FCC PART 15, SUBPART C
ISED RSS-247, ISSUE 1, MAY 2015

TEST AND MEASUREMENT REPORT

For

GoPro, Inc.

3000 Clearview Way,

San Mateo, CA 94402, USA

FCC ID: CNFASST1
IC: 10193A-ASST1

Report Type:	**Product Type:**
Original Report	Video Camera

Prepared By:	Jose Martinez Test Engineer
Report Number:	R1605201-247 DTS
Report Date:	2016-08-03
Reviewed By:	Bo Li RF Supervisor

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1605201-247 DTS	Original Report	2016-08-03

1 General Description

1.1 General Statements

Bay area Compliance Laboratory Corp. [BACL] hereby makes the following Statements:

- The Unit(s) described in this Test Report were received at BACL's facilities on 6 June 2016 and was in working condition upon arrival. Testing was performed on the Unit(s) described in this Test Report during the period 15 June through 22 July 2016.
- The Test Results reported herein apply only to the Unit(s) actually tested, and to substantially identical Units.
- This Test Report must not be used to claim product endorsement by A2LA, or any agency of the U.S. Government, or by any other foreign government.
- This Test Report is the property of BACL, and shall not be reproduced, except in full, without prior written approval of BACL.

1.2 Agent for the Responsible Party

Company Name:	Go Global Compliance
Contact:	Mr. Peter S. Merguerian
Telephone:	+1-408-416-3772
E-mail:	peter@goglobalcompliance.com

1.3 Responsible Party

Company Name:	GoPro, Inc.
Contact:	Mr. Steven Kim
Street Address:	3000 Clearview Way,
City/State/Zip:	San Mateo, CA 94402
Country:	USA
Telephone:	+1-650 436-5020
E-mail:	skim@gopro.com
Web:	www.gopro.com

1.4 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *GoPro, Inc.*, and their product model: *HERO5 BLACK (ASST1), FCC ID:* CNFASST1; IC: 10193A-ASST1 or the "EUT" as referred to in this report. It is a portable camera with Wi-Fi, Bluetooth and BLE functions. It operates in the 2.4 GHz and 5 GHz bands.

1.5 Mechanical Description of EUT

Dimensions: approximately 6cm (L) x 2.4cm (W) x 4.3cm (H)
Weight: 118 grams.
Serial Number: C31613 DVT13166 and C31613 DVT13161 assigned by GoPro, Inc.
EUT Photos: See Exhibit C of this Test Report.

1.6 Objective

This report is prepared on behalf of *GoPro, Inc*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and IC RSS-247 Issue 1, MAY 2015.

The objective is to determine compliance with FCC Part 15.247 and IC RSS-247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.7 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment DSS with FCC ID: CNFASST1
FCC Part 15, Subpart E, Equipment NII with FCC ID: CNFASST1

1.8 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 and FCC KDB 558074 D01 DTS Meas Guidance v03r05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.9 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	±1.48 dB
Unwanted Emissions, conducted	±1.57 dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 ^{o}C
Humidity	±5 %
DC and low frequency voltages	±1 %
Time	±2 %
Duty Cycle	±3 %

1.10 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.

1.11 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03)*** 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 3279.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;

- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - 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 ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test utility used was QCA Radio Control Toolkit version 3.0.174.0 provided by GoPro, Inc., the software was verified by *Jose Martinez* to comply with the standard requirements being tested against.

2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v03r05 section 6.0:

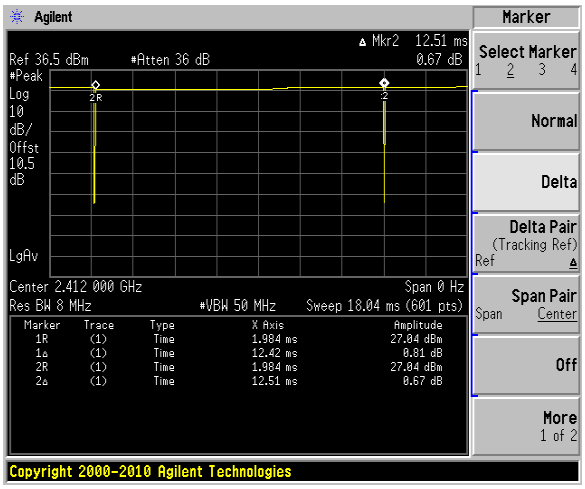
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized 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)
802.11b	12.42	12.51	99.28	0.03
802.11g	2.07	2.16	95.83	0.18
802.11n20	1.922	2.025	94.91	0.23
802.11n40	0.94	1.034	90.91	0.41
BLE	0.41	0.62	66.13	1.80

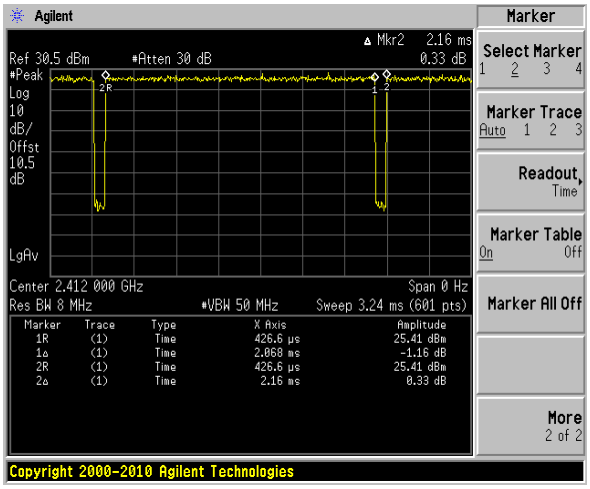
Duty Cycle = On Time (ms)/ Period (ms)
Duty Cycle Correction Factor (dB) = 10*log(1/Duty Cycle)

Please refer to the following plots.

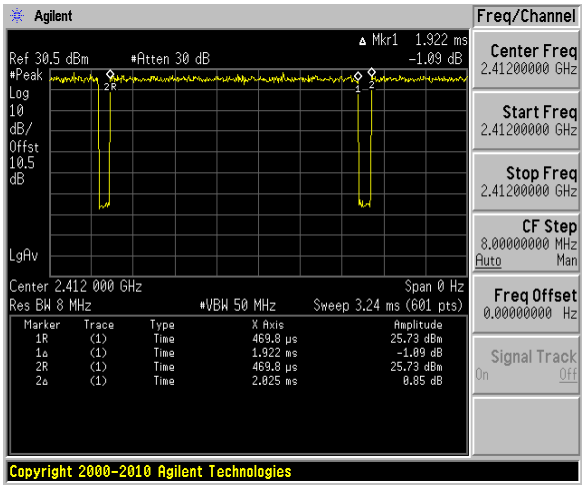
802.11b mode



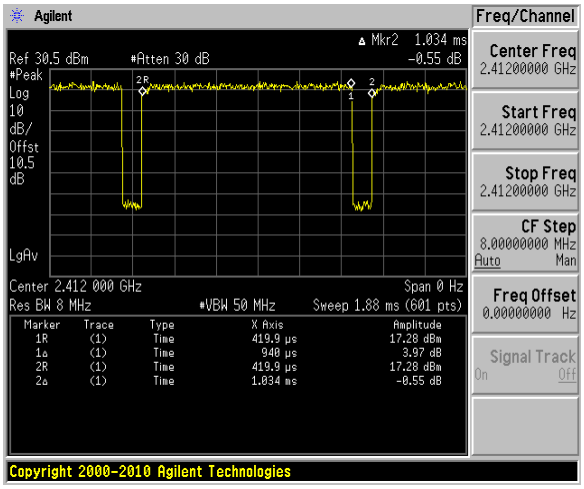
802.11g mode



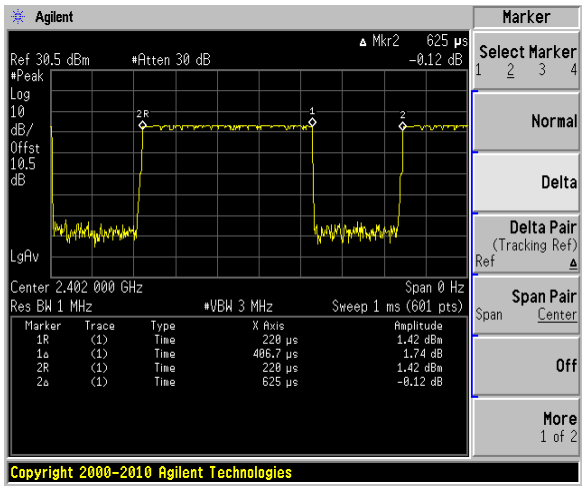
802.11n20 mode



802.11n40 mode



BLE



2.4 Equipment Modifications

A hole was cut in the back of the EUT and an SMA pigtail cable was connected to the antenna port.

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude D630

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model
GoPro	FPC, Microphone + Button	656-10756-000
GoPro	PCB, Main	656-10705-000
GoPro	RFPC, I/O	656-10826-000
GoPro	RFPC, Sensor	656-10703-000
GoPro	PCB	656-12190-000

2.7 Support Equipment

Manufacturer	Description	Model
GoPro	Debug Board	898A

2.8 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	< 1 m	Laptop	EUT
U.FL-RSMA pigtail	< 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 §2.1093, §15.247(i) ISED RSS-102	RF Exposure	Compliant[1]
FCC §2.1051, §15.247 (d) ISED RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §2.1053, §15.205, §15.209, §15.247 (d) ISED RSS-247 §5.5 ISED RSS-Gen §8.9 & §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISED RSS-247 §5.2 (1)	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) ISED RSS-247 §5.4 (4)	Maximum Peak Output Power	Compliant
FCC §15.247(d) ISED RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) ISED RSS-247 §5.2 (2)	Power Spectral Density	Compliant

[1] RF exposure analysis is covered in a separate report. Please refer to R1605201-SAR.

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 IC 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 permanent attached antennas.

Radio	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Wi-Fi/Bluetooth	2400-2483.5	-0.9
Wi-Fi	5150-5850	3.0

5 FCC §2.1093, §15.247(i) & ISED RSS-102 – RF Exposure

5.1 Applicable Standards

FCC §2.1093, §15.247(i), & IC RSS-102

5.2 Test Results

Please refer to the SAR Report: R1605201- SAR.

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

6.1 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

6.2 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.

6.3 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”.

6.4 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:

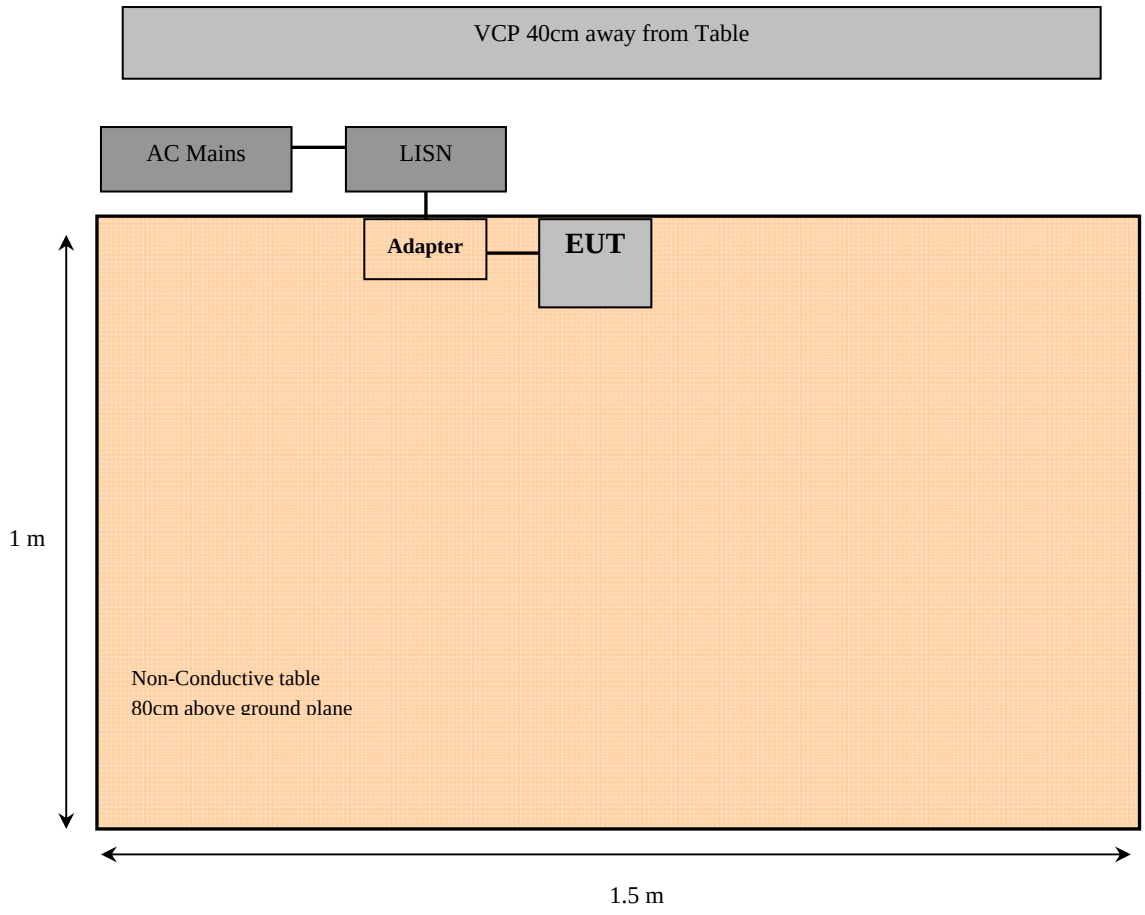
CA = Ai + CL + Atten

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

6.5 Test Setup Block Diagram



6.6 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Cal. Date	Cal. Interval
124	Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2015-07-23	1 year
679	Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101963	2015-07-15	1year
711	Keysight Technologies	RF Limiter	11867A	MY42242931	2015-12-15	1year
726	Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2016-03-09	1 year
-	Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/R
732	FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2016-04-11	1year
-	Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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

6.7 Test Location, Date, Personnel and Environmental Conditions

Test Date:	2016-06-28
Test Site:	Ground Plane Test Site
Temperature:	22° C
Relative Humidity:	43 %
Barometric Pressure:	101.8 kPa
Test Personnel:	Jose Martinez

6.8 Summary of Test Results

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

2.4 GHz Wi-Fi

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-12.01	2.434822	Line	0.15-30

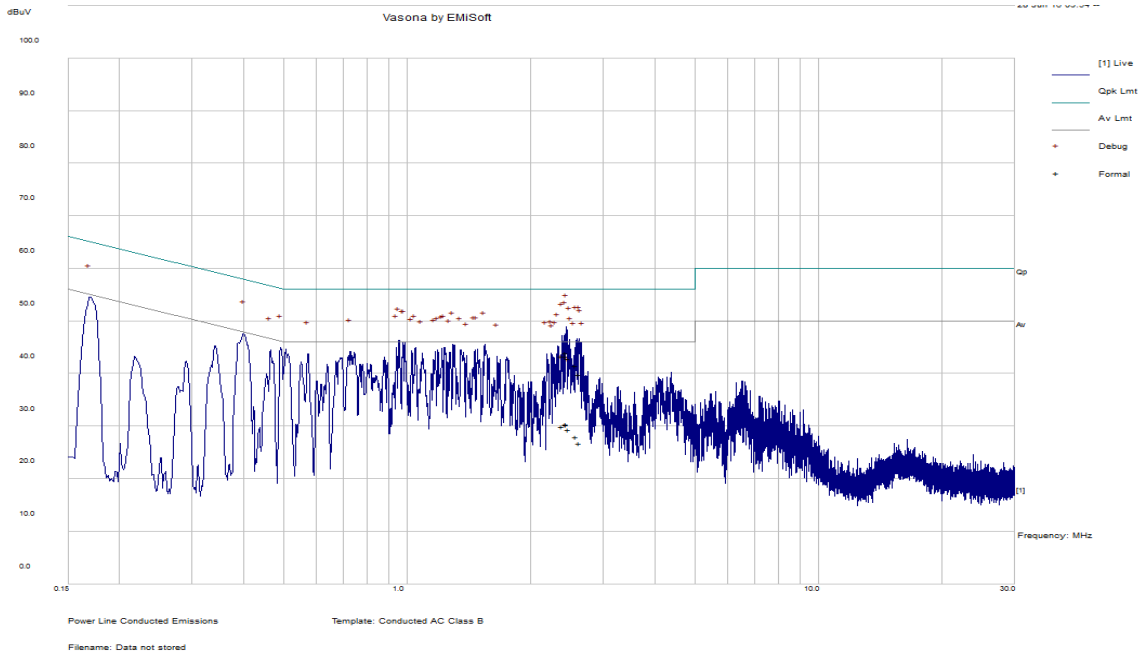
BLE

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-10.26	0.457821	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

2.4 GHz Wi-Fi

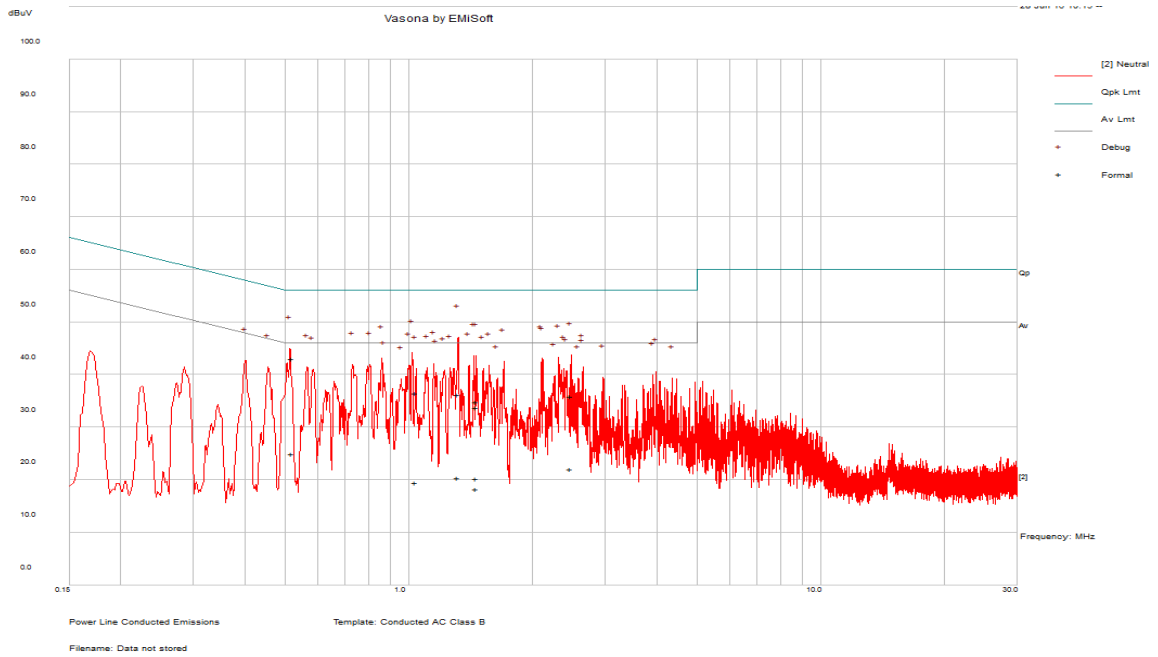
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
2.434822	43.99	Line	56	-12.01	QP
2.442472	43.38	Line	56	-12.62	QP
2.388518	43.34	Line	56	-12.66	QP
2.477274	42.85	Line	56	-13.15	QP
2.571711	41.51	Line	56	-14.49	QP
2.618932	39.86	Line	56	-16.14	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
2.434822	30.43	Line	46	-15.57	Ave.
2.442472	30.22	Line	46	-15.78	Ave.
2.388518	30.03	Line	46	-15.97	Ave.
2.477274	29.31	Line	46	-16.69	Ave.
2.571711	28.0	Line	46	-18.0	Ave.
2.618932	26.83	Line	46	-19.17	Ave.

120 V, 60 Hz – Neutral

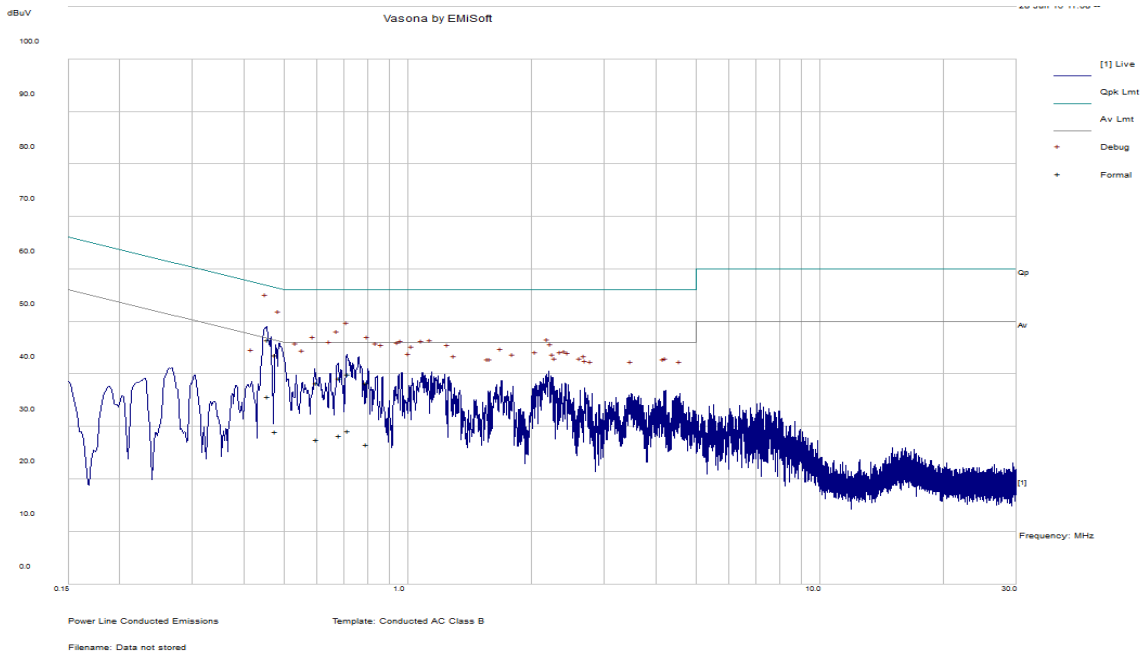


Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.520001	43.03	Neutral	56	-12.97	QP
1.036441	36.53	Neutral	56	-19.47	QP
1.312439	36.17	Neutral	56	-19.83	QP
2.467477	35.88	Neutral	56	-20.12	QP
1.456012	34.76	Neutral	56	-21.24	QP
1.455675	33.78	Neutral	56	-22.22	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.520001	25.02	Neutral	46	-20.98	Ave.
2.467477	22.00	Neutral	46	-24.00	Ave.
1.312439	20.43	Neutral	46	-25.57	Ave.
1.456012	20.21	Neutral	46	-25.79	Ave.
1.036441	19.54	Neutral	46	-26.46	Ave.
1.455675	18.28	Neutral	46	-27.72	Ave.

BLE

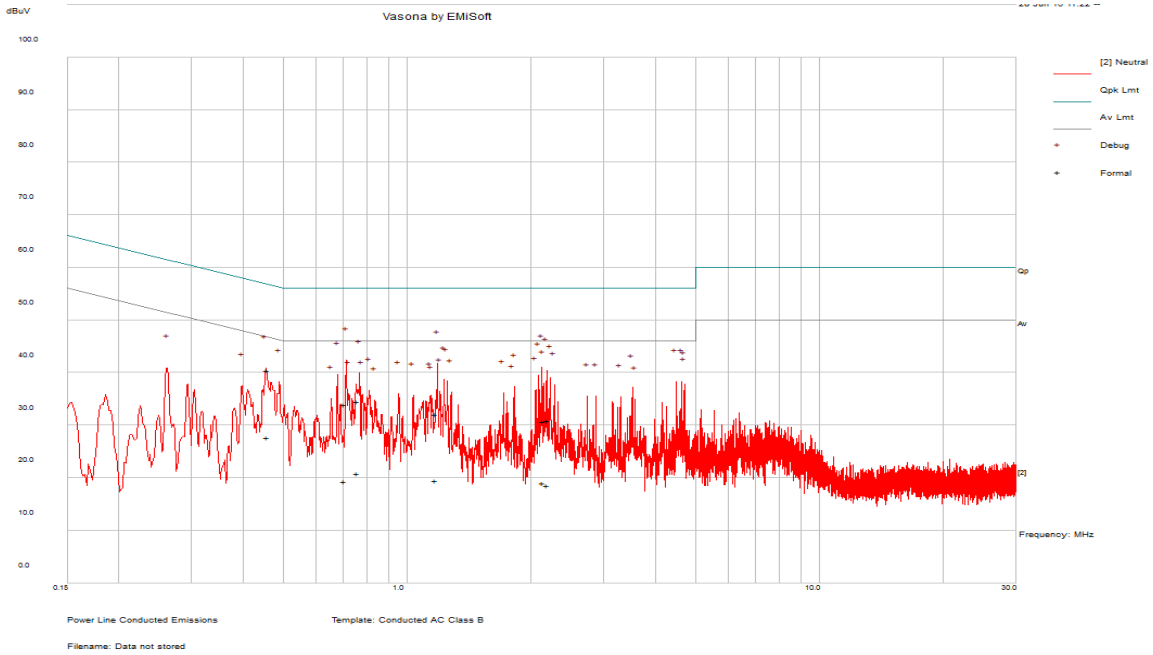
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.457821	46.47	Line	56.73	-10.26	QP
0.479364	43.58	Line	56.35	-12.77	QP
0.716646	39.99	Line	56	-16.01	QP
0.681849	39.24	Line	56	-16.76	QP
0.794652	38.33	Line	56	-17.67	QP
.0601448	38.31	Line	56	-17.69	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.457821	35.71	Line	46.73	-11.02	Ave.
0.716646	29.20	Line	46	-16.80	Ave.
0.479364	29.00	Line	46.35	-17.35	Ave.
0.681849	28.26	Line	46	-17.74	Ave.
.0601448	27.52	Line	46	-18.48	Ave.
0.794652	26.64	Line	46	-19.36	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.458379	40.49	Neutral	56.72	-16.23	QP
0.757641	34.58	Neutral	56	-21.42	QP
0.706728	33.94	Neutral	56	-22.06	QP
1.173083	32.05	Neutral	56	-23.95	QP
2.192318	30.90	Neutral	56	-25.10	QP
2.135046	30.74	Neutral	56	-25.26	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.458379	27.71	Neutral	46.72	-19.01	Ave.
0.757641	20.90	Neutral	46	-25.10	Ave.
1.173083	19.42	Neutral	46	-26.58	Ave.
0.706728	19.31	Neutral	46	-26.69	Ave.
2.135046	18.96	Neutral	46	-27.04	Ave.
2.192318	18.62	Neutral	46	-27.38	Ave.

7 FCC §15.209, §15.247(d) & ISED RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

7.1 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 §15.247 (d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

As per IC RSS-Gen 8.9,

> Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 or Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for license-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per IC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

7.2 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 the FCC 15 Subpart C and IC RSS-247 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.

7.3 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

7.4 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

7.5 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Cal. Date	Cal. Interval
124	Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2015-07-23	1 year
624	Agilent	Analyzer, Spectrum	E4446A	MY48250238	2015-11-12	1 year
323	Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
321	Sunol Science Corp	Antenna, Biconi-Log	JB3	A020106-2	2015-07-11	2 years
473	EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	1 year
125	Agilent	Amplifier, Pre	8447D	2944A10187	2016-03-23	1 year
-	Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/R
-	-	SMA cable	-	C0002	Each time[1]	N/A
-	IW Microwave	High Frequency Cable	DC-1438	SPS-2303-3840-SPS	2016-01-18	1 year
32	Agilent	Pre-Amplifier	8449B	3008A01978	2015-09-02	1year
411	Wisewave	Amplifier, Low Noise	ALN-22093530-01	12263-01	2016-05-16	1 year
91	Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2013-09-20	3 years
-	Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

[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.*

7.6 Test Location, Date, Personnel and Environmental Conditions

Test Date:	2016-07-07
Test Site:	5M Chamber 3
Temperature:	23° C
Relative Humidity:	42 %
Barometric Pressure:	102.7 kPa
Test Personnel:	Jose Martinez

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C and IC RSS-247 standard's radiated emissions limits, and had the worst margin of:

2.4 GHz Wi-Fi

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.63	2483.5	Vertical	n40 mode, high channel

BLE

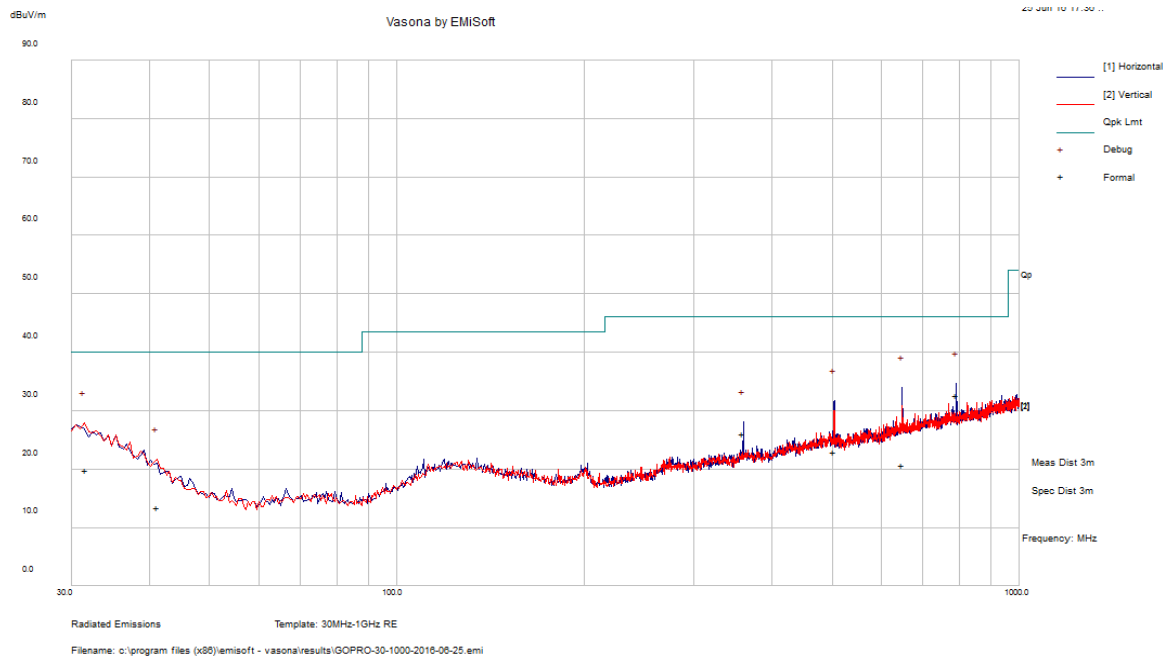
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-4.32	2483.5	Horizontal	High channel

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

7.8 Radiated Emissions Test Results

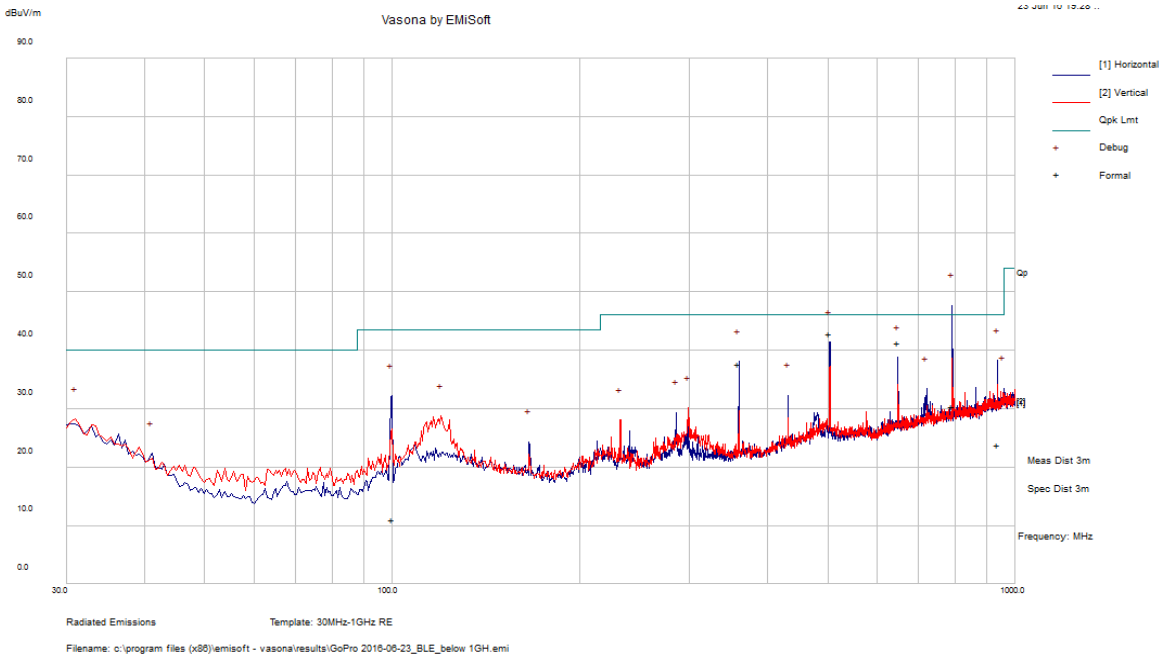
1) 30 MHz – 1 GHz Worst Case, Measured at 3 meters

2.4 GHz Wi-Fi



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
792.0068	32.61	101	H	221	46	-13.39	QP
360.0123	26.01	101	H	143	46	-19.99	QP
31.591	19.91	268	V	10	40	-20.09	QP
504.08	22.91	210	H	72	46	-23.09	QP
648.544	20.73	140	H	209	46	-25.27	QP
41.262	13.43	164	V	251	40	-26.57	QP

BLE



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
504.01	42.85	187	H	115	46	-3.15	QP
648.00	41.22	137	H	350	46	-4.78	QP
360.01	37.71	101	H	185	46	-8.29	QP
792.69	30.42	105	H	325	46	-15.58	QP
936.59	23.76	279	H	303	46	-22.24	QP
100.22	11	250	H	182	43.5	-32.5	QP

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2) 1–25 GHz Measured at 3 meters

802.11b mode

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 2412 MHz (power setting: 17)											
2412	72.42	53	127	H	29.09	5.22	0.00	106.73	N/A	N/A	PK
2412	67.55	53	127	H	29.09	5.22	0.00	101.86	N/A	N/A	AV
2412	70.27	307	350	V	29.09	5.22	0.00	104.58	N/A	N/A	PK
2412	65.34	307	350	V	29.09	5.22	0.00	99.65	N/A	N/A	AV
2390	27.11	53	127	H	28.98	5.22	0.00	61.31	74.00	-12.69	PK
2390	15.54	53	127	H	28.98	5.22	0.00	49.74	54.00	-4.26	AV
2390	26.95	307	350	V	28.98	5.22	0.00	61.15	74.00	-12.85	PK
2390	15.17	307	350	V	28.98	5.22	0.00	49.37	54.00	-4.63	AV
4824	46.57	258	328	V	32.51	7.89	36.63	50.34	74.00	-23.66	PK
4824	35.12	258	328	V	32.51	7.89	36.63	38.89	54.00	-15.11	AV
7236	45.82	262	341	V	36.86	10.51	36.42	56.77	74.00	-17.23	PK
7236	34.38	262	341	V	36.86	10.51	36.42	45.33	54.00	-8.67	AV
9648	45.22	225	120	V	37.80	11.39	36.67	57.74	74.00	-16.26	PK
9648	34.32	225	120	V	37.80	11.39	36.67	46.84	54.00	-7.16	AV
Middle Channel 2437 MHz (power setting: 17)											
2437	72.97	49	350	H	29.18	5.22	0.00	107.37	N/A	N/A	PK
2437	68.22	49	350	H	29.18	5.22	0.00	102.62	N/A	N/A	AV
2437	71.38	49	310	V	29.18	5.22	0.00	105.78	N/A	N/A	PK
2437	66.67	49	310	V	29.18	5.22	0.00	101.07	N/A	N/A	AV
4874	46.29	261	327	V	32.59	7.92	36.63	50.17	74.00	-23.83	PK
4874	35.29	261	327	V	32.59	7.92	36.63	39.17	54.00	-14.83	AV
7311	45.43	260	147	V	37.15	10.65	36.43	56.80	74.00	-17.20	PK
7311	34.15	260	147	V	37.15	10.65	36.43	45.52	54.00	-8.48	AV
9748	45.71	226	124	V	37.88	11.45	36.69	58.35	74.00	-15.65	PK
9748	34.63	226	124	V	37.88	11.45	36.69	47.27	54.00	-6.73	AV

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)	
High Channel 2462 MHz (power setting: 17)											
2462	72.57	51	278	H	29.27	5.22	0.00	107.06	N/A	N/A	PK
2462	67.61	51	278	H	29.27	5.22	0.00	102.10	N/A	N/A	AV
2462	72.12	99	208	V	29.27	5.22	0.00	106.61	N/A	N/A	PK
2462	67.11	99	208	V	29.27	5.22	0.00	101.60	N/A	N/A	AV
2483.5	27.28	51	278	H	29.35	5.35	0.00	61.98	74.00	-12.02	PK
2483.5	15.73	51	278	H	29.35	5.35	0.00	50.43	54.00	-3.57	AV
2483.5	27.49	99	208	V	29.35	5.35	0.00	62.19	74.00	-11.81	PK
2483.5	15.77	99	208	V	29.35	5.35	0.00	50.47	54.00	-3.53	AV
4924	47.14	255	128	V	32.72	7.95	36.61	51.20	74.00	-22.80	PK
4924	35.13	255	128	V	32.72	7.95	36.61	39.19	54.00	-14.81	AV
7386	45.74	222	125	V	37.14	10.80	36.44	57.24	74.00	-16.76	PK
7386	34.3	222	125	V	37.14	10.80	36.44	45.80	54.00	-8.20	AV
9848	46.57	228	130	V	37.95	11.51	36.70	59.33	74.00	-14.67	PK
9848	34.78	228	130	V	37.95	11.51	36.70	47.54	54.00	-6.46	AV

802.11g mode

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 2412 MHz (power setting: 17)											
2412	72.55	53	127	H	29.09	5.22	0.00	106.86	N/A	N/A	PK
2412	63.86	53	127	H	29.09	5.22	0.00	98.17	N/A	N/A	AV
2412	70.56	307	350	V	29.09	5.22	0.00	104.87	N/A	N/A	PK
2412	61.92	307	350	V	29.09	5.22	0.00	96.23	N/A	N/A	AV
2390	28.77	53	127	H	28.98	5.22	0.00	62.97	74.00	-11.03	PK
2390	16.91	53	127	H	28.98	5.22	0.00	51.11	54.00	-2.89	AV
2390	27.49	307	350	V	28.98	5.22	0.00	61.69	74.00	-12.31	PK
2390	16.13	307	350	V	28.98	5.22	0.00	50.33	54.00	-3.67	AV
4824	46.11	258	328	V	32.51	7.89	36.63	49.88	74.00	-24.12	PK
4824	35.08	258	328	V	32.51	7.89	36.63	38.85	54.00	-15.15	AV
7236	45.22	262	341	V	36.86	10.51	36.42	56.17	74.00	-17.83	PK
7236	34.37	262	341	V	36.86	10.51	36.42	45.32	54.00	-8.68	AV
9648	45.41	225	120	V	37.80	11.39	36.67	57.93	74.00	-16.07	PK
9648	34.27	225	120	V	37.80	11.39	36.67	46.79	54.00	-7.21	AV
Middle Channel 2437 MHz (power setting: 20)											
2437	75.97	49	350	H	29.18	5.22	0.00	110.37	N/A	N/A	PK
2437	67.11	49	350	H	29.18	5.22	0.00	101.51	N/A	N/A	AV
2437	74.28	49	310	V	29.18	5.22	0.00	108.68	N/A	N/A	PK
2437	65.47	49	310	V	29.18	5.22	0.00	99.87	N/A	N/A	AV
4874	47.18	261	327	V	32.59	7.92	36.63	51.06	74.00	-22.94	PK
4874	35.07	261	327	V	32.59	7.92	36.63	38.95	54.00	-15.05	AV
7311	45.19	260	147	V	37.15	10.65	36.43	56.56	74.00	-17.44	PK
7311	34.16	260	147	V	37.15	10.65	36.43	45.53	54.00	-8.47	AV
9748	45.74	226	124	V	37.88	11.45	36.69	58.38	74.00	-15.62	PK
9748	34.63	226	124	V	37.88	11.45	36.69	47.27	54.00	-6.73	AV
High Channel 2462 MHz (power setting: 15)											
2462	71.12	207	175	H	29.41	5.21	0.00	105.74	-	-	PK
2462	64.48	207	175	H	29.41	5.21	0.00	99.10	-	-	AV
2462	71.29	341	101	V	29.41	5.21	0.00	105.91	-	-	PK
2462	64.10	341	101	V	29.41	5.21	0.00	98.72	-	-	AV
2483.5	28.29	207	175	H	29.41	5.21	0.00	62.91	74.00	-11.09	PK
2483.5	17.88	207	175	H	29.41	5.21	0.00	52.50	54.00	-1.50	AV
2483.5	28.03	341	101	V	29.41	5.21	0.00	62.65	74.00	-11.35	PK
2483.5	17.69	341	101	V	29.41	5.21	0.00	52.31	54.00	-1.69	AV
4924	47.50	0	100	V	32.64	8.93	38.54	50.53	74.00	-23.47	PK
4924	36.21	0	100	V	32.64	8.93	38.54	39.24	54.00	-14.76	AV
7386	46.54	0	100	V	37.14	11.12	37.89	56.91	74.00	-17.09	PK
7386	35.89	0	100	V	37.14	11.12	37.89	46.26	54.00	-7.74	AV
9848	47.59	0	100	V	37.92	11.69	38.31	58.89	74.00	-15.11	PK
9848	37.13	0	100	V	37.92	11.69	38.31	48.43	54.00	-5.57	AV

802.11n20 mode

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 2412 MHz (power setting: 17)											
2412	72.31	53	127	H	29.09	5.22	0.00	106.62	N/A	N/A	PK
2412	63.54	53	127	H	29.09	5.22	0.00	97.85	N/A	N/A	AV
2412	70	307	350	V	29.09	5.22	0.00	104.31	N/A	N/A	PK
2412	61.45	307	350	V	29.09	5.22	0.00	95.76	N/A	N/A	AV
2390	28.17	53	127	H	28.98	5.22	0.00	62.37	74.00	-11.63	PK
2390	17.11	53	127	H	28.98	5.22	0.00	51.31	54.00	-2.69	AV
2390	27.43	307	350	V	28.98	5.22	0.00	61.63	74.00	-12.37	PK
2390	16.34	307	350	V	28.98	5.22	0.00	50.54	54.00	-3.46	AV
4824	46.45	258	328	V	32.51	7.89	36.63	50.22	74.00	-23.78	PK
4824	35.06	258	328	V	32.51	7.89	36.63	38.83	54.00	-15.17	AV
7236	46.29	262	341	V	36.86	10.51	36.42	57.24	74.00	-16.76	PK
7236	34.35	262	341	V	36.86	10.51	36.42	45.30	54.00	-8.70	AV
9648	45.11	225	120	V	37.80	11.39	36.67	57.63	74.00	-16.37	PK
9648	34.19	225	120	V	37.80	11.39	36.67	46.71	54.00	-7.29	AV
Middle Channel 2437 MHz (power setting: 20)											
2437	75.36	49	350	H	29.18	5.22	0.00	109.76	N/A	N/A	PK
2437	66.72	49	350	H	29.18	5.22	0.00	101.12	N/A	N/A	AV
2437	73.55	49	310	V	29.18	5.22	0.00	107.95	N/A	N/A	PK
2437	64.94	49	310	V	29.18	5.22	0.00	99.34	N/A	N/A	AV
4874	46.91	261	327	V	32.59	7.92	36.63	50.79	74.00	-23.21	PK
4874	35.07	261	327	V	32.59	7.92	36.63	38.95	54.00	-15.05	AV
7311	45.21	260	147	V	37.15	10.65	36.43	56.58	74.00	-17.42	PK
7311	34.12	260	147	V	37.15	10.65	36.43	45.49	54.00	-8.51	AV
9748	45.87	226	124	V	37.88	11.45	36.69	58.51	74.00	-15.49	PK
9748	34.55	226	124	V	37.88	11.45	36.69	47.19	54.00	-6.81	AV
High Channel 2462 MHz (power setting: 14)											
2462	70.08	206	174	H	29.41	5.21	0.00	104.70	-	-	PK
2462	62.78	206	174	H	29.41	5.21	0.00	97.41	-	-	AV
2462	71.92	83	224	V	29.41	5.21	0.00	106.54	-	-	PK
2462	64.87	83	224	V	29.41	5.21	0.00	99.50	-	-	AV
2483.5	27.51	206	174	H	29.41	5.21	0.00	62.13	74.00	-11.87	PK
2483.5	17.55	206	174	H	29.41	5.21	0.00	52.18	54.00	-1.82	AV
2483.5	27.98	83	224	V	29.41	5.21	0.00	62.60	74.00	-11.40	PK
2483.5	18.00	83	224	V	29.41	5.21	0.00	52.63	54.00	-1.37	AV
4924	47.58	0	100	V	32.64	8.93	38.54	50.61	74.00	-23.39	PK
4924	35.90	0	100	V	32.64	8.93	38.54	38.93	54.00	-15.07	AV
7386	46.72	0	100	V	37.14	11.12	37.89	57.09	74.00	-16.91	PK
7386	35.53	0	100	V	37.14	11.12	37.89	45.90	54.00	-8.10	AV
9848	47.48	0	100	V	37.92	11.69	38.31	58.78	74.00	-15.22	PK
9848	36.71	0	100	V	37.92	11.69	38.31	48.02	54.00	-5.98	AV

802.11n40 mode

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 2422 MHz (power setting: 13)											
2422	67.07	209	100	H	29.04	5.21	0.00	101.32	-	-	PK
2422	59.82	209	100	H	29.04	5.21	0.00	94.07	-	-	AV
2422	67.99	82	208	V	29.04	5.21	0.00	102.24	-	-	PK
2422	61.08	82	208	V	29.04	5.21	0.00	95.33	-	-	AV
2390	35.02	209	100	H	29.04	5.21	0.00	69.27	74.00	-4.73	PK
2390	18.93	209	100	H	29.04	5.21	0.00	53.18	54.00	-0.82	AV
2390	35.46	82	208	V	29.04	5.21	0.00	69.71	74.00	-4.29	PK
2390	18.89	82	208	V	29.04	5.21	0.00	53.14	54.00	-0.86	AV
4844	47.14	0	100	V	32.47	8.88	38.54	49.95	74.00	-24.05	PK
4844	36.59	0	100	V	32.47	8.88	38.54	39.40	54.00	-14.60	AV
7266	46.10	0	100	V	37.15	11.26	37.90	56.61	74.00	-17.39	PK
7266	36.35	0	100	V	37.15	11.26	37.90	46.86	54.00	-7.14	AV
9688	48.15	0	100	V	37.77	12.12	38.29	59.75	74.00	-14.25	PK
9688	37.22	0	100	V	37.77	12.12	38.29	48.82	54.00	-5.18	AV
Middle Channel 2437 MHz (power setting: 17)											
2437	72.22	123	217	H	29.04	5.21	0.00	106.47	-	-	PK
2437	64.51	123	217	H	29.04	5.21	0.00	98.76	-	-	AV
2437	72.37	83	219	V	29.04	5.21	0.00	106.62	-	-	PK
2437	64.67	83	219	V	29.04	5.21	0.00	98.92	-	-	AV
4874	57.23	83	225	V	32.64	8.90	38.55	60.22	74.00	-13.78	PK
4874	48.29	83	225	V	32.64	8.90	38.55	51.28	54.00	-2.72	AV
7311	47.03	0	100	V	37.15	11.25	37.90	57.53	74.00	-16.47	PK
7311	36.37	0	100	V	37.15	11.25	37.90	46.87	54.00	-7.13	AV
9748	47.86	0	100	V	37.84	11.85	38.30	59.25	74.00	-14.75	PK
9748	37.52	0	100	V	37.84	11.85	38.30	48.90	54.00	-5.10	AV
High Channel 2452 MHz (power setting: 12)											
2452	65.02	207	177	H	29.41	5.21	0.00	99.64	-	-	PK
2452	57.91	207	177	H	29.41	5.21	0.00	92.53	-	-	AV
2452	67.29	86	156	V	29.41	5.21	0.00	101.91	-	-	PK
2452	60.23	86	156	V	29.41	5.21	0.00	94.85	-	-	AV
2483.5	31.13	207	177	H	29.41	5.21	0.00	65.75	74.00	-8.25	PK
2483.5	17.82	207	177	H	29.41	5.21	0.00	52.44	54.00	-1.56	AV
2483.5	32.92	86	156	V	29.41	5.21	0.00	67.54	74.00	-6.46	PK
2483.5	18.75	86	156	V	29.41	5.21	0.00	53.37	54.00	-0.63	AV
4904	52.37	0	100	V	32.64	8.91	38.54	55.38	74.00	-18.62	PK
4904	41.21	0	100	V	32.64	8.91	38.54	44.22	54.00	-9.78	AV
7356	46.33	0	100	V	37.14	11.18	37.90	56.75	74.00	-17.25	PK
7356	36.48	0	100	V	37.14	11.18	37.90	46.90	54.00	-7.10	AV
9808	47.73	0	100	V	37.92	11.63	38.31	58.97	74.00	-15.03	PK
9808	37.71	0	100	V	37.92	11.63	38.31	48.95	54.00	-5.05	AV

BLE (Max Power)

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											
2402	63.98	82	305	H	29.05	5.22	0.00	98.25	N/A	N/A	PK
2402	61.58	82	305	H	29.05	5.22	0.00	95.85	N/A	N/A	AV
2402	58.42	80	285	V	29.05	5.22	0.00	92.69	N/A	N/A	PK
2402	55.85	80	285	V	29.05	5.22	0.00	90.12	N/A	N/A	AV
2390	26.1	156	307	H	28.98	5.22	0.00	60.30	74.00	-13.70	PK
2390	14.81	156	307	H	28.98	5.22	0.00	49.01	54.00	-4.99	AV
2390	25.63	158	315	H	28.98	5.22	0.00	59.83	74.00	-14.17	PK
2390	14.79	158	315	H	28.98	5.22	0.00	48.99	54.00	-5.01	AV
4804	46.88	105	289	H	32.48	7.88	36.64	50.60	74.00	-23.40	PK
4804	36.11	105	289	H	32.48	7.88	36.64	39.83	54.00	-14.17	AV
7206	45.49	233	235	H	36.72	10.45	36.42	56.24	74.00	-17.76	PK
7206	34.64	233	235	H	36.72	10.45	36.42	45.39	54.00	-8.61	AV
9608	44.96	236	238	H	37.78	11.37	36.66	57.45	74.00	-16.55	PK
9608	34.61	236	238	H	37.78	11.37	36.66	47.10	54.00	-6.90	AV
Middle Channel 2440 MHz											
2440	64.09	81	299	H	29.19	5.22	0.00	98.50	N/A	N/A	PK
2440	61.56	81	299	H	29.19	5.22	0.00	95.97	N/A	N/A	AV
2440	57.83	239	221	V	29.19	5.22	0.00	92.24	N/A	N/A	PK
2440	55.21	239	221	V	29.19	5.22	0.00	89.62	N/A	N/A	AV
4880	46.42	233	269	H	32.60	7.93	36.63	50.32	74.00	-23.68	PK
4880	36.02	233	269	H	32.60	7.93	36.63	39.92	54.00	-14.08	AV
7320	44.54	236	240	H	37.15	10.67	36.43	55.93	74.00	-18.07	PK
7320	33.63	236	240	H	37.15	10.67	36.43	45.02	54.00	-8.98	AV
9760	45.43	235	268	H	37.89	11.46	36.69	58.09	74.00	-15.91	PK
9760	34.86	235	268	H	37.89	11.46	36.69	47.52	54.00	-6.48	AV
High Channel 2480 MHz											
2480	62.86	78	295	H	29.34	5.22	0.00	97.42	N/A	N/A	PK
2480	59.58	78	295	H	29.34	5.22	0.00	94.14	N/A	N/A	AV
2480	60.11	80	270	V	29.34	5.22	0.00	94.67	N/A	N/A	PK
2480	56.82	80	270	V	29.34	5.22	0.00	91.38	N/A	N/A	AV
2483.5	26.48	78	295	H	29.35	5.35	0.00	61.18	74.00	-12.82	PK
2483.5	14.98	78	295	H	29.35	5.35	0.00	49.68	54.00	-4.32	AV
4960	46.26	233	272	H	32.85	7.97	36.59	50.49	74.00	-23.51	PK
4960	35.64	233	272	H	32.85	7.97	36.59	39.87	54.00	-14.13	AV
7440	45.21	238	244	H	37.04	10.82	36.45	56.62	74.00	-17.38	PK
7440	34.79	238	244	H	37.04	10.82	36.45	46.20	54.00	-7.80	AV
9920	46.39	238	242	H	38.00	11.54	36.70	59.23	74.00	-14.77	PK
9920	34.43	238	242	H	38.00	11.54	36.70	47.27	54.00	-6.73	AV

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

8 FCC §15.247(a) (2) & ISED RSS-247 §5.2 -Emission Bandwidth

8.1 Applicable Standards

According to FCC §15.247(a) (2) and IC RSS-247 §5.2, systems using digital modulation techniques may operate in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

8.3 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Analyzer, Spectrum	E4446A	MY48250238	2015-11-12	1 year
655	Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 year
-	-	U. FL to SMA pigtail	-	-	Each time[1]	N/A
-	-	10dB attenuator	-	-	Each time[1]	N/A

[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.*

8.4 Test Location, Date, Personnel and Environmental Conditions

Test Date:	2016-07-22
Test Site:	RF Site
Temperature:	22° C
Relative Humidity:	42 %
Barometric Pressure:	102.6 kPa
Test Personnel:	Jose Martinez

.

8.5 Test Results

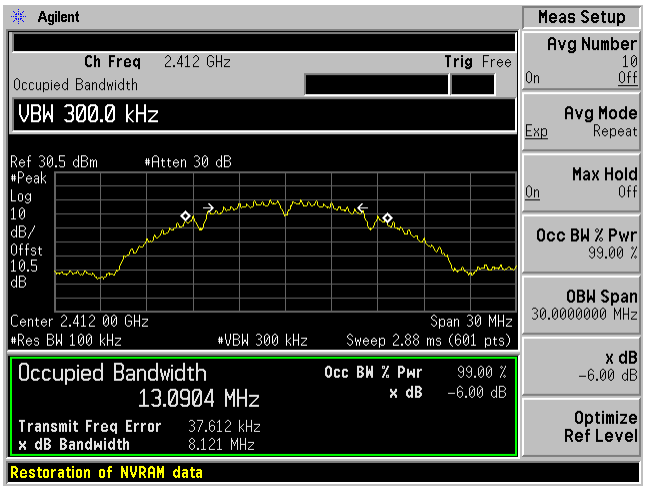
Channel	Frequency (MHz)	99% OBW (kHz)	6 dB Bandwidth (kHz)	6 dB Bandwidth Limit (kHz)
802.11b mode				
Low	2412	13090.4	8121	500
Middle	2437	13138.3	8123	500
High	2462	13119.6	8123	500
802.11g mode				
Low	2412	16256.4	15173	500
Middle	2437	16809.6	15167	500
High	2462	16266.2	15085	500
802.11n-HT20 mode				
Low	2412	17411.7	15187	500
Middle	2437	17705.3	15179	500
High	2462	17376.9	15184	500
802.11n-HT40 mode				
Low	2422	35621.8	35205	500
Middle	2437	35669.9	35224	500
High	2452	35632.2	35154	500

Channel	Frequency (MHz)	99% OBW (kHz)	6 dB Bandwidth (kHz)	6 dB Bandwidth Limit (kHz)
BLE				
Low	2402	1057.7	673.077	500
Middle	2440	1057.7	663.462	500
High	2480	1052.9	663.462	500

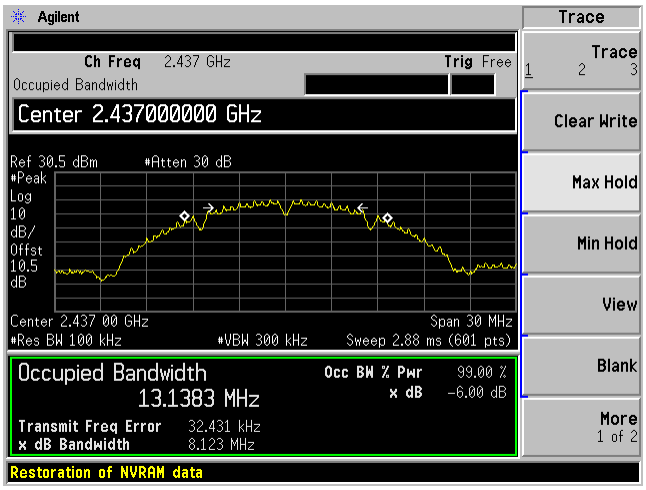
Please refer to the following plots for detailed test results.

802.11b mode

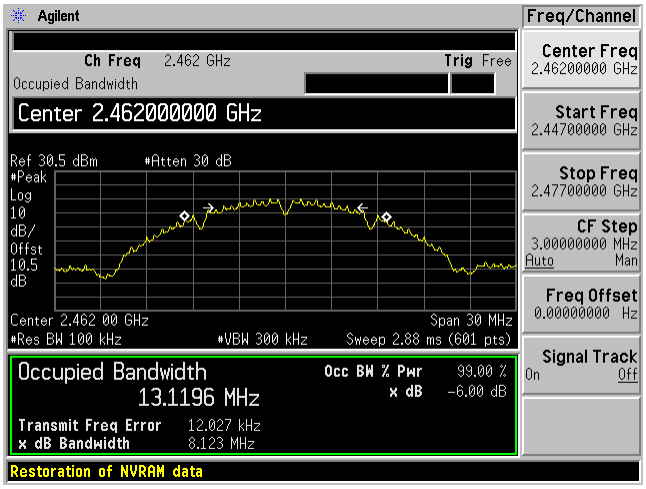
Low Channel 2412 MHz



Middle Channel 2437 MHz

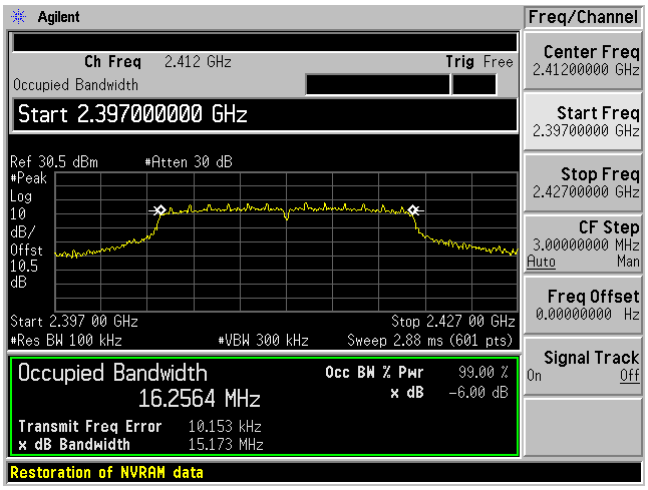


High Channel 2462 MHz

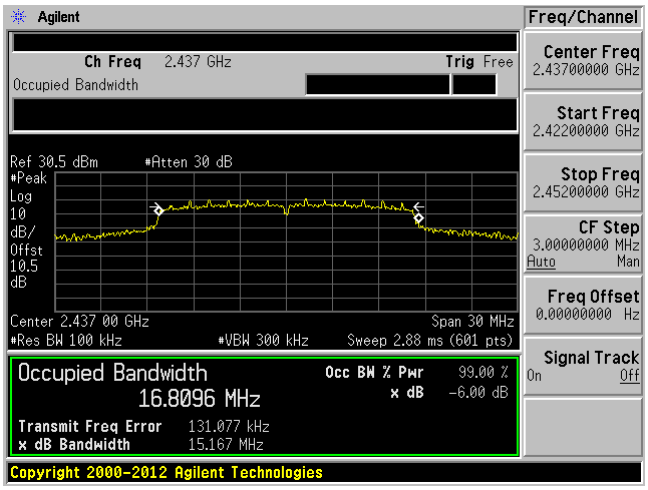


802.11g mode

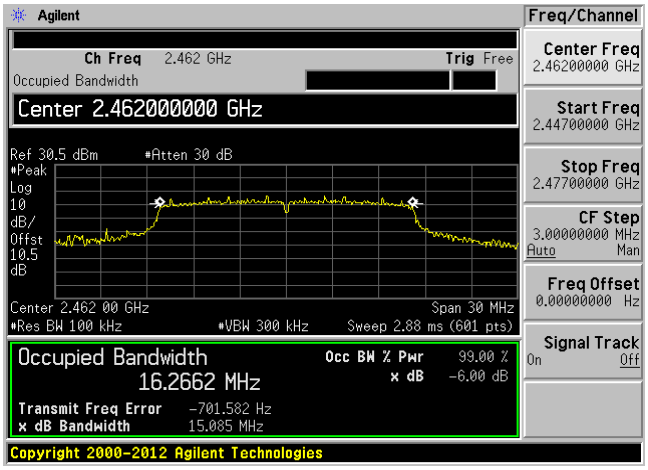
Low Channel 2412 MHz



Middle Channel 2437 MHz

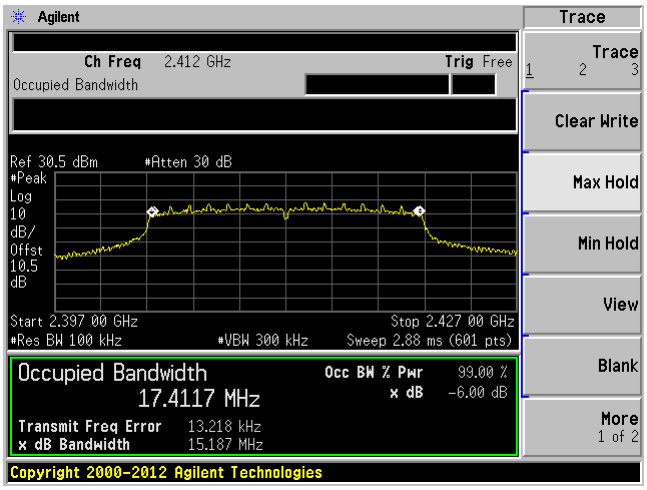


High Channel 2462 MHz

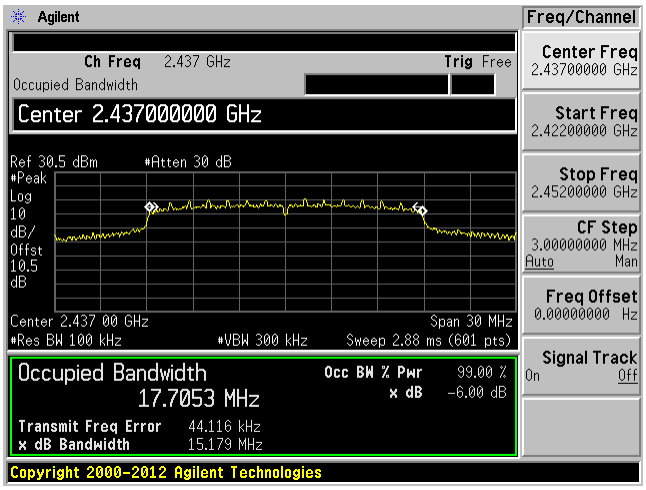


802.11n20 mode

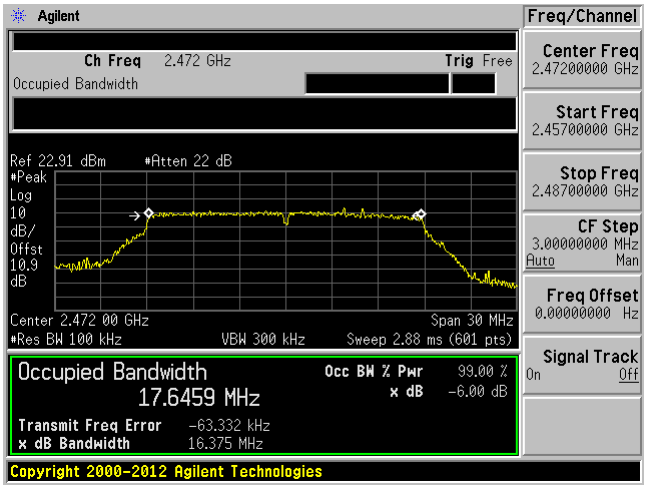
Low Channel 2412 MHz



Middle Channel 2437 MHz

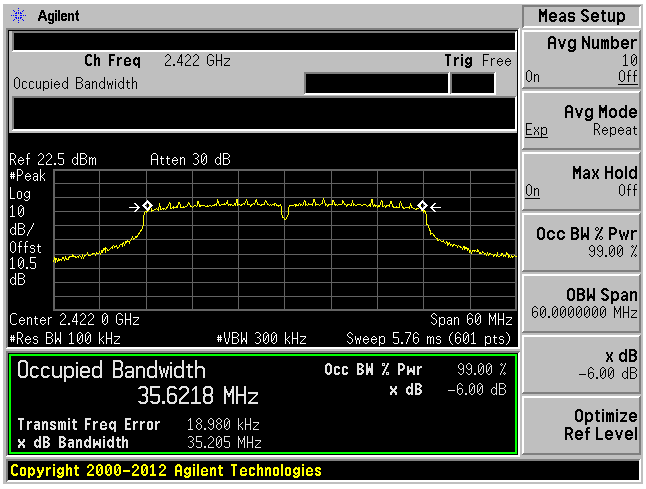


High Channel 2462 MHz

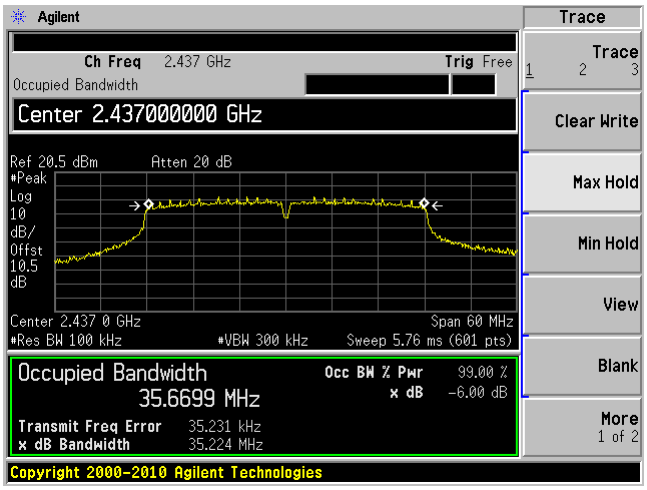


802.11n40 mode

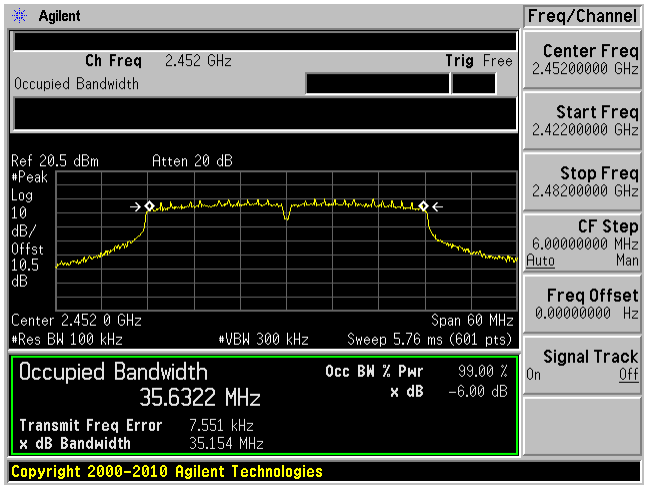
Low Channel 2422 MHz



Middle Channel 2437 MHz

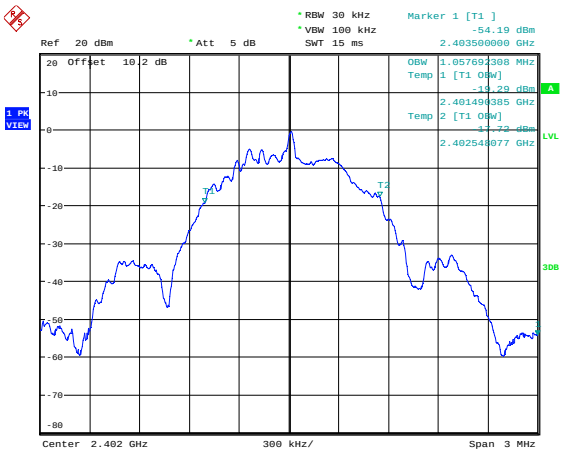


High Channel 2452 MHz



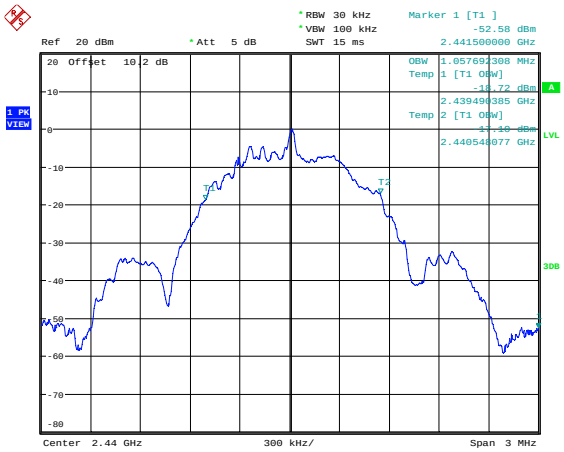
BLE

Low Channel 2402 MHz



Date: 22.JUL.2016 05:30:17

Middle Channel 2440 MHz



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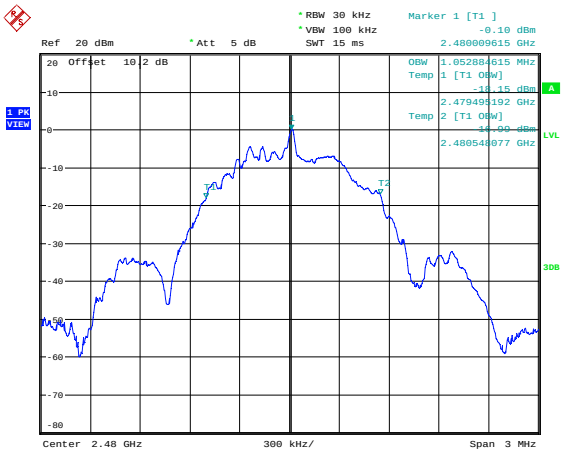
High Channel 2480 MHz



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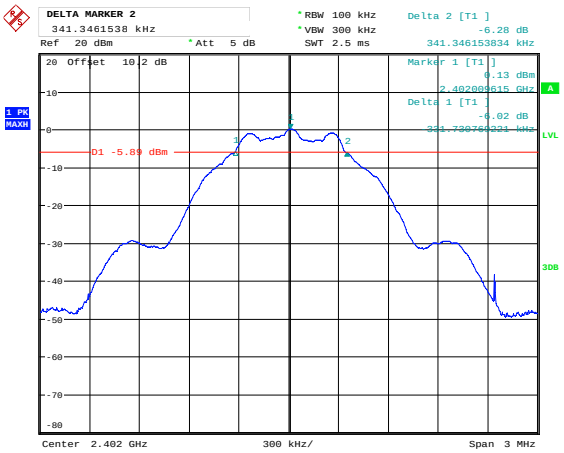
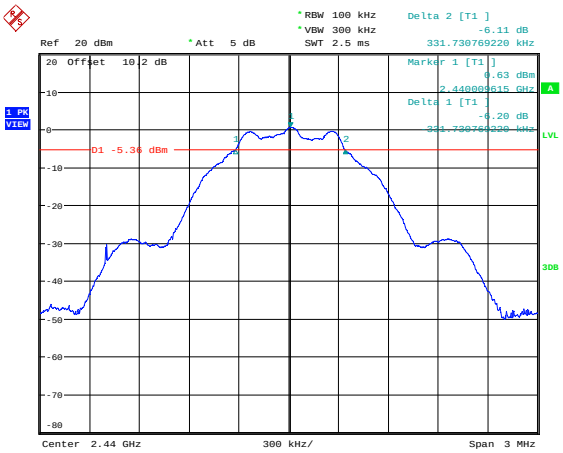
BLE 6 dB Bandwidth

Low Channel 2402 MHz



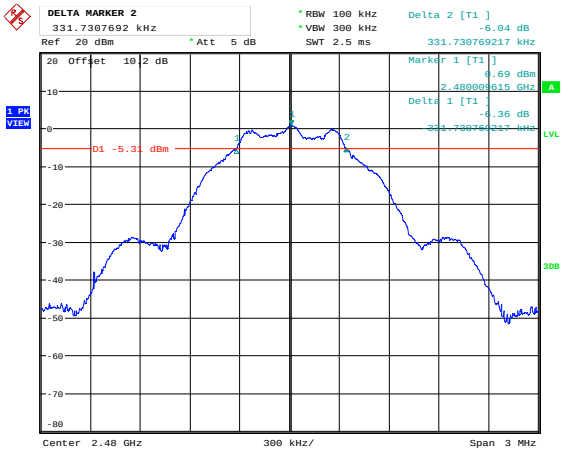
Date: 22.JUL.2016 05:18:48

Middle Channel 2440 MHz



Date: 22.JUL.2016 05:20:48

High Channel 2480 MHz



Date: 22.JUL.2016 05:35:32

9 FCC §15.247(b) (3) & ISED RSS-247 §5.4 (4) - Output Power Measurement

9.1 Applicable Standards

According to FCC §15.247(b) (3) and IC RSS-247 §5.4 (4) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power

9.3 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Analyzer, Spectrum	E4446A	MY48250238	2015-11-12	1 year
697	ETS- Lingerin	Power Sensor	7002-006	160097	2014-10-21	2 years
-	-	U. FL to SMA pigtail	-	-	Each time[1]	N/A
-	-	10dB attenuator	-	-	Each time[1]	N/A

[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.*

9.4 Test Location, Date, Personnel and Environmental Conditions

Test Date:	2016-06-22
Test Site:	RF Site
Temperature:	23° C
Relative Humidity:	42 %
Barometric Pressure:	102.9 kPa
Test Personnel:	Jose Martinez

9.5 Test Results

Average Output Power

Channel	Frequency (MHz)	Average Power (dBm)	Limit (dBm)
802.11b mode			
1	2412	17.52	30
6	2437	17.83	30
11	2462	17.71	30
802.11g mode			
1	2412	17.09	30
6	2437	19.76	30
11	2462	15.42	30
802.11n-HT20 mode			
1	2412	16.99	30
6	2437	19.55	30
11	2462	14.25	30
802.11n-HT40 mode			
3	2422	13.35	30
6	2437	17.07	30
9	2452	12.35	30

Note: Duty Cycle correction factor has already been added to the measurement.

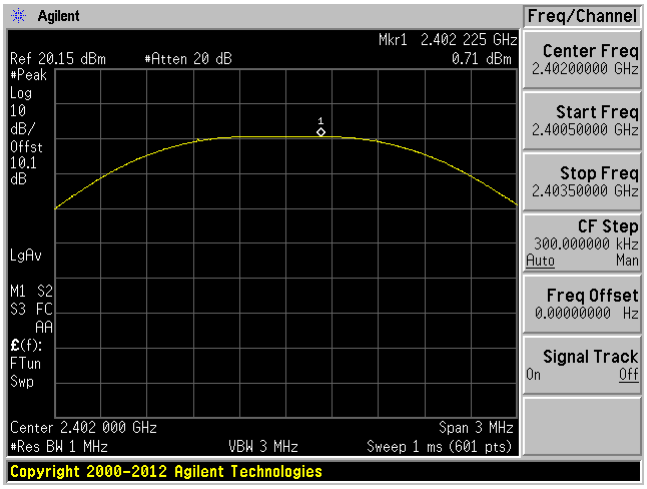
Peak Output Power

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)
BLE			
Low	2402	0.71	30
Middle	2440	1.24	30
High	2480	1.42	30

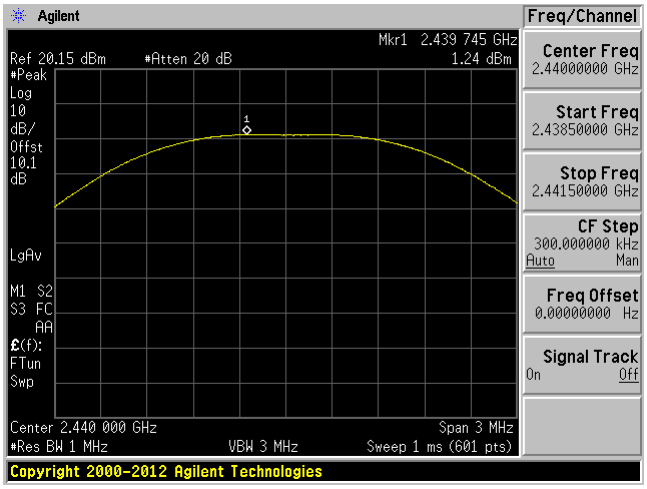
Please refer to the following plots for detailed BLE test results.

BLE

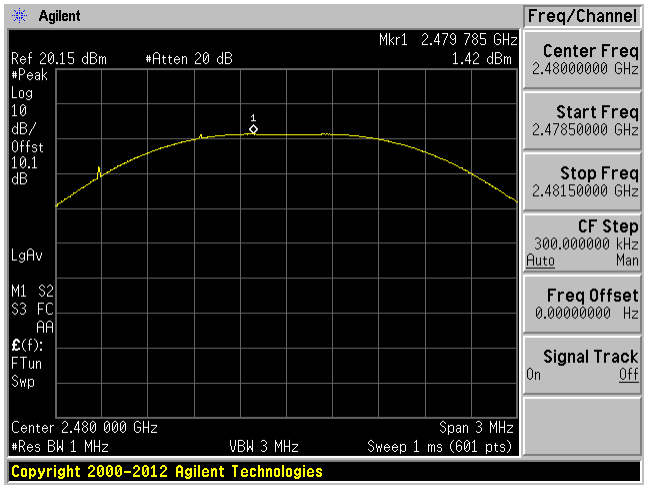
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



10 FCC §15.247(d) & ISED RSS-247 §5.5 – 100 kHz Bandwidth of Band Edges

10.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to IC RSS-247 §5.5.In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

10.3 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Analyzer, Spectrum	E4446A	MY48250238	2015-11-12	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.*

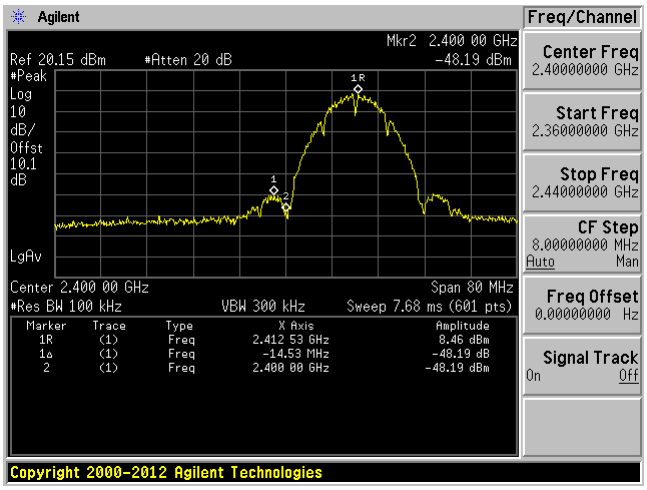
10.4 Test Location, Date, Personnel and Environmental Conditions

Test Date:	2016-06-15
Test Site:	RF Site
Temperature:	22° C
Relative Humidity:	42 %
Barometric Pressure:	102.6 kPa
Test Personnel:	Jose Martinez

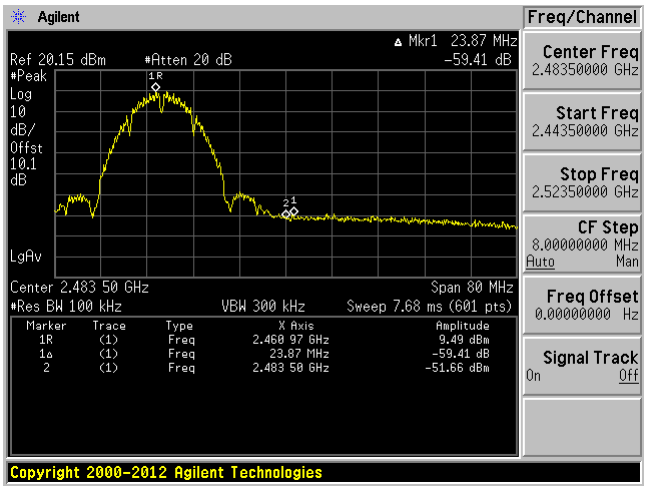
10.5 Test Results

802.11b mode

Low Channel 2412 MHz

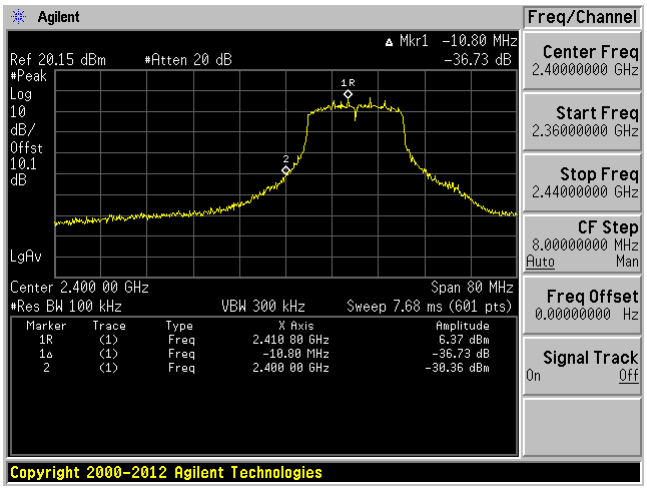


High Channel 2462 MHz

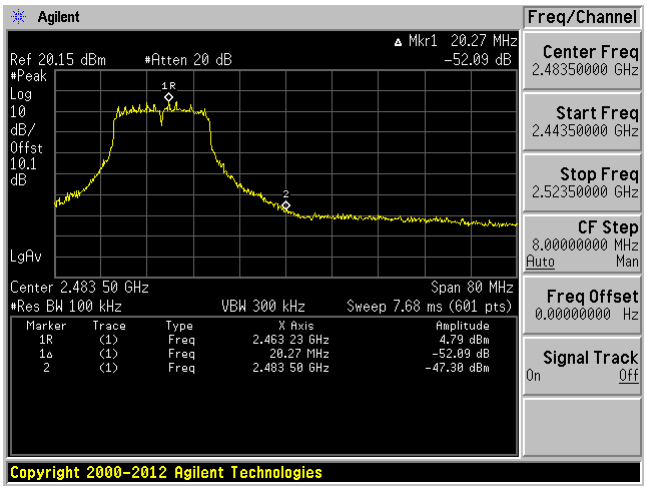


802.11g mode

Low Channel 2412 MHz

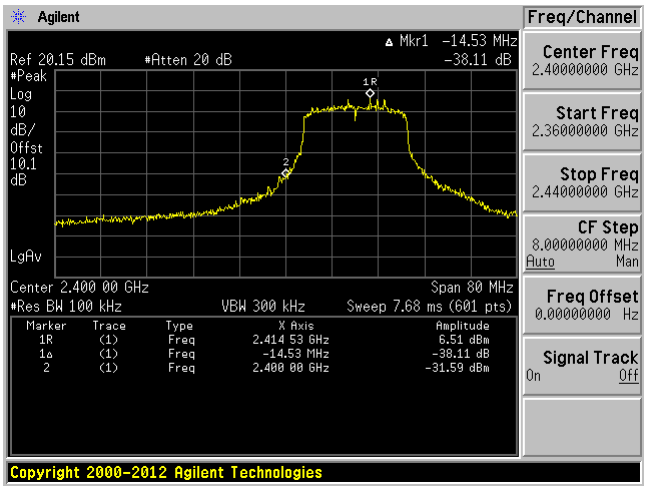


High Channel 2462 MHz

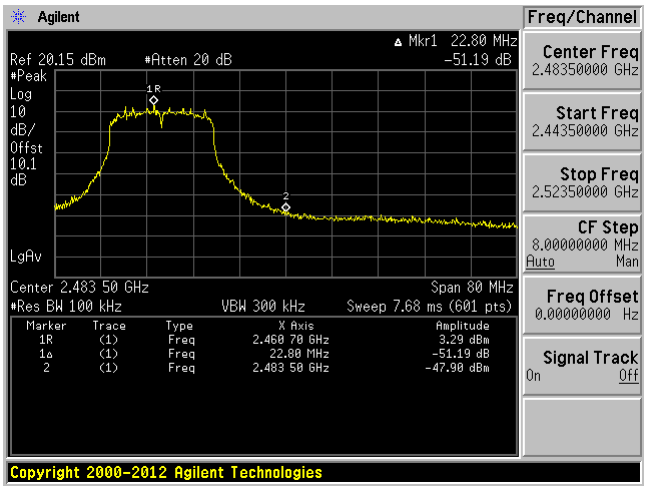


802.11n20 mode

Low Channel 2412 MHz

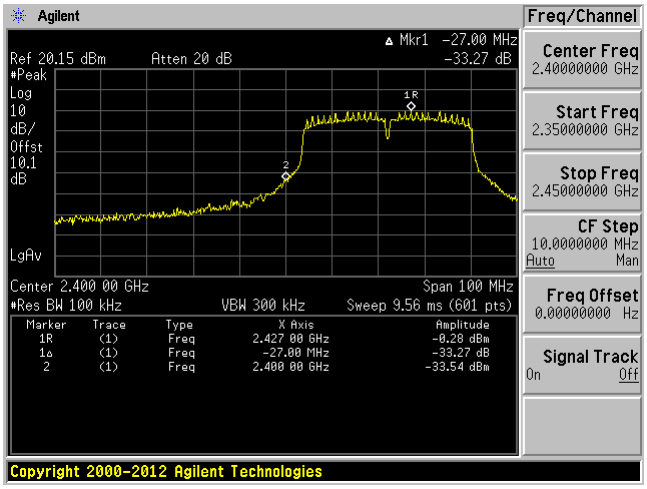


High Channel 2462 MHz

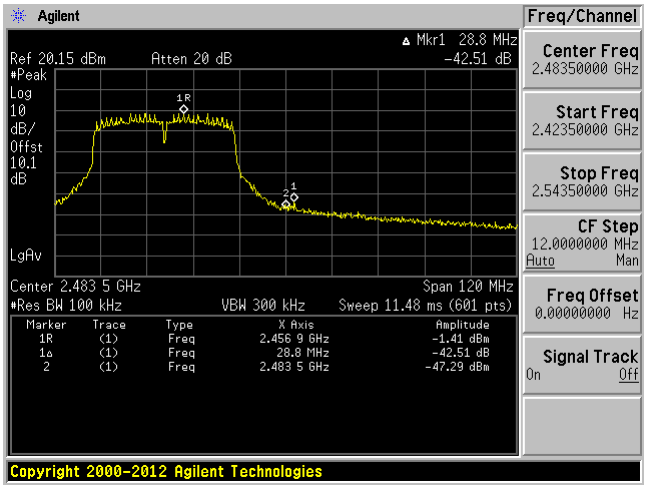


802.11n40 mode

Low Channel 2422 MHz

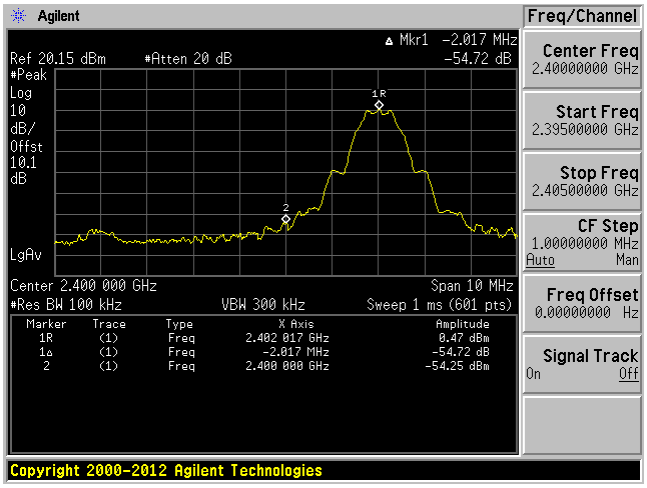


High Channel 2452 MHz

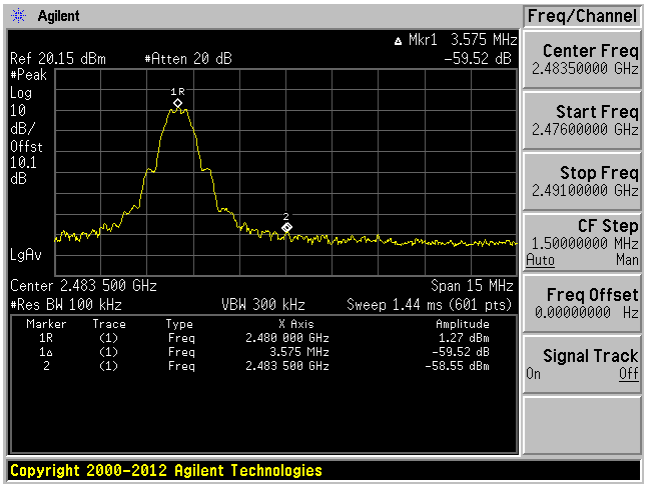


BLE

Low Channel 2402 MHz



High Channel 2480 MHz



11 FCC §15.247(e) & ISED RSS-247 §5.2(2) – Power Spectral Density

11.1 Applicable Standards

According to FCC §15.247(e) and RSS-247 §5.2 (2) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission.

11.3 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
655	Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	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.*

11.4 Test Location, Date, Personnel and Environmental Conditions

Test Date:	2016-07-22
Test Site:	RF Site
Temperature:	22° C
Relative Humidity:	42 %
Barometric Pressure:	102.7 kPa
Test Personnel:	Jose Martinez

11.5 Test Results

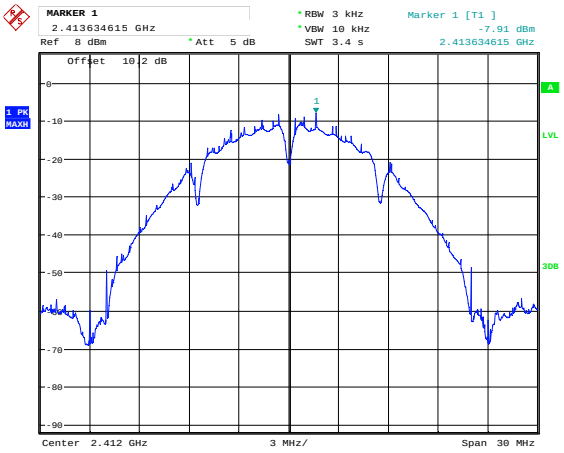
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-7.91	8
Middle	2437	-10.47	8
High	2462	-6.67	8
802.11g mode			
Low	2412	-11.61	8
Middle	2437	-7.96	8
High	2462	-11.94	8
802.11n-HT20 mode			
Low	2412	-11.13	8
Middle	2437	-8.19	8
High	2462	-13.62	8
802.11n-HT40 mode			
Low	2422	-17.34	8
Middle	2437	-15.33	8
High	2452	-18.16	8

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE			
Low	2402	-13.71	8
Middle	2440	-13.24	8
High	2480	-13.01	8

Please refer to the following plots for detailed test results

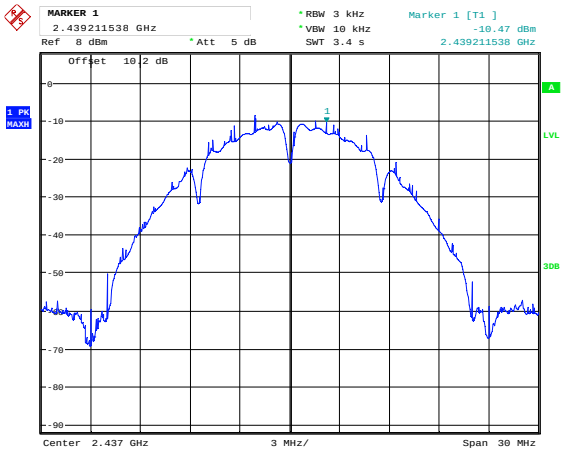
802.11b mode

Low Channel 2412 MHz



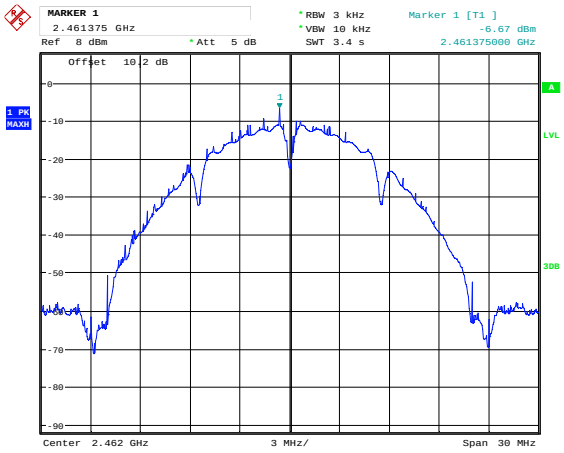
Date: 22.JUL.2016 02:38:06

Middle Channel 2437 MHz



Date: 22.JUL.2016 02:38:51

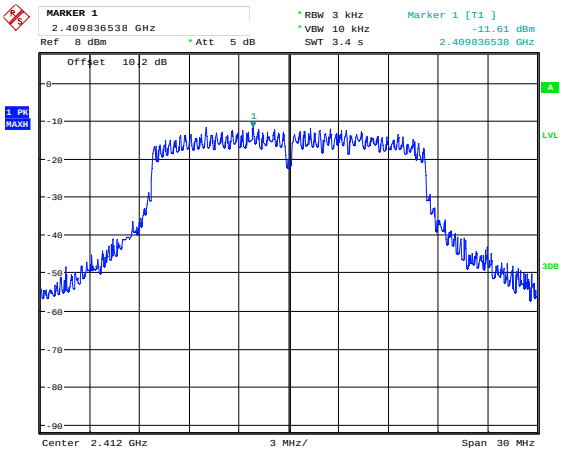
High Channel 2462 MHz



Date: 22.JUL.2016 02:39:23

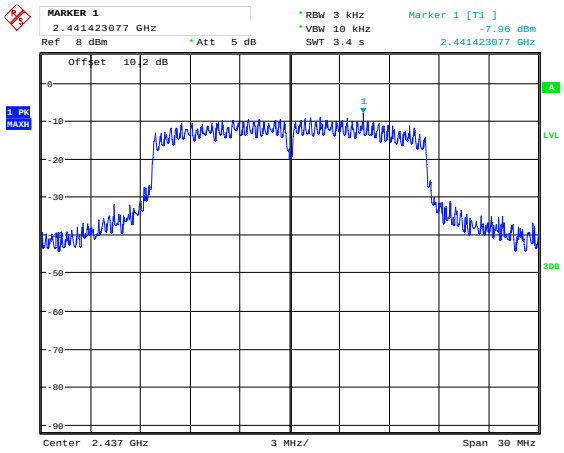
802.11g mode

Low Channel 2412 MHz



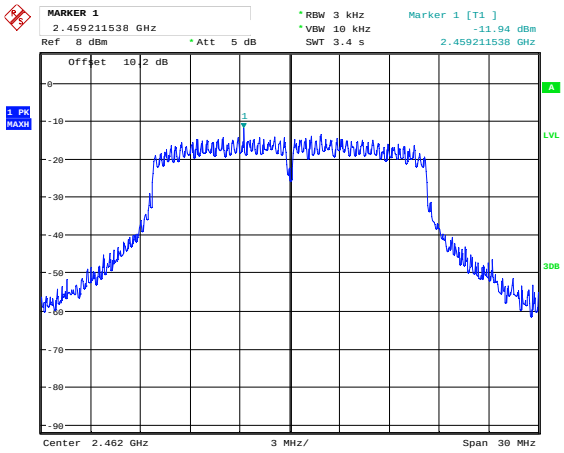
Date: 22.JUL.2016 02:40:06

Middle Channel 2437 MHz



Date: 22.JUL.2016 02:40:47

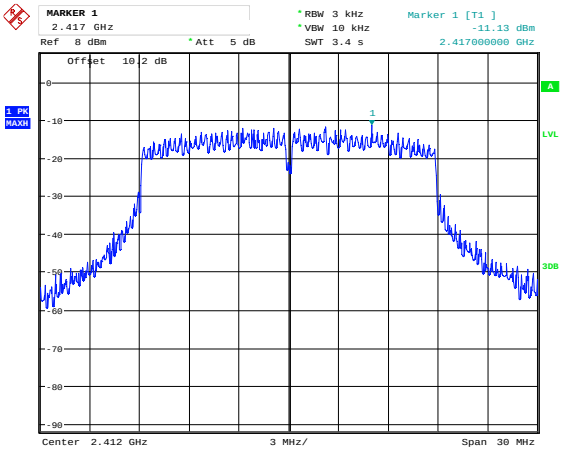
High Channel 2462 MHz



Date: 22.JUL.2016 02:41:30

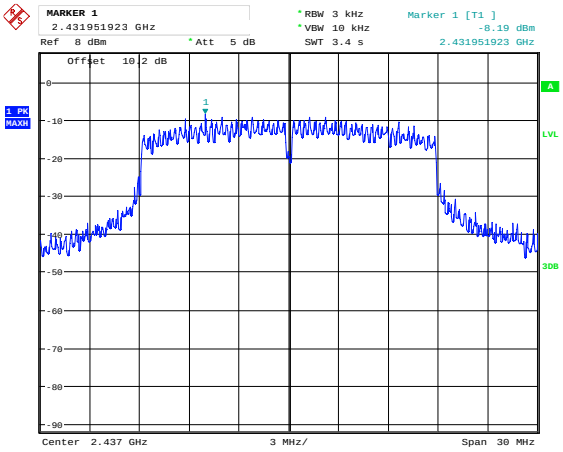
802.11n20 mode

Low Channel 2412 MHz



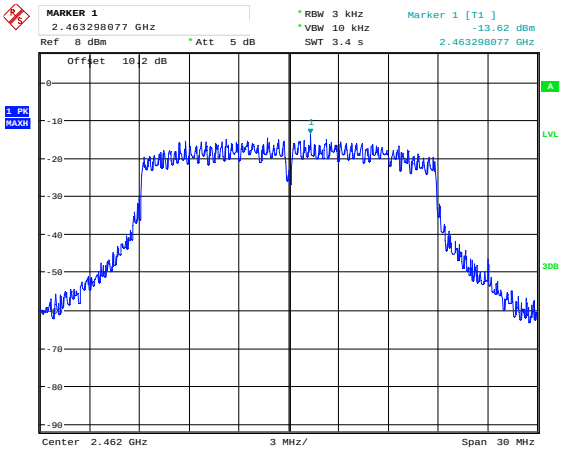
Date: 22.JUL.2016 02:42:07

Middle Channel 2437 MHz



Date: 22.JUL.2016 02:42:52

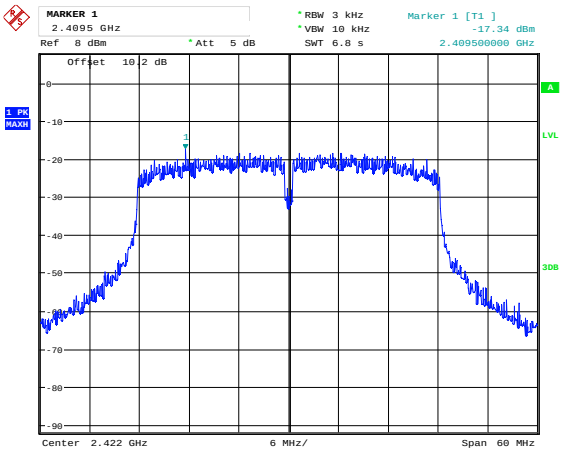
High Channel 2462 MHz



Date: 22.JUL.2016 02:43:30

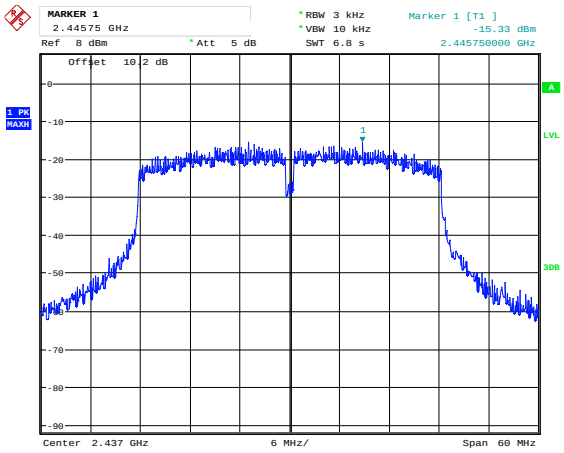
802.11n40 mode

Low Channel 2422 MHz



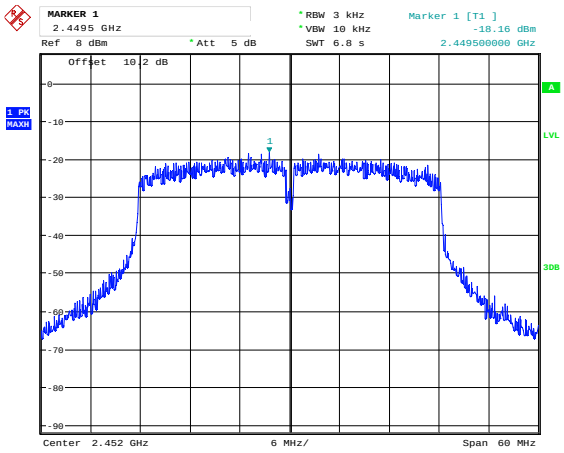
Date: 22.JUL.2016 02:44:18

Middle Channel 2437 MHz



Date: 22.JUL.2016 03:34:08

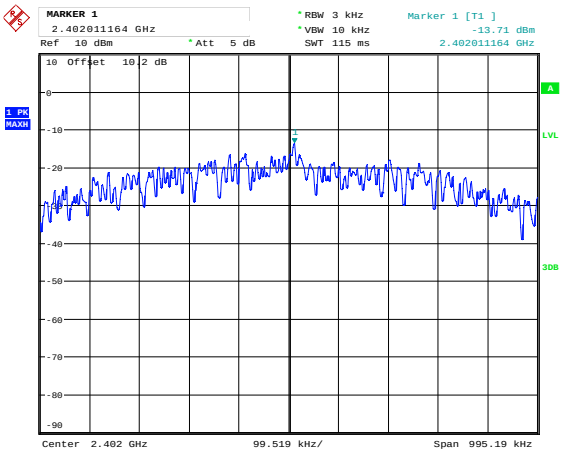
High Channel 2452 MHz



Date: 22.JUL.2016 03:35:00

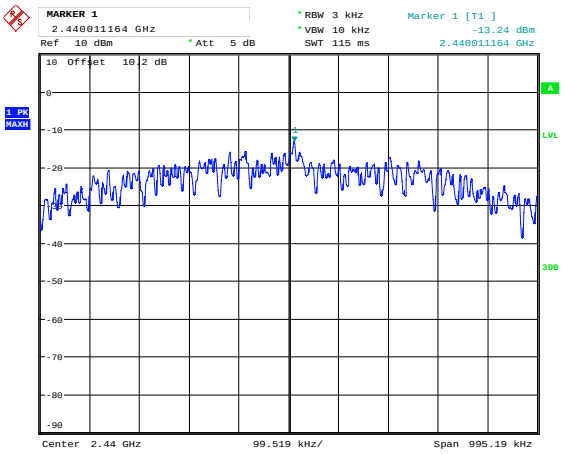
BLE

Low Channel 2402 MHz



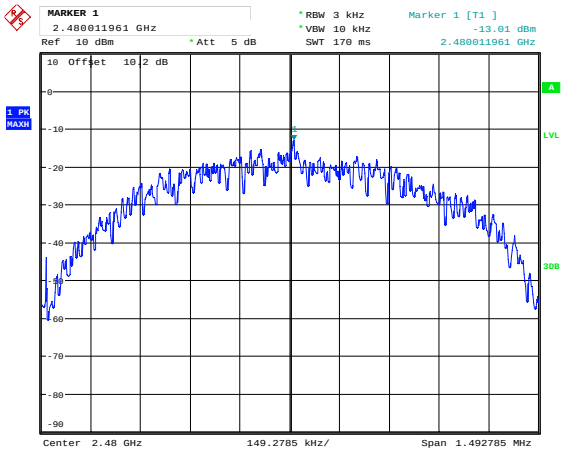
Date: 22.JUL.2016 05:38:27

Middle Channel 2440 MHz



Date: 22.JUL.2016 05:38:04

High Channel 2480 MHz



Date: 22.JUL.2016 05:36:59

12 FCC §15.247(d) & ISED RSS-247 §5.5 & IC RSS-GEN §8.9 – Spurious Emissions at Antenna Terminals

12.1 Applicable Standards

For FCC §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

As per IC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

12.2 Test Procedure

The RF 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.

12.3 Test Equipment List and Details

BACL Asset #	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
655	Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 year
-	-	U. FL to SMA pigtail	-	-	Each time[1]	N/A
-	-	10dB attenuator	-	-	Each time[1]	N/A

[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.*

12.4 Test Location, Date, Personnel and Environmental Conditions

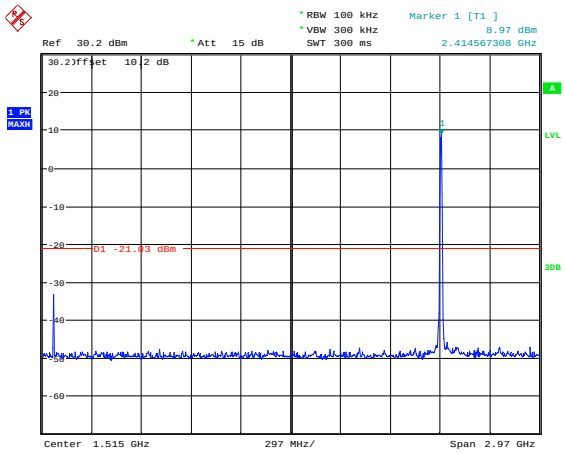
Test Date:	2016-07-22
Test Site:	RF Site
Temperature:	22° C
Relative Humidity:	42 %
Barometric Pressure:	102.7 kPa
Test Personnel:	Jose Martinez

12.5 Test Results

Please refer to following plots.

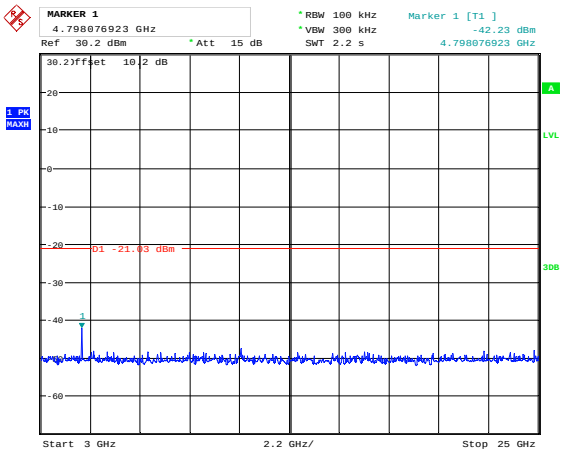
802.11b mode

Low Channel 30 MHz – 3 GHz



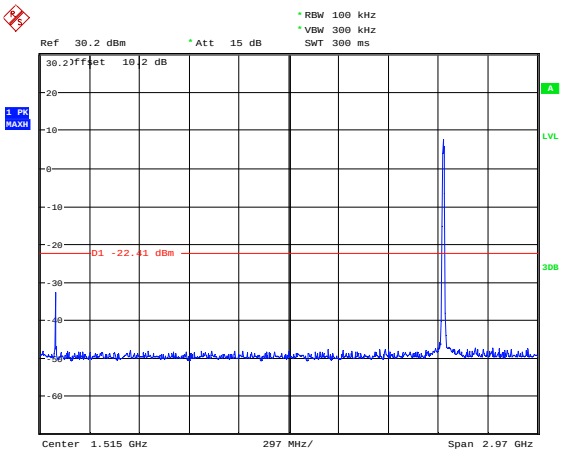
Date: 22.JUL.2016 03:50:54

Low Channel 3 GHz – 25 GHz



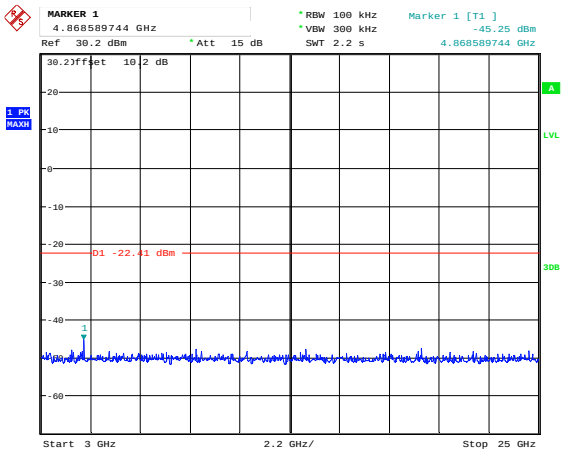
Date: 22.JUL.2016 03:51:27

Middle Channel 30 MHz – 3 GHz



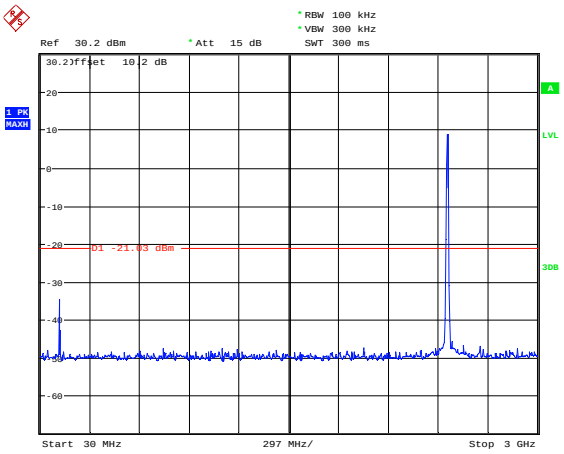
Date: 22.JUL.2016 03:52:24

Middle Channel 3 GHz – 25 GHz



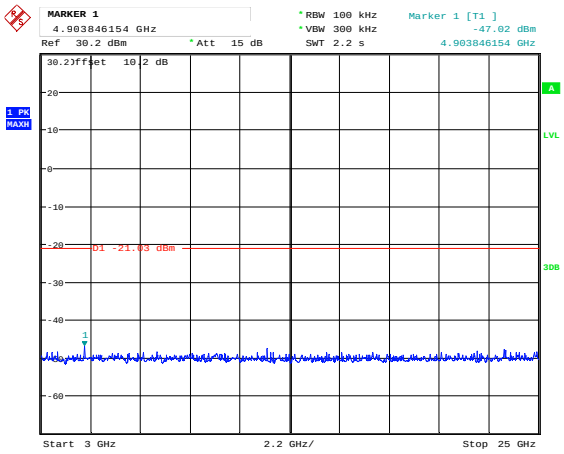
Date: 22.JUL.2016 03:52:43

High Channel 30 MHz – 3 GHz



Date: 22.JUL.2016 03:54:22

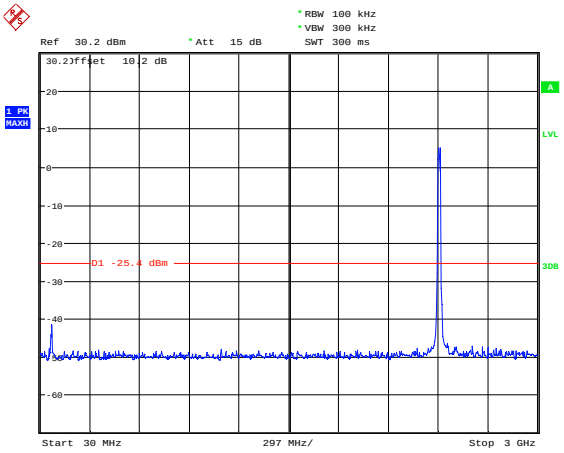
High Channel 3 GHz – 25 GHz



Date: 22.JUL.2016 03:54:53

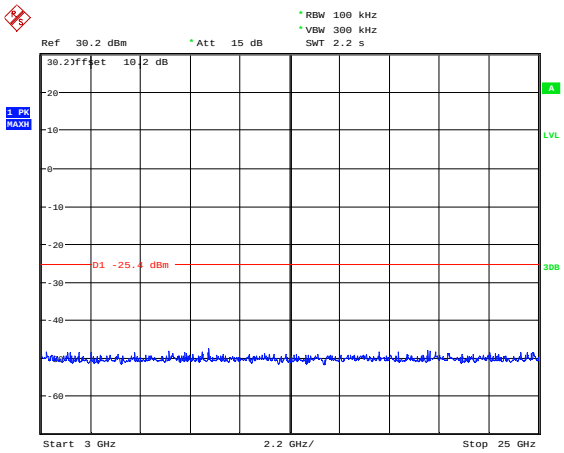
802.11g mode

Low Channel 30 MHz – 3 GHz



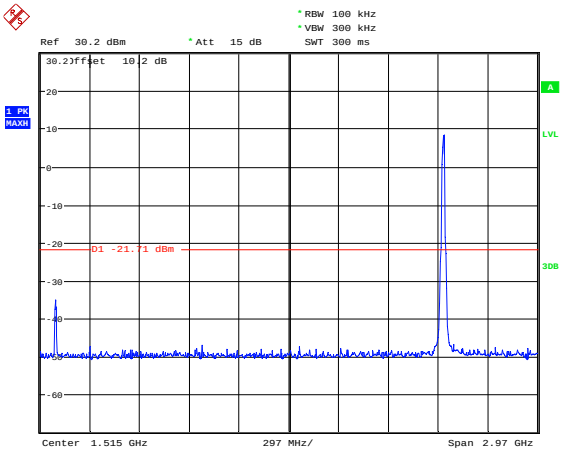
Date: 22.JUL.2016 03:55:38

Low Channel 3 GHz – 25 GHz



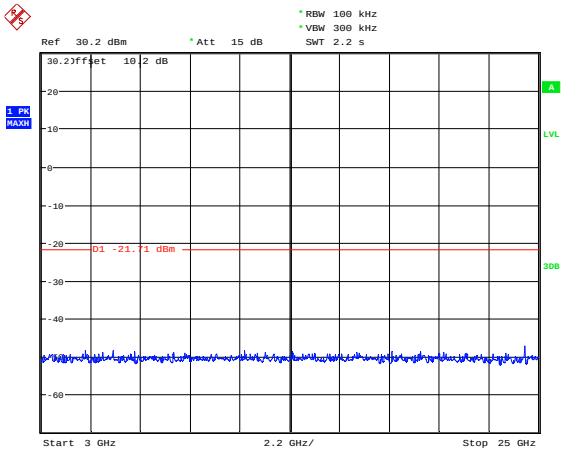
Date: 22.JUL.2016 03:55:59

Middle Channel 30 MHz – 3 GHz



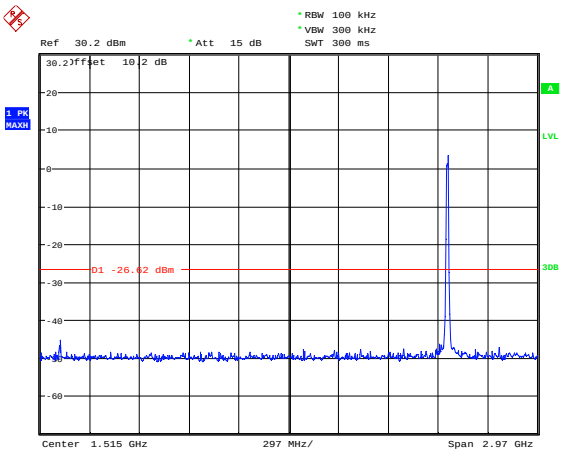
Date: 22.JUL.2016 03:56:59

Middle Channel 3 GHz – 25 GHz



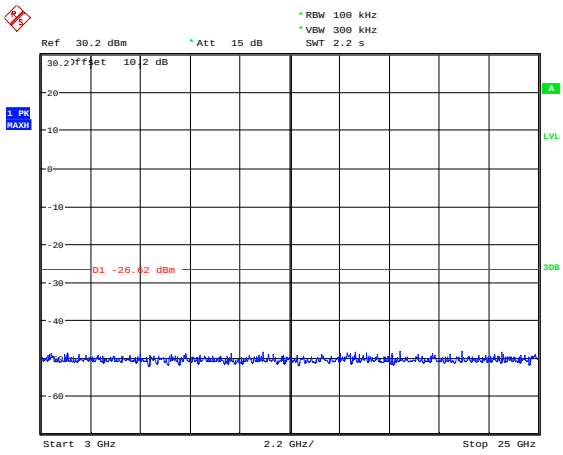
Date: 22.JUL.2016 03:57:22

High Channel 30 MHz – 3 GHz



Date: 22.JUL.2016 03:58:13

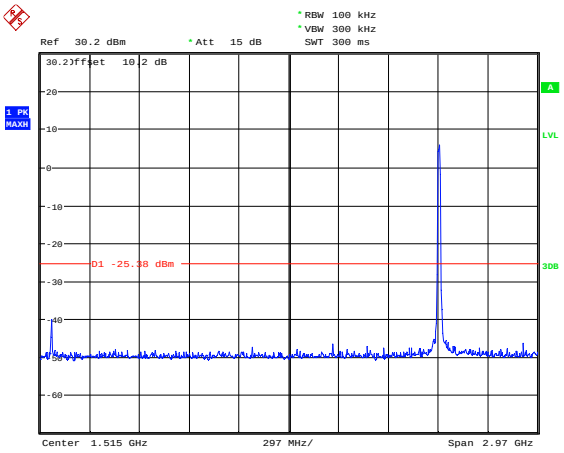
High Channel 3 GHz – 25 GHz



Date: 22.JUL.2016 03:58:36

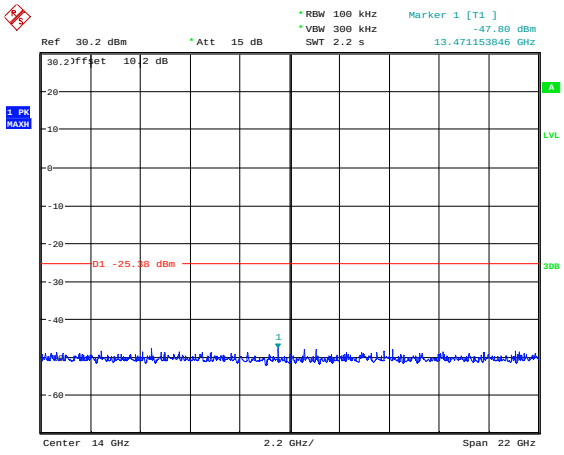
802.11n20 mode

Low Channel 30 MHz – 3 GHz



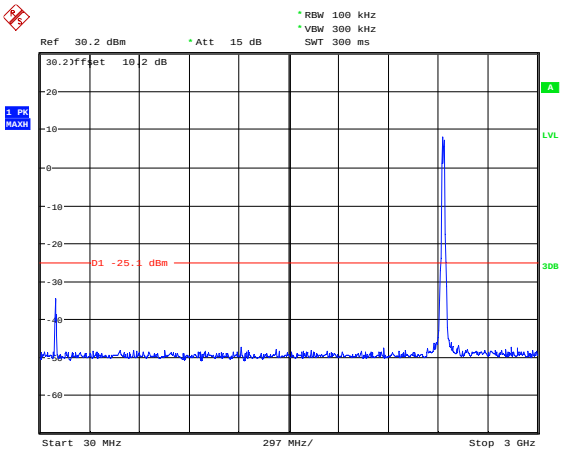
Date: 22.JUL.2016 04:19:08

Low Channel 3 GHz – 25 GHz



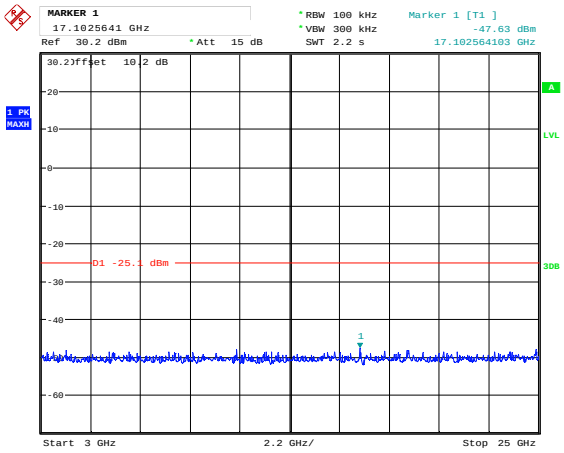
Date: 22.JUL.2016 04:19:35

Middle Channel 30 MHz – 3 GHz



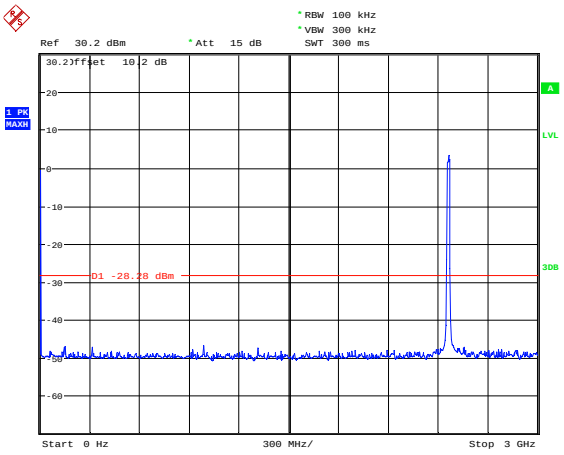
Date: 22.JUL.2016 04:20:33

Middle Channel 3 GHz – 25 GHz



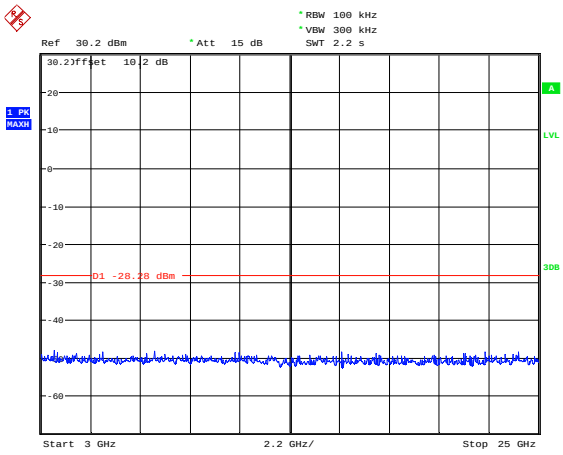
Date: 22.JUL.2016 04:21:13

High Channel 30 MHz – 3 GHz



Date: 22.JUL.2016 04:22:19

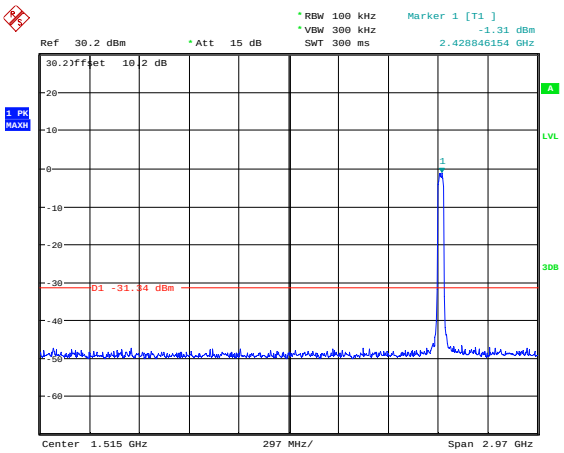
High Channel 3 GHz – 25 GHz



Date: 22.JUL.2016 04:22:38

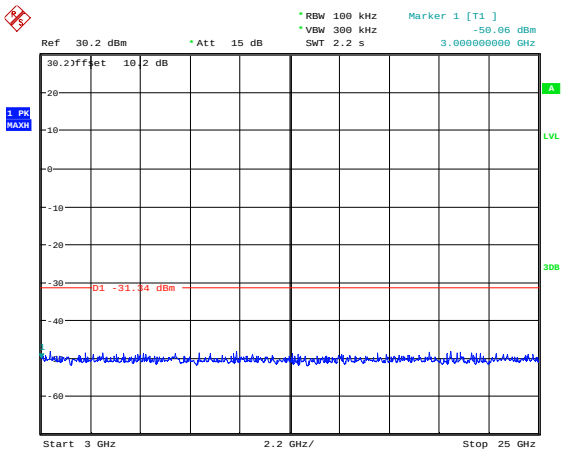
802.11n40 mode

Low Channel 30 MHz – 3 GHz



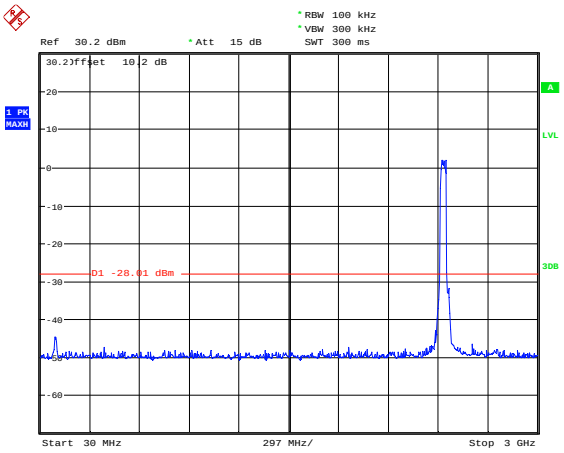
Date: 22.JUL.2016 04:24:32

Low Channel 3 GHz – 25 GHz



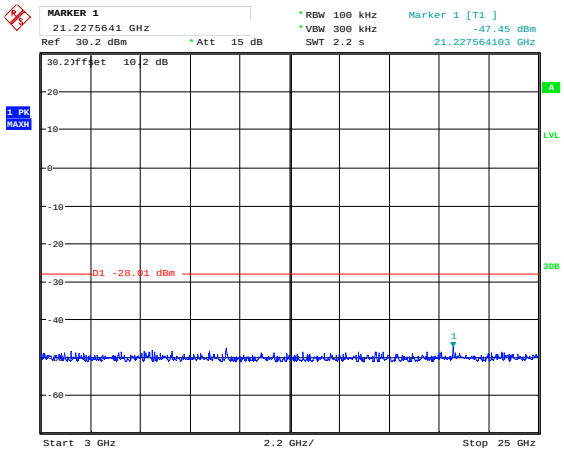
Date: 22.JUL.2016 04:25:03

Middle Channel 30 MHz – 3 GHz



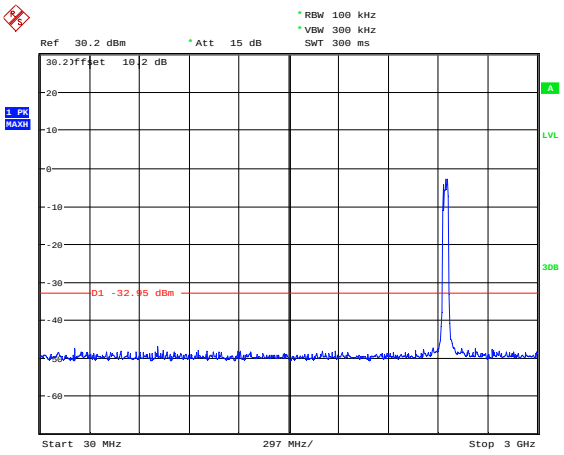
Date: 22.JUL.2016 04:30:06

Middle Channel 3 GHz – 25 GHz



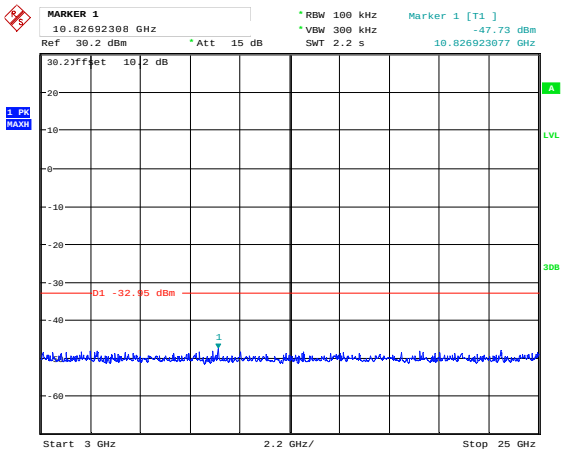
Date: 22.JUL.2016 04:30:34

High Channel 30 MHz – 3 GHz



Date: 22.JUL.2016 04:32:23

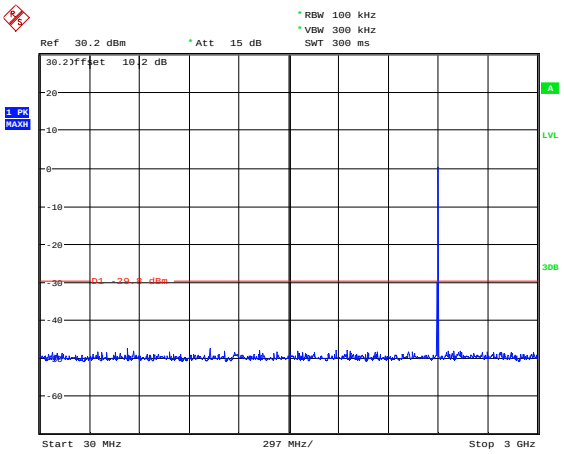
High Channel 3 GHz – 25 GHz



Date: 22.JUL.2016 04:32:47

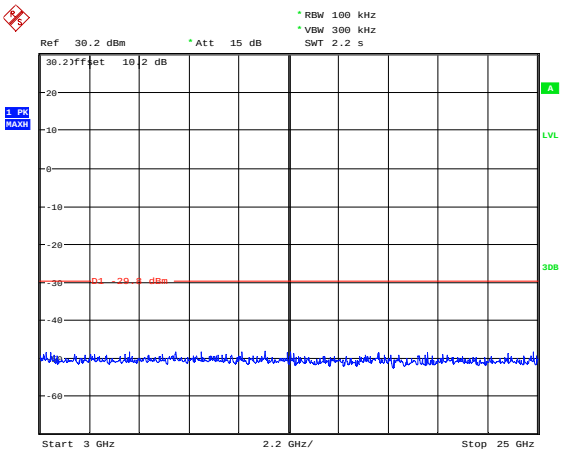
BLE

Low Channel 30 MHz – 3 GHz



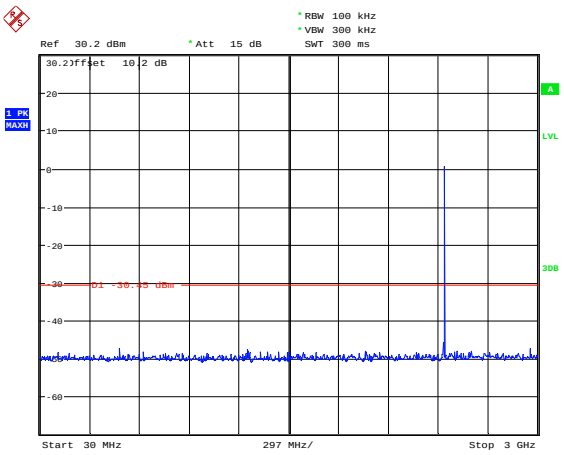
Date: 22.JUL.2016 05:11:30

Low Channel 3 GHz – 25 GHz



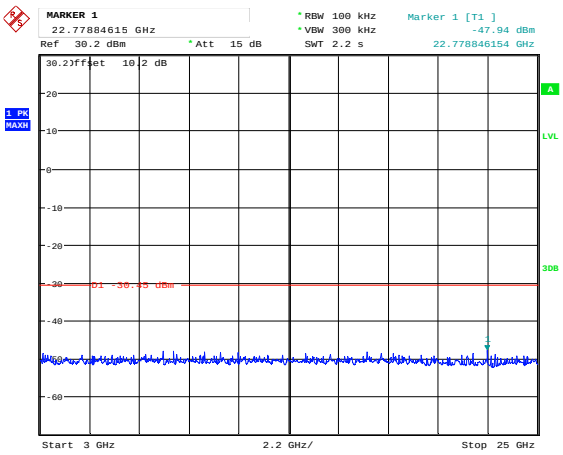
Date: 22.JUL.2016 05:11:52

Middle Channel 30 MHz – 3 GHz



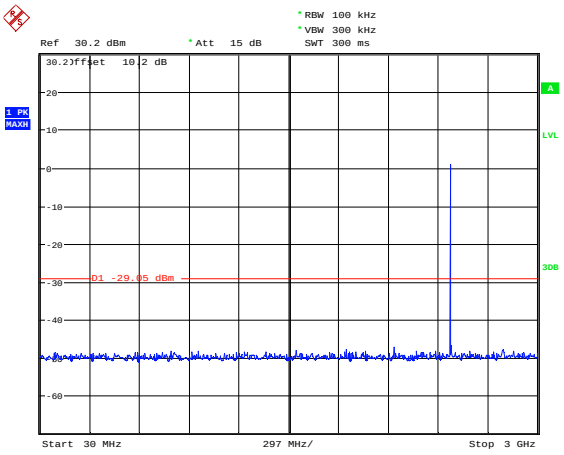
Date: 22.JUL.2016 05:12:34

Middle Channel 3 GHz – 25 GHz



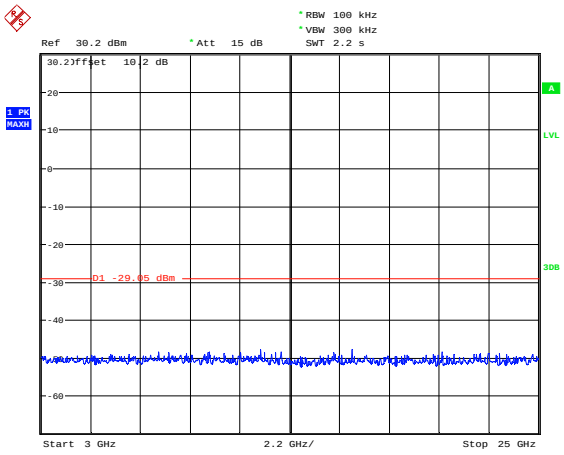
Date: 22.JUL.2016 05:12:50

High Channel 30 MHz – 3 GHz



Date: 22.JUL.2016 05:13:38

High Channel 3 GHz – 25 GHz



Date: 22.JUL.2016 05:13:51

Note: based on the 15.247(d), the BLE power measurement was based on the peak method, therefore the limit should be 20dB below the highest level of the desired power. The test plots shows the limit is 30dB below which lower than the required limit.