FCC PART 15, SUBPART C
ISED RSS-210, ISSUE 8, DECEMBER 2010

TEST AND MEASUREMENT REPORT

For

Intel Corporation

2200 Mission College Blvd.,

Santa Clara, CA 95054, USA

FCC ID: 2AB8ZND18
IC: 1000X-ND18

Report Type:	**Product Type:**
Original Report	Wearable Glasses

Prepared By:	Todd Moy Test Engineer
Report Number:	R1604212-249
Report Date:	2016-06-07
Reviewed By:	Simon Ma RF Lead

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1604212-249	Original Report	2016-06-07

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Intel Corporation*, and their product model: *Radar Pace*, FCC ID: 2AB8ZND18; IC: 1000X-ND18 or the "EUT" as referred to in this report. The EUT are wearable glasses with Bluetooth, Bluetooth Low Energy and ANT+ capabilities.

1.2 Mechanical Description of EUT

The EUT measures approximately 140 mm (L) x 150 mm (W) x 53 mm (H) and weight 50 g.

The test data gathered are from typical production sample, serial number: FC5960FZ6030038-L assigned by Intel Corporation.

1.3 Objective

This report is prepared on behalf of *Intel Corporation*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and ISED RSS-210 Issue 8, DEC 2010.

The objective is to determine compliance with FCC Part 15.249 and ISED RSS-210 rules for AC Conducted Emissions, Antenna Requirements, Occupied Bandwidth, and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment DSS with FCC ID: 2AB8ZND18
FCC Part 15, Subpart C, Equipment DTS with FCC ID: 2AB8ZND18

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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 Luminares and Computers.

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

4- A Product Certification Body accredited to ISO 17065: 2012 by A2LA to certify:
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 C63.10-2013, ANSI C63.4-2014, 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 ANSI C63.10-2013.
The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

2.2 EUT Exercise Software

The test utility used was Tera Term; the software was verified by Todd Moy to comply with the standard requirements being tested against.

2.3 Duty Cycle Correction Factor

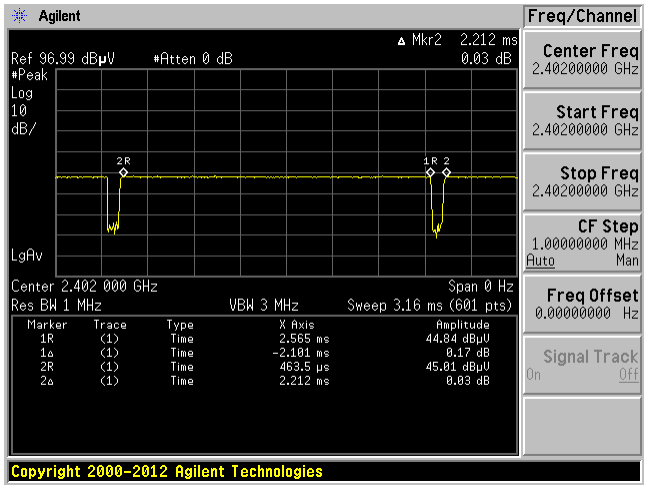
According to ANSI C63.10-2013 section 11.6:

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
ANT+	2.101	2.212	95	0.45

Duty Cycle = On Time (ms)/ Period (ms); Duty Cycle Correction Factor (dB) = 20*log (1/Duty Cycle)

Please refer to the following plot.



2.4 Equipment Modifications

SMA cables were connected to the output trace of the Bluetooth and ANT+ circuits.

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude D630

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model
Intel	Main Board	Radar Pace

2.7 Support Equipment

Manufacturer	Description	Model
Intel	USB to UART Driver	H81964-001

2.8 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	< 1 m	Laptop	EUT
SMA Pigtails	< 1 m	EUT	PSA

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & ISED Rules	Description of Test	Results
FCC §15.203 ISED RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.207 ISED RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §2.1053, §15.205, §15.209, §15.249 (a) ISED RSS-210	Radiated Spurious Emissions	Compliant
FCC §15.215 ISED RSS-Gen	Emission Bandwidth	Compliant

4 FCC §15.203 & ISED RSS-Gen §8.3 - Antenna Requirements

4.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to ISED RSS-Gen §8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the license-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

License-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the license-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of license-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. 9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

4.2 Antenna Description

The antennas used by the EUT are permanently attached antennas.

Radio	Maximum Antenna Gain (dBi) @ 2.4GHz
Bluetooth	-1.2
ANT+	-1.2

5 FCC §15.207 & ISED RSS-Gen §8.8 - AC Line Conducted Emissions

5.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §8.8 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note1	56 to 46 Note2
0.5-5	56	46
5-30	60	50

Note1: Decreases with the logarithm of the frequency.
Note2: A linear average detector is required

5.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used were FCC §15.207 and IC RSS-Gen §8.8 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

5.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cords of support equipment were connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data were recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

5.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

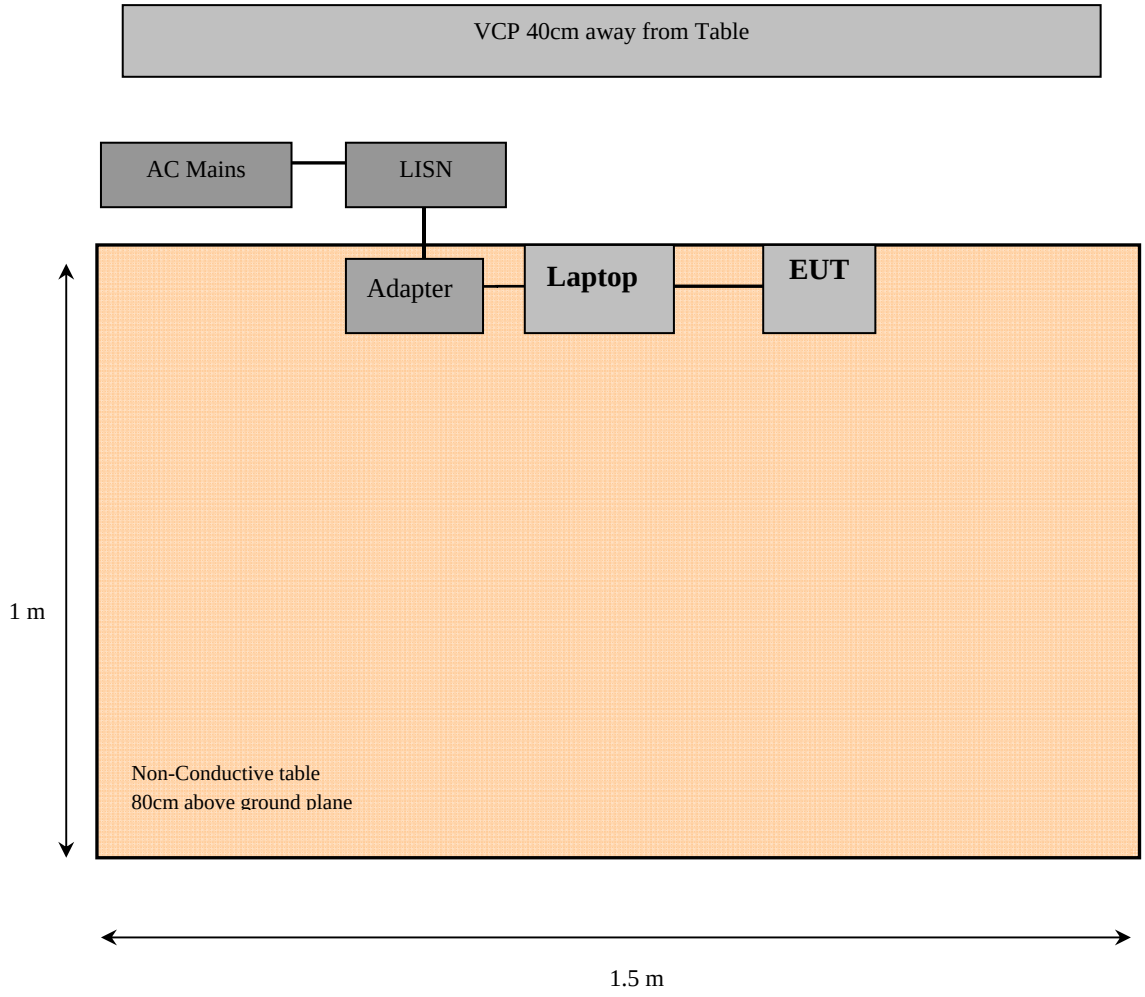
CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

5.5 Test Setup Block Diagram



5.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	2015-07-23	1 year
Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101963	2015-07-15	1year
Keysight Technologies	RF Limiter	11867A	MY42242931	2015-12-15	1year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2016-03-09	1 Year
Wireless Solutions	Conducted Emission Cable	LMR 400	691	2015-07-02	1year
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2016-04-11	1year

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

5.7 Test Environmental Conditions

Temperature:	15º C
Relative Humidity:	42 %
ATM Pressure:	101.31 kPa

The testing was performed by Leonard Gray on 2016-05-06 in the outside back panel room.

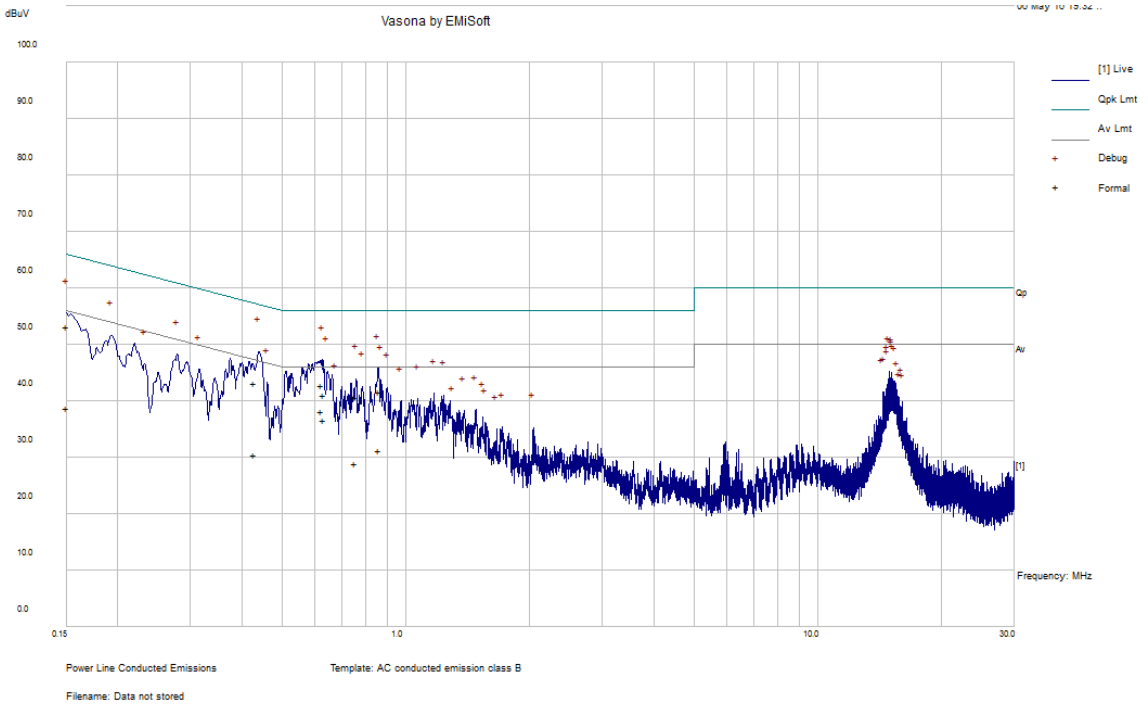
5.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C and ISED RSS-Gen standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
5.52	0.31131	Neutral	0.15-30

5.9 Conducted Emissions Test Plots and Data

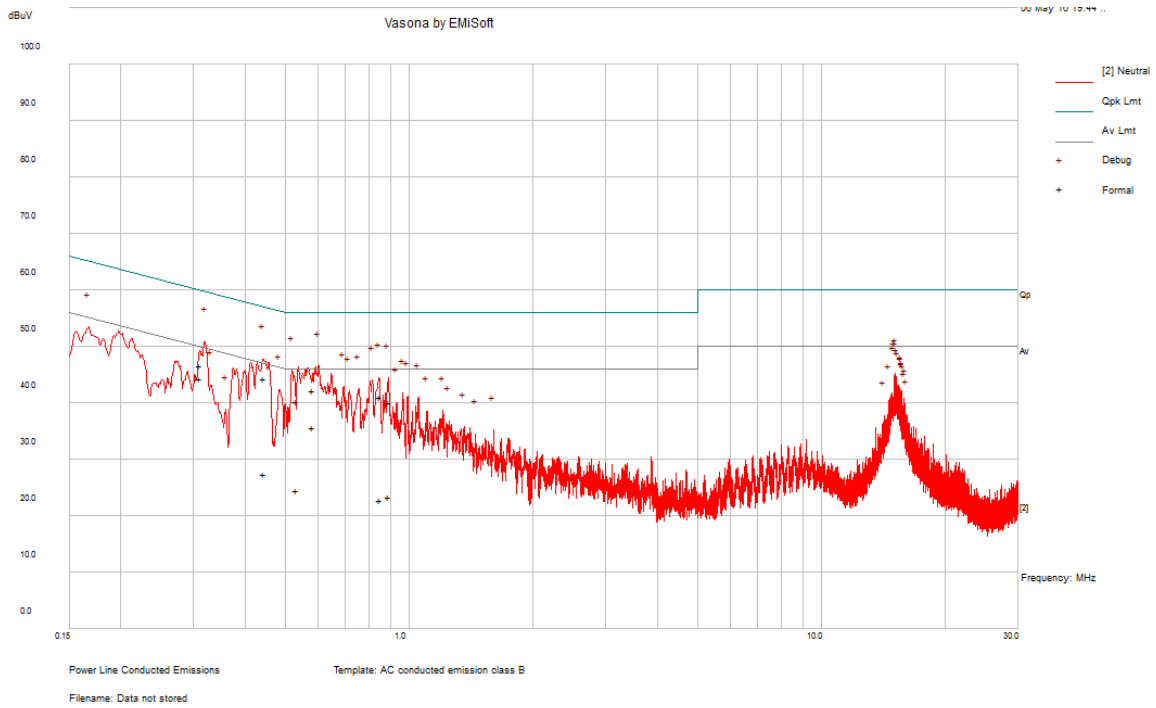
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.429579	43.26	Line	57.26	-14	QP
0.625569	42.87	Line	56	-13.13	QP
0.860673	41.6	Line	56	-14.4	QP
0.150381	53.29	Line	65.98	-12.69	QP
0.630306	41.12	Line	56	-14.88	QP
0.751389	40.78	Line	56	-15.22	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.429579	30.57	Line	47.26	-16.69	Ave.
0.625569	38.28	Line	46	-7.72	Ave.
0.860673	31.37	Line	46	-14.63	Ave.
0.150381	38.85	Line	55.98	-17.13	Ave.
0.630306	36.66	Line	46	-9.34	Ave.
0.751389	29.03	Line	46	-16.97	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.31131	46.74	Neutral	59.94	-13.2	QP
0.443592	44.36	Neutral	56.99	-12.64	QP
0.584811	42.33	Neutral	56	-13.67	QP
0.534495	40.41	Neutral	56	-15.59	QP
0.85218	41.05	Neutral	56	-14.95	QP
0.890715	40.17	Neutral	56	-15.83	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.31131	44.42	Neutral	49.94	-5.52	Ave.
0.443592	27.5	Neutral	46.99	-19.49	Ave.
0.584811	35.64	Neutral	46	-10.36	Ave.
0.534495	24.62	Neutral	46	-21.38	Ave.
0.85218	22.77	Neutral	46	-23.23	Ave.
0.890715	23.37	Neutral	46	-22.63	Ave.

6 FCC §15.209, §15.249(a) & ISED RSS-210 - Spurious Radiated Emissions

6.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.249(a) and RSS-210 Annex 2 section A2.9: Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

6.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

6.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

6.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)
The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	2015-07-23	1 year
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB3	A020106-2	2015-07-11	2 Years
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2015-03-09	2year
Agilent	Amplifier, Pre	8447D	2944A10187	2016-03-23	1 year
Wireless Solutions	Conducted Emission Cable	LMR 400	691	2015-07-02	1year
-	SMA cable	-	606	Each time[1]	N/A
IW	AOBOR Hi frequency Co AX CabelCable	DC 1531	KPS-1501A3960KPS	2015-08-10	1 Year
Agilent	Pre-Amplifier	8449B	3008A01978	2015-09-02	1year
Wisewave	Amplifier, Low Noise	ALN-22093530-01	12263-01	2016-05-16	1 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2013-09-20	3 year

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

6.6 Test Environmental Conditions

Temperature:	20-22 ºC
Relative Humidity:	42-50 %
ATM Pressure:	102.7 kPa

The testing was performed by Todd Moy from 2016-04-25 to 2016-05-11 in 5m chamber 3.

6.7 Summary of Test Results

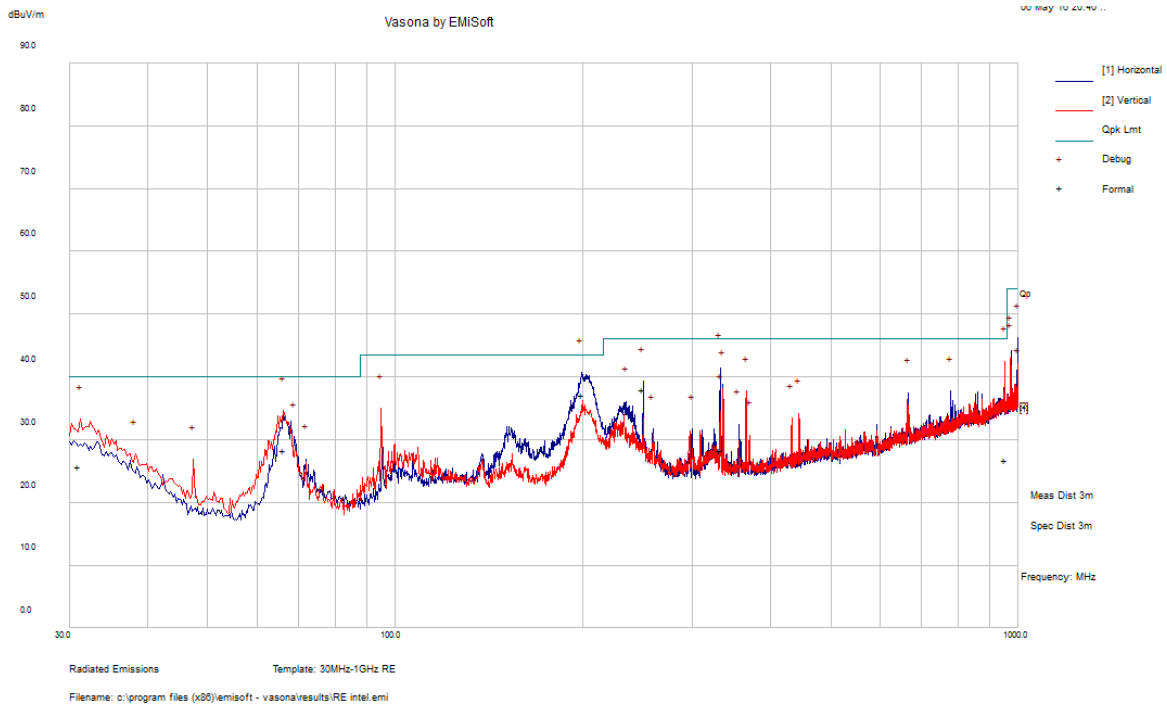
According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C and ISED RSS-210 standard's radiated emissions limits, and had the worst margin of:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
0.36	2440	Horizontal	Middle Channel

Please refer to the following table and plots for specific test result details

6.8 Radiated Emissions Test Results

1) 30 MHz – 1 GHz Worst Case, Measured at 3 meters



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
199.2528	37.19	168	H	109	43.5	-6.31	QP
951.09	26.8	220	V	154	46	-19.2	QP
332.3115	28.26	118	H	256	46	-17.74	QP
66.2895	28.27	115	V	120	40	-11.73	QP
250.0083	37.99	100	H	149	46	-8.01	QP
31.05075	25.7	106	V	179	40	-14.3	QP

2) 1–25 GHz Measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz, power setting 3											
2402	55.66	21	109	V	29.04	5.21	0.00	89.91	114	-24.09	Peak
2402	59.11	102	109	H	29.04	5.21	0.00	93.36	114	-20.64	Peak
2402	53.71	344	107	V	29.04	5.21	0.00	87.96	94	-6.04	Ave
2402	57.60	103	156	H	29.04	5.21	0.00	91.85	94	-2.15	Ave
2400	28.05	0	100	V	29.04	5.21	0.00	62.30	74	-11.70	Peak
2400	28.38	0	100	H	29.04	5.21	0.00	62.63	74	-11.37	Peak
2400	14.42	239	175	V	29.04	5.21	0.00	48.67	54	-5.33	Ave
2400	14.79	181	124	H	29.04	5.21	0.00	49.04	54	-4.96	Ave
2390	25.98	21	109	V	29.04	5.21	0.00	60.23	74	-13.77	Peak
2390	23.73	101	109	H	29.04	5.21	0.00	57.98	74	-16.02	Peak
2390	12.66	344	107	V	29.04	5.21	0.00	46.91	54	-7.09	Ave
2390	12.69	103	156	H	29.04	5.21	0.00	46.94	54	-7.06	Ave
4804	54.06	222	215	V	32.47	7.75	37.85	56.43	74	-17.57	Peak
4804	55.43	98	292	H	32.47	7.75	37.85	57.80	74	-16.20	Peak
4804	43.38	163	170	V	32.47	7.75	37.85	45.75	54	-8.25	Ave
4804	44.92	117	258	H	32.47	7.75	37.85	47.29	54	-6.71	Ave
7206	48.76	0	100	V	36.69	9.71	37.50	57.66	74	-16.34	Peak
7206	49.33	0	100	H	36.69	9.71	37.50	58.23	74	-15.77	Peak
7206	34.50	0	100	V	36.69	9.71	37.50	43.40	54	-10.60	Ave
7206	34.57	0	100	H	36.69	9.71	37.50	43.47	54	-10.53	Ave
9608	48.72	0	100	V	37.77	11.37	37.99	59.87	74	-14.13	Peak
9608	48.76	0	100	H	37.77	11.37	37.99	59.91	74	-14.09	Peak
9608	34.04	0	100	V	37.77	11.37	37.99	45.19	54	-8.81	Ave
9608	34.03	0	100	H	37.77	11.37	37.99	45.18	54	-8.82	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel 2440 MHz, power setting 3											
2440	58.41	128	240	V	29.04	5.21	0.00	92.66	114	-21.34	Peak
2440	60.24	107	282	H	29.04	5.21	0.00	94.49	114	-19.51	Peak
2440	57.04	128	244	V	29.04	5.21	0.00	91.29	94	-2.71	Ave
2440	59.39	100	279	H	29.04	5.21	0.00	93.64	94	-0.36	Ave
4880	50.38	331	245	V	32.64	7.75	37.75	53.02	74	-20.98	Peak
4880	50.63	280	286	H	32.64	7.75	37.75	53.27	74	-20.73	Peak
4880	39.03	337	246	V	32.64	7.75	37.75	41.66	54	-12.34	Ave
4880	39.05	274	232	H	32.64	7.75	37.75	41.68	54	-12.32	Ave
7320	47.46	0	100	V	37.15	9.85	37.50	56.97	74	-17.03	Peak
7320	48.80	0	100	H	37.15	9.85	37.50	58.31	74	-15.69	Peak
7320	34.14	0	100	V	37.15	9.85	37.50	43.64	54	-10.36	Ave
7320	34.22	0	100	H	37.15	9.85	37.50	43.72	54	-10.28	Ave
9760	49.97	0	100	V	37.84	11.48	38.15	61.13	74	-12.87	Peak
9760	49.98	0	100	H	37.84	11.48	38.15	61.14	74	-12.86	Peak
9760	35.66	0	100	V	37.84	11.48	38.15	46.83	54	-7.17	Ave
9760	35.51	0	100	H	37.84	11.48	38.15	46.68	54	-7.32	Ave
High Channel 2480 MHz, power setting 4											
2480	56.67	220	187	V	29.41	5.21	0.00	91.29	114	-22.71	Peak
2480	57.57	226	188	H	29.41	5.21	0.00	92.19	114	-21.81	Peak
2480	54.99	181	249	V	29.41	5.21	0.00	89.61	94	-4.39	Ave
2480	56.27	142	138	H	29.41	5.21	0.00	90.89	94	-3.11	Ave
2483.5	29.91	221	186	V	29.41	5.21	0.00	64.53	74	-9.47	Peak
2483.5	30.71	228	278	H	29.41	5.21	0.00	65.33	74	-8.67	Peak
2483.5	13.14	181	249	V	29.41	5.21	0.00	47.76	54	-6.24	Ave
2483.5	13.11	142	138	H	29.41	5.21	0.00	47.73	54	-6.27	Ave
4960	50.11	97	232	V	32.99	7.93	37.67	53.36	74	-20.64	Peak
4960	50.57	282	214	H	32.99	7.93	37.67	53.82	74	-20.18	Peak
4960	39.81	316	173	V	32.99	7.93	37.67	43.06	54	-10.94	Ave
4960	40.90	267	103	H	32.99	7.93	37.67	44.15	54	-9.85	Ave
7440	48.55	0	100	V	37.14	9.85	37.56	57.98	74	-16.02	Peak
7440	48.44	0	100	H	37.14	9.85	37.56	57.87	74	-16.13	Peak
7440	35.13	62	229	V	37.14	9.85	37.56	44.56	54	-9.44	Ave
7440	36.54	303	111	H	37.14	9.85	37.56	45.97	54	-8.03	Ave
9920	48.65	0	100	V	37.99	11.59	38.20	60.02	74	-13.98	Peak
9920	48.68	0	100	H	37.99	11.59	38.20	60.05	74	-13.95	Peak
9920	36.16	65	224	V	37.99	11.59	38.20	47.54	54	-6.46	Ave
9920	35.33	310	210	H	37.99	11.59	38.20	46.71	54	-7.29	Ave

Note: Duty Cycle Correction Factor has been added to the measurements.

7 FCC §15.215 & ISED RSS-Gen - Emission Bandwidth

7.1 Applicable Standards

The emission bandwidth (×dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated × dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3× the resolution bandwidth.
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.

7.2 Measurement Procedure

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). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.
The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

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

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
-	U. FL to SMA pigtail	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

7.4 Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

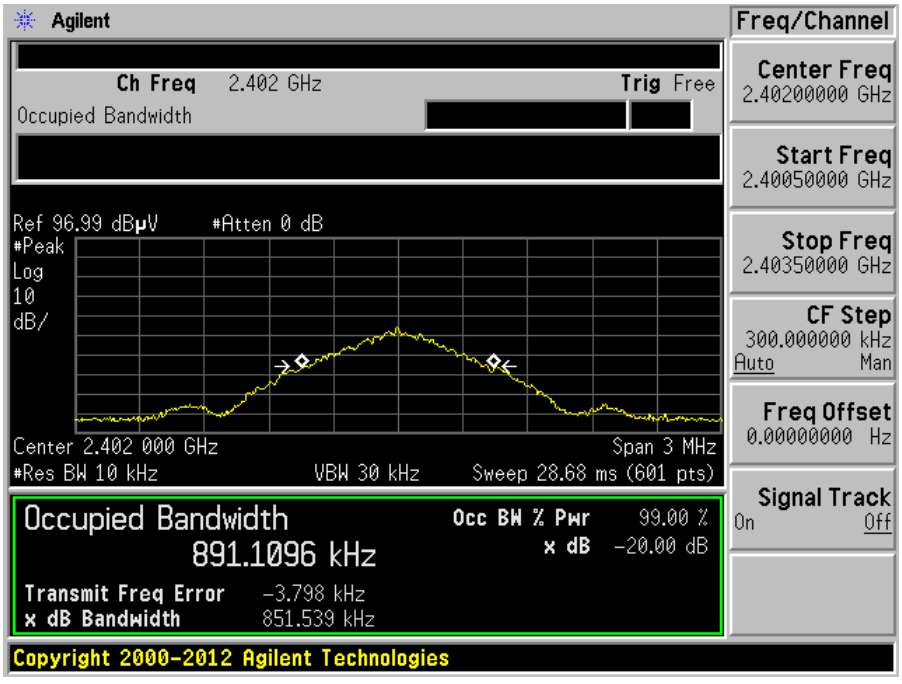
The testing was performed by Leonard Gray on 2016-04-29 in RF site.

7.5 Test Results

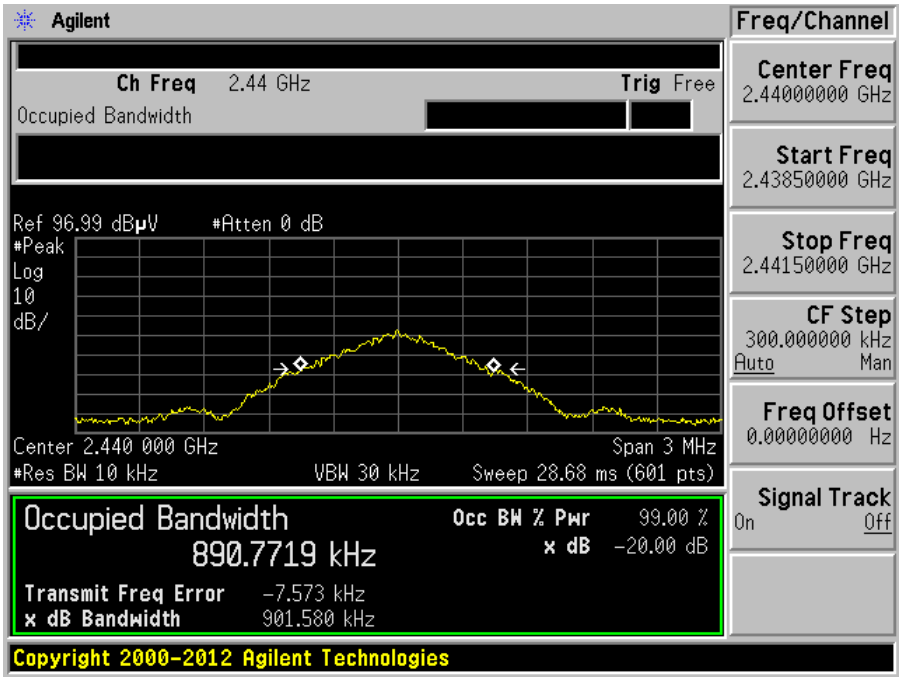
Mode	Frequency (MHz)	99% OBW (kHz)	20 dB OBW (kHz)
ANT+	2402	891.1096	851.539
	2440	890.7719	901.580
	2480	881.1361	841.249

Please refer to the following plots for detailed test results.

Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz