Lab Code: 200167-0

FCC PART 15 SUBPART 407

MEASUREMENT AND TEST REPORT

For

Hospira, Inc.

755 Jarvis Drive
Morgan Hill, CA 95037

FCC ID: STJ-20791

This Report Concerns:	Product type:
☑ Original Report	PCB Board with Wireless 802.11 a/b/g USB Dongle

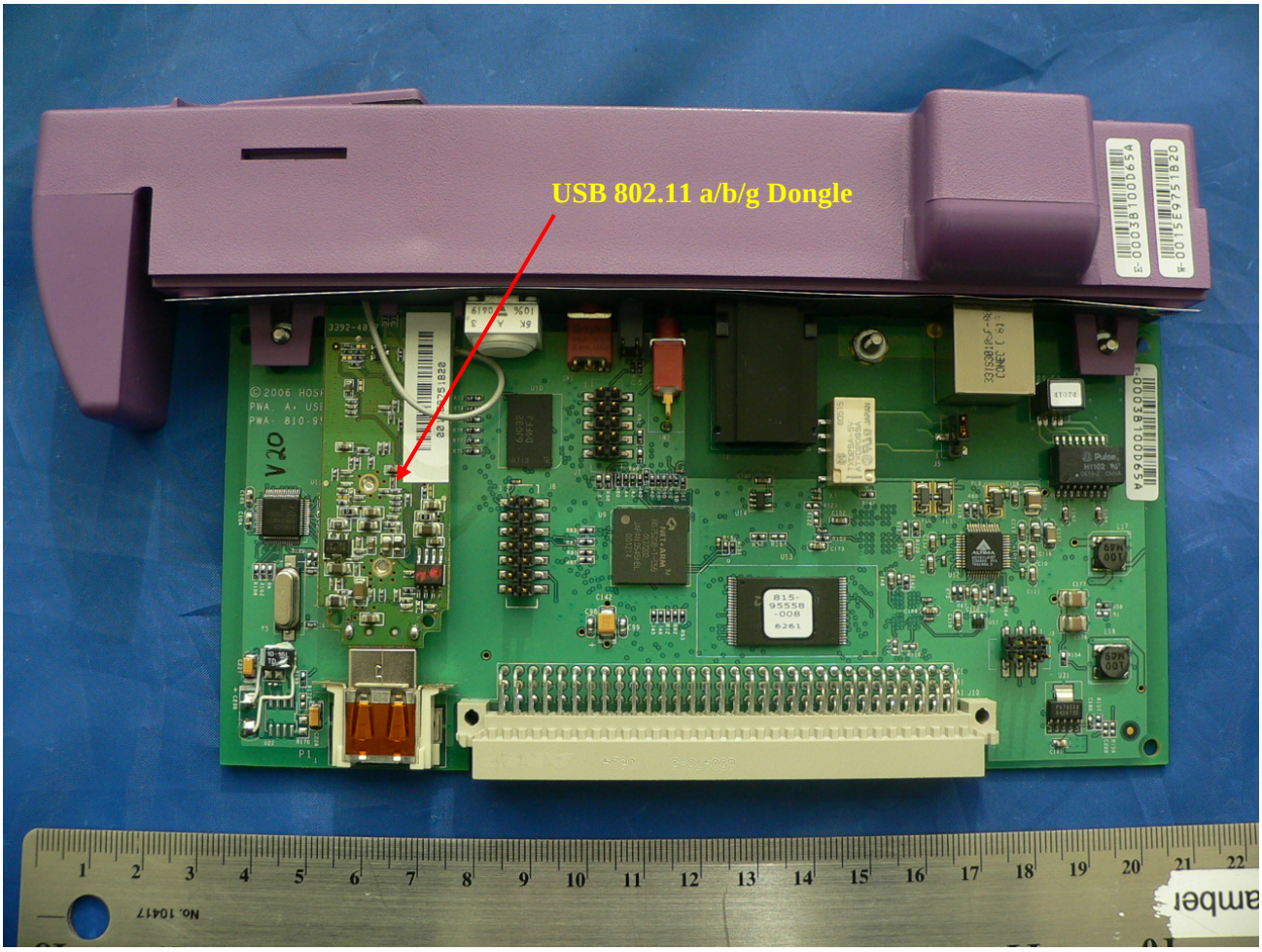
Test Engineer:	James Ma
Report Number:	R0612073-407
Report Date:	2007-01-11
Reviewed By:	Hans Mellberg, VP of Engineering
Prepared By: (12)	**Bay Area Compliance Laboratories Corp. (BACL)** 1274 Anvilwood Ave. Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

Product Description for Equipment under Test (EUT)

This Bay Area Compliance Laboratories Corp. measurement and test report has been prepared on behalf of *Hospira Inc.* and their device *MedNet 802.11 a/b/g Wireless Upgrade Module FCC ID: STJ-20791*, which will be referred to as the EUT in the rest of this report. The EUT is a PCB Board with Wireless 802.11 a/b/g USB Dongle that is designed as an upgrade module for *Hospira PlumA+ Infusion Systems* models: *20792-04-XX, 20679-04-XX and 12391-04-XX, 11971-04-XX*. Accordingly, the EUT consists of two models with identical function and layout. These models are designated *20791-04-XX* and *20677-04-XX* respectively corresponding to the host units that they are designed to upgrade, where the –XX in the two respective EUT models refer to versions 77 and up. The host units are mobile infusion devices designed to be employed in the medical care environment. The wireless functionality afforded to the host units by the EUT include the ability to download drug library information for simultaneously operating hosts without requiring a physical connection and the time spent visiting the rooms they occupy.

EUT Photo



Additional EUT photos in Exhibit C

Host Device

Mechanical Description

The EUT is a PCB Board with integrated Wireless 802.11 a/b/g USB Dongle, designed as an upgrade module for Hospira Inc. Plum A + Infusion System. It's approximate dimensions are 80 mm L x 25 mm W x 12 mm H.

** The test data gathered are from production sample, with serial number: 0015E9751C08, provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *Hospira, Inc.*. in accordance with Part 2, Subpart J, Part 15, Subparts A, B, C and E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Maximum Output Power, Antenna Requirements, 26 dB Bandwidth, peak power spectral density, Peak excursion, Band Edges Measurement, Conducted and Radiated Spurious Emissions.

Related Submittal(s)/Grant(s)

BACL report R0612073-247.

Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from $\pm$2.0 for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

Test Facility

The Test site used by BACL Corp. to collect emissions measurement data is located at it's facility in Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst*-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

EUT Exercise Software

The EUT is programmed with the following data rate settings that were used during testing:

Channel	5180 MHz	5200 MHz	5240MHz
802.11a Data Rate	54Mbps	54Mbps	54Mbps

Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude – D600	CN-OT9369-48643-52P-4582

SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.407 (f) §2.1093	RF Exposure	Compliant (Please refer to SAR report)
§15.203	Antenna Requirement	Compliant
§ 15.207 (a)	Conducted Emissions	Compliant
§ 15.407 (b)(1) & (b)(2)	Spurious Emissions at Antenna Port	Compliant
§15.205	Restricted Band	Compliant
§15.209 (a) & §15.407(a)(1) & (a)(2)	Spurious Radiated Emissions	Compliant
§15.247 (a)(2)	99% & 26 dB Bandwidth	Compliant
§15.407 (a)(1) & (a)(2)	Maximum Peak Output Power	Compliant
§15.407 (a)(1) & (a)(2)	Power Spectral Density	Compliant
§ 15.407 (a)(6)	Peak Excursion	Compliant
§15.407 (b)	Out Of Band Emission	Compliant
§15.407 (c)	Discontinue Transmitting with Absence of Data or Operational Failure	Compliant
§15.407 (g)	Frequency Stability	Compliant

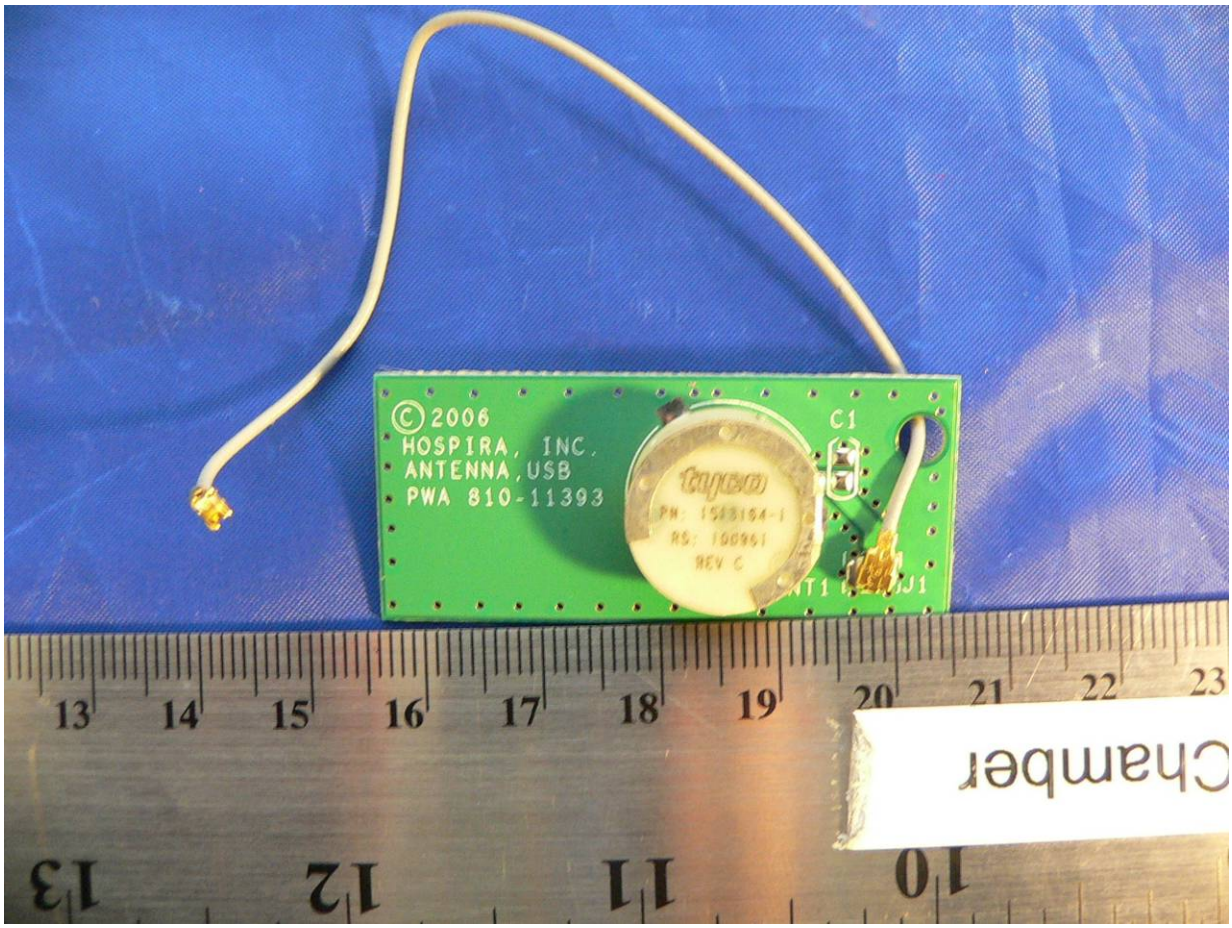
§15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to § 15.407 (a)(1) and (a)(2), if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Result: Compliant: The antenna is integrated into a PCB assembly, removal or modification of which would result in inoperability of the device as a whole; there are no allowances for replacement or modification without replacement of the entire assembly.



§15.207 - CONDUCTED EMISSIONS

Section 15.207 Conducted limits:

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 µH/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 frequencies ranges.

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

** Decreases with the logarithm of the frequency.*

Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4 – 2003 measurement procedure. The specification used was FCC Class B limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with LISN-2.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Receiver, EMI Test	Receiver, EMI Test	ESCS30	100176	2006-03-16
LISN, Artificial Mains	LISN, Artificial Mains	ESH2-Z5	871884/039	2006-11-14

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Procedure

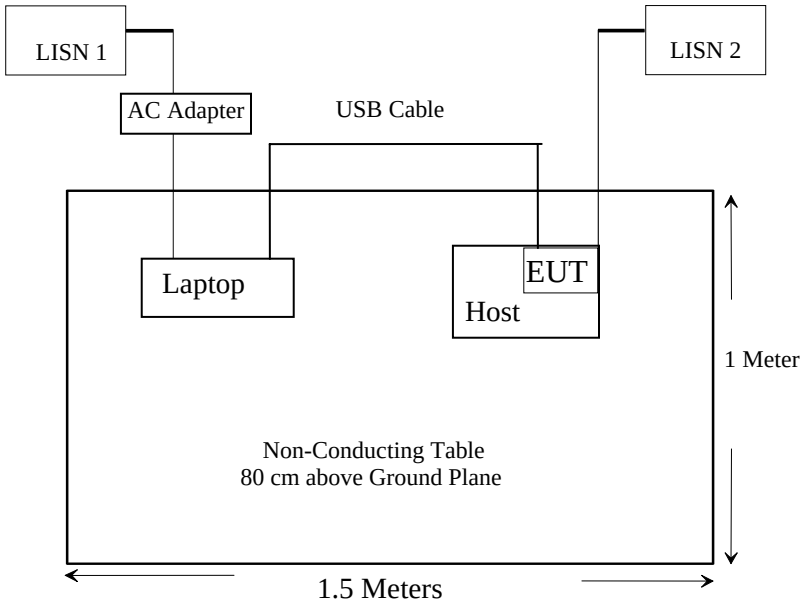
During the conducted emissions test, the power cord of the EUT was connected to the mains outlet of the LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP”. Average readings are distinguished with an “Ave”.

Test Setup Diagram

Conducted Emissions



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	40 %
ATM Pressure:	1020 mbar

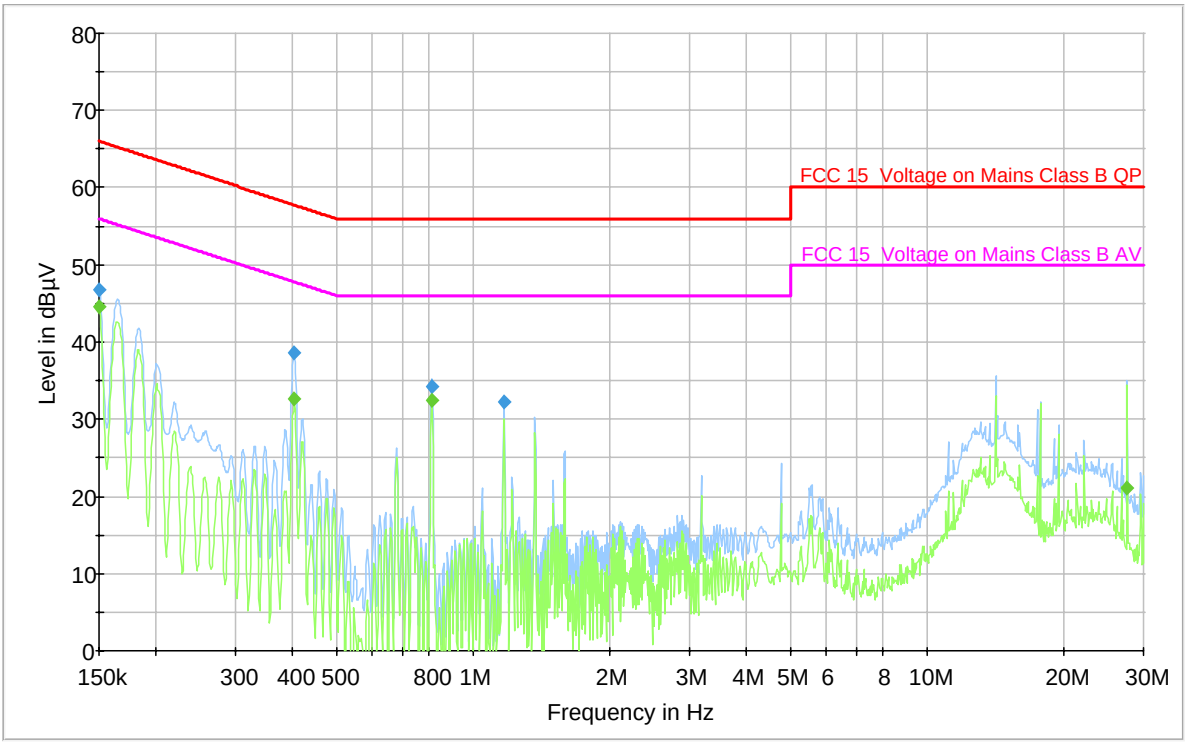
**The testing was performed by James Ma from 2006-12-21*

Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits for Class B devices, with the *worst* margin reading of:

-11.4 dB at **0.150000 MHz Line** conductor mode

120V/60 Hz Line:



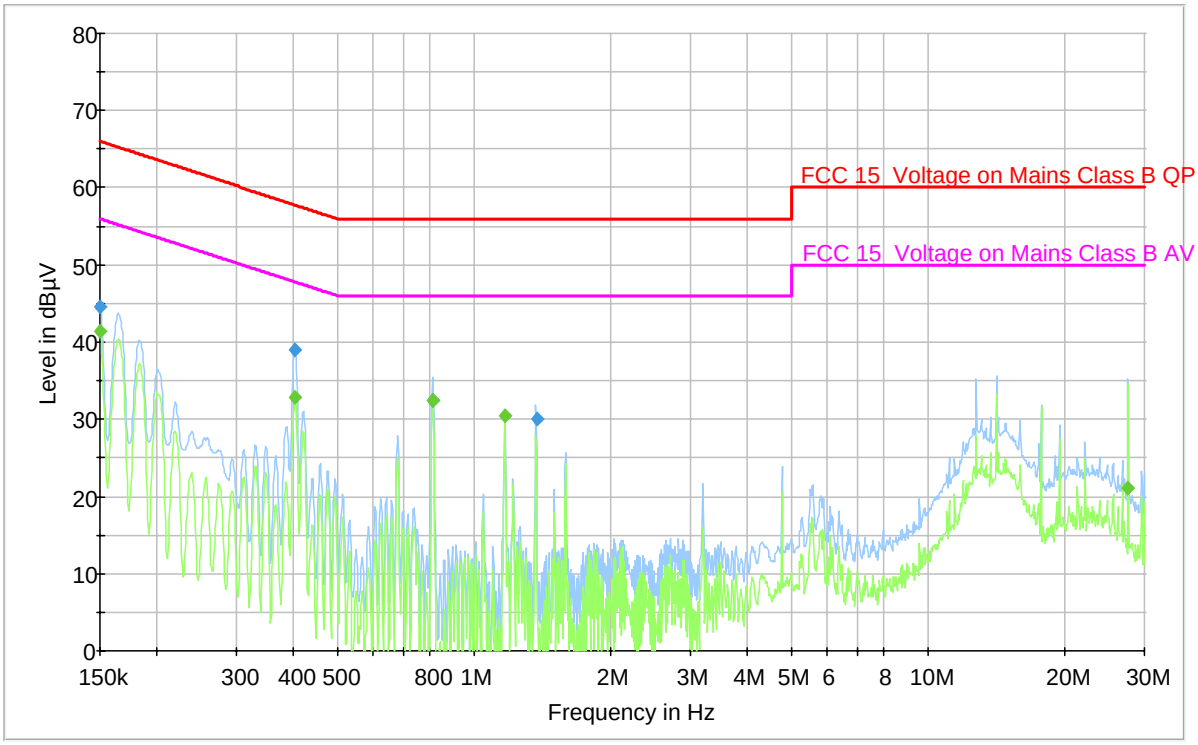
Final Measurement Quasi-Peak Detector

Frequency (MHz)	Quasi Peak (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.402710	38.7	L1	0.4	57.8	19.1
0.150000	46.8	L1	0.1	66.0	19.2
0.810690	34.3	L1	0.3	56.0	21.7
1.168300	32.3	L1	0.3	56.0	23.7

Final Measurement Average Detector

Frequency (MHz)	Average (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.150000	44.6	L1	0.1	56.0	11.4
0.810690	32.4	L1	0.3	46.0	13.6
0.402710	32.5	L1	0.4	47.8	15.3
27.607600	21.2	L1	0.5	50.0	28.9

120V/60 Hz Neutral:



Final Measurement Quasi-Peak Detector

Frequency (MHz)	Quasi Peak (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.402710	39.0	N	0.4	57.8	18.8
0.150000	44.5	N	0.1	66.0	21.5
0.810690	32.4	N	0.3	56.0	23.6
1.372970	30.1	N	0.2	56.0	25.9

Final Measurement Average Detector

Frequency (MHz)	Average (dBµV)	Line	Correction Factor (dB)	Limit (dBµV)	Margin (dB)
0.810690	32.4	N	0.3	46.0	13.6
0.150000	41.4	N	0.1	56.0	14.6
0.402710	32.8	N	0.4	47.8	15.0
1.168300	30.5	N	0.3	46.0	15.5

§15.407(b) (1) & (b) (2) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

For §15.407 (b) (1) & (b) (2), transmitters operating in the 5.15-5.35 GHz band: all emissions outside 5.15 – 5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1057.

Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram

Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	40 %
ATM Pressure:	1020 mbar

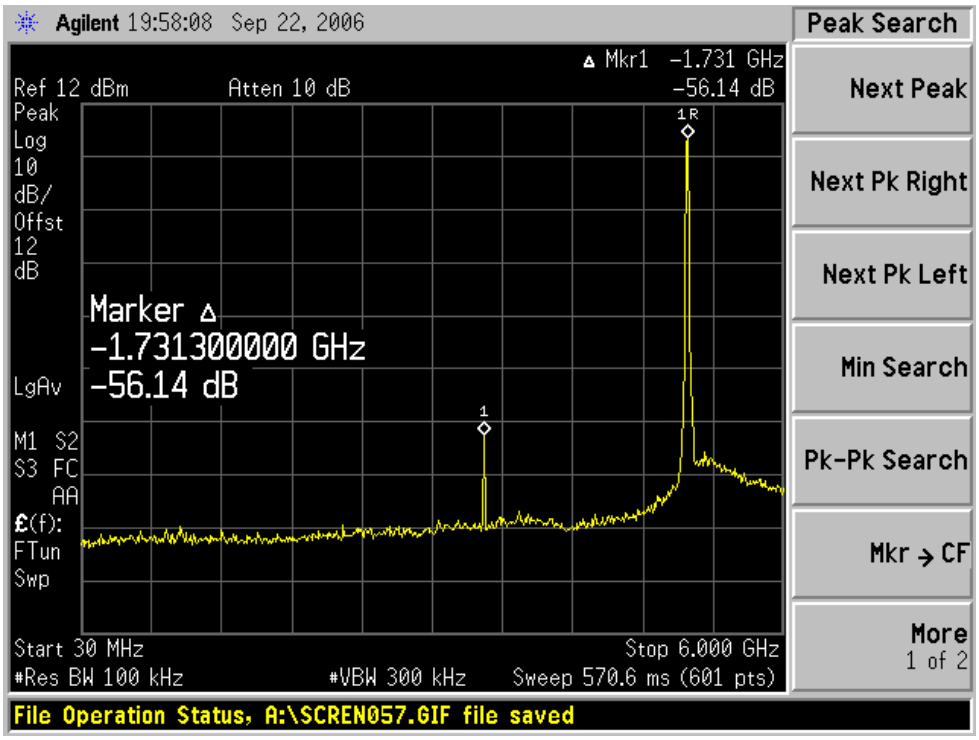
** The testing was performed by James Ma from 2006-12-21.*

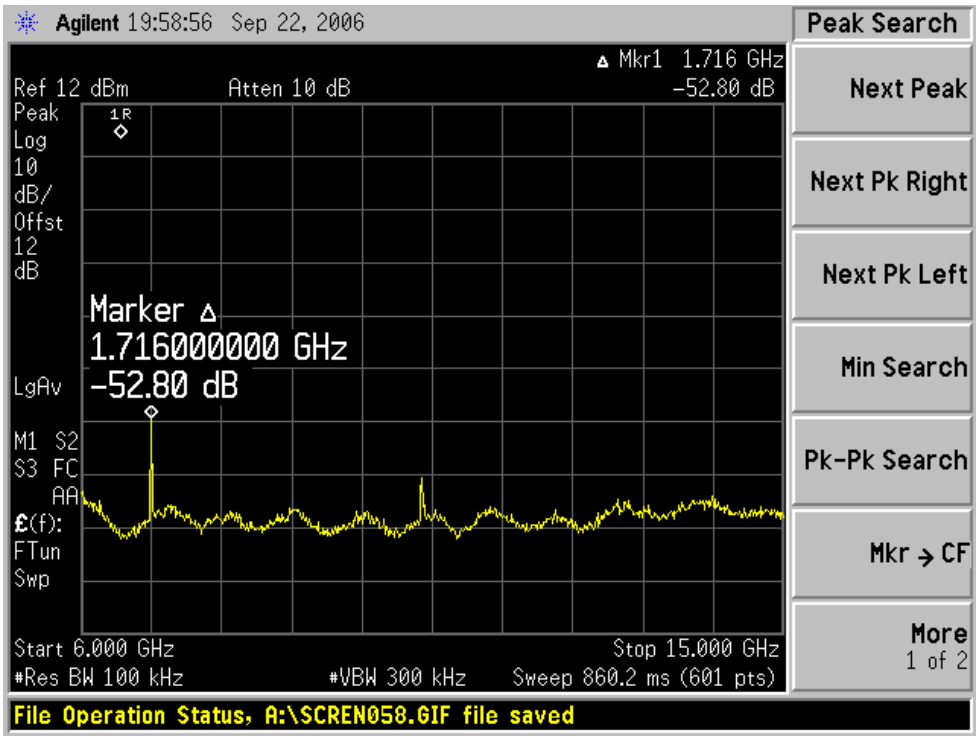
Measurement Result

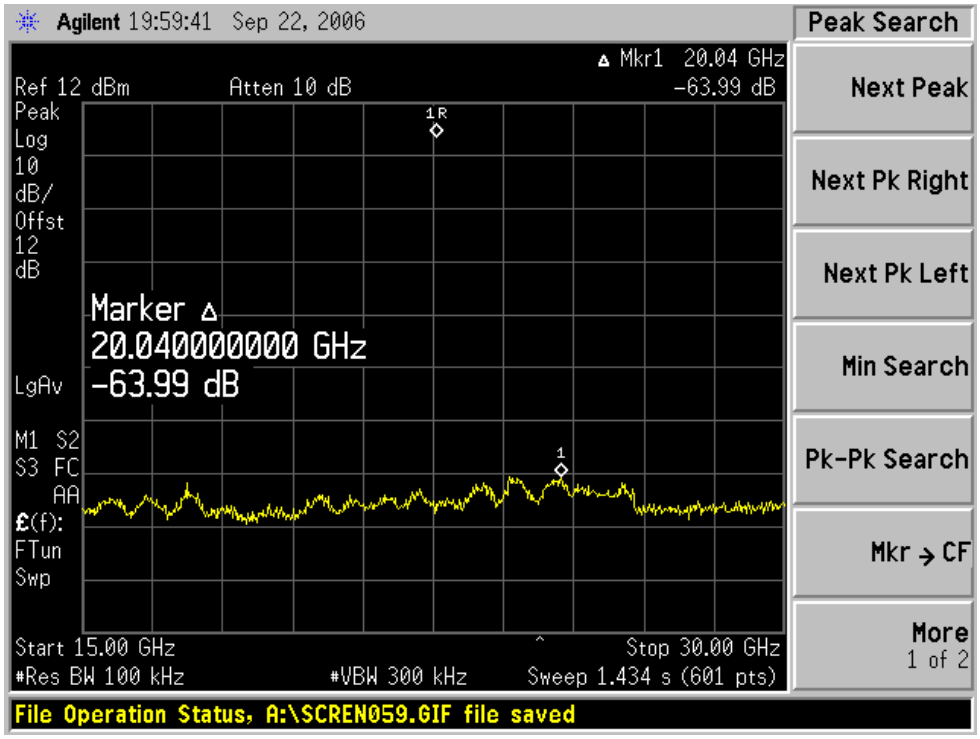
Please refer to following pages for plots of spurious emissions.

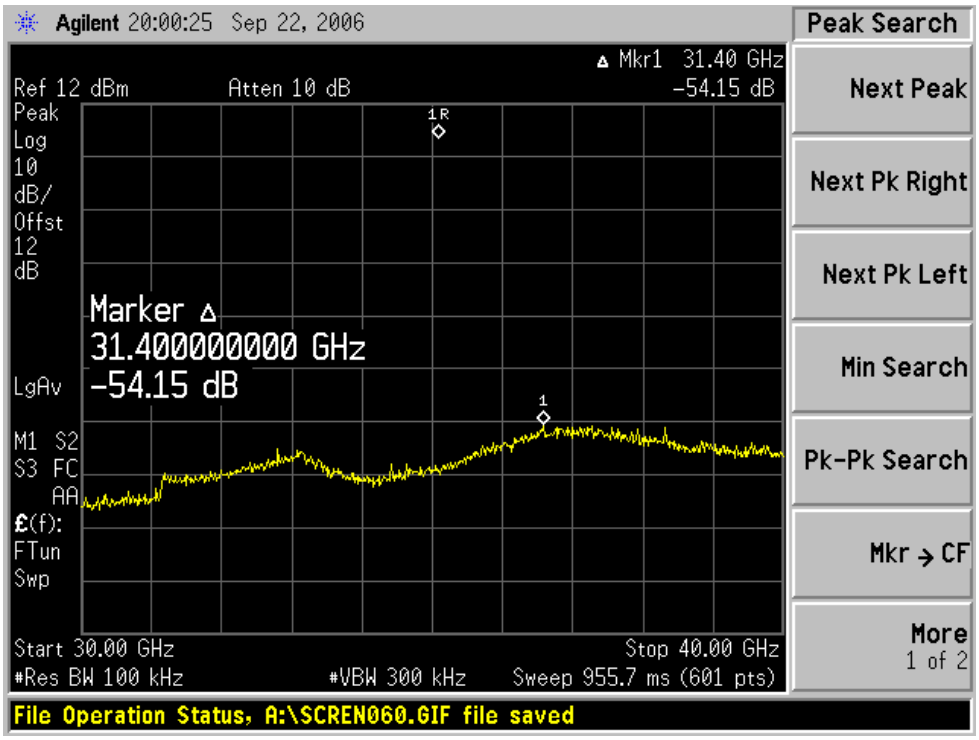
802.11a:

Low Channel

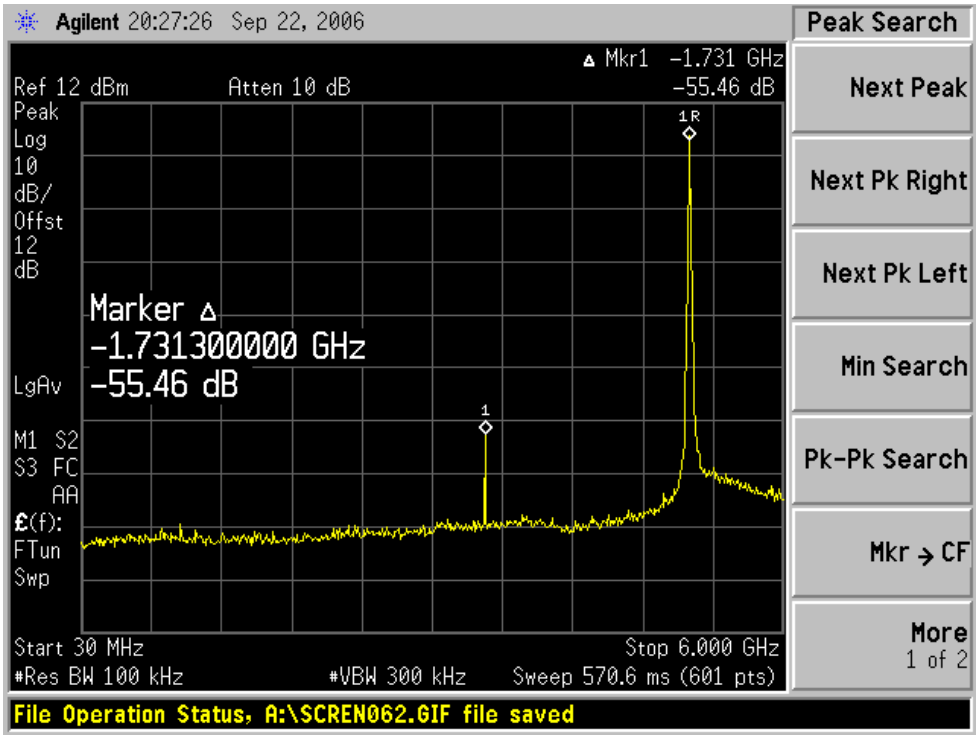


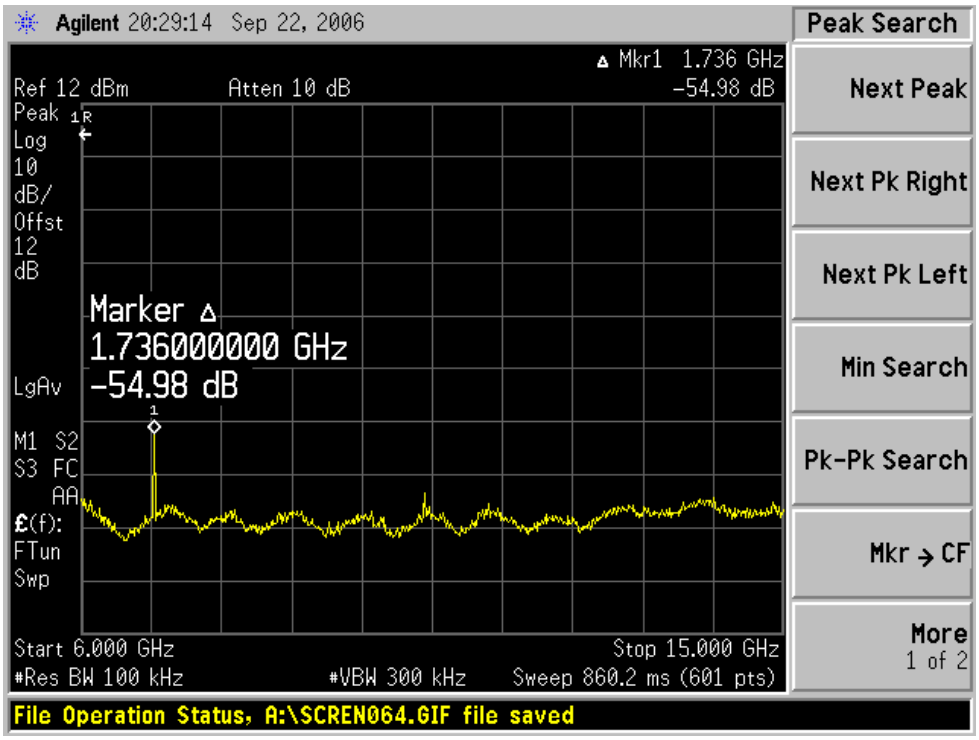


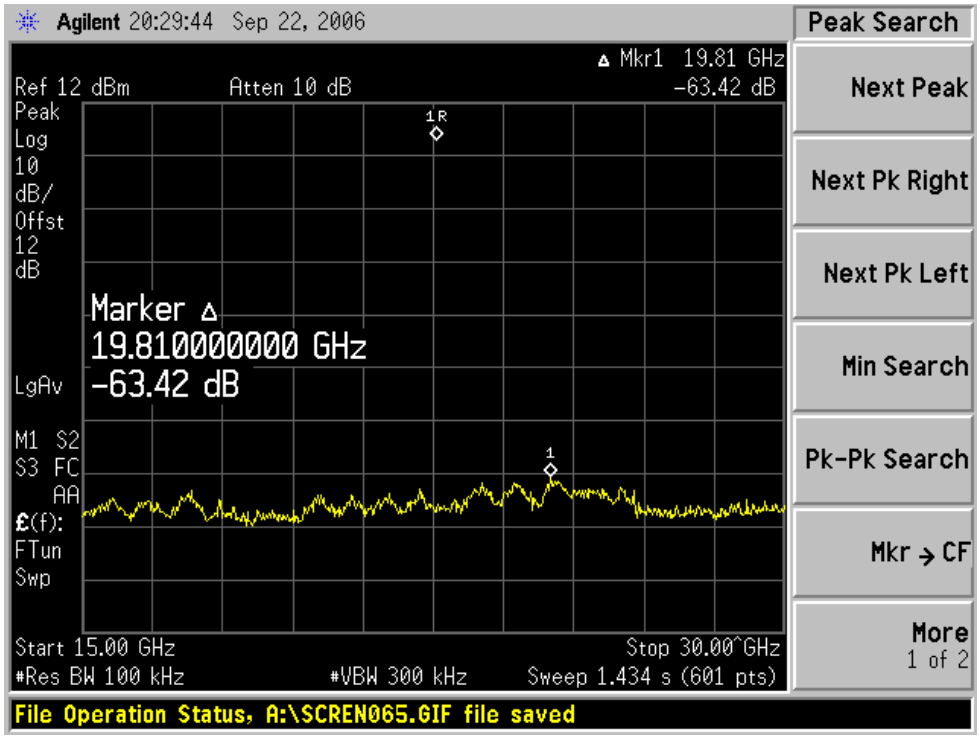

Agilent 19:59:41 Sep 22, 2006
Peak Search
Mkr1 20.04 GHz
-63.99 dB
Ref 12 dBm
Atten 10 dB
Peak
Log
10
dB/
Offst
12
dB
1R
Marker Δ
20.040000000 GHz
-63.99 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 15.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 30.00 GHz
Sweep 1.434 s (601 pts)
File Operation Status, A:\SCREN059.GIF file saved

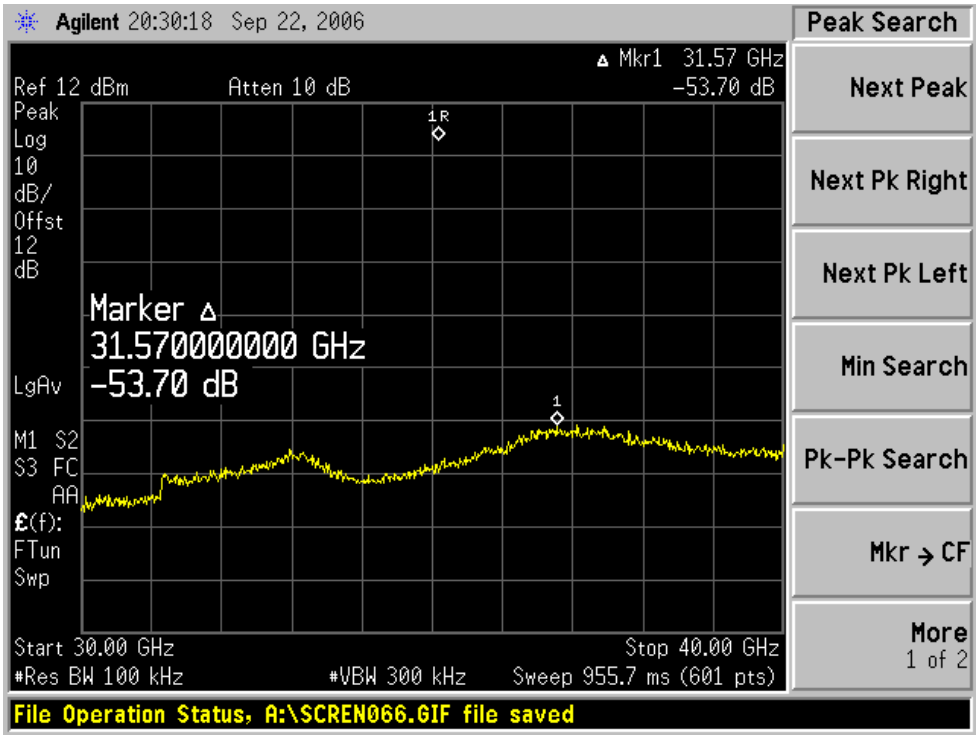

Agilent 20:00:25 Sep 22, 2006
Peak Search
Mkr1 31.40 GHz
-54.15 dB
Ref 12 dBm
Atten 10 dB
Peak
Log
10
dB/
Offst
12
dB
1R
Marker Δ
31.400000000 GHz
-54.15 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 30.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 40.00 GHz
Sweep 955.7 ms (601 pts)
File Operation Status, A:\SCREN060.GIF file saved

Middle Channel

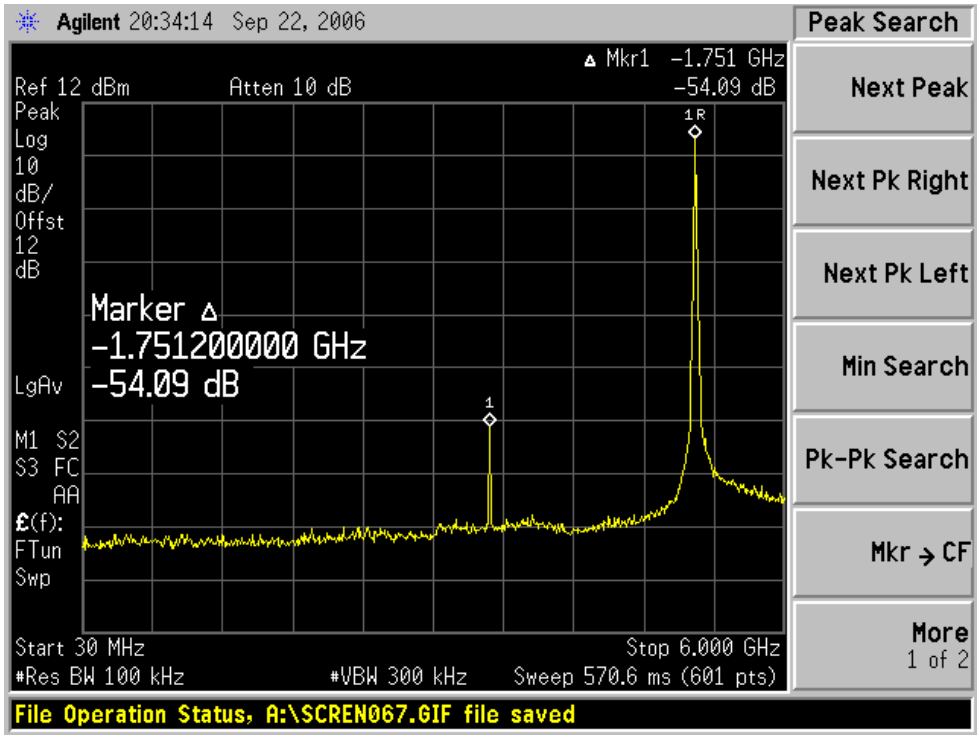


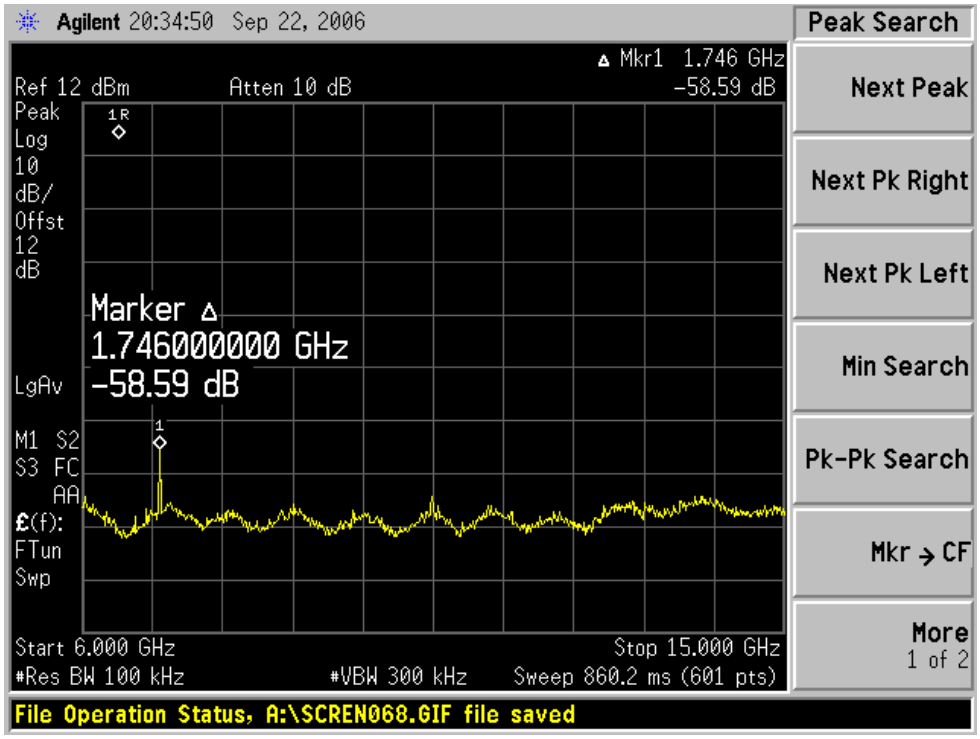


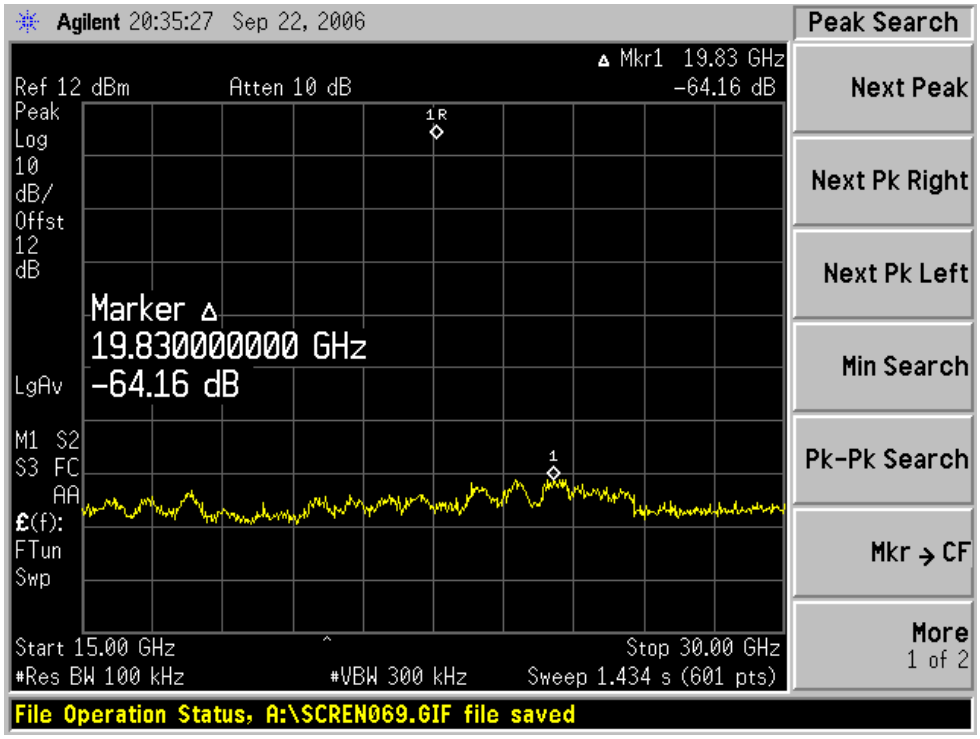

Agilent 20:29:44 Sep 22, 2006
Peak Search
Mkr1 19.81 GHz
Ref 12 dBm
Atten 10 dB
-63.42 dB
Peak
Log
10
dB/
Offst
12
dB
1R
Marker Δ
19.810000000 GHz
-63.42 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 15.00 GHz
Stop 30.00^GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\SCREN065.GIF file saved

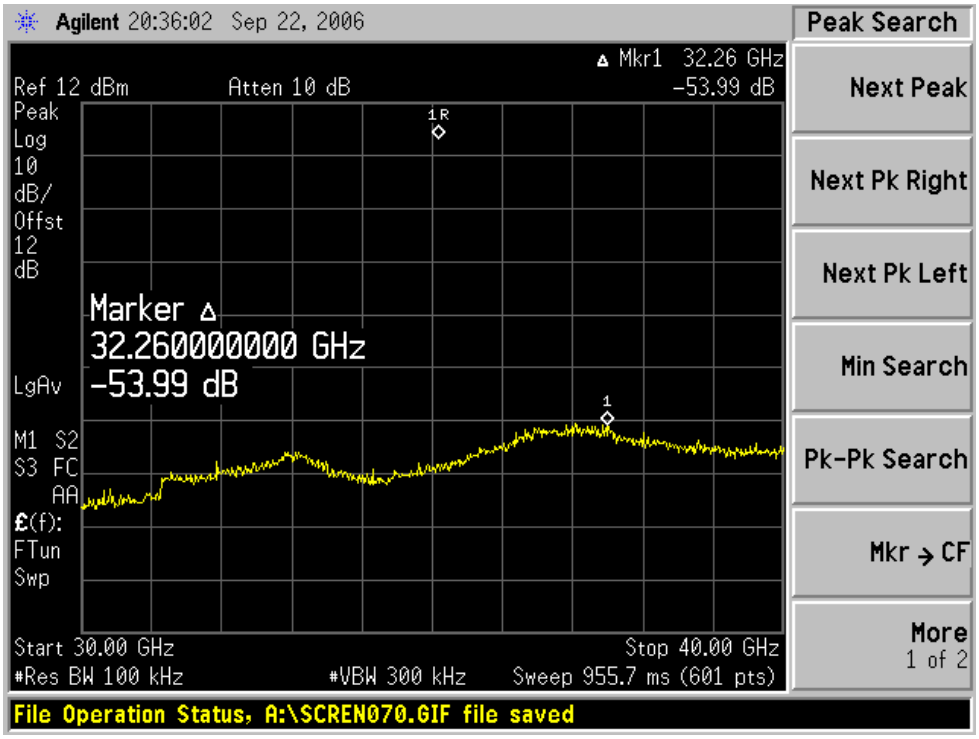

Agilent 20:30:18 Sep 22, 2006
Peak Search
Mkr1 31.57 GHz
Ref 12 dBm
Atten 10 dB
-53.70 dB
Peak
Log
10
dB/
Offst
12
dB
1R
Marker Δ
31.570000000 GHz
-53.70 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 30.00 GHz
Stop 40.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 955.7 ms (601 pts)
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\SCREN066.GIF file saved

High Channel






Agilent 20:35:27 Sep 22, 2006
Peak Search
Mkr1 19.83 GHz
-64.16 dB
Ref 12 dBm
Atten 10 dB
Peak
Log
10
dB/
Offst
12
dB
1R
Marker Δ
19.830000000 GHz
-64.16 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 15.00 GHz
Stop 30.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
File Operation Status, A:\SCREN069.GIF file saved


Agilent 20:36:02 Sep 22, 2006
Peak Search
Mkr1 32.26 GHz
-53.99 dB
Ref 12 dBm
Atten 10 dB
Peak
Log
10
dB/
Offst
12
dB
1R
Marker Δ
32.260000000 GHz
-53.99 dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 30.00 GHz
Stop 40.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 955.7 ms (601 pts)
File Operation Status, A:\SCREN070.GIF file saved

§15.205 & §15.209 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

As per 15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per 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 (micro volts/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

** 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.

As Per 15.407(a)(1) & (a)(2): for the 5.15-5.35 GHz band, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

As Per 15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C and E limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Sonoma Instruments	Pre amplifier	317	260408	2006-03-02
Agilent	Pre amplifier	8449B	3008A01978	2006-08-10
Sunol Science Corp	Combination Antenna	JB3 Antenna	A020106-3	2006-02-14
Agilent	Spectrum Analyzer	E4446A	US44300386	2006-03-06
A.R.A	Antenna Horn	DRG-118/A	1132	2006-08-17

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000MHz:

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

Above 1000MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto

(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

Corrected Amplitude & Margin Calculation

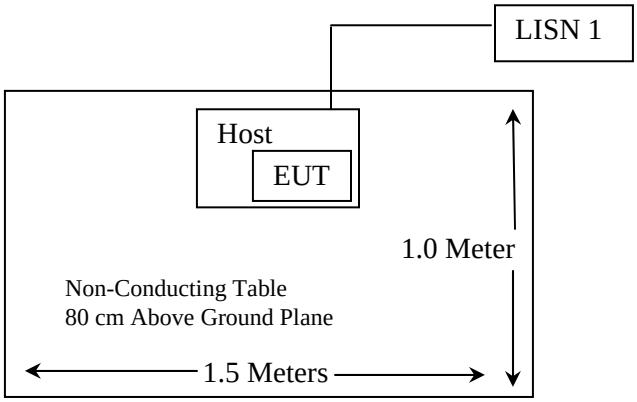
The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.
The equation for margin calculation is as follows:

Margin = Corrected Amplitude - FCC Limit

Test Setup Diagram



Environmental Conditions

Temperature:	22° C
Relative Humidity:	56 %
ATM Pressure:	1041 mbar

** The testing was performed by James Ma from 2006-12-21.*

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15 section 15.205, 15.209 and Subpart E 15.407, and had the worst margin of:

Unintentional Radiated Emissions:

-9.3 dB at **746.508750 MHz** in the **Horizontal** polarization, 300 – 1000 MHz

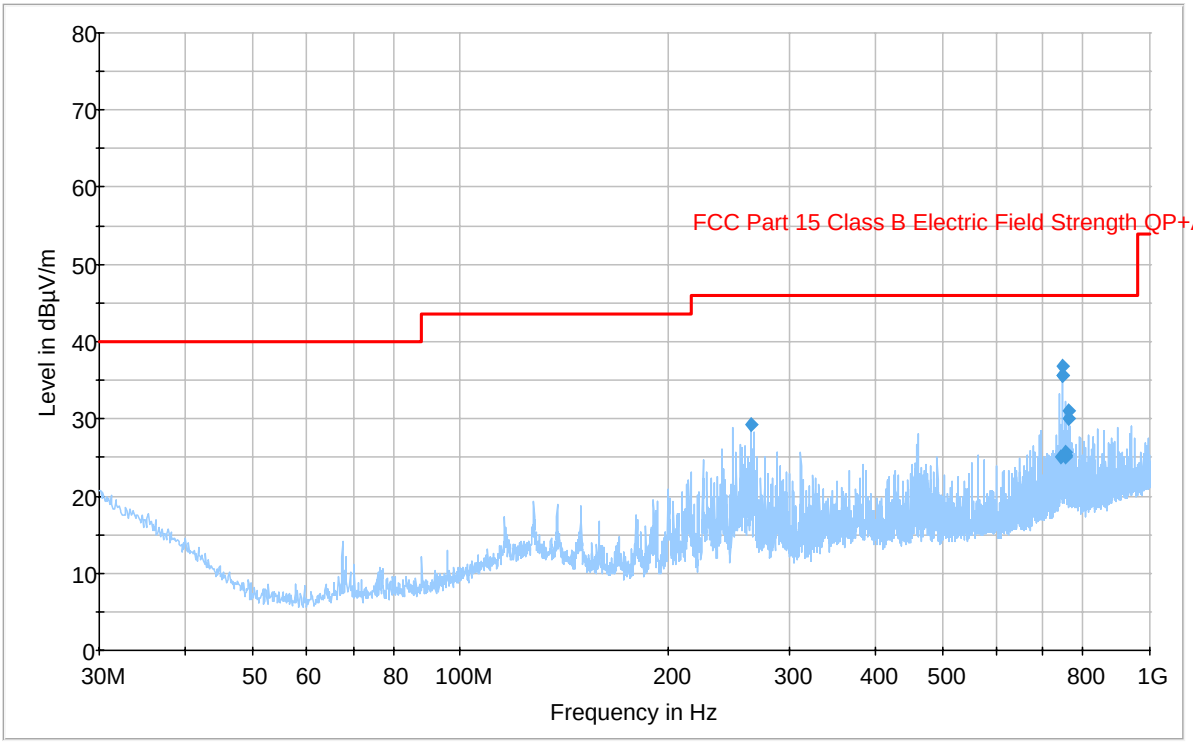
802.11a

-10.1 dB at **10360.0000 MHz** in the **Vertical** polarization for Low Channel, 1GHz – 40GHz
-9.9 dB at **15600.0000 MHz** in the **Vertical** polarization for Middle Channel, 1GHz – 40GHz
-5.4 dB at **10480.0000 MHz** in the **Vertical** polarization for High Channel, 1GHz – 40GHz

Please refer to the following plots and tables for detailed test results

Radiated Emissions Test plot & data:

Primary scan 30MHz -1GHz



Frequency (MHz)	Corrected Quasi Peak (dBµV/m)	Antenna height (cm)	Polarity (H/V)	Turntable position (deg)	Correction Value (dB)	Limit (dBµV/m)	Margin (dB)
746.508750	36.7	125.0	H	198.0	-14.2	46.0	-9.3
746.507500	35.7	101.0	H	37.0	-14.2	46.0	-10.3
746.520000	35.6	101.0	H	38.0	-14.2	46.0	-10.4
764.291250	31.0	115.0	H	194.0	-13.9	46.0	-15.0
764.278750	30.0	119.0	H	38.0	-13.9	46.0	-16.0
264.052500	29.3	125.0	H	208.0	-23.4	46.0	-16.7
755.098750	25.6	101.0	H	38.0	-14.0	46.0	-20.4
755.111250	25.3	101.0	H	35.0	-14.0	46.0	-20.7
755.087500	25.1	120.0	H	38.0	-14.0	46.0	-20.9
741.476250	25.0	119.0	H	200.0	-14.3	46.0	-21.0

802.11a: 5180 – 5240 MHz, Measured at 3 meters

Low channel 5180 MHz

Frequency MHz	Reading dBµV	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Corrected Reading dBµV/m	Limit dBµV/m	Margin dB	Comments
5180.00	99.6	60	1.5	V	34.2	6.7	35.2	105.3			Fund/Peak
5180.00	100.7	60	1.5	H	34.2	6.7	35.2	106.4			Fund/Peak
5180.00	94.5	60	1.8	V	34.2	6.7	35.2	100.2			Ave
5180.00	93.7	60	1.5	H	34.2	6.7	35.2	99.4			Ave
10360.00	27.5	270	2.4	V	39.7	11.7	35.0	43.9	54	-10.1	Ave
15540.00	26.8	90	2.0	V	39.4	13.0	35.3	43.9	54	-10.1	Ave
10360.00	27.0	180	2.3	H	39.7	11.7	35.0	43.4	54	-10.6	Ave
15540.00	26.2	200	1.0	H	39.4	13.0	35.3	43.3	54	-10.7	Ave
10360.00	34.6	45	1.7	V	39.7	11.7	35.0	51.0	74	-23.0	Peak
10360.00	33.5	70	1.7	H	39.7	11.7	35.0	49.9	74	-24.1	Peak
15540.00	32.1	90	2.0	V	39.4	13.0	35.3	49.2	74	-24.8	Peak
15540.00	31.7	200	1.0	H	39.4	13.0	35.3	48.8	74	-25.2	Peak

Mid channel 5200 MHz

Frequency MHz	Reading dBµV	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Corrected Reading dBµV/m	Limit dBµV/m	Margin dB	Comments
5200.00	101.0	45	1.0	V	34.2	6.7	35.2	106.7			Fund/Peak
5200.00	102.1	45	1.2	H	34.2	6.7	35.2	107.8			Fund/Peak
5200.00	93.5	45	1.0	V	34.2	6.7	35.2	99.2			Ave
5200.00	94.7	45	1.2	H	34.2	6.7	35.2	100.4			Ave
15600.00	27.0	30	1.3	V	39.4	13.0	35.3	44.1	54	-9.9	Ave
15600.00	26.5	180	1.0	H	39.4	13.0	35.3	43.6	54	-10.4	Ave
10400.00	27.1	35	1.5	V	39.7	11.7	35.0	43.5	54	-10.5	Ave
10400.00	27.0	160	2.2	H	39.7	11.7	35.0	43.4	54	-10.6	Ave
10400.00	34.2	35	1.5	V	39.7	11.7	35.0	50.6	74	-23.4	Peak
10400.00	33.6	160	2.2	H	39.7	11.7	35.0	50.0	74	-24.0	Peak
15600.00	32.4	30	1.3	V	39.4	13.0	35.3	49.5	74	-24.5	Peak
15600.00	32.0	180	1.0	H	39.4	13.0	35.3	49.1	74	-24.9	Peak

High channel 5240 MHz

Frequency MHz	Reading dBµV	Direction Degree	Height Meter	Polar. H / V	Antenna Factor dB/m	Cable loss dB	Amplifier dB	Corrected Reading dBµV/m	Limit dBµV/m	Margin dB	Comments
5240.00	101.7	60	1.3	V	34.2	6.7	35.2	107.4			Fund/Peak
5240.00	102.6	180	1.2	H	34.2	6.7	35.2	108.3			Fund/Peak
5240.00	94.3	60	1.3	V	34.2	6.7	35.2	100.0			Ave
5240.00	95.8	180	1.2	H	34.2	6.7	35.2	101.5			Ave
10480.00	32.2	60	2.0	V	39.7	11.7	35.0	48.6	54	-5.4	Ave
10480.00	32.0	90	2.1	H	39.7	11.7	35.0	48.4	54	-5.6	Ave
15720.00	27.2	270	2.4	V	39.4	13.0	35.3	44.3	54	-9.7	Ave
15720.00	26.4	180	1.2	H	39.4	13.0	35.3	43.5	54	-10.5	Ave
10480.00	38.4	60	2.0	V	39.7	11.7	35.0	54.8	74	-19.2	Peak
10480.00	37.2	90	2.1	H	39.7	11.7	35.0	53.6	74	-20.4	Peak
15720.00	33.4	270	2.4	V	39.4	13.0	35.3	50.5	74	-23.5	Peak
15720.00	31.3	180	1.2	H	39.4	13.0	35.3	48.4	74	-25.6	Peak

§15.407 – 26 dB & 99% BANDWIDTH

Applicable Standard

None, for power limit determination only.

Measurement Procedure

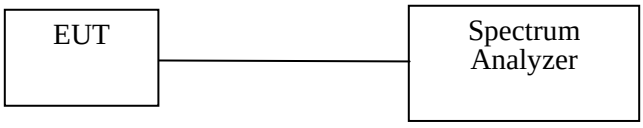
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 26 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	20° C
Relative Humidity:	40 %
ATM Pressure:	1020 mbar

** The testing was performed by James Ma from 2006-12-21.*

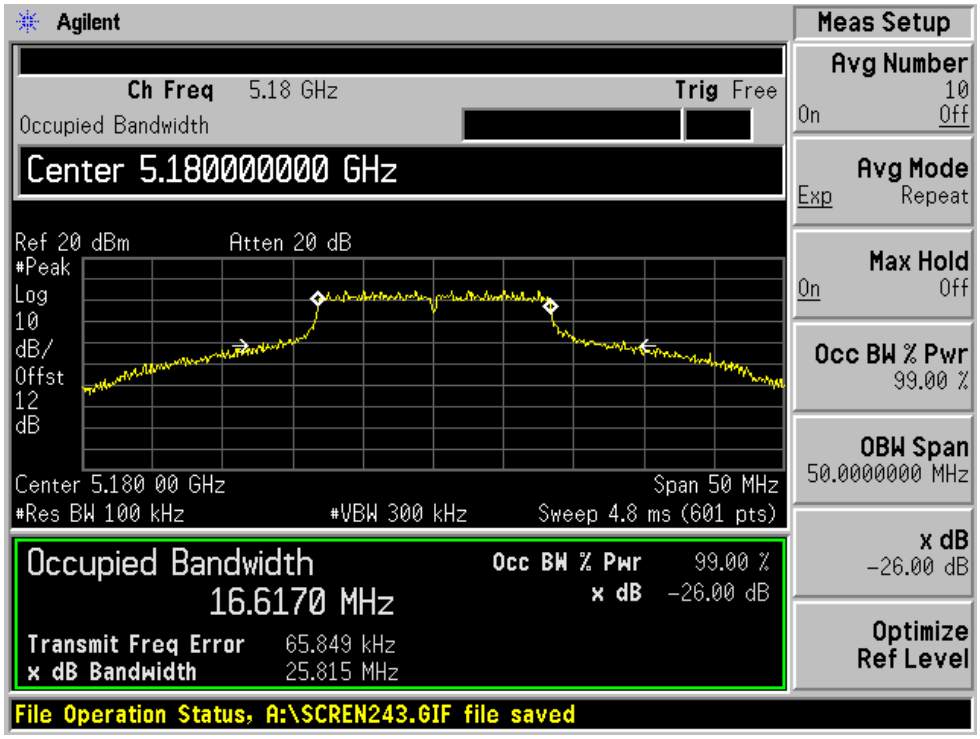
Test Results:

Channel	Frequency (MHz)	26 dB BW (kHz)
802.11a		
Low	5180	25815
Middle	5200	26942
High	5240	26958

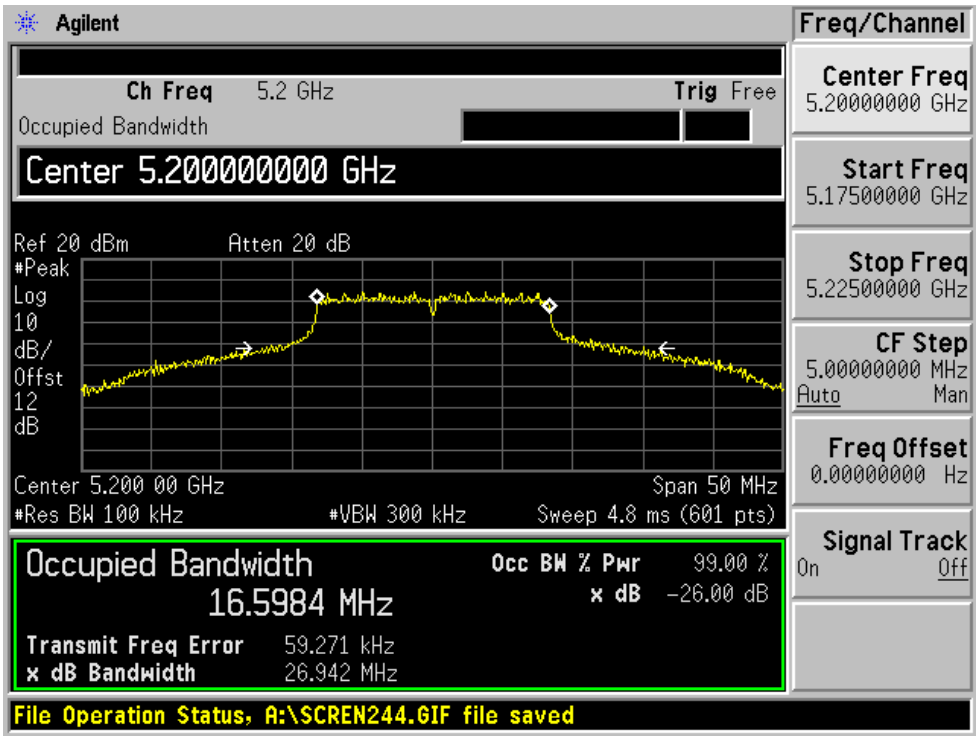
Please refer to the following plots for detailed test results

5180-5240 MHz Band

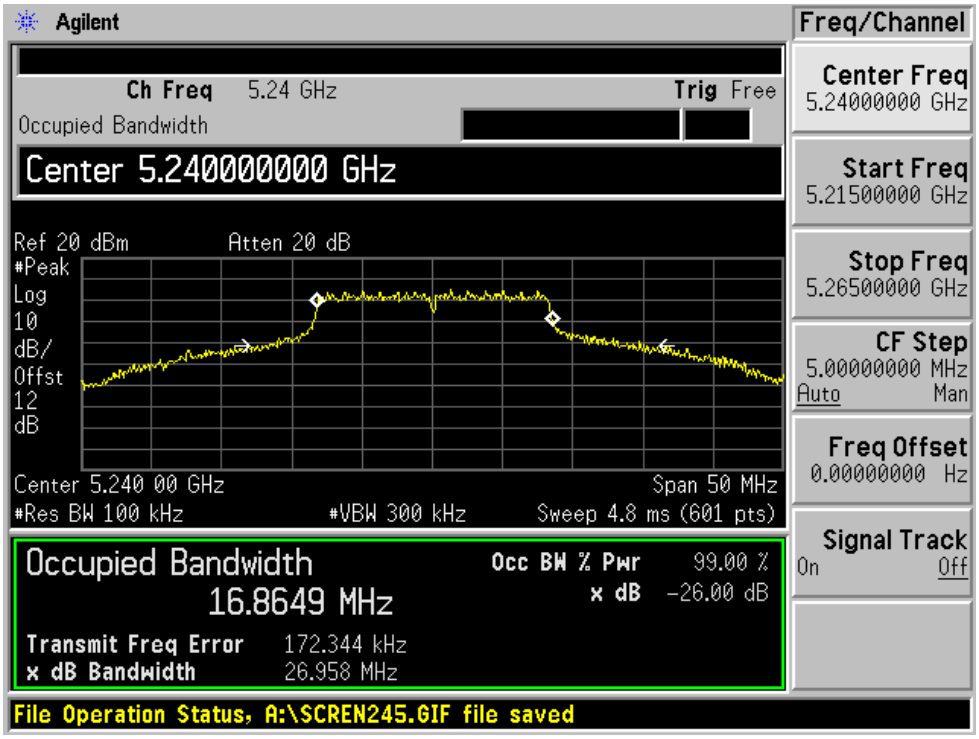
Low Channel



Middle Channel



High Channel



15.407 (a) (1) & (a) (2) - MAXIMUM POWER

Applicable Standard

§15.407 (a)(1) For the band 5.15 – 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a)(2) For the band 5.25 – 5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Procedure

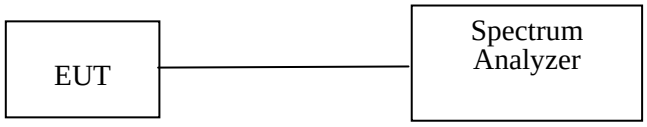
1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum analyzer	E4446A	US44300386	2006-03-06

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	44 %
ATM Pressure:	1020 mbar

** The testing was performed by James Ma from 2006-12-21.*

Test Result

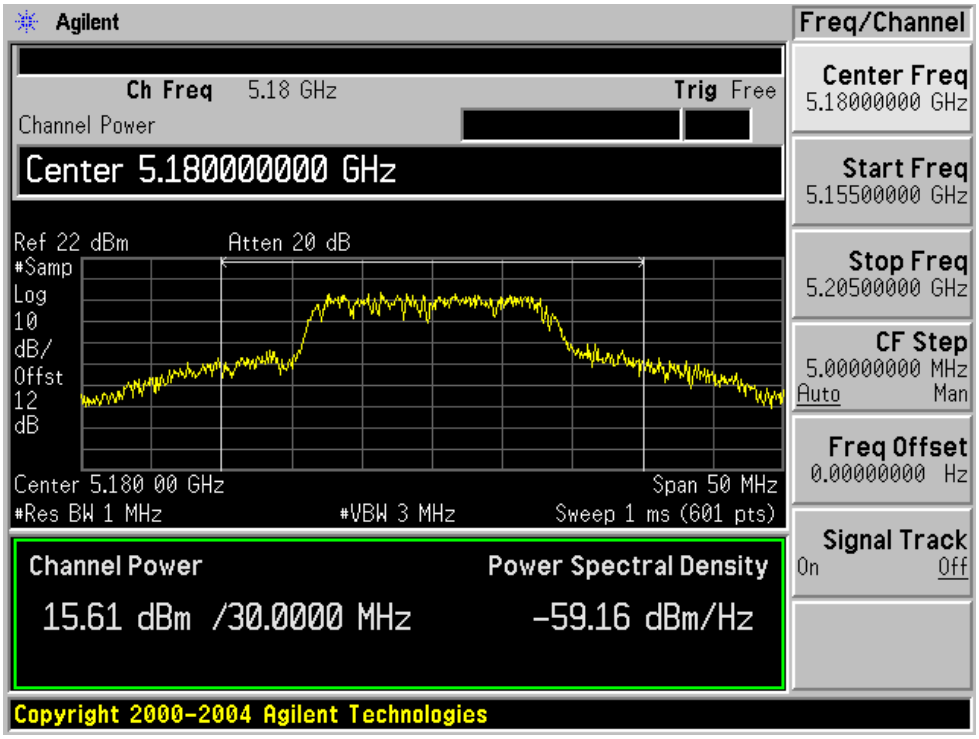
802.11a

Frequency (MHz)	Max Power (dBm)	Max Power (mW)	Limit (mW)	Result
5180	15.61	36.39	50	Pass
5200	15.54	35.81	50	Pass
5240	15.53	35.73	50	Pass

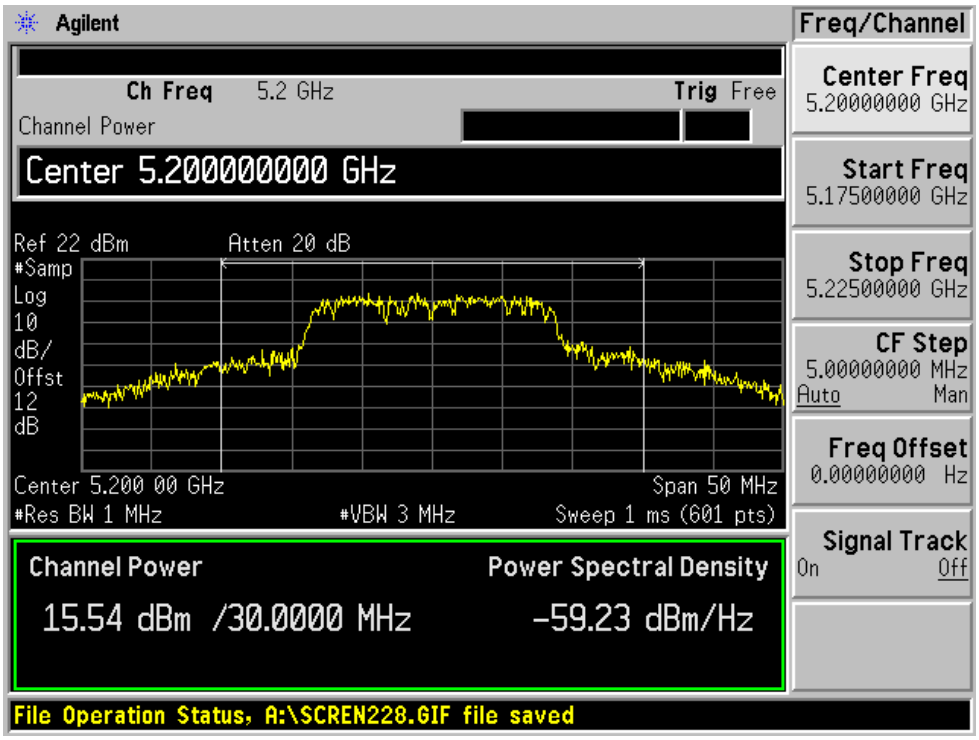
Please refer to the following plots for detailed test results

802.11a

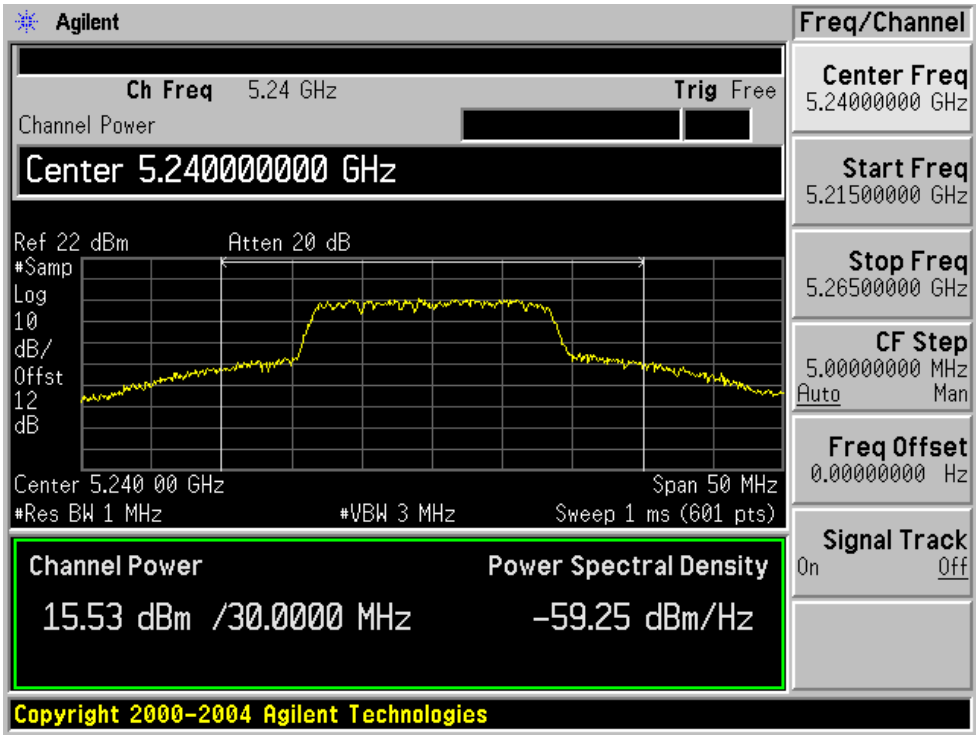
Low Channel



Middle Channel



High Channel



§15.407 (a) (1) & (a)(2) – PEAK POWER SPECTRAL DENSITY

Applicable Standard

§15.407 (a)(1) For the band 5.15 – 5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a)(2) For the band 5.25 – 5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Procedure

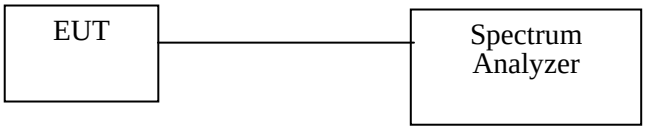
1. Using sample detector and power averaging mode, set RBW=1 MHz and VBW > 1 MHz.
2. PSD is the highest level found across the emission in any 1-MHz band after 100 sweeps of averaging.
3. When the emission bandwidth is less than 1 MHz, a measurement bandwidth equal to the emission bandwidth is used in accordance with section 15.407(a)(5).

Equipment Lists

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum analyzer	E4446A	US44300386	2006-03-06

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	40 %
ATM Pressure:	1020 mbar

**The testing was performed by James Ma from 2006-12-21.*

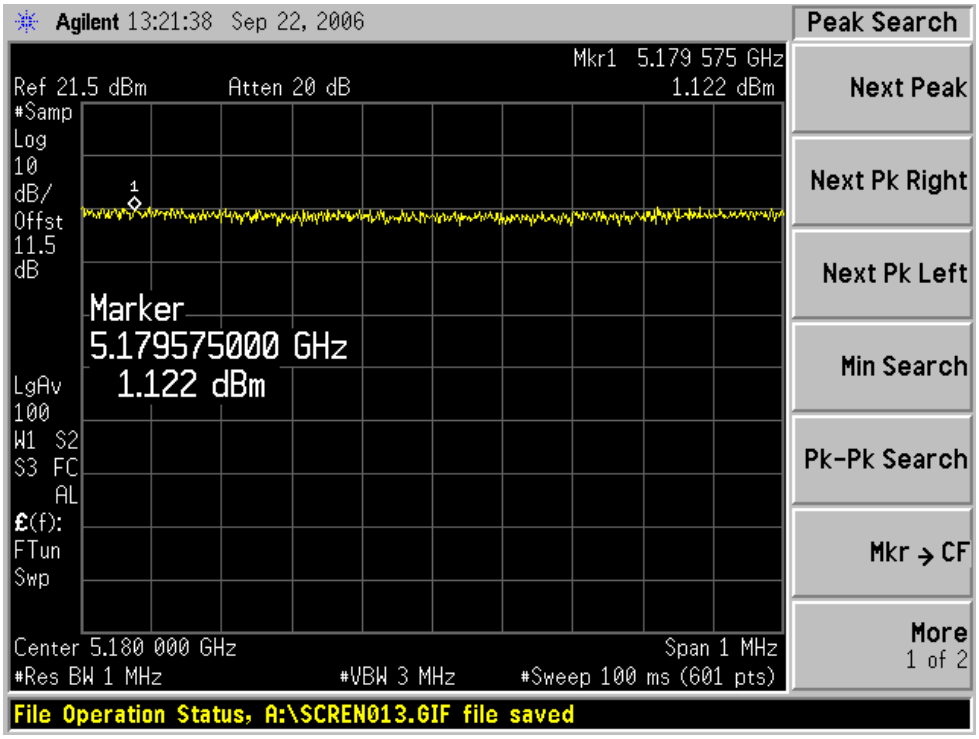
802.11a

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
5180	1.122	4	Pass
5200	1.315	4	Pass
5240	1.757	4	Pass

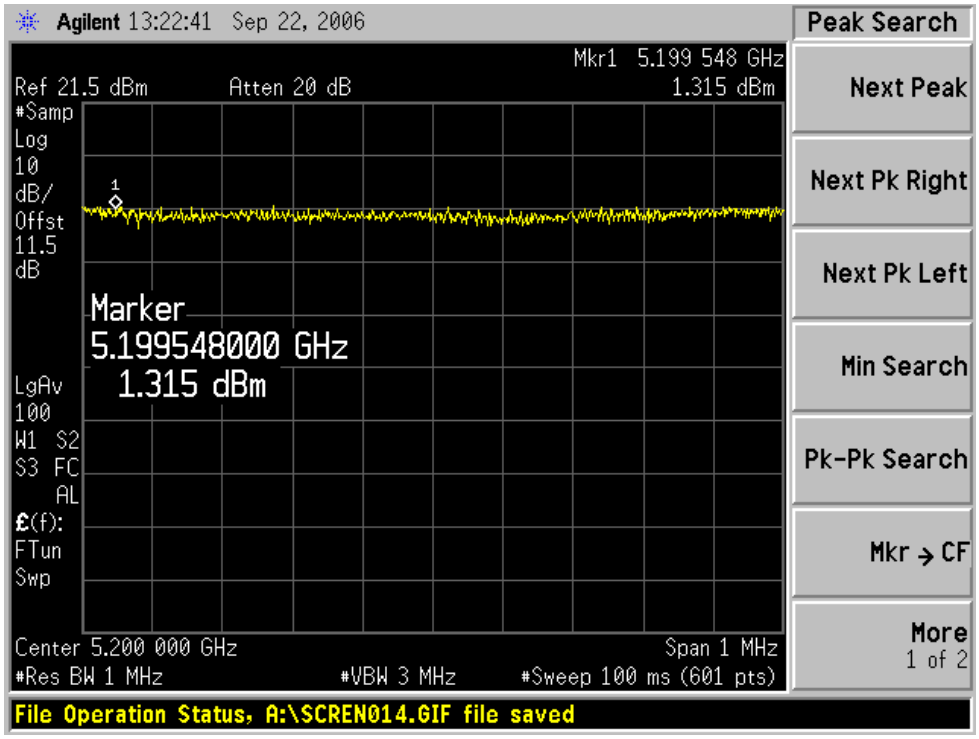
Please refer to the following plots for detailed test results

802.11a

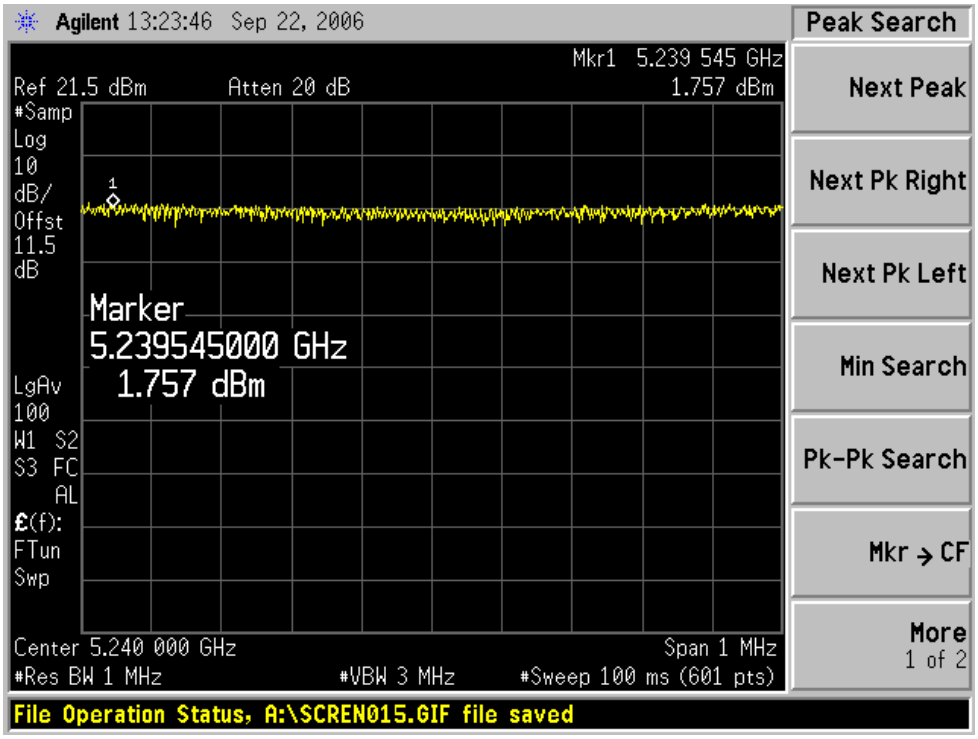
Low Channel



Middle Channel



High Channel



§15.407(a) (6) – Peak Excursion

Applicable Standard

According to §15.407 (a) (6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Measurement Procedure

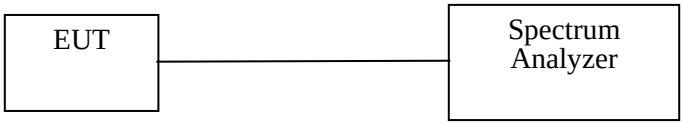
1. Set the SA span to view the entire emission bandwidth. The largest difference between the following two traces must be less than or equal to 13 dB for all frequencies across the emission bandwidth.
2. For the first trace, set RBW = 1MHz and VBW greater or equal to 3MHz utilizing the peak detector and max-hold function.
3. Second trace is created using the setting as described in method # 3 as used in measuring conducted peak output power under FCC Public Notice for U-NII devices August 30, 2002.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum analyzer	E4446A	US44300386	2006-03-06

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Setup Diagram



Environmental Conditions

Temperature:	20° C
Relative Humidity:	40 %
ATM Pressure:	1020 mbar

** The testing was performed by James Ma from 2006-12-21.*

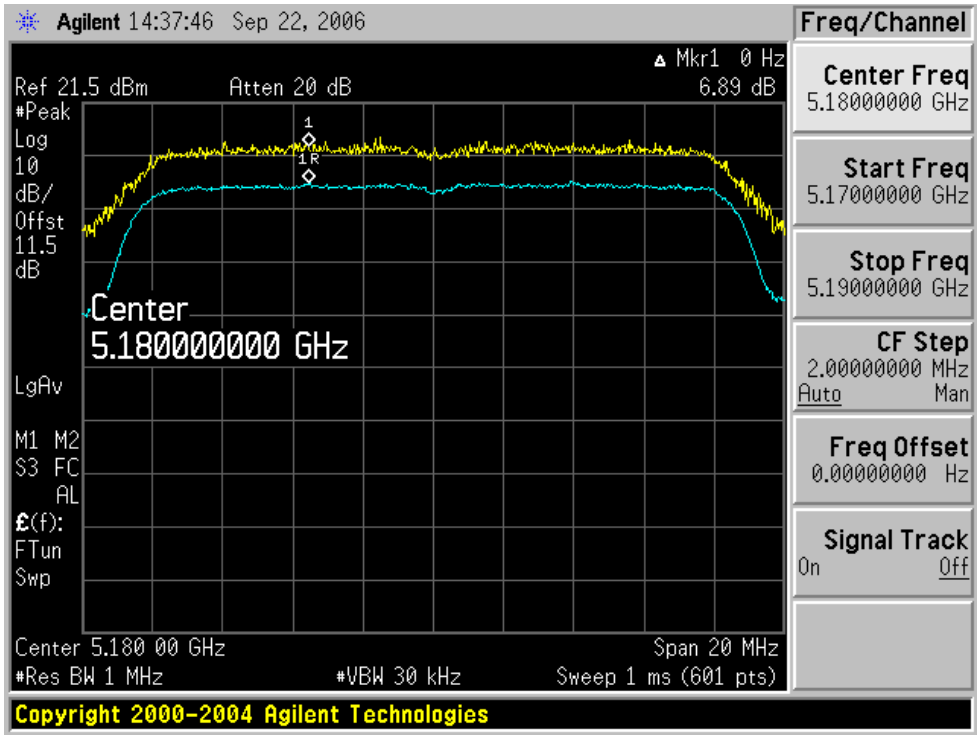
802.11a

Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Result
5180	6.89	13	Pass
5200	6.06	13	Pass
5240	6.18	13	Pass

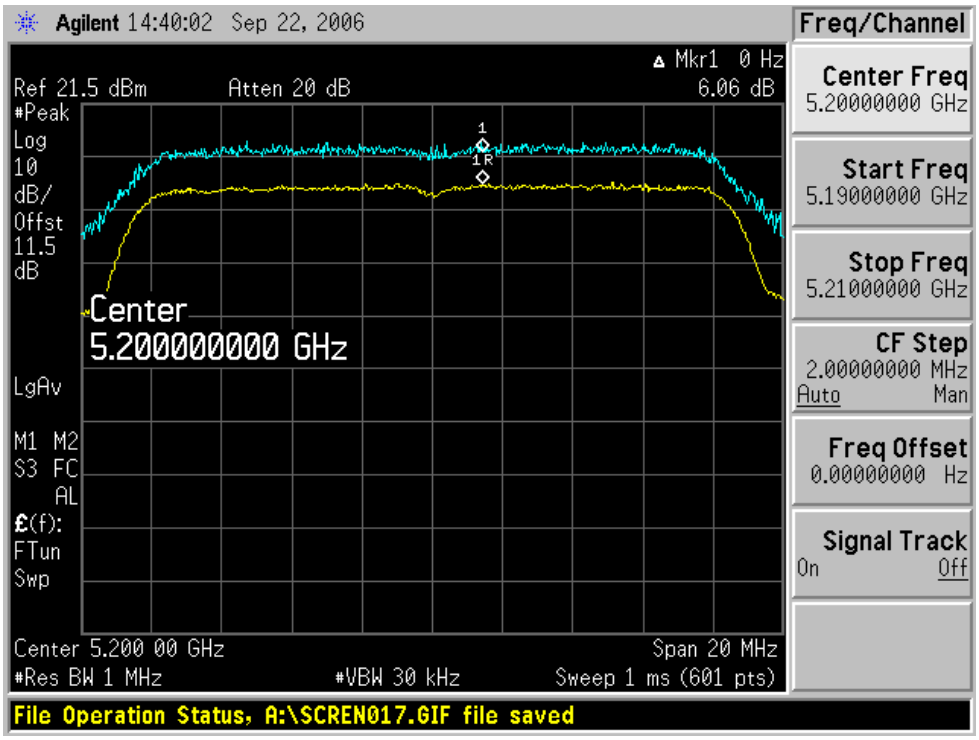
Please refer to the following plots for test result details

802.11a

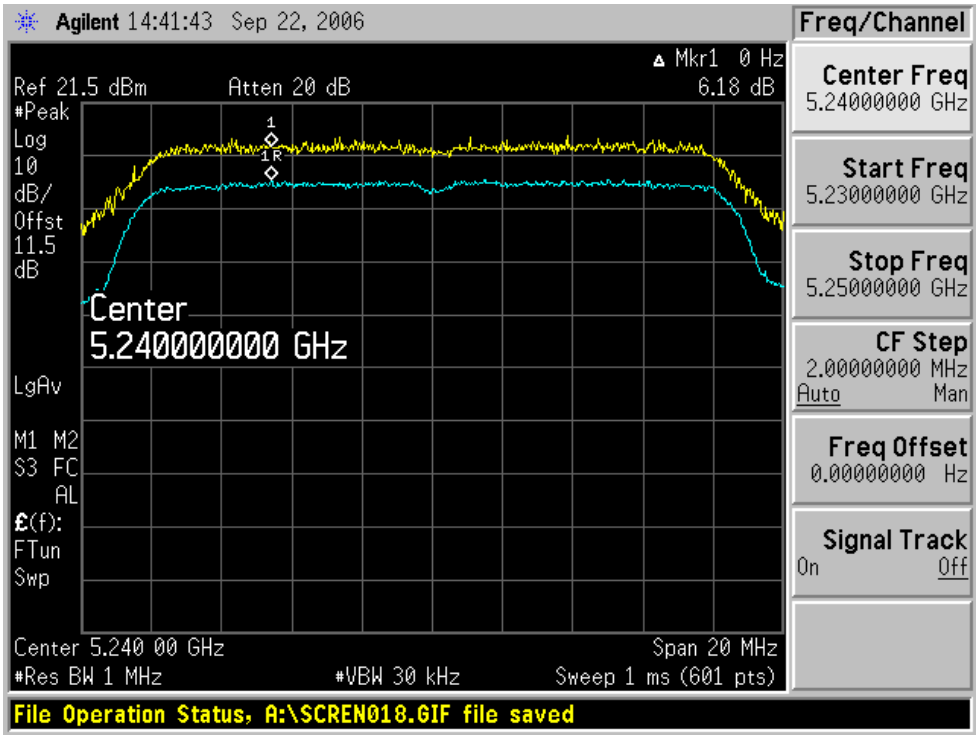
Low Channel



Middle Channel



High Channel



§15.407(b) - Out Of Band Emission

Standard Applicable

§15.407 (b), undesirable emission limits: except as shown in paragraph (b)(6) of this section, the peak emission outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

§15.407 (b) (2), for transmitters operating in the 5.25 – 5.35 GHz & 5.15 – 5.25 GHz band: all emissions outside of the 5.15 – 5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25 – 5.35 GHz band that generate emissions in the 5.15 – 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 – 5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15 – 5.25 GHz band.

Test Procedure

For this test, the EUT's antenna was removed and replaced with a low loss cable, so output power levels were calculated from conducted emission levels.

The analyzer center frequency was set to the EUT carrier frequency. The analyzer resolution and video bandwidth were set to 1MHz. The entire band from 30kHz to 40GHz was investigated.

Every suspected signal was also investigated through radiated emission. Refer to section 15.205 restricted bands of operation.

Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2006-03-06

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Measurement Result

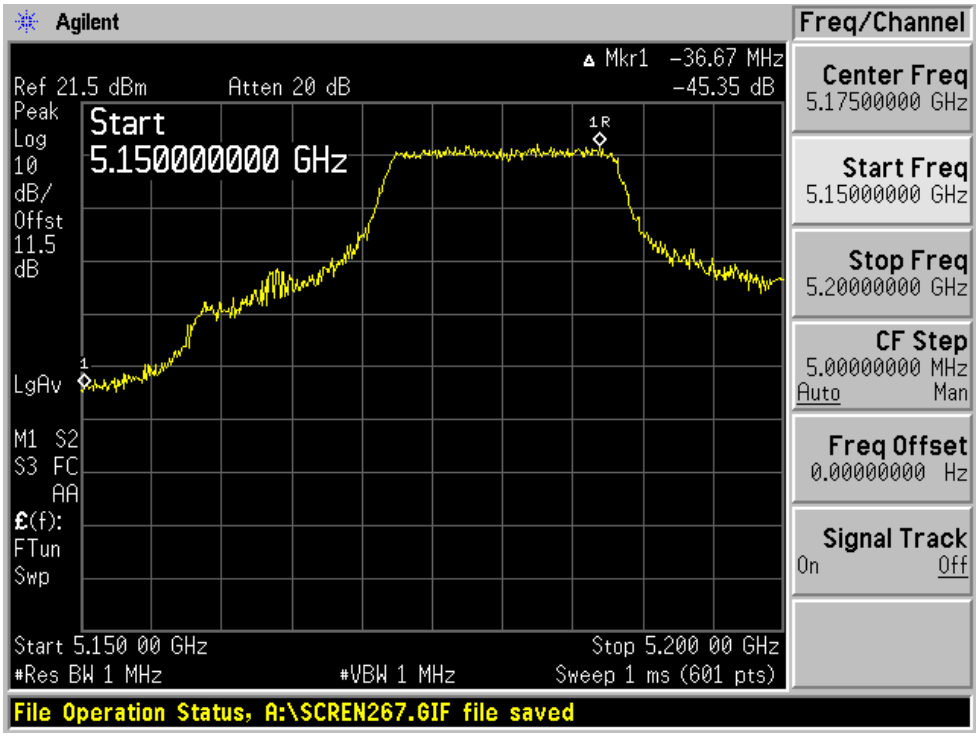
Environmental Conditions

Temperature:	21° C
Relative Humidity:	78%
ATM Pressure:	1022 mbar

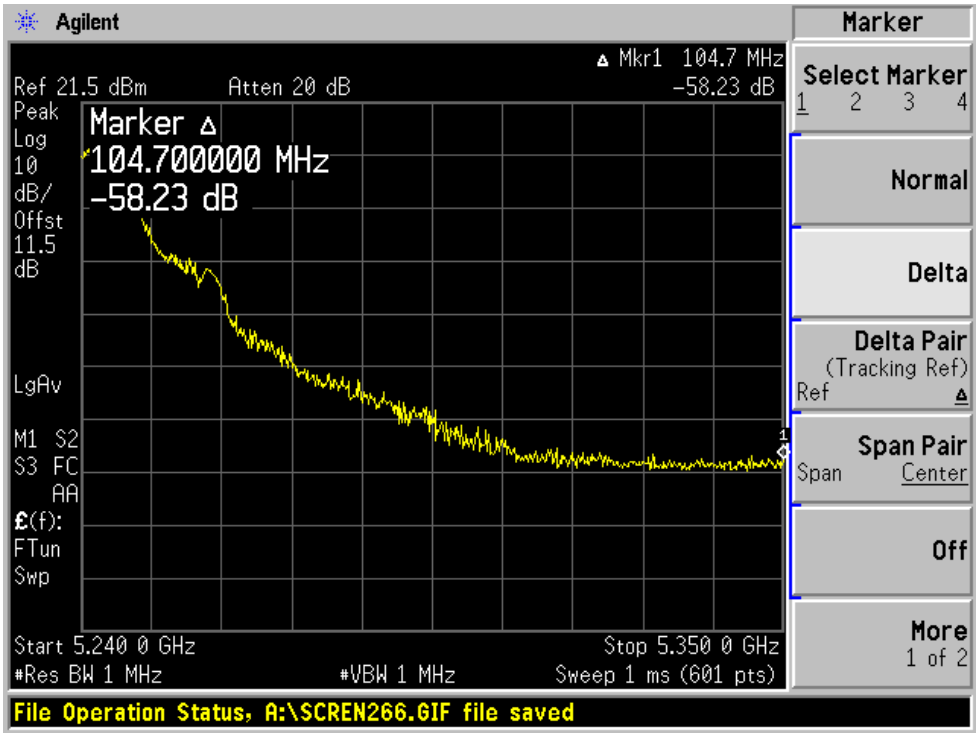
The testing was performed by James Ma on 2006-12-21.

Please refer to the following plots.

Low Channel – 5180 MHz



High Channel – 5240 MHz



15.407(c) – Discontinuance of Transmitting With Absence of Data Or Operational Failure

According to § 15.407 (c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the user of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application a description of how this requirement is met.

§15.407(g) - Frequency Stability

Standard Applicable

According to §15.407 (g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation.

Please refer to use manual for all conditions.