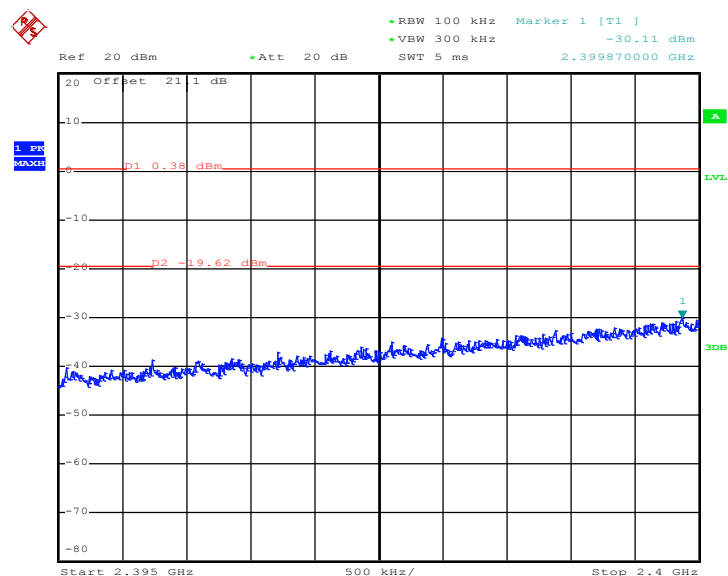


Date: 9.DEC.2010 14:31:27



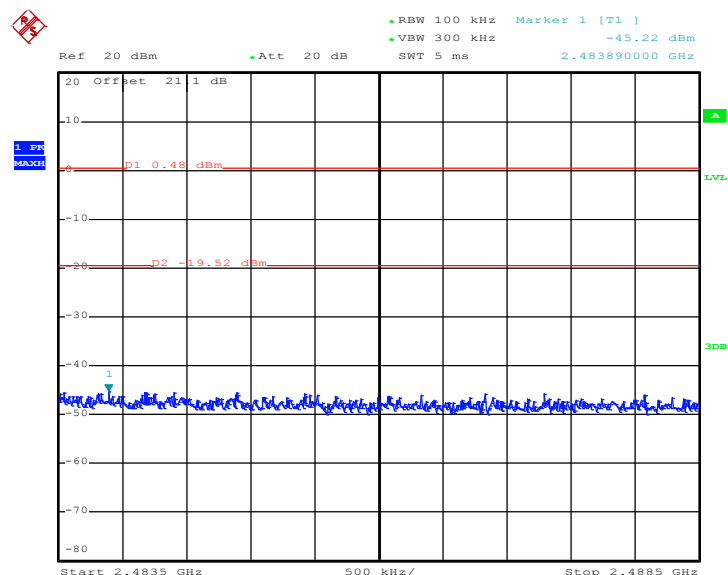
Test Mode :	Mode 7 and 9	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	01 and 11	Test Engineer :	Alan Liu

Low Band Edge Plot on 802.11n (BW 20MHz) Channel 01



Date: 9.DEC.2010 13:47:31

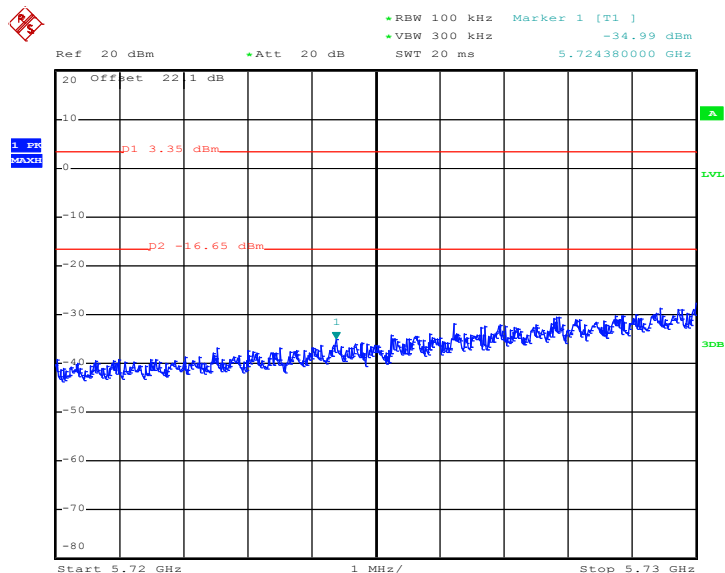
High Band Edge Plot on 802.11n (BW 20MHz) Channel 11



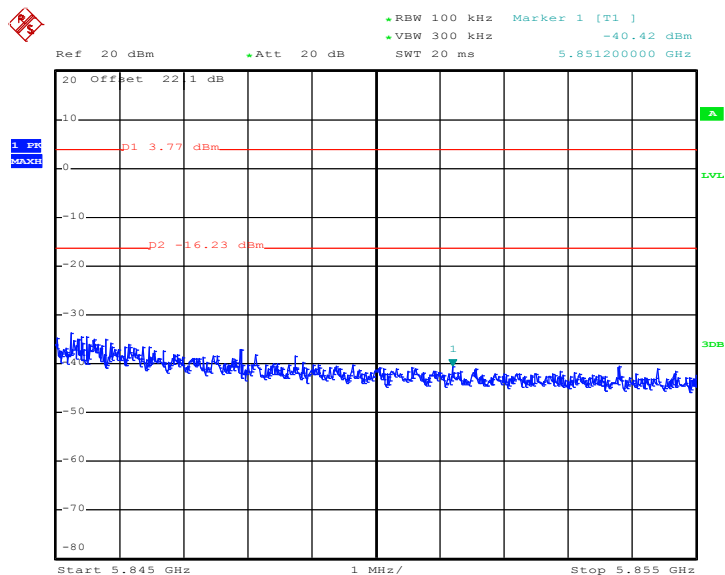
Date: 9.DEC.2010 14:12:07



Test Mode :	Mode 10 and 12	Temperature :	24~26℃
Test Band :	802.11a	Relative Humidity :	50~53%
Test Channel :	149 and 165	Test Engineer :	Alan Liu



Date: 9.DEC.2010 14:51:58

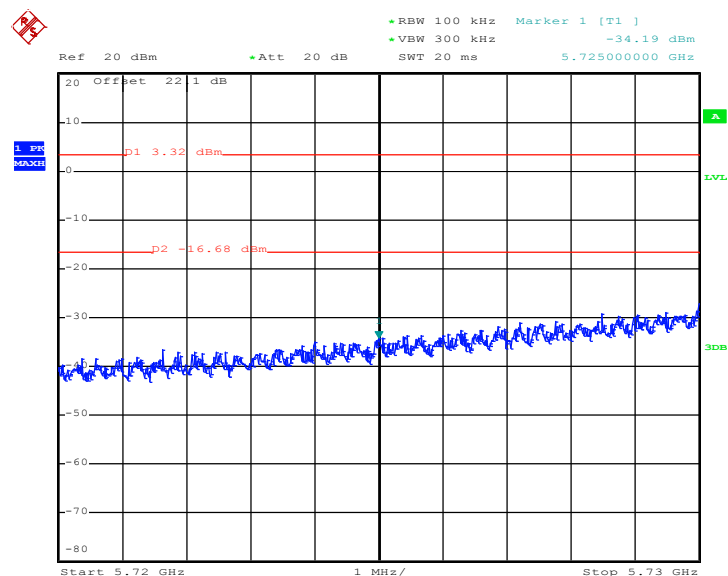


Date: 9.DEC.2010 15:26:56



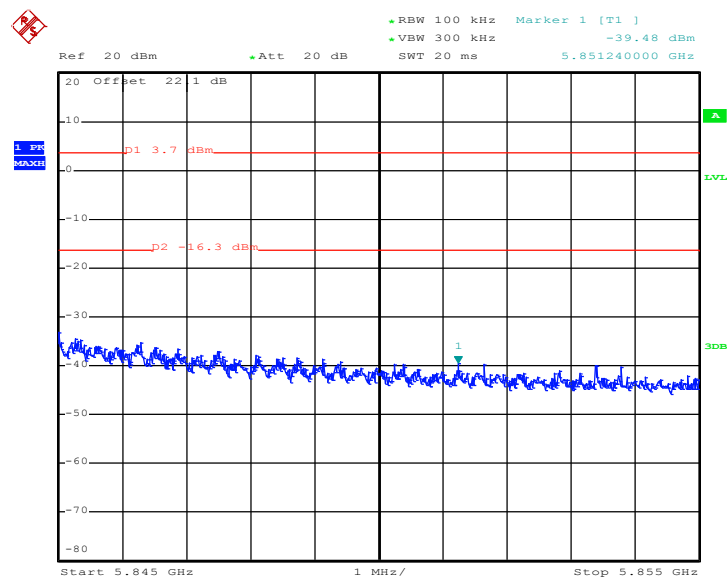
Test Mode :	Mode 13 and 15	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	149 and 165	Test Engineer :	Alan Liu

Low Band Edge Plot on 802.11n (BW 20MHz) Channel 149



Date: 9.DEC.2010 15:40:20

High Band Edge Plot on 802.11n (BW 20MHz) Channel 165



Date: 9.DEC.2010 15:47:07

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.

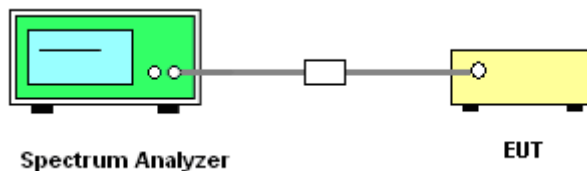
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedure

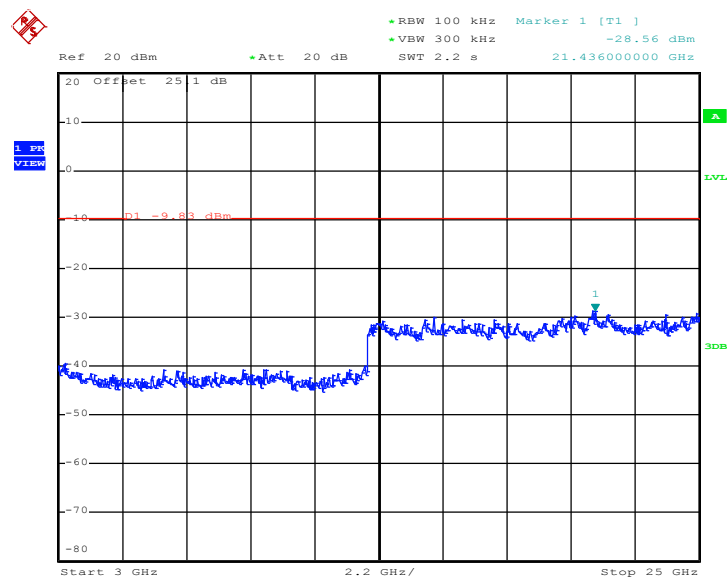
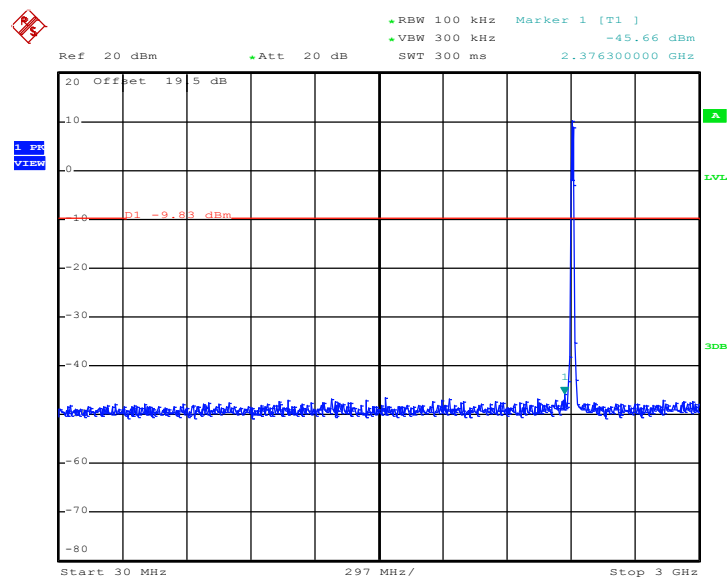
1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz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

3.4.4 Test Setup





Test Mode :	Mode 1	Temperature :	24~26℃
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Alan Liu

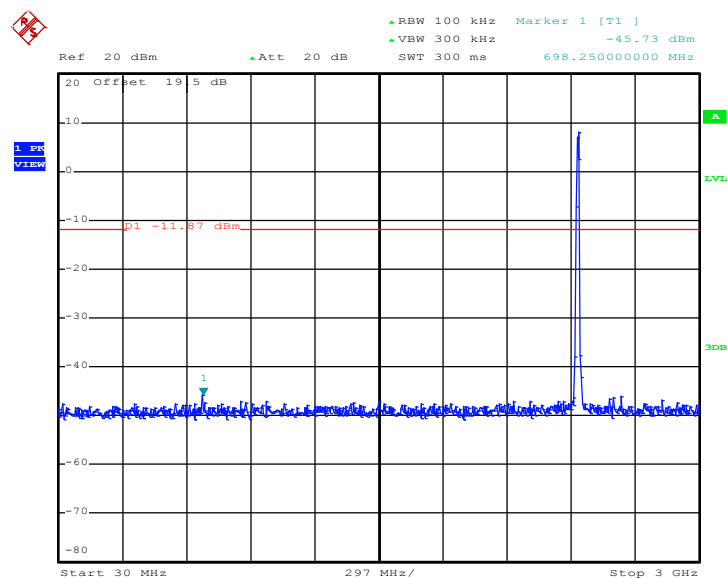


Date: 14.OCT.2011 22:42:22



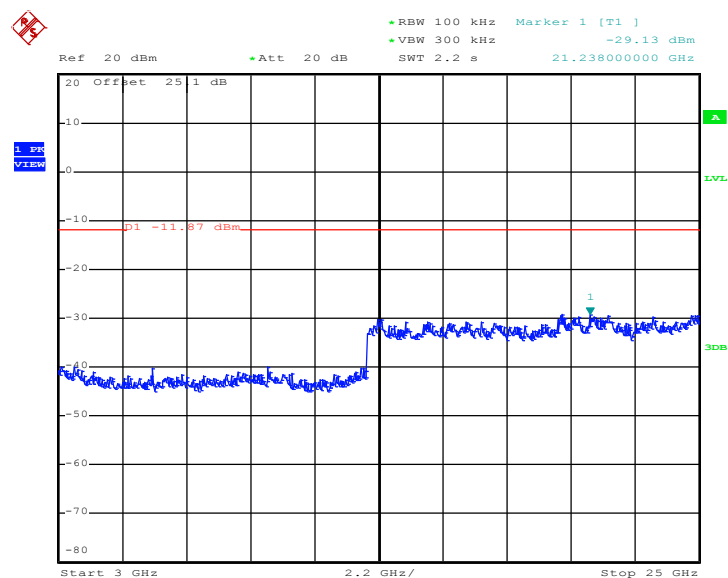
Test Mode :	Mode 2	Temperature :	24~26°C
Test Band :	802.11b	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



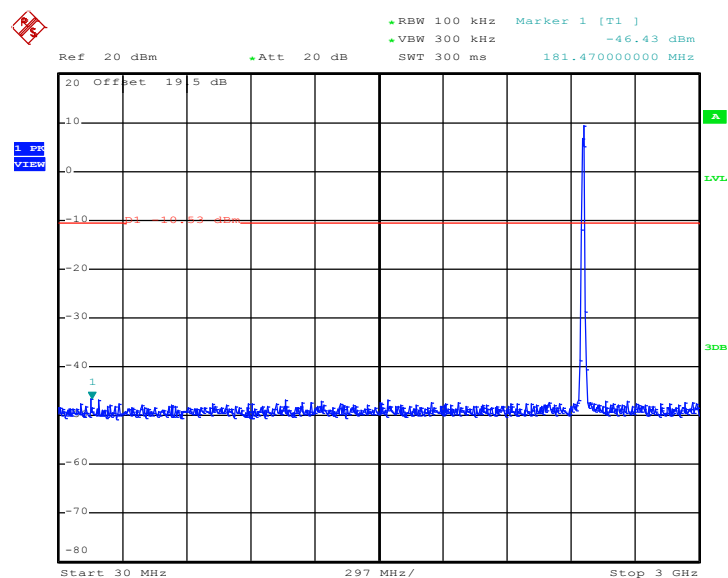
Date: 14.OCT.2011 22:43:01

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

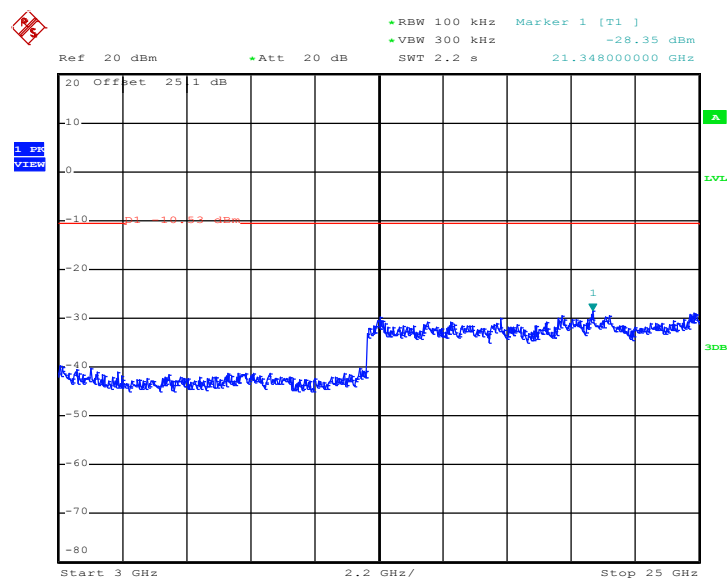


Date: 14.OCT.2011 22:43:19

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

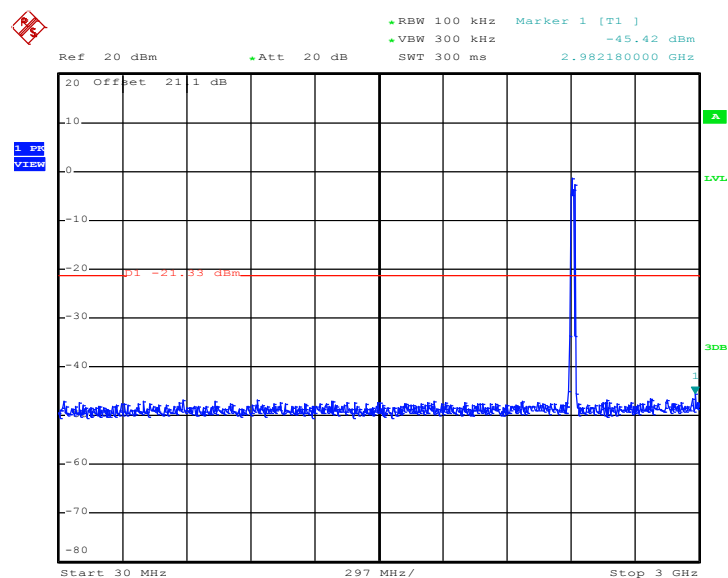
Conducted Spurious Emission Plot between 30MHz ~ 3 GHz


Date: 14.OCT.2011 22:44:06

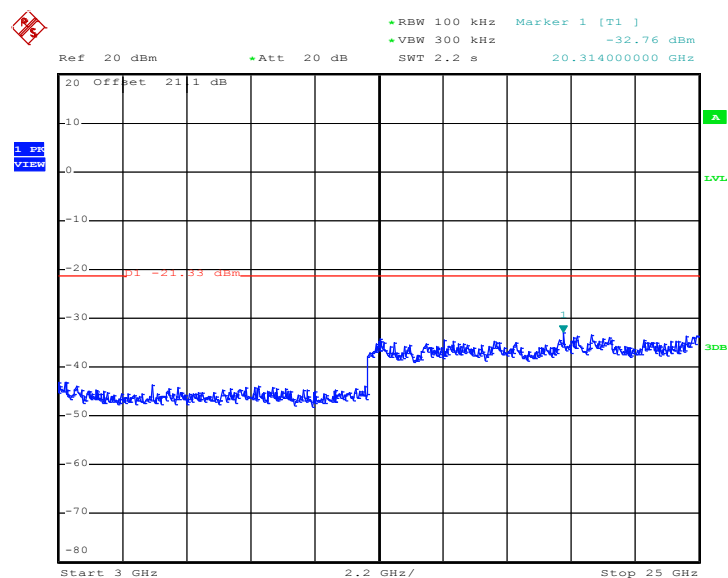
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz


Date: 14.OCT.2011 22:44:24

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

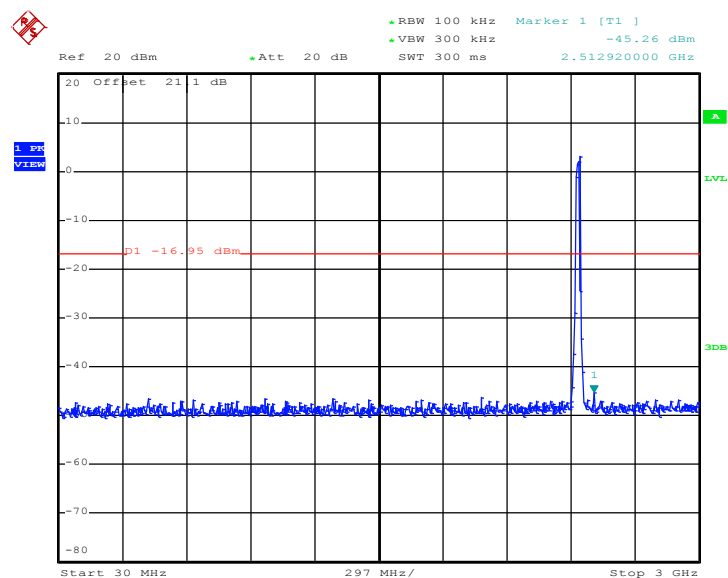
Conducted Spurious Emission Plot between 30MHz ~ 3 GHz


Date: 9.DEC.2010 14:26:40

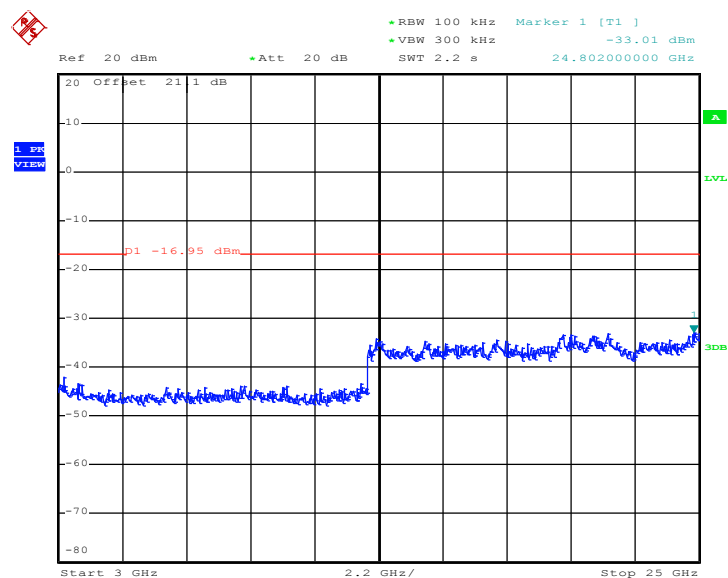
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz


Date: 9.DEC.2010 14:26:57

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

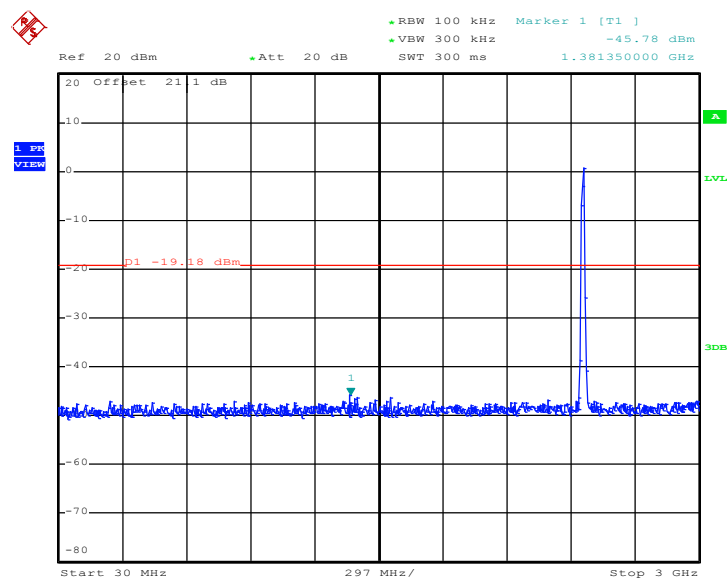
Conducted Spurious Emission Plot between 30MHz ~ 3 GHz


Date: 9.DEC.2010 14:27:52

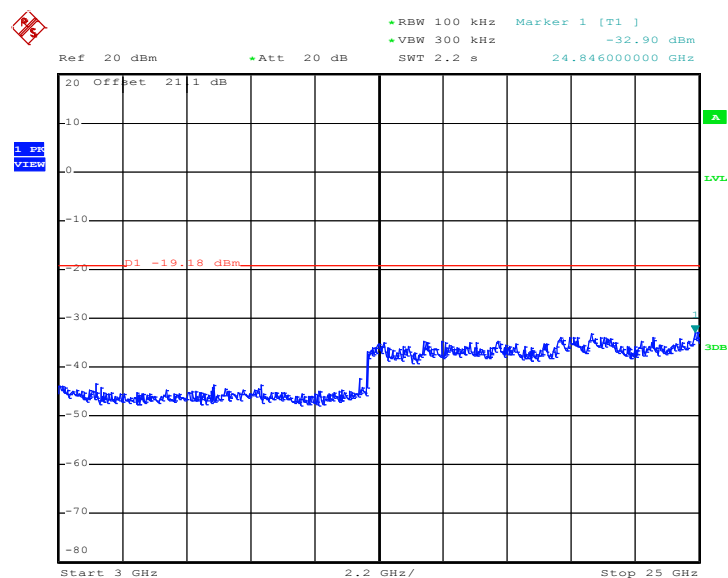
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz


Date: 9.DEC.2010 14:28:09

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

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz


Date: 9.DEC.2010 14:28:47

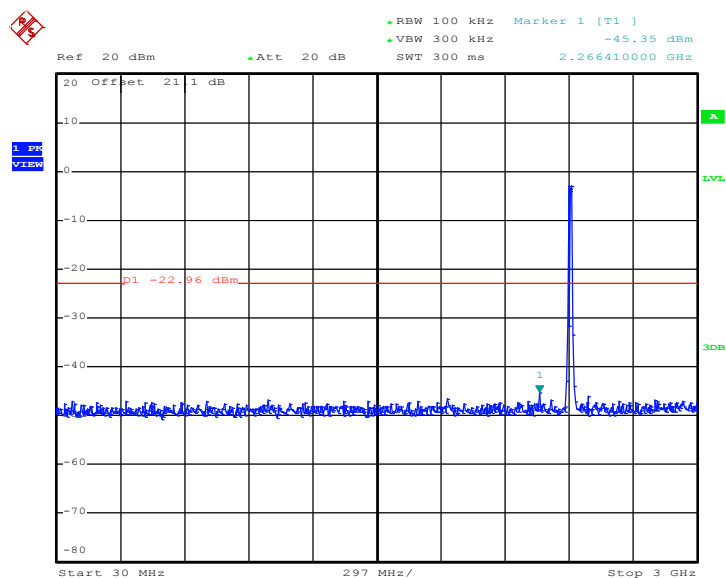
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz


Date: 9.DEC.2010 14:29:04



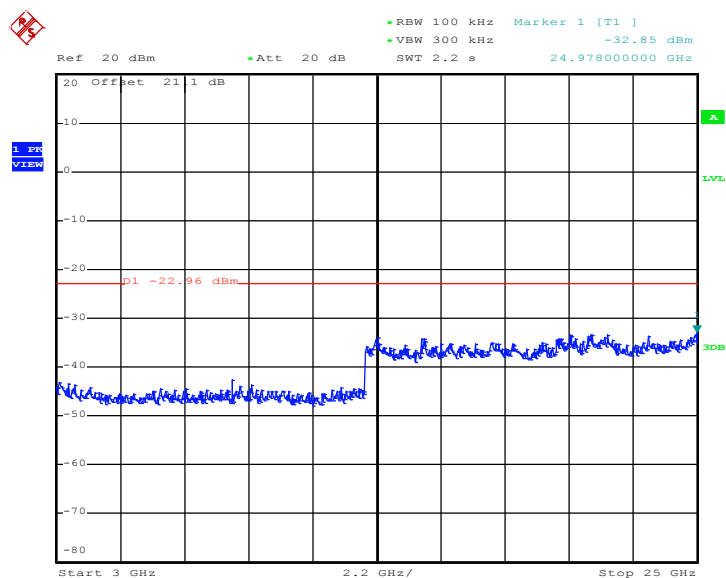
Test Mode :	Mode 7	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



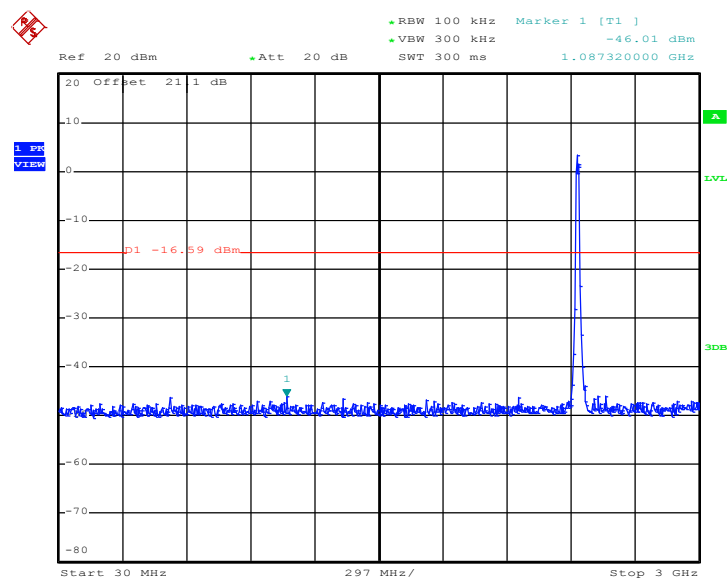
Date: 9.DEC.2010 14:33:32

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

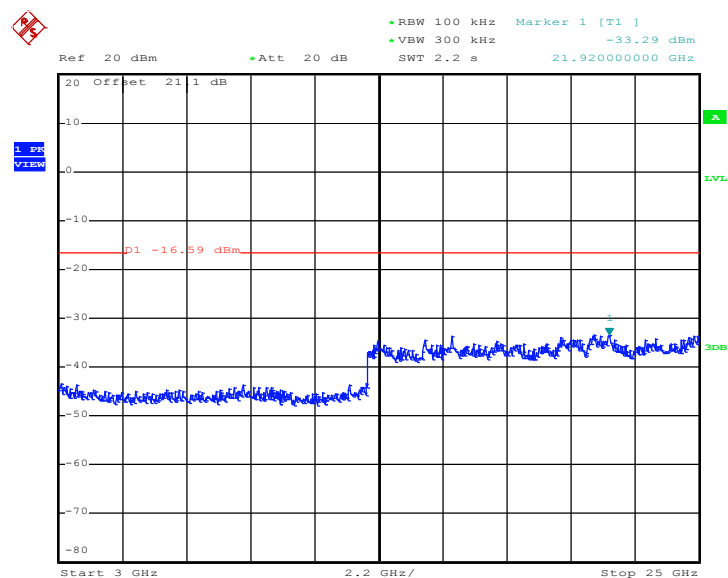


Date: 9.DEC.2010 14:33:49

Test Mode :	Mode 8	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Alan Liu

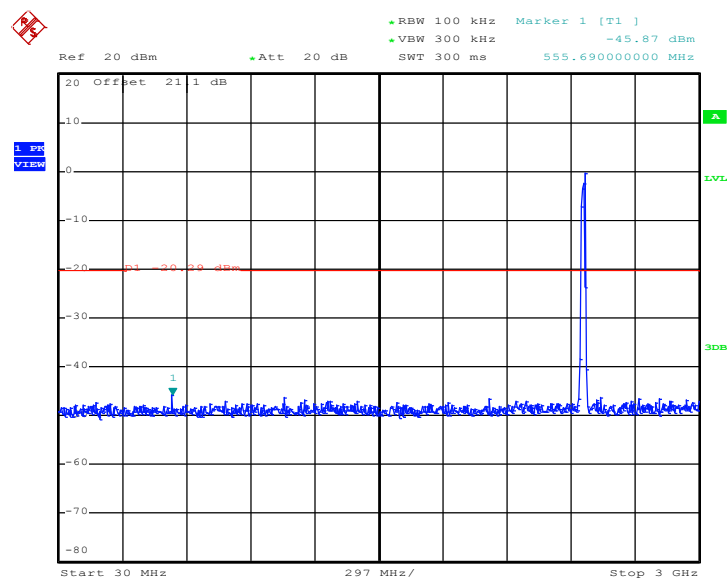
Conducted Spurious Emission Plot between 30MHz ~ 3 GHz


Date: 9.DEC.2010 14:36:18

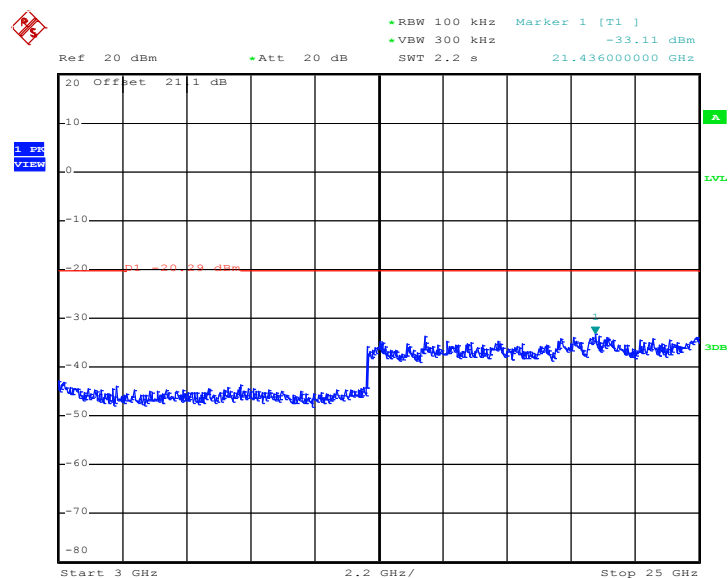
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz


Date: 9.DEC.2010 14:36:35

Test Mode :	Mode 9	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz


Date: 9.DEC.2010 14:35:03

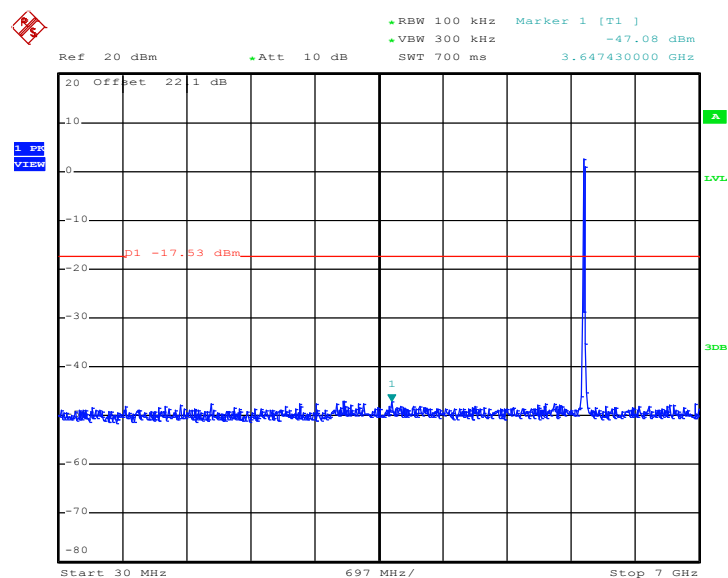
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz


Date: 9.DEC.2010 14:35:21



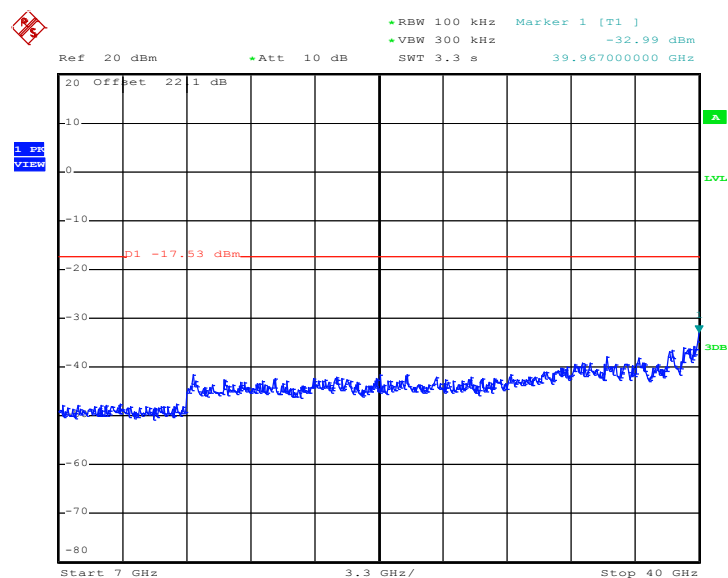
Test Mode :	Mode 10	Temperature :	24~26℃
Test Band :	802.11a	Relative Humidity :	50~53%
Test Channel :	149	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 7 GHz



Date: 9.DEC.2010 15:11:20

Conducted Spurious Emission Plot between 7 GHz ~ 40 GHz

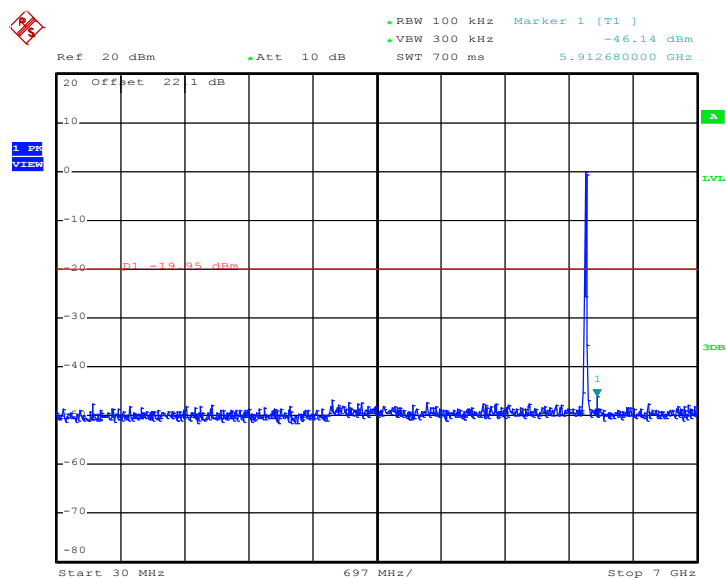


Date: 9.DEC.2010 15:11:37



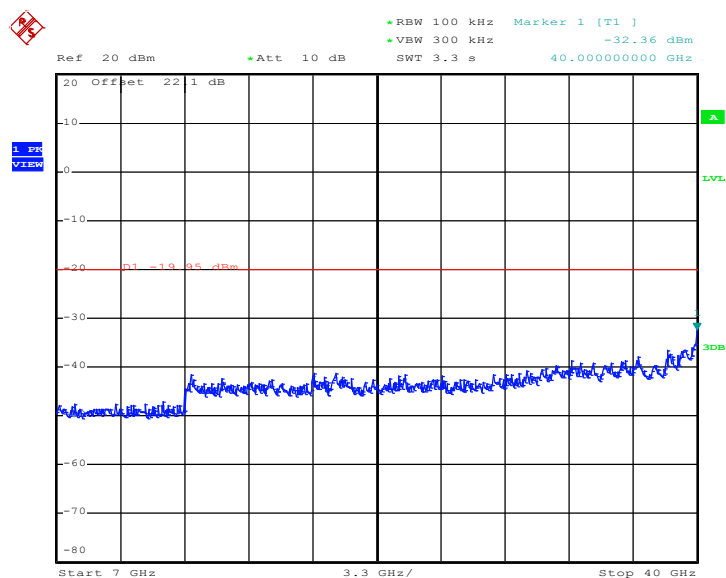
Test Mode :	Mode 11	Temperature :	24~26°C
Test Band :	802.11a	Relative Humidity :	50~53%
Test Channel :	157	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 7 GHz



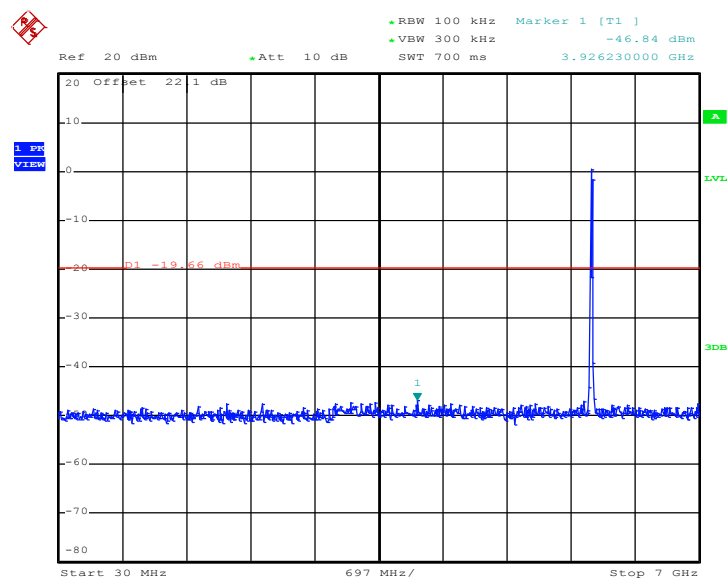
Date: 9.DEC.2010 15:14:39

Conducted Spurious Emission Plot between 7 GHz ~ 40 GHz

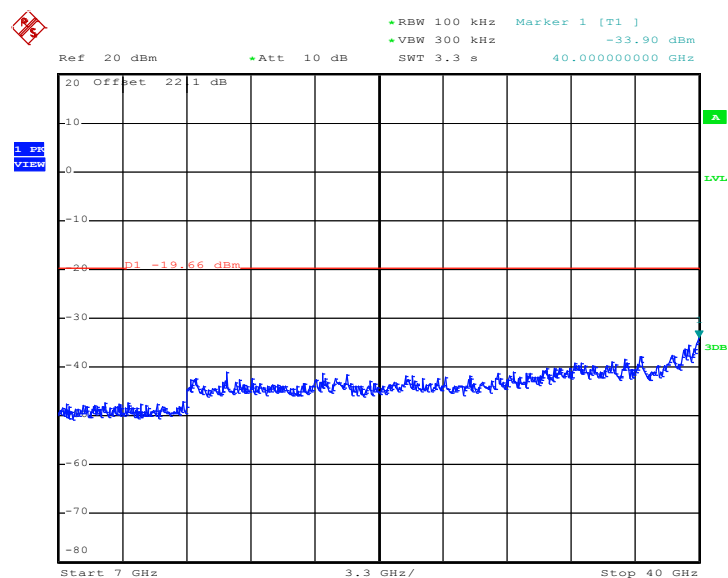


Date: 9.DEC.2010 15:14:57

Test Mode :	Mode 12	Temperature :	24~26°C
Test Band :	802.11a	Relative Humidity :	50~53%
Test Channel :	165	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 7 GHz


Date: 9.DEC.2010 15:27:44

Conducted Spurious Emission Plot between 7 GHz ~ 40 GHz


Date: 9.DEC.2010 15:28:02



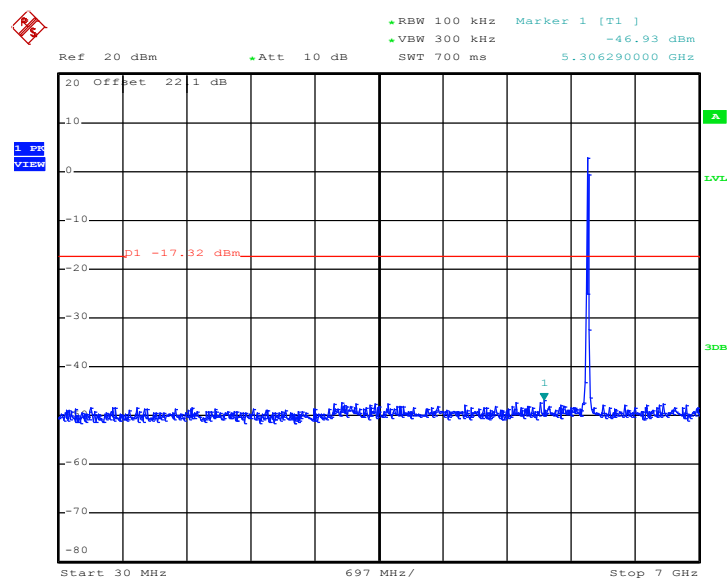
Conducted Spurious Emission Plot between 30MHz ~ 7 GHz



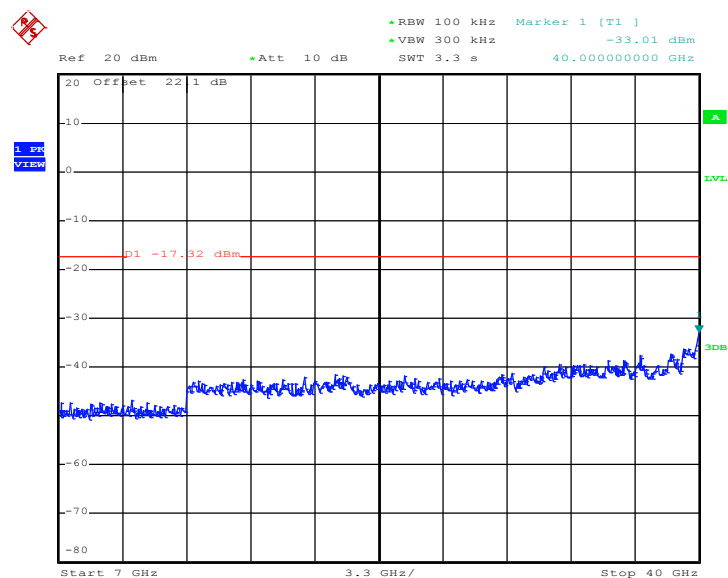
Conducted Spurious Emission Plot between 7 GHz ~ 40 GHz



Test Mode :	Mode 14	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	157	Test Engineer :	Alan Liu

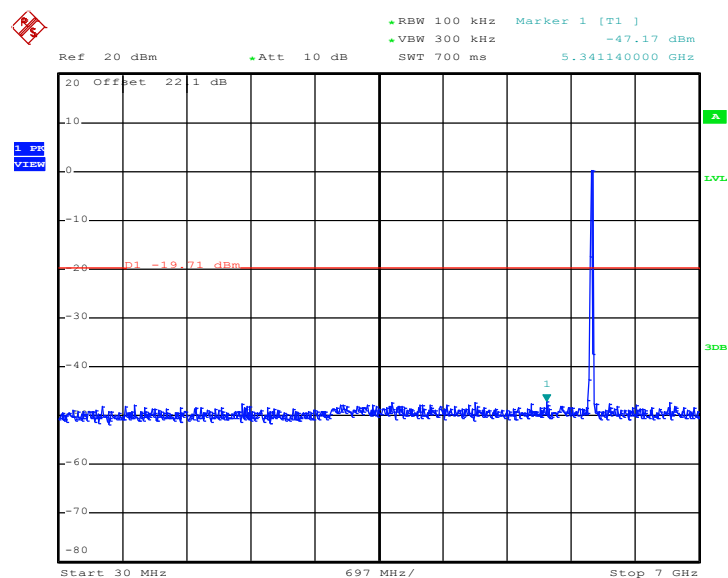
Conducted Spurious Emission Plot between 30MHz ~ 7 GHz


Date: 9.DEC.2010 15:44:16

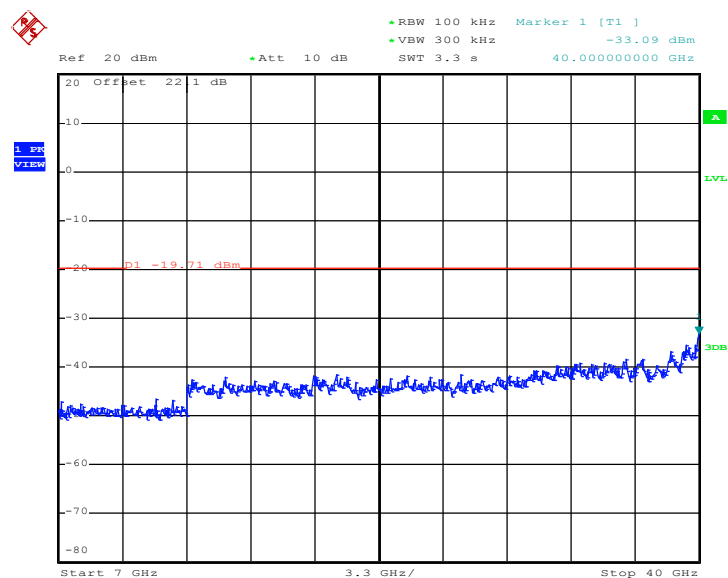
Conducted Spurious Emission Plot between 7 GHz ~ 40 GHz


Date: 9.DEC.2010 15:44:33

Test Mode :	Mode 15	Temperature :	24~26°C
Test Band :	802.11n (BW 20MHz)	Relative Humidity :	50~53%
Test Channel :	165	Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 7 GHz


Date: 9.DEC.2010 15:47:55

Conducted Spurious Emission Plot between 7 GHz ~ 40 GHz


Date: 9.DEC.2010 15:48:12

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.

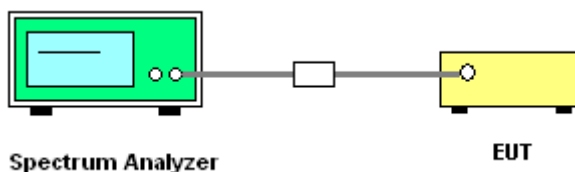
3.5.2 Measuring Instruments

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°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11b Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-2.97	8	Pass
06	2437	-3.09	8	Pass
11	2462	-2.88	8	Pass

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

Channel	Frequency (MHz)	802.11g Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-13.07	8	Pass
06	2437	-8.08	8	Pass
11	2462	-13.00	8	Pass

Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11n (BW 20MHz) Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-12.87	8	Pass
06	2437	-7.93	8	Pass
11	2462	-12.75	8	Pass



Test Mode :	Mode 10, 11, 12	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11a Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
149	5745	-10.24	8	Pass
157	5785	-10.31	8	Pass
165	5825	-9.93	8	Pass

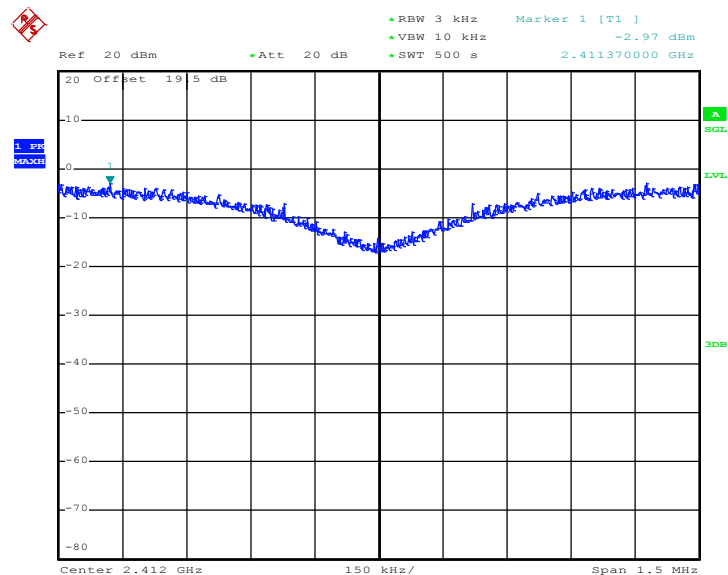
Test Mode :	Mode 13, 14, 15	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	802.11n (BW 20MHz) Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
149	5745	-9.99	8	Pass
157	5785	-9.45	8	Pass
165	5825	-9.60	8	Pass



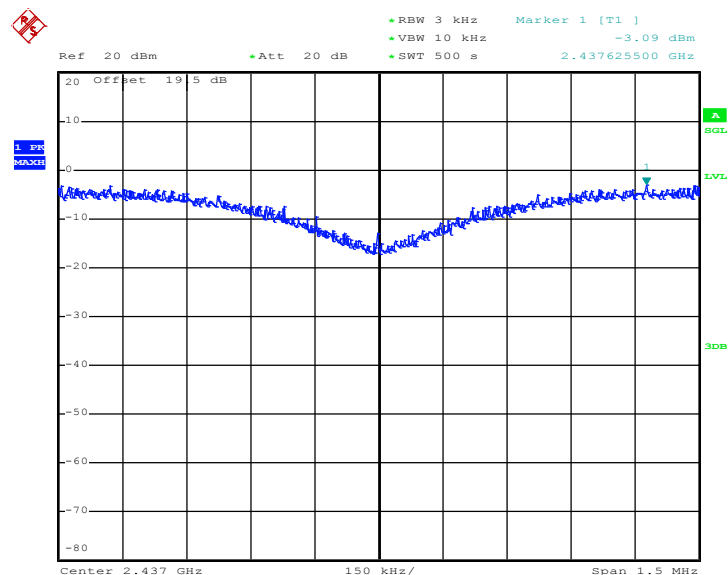
3.5.6 Test Result of Power Spectral Density Plots

Mode 1 : PSD Plot on 802.11b Channel 01

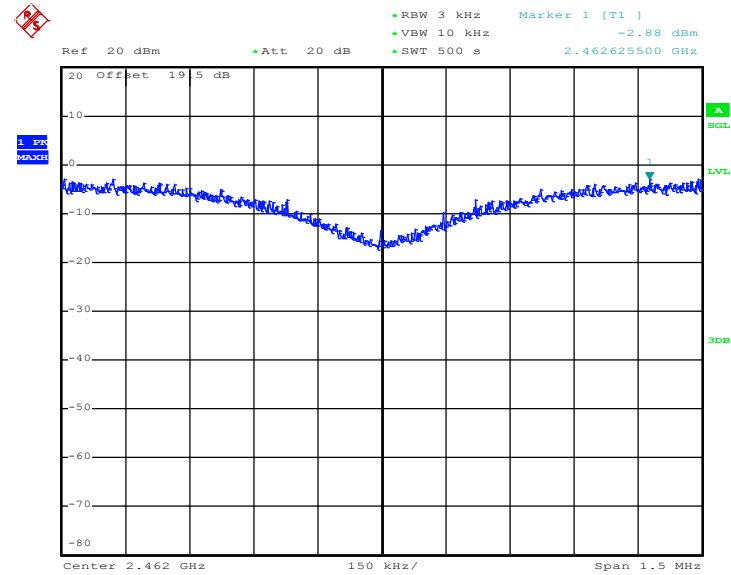


Date: 14.OCT.2011 22:17:54

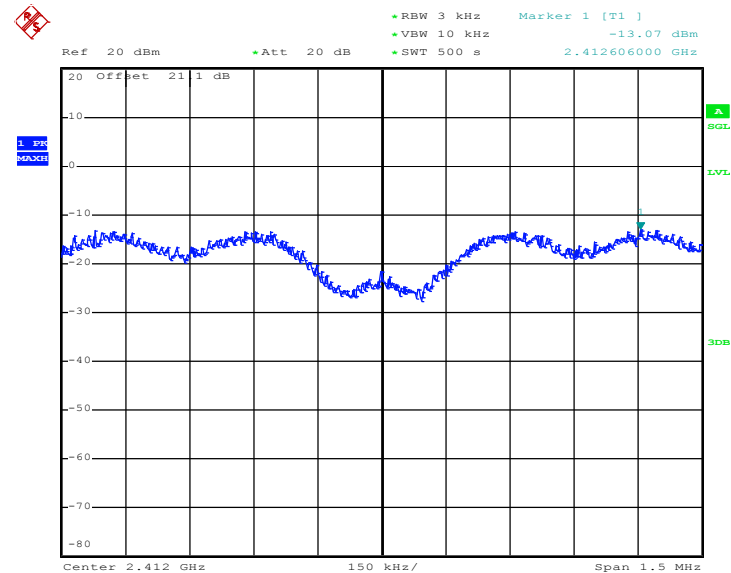
Mode 2 : PSD Plot on 802.11b Channel 06



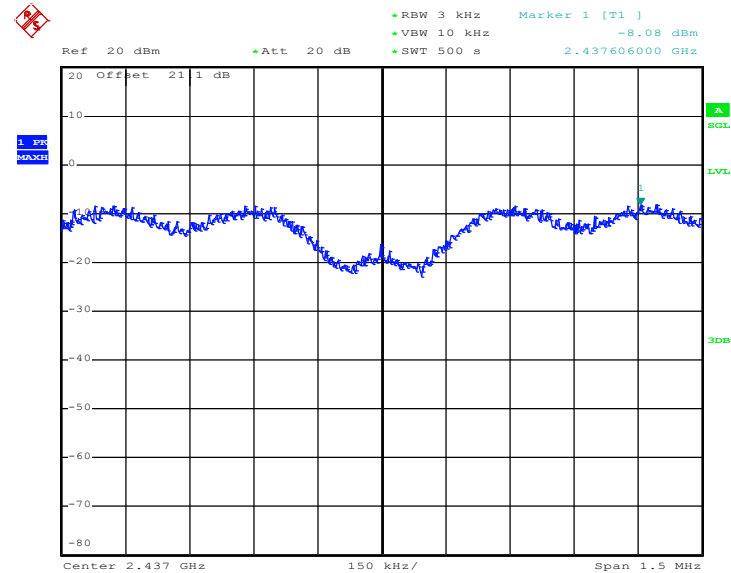
Date: 14.OCT.2011 22:02:24

Mode 3 : PSD Plot on 802.11b Channel 11


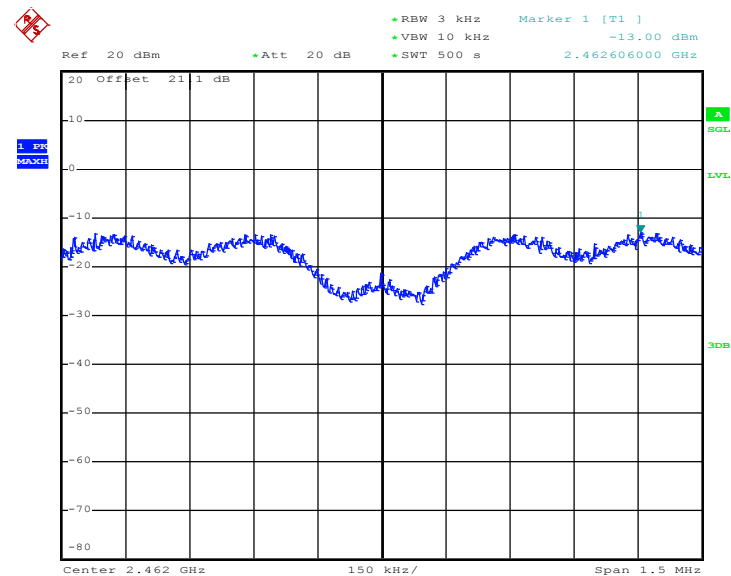
Date: 14.OCT.2011 21:48:36

Mode 4 : PSD Plot on 802.11g Channel 01


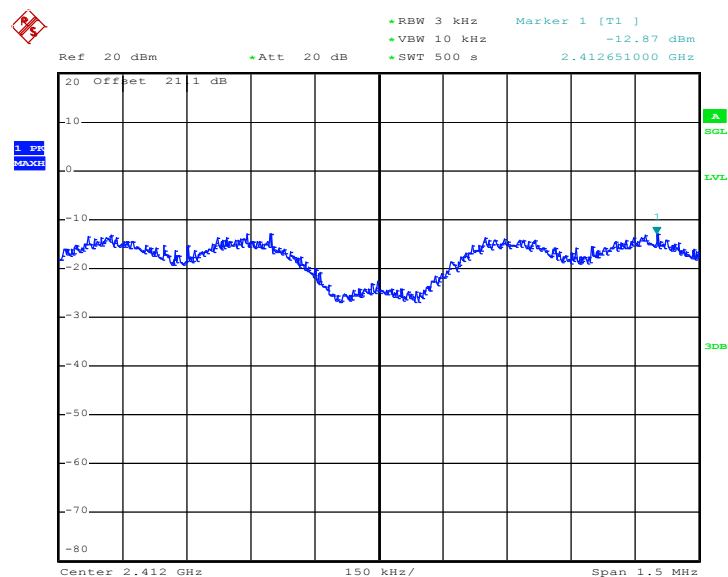
Date: 9.DEC.2010 12:31:37

Mode 5 : PSD Plot on 802.11g Channel 06


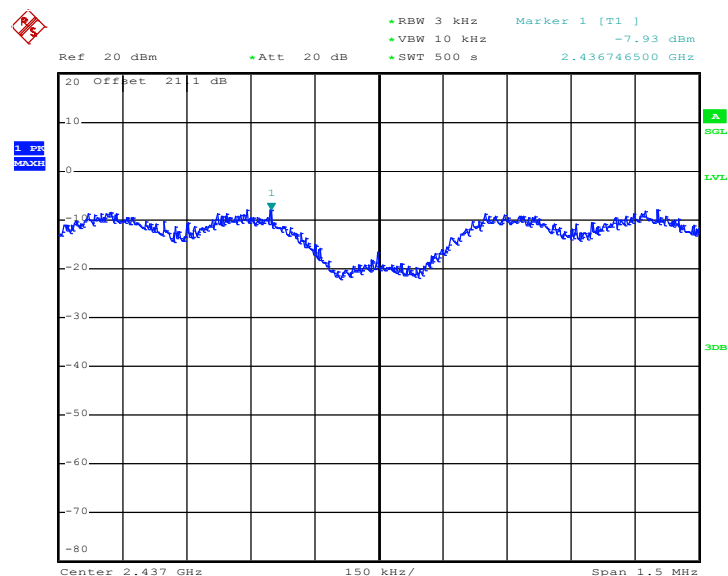
Date: 9.DEC.2010 13:11:11

Mode 6 : PSD Plot on 802.11g Channel 11


Date: 9.DEC.2010 13:30:32

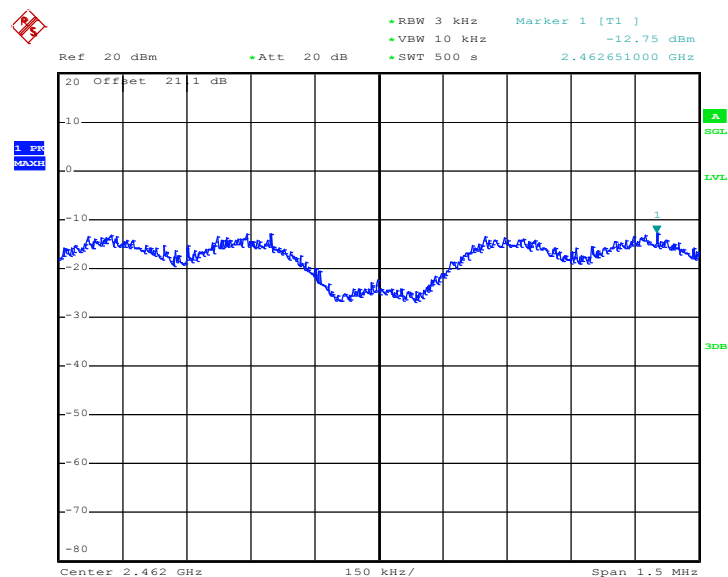
Mode 7 : PSD Plot on 802.11n (BW 20MHz) Channel 01


Date: 9.DEC.2010 13:56:32

Mode 8 : PSD Plot on 802.11n (BW 20MHz) Channel 06


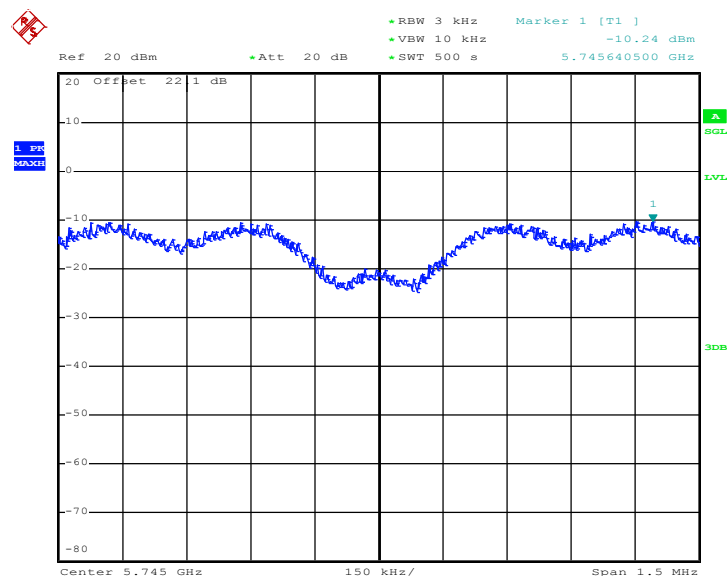
Date: 9.DEC.2010 14:47:13

Mode 9 : PSD Plot on 802.11n (BW 20MHz) Channel 11



Date: 9.DEC.2010 14:21:25

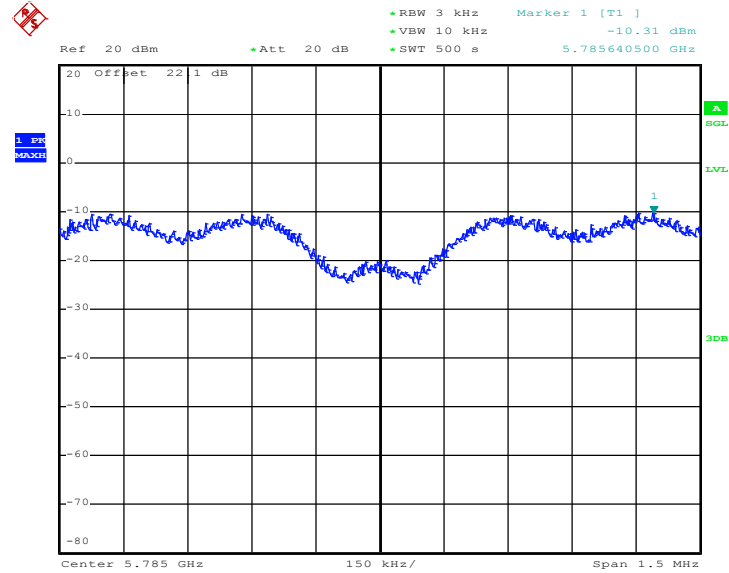
Mode 10: PSD Plot on 802.11a Channel 149



Date: 9.DEC.2010 15:04:40

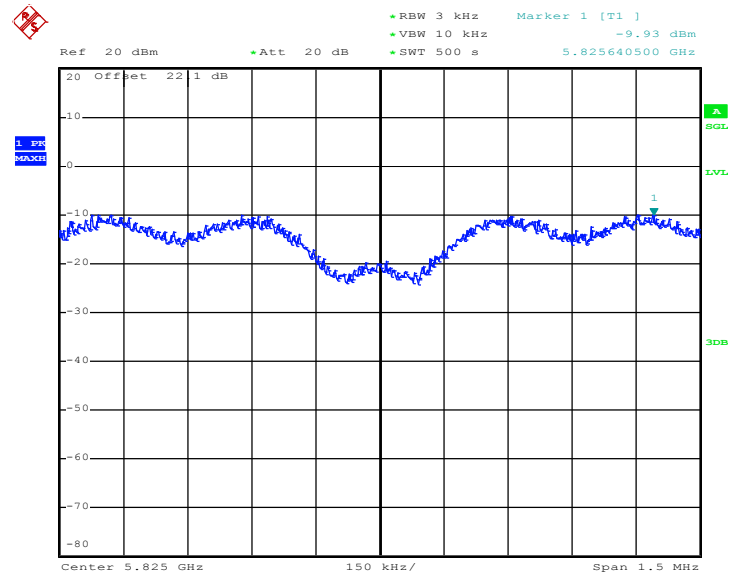


Mode 11: PSD Plot on 802.11a Channel 157

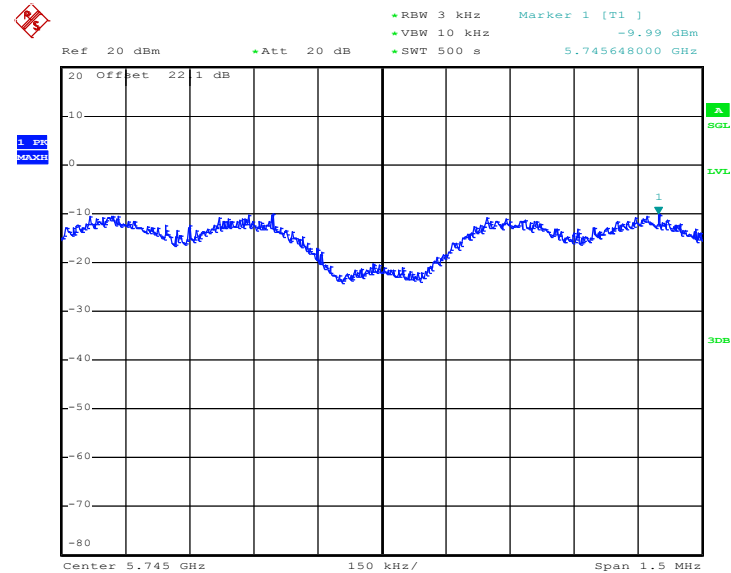


Date: 9.DEC.2010 15:24:26

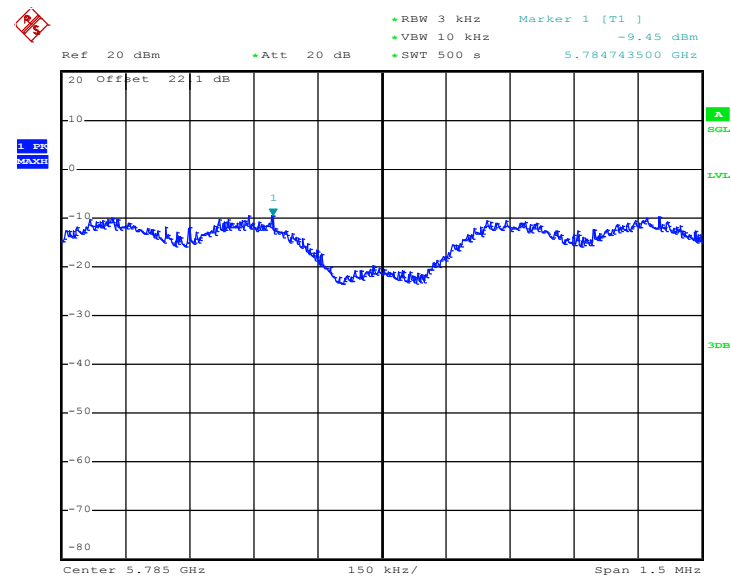
Mode 12: PSD Plot on 802.11a Channel 165



Date: 9.DEC.2010 15:36:55

Mode 13: PSD Plot on 802.11n (BW 20MHz) Channel 149


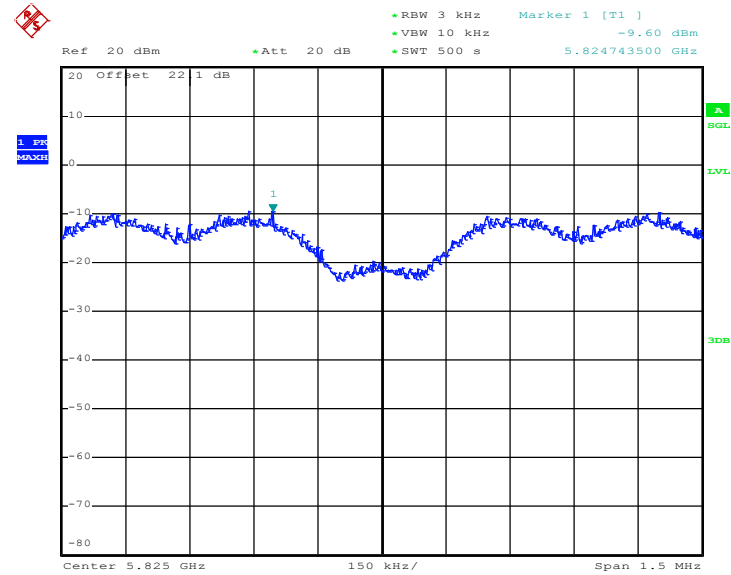
Date: 9.DEC.2010 15:57:19

Mode 14: PSD Plot on 802.11n (BW 20MHz) Channel 157


Date: 9.DEC.2010 16:06:20



Mode 15: PSD Plot on 802.11n (BW 20MHz) Channel 165



Date: 9.DEC.2010 16:16:27

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.

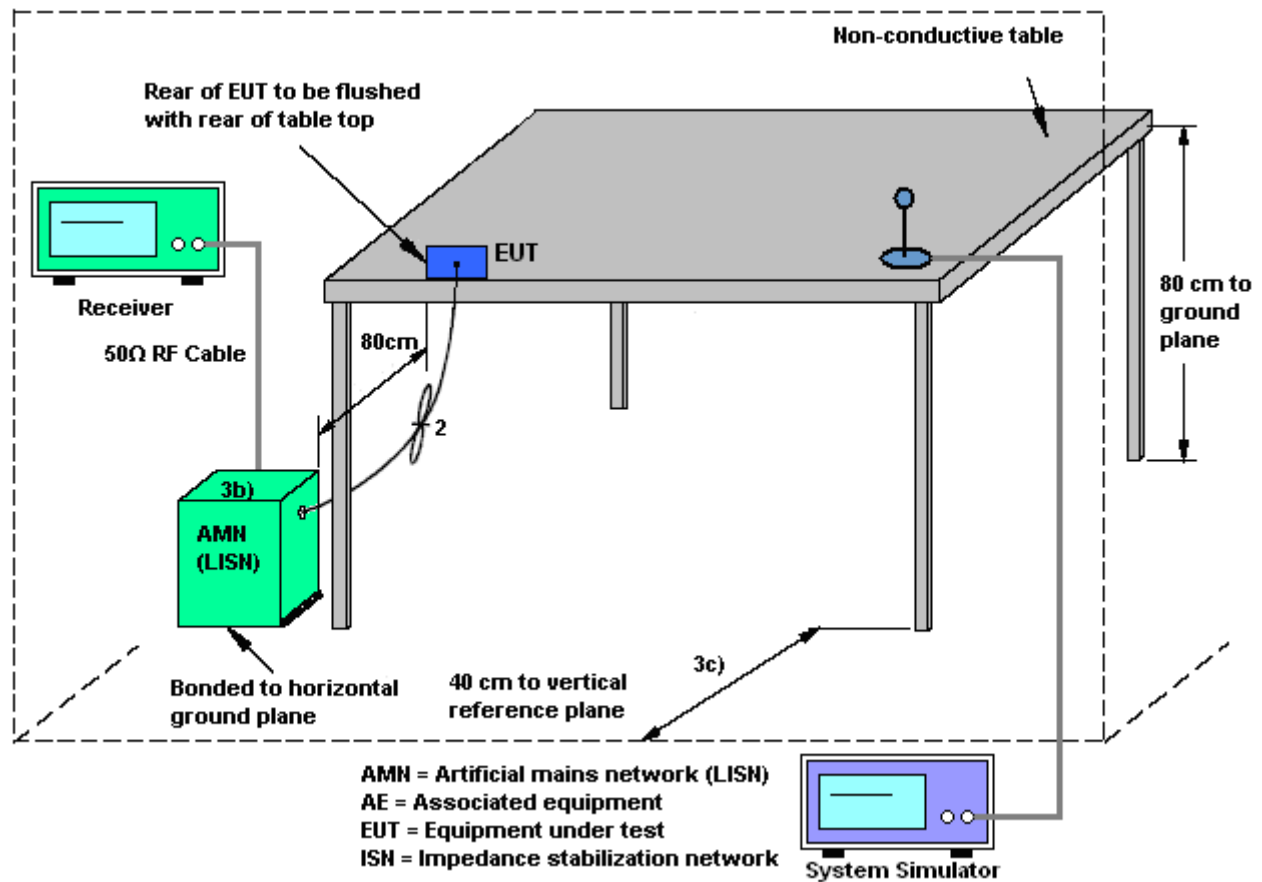
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

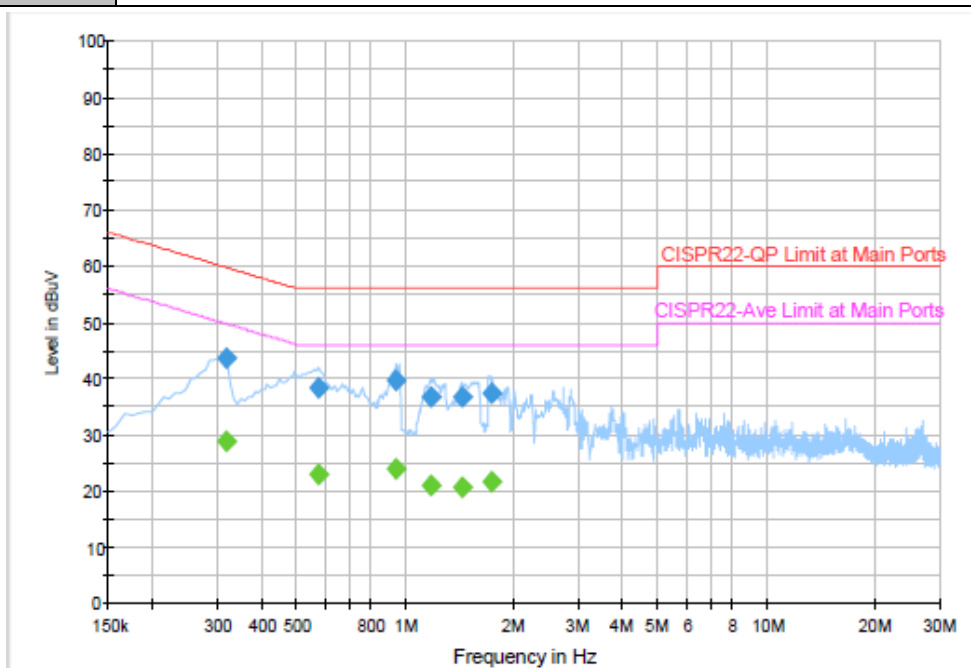
4. The testing follows the guidelines in ANSI C63.4-2003.
5. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
6. Connect EUT to the power mains through a line impedance stabilization network (LISN).
7. All the support units are connecting to the other LISN.
8. The LISN provides 50 ohm coupling impedance for the measuring instrument.
9. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
10. Both sides of AC line were checked for maximum conducted interference.
11. The frequency range from 150 kHz to 30 MHz was searched.
12. 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 :	Kai-Chun Chu	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Data Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



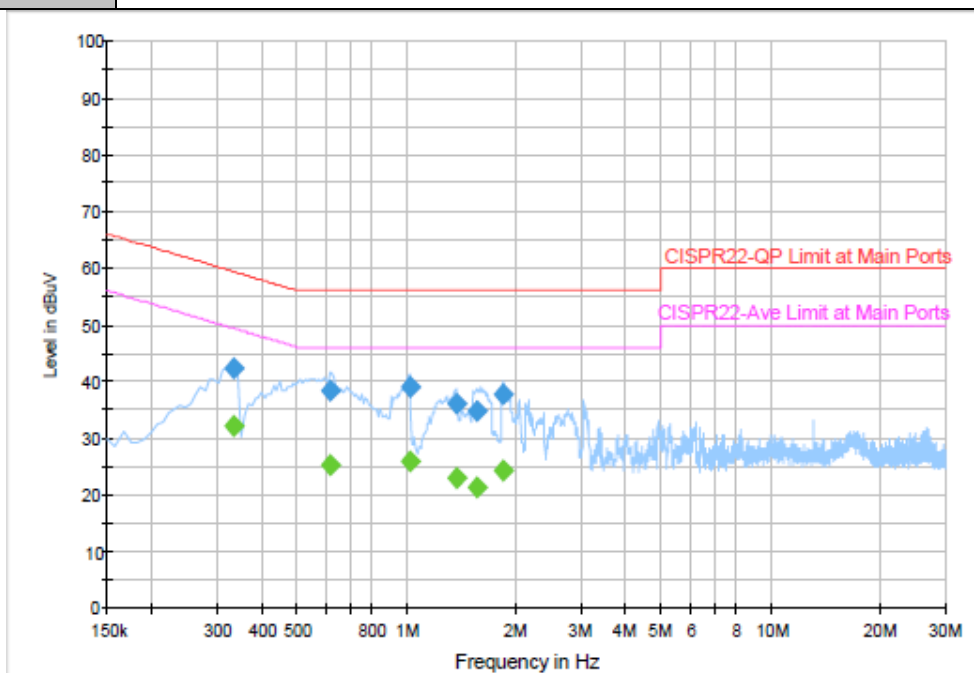
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.318000	43.5	Off	L1	19.4	16.3	59.8
0.574000	38.3	Off	L1	19.4	17.7	56.0
0.942000	39.6	Off	L1	19.4	16.4	56.0
1.166000	36.8	Off	L1	19.4	19.2	56.0
1.430000	36.6	Off	L1	19.4	19.4	56.0
1.734000	37.3	Off	L1	19.4	18.7	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.318000	28.8	Off	L1	19.4	21.0	49.8
0.574000	22.9	Off	L1	19.4	23.1	46.0
0.942000	23.9	Off	L1	19.4	22.1	46.0
1.166000	21.1	Off	L1	19.4	24.9	46.0
1.430000	20.6	Off	L1	19.4	25.4	46.0
1.734000	21.7	Off	L1	19.4	24.3	46.0

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Data Link with Notebook)		
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)
0.334000	42.3	Off	N	19.4	17.1	59.4
0.614000	38.5	Off	N	19.4	17.5	56.0
1.014000	38.9	Off	N	19.5	17.1	56.0
1.366000	36.2	Off	N	19.5	19.8	56.0
1.558000	34.8	Off	N	19.5	21.2	56.0
1.838000	37.6	Off	N	19.5	18.4	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.334000	32.2	Off	N	19.4	17.2	49.4
0.614000	25.1	Off	N	19.4	20.9	46.0
1.014000	25.8	Off	N	19.5	20.2	46.0
1.366000	23.1	Off	N	19.5	22.9	46.0
1.558000	21.3	Off	N	19.5	24.7	46.0
1.838000	24.2	Off	N	19.5	21.8	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

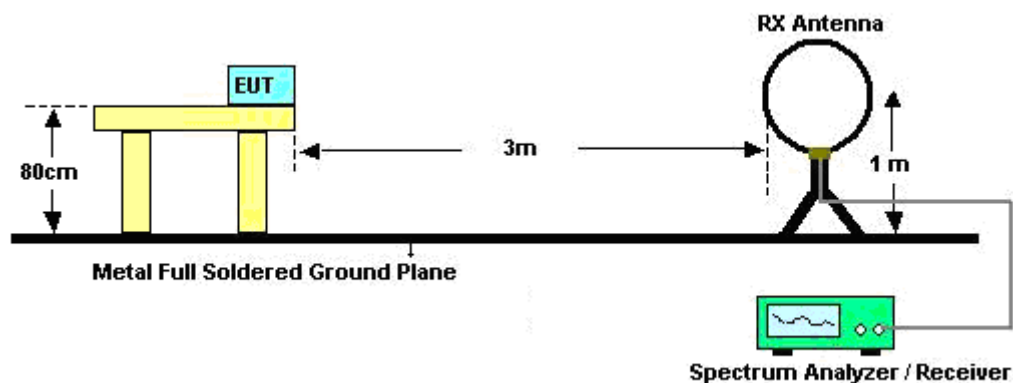
See list of measuring instruments of this test report.

3.7.3 Test Procedures

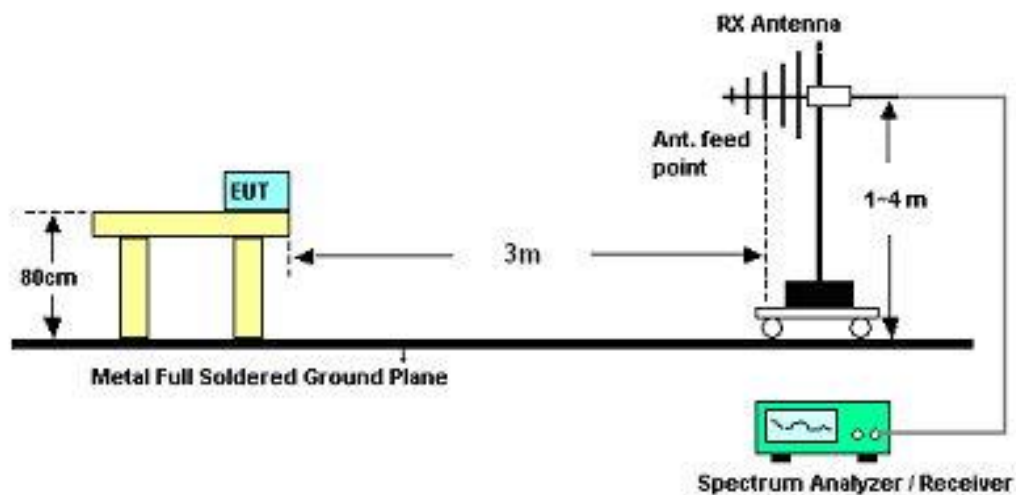
- The testing follows the guidelines in FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
- Use the following spectrum analyzer settings:
 - Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = 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

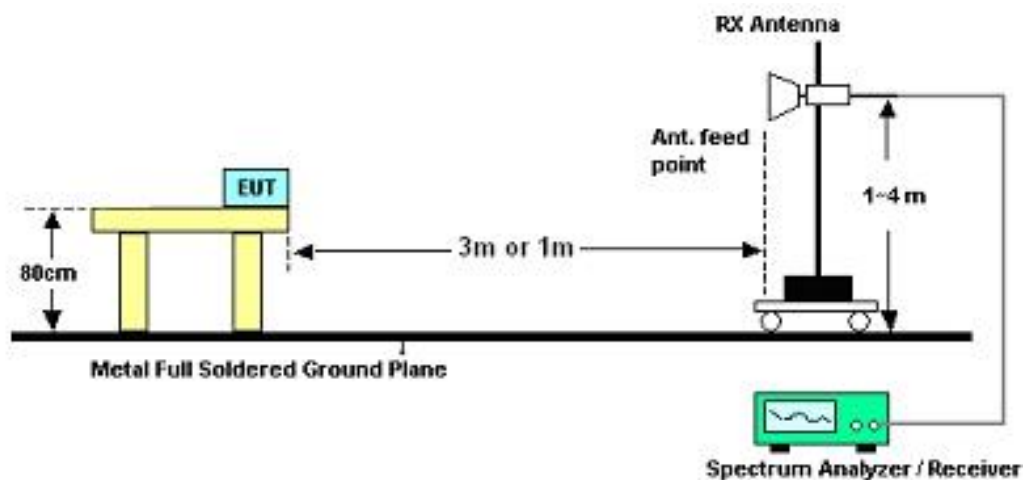
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

Test Engineer :	Elvis Chen	Temperature :	24~26°C	
		Relative Humidity :	41~43%	

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 (30MHz ~ 10th Harmonic)

Test Mode :	Mode 1	Temperature :	24~26°C
Test Channel :	01	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
128.28	28.63	-14.87	43.5	47.1	11.85	1.38	31.7	-	-	Peak
184.44	29.48	-14.02	43.5	50.15	9.42	1.58	31.67	-	-	Peak
293.79	32.4	-13.6	46	48.64	13.37	2.04	31.65	-	-	Peak
332.9	34.6	-11.4	46	49.79	14.22	2.17	31.58	100	5	Peak
663.3	28.99	-17.01	46	38.55	19.31	3.11	31.98	-	-	Peak
836.9	28.06	-17.94	46	35.41	21.09	3.49	31.93	-	-	Peak
2386.38	44.64	-9.36	54	41.73	31.9	5.4	34.39	100	310	Average
2386.38	55.09	-18.91	74	52.18	31.9	5.4	34.39	100	310	Peak
2412	107.57	-	-	104.62	31.91	5.43	34.39	100	310	Average
2412	111.2	-	-	108.25	31.91	5.43	34.39	100	310	Peak
2492	48.35	-25.65	74	45.2	32	5.52	34.37	100	310	Peak
2492	38.96	-15.04	54	35.81	32	5.52	34.37	100	310	Average



Test Mode :	Mode 1	Temperature :	24~26°C
Test Channel :	01	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
35.13	31.36	-8.64	40	47.39	14.93	0.74	31.7	-	-	Peak
51.33	28.16	-11.84	40	51.07	7.92	0.87	31.7	-	-	Peak
129.63	34.76	-8.74	43.5	53.3	11.77	1.39	31.7	-	-	Peak
663.3	37.51	-8.49	46	47.07	19.31	3.11	31.98	100	127	Peak
770.4	28.86	-17.14	46	37.21	20.35	3.35	32.05	-	-	Peak
917.4	29.79	-16.21	46	35.74	21.71	3.77	31.43	-	-	Peak
2389.61	38.84	-15.16	54	35.93	31.9	5.4	34.39	119	0	Average
2389.61	48.39	-25.61	74	45.48	31.9	5.4	34.39	119	0	Peak
2412	101.71	-	-	98.76	31.91	5.43	34.39	119	0	Average
2412	105.39	-	-	102.44	31.91	5.43	34.39	119	0	Peak
2484	45.43	-28.57	74	42.3	31.98	5.52	34.37	119	0	Peak
2484	37.67	-16.33	54	34.54	31.98	5.52	34.37	119	0	Average



Test Mode :	Mode 2	Temperature :	24~26°C
Test Channel :	06	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
184.98	29.29	-14.21	43.5	49.96	9.42	1.58	31.67	-	-	Peak
275.43	31.89	-14.11	46	48.57	13.07	1.96	31.71	-	-	Peak
295.68	32.85	-13.15	46	49.06	13.4	2.04	31.65	-	-	Peak
330.8	36.07	-9.93	46	51.33	14.17	2.16	31.59	100	37	Peak
663.3	29.95	-16.05	46	39.51	19.31	3.11	31.98	-	-	Peak
887.3	30.43	-15.57	46	36.89	21.52	3.7	31.68	-	-	Peak
2358	52.65	-21.35	74	49.82	31.86	5.37	34.4	100	58	Peak
2358	39.76	-14.24	54	36.93	31.86	5.37	34.4	100	58	Average
2437	110.74	-	-	107.73	31.93	5.46	34.38	100	58	Peak
2437	107.08	-	-	104.05	31.95	5.46	34.38	100	58	Average
2486	49.72	-24.28	74	46.59	31.98	5.52	34.37	100	58	Peak
2486	39.66	-14.34	54	36.53	31.98	5.52	34.37	100	58	Average



Test Mode :	Mode 2	Temperature :	24~26°C
Test Channel :	06	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
36.48	31.9	-8.1	40	48.73	14.1	0.77	31.7	100	28	Peak
48.63	30.15	-9.85	40	52.24	8.78	0.84	31.71	-	-	Peak
130.98	31.52	-11.98	43.5	50.09	11.74	1.39	31.7	-	-	Peak
663.3	36.62	-9.38	46	46.18	19.31	3.11	31.98	-	-	Peak
771.8	27.42	-18.58	46	35.74	20.38	3.35	32.05	-	-	Peak
892.9	29.23	-16.77	46	35.57	21.57	3.73	31.64	-	-	Peak
2380	47.14	-26.86	74	44.25	31.88	5.4	34.39	100	0	Peak
2380	40.45	-13.55	54	37.56	31.88	5.4	34.39	100	0	Average
2437	105.68	-	-	102.65	31.95	5.46	34.38	100	0	Peak
2437	101.71	-	-	98.68	31.95	5.46	34.38	100	0	Average
2486	46.78	-27.22	74	43.65	31.98	5.52	34.37	100	0	Peak
2486	38.36	-15.64	54	35.23	31.98	5.52	34.37	100	0	Average



Test Mode :	Mode 3	Temperature :	24~26°C
Test Channel :	11	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
183.63	28.76	-14.74	43.5	49.44	9.43	1.57	31.68	-	-	Peak
243.03	30.51	-15.49	46	48.13	12.22	1.82	31.66	-	-	Peak
271.38	32.35	-13.65	46	49.09	13.01	1.94	31.69	-	-	Peak
315.4	34.85	-11.15	46	50.54	13.82	2.11	31.62	100	65	Peak
665.4	29.58	-16.42	46	39.13	19.31	3.12	31.98	--	-	Peak
775.3	30.22	-15.78	46	38.48	20.42	3.36	32.04	-	-	Peak
2364	48.47	-25.53	74	45.64	31.86	5.37	34.4	100	303	Peak
2364	39.44	-14.56	54	36.61	31.86	5.37	34.4	100	303	Average
2462	109.79	-	-	106.71	31.97	5.49	34.38	100	303	Peak
2462	105.71	-	-	102.63	31.97	5.49	34.38	100	303	Average
2483.85	42.01	-11.99	54	38.88	31.98	5.52	34.37	100	303	Average
2483.85	53.26	-20.74	74	50.13	31.98	5.52	34.37	100	303	Peak



Test Mode :	Mode 3	Temperature :	24~26°C
Test Channel :	11	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
36.48	32.37	-7.63	40	49.2	14.1	0.77	31.7	100	47	Peak
64.83	29.25	-10.75	40	53.57	6.38	0.98	31.68	-	-	Peak
128.28	31.93	-11.57	43.5	50.4	11.85	1.38	31.7	-	-	Peak
665.4	36.37	-9.63	46	45.92	19.31	3.12	31.98	-	-	Peak
890.8	29.41	-16.59	46	35.79	21.55	3.72	31.65	-	-	Peak
925.8	30.19	-15.81	46	36.01	21.75	3.78	31.35	-	-	Peak
2388	45.85	-28.15	74	42.94	31.9	5.4	34.39	100	11	Peak
2388	38.25	-15.75	54	35.34	31.9	5.4	34.39	100	11	Average
2462	100.76	-	-	97.68	31.97	5.49	34.38	100	11	Average
2462	104.54	-	-	101.46	31.97	5.49	34.38	100	11	Peak
2488.98	48.68	-25.32	74	45.53	32	5.52	34.37	100	11	Peak
2488.98	38.83	-15.17	54	35.68	32	5.52	34.37	100	11	Average



Test Mode :	Mode 4	Temperature :	24~26°C
Test Channel :	01	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
128.28	30.1	-13.4	43.5	48.57	11.85	1.38	31.7	-	-	Peak
184.44	30.39	-13.11	43.5	51.06	9.42	1.58	31.67	-	-	Peak
280.83	33.04	-12.96	46	49.62	13.17	1.98	31.73	-	-	Peak
332.9	35.21	-10.79	46	50.4	14.22	2.17	31.58	100	45	Peak
663.3	29.35	-16.65	46	38.91	19.31	3.11	31.98	-	-	Peak
927.9	30.45	-15.55	46	36.24	21.76	3.78	31.33	-	-	Peak
2389.99	61.15	-12.85	74	58.24	31.9	5.4	34.39	102	60	Peak
2389.99	44.44	-9.56	54	41.53	31.9	5.4	34.39	102	60	Average
2412	107.14	-	-	104.19	31.91	5.43	34.39	102	60	Peak
2412	101.64	-	-	98.69	31.91	5.43	34.39	102	60	Average
2500	37.66	-16.34	54	34.51	32	5.52	34.37	102	60	Average
2500	47.69	-26.31	74	44.54	32	5.52	34.37	102	60	Peak



Test Mode :	Mode 4	Temperature :	24~26°C
Test Channel :	01	Relative Humidity :	41~43%
Test Engineer :	Elvis Chen	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
36.48	32.42	-7.58	40	49.25	14.1	0.77	31.7	100	37	Peak
63.48	27.49	-12.51	40	51.79	6.4	0.98	31.68	-	-	Peak
128.28	32.58	-10.92	43.5	51.05	11.85	1.38	31.7	-	-	Peak
663.3	36.76	-9.24	46	46.32	19.31	3.11	31.98	-	-	Peak
771.8	28.82	-17.18	46	37.14	20.38	3.35	32.05	-	-	Peak
890.8	29.18	-16.82	46	35.56	21.55	3.72	31.65	-	-	Peak
2389.99	51.19	-22.81	74	48.28	31.9	5.4	34.39	100	0	Peak
2389.99	38.94	-15.06	54	36.03	31.9	5.4	34.39	100	0	Average
2412	88.85	-	-	85.9	31.91	5.43	34.39	100	0	Average
2412	98.82	-	-	95.87	31.91	5.43	34.39	100	0	Peak
2492	46.33	-27.67	74	43.18	32	5.52	34.37	100	0	Peak
2492	37.55	-16.45	54	34.4	32	5.52	34.37	100	0	Average



Test Mode :	Mode 5	Temperature :	22~23°C
Test Channel :	157	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Horizontal
Remark :	5785 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
48.63	30.36	-9.64	40.00	52.13	9.08	0.68	31.53	-	-	Peak
171.21	36.98	-6.52	43.50	57.62	9.65	1.23	31.52	100	112	Peak
228.18	36.07	-9.93	46.00	54.95	11.09	1.47	31.44	-	-	Peak
327.30	36.20	-9.80	46.00	51.37	14.30	1.84	31.31	-	-	Peak
598.20	24.43	-21.57	46.00	32.93	19.74	2.68	30.92	-	-	Peak
797.70	32.16	-13.84	46.00	37.28	22.42	3.14	30.68	-	-	Peak
5785.00	112.62	-	-	101.07	34.88	9.90	33.23	100	272	Peak
5785.00	102.61	-	-	91.06	34.88	9.90	33.23	100	272	Average



Test Mode :	Mode 5	Temperature :	22~23°C
Test Channel :	157	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Vertical
Remark :	5785 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
76.17	31.76	-8.24	40.00	55.56	6.88	0.86	31.54	100	221	Peak
203.34	35.93	-7.57	43.50	56.71	9.37	1.33	31.48	-	-	Peak
249.78	36.65	-9.35	46.00	53.86	12.67	1.53	31.41	-	-	Peak
301.40	35.50	-10.50	46.00	51.54	13.52	1.77	31.33	-	-	Peak
623.40	25.05	-20.95	46.00	33.16	20.03	2.76	30.90	-	-	Peak
797.70	31.03	-14.97	46.00	36.15	22.42	3.14	30.68	-	-	Peak
5785.00	112.56	-	-	101.01	34.88	9.90	33.23	100	6	Peak
5785.00	102.73	-	-	91.18	34.88	9.90	33.23	100	6	Average

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 PIFA 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. 18, 2011	Sep. 17, 2012	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 18, 2011	Sep. 17, 2012	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Aug. 21, 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)
GPS Station	Pendulum	GSG-54	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. 30, 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 (150kHz ~ 30MHz)

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 (30MHz ~ 1000MHz)

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 (1GHz ~ 40GHz)

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 = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+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 EP0D0904-17 as below.