FCC PART 15.231

TEST AND MEASUREMENT REPORT

For

Cao Gadgets LLC

2 Welbury, Aliso Viejo, CA 92656, USA

FCC ID: ZGW06

Report Type: Original Report	**Product Type:** Wireless Sensor Tag	
Prepared By	Cipher Chu	
Report Number	R1311276	
Report Date	2014-01-31	
Reviewed By	Bo Li Test Engineer	
	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164	

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1311276	Original Report	2014-01-31

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Cao Gadgets LLC*, and their product FCC ID: *ZGW06 Model number: ZGW06* or the "EUT" as referred on this report is a transmitter operating from 431.02MHz to 439.34MHz.

1.2 Mechanical Description of EUT

The "EUT" measures approximately *10.75 cm (L) x 3.84cm (W) x 1.0cm (H)*, and weighs approximately *14*g.

The test data gathered are from typical production sample, serial number: 4BMVMO provided by BACL.

1.3 Objective

This type approval report is prepared on behalf of *Cao Gadgets LLC*, in accordance with Part 2, Subpart J and Part 15, Subparts A, B and C of the Federal Communication Commissions' rules.

The objective is to determine compliance with FCC rules for section 15.203, 15.205, 15.209 and 15.231.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, 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.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

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

1.7 Test Facility

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 host system 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

The EUT is in normal operation mode during the testing.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Remote Support Equipment

Manufacturer	Description	Model	Serial Number
Cao Gadgets LLC	Tag Manager	ZGW04	6B688F04A300

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Cao Gadgets LLC	PCB	ZGW06	-

2.6 Power Supply List and Details

N/A

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.231 (a)	Deactivation Time	Compliant
§15.205, §15.209, §15.231 (b)	Radiated Emissions	Compliant
§15.231 (c)	Emission Bandwidth	Compliant

N/A: EUT is battery powered.

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

4.1 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.

4.2 Antenna List

This antenna directly prints on the PCB board, it is non-replaceable, and it complies with the antenna requirement. Please refer to the internal photos.

5 FCC §15.231 (a) – Deactivation Time

5.1 Applicable Standard

According to FCC §15.231 (a) (2), A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument via radiated Biconi-Log antenna. Then set it to any one convenient frequency within its operating range.
3. Set span to zero and record.
4. Repeat above procedures until all frequencies measured were complete.

5.3 Test Equipment List and Details

Manufacturers	Description	Model No.	Serial No.	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Sunol Sciences	Biconi-Log Antenna	JB3	A020106-2	2013-08-15	1 year

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

5.4 Test Environmental Conditions

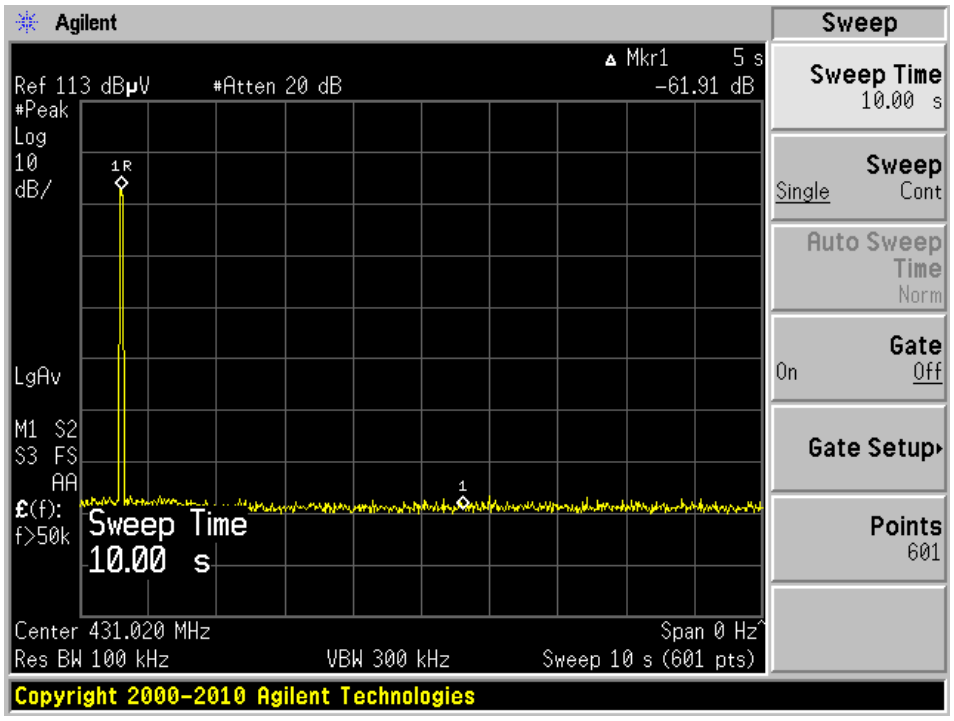
Temperature:	21° C
Relative Humidity:	59 %
ATM Pressure:	101.1 kPa

The testing was performed by Cipher Chu on 2014-01-10 at 5m chamber 3.

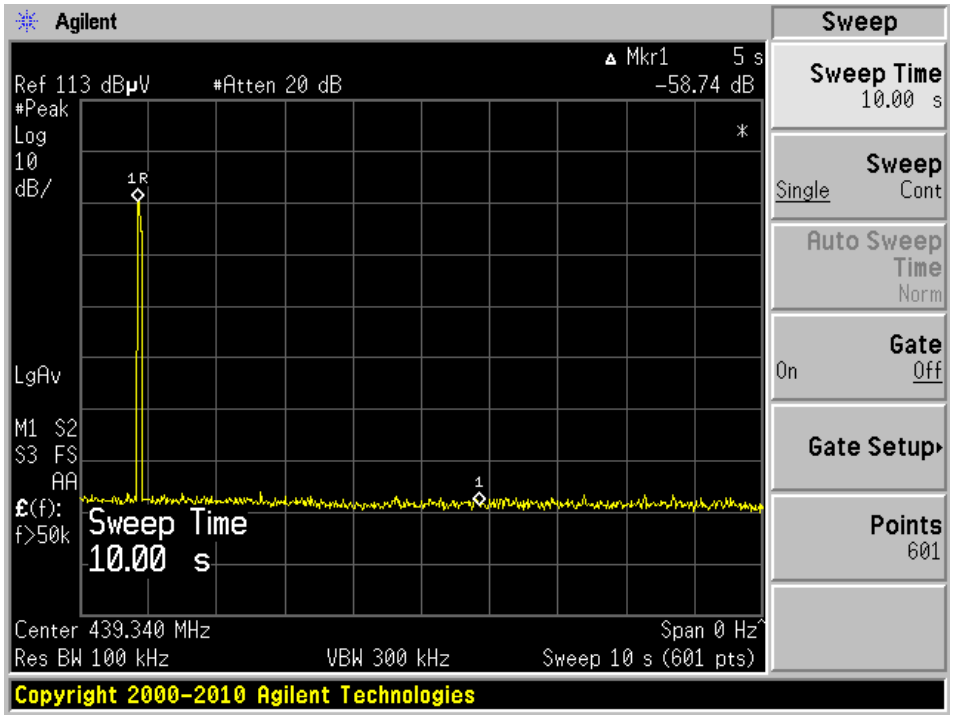
5.5 Test Results

Please refer to the following plots for detailed test results

431.02 MHz



439.34 MHz



6 FCC §15.205, §15.209 & §15.231 (b) – 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): 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	3332 – 3339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3345.8 – 3358	23.6 – 24.0
12.29 – 12.293	240 – 285	3600 – 4400	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 §15.231(e), In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70 MHz	1000	100
70-130 MHz	500	50
130-174 MHz	500 to 1500[1]	50 to 150[1]
174-260 MHz	1500	150
260-470 MHz	1500 to 5000[1]	150 to 500[1]
Above 470 MHz	5000	500

Note 1: Linear Interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

6.2 Test Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC Part15, subpart C.

The spacing between the peripherals was 10 centimeters.

6.3 Test Procedure

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

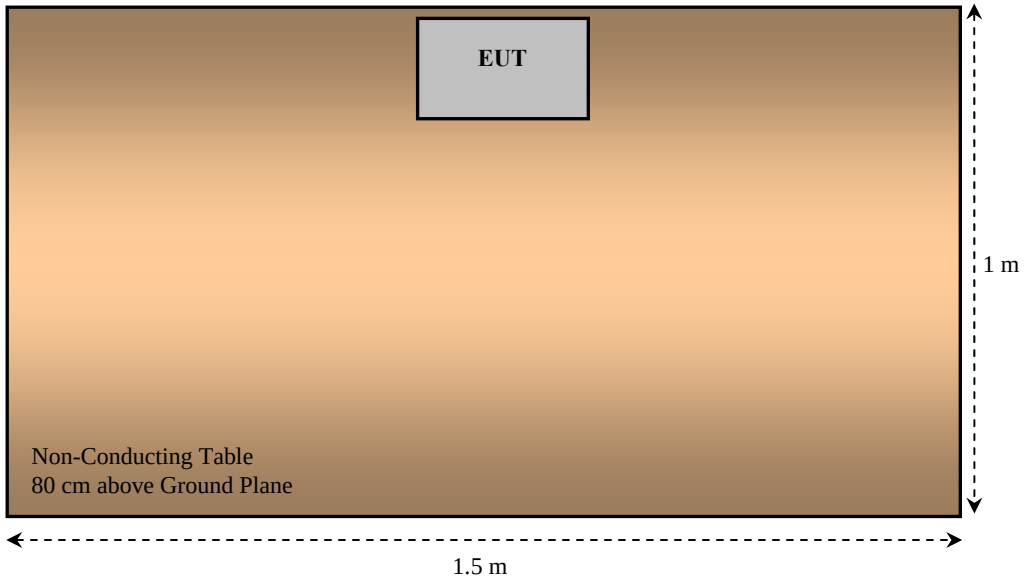
The EUT is set 3 meters away from the testing antenna, which is varied from 1-4 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both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

The spectrum analyzer or receiver is set as:

Below 1000 MHz:
RBW = 100 kHz, VBW = 300 kHz, Sweep = Auto

Above 1000 MHz:
RBW = 1MHz, VBW = 1MHz, Sweep = Auto

6.4 Test Setup Block Diagram



6.5 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 the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, the Corrected Amplitude (CA) of 40.3 dBuV/m = indicated Amplitude reading (Ai) 32.5 dBuV + Antenna Factor (AF) 23.5dB + Cable Loss (CL) 3.7 dB + Attenuator (Atten) 10 dB - Amplifier Gain (Ga) 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 (dB) = Corrected Amplitude (dBuV/m) - Limit (dBuV/m)

6.6 Test Equipment List and Details

Manufacturers	Descriptions	Model No.	Serial No.	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
EMCO	Horn Antenna	3115	9511-4627	2013-10-17	1 year
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2013-05-09	1 year
Sunol Sciences	Biconi-Log Antenna	JB3	A020106-2	2013-08-15	1 year
HP	Pre-amplifier	8447D	2944A06639	2013-06-09	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:	21-23° C
Relative Humidity:	59-61 %
ATM Pressure:	101.1-101.3 kPa

The testing was performed by Cipher Chu on 2014-01-10 at 5m chamber 3.

6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the limits presented in FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.231, and had the worst margin of:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Comments
-4.76	439.34	Horizontal	Average, Fundamental

6.9 Radiated Emissions Test Plot & Data

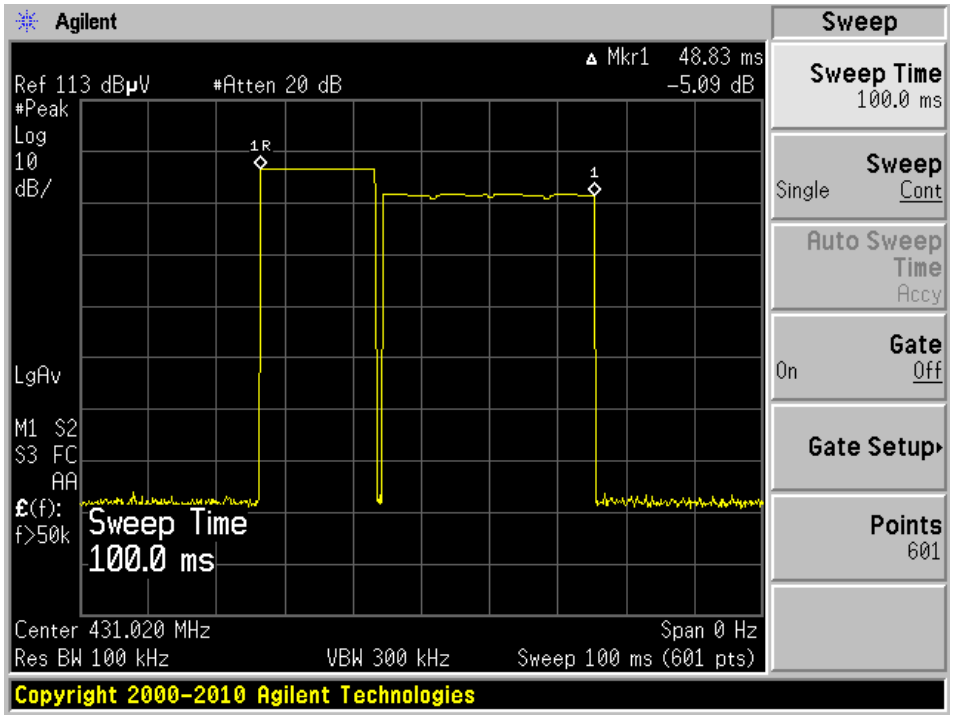
431.02 MHz

Freq. (MHz)	S.A. Reading (dBuV)	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.231		
			Height (cm)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
431.02	88.96	258	135	H	17	1.17	25.44	81.69	100.72	-19.03	Peak/Fund.
431.02	87.6	89	252	V	17	1.17	25.44	80.33	100.72	-20.39	Peak/Fund.
862.04	54.34	204	100	H	22.4	1.8	25.25	53.29	80.72	-27.43	Peak/Harm
862.04	50.76	124	106	V	22.4	1.8	25.25	49.71	80.72	-31.01	Peak/Harm
1724.08	34.54	270	100	H	26.32	2.56	27.63	35.79	80.72	-44.93	Peak/Harm
1724.08	33.95	89	100	V	26.32	2.56	27.63	35.2	80.72	-45.52	Peak/Harm
2155.1	33.81	330	100	H	28.07	3.02	27.7	37.2	80.72	-43.52	Peak/Harm
2155.1	33.57	103	124	V	28.07	3.02	27.7	36.96	80.72	-43.76	Peak/Harm
4310.2	26.62	328	100	H	32.32	4.23	27.9	35.27	74	-38.73	Peak/Harm
4310.2	24.97	99	100	V	32.32	4.23	27.9	33.62	74	-40.38	Peak/Harm

Field Strength of Average Emission							
Freq. (MHz)	Peak Measurement at 3m (dBuV/m)	Polar (H/V)	Duty Cycle Correlation Factor(dB)	Corrected Ampitude (dBµV/m)	FCC Part 15.231		
					Limit (dBuV/m)	Margin (dB)	Comment
431.02	81.69	H	-6.23	75.46	80.72	-5.26	Ave/Fund.
431.02	80.33	V	-6.23	74.1	80.72	-6.62	Ave/Fund.
862.04	53.29	H	-6.23	47.06	60.72	-13.66	Avg/Harm
862.04	49.71	V	-6.23	43.48	60.72	-17.24	Avg/Harm
1724.08	35.79	H	-6.23	29.56	60.72	-31.16	Avg/Harm
1724.08	35.2	V	-6.23	28.97	60.72	-31.75	Avg/Harm
2155.1	37.2	H	-6.23	30.97	60.72	-29.75	Avg/Harm
2155.1	36.96	V	-6.23	30.73	60.72	-29.99	Avg/Harm
4310.2	35.27	H	-6.23	29.04	54	-24.96	Avg/Harm
4310.2	33.62	V	-6.23	27.39	54	-26.61	Avg/Harm

Note: Fundamental = 431.02MHz
Duty Cycle Correction Factor = 20*log (Ton/T) = 20*log (48.83/100) = -6.23 dB

Ton



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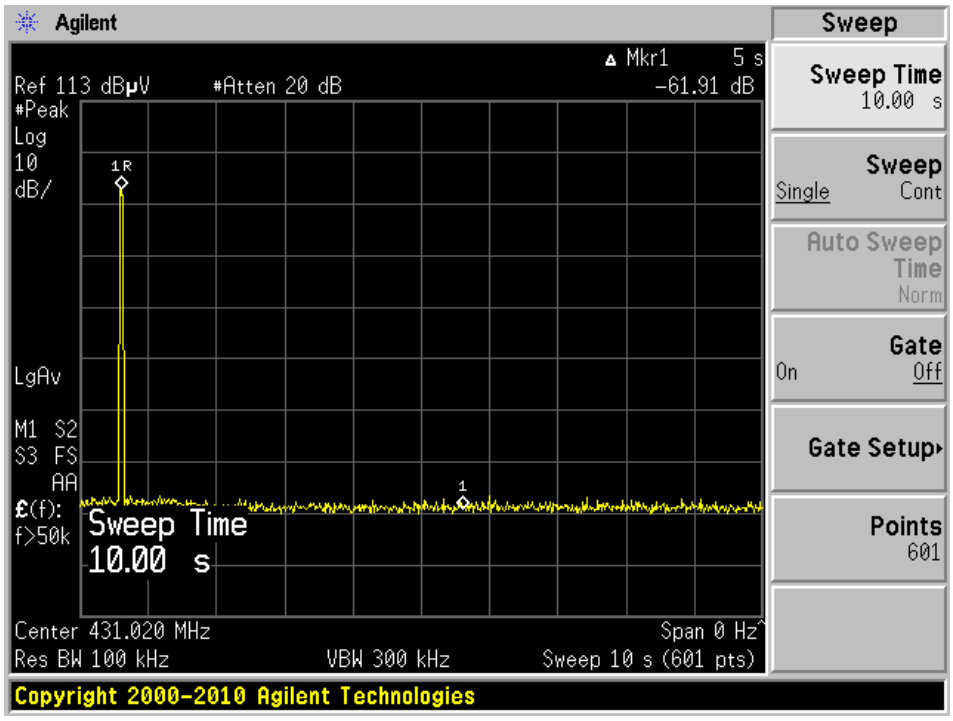


Note: A 100 ms period is used since the period is greater than 100ms.

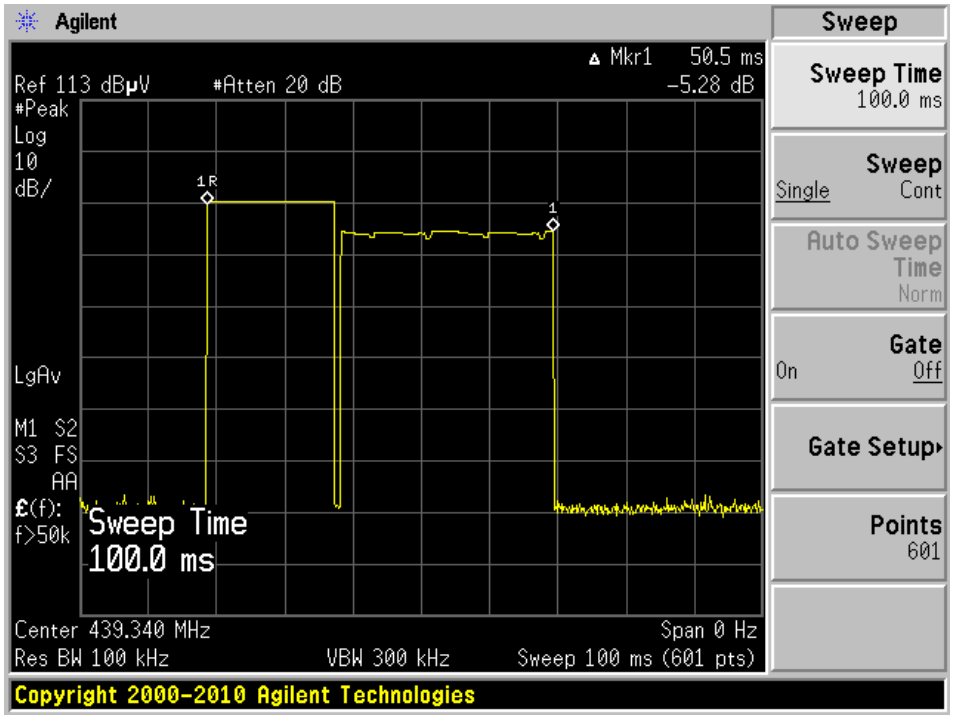
439.34 MHz

Freq. (MHz)	S.A. Reading (dBuV)	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.231		
			Height (cm)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
439.34	89.44	232	130	H	17	1.17	25.44	82.17	101	-18.83	Peak/Fund.
439.34	87.18	91	157	V	17	1.17	25.44	79.91	101	-21.09	Peak/Fund.
878.68	54.72	211	100	H	22.4	1.8	25.25	53.67	81	-27.33	Peak/Harm
878.68	50.59	93	100	V	22.4	1.8	25.25	49.54	81	-31.46	Peak/Harm
1757.36	34.25	327	100	H	26.32	2.56	27.63	35.5	81	-45.5	Peak/Harm
1757.36	33.05	87	100	V	26.32	2.56	27.63	34.3	81	-46.7	Peak/Harm
2196.7	33.06	323	100	H	28.07	3.02	27.7	36.45	81	-44.55	Peak/Harm
2196.7	33.52	97	100	V	28.07	3.02	27.7	36.91	81	-44.09	Peak/Harm
4393.4	25.93	316	100	H	32.32	4.23	27.9	34.58	74	-39.42	Peak/Harm
4393.4	24.61	96	100	V	32.32	4.23	27.9	33.26	74	-40.74	Peak/Harm

Field Strength of Average Emission							
Freq. (MHz)	Peak Measurement at 3m (dBuV/m)	Polar (H/V)	Duty Cycle Correlation Factor(dB)	Corrected Ampitude (dBµV/m)	FCC Part 15.231		
					Limit (dBuV/m)	Margin (dB)	Comment
439.34	82.17	H	-5.93	76.24	81	-4.76	Ave/Fund.
439.34	79.91	V	-5.93	73.98	81	-7.02	Ave/Fund.
878.68	53.67	H	-5.93	47.74	61	-13.26	Avg/Harm
878.68	49.54	V	-5.93	43.61	61	-17.39	Avg/Harm
1757.36	35.5	H	-5.93	29.57	61	-31.43	Avg/Harm
1757.36	34.3	V	-5.93	28.37	61	-32.63	Avg/Harm
2196.7	36.45	H	-5.93	30.52	61	-30.48	Avg/Harm
2196.7	36.91	V	-5.93	30.98	61	-30.02	Avg/Harm
4393.4	34.58	H	-5.93	28.65	54	-25.35	Avg/Harm
4393.4	33.26	V	-5.93	27.33	54	-26.67	Avg/Harm

Note: Fundamental = 439.34MHz
Duty Cycle Correction Factor = 20*log (Ton/T) = 20*log (50.5/100) = -5.93 dB

Ton



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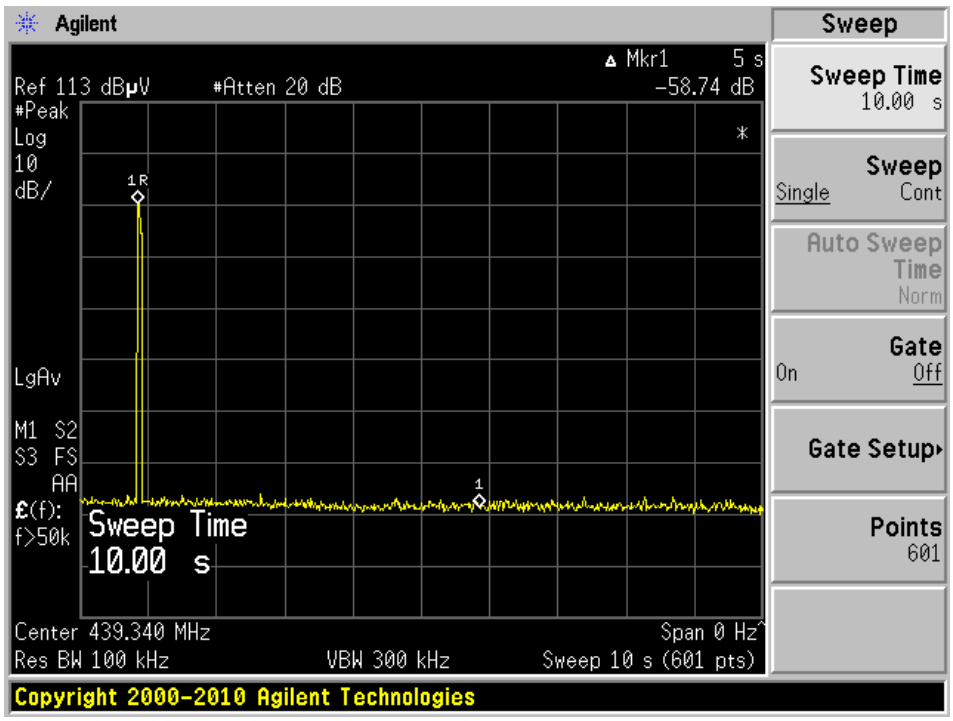


Note: A 100 ms period is used since the period is greater than 100ms.

7 FCC §15.231 (c) – Emission Bandwidth

7.1 Applicable Standard

FCC §15.231(c)

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument via radiated horn antenna. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

7.3 Test Equipment List and Details

Manufacturers	Description	Model No.	Serial No.	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2013-03-05	1 year
Sunol Sciences	Biconi-Log Antenna	JB3	A020106-2	2013-08-15	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:	21° C
Relative Humidity:	59 %
ATM Pressure:	101.1 kPa

The testing was performed by Cipher Chu on 2014-01-10 at 5 meter chamber 3.

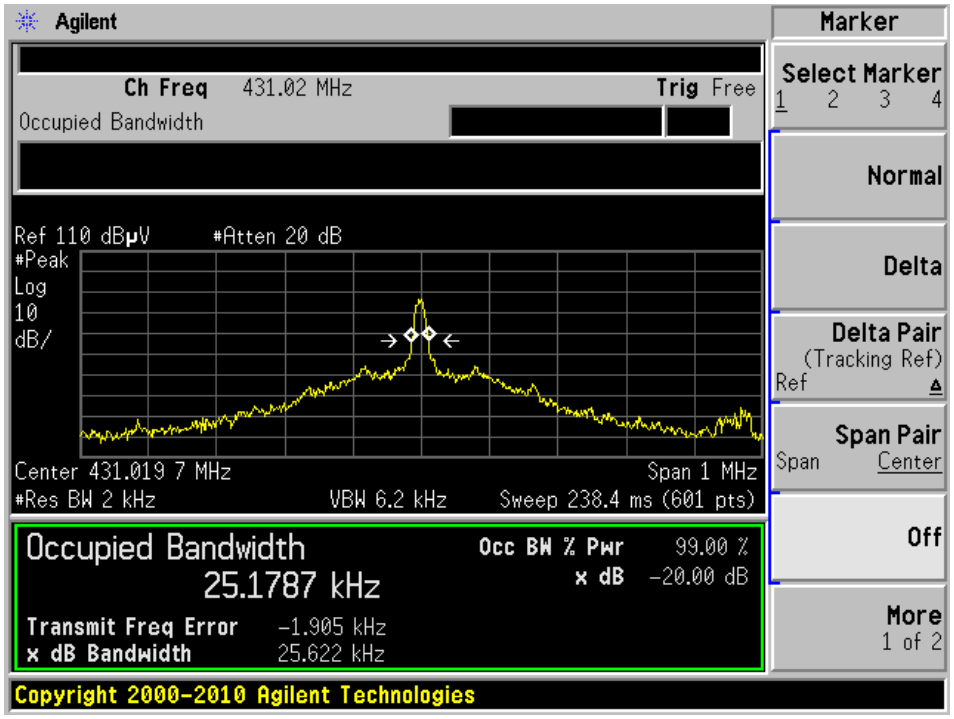
7.5 Test Results

431.02 MHz FCC Limit = Fundamental Frequency X 0.25% = 431.02 MHz ×0.25%= 1077.55 kHz
439.34 MHz FCC Limit = Fundamental Frequency X 0.25% = 439.34 MHz ×0.25%= 1098.35 kHz

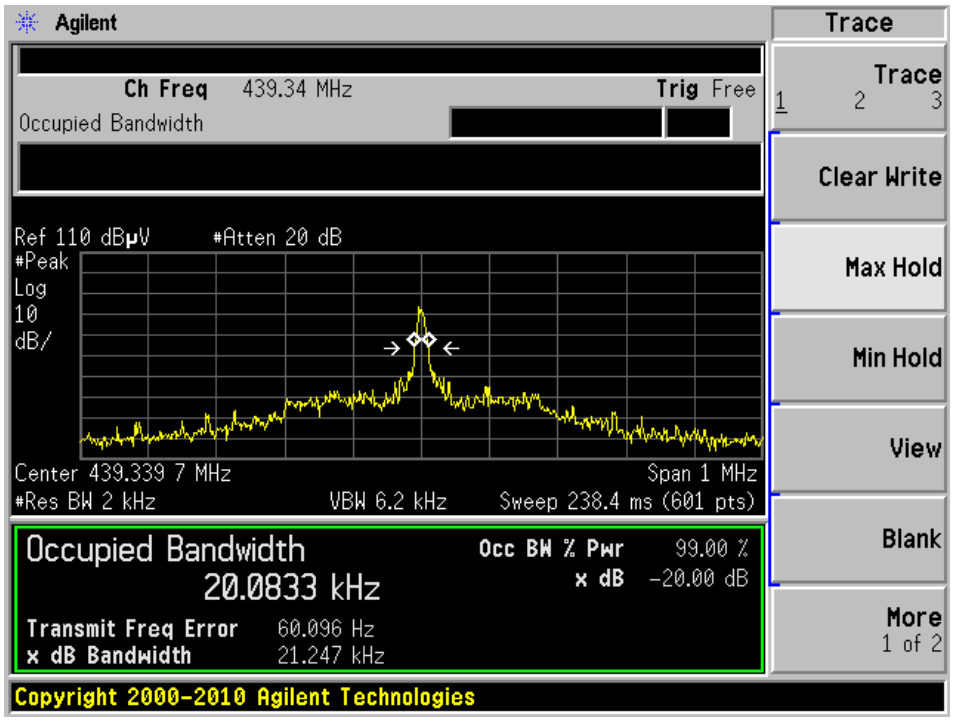
Frequency	FCC Result		
	20 dB Bandwidth (kHz)	Limit (kHz)	Result
431.02	25.622	1077.55	Compliant
439.34	21.247	1098.35	Compliant

Please refer to the following plots for detailed test results

431.02 MHz



439.34 MHz


Agilent
Trace
Ch Freq 439.34 MHz
Trig Free
Occupied Bandwidth
Trace
1 2 3
Clear Write
Ref 110 dBµV
#Atten 20 dB
Max Hold
#Peak
Log
10
dB/
Min Hold
View
Center 439.339 7 MHz
Span 1 MHz
#Res BW 2 kHz
VBW 6.2 kHz
Sweep 238.4 ms (601 pts)
Blank
Occupied Bandwidth
20.0833 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
More
1 of 2
Transmit Freq Error 60.096 Hz
x dB Bandwidth 21.247 kHz
Copyright 2000-2010 Agilent Technologies

8 Exhibit A – FCC Equipment Labeling Requirements

8.1 FCC ID Label Requirements

As per FCC §2.925,

(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example: FCC ID: XXX123

Where: XXX—Grantee Code, 123—Equipment Product Code

As per FCC §15.19,

(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or verification shall be labeled as follows:

(3) All other devices shall bear the following statement in a conspicuous location on the device:

> This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
> (1) This device may not cause harmful interference, and
> (2) This device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified above is required to be affixed only to the main control unit. If the EUT is integrated within another device then a label affixed to the host shall also state, “Contains FCC ID: XXXXXX”

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

As per FCC §15.21,

The user manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

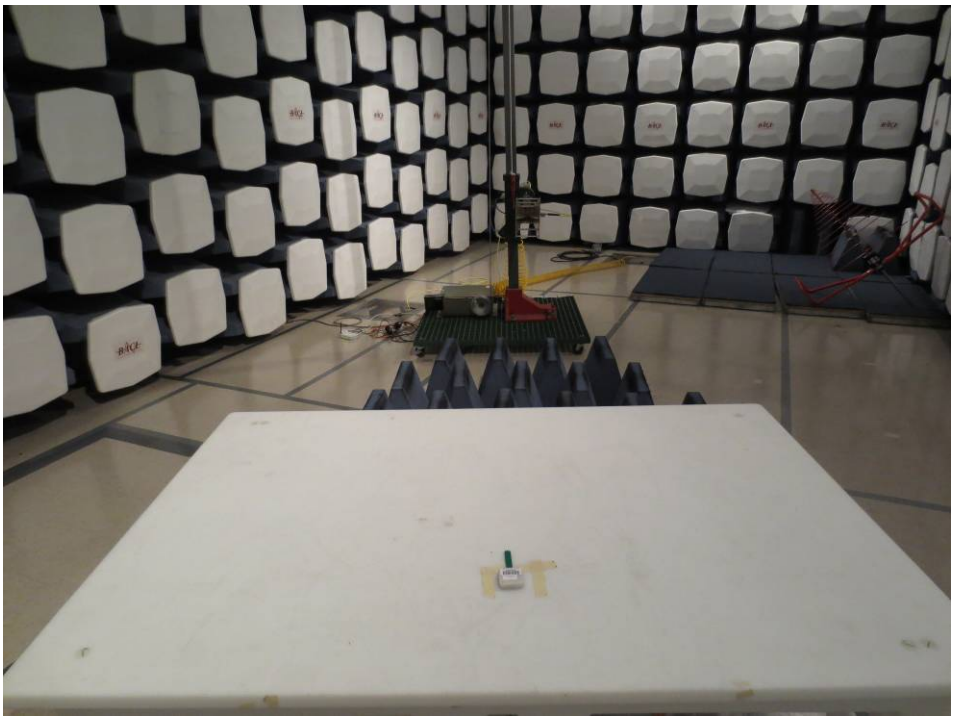
8.2 FCC ID Label Content and Location

9 Exhibit B – Test Setup Photographs

9.1 Radiated Emissions – Front View

9.2 Radiated Emissions (Below 1 GHz) – Rear View

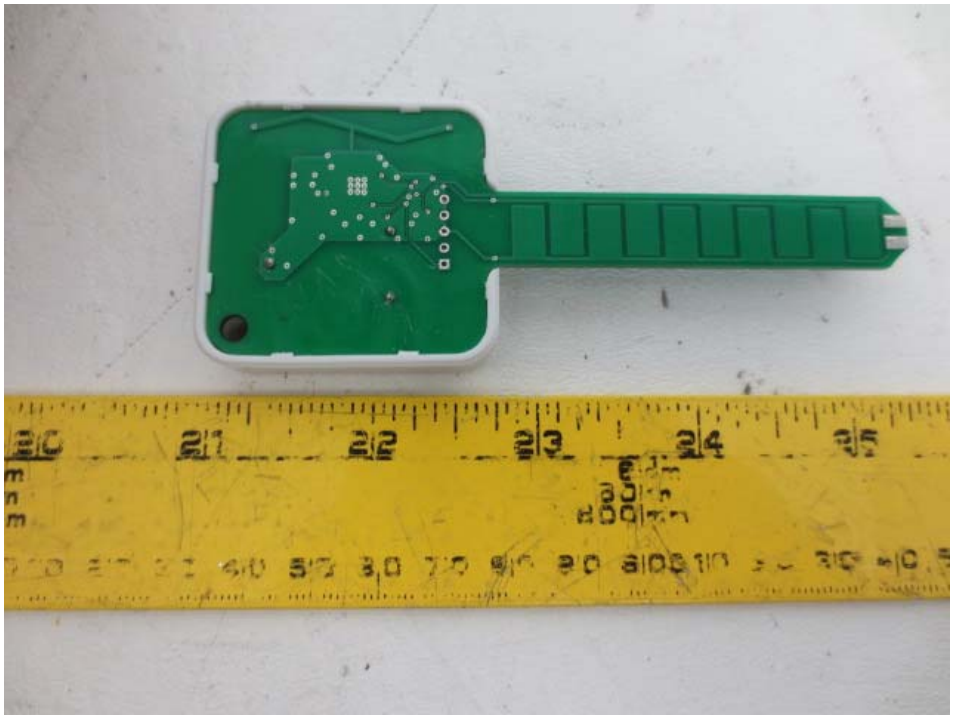
9.3 Radiated Emissions (Above 1 GHz) – Rear View



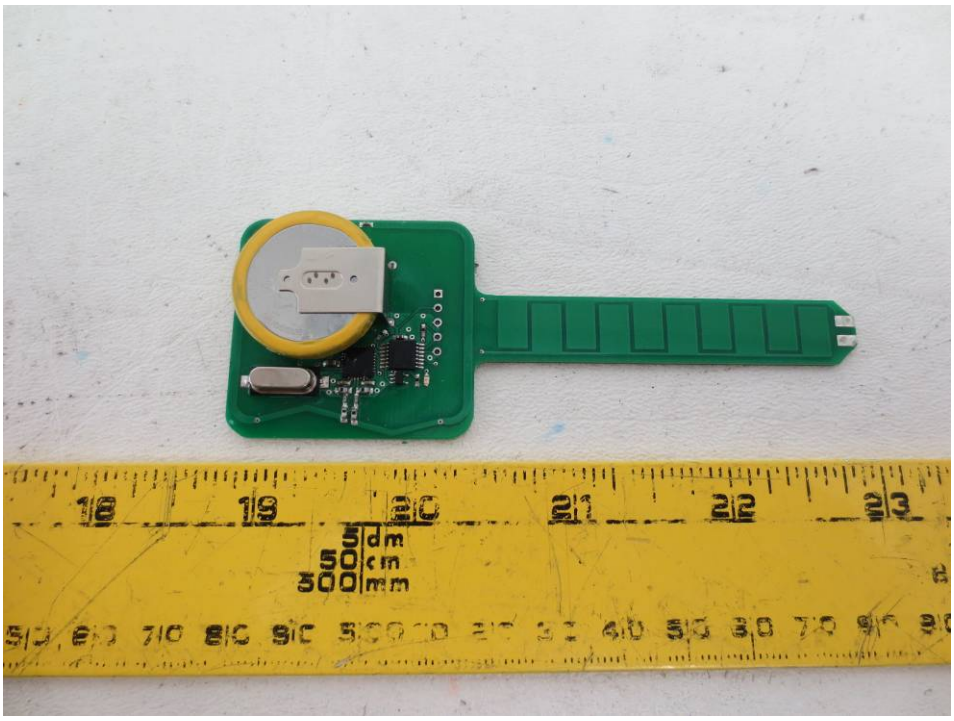
10 Exhibit C – EUT Photographs

10.1 EUT – Front View

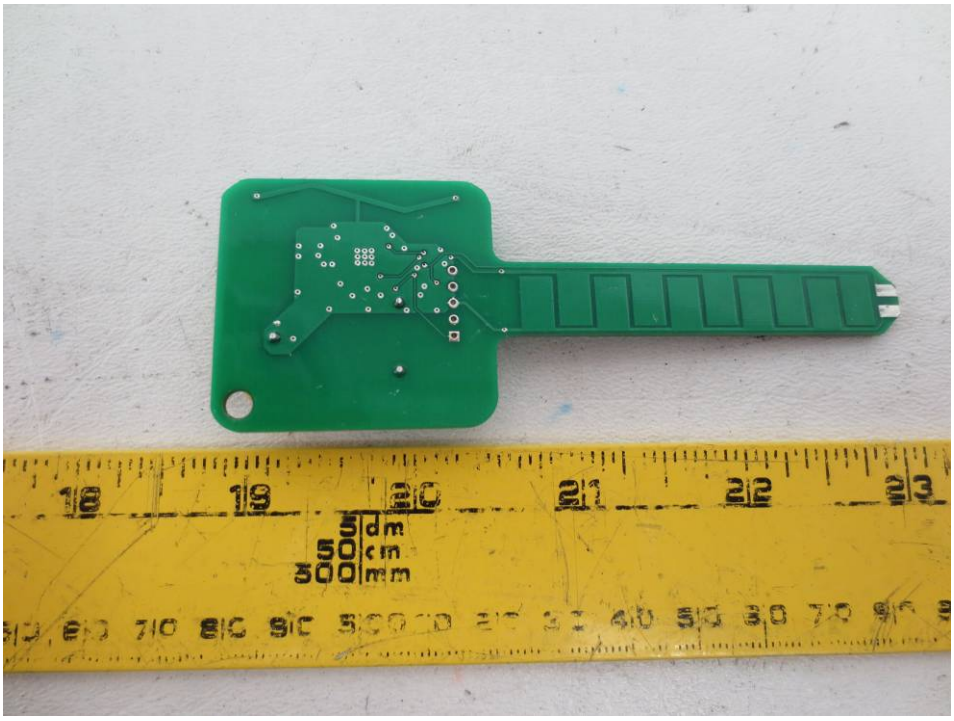
10.2 EUT – Rear View



10.3 EUT – Cover off View 1



10.4 EUT – Cover off View 2



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