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

TEST AND MEASUREMENT REPORT

For

ShotTracker Inc.

9105 Flint, Overland Park, KS 66214, USA

FCC ID: 2AC4B-S4W1
IC: 12327A-S4W1

Report Type:	**Product Type:**
Original Report	ShotTracker BLE Wrist Sensor

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Report Number:	R1408251-247 Rev A
Report Date:	2014-11-04
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1408251-247	Original Report	2014-11-03
1	R1408251-247 Rev A	Revised Report	2014-11-04

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *ShotTracker Inc*. And their product model: S4W1, FCC ID: 2AC4B-S4W1, IC: 12327A-S4W1 or the "EUT" as referred to in this report. The EUT is a ShotTracker BLE Wrist Sensor.

1.2 Mechanical Description of EUT

The EUT measures approximately 5.3 cm (L) x 2.5 cm (W) x 0.8 cm (H) and weighs 12.5 g.

The test data gathered are from typical production sample, model number: R1408251 assigned by BACL.

1.3 Objective

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

The objective is to determine compliance with FCC Part 15.247 and IC RSS-210 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.

1.4 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 v03r01: 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.

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

There were no special accessories were 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

N/A

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
ShotTracker Inc.	Main board	WRIST V3 Rev A	-

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	N/A[1]
FCC §15.247 (d) IC RSS-210 §A8.5	Spurious Emissions at Antenna Port	N/A[2]
FCC §15.205, §15.209, §15.247 (d) IC RSS-210 §A8.5, §2.2	Radiated Spurious Emissions Including Restricted Bands	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

N/A[1]: The device is only for battery powered.
N/A[2]: The device has no antenna port; all tests are performed by radiated method.

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

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):	7.11
Maximum peak output power at antenna input terminal (mW):	5.14
Prediction distance (cm):	20
Prediction frequency (MHz):	2402
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1.0
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.001
Power density of prediction frequency at 20.0 cm (W/m^2):	0.01
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

The device is compliant with the requirement MPE limit for uncontrolled exposure.

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

Frequency	Antenna Type	Antenna Gain (dBi)
2.4 GHz	Integrated	0

5.3 Result

The antenna is with less 6 dBi gain; therefore, it complies with the antenna requirement.

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

6.1 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 §15.247 (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.

6.2 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 limits.

6.3 Test Procedure

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

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

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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

6.4 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

6.5 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	A020106-2	2014-08-15	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2014-06-09	1 year
WiseWave	Horn Antenna	ARH-4223-02	10555-01	2012-08-09	3 Years
Agilent	Pre-amplifier	8449B	3008A01978	2014-02-04	1 year
Agilent	Spectrum Analyzer	E4440A	US42221851	2014-02-28	1 year
EMCO	Horn Antenna	3115	9511-4627	2013-10-17	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-03-22	1 year

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

6.6 Test Environmental Conditions

Temperature:	20-24° C
Relative Humidity:	41-45 %
ATM Pressure:	101-102 kPa

The testing was performed by Chen Ge on 2014-08-27 to 2014-08-29 at 5m chamber 3.

6.7 Summary of Test Results

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

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-20.95	42.79775	Vertical	Low Channel

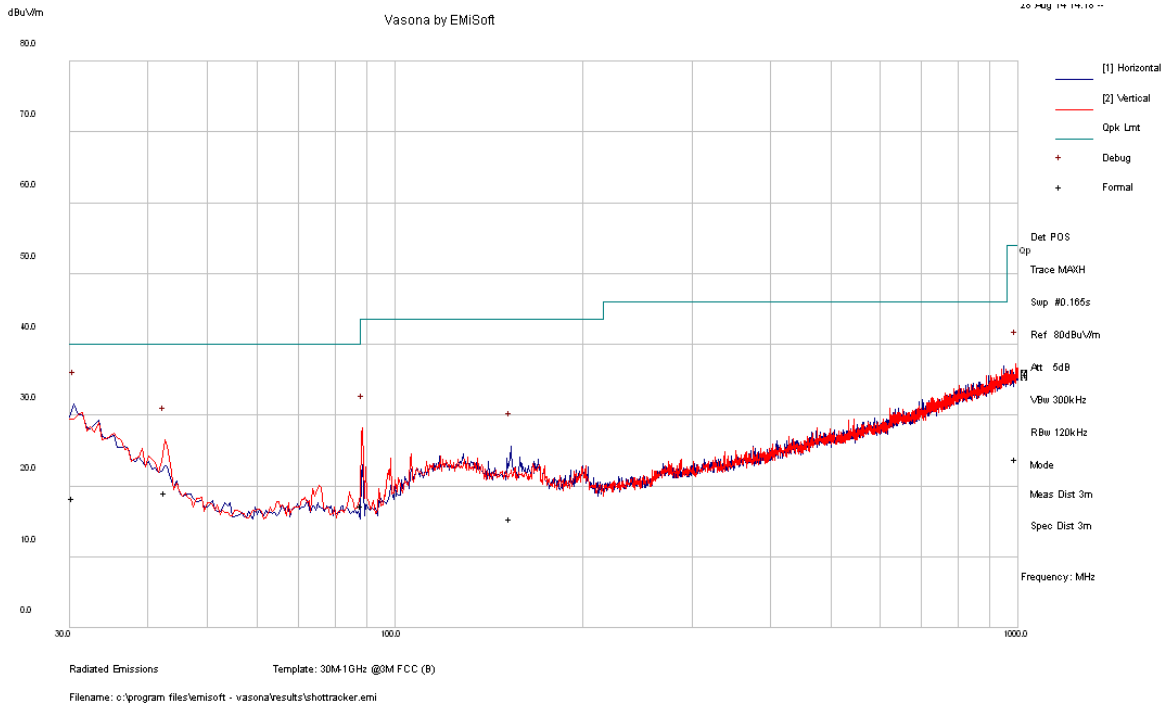
1 – 25 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-2.253	4804	Horizontal	Low Channel

Please refer to the following table for specific test result details

6.8 Radiated Emissions Test Data and Plots

1) 30-1000 MHz, measured at 3 meters distance Low Channel, worst case.



Frequency (MHz)	Corrected Amplitude (dBuV)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBuV)	Margin (dB)	Detector (PK/QP/Ave)
30.41575	18.26	159	H	298	40	-21.74	QP
42.79775	19.05	100	V	278	40	-20.95	QP
88.5115	17.28	301	V	16	43.5	-26.22	QP
992.0533	23.82	298	V	303	54	-30.18	QP
153.3108	15.39	228	H	187	43.5	-28.11	QP

2) 1 – 25 GHz, measured at 3 meters distance

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	60.12	154	110	V	28.956	3.42	0	92.496	-	-	Peak
2402	67.28	96	100	H	28.956	3.42	0	99.656	-	-	Peak
2402	47.9	154	110	V	28.956	3.42	0	80.276	-	-	Ave
2402	52.69	96	100	H	28.956	3.42	0	85.066	-	-	Ave
2390	25.01	0	100	V	28.956	3.42	0	57.386	74	-16.614	Peak
2390	24.66	0	100	H	28.956	3.42	0	57.036	74	-16.964	Peak
2390	12.22	0	100	V	28.956	3.42	0	44.596	54	-9.404	Ave
2390	12.29	0	100	H	28.956	3.42	0	44.666	54	-9.334	Ave
4804	57.81	179	100	V	33.097	5.36	34.29	61.977	74	-12.023	Peak
4804	62.05	313	100	H	33.097	5.36	34.29	66.217	74	-7.783	Peak
4804	44.21	179	100	V	33.097	5.36	34.29	48.377	54	-5.623	Ave
4804	47.58	313	100	H	33.097	5.36	34.29	51.747	54	-2.253	Ave
7206	46.74	0	100	V	35.928	6.7	34.39	54.978	72.496	-17.518	Peak
7206	46.69	0	100	H	35.928	6.7	34.39	54.928	79.656	-24.728	Peak
7206	31.45	0	100	V	35.928	6.7	34.39	39.688	60.276	-20.588	Ave
7206	31.32	0	100	H	35.928	6.7	34.39	39.558	65.066	-25.508	Ave
9608	46.82	0	100	V	37.954	8.33	34.9	58.204	72.496	-14.292	Peak
9608	46.27	0	100	H	37.954	8.33	34.9	57.654	79.656	-22.002	Peak
9608	31.73	0	100	V	37.954	8.33	34.9	43.114	60.276	-17.162	Ave
9608	31.92	0	100	H	37.954	8.33	34.9	43.304	65.066	-21.762	Ave
Middle Channel 2440 MHz, measured at 3 meters											
2440	61.28	100	100	V	28.956	3.42	0	93.656	-	-	Peak
2440	66.2	314	121	H	28.956	3.42	0	98.576	-	-	Peak
2440	46.25	100	100	V	28.956	3.42	0	78.626	-	-	Ave
2440	50.1	314	121	H	28.956	3.42	0	82.476	-	-	Ave
4880	56.46	60	100	V	33.327	5.36	34.29	60.857	74	-13.143	Peak
4880	59.01	312	100	H	33.327	5.36	34.29	63.407	74	-10.593	Peak
4880	41.29	60	100	V	33.327	5.36	34.29	45.687	54	-8.313	Ave
4880	44.08	312	100	H	33.327	5.36	34.29	48.477	54	-5.523	Ave
7320	46.71	0	100	V	36.369	6.7	34.39	55.389	74	-18.611	Peak
7320	46.58	0	100	H	36.369	6.7	34.39	55.259	74	-18.741	Peak
7320	31.21	0	100	V	36.369	6.7	34.39	39.889	54	-14.111	Ave
7320	31.54	0	100	H	36.369	6.7	34.39	40.219	54	-13.781	Ave
9760	50.24	75	100	V	38.087	8.33	34.9	61.757	73.656	-11.899	Peak
9760	49.19	68	100	H	38.087	8.33	34.9	60.707	78.576	-17.869	Peak
9760	35.51	75	100	V	38.087	8.33	34.9	47.027	58.626	-11.599	Ave
9760	34.87	68	100	H	38.087	8.33	34.9	46.387	62.476	-16.089	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	58.48	272	100	V	29.155	3.42	0	91.055	-	-	Peak
2480	64.29	315	111	H	29.155	3.42	0	96.865	-	-	Peak
2480	44.23	272	100	V	29.155	3.42	0	76.805	-	-	Ave
2480	48.79	315	111	H	29.155	3.42	0	81.365	-	-	Ave
2483.5	27.07	270	100	V	29.155	3.42	0	59.645	74	-14.355	Peak
2483.5	31.25	312	100	H	29.155	3.42	0	63.825	74	-10.175	Peak
2483.5	12.45	270	100	V	29.155	3.42	0	45.025	54	-8.975	Ave
2483.5	12.31	312	100	H	29.155	3.42	0	44.885	54	-9.115	Ave
4960	53.61	201	100	V	33.327	5.36	34.29	58.007	74	-15.993	Peak
4960	55.41	79	100	H	33.327	5.36	34.29	59.807	74	-14.193	Peak
4960	40.68	201	100	V	33.327	5.36	34.29	45.077	54	-8.923	Ave
4960	43.57	79	100	H	33.327	5.36	34.29	47.967	54	-6.033	Ave
7440	47.36	0	100	V	36.565	6.7	34.39	56.235	74	-17.765	Peak
7440	47.95	0	100	H	36.565	6.7	34.39	56.825	74	-17.175	Peak
7440	31.61	0	100	V	36.565	6.7	34.39	40.485	54	-13.515	Ave
7440	32.08	0	100	H	36.565	6.7	34.39	40.955	54	-13.045	Ave
9920	53.95	65	100	V	38.287	8.33	34.9	65.667	71.055	-5.388	Peak
9920	54.37	125	100	H	38.287	8.33	34.9	66.087	76.865	-10.778	Peak
9920	38.67	65	100	V	38.287	8.33	34.9	50.387	56.805	-6.418	Ave
9920	37.87	125	100	H	38.287	8.33	34.9	49.587	61.365	-11.778	Ave

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

7.1 Applicable Standards

According to FCC §15.247(a)(2) and IC 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

7.2 Measurement Procedure

The measurements are base 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

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2014-02-28	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
EMCO	Horn Antenna	3115	9511-4627	2013-10-17	1 year

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

7.4 Test Environmental Conditions

Temperature:	20-24 °C
Relative Humidity:	41-45 %
ATM Pressure:	101-102 kPa

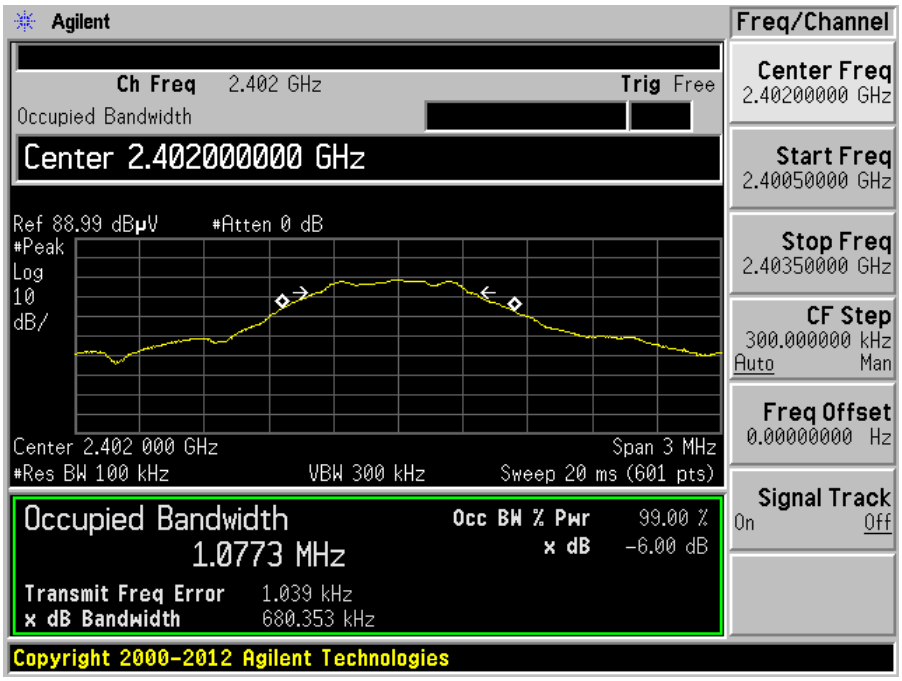
The testing was performed by Chen Ge on 2014-08-27 to 2014-08-29 at 5m chamber 3.

7.5 Test Results

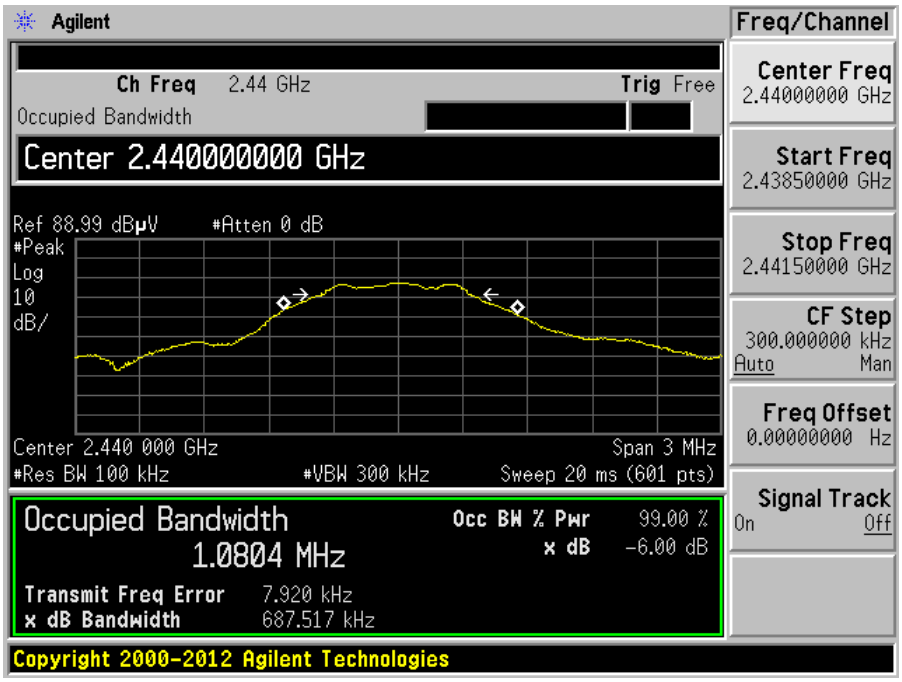
Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (MHz)	6 dB OBW Limit (MHz)	Results
Low	2402	680.353	1.0773	> 0.5	Compliant
Middle	2440	687.517	1.0804	> 0.5	Compliant
High	2480	686.291	1.0497	> 0.5	Compliant

Please refer to the following plots for detailed test results

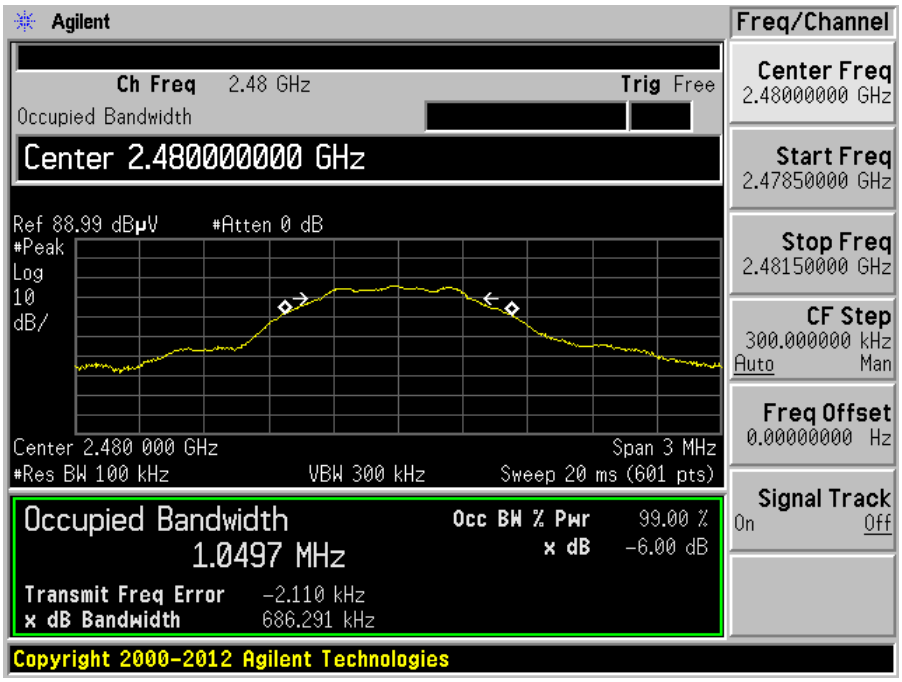
Low channel: 2402 MHz



Middle channel: 2440 MHz



High channel: 2480 MHz



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

8.1 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.

8.2 Measurement Procedure

The measurements are base 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, and ANSI C63.10 -2009.

8.3 Corrected Amplitude

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)

8.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2014-02-28	1 year
EMCO	Horn Antenna	3115	9511-4627	2013-10-17	1 Year
Sunol Sciences	System Controller	SC104V	113005-1	N/A	N/A

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

8.5 Test Environmental Conditions

Temperature:	20-24 °C
Relative Humidity:	41-45 %
ATM Pressure:	101-102 kPa

The testing was performed by Chen Ge on 2014-08-27 to 2014-08-29 at 5m chamber 3.

8.6 Test Results

Frequency (MHz)	Radiated Reading (dBµV/m) @ 3m	Antenna Polarity (H/V)	Antenna Factor (dB/m)	Cable Loss (dB)	Cord. Peak Radiated (dBµV/m) @ 3m	Antenna Gain (dBi)	Cord. Peak Output Power EIRP (dBm)	Conducted Peak Output Power (dBm)	FCC/IC Limit (dBm)	Margin (dB)
2402	59.59	V	28.956	5.72	94.266	0	-0.934	-0.934	30	-30.934
2402	67.64	H	28.956	5.72	102.316	0	7.116	7.116	30	-22.884
2440	57.97	V	28.956	5.72	92.646	0	-2.554	-2.554	30	-32.554
2440	66.36	H	28.956	5.72	101.036	0	5.836	5.836	30	-24.164
2480	56.84	V	29.155	5.72	91.715	0	-3.485	-3.485	30	-33.485
2480	64.84	H	29.155	5.72	99.715	0	4.515	4.515	30	-25.485

Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

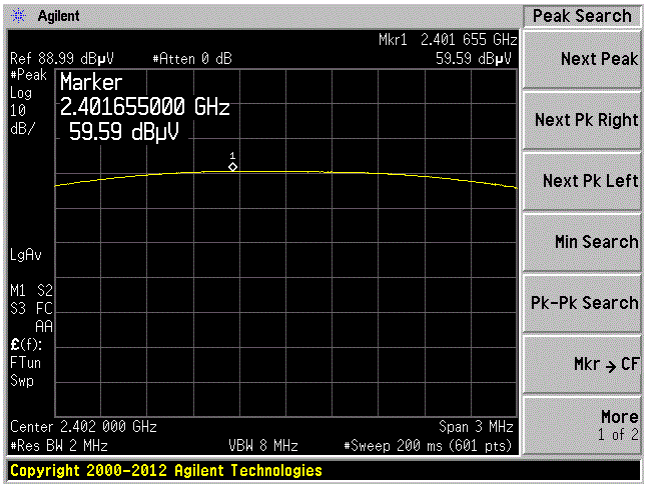
$E = EIRP – 20\log D + 104.8$

Where:

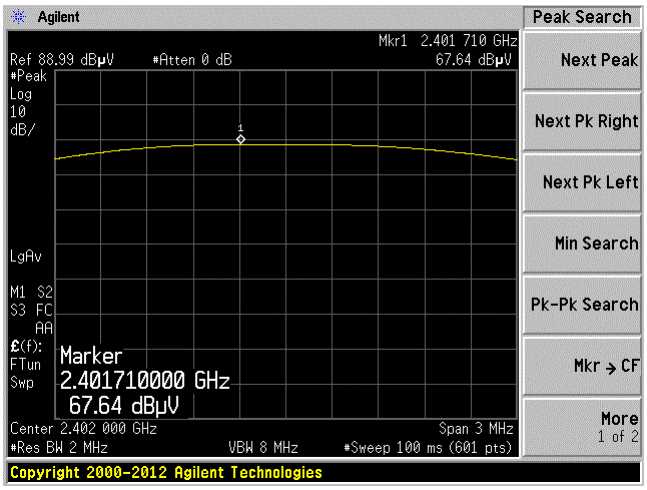
E = electric field strength in dBµV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.

Low channel: 2402 MHz

Vertical Polarity

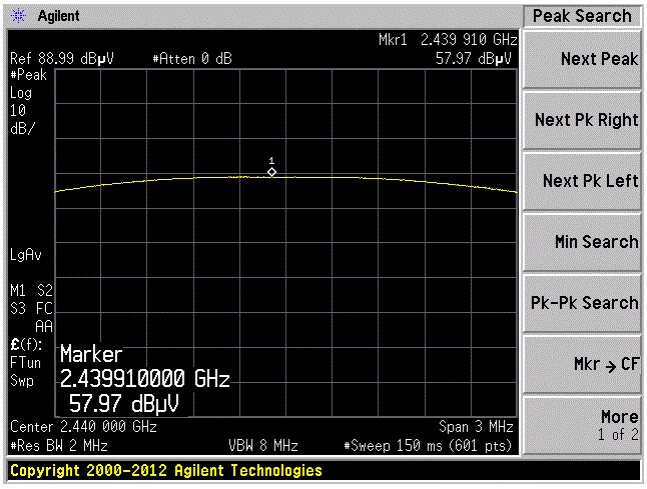


Horizontal Polarity

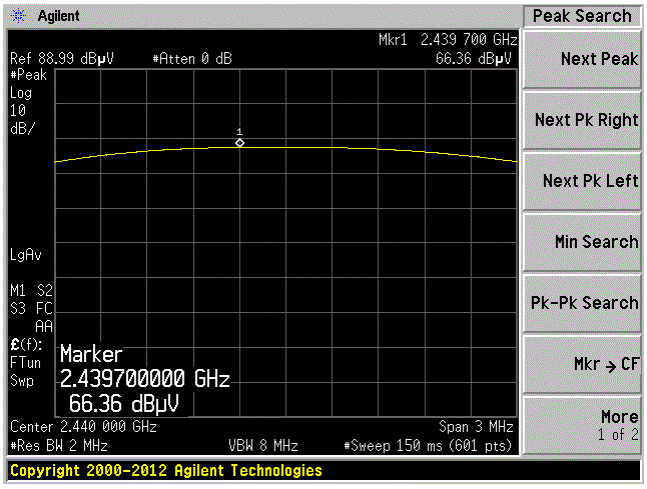


Middle channel: 2440 MHz

Vertical Polarity

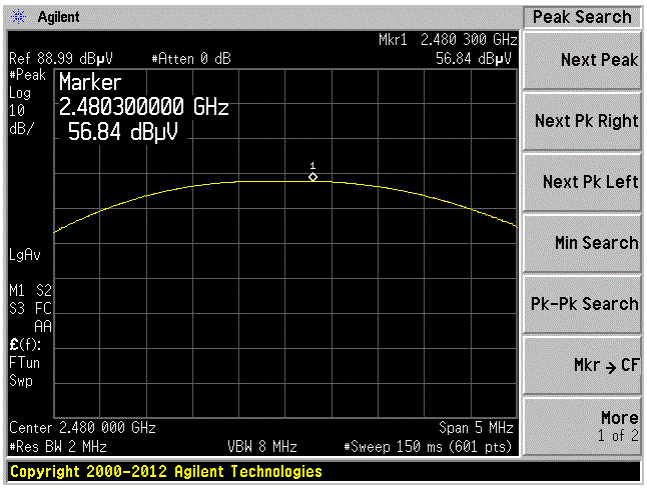


Horizontal Polarity

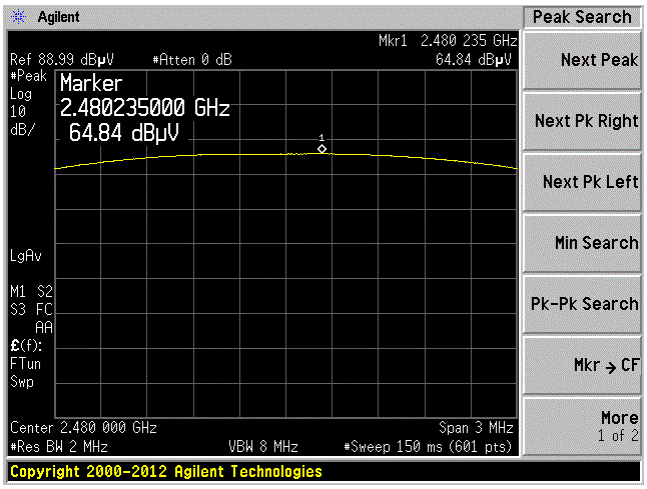


High channel: 2480 MHz

Vertical Polarity



Horizontal Polarity



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

9.1 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)).

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.

9.2 Measurement Procedure

The measurements are base 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

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2014-02-28	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
EMCO	Horn Antenna	3115	9511-4627	2013-10-17	1 year

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

9.4 Test Environmental Conditions

Temperature:	20-24 °C
Relative Humidity:	41-45 %
ATM Pressure:	101-102 kPa

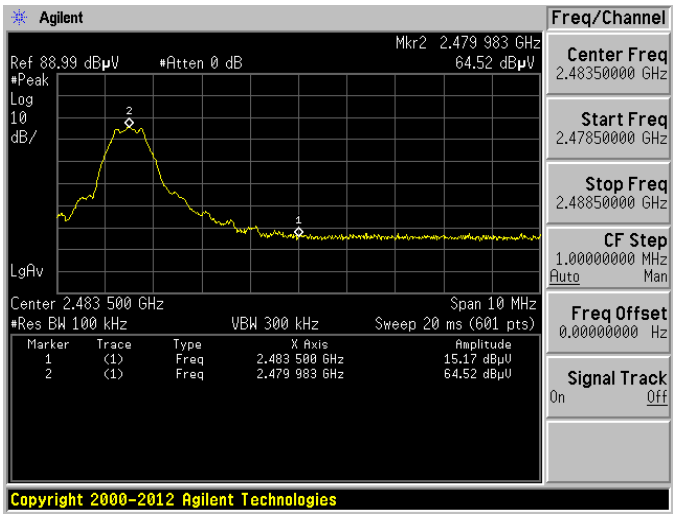
The testing was performed by Chen Ge on 2014-08-27 to 2014-08-29 at 5m chamber 3.

9.5 Test Results

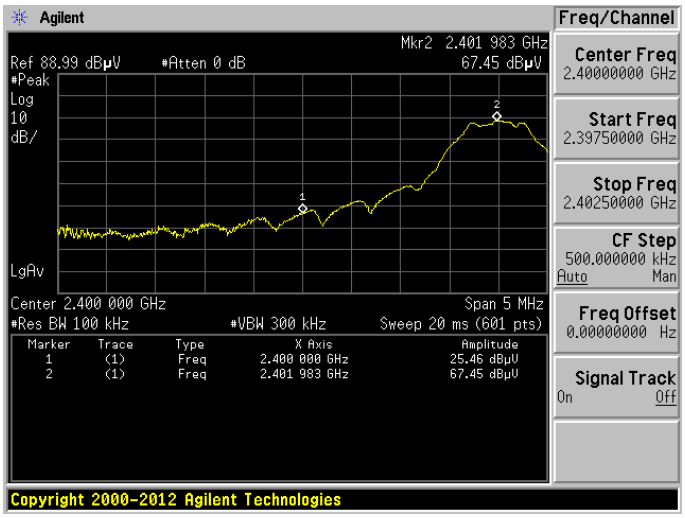
Please refer to following pages for plots of band edge.

Channel	Delta (dBc)	Limit
Low Channel, 2402 MHz	41.99	> 20dBc
High Channel, 2480 MHz	49.35	> 20dBc

Low Band Edge



High Band Edge



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

10.1 Applicable Standard

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.

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 10: Maximum power spectral density level in the fundamental emission, and ANSI C63.10 -2009.

10.3 Corrected Amplitude

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)

10.4 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US45303156	2013-08-22	2 Years
EMCO	Horn Antenna	3115	9511-4627	2013-10-17	1 Year
Sunol Sciences	System Controller	SC104V	113005-1	N/A	N/A

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

10.5 Test Environmental Conditions

Temperature:	20-24 °C
Relative Humidity:	41-45 %
ATM Pressure:	101-102 kPa

The testing was performed by Chen Ge on 2014-08-27 to 2014-08-29 at 5m chamber 3.

10.6 Test Results

Frequency (MHz)	Radiated Reading (dBµV/m) @ 3m	Antenna Polarity (H/V)	Antenna Factor (dB/m)	Cable Loss (dB)	Cord. Peak Radiated (dBµV/m) @ 3m	Antenna Gain (dBi)	Cord. PSD EIRP (dBm)	Cord. Peak PSD (dBm))	FCC/IC Limit (dBm)	Margin (dB)
2402	44.62	V	28.956	5.72	79.296	0	-15.904	-15.904	8	-23.904
2402	54.06	H	28.956	5.72	88.736	0	-6.464	-6.464	8	-14.464
2440	43.60	V	28.956	5.72	78.276	0	-16.924	-16.924	8	-24.924
2440	51.44	H	28.956	5.72	86.116	0	-9.084	-9.084	8	-17.084
2480	42.21	V	29.155	5.72	77.085	0	-18.115	-18.115	8	-26.115
2480	51.58	H	29.155	5.72	86.455	0	-8.745	-8.745	8	-16.745

The corrected Peak PSD was calculated from the formula:

E = EIRP – 20log D + 104.8

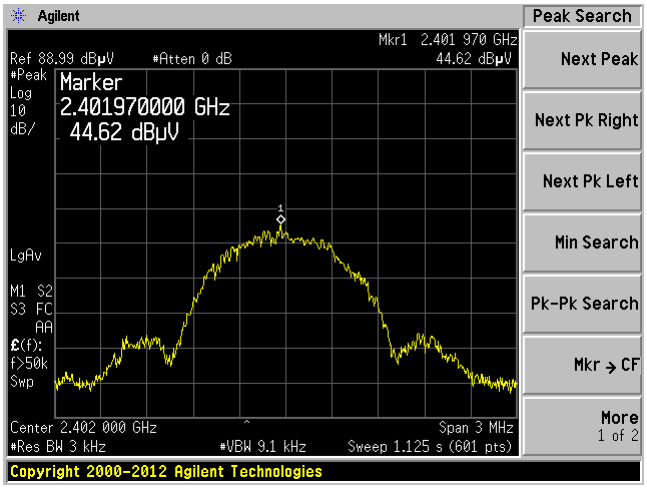
Where:

E = electric field strength in dBµV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.

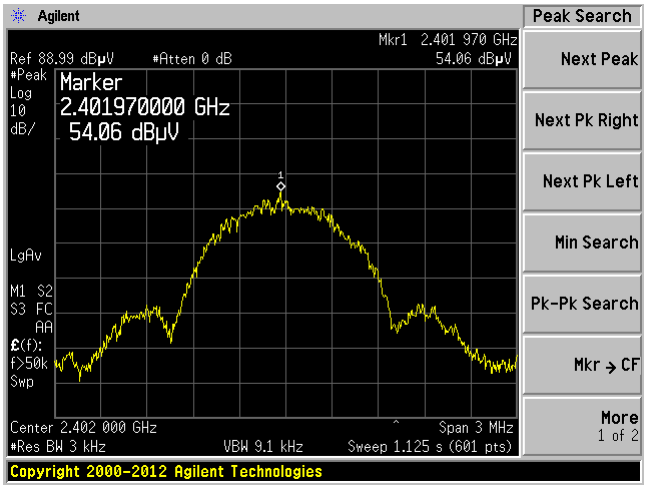
Please refer to the following plots for detailed test results:

Low channel: 2402 MHz

Vertical Polarity

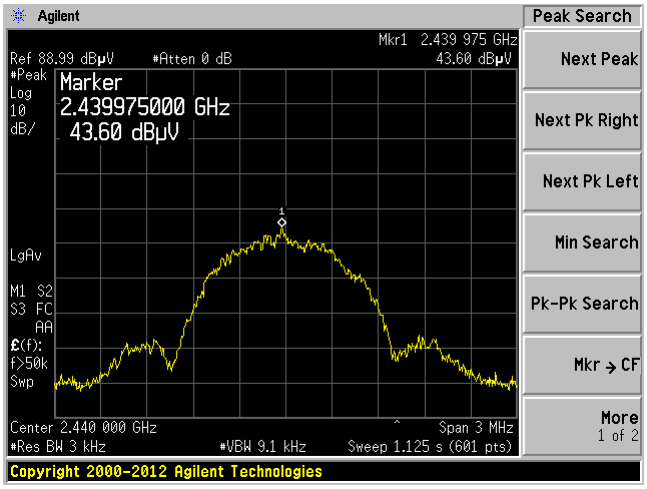


Horizontal Polarity

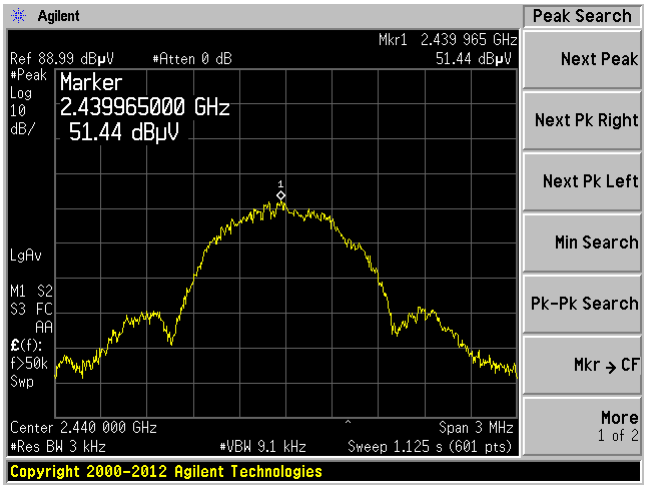


Middle channel: 2440 MHz

Vertical Polarity

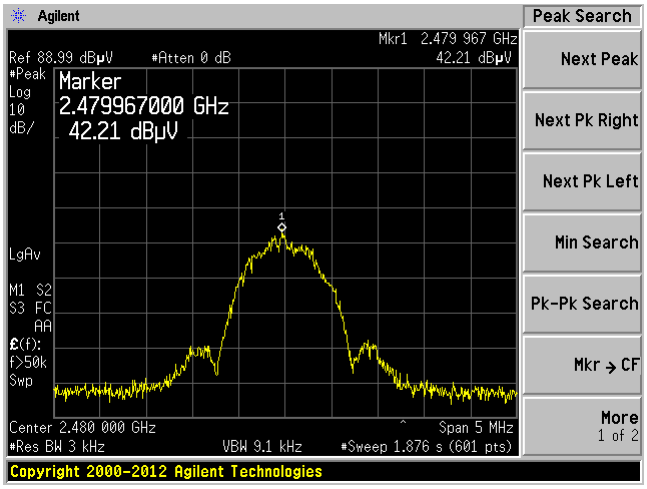


Horizontal Polarity



High channel: 2480 MHz

Vertical Polarity



Horizontal Polarity