

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART B&C
REQUIREMENTS**

OF

Wireless-AG 23dBm Network MiniPCI Adapter

FCC ID:TK4-06-WLM54AGP23

MODEL No.: IWAVEPORT WLM54AGP23

BRAND NAME: Compex

REPORT NO: SZE061008107802

ISSUE DATE: November 20, 2006

Prepared for

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Prepared by

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VERIFICATION OF COMPLIANCE

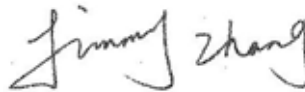
Applicant:	Compex Systems Pte. Ltd 135, Joo Seng Road, #08-01 PM Industrial Building Singapore 368363
Manufacturer	Compex Systems Pte. Ltd 135, Joo Seng Road, #08-01 PM Industrial Building Singapore 368363
Product Description:	Wireless-AG 23dBm Network MiniPCI Adapter
Brand Name:	Compex
Model Number:	Compex
Serial Number:	N/A
File Number:	SZE061008107802
Date of Test:	October 07, 2006 ~ October 25, 2006

We hereby certify that:

The above equipment was tested by Centre Testing International Company Limited. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247

The test results of this report relate only to the tested sample identified in this report.

Reviewed and Approved by:



Jimmy Zhang
Technical Director of EMC Engineering Dept.
Centre Testing International Company Limited

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1 GENERAL INFORMATION

1.1 Product Description

The EUT is an short range, lower power, Wireless-AG 23dBm Network MiniPCI Adapter designed as an “ Input Device”. It is designed by way of utilizing the DSSS technology to achieve the system operation.

A major technical descriptions of EUT is described as following:

A). Operation Frequency:

For 802.11b/g (2412 MHz, 2417 MHz, 2422 MHz, 2427 MHz, 2432 MHz, 2337 MHz, 2442 MHz, 2447 MHz, 2452 MHz, 2457 MHz, 2462 MHz, 2467 MHz, 2472 MHz) Total 13 Channels

For 802.11a (5740 MHz, 5760 MHz, 5780 MHz, 5800 MHz, 5820 MHz, 5840 MHz) Total 6 Channels

B). Modulation: DBPSK , DQPSK, CCK, OFDM

C). Data Rate: 1, 2, 5.5, 6, 9, 11,12, 18, 24, 36, 48 and 54 Mbit/s.

**D). Antenna Designation: Dedicated Antenna with Maximum 2 dBi
(Replace by end user is not permitted)**

E). Power Supply: DC 12 V (Changed by AC 120 V/60Hz Adapter)

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: TK4-06-WLM54AGP23 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

All measurement facilities used to collect the measurement data are located at

No. 6, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District, Shenzhen, China. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 16.equipment

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2 System Test Configuration

2.1 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

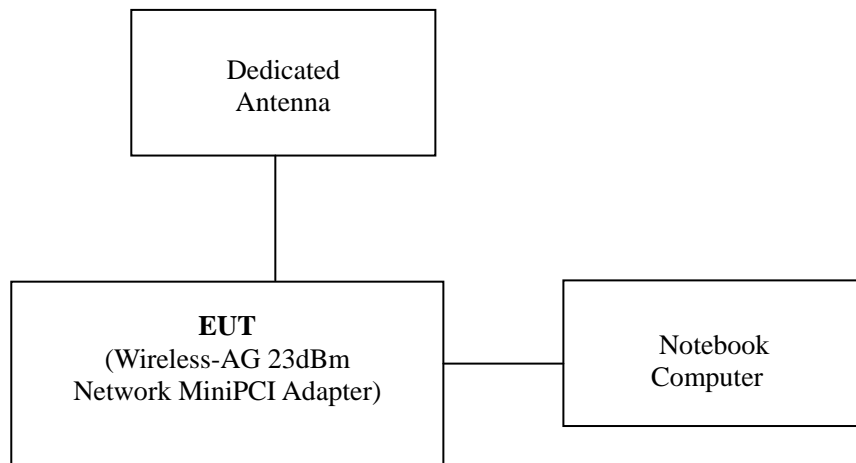


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Wireless-AG 23dBm Network MiniPCI Adapter	Compex	IWAVEPORT WLM54AGP23	TK4-06-WLM54AGP23	N/A	<i>EUT</i>
	Notebook Computer	HASSE	S263C	N/A	N/A	

3 Summary Of Test Results

FCC Rules	Description Of Test	EUT	Result
§ 15.247	Conduction Emission	Wireless-AG 23dBm Network MiniPCI Adapter (2400MHz to 2483.5 MHz)	Compliant
§ 15.247	Maximum Conducted Output Power		Compliant
§ 15.247	Maximum Power Spectral Density Conducted		Compliant
§ 15.247	Minimum 6 dB Bandwidth		Compliant
§ 15.247	Out of Band Conducted Output Power		Compliant
§ 15.247	Band Edge		Compliant
§ 15.247	Peak Transmit Power	Wireless-AG 23dBm Network MiniPCI Adapter (5725MHz to 5850 MHz)	Compliant
§ 15.247	Maximum Power Spectral Density Conducted		Compliant
§ 15.247	Minimum 6dB bandwidth		Compliant
§ 15.247	Band Edge		Compliant
§ 15.247	Parameters for Antenna		Compliant

4 Description of test modes

4.1 Continuous Transmitting Mode

4.1.1 Continuous Transmitting Mode

1. The EUT (Wireless-AG 23dBm Network MiniPCI Adapter) has been set to operate continuously on the lowest, the middle and the highest operation frequency individually for each items been evaluated.
2. The EUT stays in continuous transmitting mode on the operation frequency being set.

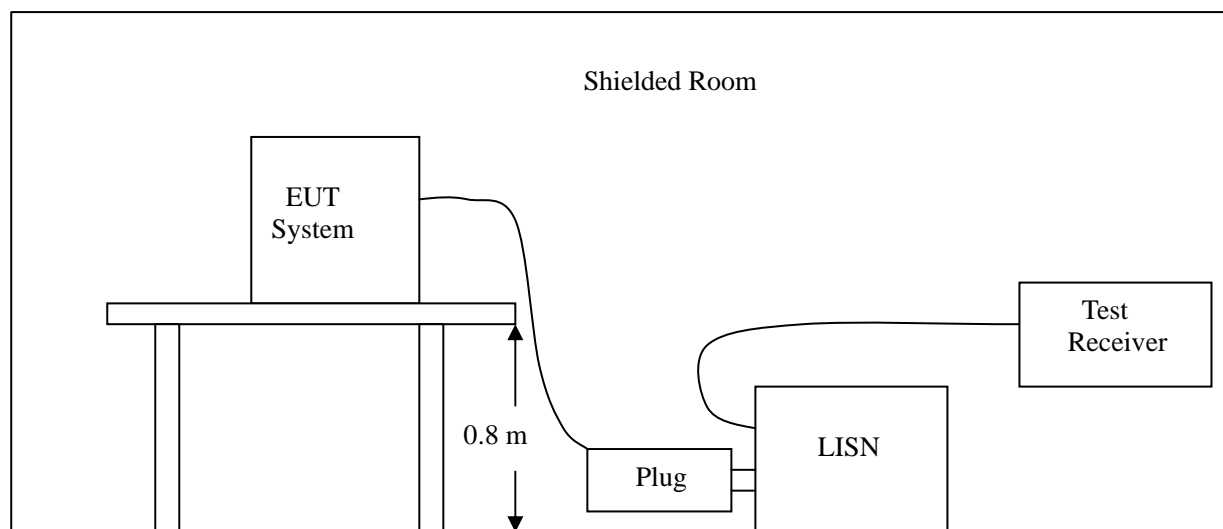
5 Parameters for 802.11b/g 2400 MHz to 2483.5 MHz

5.1 Conduction Emissions

5.1.1 Measurement Procedure:

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4.
- 2 Support equipment, if needed, was placed as per ANSI C63.4.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4 The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

5.1.2 Test SET-UP (Block Diagram of Configuration)



5.1.3 Measurement Equipment Used:

Conducted Emission Test Site # 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCS30	100038	2006/11	2007/11
ARTIFICIAL MAINS	ROHDE & SCHWARZ	ESH2-Z5	100028	2006/11	2007/11
PULSE LIMITER	ROHDE & SCHWARZ	ESHSZ2	100044	2006/11	2007/11
EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	N/A	N/A	N/A

5.1.4 Limits And Measurement Result:

Limits and Measurement Result Of Conducted Emission		
Applicable Limits	Measurement Result	
	Test Data	Criteria
Per 15.207 Conducted Emission Limit	See as the chart below	PASS

Tests was performed on 802.11a, 802.11b and 802.11g mode, on each operation mode, all kinds of modulations (DBPSK, DQPSK, CCK, OFDM) and the typical data rate(1Mbps, 11 Mbps, 54Mbps) has been evaluated for the power conducted emission. The worst case of the result when the bottom frequency operates on 802.11a employed the CCK modulation with the 54 Mbps has been recorded and reported as following:

(The chart below shows the highest readings taken from the final data)

FREQ MHz	PEAK RAW dBuV	Q.P. RAW dBuV	AVG RAW dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.402	42.22	---	---	58.76	48.76	---	-6.54	L1
0.458	41.49	---	---	57.12	47.12	---	-5.63	L1
0.582	38.73	---	---	56.00	46.00	---	-7.27	L1
0.707	37.35	---	---	56.00	46.00	---	-8.65	L1
0.953	35.02	---	---	56.00	46.00	---	-10.98	L1
1.114	38.10	---	---	56.00	46.00	---	-7.90	L1
0.608	39.50	---	---	56.00	46.00	---	-6.50	L2
0.693	37.90	---	---	56.00	46.00	---	-8.10	L2
0.986	36.71	---	---	56.00	46.00	---	-9.29	L2
1.424	35.20	---	---	56.00	46.00	---	-10.80	L2
2.012	36.30	---	---	56.00	46.00	---	-9.70	L2
2.808	37.37	---	---	56.00	46.00	---	-8.63	L2

L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

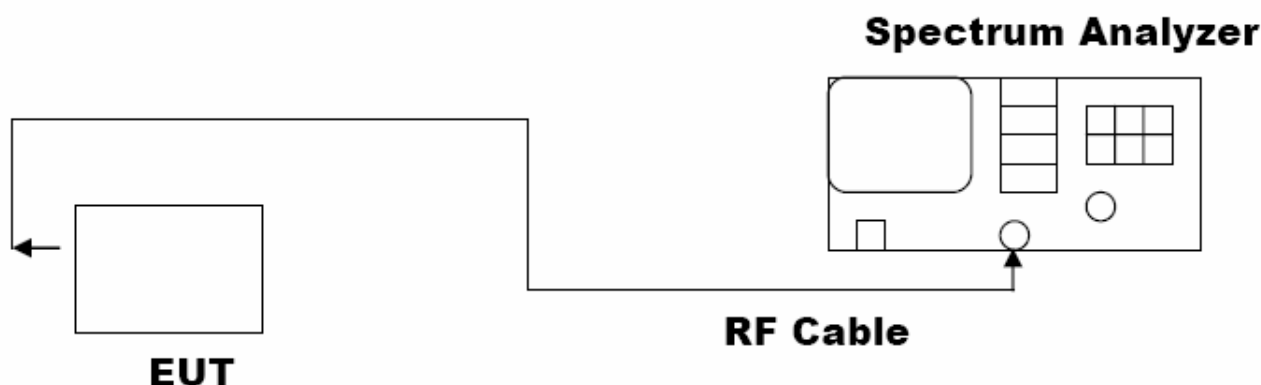
****NOTE:** “---” denotes the peak emission level was or more than 2dB below the Average limit, so no re-check anymore.

5.2 Maximum Conducted Output Power

5.2.1 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 MHz, VBW= 1 MHz.
4. Set SPA Trace 1 Max hold, then View.

5.2.2 Test SET-UP (Block Diagram of Configuration)



5.2.3 Measurement Equipment Used:

3/5 Anechoic Chamber Radiation Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2005/11	2006/11
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2005/11	2006/11
RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	N/A	N/A
TURNTABLE	ETS	2088	2149	N/A	N/A
ANTENNA MAST	ETS	2075	2346	N/A	N/A
EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	NA	N/A	N/A

5.2.4 Limits And Measurement Result:

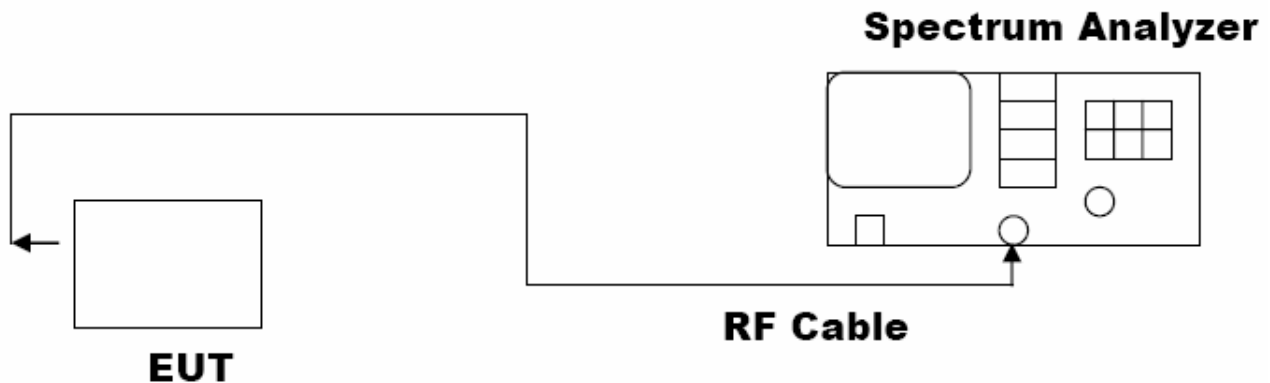
Tests was performed on 802.11b and 802.11g mode, on each operation mode, all kinds of modulations (DBPSK, DQPSK, CCK, OFDM) and the typical date rate(1Mbps, 11 Mbps, 54Mbps) has been evaluated for the Maximum Conducted Output Power. The worst case of the result when operate on 802.11b and 802.11g employed the CCK modulation with the 1 Mbps has been recorded and reported respectively as following:

5.3 Maximum Power Spectral Density Conducted

5.3.1 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 3 KHz,
VBW= 10 KHz., Sweep time= Auto
4. Set SPA Trace 1 Max hold, then View.

5.3.2 Test SET-UP (Block Diagram of Configuration)



5.3.3 Measurement Equipment Used:

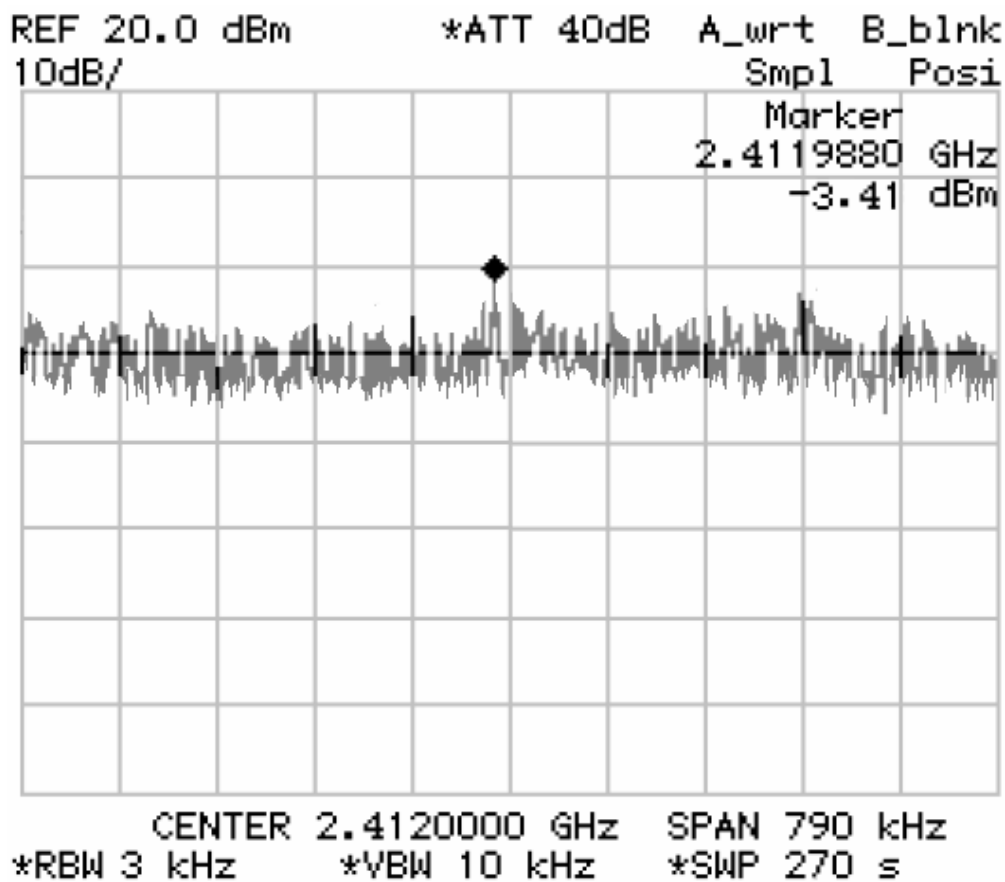
3/5 Anechoic Chamber Radiation Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2005/11	2006/11
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2005/11	2006/11
RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	N/A	N/A
TURNTABLE	ETS	2088	2149	N/A	N/A
ANTENNA MAST	ETS	2075	2346	N/A	N/A
EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	NA	N/A	N/A

5.3.4 Limits And Measurement Result:

Tests was performed on 802.11b and 802.11g mode, on each operation mode, all kinds of modulations (DBPSK, DQPSK, CCK, OFDM) and the typical date rate(1Mbps, 11 Mbps, 54Mbps) has been evaluated for the Maximum Power Spectral Density Output Power. The worst case of the result when operate on 802.11b and 802.11g employed the CCK modulation with the 1 Mbps has been recorded and reported respectively as following:

Limits and Measurement Result Of 802.11b		
Applicable Limits	Measurement Result	
	Test Data	Criteria
8 dBm / 3KHz	-3.41 dBm for Bottom frequency	PASS
	-3.66 dBm for Middle frequency	PASS
	-3.54 dBm for Top frequency	PASS

Test plots for the worst case test result of 802.11b@ Bottom Frequency



5.4 Minimum 6 dB Bandwidth

5.4.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 MHz, VBW= 3 MHz.
4. Set SPA Trace 1 Max hold, then View.

5.4.2 Test SET-UP (Block Diagram of Configuration)

The Same as described in Section 5.2.2

5.4.3 Measurement Equipment Used:

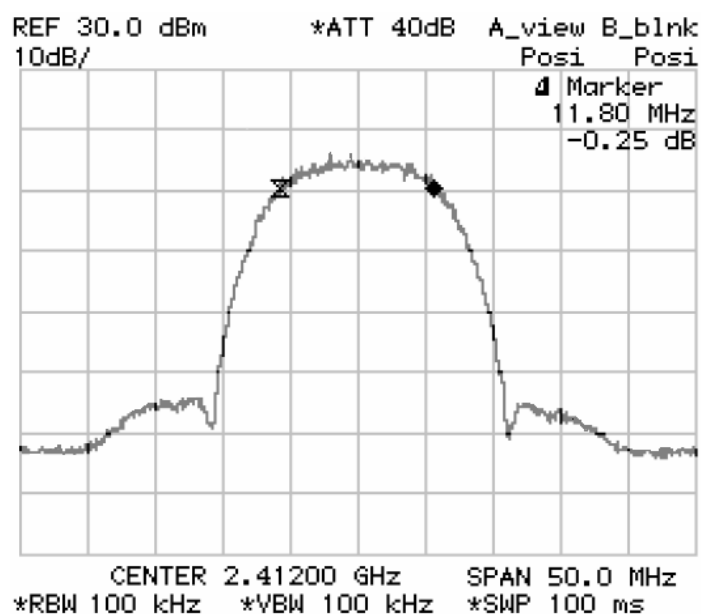
The same as described in Section 5.2.3

5.4.4 Limits And Measurement Results:

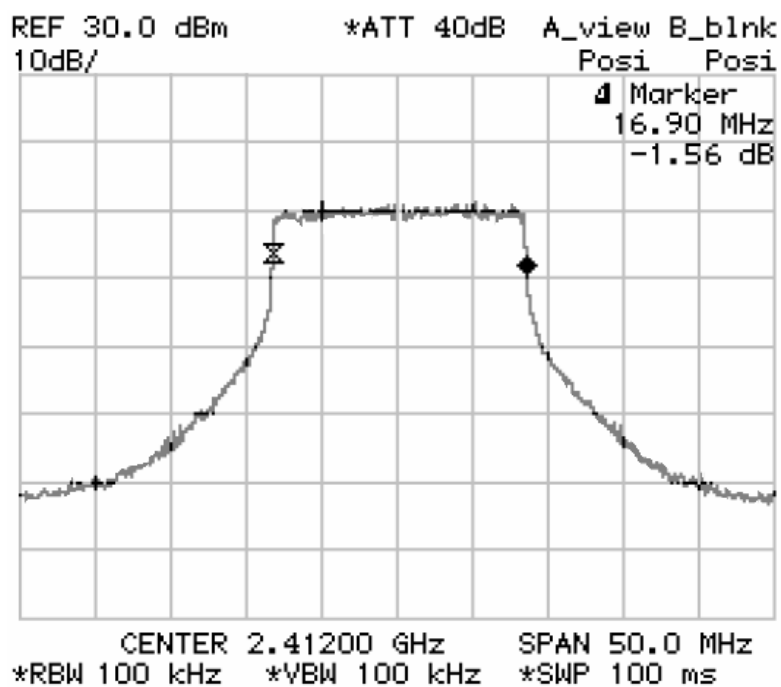
Tests was performed on 802.11b and 802.11g mode, on each operation mode, all kinds of modulations (DBPSK, DQPSK, CCK, OFDM) and the typical date rate(1Mbps, 11 Mbps, 54Mbps) has been evaluated for the Minimum 6 dB Bandwidth. The worst case of the result when operate on 802.11b and 802.11g employed the CCK modulation with the 1 Mbps has been recorded and reported respectively as following:

Limits and Measurement Result Of 802.11b		
Applicable Limits	Measurement Result	
	Test Data	Criteria
> 500 KHz	11.8 MHz for Bottom frequency	PASS
	11.4 MHz for Middle frequency	PASS
	11.5 MHz for Top frequency	PASS

Test plots for the worst case test result of 802.11b@ Bottom Frequency



Test plots for the worst case test result of 802.11g@ Bottom Frequency



5.5 Out of Band Conducted Output Power

5.5.1 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW= 100 KHz.
4. Set SPA Trace 1 Max hold, then View.

5.5.2 Test SET-UP (Block Diagram of Configuration)

The Same as described in section 5.2.2

5.5.3 Measurement Equipment Used:

The Same as described in section 5.2.3

5.5.4 Limits And Measurement Result:

Limits and Measurement Result Of 802.11b		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS

Limits and Measurement Result Of 802.11g		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS

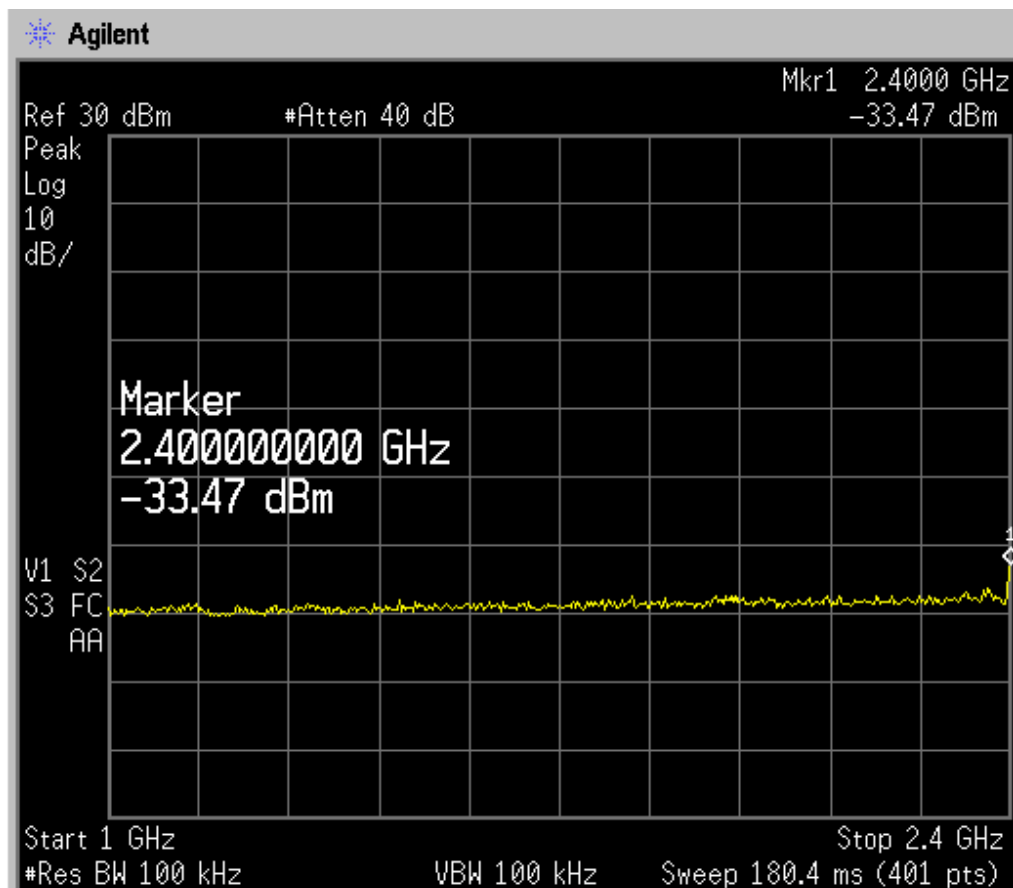
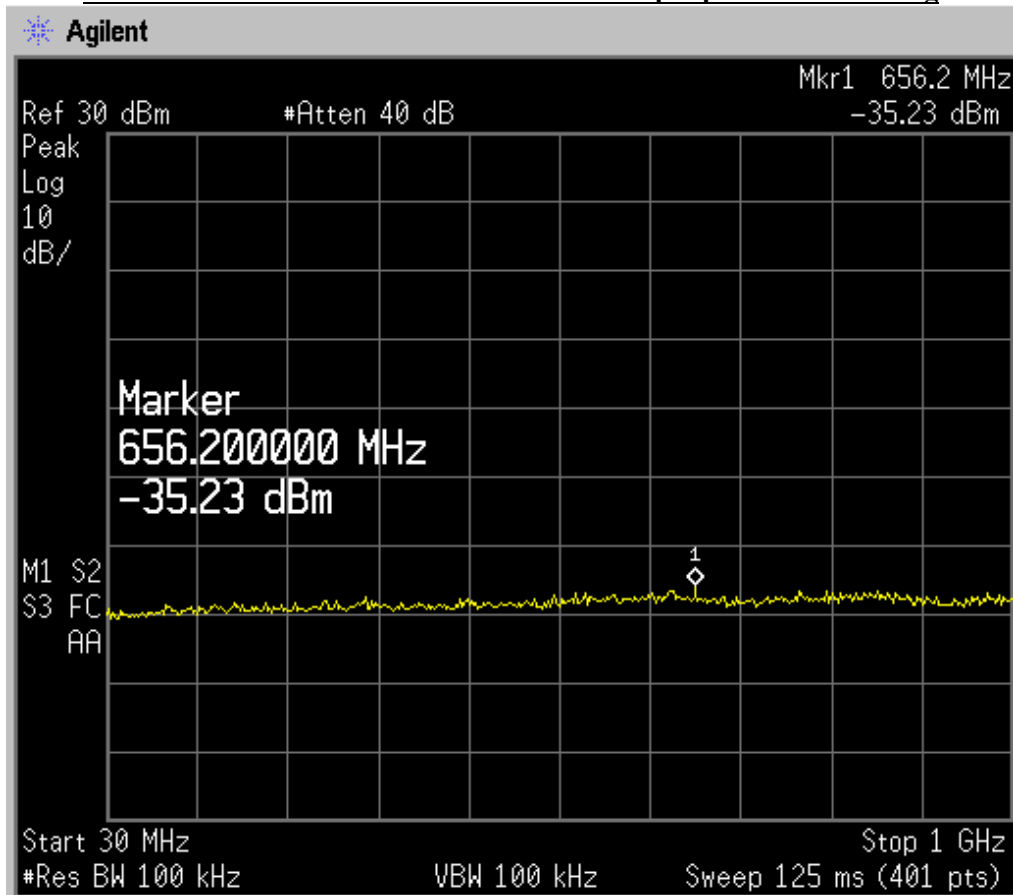
*** Remarks:

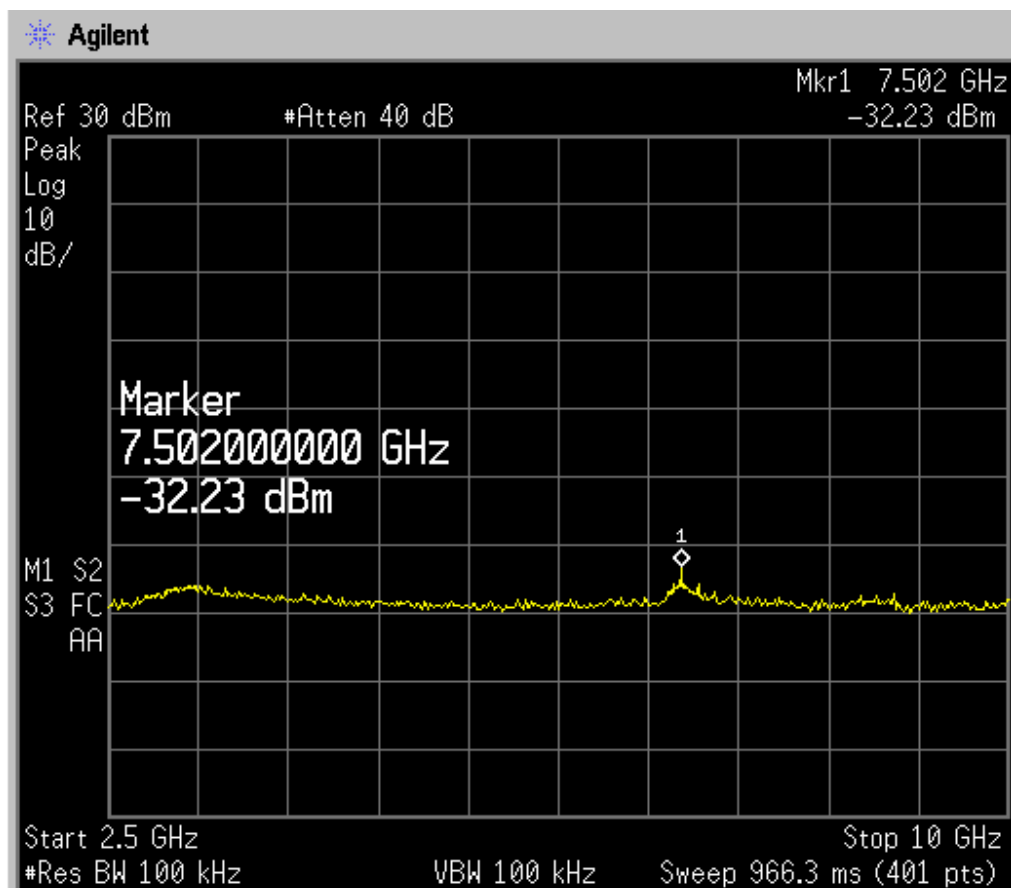
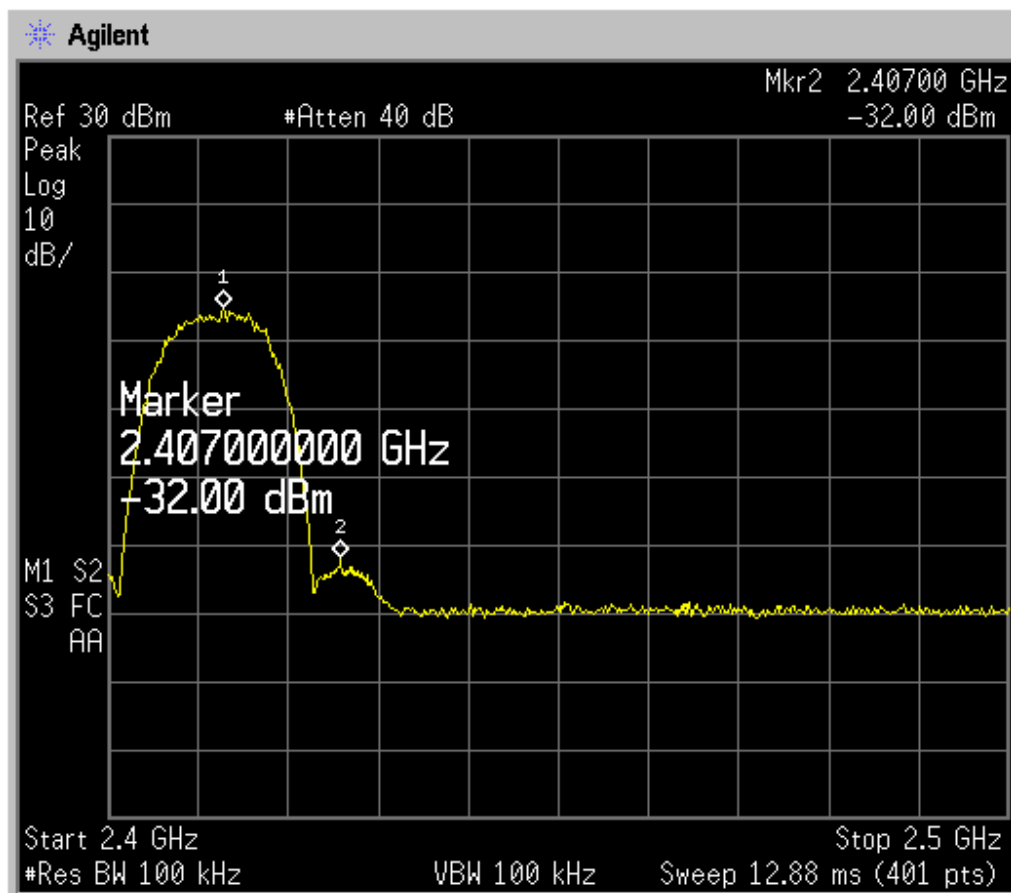
The out of band conducted output power was fully measured based on the following conditions:

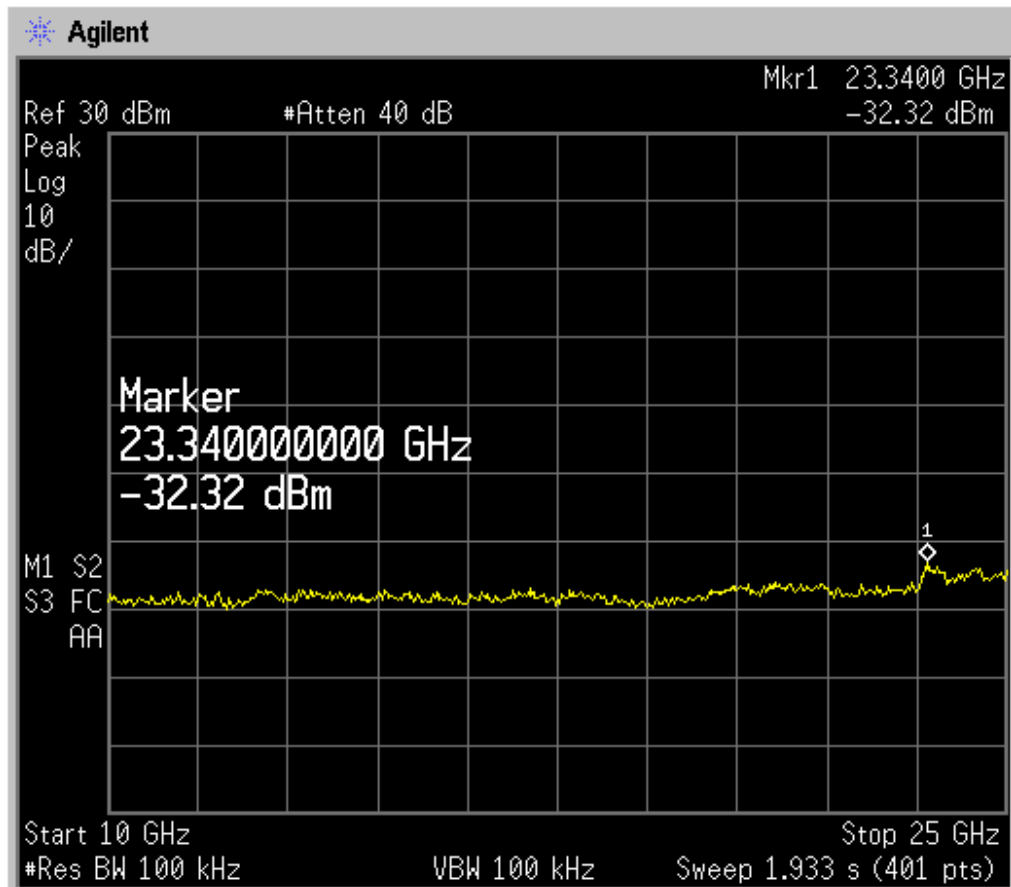
- 1, Both the operation mode of 802.11b and 802.11g was assessed
- 2, Three typical frequencies (the top one, the middle one, the bottom one) have been fully assessed on both 802.11b and 802.11g mode
- 3, The worst case of all assessments is to operate at bottom frequency on 802.11b mode

The worst case for out of band conducted output power test plots is listed as below:

The worst case of the out of band conducted output power for 802.11b/g







5.6 BAND EDGE**5.6.1 Measurement Procedure:**

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as Continuous Transmitting Mode.
3. Set SPA Center Frequency = Bottom Channel for lowest frequency band edge (Top Channel for highest frequency band edge) RBW= 100 KHz, VBW= 300 KHz, Span= 1 MHz
4. Set SPA Trace 1 Max hold, then View.

5.6.2 Test SET-UP (Block Diagram of Configuration)

The same as described in section 5.2.2

5.6.3 Measurement Equipment Used:

The same as described in section 5.2.3

5.6.4 Limits And Measurement Result:

Limits and Measurement Result Of 802.11b		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100 KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS

Limits and Measurement Result Of 802.11g		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100 KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS
	At least -20dBc than the limit Specified on the bottom frequency	PASS

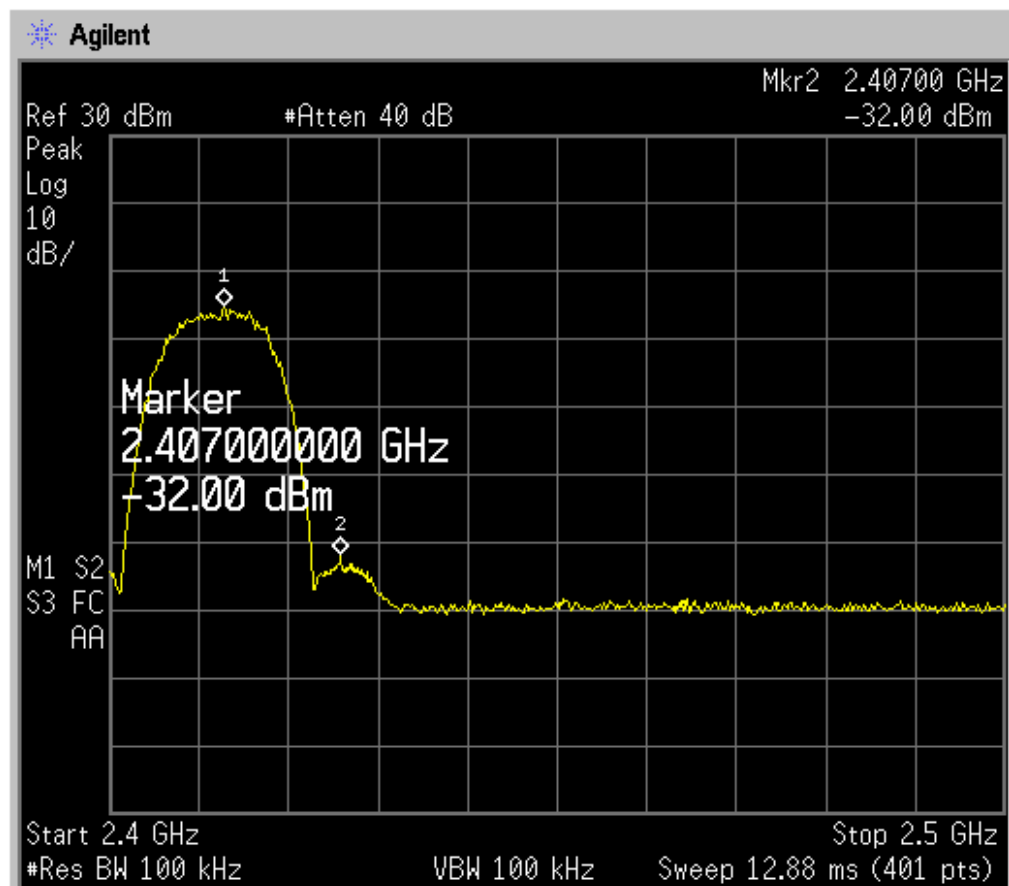
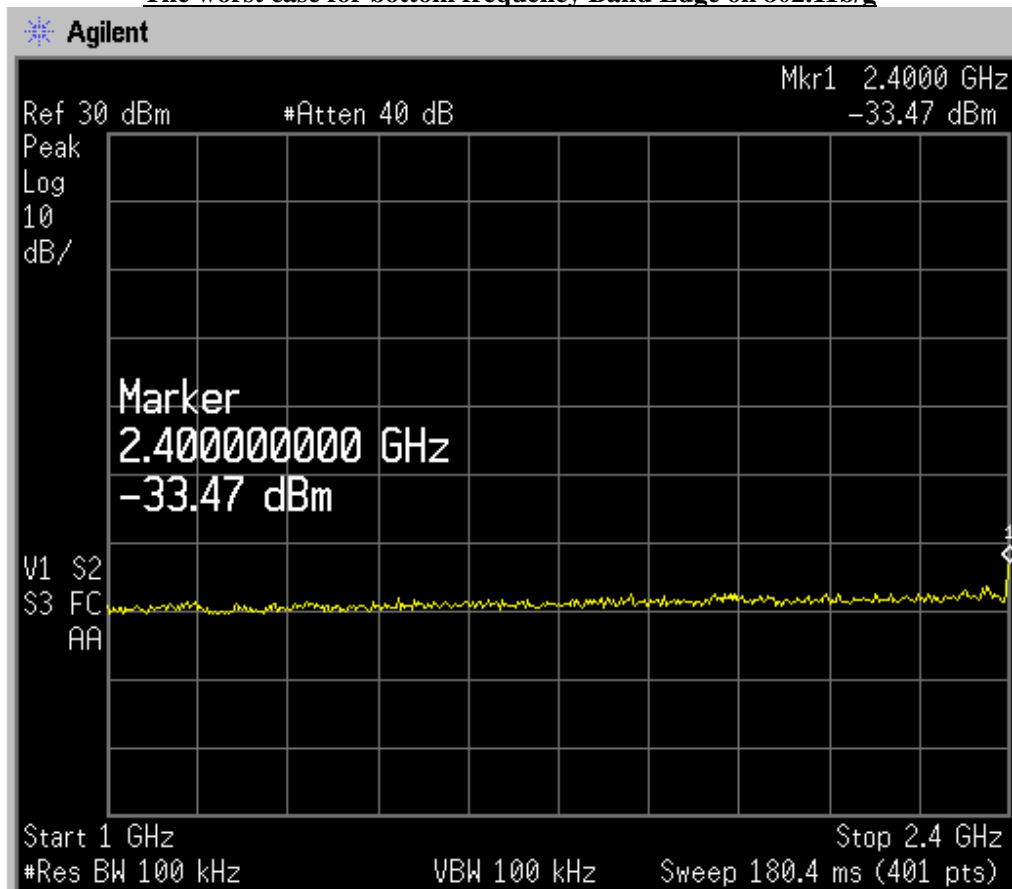
***** Remarks:**

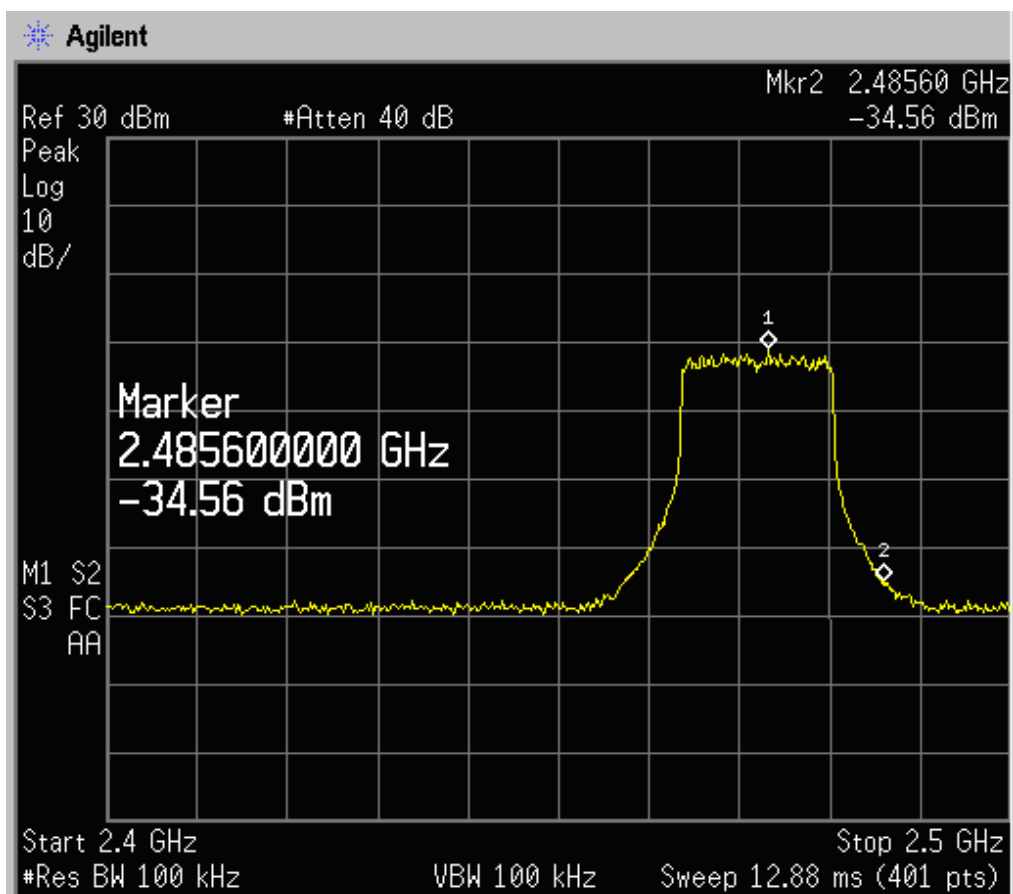
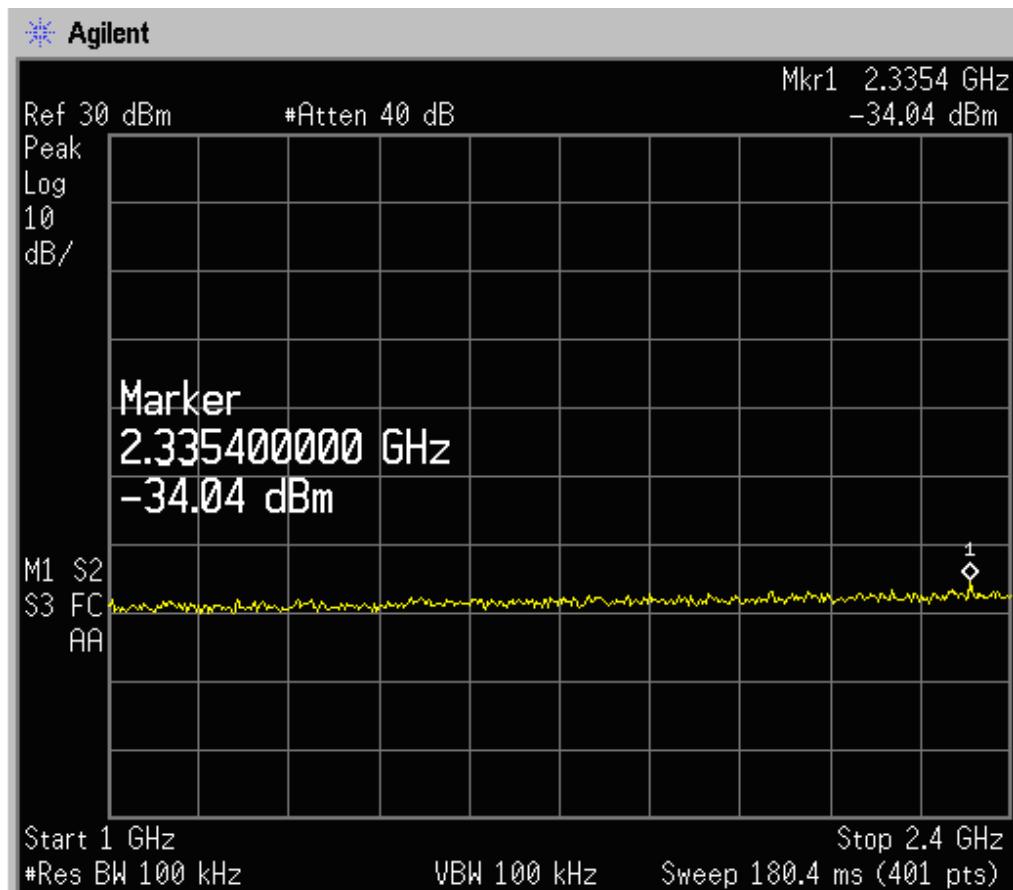
The Band Edge was fully measured based on the following conditions:

- 1, Both the operation mode of 802.11b and 802.11g was assessed
- 2, Two typical frequencies (the top one, the bottom one) have been fully assessed on both 802.11b and 802.11g mode
- 3, The worst case of all assessments is to operate on 802.11b mode

The worst case for Band Edge Test Plots is listed as below:

The worst case for bottom frequency Band Edge on 802.11b/g



The worst case for top frequency Band Edge on 802.11b/g

5.7 RADIATION EMISSION TEST

5.7.1 Measure Procedure

The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per ANSI C63.4

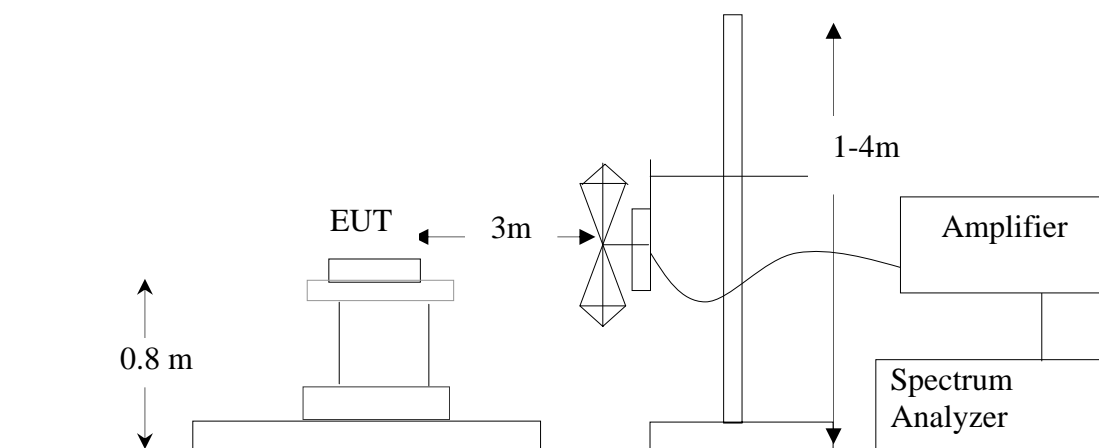
All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4

The EUT received AC120V/60Hz power through the outlet socket under the turntable. All support equipments received AC120V/60Hz power from socket under the turntable, if any. Set the EUT to operate on 802.11b/g mode

The antenna was placed at 3 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 40GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

5.7.2 Test SET-UP (Block Diagram of Configuration)



5.7.3 Measurement Equipment Used:

3M Semi-anechoic Chamber — Radiation Test Site					
Equipment Type	Manufacturer	Model Number	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	E4446A	N/A	06/29/2006	06/28/2007
Biconilog Antenna	ETS	3142C	N/A	05/30/2006	05/29/2007
Multi_device Controller	ETS	2090	N/A	06/08/2006	06/07/2007

5.7.4 Limits And Measurement Result:

Radiated Emission Limits:

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m Q.P.)
30-88	3	40.00
88-216	3	43.50
216-960	3	46.00
Above 960	3	54.00

****Note:** The lower limit shall apply at the transition frequency.

Tests was performed on 802.11a, 802.11b and 802.11g mode, on each operation mode, all kinds of modulations (DBPSK, DQPSK, CCK, OFDM) and the typical data rate(1Mbps, 11 Mbps, 54Mbps) has been evaluated for the power conducted emission. The worst case of the result when operate on 802.11a employed the CCK modulation with the 1 Mbps has been recorded and reported as following:

TheMeasurement Result of the Bottom Channel

Radiated Emission Test Result													
Frequency (MHz)	Reading Level (dBuV)			Factor	Emission Level (dBuV/m)			Limits (dBuV/m)			Margin (dB)	Result (P/F)	Remarks (H/V)
	Peak	Q.P.	Avg.	dB	Peak	Q.P.	Avg.	Peak	Q.P.	Avg.			
240.1665	28.39	--	--	13.78	42.17	--	--	--	46	--	-3.83	P	H
299.9832	18.66	--	--	15.83	34.49	--	--	--	46	--	-11.5	P	H
450.3333	19.06	--	--	19.07	38.13	--	--	--	46	--	-7.87	P	H
479.4331	20.68	--	--	20.07	40.75	--	--	--	46	--	-5.25	P	H
720.3165	16.32	--	--	24.63	40.95	--	--	--	46	--	-5.05	P	H
959.5833	13.67	--	--	26.98	40.65	--	--	--	46	--	-5.35	P	H
2390.000	21.32		--	11.32	32.64					54	-21.4	P	H
2483.500	26.45		--	12.41	38.86					54	-15.1	P	H
240.1666	27.54	--	--	13.78	41.32	--	--	--	46	--	-4.68	P	V
299.9832	21	--	--	15.83	36.83	--	--	--	46	--	-9.17	P	V
405.0667	21.08	--	--	18.42	39.5	--	--	--	46	--	-6.5	P	V
450.333	23.14	--	--	19.07	42.21	--	--	--	46	--	-3.79	P	V
479.4332	17.41	--	--	20.07	37.48	--	--	--	46	--	-8.52	P	V
720.3166	15.56	--		24.63	40.19	--			46		-5.81	P	V
2390.000	26.52		--	11.32	37.84					54	-16.2	P	V
2483.500	29.45		--	12.41	41.86					54	-12.1	P	V
Others Fre. Within 15.205	***												

Freq.

Raw Data (dBuV/m)

Corr. Factor (dB)

Emiss. Level

Limit dBuV/m

Margin dB

PK

QP

= Emission frequency in MHz

= Uncorrected Analyzer / Receiver reading

= Correction factors of antenna factor and cable loss

= Raw reading converted to dBuV/m and CF added

= Limit stated in standard

= Reading in reference to limit

=Peak Reading

=Quasi-peak

At least 20 dB down than the limits

The Measurement Result of the Top Channel

Radiated Emission Test Result													
Frequency	Reading Level (dBuV)			Factor	Emission Level (dBuV/m)			Limits (dBuV/m)			Margin	Result	Remarks
(MHz)	Peak	Q.P.	Avg.	dB	Peak	Q.P.	Avg.	Peak	Q.P.	Avg.	(dB)	(P/F)	(H/V)
240.1665	26.49	--	--	13.78	40.27	--	--	--	46	--	-5.73	P	H
299.9832	19.35	--	--	15.83	35.18	--	--	--	46	--	-10.8	P	H
450.3333	22.18	--	--	19.07	41.25	--	--	--	46	--	-4.75	P	H
479.4331	23.32	--	--	20.07	43.39	--	--	--	46	--	-2.61	P	H
720.3165	14.27	--	--	24.63	38.9	--	--	--	46	--	-7.1	P	H
959.5833	12.56	--	--	26.98	39.54	--	--	--	46	--	-6.46	P	H
2390.000	20.43		--	11.32	31.75					54	-22.3	P	H
2483.500	29.43		--	12.41	41.84					54	-12.2	P	H
240.1666	22.16	--	--	13.78	35.94	--	--	--	46	--	-10.1	P	V
299.9832	22.71	--	--	15.83	38.54	--	--	--	46	--	-7.46	P	V
405.0667	23.03	--	--	18.42	41.45	--	--	--	46	--	-4.55	P	V
450.333	24.52	--	--	19.07	43.59	--	--	--	46	--	-2.41	P	V
479.4332	14.29	--	--	20.07	34.36	--	--	--	46	--	-11.6	P	V
720.3166	13.16	--		24.63	37.79	--			46		-8.21	P	V
2390.000	22.24		--	11.32	33.56					54	-20.4	P	V
2483.500	32.52		--	12.41	44.93					54	-9.07	P	V
Others Fre. Within 15.205	***												

Freq.

Raw Data (dBuV/m)

Corr. Factor (dB)

Emiss. Level

Limit dBuV/m

Margin dB

PK

QP

= Emission frequency in MHz

= Uncorrected Analyzer / Receiver reading

= Correction factors of antenna factor and cable loss

= Raw reading converted to dBuV/m and CF added

= Limit stated in standard

= Reading in reference to limit

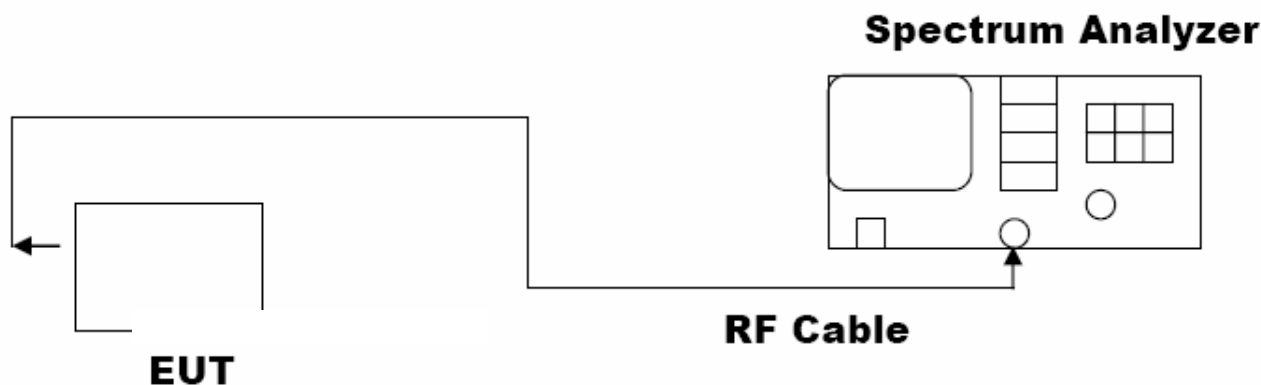
=Peak Reading

=Quasi-peak

At least 20 dB down than the limits

6, Parameters for 802.11a 5725 MHz to 5850 MHz**6.1 Peak Transmit Power****6.1.1 Measurement Procedure:**

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 MHz, VBW= 3 MHz.
4. Set SPA Trace 1 Max hold, then View.

6.1.2 Test SET-UP (Block Diagram of Configuration)**6.1.3 Measurement Equipment Used:**

3/5 Anechoic Chamber Radiation Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2005/11	2006/11
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2005/11	2006/11
RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	N/A	N/A
TURN TABLE	ETS	2088	2149	N/A	N/A
ANTENNA MAST	ETS	2075	2346	N/A	N/A
EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	NA	N/A	N/A

6.1.4 Limits And Measurement Result:

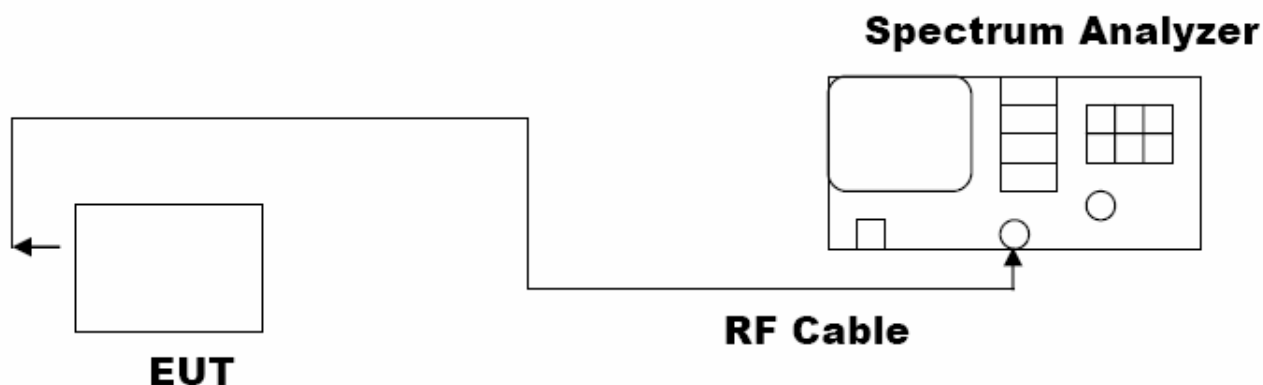
Limits and Measurement Result Of 802.11a 5725 MHz to 5850 MHz		
Applicable Limits	Measurement Result	
	Test Data	Criteria
30 dBm (for 2 dBi Antenna Gain)	22.56dBm for 5740 MHz	PASS
	22.43 dBm for 5800 MHz	PASS
	22.71dBm for 5840 MHz	PASS

6.2 Maximum Power Spectral Density Conducted

6.2.1 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 3 KHz,
VBW= 10 KHz., Sweep time= Auto
4. Set SPA Trace 1 Max hold, then View.

6.2.2 Test SET-UP (Block Diagram of Configuration)



6.2.3 Measurement Equipment Used:

3/5 Anechoic Chamber Radiation Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2005/11	2006/11
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2005/11	2006/11
RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	N/A	N/A
TURNTABLE	ETS	2088	2149	N/A	N/A
ANTENNA MAST	ETS	2075	2346	N/A	N/A
EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	NA	N/A	N/A

6.2.4 Limits And Measurement Result:

Limits and Measurement Result Of 802.11a 5725MHz to 5850 MHz		
Applicable Limits	Measurement Result	
	Test Data	Criteria
< 8 dBm / 3KHz	-4.328 dBm for 5740 MHz	PASS
	-4.631 dBm for 5800 MHz	PASS
	-4.469 dBm for 5840 MHz	PASS

6.3 6 dB bandwidth

6.3.1 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 MHz, VBW= 3 MHz.
4. Set SPA Trace 1 Max hold, then View.

6.3.2 Test SET-UP (Block Diagram of Configuration)

The Same as described in section 5.2.2

6.3.3 Measurement Equipment Used:

The Same as described in section 5.2.3

6.3.4 Limits And Measurement Result:

Limits and Measurement Result Of 802.11a 5725 MHz to 5850MHz		
Limits	Measurement Result	
	Test Data	Result
>500 KHz	17.6 MHz @ 5740 MHz	PASS
>500 KHz	17.5 MHz @ 5800 MHz	PASS
>500 KHz	17.7 MHz @ 5840 MHz	PASS

6.4 BAND EDGE**6.4.1 Measurement Procedure:**

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as Continuous Transmitting Mode.
3. Set SPA Center Frequency = Bottom Channel for lowest frequency band edge (Top Channel for highest frequency band edge) RBW= 100 KHz, VBW= 300 KHz, Span= 1 MHz
4. Set SPA Trace 1 Max hold, then View.

6.4.2 Test SET-UP (Block Diagram of Configuration)

The same as described in section 5.2.2

6.4.3 Measurement Equipment Used:

The same as described in section 5.2.3

6.4.4 Limits And Measurement Result:

Limits and Measurement Result Of 802.11a 5725 MHz to 5850 MHz		
Applicable Limits	Measurement Result	
	Test Data	Criteria
The RF Power Produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band emission.	At least -20dBc than the limit Specified on the 5740 MHz	PASS
	At least -20dBc than the limit Specified on the 5800 MHz	PASS
	At least -20dBc than the limit Specified on the 5840 MHz	PASS

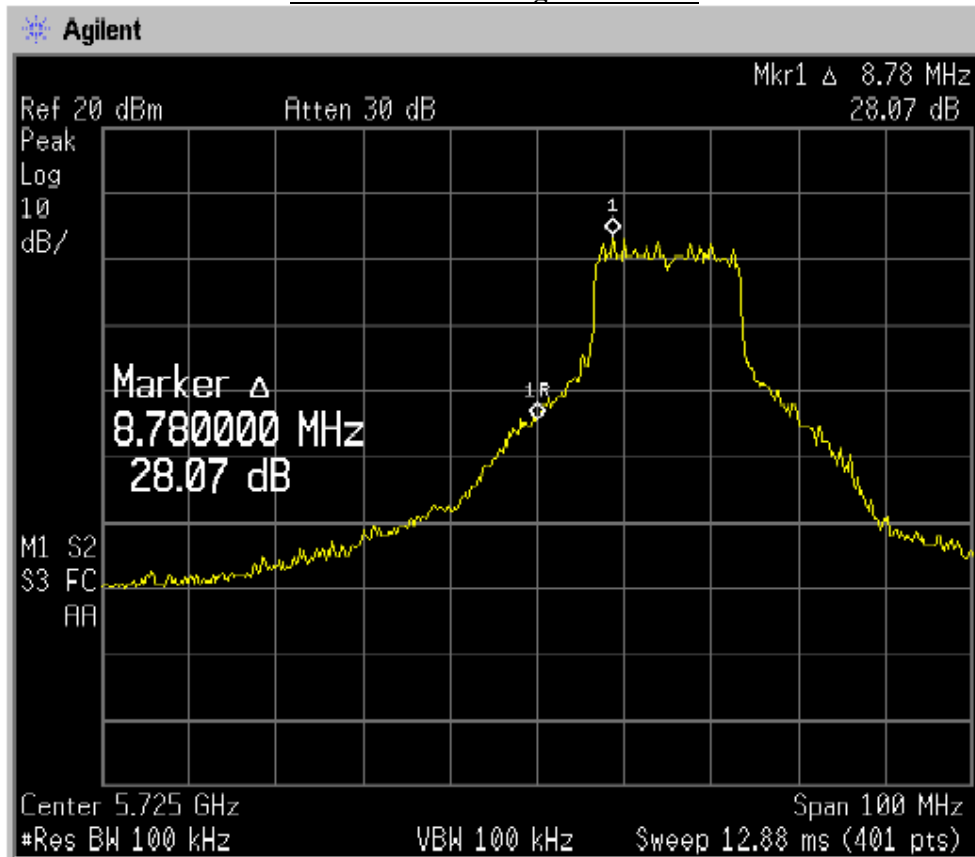
***** Remarks:**

The Band Edge was fully measured based on the following conditions:

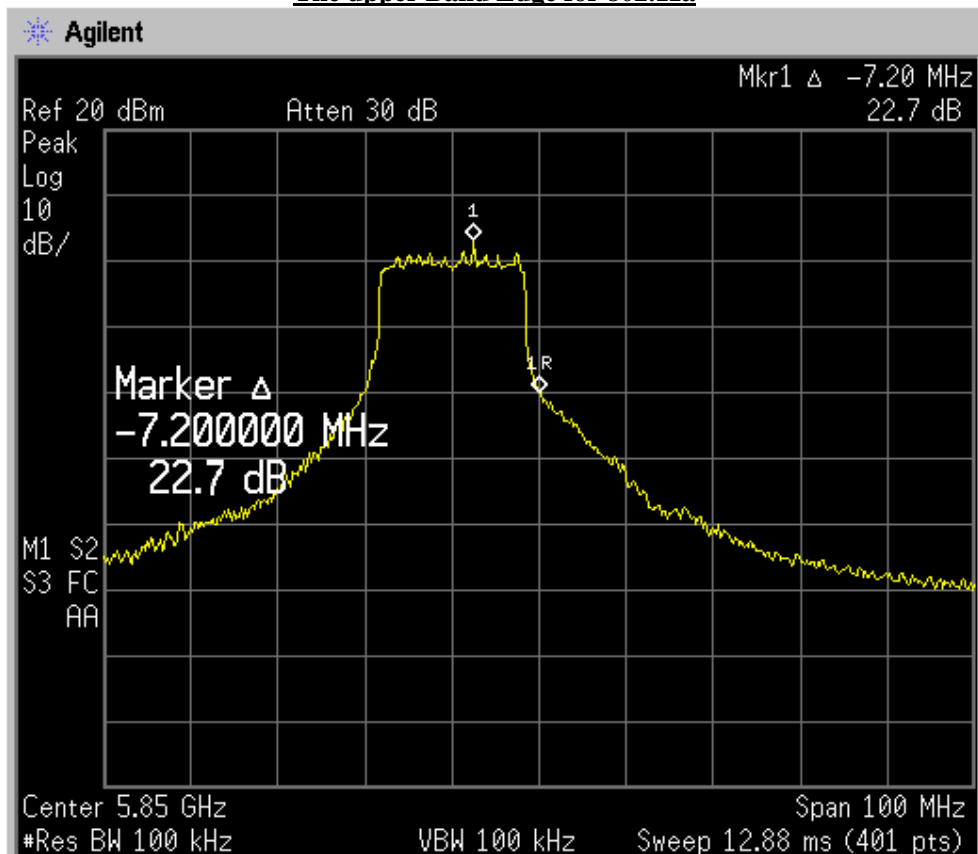
- 1, Two typical frequencies (the top one, the bottom one) have been fully assessed on 802.11a mode
- 2, The worst case of all assessments is to operate on 802.11a mode

The Band Edge Test Plots is listed as below:

The Lower Band Edge for 802.11a



The upper Band Edge for 802.11a



6.5 RADIATION EMISSION TEST

6.5.1 Measure Procedure

The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per ANSI C63.4

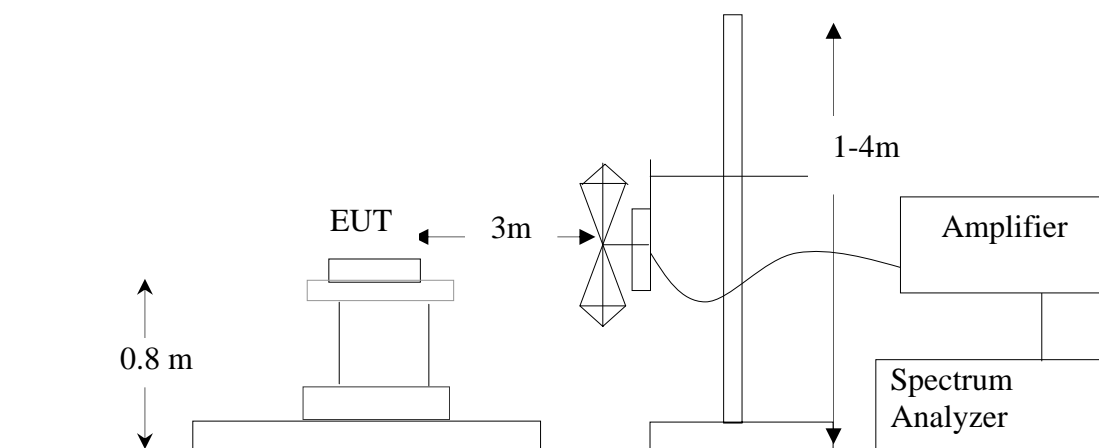
All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4

The EUT received AC120V/60Hz power through the outlet socket under the turntable. All support equipments received AC120V/60Hz power from socket under the turntable, if any. Set the EUT to operate on 802.11a mode

The antenna was placed at 3 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 40GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

6.5.2 Test SET-UP (Block Diagram of Configuration)



6.5.3 Measurement Equipment Used:

3M Semi-anechoic Chamber — Radiation Test Site					
Equipment Type	Manufacturer	Model Number	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	E4446A	N/A	06/29/2006	06/28/2007
Biconilog Antenna	ETS	3142C	N/A	05/30/2006	05/29/2007
Multi_device Controller	ETS	2090	N/A	06/08/2006	06/07/2007

6.5.4 Limits And Measurement Result:

Radiated Emission Limits:

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m Q.P.)
30-88	3	40.00
88-216	3	43.50
216-960	3	46.00
Above 960	3	54.00

****Note:** The lower limit shall apply at the transition frequency.

Tests was performed on 802.11a, 802.11b and 802.11g mode, on each operation mode, all kinds of modulations (DBPSK, DQPSK, CCK, OFDM) and the typical data rate(1Mbps, 11 Mbps, 54Mbps) has been evaluated for the power conducted emission. The worst case of the result when the bottom frequency operates on 802.11b employed the CCK modulation with the 1 Mbps has been recorded and reported as following:

The radiated emission test result of the bottom channel reported below is the worst case for the result acquired from the bottom, the middle and the top frequency while employing the worst case modulation and data rate mode

Radiated Emission Test Result													
Frequency (MHz)	Reading Level (dBuV)			Factor dB	Emission Level (dBuV/m)			Limits (dBuV/m)			Margin (dB)	Result (P/F)	Remarks (H/V)
	Peak	Q.P.	Avg.		Peak	Q.P.	Avg.	Peak	Q.P.	Avg.			
240.1665	30.16	--	--	13.78	43.94	--	--	--	46	--	-2.06	P	H
299.9832	19.32	--	--	15.83	35.15	--	--	--	46	--	-10.85	P	H
450.3333	20.15	--	--	19.07	39.22	--	--	--	46	--	-6.78	P	H
479.4331	20.36	--	--	20.07	40.43	--	--	--	46	--	-5.57	P	H
720.3165	21.19	--	--	24.63	45.82	--	--	--	46	--	-0.18	P	H
959.5833	14.26	--	--	26.98	41.24	--	--	--	46	--	-4.76	P	H
2390.000	21.38			15.32	36.70					54	-17.30	P	H
2483.500	24.15			16.09	40.24					54	-13.76	P	H
240.1666	28.05	--	--	13.78	41.83	--	--	--	46	--	-4.17	P	V
299.9832	20.36	--	--	15.83	36.19	--	--	--	46	--	-9.81	P	V
405.0667	22.33	--	--	18.42	40.75	--	--	--	46	--	-5.25	P	V
450.333	23.37	--	--	19.07	42.44	--	--	--	46	--	-3.56	P	V
479.4332	16.45	--	--	20.07	36.52	--	--	--	46	--	-9.48	P	V
720.3166	18.52	--		24.63	43.15	--			46		-2.85	P	V
2390.000	25.26			15.32	40.58					54	-13.42	P	V
2483.500	29.34			16.09	45.43					54	-8.57	P	V
Fre. Above 1GHz Within 15.205	***									54	At least 20 dB down than the Limits	P	H/V

Freq.

Raw Data (dBuV/m)

Corr. Factor (dB)

Emiss. Level

Limit dBuV/m

Margin dB

PK

QP

= Emission frequency in MHz

= Uncorrected Analyzer / Receiver reading

= Correction factors of antenna factor and cable loss

= Raw reading converted to dBuV/m and CF added

= Limit stated in standard

= Reading in reference to limit

=Peak Reading

=Quasi-peak

At least 20 dB down than the limits

7, Parameters for Antenna

Antenna Requirements		
Requirements	Antenna Type	Result
<p>According to 15.203: The intentional Radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device</p> <p>According 15.247(b), if the transmitting antenna with the directional gain greater than 6 dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi</p>	<p>The Antenna employed by this product is 1/4 wave length DIOPLE antenna with UFL Connector. The maximum Gain of this antenna is only 2 dBi</p>	<p>PASS</p>

APPENDIX 1

PHOTOGRAPHS OF SET UP

Radiated Emission Setup Photos



Conducted Emission Setup Photos



APPENDIX 2

PHOTOGRAPHS OF EUT

Top View of EUT



Bottom View of EUT

