



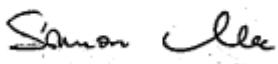
FCC PART 74 SUBPART H ISED RSS-210, ISSUE 9, ANNEX G TEST AND MEASUREMENT REPORT

For

Lectrosonics, Inc.

581 Laser Road NE, Rio Rancho, NM 87124, USA

**FCC ID: DBZDBU
IC: 8024A-DBU**

Report Type: Original Report	Product Type: Digital Wireless Microphone Transmitter
Prepared By: <u>Dean Liu</u> 	
Report Number: <u>R1705223</u>	
Report Date: <u>2017-10-17</u>	
Reviewed By: <u>Simon Ma</u> 	
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk ** (Rev.3)

TABLE OF CONTENTS

1 GENERAL DESCRIPTION	5
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	5
1.2 MECHANICAL DESCRIPTION OF EUT	5
1.3 OBJECTIVE	5
1.4 RELATED SUBMITTAL(S)/GRANT(S).....	5
1.5 TEST METHODOLOGY	5
1.6 MEASUREMENT UNCERTAINTY.....	6
1.7 TEST FACILITY.....	6
2 EUT TEST CONFIGURATION.....	9
2.1 JUSTIFICATION	9
2.2 EUT EXERCISE SOFTWARE.....	9
2.3 SPECIAL EQUIPMENT	9
2.4 EQUIPMENT MODIFICATIONS	9
2.5 LOCAL SUPPORT EQUIPMENT.....	9
2.6 INTERFACE PORTS AND CABLES	9
3 SUMMARY OF TEST RESULTS.....	10
4 FCC §2.1093 & ISED RSS-102 - RF EXPOSURE	11
4.1 APPLICABLE STANDARDS	11
4.2 TEST RESULTS	11
5 FCC §74.861(E) (1) & ISED RSS-210 G.3.1 - RF OUTPUT POWER	12
5.1 APPLICABLE STANDARDS	12
5.2 TEST PROCEDURE	12
5.3 TEST EQUIPMENT LIST AND DETAILS	12
5.4 TEST ENVIRONMENTAL CONDITIONS.....	12
5.5 TEST RESULTS	13
6 FCC §74.861(E) (7) & ISED RSS-210 G.3.2, G.3.4 - OCCUPIED BANDWIDTH & EMISSION MASK..	14
6.1 APPLICABLE STANDARDS	14
6.2 TEST PROCEDURE	14
6.3 TEST EQUIPMENT LIST AND DETAILS	15
6.4 TEST ENVIRONMENTAL CONDITIONS.....	15
6.5 TEST RESULTS	15
7 FCC §74.861(E) (7) & ISED RSS-210 G.3.4 - CONDUCTED SPURIOUS EMISSIONS AT ANTENNA PORT 19	19
7.1 APPLICABLE STANDARDS	19
7.2 TEST PROCEDURE	19
7.3 TEST EQUIPMENT LIST AND DETAILS	19
7.4 TEST ENVIRONMENTAL CONDITIONS.....	20
7.5 TEST RESULTS	20
8 FCC §74.861(E) (7) & ISED RSS-210 G.3.4 - FIELD STRENGTH OF SPURIOUS RADIATION	23
8.1 APPLICABLE STANDARDS	23
8.2 TEST PROCEDURE	23
8.3 TEST EQUIPMENT LIST AND DETAILS	24
8.4 TEST ENVIRONMENTAL CONDITIONS.....	24
8.5 TEST RESULTS	25
9 FCC §74.861(E) (4) & ISED RSS-210 G.3.3 - FREQUENCY STABILITY	26
9.1 APPLICABLE STANDARDS	26

9.2	TEST PROCEDURE	26
9.3	TEST EQUIPMENT LIST AND DETAILS	27
9.4	TEST ENVIRONMENTAL CONDITIONS	27
9.5	TEST RESULTS	28
10	APPENDIX A - TEST SETUP PHOTOGRAPHS	29
	APPENDIX B- EUT EXTERNAL PHOTOGRAPHS	30
11	APPENDIX C- EUT INTERNAL PHOTOGRAPHS	31

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1705223	Original Report	2017-10-17

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Lectrosonics, Inc.* and their product model: *DBU, FCC ID: DBZDBU, IC: 8024A-DBU* which henceforth is referred to as the EUT (Equipment Under Test). The EUT is a Digital Wireless Microphone Transmitter. The EUT operates in the frequency range: 470.1-607.975 MHz.

1.2 Mechanical Description of EUT

The EUT measures approximately 8.6 cm (L) x 6.2 cm (W) x 1.9 cm (H) and weighs approximately 0.117 kg.

The data gathered are from a typical production sample provided by the Lectrosonics, Inc with serial number: 1

1.3 Objective

The following type approved report is prepared on behalf of *Lectrosonics, Inc.* in accordance with Part 74, Subparts H of the Federal Communications Commission rules, Issue 4 of the Industry Canada RSS-Gen General Requirements and Information for the Certification of Radio Apparatus and Issue 9 of Industry Canada RSS-210, License-Exempt, Low-Power Radio Apparatus Operating in the Television Bands.

The objective is to determine compliance with Part 74 of the FCC Rules, Industry Canada RSS-Gen and Industry Canada RSS-210 Standard, limits for RF output power, Modulation characteristics, Emission bandwidth, Field strength of spurious radiation and Frequency stability for license-exempt, low-power radio apparatus operating in the television bands.

1.4 Related Submittal(s)/Grant(s)

NA

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with TIA 603-D Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9kHz to 40GHz.

All tests were performed at Bay Area Compliance Laboratories Corp.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

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

1.7 Test Facility

Bay Area Compliance Laboratories Corp. (BACL) is:

A- An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02), in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Clause 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body

-- For the USA (Federal Communications Commission):

- 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
- 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
- 3- All Telephone Terminal Equipment within FCC Scope C.

- For the Canada (Industry Canada):

- 1- All Scope 1-Licence-Exempt Radio Frequency Devices;
- 2- All Scope 2-Licensed Personal Mobile Radio Services;
- 3- All Scope 3-Licensed General Mobile & Fixed Radio Services;
- 4- All Scope 4-Licensed Maritime & Aviation Radio Services;
- 5- All Scope 5-Licensed Fixed Microwave Radio Services
- 6- All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.

For Singapore (Info-Communications Development Authority (IDA)):

- 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2

- For the Hong Kong Special Administrative Region:

- 1 All Radio Equipment, per KHCA 10XX-series Specifications;
- 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
- 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.

- For Japan:

- 1 MIC Telecommunication Business Law (Terminal Equipment):
 - All Scope A1 - Terminal Equipment for the Purpose of Calls;
 - All Scope A2 - Other Terminal Equipment
- 2 Radio Law (Radio Equipment):
 - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
 - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
 - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01) to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

- 1 Electronics and Office Equipment:
 - for Telephony (ver. 3.0)
 - for Audio/Video (ver. 3.0)
 - for Battery Charging Systems (ver. 1.1)
 - for Set-top Boxes & Cable Boxes (ver. 4.1)
 - for Televisions (ver. 6.1)
 - for Computers (ver. 6.0)
 - for Displays (ver. 6.0)
 - for Imaging Equipment (ver. 2.0)
 - for Computer Servers (ver. 2.0)
- 2 Commercial Food Service Equipment
 - for Commercial Dishwashers (ver. 2.0)
 - for Commercial Ice Machines (ver. 2.0)
 - for Commercial Ovens (ver. 2.1)
 - for Commercial Refrigerators and Freezers
- 3 Lighting Products
 - For Decorative Light Strings (ver. 1.5)
 - For Luminaires (including sub-components) and Lamps (ver. 1.2)
 - For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
 - For Integral LED Lamps (ver. 1.4)
- 4 Heating, Ventilation, and AC Products
 - for Residential Ceiling Fans (ver. 3.0)
 - for Residential Ventilating Fans (ver. 3.2)
- 5 Other
 - For Water Coolers (ver. 3.0)

D. A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
 - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
 - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
 - o EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
 - o Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB (NB)

- Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
- Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter
- USA:
 - ENERGY STAR Recognized Test Laboratory – US EPA
 - Telecommunications Certification Body (TCB) – US FCC;
 - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 EUT Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA 603-D and ANSI C63.10-2013 Standards.

2.2 EUT Exercise Software

None.

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

None.

2.6 Interface Ports and Cables

Cable Description	Length(m)	To	From
Dynamic mic level adapter	<1.0	EUT	Mini Microphone

3 Summary of Test Results

FCC & ISED Rules	Descriptions of Test	Result (s)
FCC §2.1093, ISED RSS-102	RF Exposure	Compliant ¹
FCC §74.861(e)(1), ISED RSS-210 G.3.1	RF output power	Compliant
FCC §74.861(e)(3), ISED RSS-210 G.3.5	Modulation characteristics	Not applicable
FCC §74.861(e)(7), ISED RSS-210 G.3.2 & G.3.4	Emission bandwidth & Emission Mask	Compliant
FCC §74.861(e)(7), ISED RSS-210 G.3.4	Spurious radiation at the antenna port	Compliant
FCC §74.861(e)(7), ISED RSS-210 G.3.4	Field strength of spurious radiation	Compliant
FCC §74.861(e)(4), ISED RSS-210 G.3.3	Frequency stability	Compliant

Note¹: RF exposure analysis is covered in a separate report. Please refers to R1705223-SAR

Not applicable: The EUT only supports digital modulation.

4 FCC §2.1093 & ISED RSS-102 - RF Exposure

4.1 Applicable Standards

FCC §2.1093 & ISED RSS-102

4.2 Test Results

Please refer to the SAR Report: R1705223-SAR.

5 FCC §74.861(e) (1) & ISED RSS-210 G.3.1 - RF Output Power

5.1 Applicable Standards

According to FCC §74.861 (e) (1): the power may not exceed the following values:

- (i) 54-72, 76-88, and 174-216 MHz bands—50 mW EIRP
- (ii) 470-608 and 614-698 MHz bands—250 mW Conducted power
- (iii) 600 MHz duplex gap: 20 mW EIRP

As per ISED RSS-210 Issue 9, G.3.1:

470-608 MHz and 614-698 MHz bands 250 mW e.i.r.p

5.2 Test Procedure

According to TIA-603-D Section 2.2.1; Section 6.12 of ISED RSS-Gen Issue 4

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US45303156	2017-02-24	1 year
Mini Circuits	Precision Fixed Attenuator, 10 dB	BW-S10W5+	-	-	Each time

Statement of Traceability: **BACL Corp.** attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

5.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	40 %
ATM Pressure:	101 kPa

The testing was performed by Dean Liu on 2017-06-13 at RF site.

5.5 Test Results

Channel	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limits (dBm)	Rated Conducted Power (mW/dBm)
Low	17.08	2.15	19.23	24	50/17
	14.09	2.15	16.24	24	25/14
Middle	16.99	2.15	19.14	24	50/17
	14.17	2.15	16.32	24	25/14
High	16.91	2.15	19.06	24	50/17
	14.00	2.15	16.15	24	25/14

6 FCC §74.861(e) (7) & ISED RSS-210 G.3.2, G.3.4 - Occupied Bandwidth & Emission Mask

6.1 Applicable Standards

According to FCC §74.861 (e) (7):

Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in Section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in Section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement.

As per ISED RSS-210 Issue 9, G.3.2:

The occupied bandwidth for low-power radio apparatus shall not exceed the authorized bandwidth specified in Table G1, which is 200 kHz for 470-608MHz and 614-698MHz.

As per ISED RSS-210 Issue 9, G.3.4:

The transmitter unwanted emissions shall meet the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08), *Electromagnetic compatibility and radio spectrum matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*.

6.2 Test Procedure

According to RSS-Gen Issue 4 Section 6.6, When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately $3 \times \text{RBW}$

Note: Video averaging is not permitted.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at

the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

According to Section G.2 of ISED RSS-210 Issue 9, the measurement method described in ETSI EN 300 422-1 shall be used. Clause 8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08) was followed for measuring the emission mask.

6.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
HP	Analyzer, RF Communications Test Set	8920A	3438A05338	2015-09-09	2 year
Agilent	Spectrum Analyzer	E4440A	US45303156	2017-02-24	1 year
Mini Circuits	Precision Fixed Attenuator, 10 dB	BW-S10W5+	-	-	Each time

Statement of Traceability: **BACL Corp.** attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

6.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	40 %
ATM Pressure:	101 kPa

The testing was performed by Dean Liu on 2017-06-13 at RF site.

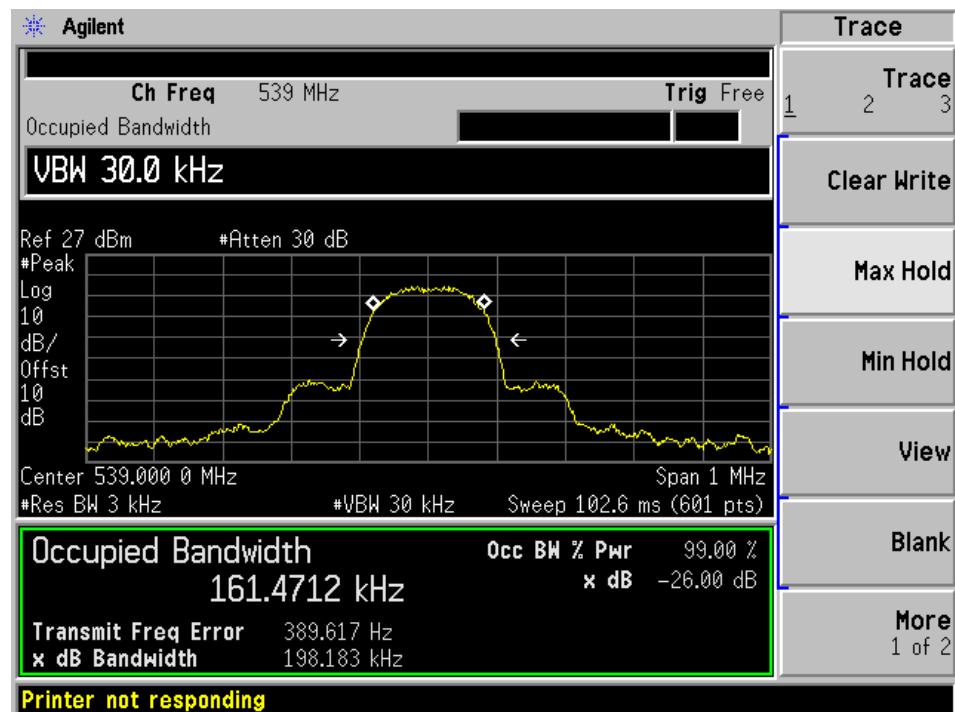
6.5 Test Results

Center Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result	Power Setting
539	161.47	200	Pass	High (50 mW)
539	160.02	200	Pass	Low (25 mW)

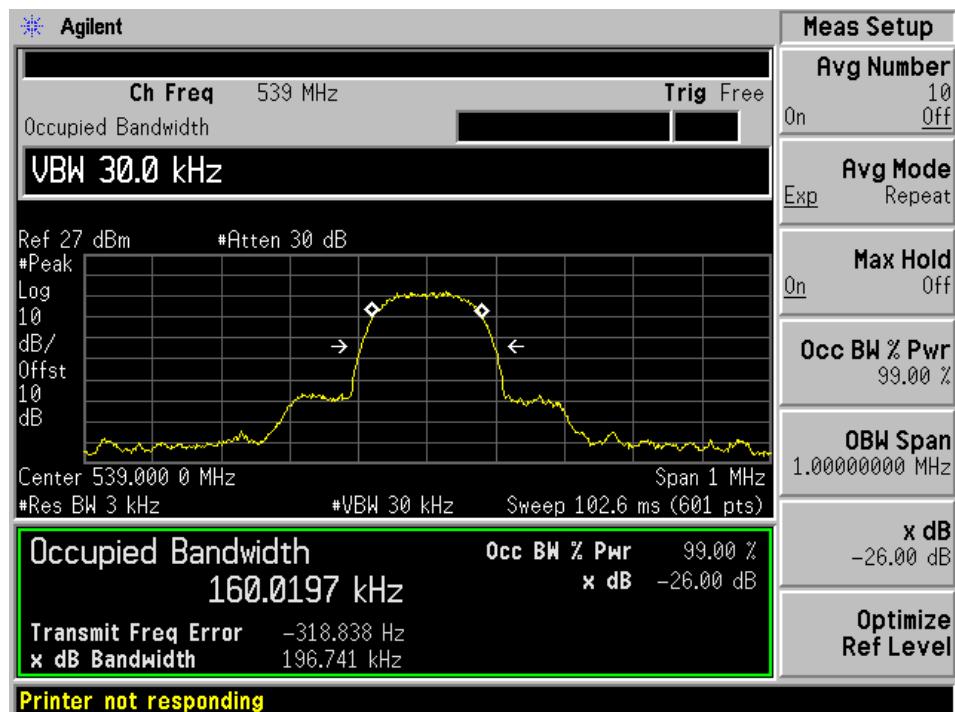
Please refer to the following table plots for detailed test results

Occupied Bandwidth

50 mW power setting

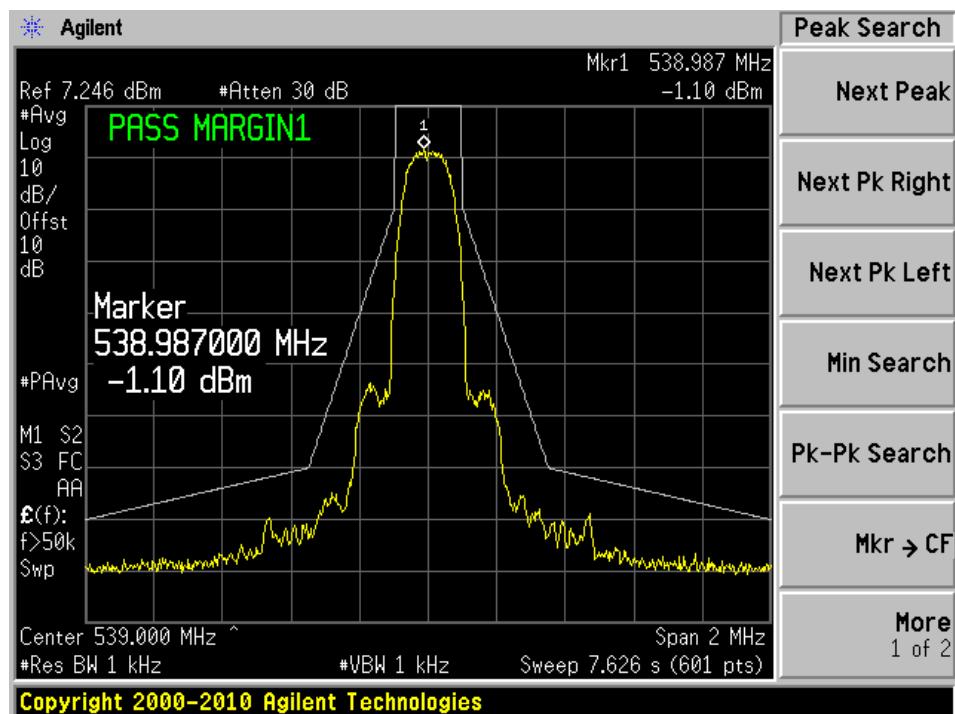
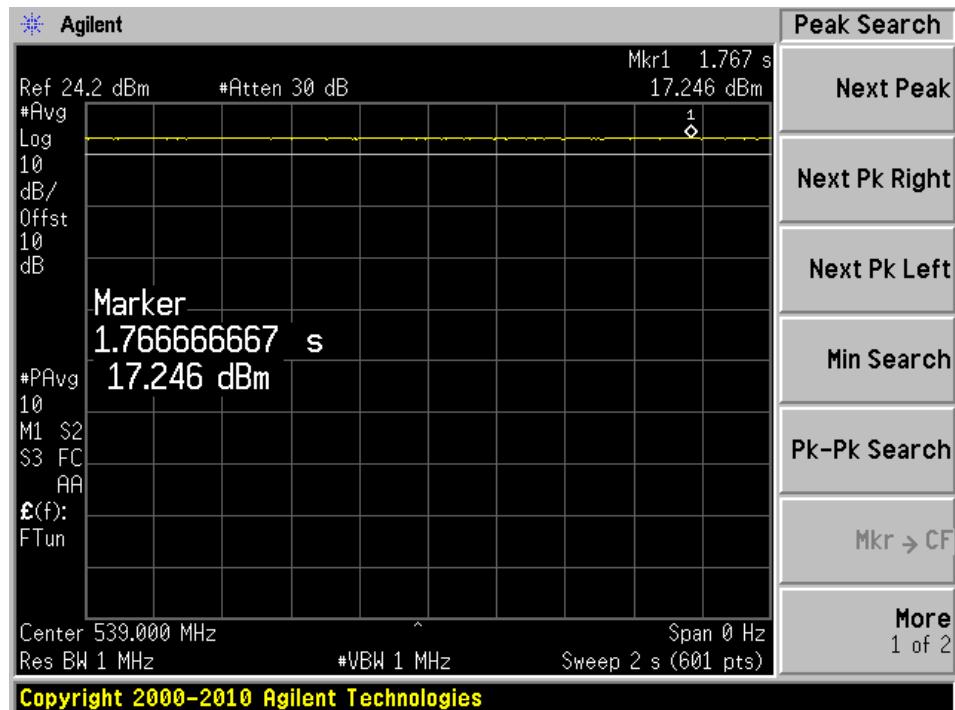


25 mW power setting

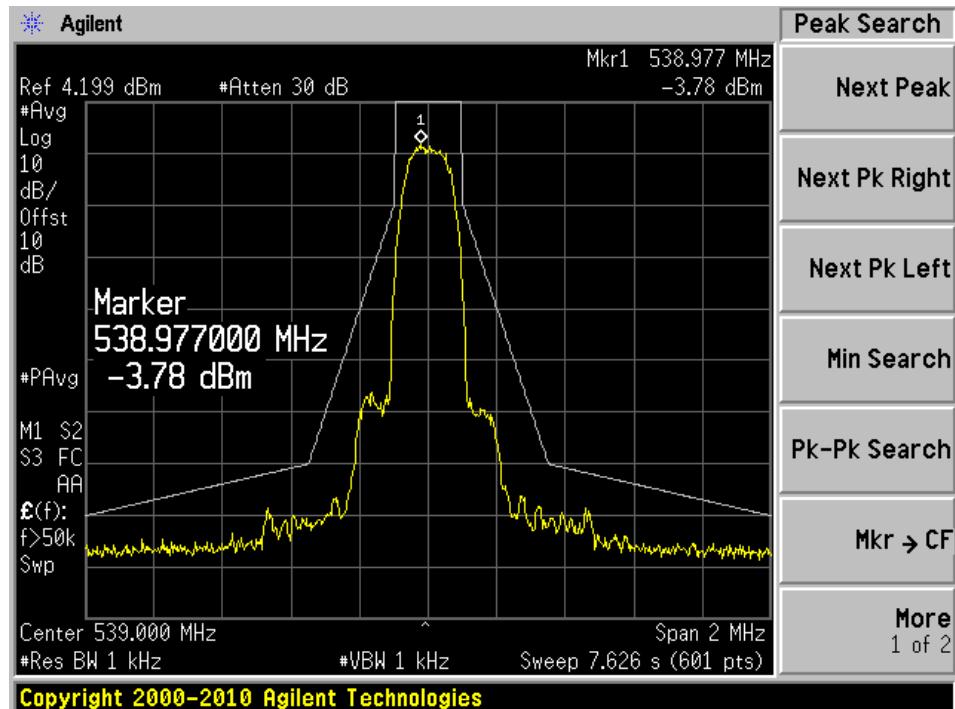
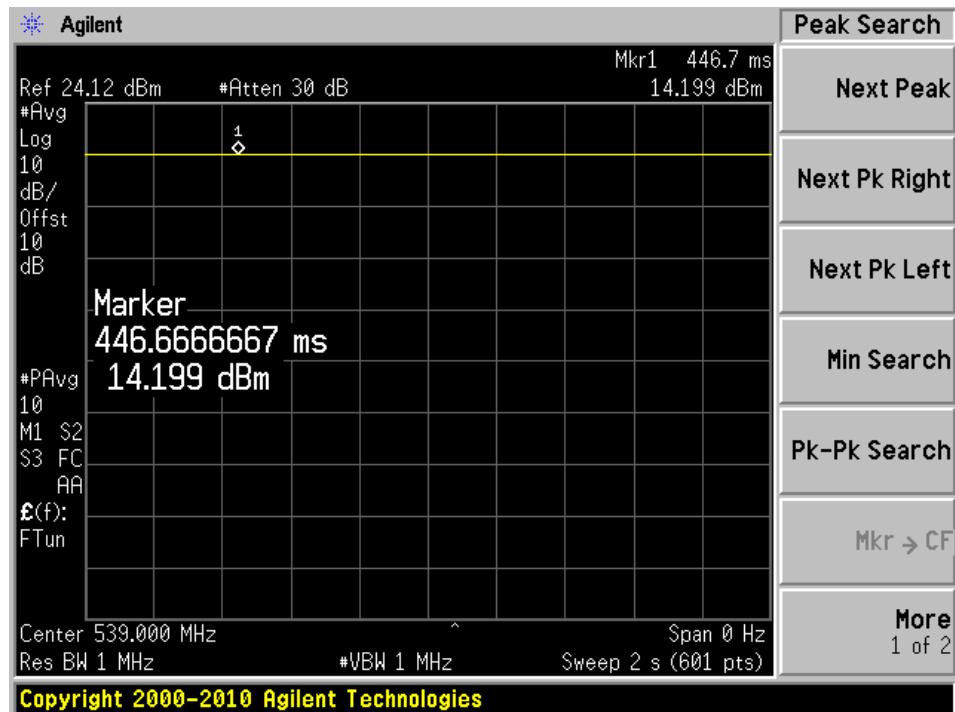


Emission Mask

50 mW power setting



25 mW power setting



7 FCC §74.861(e) (7) & ISED RSS-210 G.3.4 - Conducted Spurious Emissions at Antenna Port

7.1 Applicable Standards

According to FCC §74.861 (e) (7):

Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in Section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08).

As per ISED RSS-210 Issue 9, G.3.4:

The transmitter unwanted emissions shall meet the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08), *Electromagnetic compatibility and radio spectrum matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*.

As per Clause 8.4.3 of ETSI EN 301 422-1 V1.4.2 (2011-08), limits for spurious emissions are listed in the table below,

State	Frequency		
	47-74 MHz 87.5-137 MHz 174-230 MHz 470-862 MHz	Other Frequencies below 1000 MHz	Frequencies above 1000 MHz
Operation	4 nW	250 nW	1 μW
Standby	2 nW	2 nW	20 nW

7.2 Test Procedure

According to Section G.2 of ISED RSS-210 Issue 9, the measurement method described in ETSI EN 300 422-1 shall be used. Clause 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08) was followed for measuring the spurious emissions.

7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US45303156	2017-02-24	1 year
Mini Circuits	Precision Fixed Attenuator, 10 dB	BW-S10W5+	-	-	Each time

Statement of Traceability: **BACL Corp.** attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

7.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	40 %
ATM Pressure:	101 kPa

The testing was performed by Dean Liu on 2017-06-13 at RF site.

7.5 Test Results

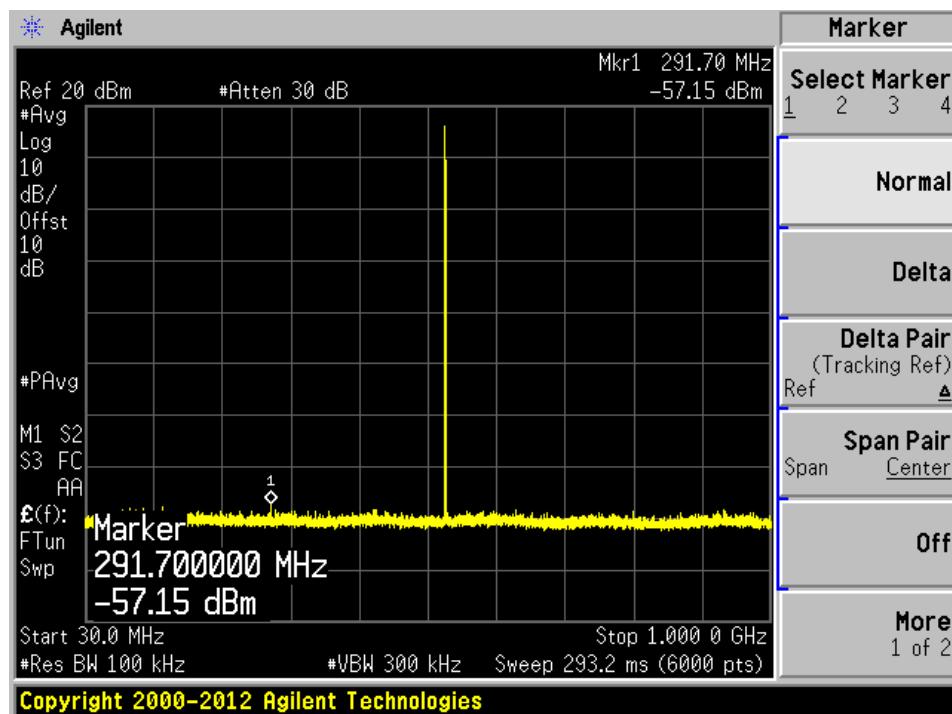
EUT Configuration	Frequency Range (GHz)	Emission Freq. (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
Transmitting	0.03-1	291.7	-57.15	-36	-21.15
	1-7	1617.1	-40.38	-30	-10.38
Stand-by	0.03-1	493.74	-88.14	-57	-31.14
	1-7	6900.4	-70.47	-47	-23.47

Please refer to the following plots for detailed test results

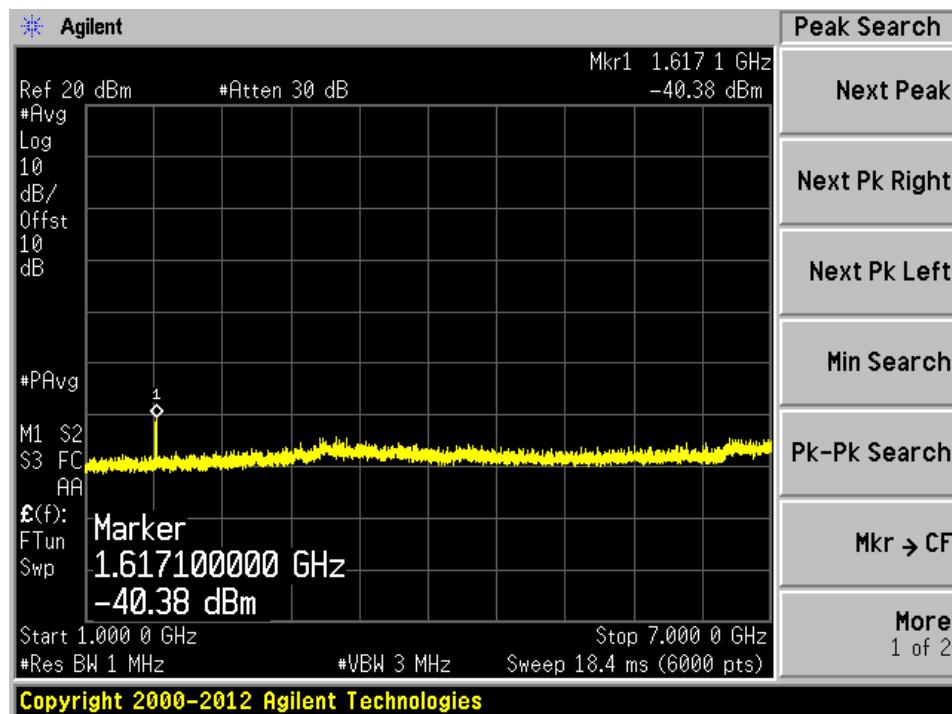
Transmitting

Highest Power Setting:

30 MHz to 1 GHz

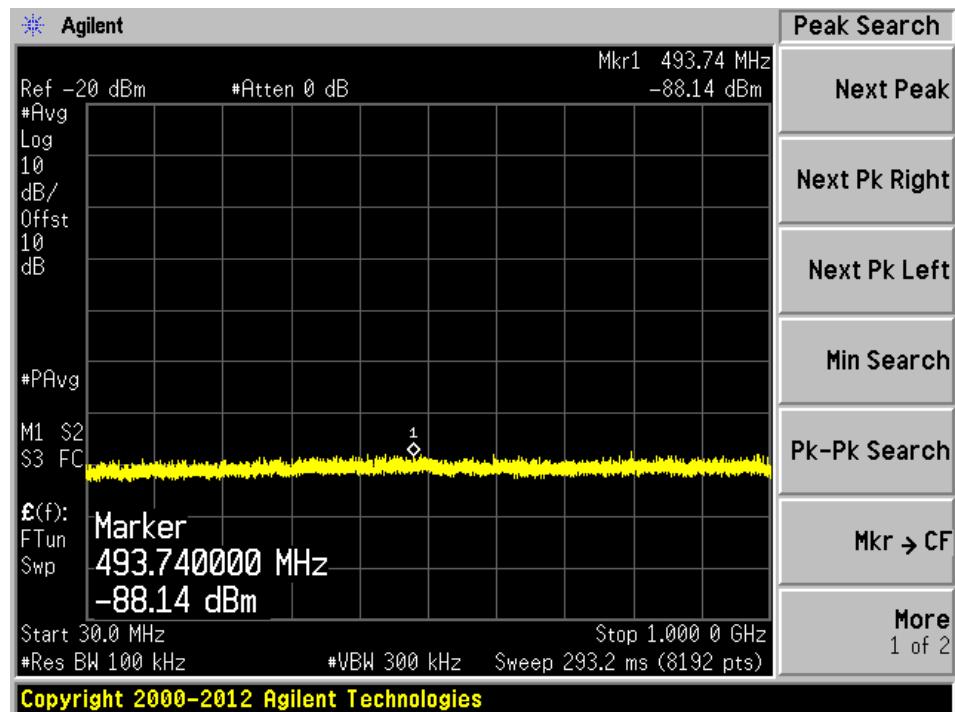


1 GHz to 7 GHz

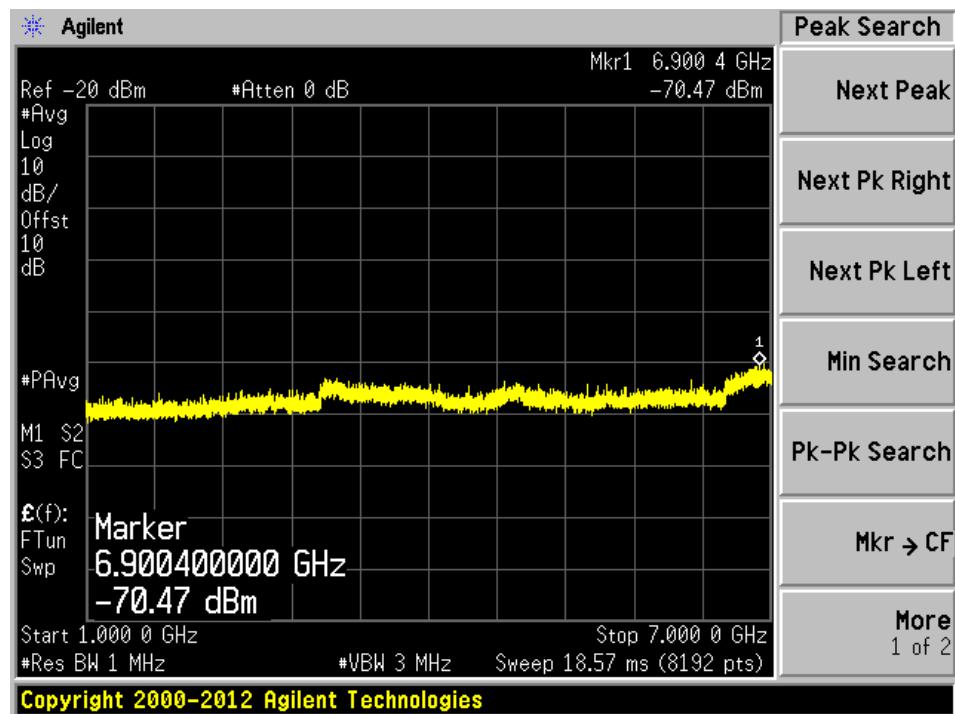


Standby:

30 MHz to 1 GHz



1 GHz to 7 GHz



8 FCC §74.861(e) (7) & ISED RSS-210 G.3.4 - Field Strength of Spurious Radiation

8.1 Applicable Standards

According to FCC §74.861 (e) (7):

Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in Section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08).

As per ISED RSS-210 Issue 9, G.3.4:

The transmitter unwanted emissions shall meet the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and radio spectrum matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement.

As per Clause 8.4.3 of ETSI EN 301 422-1 V1.4.2 (2011-08), limits for spurious emissions are listed in the table below,

State	Frequency		
	47-74 MHz 87.5-137 MHz 174-230 MHz 470-862 MHz	Other Frequencies below 1000 MHz	Frequencies above 1000 MHz
Operation	4 nW	250 nW	1 μ W
Standby	2 nW	2 nW	20 nW

8.2 Test Procedure

According to Section G.2 of ISED RSS-210 Issue 9, the measurement method described in ETSI EN 300 422-1 shall be used. Clause 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08) was followed for measuring the spurious emissions.

8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US45303156	2017-02-24	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
HP/Agilent	Pre-Amplifier	8449BOPTHO2	3008A0113	2017-05-23	1 year
A.R.A.	Antenna, Horn	DRG-118/A	1132	2015-09-21	2 years
HP	Pre-Amplifier	8447D	2944A06639	2016-06-28	1 year
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 year
COM-POWER	Antenna, Dipole	AD-100	721033DB1, 2, 3, 4	2017-02-12	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2017-01-06	1 year
-	SMA Cable	-	C0003	-	Each time
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	2 year
IW Microwave	High Frequency Cable	DC-1438	SPS-2303- 3840-SPS	2017-01-23	1 year

Statement of Traceability: **BACL Corp.** attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

8.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	39 %
ATM Pressure:	101.2 kPa

The testing was performed by Dean Liu on 2017-06-18 at RF site.

8.5 Test Results

Test mode: Transmitting

EUT was configured to high power setting

Freq. (MHz)	S.A. Amp. (dBmV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	FCC ISED Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)			
1846	48.15	292	201	V	1846	-60.21	9.5	0.95	-51.66	-30	-21.66
1902	47.62	291	162	H	1902	-59.7	9.2	0.98	-51.48	-30	-21.48
473.1	27.88	141	173	H	473.1	-72.32	0	0.29	-72.61	-54	-18.61
567.3	27.13	26	152	V	567.3	-72.27	0	0.37	-72.64	-54	-18.64

Test mode: Standby

Freq. (MHz)	S.A. Amp. (dBmV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	FCC ISED Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)			
1846	47.05	292	201	V	1846	-61.31	9.5	0.95	-52.76	-47	-5.76
1902	46.93	291	162	H	1902	-60.39	9.2	0.98	-52.17	-47	-5.17
473.1	27.66	141	173	H	473.1	-72.54	0	0.29	-72.83	-57	-15.83
567.3	26.12	26	152	V	567.3	-73.28	0	0.37	-73.65	-57	-16.65

Note: All the emissions identified were noise floor.

9 FCC §74.861(e) (4) & ISED RSS-210 G.3.3 - Frequency Stability

9.1 Applicable Standards

According to FCC §74.861 (e) (4):

The frequency tolerance of the transmitter shall be 0.005 percent

As per ISED RSS-210 Issue 9, G.3.3:

The frequency stability of equipment shall comply with the limits specified in Table G1, which is ± 50 ppm.

9.2 Test Procedure

According to ANSI/TIA-603-D 2010 section 2.2.2, the carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The measurement method is as following:

- Operate the equipment in standby conditions for 15 minutes before proceeding.
- Record the carrier frequency of the transmitter as MCF MHz.
- Calculate the ppm frequency error by the following:

$$\text{Ppm error} = (\text{MCF}/\text{ACF} - 1) * 10^6$$

Where

MCF is the Measured Carrier Frequency in MHz

ACF is the Assigned Carrier Frequency in MHz

- The value recorded above is the carrier frequency stability.

According to RSS- Gen issue 4 Section 6.11, frequency stability is a measure of frequency drift due to temperature and supply voltage variations with reference to the frequency measurement at an appropriate reference temperature and the rated supply voltage.

Unless specified otherwise in the RSS that is applicable to the device, the reference temperature for transmitters is $+20^{\circ}\text{C}$.

A hand-held device that is only capable of operating using internal batteries shall be tested using a new battery without any further requirement to vary the supply voltage. Alternatively, an external supply voltage can be used and set at the batter nominal voltage, and again at the battery operating end point voltage which must be specified by the equipment manufacturer.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency-determining circuit element shall be made subsequent to this initial set-up.

With the transmitter installed in an environment test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement. The following temperatures and supply voltage ranges apply, unless specified otherwise in the applicable RSS.

- a) At temperature of -30°C, +20°C and +50°C, and at the manufacturer's rated supply voltage; and
- b) At a temperature of +20°C and at ±15 percent of the manufacturer's rated supply voltage.

If the frequency stability limits are only met at a different temperature range than specified in (a), the frequency stability requirement will be deemed met if the transmitter is automatically inhibited from operating outside this different temperature range and the published equipment operating characteristics are revised to reflect this different temperature range.

If an unmodulated carrier is not available, the measurement method shall be described in the test report.

9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US45303156	2017-02-24	1 year
Tenney	Chamber, Environmental	TUJR	27445-06	2016-09-20	2 Years
KEPCO	Source, DC	25-10M	H1334526 66	Cal. Not Required	N/A
Fluke	Digital Multi-meter	189	89920092	2017-03-22	1 year
Mini Circuits	Precision Fixed Attenuator, 10 dB	BW-S10W5+	-	-	N/A
-	SMA Cable	-	C0003	-	N/A

Cable and attenuator included in the test set-up were checked each time before testing.

Statement of Traceability: **BACL Corp.** attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

9.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	43 %
ATM Pressure:	101.1 kPa

The testing was performed by Dean Liu on 2017-06-17 at RF site.

9.5 Test Results

Varying temperature:

Temperature (°C)	Measured Frequency (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (±ppm)
-30	539.00071	539	1.32	50
-20	539.00039	539	0.72	50
-10	539.00027	539	0.50	50
0	539.00018	539	0.33	50
10	539.00017	539	0.32	50
20	538.99877	539	-2.28	50
30	539.00008	539	0.15	50
40	538.99865	539	-2.50	50
50	538.99854	539	-2.71	50

Varying supply voltage:

Voltage (V _{DC})	Measured Frequency (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (±ppm)
2.55	538.99894	539	-1.97	50
3.45	538.99925	539	-1.74	50

10 Appendix A - Test Setup Photographs

Please refer to the attachment

Appendix B- EUT External Photographs

Please refer to the attachment

11 Appendix C- EUT Internal Photographs

Please refer to the Attachment

--- END OF REPORT ---