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

TEST AND MEASUREMENT REPORT

For

GainSpan Corporation

3590 N First Street, Suite 300,

San Jose, CA 95134, USA

FCC ID: YOPGS2101M
IC: 9154A-GS2101M

Report Type:	**Product Type:**
Original Report	Low Power 802.11b/g/n20 Wi-Fi Module

Prepared By	Jin Yang Associate Engineer
Report Number	R1603222-247
Report Date	2016-05-27
Reviewed By	Bo Li RF Supervisor

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

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1603222-247	Original	2016-05-27

General Description

Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *GainSpan Corporation,* and their product, *FCC ID: YOPGS2101M, IC: 9154A-GS2101M*, model number: *GS2101MIE, GS2101MIP*, which henceforth is referred to as the EUT (Equipment Under Test), the EUT is *a Wi-Fi Module with 802.11b/g/n20 technology*.

Mechanical Description of EUT

The EUT measures approximately *25 mm (L) x 20 mm (W) x 2.5 mm (H)* and weighs approximately *2.3 g*.

The data gathered are from a typical production sample provided by the manufacturer with serial number
GS2101MIE: 20F85E0C0088
GS2101MIP: 20F85E0C00D0

Objective

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

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209, 15.247 and IC RSS-247, RSS-gen rules.

Related Submittal(s)/Grant(s)

N/A

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.

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.

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 Guide 65: 1996** 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

System Test Configuration

Justification

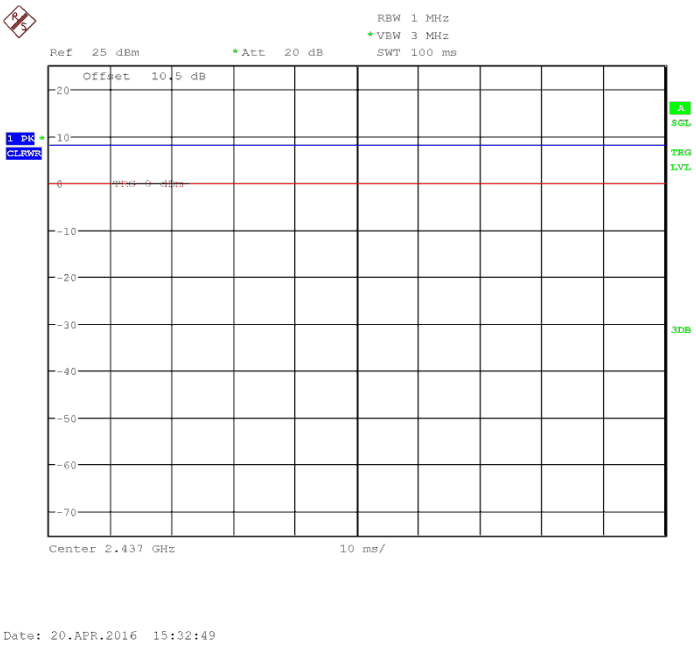
The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

EUT Exercise Software

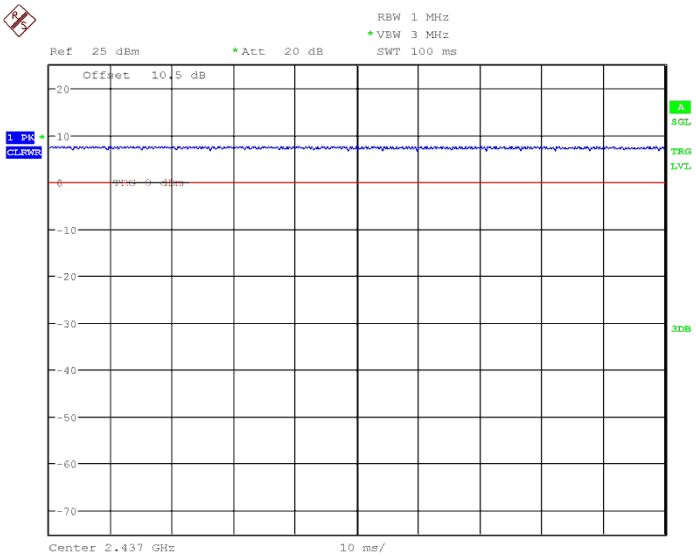
The worst condition (maximum power with 100% duty cycle) was setting by the software as following table:

Radio Mode	Test Software Version	IPOP v4.1		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level	15	15	15
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level	21	21	21
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level	21	21	21

Duty Cycle (100%) 802.11b



Duty Cycle (100%) 802.11g



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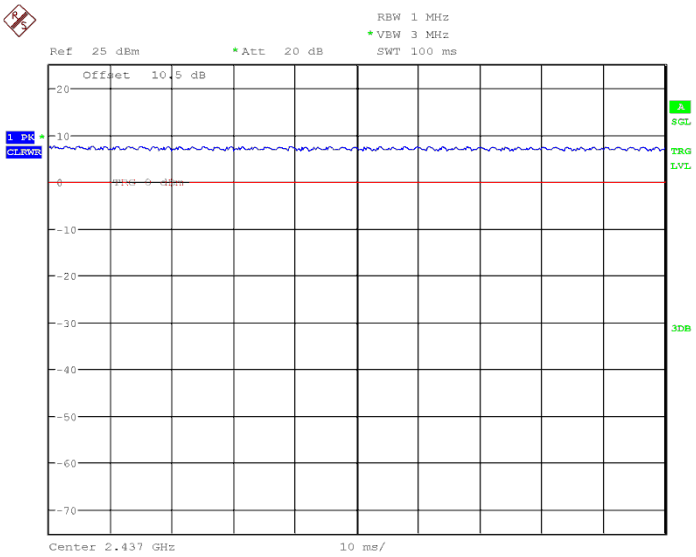
Duty Cycle (100%) 802.11n20



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Special Equipment

There were no special accessories were required, included, or intended for use with EUT during test.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment

Manufacturer	Description	Type	Serial Number
Dell	Laptop	E6410	/
GainSpan	Test Jig	GS2100M-EVB3-RE3.1	/
PHIHONG	SWITCHING POWER SUPPLY	PSAA20R-033	/

EUT Internal Configuration Details

Manufacturer	Description	Type	Serial Number
GainSpan	Module	GS2101MIP REV 1.0 /GS2101MIE REV 1.0	/
GainSpan	MCU	GS2000-68-D1 NPV03514A	/

Interface Ports and Cables

Cable Description	Length (cm)	To	From
RF Cable	20	PSA	EUT
USB Cable	92	Laptop	EUT
Adapter Cable	115	Test Jig	Switching Power Supply

Power Supply List and Details

Manufacturer	Description	Type	Serial Number
PHIHONG	Switching Power Supply	PSAA20R-033	/

Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.203 IC RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.247(i) IC RSS-102	RF Exposure	Compliant
FCC §15.247 (d) IC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-Gen §8.10	Restricted Bands	Compliant
FCC §15.209, §15.247 (d) IC RSS-247 §5.5 IC RSS-Gen §8.9	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-247 §5.2 IC RSS-Gen §6.6	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-247 §5.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) IC RSS-247 §5.2	Power Spectral Density	Compliant

Note: 3.1 dBi antenna and 2.5 dBi antenna has same conducted power level setting, therefore, all the conducted results for both antenna were shared.

FCC §15.203 & IC RSS-Gen §8.3 - Antenna Requirements

Applicable Standard

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 for Licence-Exempt Radio Apparatus

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).

Antenna List and Details

Antenna Type/Pattern	Model number	Antenna Gain @ 2.4 GHz
PCB	-	3.1dBi (Max)
Dipole with I-PEX connector	RFA-02-L2H1	2.5dBi (Max)

FCC §15.247(i) & IC RSS §102 - RF Exposure

Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

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

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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field.

According to RSS-102 Issue 5 § (2.5.2)

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

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

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

MPE Prediction

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

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

Where:
S = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

MPE Results

Maximum tune-up peak output power at antenna input terminal (dBm):	21.0
Maximum tune-up peak output power at antenna input terminal (mW):	125.89
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	3.1
Maximum Antenna Gain (numeric):	2.04
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.051
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.051 mW/cm^2. Limit is 1.0 mW/cm^2.

Note: Since 3.1 dBi antenna and 2.5 dBi antenna has same conducted power level, therefore, RF exposure evaluation was based on the highest gain 3.1 dBi.

RF exposure evaluation exemption for IC

The max tune-up peak conducted output power is 21.0 dBm at 2437 MHz and the antenna gain is 3.1 dBi, so the e.i.r.p is 24.1 dBm (0.257W).

Exemption from Routine Evaluation Limit is:
$1.31 \times 10^{-2} f^{0.6834} = 1.31 \times 10^{-2} \times 2412^{0.6834} = 2.68 > 0.257$

So the device is compliance exemption from Routine Evaluation Limits –RF exposure Evaluation.

Result: The device meets exemption limits at greater than 20 cm distance as a mobile device specified in RSS-102 § 2.5.2.

Note: If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by §2.1093 and RSS-102 § 2.5.1.

FCC §15.207 & IC RSS-Gen §8.8 - AC Power Line Conducted Emissions

Applicable Standards

Per FCC §15.207 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 (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1 Decreases with the logarithm of the frequency.

Per RSS-Gen §8.8 AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.
Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 3 below. The more stringent limit applies at the frequency range boundaries.
The conducted emissions shall be measured in accordance with the reference publication mentioned in Section 3.

Table 3 - AC Power Lines Conducted Emission Limits		
Frequency range (MHz)	Conducted limit (dBµV)	
	Quasi-Peak	Average**
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Note: * The level decreases linearly with the logarithm of the frequency.
** A linear average detector is required.

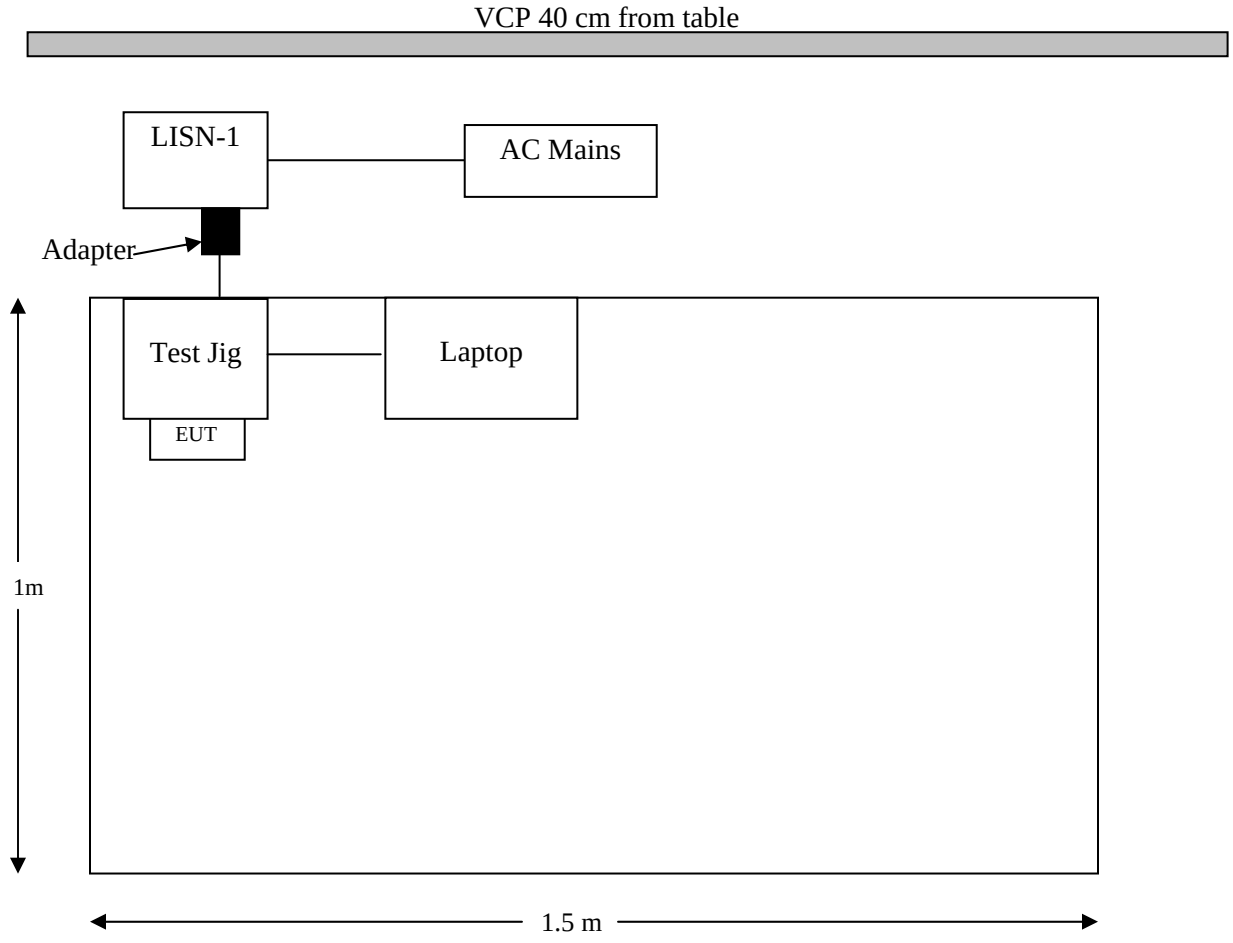
Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used was FCC §15.207/ IC RSS-247/RSS-Gen limits.

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

The switching power supply of the test jig was connected with LISN-1 which provided 120 V / 60 Hz AC power.

Test Setup Block Diagram



Test Procedure

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

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

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 dBµV = Indicated Reading (32.5 dBµV) + 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

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
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160131	2016-04-11	1 year
Keysight Technologies	RF Limiter	11867A	MY42242932	2015-12-15	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2016-03-09	1 year
Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101963	2015-07-15	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	Cal. Not Required	N/A
Hewlett-Packard	5 ft N-type RF cable	-	1268	Cal. Not Required	N/A

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

Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	47 %
ATM Pressure:	101.41 kPa

The testing was performed by Jin Yang on 2016-04-21.

Summary of Test Results

According to the recorded data, the EUT complied with FCC 15.207/IC RSS-247/RSS-Gen, and the worst margin reading of:

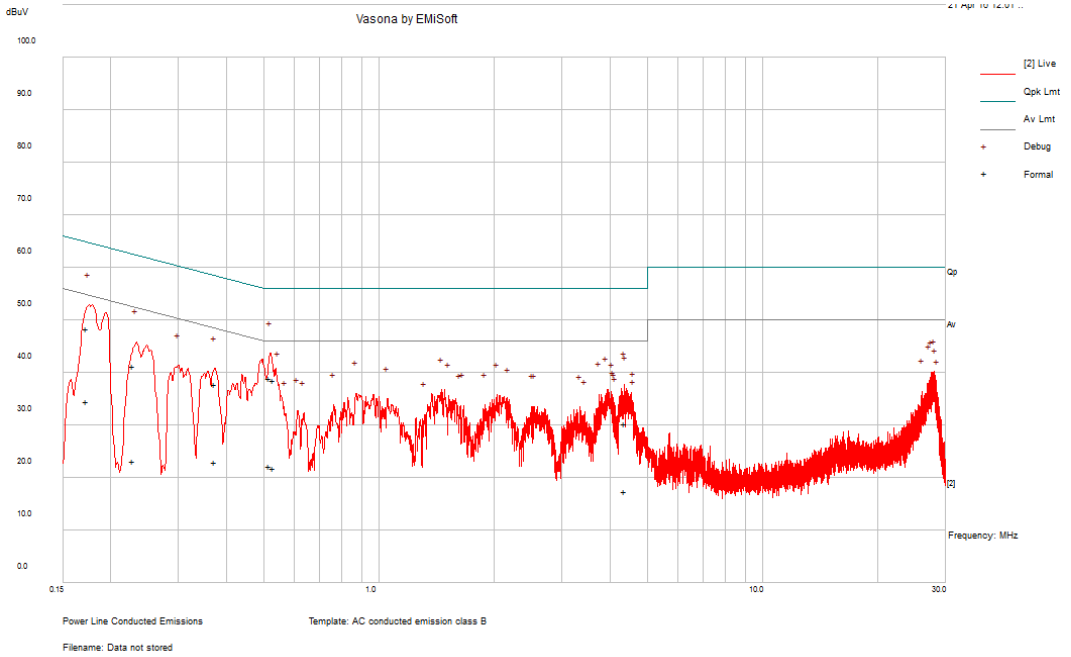
Connection: AC120 V/60 Hz (For PCB Antenna)			
Margin (dB)	**Frequency (MHz)**	**Conductor (Live/Neutral)**	**Range (MHz)**
-14.04	0.178596	Neutral	0.15-30

Connection: AC120 V/60 Hz (For Dipole Antenna)			
Margin (dB)	**Frequency (MHz)**	**Conductor (Live/Neutral)**	**Range (MHz)**
-14.17	0.186141	Neutral	0.15-30

Conducted Emissions Test Plots and Data

Transmitting Mode: (PCB Antenna)

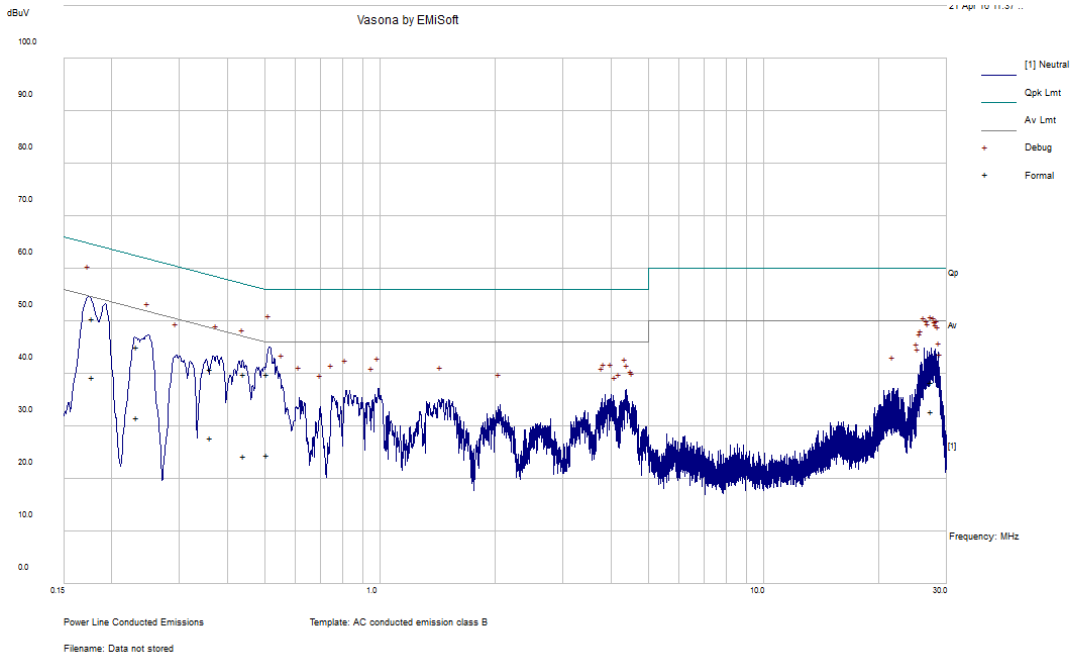
AC 120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.172815	48.33	Line	64.82	-16.49	QP
0.517032	38.91	Line	56.00	-17.09	QP
0.227925	41.18	Line	62.52	-21.34	QP
0.372465	37.90	Line	58.45	-20.55	QP
0.529983	38.59	Line	56.00	-17.41	QP
4.361594	30.34	Line	56.00	-25.66	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.172815	34.54	Line	54.82	-20.28	Ave.
0.517032	22.32	Line	46.00	-23.68	Ave.
0.227925	23.25	Line	52.52	-29.27	Ave.
0.372465	23.02	Line	48.45	-25.43	Ave.
0.529983	21.79	Line	46.00	-24.21	Ave.
4.361594	17.46	Line	46.00	-28.54	Ave.

AC 120 V, 60 Hz – Neutral

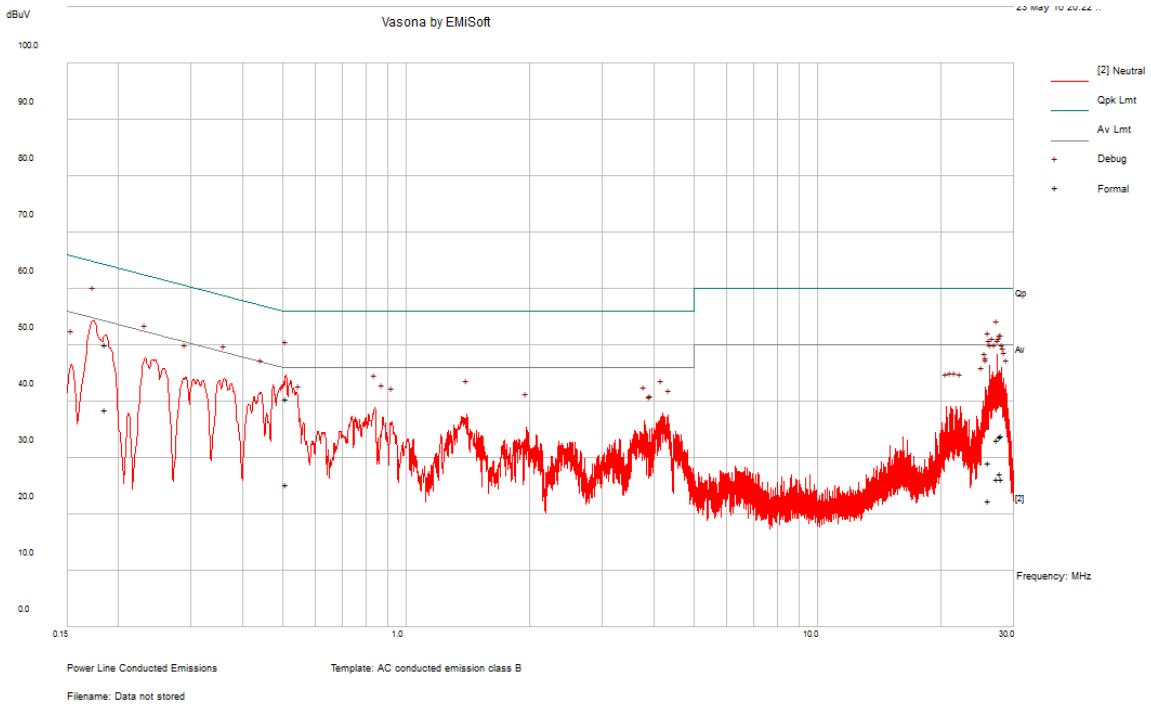


Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.178596	50.51	Neutral	64.55	-14.04	QP
0.506934	39.87	Neutral	56.00	-16.13	QP
0.232554	45.07	Neutral	62.36	-17.29	QP
0.443157	39.94	Neutral	57.00	-17.06	QP
0.362559	40.99	Neutral	58.67	-17.68	QP
27.33994	38.34	Neutral	60.00	-21.66	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.178596	39.26	Neutral	54.55	-15.29	Ave.
0.506934	24.59	Neutral	46.00	-21.41	Ave.
0.232554	31.70	Neutral	52.36	-20.66	Ave.
0.443157	24.31	Neutral	47.00	-22.69	Ave.
0.362559	27.80	Neutral	48.67	-20.87	Ave.
27.33994	32.83	Neutral	50.00	-17.17	Ave.

Transmitting Mode: (Dipole Antenna)

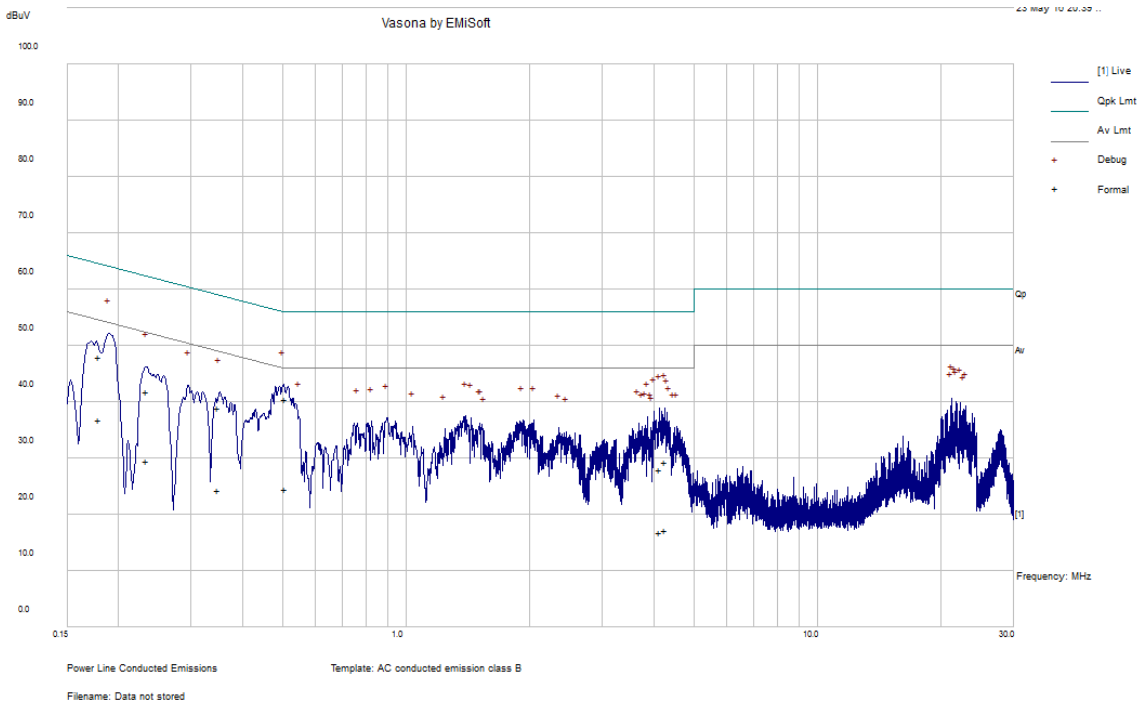
AC 120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.178998	47.95	Line	64.53	-16.58	QP
0.506742	40.58	Line	56.00	-15.42	QP
0.234042	41.80	Line	62.31	-20.51	QP
4.258469	29.34	Line	56.00	-26.66	QP
4.125341	28.07	Line	56.00	-27.93	QP
0.348468	38.97	Line	59.00	-20.02	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.178998	36.82	Line	54.53	-17.71	Ave.
0.506742	24.57	Line	46.00	-21.43	Ave.
0.234042	29.64	Line	52.31	-22.66	Ave.
4.258469	17.17	Line	46.00	-28.83	Ave.
4.125341	16.94	Line	46.00	-29.06	Ave.
0.348468	24.43	Line	49.00	-24.57	Ave.

AC120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.186141	50.04	Neutral	64.21	-14.17	QP
0.511308	40.48	Neutral	56.00	-15.52	QP
27.35306	33.30	Neutral	60.00	-26.70	QP
26.15788	29.12	Neutral	60.00	-30.88	QP
27.93741	33.74	Neutral	60.00	-26.26	QP
28.02268	33.92	Neutral	60.00	-26.08	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.186141	38.66	Neutral	54.21	-15.55	Ave.
0.511308	25.38	Neutral	46.00	-20.62	Ave.
27.35306	26.32	Neutral	50.00	-23.68	Ave.
26.15788	22.35	Neutral	50.00	-27.65	Ave.
27.93741	27.27	Neutral	50.00	-22.73	Ave.
28.02268	26.24	Neutral	50.00	-23.76	Ave.

FCC §15.247(d), §15.2095 & IC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

Applicable Standards

Per FCC §15.247 (d); §15.209; §15.205; IC RSS-247 §5.5; IC RSS-Gen §8.9, §8.10

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.

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.

Test Procedure

For the radiated emissions test, the switching power supply was 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 is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter for below 1GHz and 1.5 meter for above 1GHz above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

30 MHz-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

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 dBµV/m = Indicated Reading (32.5 dBµV) + 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

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2015-06-18	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2015-07-11	1 year
EMCO	Horn Antenna	3115	9511-4627	2016-01-15	1 year
Agilent	Pre-amplifier	8447D	2944A10187	2015-05-20	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	2015-08-05	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
IW Microwave	High Frequency Cable	DC-1438	SPS-2303-3840-SPS	2015-09-23	1 year
Hewlett-Packard	5 ft N-type RF cable	-	1268	2015-05-15	1 year
Hewlett	Pre-Amplifier	8449B	3008A01978	2015-12-11	1year
Keysight Technologies	RF Limiter	11867A	MY42243052	2016-01-18	2 years
Mini-Circuits	Reject Band Filter	2.4-2.5G	/	2016-01-18	1year

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.*

Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	46 %
ATM Pressure:	101.6 kPa

The testing was performed by Jin Yang on 2016-05-14 in 5m chamber 3.

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209, 15.247and IC RSS-247/RSS-Gen standard's radiated emissions limits, and had the worst margin of:

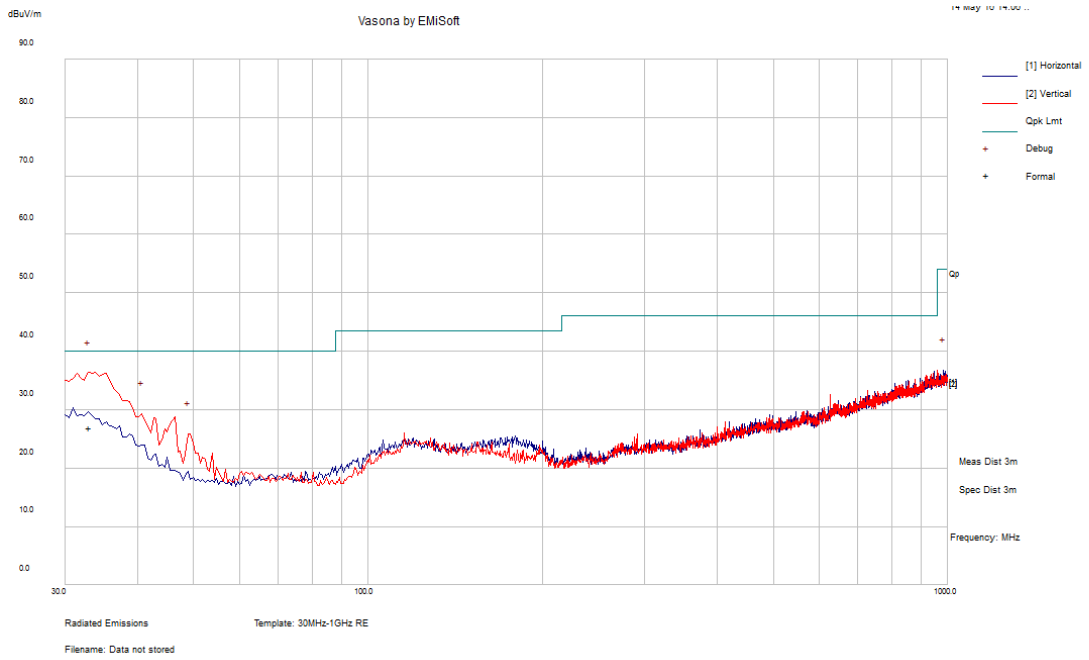
Mode: Transmitting (PCB Antenna)			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode**
-0.29	2483.5	Horizontal	802.11n20

Mode: Transmitting (Dipole Antenna)			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode**
-0.10	2483.5	Vertical	802.11n20

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

Test Results (PCB Antenna)

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



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments
32.91	36.39	185	V	70	40	-3.61	QP
40.67	29.37	100	V	0	40	-10.63	QP
48.915	25.92	100	V	0	40	-14.08	QP
983.995	36.75	200	H	0	54	-17.25	QP

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											
2412	68.49	52	287	V	28.45	5.22	0.00	102.16	-	-	Peak
2412	64.39	52	287	V	28.45	5.22	0.00	98.06	-	-	Ave
2412	70.96	149	135	H	29.04	5.22	0.00	105.22	-	-	Peak
2412	66.95	149	135	H	29.04	5.22	0.00	101.21	-	-	Ave
2390	29.35	52	287	V	28.45	5.22	0.00	63.02	74.00	-10.99	Peak
2390	17.02	52	287	V	28.45	5.22	0.00	50.69	54.00	-3.32	Ave
2390	29.70	149	135	H	29.04	5.22	0.00	63.96	74.00	-10.04	Peak
2390	17.22	149	135	H	29.04	5.22	0.00	51.48	54.00	-2.52	Ave
4824	54.81	77	300	V	32.42	7.76	38.01	56.98	74.00	-17.02	Peak
4824	50.54	77	300	V	32.42	7.76	38.01	52.71	54.00	-1.29	Ave
7236	46.59	215	290	V	36.16	9.71	37.53	54.93	74.00	-19.07	Peak
7236	32.00	215	290	V	36.16	9.71	37.53	40.34	54.00	-13.66	Ave
9648	47.64	5	110	V	37.17	11.37	38.00	58.18	74.00	-15.82	Peak
9648	32.82	5	110	V	37.17	11.37	38.00	43.36	54.00	-10.64	Ave
Middle Channel 2437 MHz											
2437	67.53	32	285	V	28.45	5.22	0.00	101.20	-	-	Peak
2437	63.61	32	285	V	28.45	5.22	0.00	97.28	-	-	Ave
2437	71.08	142	135	H	29.04	5.22	0.00	105.34	-	-	Peak
2437	67.56	142	135	H	29.04	5.22	0.00	101.82	-	-	Ave
4874	52.92	329	263	V	32.61	7.93	37.92	55.54	74.00	-18.46	Peak
4874	47.67	329	263	V	32.61	7.93	37.92	50.29	54.00	-3.71	Ave
7311	46.37	36	122	V	36.41	9.86	37.53	55.10	74.00	-18.90	Peak
7311	31.66	36	122	V	36.41	9.86	37.53	40.39	54.00	-13.61	Ave
9748	47.12	0	100	V	37.10	11.48	38.27	57.43	74.00	-16.57	Peak
9748	32.77	0	100	V	37.10	11.48	38.27	43.08	54.00	-10.92	Ave
High Channel 2462 MHz											
2462	67.51	38	301	V	28.91	5.47	0.00	101.90	-	-	Peak
2462	63.55	38	301	V	28.91	5.47	0.00	97.94	-	-	Ave
2462	69.88	229	135	H	29.41	5.47	0.00	104.77	-	-	Peak
2462	65.87	229	135	H	29.41	5.47	0.00	100.76	-	-	Ave
2483.5	29.85	38	301	V	28.91	5.47	0.00	64.24	74.00	-9.76	Peak
2483.5	17.21	38	301	V	28.91	5.47	0.00	51.60	54.00	-2.40	Ave
2483.5	30.86	229	135	H	29.41	5.47	0.00	65.75	74.00	-8.25	Peak
2483.5	17.43	229	135	H	29.41	5.47	0.00	52.32	54.00	-1.68	Ave
4924	52.65	100	291	V	32.61	7.93	37.85	55.34	74.00	-18.66	Peak
4924	47.04	100	291	V	32.61	7.93	37.85	49.73	54.00	-4.27	Ave
7386	46.23	22	112	V	36.31	9.86	37.62	54.77	74.00	-19.23	Peak
7386	31.94	22	112	V	36.31	9.86	37.62	40.48	54.00	-13.52	Ave
9848	46.58	8	100	V	37.18	11.59	38.38	56.97	74.00	-17.03	Peak
9848	32.57	8	100	V	37.18	11.59	38.38	42.96	54.00	-11.04	Ave

802.11g Mode

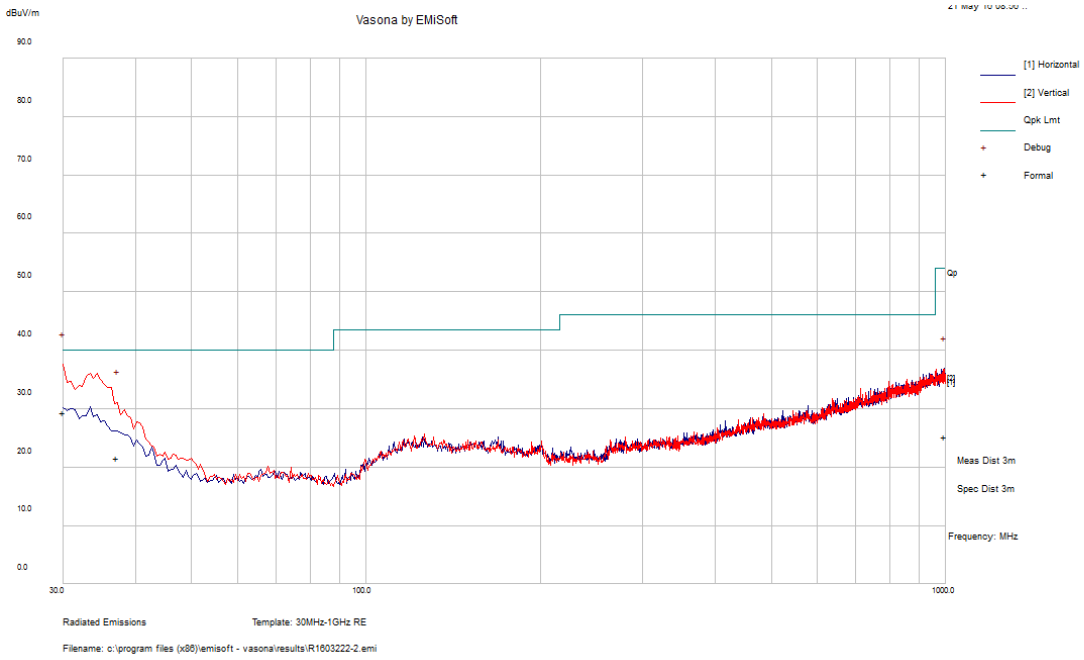
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	68.42	53	288	V	28.45	5.22	0.00	102.09	-	-	Peak
2412	59.17	53	288	V	28.45	5.22	0.00	92.84	-	-	Ave
2412	70.80	150	135	H	29.04	5.22	0.00	105.06	-	-	Peak
2412	61.59	150	135	H	29.04	5.22	0.00	95.85	-	-	Ave
2390	31.92	53	288	V	28.45	5.22	0.00	65.59	74.00	-8.41	Peak
2390	17.84	53	288	V	28.45	5.22	0.00	51.51	54.00	-2.50	Ave
2390	32.96	150	135	H	29.04	5.22	0.00	67.22	74.00	-6.78	Peak
2390	18.27	150	135	H	29.04	5.22	0.00	52.53	54.00	-1.47	Ave
4824	52.53	0	100	V	32.42	7.76	38.01	54.70	74.00	-19.30	Peak
4824	46.84	0	100	V	32.42	7.76	38.01	49.01	54.00	-4.99	Ave
7236	46.96	215	290	V	36.16	9.71	37.53	55.30	74.00	-18.70	Peak
7236	31.93	215	290	V	36.16	9.71	37.53	40.27	54.00	-13.73	Ave
9648	46.85	4	100	V	37.17	11.37	38.00	57.39	74.00	-16.61	Peak
9648	32.77	4	100	V	37.17	11.37	38.00	43.31	54.00	-10.69	Ave
Middle Channel 2437 MHz											
2437	67.30	32	285	V	28.45	5.22	0.00	100.97	-	-	Peak
2437	57.97	32	285	V	28.45	5.22	0.00	91.64	-	-	Ave
2437	71.08	142	135	H	29.04	5.22	0.00	105.34	-	-	Peak
2437	59.78	142	135	H	29.04	5.22	0.00	94.04	-	-	Ave
4874	52.23	329	263	V	32.61	7.93	37.92	54.85	74.00	-19.15	Peak
4874	46.91	329	263	V	32.61	7.93	37.92	49.53	54.00	-4.47	Ave
7311	46.04	35	199	V	36.41	9.86	37.53	54.77	74.00	-19.23	Peak
7311	31.63	35	199	V	36.41	9.86	37.53	40.36	54.00	-13.64	Ave
9748	47.31	2	100	V	37.10	11.48	38.27	57.62	74.00	-16.38	Peak
9748	32.76	2	100	V	37.10	11.48	38.27	43.07	54.00	-10.93	Ave
High Channel 2462 MHz											
2462	67.48	38	300	V	28.91	5.47	0.00	101.87	-	-	Peak
2462	58.26	38	300	V	28.91	5.47	0.00	92.65	-	-	Ave
2462	70.67	229	135	H	29.41	5.47	0.00	105.56	-	-	Peak
2462	61.58	229	135	H	29.41	5.47	0.00	96.47	-	-	Ave
2483.5	33.59	38	300	V	28.91	5.47	0.00	67.98	74.00	-6.02	Peak
2483.5	17.98	38	300	V	28.91	5.47	0.00	52.37	54.00	-1.63	Ave
2483.5	35.32	229	135	H	29.41	5.47	0.00	70.21	74.00	-3.79	Peak
2483.5	18.69	229	135	H	29.41	5.47	0.00	53.58	54.00	-0.42	Ave
4924	52.84	0	100	V	32.61	7.93	37.85	55.53	74.00	-18.47	Peak
4924	47.20	0	100	V	32.61	7.93	37.85	49.89	54.00	-4.11	Ave
7386	46.51	22	105	V	36.31	9.86	37.62	55.05	74.00	-18.95	Peak
7386	31.95	22	105	V	36.31	9.86	37.62	40.49	54.00	-13.51	Ave
9848	46.76	2	102	V	37.18	11.59	38.38	57.15	74.00	-16.85	Peak
9848	32.59	2	102	V	37.18	11.59	38.38	42.98	54.00	-11.02	Ave

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											
2412	68.11	51	286	V	28.45	5.22	0.00	101.78	-	-	Peak
2412	58.80	51	286	V	28.45	5.22	0.00	92.47	-	-	Ave
2412	70.67	150	134	H	29.04	5.22	0.00	104.93	-	-	Peak
2412	61.29	150	134	H	29.04	5.22	0.00	95.55	-	-	Ave
2390	36.70	51	286	V	28.45	5.22	0.00	70.37	74.00	-3.64	Peak
2390	18.66	51	286	V	28.45	5.22	0.00	52.33	54.00	-1.68	Ave
2390	37.23	150	134	H	29.04	5.22	0.00	71.49	74.00	-2.51	Peak
2390	19.15	150	134	H	29.04	5.22	0.00	53.41	54.00	-0.59	Ave
4824	52.30	77	300	V	32.42	7.76	38.01	54.48	74.00	-19.52	Peak
4824	46.86	77	300	V	32.42	7.76	38.01	49.03	54.00	-4.97	Ave
7236	46.42	36	127	V	36.16	9.71	37.53	54.76	74.00	-19.24	Peak
7236	31.83	36	127	V	36.16	9.71	37.53	40.17	54.00	-13.83	Ave
9648	47.29	0	100	V	37.17	11.37	38.00	57.83	74.00	-16.17	Peak
9648	32.76	0	100	V	37.17	11.37	38.00	43.30	54.00	-10.70	Ave
Middle Channel 2437 MHz											
2437	66.86	32	286	V	28.45	5.22	0.00	100.53	-	-	Peak
2437	57.48	32	286	V	28.45	5.22	0.00	91.15	-	-	Ave
2437	70.83	142	136	H	29.04	5.22	0.00	105.09	-	-	Peak
2437	61.42	142	136	H	29.04	5.22	0.00	95.68	-	-	Ave
4874	52.11	329	263	V	32.61	7.93	37.92	54.73	74.00	-19.27	Peak
4874	46.83	329	263	V	32.61	7.93	37.92	49.45	54.00	-4.55	Ave
7311	45.98	34	125	V	36.41	9.86	37.53	54.71	74.00	-19.29	Peak
7311	31.66	34	125	V	36.41	9.86	37.53	40.39	54.00	-13.61	Ave
9748	46.94	0	105	V	37.10	11.48	38.27	57.25	74.00	-16.75	Peak
9748	32.71	0	105	V	37.10	11.48	38.27	43.02	54.00	-10.98	Ave
High Channel 2462 MHz											
2462	67.36	38	300	V	28.91	5.47	0.00	101.75	-	-	Peak
2462	58.06	38	300	V	28.91	5.47	0.00	92.45	-	-	Ave
2462	70.45	229	135	H	29.41	5.47	0.00	105.34	-	-	Peak
2462	61.28	229	135	H	29.41	5.47	0.00	96.17	-	-	Ave
2483.5	32.91	38	300	V	28.91	5.47	0.00	67.30	74.00	-6.70	Peak
2483.5	18.34	38	300	V	28.91	5.47	0.00	52.73	54.00	-1.27	Ave
2483.5	36.87	229	135	H	29.41	5.47	0.00	71.76	74.00	-2.24	Peak
2483.5	18.82	229	135	H	29.41	5.47	0.00	53.71	54.00	-0.29	Ave
4924	52.51	0	100	V	32.61	7.93	37.85	55.20	74.00	-18.80	Peak
4924	47.24	0	100	V	32.61	7.93	37.85	49.93	54.00	-4.07	Ave
7386	46.49	28	144	V	36.31	9.86	37.62	55.03	74.00	-18.97	Peak
7386	31.92	28	144	V	36.31	9.86	37.62	40.46	54.00	-13.54	Ave
9848	47.02	0	102	V	37.18	11.59	38.38	57.41	74.00	-16.59	Peak
9848	32.62	0	102	V	37.18	11.59	38.38	43.01	54.00	-10.99	Ave

Test Results: (Dipole Antenna)

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



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments
30.02	29.32	149	V	351	40	-10.68	QP
37.08	21.57	188	V	278	40	-18.43	QP
996.15	25.19	200	H	167	54	-28.81	QP

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											
2412	70.96	193	133	V	28.45	5.22	0.00	104.63	-	-	Peak
2412	66.81	193	133	V	28.45	5.22	0.00	100.48	-	-	Ave
2412	60.02	99	130	H	29.04	5.22	0.00	94.28	-	-	Peak
2412	57.19	99	130	H	29.04	5.22	0.00	91.45	-	-	Ave
2390	29.48	193	133	V	28.45	5.22	0.00	63.15	74.00	-10.86	Peak
2390	17.02	193	133	V	28.45	5.22	0.00	50.69	54.00	-3.32	Ave
2390	28.2	99	130	H	29.04	5.22	0.00	62.46	74.00	-11.54	Peak
2390	16.18	99	130	H	29.04	5.22	0.00	50.44	54.00	-3.56	Ave
4824	45.28	89	283	V	32.42	7.76	38.01	47.45	74.00	-26.55	Peak
4824	39.19	89	283	V	32.42	7.76	38.01	41.36	54.00	-12.64	Ave
7236	43.18	0	300	V	36.16	9.71	37.53	51.52	74.00	-22.48	Peak
7236	31.92	0	300	V	36.16	9.71	37.53	40.26	54.00	-13.74	Ave
9648	43.18	182	280	V	37.17	11.37	38.00	53.72	74.00	-20.28	Peak
9648	32.67	182	280	V	37.17	11.37	38.00	43.21	54.00	-10.79	Ave
Middle Channel 2437 MHz											
2437	70.66	213	131	V	28.45	5.22	0.00	104.33	-	-	Peak
2437	67.7	213	131	V	28.45	5.22	0.00	101.37	-	-	Ave
2437	59.67	102	127	H	29.04	5.22	0.00	93.93	-	-	Peak
2437	56.55	102	127	H	29.04	5.22	0.00	90.81	-	-	Ave
4874	45.76	90	274	V	32.61	7.93	37.92	48.38	74.00	-25.62	Peak
4874	39.21	90	274	V	32.61	7.93	37.92	41.83	54.00	-12.17	Ave
7311	42.19	36	122	V	36.41	9.86	37.53	50.93	74.00	-23.07	Peak
7311	31.26	36	122	V	36.41	9.86	37.53	40.00	54.00	-14.00	Ave
9748	43.07	0	100	V	37.1	11.48	38.27	53.38	74.00	-20.62	Peak
9748	32.28	0	100	V	37.1	11.48	38.27	42.59	54.00	-11.41	Ave
High Channel 2462 MHz											
2462	70.92	49	126	V	28.91	5.47	0.00	105.3	-	-	Peak
2462	68.12	49	126	V	28.91	5.47	0.00	102.5	-	-	Ave
2462	58.24	215	126	H	29.41	5.47	0.00	93.12	-	-	Peak
2462	55.25	215	126	H	29.41	5.47	0.00	90.13	-	-	Ave
2483.5	28.37	49	126	V	28.91	5.47	0.00	62.75	74.00	-11.25	Peak
2483.5	17.6	49	126	V	28.91	5.47	0.00	51.98	54.00	-2.02	Ave
2483.5	27.53	215	126	H	29.41	5.47	0.00	62.41	74.00	-11.59	Peak
2483.5	16.02	215	126	H	29.41	5.47	0.00	50.9	54.00	-3.10	Ave
4924	44.66	92	300	V	32.61	7.93	37.85	47.35	74.00	-26.65	Peak
4924	36.22	92	300	V	32.61	7.93	37.85	38.91	54.00	-15.09	Ave
7386	41.81	22	112	V	36.31	9.86	37.62	50.36	74.00	-23.64	Peak
7386	30.83	22	112	V	36.31	9.86	37.62	39.38	54.00	-14.62	Ave
9848	42.57	10	102	V	37.18	11.59	38.38	52.96	74.00	-21.04	Peak
9848	32.01	10	102	V	37.18	11.59	38.38	42.4	54.00	-11.60	Ave

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											
2412	70.87	193	133	V	28.45	5.22	0.00	104.54	-	-	Peak
2412	63.09	193	133	V	28.45	5.22	0.00	96.76	-	-	Ave
2412	59.42	99	130	H	29.04	5.22	0.00	93.68	-	-	Peak
2412	51.52	99	130	H	29.04	5.22	0.00	85.78	-	-	Ave
2390	31.38	193	133	V	28.45	5.22	0.00	65.05	74.00	-8.95	Peak
2390	19.5	193	133	V	28.45	5.22	0.00	53.17	54.00	-0.83	Ave
2390	27.51	99	130	H	29.04	5.22	0.00	61.77	74.00	-12.23	Peak
2390	16.16	99	130	H	29.04	5.22	0.00	50.42	54.00	-3.58	Ave
4824	44.18	283	89	V	32.42	7.76	38.01	46.35	74.00	-27.65	Peak
4824	35.82	283	89	V	32.42	7.76	38.01	37.99	54.00	-16.01	Ave
7236	42.44	215	290	V	36.16	9.71	37.53	50.78	74.00	-23.22	Peak
7236	31.97	215	290	V	36.16	9.71	37.53	40.31	54.00	-13.69	Ave
9648	43.16	0	100	V	37.17	11.37	38	53.7	74.00	-20.3	Peak
9648	32.46	0	100	V	37.17	11.37	38	43.00	54.00	-11.00	Ave
Middle Channel 2437 MHz											
2437	70.43	213	131	V	28.45	5.22	0.00	104.1	-	-	Peak
2437	62.76	213	131	V	28.45	5.22	0.00	96.43	-	-	Ave
2437	59.19	102	127	H	29.04	5.22	0.00	93.45	-	-	Peak
2437	51.51	102	127	H	29.04	5.22	0.00	85.77	-	-	Ave
4874	44.18	90	274	V	32.61	7.93	37.92	46.80	74.00	-27.20	Peak
4874	34.46	90	274	V	32.61	7.93	37.92	37.08	54.00	-16.92	Ave
7311	42.81	38	200	V	36.41	9.86	37.53	51.55	74.00	-22.45	Peak
7311	31.26	38	200	V	36.41	9.86	37.53	40.00	54.00	-14.00	Ave
9748	43.03	5	106	V	37.1	11.48	38.27	53.34	74.00	-20.66	Peak
9748	32.24	5	106	V	37.1	11.48	38.27	42.55	54.00	-11.45	Ave
High Channel 2462 MHz											
2462	71.33	49	126	V	28.91	5.47	0.00	105.71	-	-	Peak
2462	63.43	49	126	V	28.91	5.47	0.00	97.81	-	-	Ave
2462	58.34	215	126	H	29.41	5.47	0.00	93.22	-	-	Peak
2462	50.34	215	126	H	29.41	5.47	0.00	85.22	-	-	Ave
2483.5	34.44	49	126	V	28.91	5.47	0.00	68.82	74.00	-5.18	Peak
2483.5	19.49	49	126	V	28.91	5.47	0.00	53.87	54.00	-0.13	Ave
2483.5	27.83	215	126	H	29.41	5.47	0.00	62.71	74.00	-11.29	Peak
2483.5	16.24	215	126	H	29.41	5.47	0.00	51.12	54.00	-2.88	Ave
4924	44.35	92	300	V	32.61	7.93	37.85	47.04	74.00	-26.96	Peak
4924	34.89	92	300	V	32.61	7.93	37.85	37.58	54.00	-16.42	Ave
7386	41.96	18	108	V	36.31	9.86	37.62	50.51	74.00	-23.49	Peak
7386	30.78	18	108	V	36.31	9.86	37.62	39.33	54.00	-14.67	Ave
9848	43.17	10	110	V	37.18	11.59	38.38	53.56	74.00	-20.44	Peak
9848	31.93	10	110	V	37.18	11.59	38.38	42.32	54.00	-11.68	Ave

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											
2412	70.54	193	133	V	28.45	5.22	0.00	104.21	-	-	Peak
2412	62.65	193	133	V	28.45	5.22	0.00	96.32	-	-	Ave
2412	59.06	99	130	H	29.04	5.22	0.00	93.32	-	-	Peak
2412	51.12	99	130	H	29.04	5.22	0.00	85.38	-	-	Ave
2390	36.55	193	133	V	28.45	5.22	0.00	70.22	74.00	-3.79	Peak
2390	20.19	193	133	V	28.45	5.22	0.00	53.86	54.00	-0.14	Ave
2390	27.84	99	130	H	29.04	5.22	0.00	62.10	74.00	-11.90	Peak
2390	16.28	99	130	H	29.04	5.22	0.00	50.54	54.00	-3.46	Ave
4824	48.85	89	243	V	32.42	7.76	38.01	51.02	74.00	-22.98	Peak
4824	37.13	77	300	V	32.42	7.76	38.01	39.30	54.00	-14.70	Ave
7236	42.85	38	125	V	36.16	9.71	37.53	51.19	74.00	-22.81	Peak
7236	32.00	38	125	V	36.16	9.71	37.53	40.34	54.00	-13.66	Ave
9648	43.78	3	104	V	37.17	11.37	38.00	54.32	74.00	-19.68	Peak
9648	32.56	3	104	V	37.17	11.37	38.00	43.10	54.00	-10.90	Ave
Middle Channel 2437 MHz											
2437	70.21	213	131	V	28.45	5.22	0.00	103.88	-	-	Peak
2437	62.38	213	131	V	28.45	5.22	0.00	96.05	-	-	Ave
2437	59.56	102	127	H	29.04	5.22	0.00	93.82	-	-	Peak
2437	50.33	102	127	H	29.04	5.22	0.00	84.59	-	-	Ave
4874	44.39	90	274	V	32.61	7.93	37.92	47.01	74.00	-26.99	Peak
4874	34.27	90	274	V	32.61	7.93	37.92	36.89	54.00	-17.11	Ave
7311	41.53	34	125	V	36.41	9.86	37.53	50.26	74.00	-23.74	Peak
7311	31.19	34	125	V	36.41	9.86	37.53	39.92	54.00	-14.08	Ave
9748	43.28	5	103	V	37.10	11.48	38.27	53.59	74.00	-20.41	Peak
9748	32.06	5	103	V	37.10	11.48	38.27	42.37	54.00	-11.63	Ave
High Channel 2462 MHz											
2462	71.58	49	126	V	28.91	5.47	0.00	105.97	-	-	Peak
2462	63.79	49	126	V	28.91	5.47	0.00	98.18	-	-	Ave
2462	57.83	215	126	H	29.41	5.47	0.00	92.72	-	-	Peak
2462	50.18	215	126	H	29.41	5.47	0.00	85.07	-	-	Ave
2483.5	36.79	49	126	V	28.91	5.47	0.00	71.18	74.00	-2.82	Peak
2483.5	19.51	49	126	V	28.91	5.47	0.00	53.90	54.00	-0.10	Ave
2483.5	27.45	215	126	H	29.41	5.47	0.00	62.34	74.00	-11.66	Peak
2483.5	16.29	215	126	H	29.41	5.47	0.00	51.18	54.00	-2.82	Ave
4924	44.62	92	300	V	32.61	7.93	37.85	47.31	74.00	-26.69	Peak
4924	34.91	92	300	V	32.61	7.93	37.85	37.60	54.00	-16.40	Ave
7386	41.36	28	144	V	36.31	9.86	37.62	49.90	74.00	-24.10	Peak
7386	30.84	28	144	V	36.31	9.86	37.62	39.38	54.00	-14.62	Ave
9848	42.70	0	100	V	37.18	11.59	38.38	53.09	74.00	-20.91	Peak
9848	31.98	0	100	V	37.18	11.59	38.38	42.37	54.00	-11.63	Ave

FCC §15.247(d) & IC RSS-247 §5.5 - Spurious Emissions at Antenna Terminals

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).

For 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.

Test Procedure

The measurements are based on ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-04-07	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10 dB 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.*

Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.4 kPa

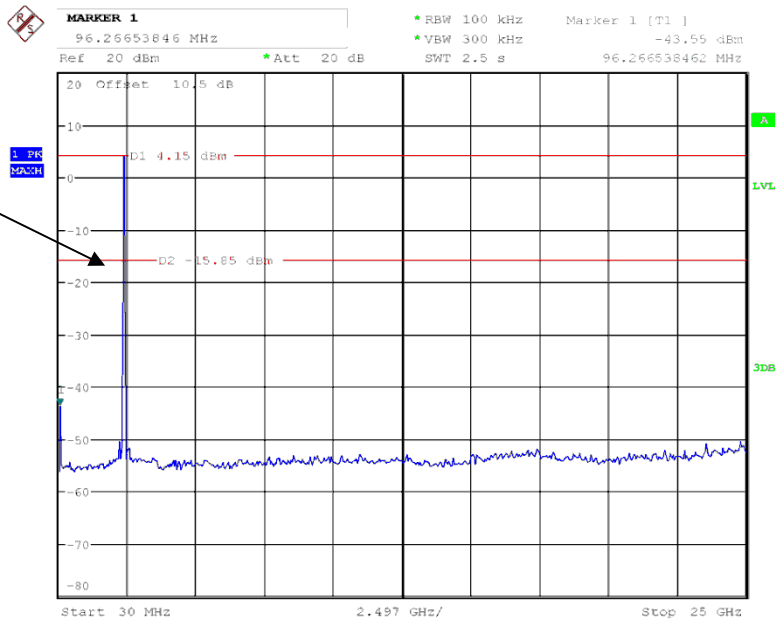
The testing was performed by Jin Yang on 2016-04-28 at RF site.

Test Results

Compliant, Please refer to the following plots

802.11b Low Channel

Fundamental



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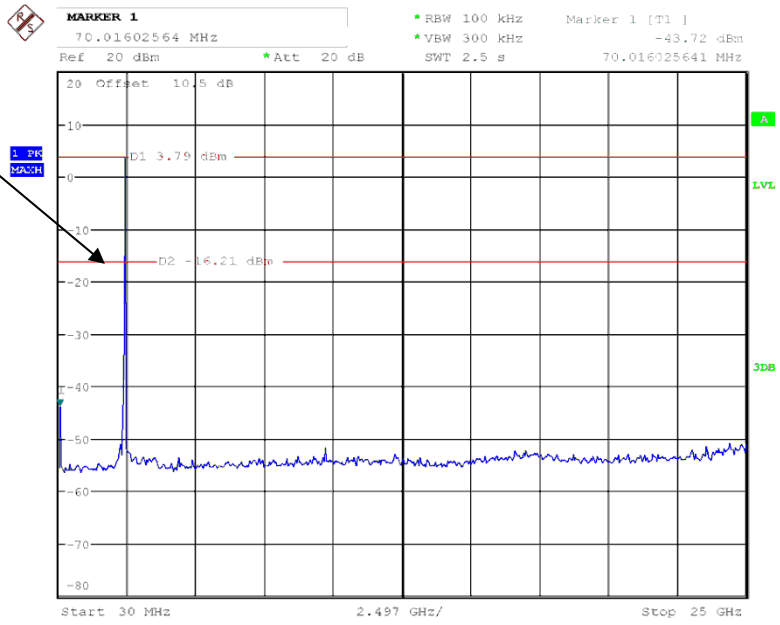
802.11b Middle Channel

Fundamental



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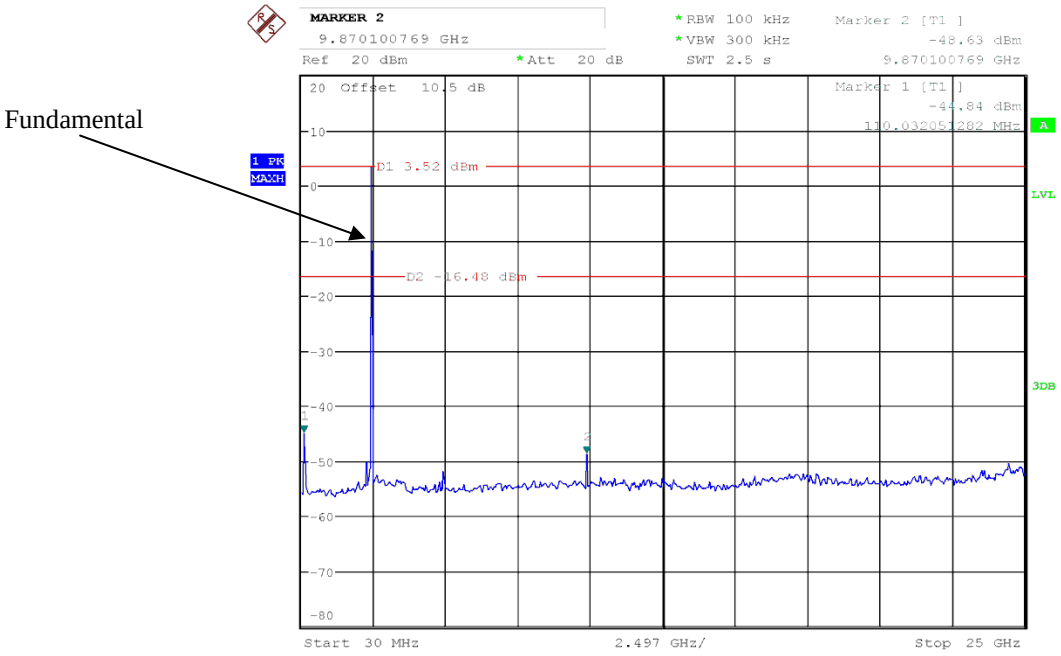
802.11b High Channel



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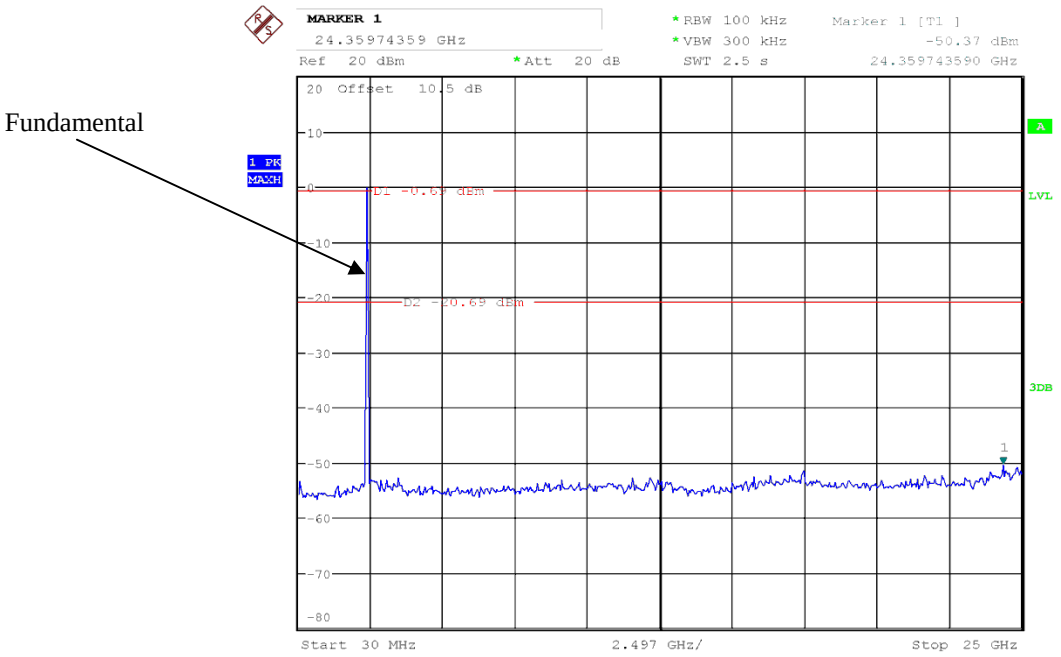
802.11g Low Channel



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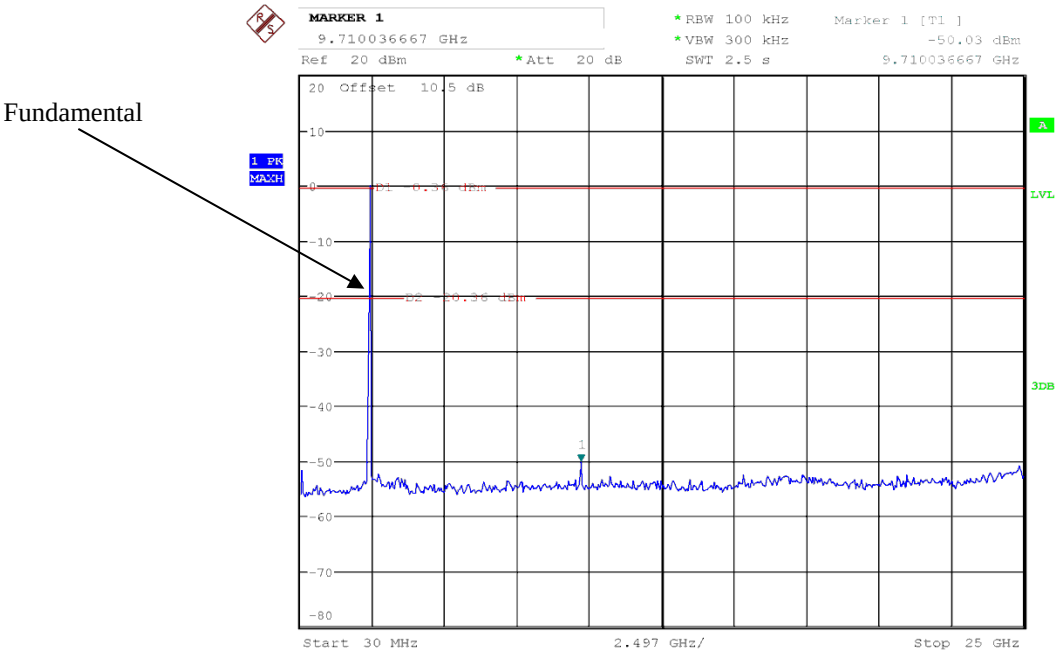
802.11g Middle Channel



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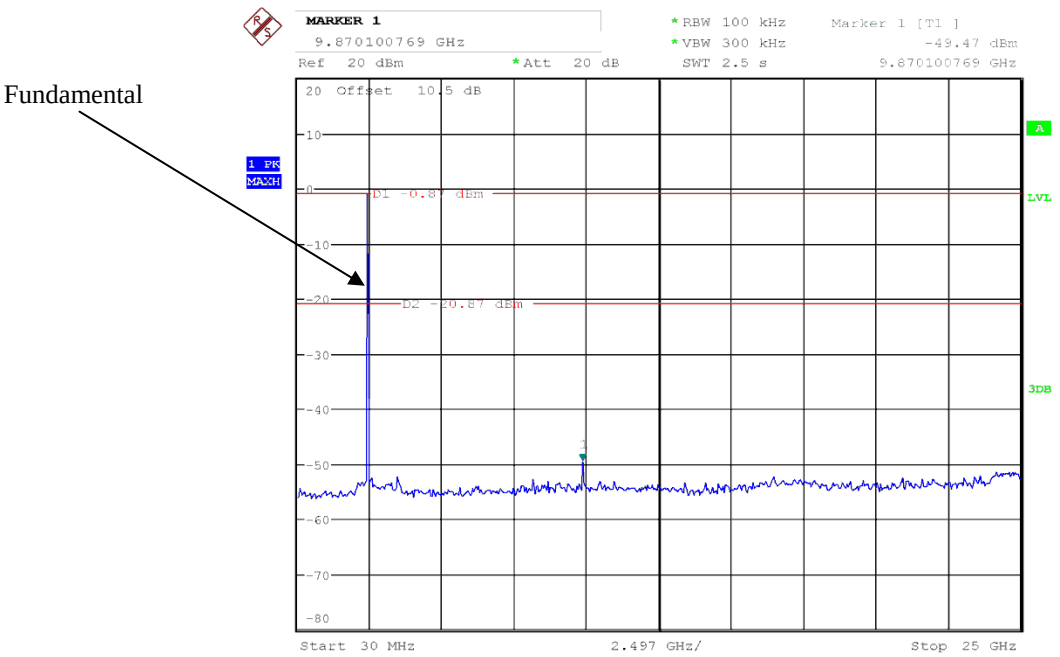
802.11g High Channel



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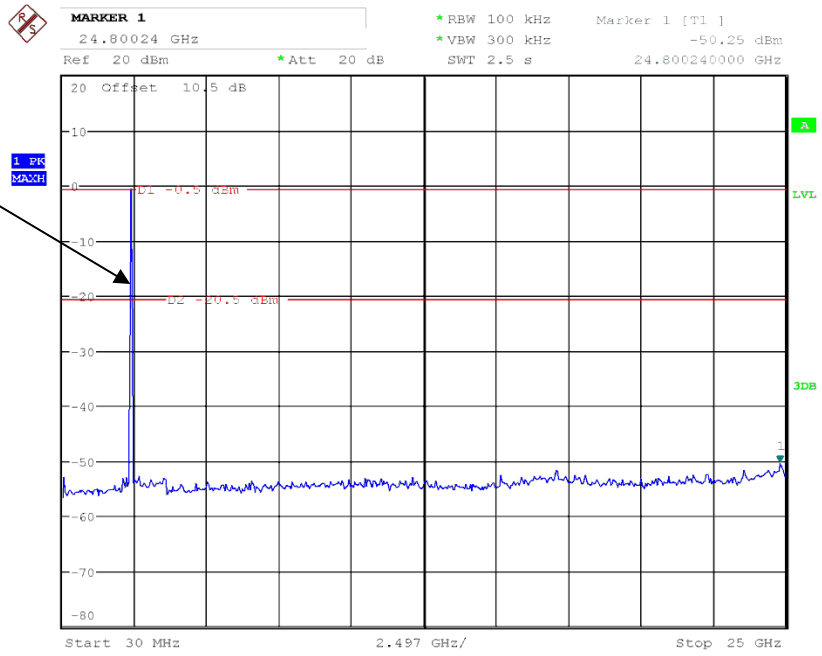
802.11n ht20 Low Channel

Fundamental



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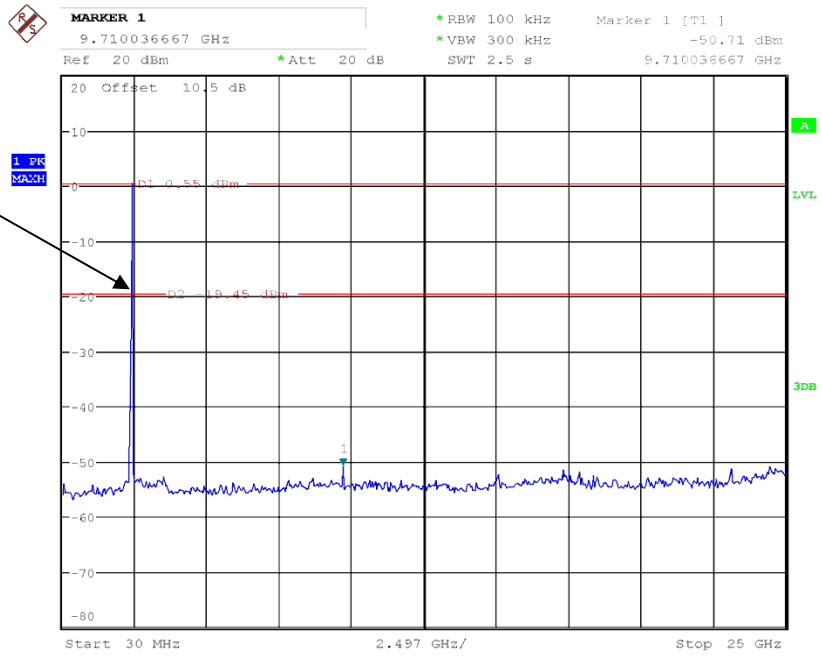
802.11n ht20 Middle Channel

Fundamental



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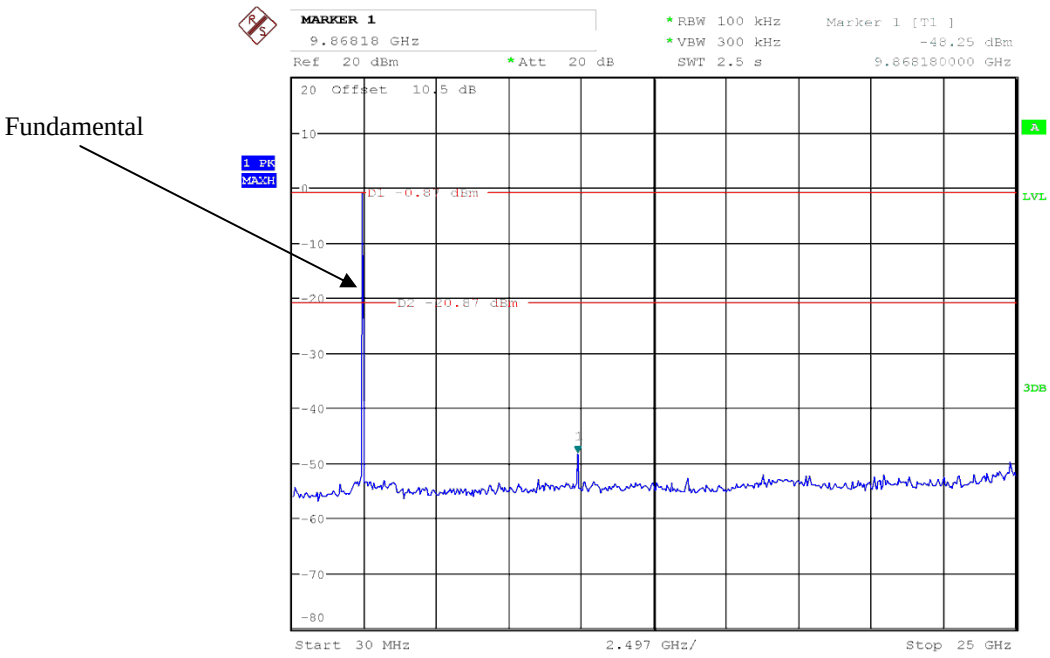
802.11n ht20 High Channel



FCC §15.247(a)(2) & IC RSS-247 §5.2 & RSS-Gen §6.6 - 6 dB & 99% Occupied Bandwidth

Applicable Standards

According to FCC §15.247(a)(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

According to IC RSS-247 5.2 (1), DTSs include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The minimum 6 dB bandwidth shall be 500 kHz for bands 902 -928 MHz and 2400 – 2483.5 MHz.

Measurement Procedure

The measurements are based on ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-04-07	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10 dB 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.*

Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.4 kPa

The testing was performed by Jin Yang on 2016-04-28 at RF site.

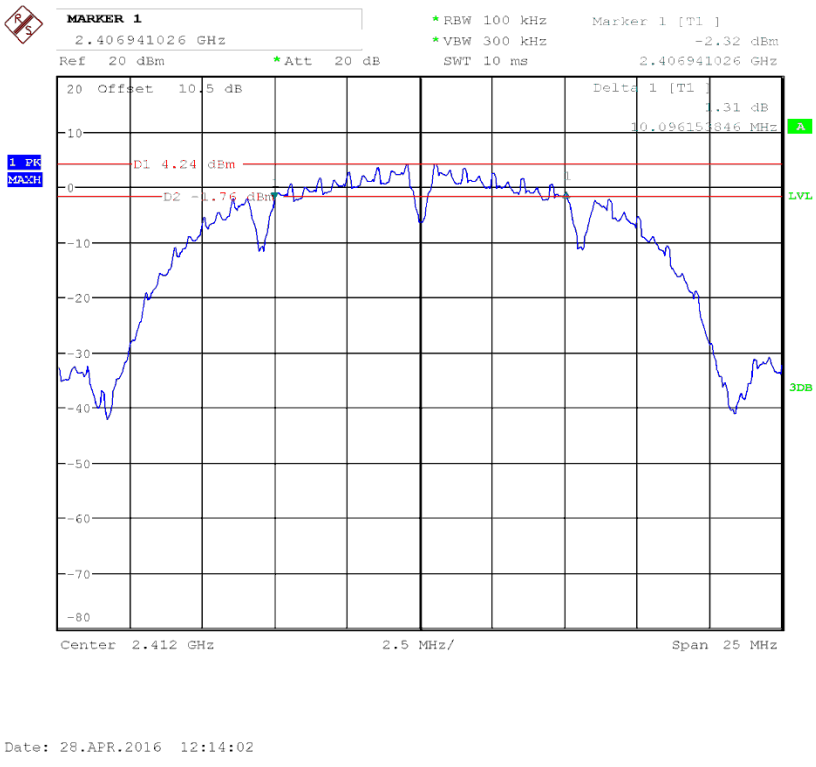
Test Results

Compliant, Please refer to the following table and plots

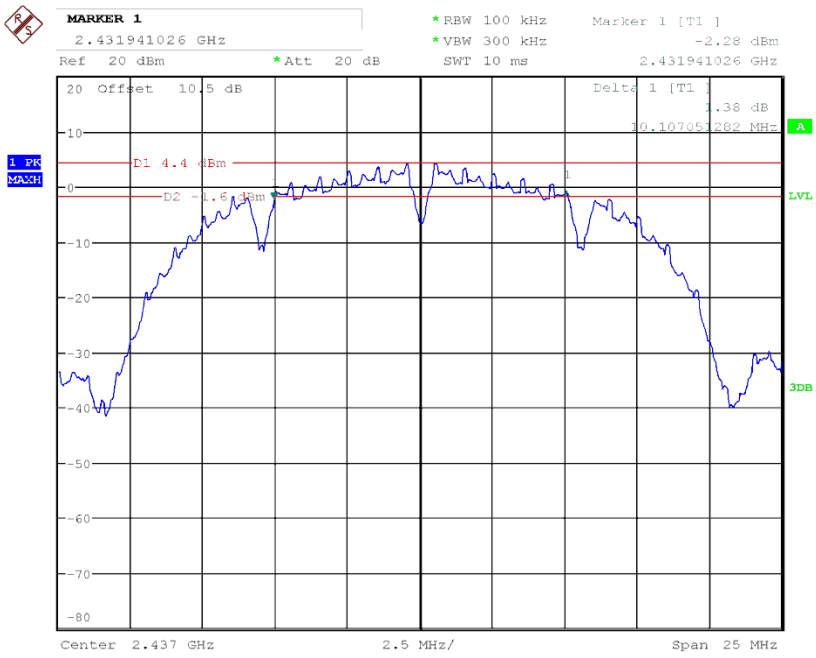
Radio Mode	Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	Limit (MHz)
802.11b	Low	2412	16.16	10.10	⩾0.5
	Middle	2437	16.16	10.10	⩾0.5
	High	2462	16.16	10.10	⩾0.5
802.11g	Low	2412	16.47	16.86	⩾0.5
	Middle	2437	16.47	16.79	⩾0.5
	High	2462	16.47	16.86	⩾0.5
802.11n20	Low	2412	17.05	17.56	⩾0.5
	Middle	2437	17.05	17.50	⩾0.5
	High	2462	16.99	17.44	⩾0.5

6 dB Bandwidth

802.11b Low Channel



802.11b Middle Channel



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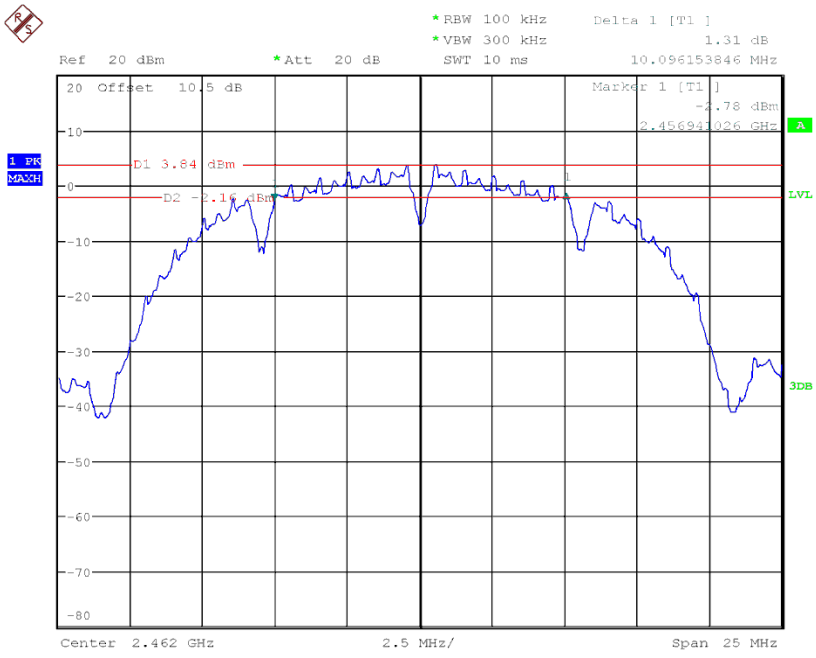
802.11b High Channel



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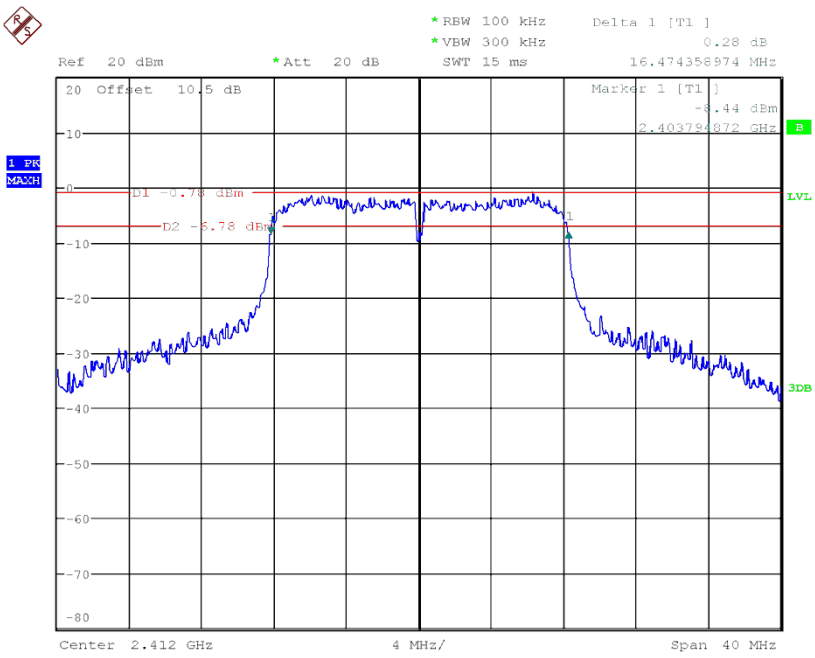
802.11g Low Channel



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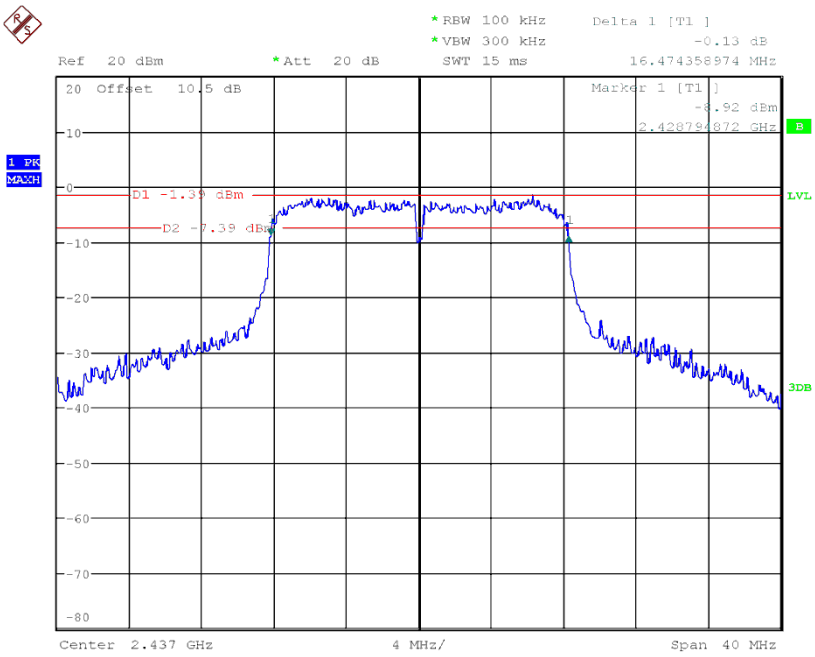
802.11g Middle Channel



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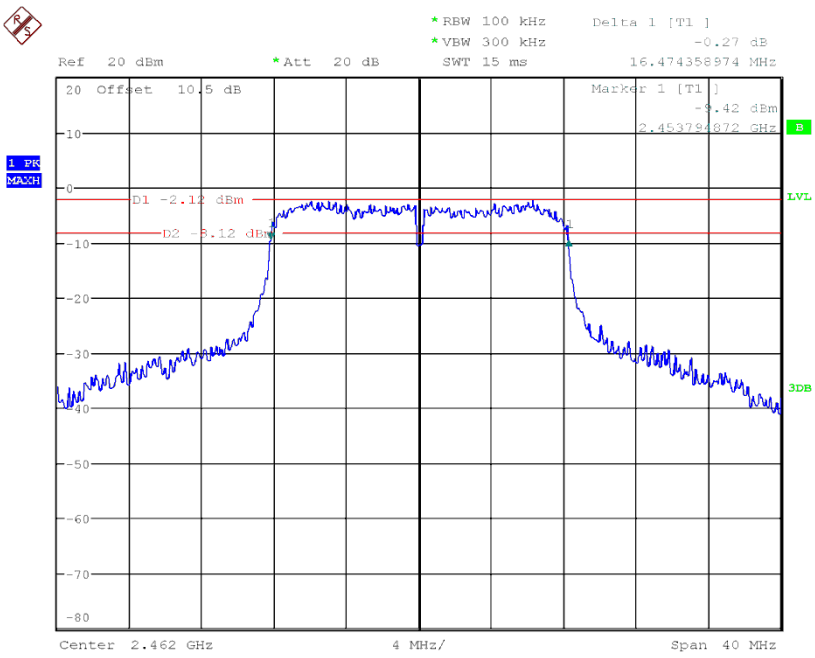
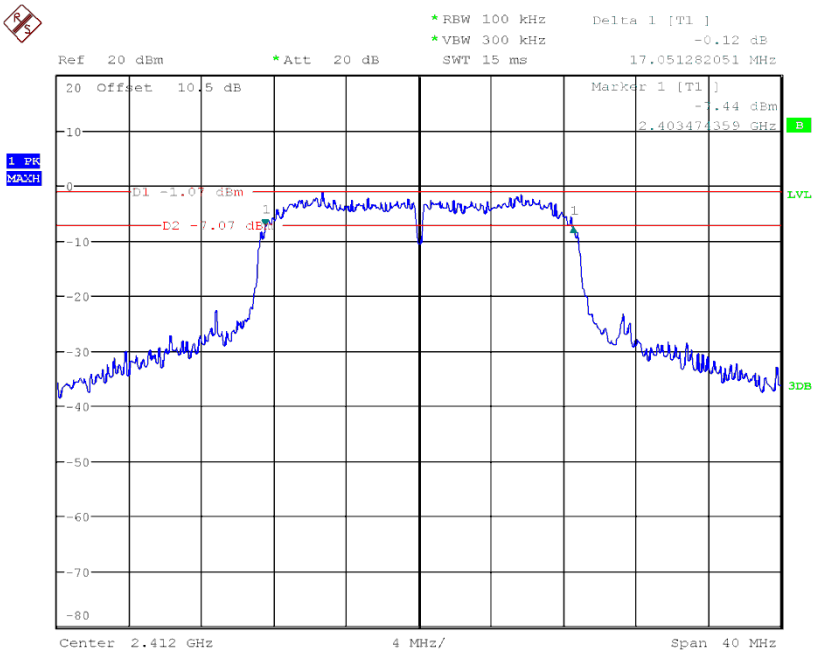
802.11g High Channel



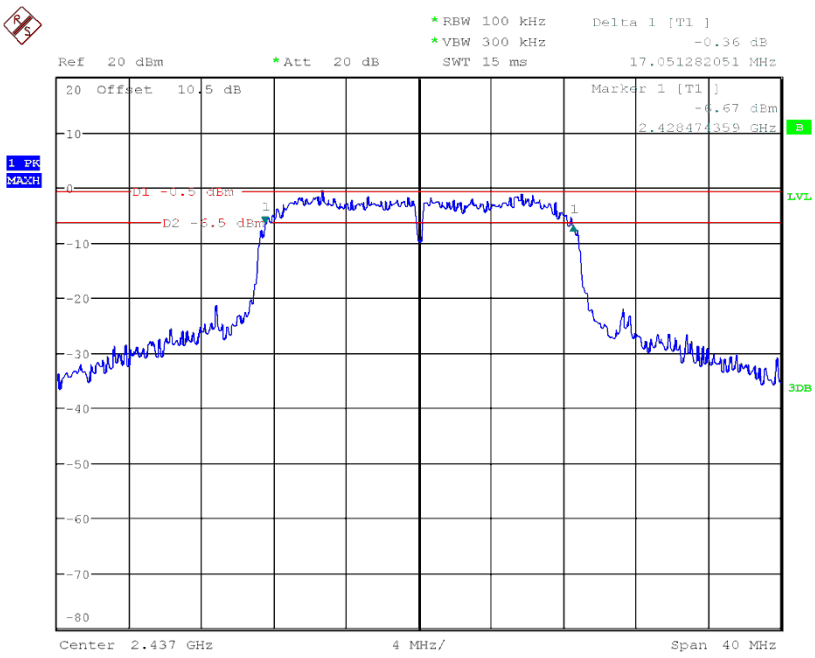
Date: 28.APR.2016 20:48:05

802.11n ht20 Low Channel



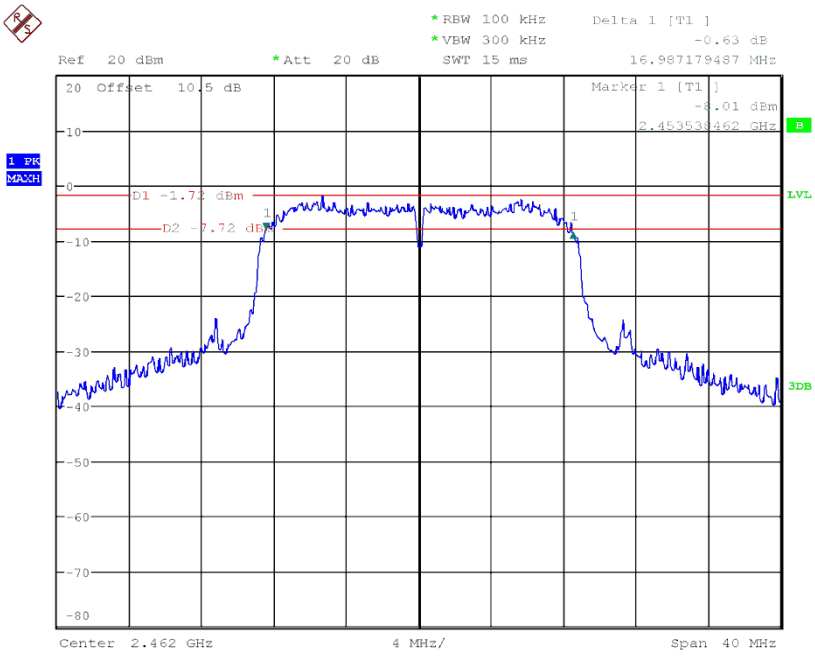
Date: 28.APR.2016 21:11:27

802.11n ht20 Middle Channel



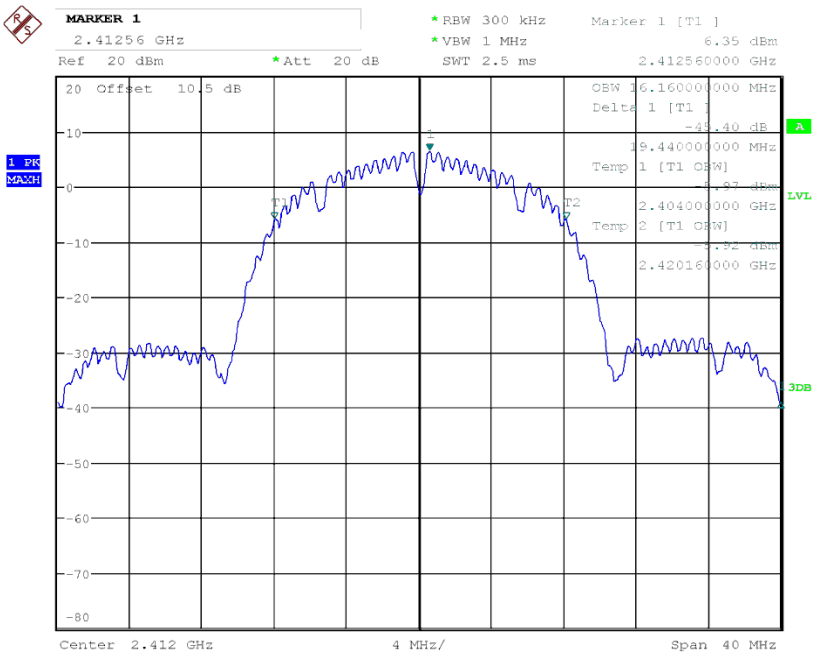
Date: 28.APR.2016 21:08:28

802.11n ht20 High Channel



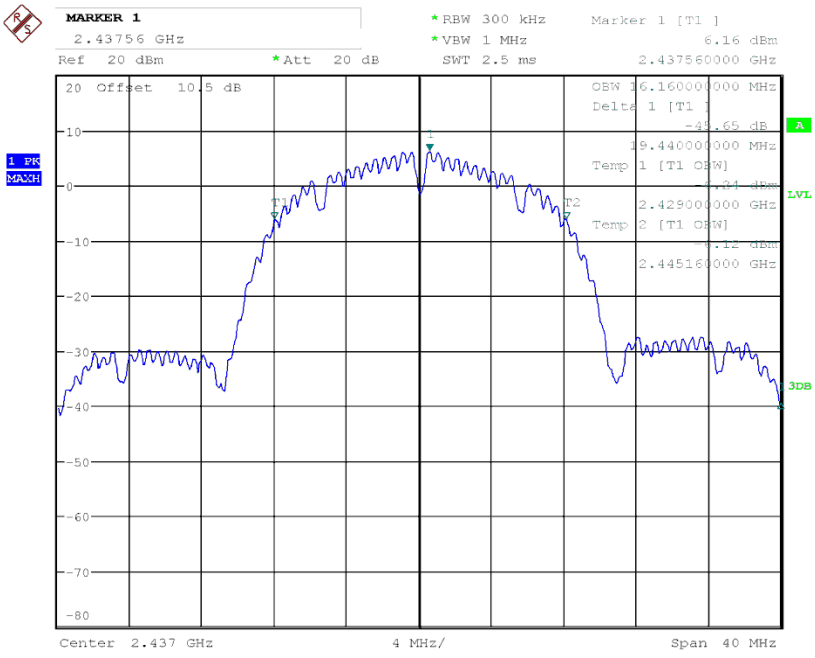
99% Occupied Bandwidth

802.11b Low Channel



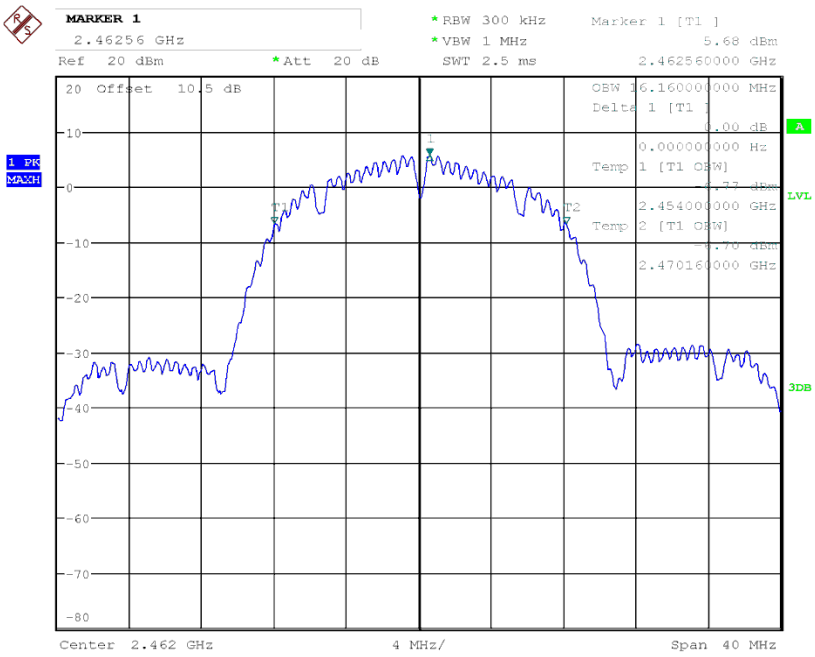
Date: 28.APR.2016 12:24:34

802.11b Middle Channel



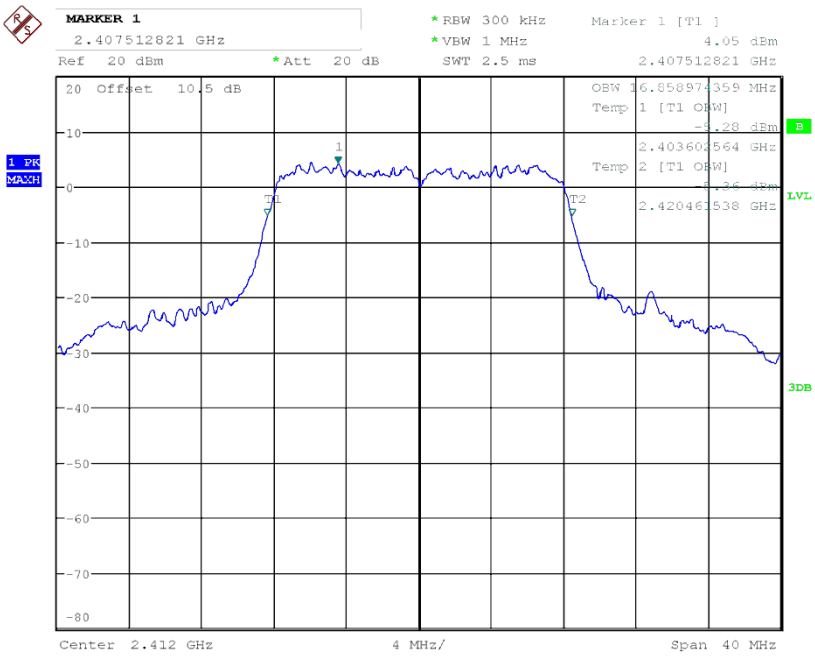
Date: 28.APR.2016 12:23:16

802.11b High Channel



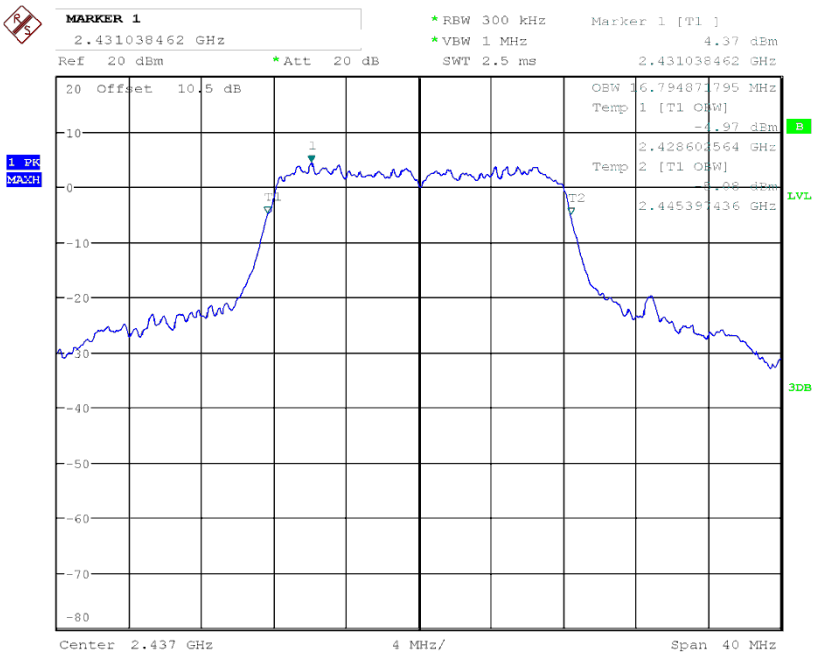
Date: 28.APR.2016 12:22:01

802.11g Low Channel



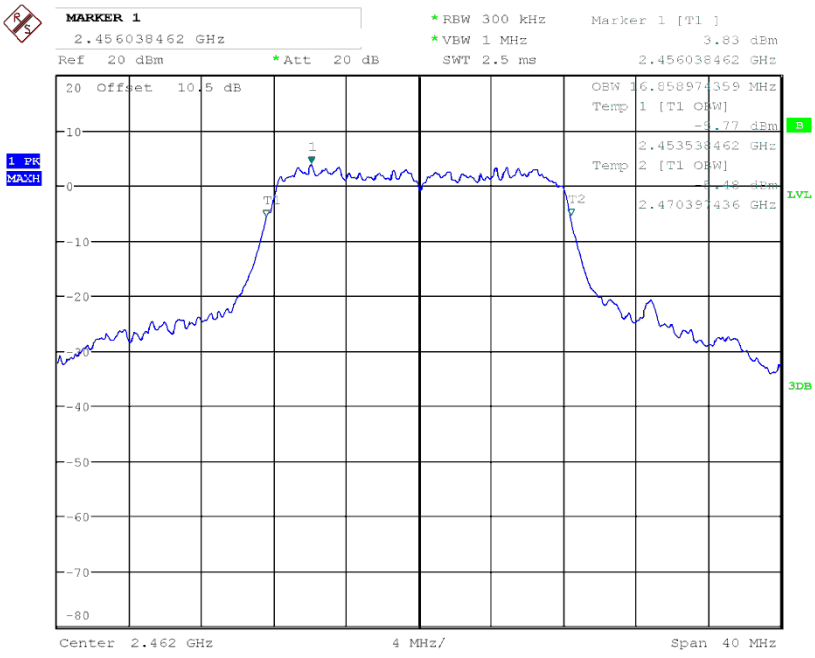
Date: 28.APR.2016 21:29:11

802.11g Middle Channel



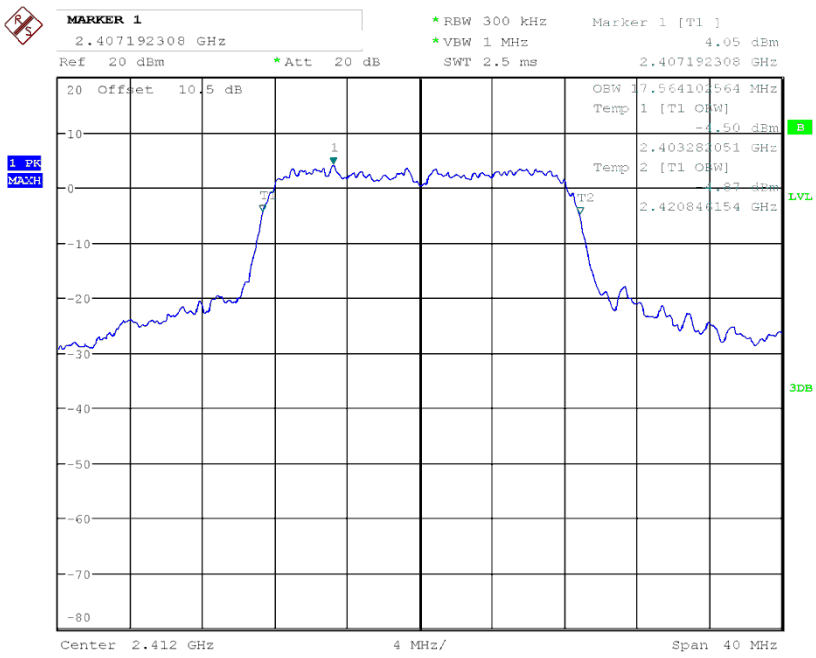
Date: 28.APR.2016 21:26:55

802.11g High Channel



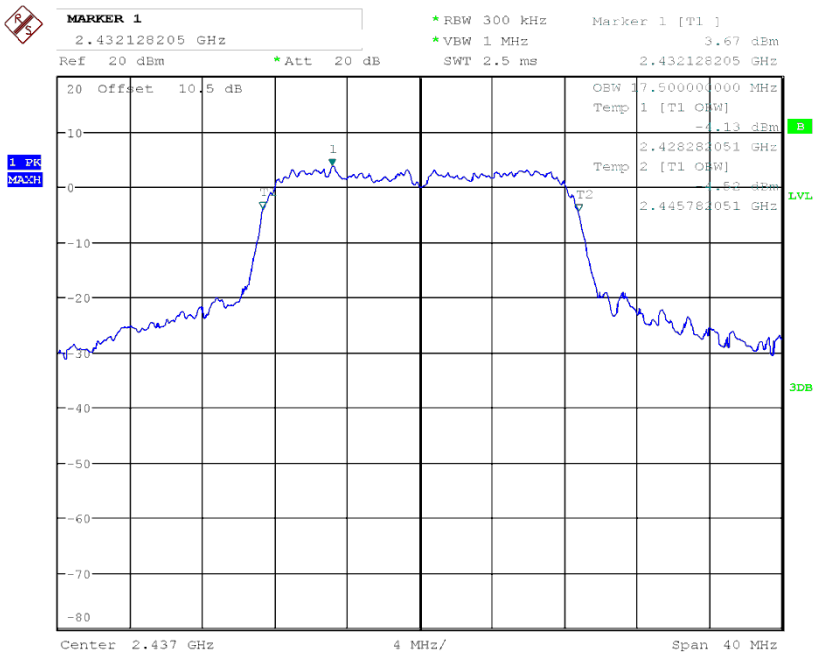
Date: 28.APR.2016 21:25:12

802.11n ht20 Low Channel



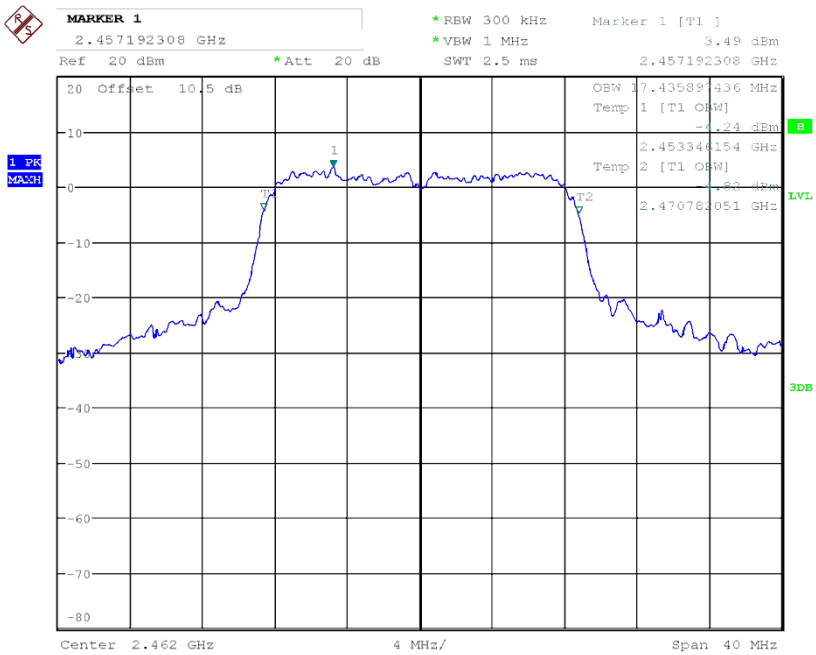
Date: 28.APR.2016 21:17:40

802.11n ht20 Middle Channel



Date: 28.APR.2016 21:21:18

802.11n ht20 High Channel



FCC §15.247(b) & IC RSS-247 §5.4 - Output Power Measurement

Applicable Standards

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

According to IC RSS-247 §5.4 (4), for DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

Measurement Procedure

The measurements are based on ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-04-07	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10 dB 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.*

Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.4 kPa

The testing was performed by Jin Yang on 2016-04-28 at RF site.

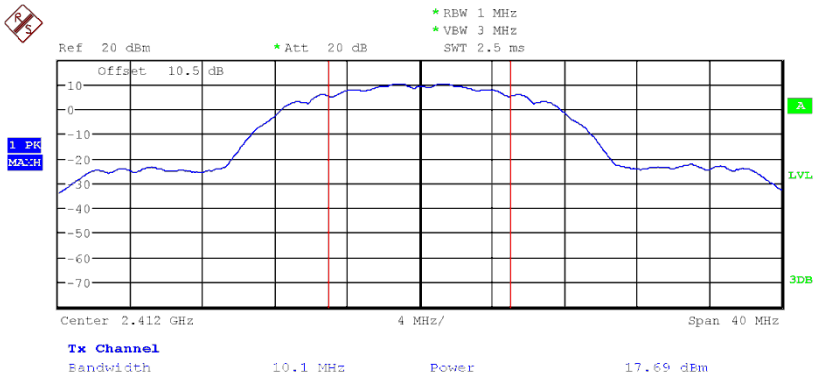
Test Results

Compliant, Please refer to the following table and plots

Radio Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)		Limit (dBm)
			Peak	Average	
802.11b	Low	2412	17.69	14.92	30
	Middle	2437	17.66	14.93	30
	High	2462	17.32	14.81	30
802.11g	Low	2412	20.23	12.65	30
	Middle	2437	20.88	12.45	30
	High	2462	20.45	12.10	30
802.11n20	Low	2412	20.19	12.55	30
	Middle	2437	20.07	12.35	30
	High	2462	20.36	12.00	30

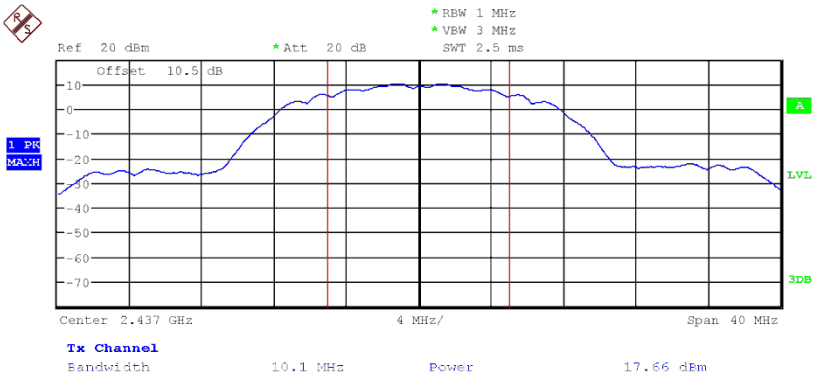
Peak Conducted Output Power

802.11b Low Channel



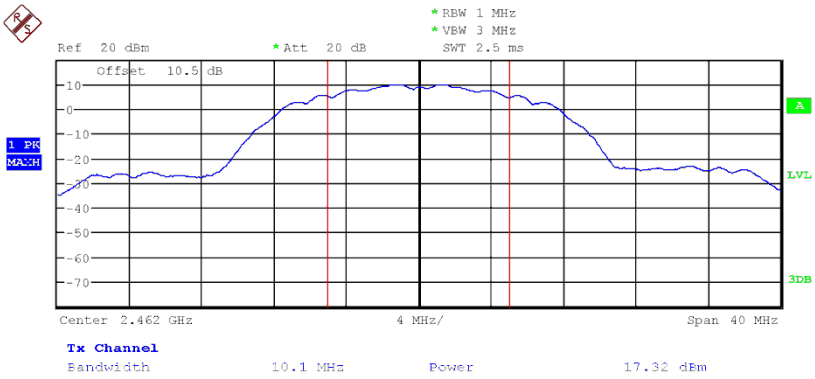
Date: 28.APR.2016 13:17:14

802.11b Middle Channel



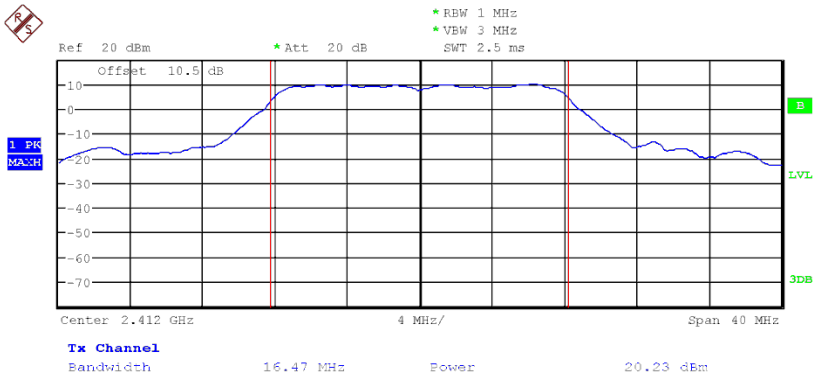
Date: 28.APR.2016 13:18:02

802.11b High Channel



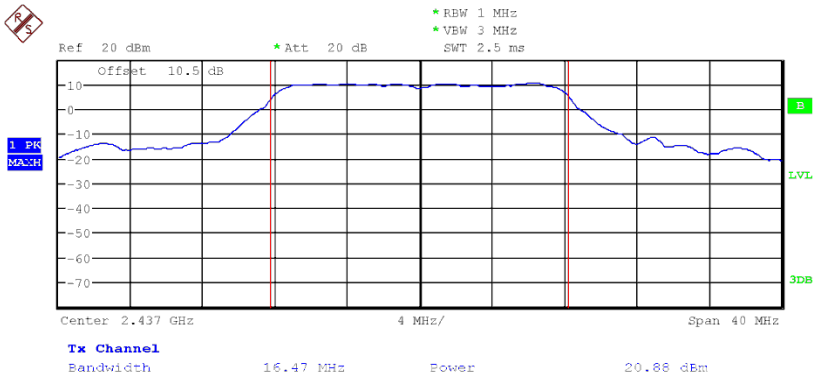
Date: 28.APR.2016 13:19:23

802.11g Low Channel



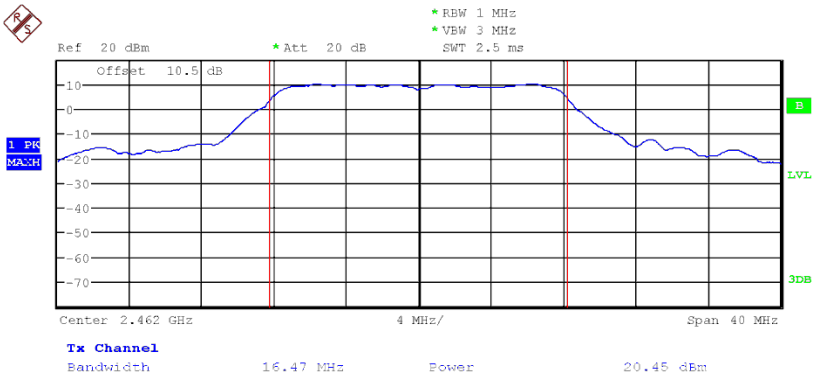
Date: 28.APR.2016 22:04:00

802.11g Middle Channel



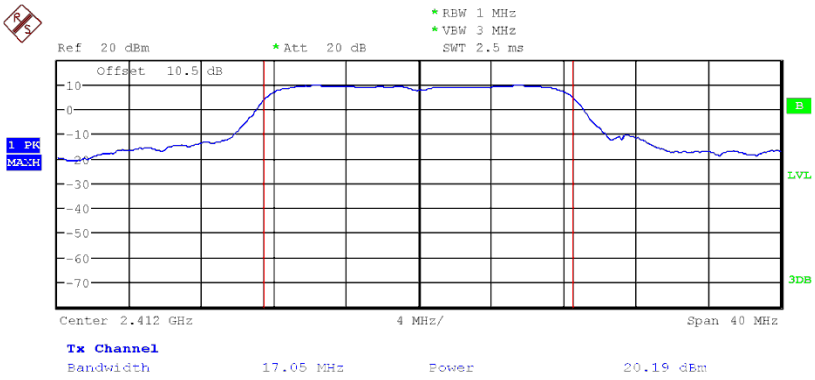
Date: 28.APR.2016 22:06:02

802.11g High Channel



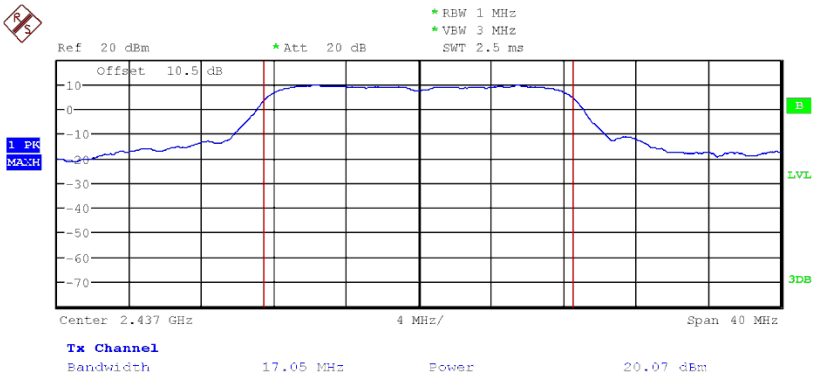
Date: 28.APR.2016 22:08:13

802.11n ht20 Low Channel



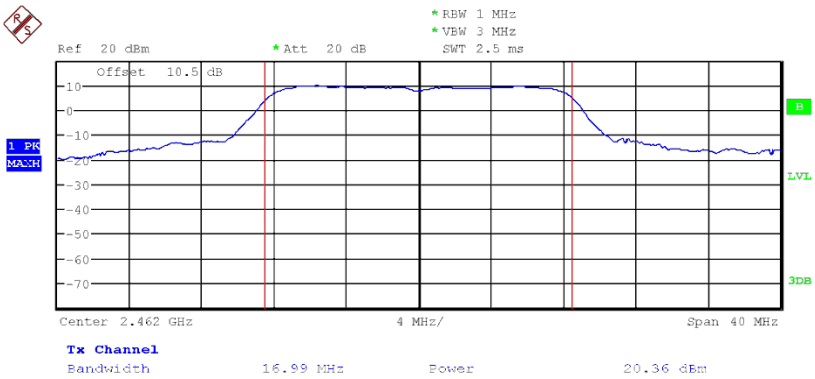
Date: 28.APR.2016 22:17:03

802.11n ht20 Middle Channel



Date: 28.APR.2016 22:19:05

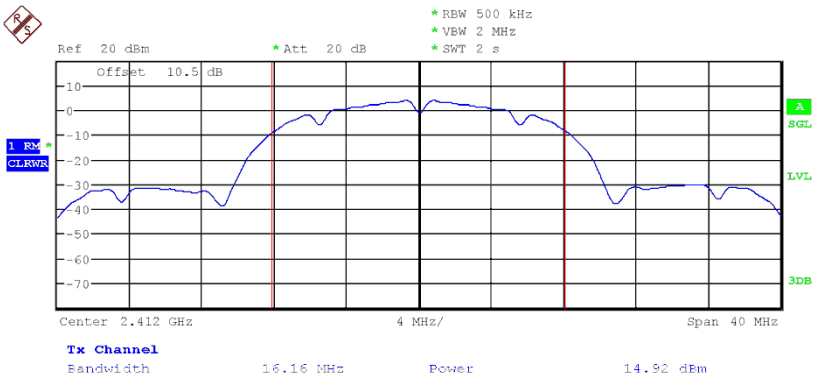
802.11n ht20 High Channel



Date: 28.APR.2016 22:13:17

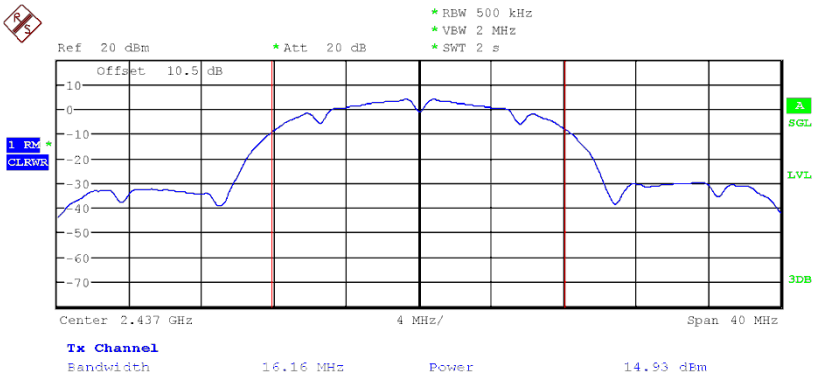
Conducted Average Output Power

802.11b Low Channel



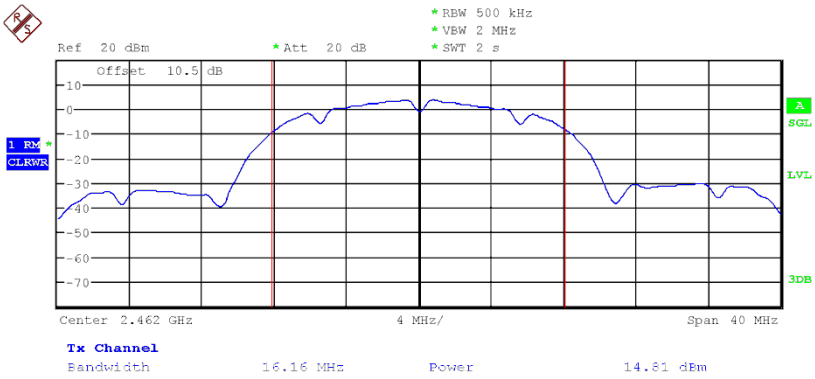
Date: 28.APR.2016 13:13:30

802.11b Middle Channel



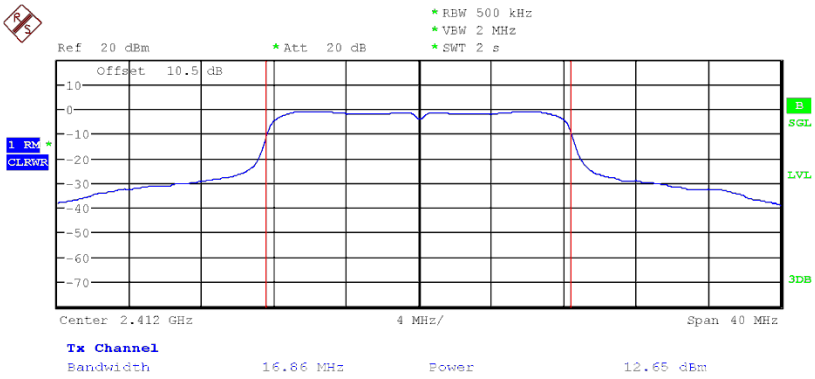
Date: 28.APR.2016 13:11:04

802.11b High Channel



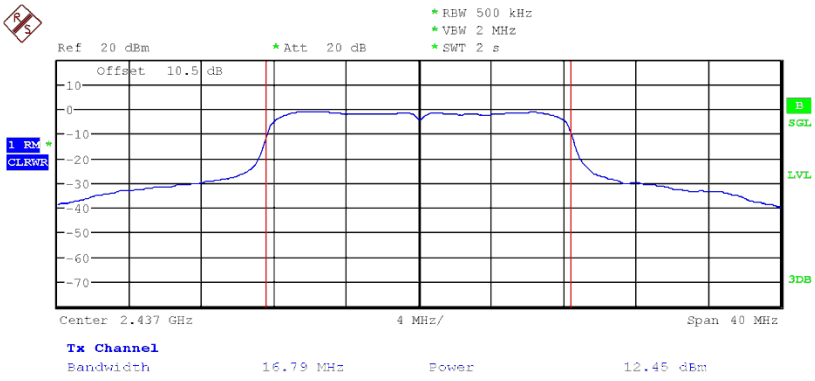
Date: 28.APR.2016 13:06:28

802.11g Low Channel



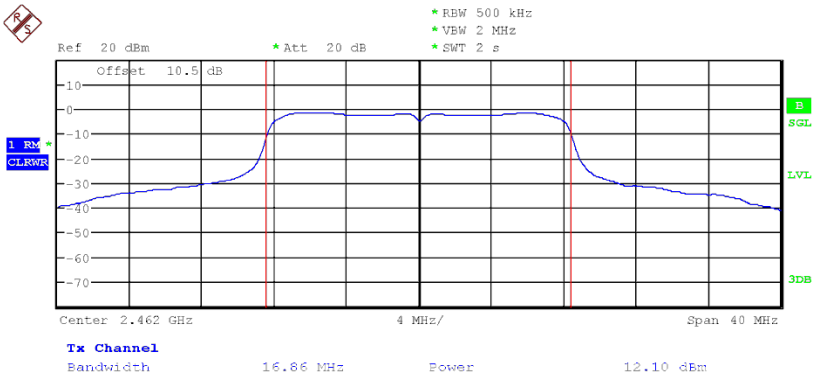
Date: 28.APR.2016 03:26:36

802.11g Middle Channel



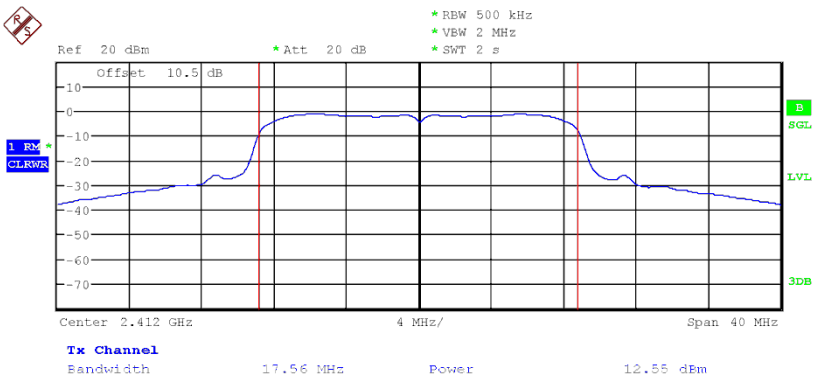
Date: 28.APR.2016 03:27:52

802.11g High Channel



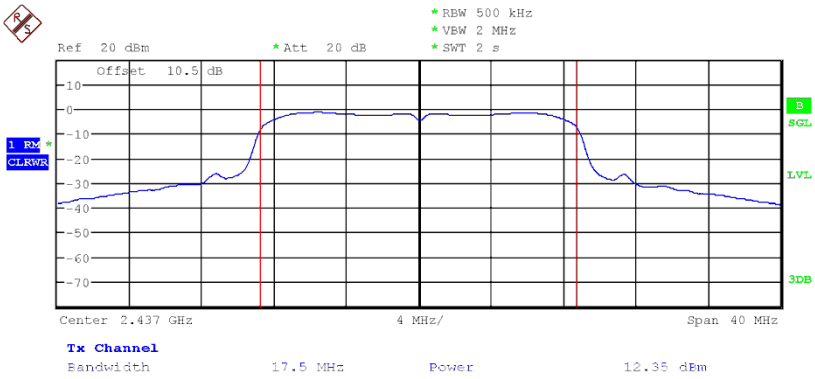
Date: 28.APR.2016 03:29:58

802.11n ht20 Low Channel



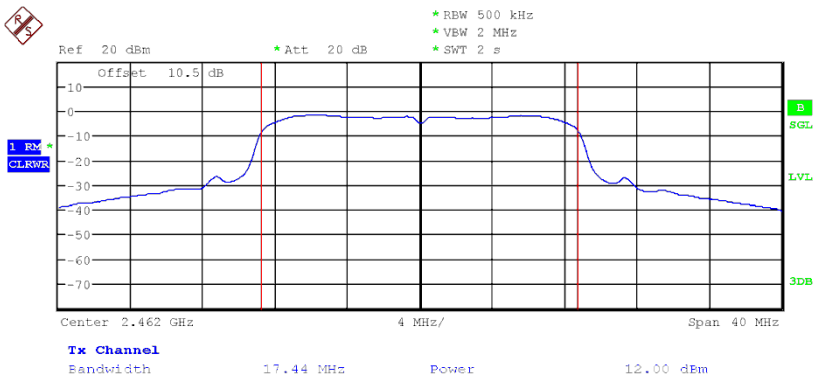
Date: 28.APR.2016 03:31:14

802.11n ht20 Middle Channel



Date: 28.APR.2016 03:32:20

802.11n ht20 High Channel



Date: 28.APR.2016 03:34:06

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

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).

For 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.

Measurement Procedure

The measurements are based on ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-04-07	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10 dB 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.*

Test Environmental Conditions

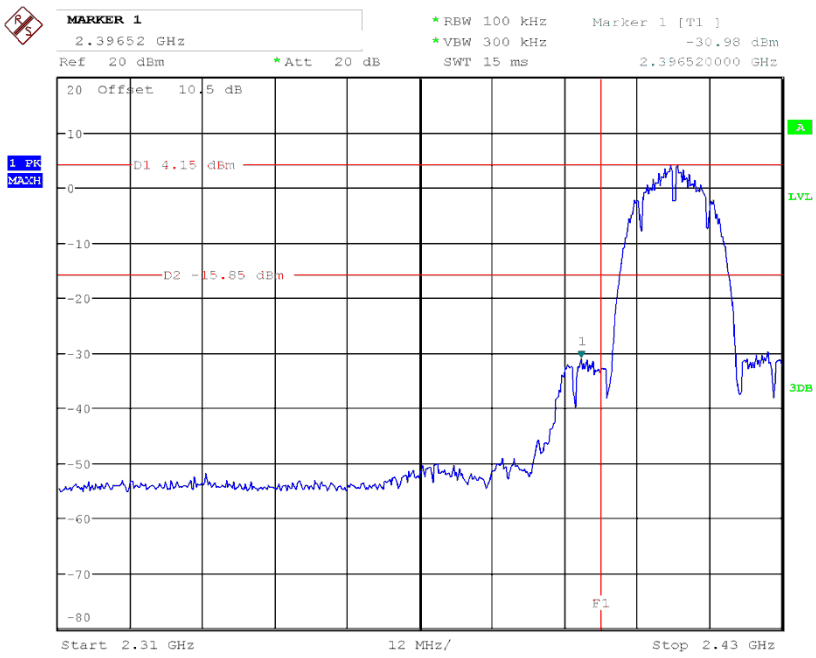
Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.4 kPa

The testing was performed by Jin Yang on 2016-04-28 at RF site.

Test Results

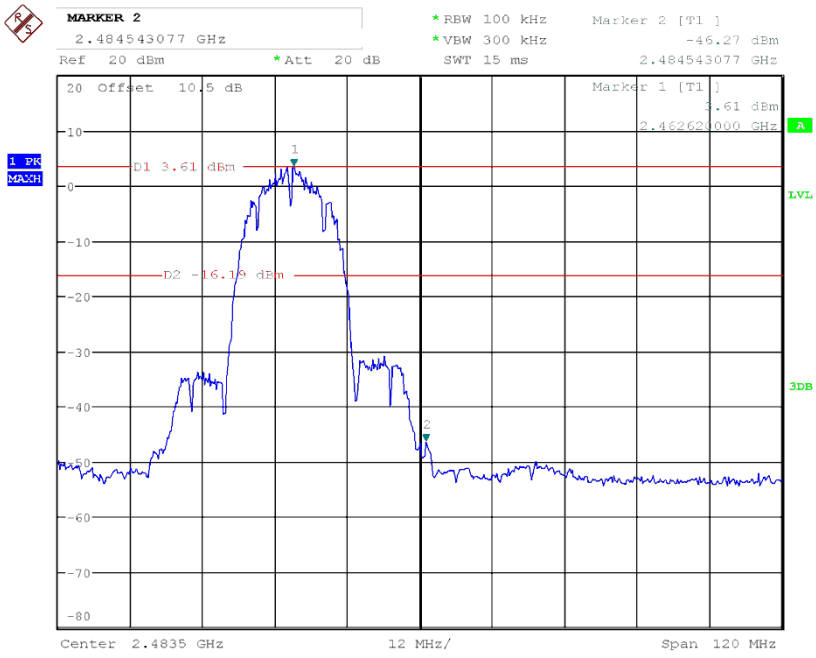
Compliant, Please refer to following plots.

802.11b: Band Edge, Left Side



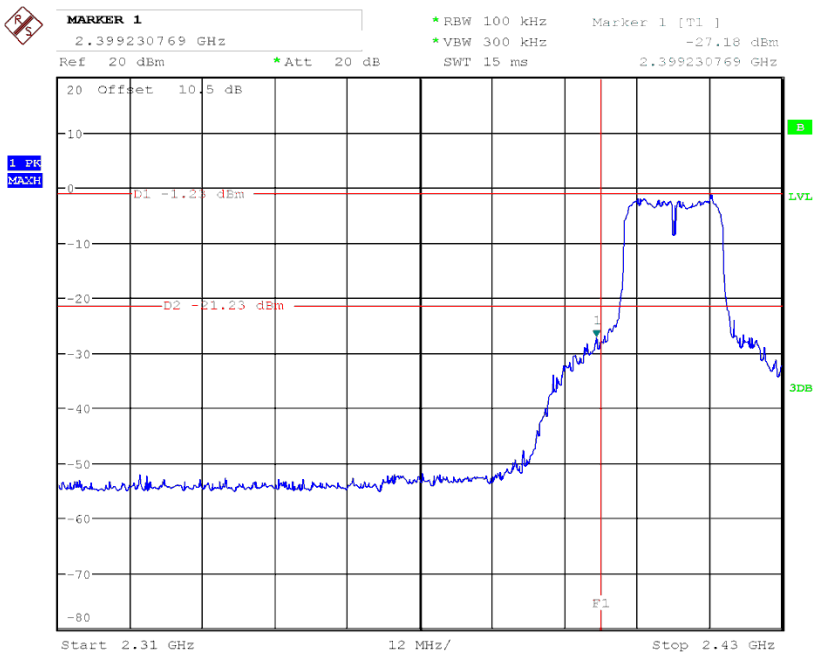
Date: 28.APR.2016 12:28:30

802.11b: Band Edge, Right Side



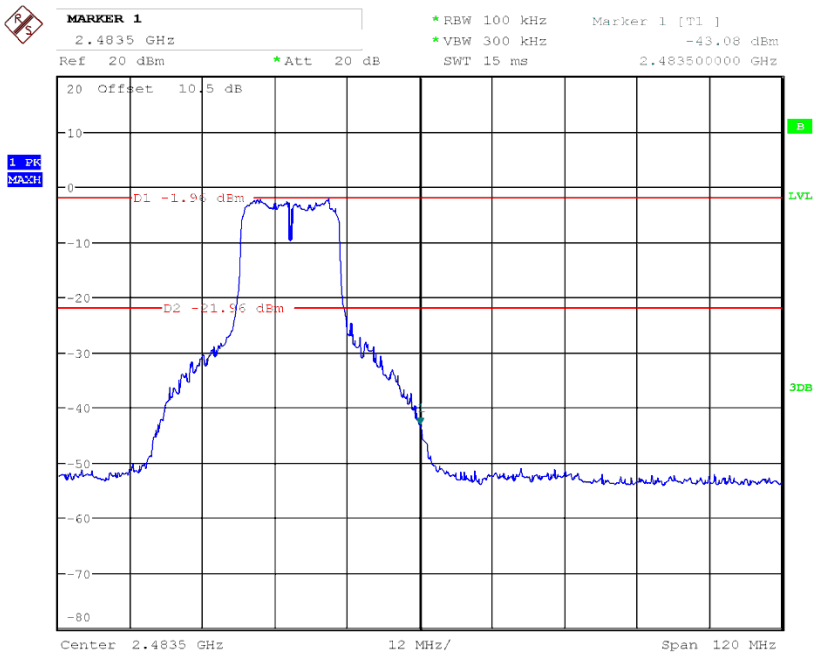
Date: 28.APR.2016 12:33:19

802.11g: Band Edge, Left Side



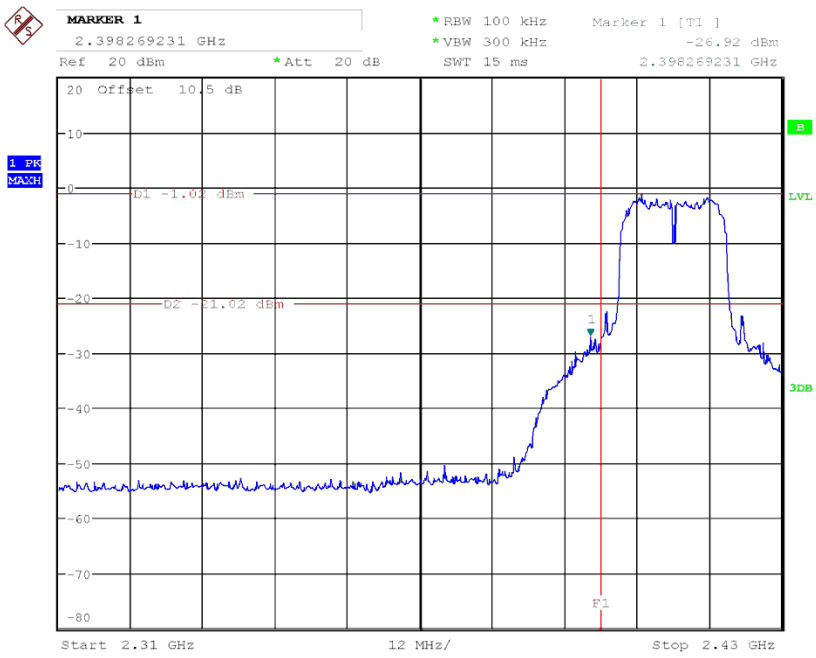
Date: 28.APR.2016 21:32:31

802.11g: Band Edge, Right Side



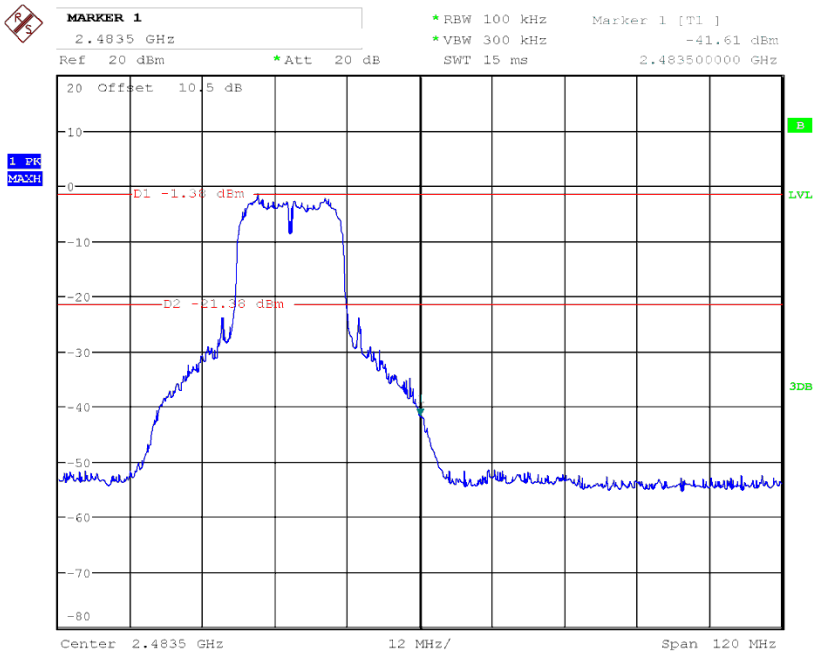
Date: 28.APR.2016 21:39:57

802.11n ht20 Band Edge, Left Side



Date: 28.APR.2016 21:34:39

802.11n ht20 Band Edge, Right Side



Date: 28.APR.2016 21:46:51

FCC §15.247(e) & ICC RSS-247 §5.2 – Power Spectral Density

Applicable Standards

According to FCC §15.247(e), 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.

According to RSS-247 §5.2(2), DTSs include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902-928 MHz and 2400- 2483.5 MHz1 : The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Measurement Procedure

The measurements are based on ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r05.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-04-07	1 year
-	SMA cable	-	C0002	Each time[1]	N/A
-	10 dB 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.*

Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.4 kPa

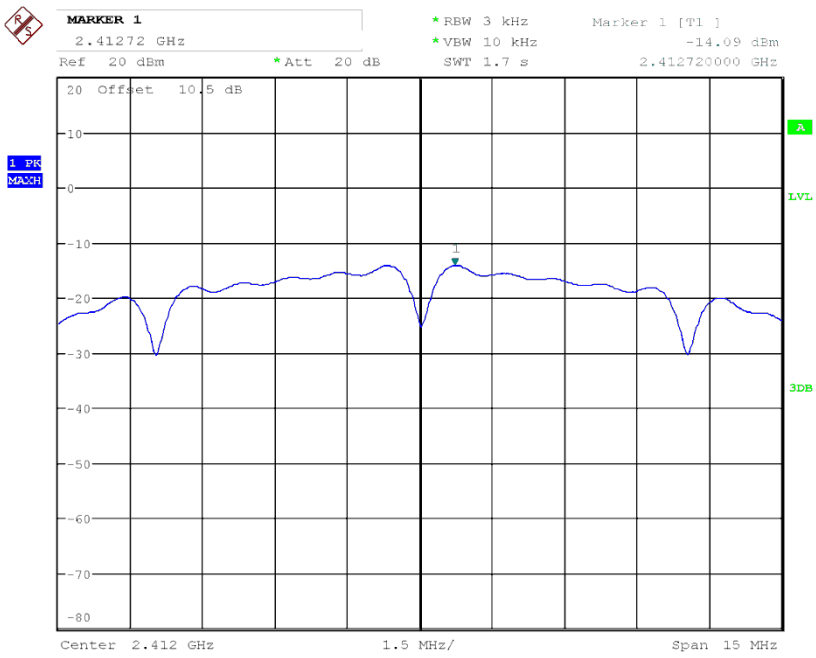
The testing was performed by Jin Yang on 2016-04-28 at RF site.

Test Results

Compliant, Please refer to following table and plots.

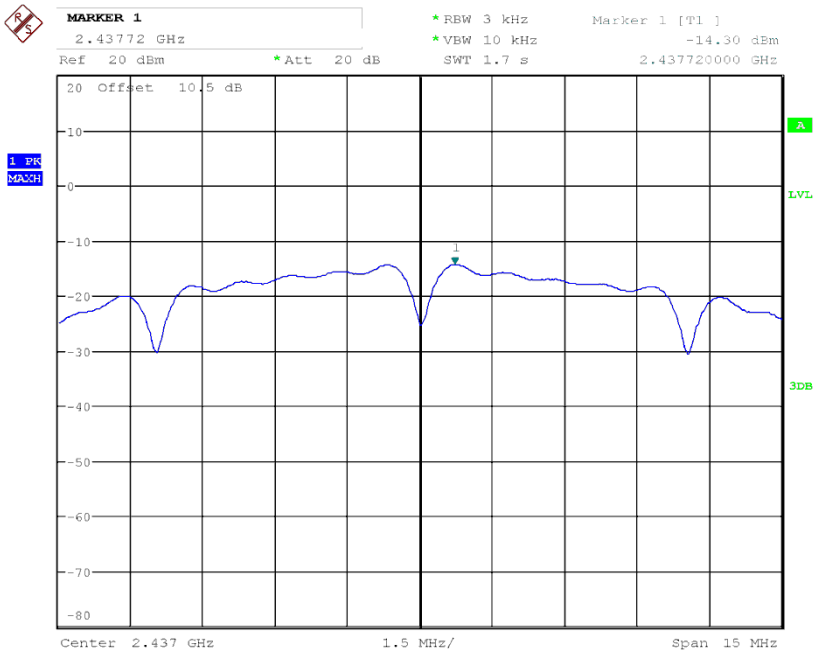
Radio Mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-14.09	⩽8
	Middle	2437	-14.30	⩽8
	High	2462	-14.76	⩽8
802.11g	Low	2412	-15.76	⩽8
	Middle	2437	-16.04	⩽8
	High	2462	-16.18	⩽8
802.11n20	Low	2412	-15.09	⩽8
	Middle	2437	-15.63	⩽8
	High	2462	-15.83	⩽8

802.11b Low Channel



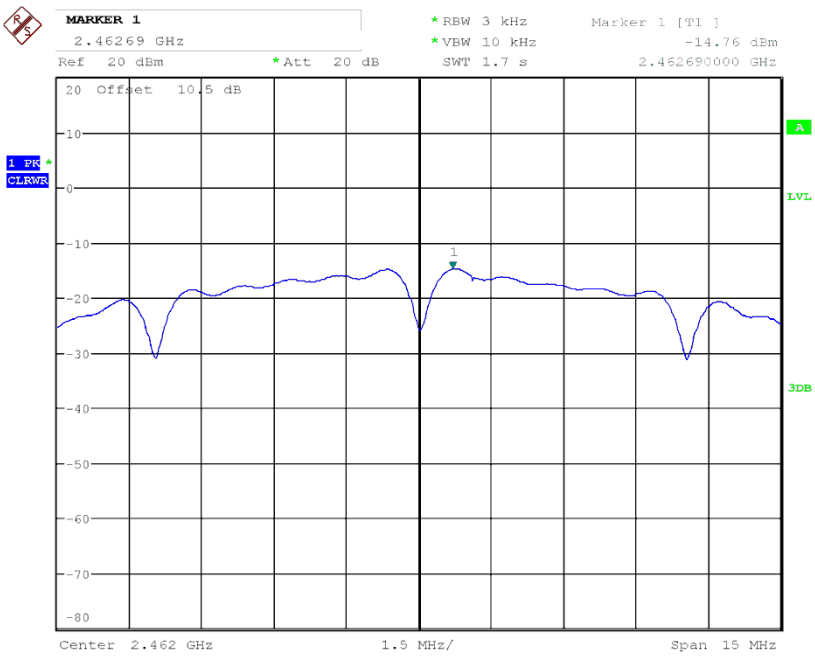
Date: 28.APR.2016 12:48:03

802.11b Middle Channel



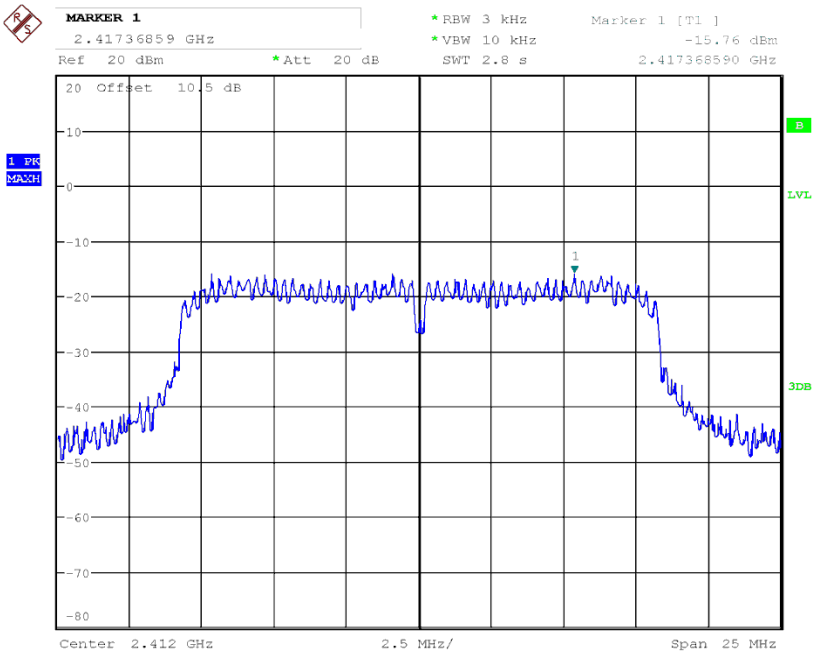
Date: 28.APR.2016 12:48:56

802.11b High Channel



Date: 28.APR.2016 12:47:00

802.11g Low Channel



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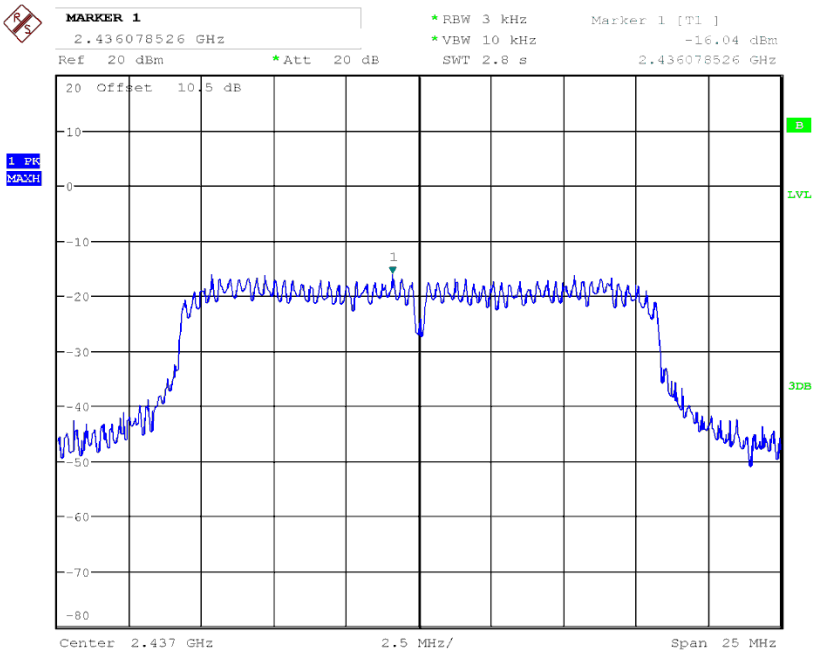
802.11g Middle Channel



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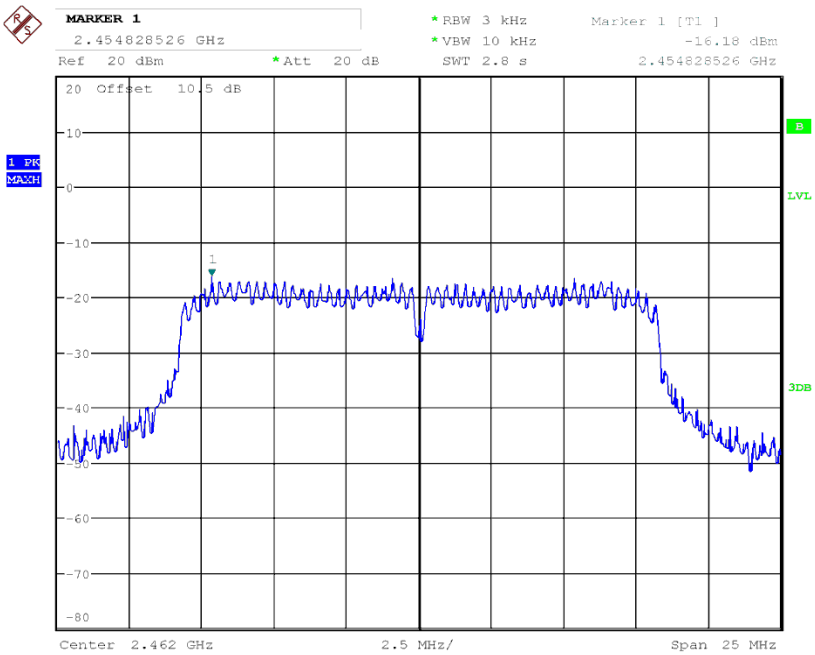
802.11g High Channel



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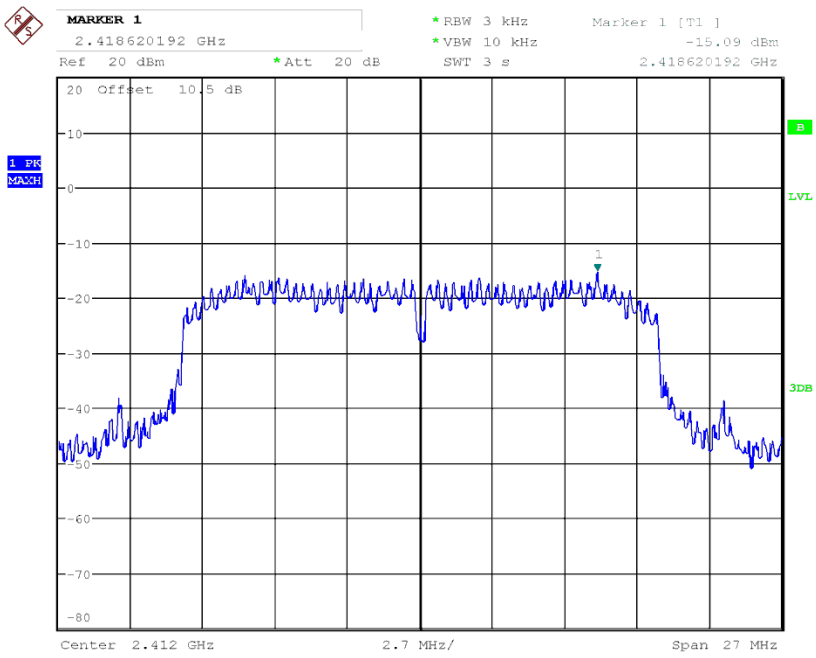
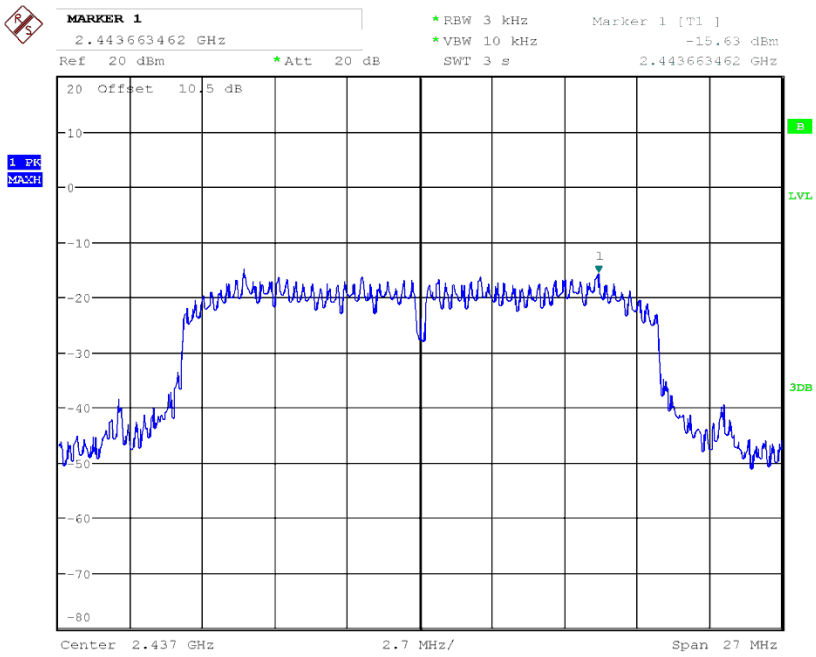
802.11n ht20 Low Channel



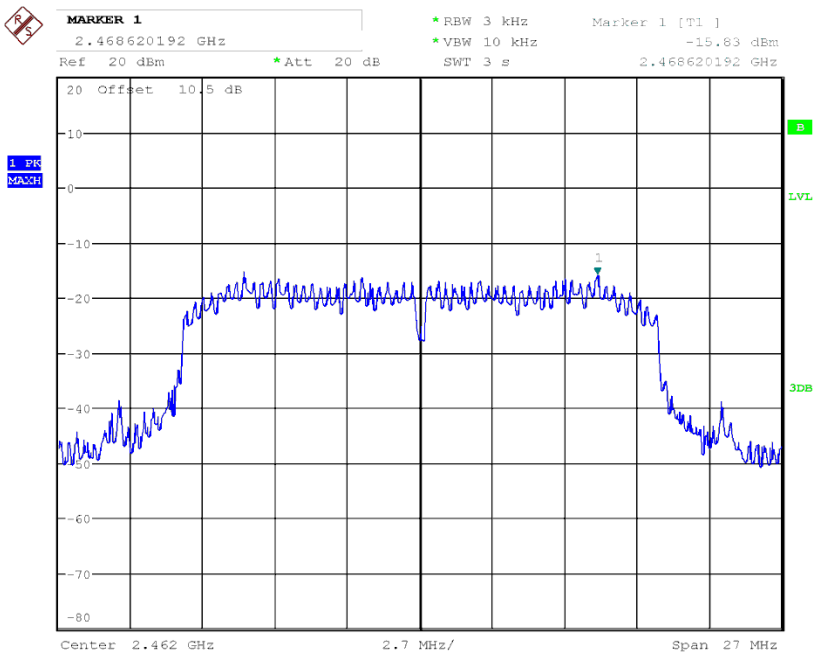
Date: 28.APR.2016 23:23:08

802.11n ht20 Middle Channel



Date: 28.APR.2016 23:25:12

802.11n ht20 High Channel



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