FCC PART 15.247

INDUSTRY CANADA RSS-210, ISSUE 7, JUNE 2007

MEASUREMENT AND TEST REPORT

For

Movea, Inc.

680 N. McCarthy Blvd. Suite 120
Milpitas, CA 95035, USA

FCC ID: JJ4-MT2
IC ID: 5689A-MT2
Model: AS03506-001

Report Type:	**Product Type:**
Original Report	USB Dongle Receiver

Test Engineer(s):	James Ma
Report Number:	R0807228
Report Date:	2008-09-02
Reviewed By:	Boni Baniqued Sr. RF Engineer
Prepared By: **(84)**	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave. Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision #	Report Number	Description of Revision	Date of Revision
0	R0807228	Original Report	2008-09-02

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This measurement and test report has been compiled on behalf of the company *Movea, Inc*. and their product model: *AS03506-001, FCC ID: JJ4-MT2, IC: 5689A-MT2* which will be henceforth in this report referred to as the EUT (Equipment under Test). The EUT is a USB transceiver for the mouse. The mouse works on the desk and also in the air to control the computers cursor functions and some special functions. Normal operating conditions: to be used with the air mouse and it is connected to laptop or desk PC. No special software is needed.

** All test data gathered is from a production sample, serial number: B1942, assigned by BACL.*

1.2 Mechanical Description of EUT

The EUT is a USB transceiver that measures approximately 50 mm (L) x 18 mm (W) x 6 mm (H) and weighs approximately 10 g. It is typically powered by plug in to USB of the computer.

** All test data gathered is from a production sample, serial number: B1942, assigned by BACL.*

1.3 EUT Photograph

Please refer to Exhibit C for more EUT photographs.

1.4 Objective

This type approval report is prepared on behalf of Movea Inc. in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules and RSS-210, Issue 7 of the Canadian Department of Industry rules.

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

1.5 Related Submittal(s)/Grant(s)

N/A

1.6 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.

1.7 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.

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.

1.8 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 site at BACL Corp. 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 have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11, 1997 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003 & TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-2463 and C-2698. 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 Corp. 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.

2 SYSTEM TEST CONFIGURATION

2.1 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.

2.2 EUT Exercise Software

The EUT is programmed with the worst-case settings that were used during testing.

2.3 Special Accessories

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

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment List and Details

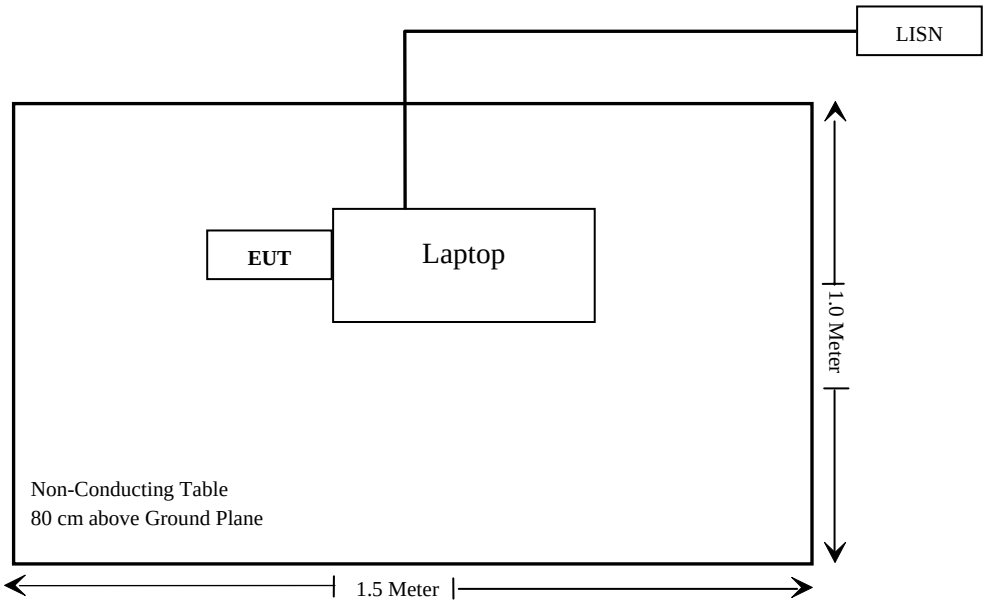
Manufacturer	Description	Model	Serial Number
Toshiba	Laptop	Satellite R15-S829	Y5040228H

2.6 Interface Ports and Cabling

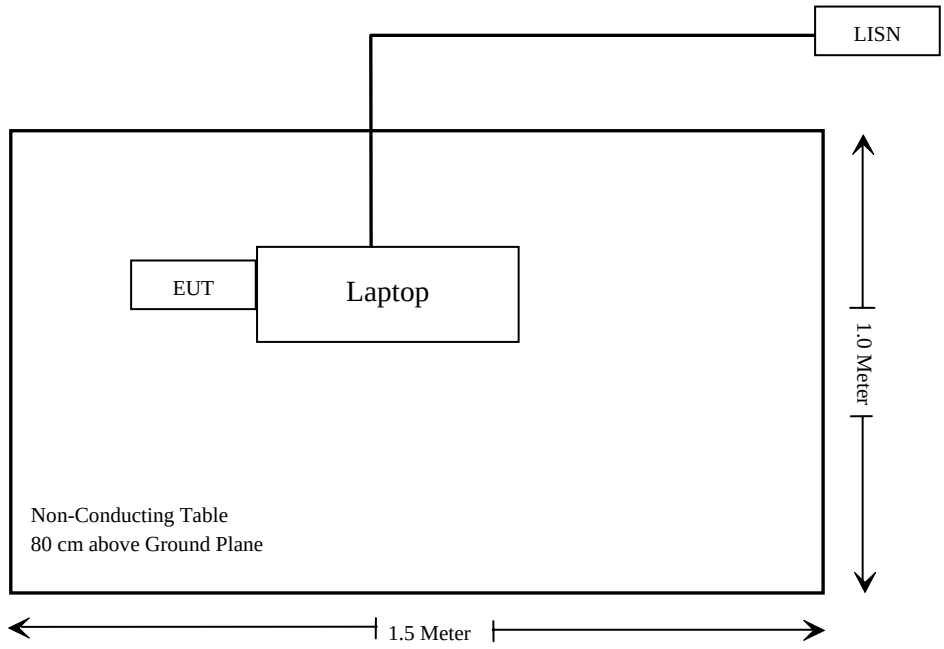
Cable Description	Length (m)	From	To
/	/	/	/
/	/	/	/

2.7 Test Setup Block Diagrams

Conducted Emission



Radiated Emissions



3 SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC Part15C & RSS-210 /RSS-Gen Rules	Description of Tests	Results
FCC §15.247 (i) and §2.1091, IC RSS-Gen 5.5 & RSS-102	RF Exposure	Compliant
FCC §15.203, IC RSS-Gen §7.1.4	Antenna Requirement	Compliant
FCC §15.207, IC RSS-Gen §7.2.2	Conducted Emissions	Compliant
IC RSS-Gen § 4.10	Receiver Spurious Emissions	Compliant
FCC §15.247(d), IC RSS-210 § A8.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205, §15.209, IC RSS-Gen §4.9	Radiated Spurious Emissions	Compliant
FCC §15.205, IC RSS-210 §2.2	Restricted Band	Compliant
FCC §15.247 (a)(2), IC RSS-210 §A8.2 (a)	6 dB Bandwidth & 99% Bandwidth	Compliant
FCC §15.247 (b)(3), IC RSS-210 § A8.4	Maximum Peak Output Power	Compliant
FCC § 15.247 (d), IC RSS-210 § A8.5	100 KHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247 (e), IC RSS-210 §A8.2 (b)	Power Spectral Density	Compliant

4 FCC §15.247 (i) and §2.1091, IC RSS-Gen 5.5 & RSS-102 - RF EXPOSURE

4.1 Applicable Standard

According to §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.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

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)**
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

Prediction of MPE limit at a given distance

Equation from page 18 of 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

Maximum peak output power at antenna input terminal (dBm):	-4.01
Maximum peak output power at antenna input terminal (mW):	0.40
Prediction distance (cm):	20
Prediction frequency (MHz):	2403
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1.0
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0000796
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

According to RSS-102 Issue 2, November 2005 §2.5.2 exception from Routine Evaluation Limits- RF Exposure Evaluation:

RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm, except when the device operates:

1) below 1.5 GHz and its e.i.r.p. is equal to or less than 2.5 W;
2) at or above 1.5 GHz and the e.i.r.p. of the device is equal to or less than 5 W.

RF limits for device used by the general public is provided hereinafter table:

Frequency Range (MHZ)	Electric Field (V/M rms)	Magnetic Field (A/m rms)	Power Density (W/m2)	Time Averaging (min)
0.003 – 1	280	2.19	-	6
1 – 10	280 / f	2.19 / f	-	6
10 – 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 - 1500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f / 150	6
1500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000 – 300 000	$f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: f is the frequency in MHz
* Power density limit applicable at frequency greater than 100 MHz.

4.3 Test Result

FCC: The power density level at 20 cm distance is 0.0000796 mW/cm², which is below the uncontrolled exposure limit of 1.0mW/cm² at 2403 MHz.

IC: The power density level at 20 cm distance is 0.000796 W/m², which is below the uncontrolled exposure limit of 10W/m² at 2403 MHz.

5 FCC §15.203, IC RSS-Gen §7.1.4 – ANTENNA REQUIREMENT

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.

As per IC RSS-Gen §7.1.4: Transmitter Antenna, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

5.2 Result

The antenna for this device is an internal antenna which antenna gain of 0 dBi.

☒ **Compliant** ☐ **N/A**

6 FCC §15.207, IC RSS-Gen §7.2.2 - CONDUCTED EMISSIONS

6.1 Applicable standards

As per FCC §15.207 & RSS-Gen 7.2.2 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 *	56 to 46 *
0.5-5	56	46
5-30	60	50

** 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 15.207 limits.

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

The EUT was powered via connection to laptop which adapter was plugged into the LISN.

6.3 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950 K03	100337	2008-04-24
Solar Electronics Co.	LISN	9252-50-R-24N	511213	2007-07-30

*** 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 system was connected to the main outlet of the LISN-1.

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 Environmental Conditions

Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

**The testing was performed by James Ma on 2008-07-24.*

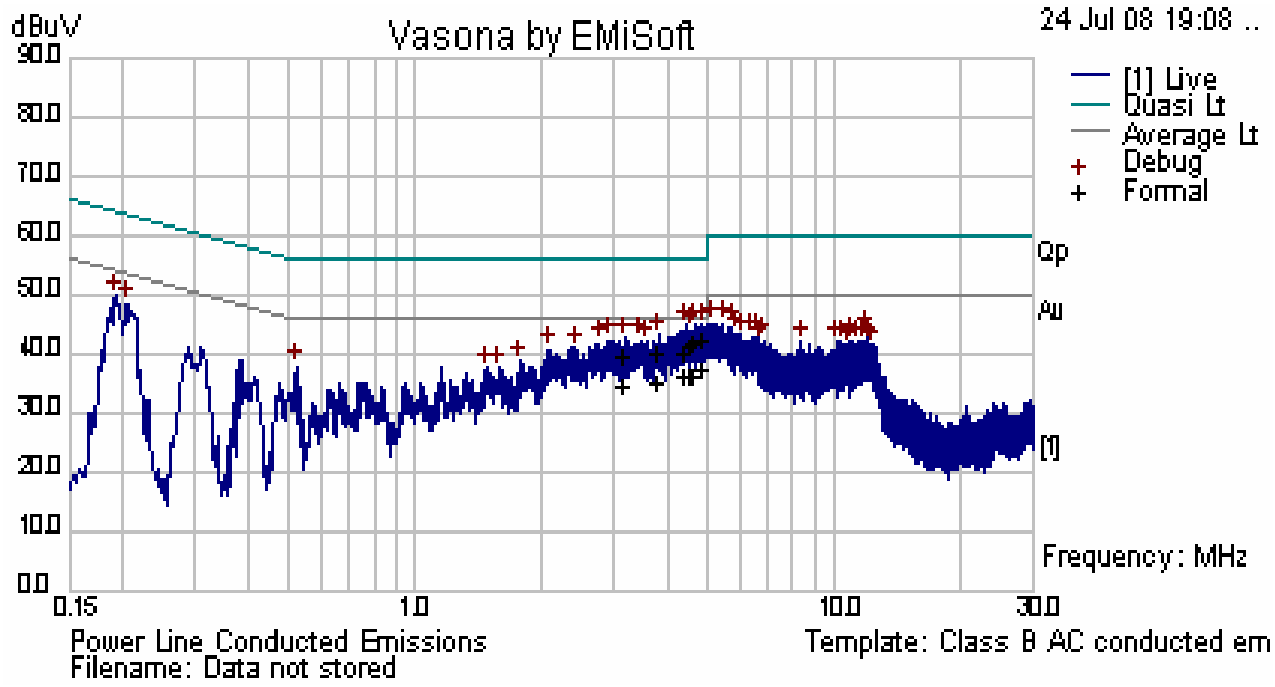
6.6 Summary of Test Results

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

Connection: 120 V/60 Hz AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range**
-9.42	4.00	Neutral	0.150 to 30 MHz

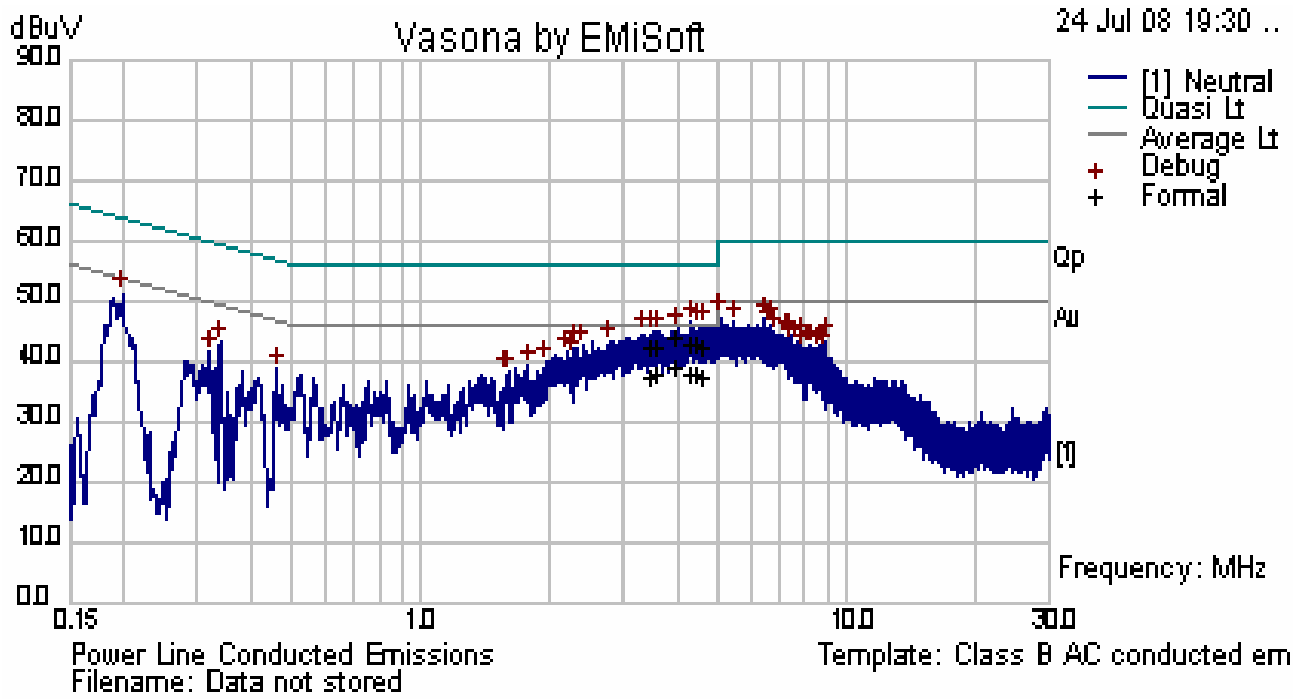
Conducted Emissions Test Plots and Data

120 Vac, 60 Hz - Line



Frequency (MHz)	Raw Data (dBuV)	Cable Loss (dB)	Corrected Reading (dBuV)	Measurement Type (AV/QP)	Line (Line/Neutral)	Limit (dBuV)	Margin (dB)
4.86	22.26	12.30	34.56	AV	Line	46	-11.44
4.67	21.67	12.30	33.97	AV	Line	46	-12.03
4.57	21.61	12.30	33.91	AV	Line	46	-12.09
4.45	21.18	12.30	33.48	AV	Line	46	-12.52
3.81	20.49	12.30	32.79	AV	Line	46	-13.21
3.18	19.91	12.30	32.21	AV	Line	46	-13.79
4.86	27.67	12.30	39.97	QP	Line	56	-16.03
4.67	26.72	12.30	39.02	QP	Line	56	-16.98
4.57	26.33	12.30	38.63	QP	Line	56	-17.37
4.45	25.57	12.30	37.87	QP	Line	56	-18.13
3.81	25.38	12.30	37.68	QP	Line	56	-18.32
3.18	24.74	12.30	37.04	QP	Line	56	-18.96

120 Vac, 60 Hz – Neutral



Frequency (MHz)	Raw Data (dBuV)	Cable Loss (dB)	Corrected Reading (dBuV)	Measurement Type (AV/QP)	Line (Line/Neutral)	Limit (dBuV)	Margin (dB)
4.00	24.28	12.30	36.58	AV	Neutral	46	-9.42
3.64	23.22	12.30	35.52	AV	Neutral	46	-10.48
4.54	23.07	12.30	35.37	AV	Neutral	46	-10.63
4.33	22.83	12.30	35.13	AV	Neutral	46	-10.87
3.53	22.75	12.30	35.05	AV	Neutral	46	-10.95
4.66	22.68	12.30	34.98	AV	Neutral	46	-11.02
4.00	29.13	12.30	41.43	QP	Neutral	56	-14.57
4.54	27.92	12.30	40.22	QP	Neutral	56	-15.78
4.33	27.89	12.30	40.19	QP	Neutral	56	-15.81
3.64	27.48	12.30	39.78	QP	Neutral	56	-16.22
4.66	27.41	12.30	39.71	QP	Neutral	56	-16.29
3.53	27.39	12.30	39.69	QP	Neutral	56	-16.31

7 RSS-Gen § 4.10 RECEIVER SPURIOUS RADIATED EMISSIONS

7.1 Test Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2003.

7.2 Equipment Lists and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
HP	Amplifier, Pre (.1~1300MHz)	8447D	2944A10198	2007-12-19
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950 K03	100337	2008-04-24
Sunol Sciences	30MHz~2GHz Antenna	JB1	A103105-3	2008-04-01

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

7.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	58 %
ATM Pressure:	101.5kPa

**The testing was performed by James Ma on 2008-07-25.*

7.4 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

7.5 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:

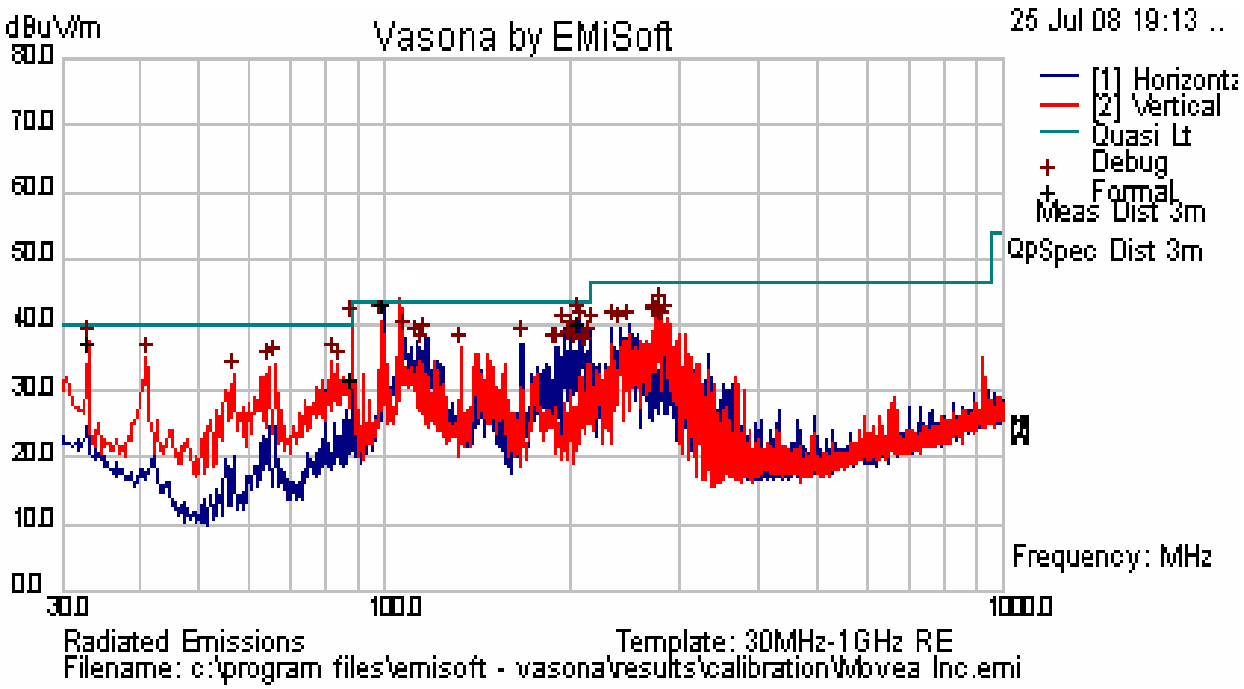
Margin = Corrected Amplitude - Limit

7.6 Summary of Test Results

According to the test data,, the EUT complied with the with the RSS-210/Gen, with the closest margins from the limit listed below:

-2.83dB at **99.67 MHz** in the **Horizontal** polarization

7.7 Test Data and Plots



Frequency (MHz)	Meter Reading (dBuV)	Detector (QP/AV)	Azimuth (Degree)	Ant. Height (cm)	Ant. Polar. (H/V)	Factor (dB)	Cable Loss (dB)	Corrected Amplitude (dBµV/m)	RSS-210/RSS-Gen	
									Limit (dBuV/m)	Margin (dB)
99.67	49.87	QP	150	174	H	-19.77	10.57	40.67	43.50	-2.83
33.17	34.63	QP	147	98	V	-10.39	10.43	34.67	40.00	-5.33
205.53	44.12	QP	30	146	H	-17.27	10.84	37.68	43.50	-5.82
105.68	42.70	QP	181	189	V	-18.11	10.58	35.17	43.50	-8.33
98.49	43.50	QP	305	163	V	-20.09	10.57	33.98	43.50	-9.52
88.48	40.63	QP	124	145	V	-21.78	10.55	29.39	43.50	-14.11

8 FCC §15.247(d), RSS-210 § A8.5 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Applicable Standard

For FCC §15.247(d) and RSS-210 § A8.5 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.

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

8.2 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 10^{th} harmonic.

8.3 Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum analyzer	E4440A	US45303156	2008-05-31

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

8.4 Environmental Conditions

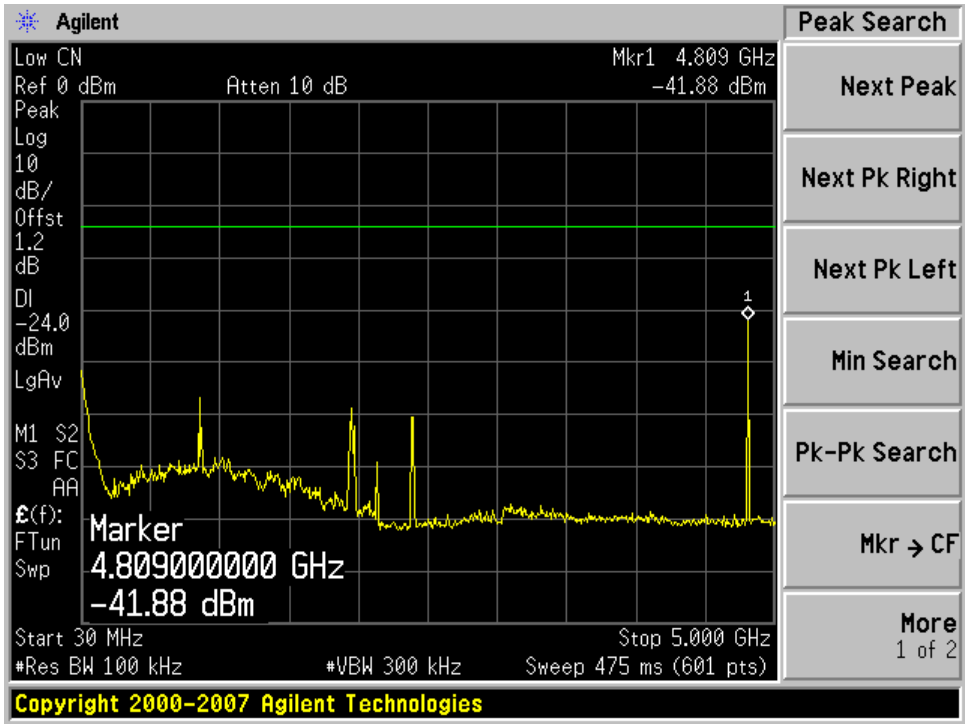
Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

**The testing was performed by James Ma on 2008-07-28.*

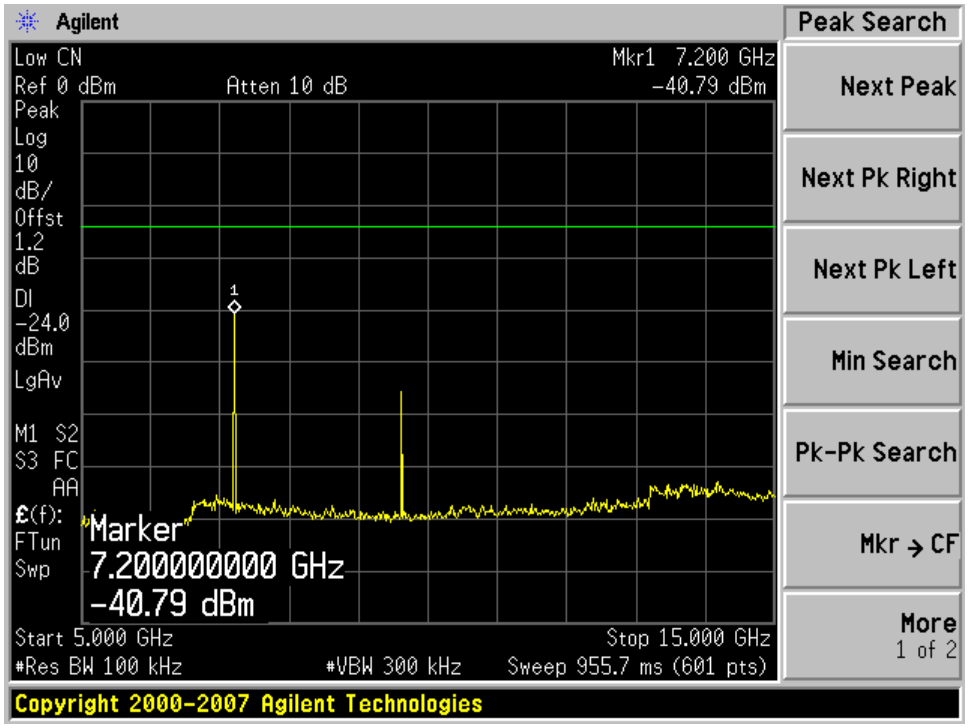
8.5 Measurement Result:

Please refer to following pages for plots of spurious emissions.

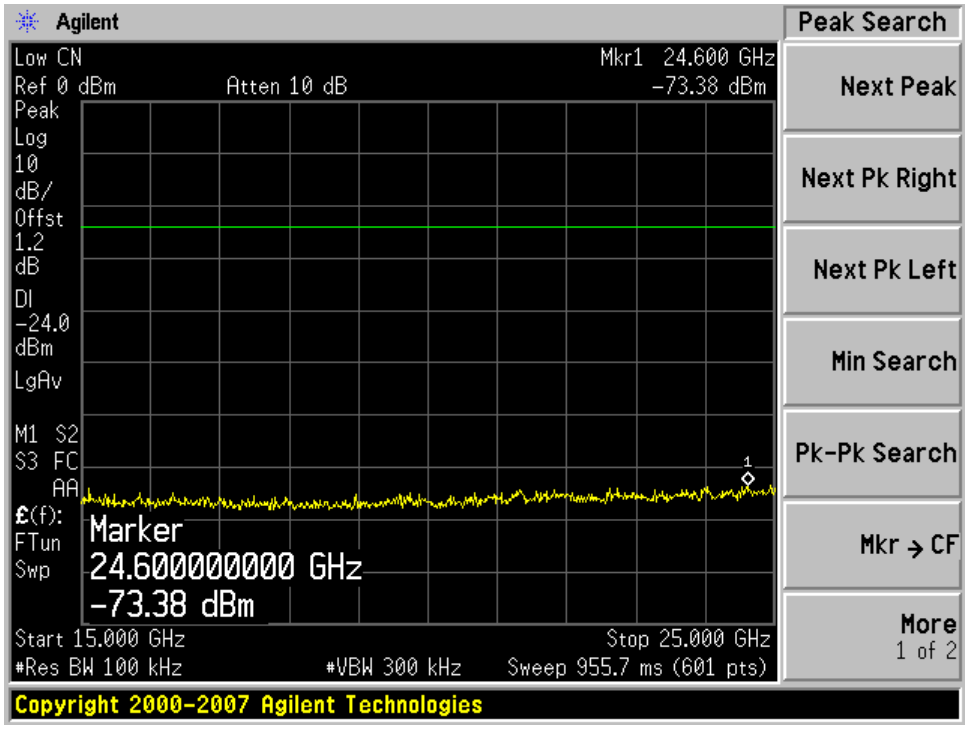
Low Channel



Plot 1: 30 MHz to 5.0 GHz

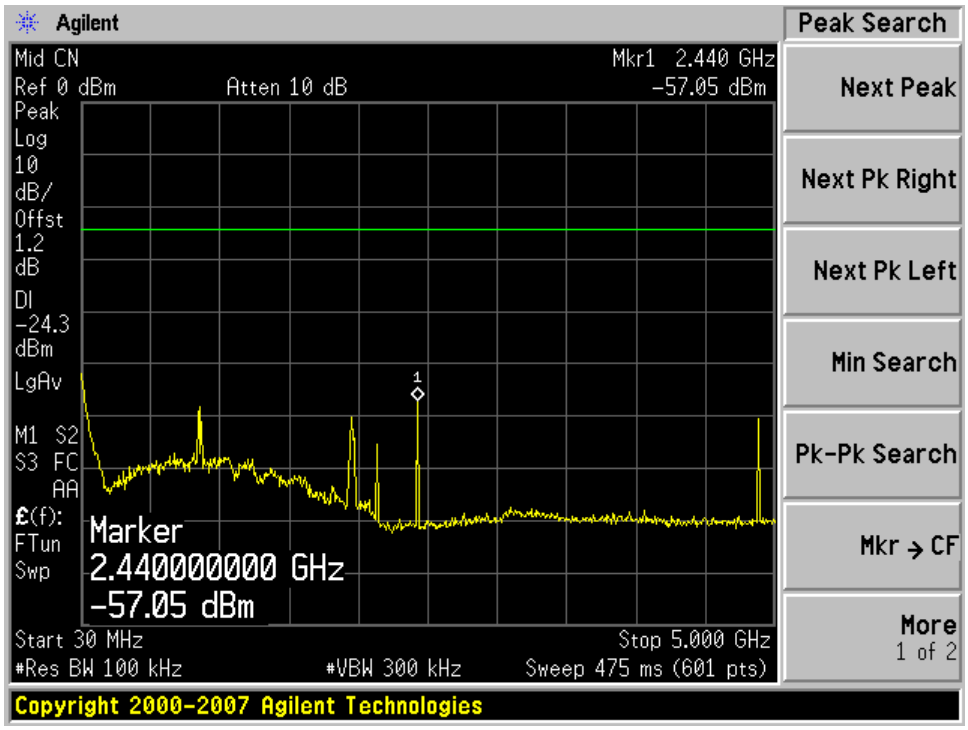


Plot 2: 5.0 GHz to 15.0 GHz

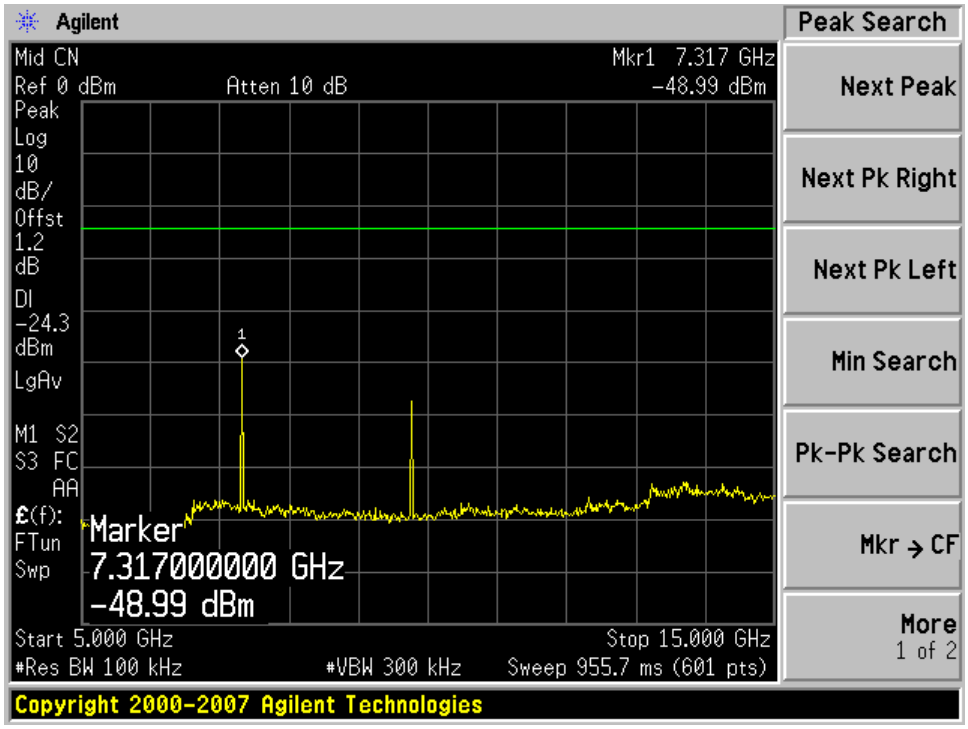


Plot 3: 15.0 GHz to 25.0 GHz

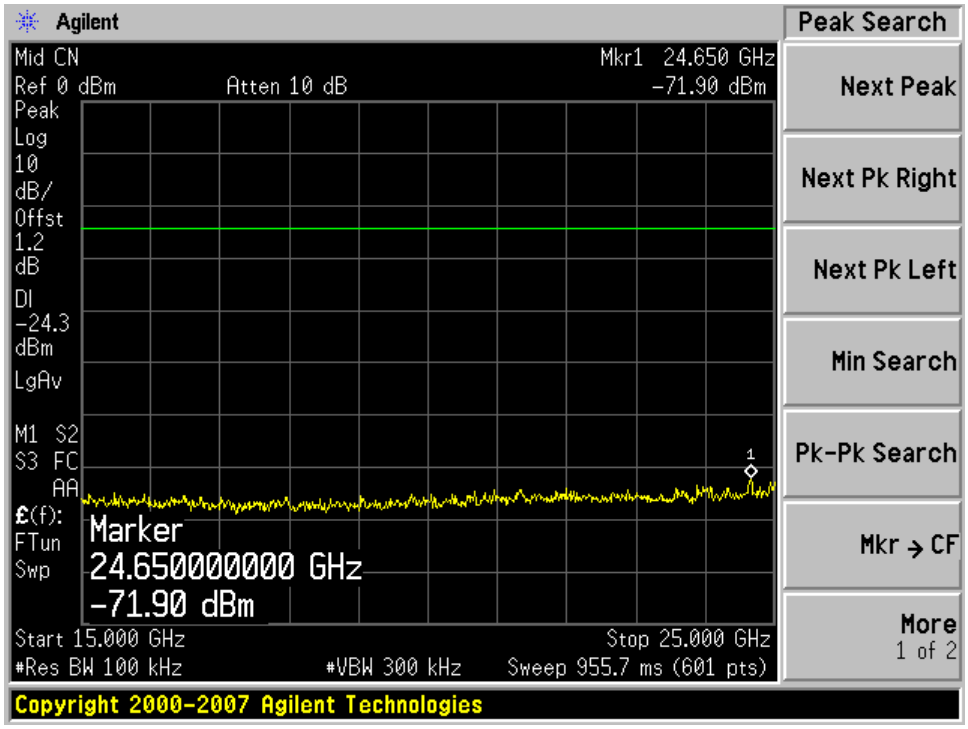
Middle Channel



Plot 1: 30 MHz to 5.0 GHz

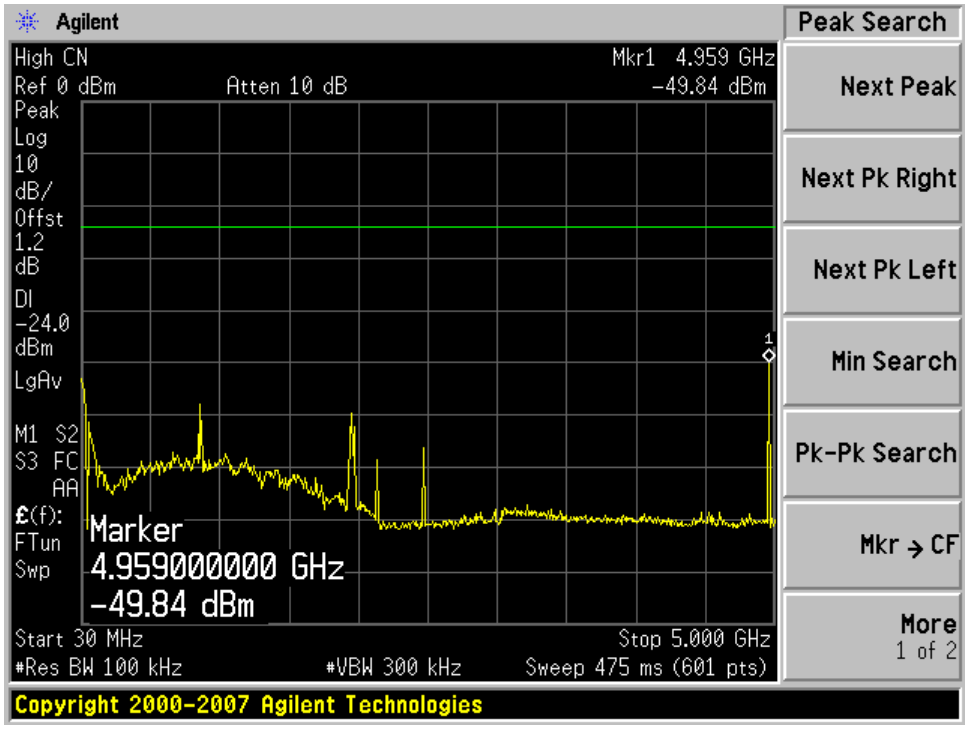


Plot 2: 5.0 GHz to 15.0 GHz

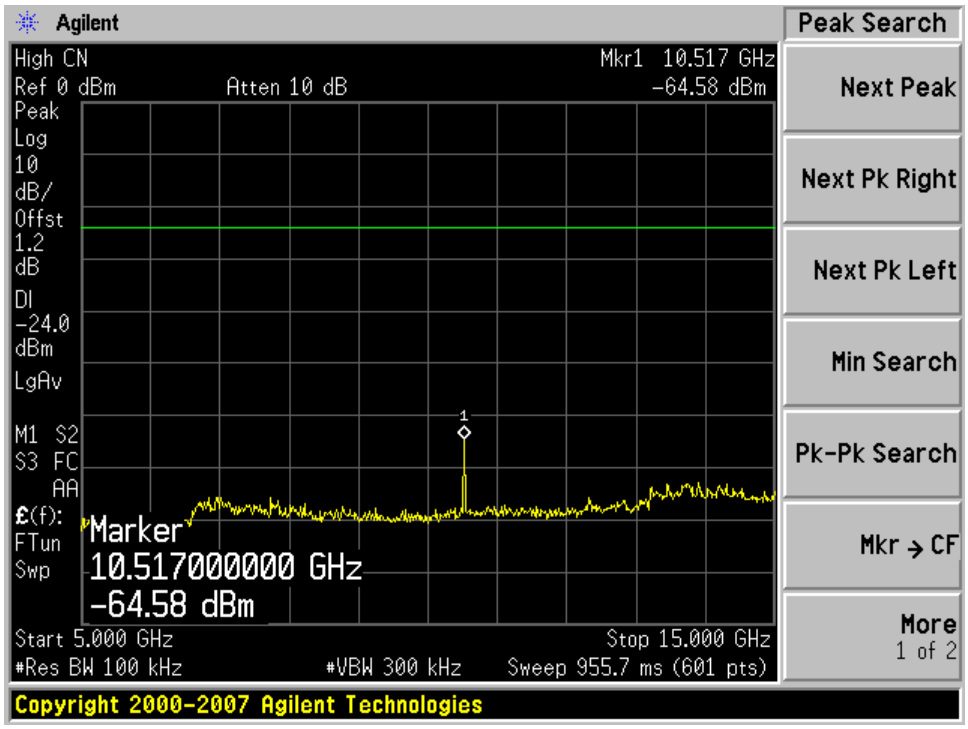


Plot 3: 15.0 GHz to 25.0 GHz

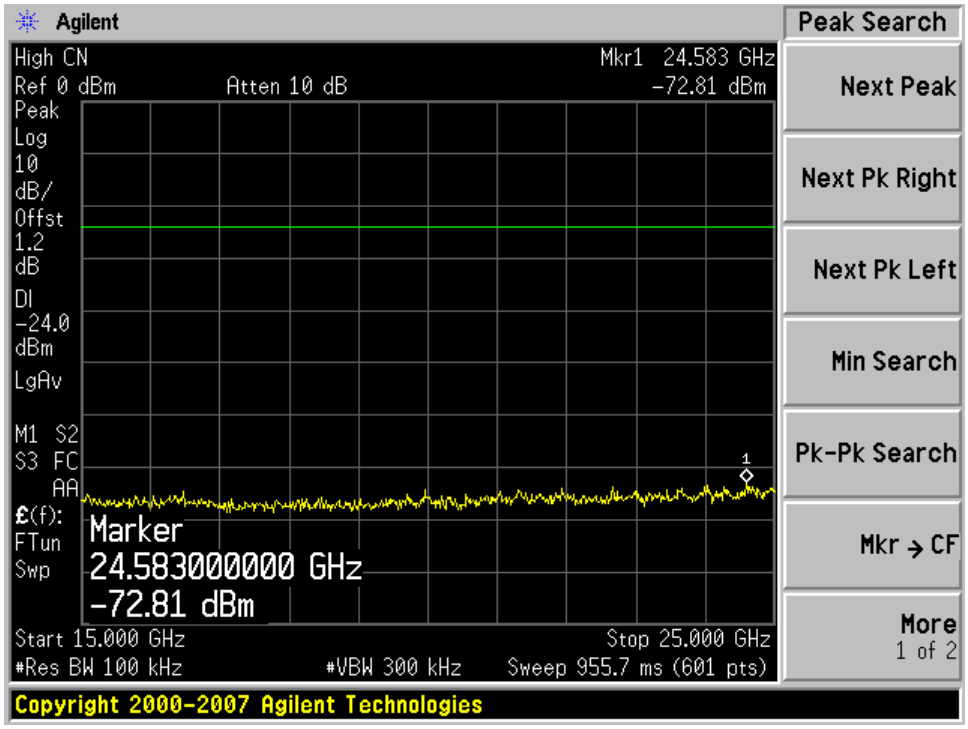
High Channel



Plot 1: 30 MHz to 5.0 GHz



Plot 2: 5.0 GHz to 15.0 GHz



Plot 3: 15.0 GHz to 25.0 GHz

9 FCC §15.205, §15.209, IC RSS-Gen §4.9 - SPURIOUS RADIATED EMISSIONS

9.1 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.

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 §15.247(c)(1)(i): Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

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)).

IC RSS-GEN §4.9 the measurement method shall be described in the test report. The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements. The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

9.2 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 limits.

9.3 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 bundled when necessary.

9.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
DRG	Horn Antenna	ARH-4223-02	10555-01	2008-05-09
Agilent	Spectrum analyzer	E4440A	US45303156	2008-06-04
Agilent	Pre amplifier	8449B	3008A01978	2007-11-05

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

9.5 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 meters away from the testing antenna, which is varied from 1-4 meters, 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

9.6 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 - Limit

9.7 Environmental Conditions

Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

**The testing was performed by James Ma on 2008-07-28.*

9.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC and IC requirements, and had the worst margin readings of:

Out of Band Emissions:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-17.90	4806.0	Horizontal	Low, 1 GHz – 25GHz
-19.80	4882.0	Horizontal	Middle, 1 GHz – 25GHz
-18.90	4958.0	Horizontal	High, 1 GHz – 25GHz

9.9 Radiated Spurious Emissions Test Data

Low channel 2403 MHz

Frequency (MHz)	Reading (dBµV)	Azimuth (degree)	Antenna Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comments
4806.0	50.4	60	1.8	H	32.5	8.2	35.0	56.1	74	-17.9	Peak
4806.0	29.7	60	1.8	H	32.5	8.2	35.0	35.4	54	-18.6	Ave
4806.0	28.4	70	2.0	V	32.5	8.2	35.0	34.1	54	-19.9	Ave
4806.0	47.2	70	2.0	V	32.5	8.2	35.0	52.9	74	-21.1	Peak

Middle channel 2441 MHz

Frequency (MHz)	Reading (dBµV)	Azimuth (degree)	Antenna Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comments
4882.0	28.5	60	1.7	H	32.5	8.2	35.0	34.2	54	-19.8	Ave
4882.0	28.2	270	2.4	V	32.5	8.2	35.0	33.9	54	-20.1	Ave
4882.0	46.7	60	1.7	H	32.5	8.2	35.0	52.4	74	-21.6	Peak
4882.0	41.8	270	2.4	V	32.5	8.2	35.0	47.5	74	-26.5	Peak

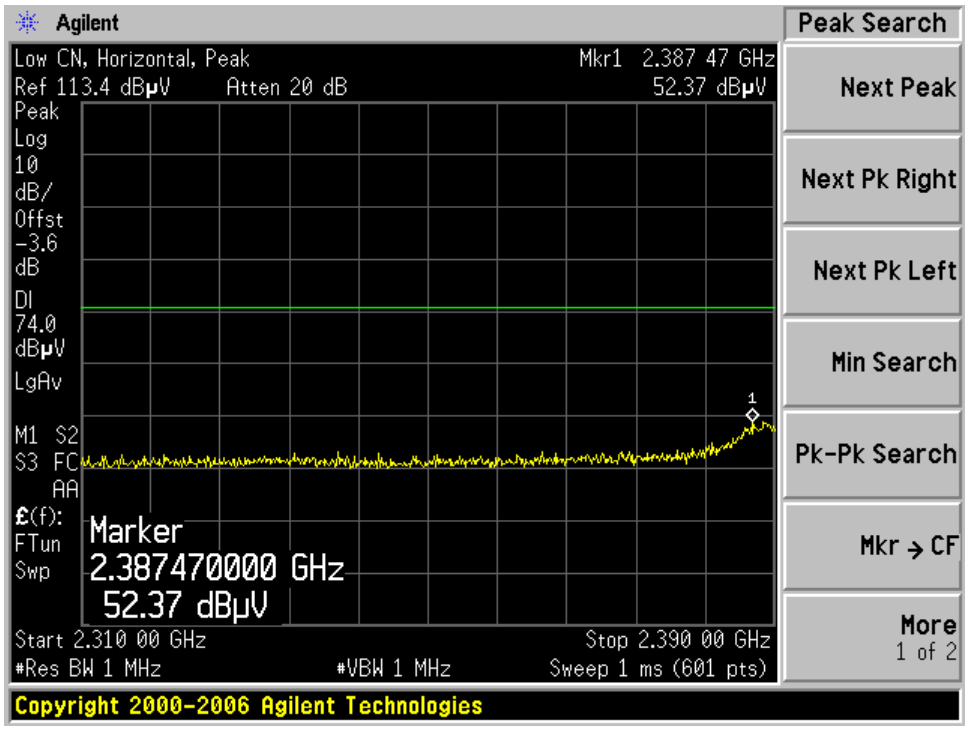
High channel 2479 MHz

Frequency (MHz)	Reading (dBµV)	Azimuth (degree)	Antenna Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comments
4958.0	29.3	90	2.1	H	32.5	8.3	35.0	35.1	54	-18.9	Ave
4958.0	28.5	270	2.4	V	32.5	8.3	35.0	34.3	54	-19.7	Ave
4958.0	44.6	90	2.1	H	32.5	8.3	35.0	50.4	74	-23.6	Peak
4958.0	42.7	270	2.4	V	32.5	8.3	35.0	48.5	74	-25.5	Peak

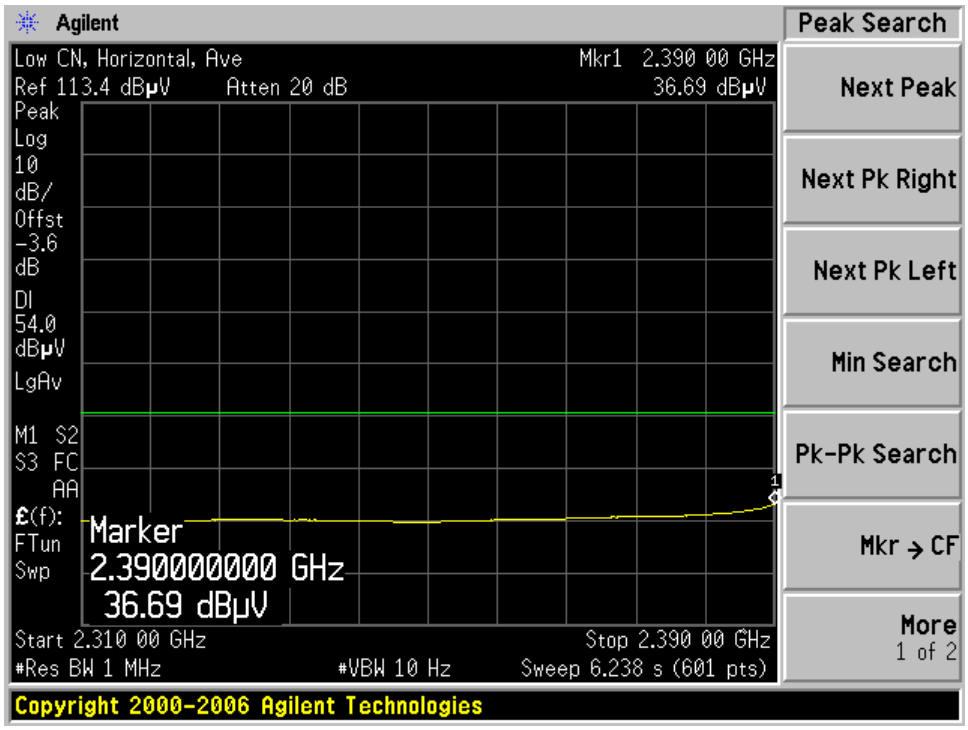
9.10 Restricted Band Edge

Low Channel

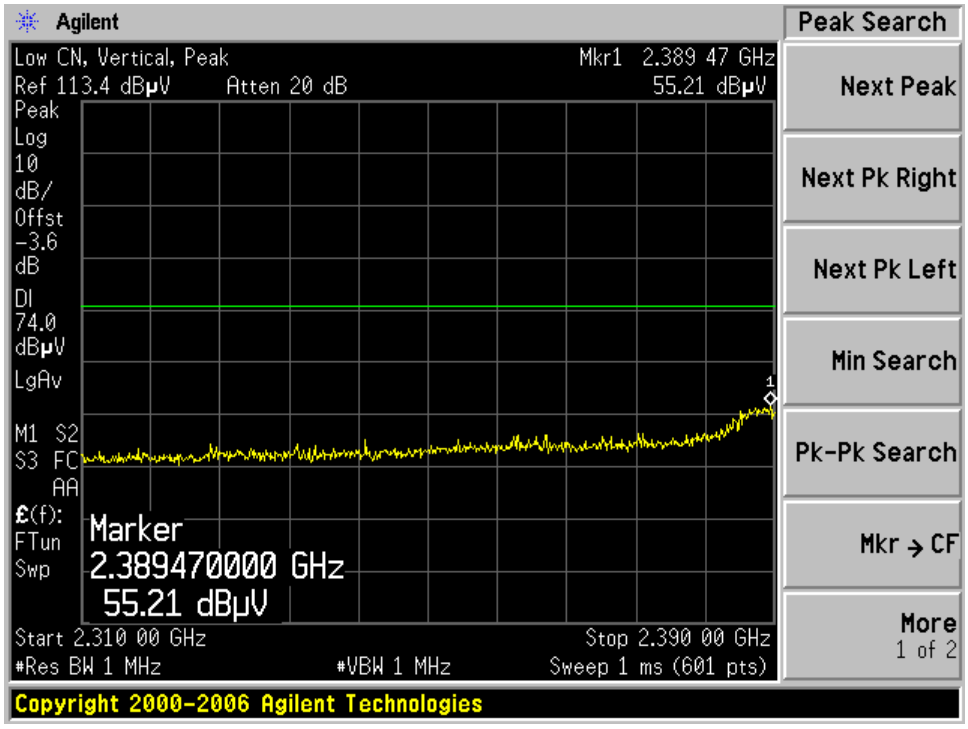
Peak, Horizontal



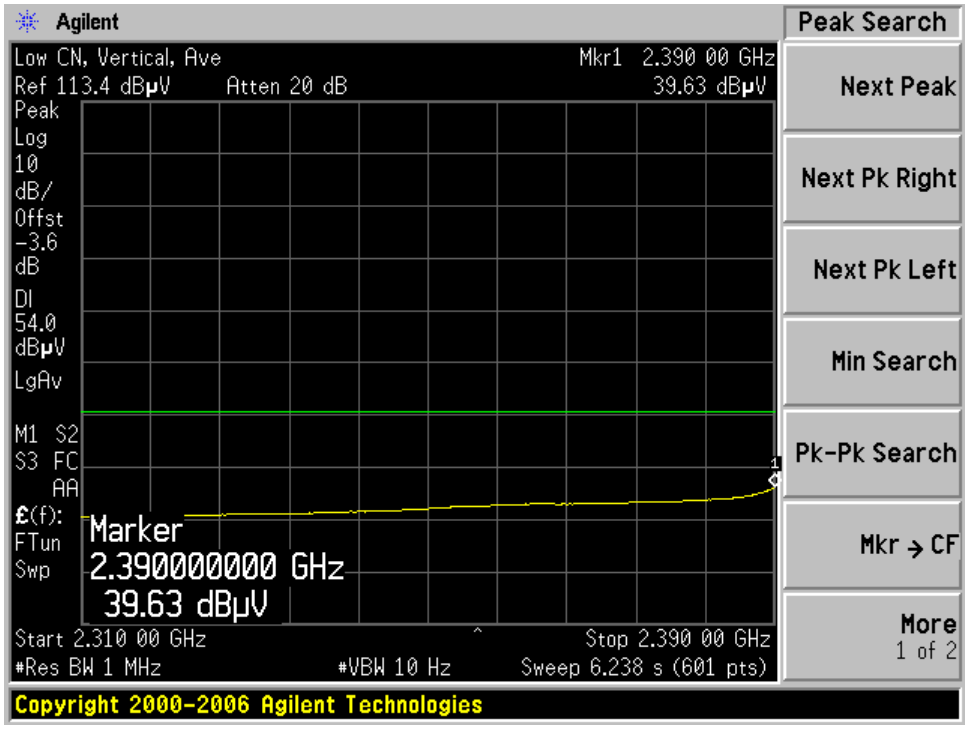
Average, Horizontal



Peak, Vertical

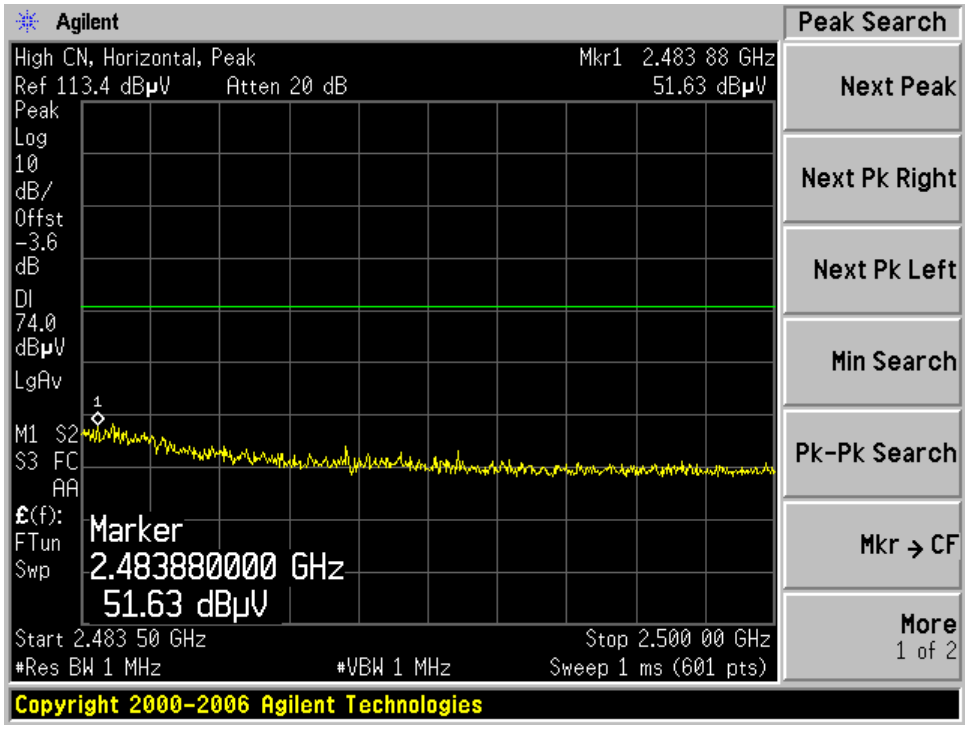


Average, Vertical

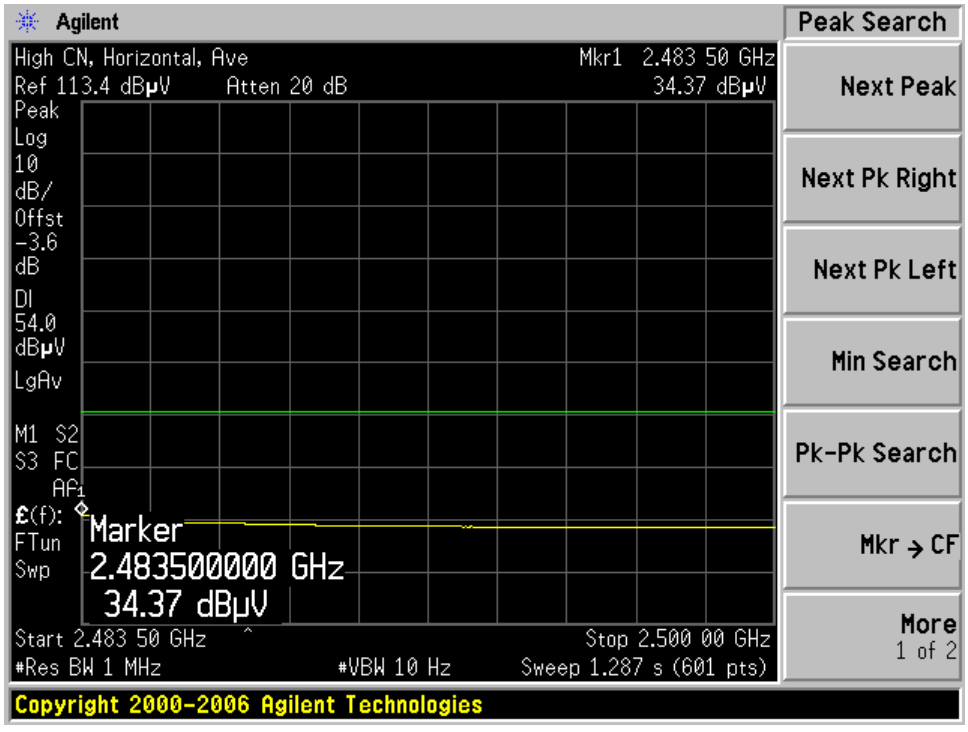


High Channel

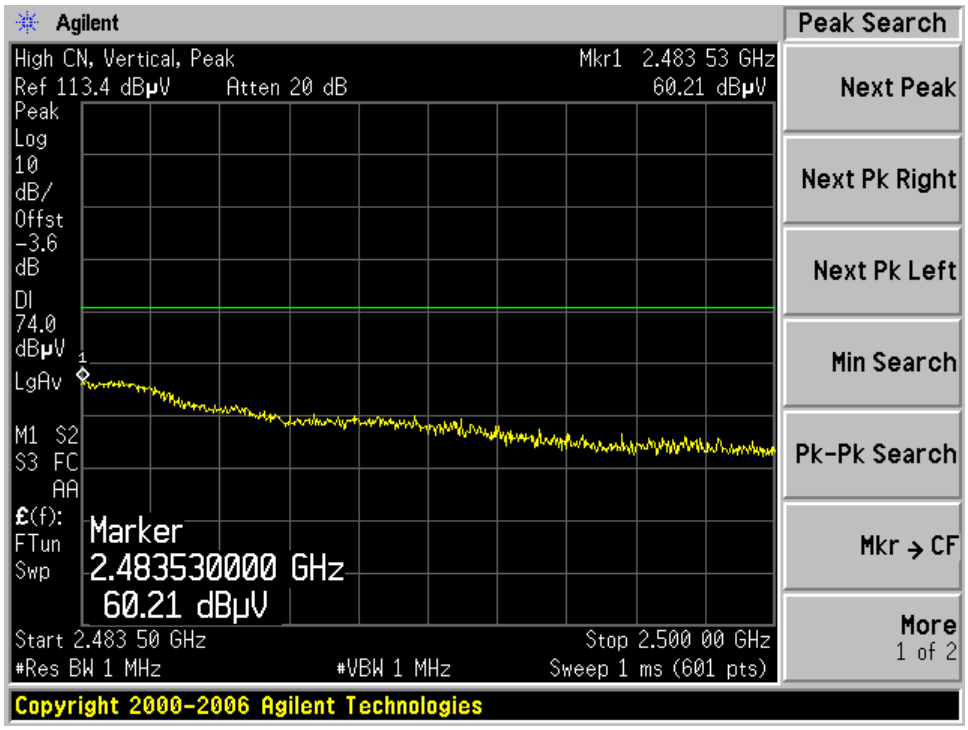
Peak, Horizontal



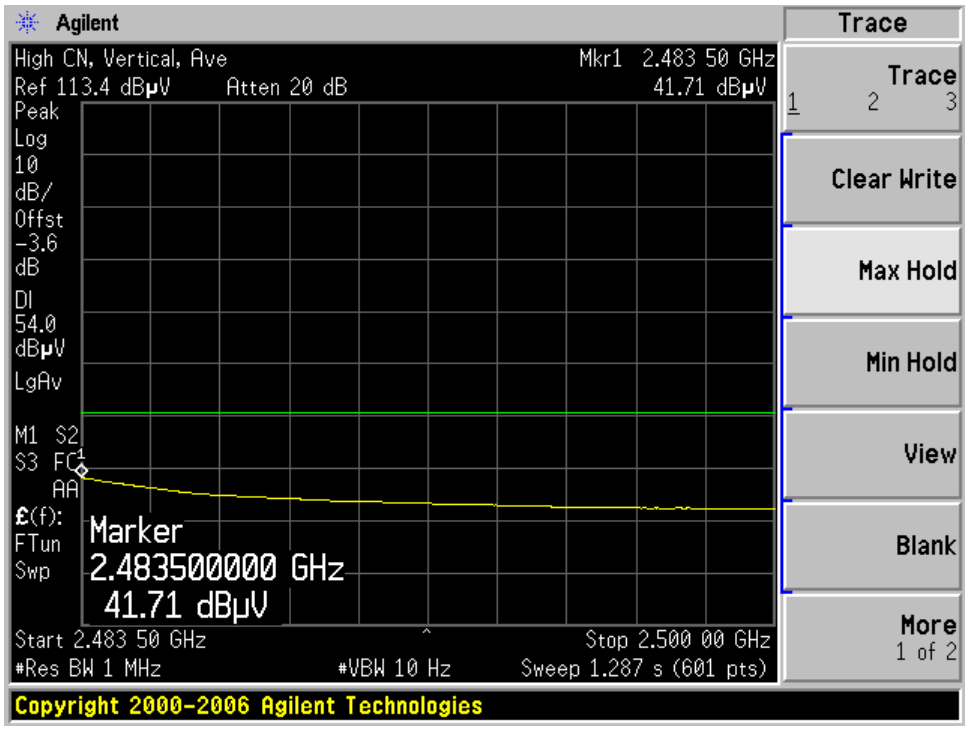
Average, Horizontal



Peak, Vertical



Average, Vertical



10 FCC §15.247(a) (2), RSS-210 § A8.2 (a) – 6 dB BANDWIDTH & OCCUPIED BANDWIDTH

10.1 Applicable Standard

According to §15.247(a) (2), RSS-210 §A8.2 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.

10.2 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. (6 dB bandwidth for DTS)
4. Repeat above procedures until all frequencies measured were complete.

10.3 Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2008-05-31

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

10.4 Environmental Conditions

Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

**The testing was performed by James Ma from 2008-07-28.*

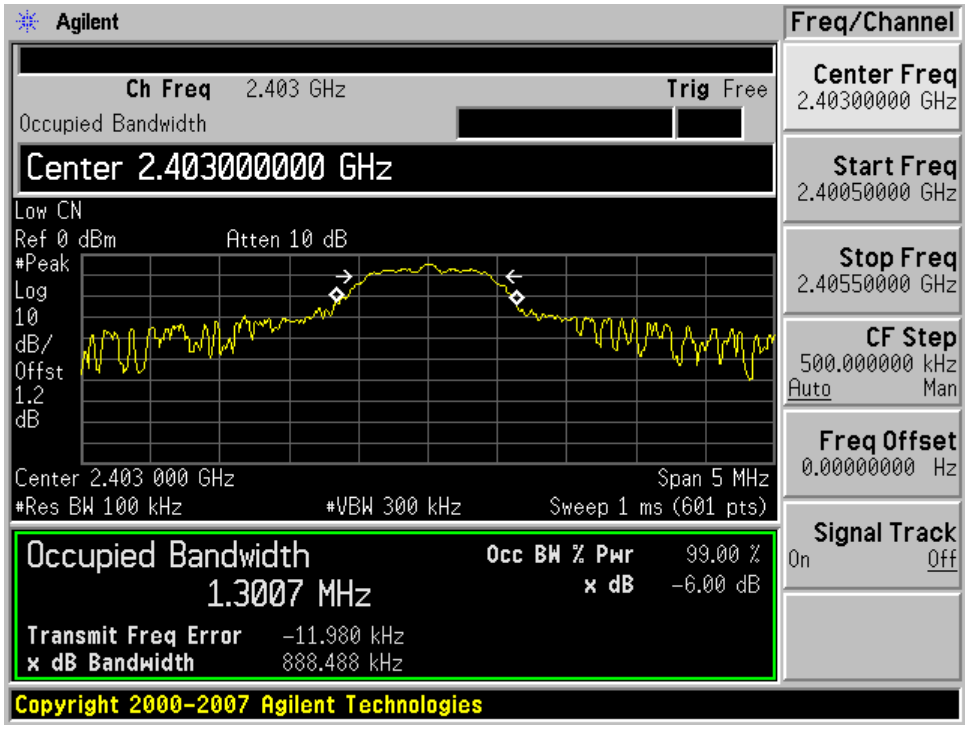
10.5 Summary of Test Results

Channel	Frequency (MHz)	6 dB BW (kHz)	Limit (kHz)	Results
Low	2403	888.488	>500	Compliant
Mid	2441	885.687	>500	Compliant
High	2479	884.505	>500	Compliant

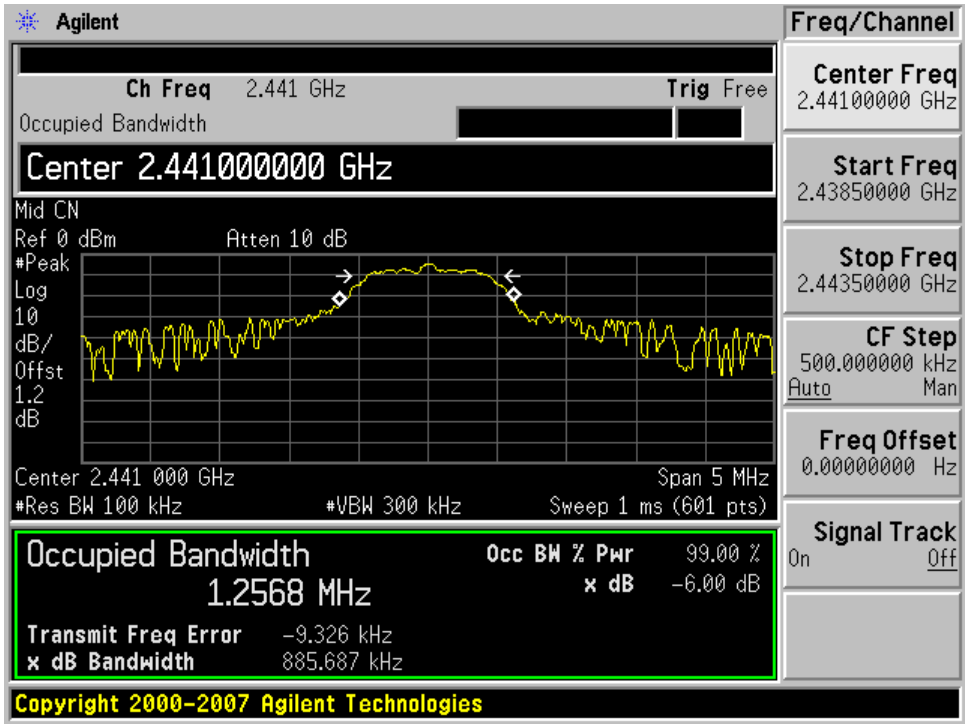
Channel	Frequency (MHz)	99% Occupied BW (MHz)
Low	2403	1.300
Middle	2441	1.257
High	2479	1.309

Please refer to the following plots for detailed test results

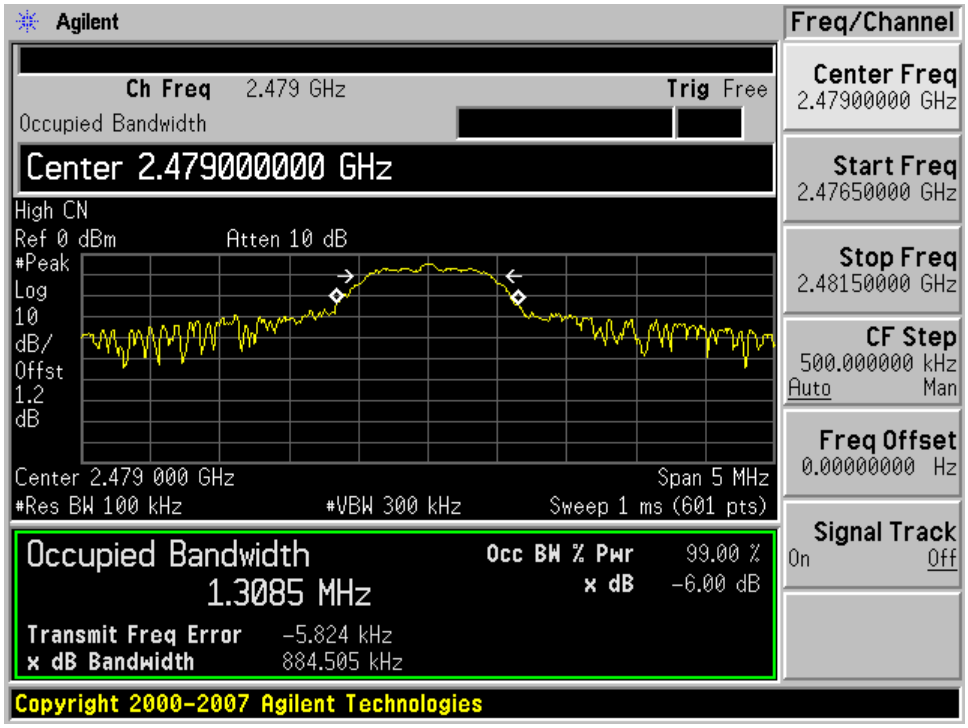
Low Channel



Middle Channel



High Channel



11 FCC §15.247(b), RSS210 § A8.4 - PEAK OUTPUT POWER MEASUREMENT

11.1 Applicable Standard

§15.247(b) the maximum peak output power of the intentional radiator shall not exceed the following:

§15.247(b) (3) and RSS210 § A8.4 (4) for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

§15.247(b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

11.2 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.

11.3 Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2008-05-31

11.4 Environmental Conditions

Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

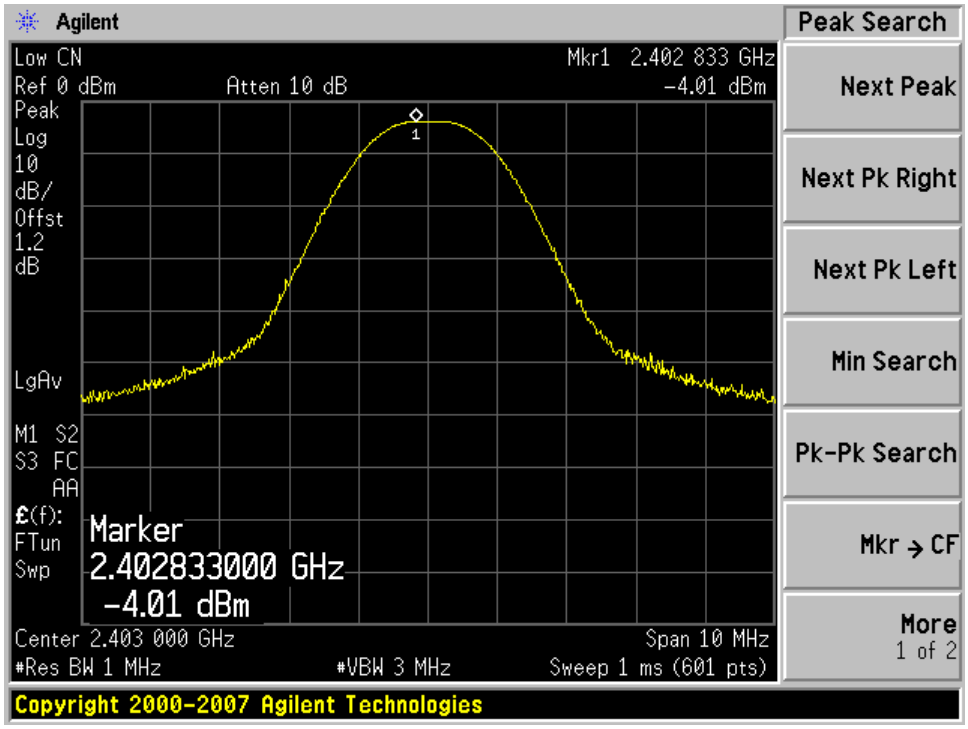
**The testing was performed by James on 2008-07-28.*

11.5 Summary of Test Results

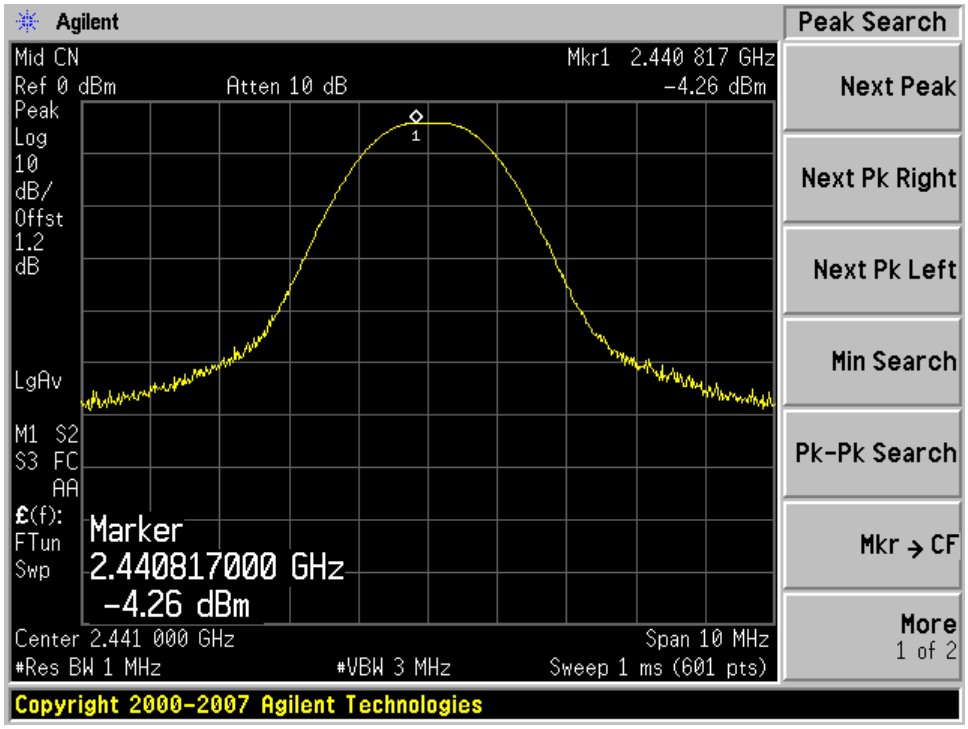
Channel	Frequency (MHz)	Output Power		Limit (mW)	Results
		(dBm)	(mW)		
Low	2403	-4.01	0.40	1000	pass
Mid	2441	-4.26	0.37	1000	pass
High	2479	-4.03	0.40	1000	pass

Please refer to the following plots

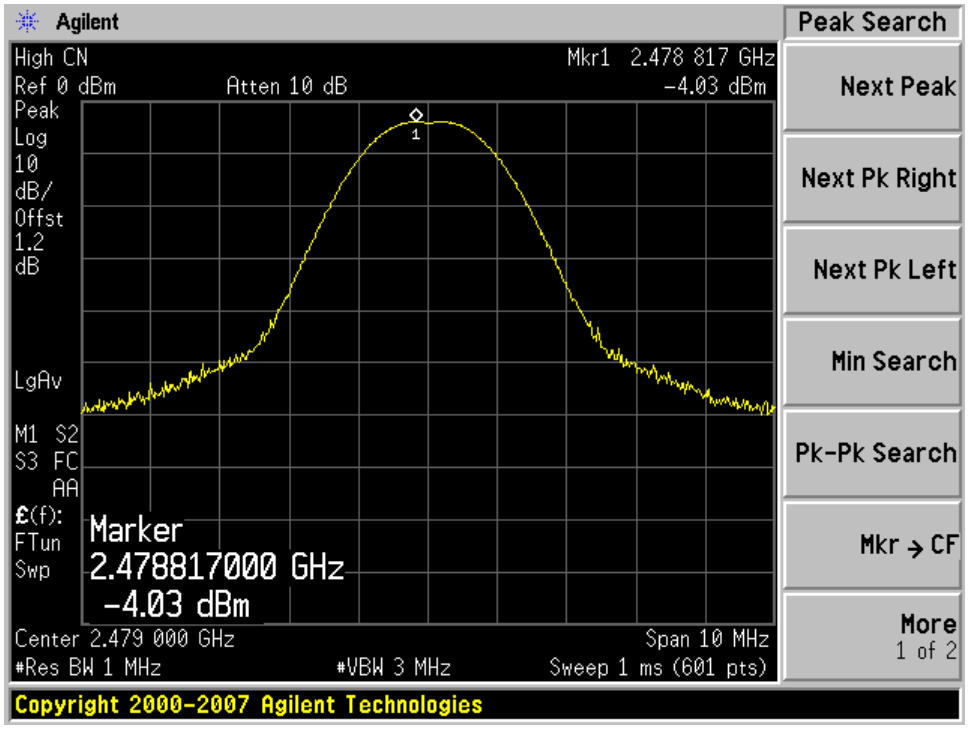
Low Channel



Middle Channel



High Channel



12 FCC §15.247(d), RSS-210 § A8.5 - 100 KHz BANDWIDTH OF BAND EDGES

12.1 Applicable Standard

According to §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)).

RSS210§ A8.5: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emissions limits specified in Tables 2 and 3.

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 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.

12.3 Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2008-05-31

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

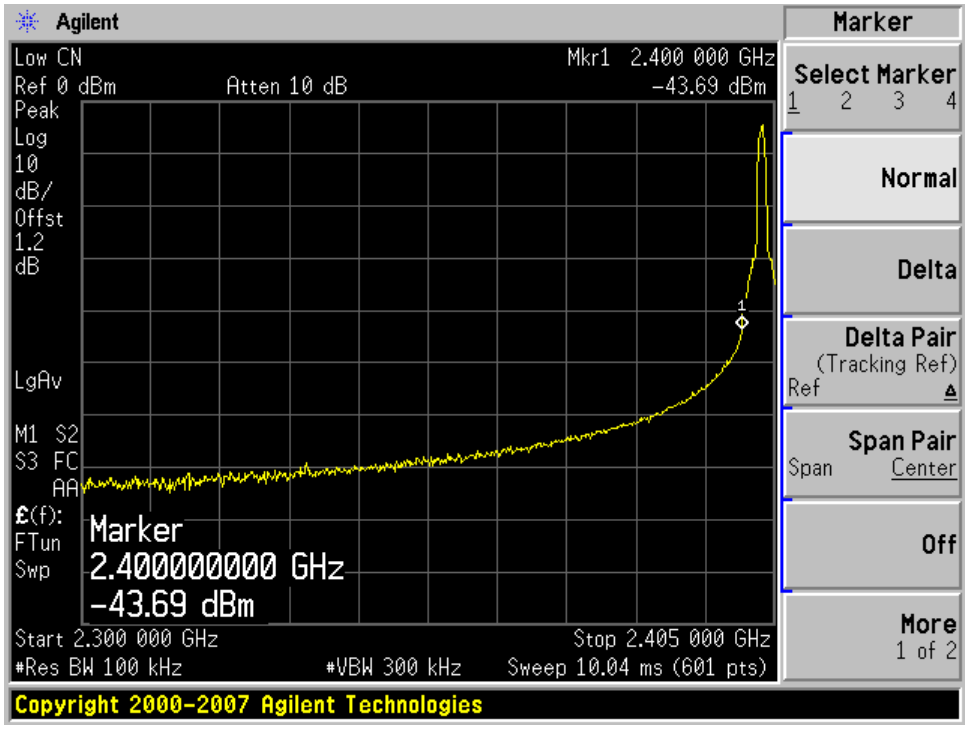
12.4 Environmental Conditions

Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

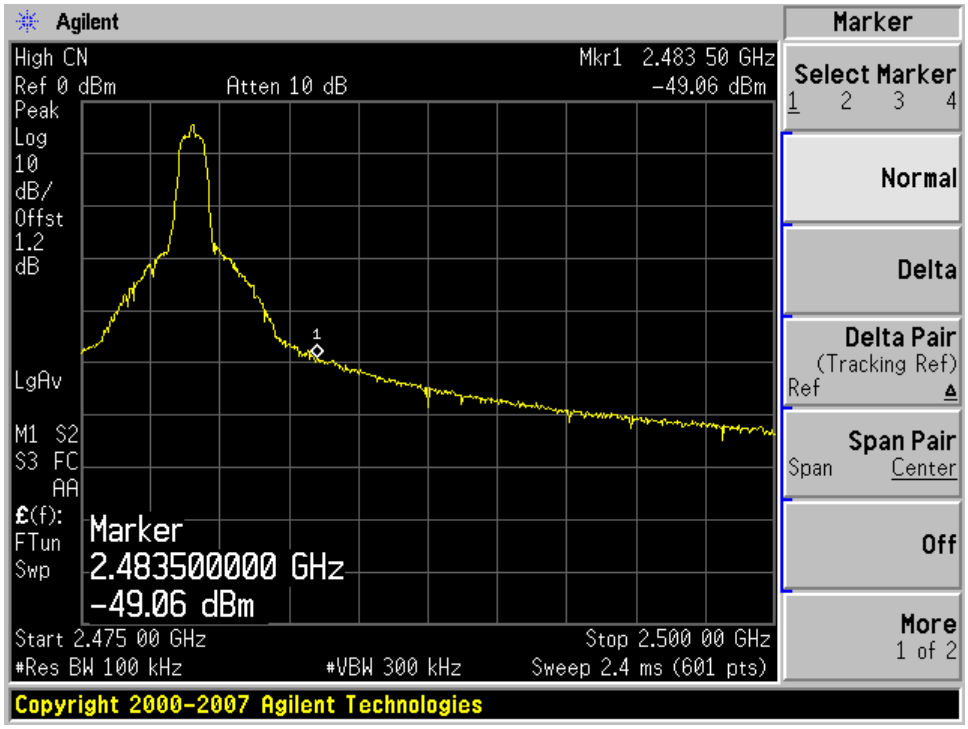
**The testing was performed by James Ma on 2008-07-28.*

Please refer to the following plots

Low Channel



High Channel



13 FCC §15.247(e), RSS-210 § A8.2 (b) - POWER SPECTRAL DENSITY

13.1 Applicable Standard

According to §15.247 (e) and RSS-210 § A8.2 (b) , 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.

13.2 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. (DTS)
4. Repeat above procedures until all frequencies measured were complete.

13.3 Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2008-05-31

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

13.4 Environmental Conditions

Temperature:	27 °C
Relative Humidity:	40 %
ATM Pressure:	102.0kPa

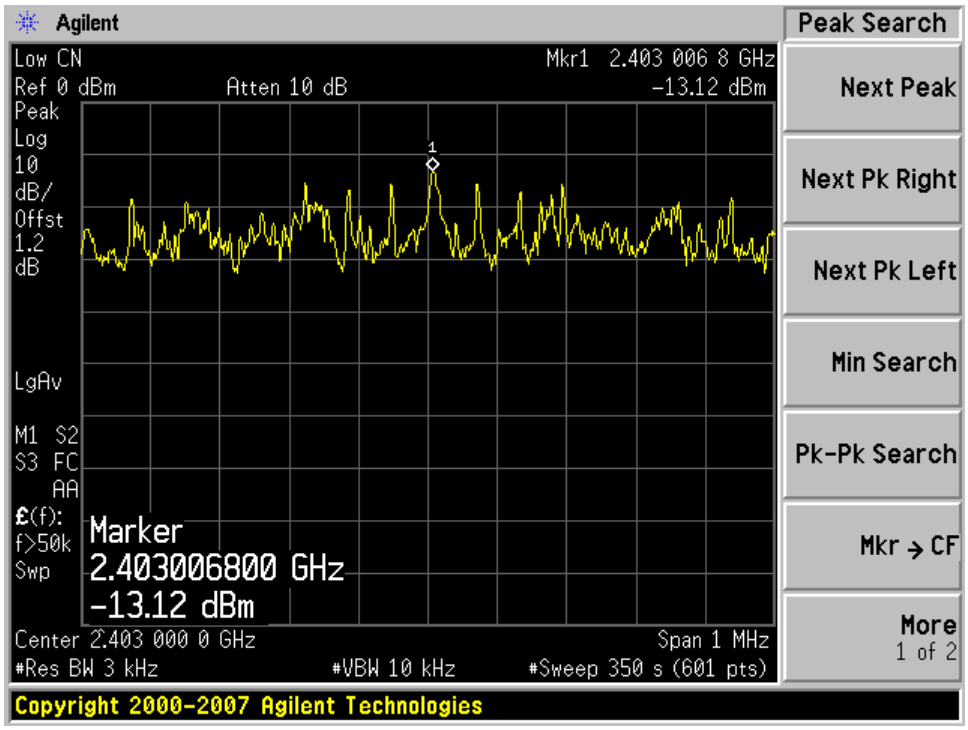
**The testing was performed by James Ma on 2008-07-28.*

13.5 Summary of Test Results

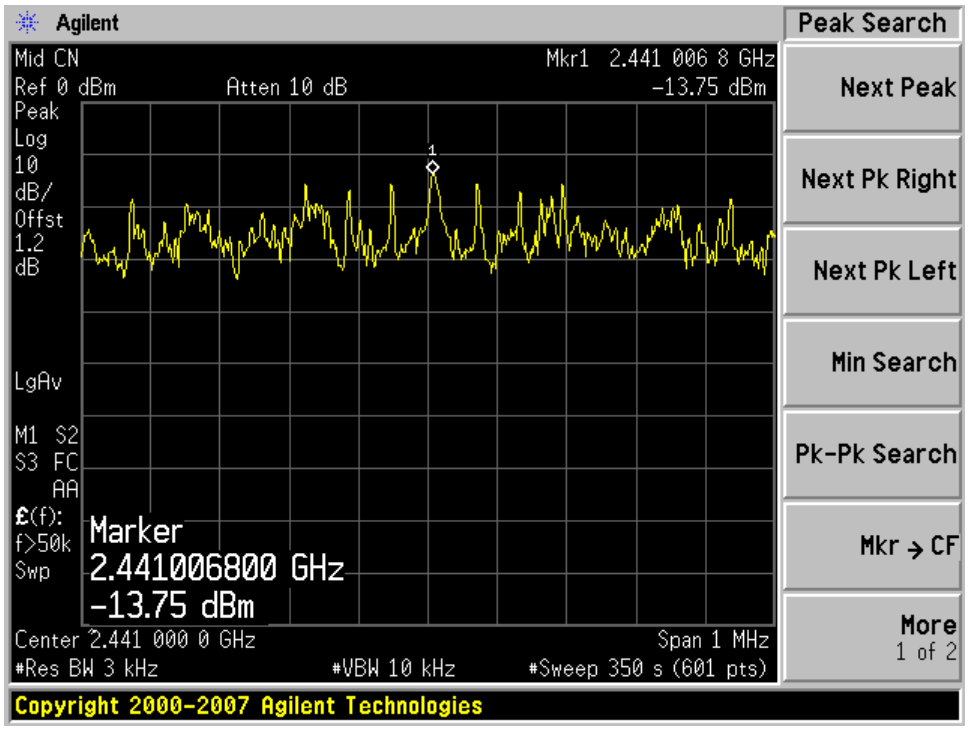
Frequency (MHz)	PSD (dBm)	Limit (dBm)	Results
2403	-13.12	8	Compliant
2441	-13.75	8	Compliant
2479	-13.47	8	Compliant

Please refer to the following plots for detailed test results.

Low Channel



Middle Channel



High Channel