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

TEST REPORT

For

Roost, Inc.

955 Benecia Avenue
Sunnyvale, CA 94085, USA

FCC ID: 2AE5A-RSW200
IC: 20891-RSW200

Report Type:	**Product Type:**
Original Report	2.4GHz Wi-Fi Module

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" (Rev.2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1612084-247	Original Report	2017-03-08

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Roost Inc.*, and their product model: *RSW-200,* FCC ID: 2AE5A-RSW200, IC: 20891-RSW200 or the "EUT" as referred to in this report. It was a 2.4GHz Wi-Fi module. It operated in the 2.4 GHz band.

1.2 Mechanical Description of EUT

The EUT measures approximately 23.0 mm (L) x 14.0 mm (W) x 3.0 mm (H).

The test data gathered are from typical production sample, serial number: SB-WM-N04 1441 assigned by Roost, Inc.

1.3 Objective

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

The objective is to determine compliance with FCC Part 15.247 and ISED 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.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v03r05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.6 Measurement Uncertainty

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

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Power Spectral Density, conducted	±1.48dB
Unwanted Emissions, conducted	±1.57dB
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	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

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

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03)*** to certify

- For the USA (Federal Communications Commission):
  1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  2 All Scope 2-Licensed Personal Mobile Radio Services;
  3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  5 All Scope 5-Licensed Fixed Microwave Radio Services
  6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  1 All Radio Equipment, per KHCA 10XX-series Specifications;
  2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

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

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

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

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

5 Other
- For Water Coolers (ver. 3.0)

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

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EC US-EU EMC & Telecom MRA CAB
  - Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB

  Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to 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 EUT and support equipment were pre-installed with exercising software and provided by Roost, Inc. After the EUT and support equipment were connected, the command "wl4390a1.exe serial (port#) ver" was entered into command prompt while under the correct directory. From there, the correct modulation, channel, and antenna configuration was chosen.

2.3 Duty Cycle Correction Factor

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

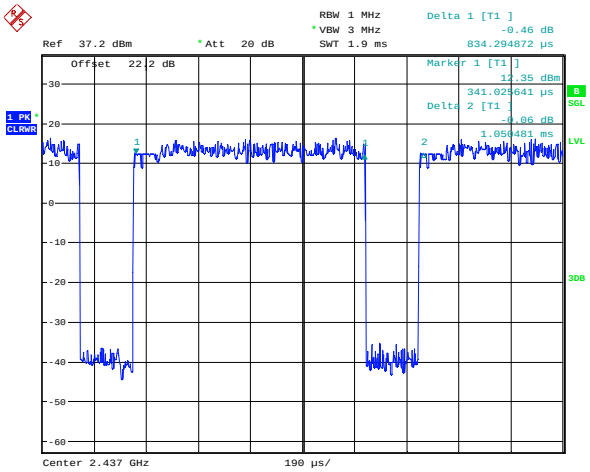
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized 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	0.834	1.05	79	1.00
802.11g	2.06	2.09	99	0.06
802.11n20	1.30	1.51	86	0.65

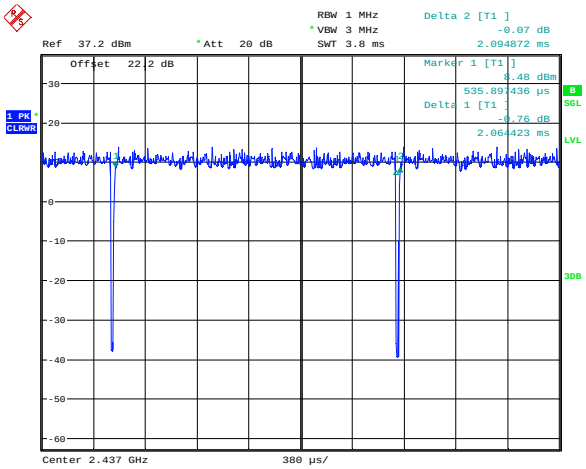
Duty Cycle = On Time (ms)/ Period (ms)
Duty Cycle Correction Factor (dB) = 10*log (1/Duty Cycle)

Please refer to the following plots.

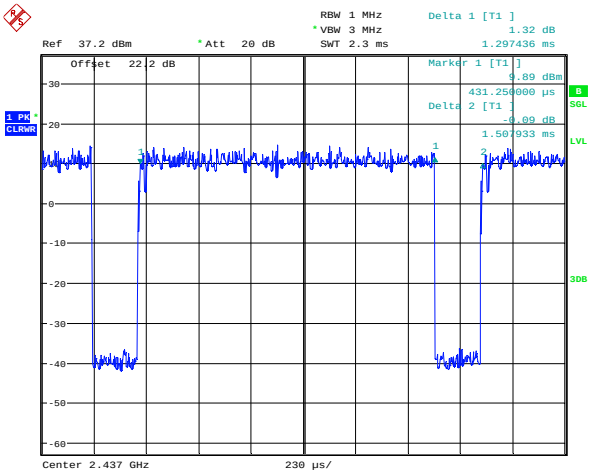
802.11b mode



802.11g mode



802.11n20 mode



2.4 Equipment Modifications

The EUT with attached on the support board during testing.

2.5 Local Support Equipment

Manufacturer/ Product Type	Description	Model No.	Serial No.
Hewlett Packard	Triple Output DC Power Supply	E3630A	KR64309342
Dell	Laptop	Latitude E6410	FFXR4Q1
Dell	AC Adapter	AA90PM111	218-OOCY-AO2
-	Antenna Development Platform	830-00011 Rev 1C7	-

2.6 Interface Ports and Cabling

Cable Description	Length (m)	To	From
Communication USB Cable	< 1.0	EUT	Laptop
DC Power Cables	< 1.0	EUT	DC Power Supply
USB Extension	1.75	Communication USB Cable	Laptop

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC 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	N/A[1]
FCC §2.1091, §15.247(i) ISED RSS-102	RF Exposure	Compliant
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

Note[1]: N/A because EUT is Battery/DC operated only.

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

4.1 Applicable Standards

According to FCC §15.203:

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

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

According to ISED RSS-Gen §8.3: Transmitter Antenna

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

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

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

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

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

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

4.2 Antenna Description

The antennas used by the EUT are permanent attached antennas.

Antenna usage	Frequency Range (MHz)	Maximum Antenna 0 Gain (dBi)	Maximum Antenna 1 Gain (dBi)
Wi-Fi	2400-2500	-5.2	-5.5

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

5.1 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 ISEDC RSS-102 §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 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.

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.

5.2 MPE Prediction

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

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

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

5.3 MPE Results

Maximum peak output power at antenna input terminal (dBm):	19.44
Maximum peak output power at antenna input terminal (mW):	87.902
Prediction distance (cm):	20
Prediction frequency (MHz):	2462
Maximum Antenna Gain, typical (dBi):	-5.2
Maximum Antenna Gain (numeric):	0.301995
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.005281
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 0.005281 mW/cm^2. Limit is 1.0 mW/cm^2.

Note: The highest power of the two chains was used for MPE- 802.11n20, Antenna Chain 0, High Channel.

5.4 RF exposure evaluation exemption for IC

19.44 + (-5.2) dBi = 14.24 dBm < $1.31\times10^{-2}f^{0.6834}$ = 2.722 W = 34.349 dBm

Therefore the RF exposure is not required.

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

6.1 Applicable Standards

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

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

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

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

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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (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 ISED 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 ISED 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.

6.2 Test Setup

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

6.3 Test Procedure

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

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

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

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

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

Above 1000 MHz:

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

Where T is the period of the signal

6.4 Corrected Amplitude & Margin Calculation

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

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

Margin = Corrected Amplitude - Limit

6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	2015-07-23	2 Years
Agilent	PSA	E4446A	MY48250238	2016-12-16	1 Year
Sunol Sciences	Controller, System	SC104V	122303-1	Cal. Not required	Cal. Not required
Sunol Sciences	Antenna, BiConiLog	JB1	A013105-3	2015-07-11	2 Years
Keysight Technologies	RF Limiter	11867A	MY42243052	2016-01-18	2 Years
HP	Pre Amplifier	8447D	2443A04374	2016-06-28	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2015-03-09	2 years
IW	High Frequency SMA Cable	-	00687	2017-01-06	1 year
-	SMA cable	-	C00011	Each time[1]	N/A
-	N-Type Cable	-	C00013	2016-04-28	1 year
-	N-Type Cable	-	C00014	2016-05-28	1 year
HP/ Agilent	Pre Amplifier	8449B OPT HO2	3008A0113	2016-05-23	1 year
Sunol Sciences	Motor, Tower	-	-	Cal. Not required	Cal. Not required
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

6.6 Test Environmental Conditions

Temperature:	21º C
Relative Humidity:	46 %
ATM Pressure:	101.8 kPa

The testing was performed by Shoaib Khan from 2017-01-06 in 5m chamber 3.

6.7 Summary of Test Results

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

2.4 GHz Wi-Fi

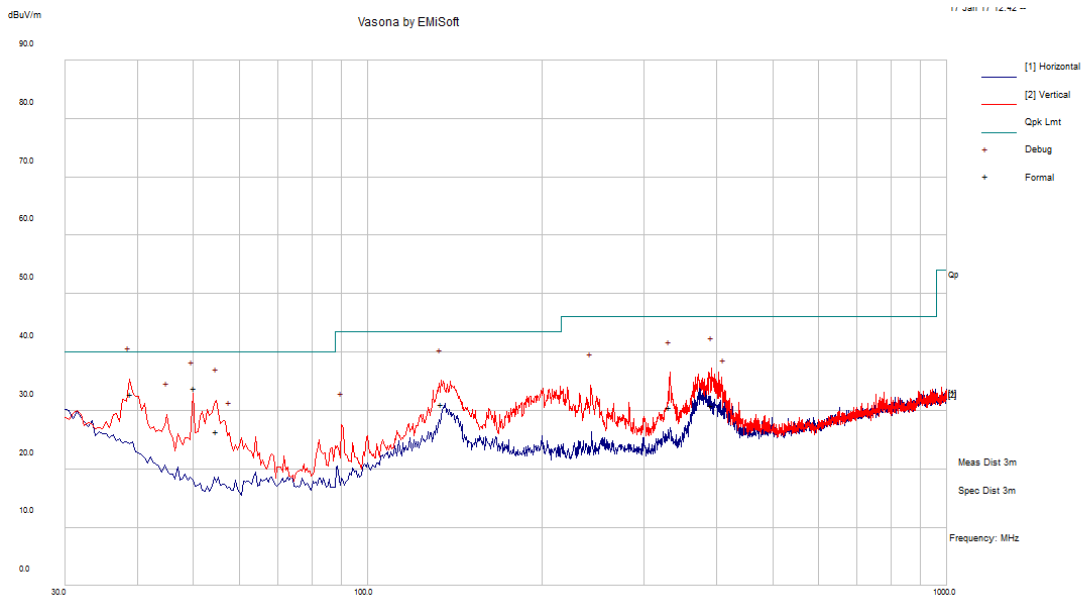
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, channel**
-0.47	2483.5	Horizontal	802.11n20 Mode, Antenna Chain 0, High Channel
-0.25	2390	Horizontal	802.11n20 Mode, Antenna Chain 1, Low Channel

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

6.8 Radiated Emissions Test Results

1) 30 MHz to 1 GHz on 802.11n20 Mode, Antenna Chain 0, High Channel (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
50.1	33.95	112	V	138	40	-6.05	QP
38.95675	32.81	132	V	172	40	-7.19	QP
133.8505	31.16	101	V	141	43.5	-12.34	QP
54.7775	26.47	100	V	42	40	-13.53	QP
392.121	30.88	126	V	184	46	-15.12	QP
331.922	30.5	100	V	122	46	-15.5	QP

2) 1–25 GHz Measured at 3 meters

802.11b Mode Antenna Chain 0

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	54.78	51	247	V	29.04	5.20	0.00	89.02	-	-	Peak
2412	61.34	28	145	H	29.04	5.20	0.00	95.58	-	-	Peak
2390	27.82	0	100	V	29.04	5.20	0.00	62.06	74.00	-11.94	Peak
2390	27.62	0	100	H	29.04	5.20	0.00	61.86	74.00	-12.14	Peak
2390	17.47	0	100	V	29.04	5.20	0.00	51.71	54.00	-2.29	Ave
2390	17.49	0	100	H	29.04	5.20	0.00	51.73	54.00	-2.27	Ave
4824	47.78	51	101	V	32.47	7.37	38.56	49.06	74.00	-24.94	Peak
4824	48.54	36	174	H	32.47	7.37	38.56	49.82	74.00	-24.18	Peak
4824	35.17	30	107	V	32.47	7.37	38.56	36.45	54.00	-17.55	Ave
4824	36.61	21	230	H	32.47	7.37	38.56	37.89	54.00	-16.11	Ave
7236	47.00	0	100	V	36.69	8.38	37.91	54.16	74.00	-19.84	Peak
7236	46.88	0	100	H	36.69	8.38	37.91	54.04	74.00	-19.96	Peak
7236	34.09	0	100	V	36.69	8.38	37.91	41.25	54.00	-12.75	Ave
7236	34.06	0	100	H	36.69	8.38	37.91	41.22	54.00	-12.78	Ave
9648	47.60	0	100	V	37.84	11.56	38.29	58.70	74.00	-15.30	Peak
9648	47.36	0	100	H	37.84	11.56	38.29	58.46	74.00	-15.54	Peak
9648	34.66	0	100	V	37.84	11.56	38.29	45.76	54.00	-8.24	Ave
9648	34.69	0	100	H	37.84	11.56	38.29	45.79	54.00	-8.21	Ave
Middle Channel 2437 MHz											
2437	54.30	323	103	V	29.04	5.20	0.00	88.54	-	-	Peak
2437	61.49	28	100	H	29.04	5.20	0.00	95.73	-	-	Peak
4874	46.14	0	100	V	32.64	7.37	38.56	47.58	74.00	-26.42	Peak
4874	46.55	0	100	H	32.64	7.37	38.56	47.99	74.00	-26.01	Peak
4874	35.55	0	100	V	32.64	7.37	38.56	36.99	54.00	-17.01	Ave
4874	36.52	0	100	H	32.64	7.37	38.56	37.96	54.00	-16.04	Ave
7311	44.64	0	100	V	37.15	8.56	37.91	52.44	74.00	-21.56	Peak
7311	46.37	0	100	H	37.15	8.56	37.91	54.17	74.00	-19.83	Peak
7311	34.53	0	100	V	37.15	8.56	37.91	42.33	54.00	-11.67	Ave
7311	34.60	0	100	H	37.15	8.56	37.91	42.40	54.00	-11.60	Ave
9748	44.53	0	100	V	37.92	11.62	38.29	55.78	74.00	-18.22	Peak
9748	44.46	0	100	H	37.92	11.62	38.29	55.71	74.00	-18.29	Peak
9748	34.89	0	100	V	37.92	11.62	38.29	46.14	54.00	-7.86	Ave
9748	34.99	0	100	H	37.92	11.62	38.29	46.24	54.00	-7.76	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	57.32	43	266	V	29.41	5.20	0.00	91.93	-	-	Peak
2462	61.75	29	100	H	29.41	5.20	0.00	96.36	-	-	Peak
2483.5	28.04	0	100	V	29.41	5.20	0.00	62.65	74.00	-11.35	Peak
2483.5	27.79	0	100	H	29.41	5.20	0.00	62.40	74.00	-11.60	Peak
2483.5	17.14	0	100	V	29.41	5.20	0.00	51.75	54.00	-2.25	Ave
2483.5	17.11	0	100	H	29.41	5.20	0.00	51.72	54.00	-2.28	Ave
4924	49.04	0	100	V	32.99	6.90	38.54	50.32	74.00	-23.68	Peak
4924	48.42	0	100	H	32.99	6.90	38.54	49.77	74.00	-24.23	Peak
4924	35.73	0	100	V	32.99	6.90	38.54	37.01	54.00	-16.99	Ave
4924	37.09	20	155	H	32.99	6.90	38.54	38.44	54.00	-15.56	Ave
7386	45.09	0	100	V	37.14	8.56	37.91	52.88	74.00	-21.12	Peak
7386	44.28	0	100	H	37.14	8.56	37.91	52.07	74.00	-21.93	Peak
7386	34.97	0	100	V	37.14	8.56	37.91	42.76	54.00	-11.24	Ave
7386	34.98	0	100	H	37.14	8.56	37.91	42.77	54.00	-11.23	Ave
9848	45.19	0	100	V	37.99	11.23	38.29	56.11	74.00	-17.89	Peak
9848	43.89	0	100	H	37.99	11.23	38.29	54.81	74.00	-19.19	Peak
9848	34.82	0	100	V	37.99	11.23	38.29	45.74	54.00	-8.26	Ave
9848	34.83	0	100	H	37.99	11.23	38.29	45.75	54.00	-8.25	Ave

802.11g Mode Antenna Chain 0

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	53.76	6	130	V	29.04	5.20	0.00	88.00	-	-	Peak
2412	60.04	31	166	H	29.04	5.20	0.00	94.28	-	-	Peak
2390	27.71	0	100	V	29.04	5.20	0.00	61.95	74.00	-12.05	Peak
2390	29.7	52	190	H	29.04	5.20	0.00	63.94	74.00	-10.06	Peak
2390	15.85	0	100	V	29.04	5.20	0.00	50.09	54.00	-3.91	Ave
2390	17.57	55	258	H	29.04	5.20	0.00	51.81	54.00	-2.19	Ave
4824	47.82	0	100	V	32.47	7.37	38.56	49.10	74.00	-24.90	Peak
4824	46.79	0	100	H	32.47	7.37	38.56	48.07	74.00	-25.93	Peak
4824	35.39	0	100	V	32.47	7.37	38.56	36.67	54.00	-17.33	Ave
4824	36.88	0	100	H	32.47	7.37	38.56	38.16	54.00	-15.84	Ave
7236	43.58	0	100	V	36.69	8.38	37.91	50.74	74.00	-23.26	Peak
7236	45.65	0	100	H	36.69	8.38	37.91	52.81	74.00	-21.19	Peak
7236	34.63	0	100	V	36.69	8.38	37.91	41.79	54.00	-12.21	Ave
7236	34.54	0	100	H	36.69	8.38	37.91	41.70	54.00	-12.30	Ave
9648	45.57	0	100	V	37.84	11.56	38.29	56.67	74.00	-17.33	Peak
9648	44.30	0	100	H	37.84	11.56	38.29	55.40	74.00	-18.60	Peak
9648	34.86	0	100	V	37.84	11.56	38.29	45.96	54.00	-8.04	Ave
9648	34.93	0	100	H	37.84	11.56	38.29	46.03	54.00	-7.97	Ave
Middle Channel 2437 MHz											
2437	52.62	322	100	V	29.04	5.20	0.00	86.86	-	-	Peak
2437	59.91	32	140	H	29.04	5.20	0.00	94.15	-	-	Peak
4874	44.54	0	100	V	32.64	7.37	38.56	45.98	74.00	-28.02	Peak
4874	46.64	0	100	H	32.64	7.37	38.56	48.08	74.00	-25.92	Peak
4874	35.44	0	100	V	32.64	7.37	38.56	36.88	54.00	-17.12	Ave
4874	36.77	0	100	H	32.64	7.37	38.56	38.21	54.00	-15.79	Ave
7311	44.26	0	100	V	37.15	8.56	37.91	52.06	74.00	-21.94	Peak
7311	43.65	0	100	H	37.15	8.56	37.91	51.45	74.00	-22.55	Peak
7311	34.28	0	100	V	37.15	8.56	37.91	42.08	54.00	-11.92	Ave
7311	34.29	0	100	H	37.15	8.56	37.91	42.09	54.00	-11.91	Ave
9748	46.47	0	100	V	37.92	11.62	38.29	57.72	74.00	-16.28	Peak
9748	44.87	0	100	H	37.92	11.62	38.29	56.12	74.00	-17.88	Peak
9748	35.06	0	100	V	37.92	11.62	38.29	46.31	54.00	-7.69	Ave
9748	34.93	0	100	H	37.92	11.62	38.29	46.18	54.00	-7.82	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	54.98	40	265	V	29.41	5.20	0.00	89.59	-	-	Peak
2462	59.71	32	100	H	29.41	5.20	0.00	94.32	-	-	Peak
2483.5	27.87	0	100	V	29.41	5.20	0.00	62.48	74.00	-11.52	Peak
2483.5	28.76	0	100	H	29.41	5.20	0.00	63.37	74.00	-10.63	Peak
2483.5	15.71	0	100	V	29.41	5.20	0.00	50.32	54.00	-3.68	Ave
2483.5	15.69	0	100	H	29.41	5.20	0.00	50.30	54.00	-3.70	Ave
4924	46.25	0	100	V	32.99	6.90	38.54	47.53	74.00	-26.47	Peak
4924	47.00	0	100	H	32.99	6.90	38.54	48.35	74.00	-25.65	Peak
4924	35.67	0	100	V	32.99	6.90	38.54	36.95	54.00	-17.05	Ave
4924	37.69	0	100	H	32.99	6.90	38.54	39.04	54.00	-14.96	Ave
7386	44.92	0	100	V	37.14	8.56	37.91	52.71	74.00	-21.29	Peak
7386	46.49	0	100	H	37.14	8.56	37.91	54.28	74.00	-19.72	Peak
7386	34.89	0	100	V	37.14	8.56	37.91	42.68	54.00	-11.32	Ave
7386	34.59	0	100	H	37.14	8.56	37.91	42.38	54.00	-11.62	Ave
9848	45.27	0	100	V	37.99	11.23	38.29	56.19	74.00	-17.81	Peak
9848	45.52	0	100	H	37.99	11.23	38.29	56.44	74.00	-17.56	Peak
9848	34.88	0	100	V	37.99	11.23	38.29	45.80	54.00	-8.20	Ave
9848	34.98	0	100	H	37.99	11.23	38.29	45.90	54.00	-8.10	Ave

802.11n20 Mode Antenna Chain 0

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	53.94	12	101	V	29.04	5.02	0.00	88.00	-	-	Peak
2412	60.25	32	142	H	29.04	5.02	0.00	94.31	-	-	Peak
2390	29.02	0	100	V	29.04	4.90	0.00	62.96	74.00	-11.04	Peak
2390	27.81	0	100	H	29.04	4.90	0.00	61.75	74.00	-12.25	Peak
2390	17.85	0	136	V	29.04	4.90	0.00	51.80	54.00	-2.20	Ave
2390	56.58	32	180	H	29.04	5.85	39.47	52.01	54.00	-1.99	Ave
4824	45.38	0	100	V	32.47	7.37	38.56	46.66	74.00	-27.34	Peak
4824	47.39	0	100	H	32.47	7.37	38.56	48.67	74.00	-25.33	Peak
4824	35.29	0	100	V	32.47	7.37	38.56	36.57	54.00	-17.43	Ave
4824	36.56	0	100	H	32.47	7.37	38.56	37.84	54.00	-16.16	Ave
7236	43.89	0	100	V	36.69	8.38	37.91	51.05	74.00	-22.95	Peak
7236	44.92	0	100	H	36.69	8.38	37.91	52.08	74.00	-21.92	Peak
7236	34.48	0	100	V	36.69	8.38	37.91	41.64	54.00	-12.36	Ave
7236	34.48	0	100	H	36.69	8.38	37.91	41.64	54.00	-12.36	Ave
9648	45.97	0	100	V	37.84	11.56	38.29	57.07	74.00	-16.93	Peak
9648	44.18	0	100	H	37.84	11.56	38.29	55.28	74.00	-18.72	Peak
9648	35.04	0	100	V	37.84	11.56	38.29	46.14	54.00	-7.86	Ave
9648	35.00	0	100	H	37.84	11.56	38.29	46.10	54.00	-7.90	Ave
Middle Channel 2437 MHz											
2437	53.01	327	100	V	29.04	5.20	0.00	87.25	-	-	Peak
2437	56.39	35	103	H	29.04	5.20	0.00	90.63	-	-	Peak
4874	45.97	0	100	V	32.64	7.37	38.56	47.41	74.00	-26.59	Peak
4874	46.95	0	100	H	32.64	7.37	38.56	48.39	74.00	-25.61	Peak
4874	36.42	0	100	V	32.64	7.37	38.56	37.86	54.00	-16.14	Ave
4874	36.40	0	100	H	32.64	7.37	38.56	37.84	54.00	-16.16	Ave
7311	44.40	0	100	V	37.15	8.56	37.91	52.20	74.00	-21.80	Peak
7311	44.33	0	100	H	37.15	8.56	37.91	52.13	74.00	-21.87	Peak
7311	34.23	0	100	V	37.15	8.56	37.91	42.03	54.00	-11.97	Ave
7311	34.26	0	100	H	37.15	8.56	37.91	42.06	54.00	-11.94	Ave
9748	45.16	0	100	V	37.92	11.62	38.29	56.41	74.00	-17.59	Peak
9748	44.90	0	100	H	37.92	11.62	38.29	56.15	74.00	-17.85	Peak
9748	35.03	0	100	V	37.92	11.62	38.29	46.28	54.00	-7.72	Ave
9748	34.89	0	100	H	37.92	11.62	38.29	46.14	54.00	-7.86	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	55.85	15	103	V	29.41	5.20	0.00	90.46	-	-	Peak
2462	60.36	51	102	H	29.41	5.20	0.00	94.97	-	-	Peak
2483.5	29.54	19	101	V	29.41	5.20	0.00	64.15	74.00	-9.85	Peak
2483.5	30.71	40	112	H	29.41	5.20	0.00	65.32	74.00	-8.68	Peak
2483.5	17.71	24	102	V	29.41	5.20	0.00	52.32	54.00	-1.68	Ave
2483.5	18.92	32	103	H	29.41	5.20	0.00	53.53	54.00	-0.47	Ave
4924	45.53	0	100	V	32.99	6.90	38.54	46.81	74.00	-27.19	Peak
4924	45.87	0	100	H	32.99	6.90	38.54	47.22	74.00	-26.78	Peak
4924	35.60	0	100	V	32.99	6.90	38.54	36.88	54.00	-17.12	Ave
4924	37.22	0	100	H	32.99	6.90	38.54	38.57	54.00	-15.43	Ave
7386	45.41	0	100	V	37.14	8.56	37.91	53.20	74.00	-20.80	Peak
7386	45.36	0	100	H	37.14	8.56	37.91	53.15	74.00	-20.85	Peak
7386	34.81	0	100	V	37.14	8.56	37.91	42.60	54.00	-11.40	Ave
7386	34.80	0	100	H	37.14	8.56	37.91	42.59	54.00	-11.41	Ave
9848	44.59	0	100	V	37.99	11.23	38.29	55.51	74.00	-18.49	Peak
9848	45.58	0	100	H	37.99	11.23	38.29	56.50	74.00	-17.50	Peak
9848	34.84	0	100	V	37.99	11.23	38.29	45.76	54.00	-8.24	Ave
9848	34.98	0	100	H	37.99	11.23	38.29	45.90	54.00	-8.10	Ave

802.11b Mode Antenna Chain 1

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	55.44	0	176	V	29.04	5.02	0.00	89.50	-	-	Peak
2412	62.97	39	178	H	29.04	5.02	0.00	97.03	-	-	Peak
2390	27.96	0	100	V	29.04	4.90	0.00	61.90	74.00	-12.10	Peak
2390	28.19	0	100	H	29.04	4.90	0.00	62.13	74.00	-11.87	Peak
2390	16.99	0	100	V	29.04	4.90	0.00	50.93	54.00	-3.07	Ave
2390	16.99	0	100	H	29.04	4.90	0.00	50.93	54.00	-3.07	Ave
4824	48.13	0	100	V	32.47	7.37	33.72	54.25	74.00	-19.75	Peak
4824	49.20	0	100	H	32.47	7.37	33.72	55.32	74.00	-18.68	Peak
4824	35.73	0	100	V	32.47	7.37	33.72	41.85	54.00	-12.15	Ave
4824	37.04	0	100	H	32.47	7.37	33.72	43.16	54.00	-10.84	Ave
7236	47.55	0	100	V	36.69	8.38	33.93	58.69	74.00	-15.31	Peak
7236	46.41	0	100	H	36.69	8.38	33.93	57.55	74.00	-16.45	Peak
7236	35.01	0	100	V	36.69	8.38	33.93	46.15	54.00	-7.85	Ave
7236	35.02	0	100	H	36.69	8.38	33.93	46.16	54.00	-7.84	Ave
9648	47.66	0	100	V	37.84	11.56	34.31	62.74	74.00	-11.26	Peak
9648	47.50	0	100	H	37.84	11.56	34.31	62.58	74.00	-11.42	Peak
9648	34.81	0	100	V	37.84	11.56	34.31	49.89	54.00	-4.11	Ave
9648	35.28	0	100	H	37.84	11.56	34.31	50.36	54.00	-3.64	Ave
Middle Channel 2437 MHz											
2437	54.39	4	176	V	29.04	5.02	0.00	88.45	-	-	Peak
2437	60.36	40	172	H	29.04	5.02	0.00	94.42	-	-	Peak
4874	47.74	0	100	V	32.64	7.37	33.75	54.00	74.00	-20.00	Peak
4874	48.65	0	100	H	32.64	7.37	33.75	54.91	74.00	-19.09	Peak
4874	35.49	0	100	V	32.64	7.37	33.75	41.75	54.00	-12.25	Ave
4874	36.04	0	100	H	32.64	7.37	33.75	42.30	54.00	-11.70	Ave
7311	47.30	0	100	V	37.15	8.56	33.99	59.02	74.00	-14.98	Peak
7311	46.85	0	100	H	37.15	8.56	33.99	58.57	74.00	-15.43	Peak
7311	35.11	0	100	V	37.15	8.56	33.99	46.83	54.00	-7.17	Ave
7311	34.59	0	100	H	37.15	8.56	33.99	46.31	54.00	-7.69	Ave
9748	47.25	0	100	V	37.92	11.62	34.31	62.48	74.00	-11.52	Peak
9748	47.74	0	100	H	37.92	11.62	34.31	62.97	74.00	-11.03	Peak
9748	35.17	0	100	V	37.92	11.62	34.31	50.40	54.00	-3.60	Ave
9748	35.15	0	100	H	37.92	11.62	34.31	50.37	54.00	-3.63	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	53.92	13	191	V	29.41	5.02	0.00	88.35	-	-	Peak
2462	59.52	57	105	H	29.41	5.02	0.00	93.95	-	-	Peak
2483.5	28.29	0	100	V	29.41	5.02	0.00	62.72	74.00	-11.28	Peak
2483.5	28.06	0	100	H	29.41	5.02	0.00	62.49	74.00	-11.51	Peak
2483.5	17.52	0	100	V	29.41	5.02	0.00	51.95	54.00	-2.05	Ave
2483.5	17.52	0	100	H	29.41	5.02	0.00	51.95	54.00	-2.05	Ave
4924	47.90	0	100	V	32.99	6.90	34.62	53.10	74.00	-20.90	Peak
4924	48.24	0	100	H	32.99	6.90	34.62	53.51	74.00	-20.49	Peak
4924	35.76	0	100	V	32.99	6.90	34.62	40.96	54.00	-13.04	Ave
4924	36.11	0	100	H	32.99	6.90	34.62	41.38	54.00	-12.62	Ave
7386	47.14	0	100	V	37.14	8.56	33.99	58.85	74.00	-15.15	Peak
7386	46.89	0	100	H	37.14	8.56	33.99	58.60	74.00	-15.40	Peak
7386	34.51	0	100	V	37.14	8.56	33.99	46.22	54.00	-7.78	Ave
7386	34.53	0	100	H	37.14	8.56	33.99	46.24	54.00	-7.76	Ave
9848	47.85	0	100	V	37.99	11.23	34.39	62.67	74.00	-11.33	Peak
9848	46.83	0	100	H	37.99	11.23	34.39	61.65	74.00	-12.35	Peak
9848	34.71	0	100	V	37.99	11.23	34.39	49.53	54.00	-4.47	Ave
9848	35.15	0	100	H	37.99	11.23	34.39	49.97	54.00	-4.03	Ave

802.11g Mode Antenna Chain 1

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	53.26	357	134	V	29.04	5.02	0.00	87.32	-	-	Peak
2412	60.78	36	155	H	29.04	5.02	0.00	94.84	-	-	Peak
2390	28.8	0	100	V	29.04	4.90	0.00	62.74	74.00	-11.26	Peak
2390	33.4	51	172	H	29.04	4.90	0.00	67.34	74.00	-6.66	Peak
2390	17.12	25	180	V	29.04	4.90	0.00	51.06	54.00	-2.94	Ave
2390	57.46	53	181	H	29.04	5.85	39.47	52.89	54.00	-1.11	Ave
4824	47.85	0	100	V	32.47	7.37	33.72	53.97	74.00	-20.03	Peak
4824	47.95	0	100	H	32.47	7.37	33.72	54.07	74.00	-19.93	Peak
4824	35.65	0	100	V	32.47	7.37	33.72	41.77	54.00	-12.23	Ave
4824	36.09	0	100	H	32.47	7.37	33.72	42.21	54.00	-11.79	Ave
7236	47.24	0	100	V	36.69	8.38	33.93	58.38	74.00	-15.62	Peak
7236	47.53	0	100	H	36.69	8.38	33.93	58.67	74.00	-15.33	Peak
7236	35.11	0	100	V	36.69	8.38	33.93	46.25	54.00	-7.75	Ave
7236	35.05	0	100	H	36.69	8.38	33.93	46.19	54.00	-7.81	Ave
9648	47.97	0	100	V	37.84	11.56	34.31	63.05	74.00	-10.95	Peak
9648	48.21	0	100	H	37.84	11.56	34.31	63.29	74.00	-10.71	Peak
9648	35.56	0	100	V	37.84	11.56	34.31	50.64	54.00	-3.36	Ave
9648	35.58	0	100	H	37.84	11.56	34.31	50.66	54.00	-3.34	Ave
Middle Channel 2437 MHz											
2437	53.34	5	185	V	29.04	5.02	0.00	87.40	-	-	Peak
2437	59.4	46	165	H	29.04	5.02	0.00	93.46	-	-	Peak
4874	48.24	0	100	V	32.64	7.37	33.75	54.50	74.00	-19.50	Peak
4874	48.40	0	100	H	32.64	7.37	33.75	54.66	74.00	-19.34	Peak
4874	35.75	0	100	V	32.64	7.37	33.75	42.01	54.00	-11.99	Ave
4874	35.57	0	100	H	32.64	7.37	33.75	41.83	54.00	-12.17	Ave
7311	47.10	0	100	V	37.15	8.56	33.99	58.82	74.00	-15.18	Peak
7311	45.90	0	100	H	37.15	8.56	33.99	57.62	74.00	-16.38	Peak
7311	34.59	0	100	V	37.15	8.56	33.99	46.31	54.00	-7.69	Ave
7311	34.60	0	100	H	37.15	8.56	33.99	46.32	54.00	-7.68	Ave
9748	46.86	0	100	V	37.92	11.62	34.31	62.09	74.00	-11.91	Peak
9748	47.24	0	100	H	37.92	11.62	34.31	62.47	74.00	-11.53	Peak
9748	34.04	0	100	V	37.92	11.62	34.31	49.27	54.00	-4.73	Ave
9748	34.07	0	100	H	37.92	11.62	34.31	49.30	54.00	-4.70	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	52.88	182	103	V	29.41	5.02	0.00	87.31	-	-	Peak
2462	58.86	43	179	H	29.41	5.02	0.00	93.29	-	-	Peak
2483.5	28.86	0	100	V	29.41	5.02	0.00	63.29	74.00	-10.71	Peak
2483.5	32.3	36	166	H	29.41	5.02	0.00	66.73	74.00	-7.27	Peak
2483.5	17.18	12	165	V	29.41	5.02	0.00	51.61	54.00	-2.39	Ave
2483.5	55.94	42	173	H	29.41	5.85	39.47	51.74	54.00	-2.26	Ave
4924	48.52	0	100	V	32.99	6.90	34.62	53.72	74.00	-20.28	Peak
4924	48.37	0	100	H	32.99	6.90	34.62	53.64	74.00	-20.36	Peak
4924	35.90	0	100	V	32.99	6.90	34.62	41.10	54.00	-12.90	Ave
4924	36.16	0	100	H	32.99	6.90	34.62	41.43	54.00	-12.57	Ave
7386	46.85	0	100	V	37.14	8.56	33.99	58.56	74.00	-15.44	Peak
7386	47.37	0	100	H	37.14	8.56	33.99	59.08	74.00	-14.92	Peak
7386	35.02	0	100	V	37.14	8.56	33.99	46.73	54.00	-7.27	Ave
7386	35.04	0	100	H	37.14	8.56	33.99	46.75	54.00	-7.25	Ave
9848	47.05	0	100	V	37.99	11.23	34.39	61.87	74.00	-12.13	Peak
9848	46.91	0	100	H	37.99	11.23	34.39	61.73	74.00	-12.27	Peak
9848	34.88	0	100	V	37.99	11.23	34.39	49.70	54.00	-4.30	Ave
9848	35.14	0	100	H	37.99	11.23	34.39	49.96	54.00	-4.04	Ave

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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	53.51	181	254	V	29.04	5.02	0.00	87.57	-	-	Peak
2412	60.11	47	139	H	29.04	5.02	0.00	94.17	-	-	Peak
2390	28.43	43	148	V	29.04	4.90	0.00	62.37	74.00	-11.63	Peak
2390	33.90	55	211	H	29.04	4.90	0.00	67.84	74.00	-6.16	Peak
2390	17.37	108	212	V	29.04	4.90	0.00	51.31	54.00	-2.69	Ave
2390	58.33	60	175	H	29.04	5.85	39.47	53.75	54.00	-0.25	Ave
4824	47.66	0	100	V	32.47	7.37	33.72	53.78	74.00	-20.22	Peak
4824	48.06	0	100	H	32.47	7.37	33.72	54.18	74.00	-19.82	Peak
4824	35.47	0	100	V	32.47	7.37	33.72	41.59	54.00	-12.41	Ave
4824	35.97	0	100	H	32.47	7.37	33.72	42.10	54.00	-11.90	Ave
7236	46.90	0	100	V	36.69	8.38	33.93	58.04	74.00	-15.96	Peak
7236	46.85	0	100	H	36.69	8.38	33.93	57.99	74.00	-16.01	Peak
7236	34.68	0	100	V	36.69	8.38	33.93	45.82	54.00	-8.18	Ave
7236	34.22	0	100	H	36.69	8.38	33.93	45.36	54.00	-8.64	Ave
9648	48.22	0	100	V	37.84	11.56	34.31	63.30	74.00	-10.70	Peak
9648	47.35	0	100	H	37.84	11.56	34.31	62.43	74.00	-11.57	Peak
9648	34.56	0	100	V	37.84	11.56	34.31	49.64	54.00	-4.36	Ave
9648	34.62	0	100	H	37.84	11.56	34.31	49.70	54.00	-4.30	Ave
Middle Channel 2437 MHz											
2437	49.19	272	141	V	29.04	5.02	0.00	83.25	-	-	Peak
2437	59.23	56	183	H	29.04	5.02	0.00	93.29	-	-	Peak
4874	48.12	0	100	V	32.64	7.37	33.75	54.38	74.00	-19.62	Peak
4874	47.53	0	100	H	32.64	7.37	33.75	53.79	74.00	-20.21	Peak
4874	35.55	0	100	V	32.64	7.37	33.75	41.81	54.00	-12.19	Ave
4874	35.72	0	100	H	32.64	7.37	33.75	41.98	54.00	-12.02	Ave
7311	46.49	0	100	V	37.15	8.56	33.99	58.21	74.00	-15.79	Peak
7311	46.28	0	100	H	37.15	8.56	33.99	58.00	74.00	-16.00	Peak
7311	34.35	0	100	V	37.15	8.56	33.99	46.07	54.00	-7.93	Ave
7311	34.34	0	100	H	37.15	8.56	33.99	46.06	54.00	-7.94	Ave
9748	47.55	0	100	V	37.92	11.62	34.31	62.78	74.00	-11.22	Peak
9748	47.59	0	100	H	37.92	11.62	34.31	62.82	74.00	-11.18	Peak
9748	34.79	0	100	V	37.92	11.62	34.31	50.02	54.00	-3.98	Ave
9748	35.03	0	100	H	37.92	11.62	34.31	50.26	54.00	-3.74	Ave

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	51.07	114	228	V	29.41	5.02	0.00	85.50	-	-	Peak
2462	57.93	58	230	H	29.41	5.02	0.00	92.36	-	-	Peak
2483.5	28.68	91	204	V	29.41	5.02	0.00	63.11	74.00	-10.89	Peak
2483.5	31.71	62	152	H	29.41	5.02	0.00	66.14	74.00	-7.86	Peak
2483.5	49.58	136	183	V	29.41	5.85	39.47	45.38	54.00	-8.62	Ave
2483.5	54.14	61	177	H	29.41	5.85	39.47	49.94	54.00	-4.06	Ave
4924	48.29	0	100	V	32.99	6.90	34.62	53.49	74.00	-20.51	Peak
4924	48.13	0	100	H	32.99	6.90	34.62	53.40	74.00	-20.60	Peak
4924	35.29	0	100	V	32.99	6.90	34.62	40.49	54.00	-13.51	Ave
4924	35.97	0	100	H	32.99	6.90	34.62	41.24	54.00	-12.76	Ave
7386	47.04	0	100	V	37.14	8.56	33.99	58.75	74.00	-15.25	Peak
7386	47.19	0	100	H	37.14	8.56	33.99	58.90	74.00	-15.10	Peak
7386	34.88	0	100	V	37.14	8.56	33.99	46.59	54.00	-7.41	Ave
7386	34.90	0	100	H	37.14	8.56	33.99	46.61	54.00	-7.39	Ave
9848	46.96	0	100	V	37.99	11.23	34.39	61.78	74.00	-12.22	Peak
9848	46.66	0	100	H	37.99	11.23	34.39	61.48	74.00	-12.52	Peak
9848	34.81	0	100	V	37.99	11.23	34.39	49.63	54.00	-4.37	Ave
9848	34.78	0	100	H	37.99	11.23	34.39	49.60	54.00	-4.40	Ave

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

7.1 Applicable Standards

According to FCC 15.247(a) (2) and ISED 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.

7.2 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.

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 Year
-	RF cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

7.4 Test Environmental Conditions

Temperature:	21º C
Relative Humidity:	46 %
ATM Pressure:	102.5 KPa

The testing was performed by Shoaib Khan on 2017-01-11and 2017-03-06 in RF site.

7.5 Test Results

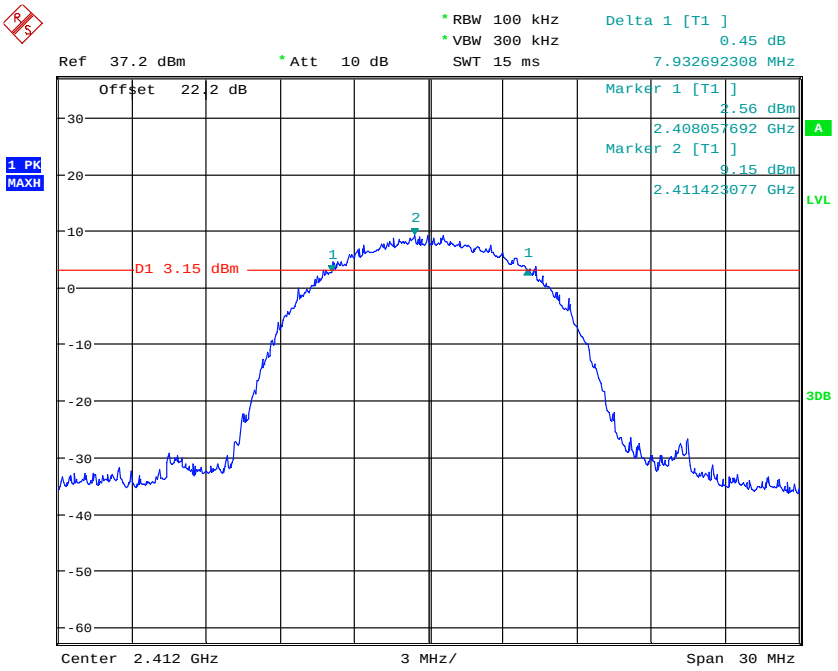
Channel	Frequency (MHz)	99% OBW (kHz)	6 dB BW (kHz)	6 dB OBW limit (kHz)
802.11b Mode Antenna Chain 0				
Low	2412	11298.1	7932.7	500
Middle	2437	11201.9	8317.3	500
High	2462	11201.9	7740.4	500
802.11g Mode Antenna Chain 0				
Low	2412	17019.2	16442.3	500
Middle	2437	16971.2	16394.2	500
High	2462	16971.2	16394.2	500
802.11n20 Mode Antenna Chain 0				
Low	2412	18028.8	17836.5	500
Middle	2437	17980.8	17692.3	500
High	2462	17980.8	17692.3	500
802.11b Mode Antenna Chain 1				
Low	2412	11105.8	8509.6	500
Middle	2437	11057.7	8509.6	500
High	2462	11153.8	7836.5	500
802.1g Mode Antenna Chain 1				
Low	2412	17211.5	16442.3	500
Middle	2437	17019.2	16442.3	500
High	2462	17019.2	16538.5	500
802.11n20 Mode Antenna Chain 1				
Low	2412	18076.9	17740.4	500
Middle	2437	18076.9	17692.3	500
High	2462	18076.9	17692.3	500

Please refer to the following plots for detailed test results.

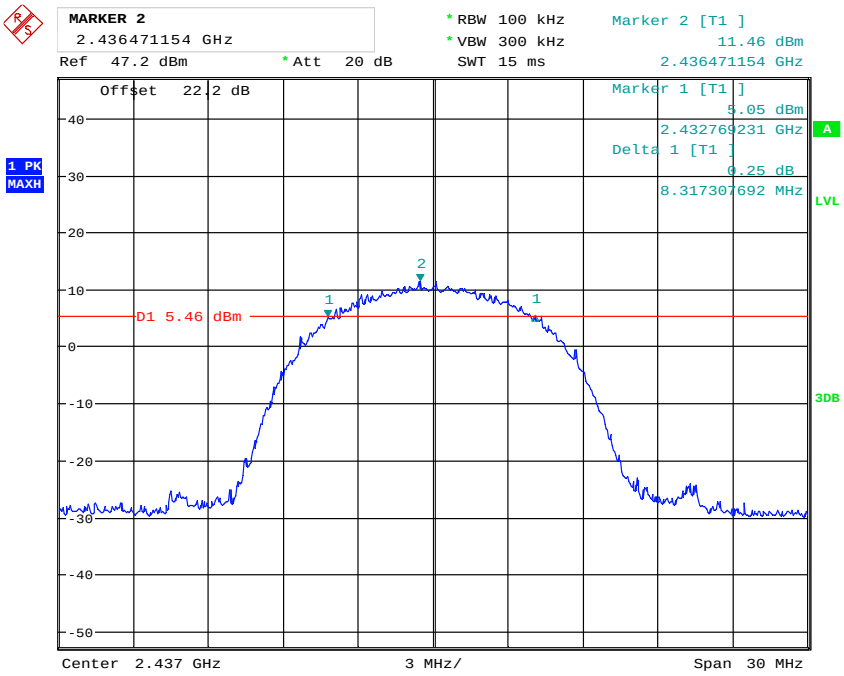
6 dB Bandwidth

802.11b Mode Antenna Chain 0

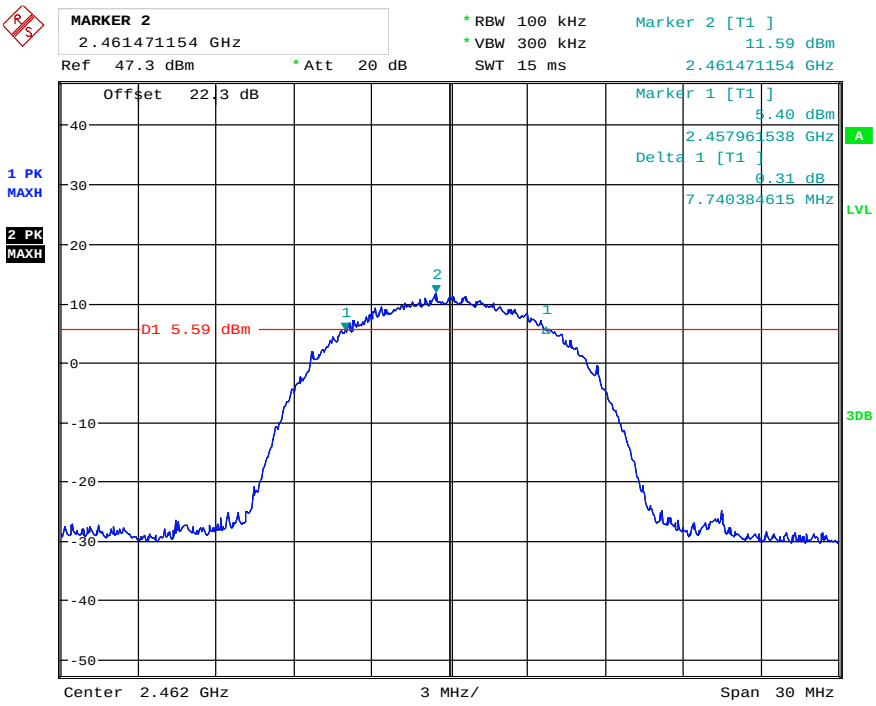
Low Channel 2412 MHz



Middle Channel 2437 MHz

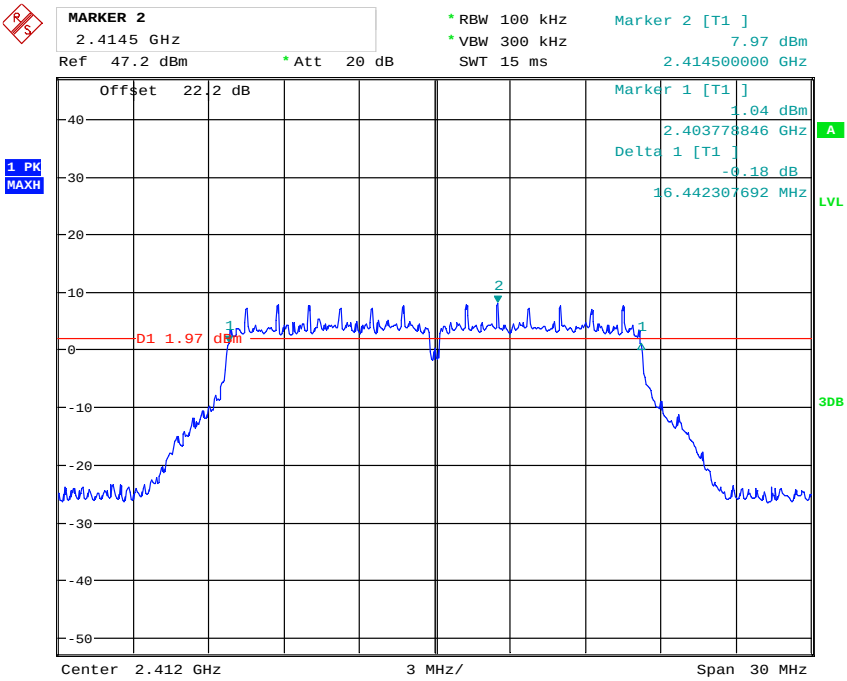


High Channel 2462 MHz

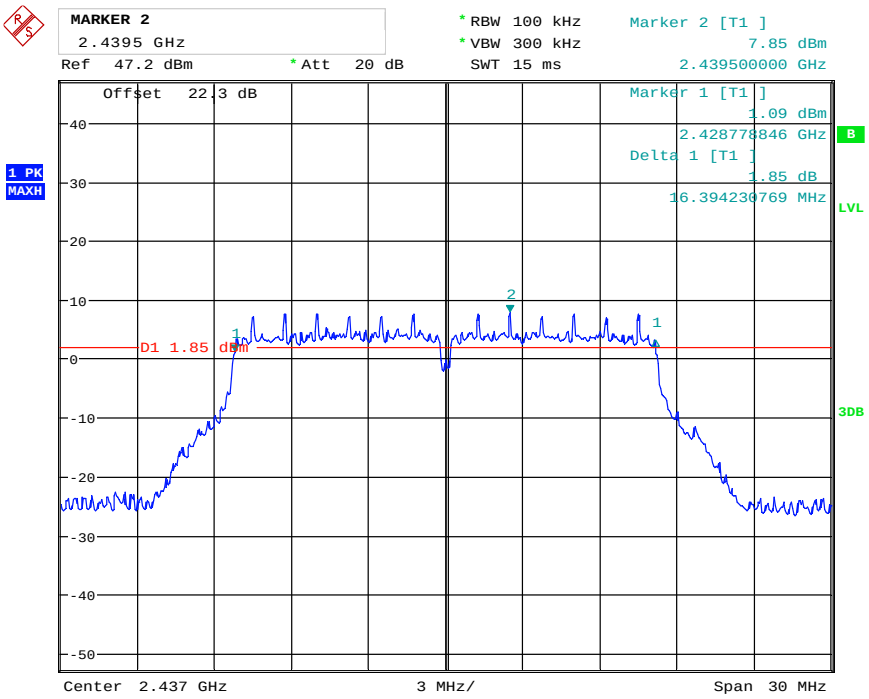


802.11g Mode Antenna Chain 0

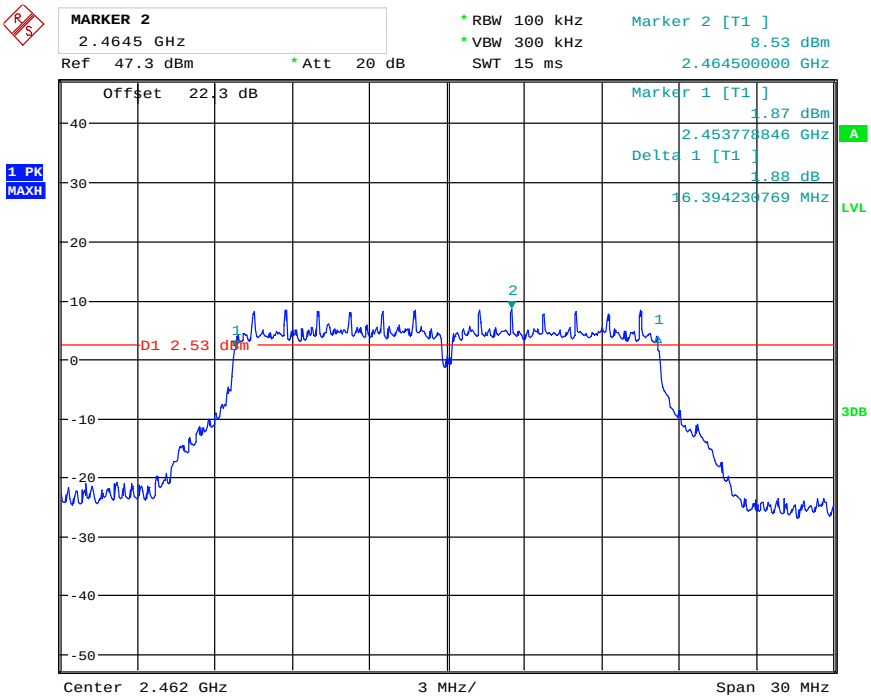
Low Channel 2412 MHz



Middle Channel 2437 MHz

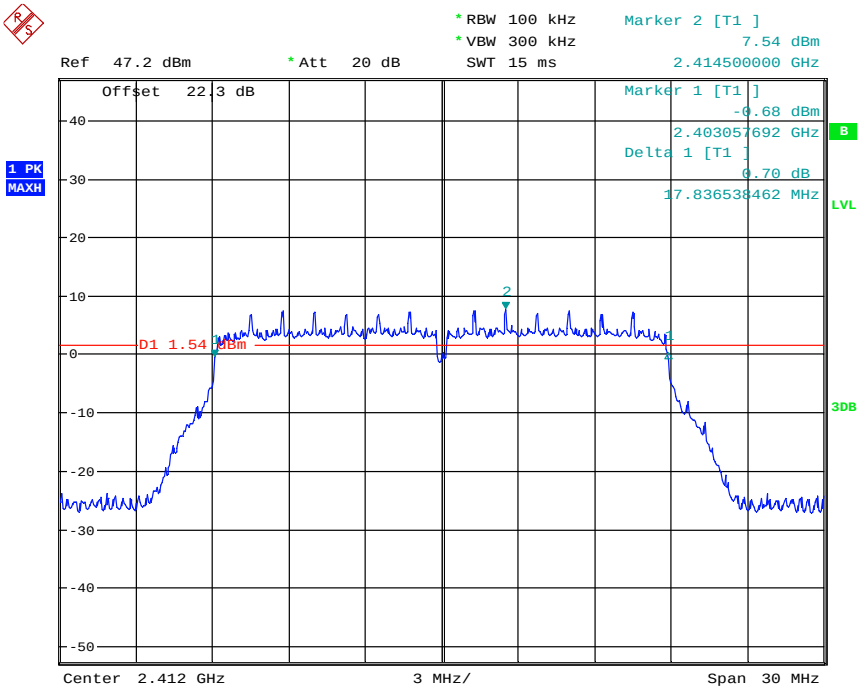


High Channel 2462 MHz

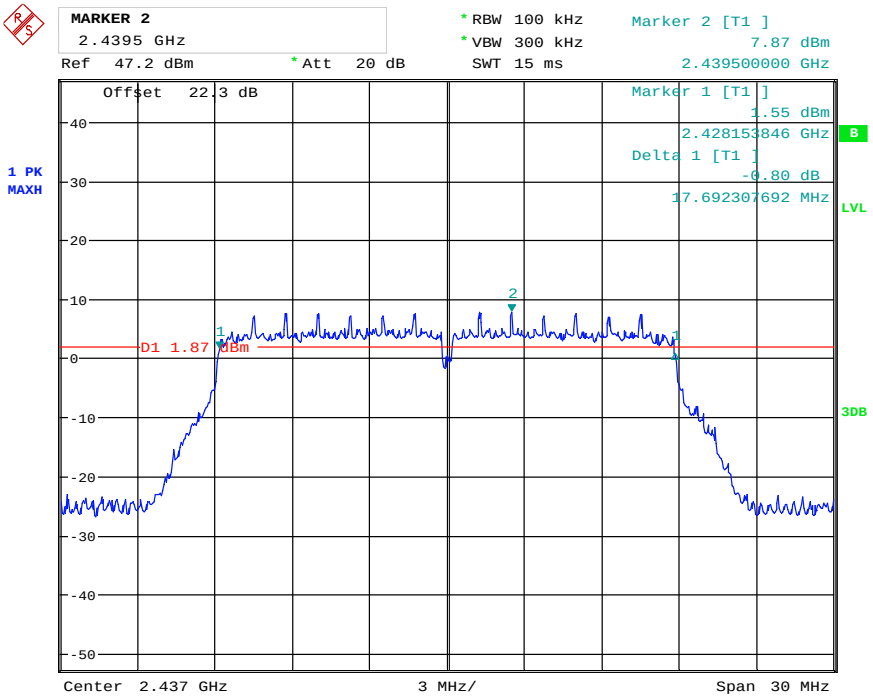


802.11n20 Mode Antenna Chain 0

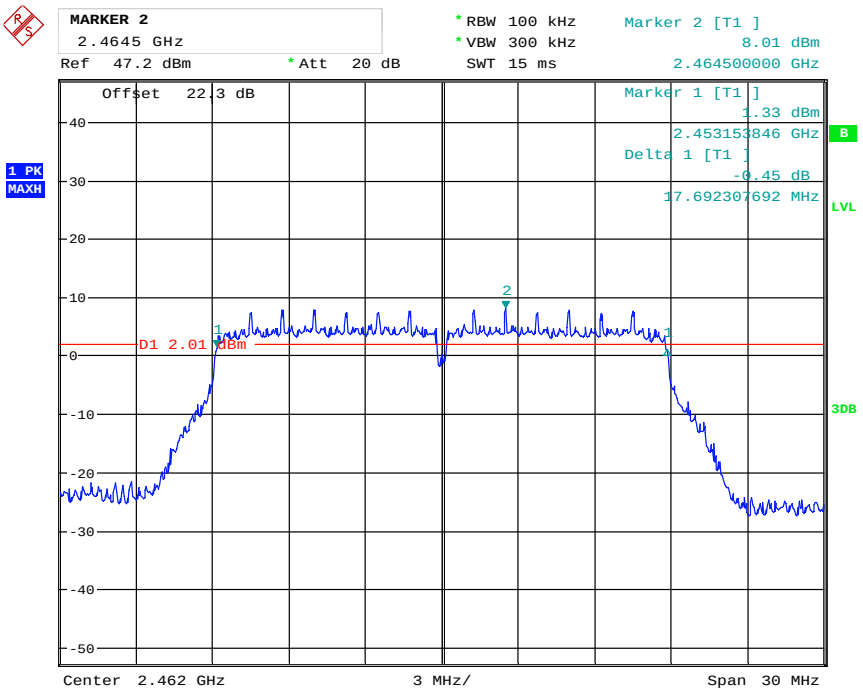
Low Channel 2412 MHz



Middle Channel 2437 MHz

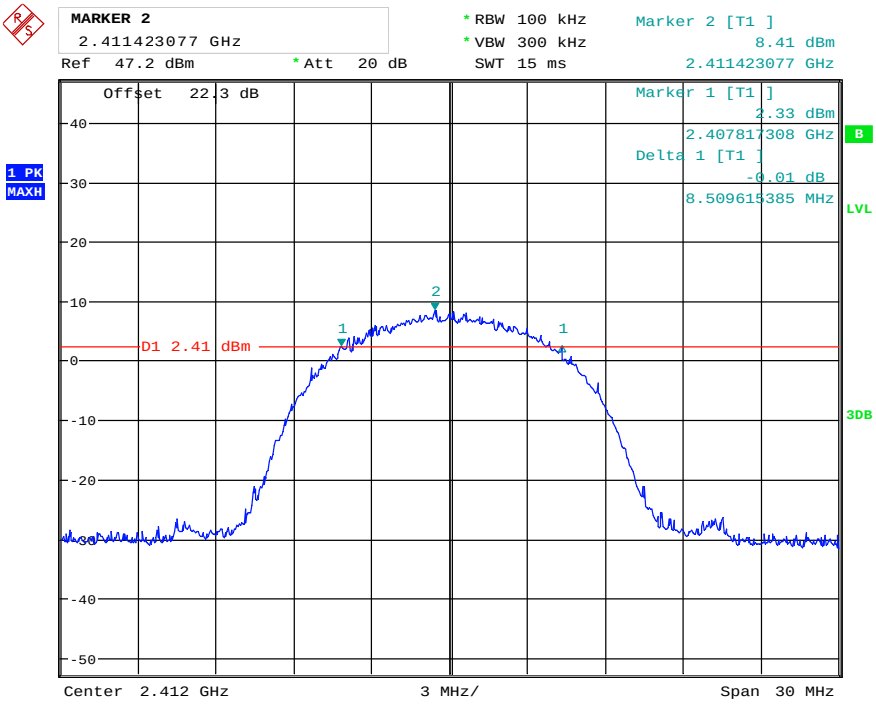


High Channel 2462 MHz

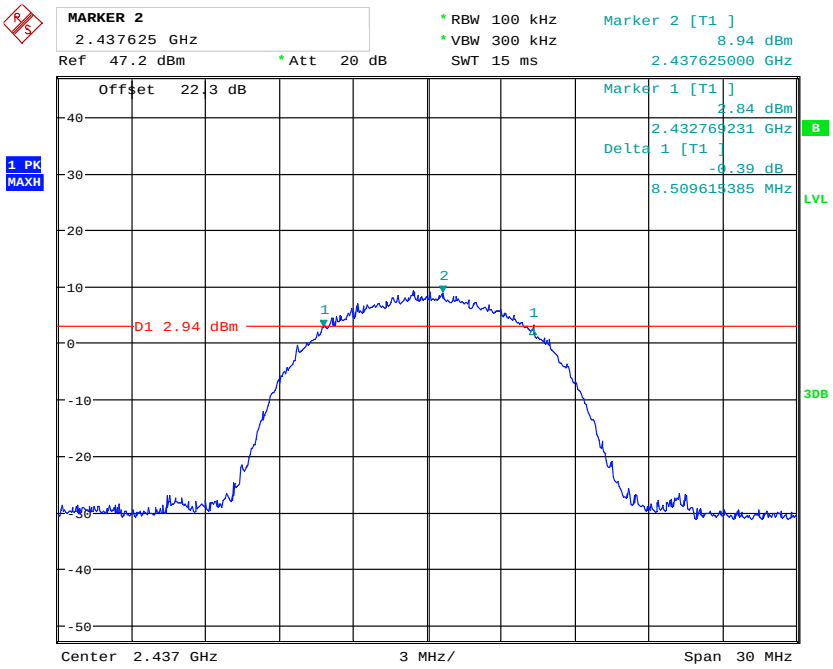


802.11b Mode Antenna Chain 1

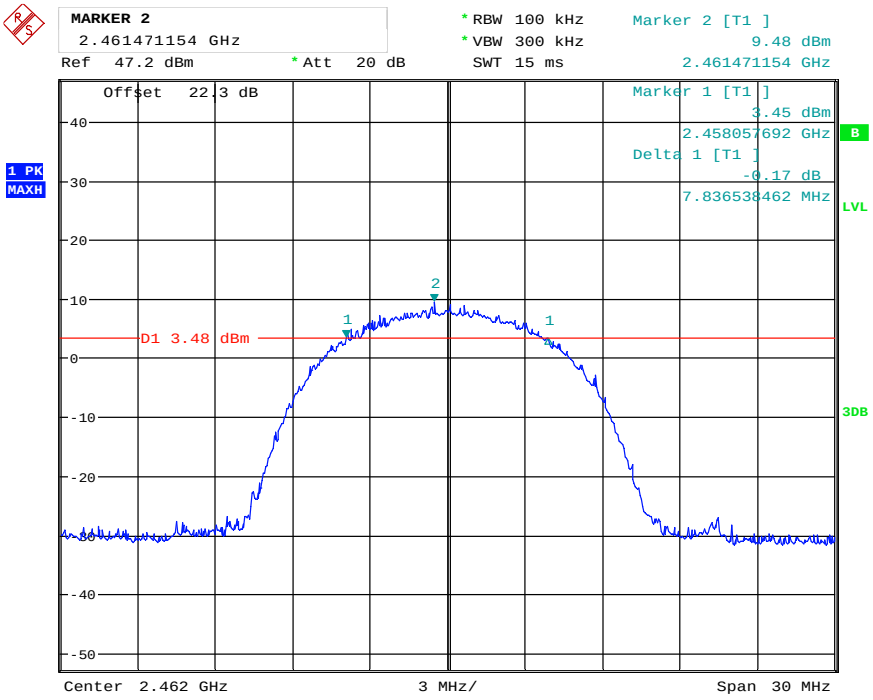
Low Channel 2412 MHz



Middle Channel 2437 MHz

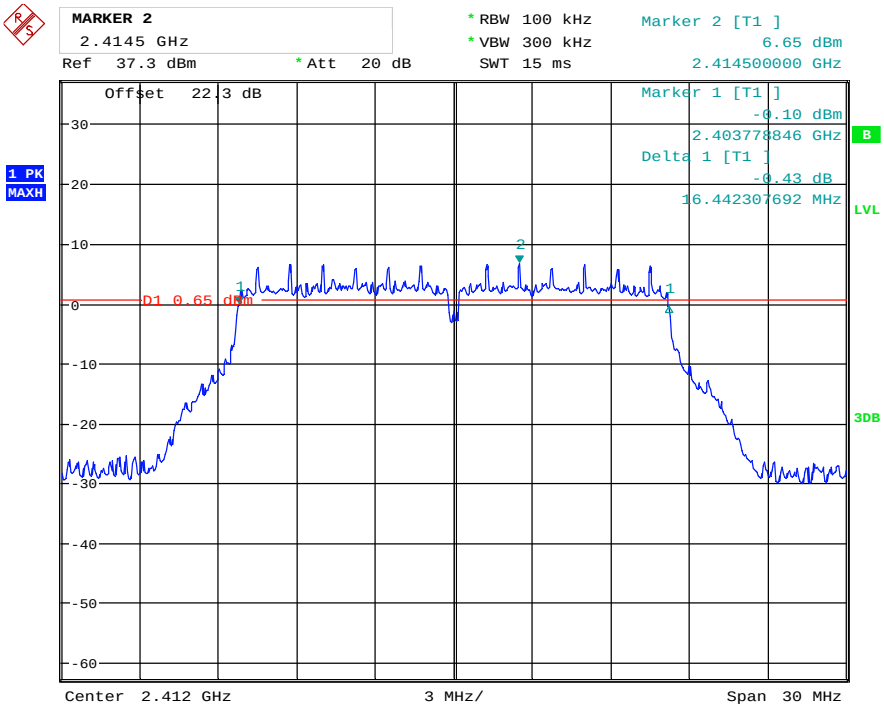


High Channel 2462 MHz

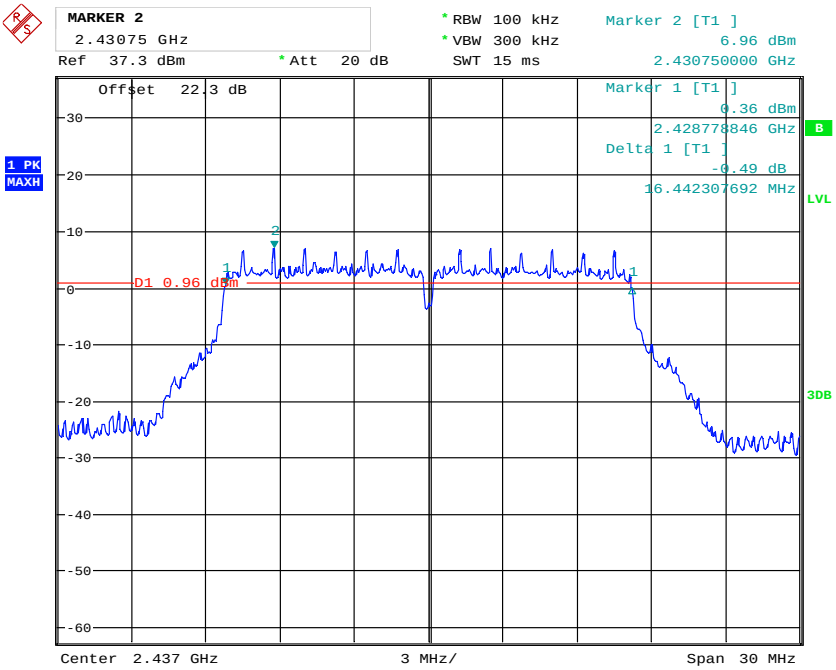


802.11g Mode Antenna Chain 1

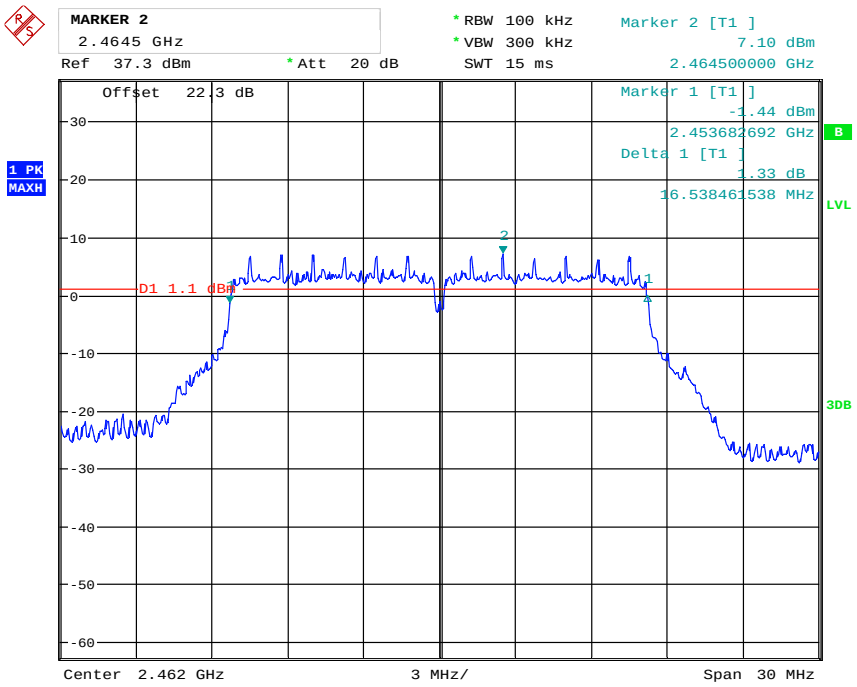
Low Channel 2412 MHz



Middle Channel 2437 MHz

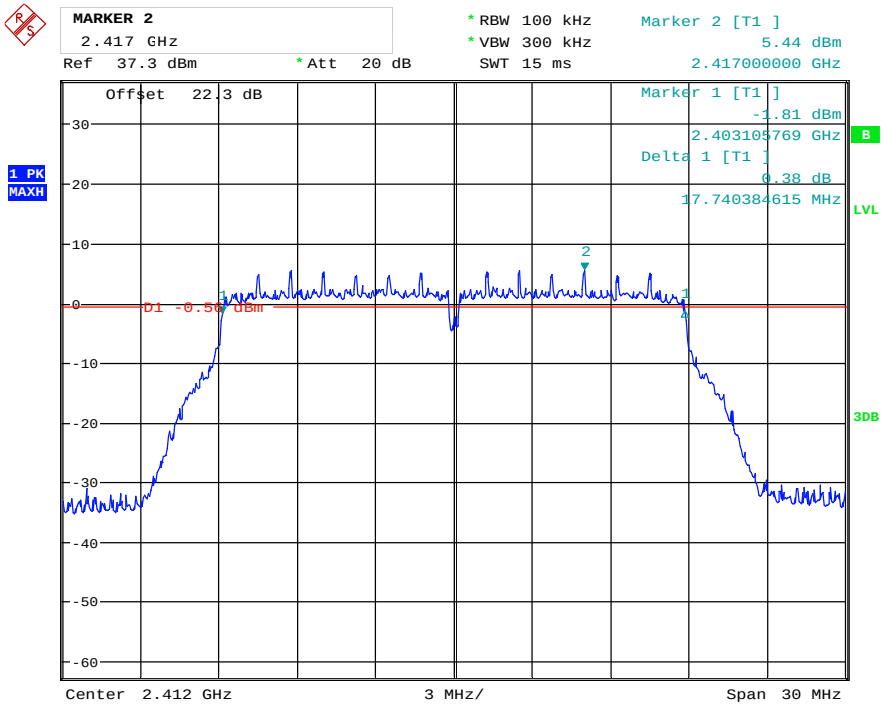


High Channel 2462 MHz

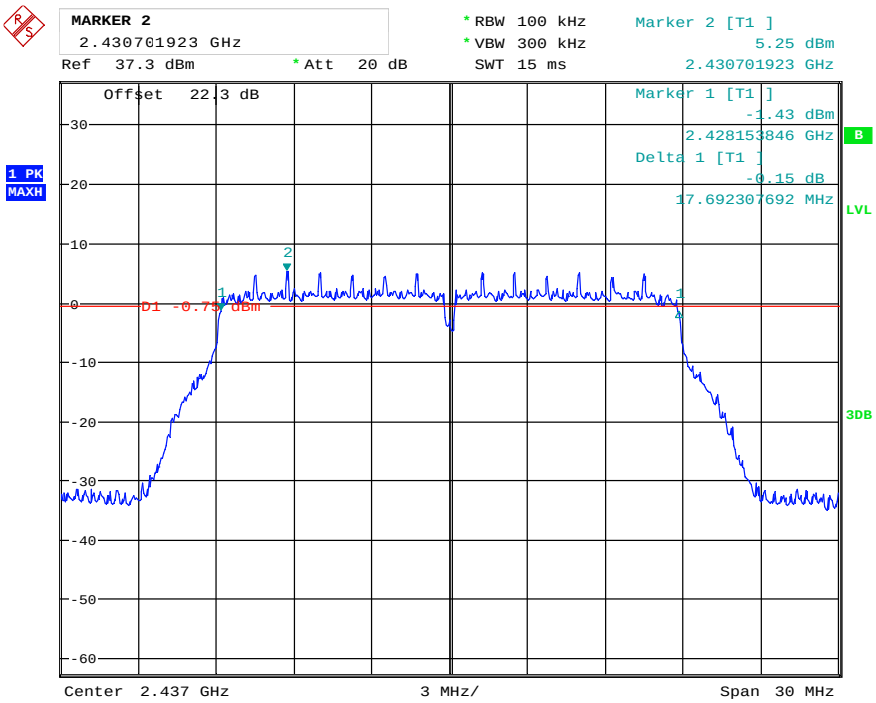


802.11n20 Mode Antenna Chain 1

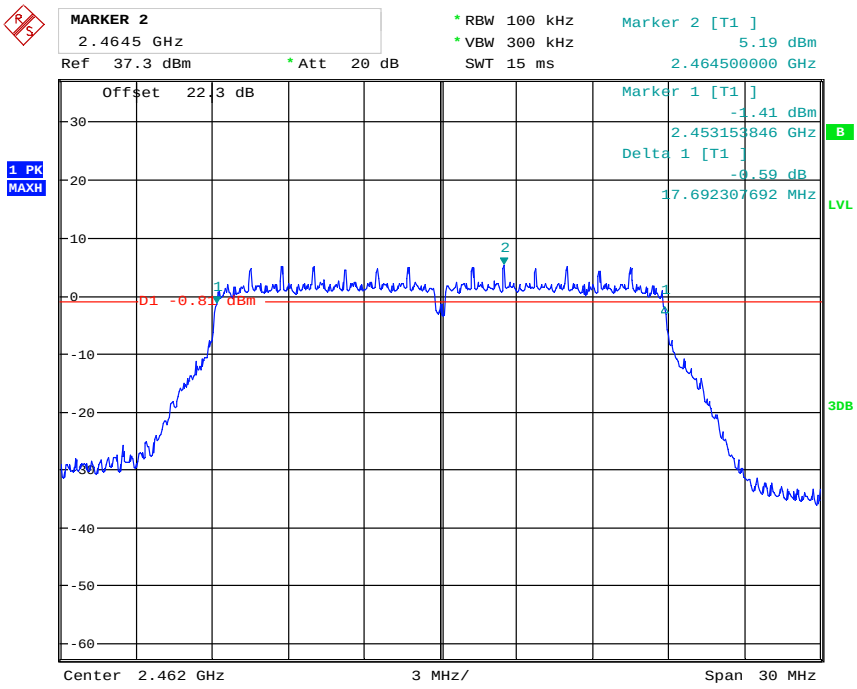
Low Channel 2412 MHz



Middle Channel 2437 MHz



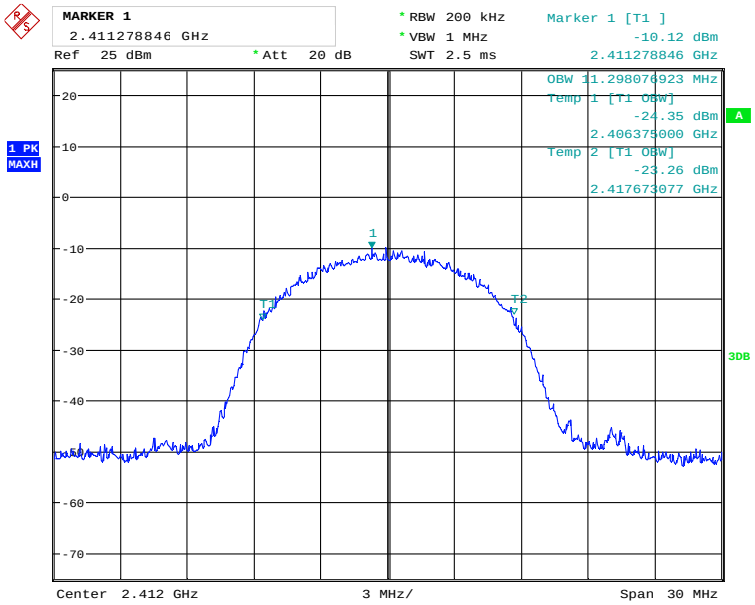
High Channel 2462 MHz



99% Occupied Bandwidth

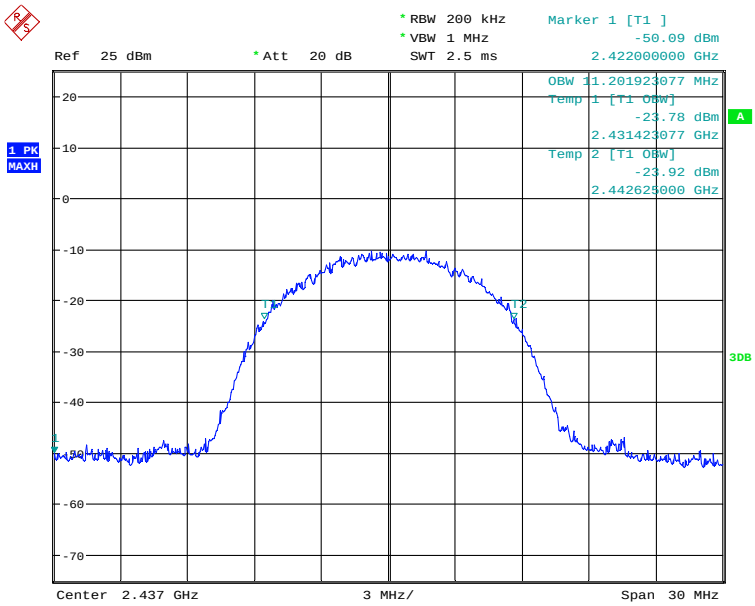
802.11b Mode Antenna Chain 0

Low Channel 2412 MHz



Date: 6.MAR.2017 23:41:24

Middle Channel 2437 MHz



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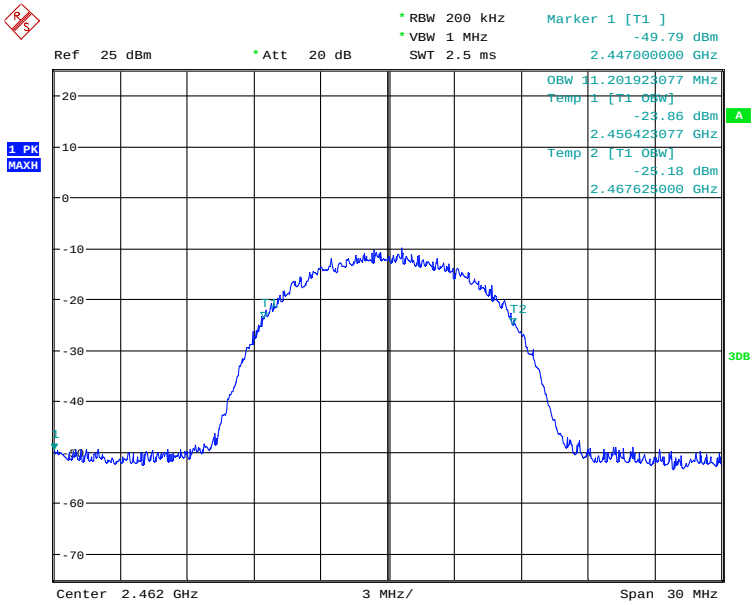
High Channel 2462 MHz



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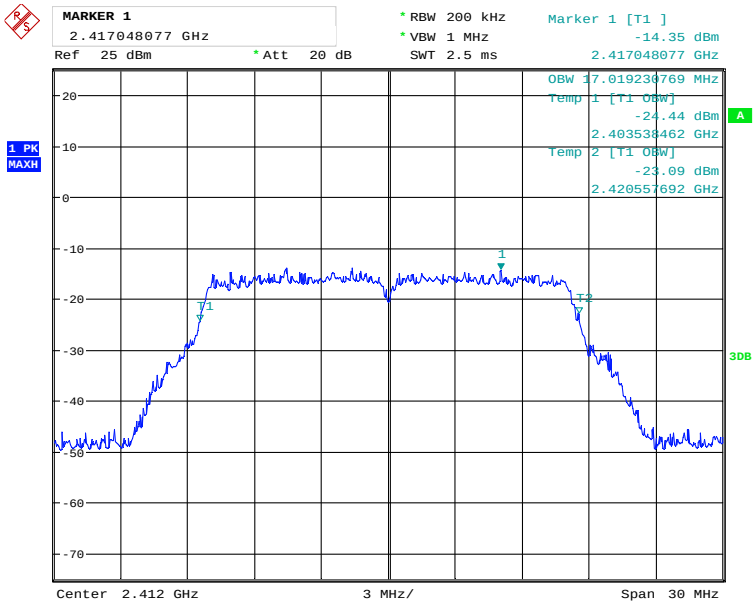
802.11g Mode Antenna Chain 0

Low Channel 2412 MHz



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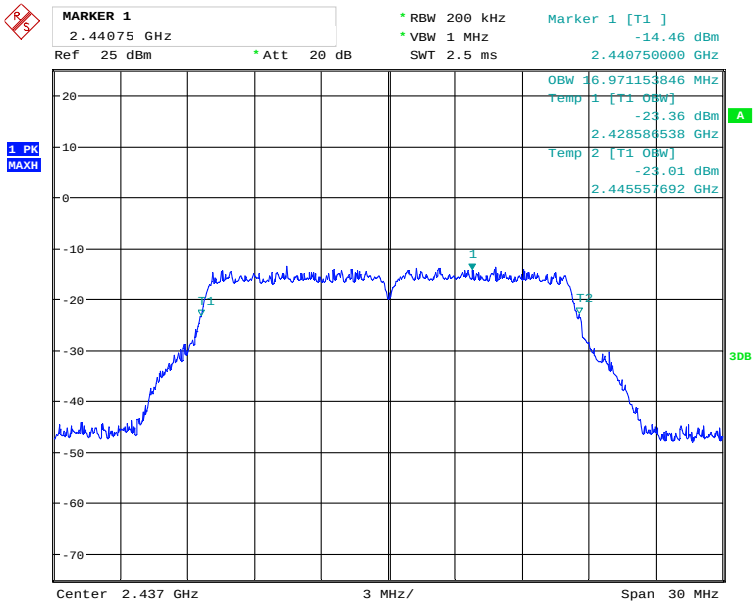
Middle Channel 2437 MHz



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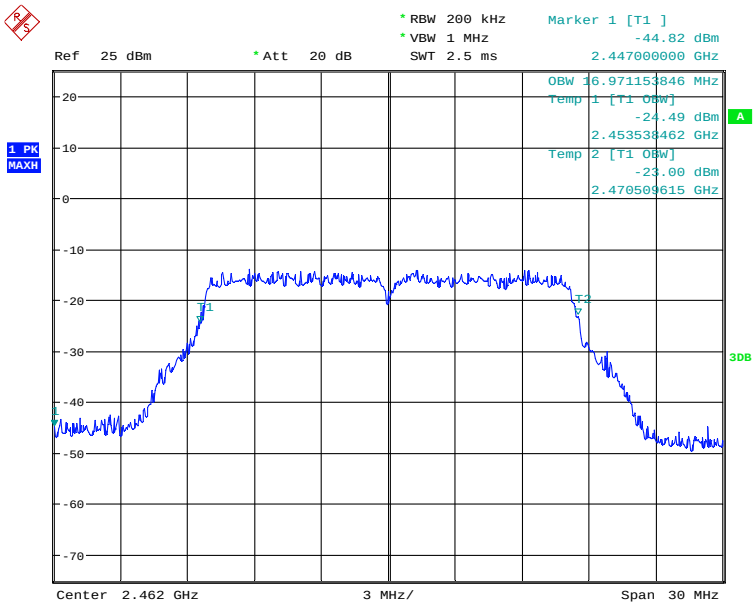
High Channel 2462 MHz



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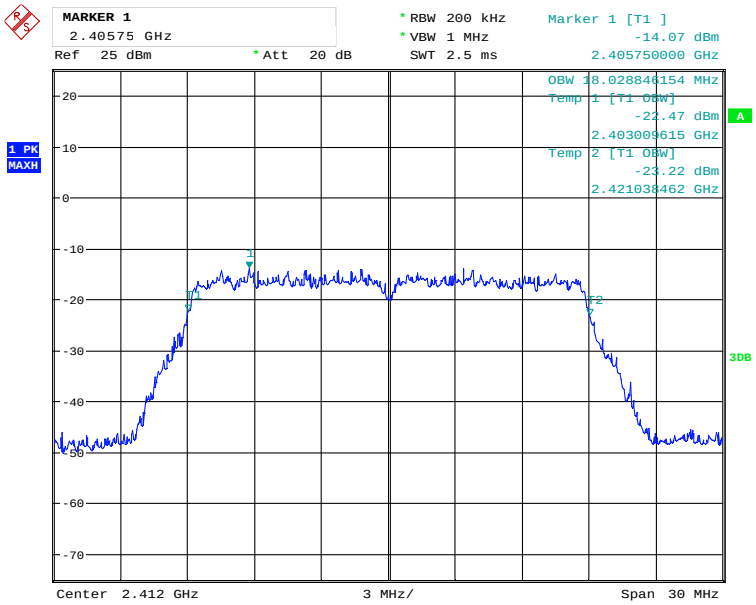
802.11n20 Mode Antenna Chain 0

Low Channel 2412 MHz



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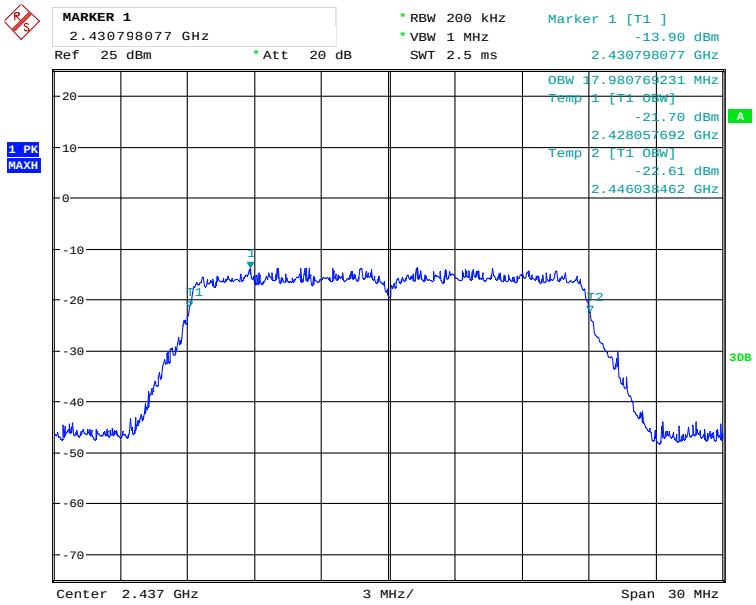
Middle Channel 2437 MHz



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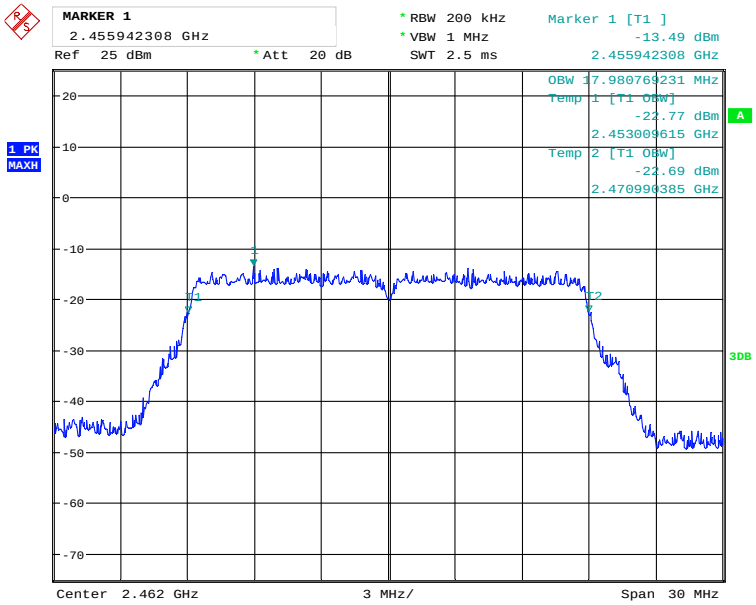
High Channel 2462 MHz



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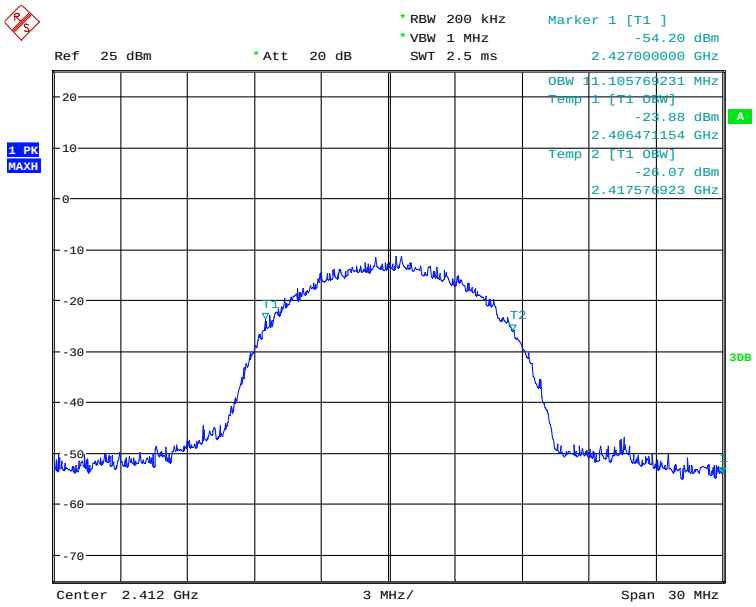
802.11b Mode Antenna Chain 1

Low Channel 2412 MHz



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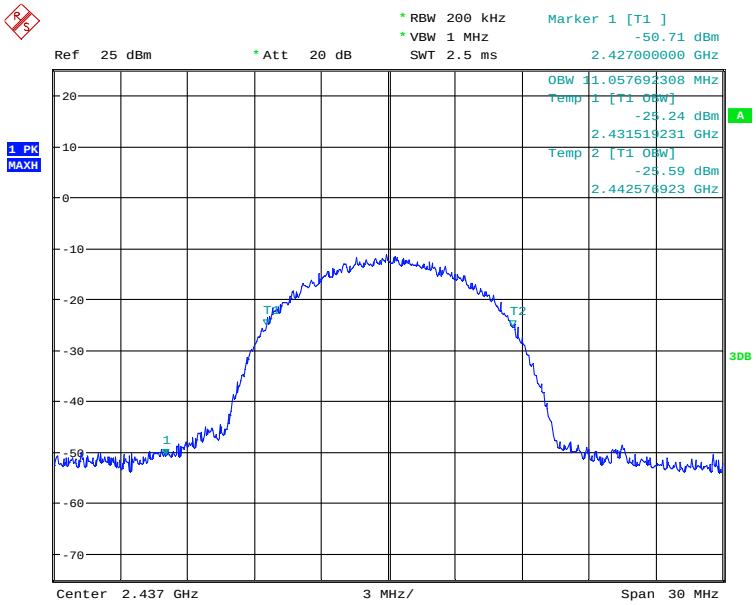
Middle Channel 2437 MHz



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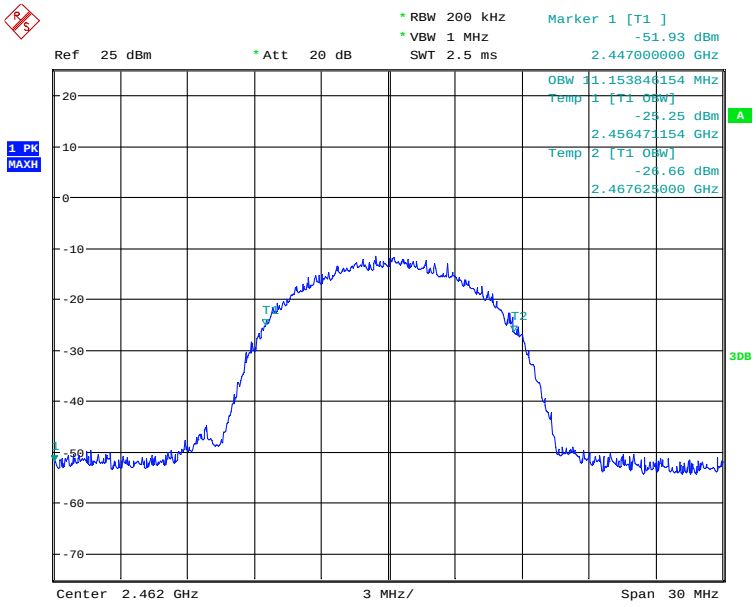
High Channel 2462 MHz



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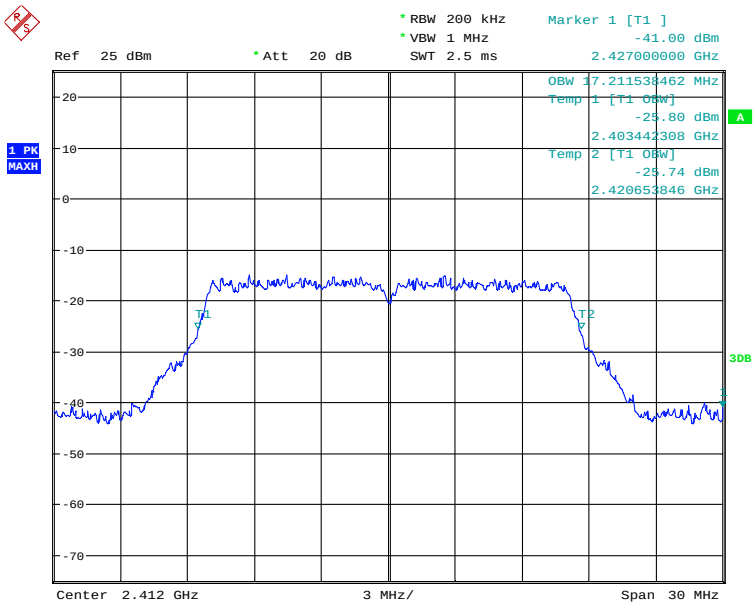
802.11g Mode Antenna Chain 1

Low Channel 2412 MHz



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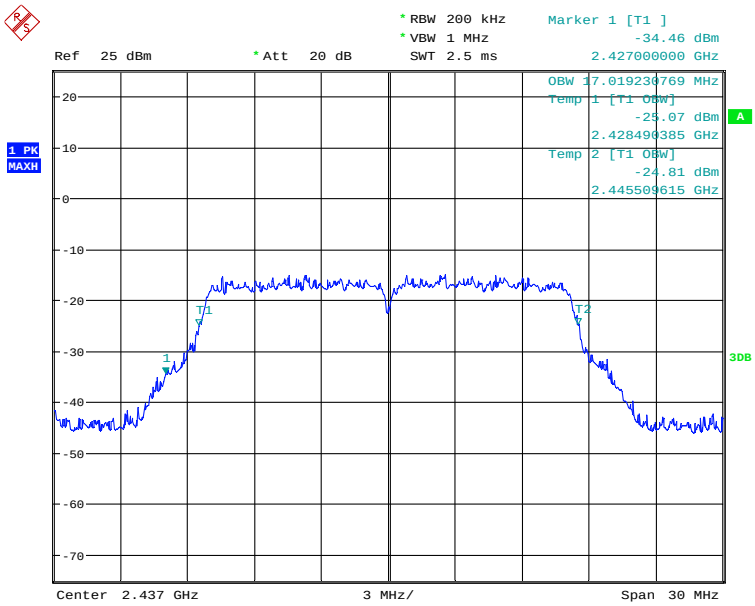
Middle Channel 2437 MHz



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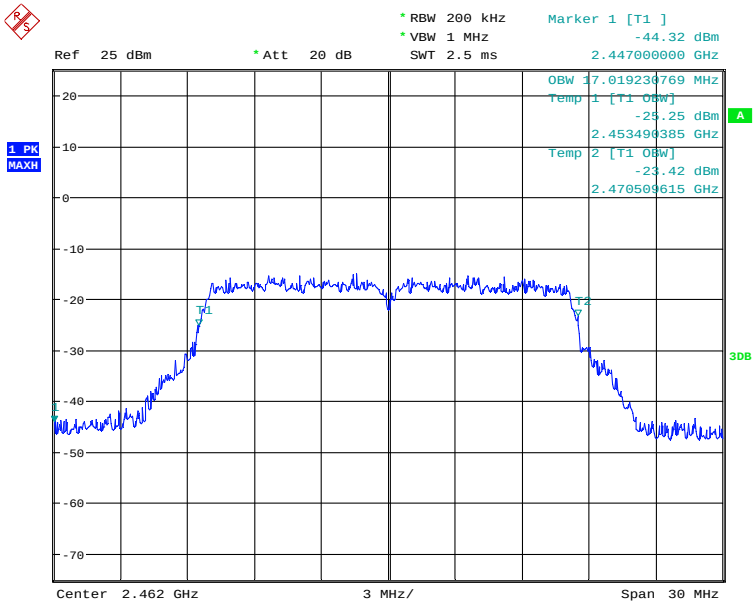
High Channel 2462 MHz



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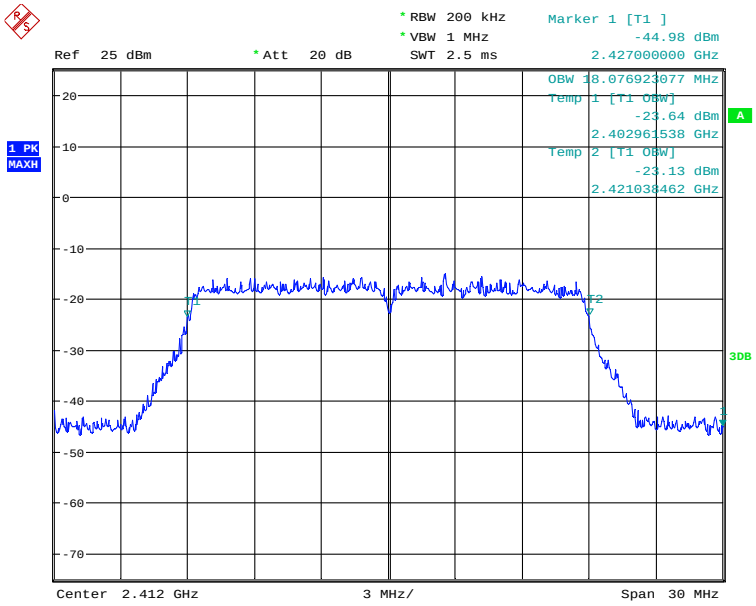
802.11n20 Mode Antenna Chain 1

Low Channel 2412 MHz



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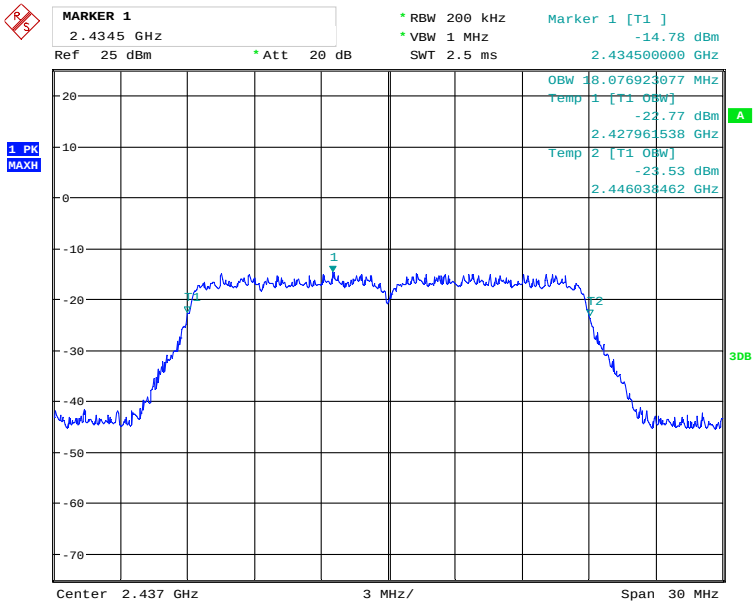
Middle Channel 2437 MHz



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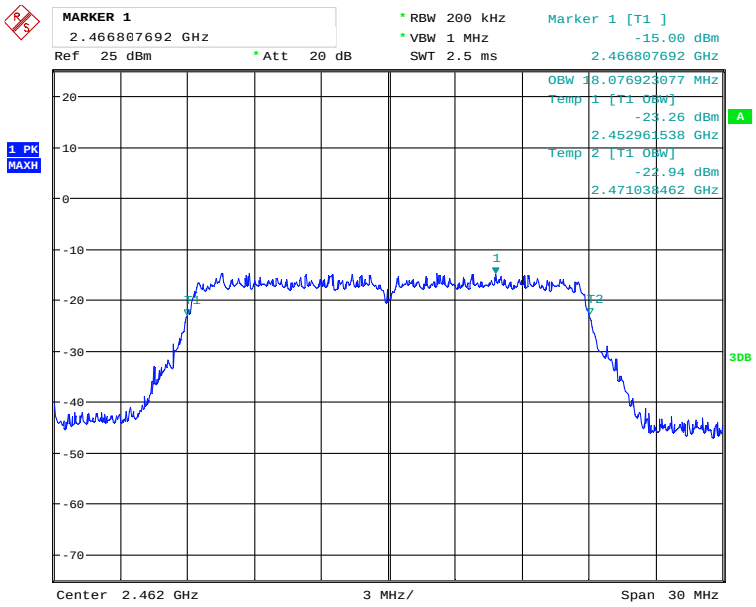
High Channel 2462 MHz



Date: 6.MAR.2017 23:52:23

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

8.1 Applicable Standards

According to FCC 15.247(b) (3) and ISED 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.

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 9: Fundamental emission output power.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 Year
-	RF cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

8.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.5 KPa

The testing was performed by Shoaib Khan on 2017-01-11 in RF site.

8.5 Test Results

Wi-Fi Output Power

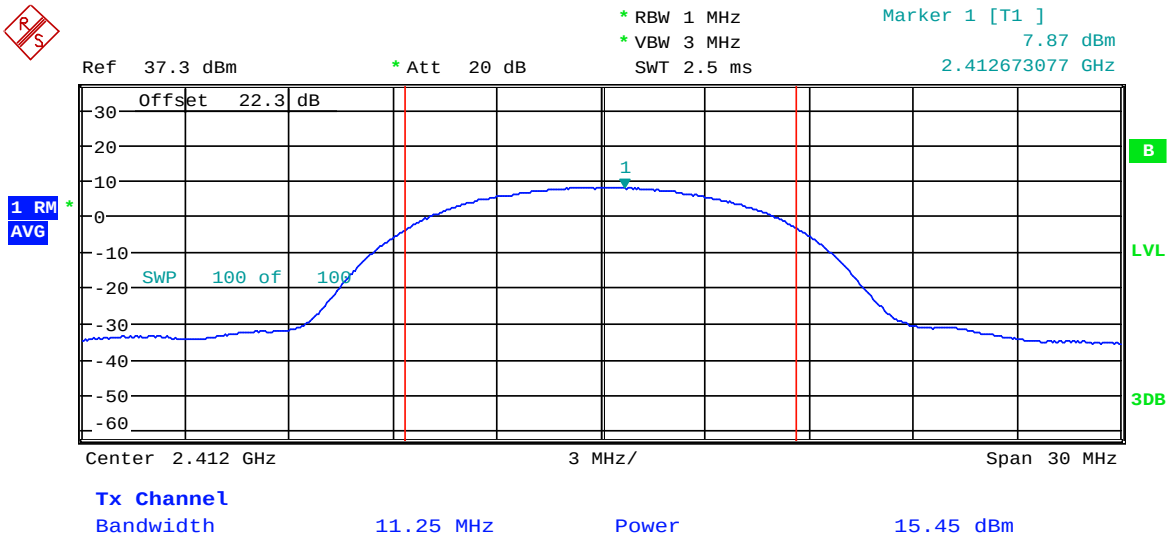
Channel	Frequency (MHz)	Ave Power (dBm)	Limit (dBm)
802.11b Mode Antenna Chain 0			
1	2412	16.45	30
6	2437	17.81	30
11	2462	18.17	30
802.11g Mode Antenna Chain 0			
1	2412	18.68	30
6	2437	18.86	30
11	2462	18.88	30
802.11n20 Mode Antenna Chain 0			
1	2412	18.91	30
6	2437	19.31	30
11	2462	19.44	30
802.11b Mode Antenna Chain 1			
1	2412	17.02	30
6	2437	17.10	30
11	2462	17.45	30
802.11g Mode Antenna Chain 1			
1	2412	17.45	30
6	2437	17.85	30
11	2462	17.85	30
802.11n20 Mode Antenna Chain 1			
1	2412	16.08	30
6	2437	16.35	30
11	2462	16.32	30

Note 1: Duty Cycle correction factor has already been added to the measurement.

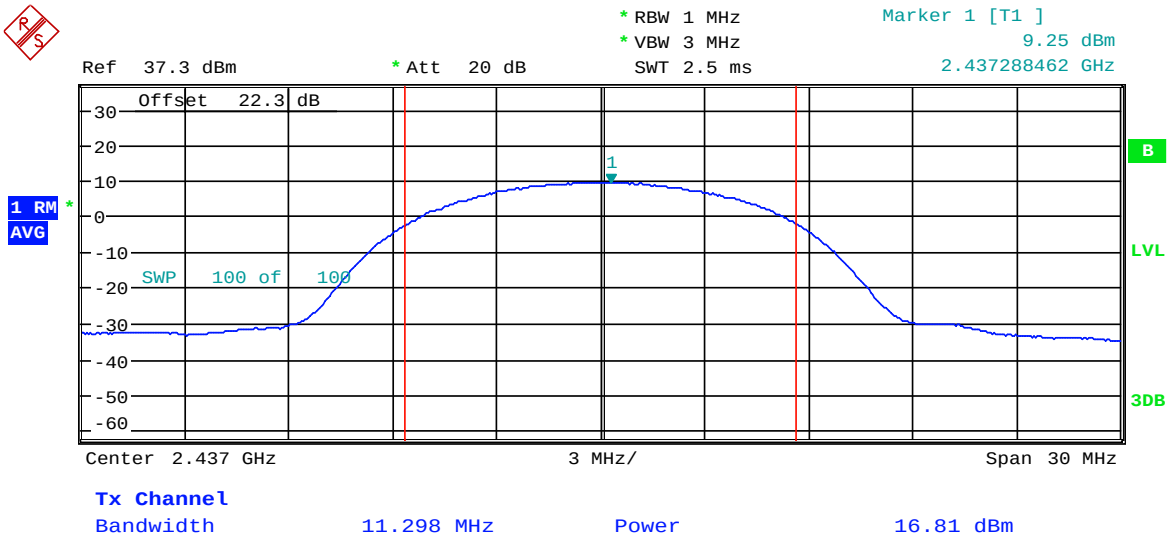
Note 2: The EUT cannot transmit both antenna chains at the same time.

802.11b Mode Antenna Chain 0

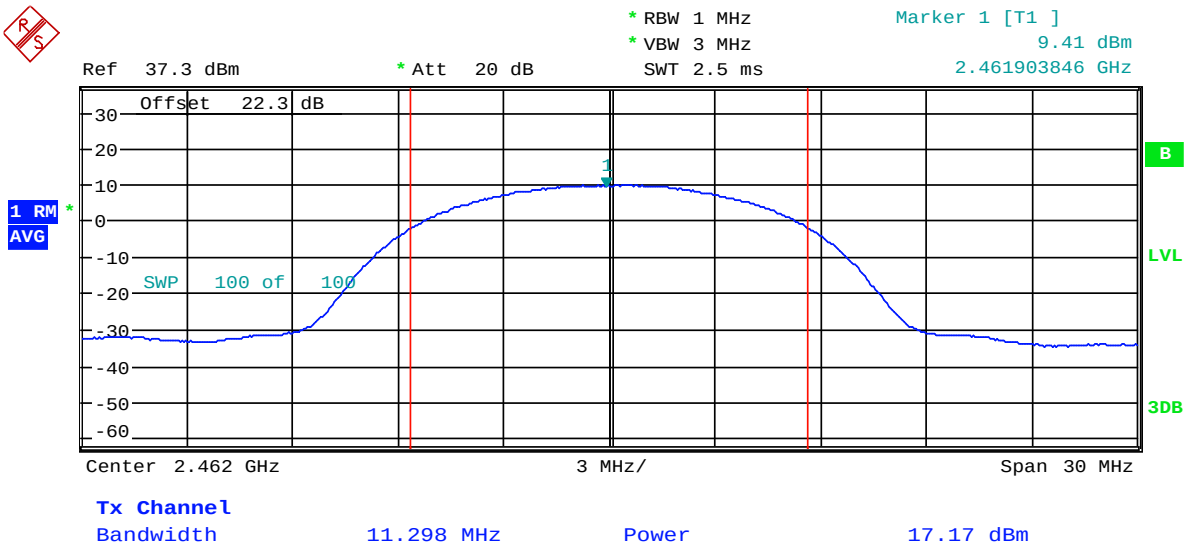
Low Channel 2412 MHz



Mid Channel 2437 MHz



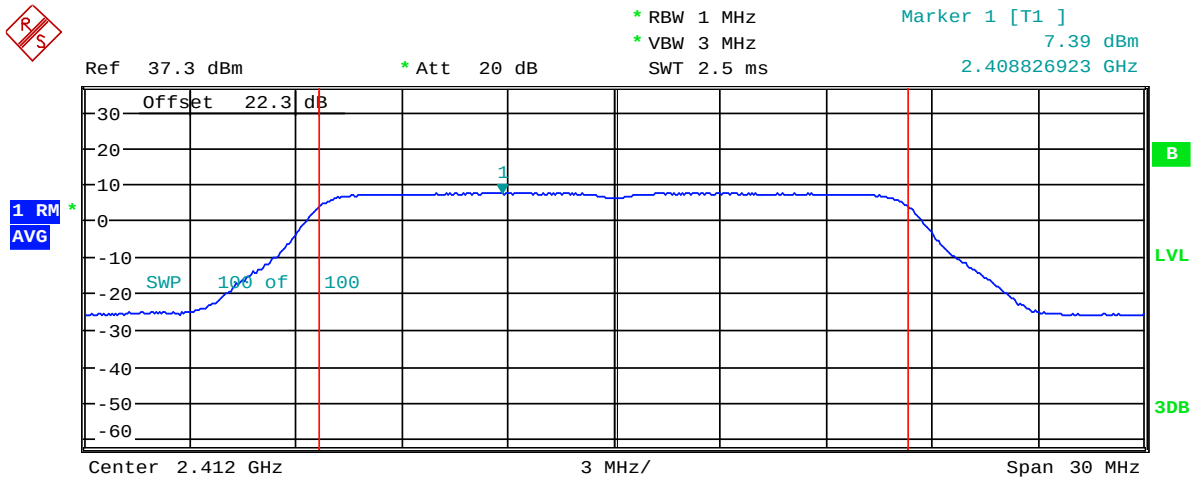
High Channel 2462 MHz



Tx Channel
Bandwidth 11.298 MHz Power 17.17 dBm

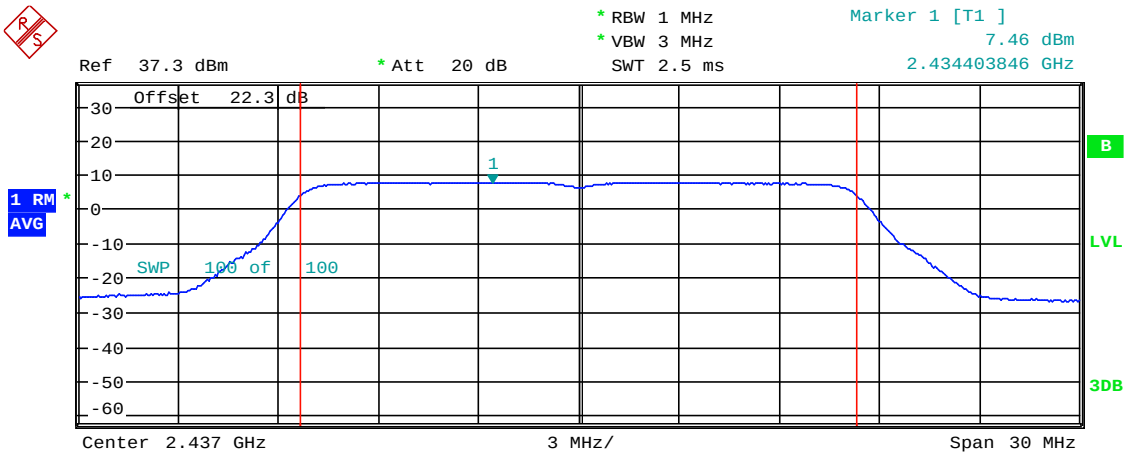
802.11g Mode Antenna Chain 0

Low Channel 2412 MHz



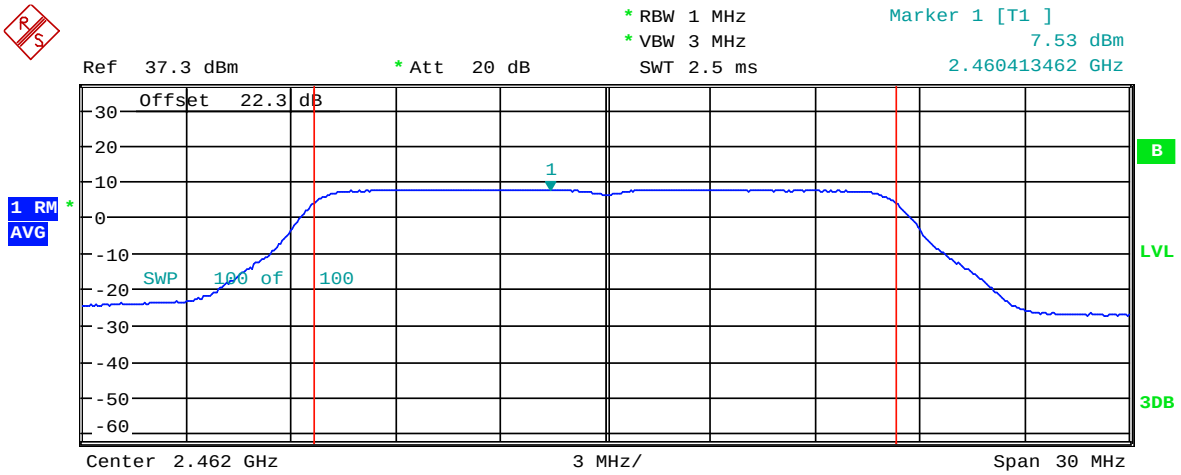
Tx Channel
Bandwidth 16.634 MHz Power 18.61 dBm

Mid Channel 2437 MHz



Tx Channel
Bandwidth 16.634 MHz Power 18.79 dBm

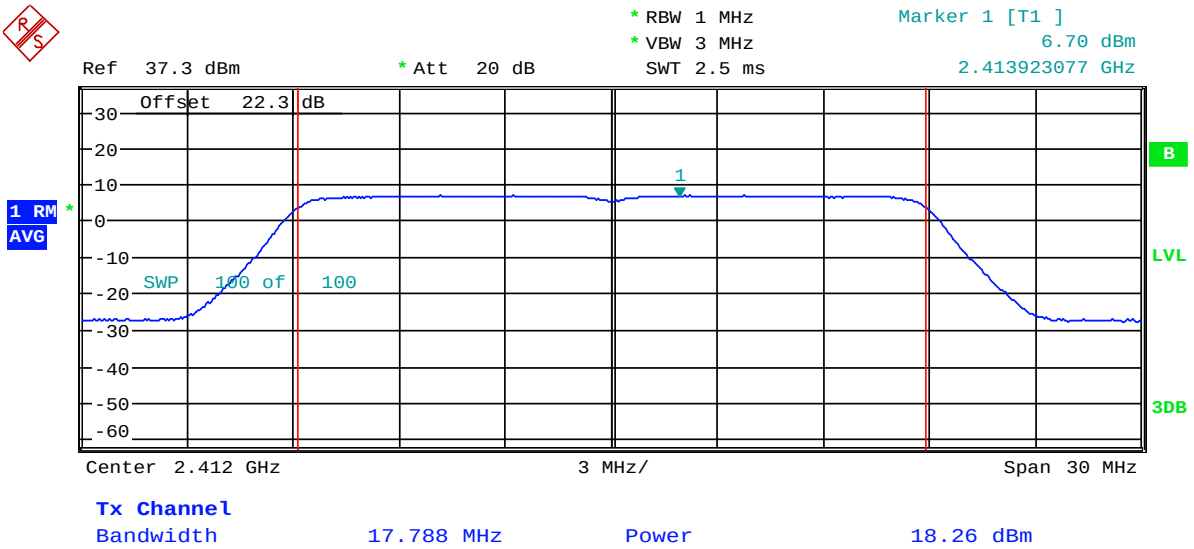
High Channel 2462 MHz



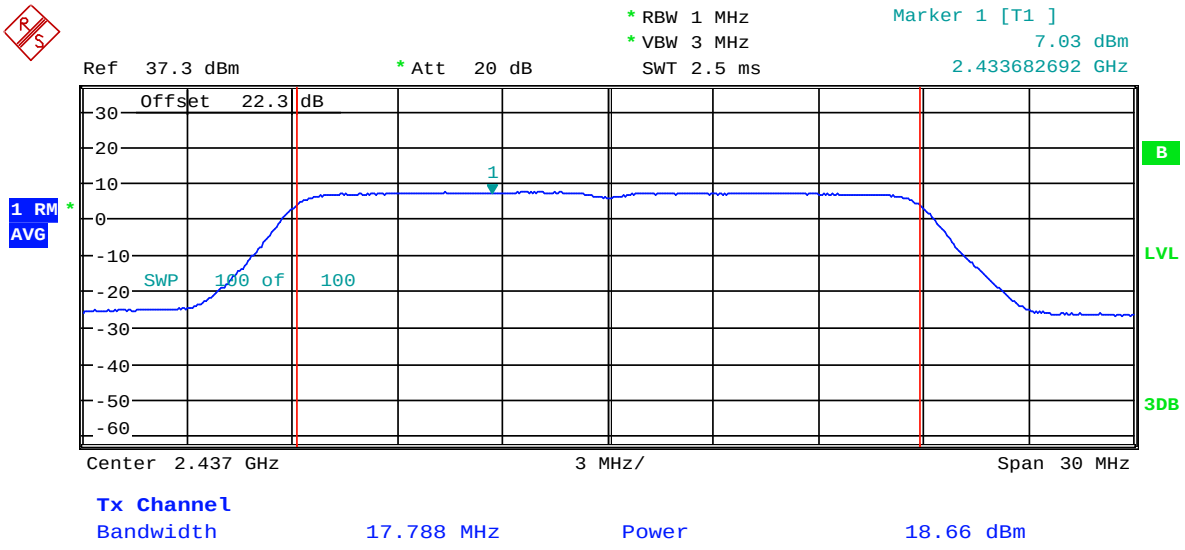
Tx Channel
Bandwidth 16.634 MHz Power 18.81 dBm

802.11n20 Mode Antenna Chain 0

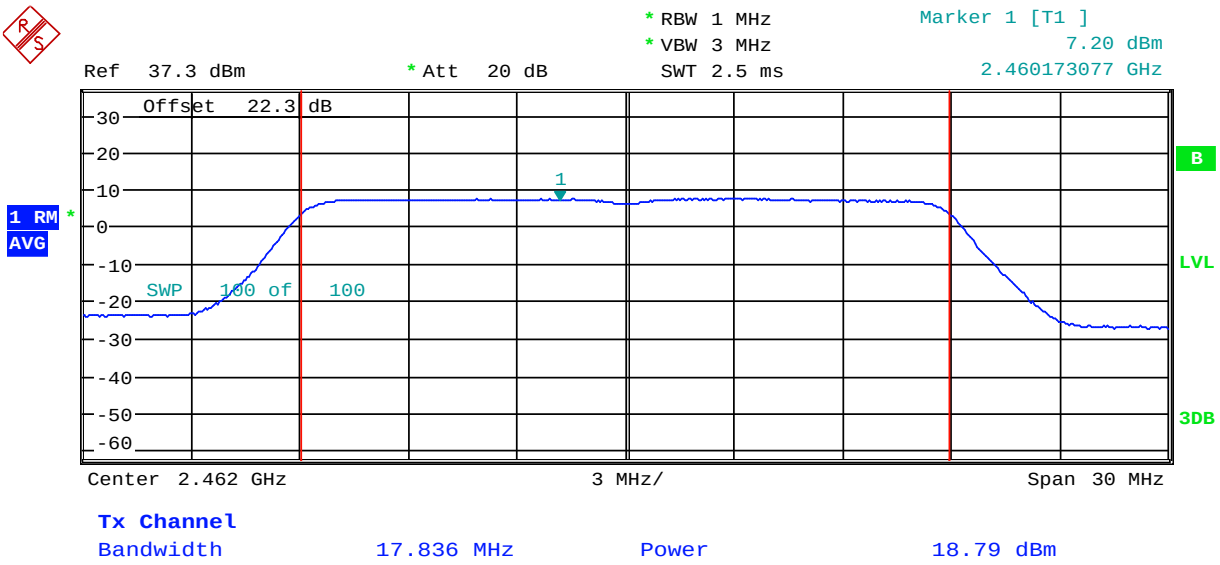
Low Channel 2412 MHz



Mid Channel 2437 MHz

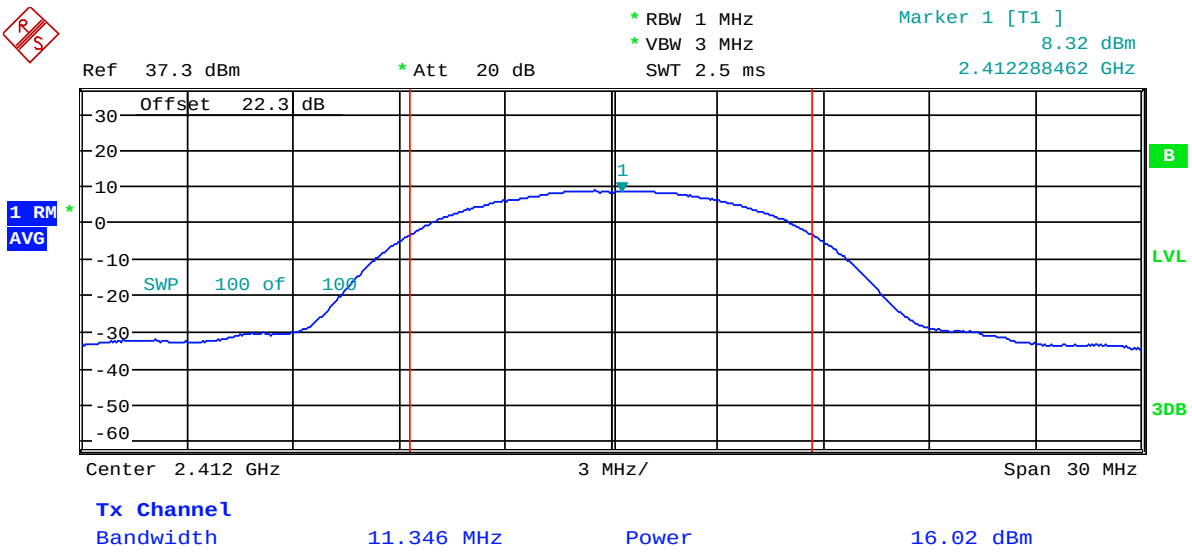


High Channel 2462 MHz

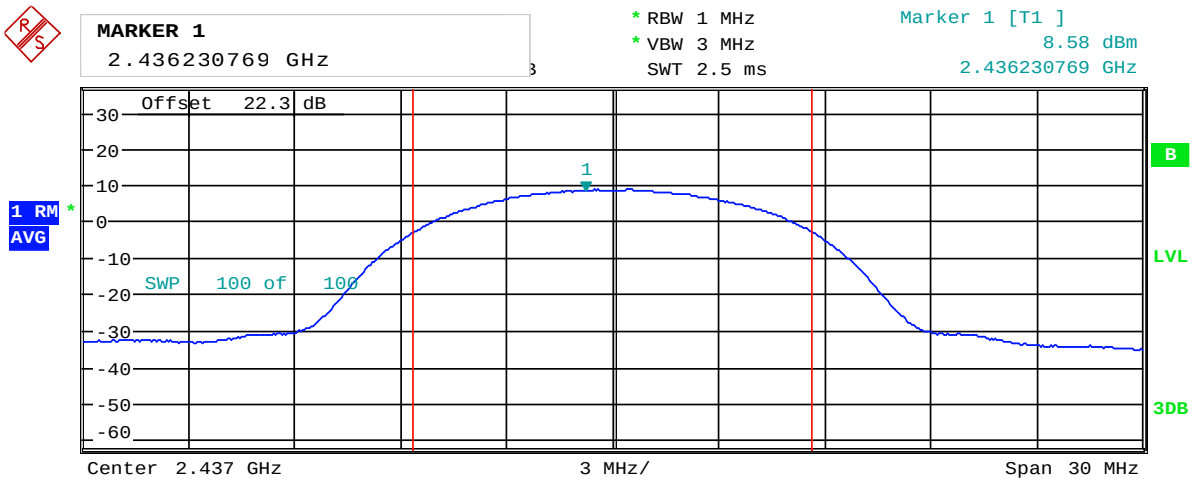


802.11b Mode Antenna Chain 1

Low Channel 2412 MHz

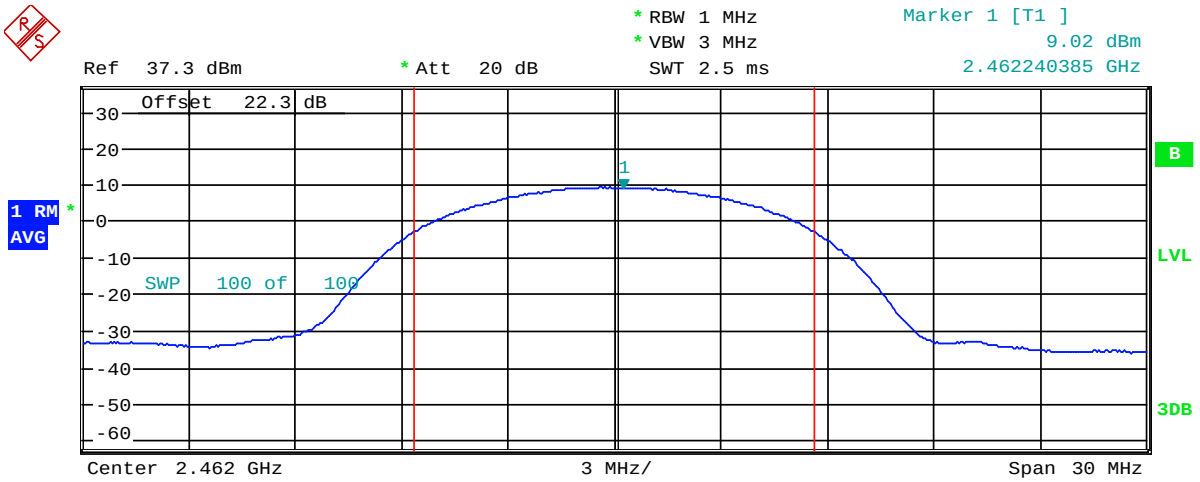


Mid Channel 2437 MHz



Tx Channel
Bandwidth 11.298 MHz Power 16.10 dBm

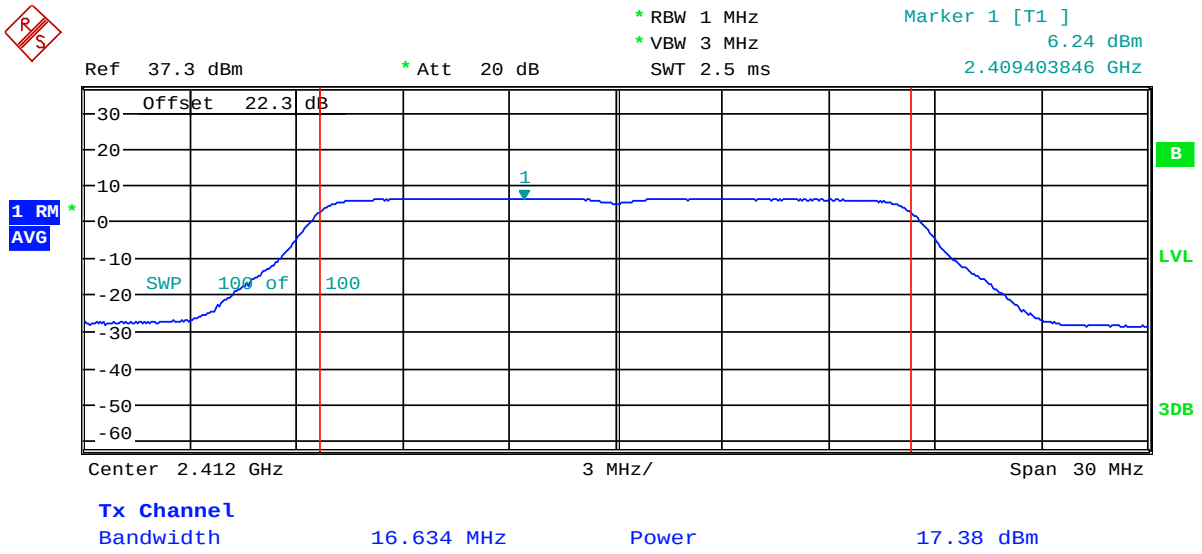
High Channel 2462 MHz



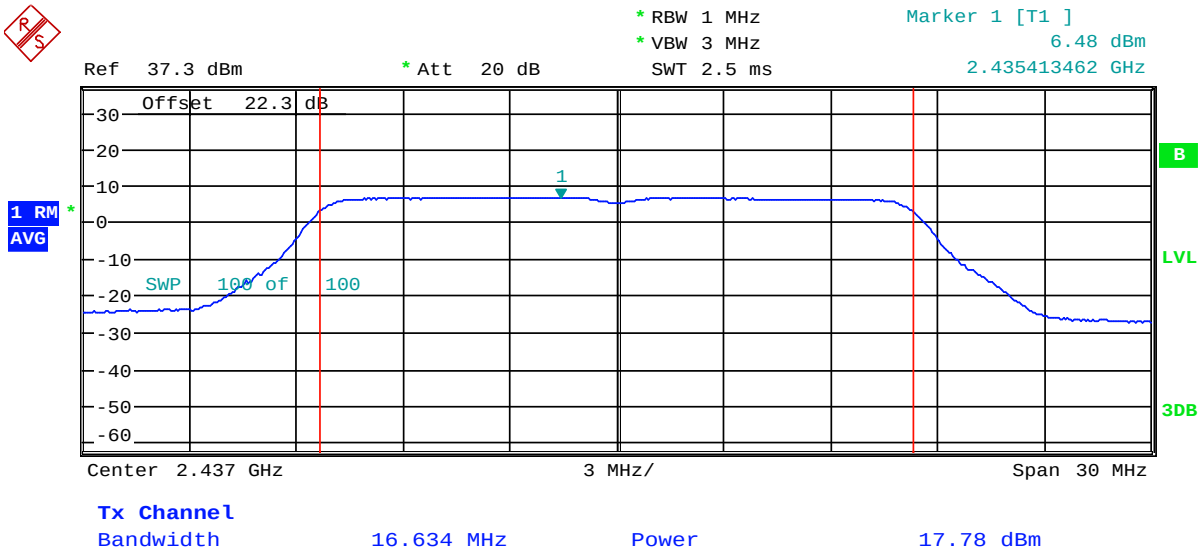
Tx Channel
Bandwidth 11.298 MHz Power 16.45 dBm

802.11g Mode Antenna Chain 1

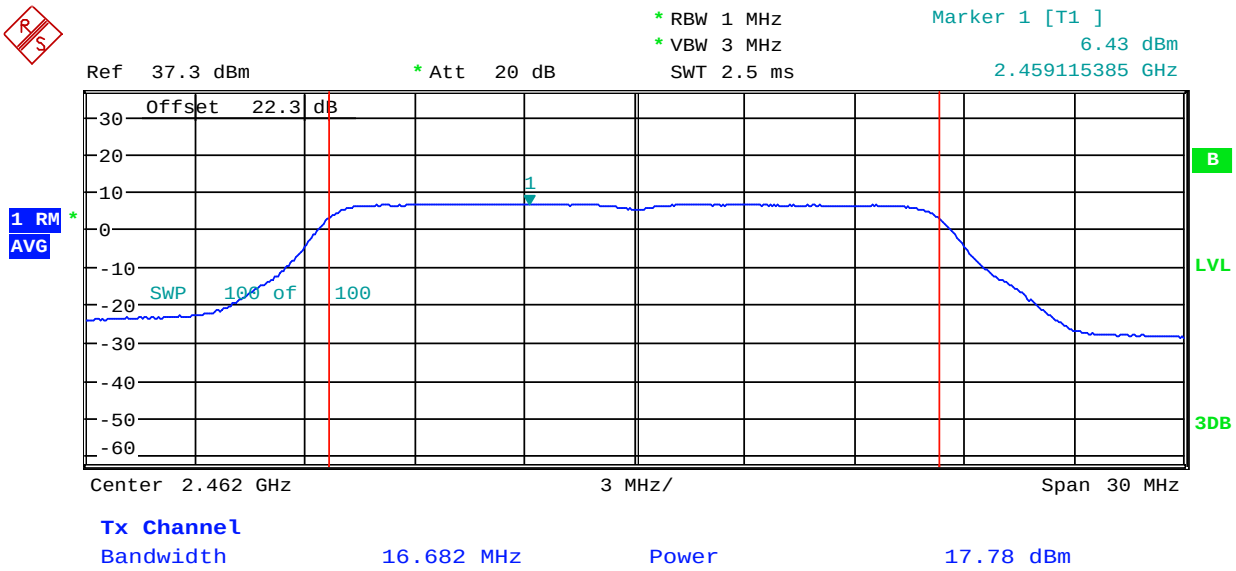
Low Channel 2412 MHz



Mid Channel 2437 MHz

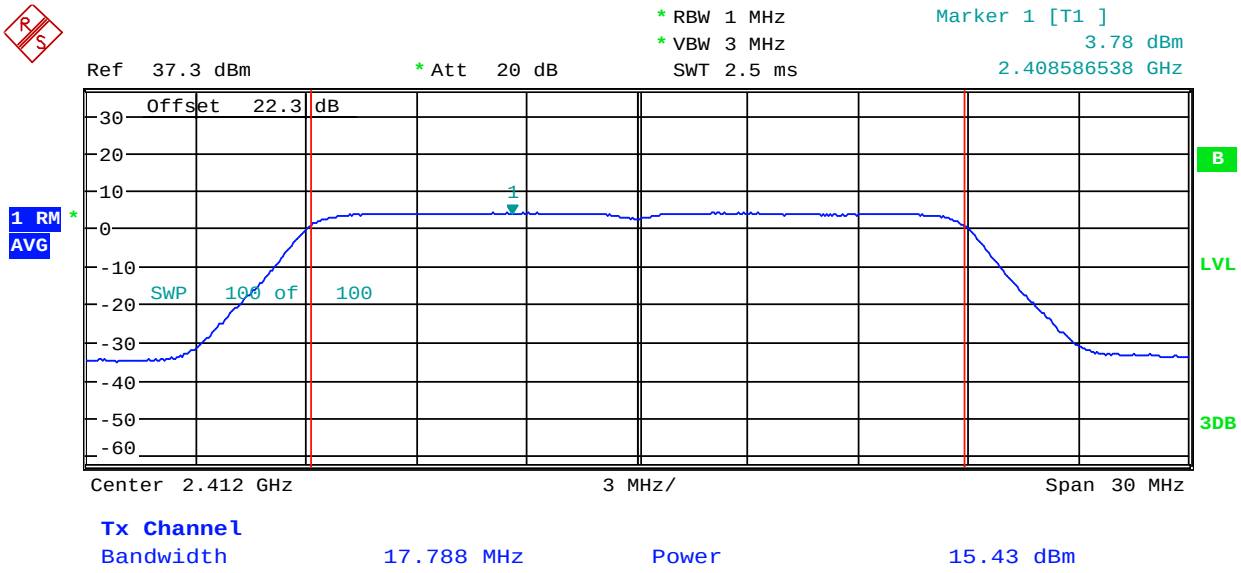


High Channel 2462 MHz

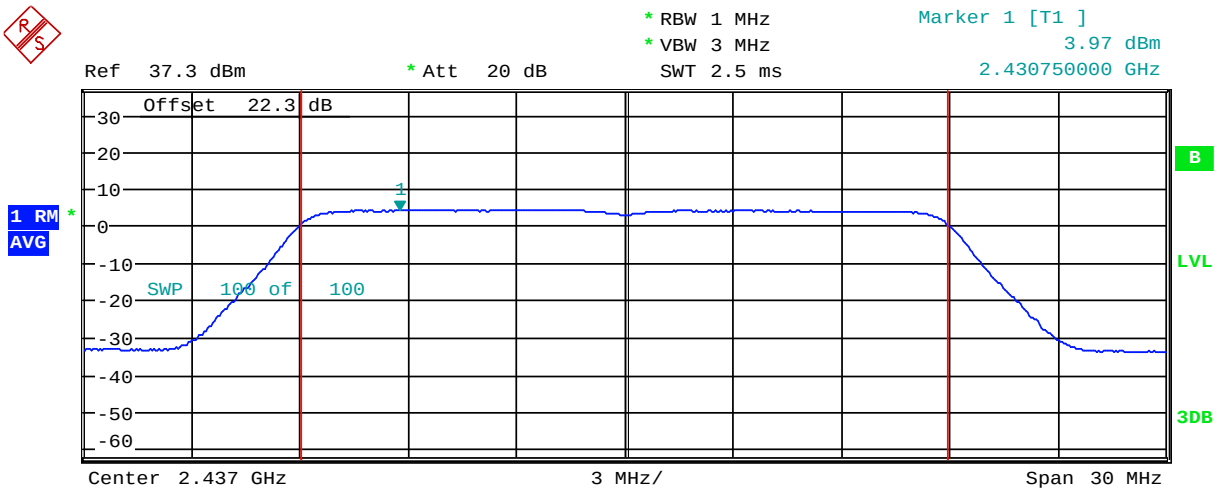


802.11n20 Mode Antenna Chain 1

Low Channel 2412 MHz

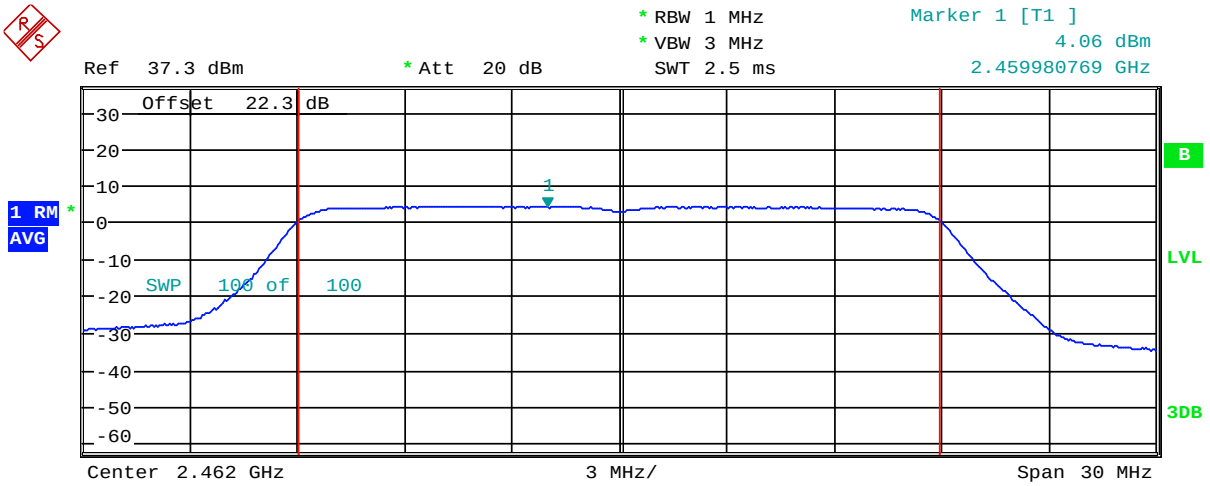


Mid Channel 2437 MHz



Tx Channel
Bandwidth 17.836 MHz Power 15.70 dBm

High Channel 2462 MHz



Tx Channel
Bandwidth 17.836 MHz Power 15.67 dBm

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

9.1 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 ISED 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.

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 13: Band-edge measurements.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 Year
-	RF cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

9.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.5 KPa

The testing was performed by Shoaib Khan on 2017-01-11 in RF site.

9.5 Test Results

Chain 0

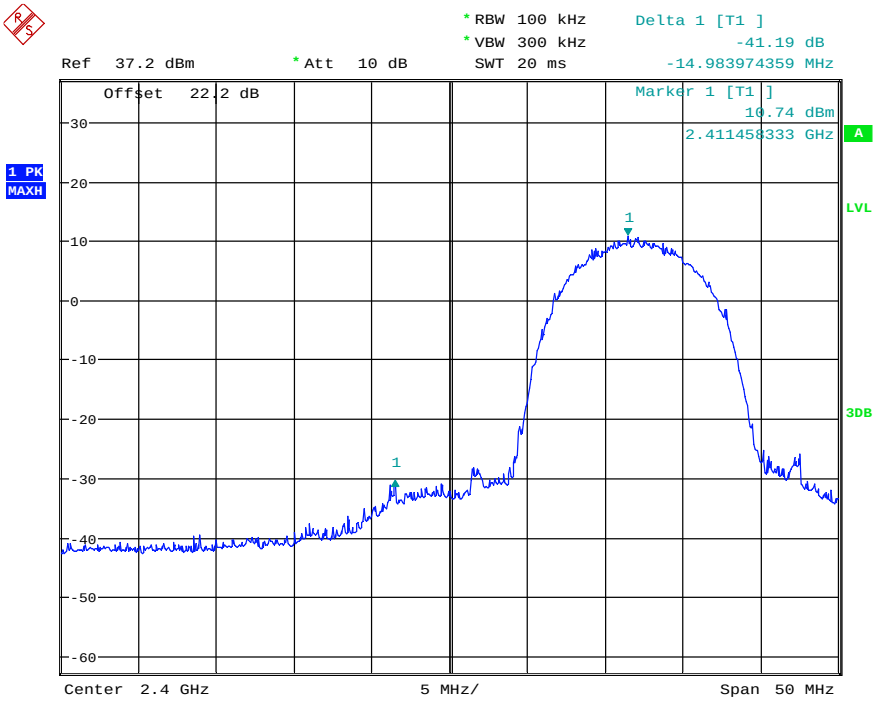
Modulation	Channel	Highest Emission (dBm)	Peak Value (dBm)	Limit (dBm)	Margin (dB)
802.11b	Low	-30.45	10.74	-19.26	-11.19
	High	-30.56	11.53	-18.47	-12.09
802.11g	Low	-23.8	7.78	-22.22	-1.58
	High	-27.11	7.71	-22.29	-4.82
802.11n20	Low	-23.82	7.71	-22.29	-1.53
	High	-27.84	8.28	-21.72	-6.12

Chain 1

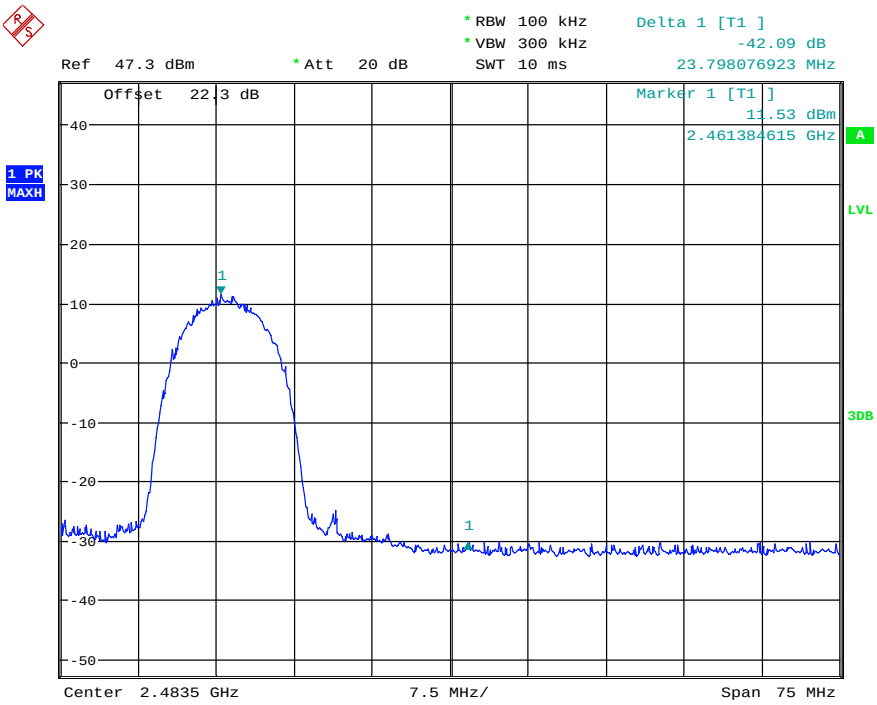
Modulation	Channel	Highest Emission (dBm)	Peak Value (dBm)	Limit (dBm)	Margin (dB)
802.11b	Low	-29.39	8.77	-21.23	-8.16
	High	-30.11	9.27	-20.73	-9.38
802.11g	Low	-26.56	6.35	-23.65	-2.91
	High	-29.89	7.06	-22.94	-6.95
802.11n20	Low	-33.54	5.19	-24.81	-8.73
	High	-35.11	5.43	-24.57	-10.54

802.11b Mode Antenna Chain 0

Low Channel 2412 MHz

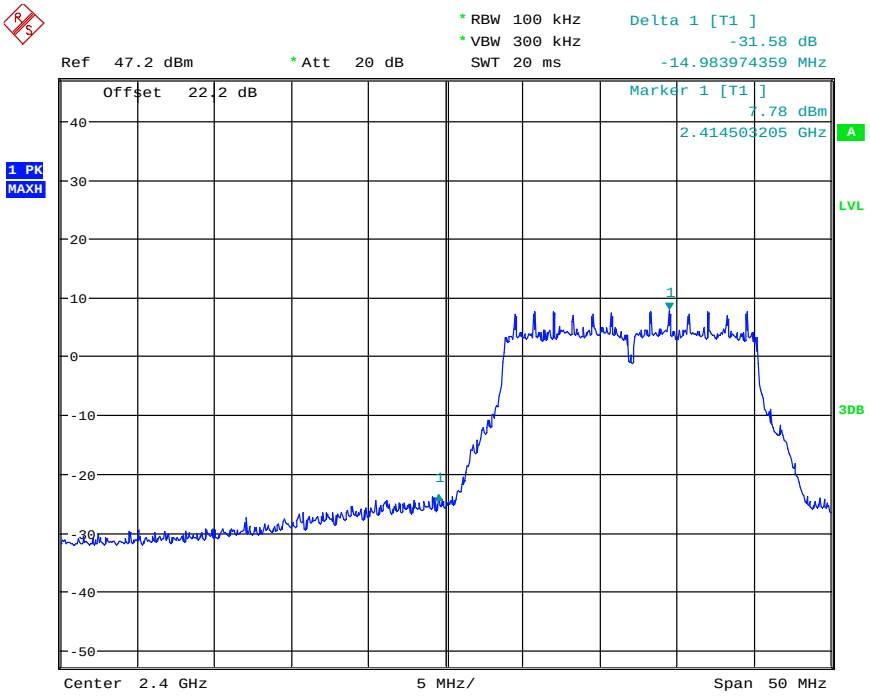


High Channel 2462 MHz

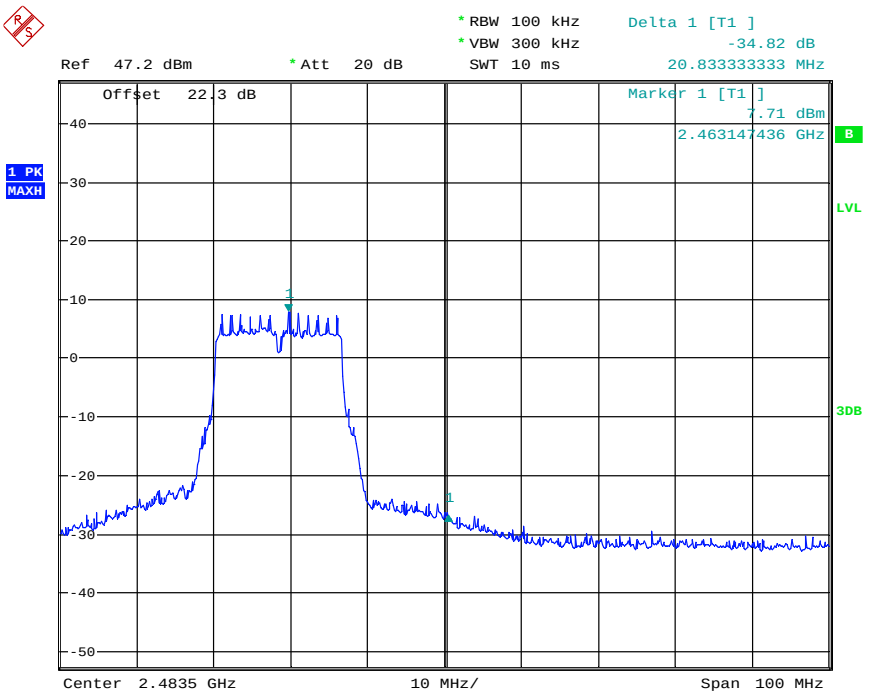


802.11g Mode Antenna Chain 0

Low Channel 2412 MHz

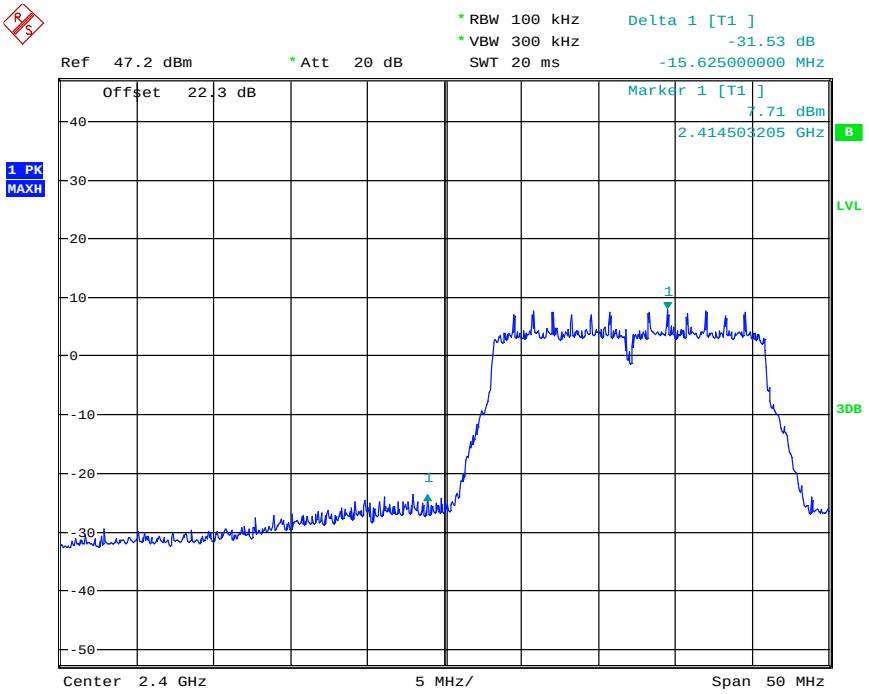


High Channel 2462 MHz

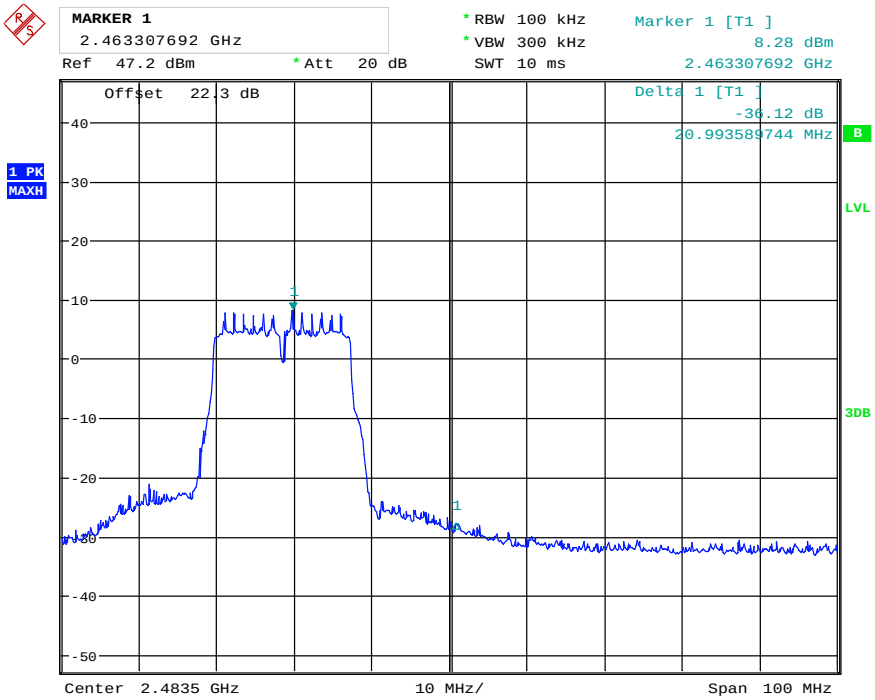


802.11n20 Mode Antenna Chain 0

Low Channel 2412 MHz

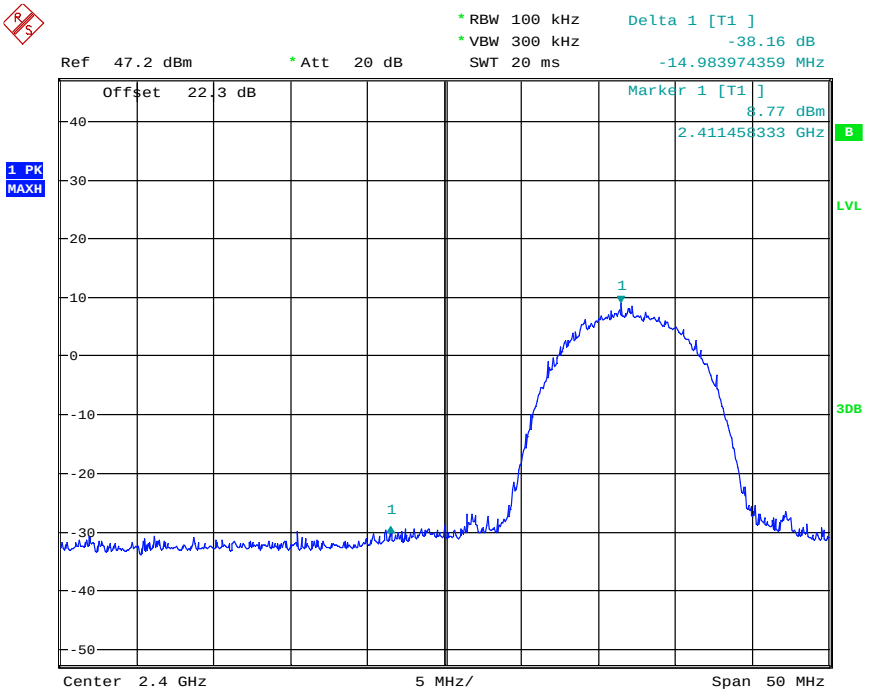


High Channel 2462 MHz

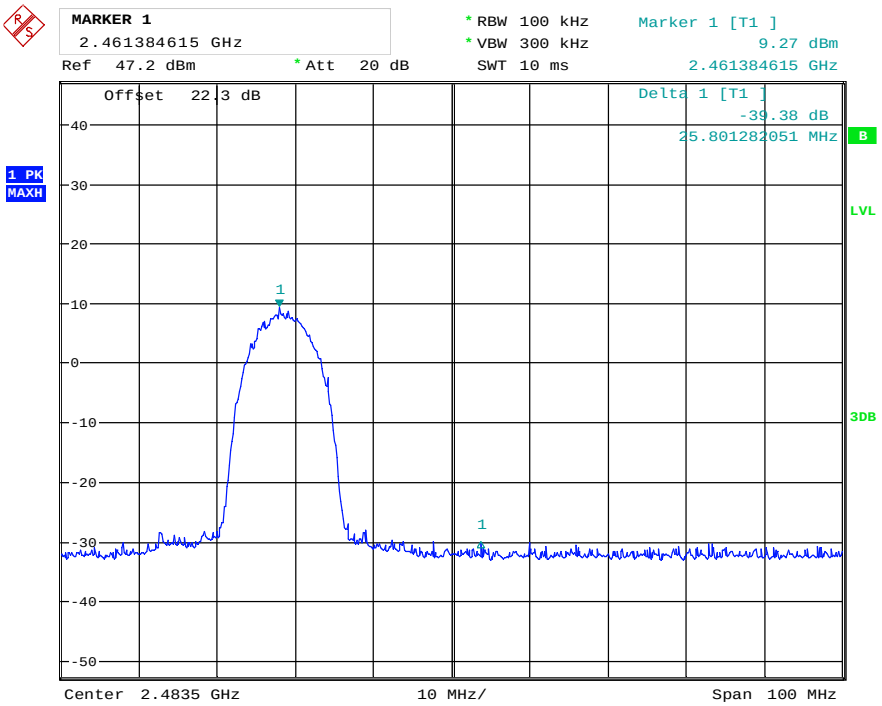


802.11b Mode Antenna Chain 1

Low Channel 2412 MHz

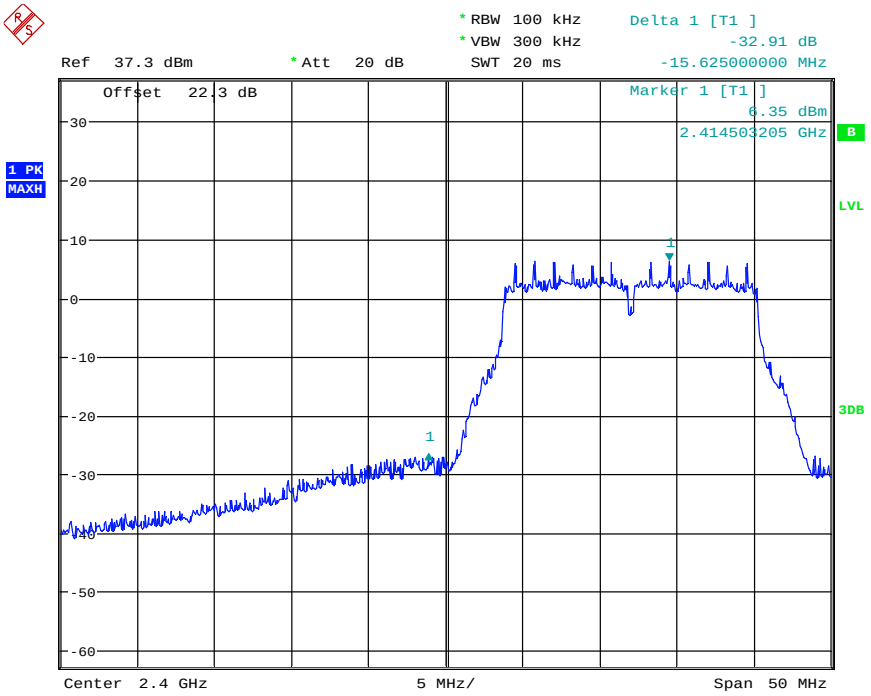


High Channel 2462 MHz

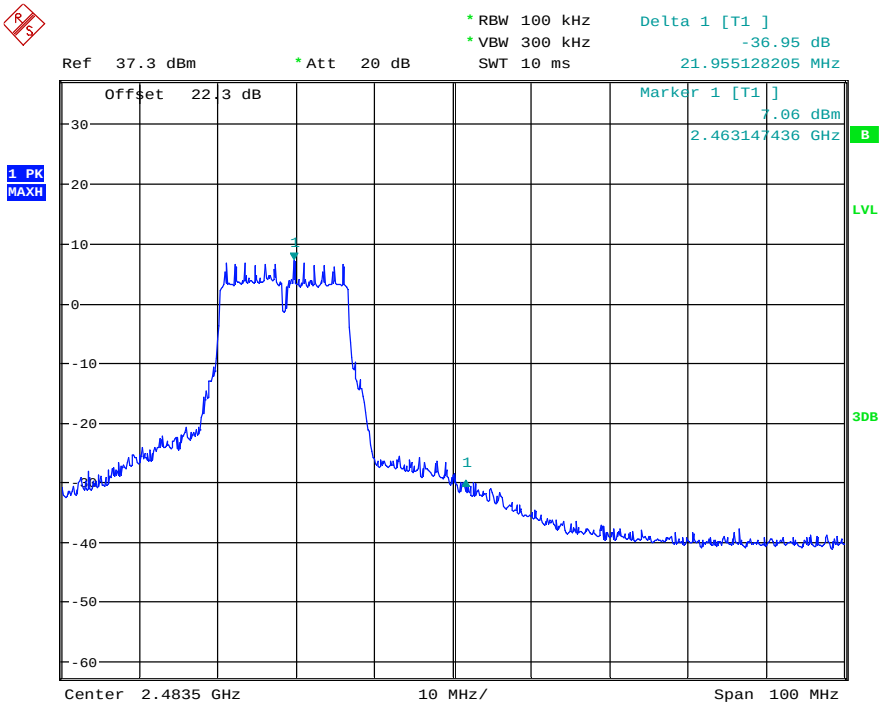


802.11g Mode Antenna Chain 1

Low Channel 2412 MHz

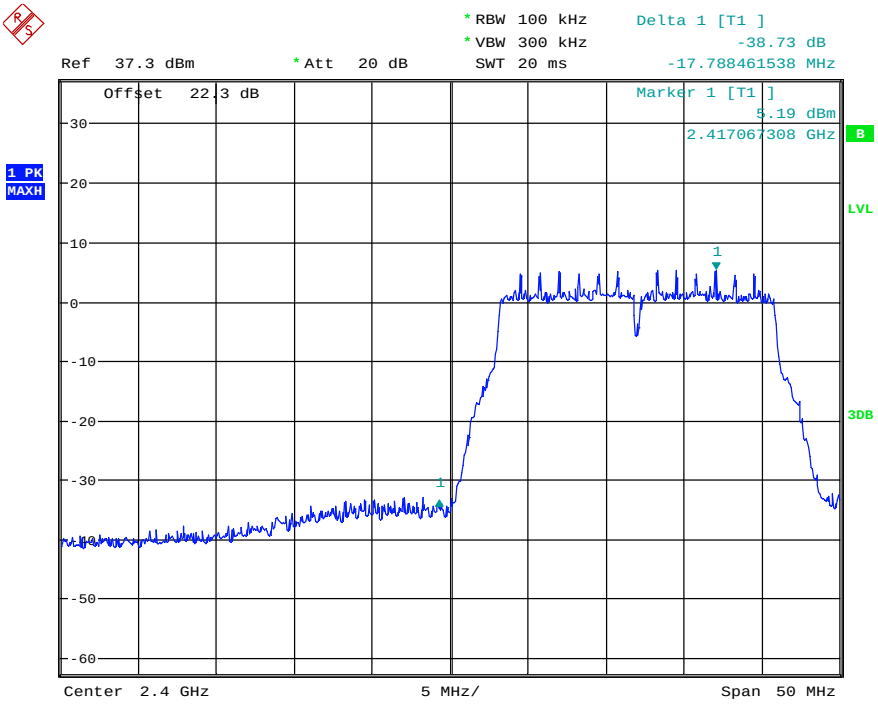


High Channel 2462 MHz

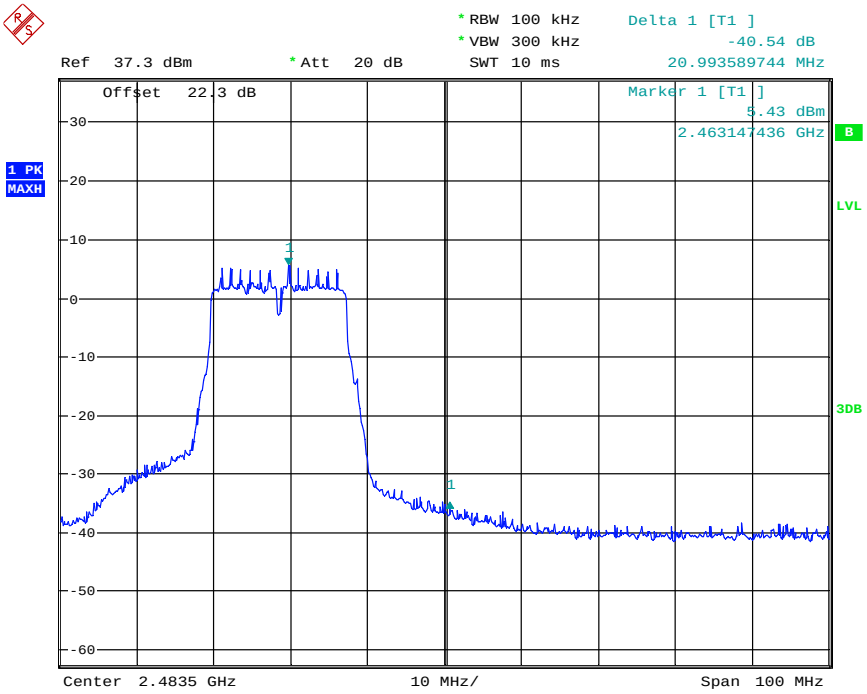


802.11n20 Mode Antenna Chain 1

Low Channel 2412 MHz



High Channel 2462 MHz



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

10.1 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.

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 10: Maximum power spectral density level in the fundamental emission.

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 Year
-	RF cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

10.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.5 KPa

The testing was performed by Shoaib Khan on 2017-01-11 in RF site.

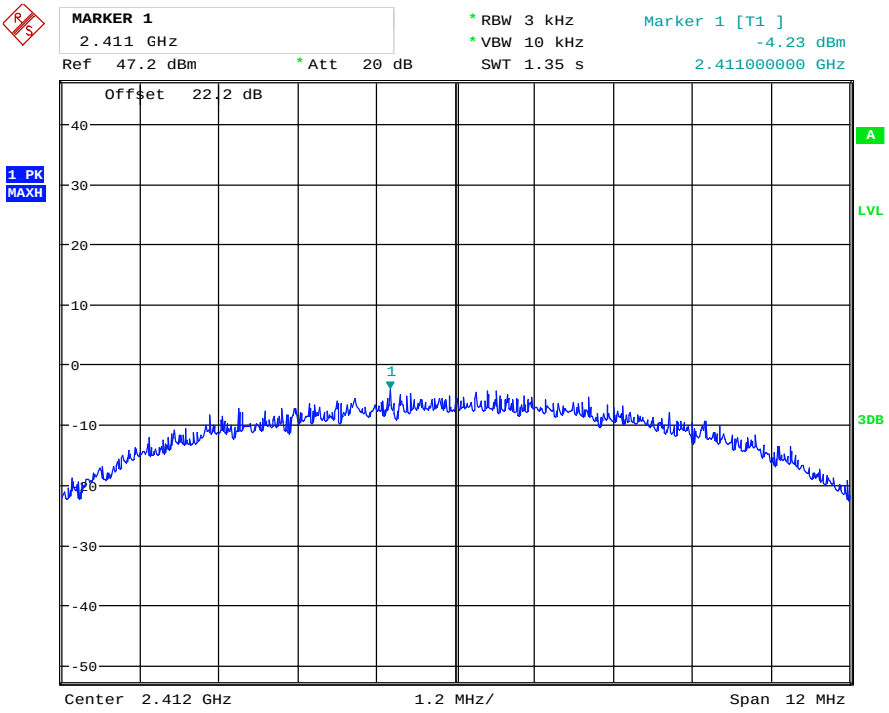
10.5 Test Results

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode Antenna Chain 0			
Low	2412	-4.23	8
Middle	2437	-4.03	8
High	2462	-3.97	8
802.11g Mode Antenna Chain 0			
Low	2412	-5.63	8
Middle	2437	-6.46	8
High	2462	-5.60	8
802.11n20 Mode Antenna Chain 0			
Low	2412	-6.29	8
Middle	2437	-6.13	8
High	2462	-6.62	8
802.11b Mode Antenna Chain 1			
Low	2412	-6.45	8
Middle	2437	-5.70	8
High	2462	-4.93	8
802.11g Mode Antenna Chain 1			
Low	2412	-7.68	8
Middle	2437	-6.50	8
High	2462	-6.61	8
802.11n20 Mode Antenna Chain 1			
Low	2412	-9.31	8
Middle	2437	-9.79	8
High	2462	-8.83	8

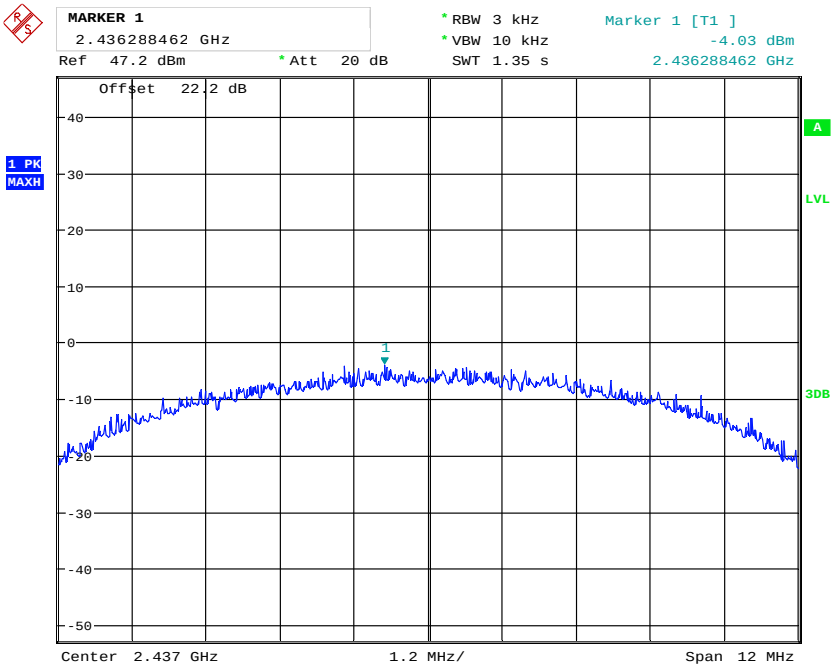
Please refer to the following plots for detailed test results

802.11b Mode Antenna Chain 0

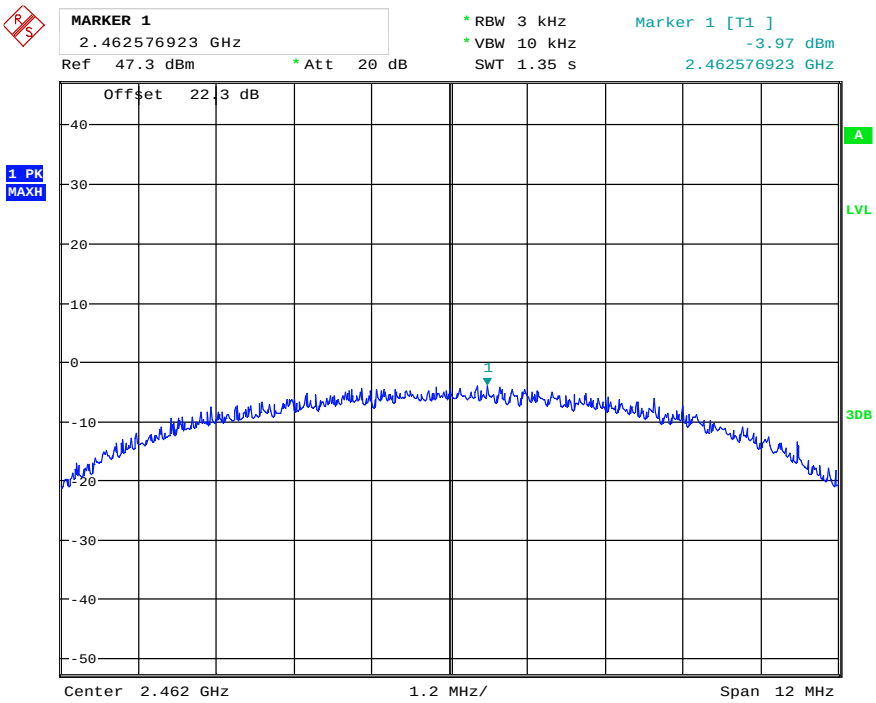
Low Channel 2412 MHz



Middle Channel 2437 MHz

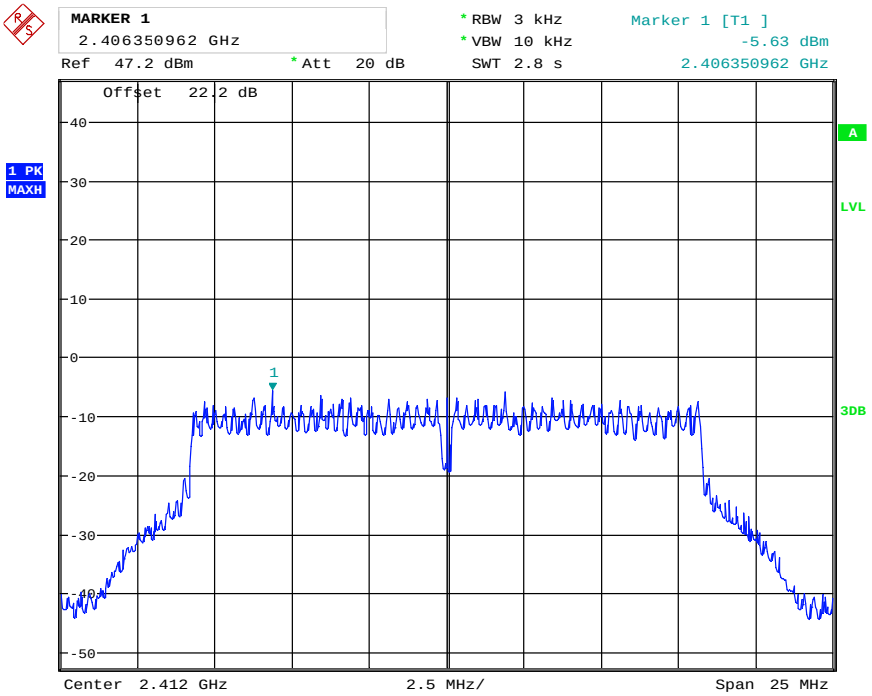


High Channel 2462 MHz

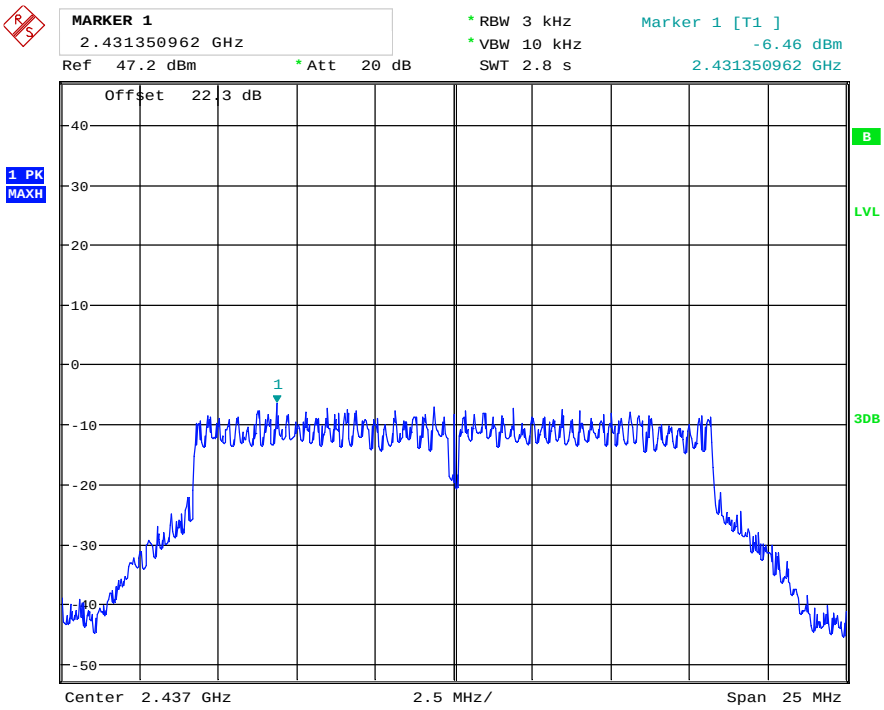


802.11g Mode Antenna Chain 0

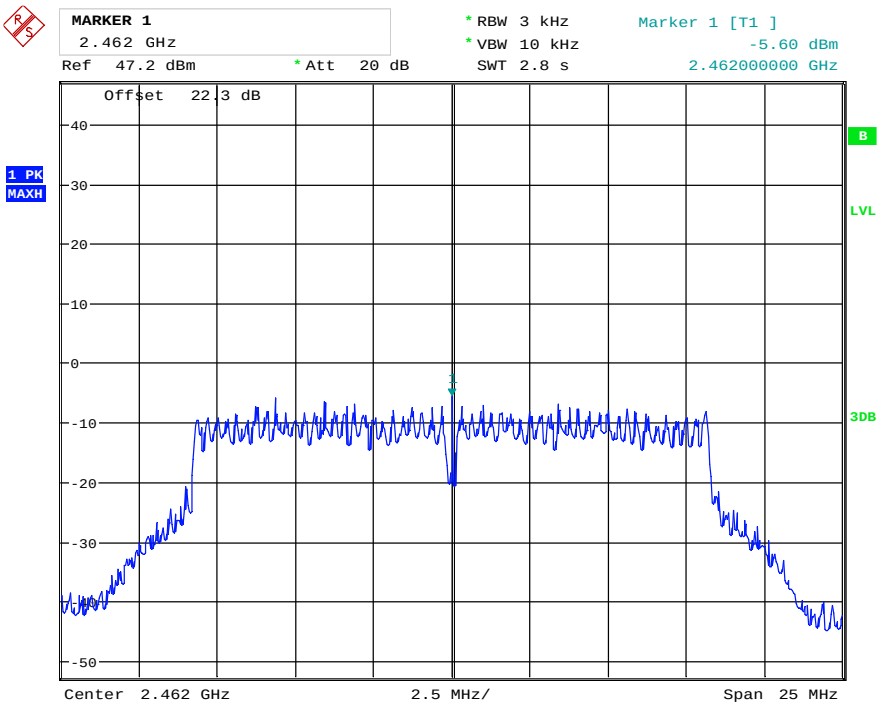
Low Channel 2412 MHz



Middle Channel 2437 MHz

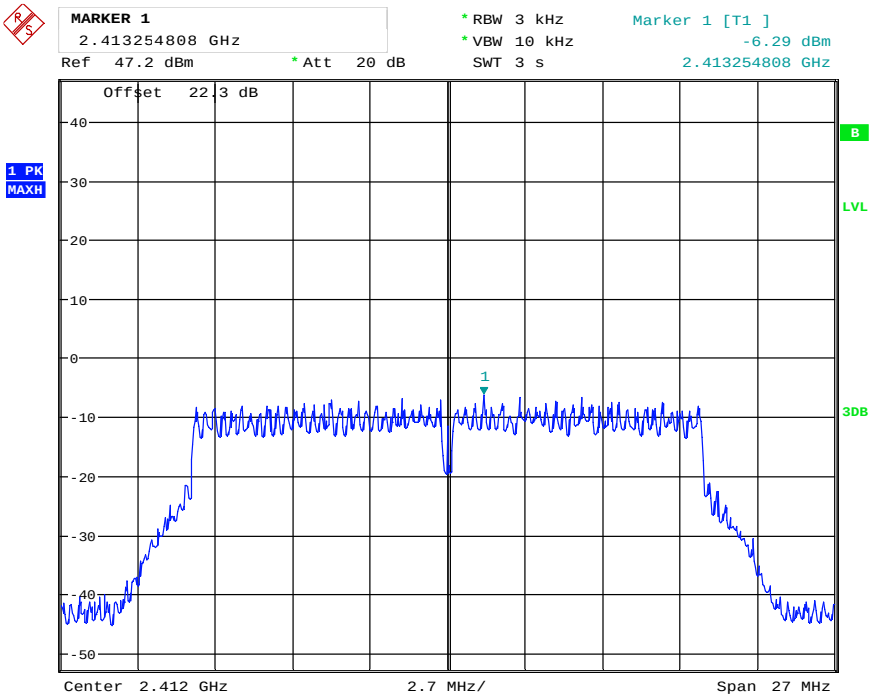


High Channel 2462 MHz

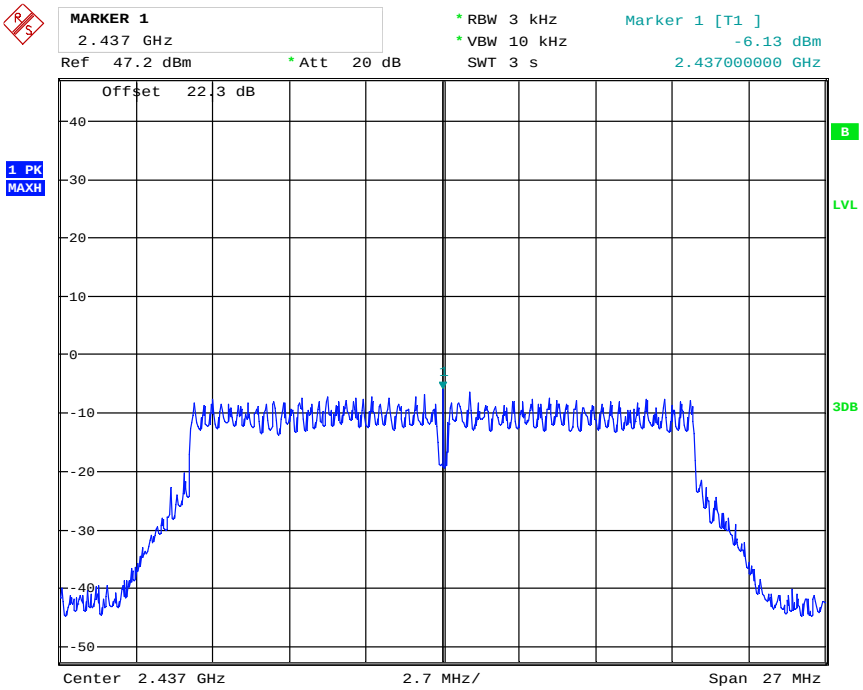


802.11n20 Mode Antenna Chain 0

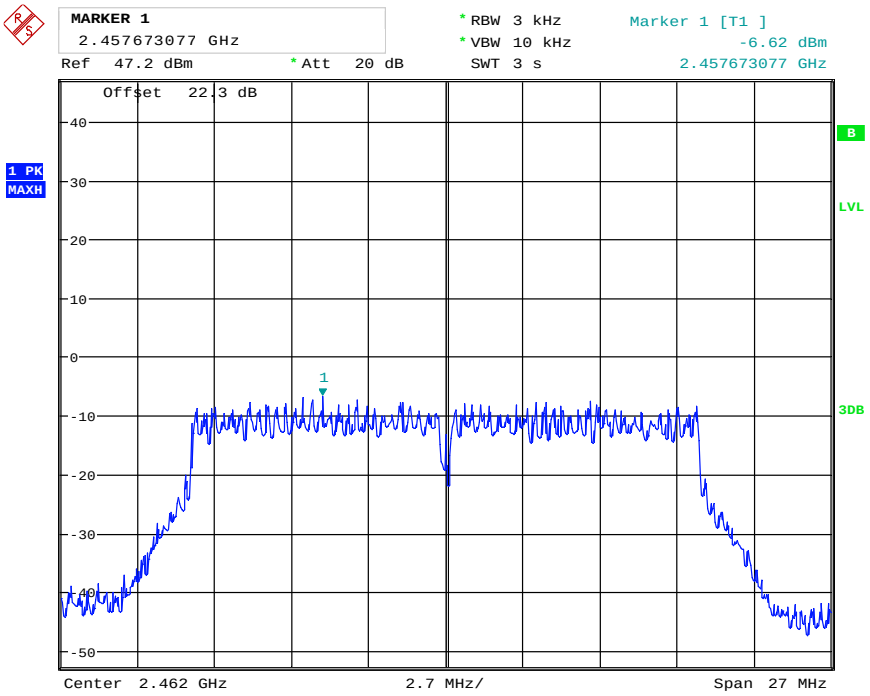
Low Channel 2412 MHz



Middle Channel 2437 MHz

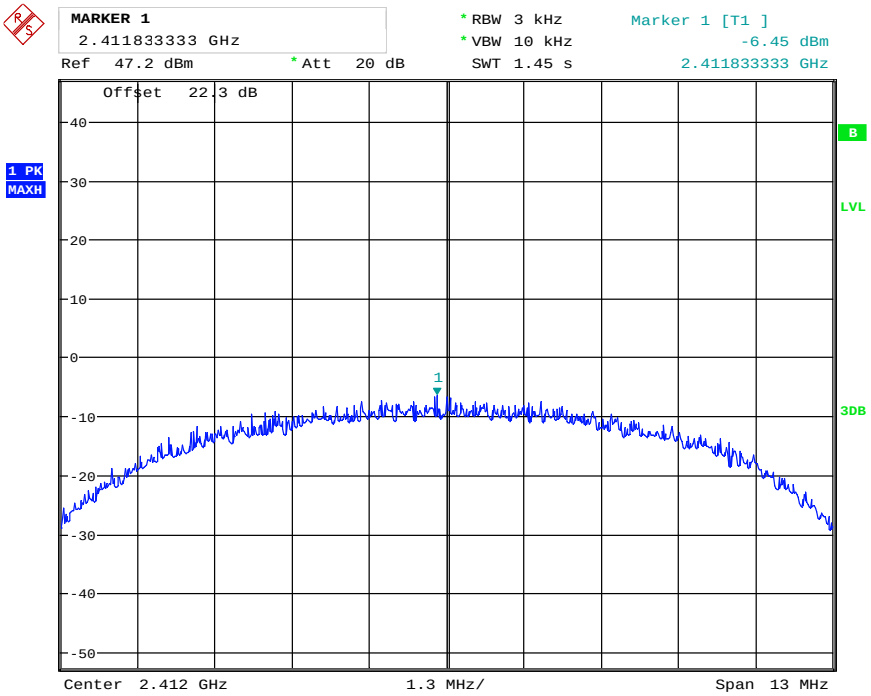


High Channel 2462 MHz

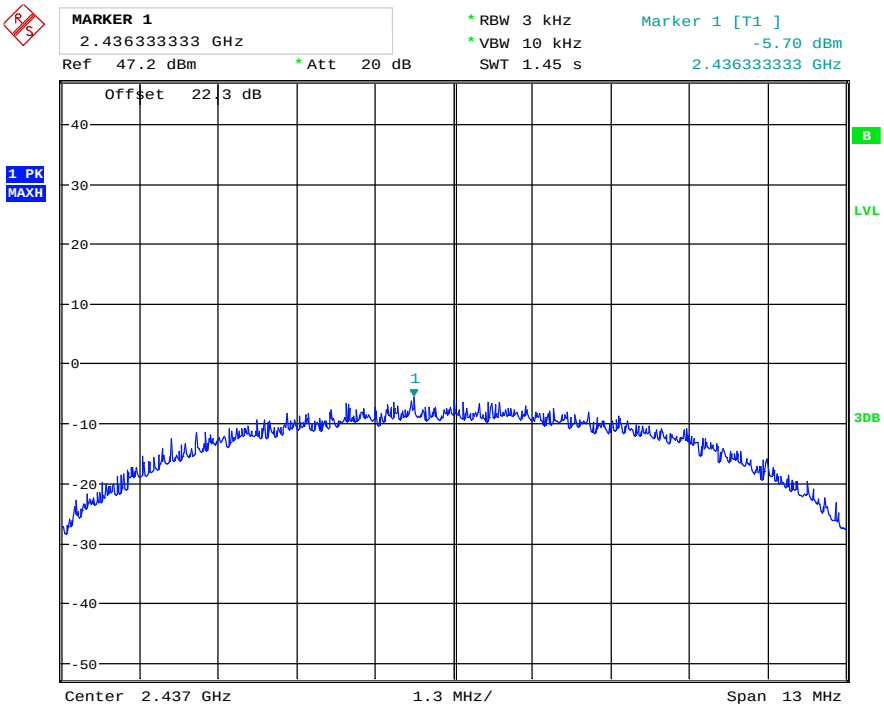


802.11b Mode Antenna Chain 1

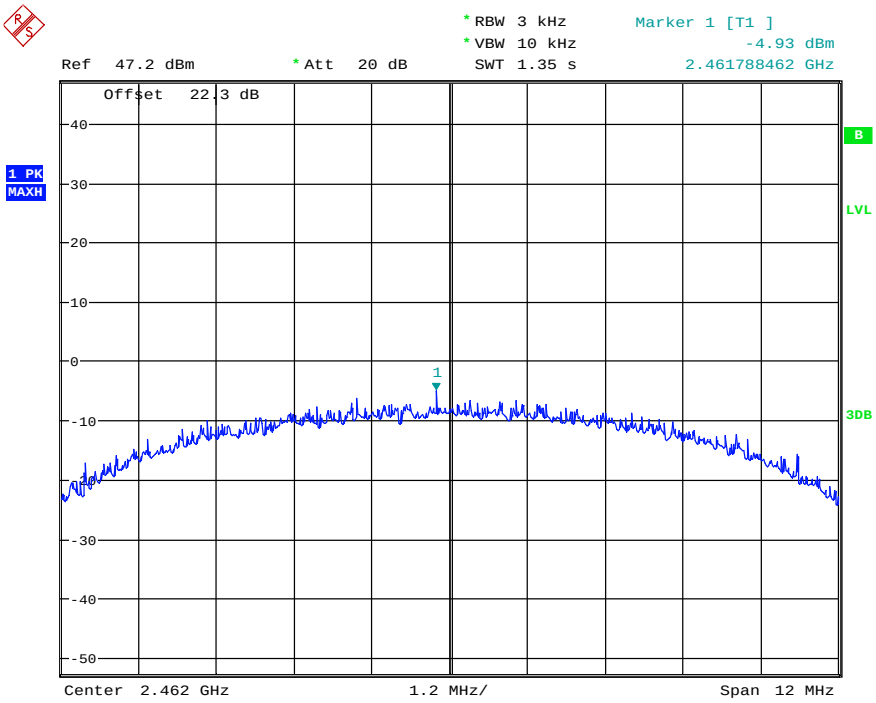
Low Channel 2412 MHz



Middle Channel 2437 MHz

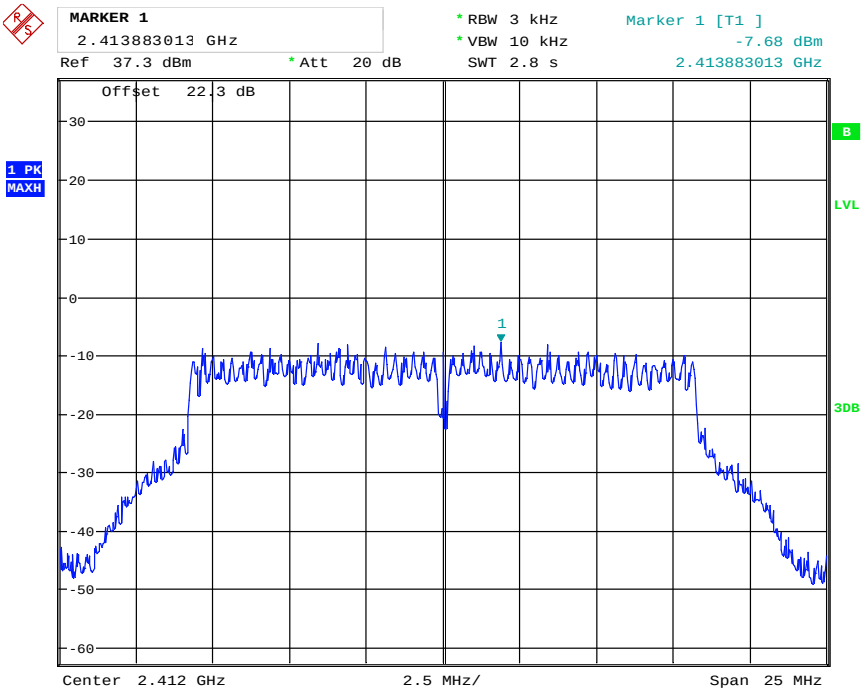


High Channel 2462 MHz

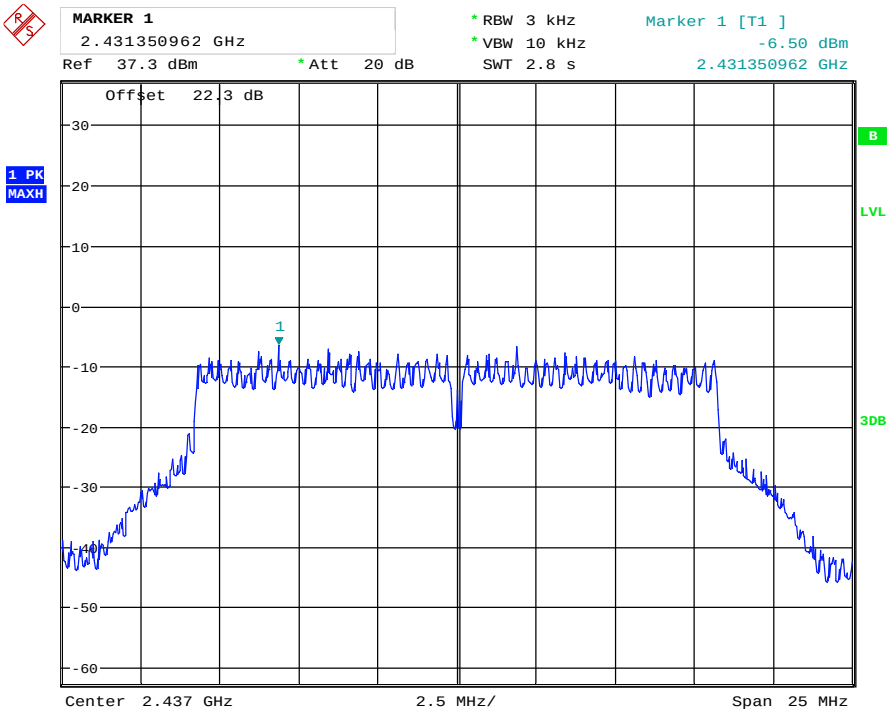


802.11g Mode Antenna Chain 1

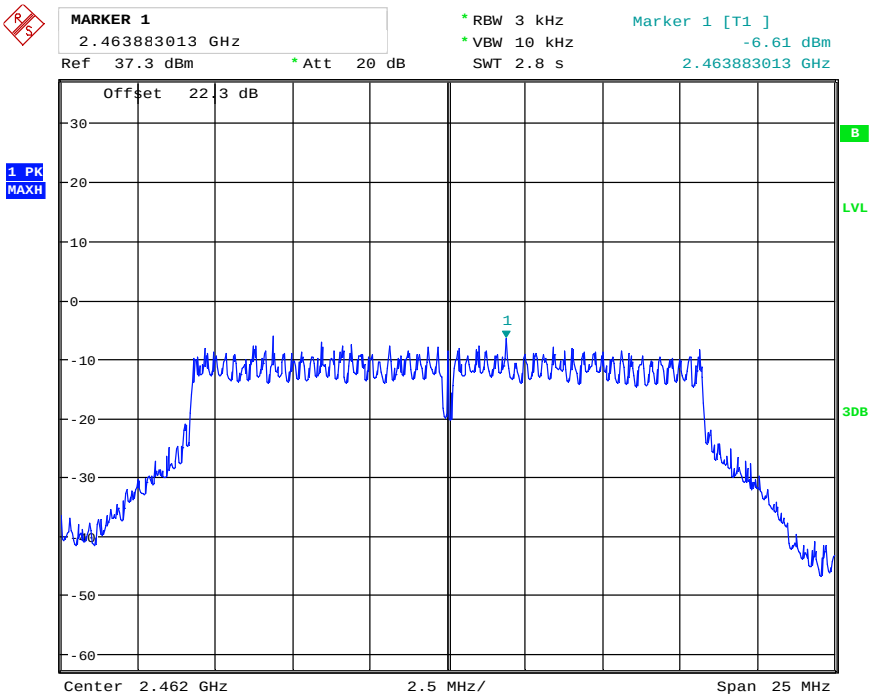
Low Channel 2412 MHz



Middle Channel 2437 MHz

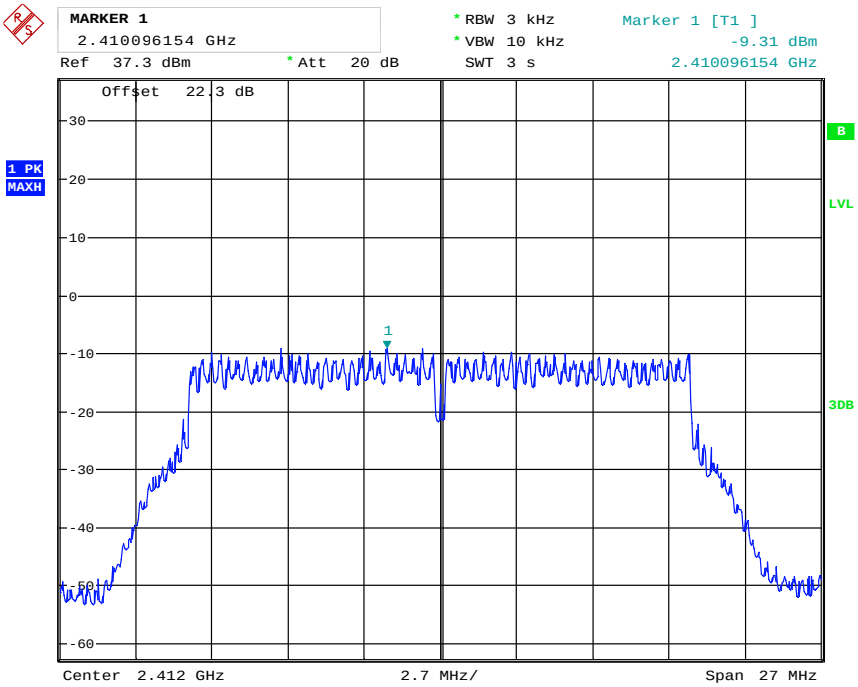


High Channel 2462 MHz

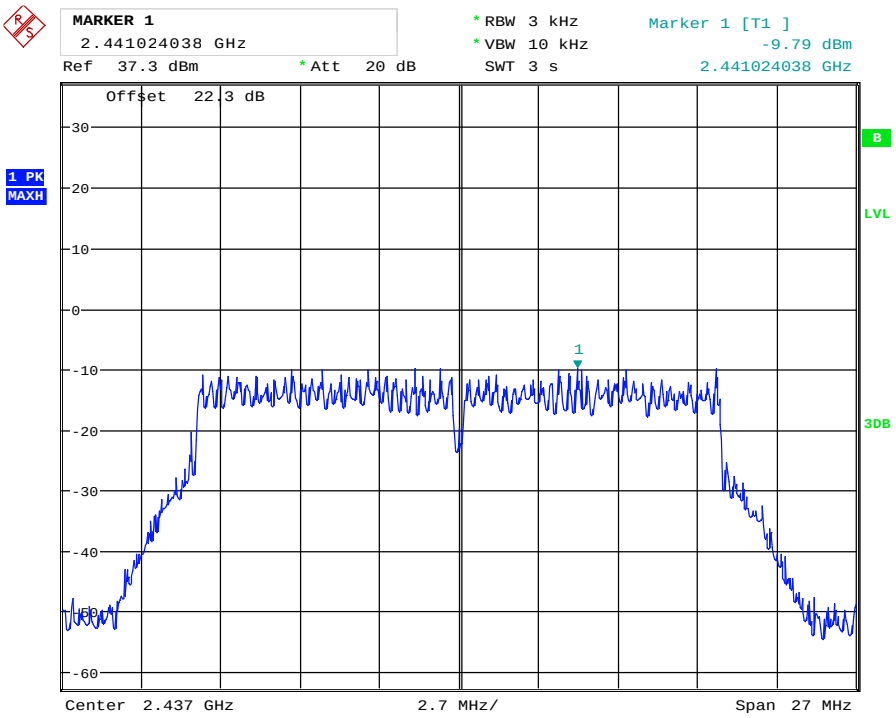


802.11n20 Mode Antenna Chain 1

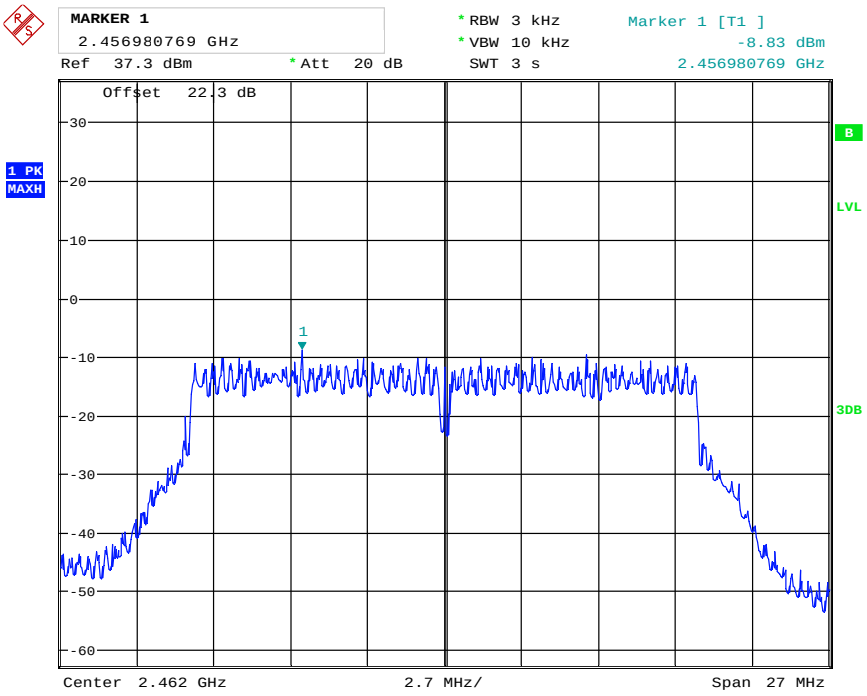
Low Channel 2412 MHz



Middle Channel 2437 MHz



High Channel 2462 MHz



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

11.1 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 ISED 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.

11.2 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.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2016-03-24	1 Year
-	RF cable	-	-	Each time[1]	N/A
-	20dB 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 of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 9 June 2016) "A2LA Policy on Metrological Traceability".

11.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.5 KPa

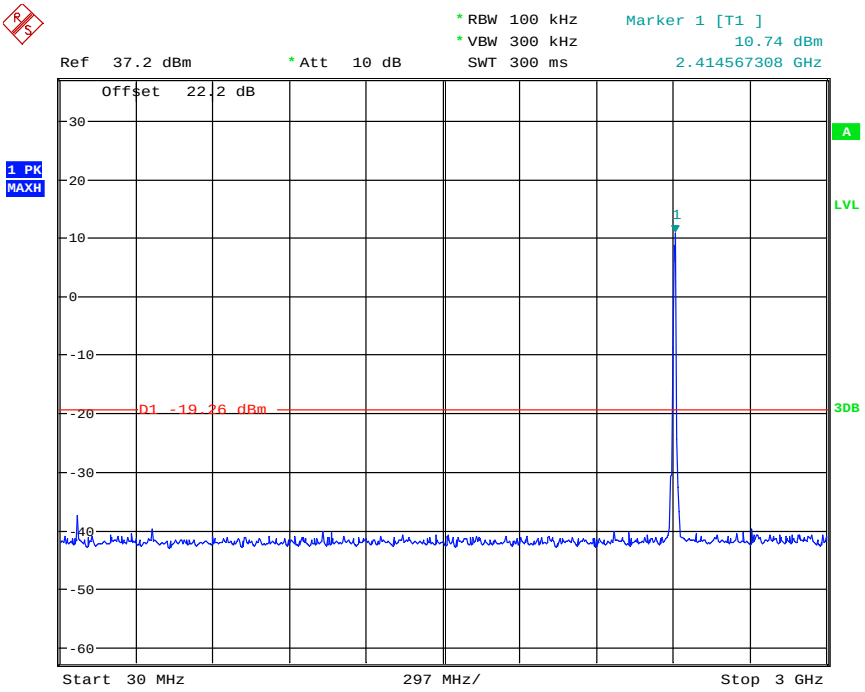
The testing was performed by Shoaib Khan on 2017-01-17 in RF site.

11.5 Test Results

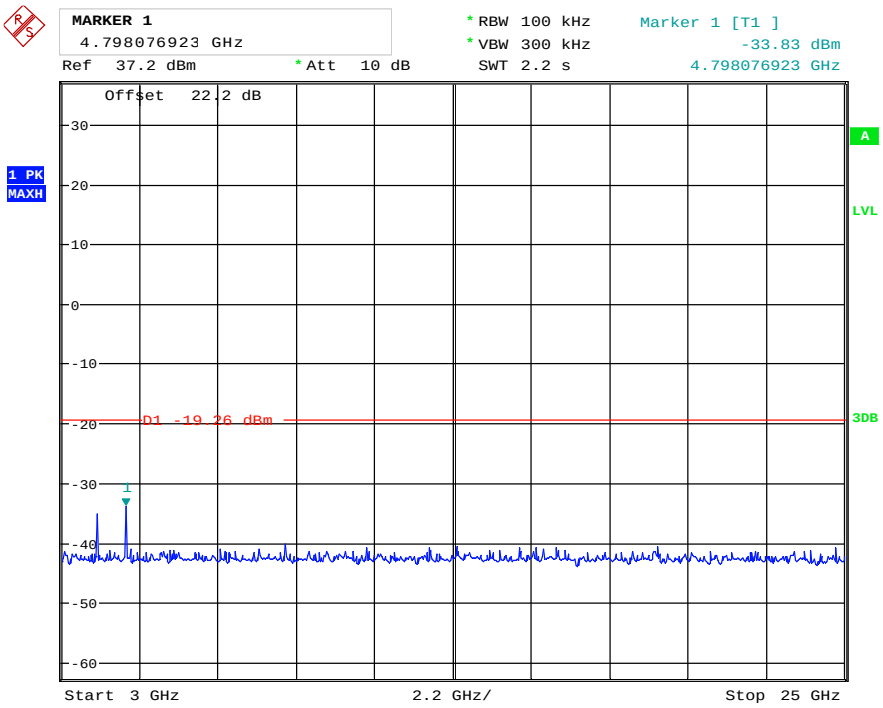
Please refer to following plots.

802.11b Mode Antenna Chain 0

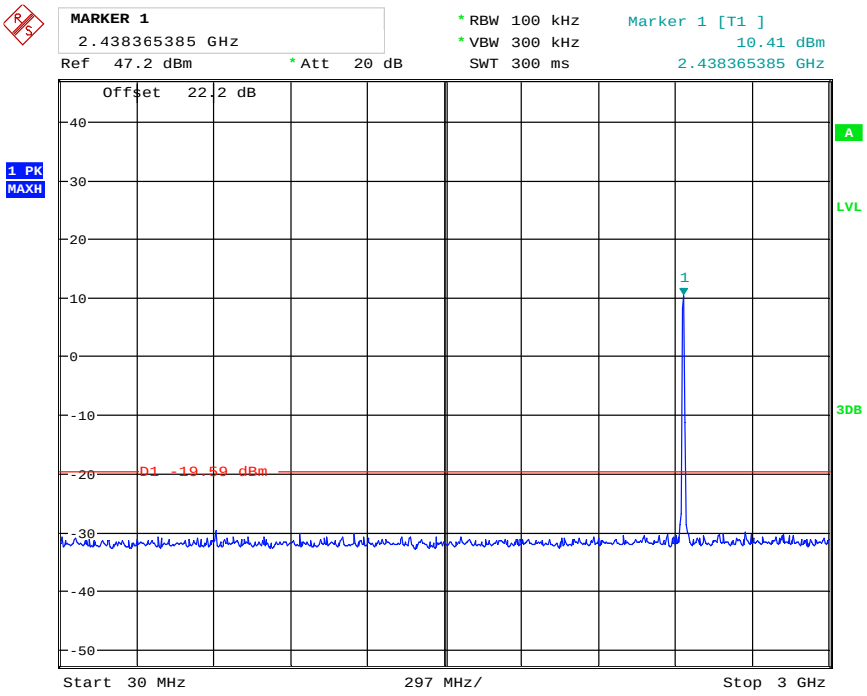
Low Channel 30 MHz – 3 GHz



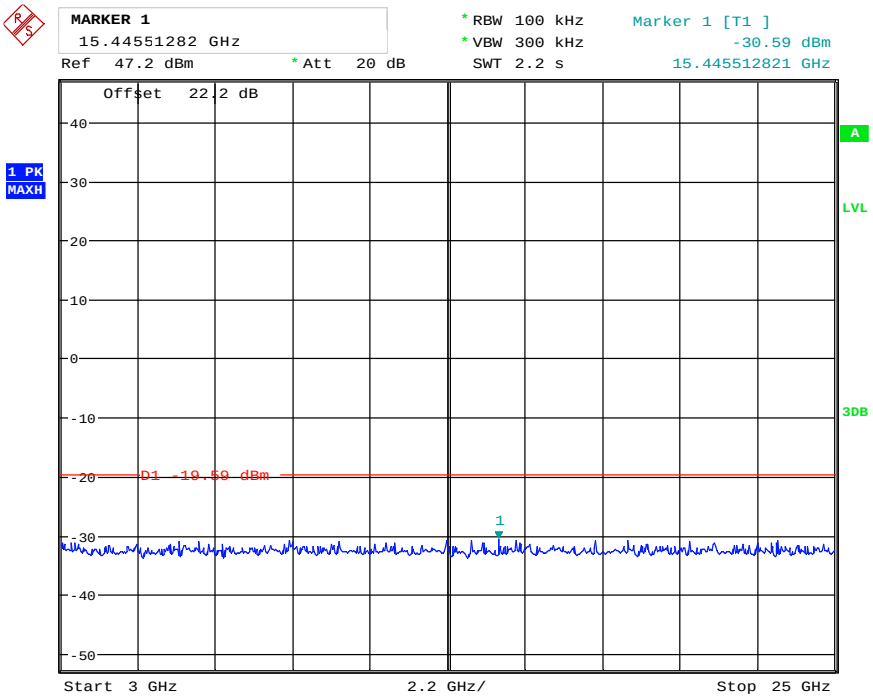
Low Channel 3 GHz – 25 GHz



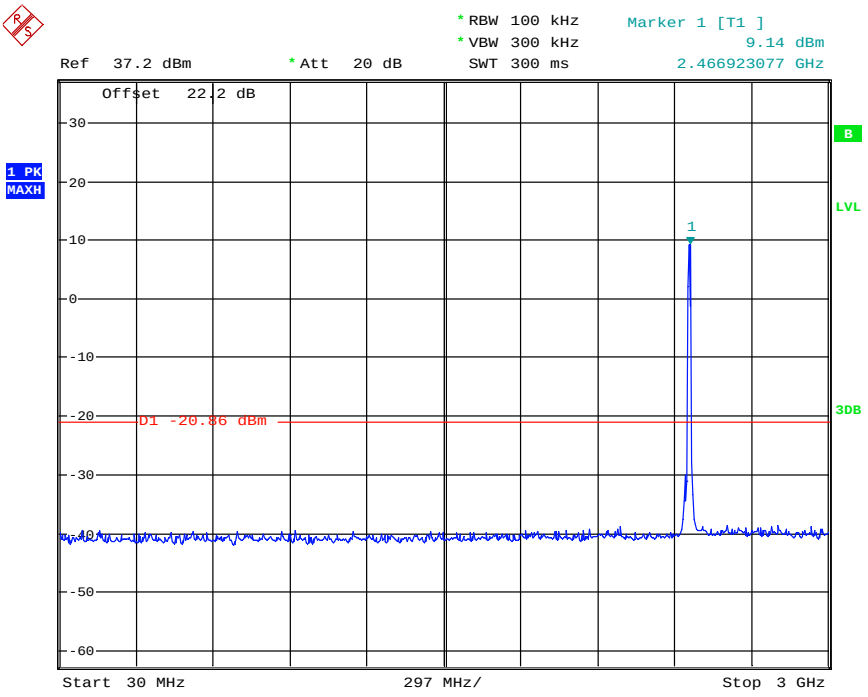
Middle Channel 30 MHz – 3 GHz



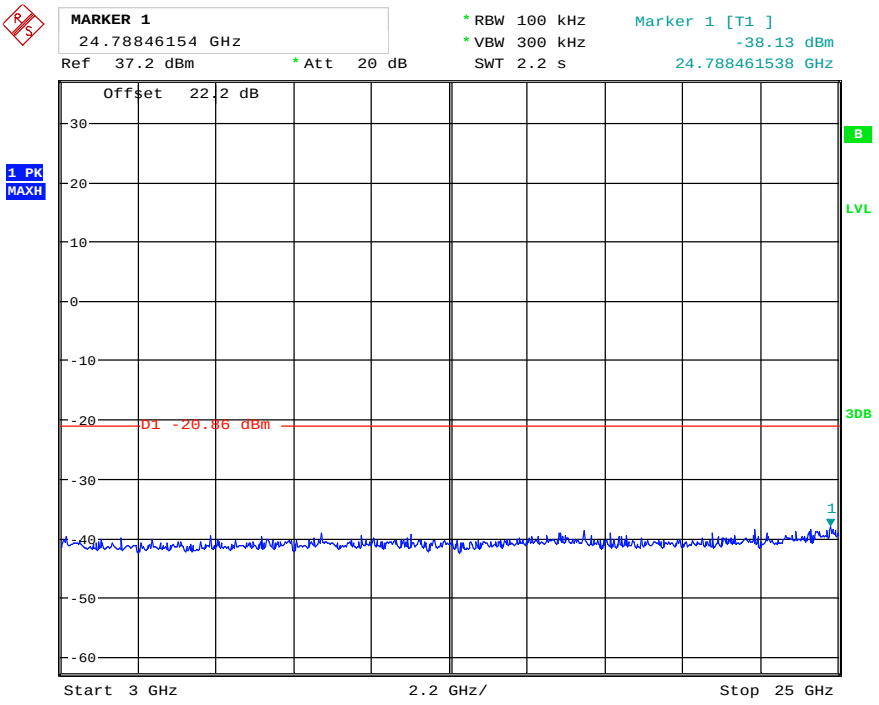
Middle Channel 3 GHz – 25 GHz



High Channel 30 MHz – 3 GHz

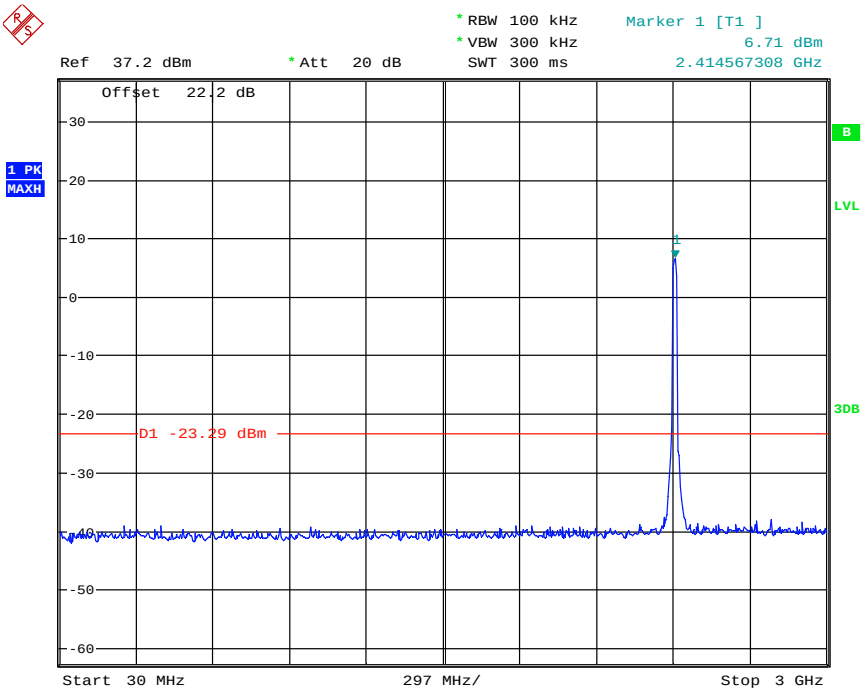


High Channel 3 GHz – 25 GHz

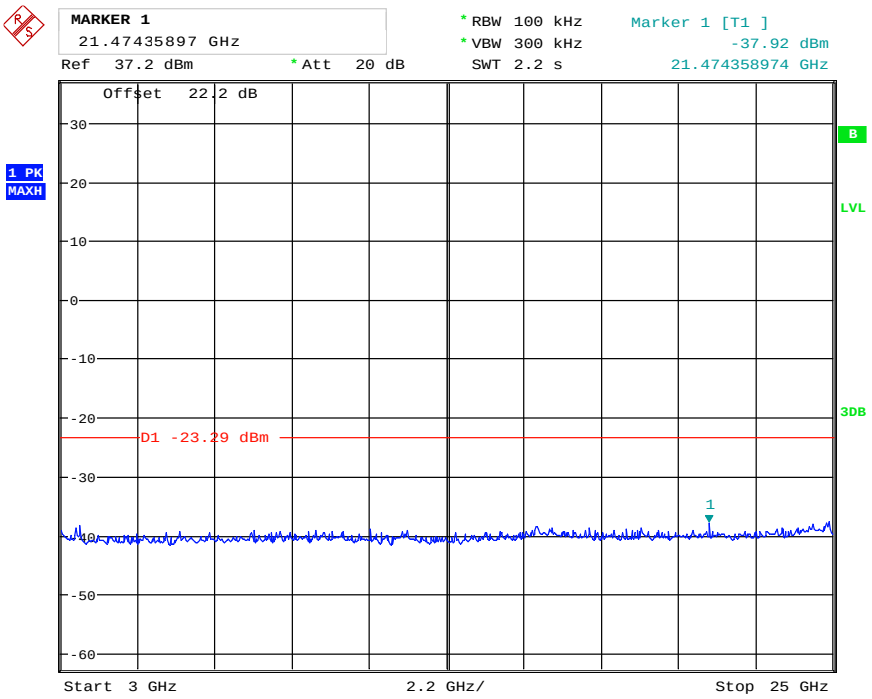


802.11g Mode Antenna Chain 0

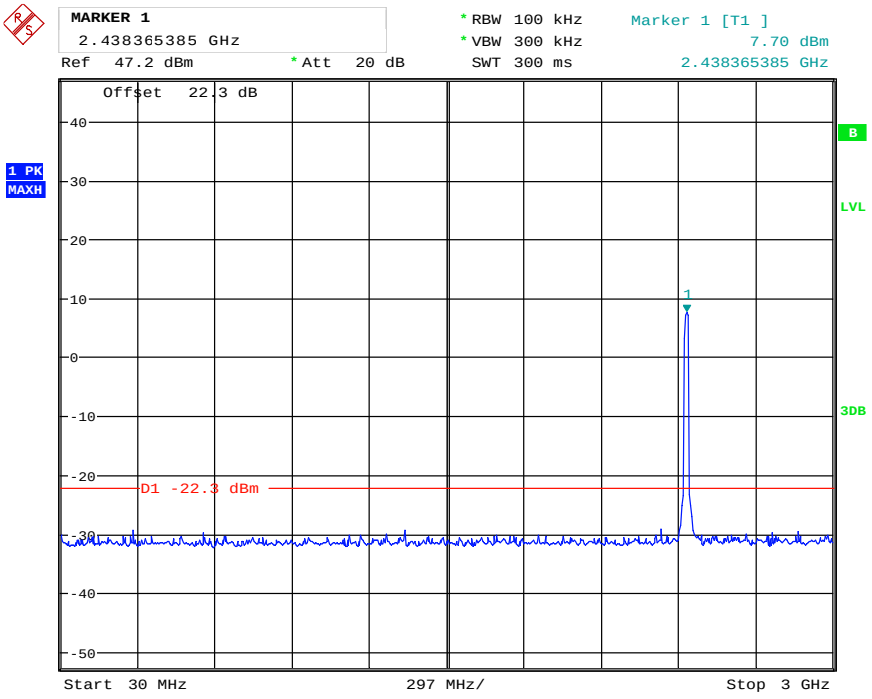
Low Channel 30 MHz – 3 GHz



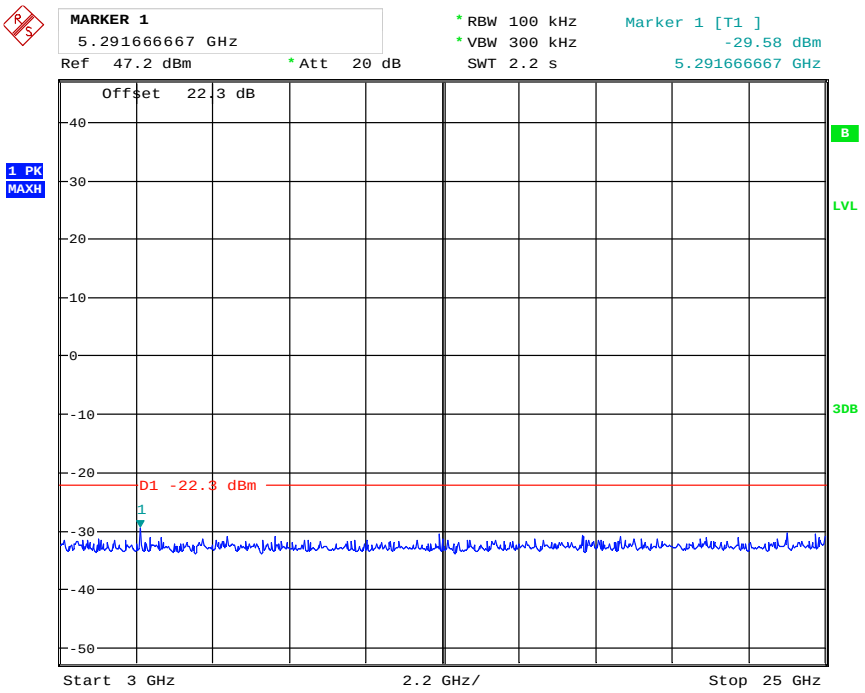
Low Channel 3 GHz – 25 GHz



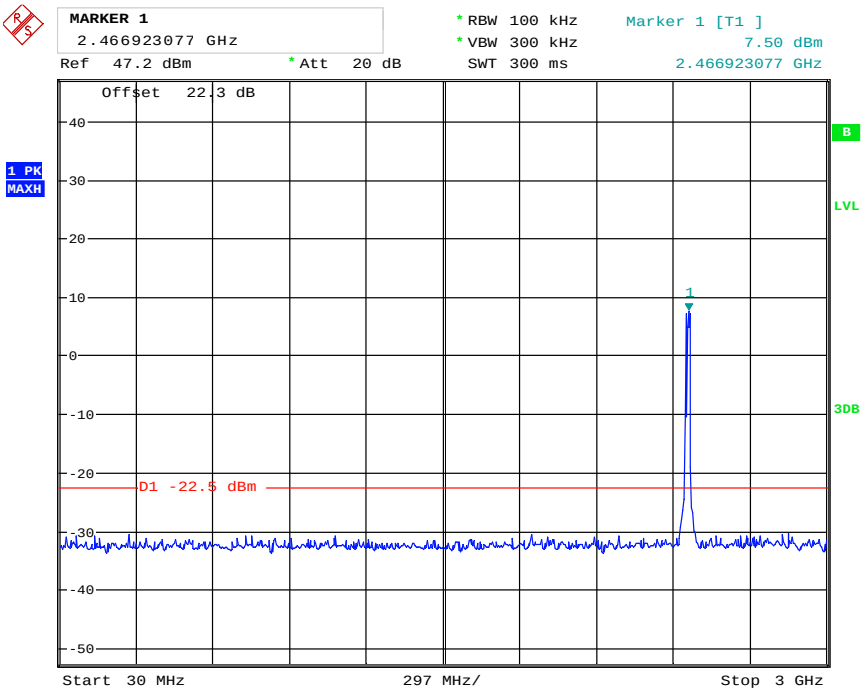
Middle Channel 30 MHz – 3 GHz



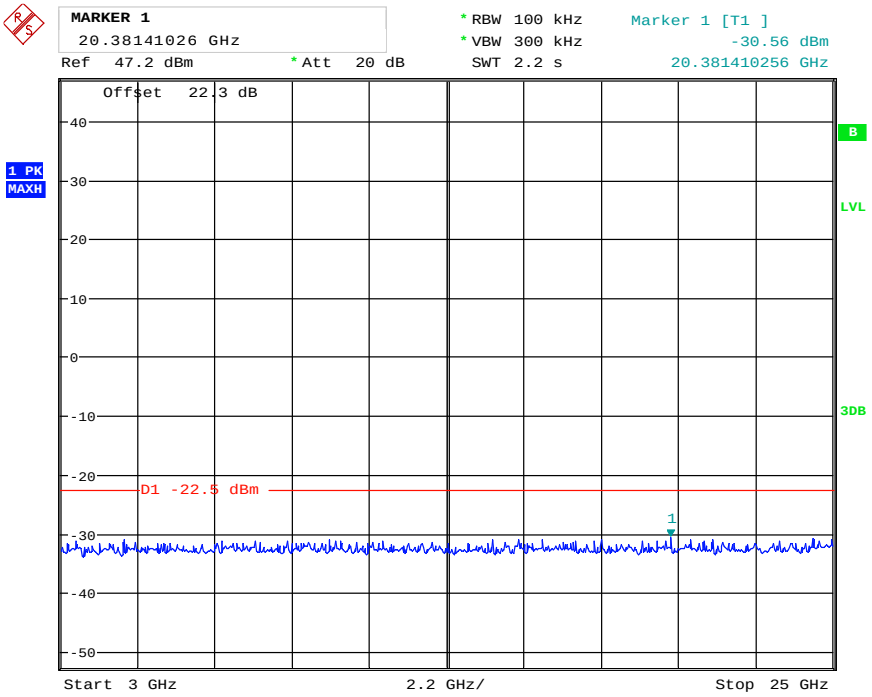
Middle Channel 3 GHz – 25 GHz



High Channel 30 MHz – 3 GHz

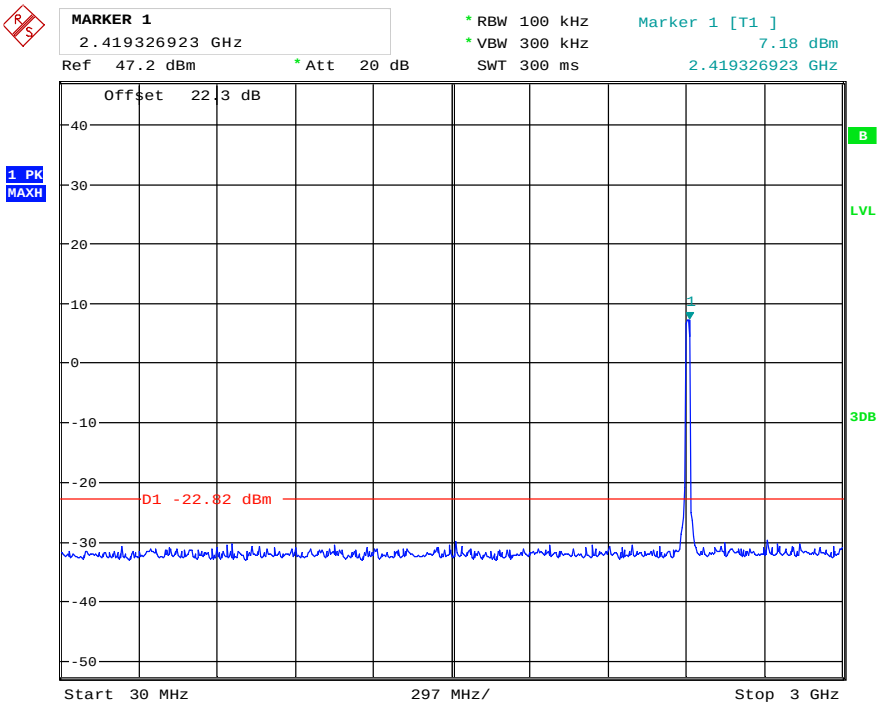


High Channel 3 GHz – 25 GHz

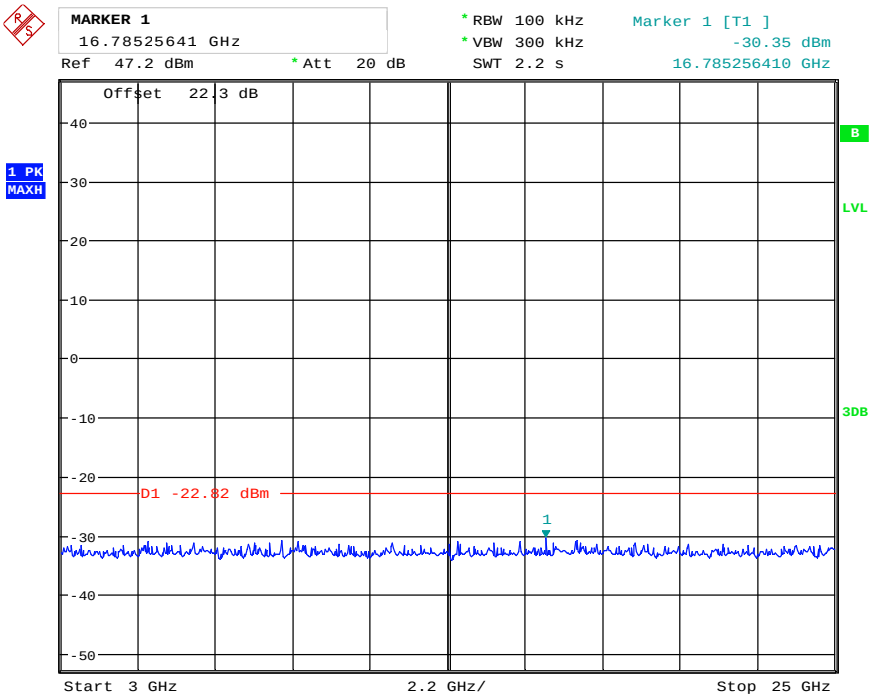


802.11n20 Mode Antenna Chain 0

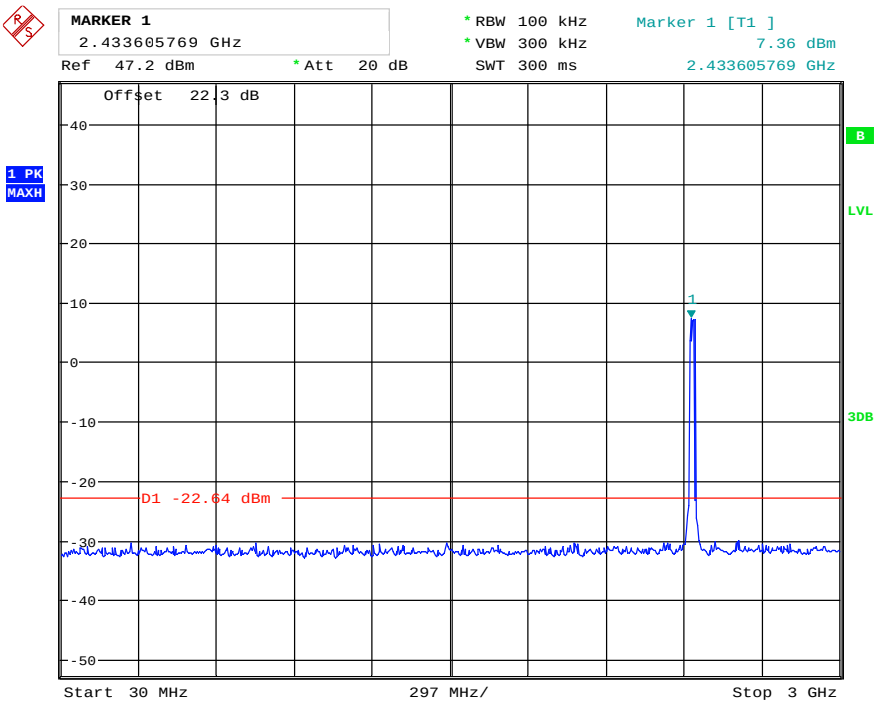
Low Channel 30 MHz – 3 GHz



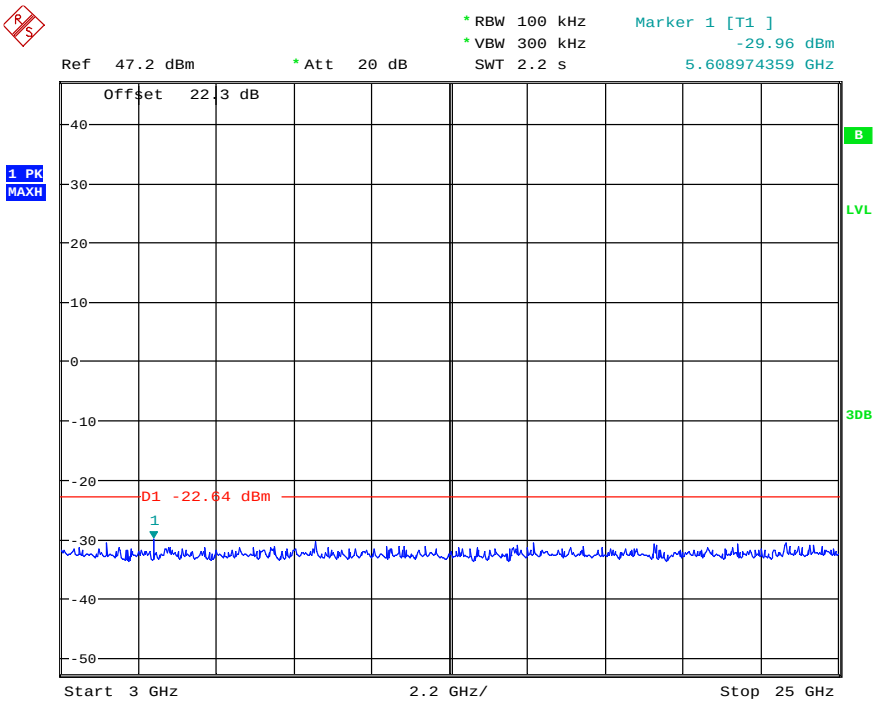
Low Channel 3 GHz – 25 GHz



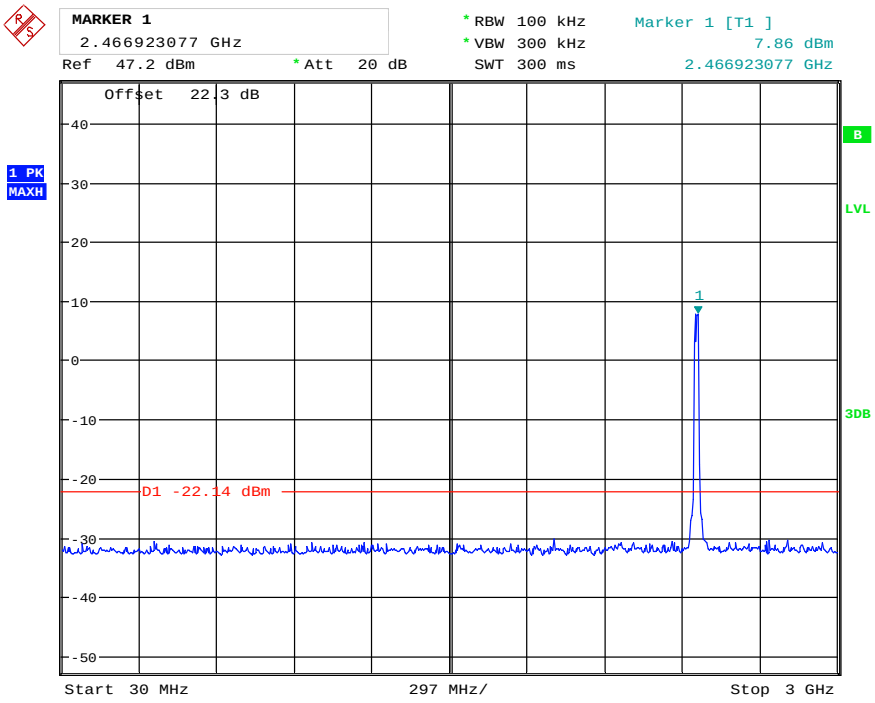
Middle Channel 30 MHz – 3 GHz



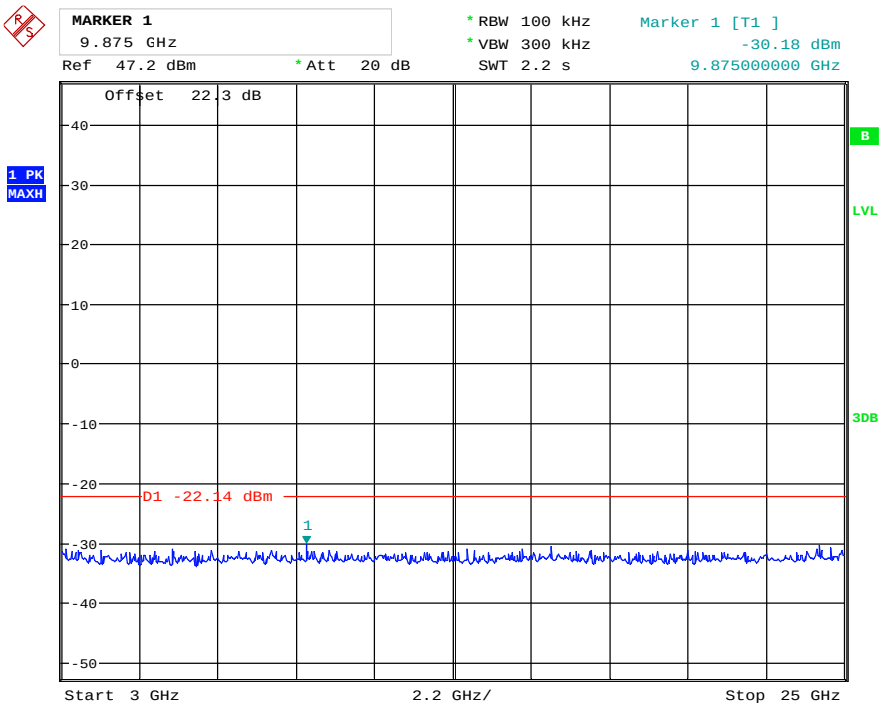
Middle Channel 3 GHz – 25 GHz



High Channel 30 MHz – 3 GHz

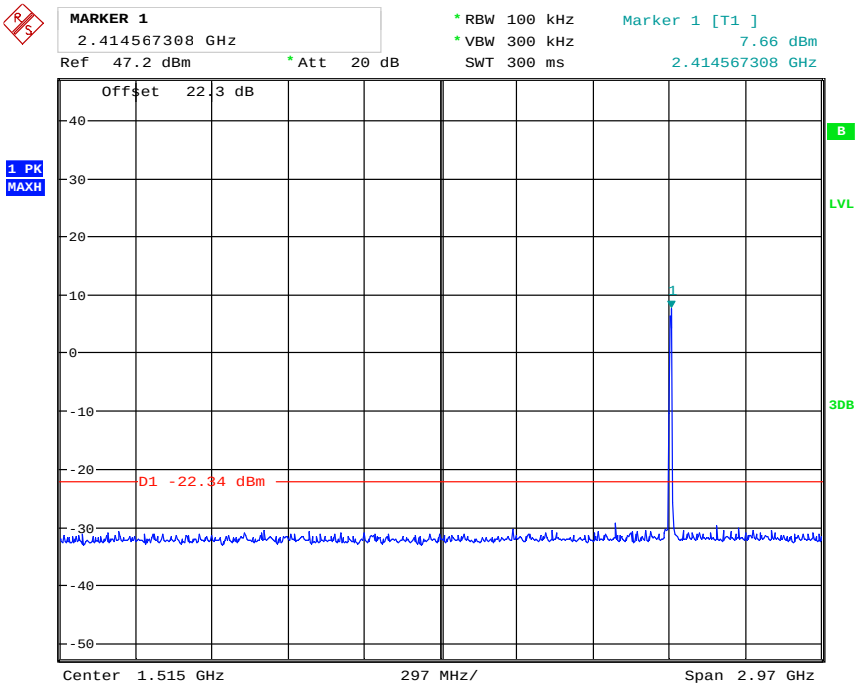


High Channel 3 GHz – 25 GHz

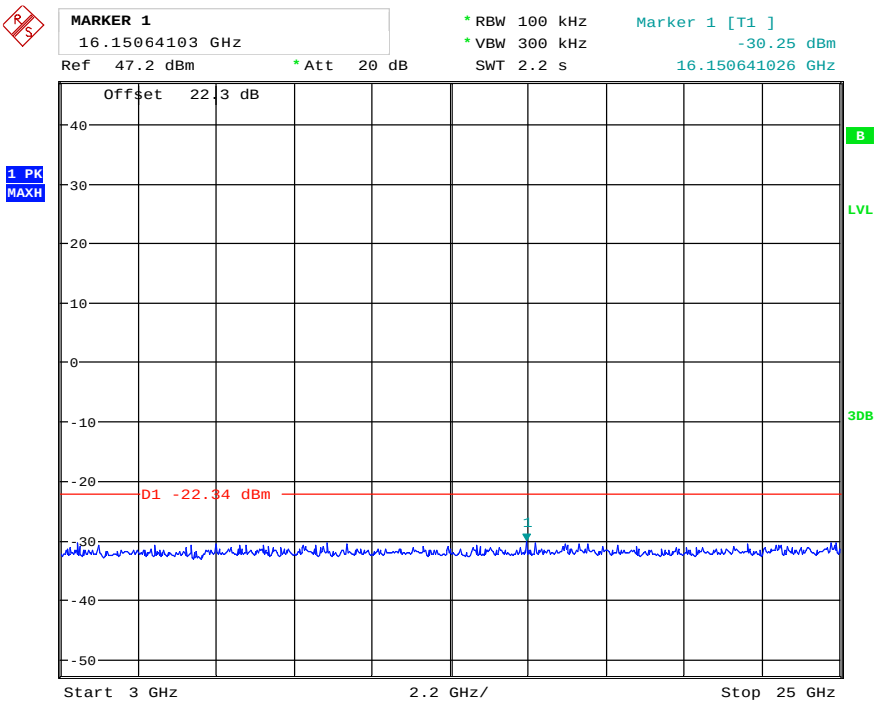


802.11b Mode Antenna Chain 1

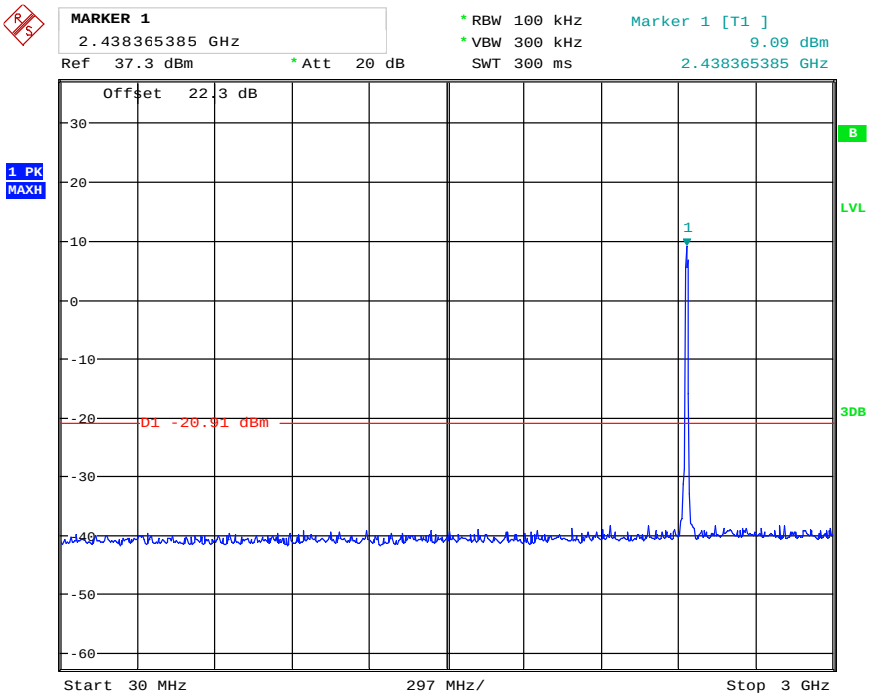
Low Channel 30MHz – 3 GHz



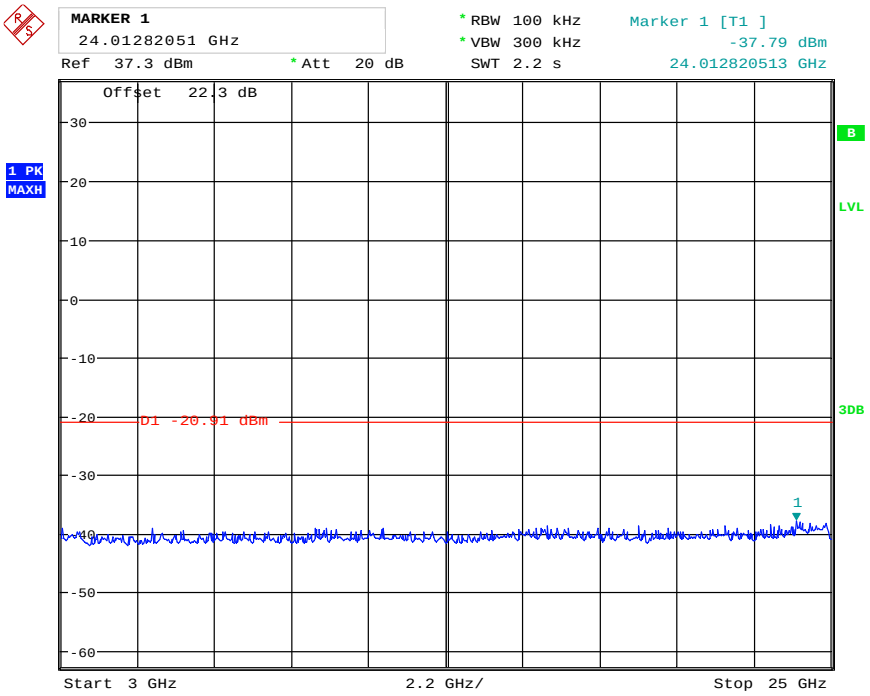
Low Channel 3 GHz – 25 GHz



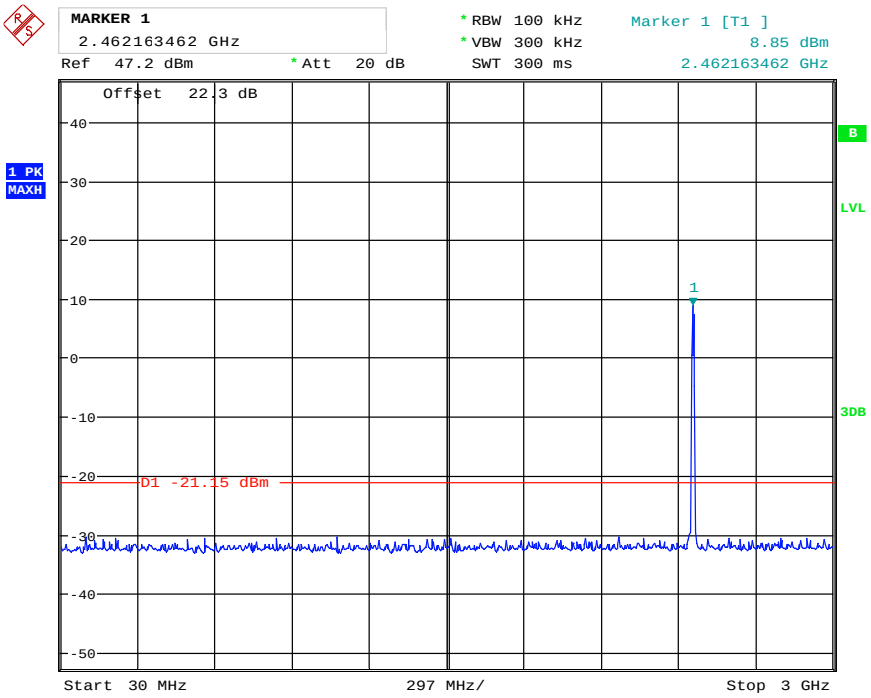
Middle Channel 30 MHz – 3 GHz



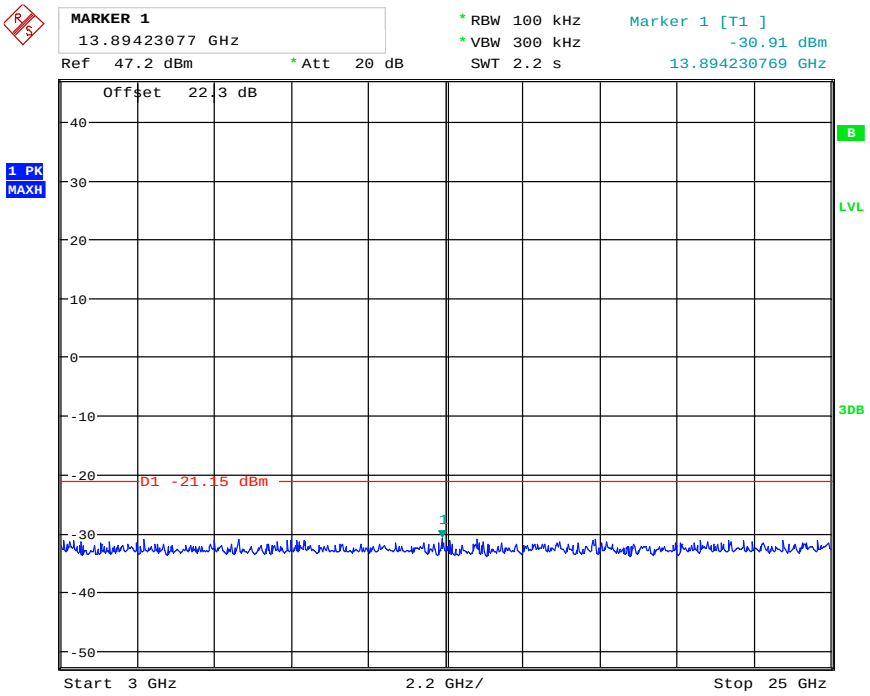
Middle Channel 3 GHz – 25 GHz



High Channel 30 MHz – 3 GHz

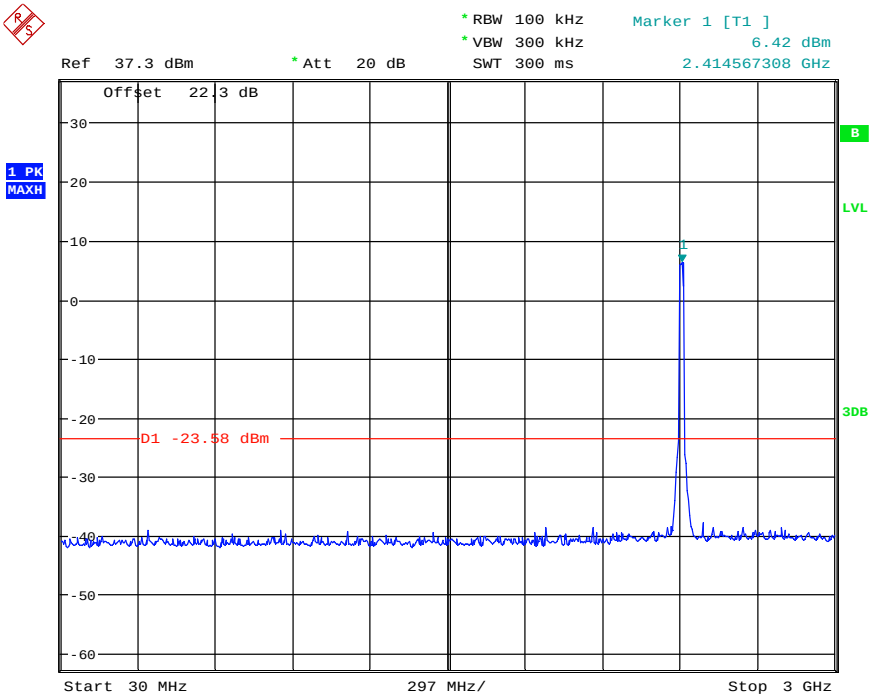


High Channel 3 GHz – 26 GHz

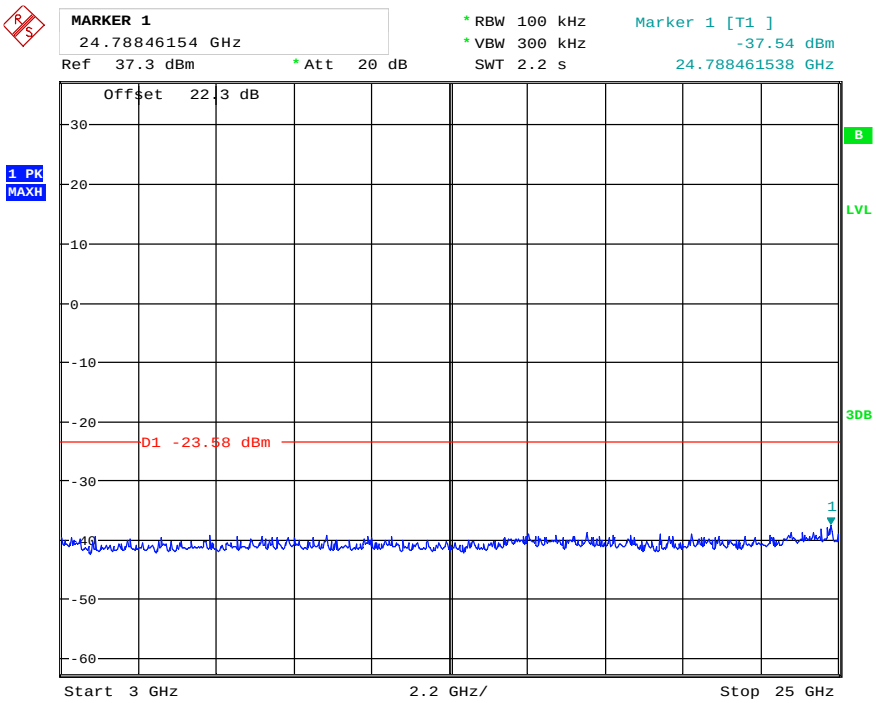


802.11g Mode Antenna Chain 1

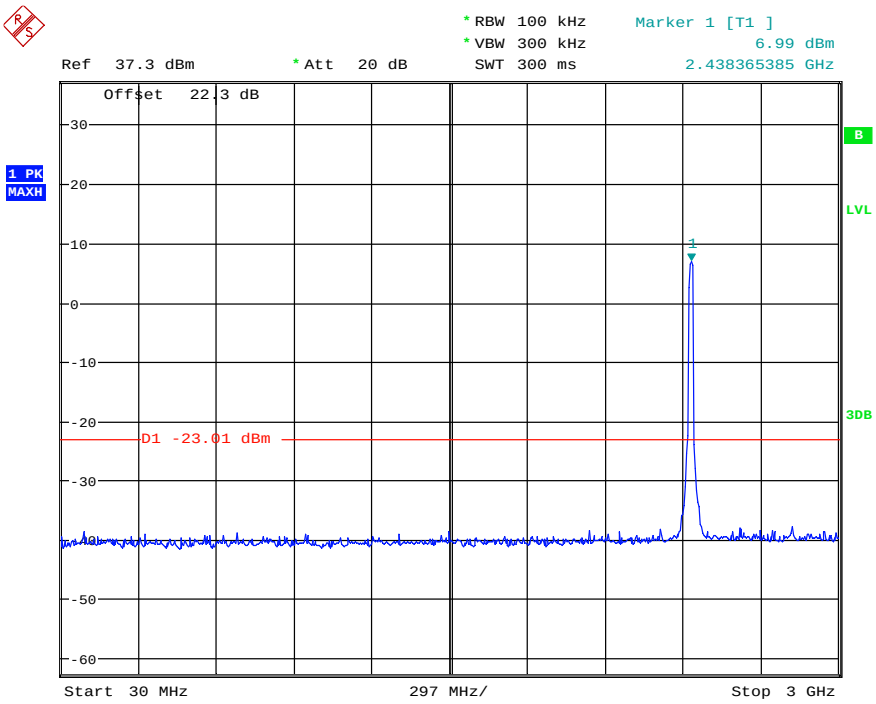
Low Channel 30 MHz – 3 GHz



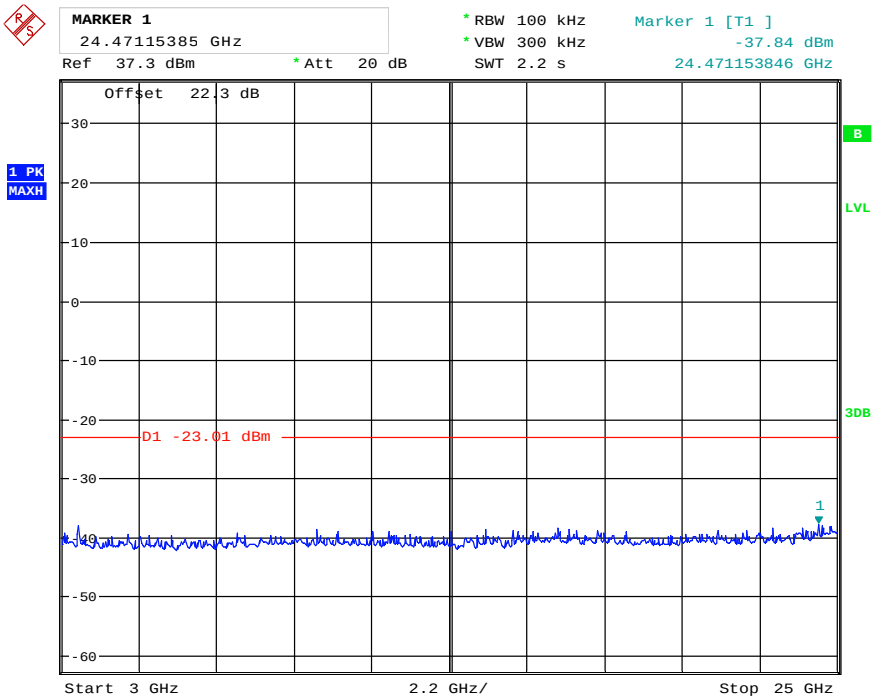
Low Channel 3 GHz – 25 GHz



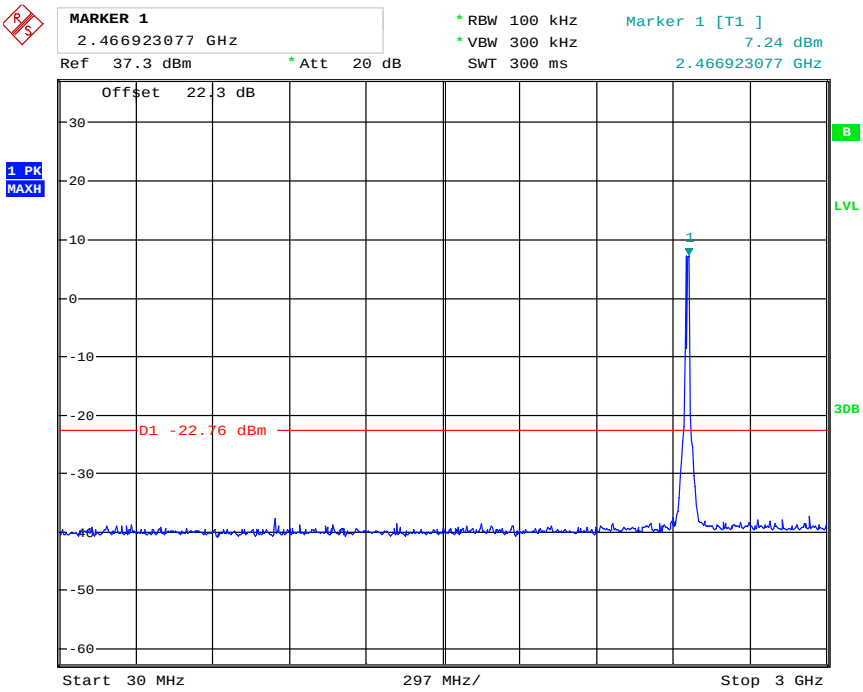
Middle Channel 30 MHz – 3 GHz



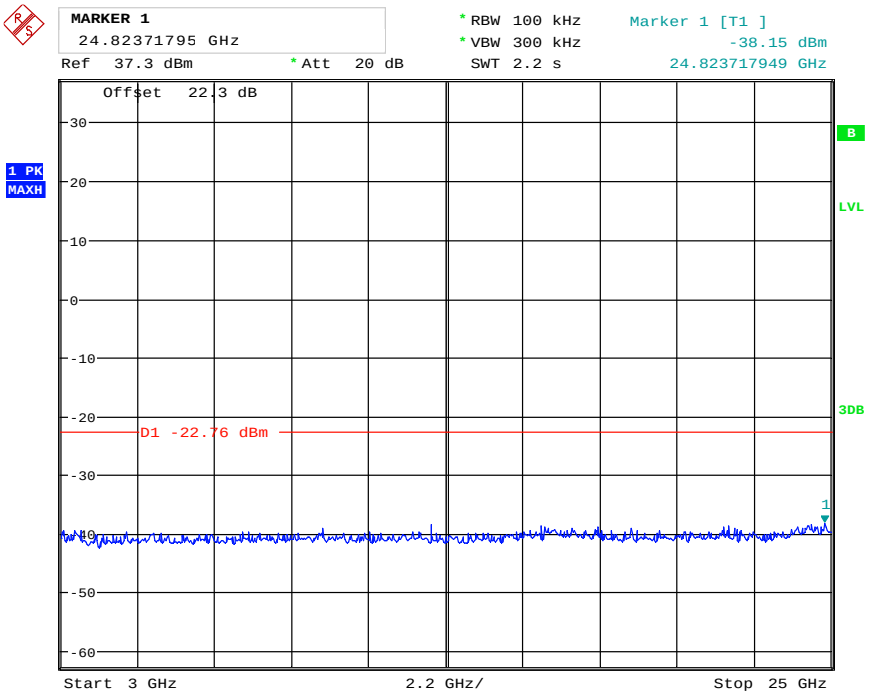
Middle Channel 3 GHz – 25 GHz



High Channel 30 MHz – 3 GHz

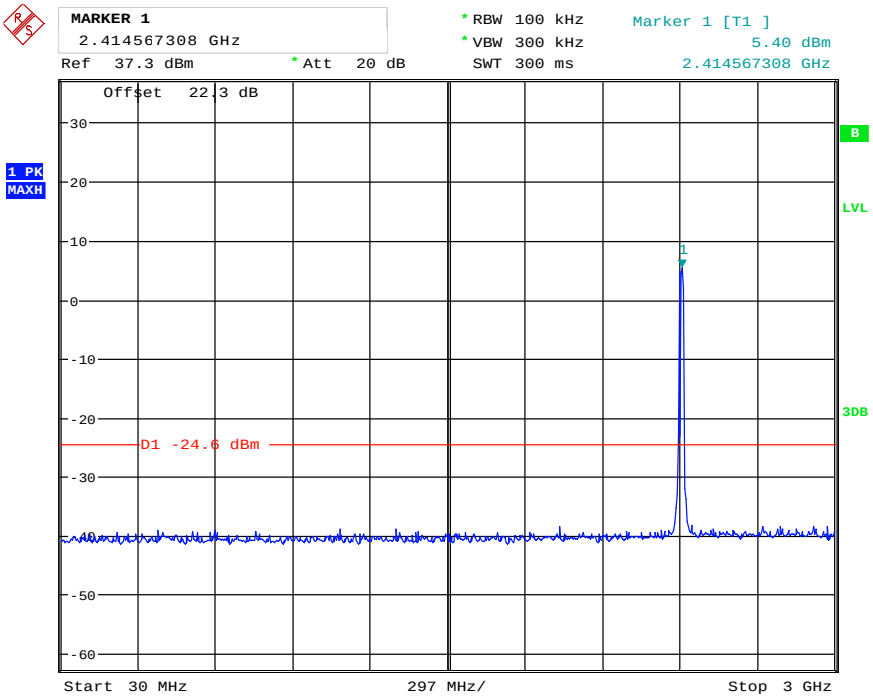


High Channel 3 GHz – 25 GHz

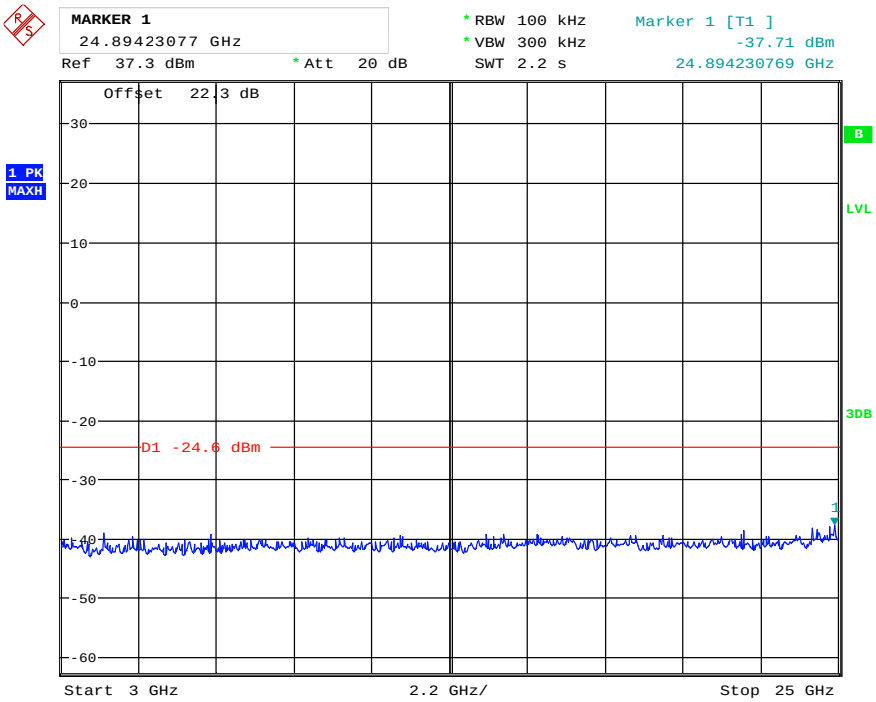


802.11n20 Mode Antenna Chain 1

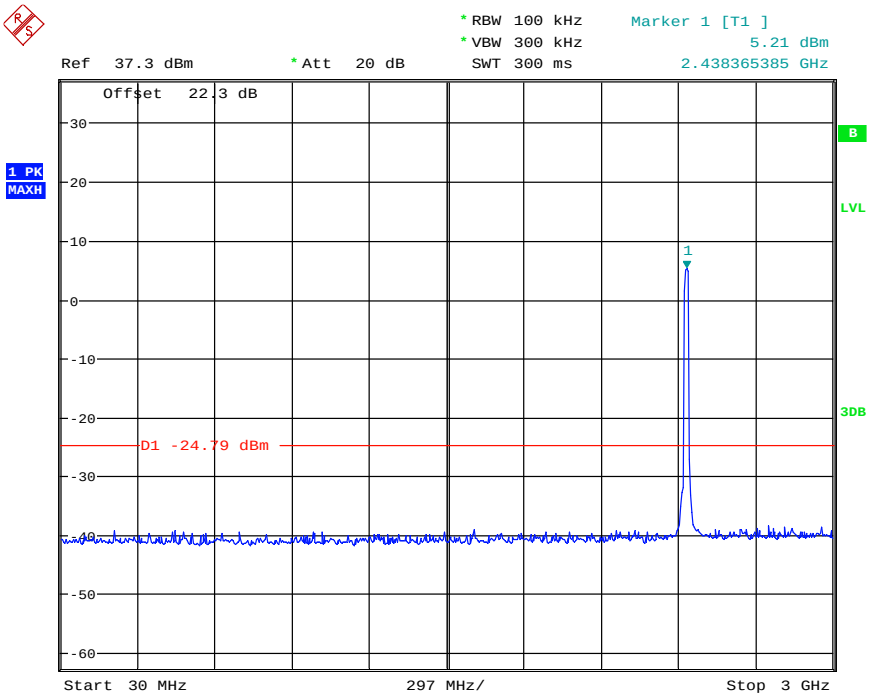
Low Channel 30 MHz – 3 GHz



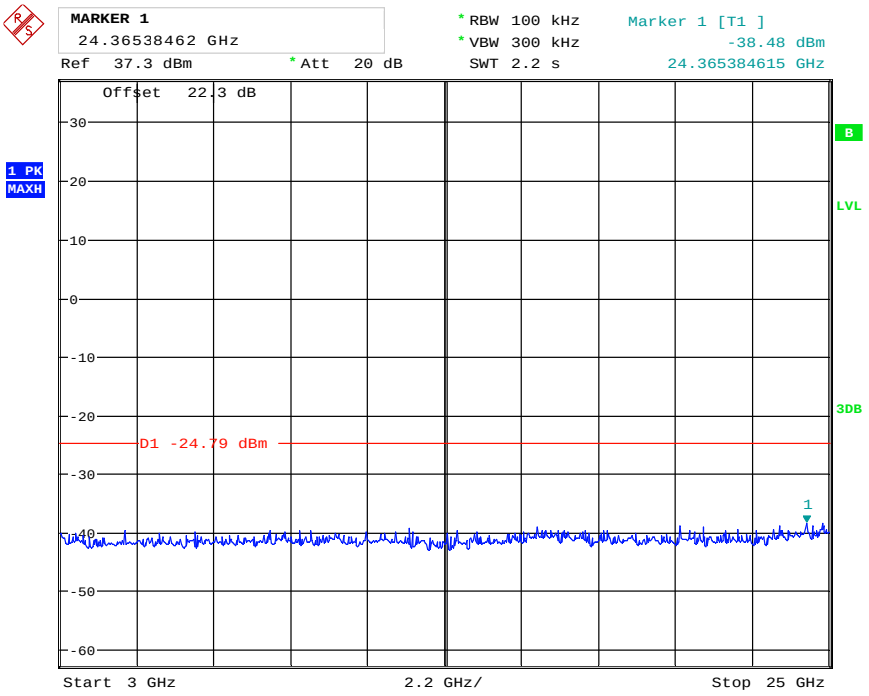
Low Channel 3 GHz – 25 GHz



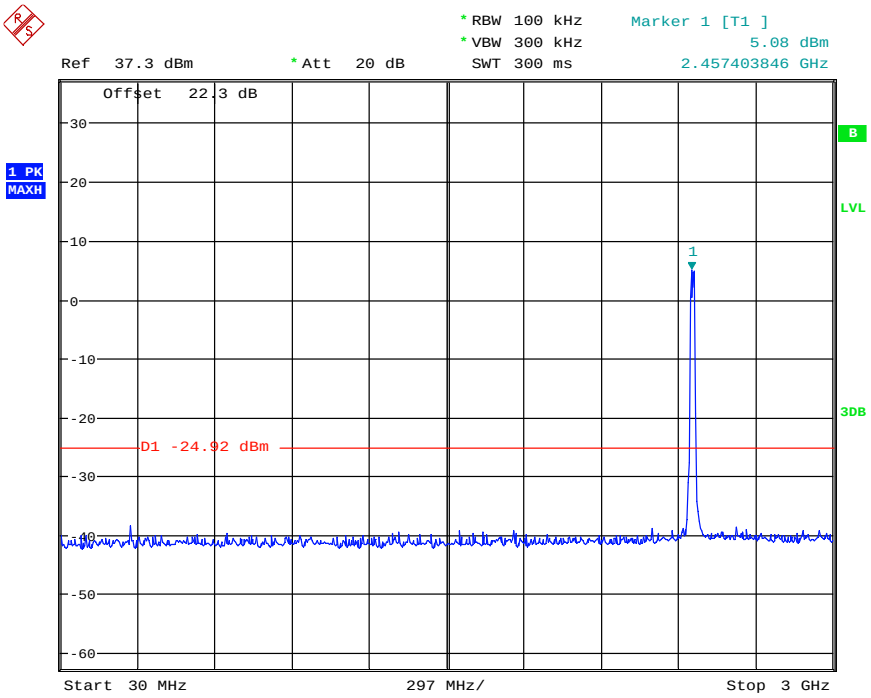
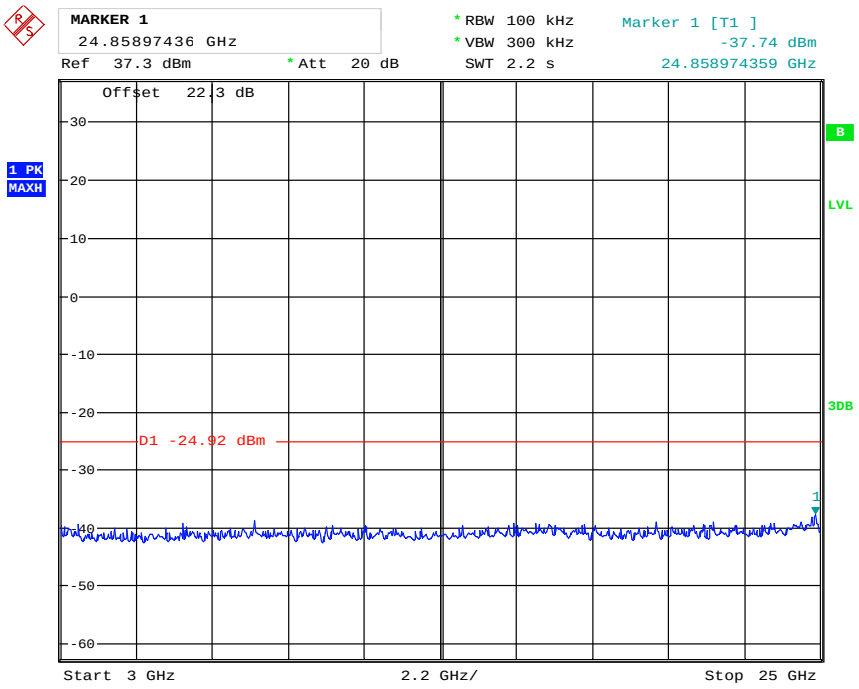
Middle Channel 30 MHz – 3 GHz



Middle Channel 3 GHz – 25 GHz



High Channel 30 MHz – 3 GHz



High Channel 3 GHz – 25 GHz