



## FCC PART 24E

# TEST AND MEASUREMENT REPORT

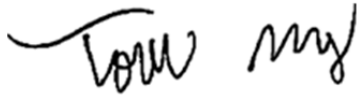
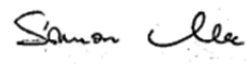
For

**Intelibs, Inc.**

1500 Stony Brook Road,

Stony Brook, NY 11794

**FCC ID: Z69D01T4JX4**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Radio Hub Unit
<b>Prepared By:</b>	Todd Moy  Test Engineer
<b>Report Number:</b>	R1602024-24
<b>Report Date:</b>	2016-02-24
<b>Reviewed By:</b>	Simon Ma  RF Lead
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164	

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\* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk

## TABLE OF CONTENTS

<b>1</b>	<b>GENERAL INFORMATION .....</b>	<b>5</b>
1.1	PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
1.2	MECHANICAL DESCRIPTION .....	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
<b>2</b>	<b>SYSTEM TEST CONFIGURATION .....</b>	<b>8</b>
2.1	JUSTIFICATION.....	8
2.2	EUT EXERCISE SOFTWARE.....	8
2.3	EQUIPMENT MODIFICATIONS .....	8
2.4	EUT INTERNAL CONFIGURATION .....	8
2.5	LOCAL SUPPORT EQUIPMENT LIST AND DETAILS .....	8
2.6	POWER SUPPLY AND LINE FILTERS.....	9
2.7	INTERFACE PORTS AND CABLING .....	9
<b>3</b>	<b>SUMMARY OF TEST RESULTS.....</b>	<b>10</b>
<b>4</b>	<b>FCC §2.1091 - RF EXPOSURE .....</b>	<b>11</b>
4.1	APPLICABLE STANDARDS .....	11
4.2	MPE PREDICTION .....	11
4.3	TEST RESULTS .....	11
<b>5</b>	<b>FCC §2.1046 &amp; §24.232(A) - EQUIVALENT ISOTROPIC RADIATED POWER .....</b>	<b>13</b>
5.1	APPLICABLE STANDARDS .....	13
5.2	TEST PROCEDURE .....	13
5.3	TEST EQUIPMENT LIST AND DETAILS .....	13
5.4	TEST ENVIRONMENTAL CONDITIONS.....	14
5.5	TEST RESULTS .....	14
<b>6</b>	<b>FCC §2.1049 &amp; §24.238(B) - OCCUPIED BANDWIDTH .....</b>	<b>15</b>
6.1	APPLICABLE STANDARDS .....	15
6.2	TEST PROCEDURE .....	15
6.3	TEST EQUIPMENT LIST AND DETAILS .....	15
6.4	TEST ENVIRONMENTAL CONDITIONS.....	15
6.5	TEST RESULTS .....	16
<b>7</b>	<b>FCC §2.1053 &amp; §24.232(A) - SPURIOUS RADIATED EMISSIONS .....</b>	<b>19</b>
7.1	APPLICABLE STANDARDS .....	19
7.2	TEST PROCEDURE .....	19
7.3	TEST EQUIPMENT LIST AND DETAILS .....	19
7.4	TEST SETUP BLOCK DIAGRAM.....	20
7.5	TEST ENVIRONMENTAL CONDITIONS.....	20
7.6	TEST RESULTS .....	21
<b>8</b>	<b>FCC §2.1051 &amp; §24.238(A) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS .....</b>	<b>22</b>
8.1	APPLICABLE STANDARDS .....	22
8.2	TEST PROCEDURE .....	22
8.3	TEST EQUIPMENT LIST AND DETAILS .....	22
8.4	TEST ENVIRONMENTAL CONDITIONS.....	22

8.5	TEST RESULTS .....	23
<b>9</b>	<b>FCC §24.238(A) (B) - BAND EDGE &amp; INTERMODULATION.....</b>	<b>26</b>
9.1	APPLICABLE STANDARDS .....	26
9.2	TEST PROCEDURE .....	26
9.3	TEST EQUIPMENT LIST AND DETAILS .....	26
9.4	TEST ENVIRONMENTAL CONDITIONS.....	26
9.5	TEST RESULTS .....	27
<b>10</b>	<b>FCC §20.21 - OUT OF BAND REJECTION.....</b>	<b>31</b>
10.1	APPLICABLE STANDARD .....	31
10.2	TEST PROCEDURE .....	31
10.3	TEST EQUIPMENT LIST AND DETAILS .....	31
10.4	TEST ENVIRONMENTAL CONDITIONS.....	31
10.5	TEST RESULTS .....	32
<b>11</b>	<b>EXHIBIT A - FCC ID LABELING REQUIREMENTS .....</b>	<b>33</b>
11.1	FCC ID LABEL REQUIREMENTS.....	33
11.2	FCC ID LABEL CONTENTS AND LOCATION .....	33
<b>12</b>	<b>EXHIBIT B - EUT SETUP PHOTOGRAPHS.....</b>	<b>35</b>
12.1	RADIATED EMISSION BELOW 1 GHz FRONT VIEW .....	35
12.2	RADIATED EMISSION BELOW 1 GHz REAR VIEW.....	35
12.3	RADIATED EMISSION ABOVE 1 GHz FRONT VIEW .....	36
12.4	RADIATED EMISSION ABOVE 1 GHz REAR VIEW .....	36
<b>13</b>	<b>EXHIBIT C – EUT PHOTOGRAPHS.....</b>	<b>37</b>
13.1	EUT – FRONT VIEW.....	37
13.2	EUT – BOTTOM VIEW .....	37
13.3	EUT – LEFT VIEW .....	38
13.4	EUT – RIGHT VIEW .....	38
13.5	EUT – TOP VIEW .....	39
13.6	EUT – BOTTOM VIEW .....	39
13.7	EUT – OPEN COVER VIEW-1 .....	40
13.9	EUT – 850 MHz RHM _RFU Top View .....	41
13.10	EUT – 850 MHz RHM _RFU Bottom View .....	41
13.11	EUT – 850 MHz RHM _DUPLEXER FILTER .....	42
13.13	EUT – 1950 MHz RHM _RFU Bottom View .....	43
13.14	EUT – 1950 MHz RHM _RFU Bottom View .....	43
13.15	EUT – GPS FEM UNIT .....	44
13.16	EUT – RHOM (OPTICAL TRANSCEIVER) UNIT.....	44
13.17	EUT – GPS CONTROLLER UNIT.....	45
13.18	EUT – RF CONTROLLER UNIT .....	45
13.19	EUT – POE SPLITTER .....	46
13.20	EUT – AC/DC CONVERTER.....	46
13.21	SUPPORT EQUIPMENT .....	47
13.22	SUPPORT EQUIPMENT POWER OVER ETHERNET SPLITTER .....	47

**DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	R1602024-24	Initial	2016-02-24

## 1 General Information

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### 1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Intelibs Inc.* and their product model: Radio Hub Unit (RHU), FCC ID: Z69D01T4JX4, which will henceforth be referred to as the EUT (Equipment under Test). The EUT was a radio hub unit with GPS service. The EUT operated in the uplink frequency band of 1900MHz for LTE, GSM, CDMA and WCDMA.

### 1.2 Mechanical Description

The EUT measured approximately 51 cm (L) x 43.5 cm (W) x 34.5 cm (H) and weighs 28.58 kg.

*The test data gathered were from typical production sample, serial number: R1602024-1, assigned by BACL.*

### 1.3 Objective

This type approval report was prepared on behalf of *Intelibs Inc.* in accordance with Part 2, Subpart J, Part 20.21, Part 24 Subpart E, of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC/IC rules for RF output power, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation and band edge

### 1.4 Related Submittal(s)/Grant(s)

No Related Submittals

### 1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 20.21 – Signal Boosters

Part 24 Subpart E – Broadband PCS

Applicable Standards: TIA/EIA603-D, FCC KDB 935210.

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

## 1.6 Measurement Uncertainty

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

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

## 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 Luminaires and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC (Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:

1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.

2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.

3. Radio Communication Equipment for Singapore.

4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.

5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).

6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

<http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

## 2 System Test Configuration

### 2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-D.  
The final qualification test was performed with the EUT operating at normal mode.

### 2.2 EUT Exercise Software

There was no exercise software with the EUT; signal was sent through EUT using a signal generator.

### 2.3 Equipment Modifications

No modifications were made to the EUT.

### 2.4 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Intelibs	850 MHz RHM_RFU	-	-
Intelibs	850 MHz RHM_Duplexer Filter	-	-
Intelibs	1900 MHz RHM_RFU	-	-
Intelibs	1900 MHz RHM_Duplexer Filter	-	-
Intelibs	GPS FEM Unit	-	-
Intelibs	RHOM (Optical Transceiver) Unit	-	-
Intelibs	GPS Controller Unit	-	-
Intelibs	RF Controller Unit	-	-
TDK-Lambda	AC/DC Converter	DPP120-24-1	-

### 2.5 Local Support Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers
Dell	Laptop	Latitude D600	CN-0X2034-48643-3A6-8307
Lenovo	Laptop	Lenovo G560	CB08585694



## 2.6 Power Supply and Line Filters

Manufacturers	Descriptions	Models	Serial Numbers
-	POE Splitter	MET-26-8024DH	158000002ASC00

## 2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	< 1	Signal Generator	Support Equipment
RF cable	< 1	EUT Output	Spectrum Analyzer
Fiber Optic Cable	1	Support Equipment	EUT Input

### 3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1091	RF Exposure	Compliant
§2.1046, §24.232(c)	Output Power	Compliant
§2.1049, §24.238(b)	26 dB Occupied Bandwidth	Compliant
§2.1053, §24.238(a)	Spurious Radiated Emissions	Compliant
§2.1053, §24.238(a)	Spurious Emissions at Antenna Terminals	Compliant
§2.1053, §24.238(a)	Band Edge & Intermodulation	Compliant
§2.1055, §24.235	Frequency Stability	N/A <sup>1</sup>
§20.21	Out of Band Rejection	Compliant

<sup>1</sup> The EUT is a signal booster.

## 4 FCC §2.1091 - RF Exposure

### 4.1 Applicable Standards

According to §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
<b>Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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

### 4.2 MPE Prediction

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

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

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

### 4.3 Test Results

MPE Calculations with a 13 dBi antenna gain

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>20.64</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>115.88</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>1889.26</u>
<u>Antenna Gain, typical (dBi):</u>	<u>13</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>19.95</u>
<u>Power density at predication frequency and distance (mW/cm<sup>2</sup>):</u>	<u>0.460</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

## MPE Calculation with an 18 dBi antenna gain

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>20.64</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>115.88</u>
<u>Prediction distance (cm):</u>	<u>35.00</u>
<u>Prediction frequency (MHz):</u>	<u>1889.26</u>
<u>Antenna Gain, typical (dBi):</u>	<u>18.00</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>63.10</u>
<u>Power density at predication frequency and distance (mW/cm<sup>2</sup>):</u>	<u>0.475</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

**Results**

The highest power density levels at 35 cm are below the MPE uncontrolled exposure limit with an 18 dBi antenna gain.

## 5 FCC §2.1046 & §24.232(a) - Equivalent Isotropic Radiated Power

### 5.1 Applicable Standards

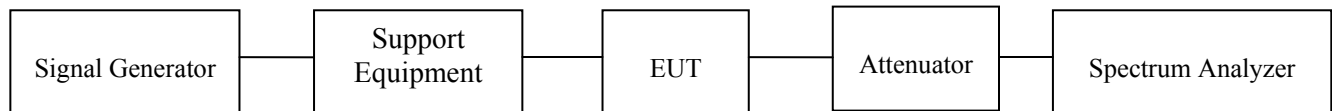
According to FCC §24.232 (a)

- (1) Base station with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
- (2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b).

### 5.2 Test Procedure

*Conducted:*

The signal generator was connected to the support equipment and the support equipment was connected to the EUT through a fiber cable. The output of the EUT was connected to a signal generator.



### 5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2015-10-22	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	10 dB attenuator	-	-	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0001	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0002	Each Time <sup>1</sup>	Each Time <sup>1</sup>

<sup>1</sup>Note: This equipment was calibrated for each test.

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

## 5.4 Test Environmental Conditions

<b>Temperature:</b>	21-23° C
<b>Relative Humidity:</b>	42-48 %
<b>ATM Pressure:</b>	101.4-102 kPa

*The testing was performed by Todd Moy 2016-02-19 in the RF Site.*

## 5.5 Test Results

Signal Type	AGC	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Output EIRP (dBm)
Broadband	Off	-54.35	19.67	74.02	37.67
	On	-51.13	20.37	71.5	38.37
Narrowband	Off	-54.57	19.42	73.99	37.42
	On	-51.45	20.64	72.09	38.64

Note: EIRP (dBm)=Conducted Output Power (dBm) + Antenna Gain (dBi), gain of the antenna that applies to this device is 18 dBi.

## 6 FCC §2.1049 & §24.238(b) - Occupied Bandwidth

### 6.1 Applicable Standards

Requirements: §24.238(b)

### 6.2 Test Procedure

The signal generator was connected to the support equipment and the support equipment was connected to the EUT through a fiber cable. The output of the EUT was connected to a signal generator.

The resolution bandwidth of the spectrum analyzer was set to at least 1 to 5% of the OBW and the 26 dB & 99% bandwidth was recorded.



### 6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2015-10-22	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	10 dB attenuator	-	-	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0001	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0002	Each Time <sup>1</sup>	Each Time <sup>1</sup>

<sup>1</sup>Note: This equipment was calibrated for each test.

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

### 6.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2016-02-19 in the RF Site.

## 6.5 Test Results

Please refer to the following tables and plots.

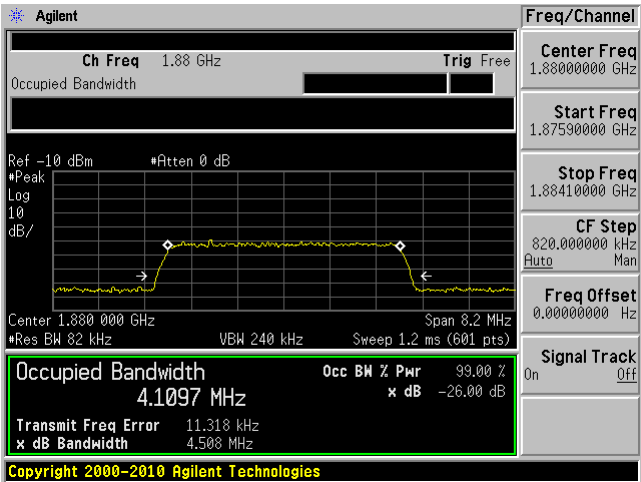
Signal Type	AGC	Input		Output	
		99 % OBW (kHz)	26 dB OBW (kHz)	99 % OBW (kHz)	26 dB OBW (kHz)
Broadband	off	4109.7	4508	4115.3	4494
	on	4109.7	4508	4096.2	4507
Narrowband	off	242.874	327.184	244.6881	319.043
	on	242.874	327.184	244.4057	322.908



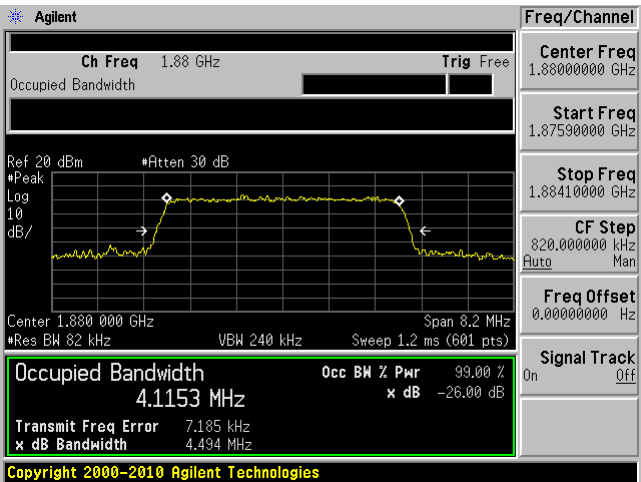
Broadband

AGC off

Input

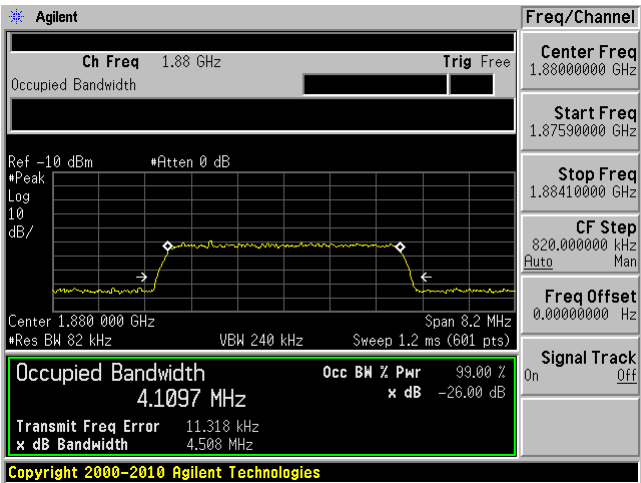


Output

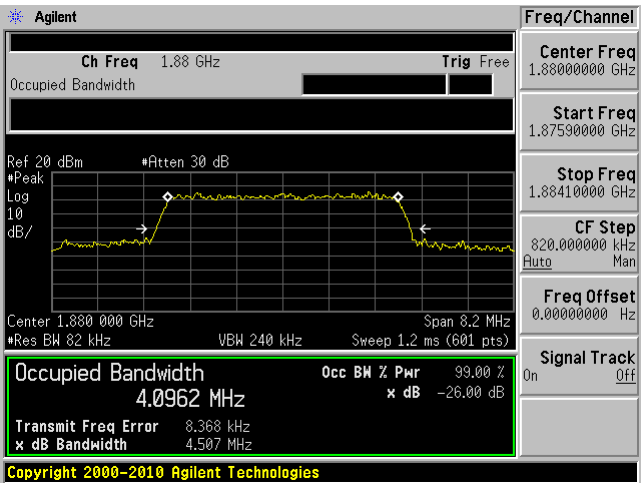


AGC on

Input



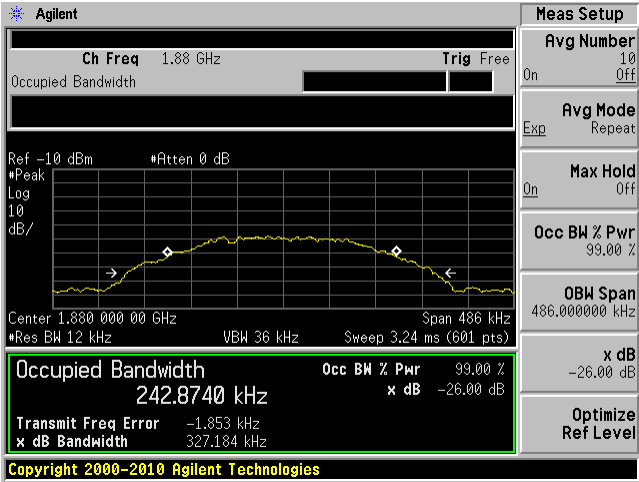
Output



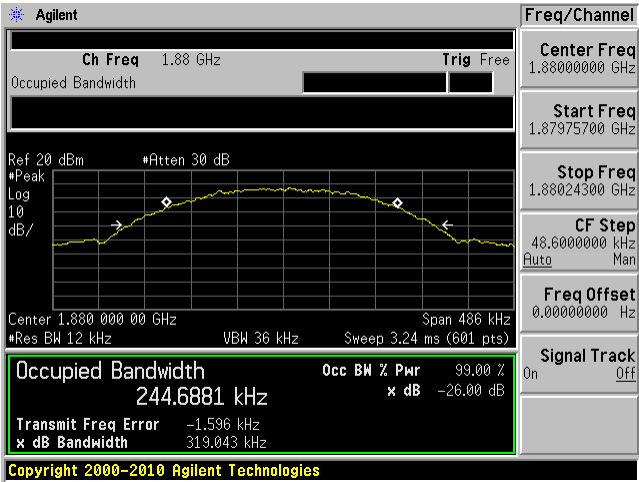
Narrowband

AGC off

Input

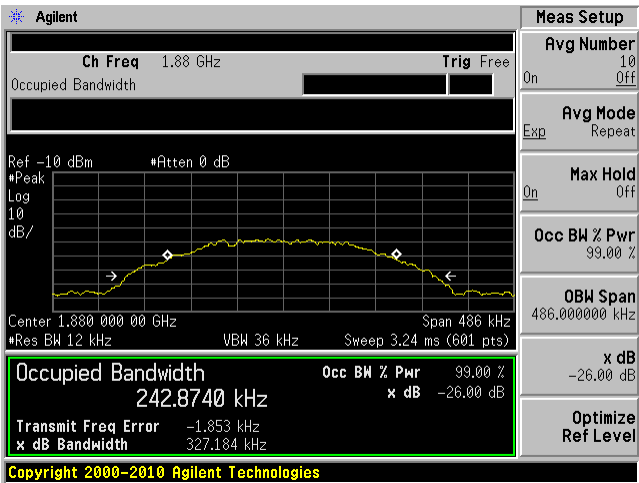


Output

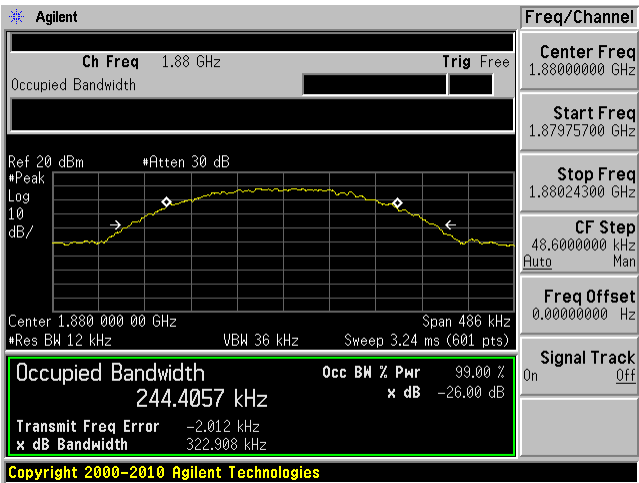


AGC on

Input



Output



## 7 FCC §2.1053 & §24.232(a) - Spurious Radiated Emissions

### 7.1 Applicable Standards

According to FCC §24.238(a) the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 7.2 Test Procedure

The transmitter was placed on the turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \log(\text{TX Power in Watts}/0.001)$  – the absolute level  
 Spurious attenuation limit in dB =  $43 + 10 \log_{10}(\text{power out in Watts})$

### 7.3 Test Equipment List and Details

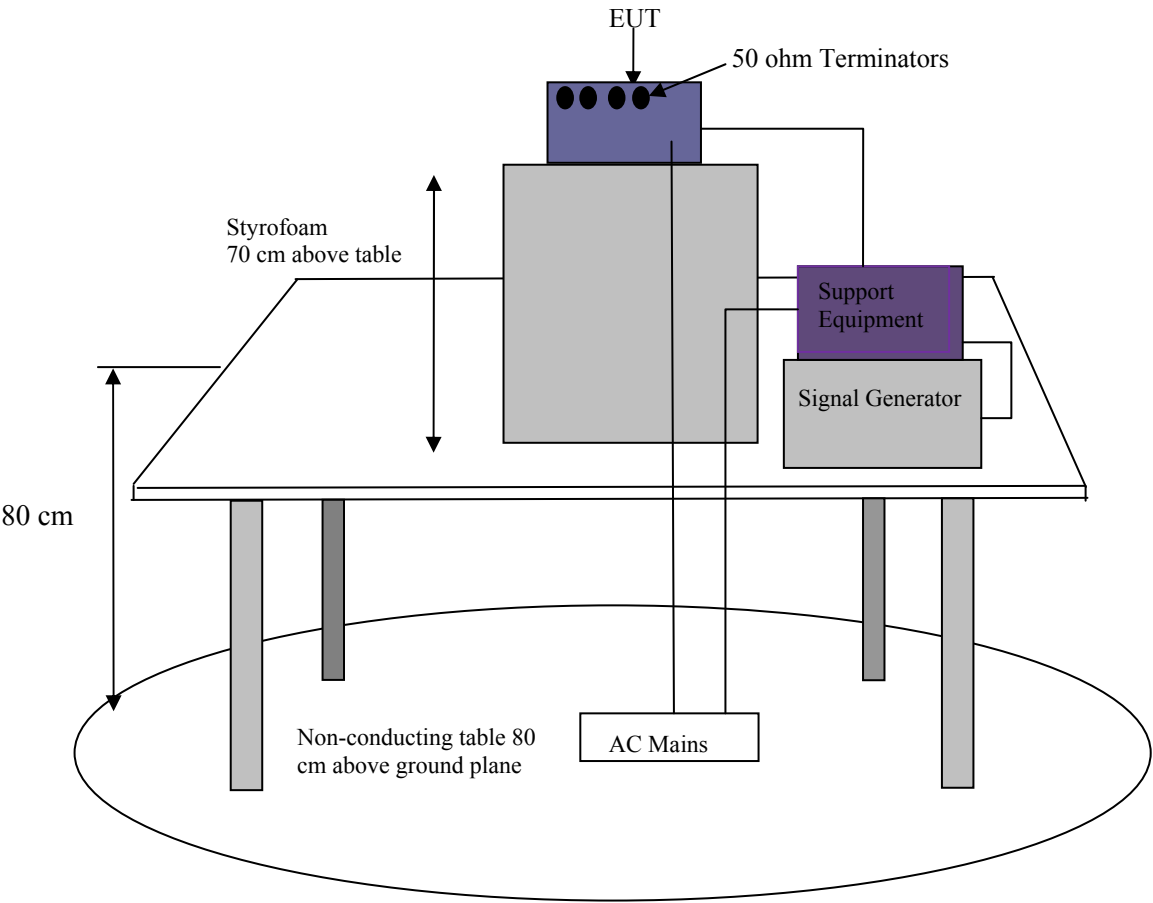
Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB3	A020106-2	2015-07-11	2 Years
Agilent	Amplifier, Pre	8447D	2944A10187	2015-03-20	1 year
HP/ Agilent	Pre Amplifier	8449B OPT HO2	3008A0113	2015-05-19	1year
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 years
A.R.A.	Antenna, Horn	DRG-118/A	1132	2015-09-21	2 year
Agilent	Generator, Signal	E4438C	MY45091309	2015-08-21	1 year
COM-POWER	Antenna, Dipole	AD-100	721033DB1/2/3/4	2014-11-03	2 years
-	SMA cable	-	C0001	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0002	Each Time <sup>1</sup>	Each Time <sup>1</sup>

<sup>1</sup>Note: This equipment was calibrated for each test.

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

7.4 Test Setup Block Diagram

Radiated Emissions Testing



7.5 Test Environmental Conditions

Temperature:	20-21°C
Relative Humidity:	47-49 %
ATM Pressure:	101.4-101.6 kPa

The testing was performed by Jason Qian on 2016-02-22 in 5 Meter Chamber 3.

## 7.6 Test Results

### Carrier Wave Signal

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
Low CH											
117.3	59.48	190	270	H	117.3	-45.4	0	0.2	-45.6	-13	-32.6
117.3	61.3	210	100	V	117.3	-41.67	0	0.2	-41.87	-13	-28.87
191.7	56.82	220	230	H	191.7	-48.3	0	0.2	-48.5	-13	-35.5
191.7	53.65	220	100	V	191.7	-49.34	0	0.2	-49.54	-13	-36.54
1500	48.65	0	100	H	1500	-60.56	8.152	0.8	-53.208	-13	-40.208
1500	48.39	0	100	V	1500	-60.99	8.152	0.8	-53.638	-13	-40.638
2800	45.79	0	100	H	2800	-58.85	10.177	1	-49.673	-13	-36.673
2800	45.6	0	100	V	2800	-58.32	10.177	1	-49.143	-13	-36.143
Mid CH											
117.3	59.72	280	275	H	117.3	-45.16	0	0.2	-45.36	-13	-32.36
117.3	61.27	210	100	V	117.3	-41.7	0	0.2	-41.9	-13	-28.9
191.7	56.65	200	240	H	191.7	-48.47	0	0.2	-48.67	-13	-35.67
191.7	53.74	220	100	V	191.7	-49.25	0	0.2	-49.45	-13	-36.45
1500	47.13	0	100	H	1500	-62.08	8.152	0.8	-54.728	-13	-41.728
1500	47.21	0	100	V	1500	-62.17	8.152	0.8	-54.818	-13	-41.818
2800	45.81	0	100	H	2800	-58.83	10.177	1	-49.653	-13	-36.653
2800	47.22	0	100	V	2800	-56.7	10.177	1	-47.523	-13	-34.523
High CH											
117.3	59.54	200	275	H	117.3	-45.34	0	0.2	-45.54	-13	-32.54
117.3	61.35	210	100	V	117.3	-41.62	0	0.2	-41.82	-13	-28.82
191.7	55.77	200	275	H	191.7	-49.35	0	0.2	-49.55	-13	-36.55
191.7	53.67	220	100	V	191.7	-49.32	0	0.2	-49.52	-13	-36.52
1500	47.76	0	100	H	1500	-61.45	8.152	0.8	-54.098	-13	-41.098
1500	47.41	0	100	V	1500	-61.97	8.152	0.8	-54.618	-13	-41.618
2800	45.79	0	100	H	2800	-58.85	10.177	1	-49.673	-13	-36.673
2800	46.16	0	100	V	2800	-57.76	10.177	1	-48.583	-13	-35.583

## 8 FCC §2.1051 & §24.238(a) - Spurious Emissions at Antenna Terminals

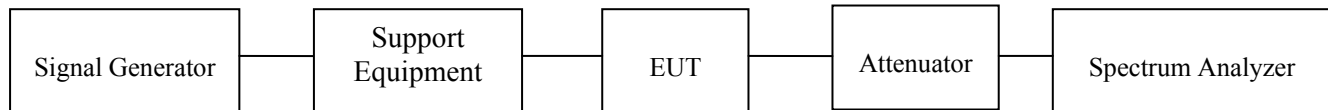
### 8.1 Applicable Standards

According to FCC §24.238(a) and §2.1051 the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 8.2 Test Procedure

The signal generator was connected to the support equipment and the support equipment was connected to the EUT through a fiber cable. The output of the EUT was connected to a signal generator.

The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.



### 8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2015-10-22	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	10 dB attenuator	-	-	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0001	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0002	Each Time <sup>1</sup>	Each Time <sup>1</sup>

<sup>1</sup>Note: This equipment was calibrated for each test.

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

### 8.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2016-02-19 in the RF Site.

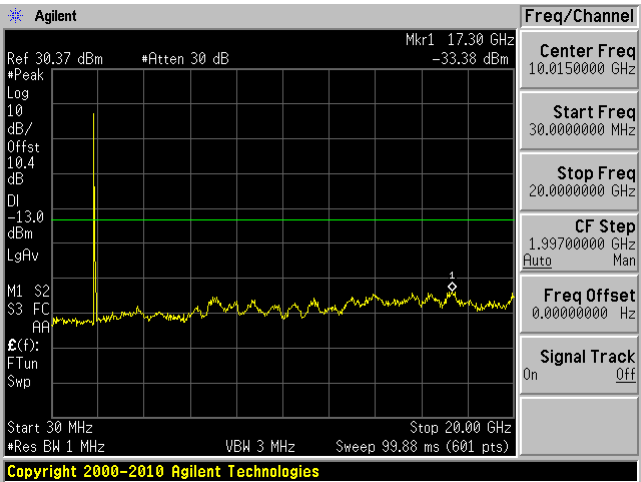
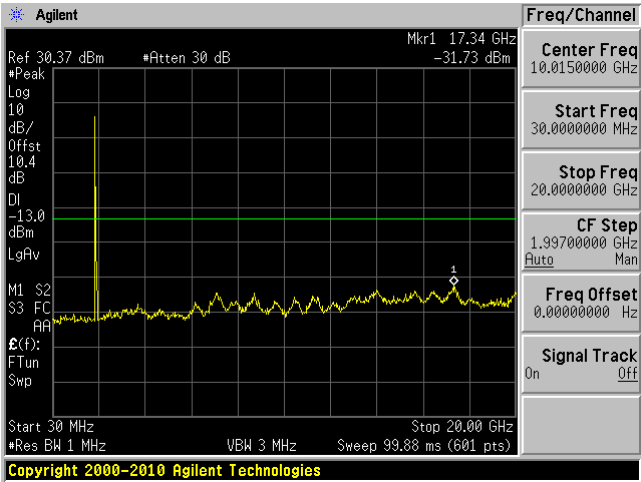
8.5 Test Results

Please refer to the following plots.

Broadband Signal

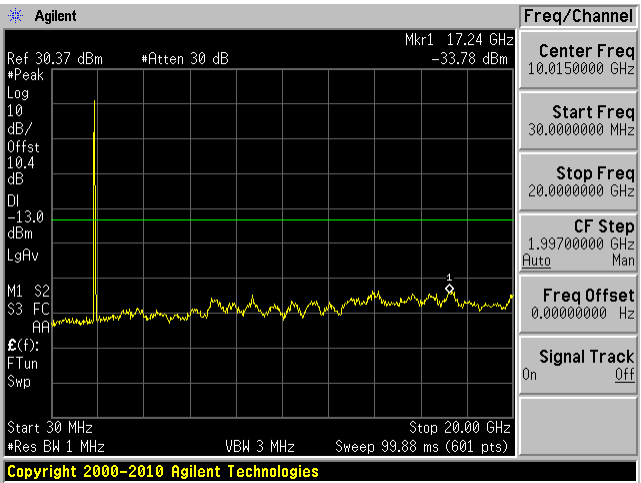
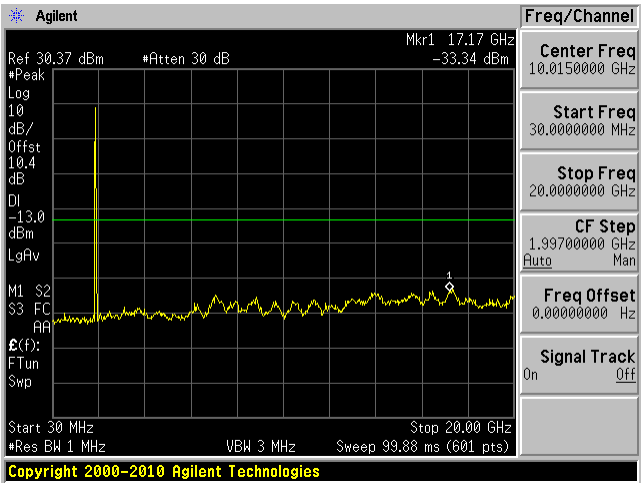
1852.5 MHz, AGC off

1852.5 MHz, AGC on



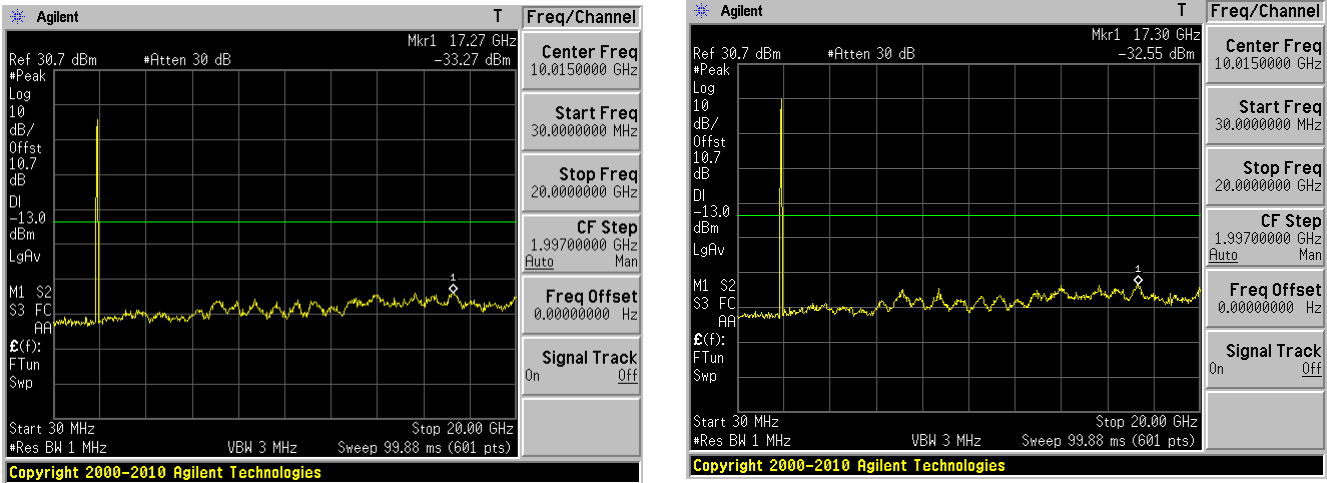
1880 MHz, AGC off

1880 MHz, AGC on



1912.5 MHz, AGC off

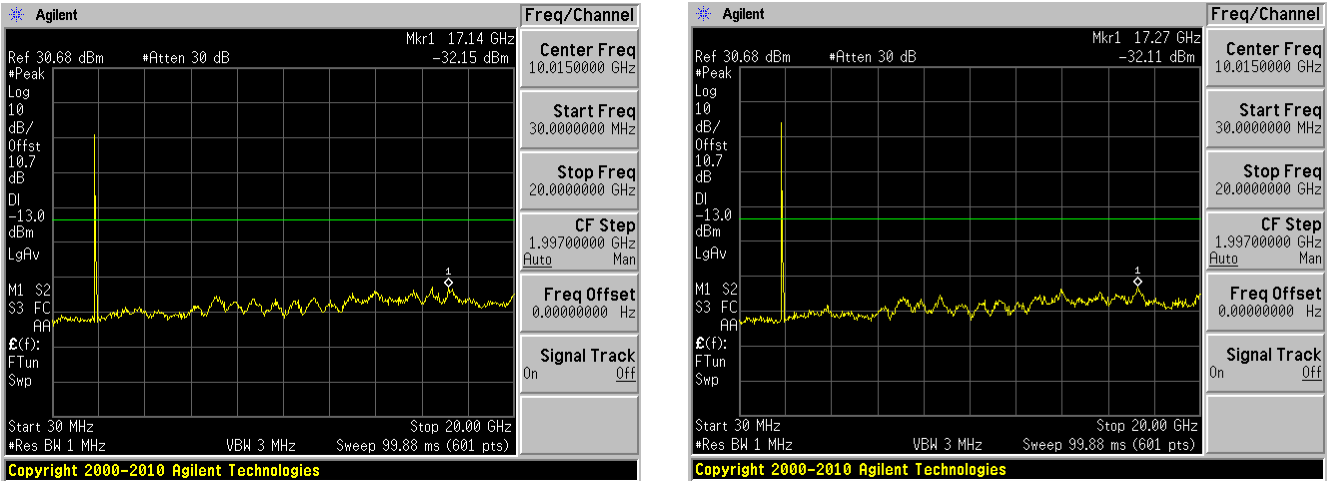
1912.5 MHz, AGC on



Narrowband Signal

1850.2 MHz, AGC off

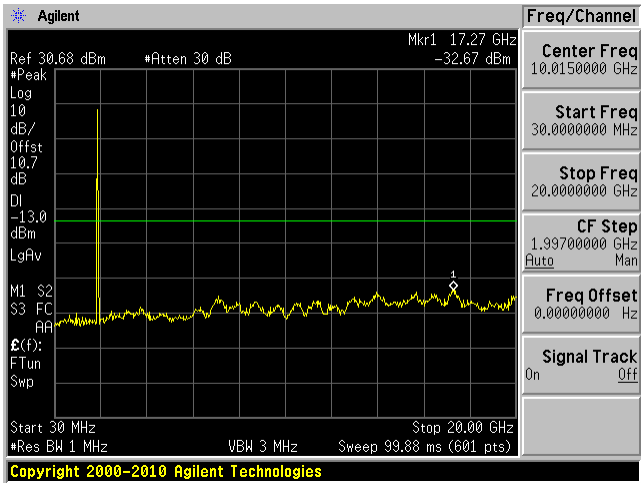
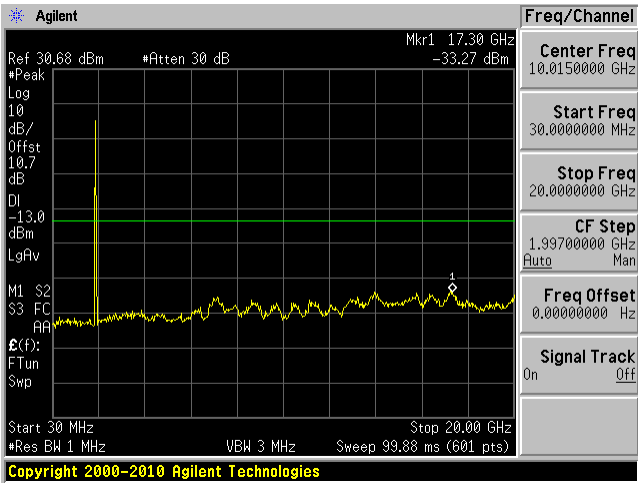
1850.2 MHz, AGC on





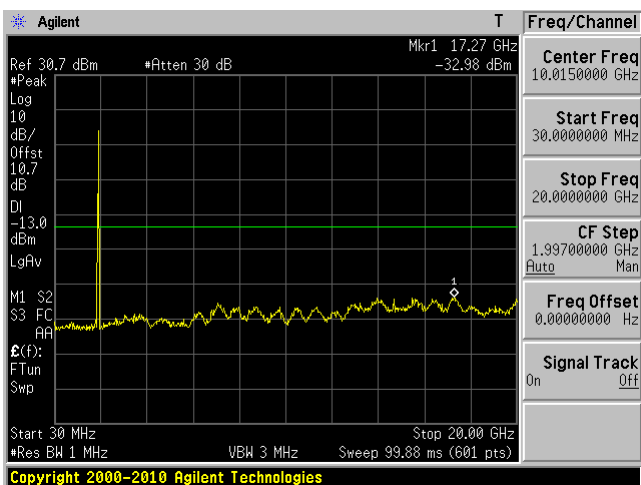
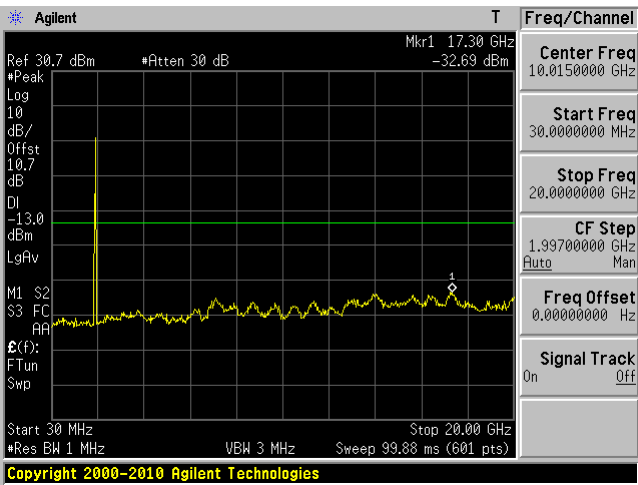
1880 MHz, AGC off

1880 MHz, AGC on



1914.8 MHz, AGC off

1914.8 MHz, AGC on



## 9 FCC §24.238(a) (b) - Band Edge & Intermodulation

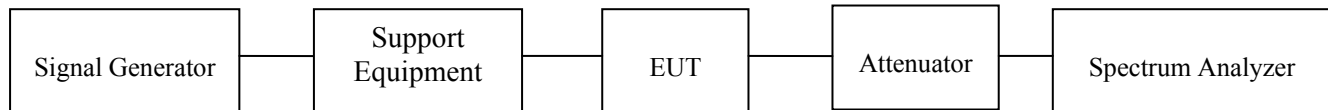
### 9.1 Applicable Standards

According to FCC §24.238(a) the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 9.2 Test Procedure

The signal generator was connected to the support equipment and the support equipment was connected to the EUT through a fiber cable. The output of the EUT was connected to a signal generator.

The center of the spectrum analyzer was set according to center frequency of the EUT to be transmitted and resolution bandwidth was set to at least 1MHz or 1% of the emission bandwidth.



### 9.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2015-10-22	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	10 dB attenuator	-	-	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0001	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0002	Each Time <sup>1</sup>	Each Time <sup>1</sup>

<sup>1</sup>Note: This equipment was calibrated for each test.

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

### 9.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2016-02-19 in the RF Site.

9.5 Test Results

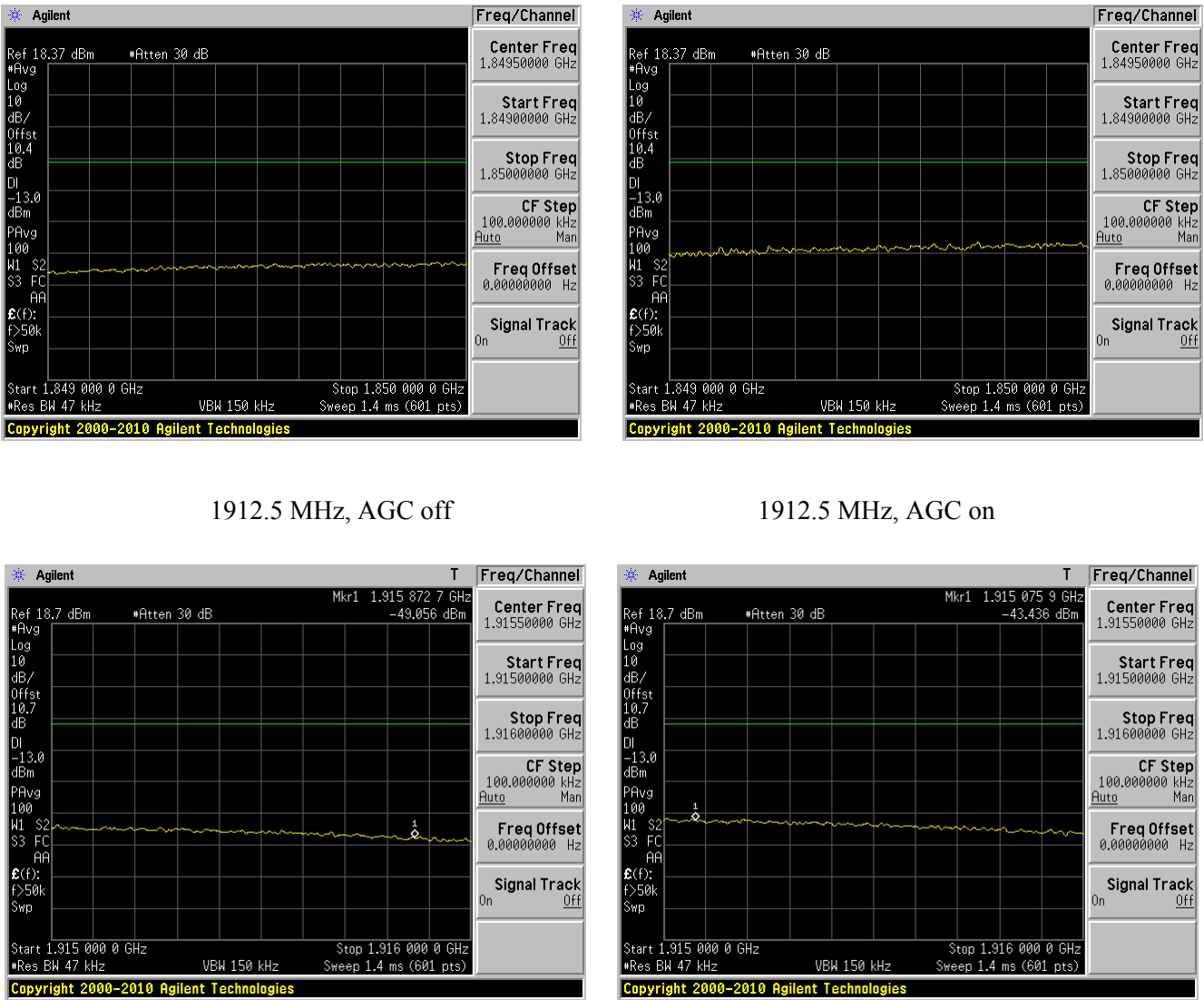
Please refer to the following plots.

Band Edge

Broadband Signal

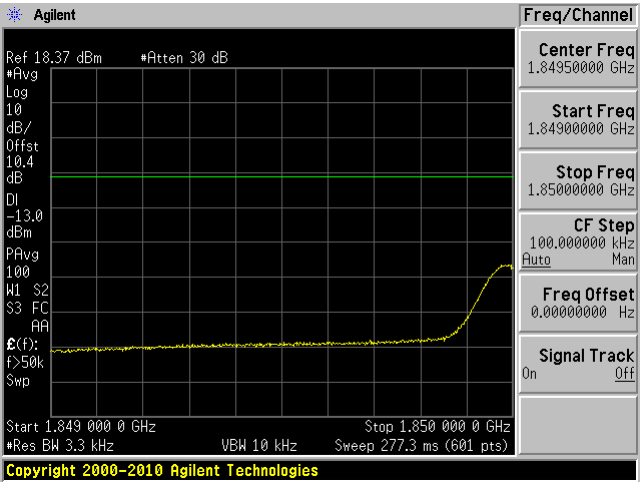
1852.5 MHz, AGC off

1852.5 MHz, AGC on

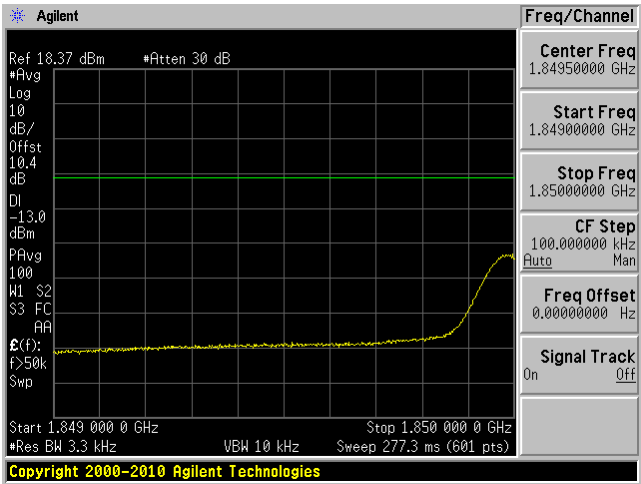


Narrowband Signal

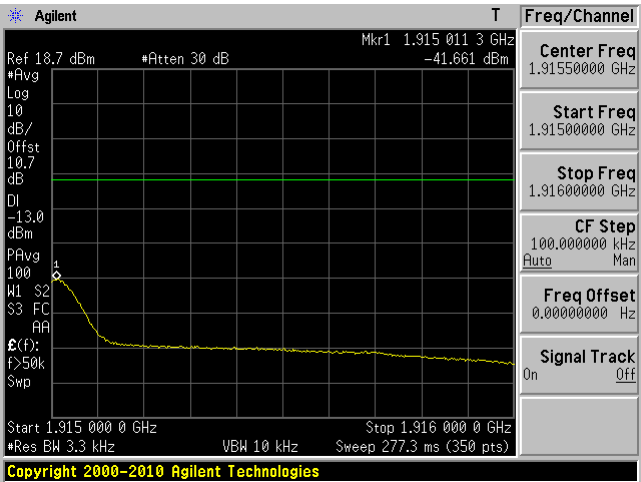
1850.2 MHz, AGC off



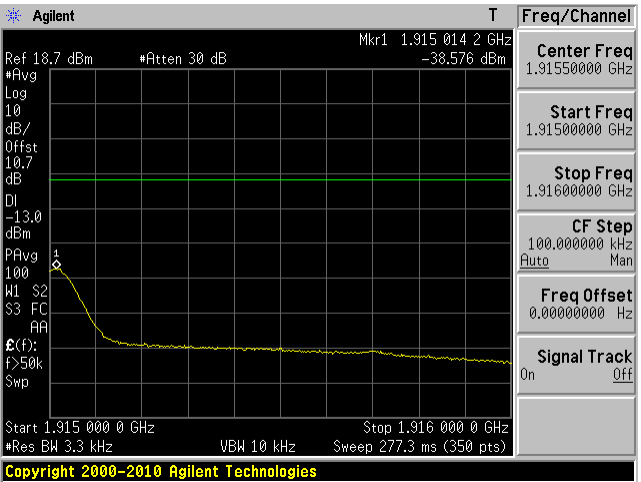
1850.2 MHz, AGC on



1914.8 MHz, AGC off



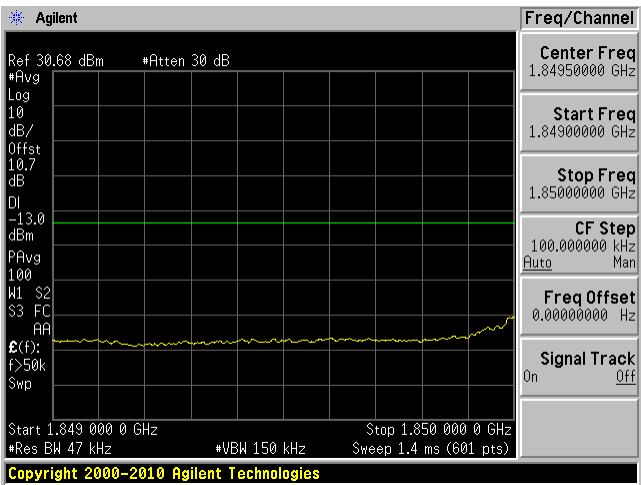
1914.8 MHz, AGC on



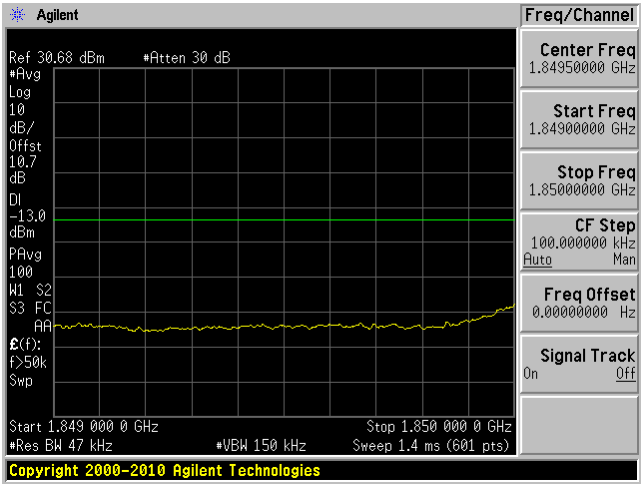
Intermodulation

Broadband Signal

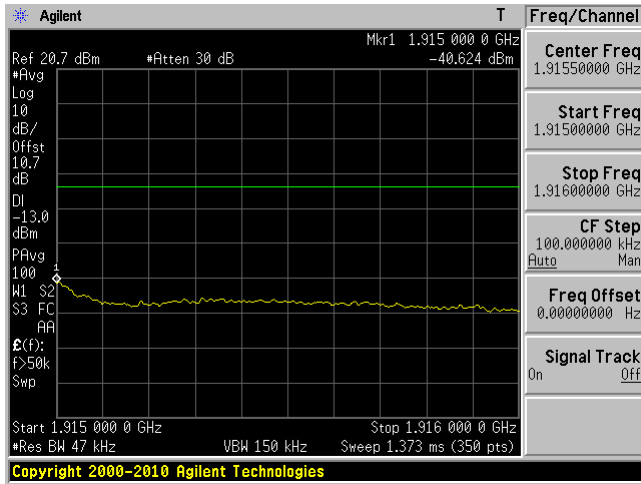
1852.5 MHz, AGC off



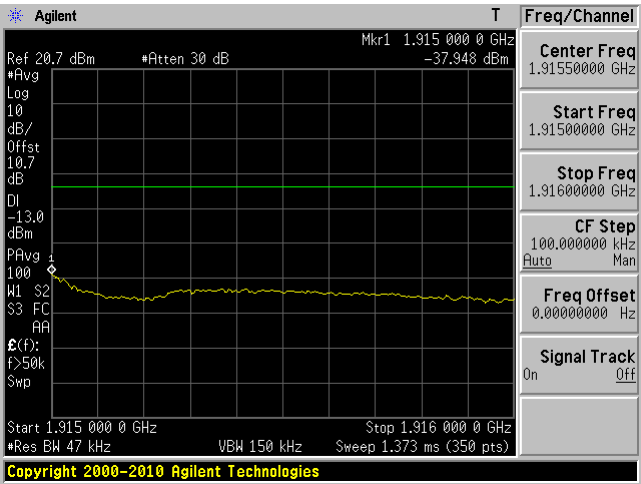
1852.5 MHz, AGC on



1912.5 MHz, AGC off

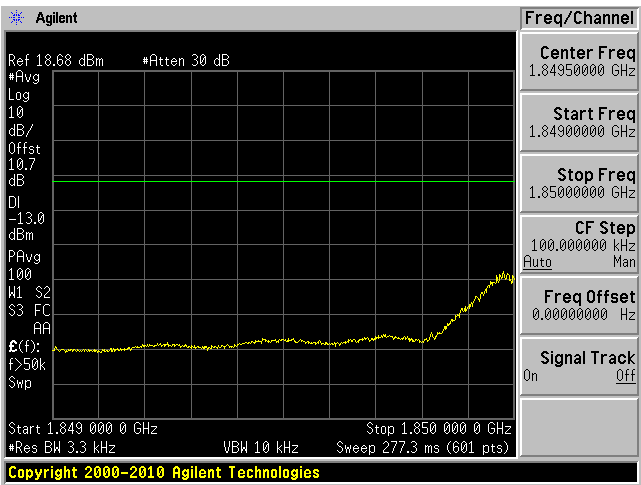


1912.5 MHz, AGC on

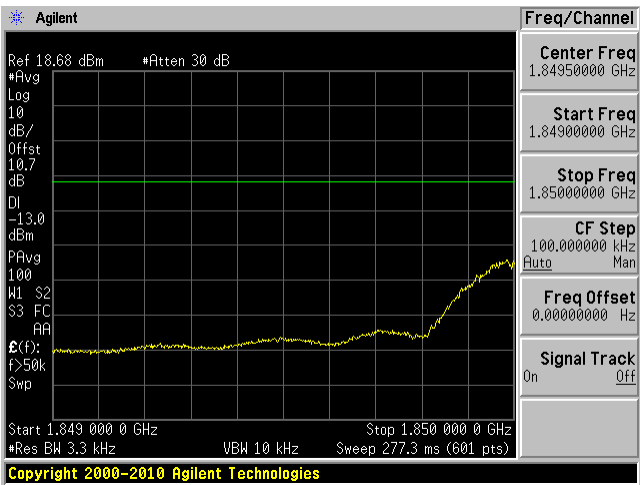


Narrowband Signal

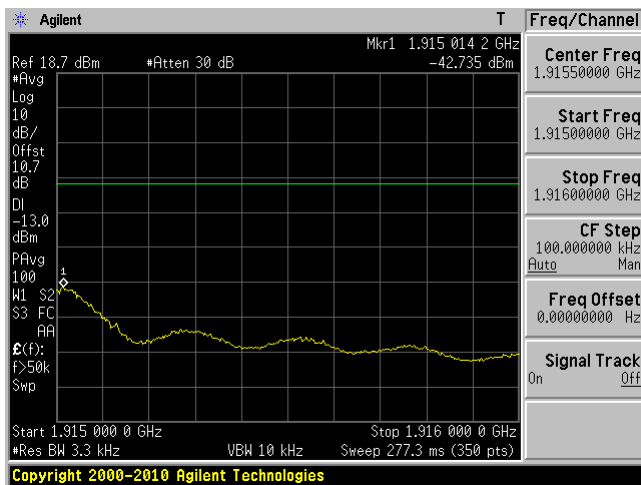
1850.2 MHz, AGC off



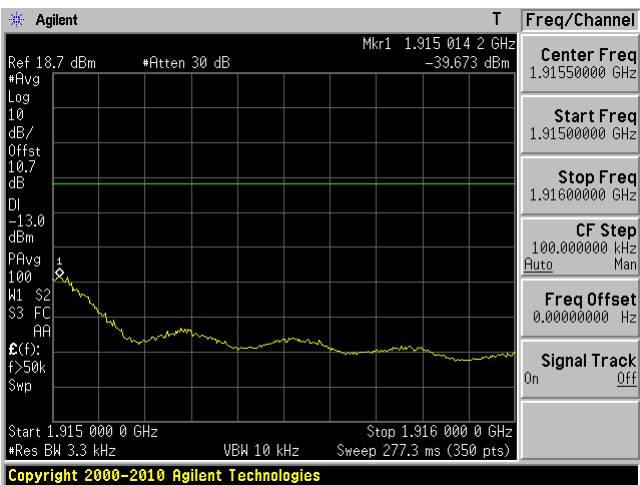
1850.2 MHz, AGC on



1914.8 MHz, AGC off



1914.8 MHz, AGC on



## 10 FCC §20.21 - Out of Band Rejection

### 10.1 Applicable Standard

According to FCC Part 20.21, a frequency selective booster shall have -20 dB at the band edge referenced to the gain in the center of the pass band of the booster, where band edge is the end of the licensee's allocated spectrum.

### 10.2 Test Procedure

KDB 935210 D05, Section 3.3.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The span of the spectrum analyzer was set to be wide enough in order to capture the spectrum of entire operating band.

### 10.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2015-10-22	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	SMA cable	-	C0001	Each Time <sup>1</sup>	Each Time <sup>1</sup>
-	SMA cable	-	C0002	Each Time <sup>1</sup>	Each Time <sup>1</sup>

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

### 10.4 Test Environmental Conditions

<b>Temperature:</b>	21-23° C
<b>Relative Humidity:</b>	42-48 %
<b>ATM Pressure:</b>	101.4-102 kPa

*The testing was performed by Todd Moy 2016-02-19 in the RF Site.*

10.5 Test Results

Please refer to the following plot.

1850-1915 MHz

