



FCC PART 15, SUBPART C
IC RSS-210, ISSUE 8, DECEMBER 2010

TEST AND MEASUREMENT REPORT

For

AnyDATA Corporation

5 Oldfield, Irvine, CA 92618, USA

FCC ID: P4M-ACT10
IC: 4594B-ACT10

Report Type: Original Report	Product Type: Bluetooth OBD Vehicle Device
Prepared By: <u>Chen Ge</u> Test Engineer	<i>Chen Ge</i>
Report Number: <u>R1409081-247 BLE</u>	
Report Date: <u>2014-10-21</u>	
Reviewed By: <u>Suhaila Khushzad</u> Engineering Manager	<i>Suhaila Khushzad</i>
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164	

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" sec.10

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1409081-247 BLE	Original Report	2014-10-21

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *AnyData Corporation*, and their product, *model: ACT10; FCC ID: P4M-ACT10, IC: 4594B-ACT10*, or the “EUT” as referred to this report. The EUT is a 2.4GHz Bluetooth and BLE vehicle monitoring and management device.

1.2 Mechanical Description of EUT

The EUT measures approximately 45 mm (L) x 30 mm (W) x 24 mm (H) and weighs approximately 32 g.

The data gathered are from a typical production sample provided by the manufacturer with serial number: I94T18.

1.3 Objective

This report is prepared on behalf of *AnyData Corporation*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules and IC RSS-210 Issue 8, Dec 2010.

The objective is to determine compliance with FCC Part 15.247 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.

This amended report is prepared to add IC RSS-210 rules based on the FCC test report released on Sept 26, 2013. No additional testing was involved.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, 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 and FCC KDB 558074 D01 DTS Meas Guidance: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BAEL Corp.

1.7 Test Facility

Bay Area Compliance Laboratories Corp. (BACL) is:

1- An independent Commercial Test Laboratory accredited to ISO 17025: 2005 by A2LA, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminaires and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC (Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4 - A Product Certification Body accredited to ISO Guide 65: 1996 by A2LA to certify:

1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.

2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.

3. Radio Communication Equipment for Singapore.

4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.

5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).

6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

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 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz, as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24: 2010.

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.: A-0027. 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 an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

<http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2009 and FCC KDB 558074 D01 DTS Meas Guidance v03r01.

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

2.2 EUT Exercise Software

The test utility used was *BTCmd version 1.1* was provided by AnyData Corporation., and was verified *Chen Ge* to comply with the standard requirements being tested against.

2.3 Special Accessories

N/A

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
Dell	Laptop	PP11L	CN-0D4571-48643-57F-7162

2.6 Power Supply and Line Filters

Manufacturer	Description	Model No.	Serial No.
Hon-Kwang	AC Power Adapter	HK-Q106-A12	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF Cable	<1	EUT	Spectrum Analyzer

2.8 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
AnyData	Main board	ACT10 v1.0	-

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.247(i), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §7.1.2	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §7.2.4	AC Line Conducted Emissions	Compliant
FCC §15.247 (d) IC RSS-210 §A8.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-210 §2.2	Restricted Bands	Compliant
FCC §15.209, §15.247 (d) IC RSS-210 §A8.5	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-210 §A8.2	6 dB Emission 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), §2.1091 & IC RSS-102 – RF Exposure

4.1 Applicable Standards

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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	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 – 1 500	1.585 f ^{0.5}	0.0042 f ^{0.5}	f / 150	6
1 500 – 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	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000 / f ^{1.2}

Note: f is frequency in MHz

* = Power density limit is applicable at frequencies greater than 100 MHz

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

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>7.17</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>5.21</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2440</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>-5</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>0.316</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.000328</u>
<u>Power density of prediction frequency at 20.0 cm (W/m²):</u>	<u>0.00328</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>
<u>MPE limit for uncontrolled exposure at prediction frequency (W/m²):</u>	<u>10</u>

The device meets FCC/IC MPE limit at 20 cm distance.

5 FCC §15.203 & IC RSS-Gen §7.1.2 – Antenna Requirements

5.1 Applicable Standards

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.

According to IC RSS-Gen §7.1.2: 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.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 mW or less. For devices of output powers greater than 10 mW, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

5.2 Antenna List

Manufacturers	Antenna Type/Pattern	Antenna Gain (dBi) @ 2.4 GHz
AnyData	Internal PIFA	-5

The antenna gain is less than 6 dBi; therefore, it complies with the antenna requirement. Please refer to the internal photos.

6 FCC §15.207 & IC RSS-Gen §7.2.4 – AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.4 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 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the 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 C63.4-2009 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen 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 EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

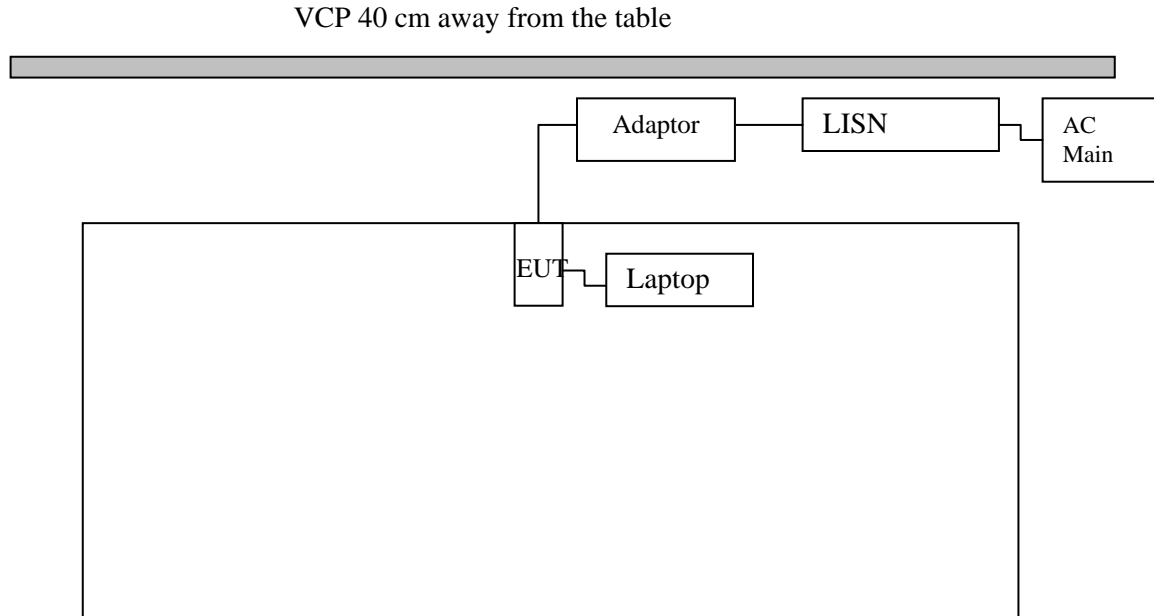
6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains 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”.

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL) plus the High Pass Filter/Attenuator value (HA) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + CL + HA - Ga$$

For example, a corrected amplitude (CA) of 36 dBuV = Indicated Amplitude reading (Ai) of 50.0 dBuV + Cable Loss (CL) 1.0 dB + High Pass Filter/Attenuator (IA) 5 dB - Amplifier Gain (Ga) 20 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:

$$\text{Margin (dB)} = \text{Corrected Amplitude (dBuV)} - \text{Limit (dBuV)}$$

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2014-09-19	1 year
Solar Electronics	LISN	9252-R-24-BNC	511205	2014-06-25	1 year

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

6.7 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	45 %
ATM Pressure:	101.6 KPa

The testing was performed by Chen Ge on 2014-09-30 in 5m chamber 3.

6.8 Summary of Test Results

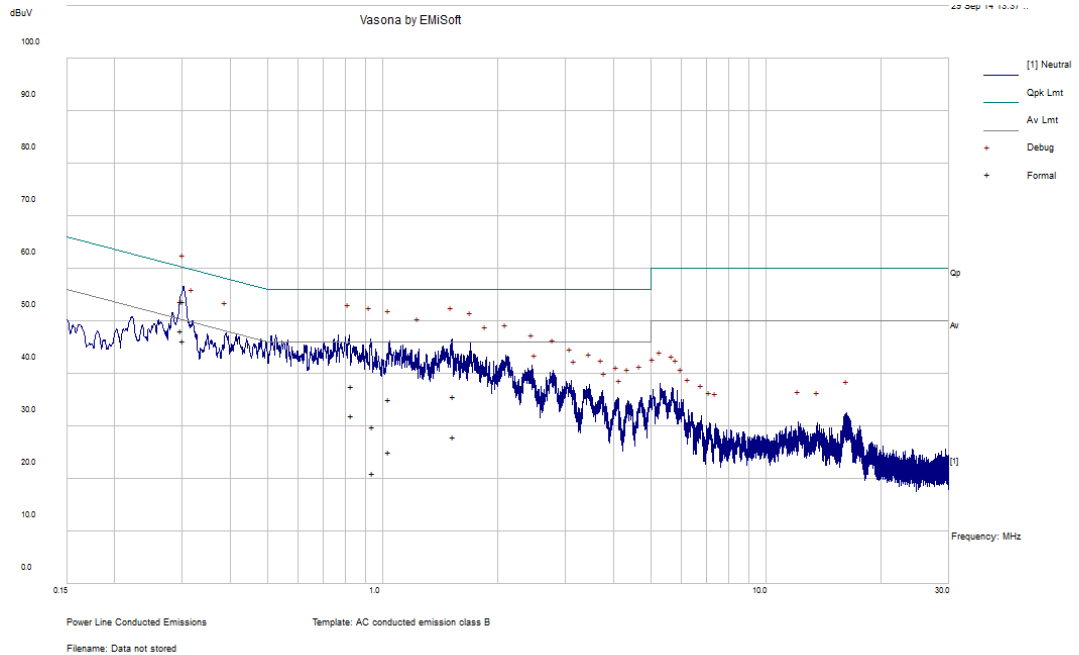
According to the recorded data in following table, the EUT complied with the FCC and IC standard's conducted emissions limits, with a worst case margin of:

Transmitter Mode Worst Case Middle Channel

Connection: AC/DC adapter of Laptop connected to 120 V/60 Hz, AC			
Margin (dB)	Frequency (MHz)	Conductor (Line/Neutral)	Range (MHz)
-2.01	0.298785	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

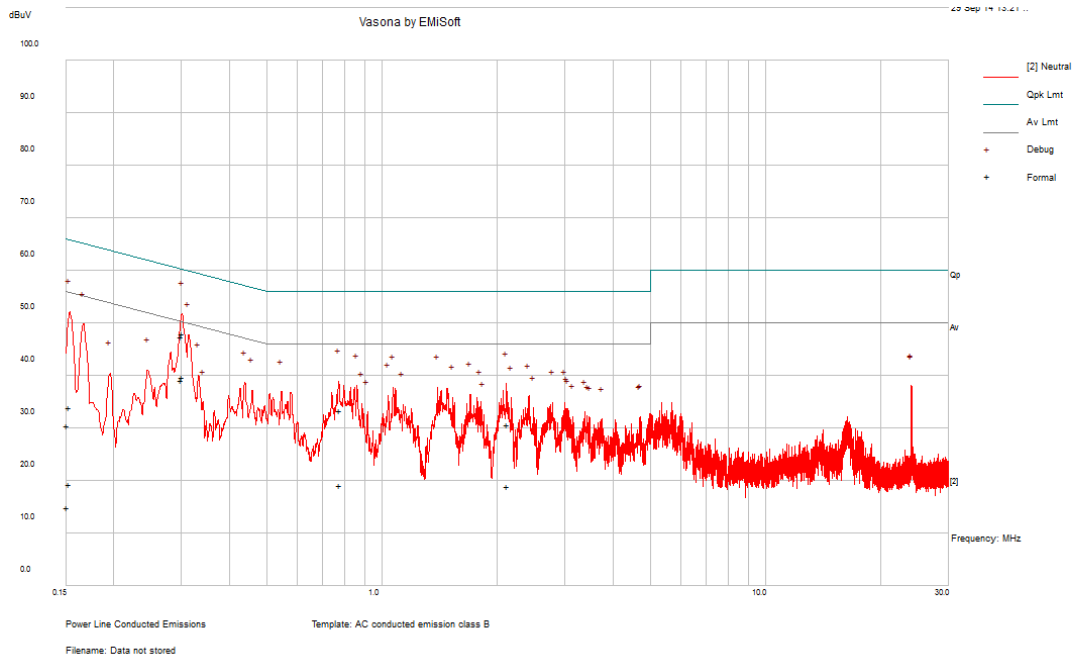
120 V, 60 Hz – Line, AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.298785	53.72	Line	60.28	-6.55	QP
0.830882	37.66	Line	56	-18.34	QP
1.532039	35.64	Line	56	-20.36	QP
0.940974	29.84	Line	56	-26.16	QP
0.302582	53.7	Line	60.17	-6.47	QP
1.04001	35.13	Line	56	-20.87	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.298785	48.27	Line	50.28	-2.01	Ave.
0.830882	31.98	Line	46	-14.02	Ave.
1.532039	28.03	Line	46	-17.97	Ave.
0.940974	21.16	Line	46	-24.84	Ave.
0.302582	46.26	Line	50.17	-3.91	Ave.
1.04001	25.14	Line	46	-20.86	Ave.

120 V, 60 Hz – Neutral, AC/DC Adaptor



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.300984	48.01	Neutral	60.22	-12.21	QP
0.300387	47.46	Neutral	60.23	-12.78	QP
0.152924	33.99	Neutral	65.84	-31.85	QP
0.151442	30.58	Neutral	65.92	-35.34	QP
0.778601	33.37	Neutral	56	-22.63	QP
2.11728	30.76	Neutral	56	-25.24	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.300984	39.74	Neutral	50.22	-10.48	Ave.
0.300387	39.16	Neutral	50.23	-11.08	Ave.
0.152924	19.43	Neutral	55.84	-36.41	Ave.
0.151442	15	Neutral	55.92	-40.92	Ave.
0.778601	19.11	Neutral	46	-26.89	Ave.
2.11728	18.98	Neutral	46	-27.02	Ave.

7 FCC §2.1051, §15.247(d) & IC RSS-210 §A8.5 – Spurious Emissions at Antenna Terminals

7.1 Applicable Standards

For FCC §15.247(d) and IC 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.

7.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 11: Emissions in non-restricted frequency bands and section 12: Emissions in restricted frequency bands.

7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	1 year

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

7.4 Test Environmental Conditions

Temperature:	21° C
Relative Humidity:	45 %
ATM Pressure:	101.6 kPa

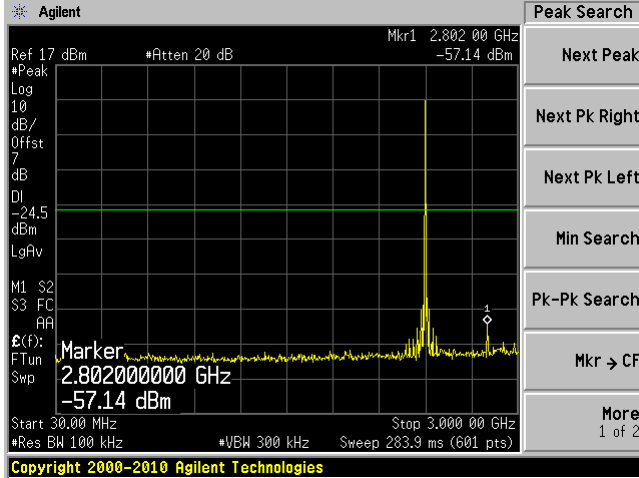
The testing was performed by Chen Ge on 2014-09-24 at RF site.

7.5 Test Results

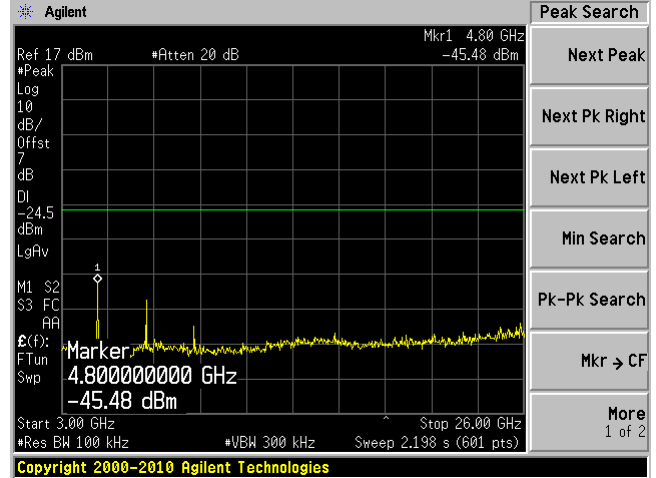
Please refer to the following plots of spurious emissions.

Low Channel, 2402 MHz

Plot: 30 MHz – 3 GHz

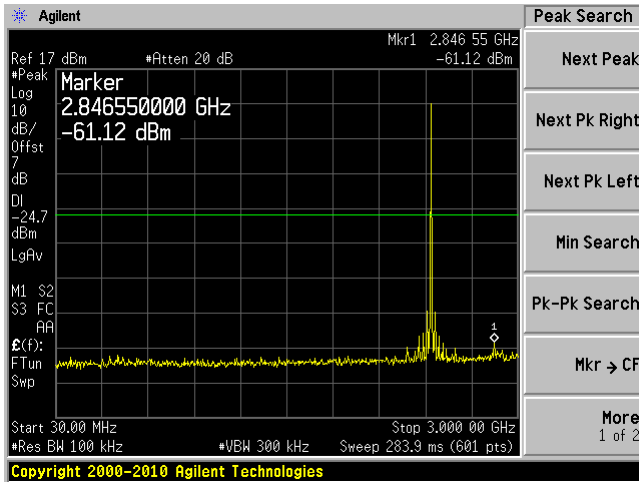


Plot: 3 GHz – 26 GHz

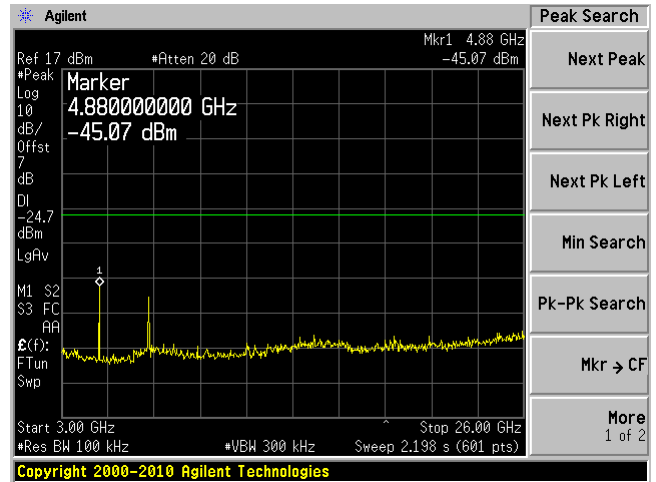


Middle Channel, 2440 MHz

Plot: 30 MHz – 3 GHz

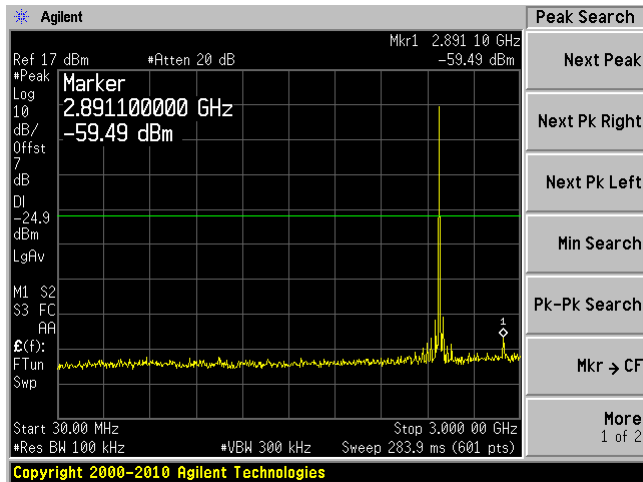


Plot: 3 GHz – 26 GHz

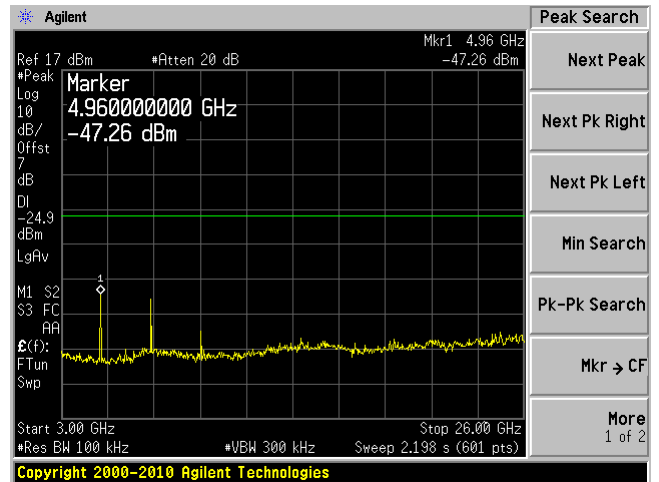


High Channel, 2480 MHz

Plot: 30 MHz – 3 GHz



Plot: 3 GHz – 26 GHz



8 FCC §15.205, §15.209 & §15.247(d) & IC RSS-210 §A8.5 – Spurious Radiated Emissions

8.1 Applicable Standards

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) and RSS-210: 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	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

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)).

As per IC RSS-210 A8.5 Out-of-band Emissions, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square 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 field strength limits specified in RSS-Gen is not required.

8.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2009. The specification used was the FCC 15C and IC RSS-210/RSS-Gen limits.

The spacing between the peripherals was 3 centimeters.
External I/O cables were draped along the edge of the test table and bundle when necessary.

8.3 Test Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 11: Emissions in non-restricted frequency bands and section 12: Emissions in restricted frequency bands. As well as ANSI C63.4: 2009 as described below:

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

8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 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:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

8.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science	Combination Antenna	JB3	A020106-3	2014-07-11	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2014-06-09	1 year
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2014-05-09	1 year
Agilent	Spectrum Analyzer	E4446A	US44300386	2014-09-29	1 year
EMCO	Horn Antenna	3315	9511-4627	2013-10-17	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-03-28	1 year

Statement of Traceability: *BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

8.6 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	44 %
ATM Pressure:	101.6 kPa

The testing was performed by Chen Ge on 2014-10-09 in 5 m chamber 3.

8.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C and IC RSS-210 standard's radiated emissions limits, and had the worst margin of:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel
-11.38	216.002	Horizontal	Middle Channel

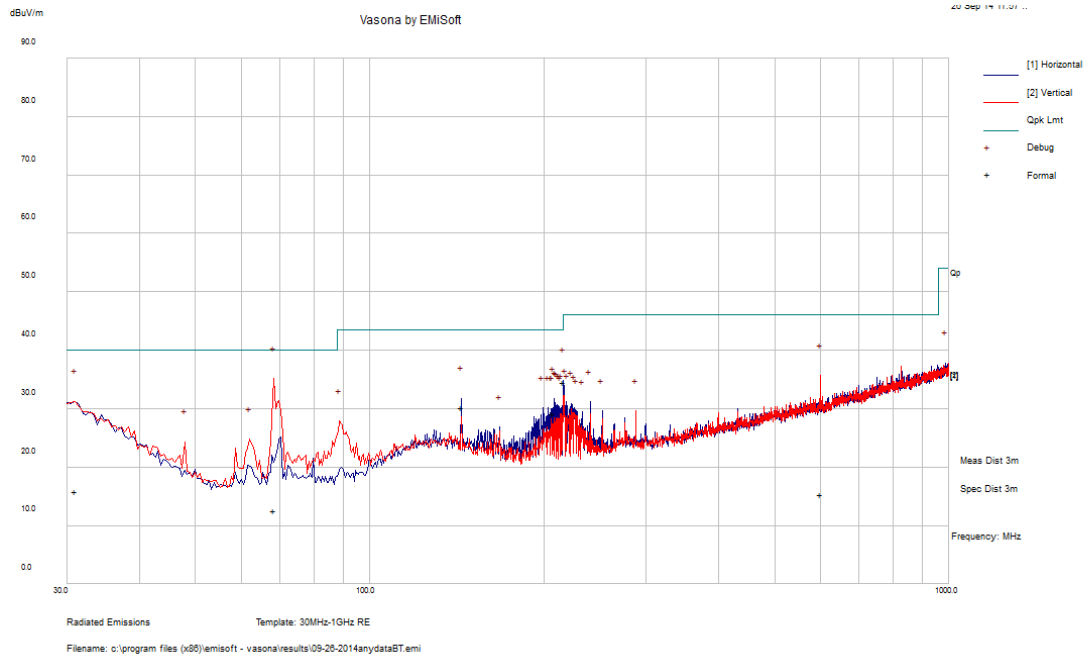
1-25 GHz:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel
-1.913	4960	Vertical	High Channel

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

8.8 Radiated Emissions Test Data and Plots

1) 30 MHz–1 GHz, Measured at 3 meters, Quasi-Peak Measurements



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
68.28275	12.58	105	V	136	40	-27.42
216.002	34.62	106	H	6	46	-11.38
30.978	15.81	180	V	274	40	-24.19
600.2468	15.41	150	V	220	46	-30.59
143.976	30.18	173	H	155	43.5	-13.32
207.9818	29.26	123	H	10	43.5	-14.24

2) 1–25 GHz, Measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz, measured at 3 meters											
2402	72.11	42	100	V	28.956	3.42		104.486	-	-	Peak
2402	71.58	116	100	H	28.956	3.42		103.956	-	-	Peak
2402	51.39	42	100	V	28.956	3.42		83.766	-	-	Ave
2402	51.47	116	100	H	28.956	3.42		83.846	-	-	Ave
2390	26.79	0	100	V	28.956	3.42		59.166	74	-14.834	Peak
2390	26.82	0	100	H	28.956	3.42		59.196	74	-14.804	Peak
2390	12.78	0	100	V	28.956	3.42		45.156	54	-8.844	Ave
2390	12.63	0	100	H	28.956	3.42		45.006	54	-8.994	Ave
4804	55.3	306	116	V	33.097	5.36	34.29	59.467	74	-14.533	Peak
4804	52.18	28	100	H	33.097	5.36	34.29	56.347	74	-17.653	Peak
4804	44.29	306	116	V	33.097	5.36	34.29	48.457	54	-5.543	Ave
4804	40.25	28	100	H	33.097	5.36	34.29	44.417	54	-9.583	Ave
7206	51.92	306	116	V	35.928	6.7	34.39	60.158	84.486	-24.328	Peak
7206	45.98	28	100	H	35.928	6.7	34.39	54.218	83.956	-29.738	Peak
7206	39.48	306	116	V	35.928	6.7	34.39	47.718	63.766	-16.048	Ave
7206	31.95	28	100	H	35.928	6.7	34.39	40.188	63.846	-23.658	Ave
9608	45.57	0	100	V	37.954	8.33	34.9	56.954	84.486	-27.532	Peak
9608	45.36	0	100	H	37.954	8.33	34.9	56.744	83.956	-27.212	Peak
9608	32.05	0	100	V	37.954	8.33	34.9	43.434	63.766	-20.332	Ave
9608	32.14	0	100	H	37.954	8.33	34.9	43.524	63.846	-20.322	Ave
Middle Channel 2440 MHz, measured at 3 meters											
2440	70.07	45	102	V	28.956	3.42		102.446	-	-	Peak
2440	72.33	117	100	H	28.956	3.42		104.706	-	-	Peak
2440	49.96	45	102	V	28.956	3.42		82.336	-	-	Ave
2440	51.4	117	100	H	28.956	3.42		83.776	-	-	Ave
4880	55.36	301	100	V	33.327	5.36	34.29	59.757	74	-14.243	Peak
4880	53.14	152	100	H	33.327	5.36	34.29	57.537	74	-16.463	Peak
4880	44.93	301	100	V	33.327	5.36	34.29	49.327	54	-4.673	Ave
4880	39.36	152	100	H	33.327	5.36	34.29	43.757	54	-10.243	Ave
7320	45.75	301	100	V	36.369	6.7	34.39	54.429	74	-19.571	Peak
7320	40.36	152	100	H	36.369	6.7	34.39	49.039	74	-24.961	Peak
7320	40.06	301	100	V	36.369	6.7	34.39	48.739	54	-5.261	Ave
7320	32.25	152	100	H	36.369	6.7	34.39	40.929	54	-13.071	Ave
9760	45.36	0	100	V	38.087	8.33	34.9	56.877	82.446	-25.569	Peak
9760	45.48	0	100	H	38.087	8.33	34.9	56.997	84.706	-27.709	Peak
9760	32.36	0	100	V	38.087	8.33	34.9	43.877	62.336	-18.459	Ave
9760	32.45	0	100	H	38.087	8.33	34.9	43.967	63.776	-19.809	Ave

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBμV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
High Channel 2480 MHz, measured at 3 meters											
2480	70.25	46	100	V	29.155	3.42		102.825	-	-	Peak
2480	72.69	116	106	H	29.155	3.42		105.265	-	-	Peak
2480	49.87	46	100	V	29.155	3.42		82.445	-	-	Ave
2480	51.36	116	106	H	29.155	3.42		83.935	-	-	Ave
2483.5	28.65	0	100	V	29.155	3.42		61.225	74	-12.775	Peak
2483.5	28.36	0	100	H	29.155	3.42		60.935	74	-13.065	Peak
2483.5	13.24	0	100	V	29.155	3.42		45.815	54	-8.185	Ave
2483.5	13.12	0	100	H	29.155	3.42		45.695	54	-8.305	Ave
4960	56.32	185	100	V	33.327	5.36	34.29	60.717	74	-13.283	Peak
4960	52.58	144	100	H	33.327	5.36	34.29	56.977	74	-17.023	Peak
4960	47.69	185	100	V	33.327	5.36	34.29	52.087	54	-1.913	Ave
4960	40.02	144	100	H	33.327	5.36	34.29	44.417	54	-9.583	Ave
7440	46.32	185	100	V	36.565	6.7	34.39	55.195	74	-18.805	Peak
7440	40.64	144	100	H	36.565	6.7	34.39	49.515	74	-24.485	Peak
7440	41.25	185	100	V	36.565	6.7	34.39	50.125	54	-3.875	Ave
7440	33.55	144	100	H	36.565	6.7	34.39	42.425	54	-11.575	Ave
9920	45.47	0	100	V	38.287	8.33	34.9	57.187	82.825	-25.638	Peak
9920	45.36	0	100	H	38.287	8.33	34.9	57.077	85.265	-28.188	Peak
9920	32.47	0	100	V	38.287	8.33	34.9	44.187	62.445	-18.258	Ave
9920	32.85	0	100	H	38.287	8.33	34.9	44.567	63.935	-19.368	Ave

9 FCC§15.247(a)(2) & IC RSS-210 §A8.2 – 6 dB & 99% Emission Bandwidth

9.1 Applicable Standards

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

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

9.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	45 %
ATM Pressure:	101.6 KPa

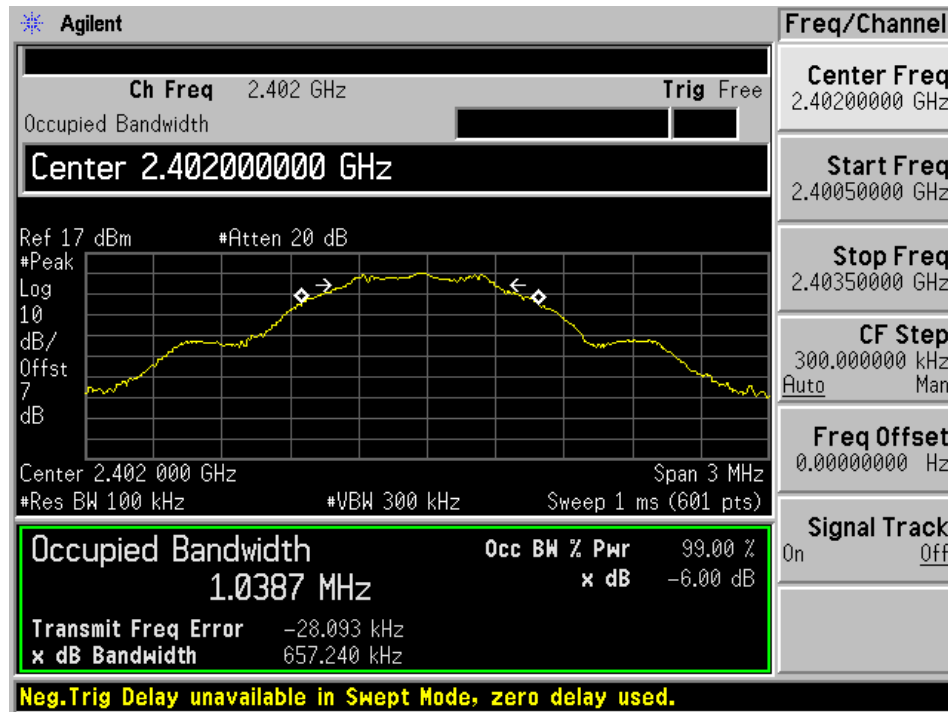
The testing was performed by Chen Ge on 2014-09-24 at RF site.

9.5 Test Results

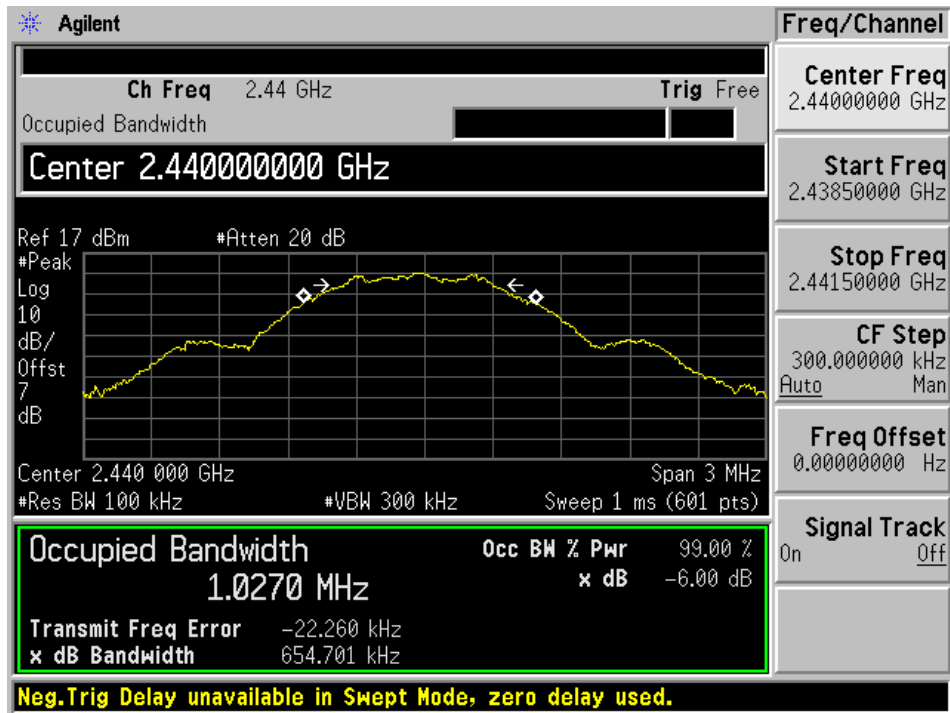
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
Low	2402	0.657	1.0387	> 0.5	Compliant
Middle	2440	0.654	1.0270	> 0.5	Compliant
High	2480	0.664	1.0362	> 0.5	Compliant

Please refer to the following plots for detailed test results

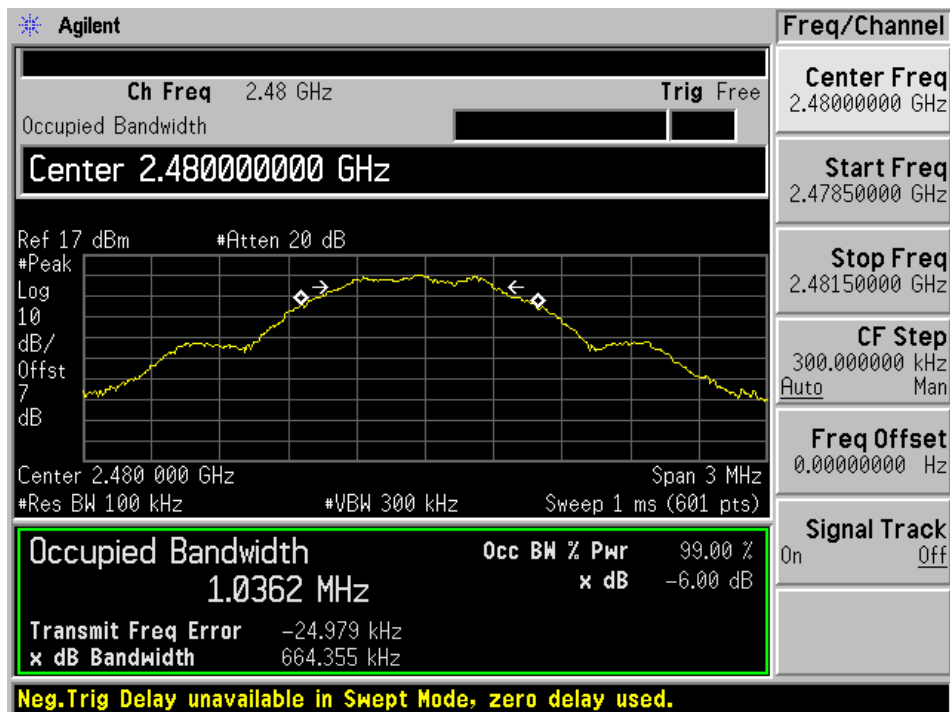
Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz



10 FCC §15.247(b) & IC RSS-210 §A8.4 – Peak Output Power Measurement

10.1 Applicable Standards

According to FCC §15.247(b) and IC RSS-210 §A8.4 (4) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power

10.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

10.4 Test Environmental Conditions

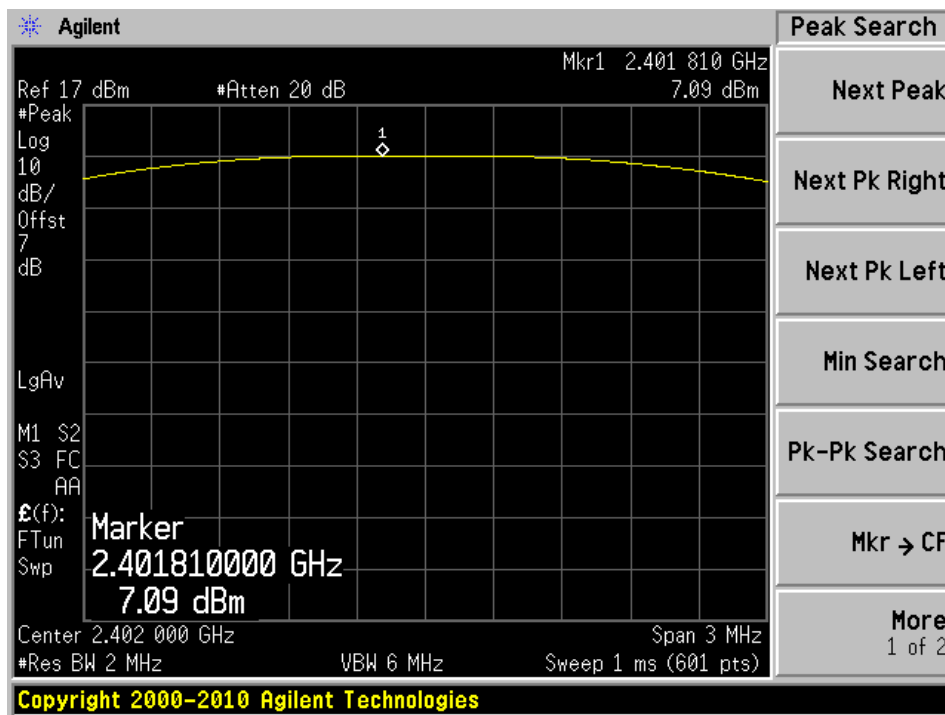
Temperature:	21° C
Relative Humidity:	45 %
ATM Pressure:	101.6 kPa

The testing was performed by Chen Ge on 2014-09-24 at RF site.

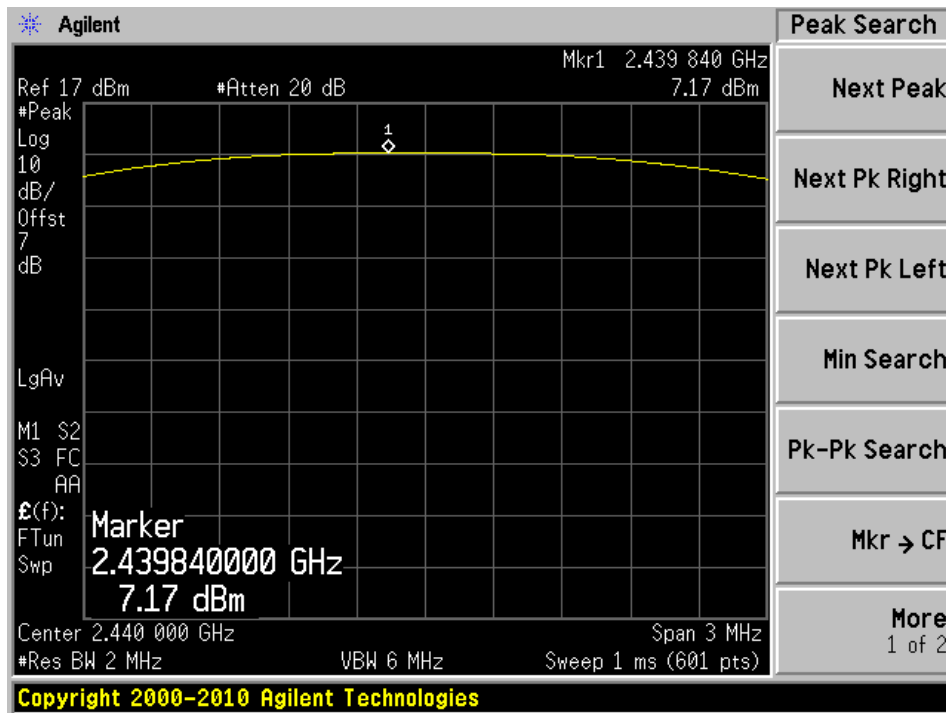
10.5 Test Results

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.09	30	-22.91
Middle	2440	7.17	30	-22.83
High	2480	7.01	30	-22.99

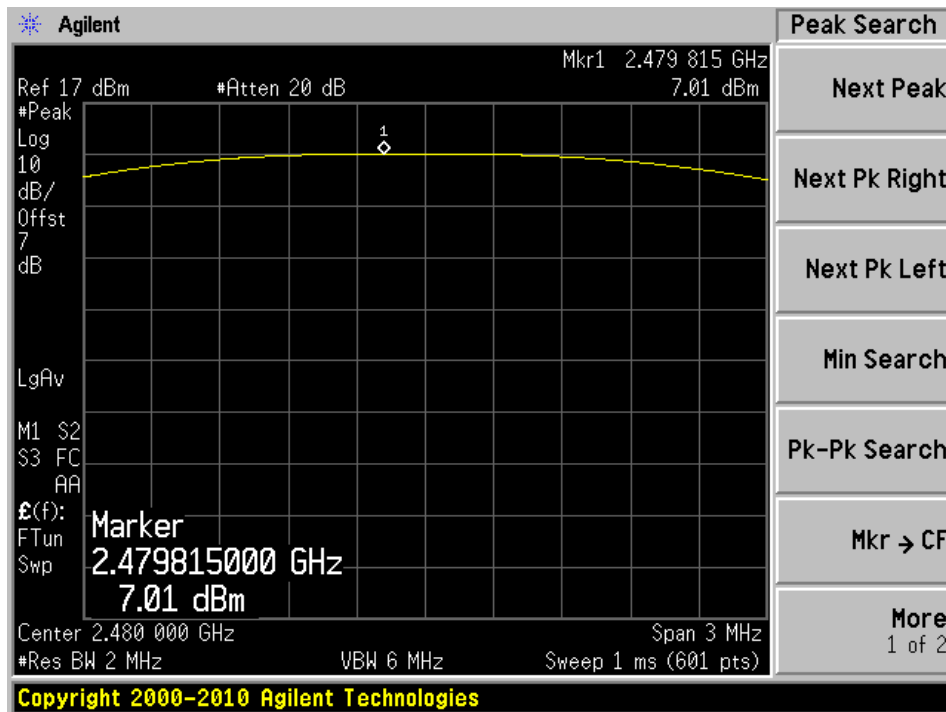
Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz



11 FCC §15.247(d) & IC RSS-210 §A8.5 – 100 kHz Bandwidth of Band Edges

11.1 Applicable Standards

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).

According to IC Rss-210 §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.

11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

11.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year

Statement of Traceability: BACL Corp. attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

11.4 Test Environmental Conditions

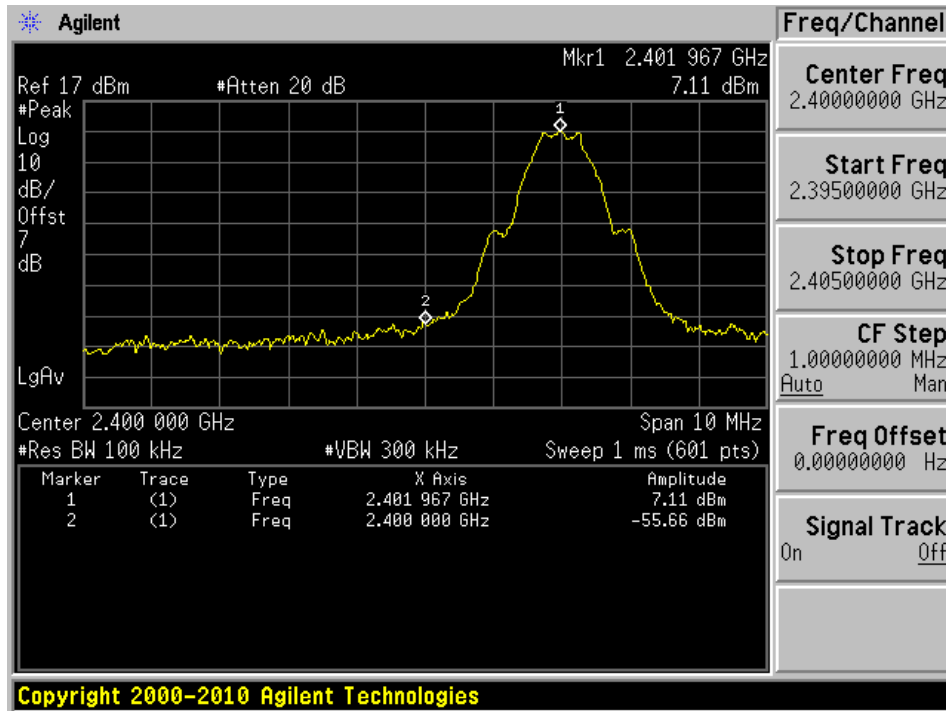
Temperature:	21° C
Relative Humidity:	45 %
ATM Pressure:	101.6 kPa

The testing was performed by Chen Ge on 2014-09-24 at RF site.

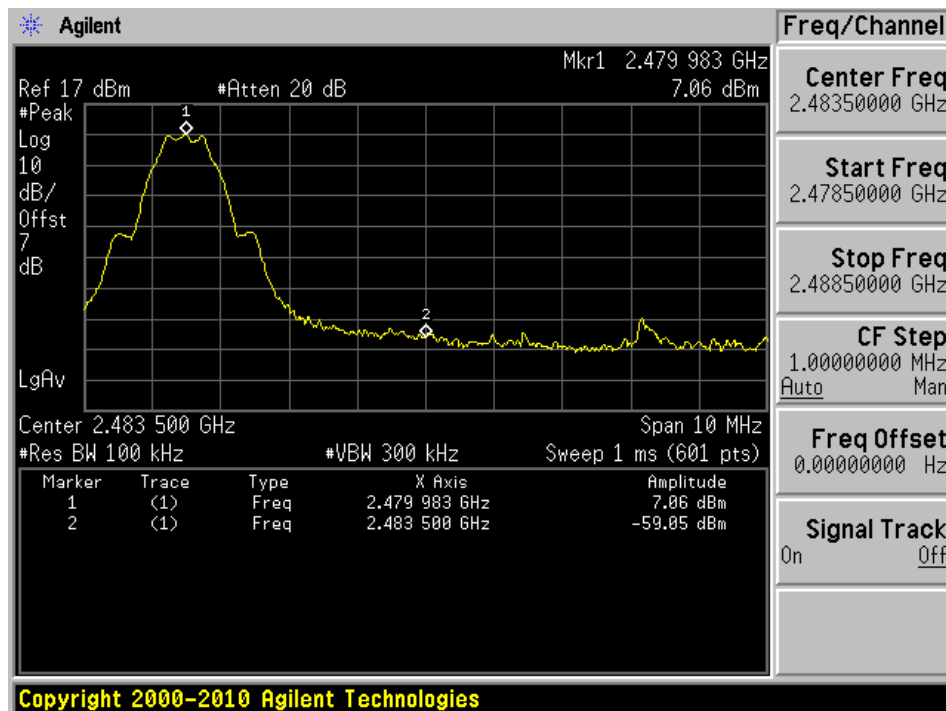
11.5 Test Results

Please refer to following pages for plots of band edge.

Low Band Edge



High Band Edge



12 FCC §15.247(e) & IC RSS-210 §A8.2 (b) – Power Spectral Density

12.1 Applicable Standards

According to FCC §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.

12.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission

12.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

12.4 Test Environmental Conditions

Temperature:	21° C
Relative Humidity:	45 %
ATM Pressure:	101.6 kPa

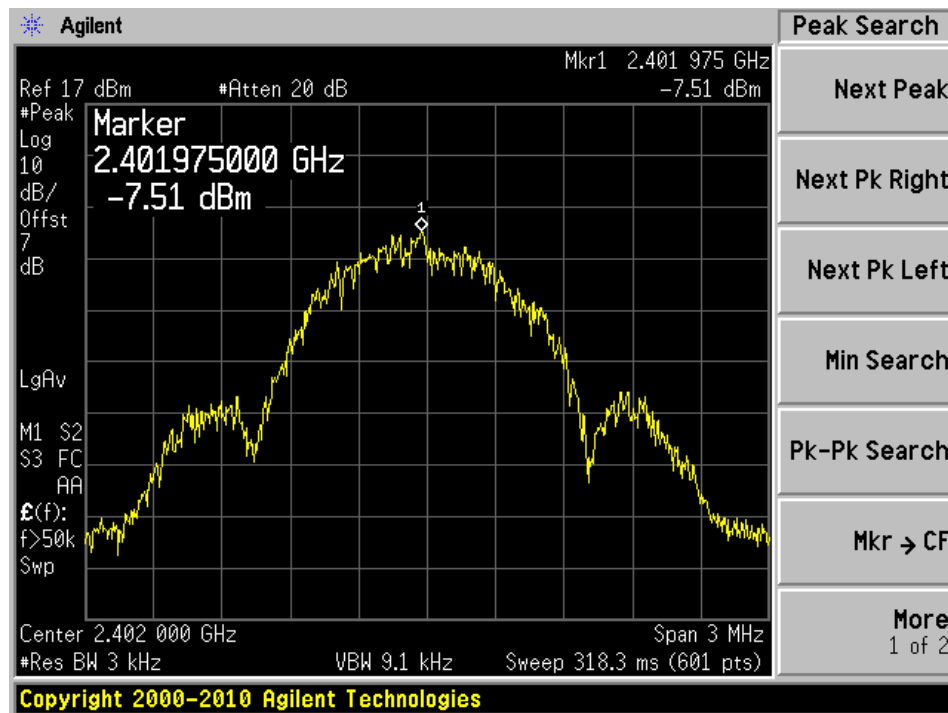
The testing was performed by Chen Ge on 2014-09-24 at RF site.

12.5 Test Results

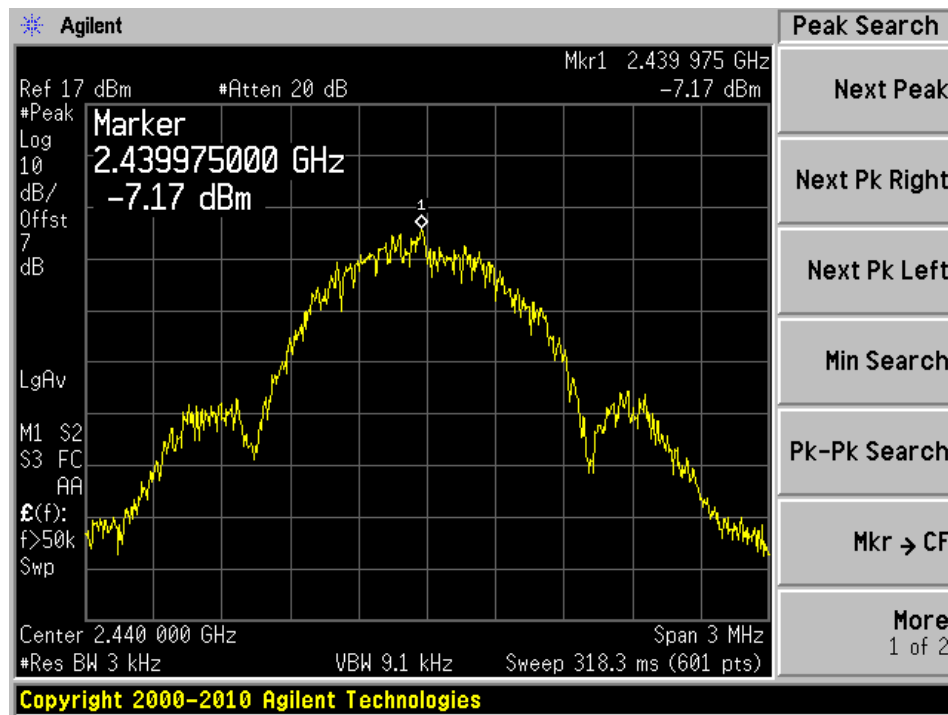
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-7.51	8	-15.51
Middle	2440	-7.17	8	-15.17
High	2480	-7.40	8	-14.40

Please refer to the following plots for detailed test results:

Low channel 2402 MHz



Middle channel 2440 MHz



High channel 2480 MHz

