

# FCC 47 CFR PART 15 SUBPART C

# TEST REPORT

For

Mobile phone

Model: CAP8

# Trade Name: COMPALCOMM

Issued to

**COMPAL COMMUNICATIONS, INC.** No. 385, Yangguang Street, Neihu, Taipei. (11491) Tawain

Issued by



Compliance Certification Services Inc. No. 81-1, Lane 210, Pa-De 2nd Rd., Luchu Hsiang, Taoyuan Shien, (338), Taiwan, R.O.C. http://www.ccsrf.com service@ccsrf.com



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# **1. TEST RESULT CERTIFICATION**

Applicant:	COMPAL COMMUNICATIONS, INC. No. 385, Yangguang Street, Neihu, Taipei. (11491) Tawain		
Equipment Under Test:	Mobile phone		
Trade Name:	COMPALCOMM		
Model:	CAP8		
Date of Test:	September 23 ~ October 1, 2010		

APPLICABLE STANDARDS			
STANDARD	TEST RESULT		
FCC 47 CFR Part 15 Subpart C	No non-compliance noted		

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. 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 the requirements of FCC Rules Part 15.207, 15.209, 15.247.

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

Approved by:

Rex Lai Section Manager Compliance Certification Services Inc.

Reviewed by:

Gina Lo

Gina Lo Section Manager Compliance Certification Services Inc.



# 2. EUT DESCRIPTION

Product	Mobile phone
Trade Name	COMPALCOMM
Model Number	CAP8
Model Discrepancy	N/A
Power Supply	<ol> <li>Power from Power Adapter Model Number: ASUC1-050055 P/N : ASUC309004 I/P: 100-240V, 50-60Hz, 0.3A O/P: 5V, 550mA</li> <li>Power from Battery 3.7V, 1000mAh, 3.7wh</li> <li>Power by host device via USB Cable</li> </ol>
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b: 13.71 dBm IEEE 802.11g: 24.86 dBm
Modulation Technique	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	IEEE 802.11b Mode: 11, 5.5, 2, 1 Mbps IEEE 802.11g Mode: 54, 48, 36, 24, 18, 12, 9, 6Mbps
Number of Channels	11 Channels
Antenna Specification	Gain: 1.15 dBi
Antenna Designation	Embedded Inverted-F antenna

#### Remark:

- 1. The sample selected for test was production product and was provided by manufacturer.
- 2. This submittal(s) (test report) is intended for FCC ID: <u>OOX-CAP8</u> filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



# **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 Part 15.207, 15.209 and 15.247.

# 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

### **3.3 GENERAL TEST PROCEDURES**

#### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

#### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003.



### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
$^{1}0.495 - 0.505$	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	$(^{2})$
13.36 - 13.41	322 - 335.4		

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



# **3.5 DESCRIPTION OF TEST MODES**

The EUT (model: CAP8) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

This device is for handheld operation only.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

IEEE 802.11b mode: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 1Mbps data rate were chosen for the final testing.

IEEE 802.11g mode: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 6Mbps data rate were chosen for the final testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (Y axis) and the worst case was recorded.



# 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

# 4.2 MEASUREMENT EQUIPMENT USED

#### **Equipment Used for Emissions Measurement**

**Remark:** Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

Conducted Emissions Test Site						
Name of Equipment Manufacturer Model Serial Number Calibration Due						
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/03/2011		
Power Meter	Agilent	E4416A	GB41291611	06/27/2011		
Power Sensor	Agilent	E9327A	US40441097	06/27/2011		

3M Semi Anechoic Chamber						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due		
Spectrum Analyzer	Agilent	E4446A	US42510252	10/26/2010		
EMI Test Receiver	R&S	ESCI	100064	02/04/2011		
Pre-Amplifier	Mini-Circults	ZFL-1000LN	SF350700823	01/13/2011		
Pre-Amplifier	MITEQ	AFS44-00102650- 42-10P-44	1415367	11/20/2010		
Bilog Antenna	Sunol Sciences	JB3	A030105	09/10/2011		
Horn Antenna	EMCO	3117	00055165	12/07/2010		
Loop Antenna	EMCO	6502	8905/2356	06/10/2013		
Turn Table	CCS	CC-T-1F	N/A	N.C.R		
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R		
Controller	CCS	CC-C-1F	N/A	N.C.R		
Site NSA	CCS	N/A	N/A	12/31/2010		
Test S/W	EZ-EMC (CCS-3A1RE)					

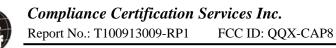
Powerline Conducted Emissions Test Site						
Name of EquipmentManufacturerModelSerial NumberCalibration Due						
EMI Test Receiver	R&S	ESHS30	828144/003	12/06/2010		
LISN	EMCO	3825/2	9106-1809	05/02/2011		
LISN	SCHAFFNER	NNB 41	03/10013	12/03/2010		



# 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.6202
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0606
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9979
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5790
3M Semi Anechoic Chamber / 8G~18G	+/- 2.5928
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7212
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9520

*Remark*: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



# 5. FACILITIES AND ACCREDITATIONS

### **5.1 FACILITIES**

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

No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
 Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

 No. No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **5.2 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 pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

# **5.3TABLE OF ACCREDITATIONS AND LISTINGS**

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	ACCREDITED No. 0824-01
USA	FCC MRA	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	FC <sub>TW1026</sub>
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	<b>VCCI</b> R-2882/2541/2798/725/1868 C-402/747/912 T-321/325
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	Canada IC 2324C-3 IC 2324C-5

\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.



# 6. SETUP OF EQUIPMENT UNDER TEST

# 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

# 6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Sim Card	N/A	N/A	N/A	N/A	N/A	N/A
2	Notebook PC	HP	dv6-1332TX	CNF9491GM9	PD9112BNHU	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3	Bluetooth earphone	corega	10T	CG-BTHS01	BTHS01	N/A	N/A
4	Universal Radio Communication Tester (Remote)	R&S	CMU200	101245	N/A	N/A	Unshielded, 1.8m

#### Remark:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



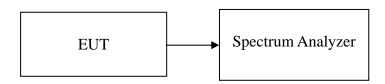
# 7. FCC PART 15.247 REQUIREMENTS

## 7.1 6DB BANDWIDTH

# LIMIT

According to \$15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

#### **Test Configuration**



### TEST PROCEDURE

- 1. Place the EUT on the table and set it in the transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW = 100 kHz, VBW = RBW, Span = 50MHz, Sweep = auto.
- 4. Mark the peak frequency and –6dB (upper and lower) frequency.
- 5. Repeat until all the rest channels are investigated.

### TEST RESULTS

No non-compliance noted.



### IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	9080		PASS
Mid	2437	8500	>500	PASS
High	2462	8170		PASS

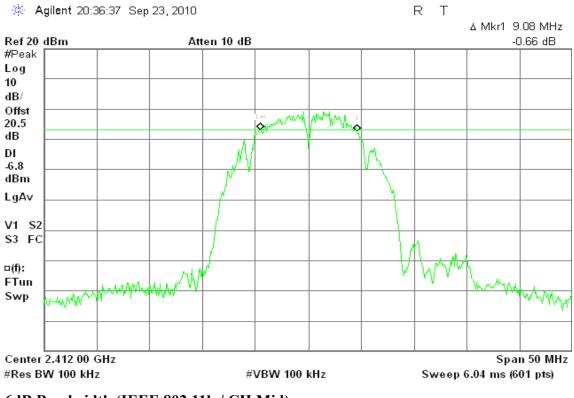
#### **IEEE 802.11g**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16170		PASS
Mid	2437	16330	>500	PASS
High	2462	14830		PASS

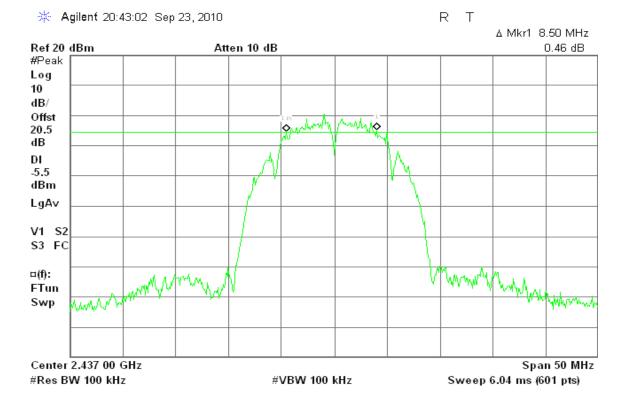


#### **Test Plot**

#### 6dB Bandwidth (IEEE 802.11b / CH Low)

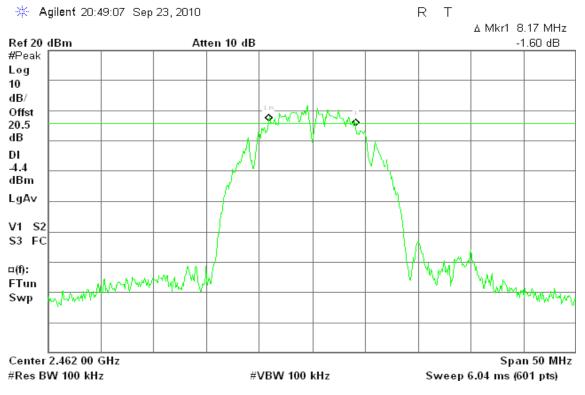


#### 6dB Bandwidth (IEEE 802.11b / CH Mid)

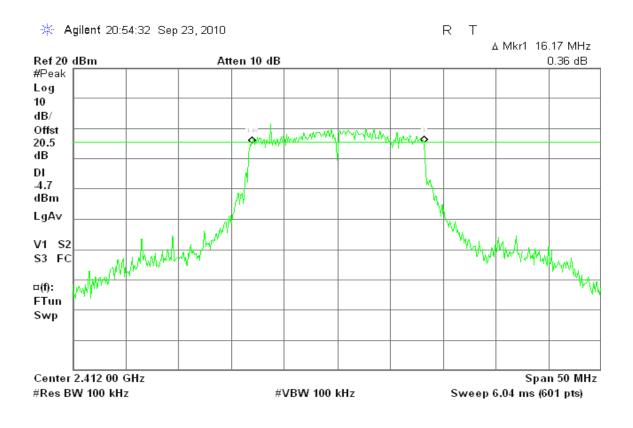




#### 6dB Bandwidth (IEEE 802.11b / CH High)

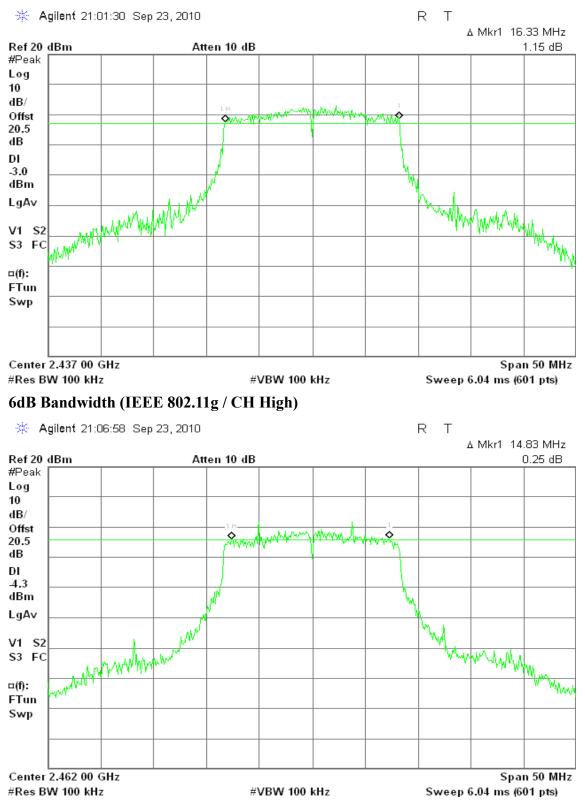


6dB Bandwidth (IEEE 802.11g / CH Low)





#### 6dB Bandwidth (IEEE 802.11g / CH Mid)





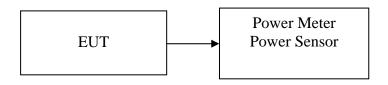
### **7.2PEAK POWER**

# LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

- 1. According to \$15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
- 2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **Test Configuration**



### **TEST PROCEDURE**

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

# TEST RESULTS

No non-compliance noted.



### <u>Test Data</u>

### IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	13.56	0.02270		PASS
Mid	2437	12.57	0.01807	1	PASS
High	2462	13.71	0.02350		PASS

### IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	23.78	0.23878		PASS
Mid	2437	24.86	0.30620	1	PASS
High	2462	22.9	0.19498		PASS

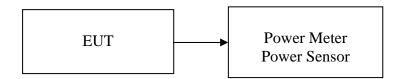


# 7.3AVERAGE POWER

# LIMIT

None; for reporting purposes only.

### **Test Configuration**



### **TEST PROCEDURE**

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

## **TEST RESULTS**

No non-compliance noted.



### <u>Test Data</u>

### Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	10.44	0.01107
Mid	2437	9.56	0.00904
High	2462	10.59	0.01146

#### Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	14.01	0.02518
Mid	2437	16.19	0.04159
High	2462	12.89	0.01945

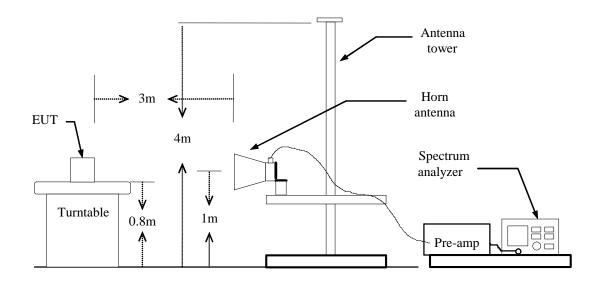


# 7.4BAND EDGES MEASUREMENT

# LIMIT

According to \$15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated 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) (see Section 15.205(c)).

#### **Test Configuration**



#### TEST PROCEDURE

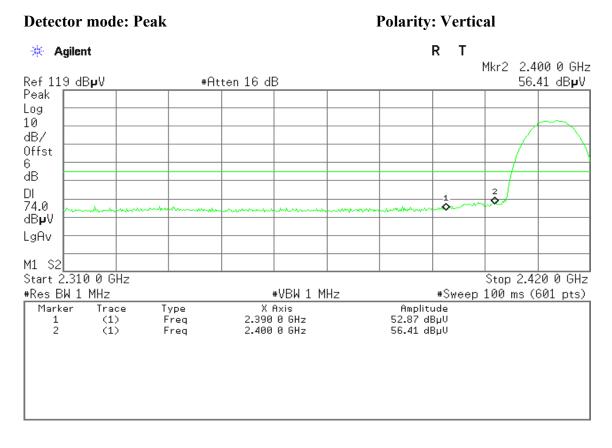
- 1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
- 5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### TEST RESULTS

Refer to attach spectrum analyzer data chart.

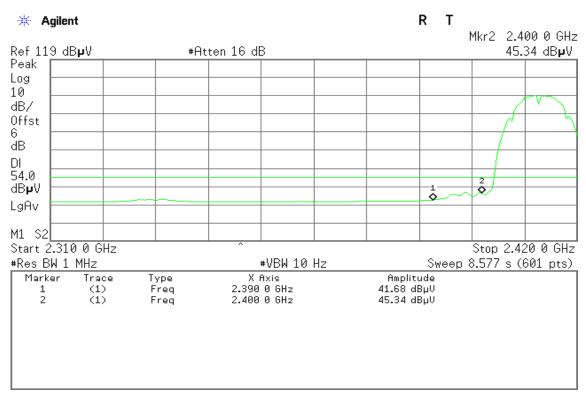


#### Band Edges (IEEE 802.11b / CH Low)



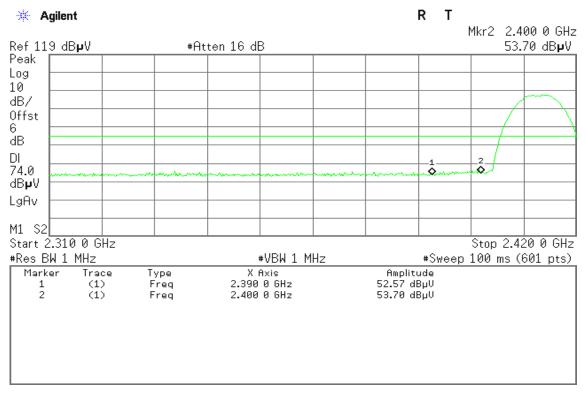
#### **Detector mode: Average**

#### **Polarity: Vertical**





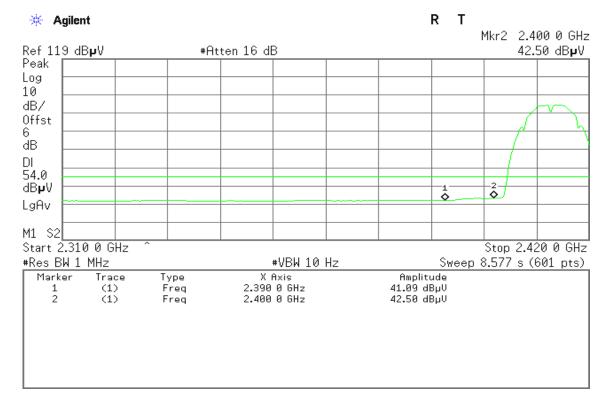
#### **Detector mode: Peak**



#### **Detector mode: Average**

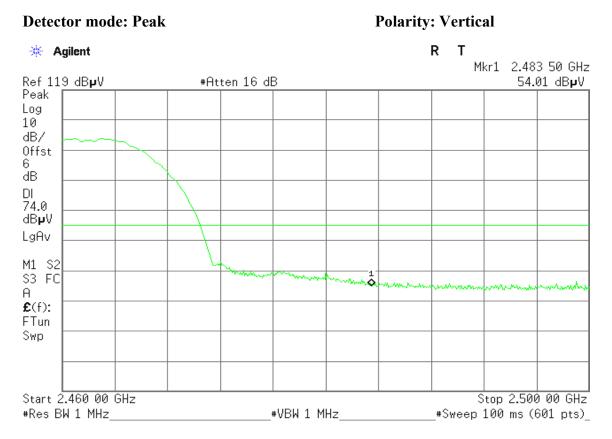
**Polarity: Horizontal** 

**Polarity: Horizontal** 



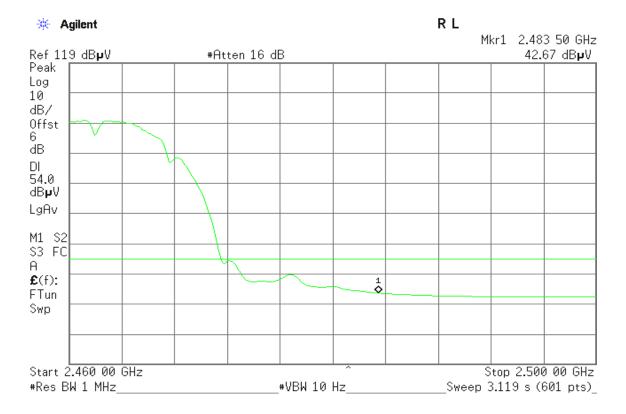


#### Band Edges (IEEE 802.11b / CH High)



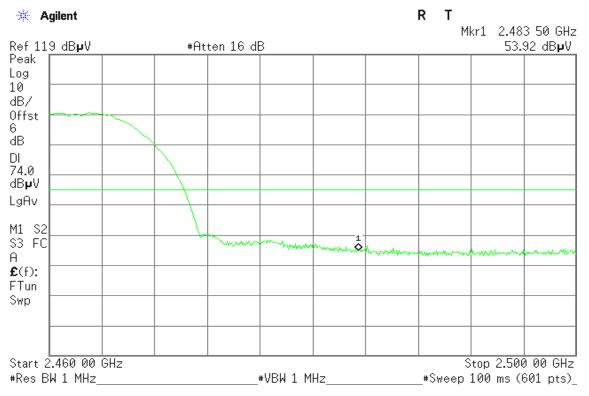
#### **Detector mode: Average**

#### **Polarity: Vertical**





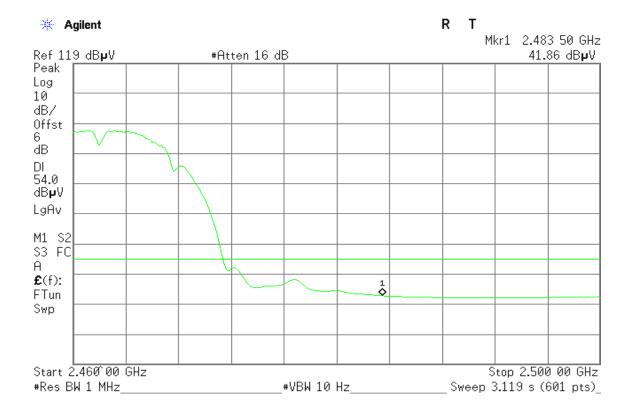
#### **Detector mode: Peak**



#### **Detector mode: Average**

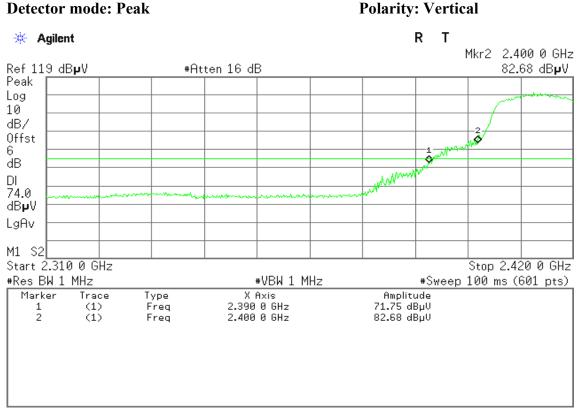
**Polarity: Horizontal** 

**Polarity: Horizontal** 



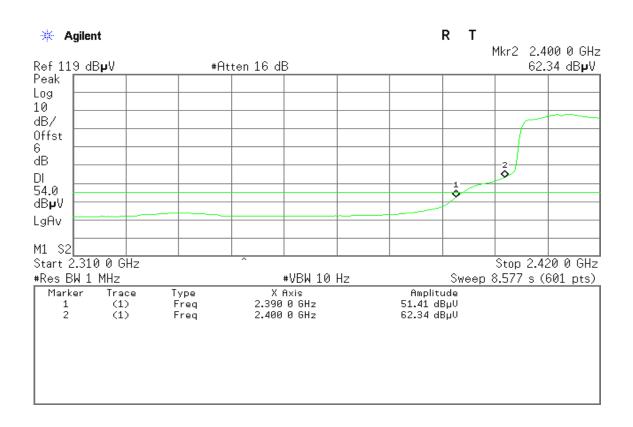


#### Band Edges (IEEE 802.11g / CH Low)



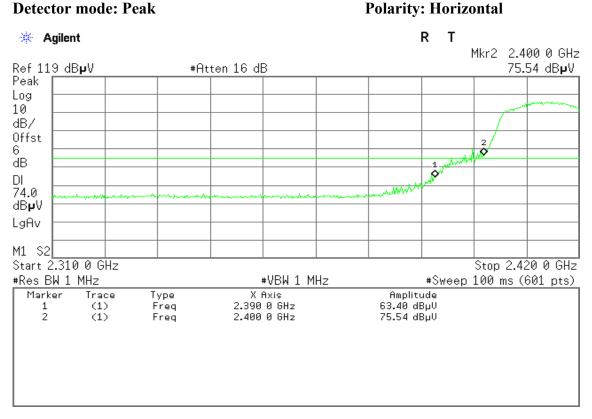
#### **Detector mode: Average**

**Polarity: Vertical** 



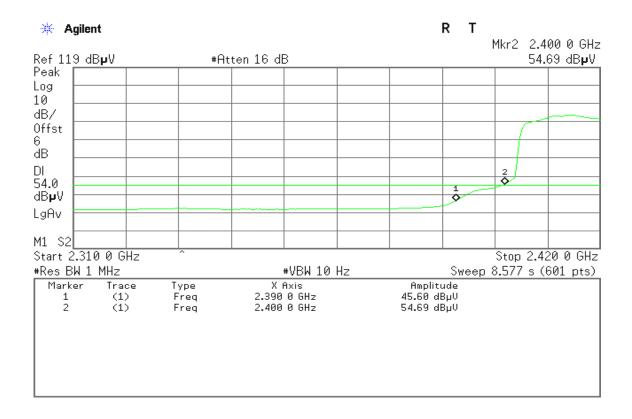


#### **Detector mode: Peak**



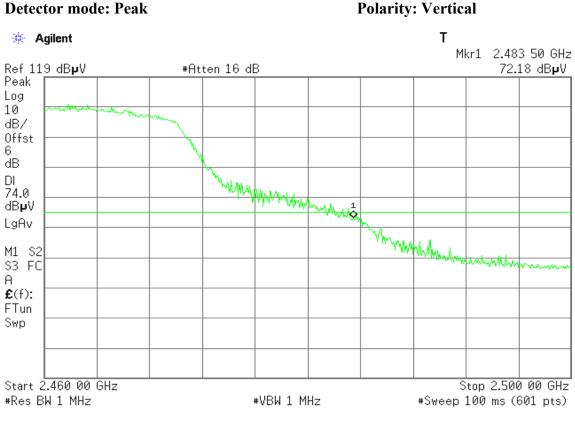
#### **Detector mode: Average**

**Polarity: Horizontal** 



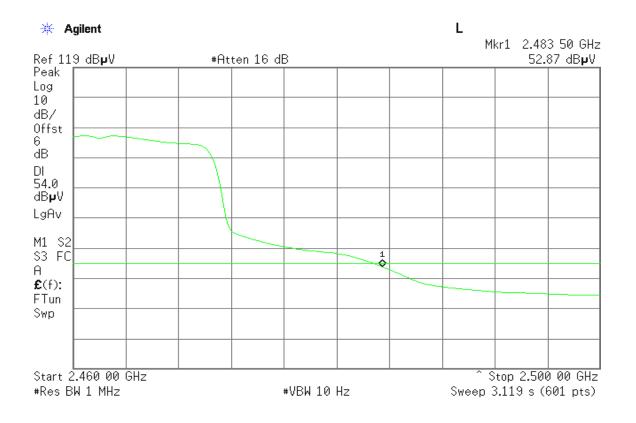


#### Band Edges (IEEE 802.11g / CH High)



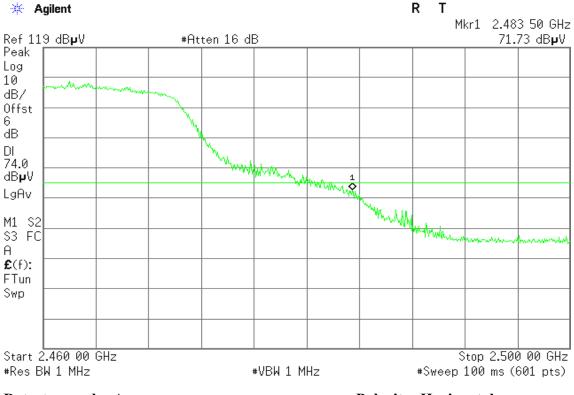
**Detector mode: Average** 

**Polarity: Vertical** 





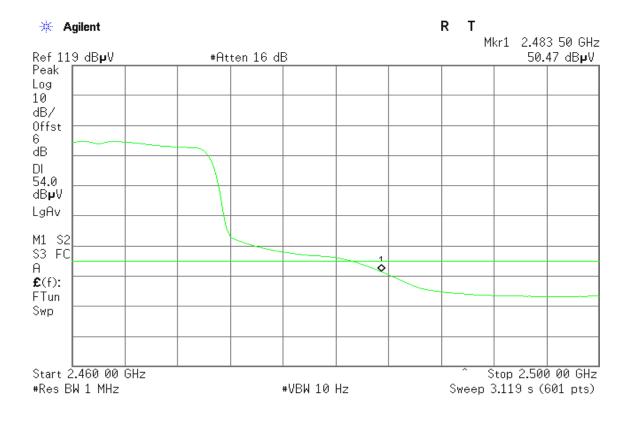
#### **Detector mode: Peak**



### Detector mode: Average

**Polarity: Horizontal** 

**Polarity: Horizontal** 



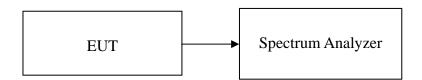


# 7.5 PEAK POWER SPECTRAL DENSITY

# LIMIT

- 1. According to \$15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
- 2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

#### **Test Configuration**



## TEST PROCEDURE

- 1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s
- 3. Record the max. reading.
- 4. Repeat the above procedure until the measurements for all frequencies are completed.

### TEST RESULTS

No non-compliance noted.



### <u>Test Data</u>

#### IEEE 802.11b

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-11.33		PASS
Mid	2437	-11.16	8.00	PASS
High	2462	-9.6		PASS

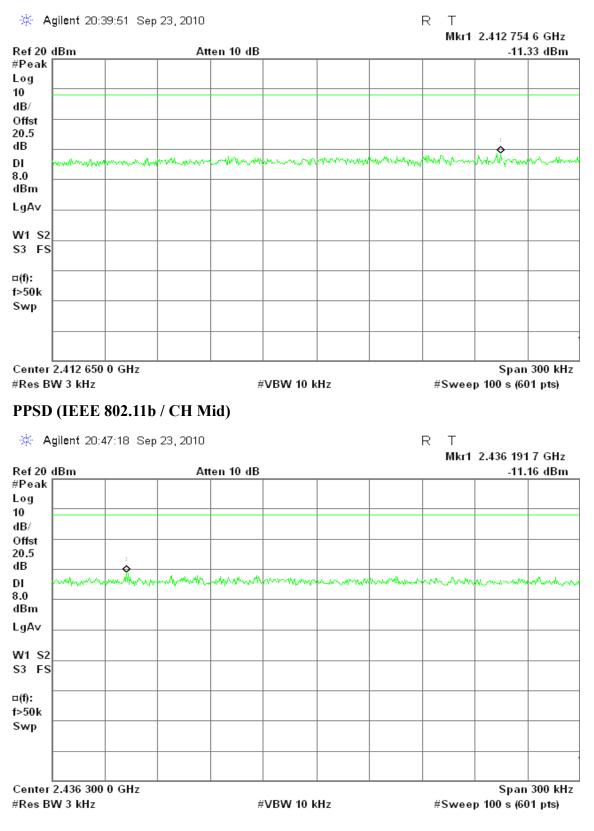
### **IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-10.01		PASS
Mid	2437	-6.95	8.00	PASS
High	2462	-10.74		PASS



#### Test Plot

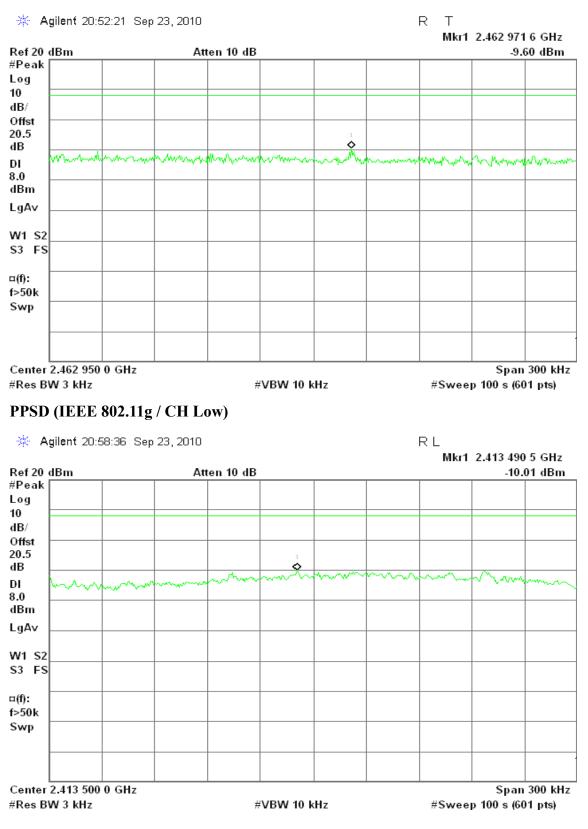
#### PPSD (IEEE 802.11b / CH Low)



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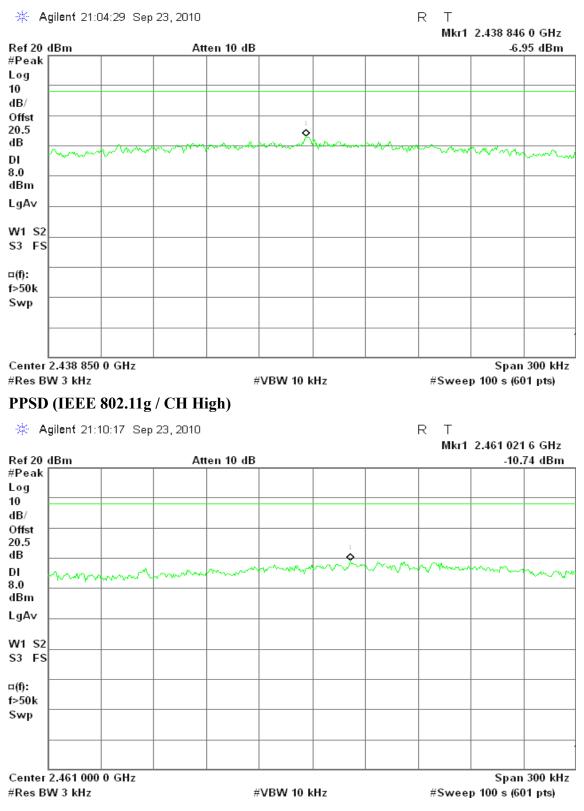


#### PPSD (IEEE 802.11b / CH High)





#### PPSD (IEEE 802.11g / CH Mid)





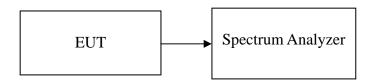
# 7.6 SPURIOUS EMISSIONS

## 7.6.1 Conducted Measurement

# **LIMIT**

According to \$15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated 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) (see Section 15.205(c)).

#### **Test Configuration**



### TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

### **TEST RESULTS**

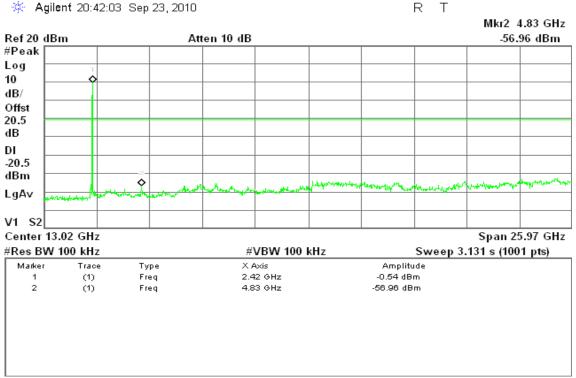
No non-compliance noted.



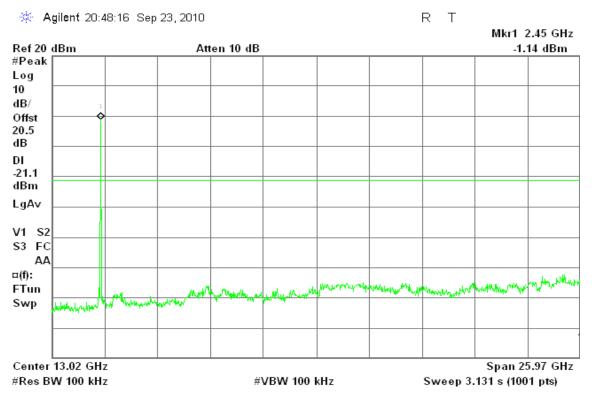
### **Test Plot**

### **IEEE 802.11b / CH Low**



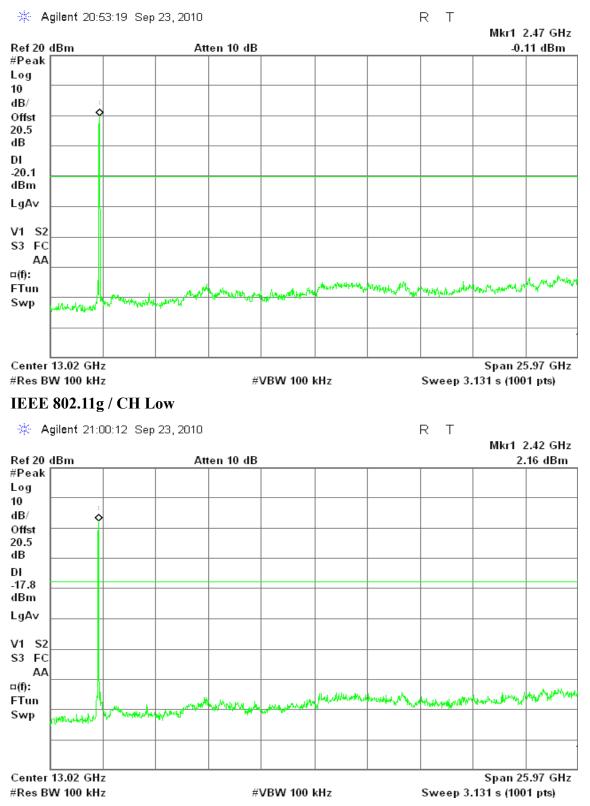


#### **IEEE 802.11b / CH Mid**



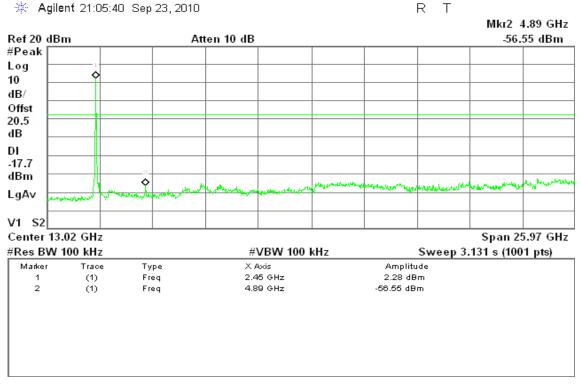


#### IEEE 802.11b / CH High

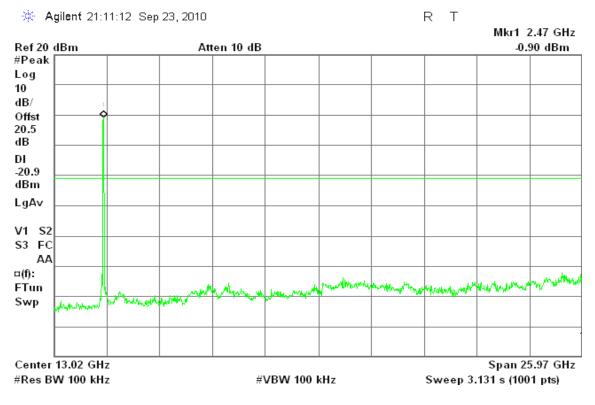




#### IEEE 802.11g / CH Mid



#### IEEE 802.11g / CH High





# 7.6.2 Radiated Emissions

# LIMIT

1. According to \$15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

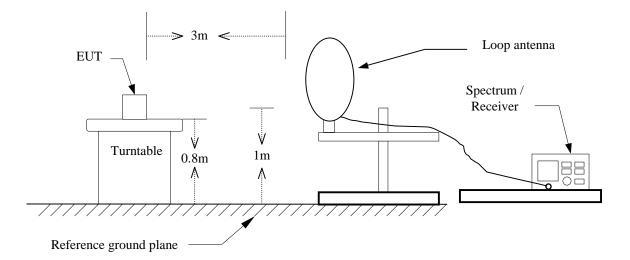
2. In the emission table above, the tighter limit applies at the band edges.

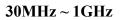
Frequency (MHz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

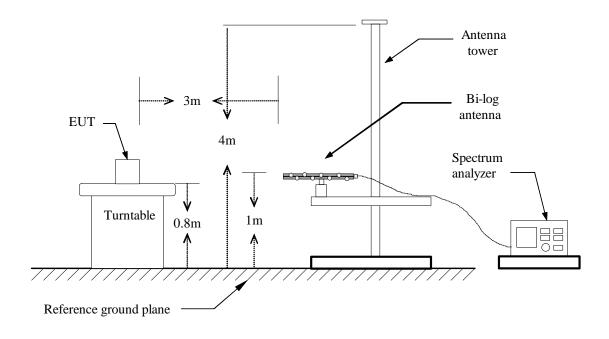


### **Test Configuration**

## $9 \text{kHz} \sim 30 \text{MHz}$

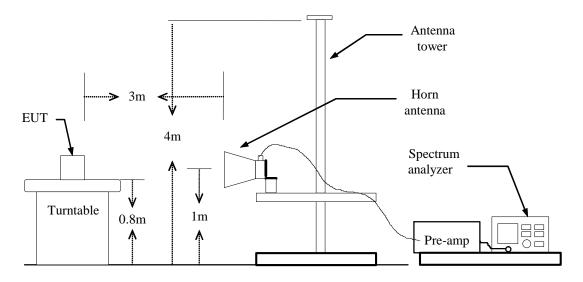








Above 1 GHz





# **TEST PROCEDURE**

- 1. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.



# **TEST RESULTS**

No non-compliance noted

#### Below 1 GHz

<b>Operation Mode:</b>	: Normal Link	<b>Test Date:</b>	September 23, 2010
Temperature:	25°C	Tested by:	Mark Yang
Humidity:	50 % RH	<b>Polarity:</b>	Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
33.23	V	36.18	-4.19	31.99	40.00	-8.01	Peak
46.17	V	44.89	-13.06	31.83	40.00	-8.17	Peak
135.08	V	42.82	-9.82	33.01	43.50	-10.49	Peak
214.30	V	44.59	-11.03	33.56	43.50	-9.94	Peak
647.57	V	31.15	-2.95	28.21	46.00	-17.79	Peak
728.40	V	29.98	-2.13	27.85	46.00	-18.15	Peak
135.08	Н	35.86	-9.82	26.05	43.50	-17.45	Peak
236.93	Н	44.07	-11.15	32.92	46.00	-13.08	Peak
340.40	Н	37.19	-8.28	28.91	46.00	-17.09	Peak
506.92	Н	33.89	-5.06	28.84	46.00	-17.16	Peak
728.40	Н	27.34	-2.13	25.21	46.00	-20.79	Peak
752.65	Н	28.48	-1.79	26.69	46.00	-19.31	Peak

- 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5. Margin(dB) = Remark result(dBuV/m) Quasi-peak limit(dBuV/m).



Above 1 GHz

Operation Mode:IEEE 802.11b / TX / CH LowTemperature:25°CHumidity:50 % RH

Test Date:September 23, 2010Tested by:Mark YangPolarity:Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1496.67	V	58.88		-8.77	50.11		74.00	54.00	-3.89	Peak
N/A										
1500.00	Н	59.42		-8.76	50.66		74.00	54.00	-3.34	Peak
4825.00	Н	53.71	51.31	1.18	54.89	52.49	74.00	54.00	-1.51	AVG
N/A										

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin(dB) = Remark result(dBuV/m) Average limit(dBuV/m).



Operation Mode: IEEE 802.11b / TX / CH Mid

**Temperature:** 25°C

Humidity: 50 % RH

Test Date:September 23, 2010Tested by:Mark YangPolarity:Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1576.67	V	58.39		-8.05	50.33		74.00	54.00	-3.67	Peak
N/A										
1496.67	Н	58.83		-8.77	50.06		74.00	54.00	-3.94	Peak
4875.00	Н	53.10	50.55	1.16	54.26	51.71	74.00	54.00	-2.29	AVG
N/A										

## Remark:

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin(dB) = Remark result(dBuV/m) Average limit(dBuV/m).



**Operation Mode:** IEEE 802.11b / TX / CH High

**Temperature:** 25°C

Humidity: 50 % RH

Test Date:September 23, 2010Tested by:Mark YangPolarity:Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1496.67	V	58.72		-8.77	49.95		74.00	54.00	-4.05	Peak
N/A										
1500.00	Н	58.73		-8.76	49.97		74.00	54.00	-4.03	Peak
4925.00	Н	53.06	50.89	1.14	54.21	52.03	74.00	54.00	-1.97	AVG
N/A										

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin(dB) = Remark result(dBuV/m) Average limit(dBuV/m).



**Operation Mode:** IEEE 802.11g / TX / CH Low

**Temperature:** 25°C

Humidity: 50 % RH

Test Date: September 23, 2010

Tested by: Mark Yang

Polarity: Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1496.67	V	58.37		-8.88	49.49		74.00	54.00	-4.51	Peak
4825.00	V	56.17	44.34	1.14	57.32	45.48	74.00	54.00	-8.52	AVG
N/A										
1553.33	Н	57.77		-8.27	49.50		74.00	54.00	-4.50	Peak
4825.00	Н	58.78	48.17	1.18	59.95	49.35	74.00	54.00	-4.65	AVG
N/A										

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin(dB) = Remark result(dBuV/m) Average limit(dBuV/m).



Operation Mode: IEEE 802.11g / TX / CH Mid

Temperature: 25°C

Humidity: 50 % RH

Test Date:September 23, 2010Tested by:Mark YangPolarity:Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1496.67	V	59.00		-8.77	50.23		74.00	54.00	-3.77	Peak
2356.67	V	58.54	49.37	-3.09	55.45	46.28	74.00	54.00	-7.72	AVG
4866.67	V	56.70	43.00	1.16	57.86	44.16	74.00	54.00	-9.84	AVG
N/A										
1726.67	Н	58.28		-6.67	51.61		74.00	54.00	-2.39	Peak
4875.00	Н	61.10	50.28	1.16	62.26	51.44	74.00	54.00	-2.56	AVG
N/A										

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin(dB) = Remark result(dBuV/m) Average limit(dBuV/m).



**Operation Mode:** IEEE 802.11g / TX / CH High

**Temperature:** 25°C

Humidity: 50 % RH

Test Date:September 23, 2010Tested by:Mark YangPolarity:Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1496.67	V	58.35		-8.77	49.58		74.00	54.00	-4.42	Peak
2380.00	V	58.56	48.28	-3.02	55.55	45.26	74.00	54.00	-8.74	AVG
N/A										
1426.67	Н	58.37		-8.88	49.49		74.00	54.00	-4.51	Peak
4925.00	Н	56.17	44.34	1.14	57.32	45.48	74.00	54.00	-8.52	AVG
N/A										

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin(dB) = Remark result(dBuV/m) Average limit(dBuV/m).



# 7.7 POWERLINE CONDUCTED EMISSIONS

# LIMIT

According to \$15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range	Limits (dBµV)					
(MHz)	Quasi-peak	Average				
0.15 to 0.50	66 to 56*	56 to 46*				
0.50 to 5	56	46				
5 to 30	60	50				

### **Test Configuration**

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

## **TEST PROCEDURE**

- 1. The EUT was placed on a table, which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.



# TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

### Test Data

<b>Operation Mode:</b>	Normal Link	Test Date:	October 1, 2010
Temperature:	26°C	Tested by:	Edward Lin
Humidity:	60% RH		

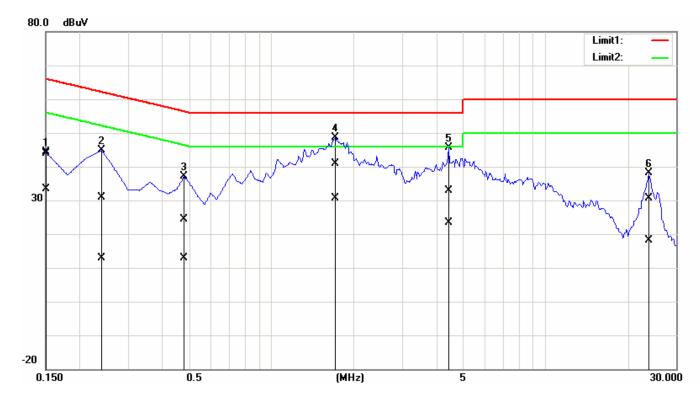
Frequency (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1500	43.66	33.36	0.14	43.80	33.50	66.00	56.00	-22.20	-22.50	L1
0.2400	30.77	12.67	0.13	30.90	12.80	62.10	52.10	-31.20	-39.30	L1
0.4800	24.36	12.86	0.14	24.50	13.00	56.34	46.34	-31.84	-33.34	L1
1.7100	40.71	30.61	0.09	40.80	30.70	56.00	46.00	-15.20	-15.30	L1
4.4400	32.79	23.39	0.11	32.90	23.50	56.00	46.00	-23.10	-22.50	L1
23.8200	30.03	17.63	0.57	30.60	18.20	60.00	50.00	-29.40	-31.80	L1
0.2400	37.70	22.40	0.10	37.80	22.50	62.10	52.10	-24.30	-29.60	L2
0.3300	37.90	21.10	0.10	38.00	21.20	59.45	49.45	-21.45	-28.25	L2
0.4500	38.20	24.40	0.10	38.30	24.50	56.88	46.88	-18.58	-22.38	L2
1.7400	41.87	32.17	0.03	41.90	32.20	56.00	46.00	-14.10	-13.80	L2
4.9200	35.08	26.78	0.02	35.10	26.80	56.00	46.00	-20.90	-19.20	L2
24.8400	28.80	19.30	0.20	29.00	19.50	60.00	50.00	-31.00	-30.50	L2

- 1. Measuring frequencies from 0.15 MHz to 30MHz.
- 2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
- 3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
- 4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)
- 5. "-" means Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

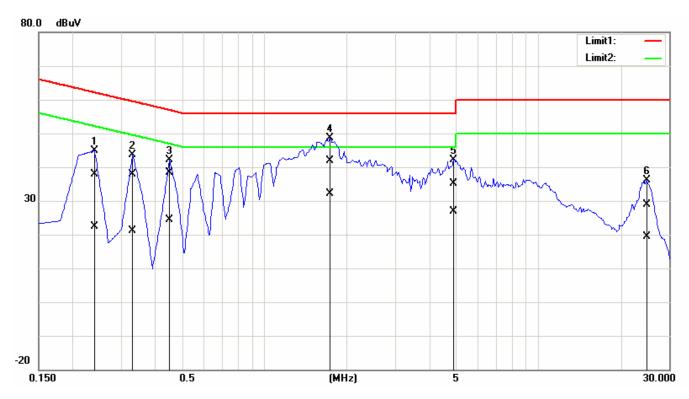


## **Test Plots**

## Conducted emissions (Line 1)



Conducted emissions (Line 2)





# APPENDIX I RADIO FREQUENCY EXPOSURE

# LIMIT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See 15.247(i) and 1.1307(b)(1) of this chapter.

### **EUT Specification**

EUT	Mobile phone				
Frequency band (Operating)	<ul> <li>WLAN: 2.412GHz ~ 2.462GHz</li> <li>WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz</li> <li>WLAN: 5.745GHz ~ 5.825GHz</li> <li>Bluetooth: 2.402GHz ~ 2.480 GHz</li> </ul>				
Device category	<ul> <li>Portable (&lt;20cm separation)</li> <li>Mobile (&gt;20cm separation)</li> </ul>				
Exposure classification	<ul> <li>Occupational/Controlled exposure (S = 5mW/cm2)</li> <li>General Population/Uncontrolled exposure (S=1mW/cm2)</li> </ul>				
Antenna diversity	<ul> <li>Single antenna</li> <li>Multiple antennas</li> <li>Tx diversity</li> <li>Rx diversity</li> <li>Tx/Rx diversity</li> </ul>				
Max. output power	IEEE 802.11b: 13.71 dBm (23.50mW) IEEE 802.11g: 24.86 dBm (30.62mW)				
Antenna gain (Max)	1.15 dBi (Numeric gain: 1.30)				
Evaluation applied	<ul> <li>MPE Evaluation</li> <li>SAR Evaluation*</li> <li>N/A</li> </ul>				

#### Remark:

- The maximum output power is <u>24.86dBm (30.62mW)</u> at <u>2437MHz</u> (with <u>1.30 numeric</u> <u>antenna gain</u>.)
- 2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
- 3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.

# TEST RESULTS

No non-compliance noted.

**Remark:** Please refer to the separated SAR report.

# **MPE EVALUATION**

Not applicable.