Lab Code: 200167-0

FCC PART 15 SUBPART C
TEST AND MEASUREMENT REPORT

For

SecureALL Corporation

695 Woburn Court,

Mountain View, CA 94040, USA

FCC ID: Y29SA-AP-200
Model: SA-AP-200

Report Type:	**Product Type:**
Original Report	DSSS Wireless Router

Test Engineers:	Jerry Huang
Report Number:	R1012015-247
Report Date:	2010-12-16
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1012015-247	Original Report	2010-12-16

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *SecureAll Corporation* and their product, *model: SA-AP-200,FCC ID: Y29SA-AP-200,* which will be henceforth in this report referred to as the EUT (Equipment under Test). The EUT is a Router with DSSS transceiver. The Router could be powerd by DC power adaptor or PoE (Power Over Ethernet), using a pair of rechargeable NiMH battery for power backup. It works on fix location, communicates with SecureALL Application Server and on or more SecureALL wireless devices; Operating frequency range from 2400 MHz to 2483.5 MHz, 16 channels with 5 MHz opterating bandwidth.

1.2 Mechanical Description of EUT

The EUT measures approximately 110mm of diameter 110mm height, and weighs approximately 193g.

The data gathered are from a production sample provided by the manufacturer, serial number: 32.

1.3 Objective

This report is prepared on behalf of *SecureAll Corporation, Proprietary* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rule.

The objective is to determine compliance with FCC rules for Conducted Emission, Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Conducted Spurious Emissions and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals.

1.5 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.

1.6 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 +2.0 for Conducted Emissions tests and +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.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have 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, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: R-2463 and C-2698. The test site has been approved by the FCC, IC, 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/Standards/scopes/2001670.htm

2 System Test Configuration

2.1 Justification

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

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

2.2 EUT Exercise Software

The software to exercise the unit was provided by the client.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

N/A

2.5 Local Support Equipment

Manufacturers	Descriptions	Models	Serial Numbers
CUI Inc.	Class 2 DC Power Adaptor	EPS050100	-
TrendNet	PoE Router	TPE-S44	-

2.6 EUT Internal Configuration Details

Manufacturers	Descriptions	Models	Serial Numbers
SecureALL Corp.	PCB Assembly Board	SA-AP-200	GCI-033982

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
FCC §15.247(i)	RF Exposure	Compliant
FCC §15.203	Antenna Requirement	Compliant
FCC §15.207(a)	AC Line Conducted Emissions	Compliant
FCC §15.247(d)	Spurious Emissions at Antenna Port	Compliant
FCC §15.205	Restricted Bands	Compliant
FCC §15.209(a), §15.247(d)	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2)	6 dB Bandwidth	Compliant
FCC §15.247(b)(3)	Maximum Peak Output Power	Compliant
FCC §15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e)	Power Spectral Density	Compliant

4 FCC §15.247(i) & §2.1091 - RF Exposure Information

4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), 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 level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 MPE Results

Maximum peak output power at antenna input terminal (dBm):	10.23
Maximum peak output power at antenna input terminal (mW):	10.544
Prediction distance (cm):	20
Prediction frequency (MHz):	2440
Maximum Antenna Gain, typical (dBi):	5.0
Maximum Antenna Gain (numeric):	3.162
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00663
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00663mW/cm^2.Limit is 1mW/cm^2.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to FCC §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 FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna Connector Construction

EUT has one Transmitter/Receiver antennae which is internal antenna. The Transmitter antenna has a max gain of 5 dBi which fulfills the requirements of FCC§15.203.

Frequency Band	Antenna Gain (dBi)
2.4 GHz	5.0

6 FCC §15.207 – AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §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 (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [1]	56 to 46 [1]
0.5-5	56	46
5-30	60	50

[1] *Decreases with the logarithm of the frequency.*

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC Part15.207 limits.

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

The AC/DC power adapter of the Supporting Laptop which connects the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Solar Electronics	LISN	9252-R-24-BNC	511213	2010-06-28
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24

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

6.4 Test Procedure

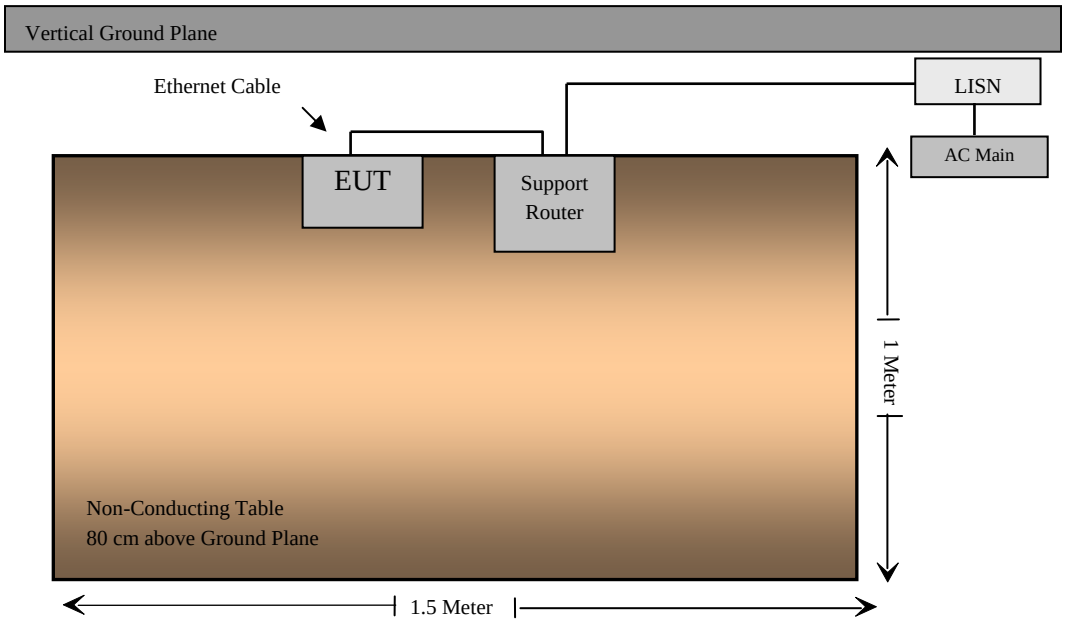
During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

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

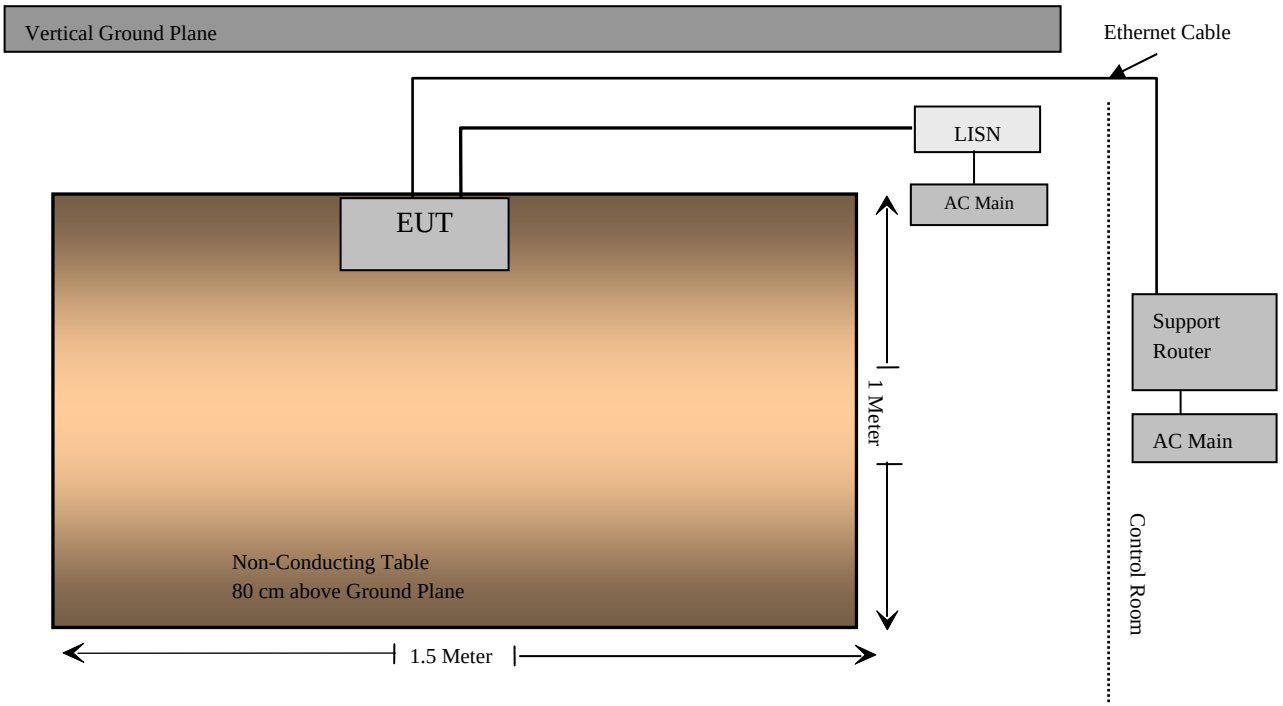
All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.5 Test Setup Block Diagram

EUT Powered by PoE



EUT Powered by AC/DC Adpator



6.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10 dB)

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

Margin = Corrected Amplitude - Limit

6.7 Test Environmental Conditions

Temperature:	16~20 °C
Relative Humidity:	31~40 %
ATM Pressure:	101.2-102.4kPa

The testing was performed by Jerry Huang on 2010-12-1 ~ 2010-12-2 in 5 meter chamber 3.

6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits, with the margin reading of:

EUT Powered By PoE

Worst case: DSSS Middle Channel, Transmitting Mode

Connection: POE			
Margin (dB)	**Frequency (MHz)**	**Conductor (Line/Neutral)**	**Range (MHz)**
-10.07	0.491187	Line	0.15 to 30

EUT Powered By AC Adaptor

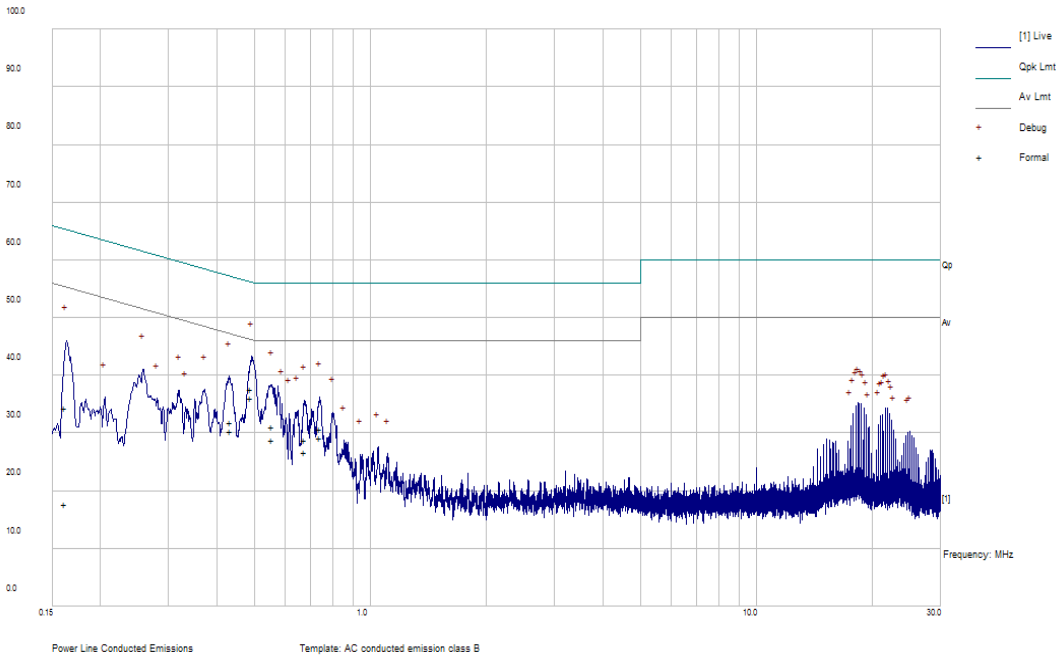
Worst Case: DSSS Middle Channel Transmitting Mode

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor (Line/Neutral)**	**Range (MHz)**
-0.08	0.234291	Neutral	0.15 to 30

6.9 Conducted Emissions Test Plots and Data

EUT Powered by PoE - DSSS Middle channel (2440 MHz)

120 V, 60 Hz – Line



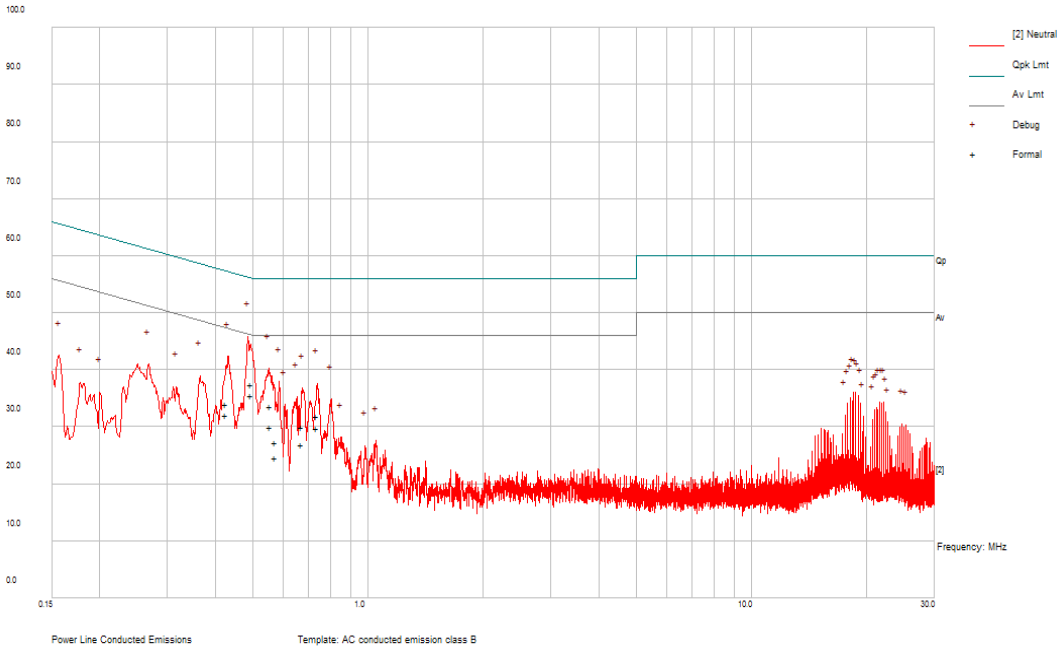
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.161856	34.42	Line	65.37	-30.95
0.435081	31.91	Line	57.16	-25.25
0.491187	37.58	Line	56.15	-18.57
0.557280	31.12	Line	56.00	-24.88
0.673785	28.93	Line	56.00	-27.07
0.738291	30.80	Line	56.00	-25.20

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.161856	17.81	Line	55.37	-37.56
0.435081	30.32	Line	47.16	-16.84
0.491187	36.08	Line	46.15	-10.07
0.557280	28.83	Line	46.00	-17.17
0.673785	26.82	Line	46.00	-19.18
0.738291	29.16	Line	46.00	-16.84

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

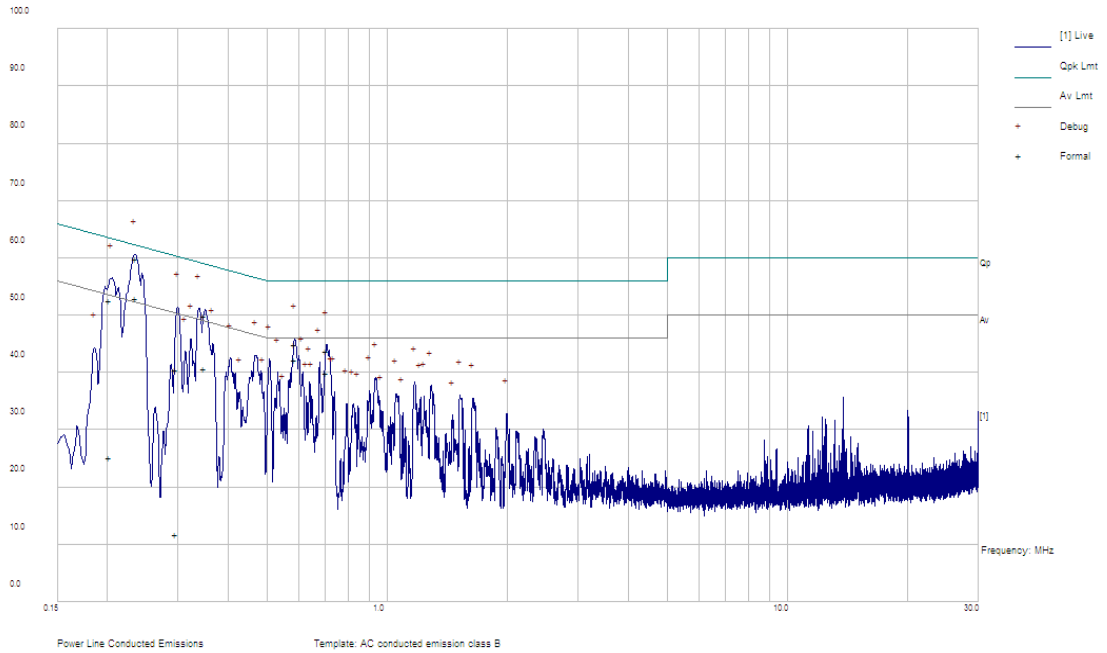
Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.427086	34.04	Neutral	57.31	-23.27
0.495366	37.51	Neutral	56.08	-18.57
0.557958	33.69	Neutral	56.00	-22.31
0.573990	27.23	Neutral	56.00	-28.77
0.671391	30.06	Neutral	56.00	-25.94
0.736392	31.82	Neutral	56.00	-24.18

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.427086	32.18	Neutral	47.31	-15.13
0.495366	35.56	Neutral	46.08	-10.52
0.557958	30.05	Neutral	46.00	-15.95
0.573990	24.53	Neutral	46.00	-21.47
0.671391	27.01	Neutral	46.00	-18.99
0.736392	29.79	Neutral	46.00	-16.21

EUT Powered by AC/DC Adaptor - DSSS Middle channel (2440 MHz)

120 V, 60 Hz – Line



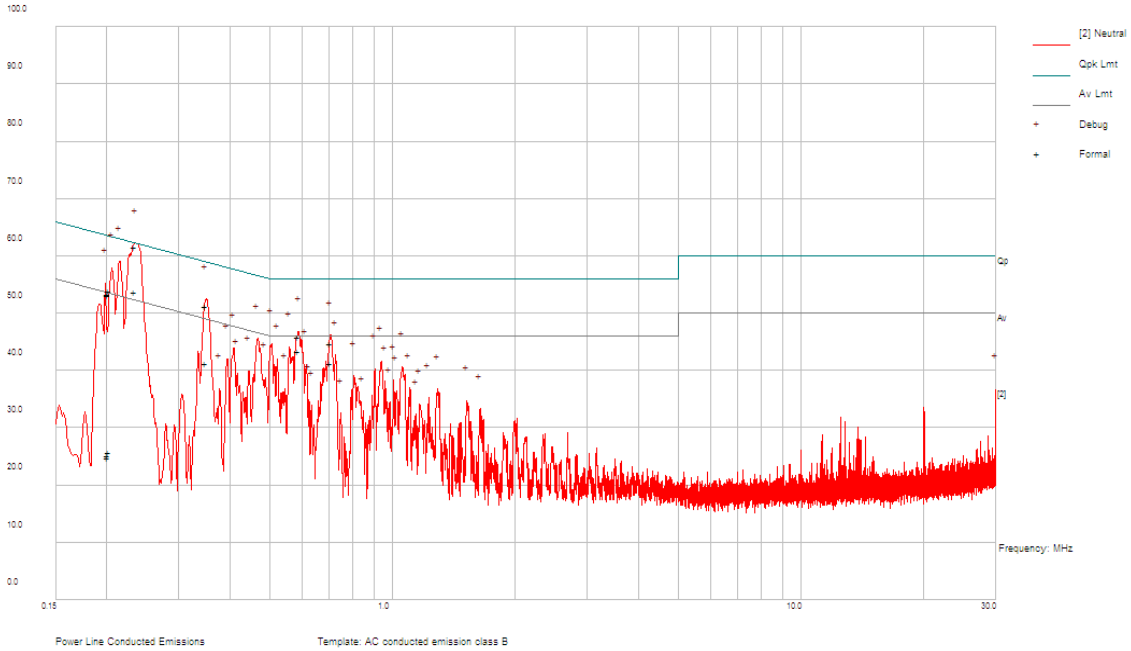
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.202527	52.66	Line	63.51	-10.85
0.234960	59.13	Line	62.27	-3.14
0.297138	40.59	Line	60.32	-19.73
0.349392	50.01	Line	58.98	-8.97
0.586896	45.01	Line	56.00	-10.99
0.703767	43.72	Line	56.00	-12.28

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.202527	25.10	Line	53.51	-28.4
0.234960	51.16	Line	52.27	-0.11
0.297138	11.81	Line	50.32	-38.52
0.349392	40.79	Line	48.98	-8.19
0.586896	42.28	Line	46.00	-3.72
0.703767	39.87	Line	46.00	-6.13

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.200616	53.11	Neutral	63.59	-10.48
0.201075	53.41	Neutral	63.57	-10.16
0.201846	53.86	Neutral	63.53	-9.68
0.234291	59.93	Neutral	62.30	-2.37
0.349860	51.28	Neutral	58.97	-7.69
0.587265	45.89	Neutral	56.00	-10.11

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.200616	24.88	Neutral	53.59	-28.71
0.201075	25.18	Neutral	53.57	-28.39
0.201846	25.79	Neutral	53.53	-27.74
0.234291	52.21	Neutral	52.30	-0.08
0.349860	41.36	Neutral	48.97	-7.60
0.587265	43.32	Neutral	46.00	-2.68

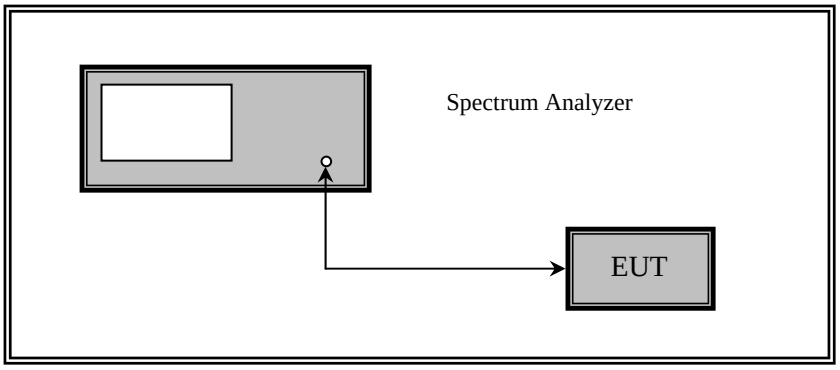
7 FCC §15.247(a) (2) – 6 dB & 99% Emission Bandwidth

7.1 Applicable Standard

According to FCC §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

7.2 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 6 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2010-05-09

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

7.4 Test Environmental Conditions

Temperature:	17~20 °C
Relative Humidity:	30~34 %
ATM Pressure:	101.2-103.2kPa

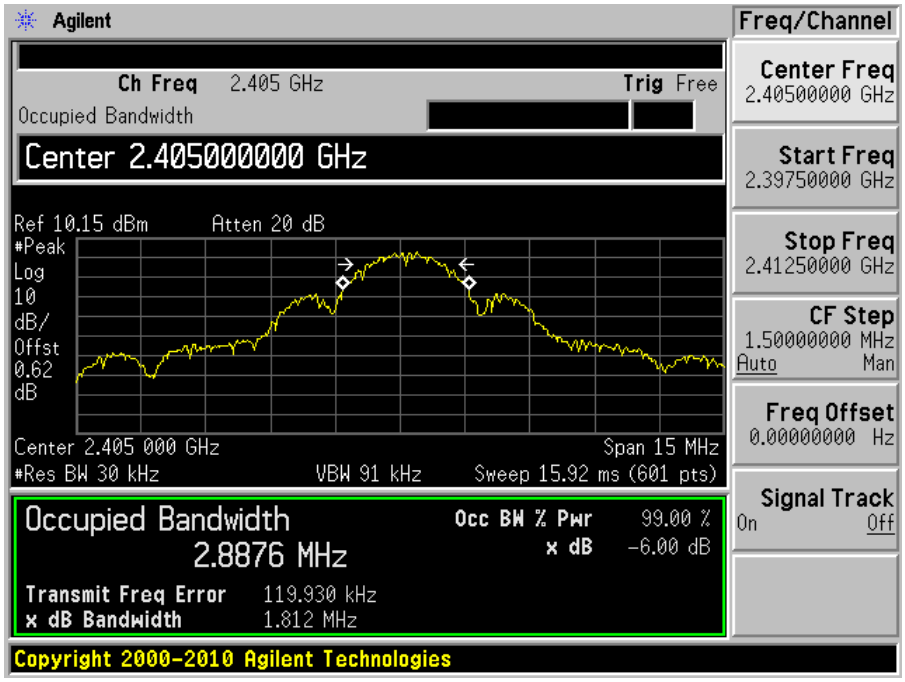
The testing was performed by Jerry Huang on 2010-12-3 in RF site.

7.5 Summary of Test Results

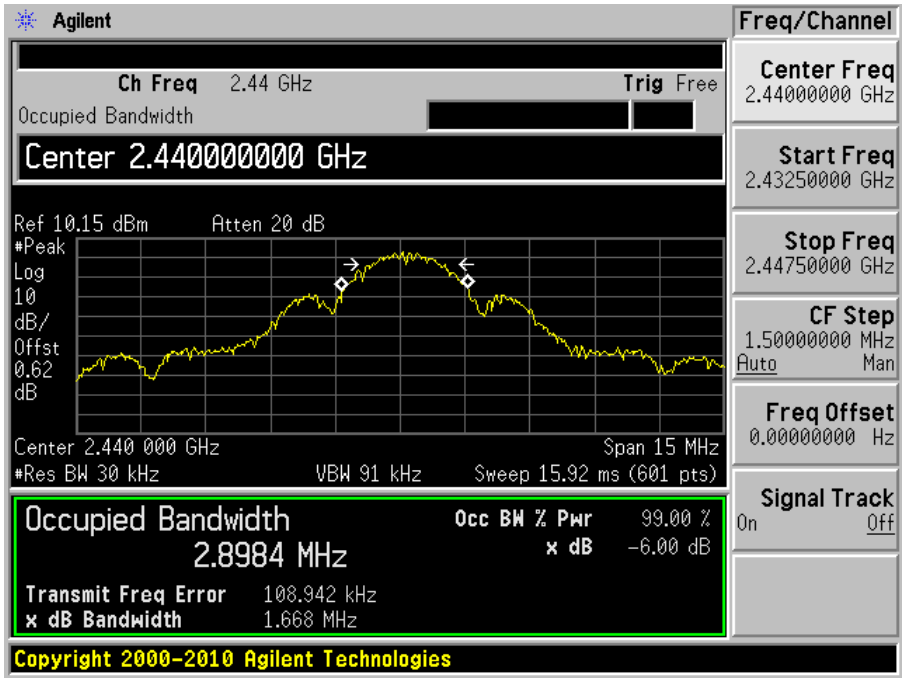
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
Low	2405	1.812	2.8876	> 0.5	Compliant
Middle	2440	1.668	2.8984	> 0.5	Compliant
High	2475	1.669	3.0276	> 0.5	Compliant

Please refer to the following plots for detailed test results:

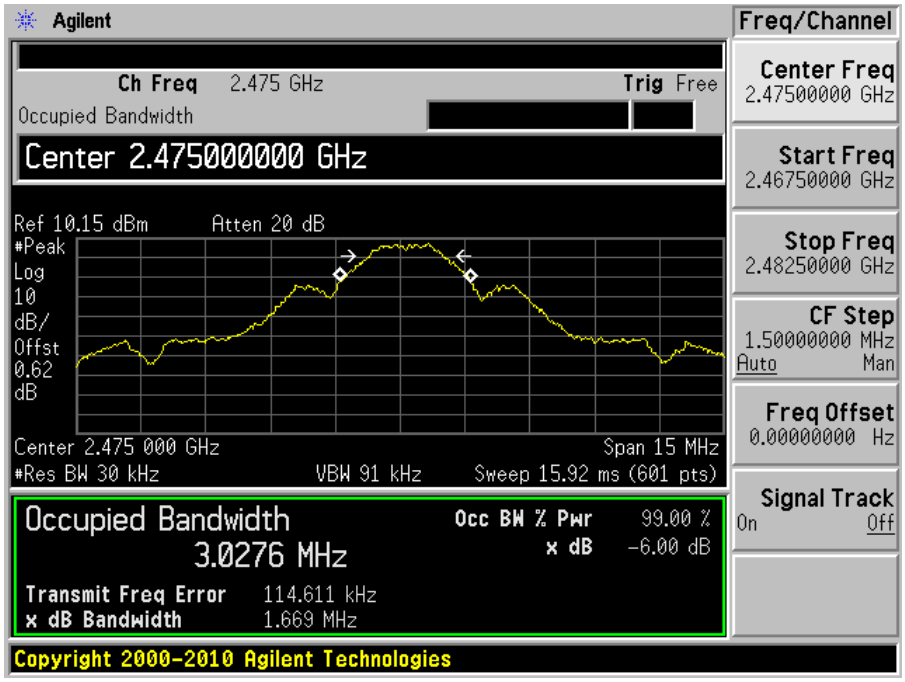
Low Channel: 2405 MHz



Middle Channel: 2440 MHz



High Channel: 2475 MHz



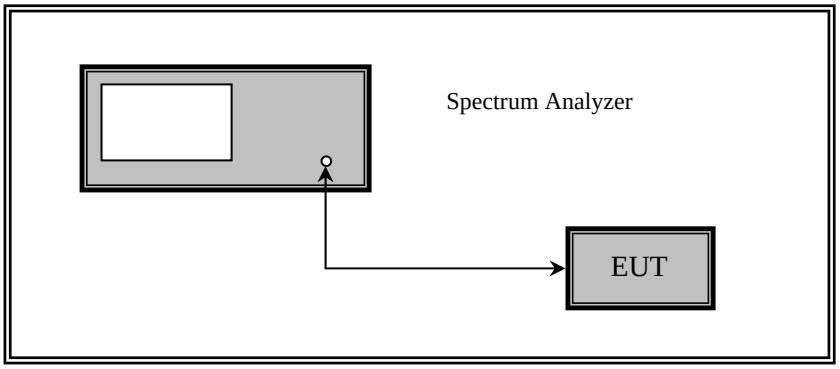
8 FCC §15.247(b) (3) - Peak Output Power

8.1 Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

8.2 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.



8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2010-05-09

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

8.4 Test Environmental Conditions

Temperature:	17~20 °C
Relative Humidity:	30~34 %
ATM Pressure:	101.2-103.2kPa

The testing was performed by Jerry Huang on 2010-12-3 in RF site.

8.5 Test Results

Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC Limit (dBm)	Margin (dB)
Low	2405	10.07	30	-19.93
Middle	2440	10.23	30	-19.77
High	2475	10.04	30	-19.96

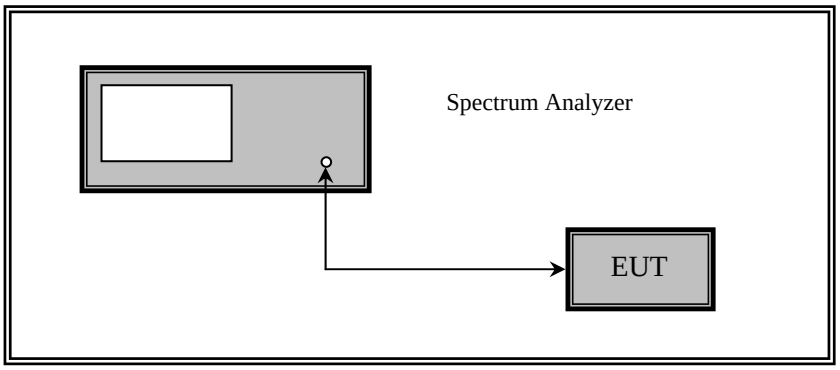
9 FCC §15.247(d) - Spurious Emissions at Antenna Terminals

9.1 Applicable Standard

For FCC §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is 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.

9.2 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 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2010-05-09

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

9.4 Test Environmental Conditions

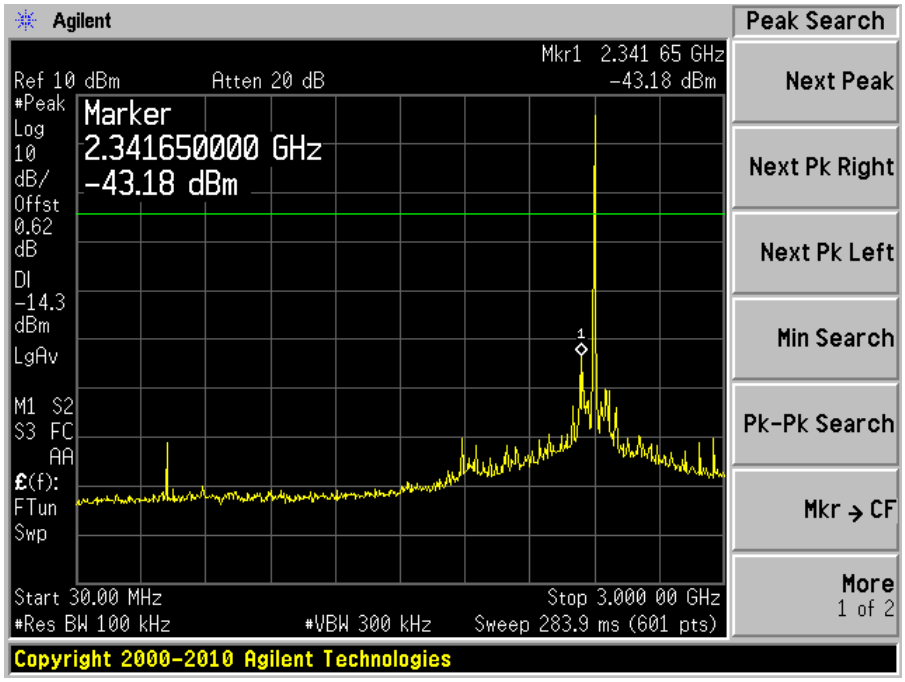
Temperature:	17~20 °C
Relative Humidity:	30~34 %
ATM Pressure:	101.2-103.2kPa

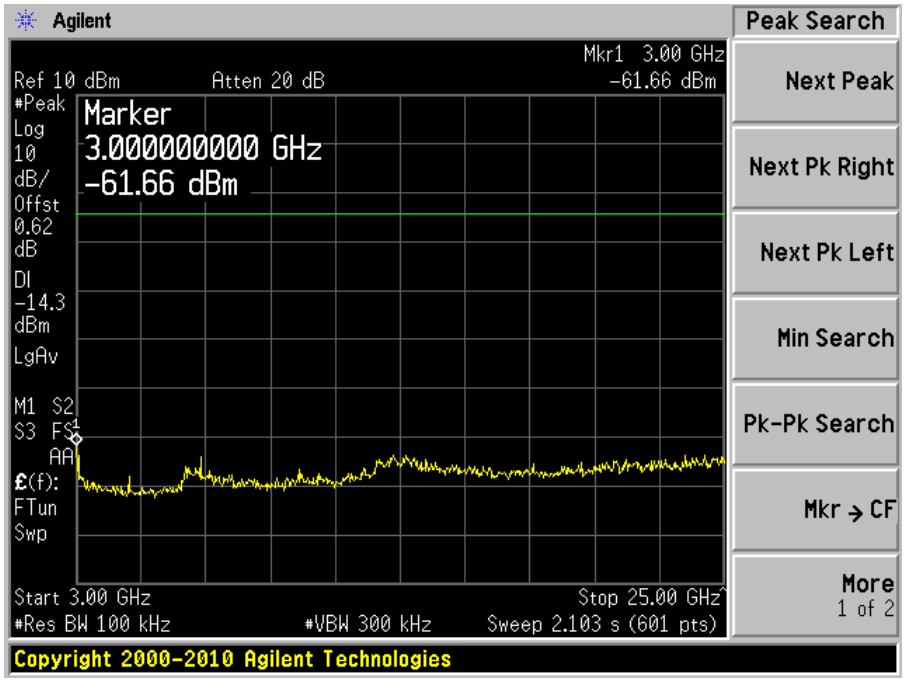
The testing was performed by Jerry Huang on 2010-12-3 in RF site.

9.5 Measurement Result

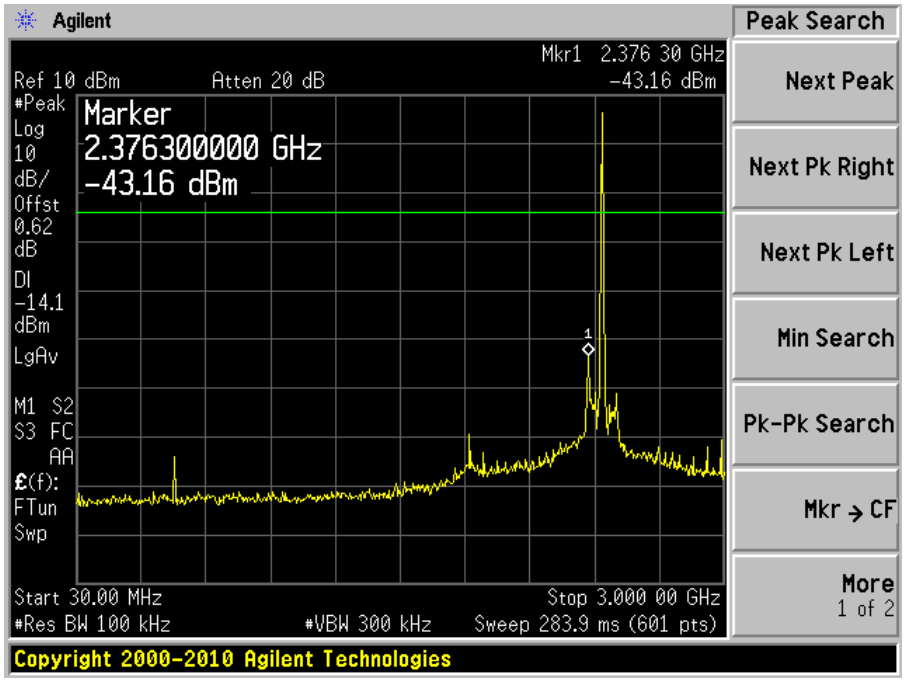
Please refer to following plots of spurious emissions.

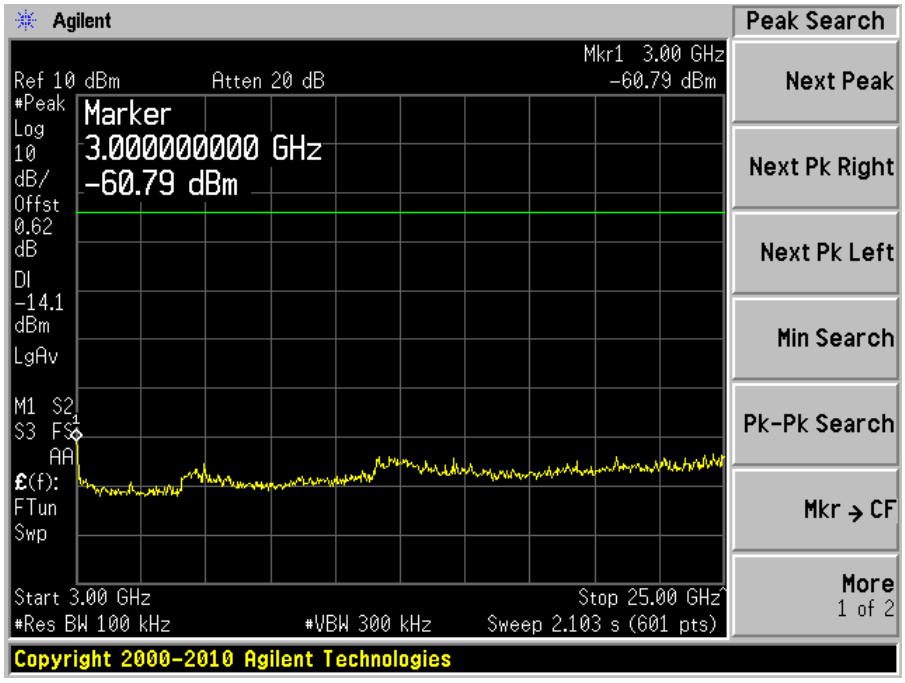
Low Channel: 2405 MHz



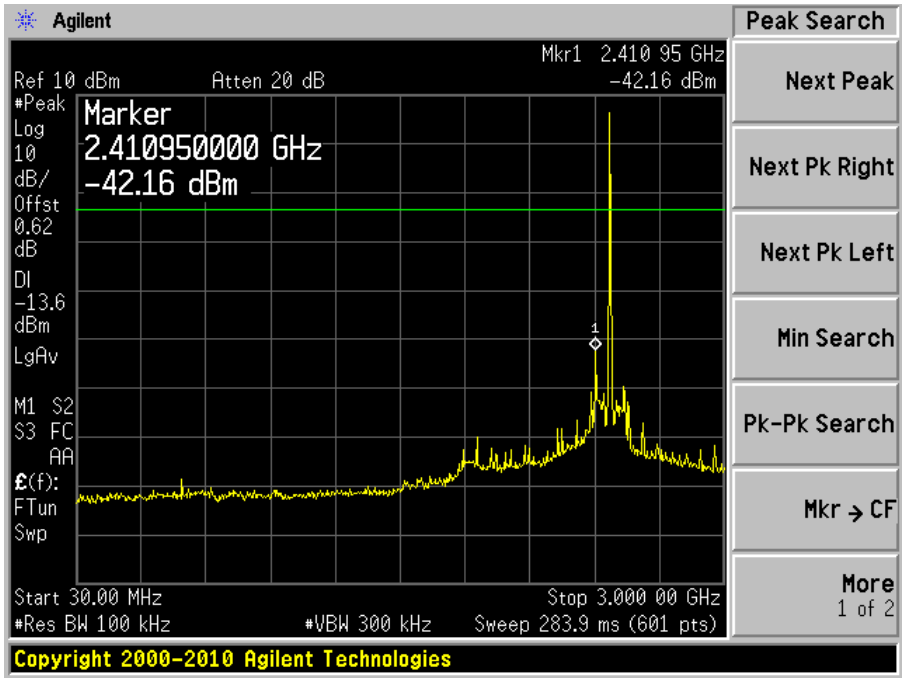


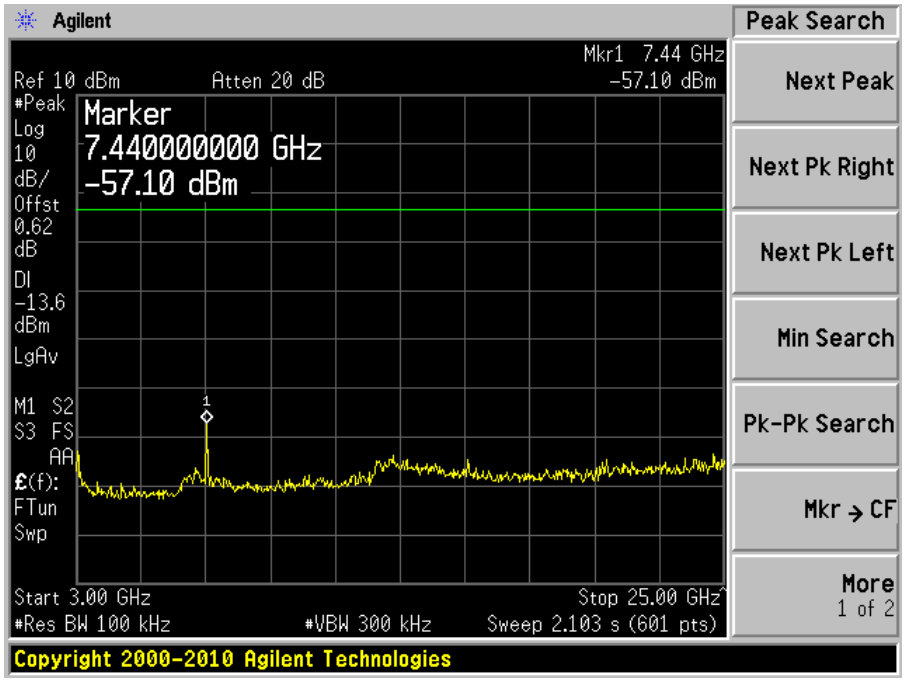
Middle Channel: 2440 MHz





High Channel: 2475 MHz





10 FCC §15.205, §15.209, §15.247(d) §4.9 – Spurious Radiated Emissions

10.1 Applicable Standard

As per FCC §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. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, *e.g.* , see §§15.250, 15.252, 15.255, and 15.509–15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

As per FCC §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 FCC §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:

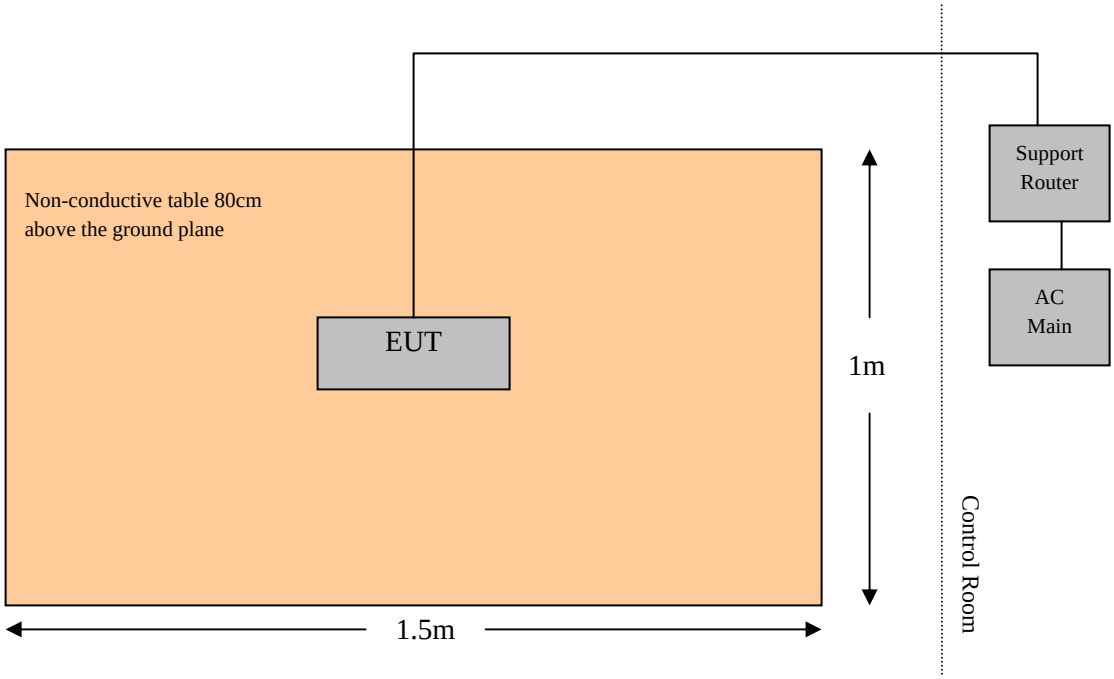
MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 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

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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 §15.205(c).

10.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15C limits.

10.3 Test Setup Block Diagram



10.4 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C 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.

10.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Mini-Circuits	Pre amplifier	ZVA-183-S	570400946	2010-05-10
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2010-05-28
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
EMCO	Antenna, Horn	3115	9511-4627	2010-08-09
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2010-05-09
Agilent	Pre Amplifier	8449B	3008A01978	2010-01-29

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

10.6 Test Procedure

For the radiated emissions test, the EUT host, 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 meter, 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 1000 MHz:

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

Above 1000 MHz:

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

10.7 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10 dB)

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

Margin = Corrected Amplitude - Limit

10.8 Test Environmental Conditions

Temperature:	16~20 °C
Relative Humidity:	31~40 %
ATM Pressure:	101.2-102.4kPa

The testing was performed by Jerry Huang on 2010-12-1 ~ 2010-12-2 in 5 meter chamber 3.

10.9 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247 standard's radiated emissions limits, and had the worst margin of:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-1.5	105.6723	Vertical	30 MHz – 1GHz

Above 1 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-0.62	7215	Vertical	1GHz– 25GHz

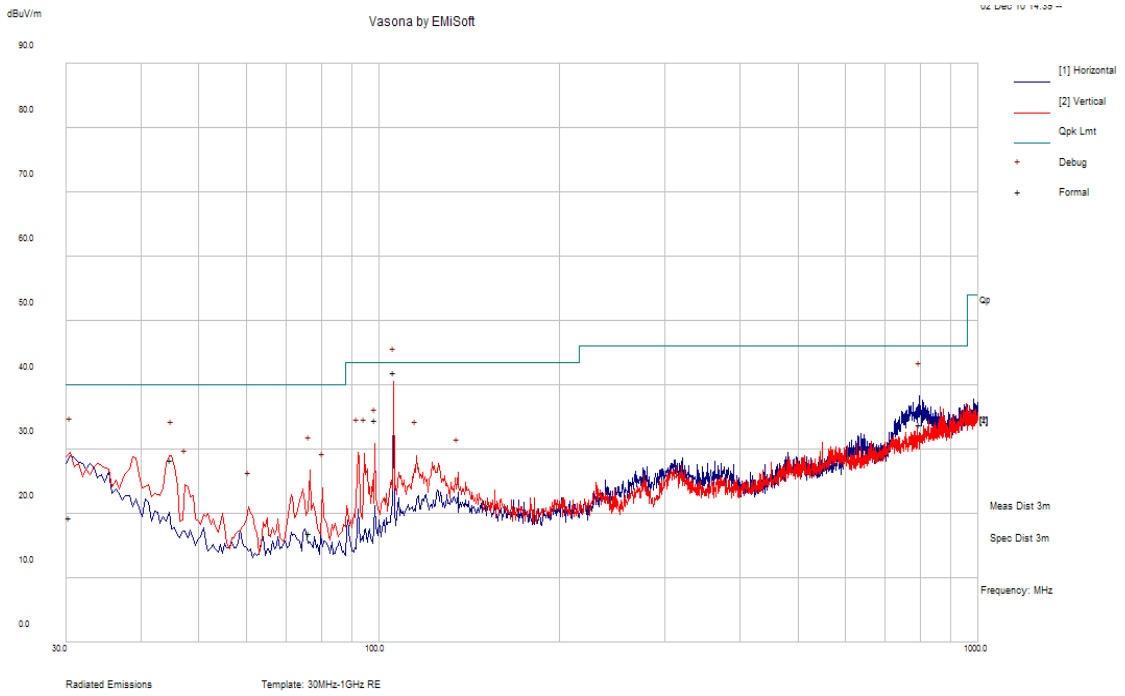
Please refer to the following table and plots for specific test result details

10.10 Radiated Spurious Emissions Test Data and Plots

3 0 MHz – 1 GHz @ 3 Meters

EUT worked on worst channel.

Middle Channel (2440 MHz)



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.67230	42.00	V	137	325	43.5	-1.50
797.34480	33.81	H	92	358	46	-12.19
30.35900	19.42	V	320	289	40	-20.58
44.81125	28.41	V	125	26	40	-11.59
98.47425	34.56	V	112	117	43.5	-8.94
76.42600	16.97	V	98	145	40	-23.03

1 GHz – 25 GHz:

Measured at 3 meters

Low Channel: 2405 MHz

Freq. (MHz)	S.A. Reading (dBuV)	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.247/209		
			Height (cm)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
7215	42.51	169	139	H	37.38	5.33	26.8	58.42	74	-15.58	Peak
7215	47	37	131	V	37.38	5.33	26.8	62.91	74	-11.09	Peak
7215	27.86	169	139	H	37.38	5.33	26.8	43.77	54	-10.23	Ave
7215	37.47	37	131	V	37.38	5.33	26.8	53.38	54	-0.62	Ave

Middle Channel: 2440 MHz

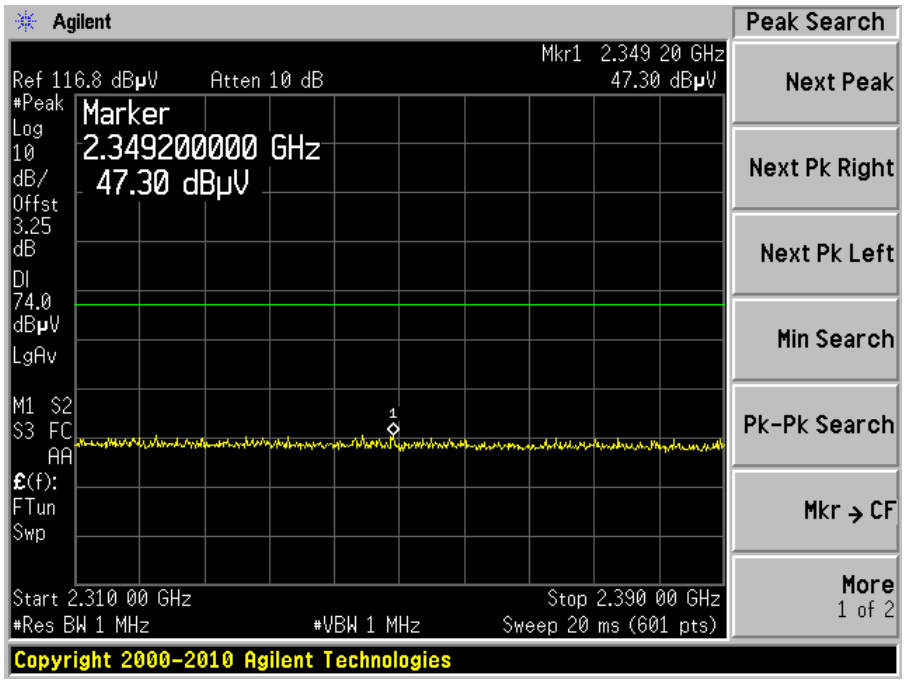
Freq. (MHz)	S.A. Reading (dBuV)	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.247/209		
			Height (cm)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
7320	41.72	218	124	H	37.38	5.33	26.8	57.63	74	-16.37	Peak
7320	46.31	64	149	V	37.38	5.33	26.8	62.22	74	-11.78	Peak
7320	30.1	218	124	H	37.38	5.33	26.8	46.01	54	-7.99	Ave
7320	36.89	64	149	V	37.38	5.33	26.8	52.8	54	-1.2	Ave

High Channel: 2475 MHz

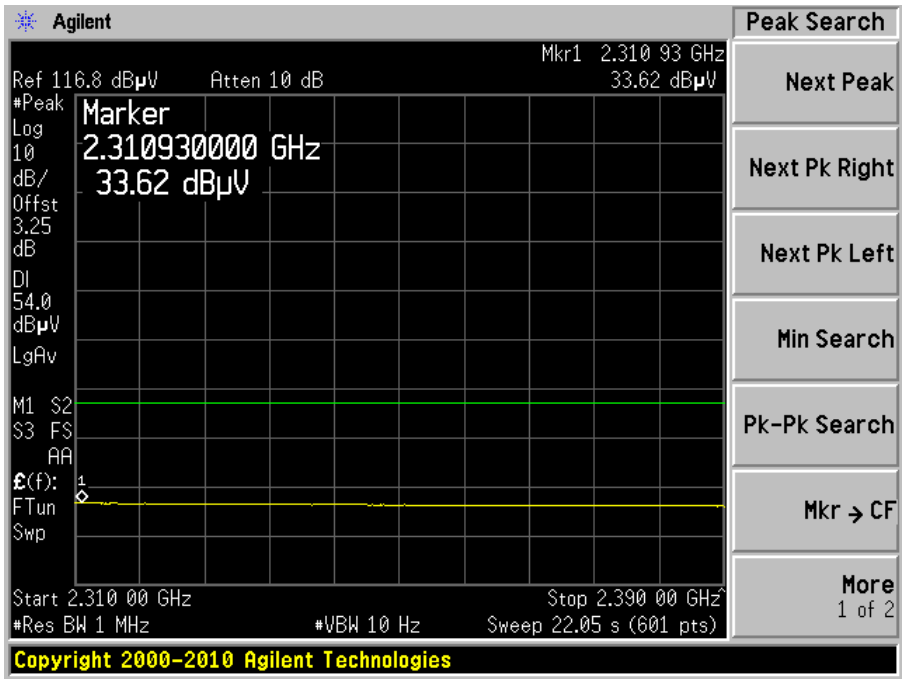
Freq. (MHz)	S.A. Reading (dBuV)	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.247/209		
			Height (cm)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
7425	41.48	174	145	H	36.916	5.36	26.8	56.956	74	-17.044	Peak
7425	44.57	73	154	V	36.916	5.36	26.8	60.046	74	-13.954	Peak
7425	29.36	174	145	H	36.916	5.36	26.8	44.836	54	-9.164	Ave
7425	33.77	73	154	V	36.916	5.36	26.8	49.246	54	-4.754	Ave

Restricted Band Emissions:

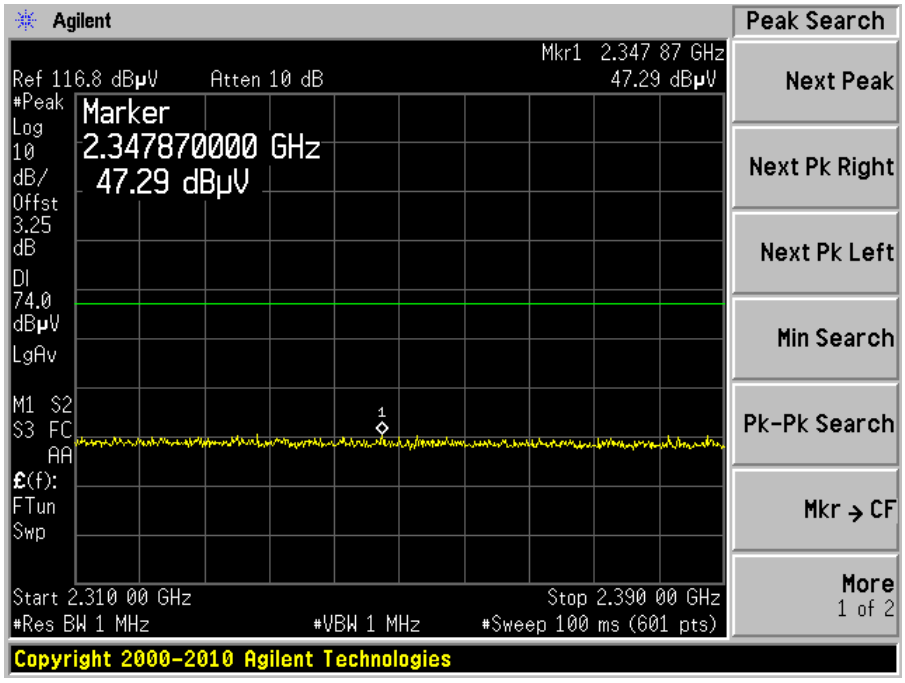
Lowest Channel at Horizontal, Peak



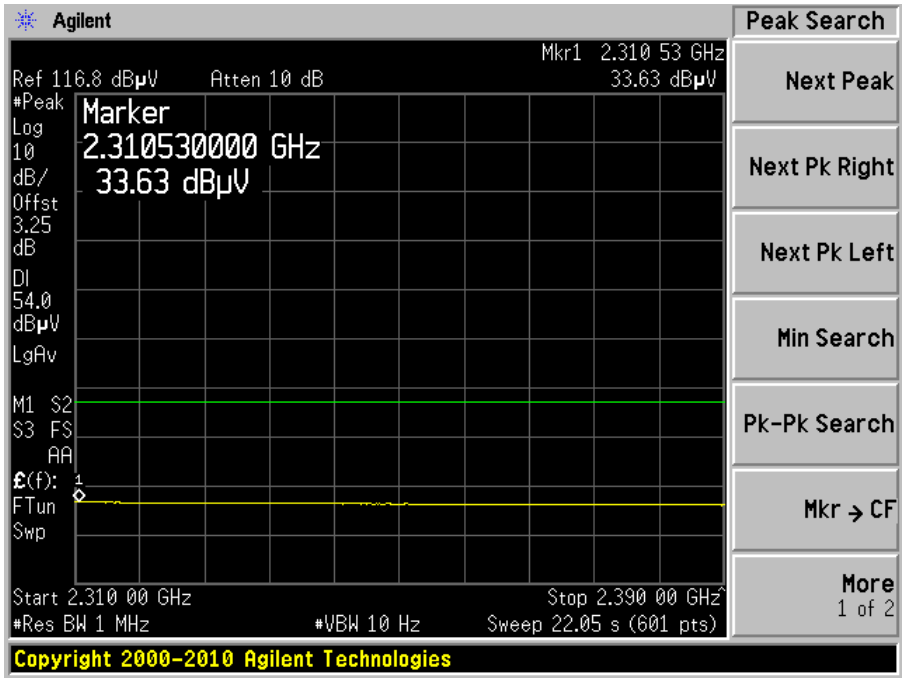
Lowest Channel at Horizontal, Average



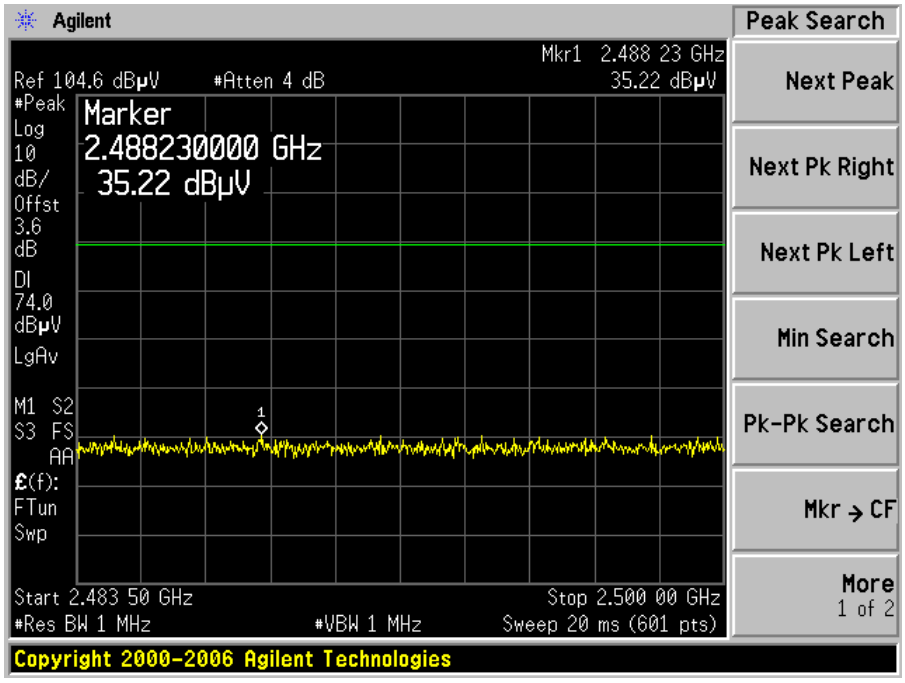
Lowest Channel at Vertical, Peak



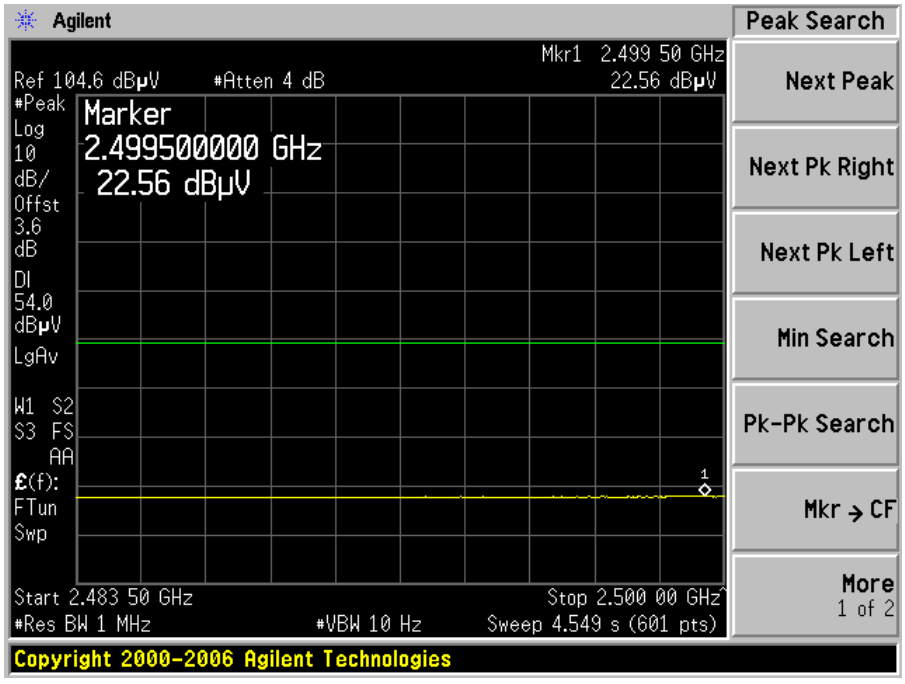
Lowest Channel at Vertical, Average



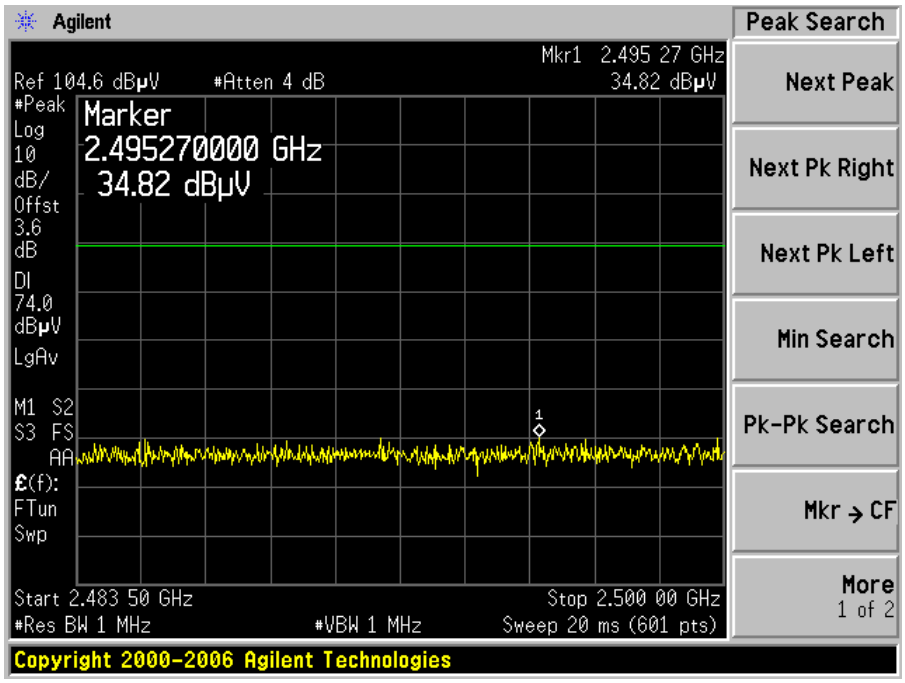
Highest Channel at Horizontal, Peak



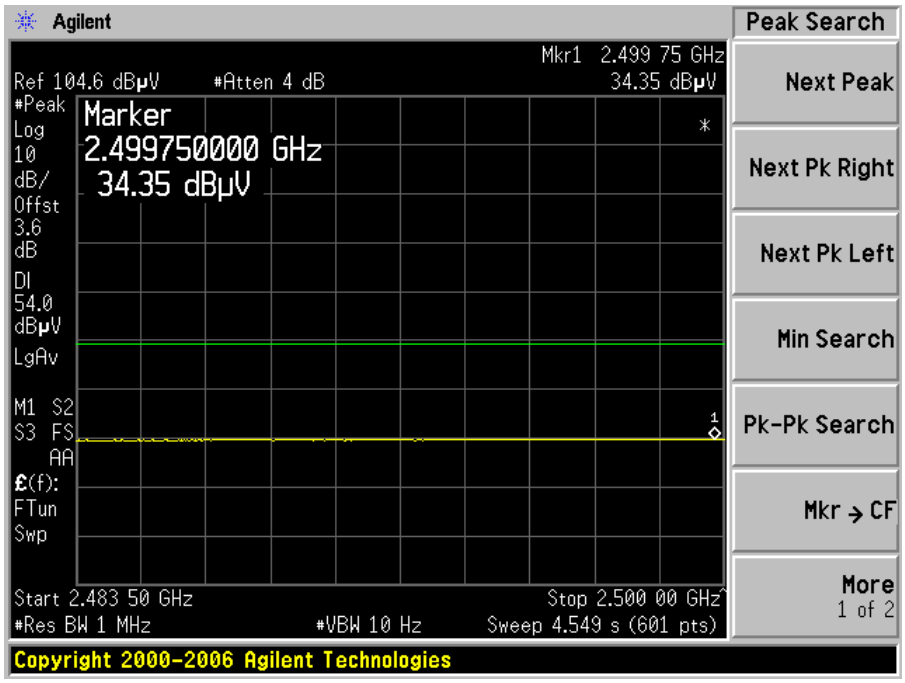
Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak



Highest Channel at Vertical, Average



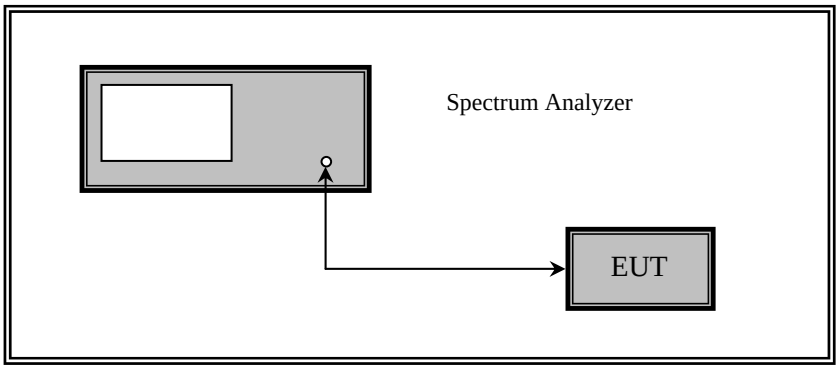
11 FCC §15.247(d) - 100 kHz Bandwidth Out-of-Band Emissions

11.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

11.2 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 its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2010-05-09

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

11.4 Test Environmental Conditions

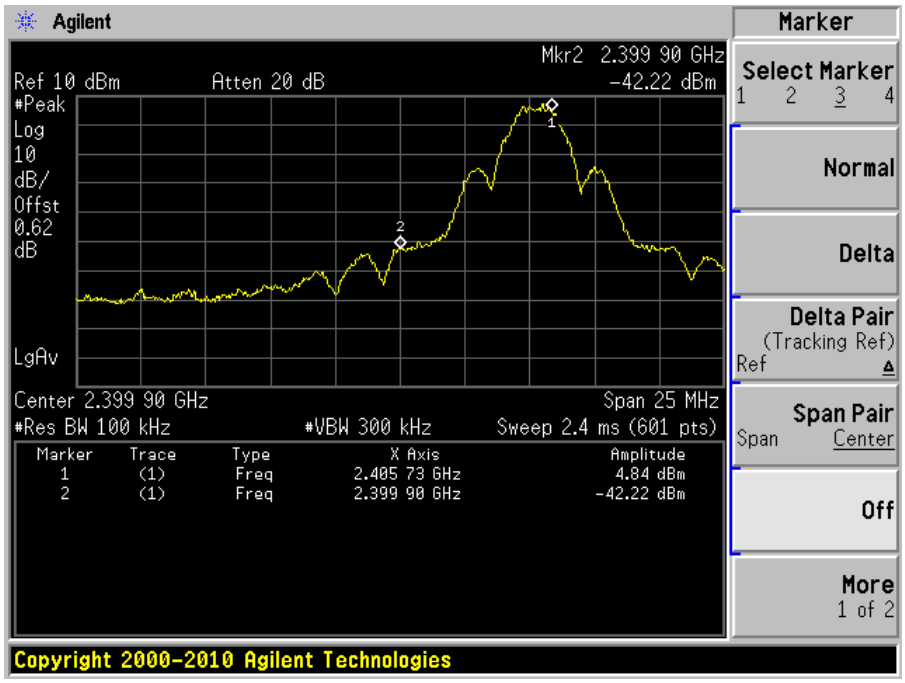
Temperature:	17~20 °C
Relative Humidity:	30~34 %
ATM Pressure:	101.2-103.2kPa

The testing was performed by Jerry Huang on 2010-12-3 in RF site.

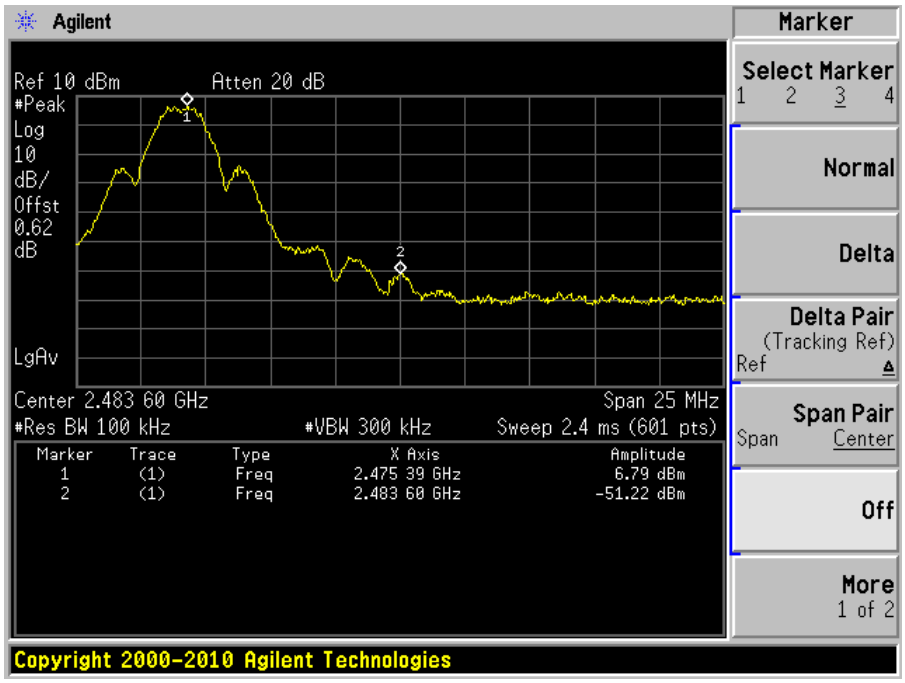
11.5 Measurement Results

Please refer to following pages for plots of band edge.

Low Band Edge



High Band Edge



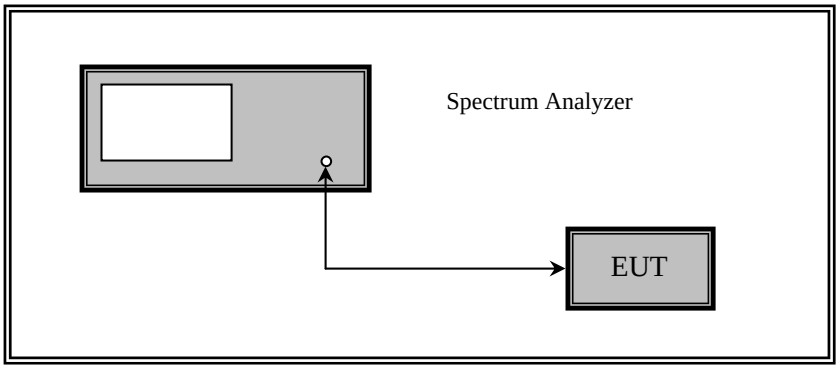
12 FCC §15.247(e) - Power Spectral Density

12.1 Applicable Standard

According to FCC §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.

12.2 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 was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.



12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2010-05-09

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

12.4 Test Environmental Conditions

Temperature:	17~20 °C
Relative Humidity:	30~34 %
ATM Pressure:	101.2-103.2kPa

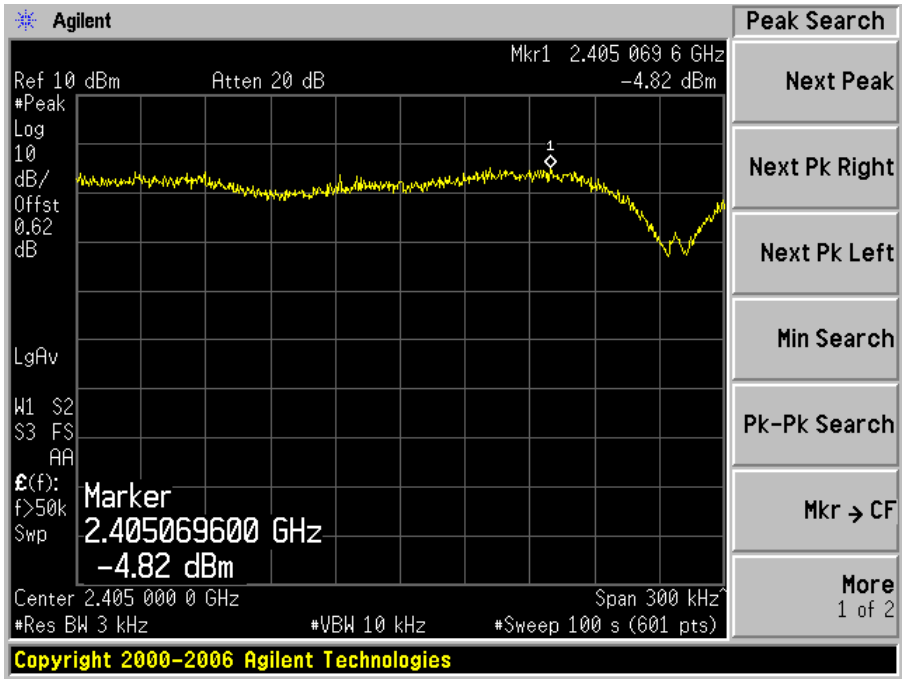
The testing was performed by Jerry Huang on 2010-12-3 in RF site.

12.5 Summary of Test Results

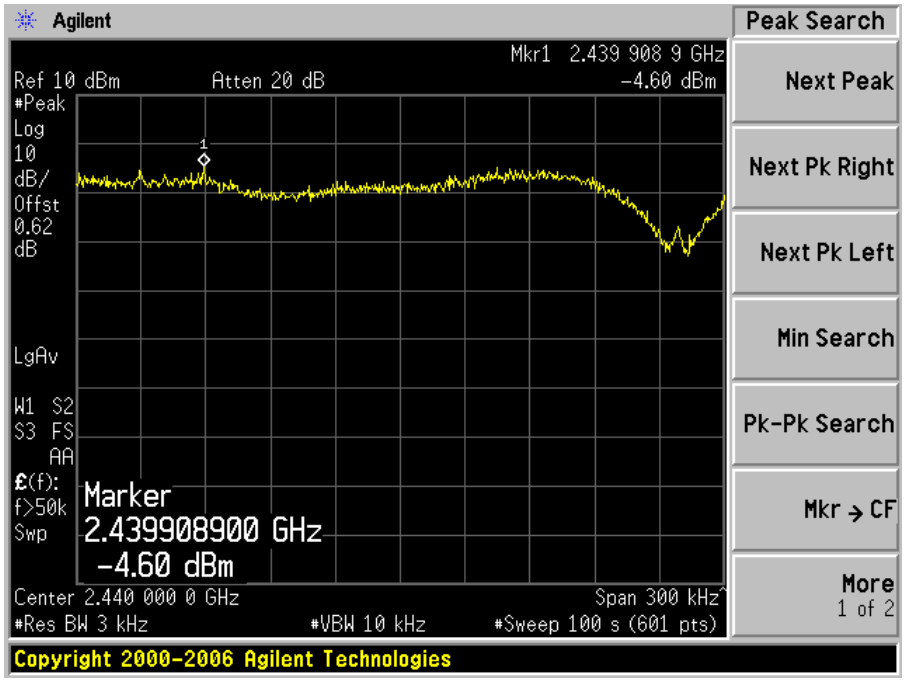
Channel	Frequency (MHz)	Power Spectral Density (dBm)	FCC Limit (dBm)	Result
Low	2405	-4.82	8	Compliant
Mid	2440	-4.60	8	Compliant
High	2475	-4.69	8	Compliant

Please refer to the following plots for detailed test results:

Low Channel: 2405 MHz



Middle Channel: 2440 MHz



High Channel: 2475 MHz