FCC PART 22H

TEST AND MEASUREMENT REPORT

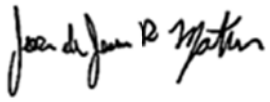
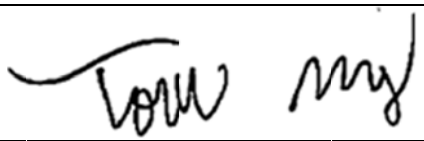
For

Intelibs, Inc.

1500 Stony Brook Road,
Stony Brook, NY 11794, USA

FCC ID:Z69D01T4JX5

Report Type:	**Product Type:**
Original Report	Radio Hub Unit (RHU)

Prepared By:	Jose Martinez Associate Test Engineer	
Report Number:	R1608091-22	
Report Date:	2016-12-19	
Reviewed By:	Todd Moy RF Lead	
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1608091-22	Original	2016-12-19

1 General Information

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: RHU, FCC ID: Z69D01T4JX5, which will henceforth be referred to as the EUT (Equipment under Test). The EUT is a Radio Hub Unit (RHU) with global positioning system (GPS) service. The EUT operates in the uplink ESMR, Cellular, 700 MHz, Broadband PCS, and the AWS-1 bands.

1.2 Mechanical Description

The EUT measured approximately 35.5 cm (L) x 44.5 cm (W) x 25.4 cm (H) and weighs 32 kg.

The test data gathered were from typical production sample, serial number: R1608092-1, 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 22 Subpart H, of the Federal Communication Commission's rules.

The objective was to determine compliance with FCC 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)

FCC Part 24, Subpart E, Equipment B2I with FCC ID: Z69D01T4JX5
FCC Part 27, Subpart C, Equipment B2I with FCC ID: Z69D01T4JX5
FCC Part 90, Subpart S, Equipment B2I with FCC ID: Z69D01T4JX5

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 22 Sub-part H - Public Mobile Services

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.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
Temperature	±2 º C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

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 3297.02),*** 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 Accreditation Certificate Number 3297.03)*** to certify

- 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 3297.01)*** 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/EC US-EU EMC & Telecom MRA CAB
  - Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB

  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;
- Vietnam: APEC Tel MRA -Phase I;

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	700MHz RHM Unit	-	-
Intelibs	850MHz RHM Unit	-	-
Intelibs	1900MHz RHM Unit	-	-
Intelibs	2100 RHM Unit	-	-
Intelibs	GPS FEM	-	-
Intelibs	RHOM	-	-
Intelibs	RF Controller	-	-
Intelibs	GPS Controller	-	-

2.5 Local Support Equipment List and Details

NA

2.6 Power Supply and Line Filters

Manufacturers	Descriptions	Models	Serial Numbers
TDK-Lambda	SMPS	-	-

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, §22.913	Output Power	Compliant
§2.1049	Occupied Bandwidth	Compliant
§2.1053, §22.917	Spurious Radiated Emissions	Compliant
§2.1053, §22.917	Spurious Emissions at Antenna Terminals	Compliant
§2.1053, §22.917	Band Edge & Intermodulation	Compliant
§2.1055, §22.355	Frequency Stability	N/A[1]
§20.21	Out of Band Rejection	Compliant

[1] The EUT was 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^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

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

Maximum peak output power at antenna input terminal (dBm):	20.87
Maximum peak output power at antenna input terminal (mW):	122.18
Prediction distance (cm):	40
Prediction frequency (MHz):	836.5
Antenna Gain, typical (dBi):	18
Maximum Antenna Gain (numeric):	63.10
Power density at predication frequency and distance (mW/cm^2):	0.3834
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.56

Results
The highest power density levels at 40 cm are below the MPE uncontrolled exposure limit with an 18 dBi antenna gain.

5 FCC §2.1046 & §22.913– Effective Radiated Power

5.1 Applicable Standards

According to FCC §22.913:

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) *Maximum ERP.* In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

(1) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or,

(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

(b) *Height-power limit.* The ERP of base transmitters must not exceed the amount that would result in an average distance to the service area boundary of 79.1 kilometers (49 miles) for cellular systems authorized to serve the Gulf of Mexico MSA and 40.2 kilometers (25 miles) for all other cellular systems. The average distance to the service area boundary is calculated by taking the arithmetic mean of the distances determined using the procedures specified in §22.911 for the eight cardinal radial directions.

(c) *Coordination exemption.* Licensees need not comply with the height-power limit in paragraph (b) of this section if the proposed operation is coordinated with the licensees of all affected cellular systems on the same channel block within 121 kilometers (75 miles) and concurrence is obtained.

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 spectrum analyzer through appropriate attenuation.

5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US 42221851	2016-06-10	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2016-07-29	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	SMA cable	-	C0003	Each Time[1]	Each Time[1]
-	SMA cable	-	C0006	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***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 9 June 2016) "A2LA Policy on Metrological Traceability".

5.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	32 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Jose Martinez 2016-08-29 in the RF Site

5.5 Test Results

Signal Type	AGC	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Output ERP (dBm)
Broadband	Off	-66.95	17.17	84.12	33.02
	On	-63.52	20.87	84.39	36.72
Narrowband	Off	-64.16	18.98	83.14	34.83
	On	-60.57	20.07	80.64	35.92

Note: The maximum recommended antenna gain used with the EUT is 18 dBi.

ERP (dBm) =Conducted Output Power (dBm) + Antenna Gain (dBi) -2.15 dB

Note: Calculation results of the amplifier gain listed in the table above contains two parts: gain of RHU (the EUT) and gain of MRU. The typical gain of RHU is around 40 dB. Thus, the typical gain of MRU is around 45 dB, please refer to FCC ID: Z69D01T4JX6.

6 FCC §2.1049 – Occupied Bandwidth

6.1 Applicable Standards

Requirements: FCC §2.1049

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 spectrum analyzer through appropriate attenuation.

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	E4440A	US 42221851	2016-06-10	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2016-07-29	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	SMA cable	-	C0003	Each Time[1]	Each Time[1]
-	SMA cable	-	C0006	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***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 9 June 2016) "A2LA Policy on Metrological Traceability".

6.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	32 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Jose Martinez 2016-08-26 in the RF Site.

6.5 Test Results

Please refer to the following table and plots.

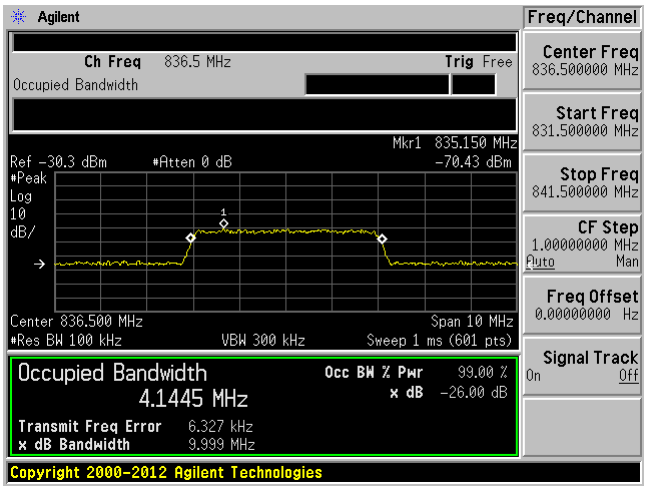
Signal Type	AGC	Input	Output
		99 % OBW (kHz)	99 % OBW (kHz)
Broadband	off	4144.5	4021.7
	on	4144.5	4030.6
Narrowband	off	243.48	248.73
	on	243.48	247.45

Note: The 99 % occupied bandwidth was used to compare the input and output signal.

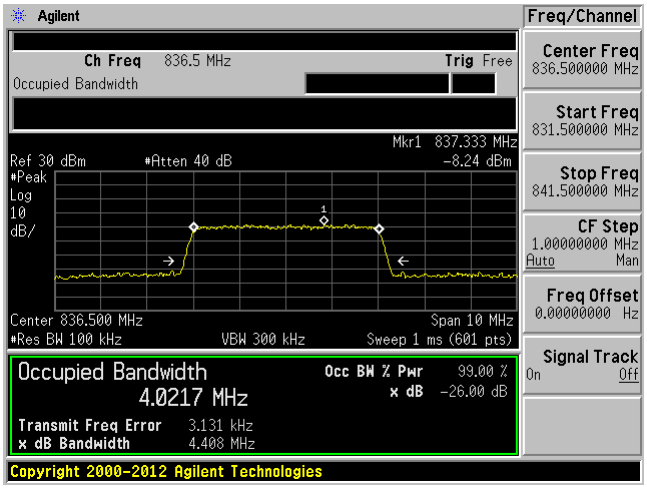
Broadband Signal

AGC off

Input

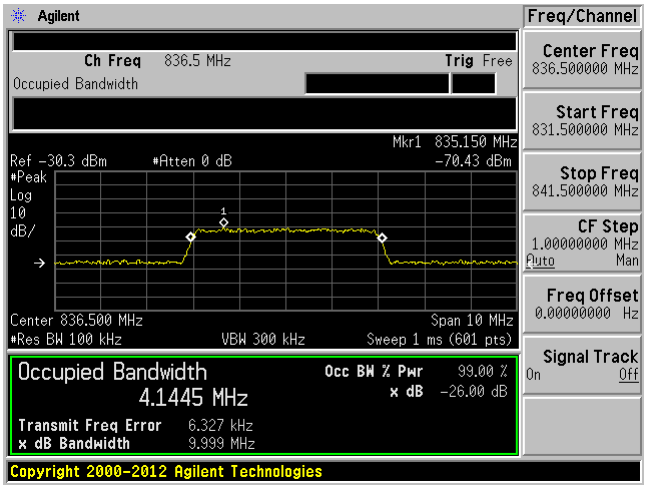


Output

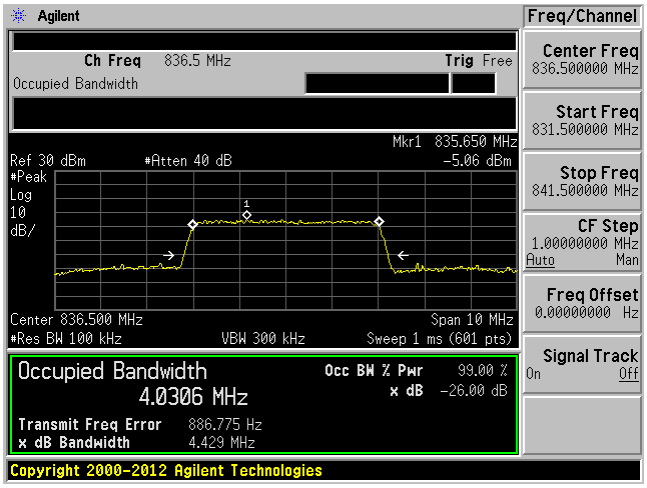


AGC on

Input



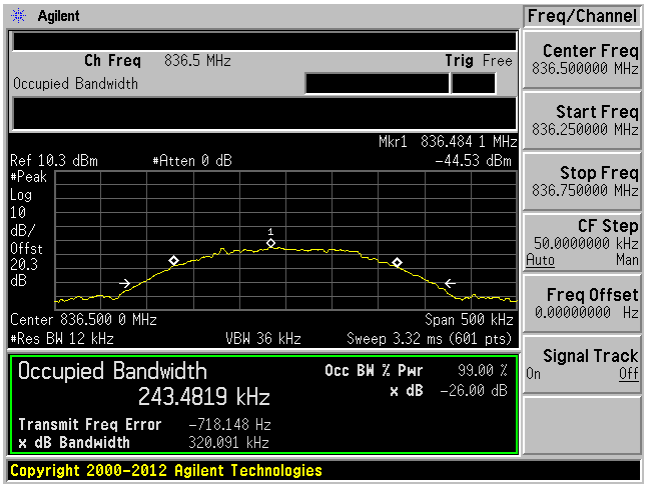
Output



Narrowband Signal

AGC off

Input



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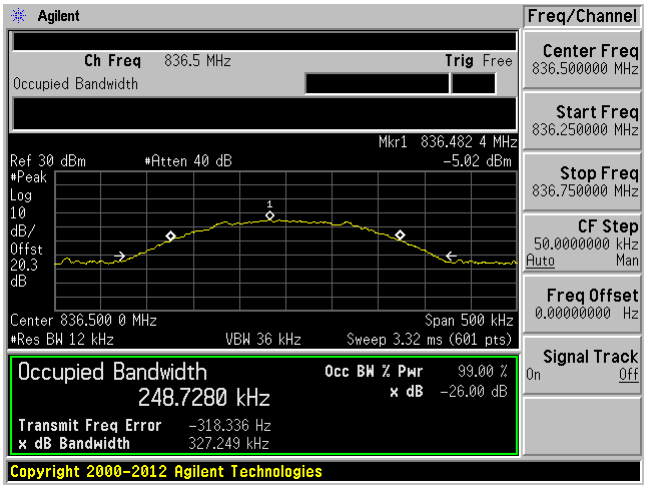
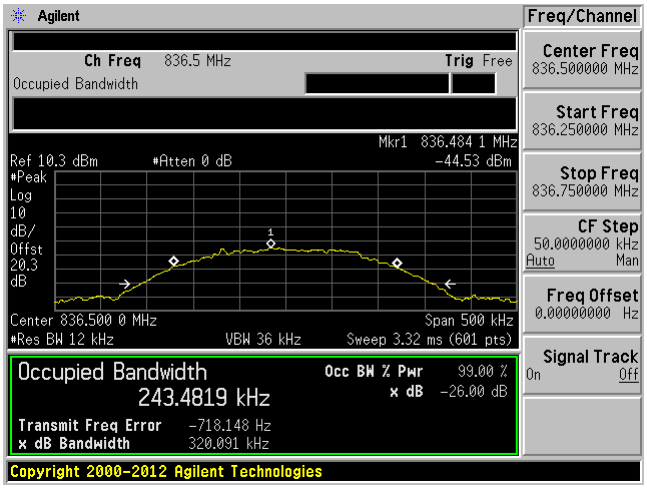
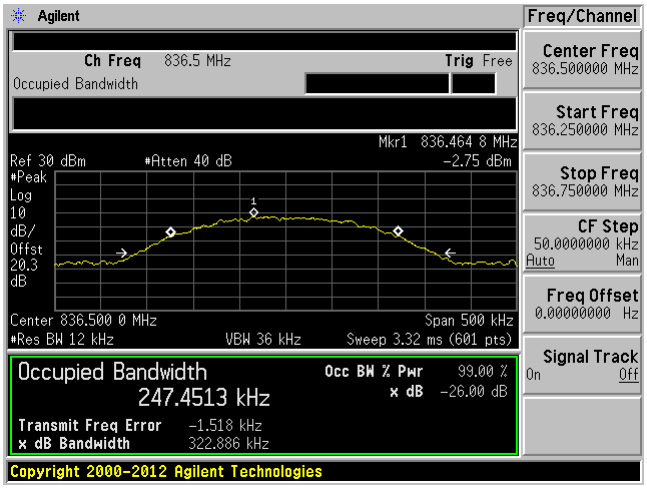


AGC on

Input



Output



7 FCC §2.1053 & §22.917- Spurious Radiated Emissions

7.1 Applicable Standards

According to FCC §22.917(a) (1), 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 onto a Styrofoam block. The unit was normally transmitting with a 50 ohm terminator connected to the antenna terminal.

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.

Emissions were investigated up to the tenth harmonic of the fundamental frequency.

After the emissions were found, the EUT was removed and replaced by a substituting antenna. A signal generator was connected to the substituting antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level
Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

7.3 Test Equipment List and Details

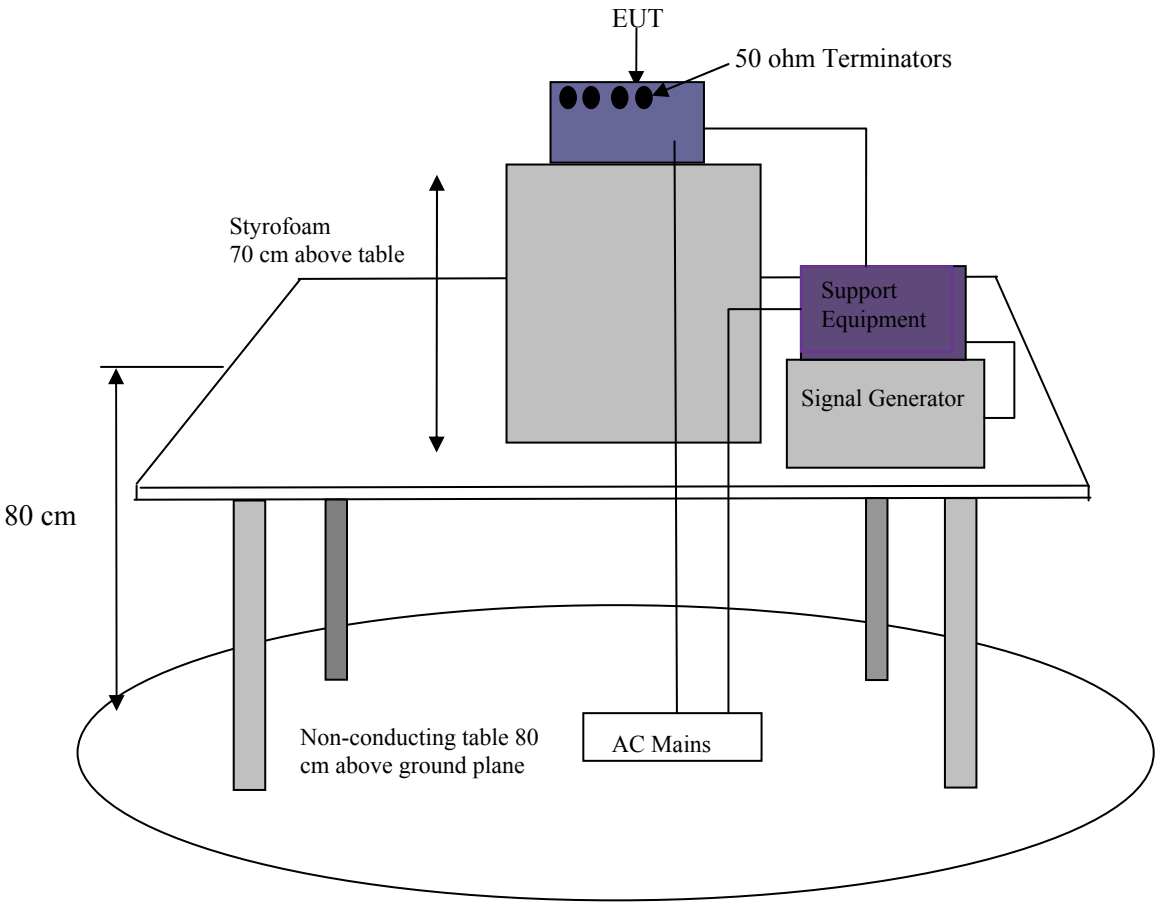
Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US 42221851	2016-06-10	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB3	A020106-2	2015-07-11	2 years
Agilent	Amplifier, Pre	8447D	2944A10187	2016-03-23	1 year
HP/ Agilent	Pre Amplifier	8449B OPT HO2	3008A0113	2016-05-23	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 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
COM-POWER	Antenna, Dipole	AD-100	721033DB1/2/3/4	2014-11-03	2 years
-	N-Type Cable	-	C00013	2016-04-28	1 year
-	N-Type Cable	-	C00014	2016-05-28	1 year
-	SMA cable	-	C0003	Each Time[1]	Each Time[1]
-	SMA cable	-	C0006	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***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 9 June 2016) "A2LA Policy on Metrological Traceability".

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 Jose Martinez on 2016-10-04 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)		
Middle Channel											
60	62.06	0	300	H	60	-27.78	0.000	0.38	-28.16	-13	-15.16
60	64.91	55	277	V	60	-20.76	0.000	0.38	-21.14	-13	-8.14
80	55.91	325	210	H	80	-33.93	0.000	0.33	-34.26	-13	-21.26
80	56.89	120	100	V	80	-28.78	0.000	0.33	-29.11	-13	-16.11
1673	33.01	0	100	H	1673	-41.29	8.895	0.49	-32.885	-13	-19.89
1673	32.22	0	100	V	1673	-42.31	8.913	0.49	-33.887	-13	-20.89
2509.5	32.88	0	100	H	2509.5	-38.02	9.115	0.60	-29.505	-13	-16.51
2509.5	33.91	0	100	V	2509.5	-36.15	9.039	0.60	-27.711	-13	-14.71

8 FCC §2.1051 & §22.917- Spurious Emissions at Antenna Terminals

8.1 Applicable Standards

According to FCC §22.917(a) (1), 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 spectrum analyzer through appropriate attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US 42221851	2016-06-10	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2016-07-29	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	SMA cable	-	C0003	Each Time[1]	Each Time[1]
-	SMA cable	-	C0006	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***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 9 June 2016) "A2LA Policy on Metrological Traceability".

8.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	32 %
ATM Pressure:	101.4-102 kPa

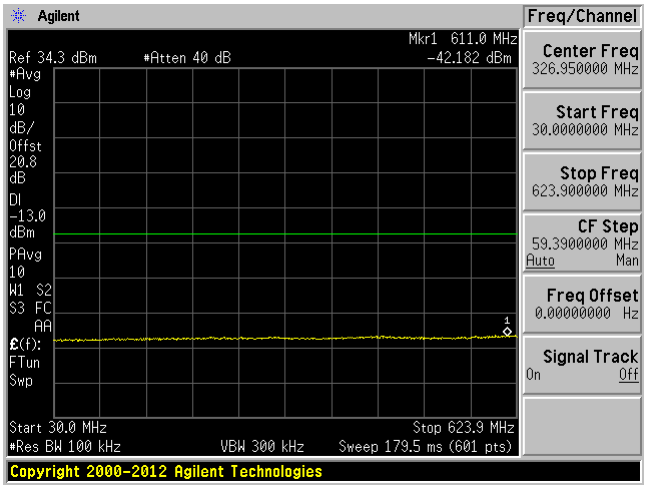
The testing was performed by Jose Martinez 2016-09-13 in the RF Site.

Broadband Signal

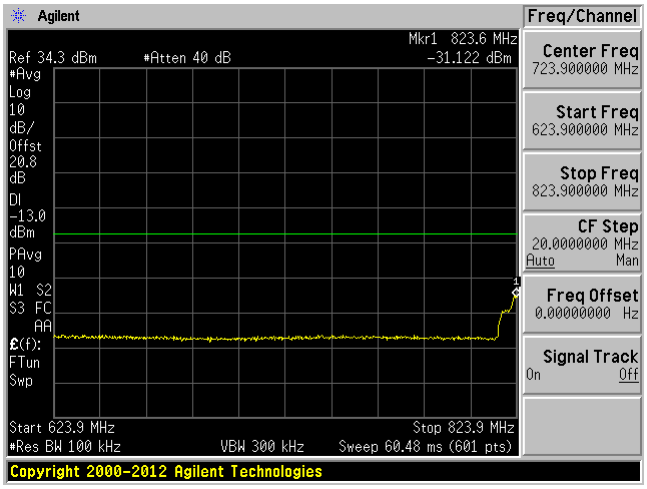
AGC Off

Low Channel

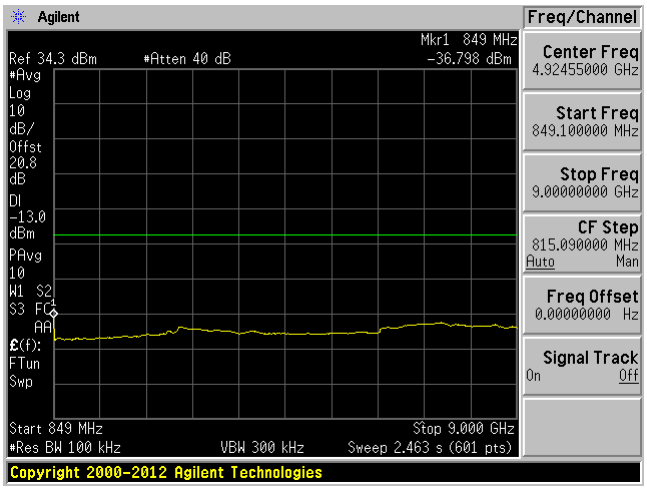
Low Channel: 30 MHz-623.9 MHz



Low Channel: 623.9 MHz-823.9 GHz

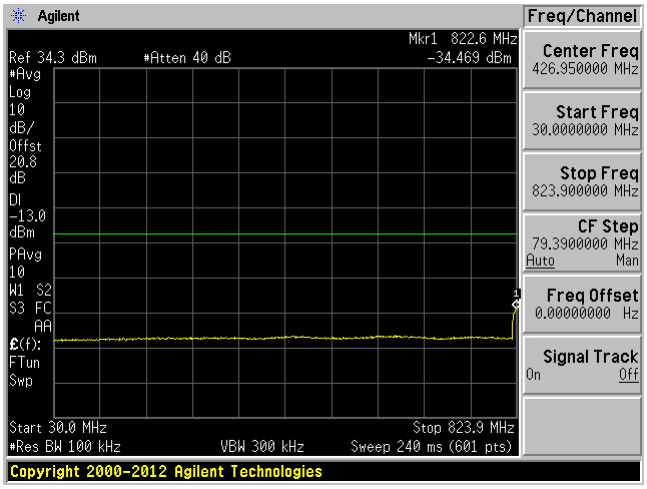


Low Channel: 849.1 MHz-9 GHz

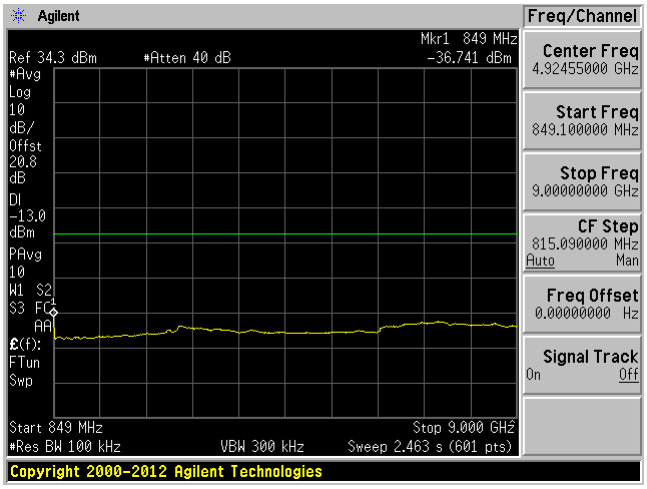


Middle Channel

Middle Channel: 30 MHz-823.9 MHz

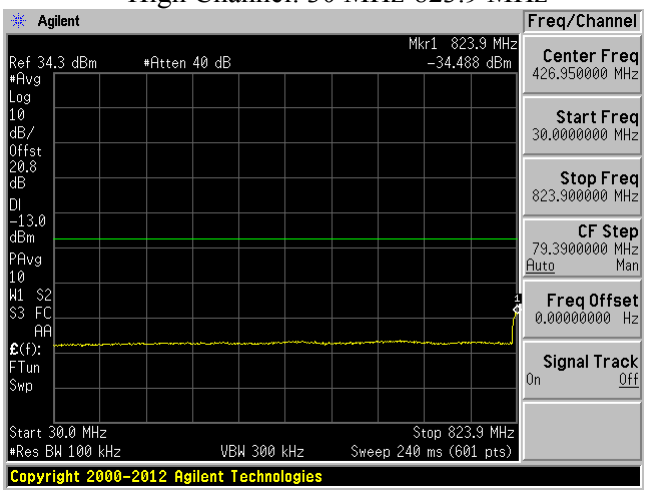


Middle Channel: 849.1 MHz-9 GHz

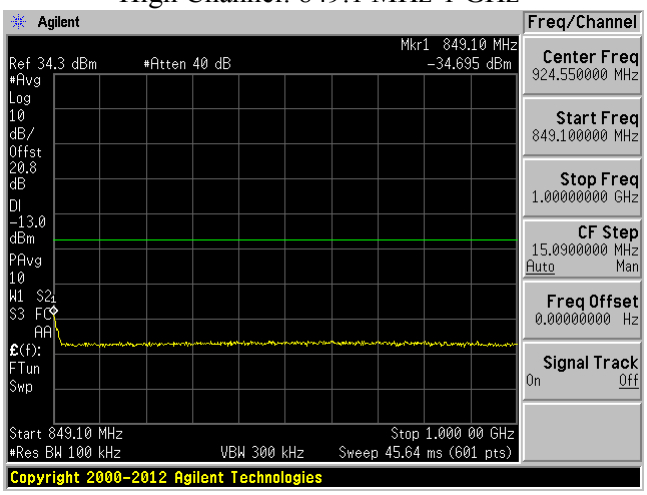


High Channel

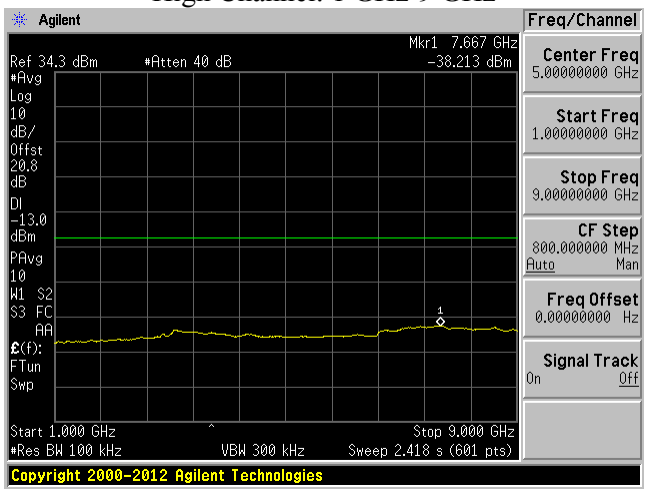
High Channel: 30 MHz-823.9 MHz



High Channel: 849.1 MHz-1 GHz



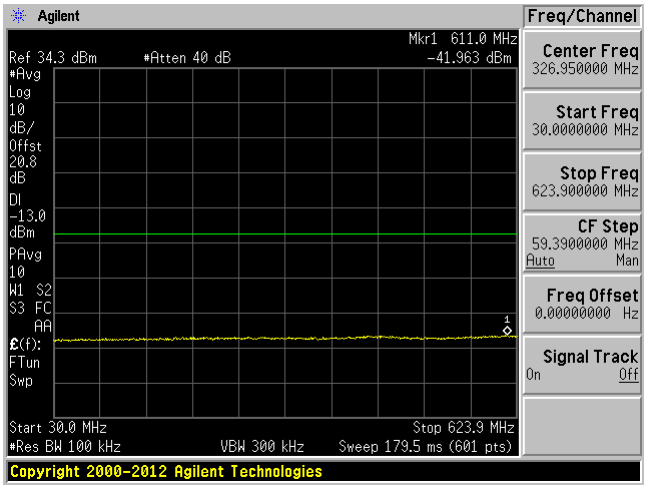
High Channel: 1 GHz-9 GHz



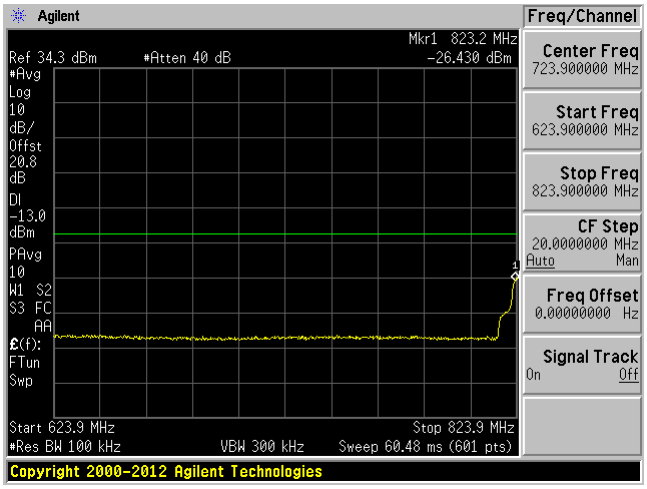
AGC On

Low Channel

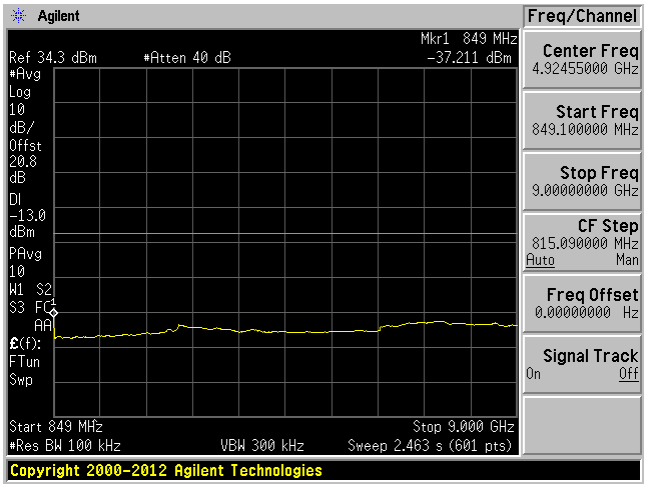
Low Channel: 30 MHz-623.9 MHz



Low Channel: 623.9 MHz-823.9 GHz

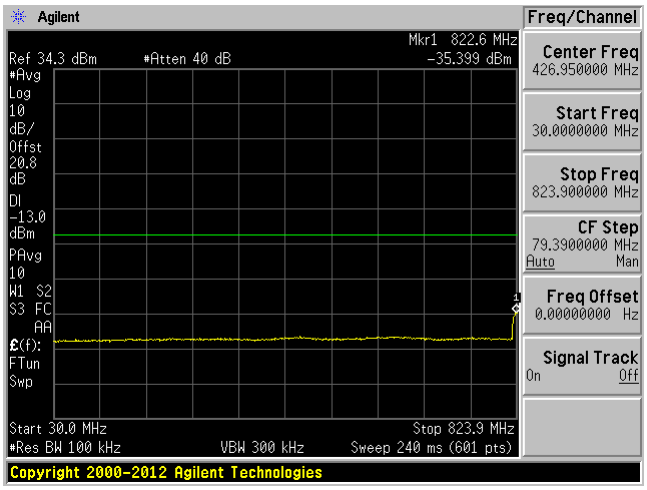


Low Channel: 849.1 MHz-9 GHz

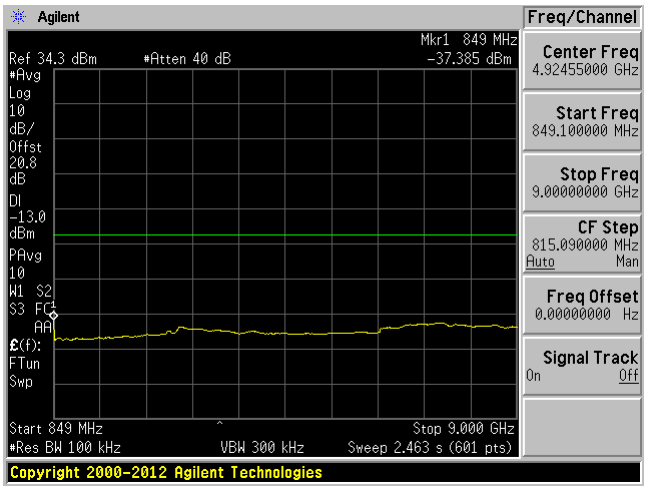


Middle Channel

Middle Channel: 30 MHz-823.9 MHz

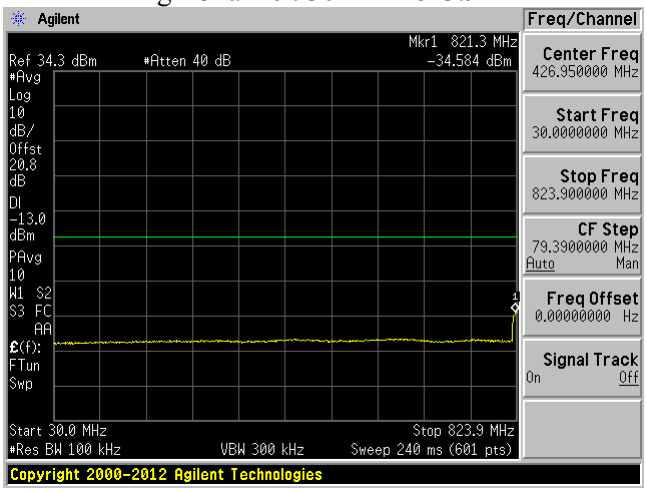


Middle Channel: 849.1 MHz-9 GHz

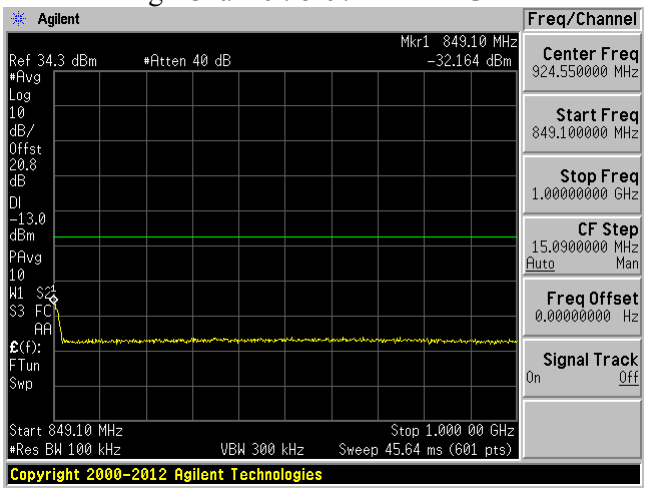


High Channel

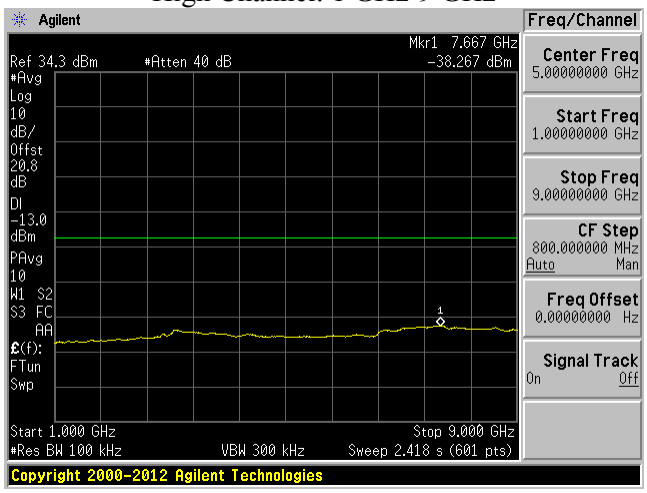
High Channel: 30 MHz-823.9 MHz



High Channel: 849.1 MHz-1 GHz



High Channel: 1 GHz-9 GHz

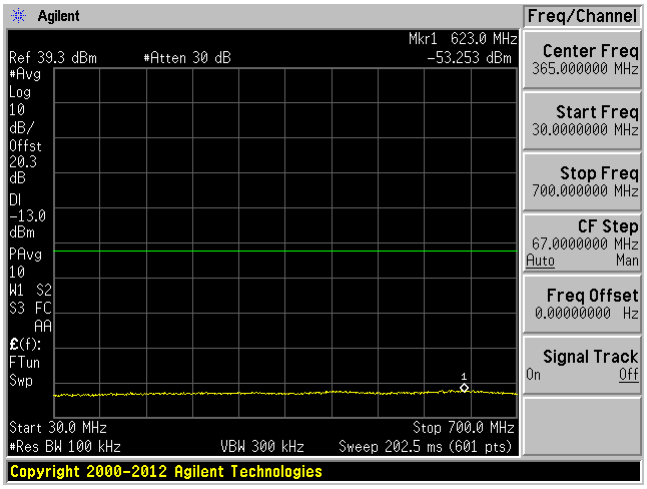


Narrowband signal

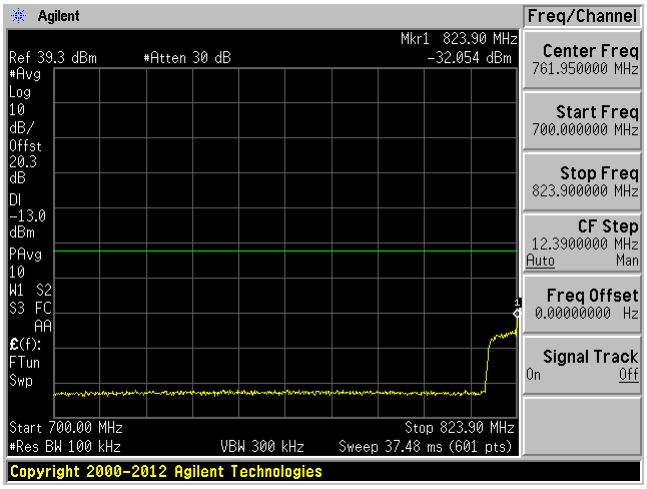
AGC Off

Low Channel

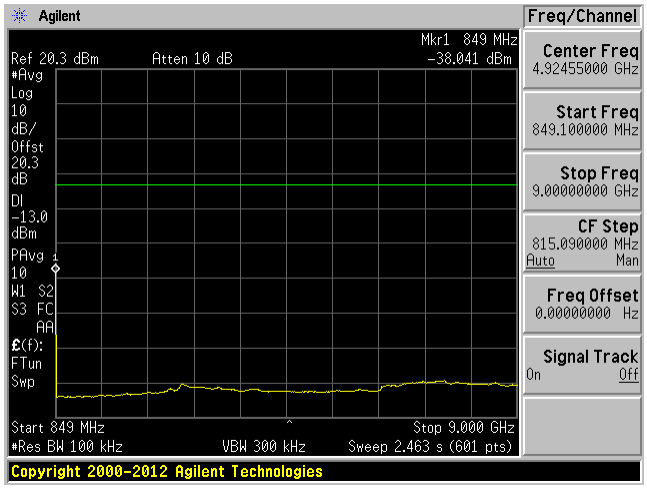
Low Channel: 30 MHz-700 MHz



Low Channel: 700 MHz-823.9 MHz

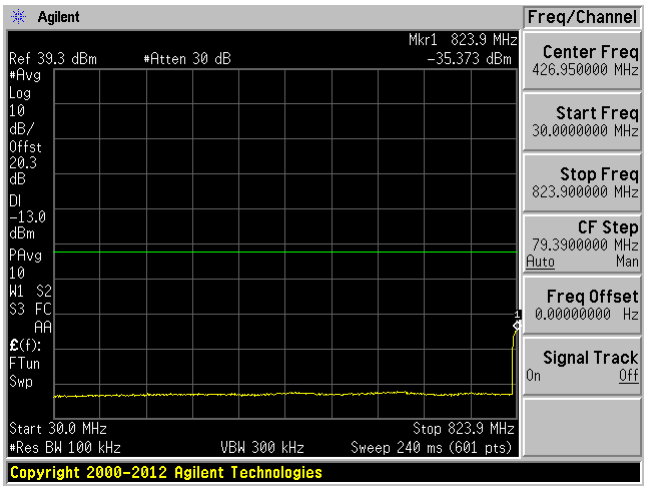


Low Channel: 849.1 MHz-9 GHz

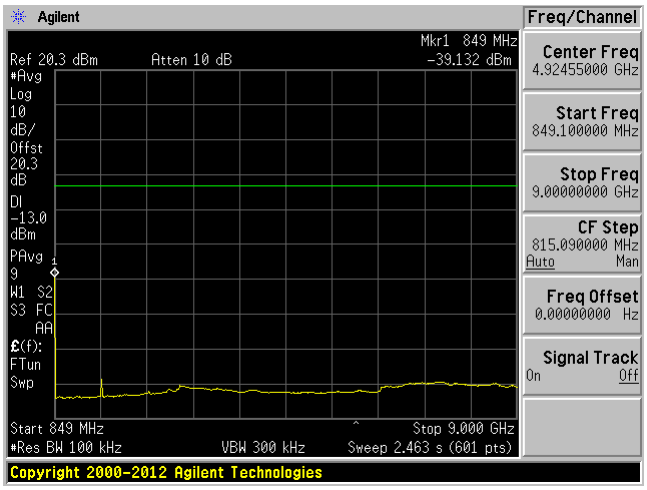


Middle Channel

Middle Channel: 30 MHz-823.9 MHz

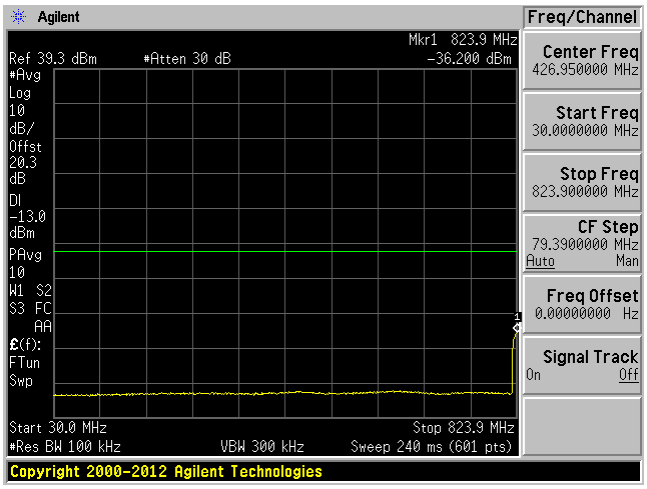


Middle Channel: 849.1 MHz-9 GHz

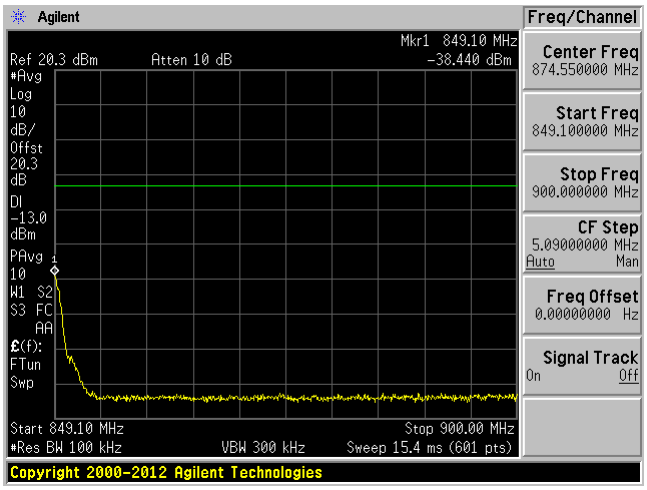


High Channel

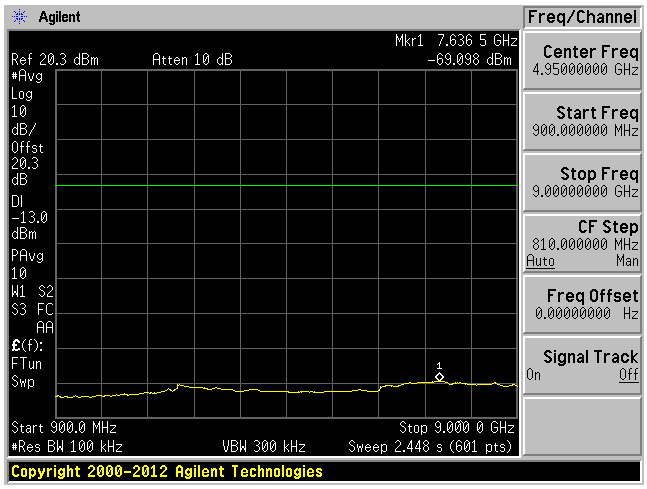
High Channel: 30 MHz-823.9 MHz



High Channels: 894.1 MHz-900 MHz



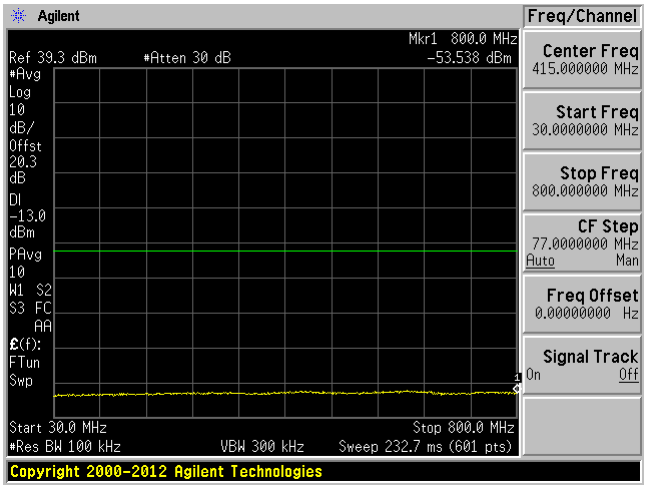
High Channel: 900 MHz-9 GHz



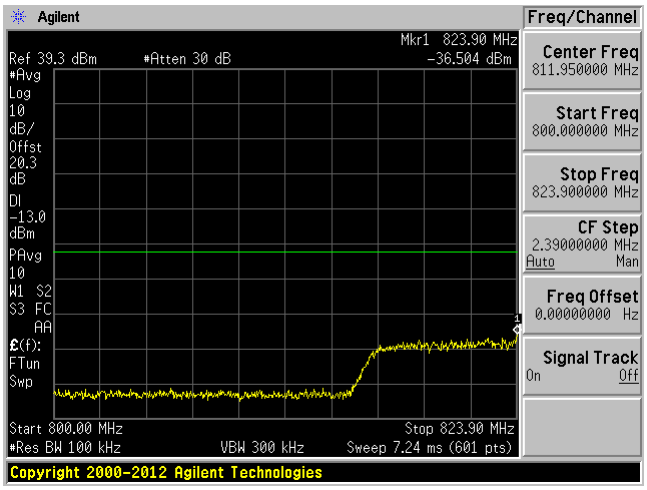
AGC On

Low Channel

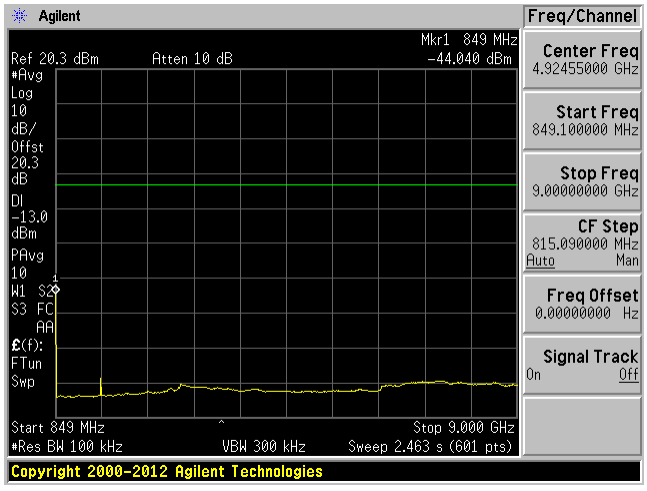
Low Channel: 30 MHz-800 MHz



Low Channel: 800 MHz-823.9 MHz

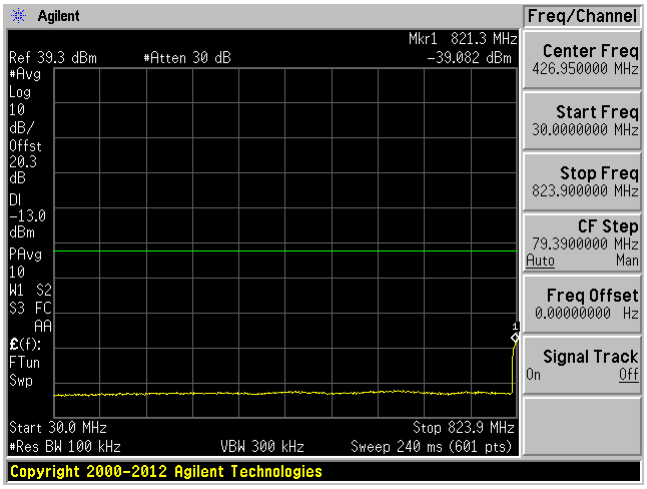


Low Channel: 849.1 MHz-9 GHz

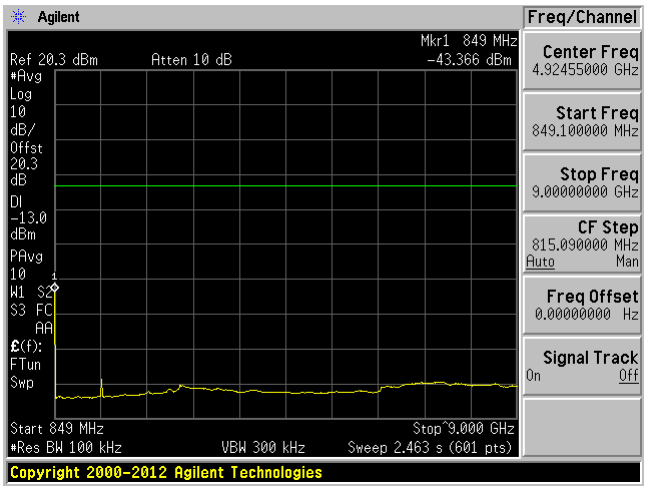


Middle Channel

Middle Channel: 30 MHz-823.9 MHz

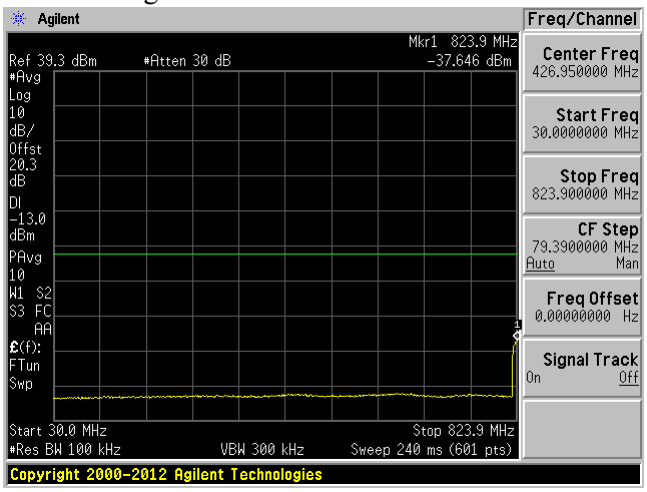


Middle Channel: 849.1 MHz-9 GHz

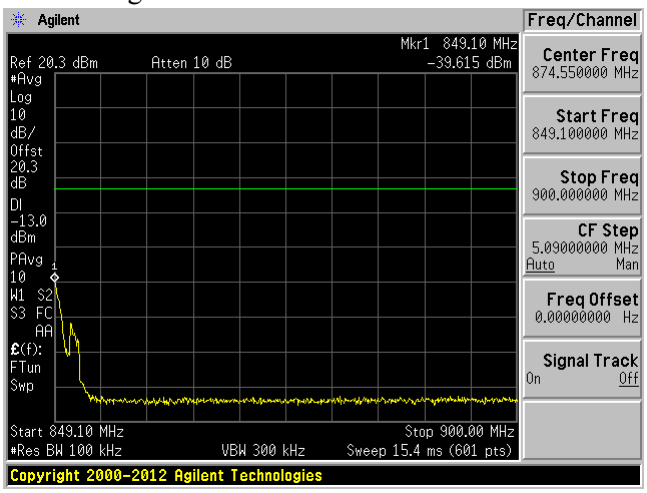


High Channel

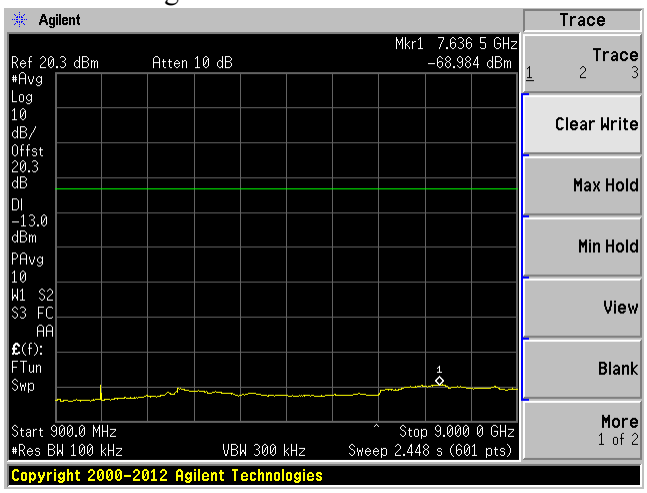
High Channel: 30 MHz-823.9 MHz



High Channel: 849.1 MHz-900 MHz



High Channel: 900 MHz-9 GHz



9 FCC §22.917- Band Edge & Intermodulation

9.1 Applicable Standards

According to FCC §22.917(a) (1), 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 spectrum analyzer through appropriate attenuation.

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 100 kHz 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	E4440A	US 42221851	2016-06-10	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2016-07-29	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	SMA cable	-	C0003	Each Time[1]	Each Time[1]
-	SMA cable	-	C0006	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***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 9 June 2016) "A2LA Policy on Metrological Traceability".

9.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	32 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Jose Martinez 2016-09-14 in the RF Site.

9.5 Test Results

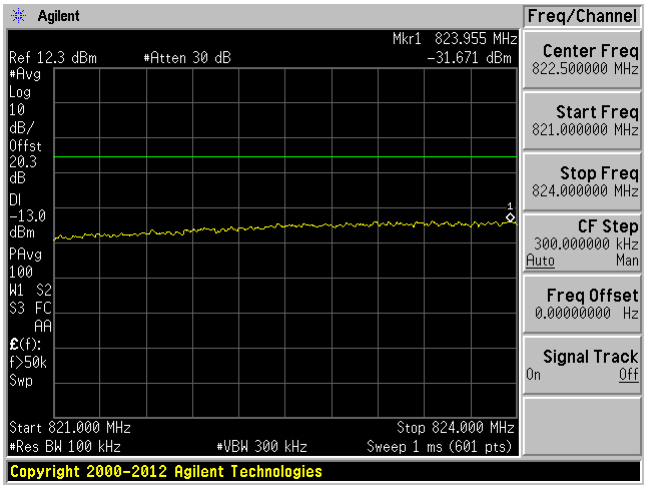
Please refer to the following plots.

Band Edge

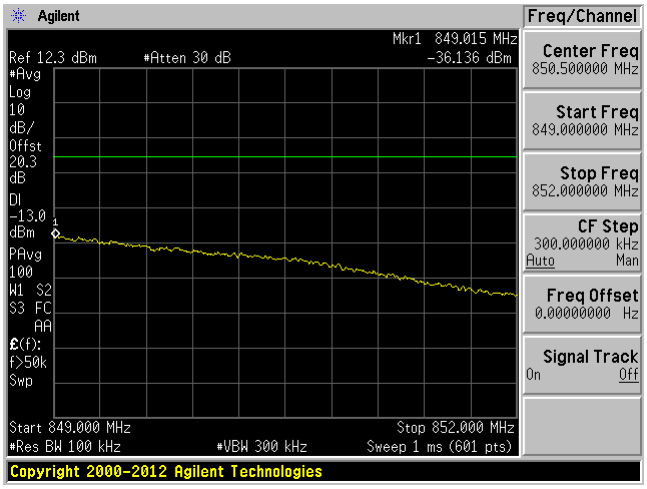
Broadband Signal

AGC Off

Lower Band Edge

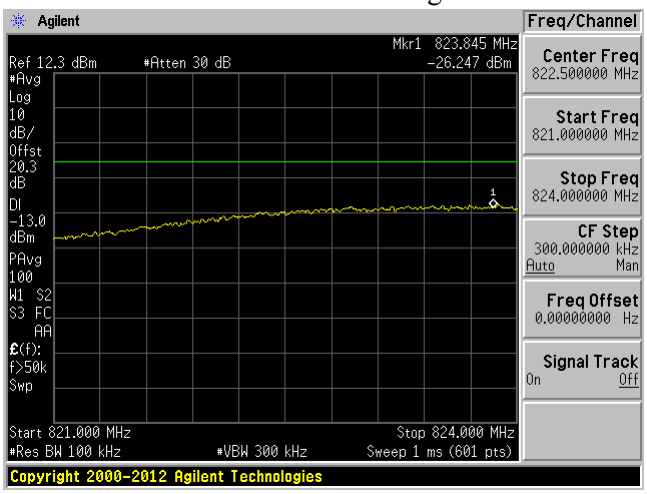


Upper Band Edge

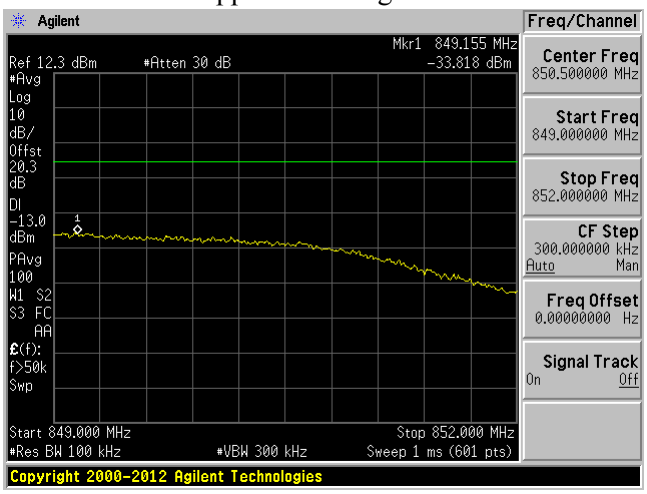


AGC On

Lower Band Edge



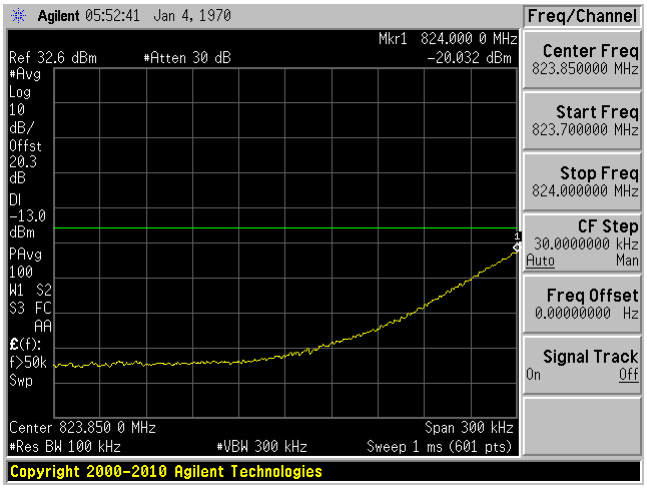
Upper Band Edge



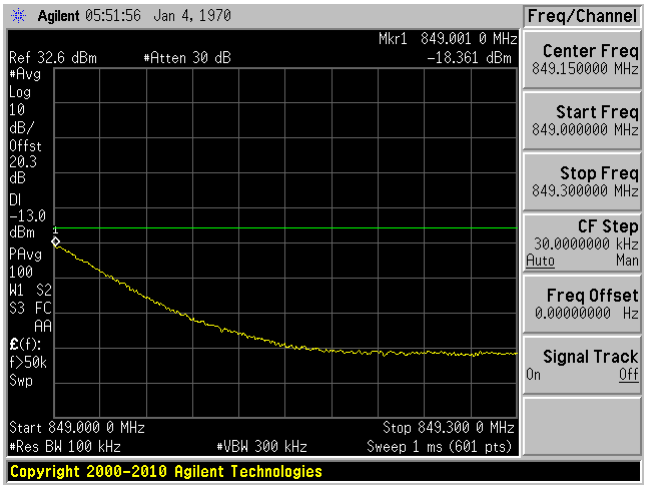
Narrowband Signal

AGC Off

Lower Band Edge

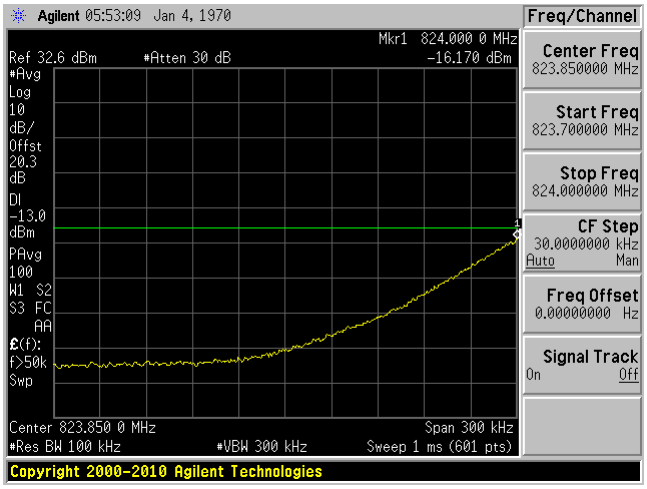


Upper Band Edge

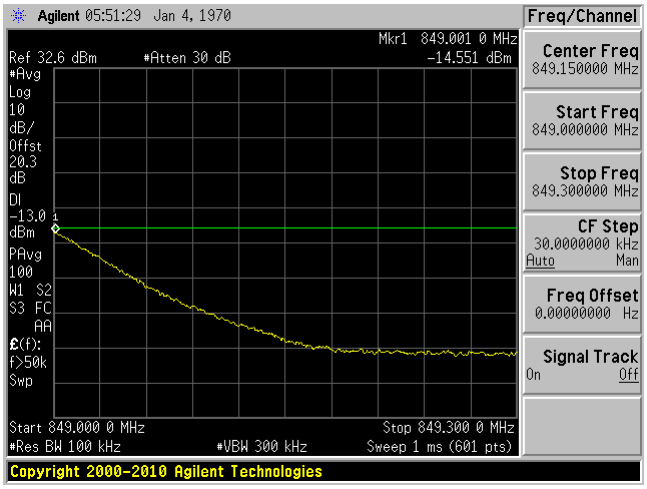


AGC On

Lower Band Edge



Upper Band Edge

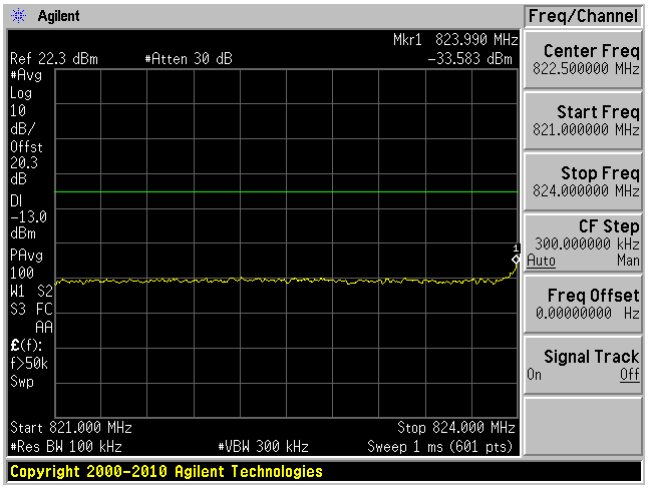


Intermodulation

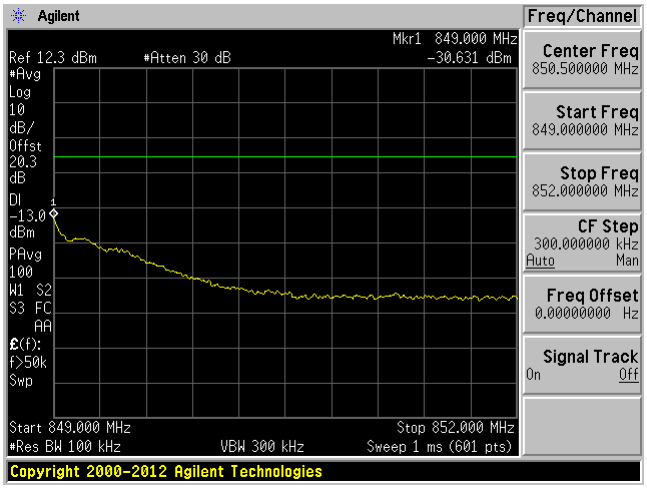
Broadband Signal

AGC Off

Low Channel

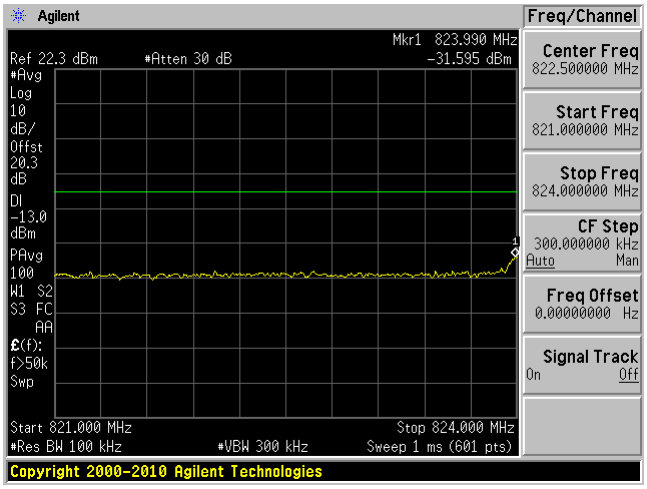


High Channel

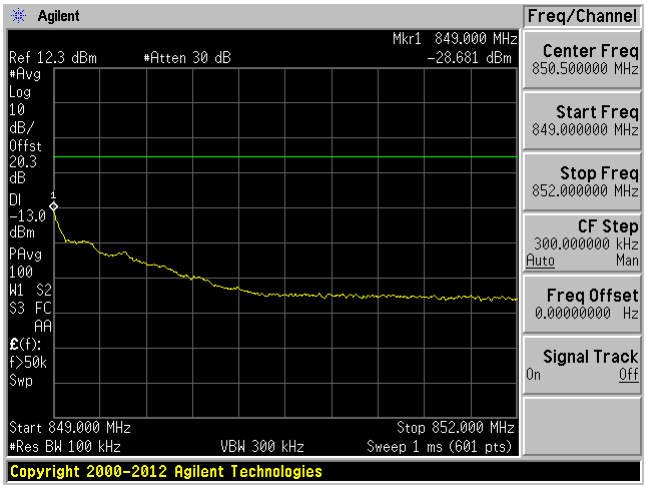


AGC On

Low Channel



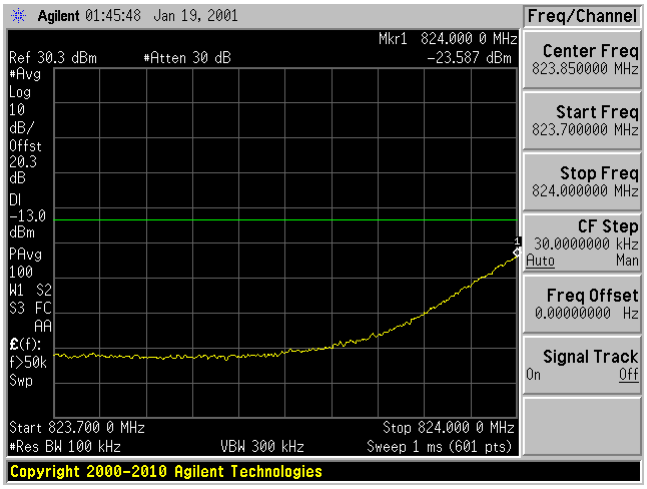
High Channel



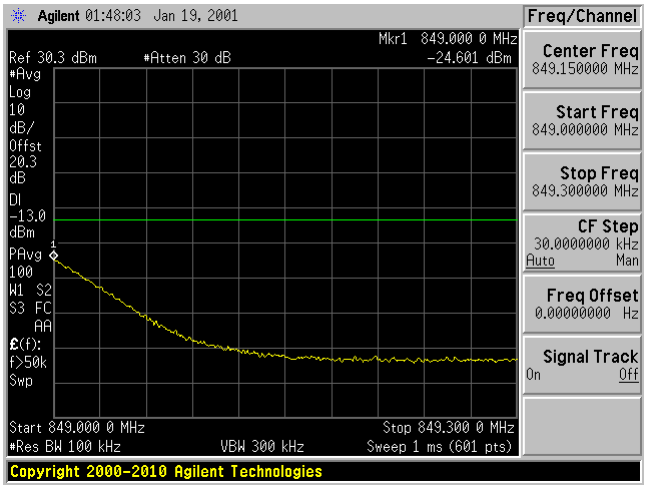
Narrowband Signal

AGC Off

Low Channel

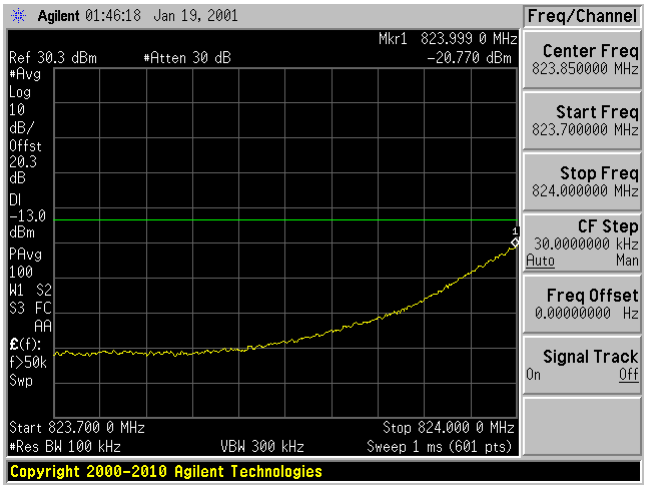


High Channel

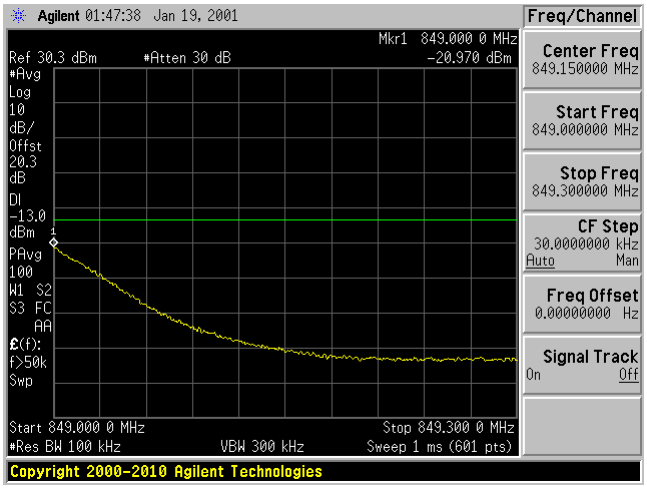


AGC On

Low Channel



High Channel



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 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 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	E4440A	US 42221851	2016-06-10	1 year
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2016-07-29	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2015-11-18	1 year
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	20 dB attenuator	-	-	Each Time[1]	Each Time[1]
-	SMA cable	-	C0003	Each Time[1]	Each Time[1]
-	SMA cable	-	C0006	Each Time[1]	Each Time[1]

[1]*Note: This equipment was calibrated for each test.*

***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 9 June 2016) "A2LA Policy on Metrological Traceability".

10.4 Test Environmental Conditions

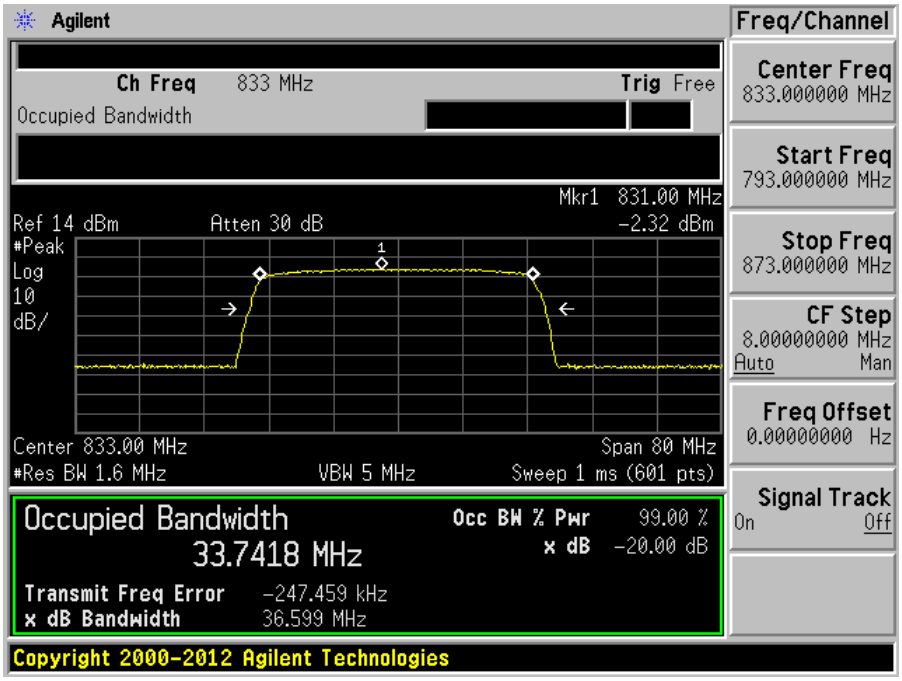
Temperature:	23° C
Relative Humidity:	32 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Jose Martinez 2016-09-08 in the RF Site.

10.5 Test Results

Please refer to the following plot,

817 – 849 MHz



Note: A single filter is used for the 817-824 MHz and the 824-849 MHz band.