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

TEST AND MEASUREMENT REPORT

For

Arts, Sciences et Technologies Infinition Inc.

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Trois-Rivières, Québec, Canada

FCC ID: PDG-LABRADAR
IC: 12550A-LABRADAR

Report Type:	**Product Type:**
Original Report	Radar, Velocity detector

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Report Number	R1410104-245 Rev A
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1410104-245	Original Report	2014-12-17
1	R1410104-245 Rev A	Revised Report	2015-01-13

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Arts, Sciences et Technologies Infinition Inc*. and their product FCC ID: PDG-LABRADAR, IC: 12550A-LABRADAR, Model: Labradar, or the "EUT" as referred to in this report. The EUT is radar; velocity detector operates in 24080-24168 MHz range.

1.2 Mechanical Description of EUT

The EUT measures approximately 290 mm (L) x 260 mm (W) x 60 mm (H) and weighs approximately 950 g.

The data gathered are from a typical production sample provided by the manufacturer with serial number: BACL-#3

1.3 Objective

This report is prepared on behalf of *Arts, Sciences et Technologies Infinition Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Part 15.245 rules and IC RSS-210 rules for Output Power, Antenna Requirements Spurious Emissions.

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.

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.

The following calculation follows the procedures as set forth in clause 7.2.3, ETSI TR 100 028-1 V1.4.1 (2001-12), the expression of Uncertainty in Radiated RF Testing is in accordance to ISO/IEC 17025 and TR 100 028-1 V1.4.1 (2001-12).

The expanded Measurement Uncertainty value having a confidence factor of 95%, is within a range of 5.48 dB. This means that the value of conducted RF carrier power test will be within +/- 2.74 dB of the measuring radiated emissions power versus the expected value.
The expected value is defined as the power at the antenna of the Transmitter under Test.

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 Luminares 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.

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

2.2 EUT Exercise Software

N/A

2.3 Special Equipment

N/A

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

N/A

2.6 EUT Internal Configuration Details

Manufacturer	Description	Type	Serial Number
Infinition	Main PCB Board	Labradar Main Controller V1.1	-
Infinition	RF PCB Board and Antenna	ASSY1000480 v1.1c	-

2.7 Power Supply and Line Filters

N/A

2.8 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	<1.0	Laptop	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC/IC Rules	Description of Test	Results
FCC §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 §15.209, §15.245(b) IC RSS-210 §7	Field strength of fundamental Field strength of harmonics	Compliant

4 FCC §2.1091 & IC RSS-102 – RF Exposure

4.1 Applicable Standard

According to FCC §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 field

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	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

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

Maximum peak output power at antenna input terminal (dBm):	4.84
Maximum peak output power at antenna input terminal (mW):	3.05
Prediction distance (cm):	20
Prediction frequency (MHz):	24080
Maximum Antenna Gain, typical (dBi):	22
Maximum Antenna Gain (numeric):	158.489
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.096101
Power density of prediction frequency at 20.0 cm (W/m^2):	0.96101
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	10

5 FCC §15.203 & IC RSS-Gen §7.1.2 – 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.

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.
Note: The power setting was controlled by manufacture with different antenna configuration. The power setting of the different antenna will be set with the corresponded value and no more than the level reported.

5.2 Antenna Description

The total Gain is 22dBi. The antenna is permanently attached to the PCB board. 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 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.

As per IC RSS-Gen §7.2.4 Conducted limits:

Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with abattery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The more stringent limit applies at the frequency range boundaries. The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network (LISN).

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 limits.

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

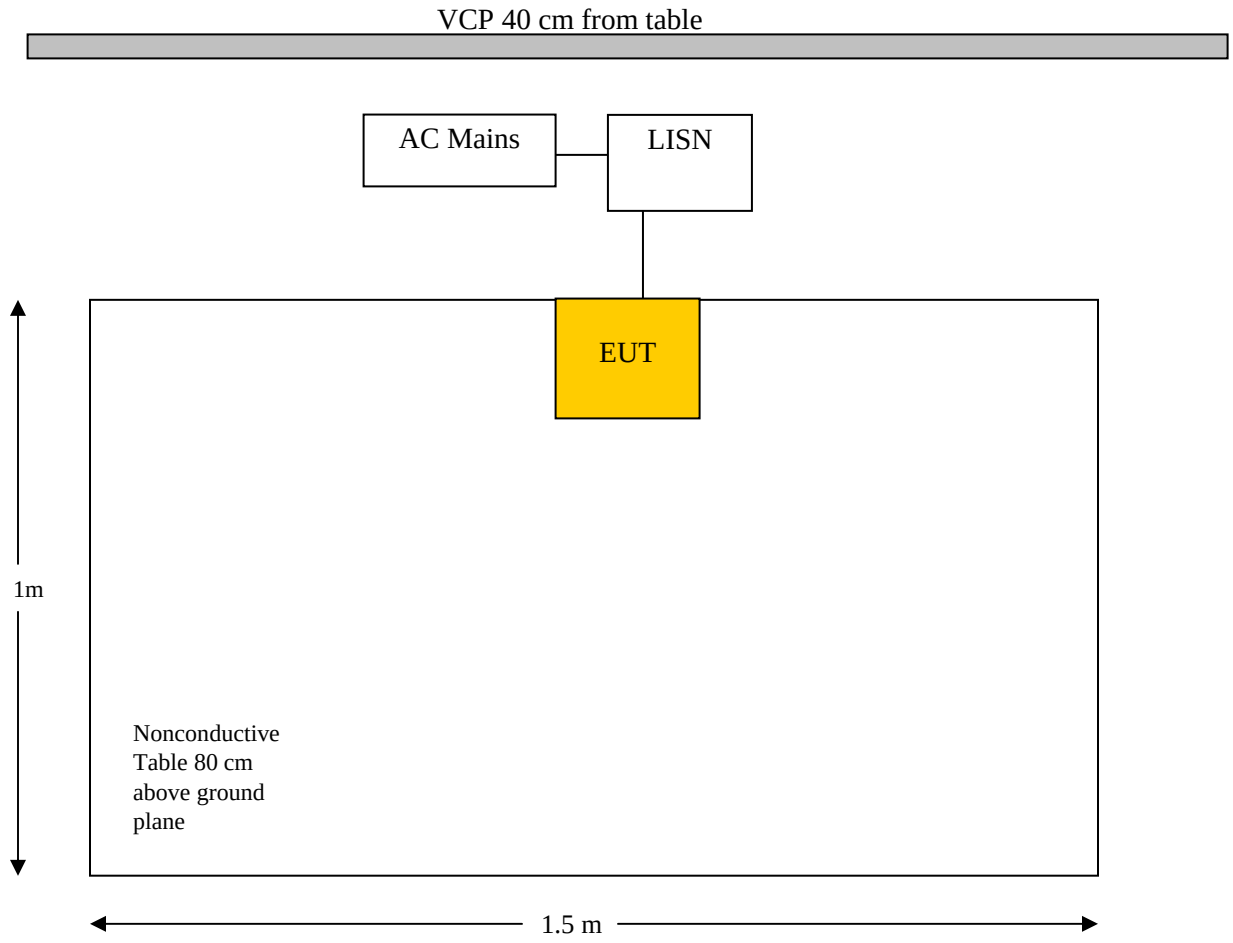
The POE power adapter of the EUT was connected with LISN which provided 120 V / 60 Hz AC power.

6.3 Test Procedure

Maximizing procedure was performed on the 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), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (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

6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-03-28	1 year
Solar Electronics	LISN	9252-50-R-24-N	511213	2014-07-14	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:	22-24º C
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

The testing was performed by Rui Zhou on 2014-11-07 in 5m chamber2.

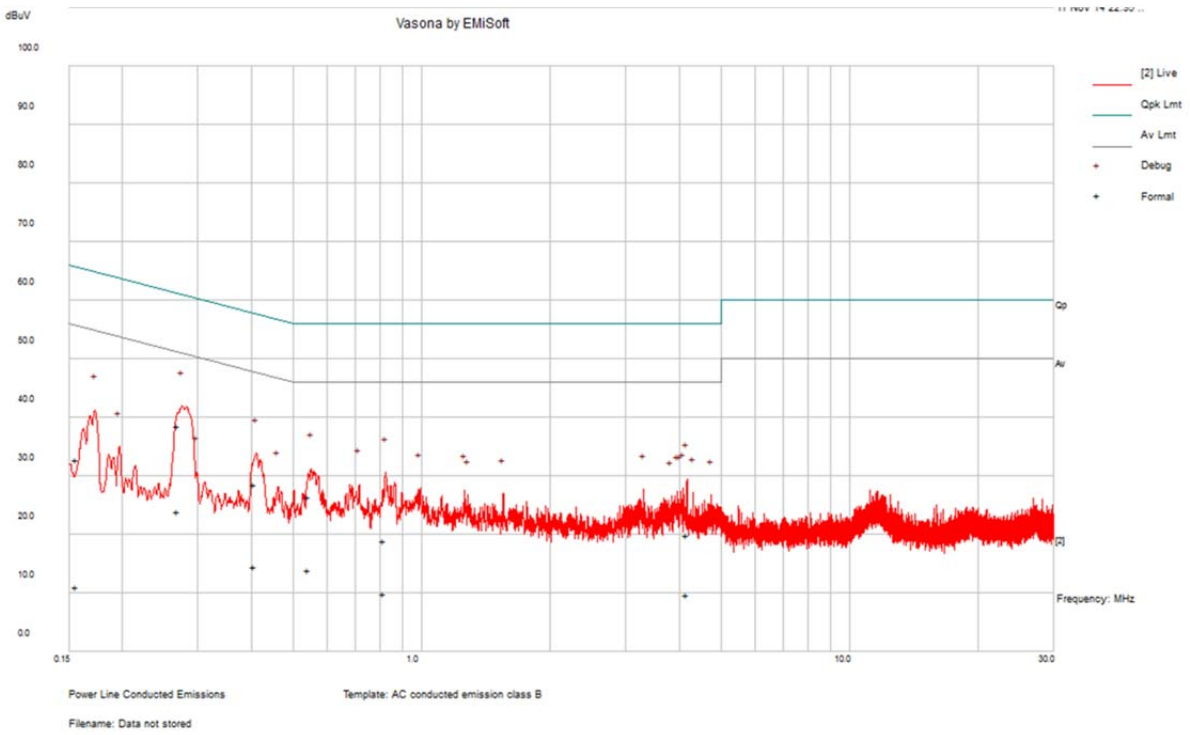
6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C and IC RSS-210 standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-22.57	0.26829	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

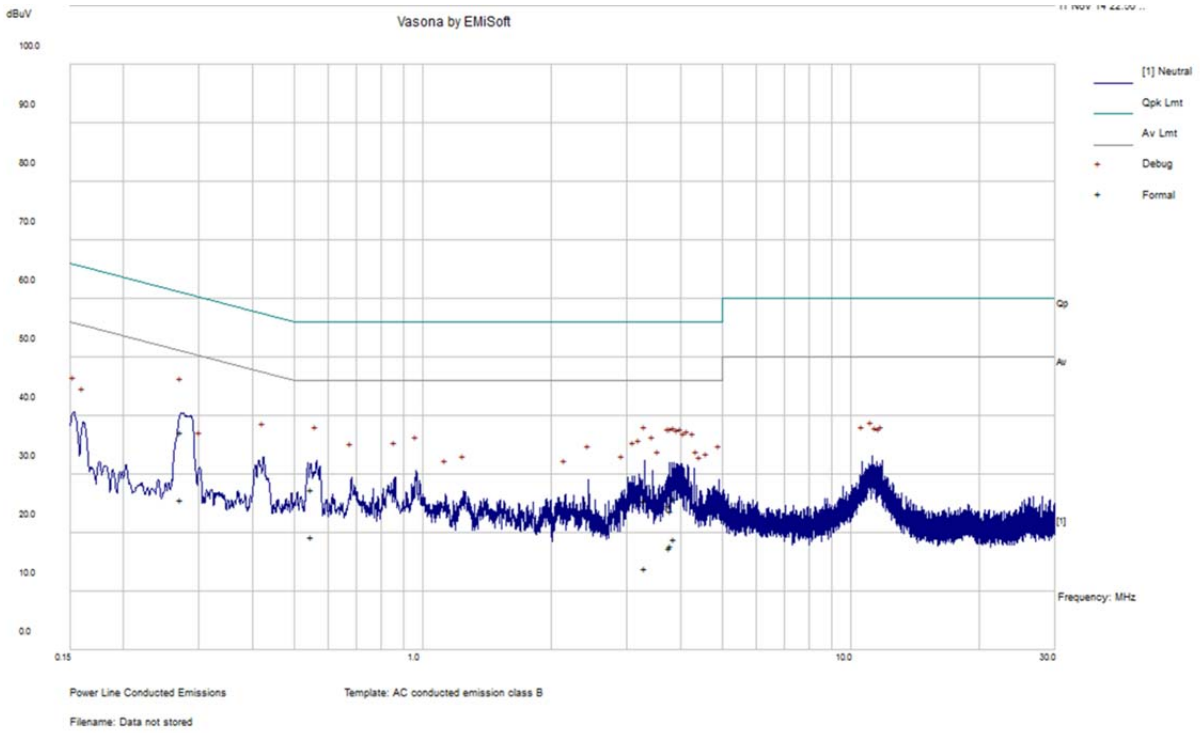
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.26829	38.6	Line	61.17	-22.57	QP
0.15558	32.74	Line	65.7	-32.96	QP
0.40505	28.68	Line	57.75	-29.06	QP
0.542063	26.46	Line	56	-29.54	QP
0.814772	19.03	Line	56	-36.97	QP
4.164182	19.88	Line	56	-36.12	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.26829	23.96	Line	51.17	-27.21	Ave.
0.15558	11.17	Line	55.7	-44.53	Ave.
0.40505	14.61	Line	47.75	-33.14	Ave.
0.542063	14.05	Line	46	-31.95	Ave.
0.814772	9.88	Line	46	-36.12	Ave.
4.164182	9.76	Line	46	-36.24	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.271556	37.29	Neutral	61.07	-23.78	QP
3.296902	25.59	Neutral	56	-30.41	QP
0.550625	27.46	Neutral	56	-28.54	QP
3.868943	25.91	Neutral	56	-30.09	QP
3.79852	23.78	Neutral	56	-32.22	QP
3.764951	24.74	Neutral	56	-31.26	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.271556	25.65	Neutral	51.07	-25.42	Ave.
3.296902	13.97	Neutral	46	-32.03	Ave.
0.550625	19.36	Neutral	46	-26.64	Ave.
3.868943	19.05	Neutral	46	-26.95	Ave.
3.79852	17.76	Neutral	46	-28.24	Ave.
3.764951	17.52	Neutral	46	-28.48	Ave.

7 FCC §15.209, §15.245(d) & IC RSS-210 §A7 – Field Strength of Fundamental and Harmonics

7.1 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) 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 §15.245 (b) and IC RSS-210 §A7, The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

As per IC RSS-210 7.2: Additionally, harmonic emissions falling into a restricted band of RSS-Gen and below 17.7 GHz shall meet the general field strength limits of RSS-Gen. Those falling into restricted bands above 17.7 GHz shall not exceed the following field strength limits measured at a distance of 3 metres: 25 mV/m for the second and third harmonics of field disturbance sensors operating in the 24075–24175 MHz band and for devices designed for use only within buildings or for intermittent use, such as to open building doors; 7.5 mV/m for all other devices.

7.2 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 15 Subpart C and IC RSS-210 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.

7.3 Test Procedure

The measurements are base 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

7.4 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:

Margin = Corrected Amplitude - Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2014-07-24	1 year
Hewlett Packard	Pre-amplifier 1-26.5 GHz	8447D	2944A06639	2014-04-26	1 year
Agilent	Spectrum Analyzer	E4446A	MY48250238	2014-10-24	1 year
Sunol Sciences	Horn Antenna	DRH-118	A052704	2014-03-28	1 year
Wisewave	Horn antenna (26-40GHz)	ARH-2823-02	10555-02	2013-09-20	3 years
Wisewave	Horn antenna (18-26GHz)	ARH-4223-02	10555-01	2012-08-09	3 years
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-05-28	1 year
Wisewave	Horn Antenna (40-60 GHz)	ARH-1923-02	11648-01	2015-01-09	1 year
OML	Mixer (40-60GHz)	M19HWD	U60313-1	2015-01-09	1 year
OML	Mixer with Horn Antenna (60-90 GHz)	M12HWD	E60120-1	2015-01-09	1 year
OML	Mixer with Horn Antenna (90-140 GHz)	M08HWD	F60313-1	2015-01-09	1 year

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

7.6 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

The testing was performed by Rui Zhou on 2015-01-10 in 5 m chamber 3.

7.7 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)**	**Mode, Channel**
-0.39	288.001	Horizontal	Low Channel

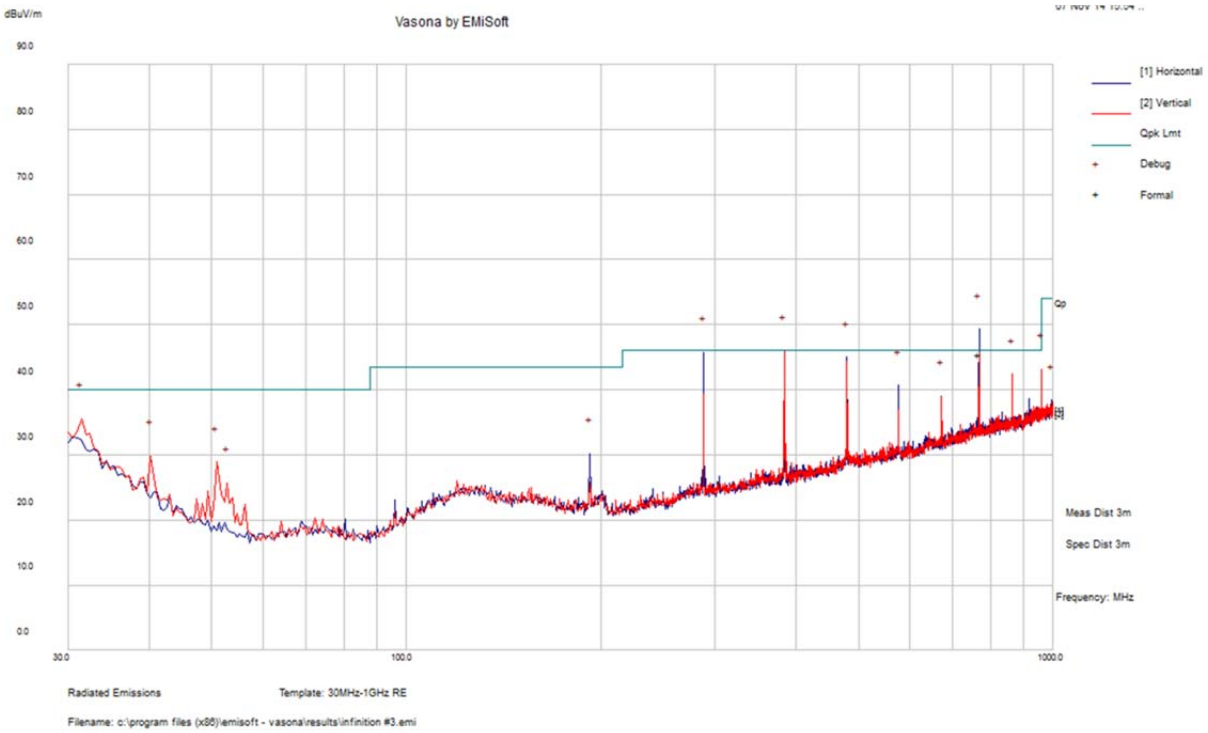
1–100 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-5.57	4525.4	Horizontal	Middle Channel

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

7.8 Radiated Emissions Test Results

1) 30 MHz – 1 GHz



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
288.001	45.61	101	H	306	46	-0.39
768.012	45.49	131	H	202	46	-0.51
383.99	45.3	110	V	313	46	-0.70
480.0093	44.67	187	H	154	46	-1.33

2) 1–40 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 24080 MHz, measured at 3 meters											
24080	51.07	0	120	V	35.2	9.83	N/A	96.1	128	-31.9	Peak
24080	77.01	349	120	H	35.2	9.83	N/A	122.04	128	-5.96	Peak
24080	50.28	0	120	V	35.2	9.83	N/A	95.31	128	-32.69	Ave
24080	76.78	349	120	H	35.2	9.83	N/A	121.81	128	-6.19	Ave
24000	46.8	0	120	V	35.2	9.91	0	91.91	108	-16.09	Peak
24000	47.1	349	120	H	35.2	9.91	0	92.21	108	-15.79	Peak
24000	34.77	0	120	V	35.2	9.91	0	79.88	88	-8.12	Ave
24000	35.02	349	120	H	35.2	9.91	0	80.13	88	-7.87	Ave
4515.04	50.29	0	100	V	31.9	2.38	33.87	50.7	74	-23.3	Peak
4515.04	50.58	0	100	H	31.9	2.38	33.87	50.99	74	-23.01	Peak
4515.04	45.63	0	100	V	31.9	2.38	33.87	46.04	54	-7.96	Ave
4515.04	46.86	0	100	H	31.9	2.38	33.87	47.27	54	-6.73	Ave
Middle Channel 24136 MHz, measured at 3 meters											
24136	50.87	12	120	V	35.2	9.83	N/A	95.9	128	-32.1	Peak
24136	75.11	342	120	H	35.2	9.83	N/A	120.14	128	-7.86	Peak
24136	50.02	12	120	V	35.2	9.83	N/A	95.05	128	-32.95	Ave
24136	74.45	342	120	H	35.2	9.83	N/A	119.48	128	-8.52	Ave
24000	46.75	20	120	V	35.2	9.91	0	91.86	108	-16.14	Peak
24000	47.23	342	120	H	35.2	9.91	0	92.34	108	-15.66	Peak
24000	34.68	20	120	V	35.2	9.91	0	79.79	88	-8.21	Ave
24000	35.11	324	120	H	35.2	9.91	0	80.22	88	-7.78	Ave
4525.4	50.02	0	100	V	31.9	2.38	33.87	50.43	74	-23.57	Peak
4525.4	50.87	0	100	H	31.9	2.38	33.87	51.28	74	-22.72	Peak
4525.4	47.98	0	100	V	31.9	2.38	33.87	48.39	54	-5.61	Ave
4525.4	48.02	0	100	H	31.9	2.38	33.87	48.43	54	-5.57	Ave
High Channel 24168 MHz, measured at 3 meters											
24168	50.95	8	120	V	34.01	9.83	N/A	94.79	128	-33.21	Peak
24168	75.23	351	120	H	34.01	9.83	N/A	119.07	128	-8.93	Peak
24168	50.26	8	120	V	34.01	9.83	N/A	94.1	128	-33.9	Ave
24168	74.81	351	120	H	34.01	9.83	N/A	118.65	128	-9.35	Ave
24000	46.33	0	120	V	36.2	9.91	0	92.44	108	-15.56	Peak
24000	46.89	351	120	H	36.2	9.91	0	93	108	-15	Peak
24000	33.67	0	120	V	36.2	9.91	0	79.78	88	-8.22	Ave
24000	34.52	351	120	H	36.2	9.91	0	80.63	88	-7.37	Ave
4531.2	49.63	0	100	V	31.9	2.38	34.27	49.64	74	-24.36	Peak
4531.2	51.46	0	100	H	31.9	2.38	34.27	51.47	74	-22.53	Peak
4531.2	44.38	0	100	V	31.9	2.38	34.27	44.39	54	-9.61	Ave
4531.2	48.31	0	100	H	31.9	2.38	34.27	48.32	54	-5.68	Ave

3) 40–100 GHz, Measured at 1 meter.

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 24080 MHz, measured at 1 meter											
48160	23.11	0	100	V	34.6	0	0	57.71	107	-49.29	Peak
48160	24.65	0	100	H	34.6	0	0	59.25	107	-47.75	Peak
48160	14.81	0	100	V	34.6	0	0	49.41	87	-37.59	Ave
48160	13.74	0	100	H	34.6	0	0	48.34	87	-38.66	Ave
72240	25.22	0	100	V	43.5	0	0	68.72	107	-38.28	Peak
72240	25.17	0	100	H	43.5	0	0	68.67	107	-38.33	Peak
72240	11.13	0	100	V	43.5	0	0	54.63	87	-32.37	Ave
72240	11.11	0	100	H	43.5	0	0	54.61	87	-32.39	Ave
96320	25.67	0	100	V	44.9	0	0	70.57	117	-46.43	Peak
96320	25.58	0	100	H	44.9	0	0	70.48	117	-46.52	Peak
96320	12.13	0	100	V	44.9	0	0	57.03	97	-39.97	Ave
96320	12.11	0	100	H	44.9	0	0	57.01	97	-39.99	Ave
Middle Channel 24136 MHz, measured at 1 meter											
48272	23.58	0	100	V	34.4	0	0	57.98	107	-49.02	Peak
48272	23.38	0	100	H	34.4	0	0	57.78	107	-49.22	Peak
48272	13.19	0	100	V	34.4	0	0	47.59	87	-39.41	Ave
48272	12.45	0	100	H	34.4	0	0	46.85	87	-40.15	Ave
72408	25.06	0	100	V	43.8	0	0	68.86	107	-38.14	Peak
72408	25.01	0	100	H	43.8	0	0	68.81	107	-38.19	Peak
72408	11.15	0	100	V	43.8	0	0	54.95	87	-32.05	Ave
72408	11.13	0	100	H	43.8	0	0	54.93	87	-32.07	Ave
96544	24.55	0	100	V	45.1	0	0	69.65	117	-47.35	Peak
96544	24.47	0	100	H	45.1	0	0	69.57	117	-47.43	Peak
96544	11.94	0	100	V	45.1	0	0	57.04	97	-39.96	Ave
96544	11.89	0	100	H	45.1	0	0	56.99	97	-40.01	Ave
High Channel 24168 MHz, measured at 1 meter											
48336	24.03	0	100	V	34.2	0	0	58.23	107	-48.77	Peak
48336	23.62	0	100	H	34.2	0	0	57.82	107	-49.18	Peak
48336	12.18	0	100	V	34.2	0	0	46.38	87	-40.62	Ave
48336	11.92	0	100	H	34.2	0	0	46.12	87	-40.88	Ave
72504	25.07	0	100	V	44.1	0	0	69.17	107	-37.83	Peak
72504	25.13	0	100	H	44.1	0	0	69.23	107	-37.77	Peak
72504	11.01	0	100	V	44.1	0	0	55.11	87	-31.89	Ave
72504	11.02	0	100	H	44.1	0	0	55.12	87	-31.88	Ave
96672	24.99	0	100	V	45.3	0	0	70.29	117	-46.71	Peak
96672	24.83	0	100	H	45.3	0	0	70.13	117	-46.87	Peak
96672	11.91	0	100	V	45.3	0	0	57.21	97	-39.79	Ave
96672	11.88	0	100	H	45.3	0	0	57.18	97	-39.82	Ave

8 FCC §15.215 & IC RSS-Gen §4.6 – Emission Bandwidth

8.1 Applicable Standards

FCC §15.215, IC RSS-Gen §4.6.

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 15 Subpart C and IC RSS-210 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.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2014-07-24	1 year
Hewlett Packard	Pre-amplifier 1-26.5 GHz	8447D	2944A06639	2014-04-26	1 year
Agilent	Spectrum Analyzer	E4446A	MY48250238	2014-10-24	1 year
Sunol Sciences	Horn Antenna	DRH-118	A052704	2014-03-28	1 year

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

8.4 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	52 %
ATM Pressure:	101.9 kPa

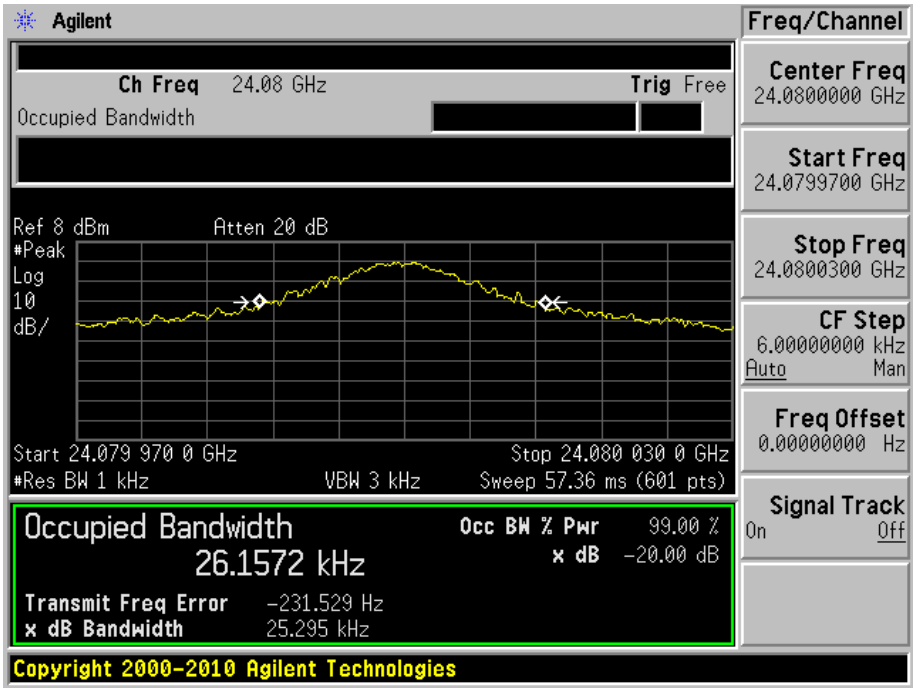
The testing was performed by Rui Zhou on 2015-01-10 in 5 m chamber 3.

8.5 Test Results

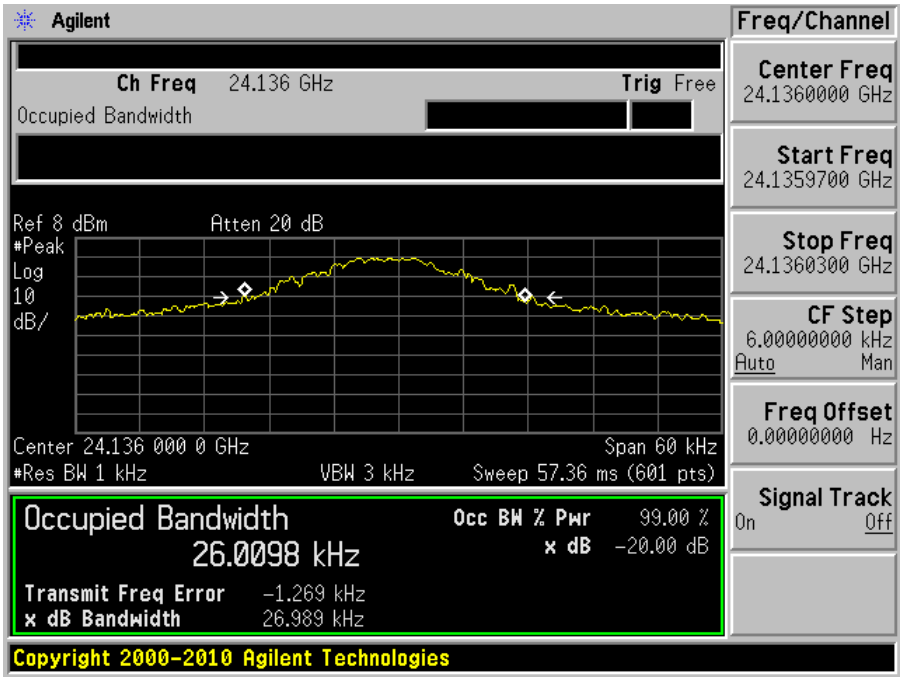
Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	20 dB Emission Bandwidth (kHz)
Low	24080	26.1572	25.295
Mid	24136	26.0098	26.989
High	24168	28.3985	23.314

Please refer to the following plots.

Low Channel



Middle Channel



High Channel