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: DBZM2T
IC: 8024A-M2T

Report Type:	**Product Type:**
Original Report	Digital IEM Transmitter

Prepared By:	Dean Liu Test Engineer
Report Number:	R1705125-74
Report Date:	2017-08-31
Reviewed By:	Simon Ma RF Lead

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1705125-74	Original Report	-

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: *M2T, FCC ID: DBZM2T, IC: 8024A-M2T* which henceforth is referred to as the EUT (Equipment Under Test). The EUT is a Digital IEM Transmitter. The EUT operates in the frequency range: 470.1-607.975 MHz. The modulation is 8PSK, the EUT has 2 RF carriers and can transmit simultaneously.

1.2 Mechanical Description of EUT

The EUT measures approximately 19.7 cm (D) x 21.3 cm (W) x 4.4 cm (H).

The data gathered are from a typical production sample provided by the Lectrosonics, Inc. with serial number: 6300002

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, Feld 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)

None

1.5 Test Methodology

KDB 971168 D01 v02r02

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 Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

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 Section 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):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - 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 KDB 971168 D01 v02r02.

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
Low capacitance shielded data cable	<3.0	Microphone	EUT

3 Summary of Test Results

FCC & ISED Rules	Descriptions of Test	Result (s)
FCC §2.1091, ISED RSS-102 §2.5.2	RF exposure	Compliant
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)(5)(6), ISED RSS-210 G.3.2 & G.3.4	Operating bandwidth & Emission mask	Compliant
FCC §74.861(e)(6)	Spurious emissions at the antenna port	Compliant
FCC §74.861(e)(6), ISED RSS-210 G.3.4	Field strength of spurious emissions	Compliant
FCC §74.861(e)(4), ISED RSS-210 G.3.3	Frequency stability	Compliant

Not applicable: The EUT only supports digital modulation.

4 FCC §2.1091 & ISED RSS-102 - RF Exposure

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz
* = Plane-wave equivalent power density

According to RSS-102 § 2.5.2 Exemption Limits for Routine Evaluation — RF Exposure Evaluation:

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHzFootnote6 and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W(adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 22.48/*f*0.5 W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 *f*0.6834 W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

4.1 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.2 Test Results

For FCC

RF1:

Maximum output power at antenna input terminal (dBm):	17.25
Maximum output power at antenna input terminal (mW):	53.088
Prediction distance (cm):	20
Prediction frequency (MHz):	470.1
Antenna Gain, typical (dBi):	2.17
Maximum Antenna Gain (numeric):	1.648
Power density at predication frequency at 20cm (mW/cm^2):	0.017
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.313

RF2:

Maximum output power at antenna input terminal (dBm):	17.28
Maximum output power at antenna input terminal (mW):	53.456
Prediction distance (cm):	20
Prediction frequency (MHz):	470.1
Antenna Gain, typical (dBi):	2.17
Maximum Antenna Gain (numeric):	1.648
Power density at predication frequency at 20cm (mW/cm^2):	0.018
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.313

The device is compliant with the required MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.018 mW/cm^2. Limit is 0.313 mW/cm^2. The total percentage is 0.017/0.313 (RF1) + 0.018/0.313 (RF2) = 11.14% < 1.

For ISED

RF1:

Maximum output power at antenna input terminal (dBm):	17.25
Maximum output power at antenna input terminal (mW):	53.088
Prediction distance (cm):	20
Prediction frequency (MHz):	470.1
Antenna Gain, typical (dBi):	2.17
Maximum Antenna Gain (numeric):	1.648
Source-based, time-averaged maximum e.i.r.p. (W):	0.088
Exemption limit at predication frequency at 20 cm (W):	0.878

RF2:

Maximum output power at antenna input terminal (dBm):	17.28
Maximum output power at antenna input terminal (mW):	53.456
Prediction distance (cm):	20
Prediction frequency (MHz):	470.1
Antenna Gain, typical (dBi):	2.17
Maximum Antenna Gain (numeric):	1.648
Source-based, time-averaged maximum e.i.r.p. (W):	0.087
Exemption limit at predication frequency at 20 cm (W):	0.878

The device is exempted from RF Exposure evaluation.

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

KDB 971168 D01 v02r02

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
ETS- Lingerin	Power Sensor	7002-006	160097	2016-12-05	25 months
Mini Circuits	Precision Fixed Attenuator, 10 dB	BW-S10W5+	-	Each time	N/A
-	RF cable	-	-	Each time	N/A

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:	22 ºC
Relative Humidity:	45 %
ATM Pressure:	101.2 kPa

The testing was performed by Dean Liu on 2017-06-20 at RF site.

5.5 Test Results

RF1:

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limits* (dBm)	Rated Power (mW/dBm)
Low	470.1	17.25	2.17	19.42	24	50/17
		14.31	2.17	16.48	24	25/14
		10.26	2.17	12.43	24	10/10
Middle	539	17.21	2.17	19.38	24	50/17
		14.20	2.17	16.37	24	25/14
		10.34	2.17	12.51	24	10/10
High	607.975	16.89	2.17	19.06	24	50/17
		14.18	2.17	16.35	24	25/14
		9.65	2.17	11.82	24	10/10

RF2:

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limits* (dBm)	Rated Power (mW/dBm)
Low	470.1	17.28	2.17	19.45	24	50/17
		14.21	2.17	16.38	24	25/14
		10.03	2.17	12.20	24	10/10
Middle	539	17.11	2.17	19.28	24	50/17
		14.37	2.17	16.54	24	25/14
		10.23	2.17	12.40	24	10/10
High	607.975	16.48	2.17	18.65	24	50/17
		13.48	2.17	15.65	24	25/14
		9.32	2.17	11.49	24	10/10

*Note: the limit 24 dBm is conducted power for the FCC and e.i.r.p for ISED. The device is compliant with both conducted power and e.i.r.p limit.

6 FCC §74.861(e) (5) (6) & ISED RSS-210 G.3.2 & G.3.4 - Occupied Bandwidth & Emission Mask

6.1 Applicable Standards

According to 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+10log10 (mean output power in watts) dB.

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×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). Us 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.

The Emission mask for ISED according to sections 8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08).

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	N/A
-	RF cable	-	-	Each time	N/A

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:	22 ºC
Relative Humidity:	45 %
ATM Pressure:	101.2 kPa

The testing was performed by Dean Liu on 2017-06-20 at RF site.

6.5 Test Results

RF1:

Center Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result	Power Setting
539	168.02	200	Pass	High (50 mW)
539	167.74	200	Pass	Low (10 mW)

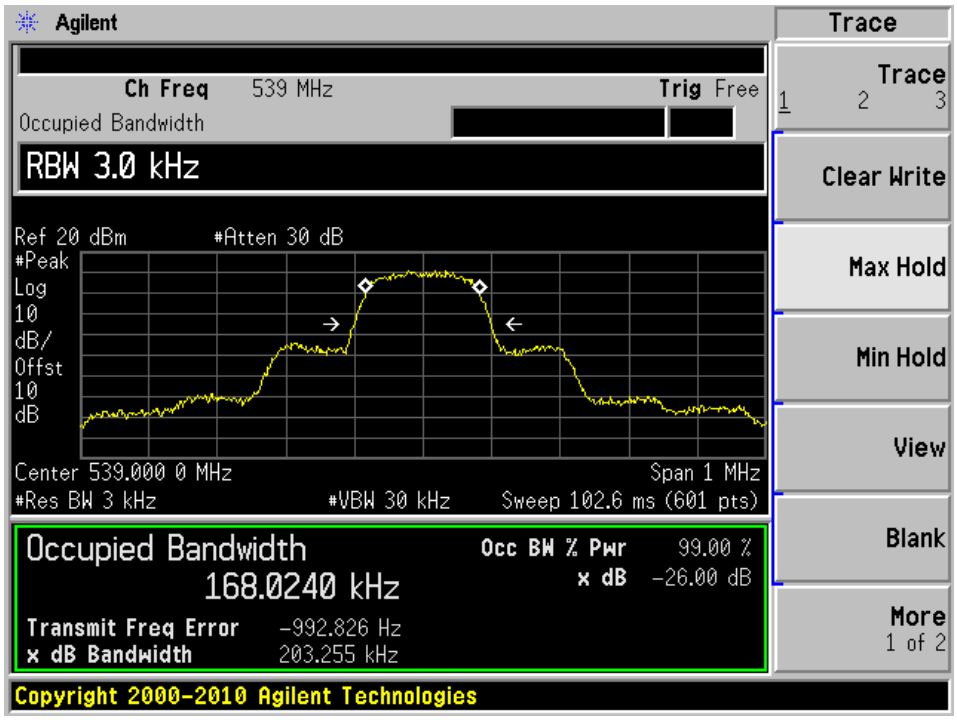
RF2:

Center Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result	Power Setting
539	167.80	200	Pass	High (50 mW)
539	167.69	200	Pass	Low (10 mW)

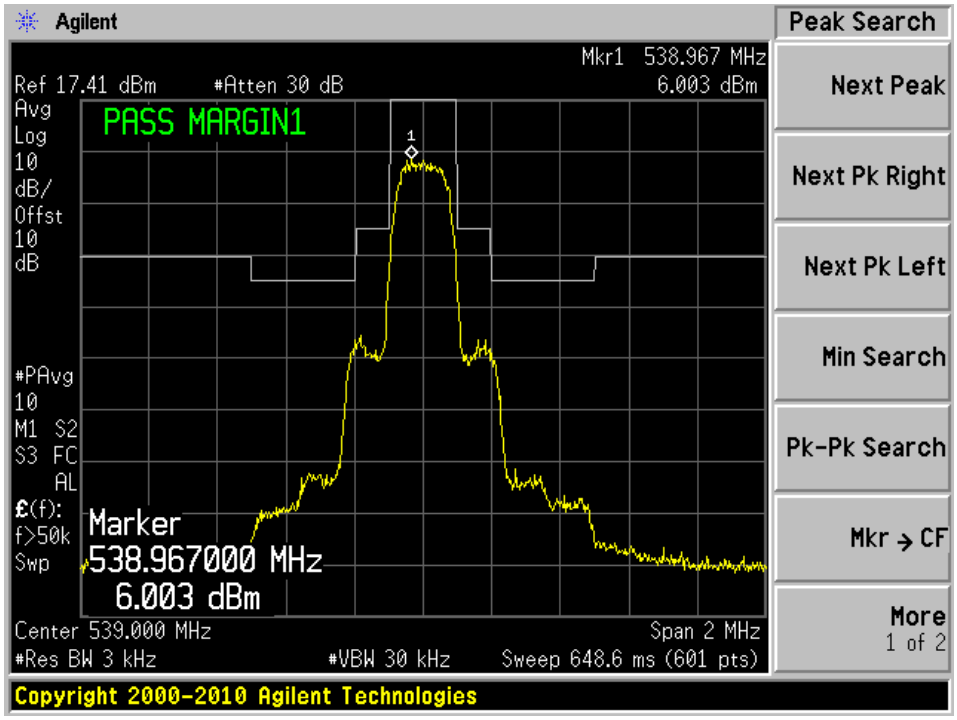
Please refer to the following plots for detailed test results

RF1 (50mW power setting)

Occupied Bandwidth



Emission Mask for FCC



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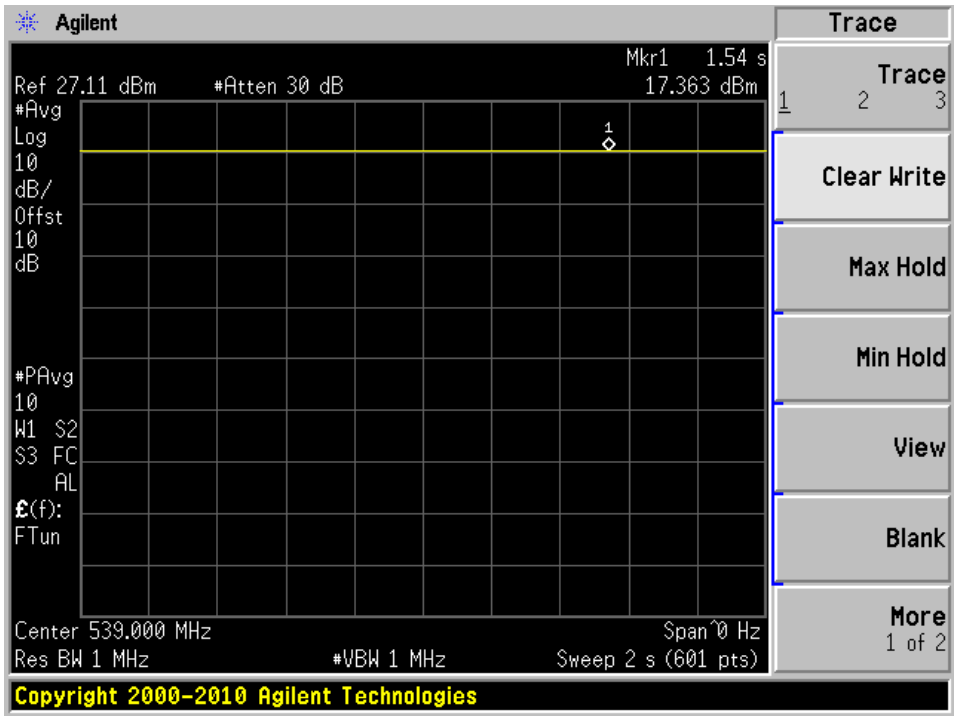
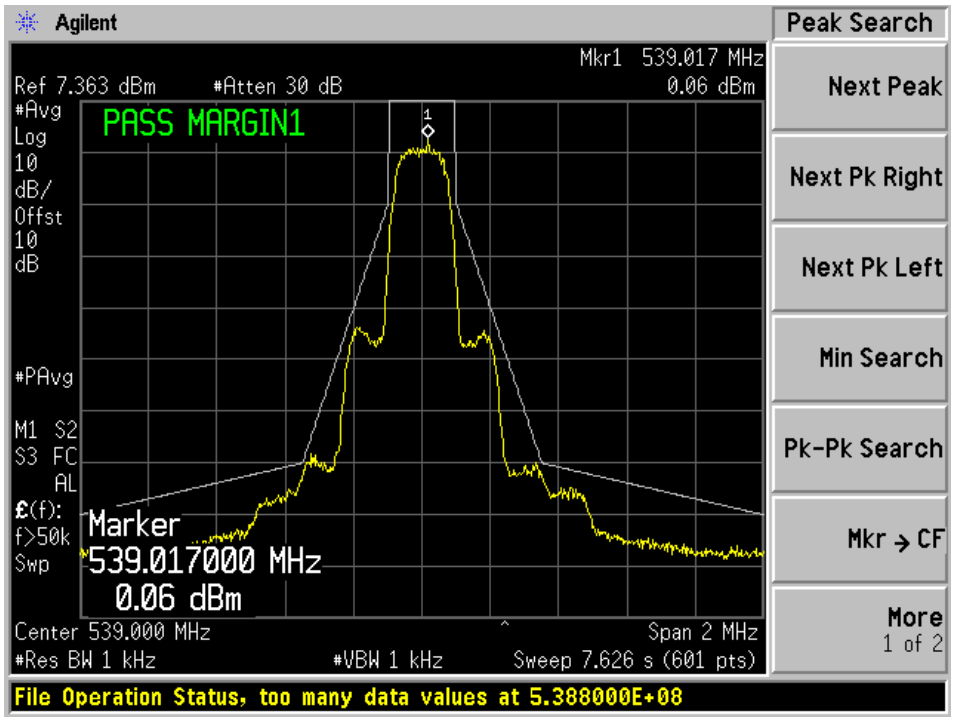
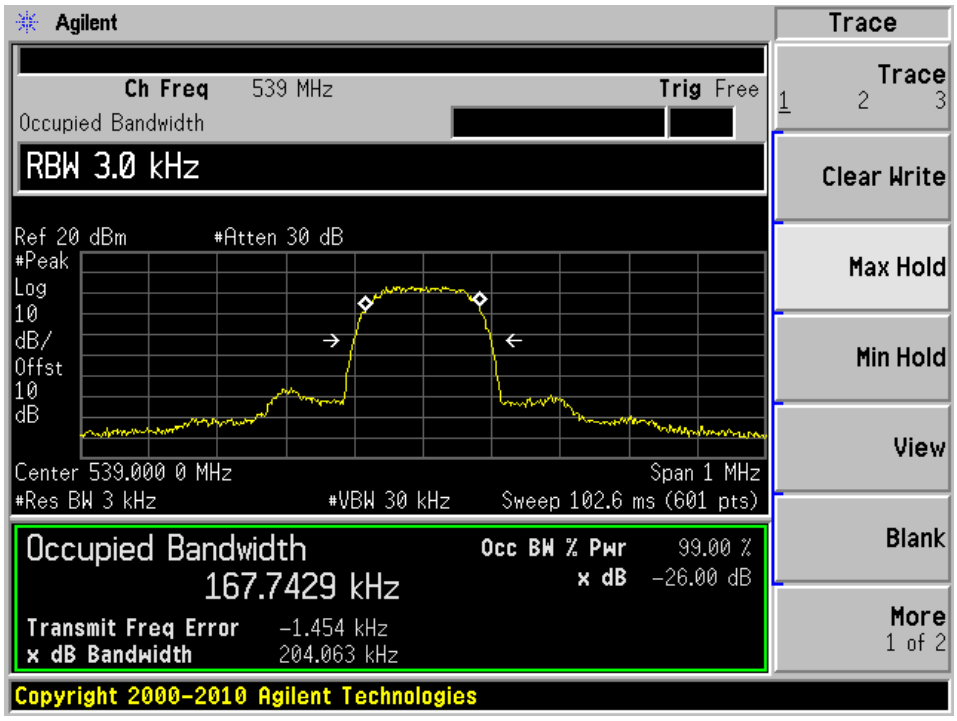


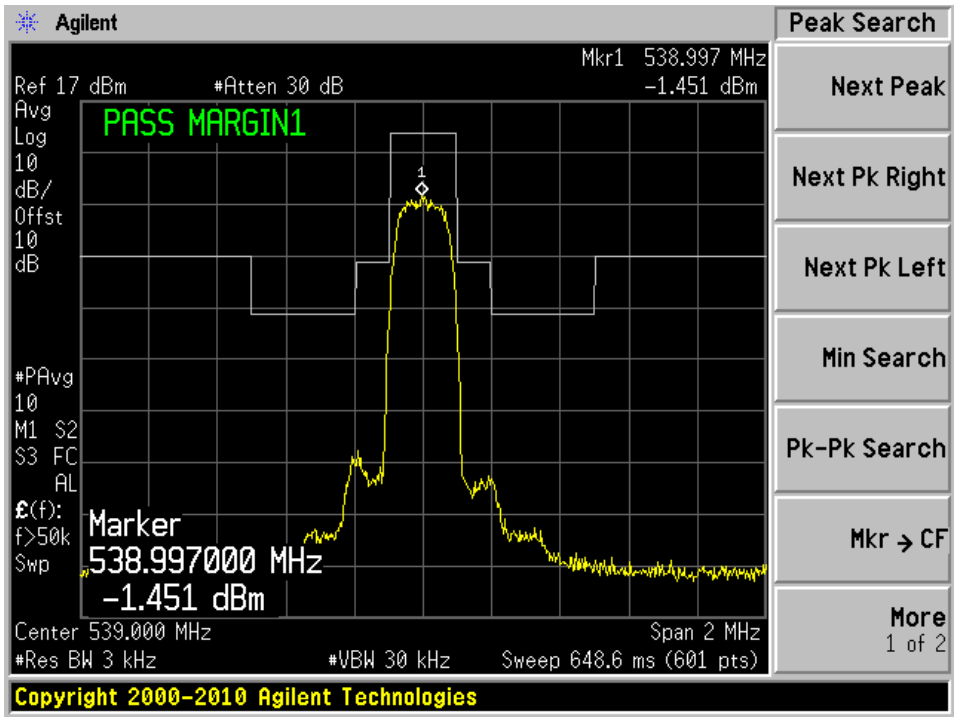


RF1 (10mW power setting)

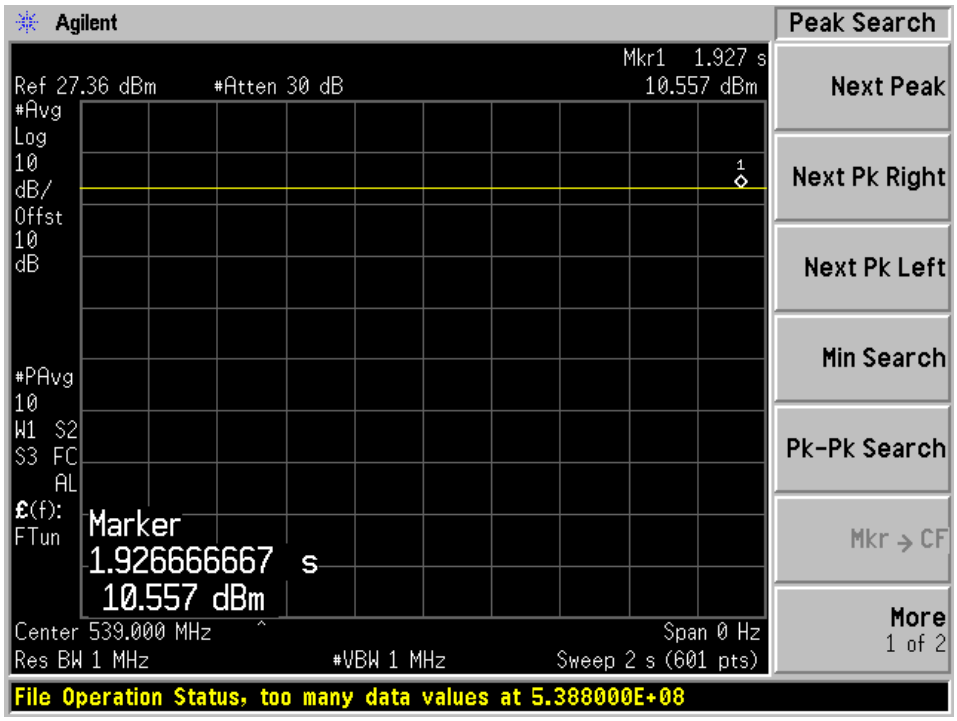
Occupied Bandwidth

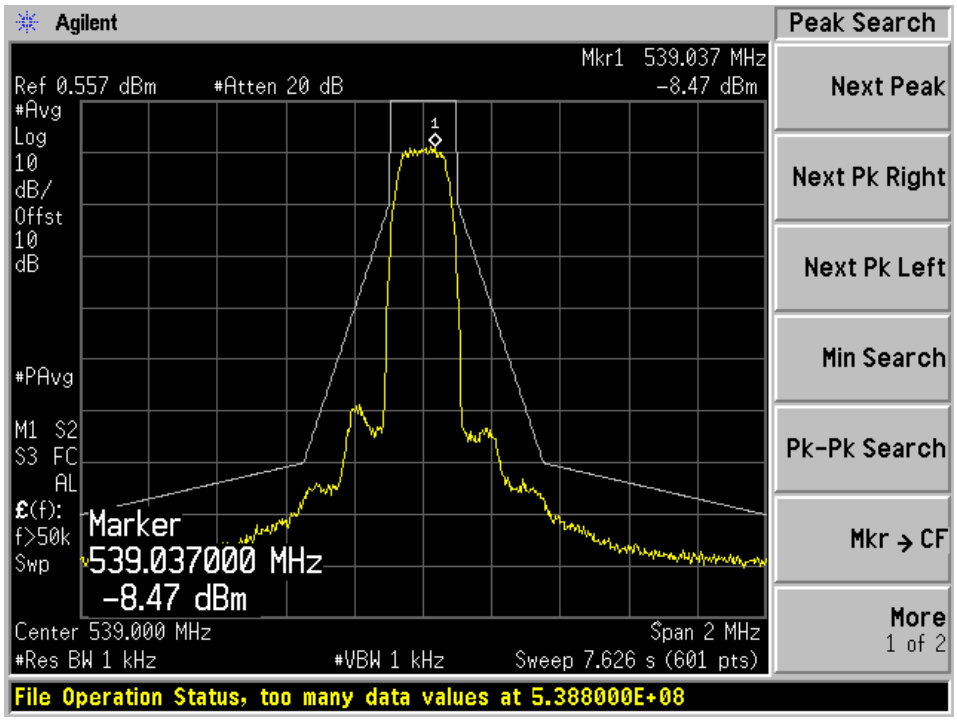


Emission Mask for FCC



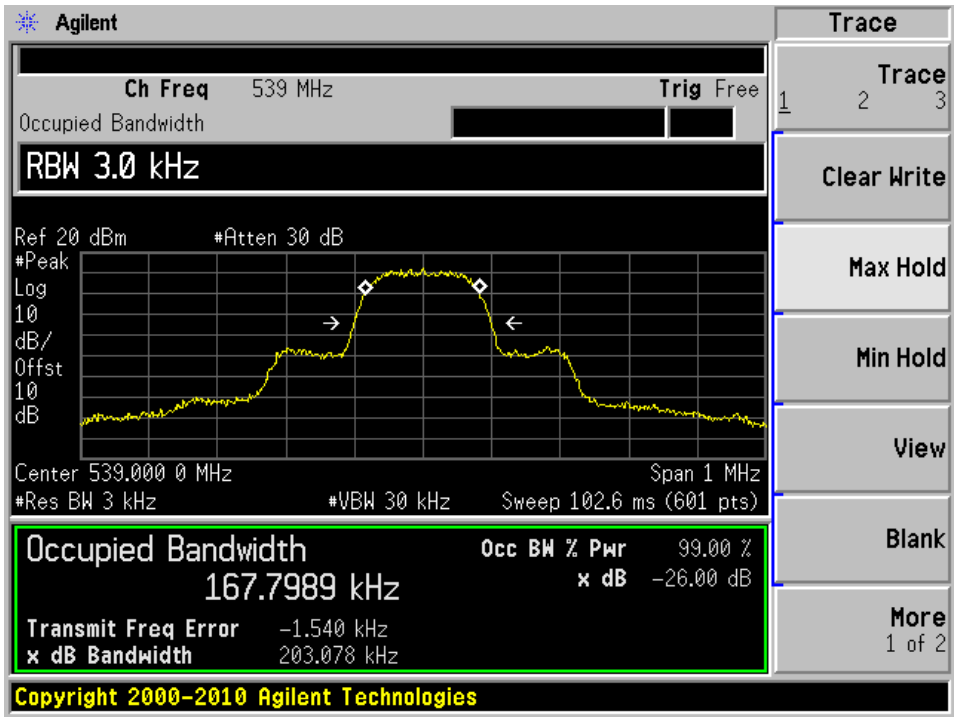
Emission Mask for ISED



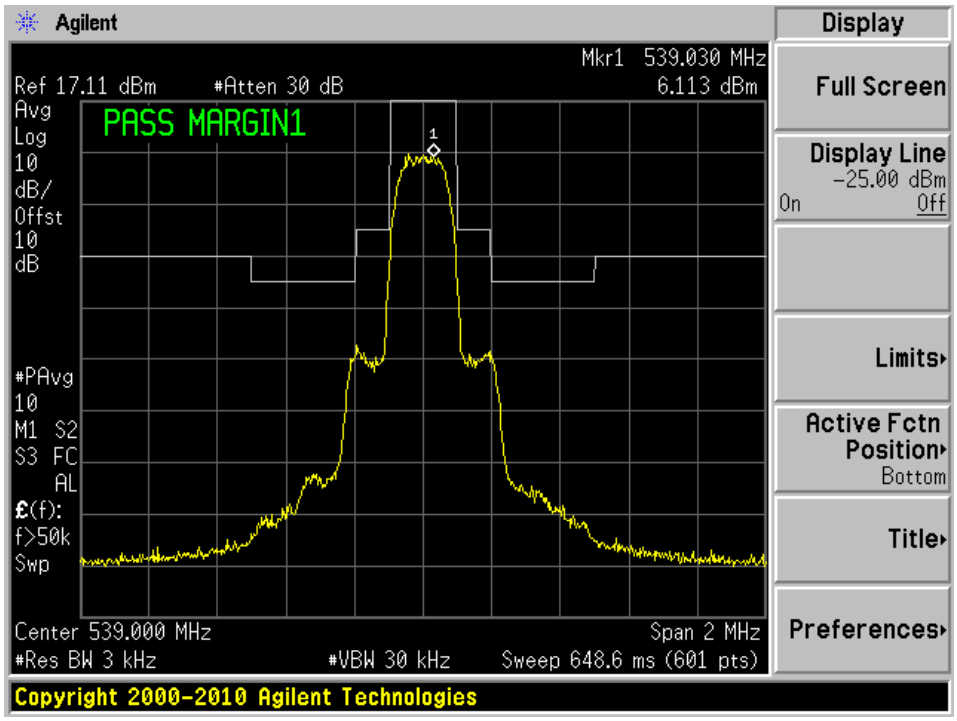


RF2 (50mW power setting)

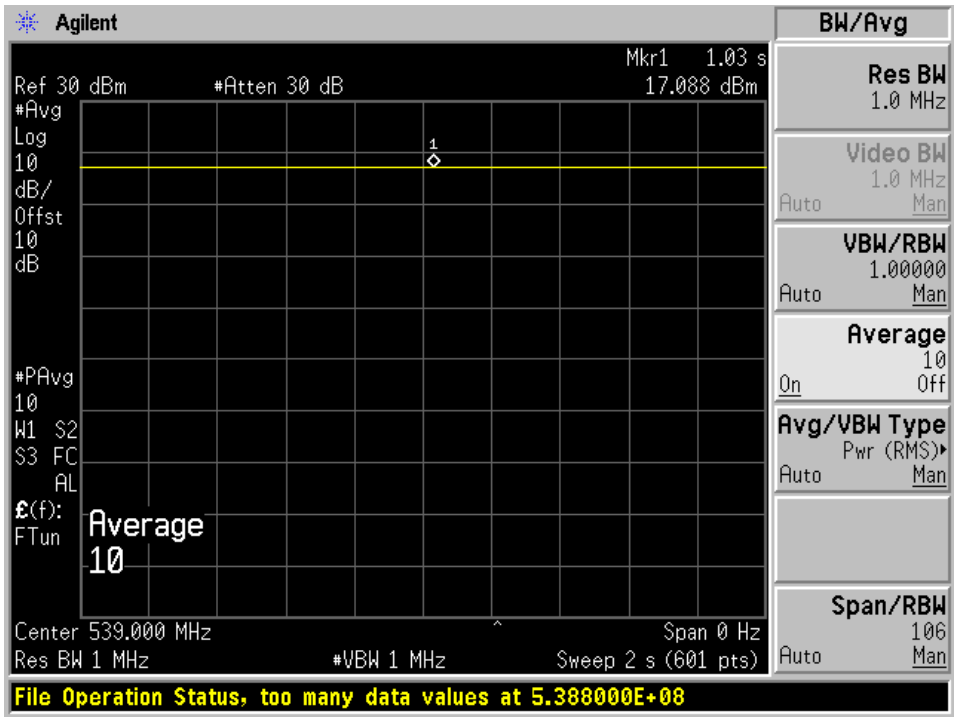
Occupied Bandwidth

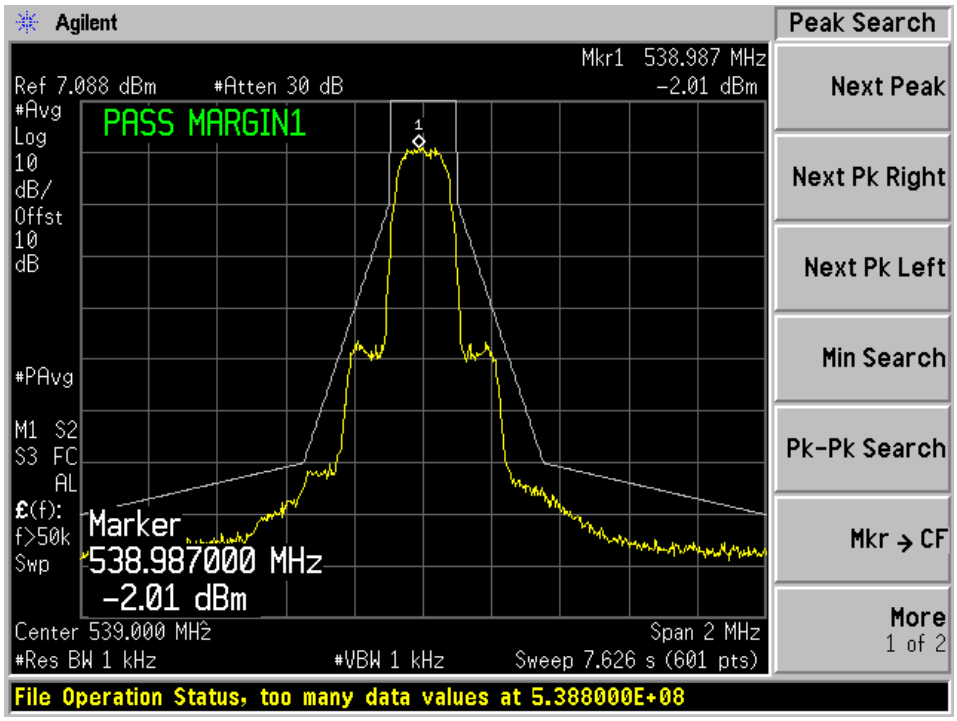


Emission Mask for FCC



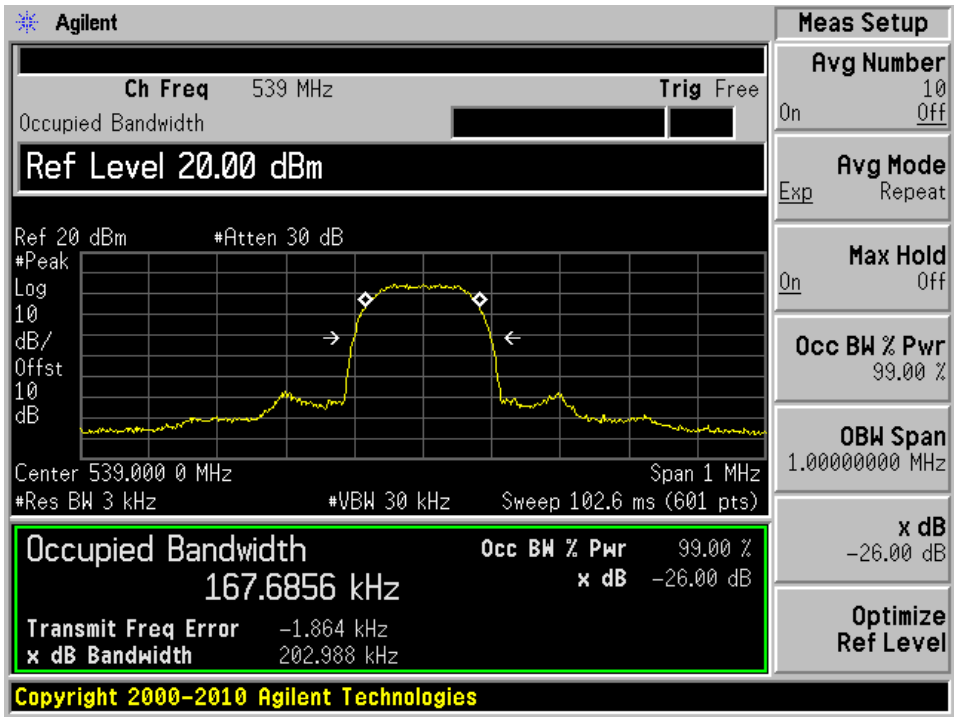
Emission Mask for ISED



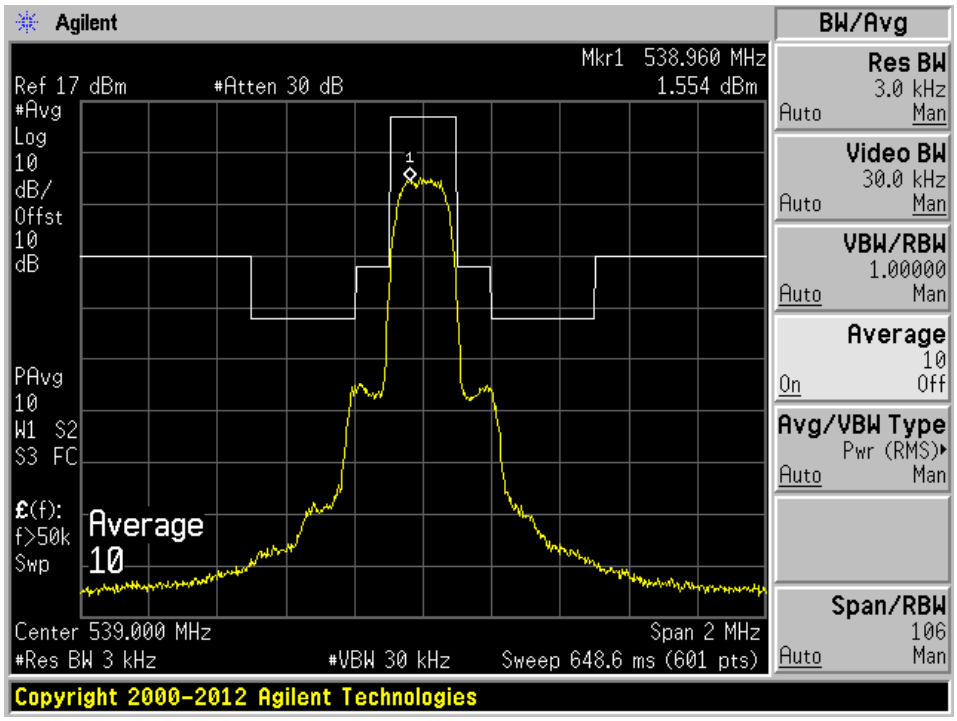


RF2 (10mW power setting)

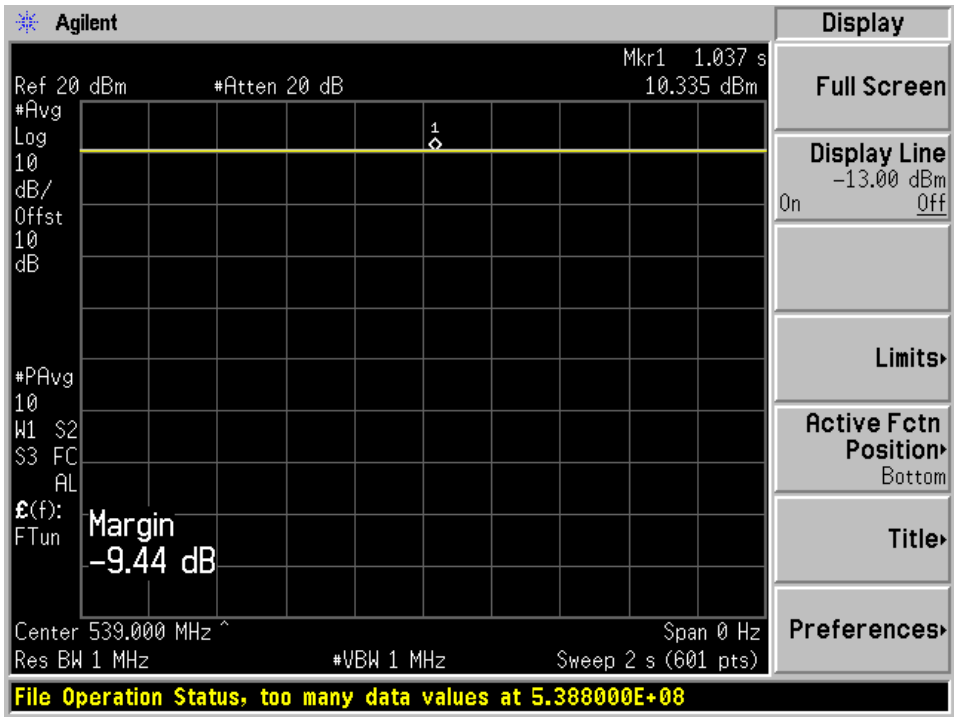
Occupied Bandwidth

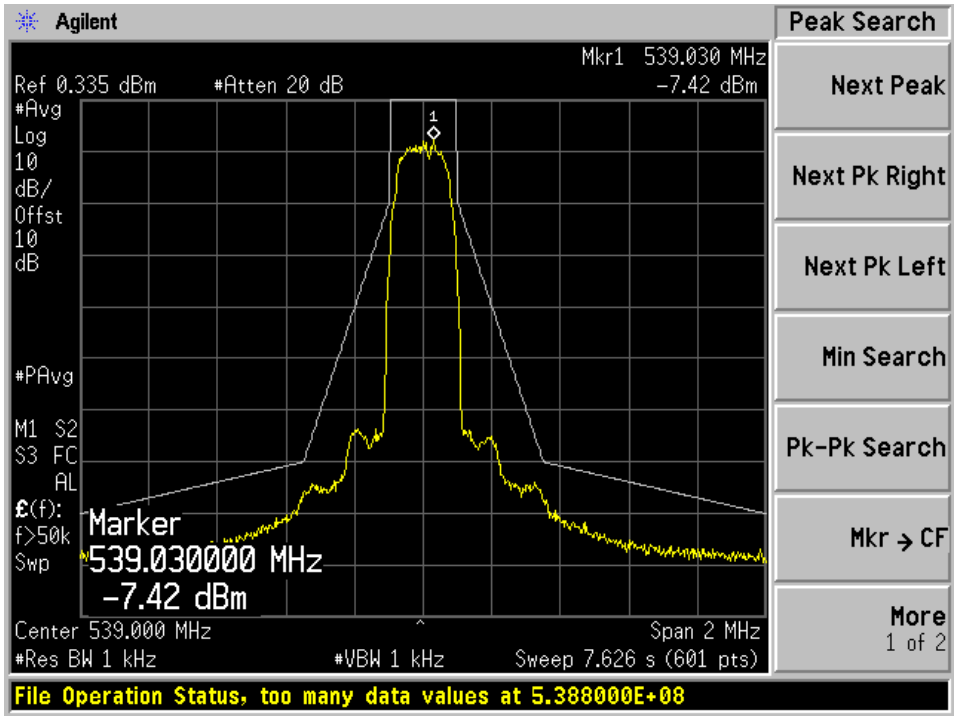


Emission Mask for FCC



Emission Mask for ISED





7 FCC §74.861(e) (6) (iii) - Conducted Spurious Emissions at Antenna Port

7.1 Applicable Standards

According to 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.

7.2 Test Procedure

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 = 100 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 = peak.
- Record the frequencies and level of 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	N/A
-	RF cable	-	-	Each time	N/A

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:	22 ºC
Relative Humidity:	45 %
ATM Pressure:	101.2 kPa

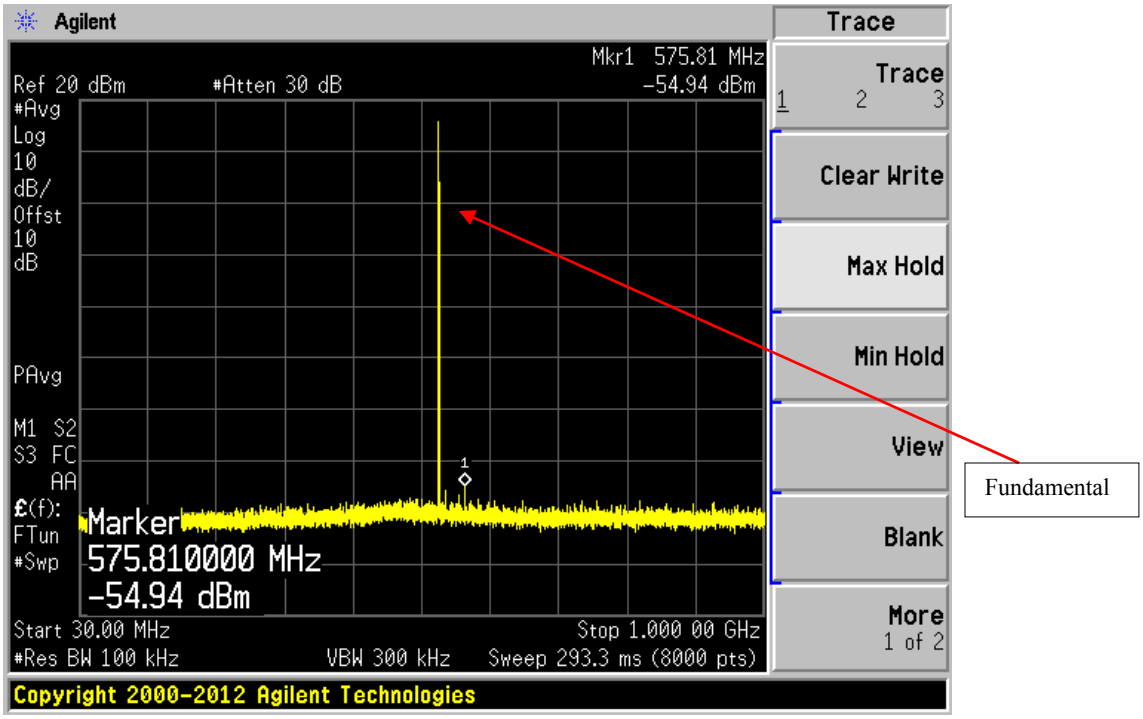
The testing was performed by Dean Liu on 2017-06-20 at RF site.

7.5 Test Results

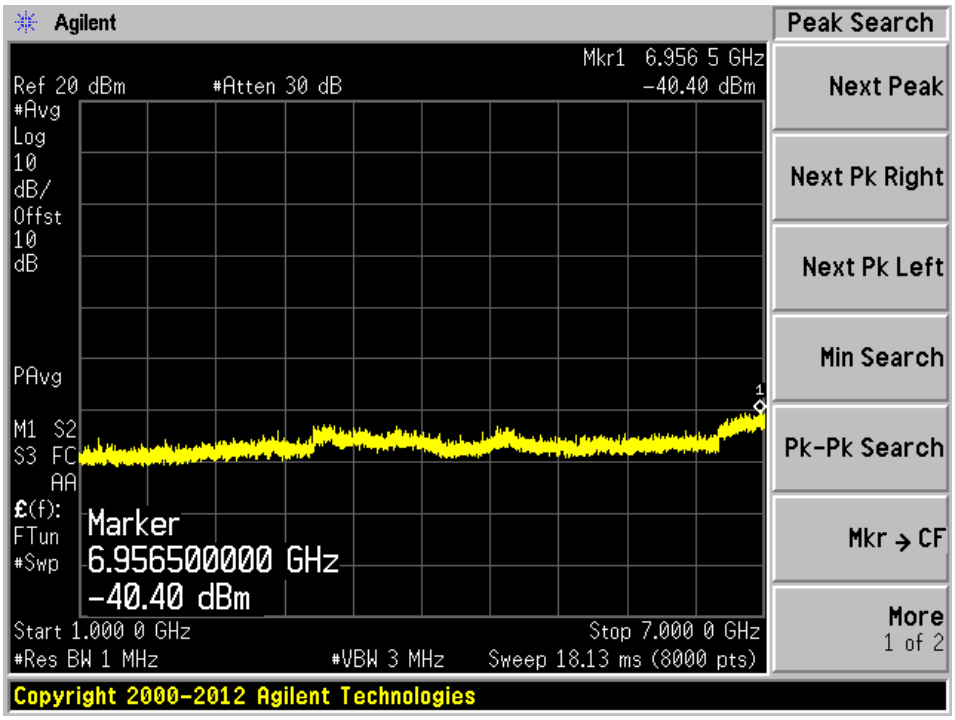
Please refer to the following table plots for detailed test results, testing was done at the highest power setting.

RF1:

30 MHz to 1 GHz

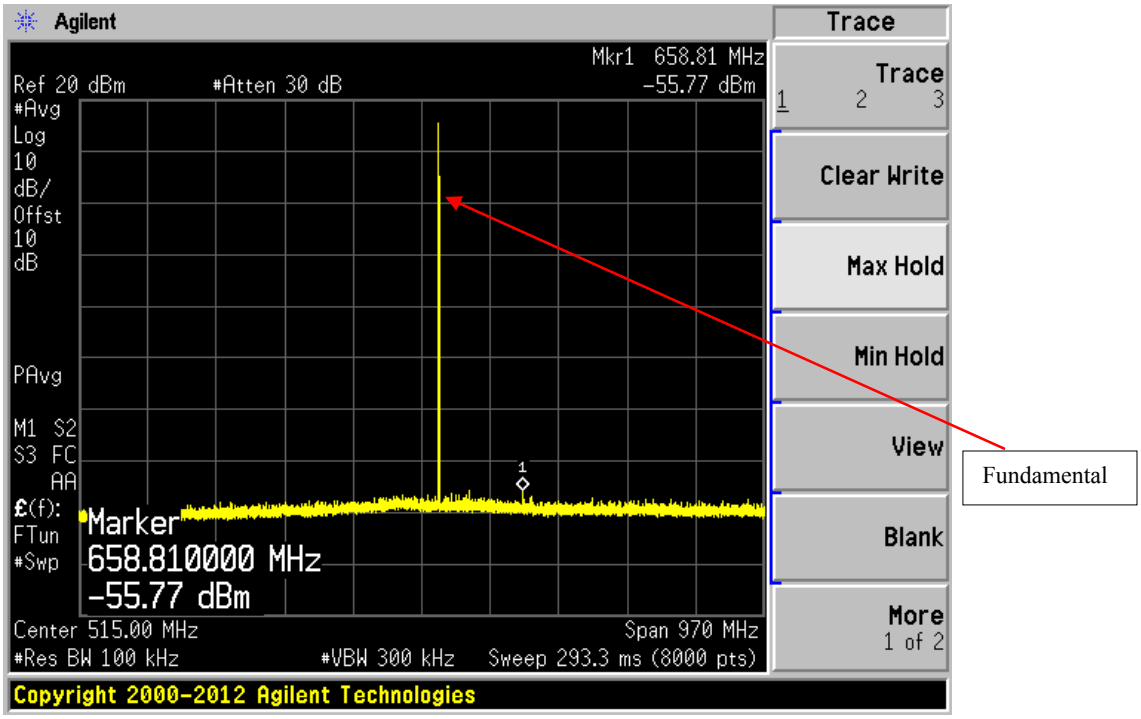


1 GHz to 7 GHz

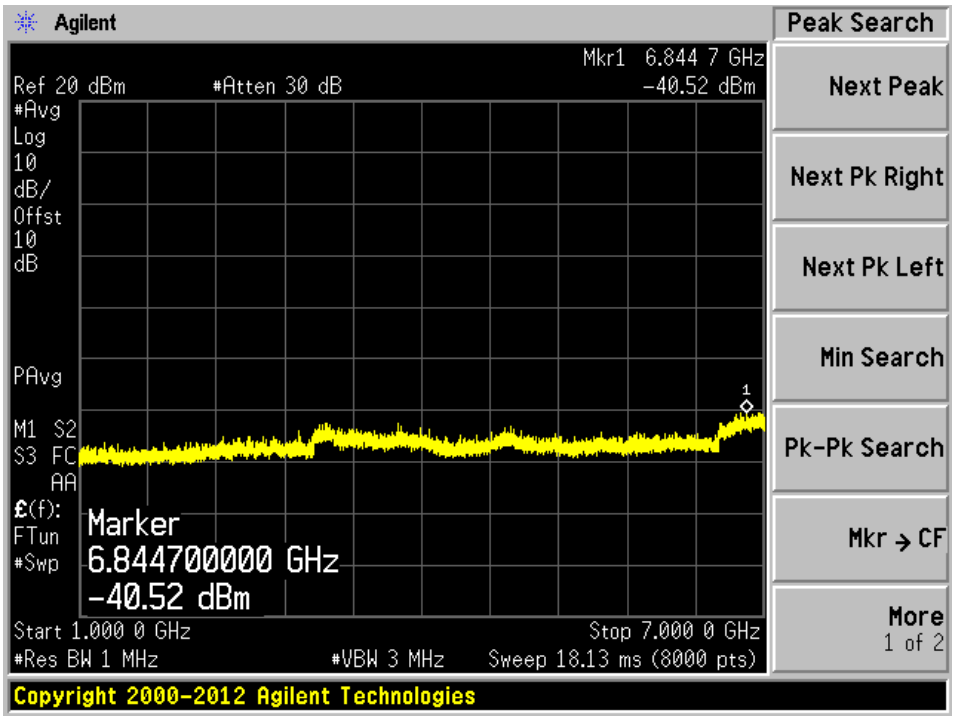


RF2:

30 MHz to 1 GHz



1 GHz to 7 GHz



8 FCC §74.861(e) (6) (iii) & ISED RSS-210 G.3.4 - Field Strength of Spurious Radiation

8.1 Applicable Standards

According to 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 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 to3 GHz frequency range; Part 1: Technical characteristics and methods of measurement.

8.2 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:
    5. Resolution bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
    6. Video bandwidth ≥ 3 times the resolution bandwidth.
    7. Sweep speed ≤ 2000 Hz per second
    8. Detector mode = mean or average power.
- Record the frequencies and level of 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/Agilant	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:	22 ºC
Relative Humidity:	40 %
ATM Pressure:	101.0 kPa

The testing was performed by Dean Liu on 2017-06-22 at RF site.

8.5 Test Results

Test mode: Transmitting Simultaneously

EUT was configured to the highest power setting

Freq. (MHz)	S.A. Amp. (dBmV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	Limit* (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)			
303.397	51.62	336	152	V	303.397	-49.6	0	0.5	-50.1	-36	-14.1
327.5	49.19	45	100	V	327.5	-52.71	0	0.5	-53.21	-36	-17.21
214.5	46.57	0	129	V	214.5	-55.43	0	0.5	-55.93	-54	-1.93
59.327	50.35	198	201	V	59.327	-58.76	0	0.5	-59.26	-54	-5.26
736.5	30.46	75	145	V	736.5	-66.04	0	0.5	-66.54	-54	-12.54
303.397	48.89	125	200	H	303.397	-52.07	0	0.5	-52.57	-36	-16.57
327.5	48.06	179	300	H	327.5	-53.74	0	0.5	-54.24	-36	-18.24
214.5	46.57	286	198	H	214.5	-54.63	0	0.5	-55.13	-54	-1.13
60	47.31	275	135	H	60	-62.3	0	0.5	-62.8	-54	-8.8
1279	50.44	122	169	V	1279	-61.45	7.23	0.91	-55.13	-30	-25.13
1198	50.26	64	229	H	1198	-61.15	7.19	0.85	-54.81	-30	-24.81

*Note: limits for radiated spurious emissions from ISED RSS-210 were applied to determine compliance. FCC limit is -13 dBm, which is higher than the ISED limit.

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°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	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 ºC
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

RF1:

Varying temperature:

Temperature (℃)	Measured Frequency (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (+/-ppm)
-30	538.99987	539	-0.24	50
-20	538.99995	539	-0.09	50
-10	539.00009	539	0.17	50
0	538.99948	539	-0.96	50
10	538.99941	539	-1.09	50
20	538.99774	539	-4.19	50
30	538.99949	539	-0.95	50
40	538.99835	539	-3.06	50
50	538.99792	539	-3.86	50

Varying supply voltage:

Voltage (V_{AC})	Measured Frequency (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (+/-ppm)
102	538.99894	539	-1.97	50
138	538.99906	539	-1.39	50

RF2:

Varying temperature:

Temperature (℃)	Measured Frequency (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (+/-ppm)
-30	538.99813	539	-3.47	50
-20	538.99837	539	-3.02	50
-10	538.99896	539	-1.93	50
0	539.00002	539	0.04	50
10	538.99926	539	-1.37	50
20	538.99988	539	-0.22	50
30	538.99587	539	-7.66	50
40	538.99843	539	-2.91	50
50	538.99776	539	-4.16	50

Varying supply voltage:

Voltage (V_{AC})	Measured Frequency (MHz)	Channel Frequency (MHz)	Frequency Tolerance (ppm)	Limits (+/-ppm)
102	538.99923	539	-1.43	50
138	538.99852	539	-2.75	50

10 Exhibit A – Test Setup Photographs

Please see the attachment

11 Exhibit B - EUT External Photographs

Please see the attachment

12 Exhibit C - EUT Internal Photographs

Please see the attachment

--- END OF REPORT ---