FCC PART 74H
IC RSS-123, ISSUE 2
TEST AND MEASUREMENT REPORT

For

Lectrosonics, Inc.

581 Laser Road NE, PO Box 15900,

Rio Rancho, NM 87124, USA

FCC ID: DBZDB
IC: 8024A-DB

Report Type: Original Report	**Product Type:** Digital Wireless Microphone Transmitter
Prepared By	Isaac Aguilar
Report Number	R1407293-74 Rev D
Report Date	2015-01-05
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1407293-74	Original Report	2014-09-23
1	R1407293-74 Rev A	Revised Report	2014-11-19
2	R1407293-74 Rev B	Revised Report with updated labeling information	2014-11-19
3	R1407293-74 Rev C	Revised Report with updated labeling information	2014-11-20
4	R1407293-74 Rev D	Revised Report based on TE's comments	2015-01-05

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Lectrosonics, Inc*., and their product model: *DB, FCC ID: DBZDB, IC: 8024A-DB* or the "EUT" as referred on this report. The EUT is Digital wireless microphone transmitter.

1.2 Mechanical Description of EUT

The "EUT" measures approximately *8.35 cm (L) x 6.13 cm (W) x 1.81 cm (H)*, and weighs approximately *0.231 kg with alkaline AA batteries.*

The test data gathered are from typical production sample, serial number: 20 provided by the manufacture.

1.3 Objective

This report is prepared on behalf of *Lectrosonics, Inc.* in accordance with Part 74, Subparts H of the Federal Communications Commission rules, Issue 3 of Industry Canada RSS-Gen General Requirements and Information for the Certification of Radio Apparatus and Issue 2 of Industry Canada RSS-123, Licensed Low-Power Radio Apparatus.

The objective is to determine compliance with Part 74 of the FCC Rules, Industry Canada RSS-Gen and Industry Canada RSS-123 Standard, limits for RF output power, Modulation characteristics, Emission bandwidth, Field strength of spurious radiation and Frequency stability for Information Technology Equipment.

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 +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:
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 in accordance to TIA-603-D Standards.

2.2 EUT Exercise Software

Putty was used to configure the EUT to transmit in different modes (CW or modulated)

2.3 Equipment Modifications

N/A

2.4 Special Equipment

N/A

2.5 Local Support Equipment

N/A

2.6 EUT Internal Configuration Details

Manufacturers	Descriptions	Models	Serial Numbers
Lectrosonics	Audio ASSY	17444	N/A
Lectrosonics	RF ASSY	17445	N/A

2.7 Power Supply List and Details

N/A

2.8 Interface Ports and Cables

Cable Description	Length (m)	To	From
RF Cable	<1.0	PSA	EUT
Dynamic mic level adapter cable	<1.0	EUT	Communication Test Set

3 Summary of Test Results

FCC & IC Rules	Descriptions of Test	Result(s)
FCC §74.861(e)(1) RSS-123 Section 5.1	RF output power	Compliant
FCC §74.861(e)(3) RSS-123 Section 5.2	Modulation characteristics	N/A[1]
FCC §74.861(e)(5)(6) RSS-123 Section 5.3	Emission bandwidth & Emission Mask	Compliant
FCC §74.861(e)(6) RSS-123 Section 5.5	Spurious emissions at antenna terminals	Compliant
FCC §74.861(e)(6) RSS-123 Section 5.5	Field strength of spurious radiation	Compliant
FCC §74.861(e)(4) RSS-123 Section 5.4	Frequency stability	Compliant
FCC §2.1093 IC RSS-102	RF Exposure (SAR)	Compliant*

Note: NA[1]: The EUT utilizes digital modulation.
* Please refer to SAR report (R1407293-SAR).

4 FCC §2.1093 & IC RSS-102 – RF Exposure

4.1 Applicable Standards

FCC Part 2.1093, IC RSS-102

4.2 Result

Please refer to SAR report: R1407293-SAR

5 FCC §74.861 & IC RSS-123 §5.1 – RF Output Power

5.1 Applicable Standards

As per FCC §74.861 (e) (1): the power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed the following:

(i) 54-72, 76-88, and 174-216 MHz bands – 50 mW
(ii) 470-608 and 614-698 MHz bands – 250 mW

As per IC RSS-123 §5.1:

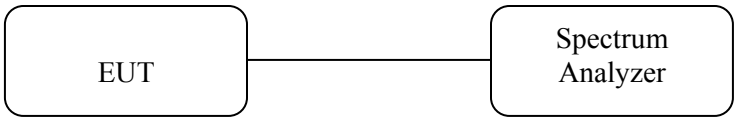
470-608 MHz and 614-698 MHz bands – 250mW

5.2 Test Procedure

Connect the EUT to spectrum analyzer and set the spectrum analyzer as following:

- Center frequency: channel frequency under test
- RBW: 100 kHz
- VBW: 300 kHz
- Detector mode: peak
- Span: 1 MHz

Max-hold the trace and record the peak value once the trace stabilized.



5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4446	US44300386	2013-10-22	1 year

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

5.4 Test Environmental Conditions

Temperature:	23°-24° C
Relative Humidity:	44-48 %
ATM Pressure:	101.56-101.28 kPa

The testing was performed by Isaac Aguilar from 2014-08-27 to 2014-09-02 at RF site.

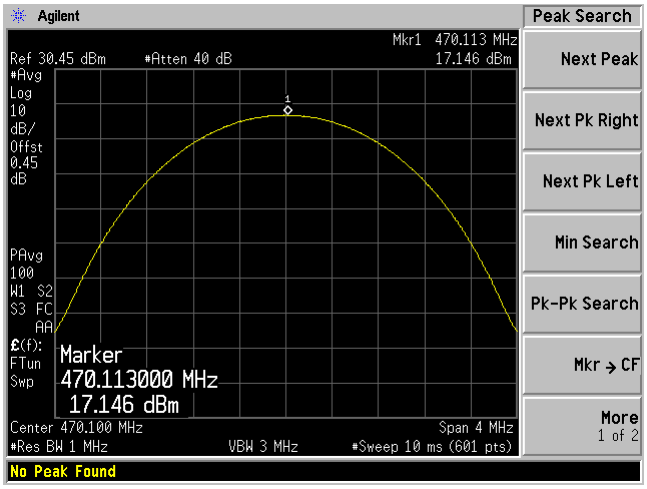
5.5 Test Results

Conducted output power:

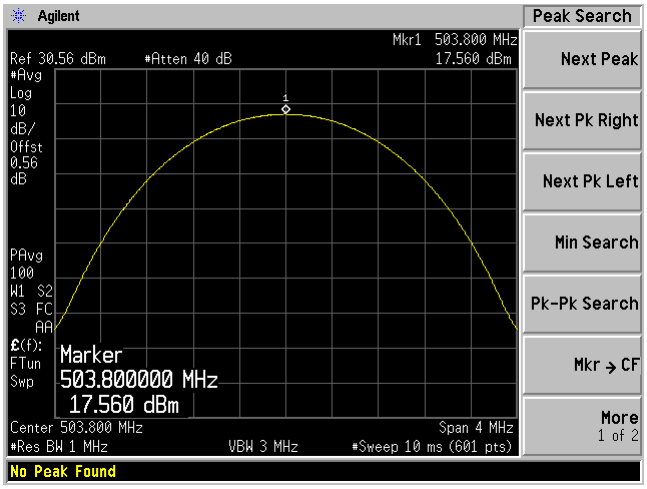
Frequency (MHz)	Conducted Output Power (dBm)	Limits (dBm)	Margin (dB)
470.100	17.146	24	-6.854
503.800	17.56	24	-6.44
537.575	17.584	24	-6.416
537.600	17.61	24	-6.39
575.975	17.969	24	-6.031
614.375	17.748	24	-6.252
614.4	17.827	24	-6.173
652.775	16.987	24	-7.013
691.175	15.853	24	-8.147

Please refer to the following plots.

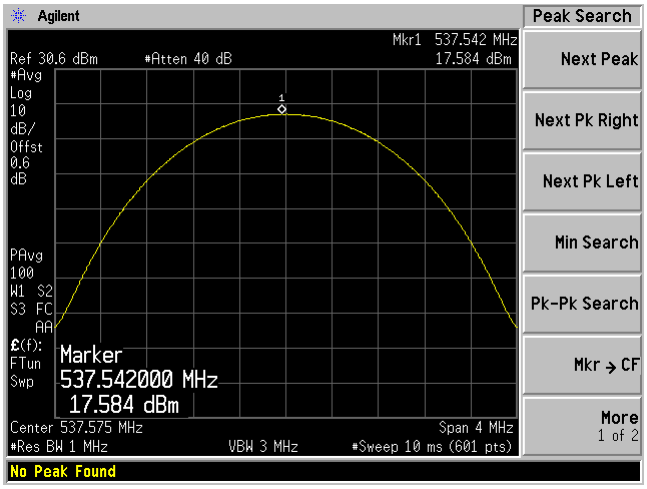
470.100 MHz



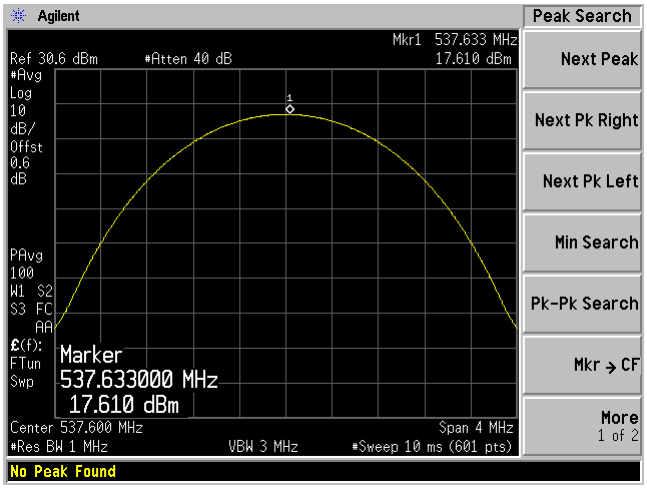
503.800 MHz



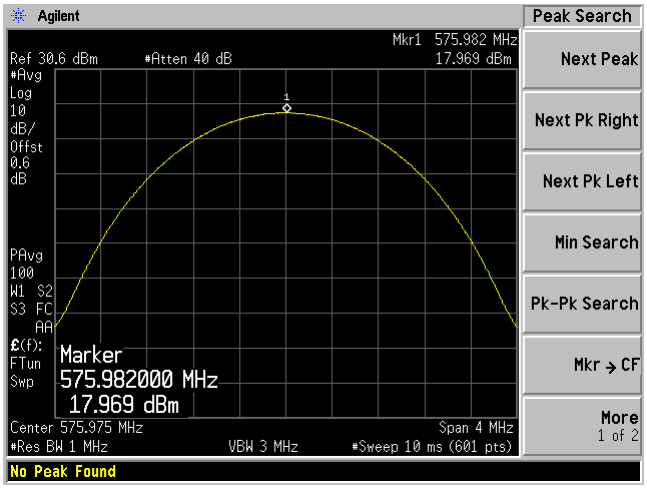
537.575 MHz



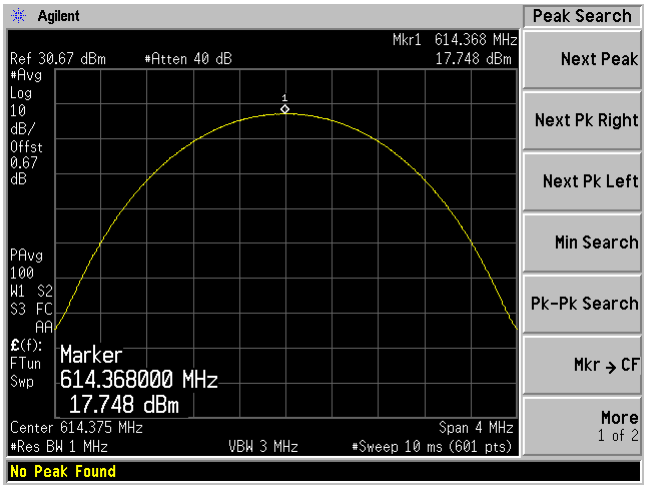
537.600 MHz



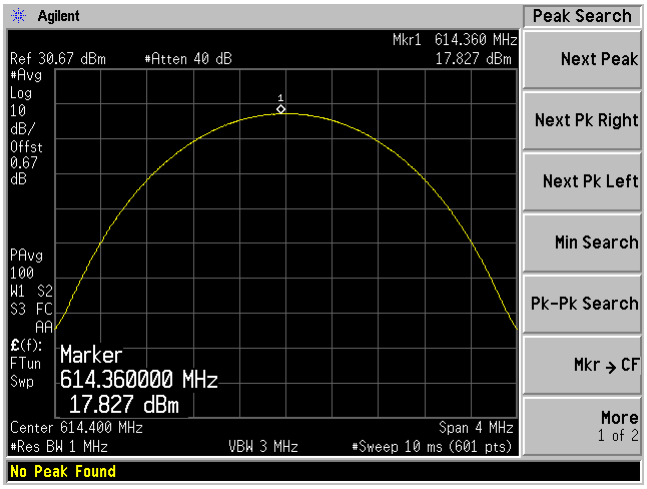
575.975 MHz



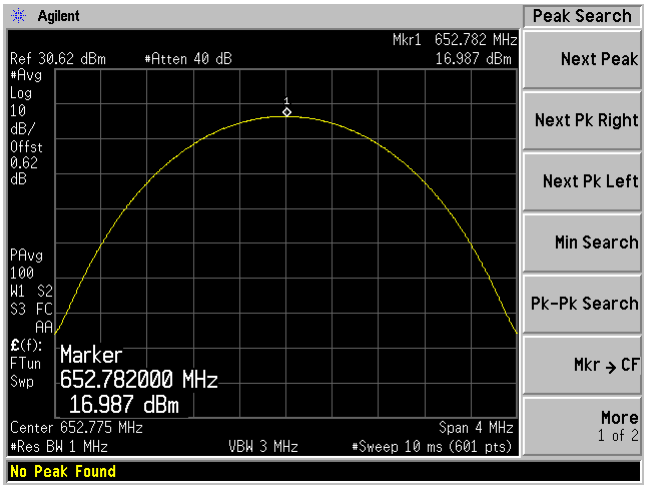
614.375 MHz



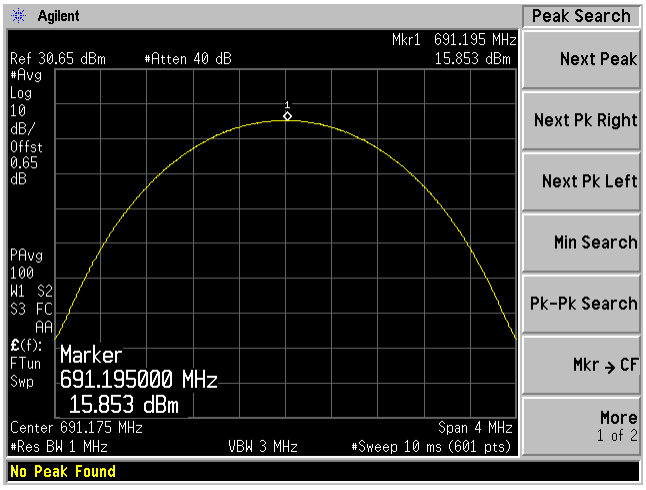
614.4 MHz



652.775 MHz



691.175 MHz



6 FCC §74.861(e) (5)(6) & IC RSS-123 §5.3 - Emission Bandwidth & Mask

6.1 Applicable Standards

As per FCC §74.861(e) (5) (6):

The operating bandwidth shall not exceed 200 kHz.

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
- On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
- On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log (mean output power in watts) dB.

As per IC RSS-123 §5.3:

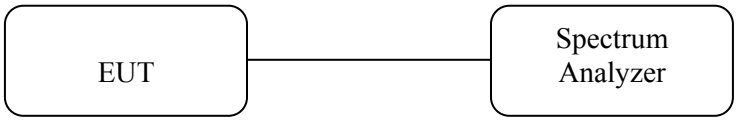
The occupied bandwidth as defined in RSS-Gen shall not exceed the authorized bandwidth of 200 kHz when the frequency band is 470 MHz-608 MHz, and 614 MHz-698 MHz.

6.2 Test Procedure

According to RSS-Gen issue 3 Section 4.6.1, when an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 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 shal be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold my produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear 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. This frequency is recorded. The span between two recorded frequencies is the occupied bandwidth.



6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Interval
HP	RF Communications Test Set	8920A	3438A05338	2014-06-04	1 year
Agilent	Analyzer Spectrum	E4446A	US44300386	2013-10-22	1year

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

6.4 Test Environmental Conditions

Temperature:	23-24° C
Relative Humidity:	44 %
ATM Pressure:	101.28 kPa

The testing was performed by Isaac Aguilar on 2014-08-21 to 2014-08-27 on RF site.

6.5 Test Results

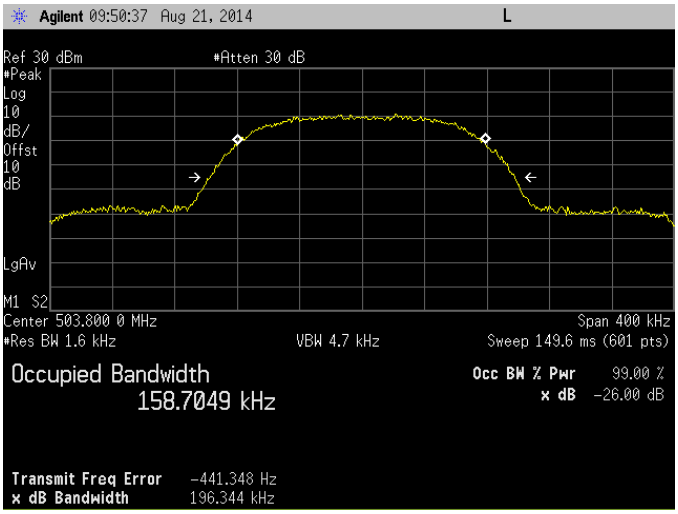
Occupied Bandwidth Table

Center Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
503.800	158.70	196.34	200	Pass
575.975	159.18	196.20	200	Pass
652.775	159.51	196.50	200	Pass

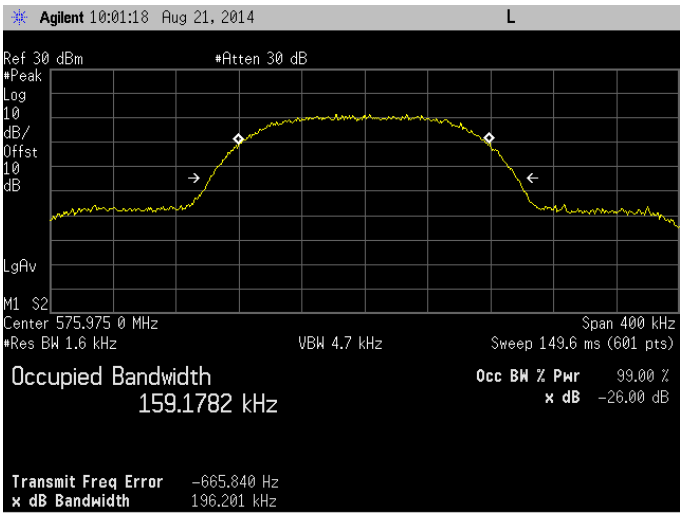
Please refer to the following plots.

Emission Bandwidth

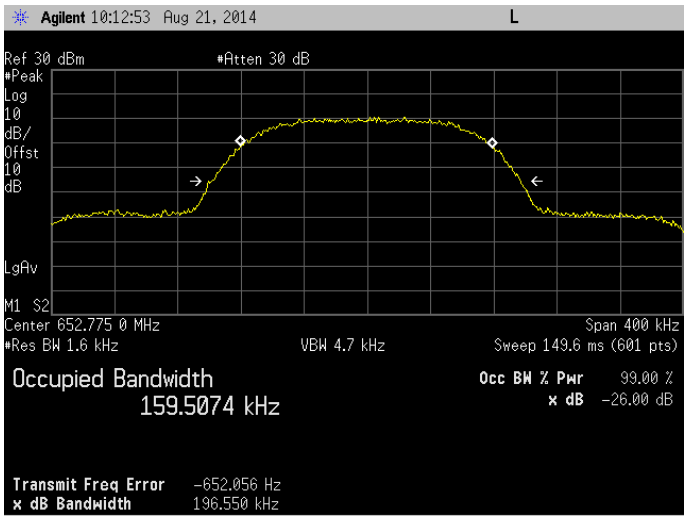
503.800 MHz OBW



575.975 MHz OBW

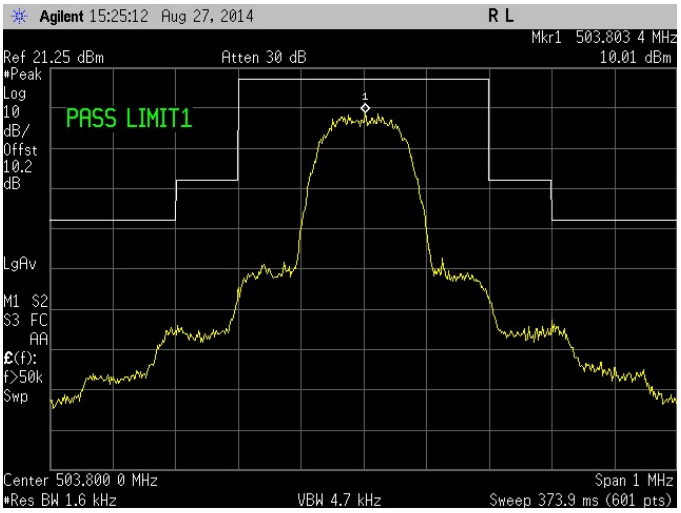


652.775 MHz OBW

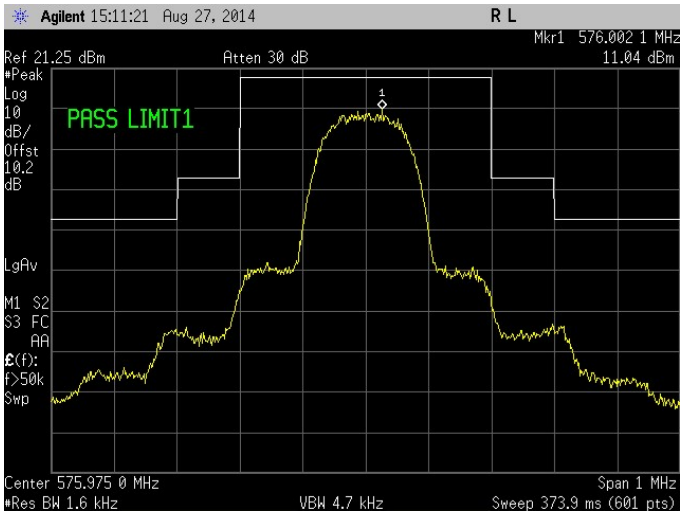


Emission Mask

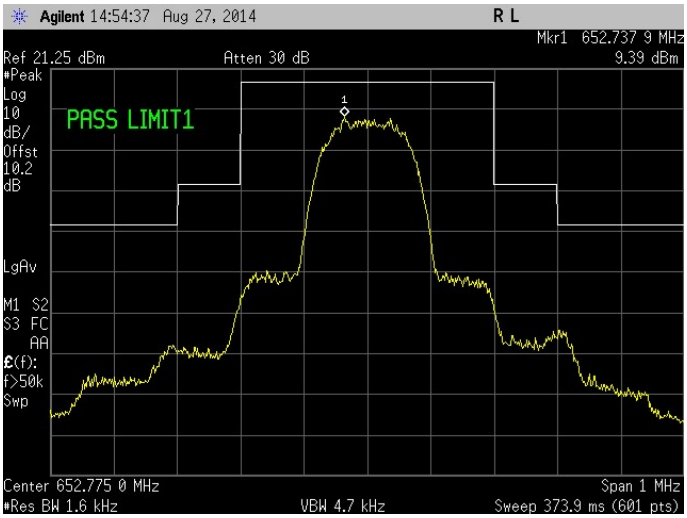
503.800 MHz



575.975 MHz



652.755 MHz



7 FCC §74.861(e)(6) & IC RSS-123 §5.5 - Spurious Emissions at Antenna Port

7.1 Applicable Standards

As per FCC §74.861(e) (6) (iii):

On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log (mean output power in watts) dB.

As per IC RSS-123 §5.5:

The power of unwanted emissions (measured with a resolution bandwidth of 30 kHz) shall be attenuated below the mean output power, p-mean in dBW, of the transmitter as follows:

At least 55 + 10log (P-mean in watts) dB: on any frequency removed from the operating frequency by more than 250% of the authorized bandwidth.

7.2 Test Procedure

According to ANSI/TIA-603-D 2010 section 2.2.13, conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired. The method of measurement is as following:

- Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.

- Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.

- Adjust the spectrum analyzer for the following setting:

    1) Resolution bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
    2) Video bandwidth ≥ 3 times the resolution bandwidth.
    3) Sweep speed ≤ 2000 Hz per second.
    4) Detector mode = mean or average power.

- Record the frequencies and levels of spurious emissions.

According to RSS-Gen issue 3 Section 4.6.1, when the applicable unwanted emissions limits are defined in relative terms, the same parameter, peak power or average power, used for the transmitter output power measurement, shall be used for unwanted emission measurement.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given in (a) and (b):

(a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency, as well as to those frequencies removed from the carrier by multiple of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value need not be reported.

When limits are expressed in absolute terms, compliance with the emission limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth for emissions below 1000 MHz. as an alternative to CISPR quasi-peak measurement, compliance with the emission limits can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth.

Above 1000 MHz, compliance with the emission limits shall be demonstrated using an average detector with a minimum resolution bandwidth of 1 MHz.

7.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Interval
HP	RF Communications Test Set	8920A	3438A05338	2014-06-04	1 year
Rohde & Schwarz	Receiver	FSQ	200749	2014-02-24	1year

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

7.4 Test Environmental Conditions

Temperature:	24 °C
Relative Humidity:	45 %
ATM Pressure:	101.78 kPa

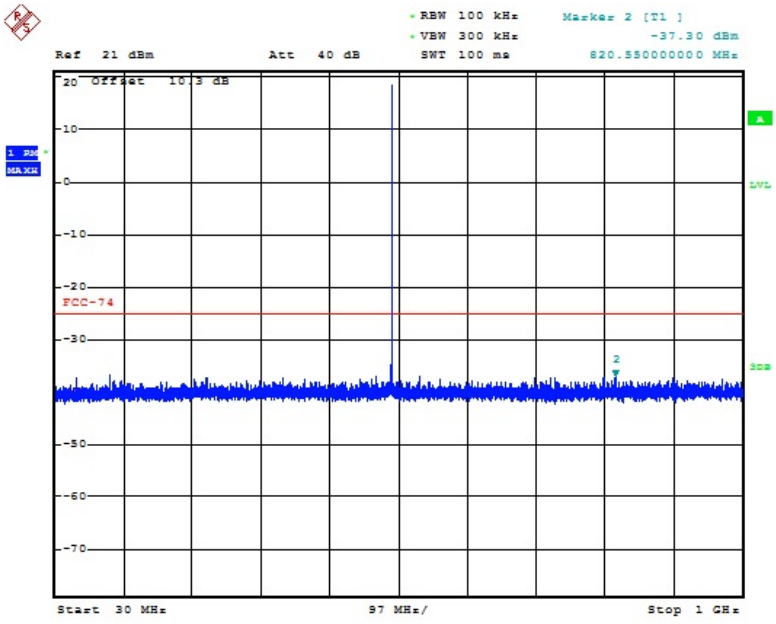
The testing was performed by Isaac Aguilar on 2014-09-01 on RF site.

7.5 Test Results

Frequency (GHz)	Receiver Reading (dBm)	FCC Limit (dBm)	IC Limit (dBm)	FCC Margin (dB)	IC Margin (dB)	Results
503.800 MHz Spurious Emissions						
4.030	-50.16	-13	-25	-37.16	-25.16	Pass
1.007	-39.12	-13	-25	-26.12	-14.12	Pass
4.534	-41.02	-13	-25	-28.02	-16.02	Pass
5.038	-41.55	-13	-25	-28.55	-16.55	Pass
0.821	-37.3	-13	-25	-24.3	-12.3	Pass
575.775 MHz Spurious Emissions						
4.032	-45.90	-13	-25	-32.9	-20.9	Pass
1.152	-35.46	-13	-25	-22.46	-10.46	Pass
4.608	-41.68	-13	-25	-28.68	-16.68	Pass
5.184	-41.46	-13	-25	-28.46	-16.46	Pass
0.695	-42.85	-13	-25	-29.85	-17.85	Pass
0.155	-43.64	-13	-25	-30.64	-18.64	Pass
652.775 MHz Spurious Emissions						
3.9176	-48.61	-13	-25	-35.61	-23.61	Pass
1.305	-38.98	-13	-25	-25.98	-13.98	Pass
5.222	-43.17	-13	-25	-30.17	-18.17	Pass
4.569	-42.77	-13	-25	-29.77	-17.77	Pass
0.975	-42.9	-13	-25	-29.9	-17.9	Pass
0.403	-41.86	-13	-25	-28.86	-16.86	Pass

503.800 MHz Channel

30 MHz – 1000 MHz



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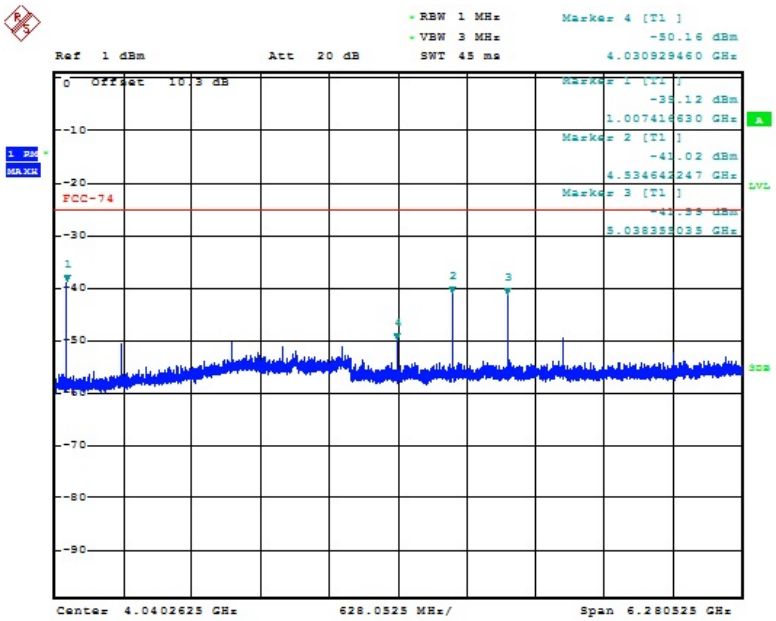
1 GHz to 7.2 GHz



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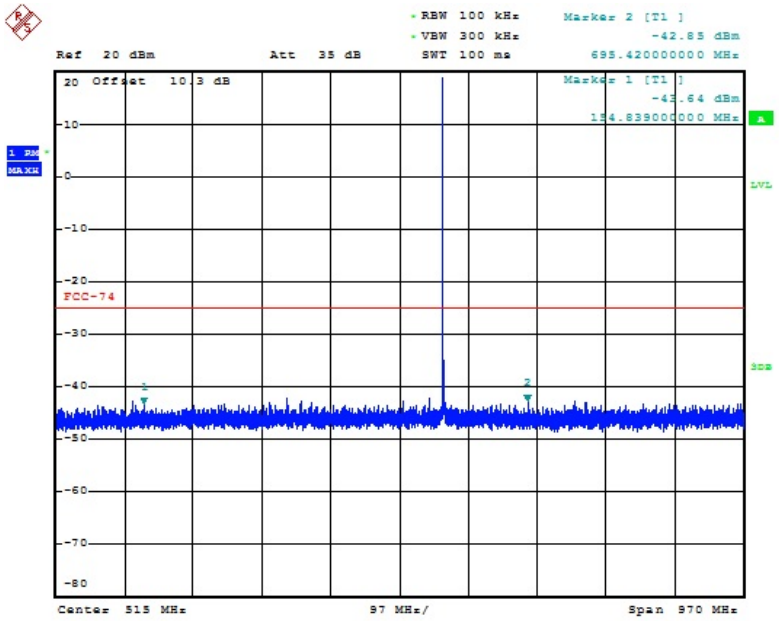
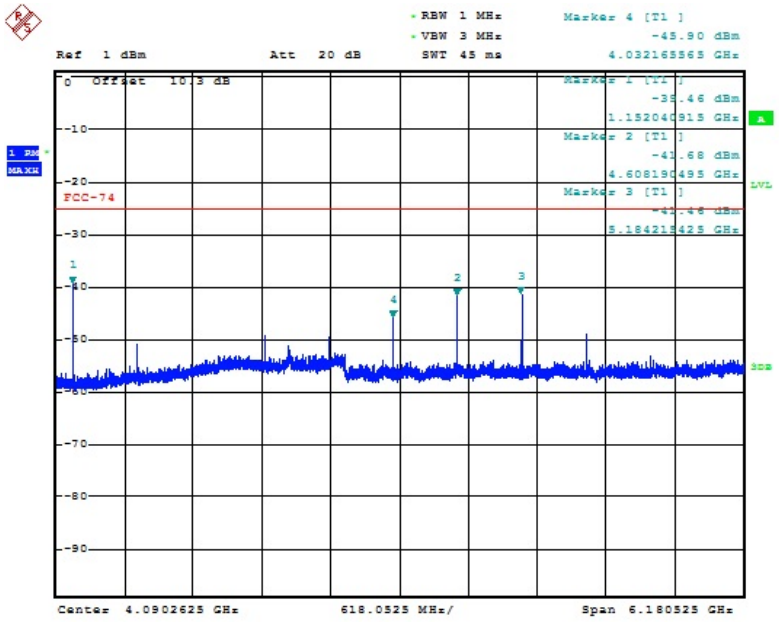
575.975 MHz Channel

30 MHz – 1000 MHz

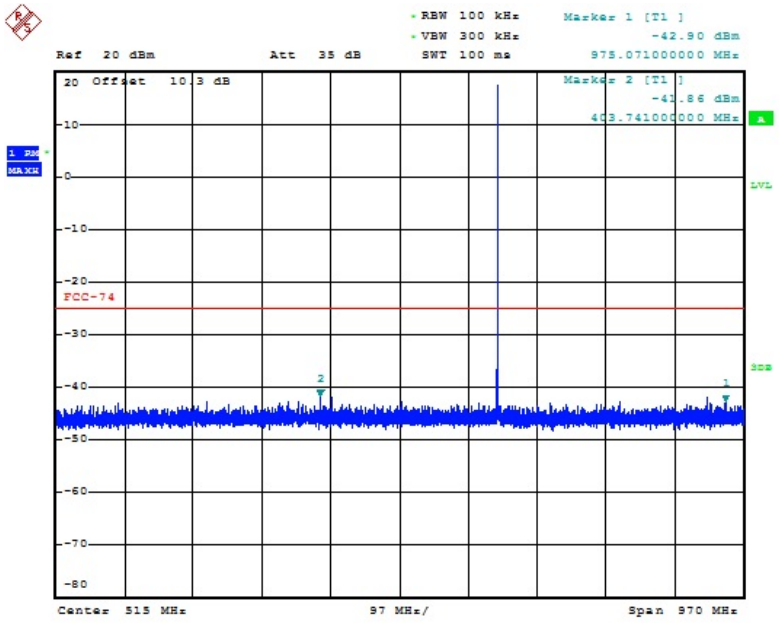


1 GHz to 7.2 GHz



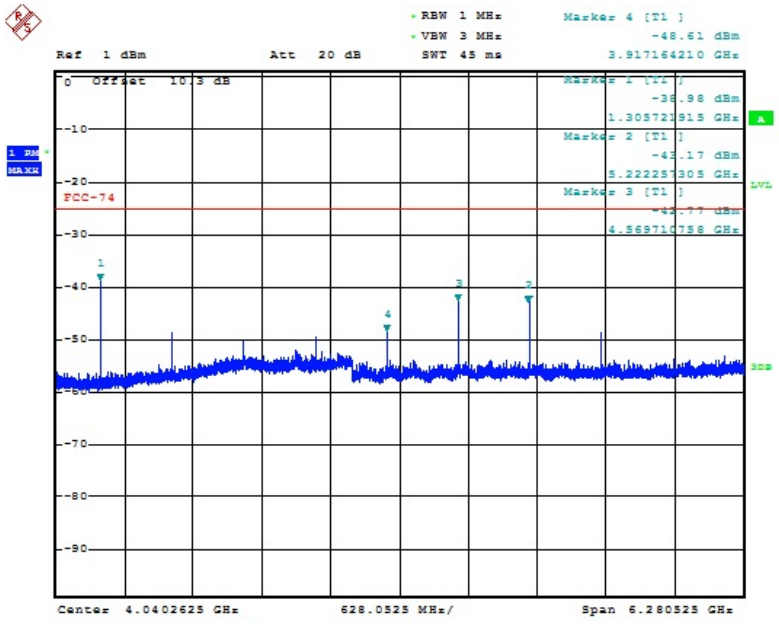
652.775 MHz Channel

30 MHz – 1000 MHz



Date: 18.SEP.2014 14:40:06

1 GHz to 7.2 GHz



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8 FCC §74.861(e)(6) & IC RSS-123 §5.5 - Field Strength of Spurious Radiation

8.1 Applicable Standards

As per FCC §74.861(e) (6) (iii):

On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log (mean output power in watts) dB.

As per IC RSS-123 §5.5:

The power of unwanted emissions (measured with a resolution bandwidth of 30 kHz) shall be attenuated below the mean output power, p-mean in dBW, of the transmitter as follows:

At least 55 + 10log (P-mean in watts) dB: on any frequency removed from the operating frequency by more than 250% of the authorized bandwidth.

8.2 Test Procedure

ANSI/TIA603-D 2010 section 2.2.12.

8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver	FSQ	200749	2014-02-24	1 year
HP	Signal Generator	8648C	3847M00143	2012-11-229	2 Year
Sunol Sciences	Bi-Log Antenna	JB3	A020106-3	2014-07-24	1 Year
Sunol Sciences	Bi-Log Antenna	JB1	A013106-3	2014-080-11	1 Year
HP	Pre-Amp	8449B OPT H02	3008A01103	2014-03-10	1 Year
HP	Pre-Amp	8447D	2944A06639	2014-06-09	1 Year
EMCO	Horn Antenna	`3115	9511-4627	2014-03-28	1 Year
Sunol Sciences	Horn Antenna	DRH-118	A052704	2014-01-06	1 Year

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

8.4 Test Environmental Conditions

Temperature:	23°- 24° C
Relative Humidity:	42 – 48 %
ATM Pressure:	101.38 – 101.56 kPa

The testing was performed by Isaac Aguilar from 2014-09-02-2014-09-04 in 5 meter chamber 3.

8.5 Test Results

F = 503.800 MHz

Freq. (MHz)	S.A. Amp. (dBmV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	IC RSS-123	
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
96.9	46.63	0	150	V	96.9	-63.37	0	0.3	-63.67	-25	-38.67
174.1	46.57	0	150	V	174.1	-62.43	0	0.4	-62.83	-25	-37.83
1007.3	69.67	21	172	V	1007.3	-30.33	5.998	2.57	-26.902	-25	-1.902
7463.3	60.22	0	150	V	7463.3	-34.78	11.668	5.48	-28.592	-25	-3.592

F = 575.975 MHz

Freq. (MHz)	S.A. Amp. (dBmV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	IC RSS-123	
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
439.5	45.53	0	150	V	439.5	-61.47	0	0.7	-62.17	-25	-37.17
653.5	45.27	0	150	V	653.5	-62.73	0	0.9	-63.63	-25	-38.63
1151.3	74.32	56	161	V	1151.3	-30.68	5.998	2.57	-27.252	-25	-2.252
1728.6	61.73	43	165	V	1728.6	-38.27	8.826	2.95	-32.394	-25	-7.394

F = 652.775 MHz

Freq. (MHz)	S.A. Amp. (dBmV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	IC RSS-123	
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
742.3	43.84	0	150	V	742.3	-59.16	0	1	-60.16	-25	-35.16
604	45.81	0	150	V	604	-62.19	0	0.9	-63.09	-25	-38.09
1305.5	73.59	68	167	V	1305.5	-30.41	6.814	2.94	-26.536	-25	-1.536
2611.4	60.22	91	153	V	2611.4	-39.78	10.166	3.59	-33.204	-25	-8.204

Note: FCC limit is -13 dBm, which is higher than the RSS-123 limit.

9 FCC §74.861 (e)(4) & IC RSS-123 §5.4 – Frequency Stability

9.1 Applicable Standards

As per FCC §74.861(e) (4):

The frequency tolerance of the transmitter shall be 0.005 percent.

As per IC RSS-123 §5.4:

The frequency stability of low-power licensed radio apparatus shall comply with the limits of 50 ppm when the frequency band is 470 MHz-608 MHz.

9.2 Test Procedure

According to ANSI/TIA603-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 3 Section 4.7, 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℃.

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 battery 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℃, +20℃ and +50℃, and at the manufacturer's rated supply voltage; and
(b) At a temperature of +20℃ 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

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Interval
Espec	Humidity Chamber	ESL-4CA	18010	2014-02-11	1year
Rohde & Schwarz	Receiver	FSQ	200749	2014-02-24	1 Year
Tenny	Environmental Chamber	TUJR	27445-06	2014-08-06	1 Year
HP	Power Supply (DC)	6236B	N/A	N/R	N/A

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

9.4 Test Environmental Conditions

Temperature:	25 °C
Relative Humidity:	42 %
ATM Pressure:	101.56 kPa

The testing was performed by Isaac Aguilar from 2014-09-04 on RF site.

9.5 Test Results

Varying temperature

Temperature (℃)	Measured (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (ppm)
-20	503.799	503.800	-2	50
-10	503.799	503.800	-2	50
0	503.799	503.800	-2	50
10	503.799	503.800	-2	50
20	503.799	503.800	-2	50
30	503.799	503.800	-2	50
40	503.798	503.800	-4	50
50	503.797	503.800	-6	50

Temperature (℃)	Measured (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (ppm)
-20	575.973	575.975	-3	50
-10	575.974	575.975	-2	50
0	575.974	575.975	-2	50
10	575.974	575.975	-2	50
20	575.974	575.975	-2	50
30	575.974	575.975	-2	50
40	575.973	575.975	-3	50
50	575.973	575.975	-3	50

Temperature (℃)	Measured (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (ppm)
-20	652.773	652.775	-3	50
-10	652.774	652.775	-2	50
0	652.774	652.775	-2	50
10	652.774	652.775	-2	50
20	652.774	652.775	-2	50
30	652.774	652.775	-2	50
40	652.774	652.775	-2	50
50	652.773	652.775	-3	50

Varying supply voltage

Conditions	Measured (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (ppm)
3.86 VDC supply at 20℃	503.801	503.800	2	50
	575.976	575.975	2	50
	652.976	652.975	2	50
5.23 VDC supply at 20℃	503.801	503.800	2	50
	575.976	575.975	2	50
	652.976	652.975	2	50