# FCC PART 15.247

# TEST REPORT

For

# Shenzhen KVD Communication Equipment

Lenovo R&D Center 2F-B, South First Road, High-tech Park, Nanshan District, Shenzhen China

## FCC ID: 2ADTE-X20L

| **Report Type:** | **Product Name:** |
|---|---|
| Original Report | Mobile phone |

| | |
|---|---|
| **Report Number:** | RDG171130004-00C |
| **Report Date:** | 2017-12-20 |
| **Reviewed By:** | Jerry Zhang<br>EMC Manager |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp. (Dongguan)<br>No.69 Pulongcun, Puxinhu Industry Area,<br>Tangxia, Dongguan, Guangdong, China<br>Tel: +86-769-86858888<br>Fax: +86-769-86858891<br>www.baclcorp.com.cn |

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

# TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The ***Shenzhen KVD Communication Equipment***'s product, model number: ***X20L*** ***(FCC ID: 2ADTE-X20L)*** (the "EUT") in this report was a ***Mobile phone,*** which was measured approximately: 145.5mm (L) x 71.9mm (W) x 8.8mm (H), rated input voltage:DC 3.8V from battery or DC 5V from adapter.

*Adapter Information:*
*Model:HJ-0501000E1-US*
*Input: AC100-240V~50/60Hz 0.2A*
*Output: DC5V, 1000mA*

**All measurement and test data in this report was gathered from production sample serial number: 171130004 (Assigned by BACL,Dongguan). The EUT was received on 2017-11-25.*

## Objective

This report is prepared on behalf of ***Shenzhen KVD Communication Equipment*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

## Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: 2ADTE-X20L.
FCC Part 15B JBP submissions with FCC ID: 2ADTE-X20L.
FCC Part 22H, 24E, 27 PCE submissions with FCC ID: 2ADTE-X20L.

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and KDB 558074 D01 DTS Meas Guidance v04.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

## Measurement Uncertainty

| Parameter | Measurement Uncertainty |
|---|---|
| Occupied Channel Bandwidth | ±5 % |
| RF output power, conducted | ±0.61dB |
| Power Spectral Density, conducted | ±0.61 dB |
| Unwanted Emissions, radiated | 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical<br>200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical<br>1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB |
| Unwanted Emissions, conducted | ±1.5 dB |
| Temperature | ±1℃ |
| Humidity | ±5% |
| DC and low frequency voltages | ±0.4% |
| Duty Cycle | 1% |
| AC Power Lines Conducted Emission | 3.12 dB (150 kHz to 30 MHz) |

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China

Bay Area Compliance Laboratories Corp. (Dongguan) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L5662). And accredited to ISO/IEC 17025 by NVLAP(Test Laboratory Accreditation Certificate Number 500069-0), the FCC Designation No. CN5002 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Dongguan) was registered with ISED Canada under ISED Canada Registration Number 3062D.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For 2.4GHz band, total 11 channels are provided:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 1 | 2412 | 7 | 2442 |
| 2 | 2417 | 8 | 2447 |
| 3 | 2422 | 9 | 2452 |
| 4 | 2427 | 10 | 2457 |
| 5 | 2432 | 11 | 2462 |
| 6 | 2437 | / | / |

For 802.11b, 802.11g, and 802.11n ht20 modes were test with channel 1,6,11.
For 802.11n ht40 mode was test with channel 3,6,9.

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

For Bluetooth LE mode, 40 channels are provided for testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 0 | 2402 | 20 | 2442 |
| 1 | 2404 | … | … |
| … | … | … | … |
| … | … | … | … |
| .. | … | 38 | 2478 |
| 19 | 2440 | 39 | 2480 |

EUT was tested with channel 0, 19 and 39.

## EUT Exercise Software

The software "Engineer Mode" was used for testing, which was provided by manufacturer. The maximum power was configured as below table, that provided by the manufacturer:

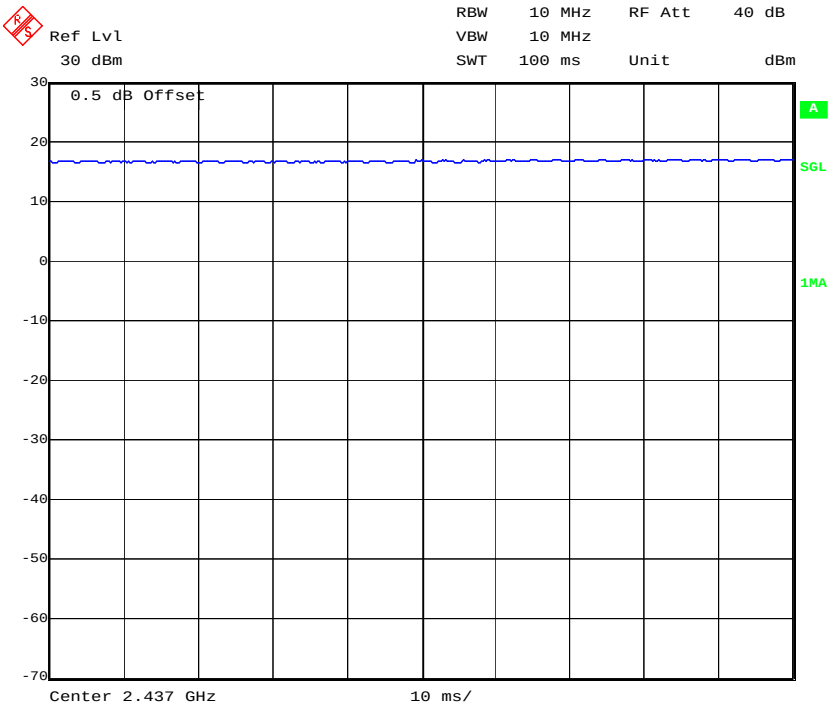
| Test Mode | Test Software Version | Engineering Mode | | |
|---|---|---|---|---|
| **802.11b** | Test Frequency | 2412MHz | 2437MHz | 2462MHz |
| | Data Rate | 1Mbps | 1Mbps | 1Mbps |
| | Power Level Setting | 18 | 18 | 18 |
| **802.11g** | Test Frequency | 2412MHz | 2437MHz | 2462MHz |
| | Data Rate | 6Mbps | 6Mbps | 6Mbps |
| | Power Level Setting | 18 | 18 | 18 |
| **802.11n ht20** | Test Frequency | 2412MHz | 2437MHz | 2462MHz |
| | Data Rate | MCS0 | MCS0 | MCS0 |
| | Power Level Setting | 18 | 18 | 18 |
| **802.11n ht40** | Test Frequency | 2422MHz | 2437MHz | 2452MHz |
| | Data Rate | MCS0 | MCS0 | MCS0 |
| | Power Level Setting | 18 | 18 | 18 |

Note: BLE mode configured as maximum power by the system default setting.

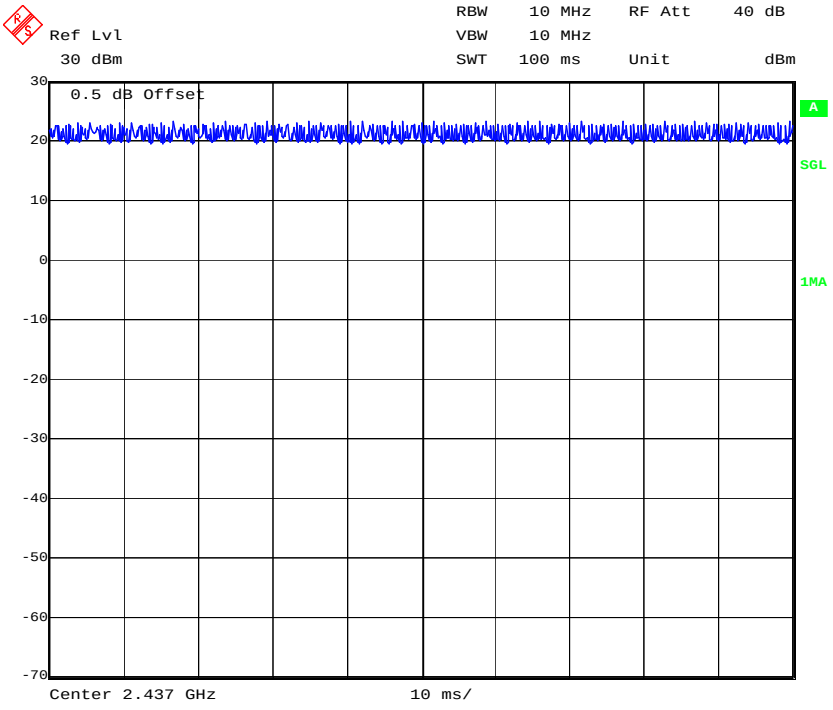
The maximum duty cycle as following table:

| Test mode | $T_{on}$ (ms) | $T_{on+off}$ (ms) | Duty Cycle (%) |
|---|---|---|---|
| 802.11b | 100 | 100 | 100 |
| 802.11g | 100 | 100 | 100 |
| 802.11n ht20 | 100 | 100 | 100 |
| 802.11n ht40 | 100 | 100 | 100 |
| BLE | 0.411 | 0.631 | 65.1 |

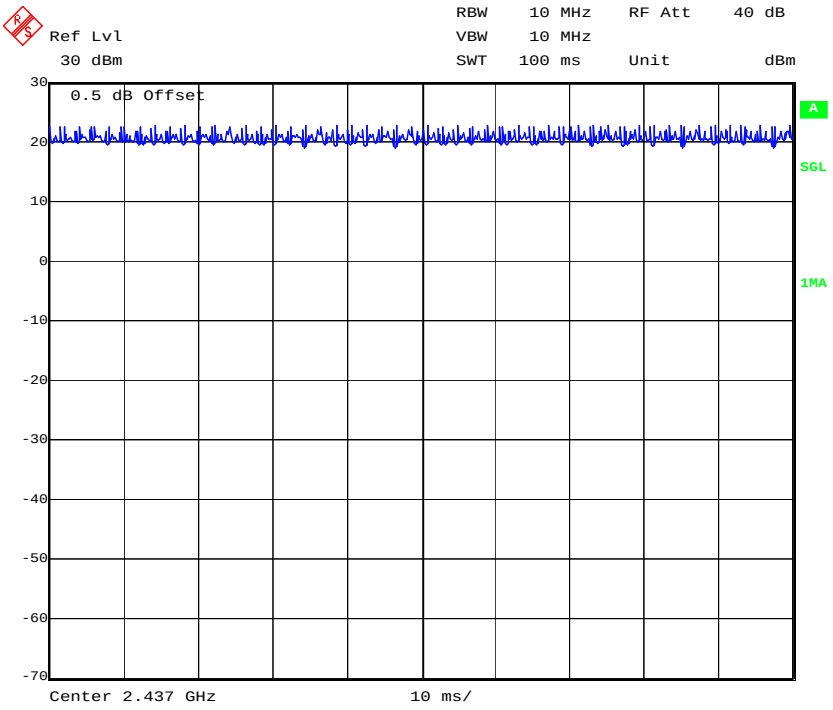
**802.11b**




**802.11g**

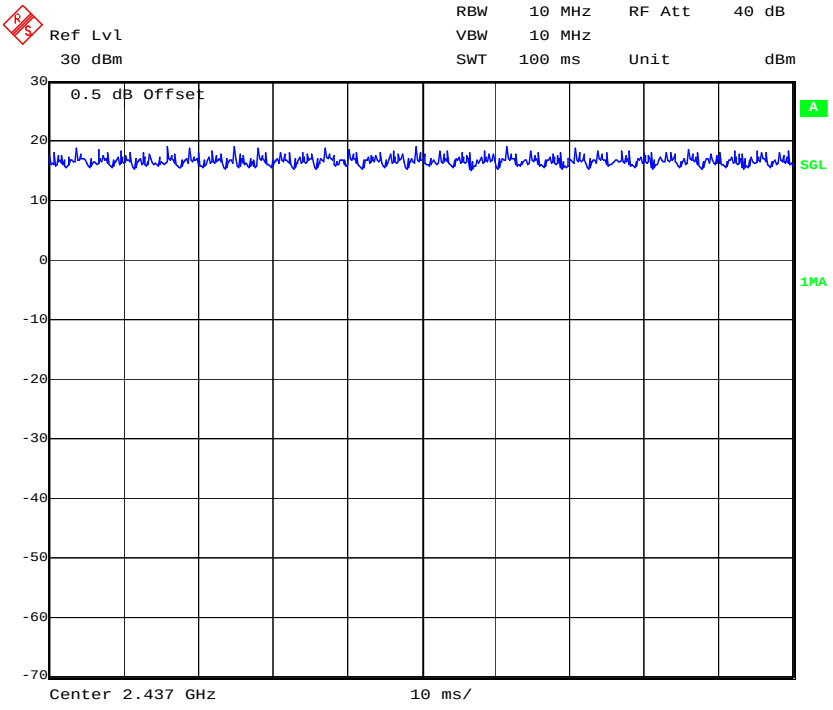


**802.11n ht20**



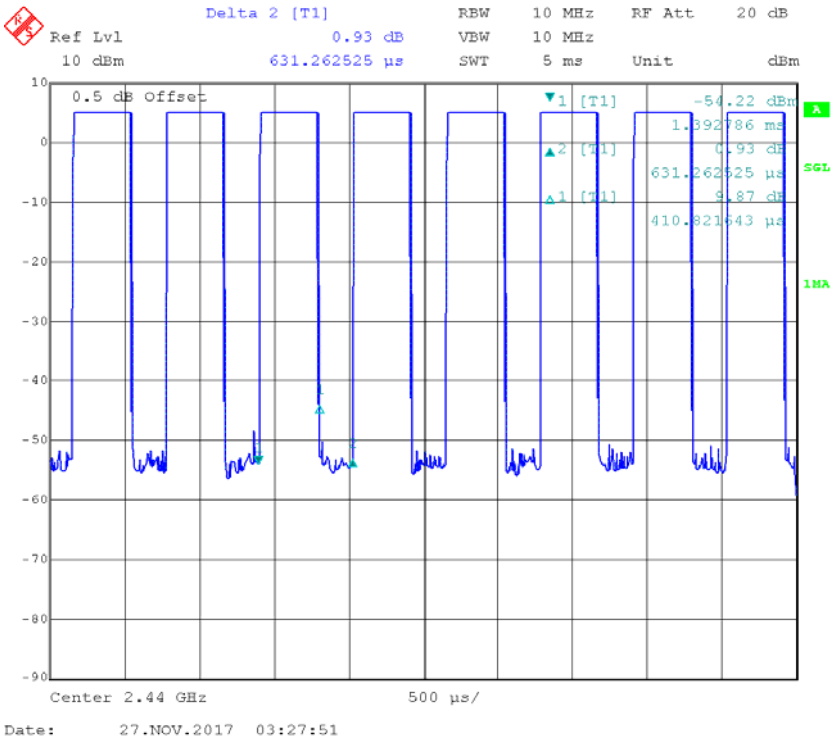

Date: 26.NOV.2017 16:30:37

**802.11n ht40**




Date: 26.NOV.2017 16:31:35

**BLE**



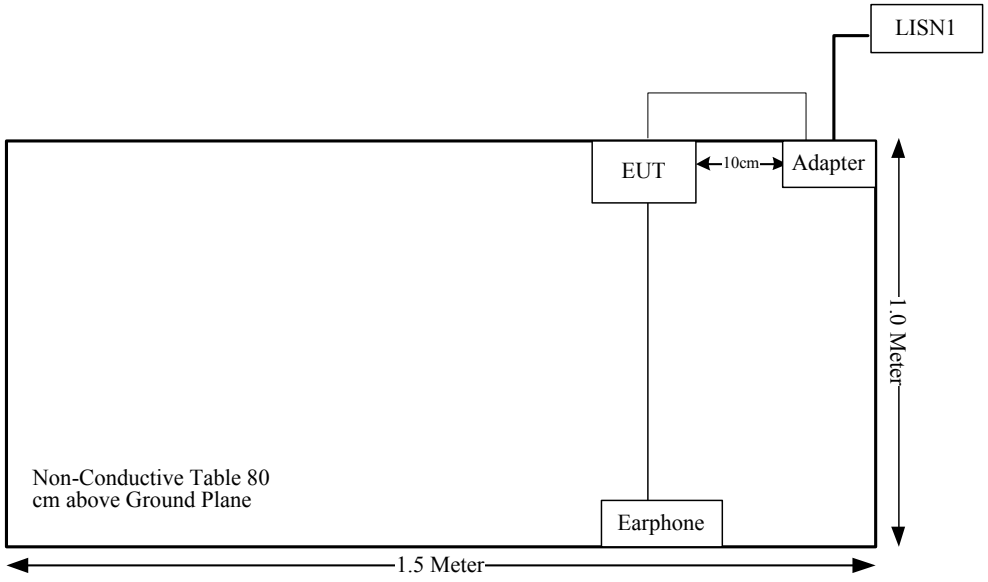

## Equipment Modifications

No modification was made to the EUT.

## Support Cable List and Details

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From | To |
|---|---|---|---|---|---|
| USB Cable | No | No | 1.01 | EUT | Adapter |
| Earphone Cable | No | No | 1.21 | EUT | Earphone |

## Block Diagram of Test Setup



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| FCC §15.247 (i) & §1.1310 & §2.1093 | RF Exposure | Compliance |
| §15.203 | Antenna Requirement | Compliance |
| §15.207 (a) | AC Line Conducted Emissions | Compliance |
| §15.205, §15.209, §15.247(d) | Spurious Emissions | Compliance |
| §15.247 (a)(2) | 6 dB Bandwidth | Compliance |
| §15.247(b)(3) | Maximum Conducted Output Power | Compliance |
| §15.247(d) | 100 kHz Bandwidth of Frequency Band Edge | Compliance |
| §15.247(e) | Power Spectral Density | Compliance |

# FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

## Applicable Standard

According to§15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

**Measurement Result**

**For Bluetooth LE mode:**

The max conducted power including tune-up tolerance is 6.0 dBm (3.98 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 3.98/5*(√2.480) = 1.3< 3.0

**So the stand-alone SAR evaluation is not necessary.**

**For WLAN mode:**

Please refer the SAR report:RDG171130004-20.

# FCC §15.203 - ANTENNA REQUIREMENT

## Applicable Standard

According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

## Antenna Connector Construction

The EUT has one internal antenna arrangement for BT and WIFI, and the antenna gain is 1.25 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

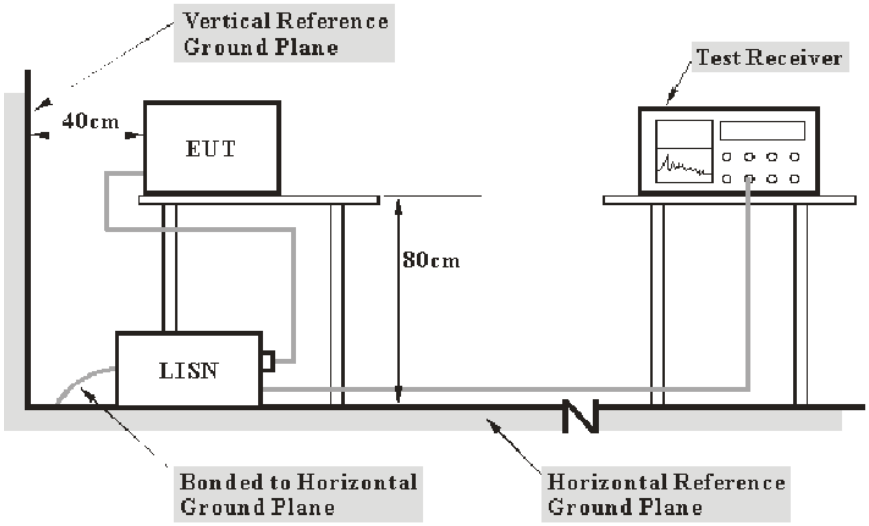
**Result:** Compliance.

# FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

## Applicable Standard

FCC§15.207(a)

## EUT Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main lisn with a 120 V/60 Hz AC power source.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|---|---|
| 150 kHz – 30 MHz | 9 kHz |

## Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

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

All data was recorded in the Quasi-peak and average detection mode.

## Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
$V_C$ (cord. Reading): corrected voltage amplitude
$V_R$: reading voltage amplitude
$A_c$: attenuation caused by cable loss
VDF: voltage division factor of AMN
$C_f$: Correction Factor

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

Margin = Limit – Corrected Amplitude

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | EMI Test Receiver | ESCS 30 | 830245/006 | 2016-12-08 | 2017-12-08 |
| R&S | L.I.S.N | ESH2-Z5 | 892107/021 | 2017-09-01 | 2018-09-01 |
| R&S | Two-line V-network | ENV 216 | 3560.6550.12 | 2016-12-08 | 2017-12-08 |
| R&S | Test Software | EMC32 | Version8.53.0 | N/A | N/A |
| Unknown | Coaxial Cable | C-NJNJ-50 | C-0200-01 | 2017-09-05 | 2018-09-05 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

# Test Data

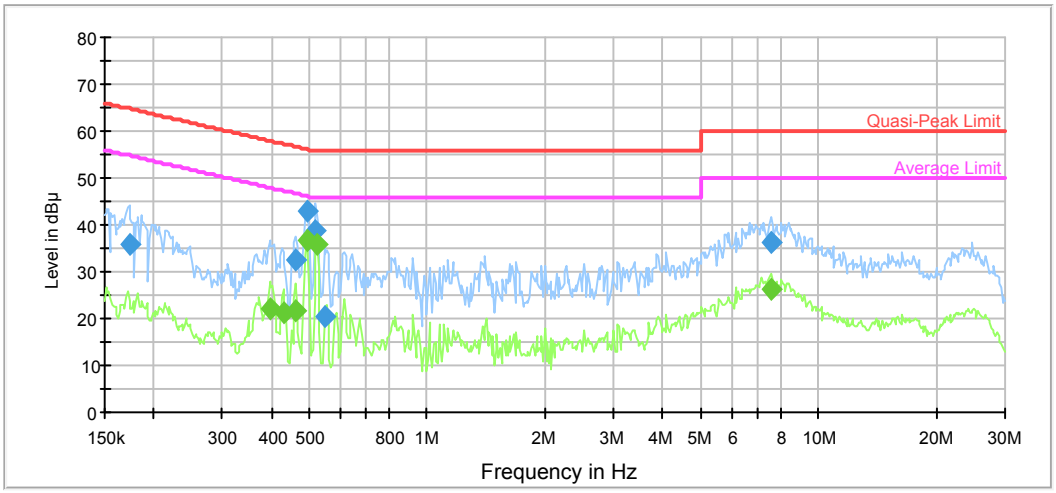
## Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25.3 °C |
| **Relative Humidity:** | 40 % |
| **ATM Pressure:** | 100.8 kPa |

*The testing was performed by Ade Xiao on 2017-12-04.*

*Test Mode: Transmitting*

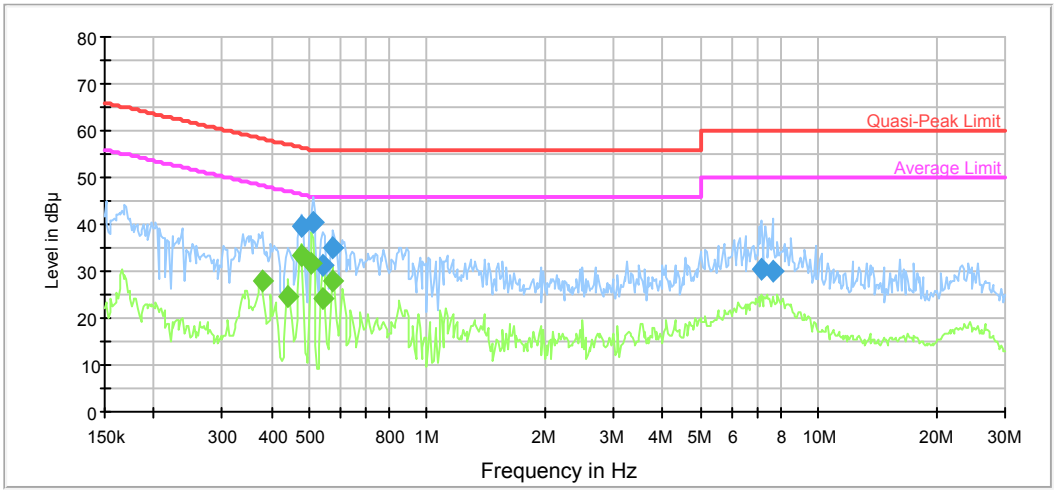
## AC120 V, 60 Hz, Line:




| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.173134 | 36.0 | 9.000 | L1 | 10.9 | 28.8 | 64.8 | Compliance |
| 0.461346 | 32.5 | 9.000 | L1 | 9.9 | 24.2 | 56.7 | Compliance |
| 0.495646 | 42.8 | 9.000 | L1 | 9.9 | 13.3 | 56.1 | Compliance |
| 0.519918 | 38.7 | 9.000 | L1 | 9.9 | 17.3 | 56.0 | Compliance |
| 0.545378 | 20.5 | 9.000 | L1 | 9.9 | 35.5 | 56.0 | Compliance |
| 7.562639 | 36.2 | 9.000 | L1 | 9.8 | 23.8 | 60.0 | Compliance |

| Frequency (MHz) | Average (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.396530 | 22.3 | 9.000 | L1 | 10.0 | 25.6 | 47.9 | Compliance |
| 0.429420 | 21.4 | 9.000 | L1 | 9.9 | 25.9 | 47.3 | Compliance |
| 0.461346 | 21.8 | 9.000 | L1 | 9.9 | 24.9 | 46.7 | Compliance |
| 0.491712 | 36.6 | 9.000 | L1 | 9.9 | 9.6 | 46.2 | Compliance |
| 0.524077 | 35.9 | 9.000 | L1 | 9.9 | 10.1 | 46.0 | Compliance |
| 7.562639 | 26.4 | 9.000 | L1 | 9.8 | 23.6 | 50.0 | Compliance |

**AC120 V, 60 Hz, Neutral:**




| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.480097 | 39.5 | 9.000 | N | 9.9 | 16.8 | 56.3 | Compliance |
| 0.511698 | 40.5 | 9.000 | N | 9.9 | 15.5 | 56.0 | Compliance |
| 0.541050 | 31.4 | 9.000 | N | 9.9 | 24.6 | 56.0 | Compliance |
| 0.576662 | 35.0 | 9.000 | N | 9.8 | 21.0 | 56.0 | Compliance |
| 7.152364 | 30.6 | 9.000 | N | 9.8 | 29.4 | 60.0 | Compliance |
| 7.623140 | 29.9 | 9.000 | N | 9.8 | 30.1 | 60.0 | Compliance |

| Frequency (MHz) | Average (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.378019 | 28.0 | 9.000 | N | 10.0 | 20.3 | 48.3 | Compliance |
| 0.443327 | 24.5 | 9.000 | N | 9.9 | 22.5 | 47.0 | Compliance |
| 0.476287 | 33.4 | 9.000 | N | 9.9 | 13.0 | 46.4 | Compliance |
| 0.507637 | 31.8 | 9.000 | N | 9.9 | 14.2 | 46.0 | Compliance |
| 0.541050 | 24.1 | 9.000 | N | 9.9 | 21.9 | 46.0 | Compliance |
| 0.576662 | 28.0 | 9.000 | N | 9.8 | 18.0 | 46.0 | Compliance |

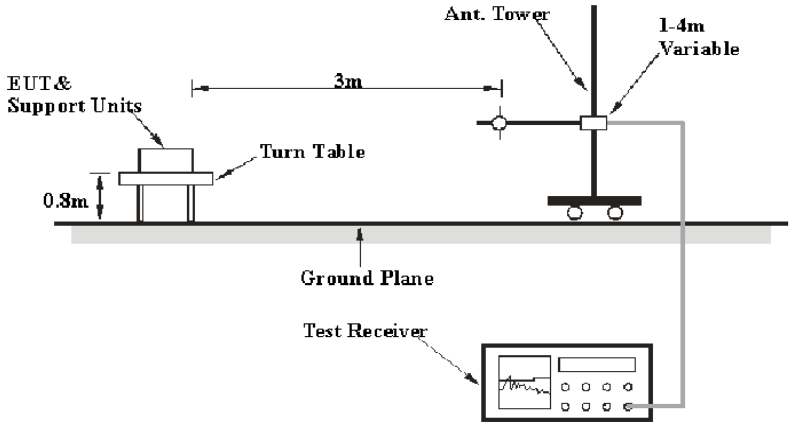
# FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

## Applicable Standard

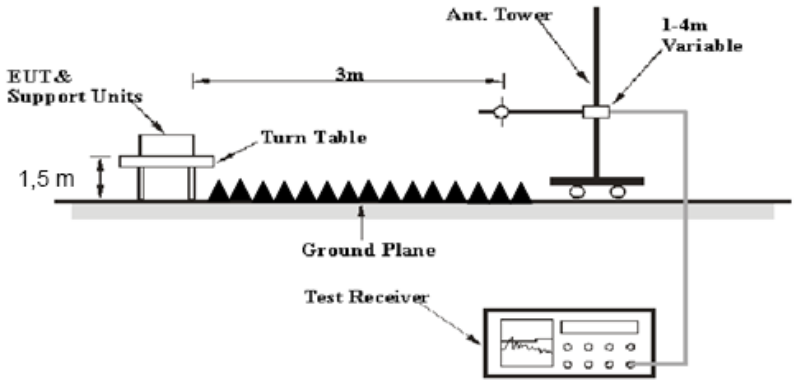
FCC §15.247 (d); §15.209; §15.205;

## EUT Setup

**Below 1GHz:**




**Above 1GHz:**




The radiated emission tests were performed in the 3 meters distance, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

| Measurement | RBW | Video B/W | IF B/W |
|---|---|---|---|
| QP | 120 kHz | 300 kHz | 120kHz |

1GHz- 25GHz:

| Measurement | Duty cycle | RBW | Video B/W |
|---|---|---|---|
| PK | Any | 1MHz | 3 MHz |
| AV | >98% | 1MHz | 10 Hz |
| | <98% | 1MHz | 1/T |

Note: T is minimum transmission duration

## Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Limit – Corrected Amplitude

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | EMI Test Receiver | ESCI | 100224 | 2017-09-01 | 2018-08-31 |
| Sunol Sciences | Antenna | JB3 | A060611-1 | 2017-11-10 | 2020-11-10 |
| HP | Amplifier | 8447D | 2727A05902 | 2017-09-05 | 2018-09-05 |
| R&S | Spectrum Analyzer | E4440A | SG43360054 | 2016-12-08 | 2017-12-08 |
| ETS-Lindgren | Horn Antenna | 3115 | 000 527 35 | 2016-01-05 | 2019-01-04 |
| Ducommun Technolagies | Horn Antenna | ARH-4223-02 | 1007726-02 1304 | 2017-06-16 | 2020-06-15 |
| MITEQ | Amplifier | AFS42-00101800-25-S-42 | 2001271 | 2017-09-05 | 2018-09-05 |
| Quinstar | Amplifier | QLW-18405536-JO | 15964001001 | 2017-09-06 | 2018-09-06 |
| Unknown | Coaxial Cable | C-NJNJ-50 | C-0400-01 | 2017-09-05 | 2018-09-05 |
| Unknown | Coaxial Cable | C-NJNJ-50 | C-0075-01 | 2017-09-05 | 2018-09-05 |
| Unknown | Coaxial Cable | C-NJNJ-50 | C-1000-01 | 2017-09-05 | 2018-09-05 |
| Unknown | Coaxial Cable | C-SJSJ-50 | C-0800-01 | 2017-09-05 | 2018-09-05 |
| Chengdu Ouli | Band Rejection Filter | 2400-2483.5 | 002 | 2017-09-05 | 2018-09-05 |
| Farad | Test Software | EZ-EMC | V1.1.4.2 | N/A | N/A |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.0~26.8 °C |
| **Relative Humidity:** | 42~28.8 % |
| **ATM Pressure:** | 101~101.4 kPa |

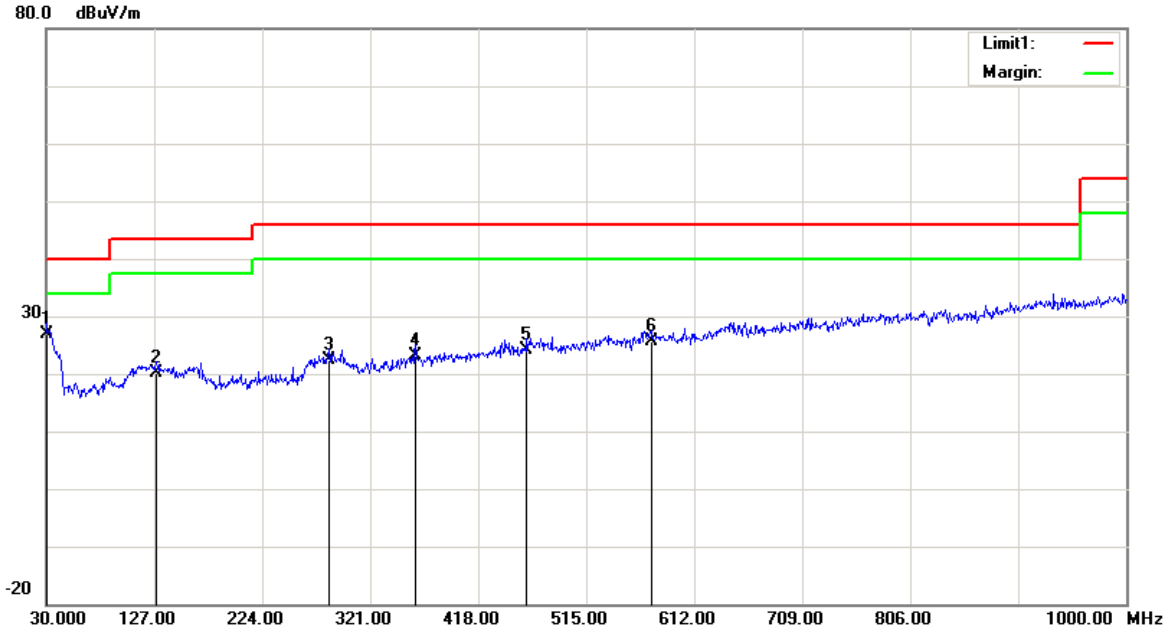
** The testing was performed by Blake Yang&Steven Zuo from 2017-11-27 to 2017-11-30.*

*Test Result: Compliance, please Refer to the following data*

*Test Mode: Transmitting*

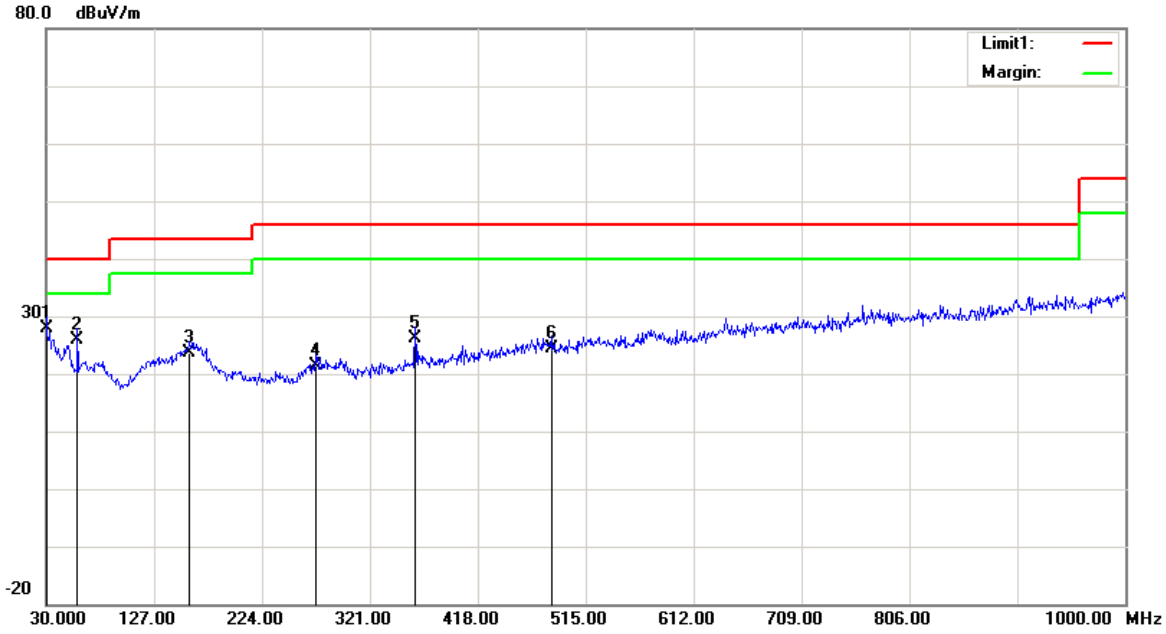
**1) 30MHz-1GHz** (Wifi 802.11b mode middle channel was the worst)**:**

**Horizontal:**




| Frequency (MHz) | Receiver Reading (dBuV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 30.0000 | 25.82 | QP | 1.08 | 26.90 | 40.00 | 13.10 |
| 128.9400 | 25.28 | QP | -5.08 | 20.20 | 43.50 | 23.30 |
| 284.1400 | 26.04 | QP | -3.74 | 22.30 | 46.00 | 23.70 |
| 361.7400 | 26.10 | QP | -2.90 | 23.20 | 46.00 | 22.80 |
| 461.6500 | 25.08 | QP | -0.98 | 24.10 | 46.00 | 21.90 |
| 573.2000 | 25.07 | QP | 0.53 | 25.60 | 46.00 | 20.40 |

**Vertical:**




| Frequency (MHz) | Receiver Reading (dBuV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 30.0000 | 26.72 | QP | 1.08 | 27.80 | 40.00 | 12.20 |
| 58.1300 | 38.37 | QP | -12.57 | 25.80 | 40.00 | 14.20 |
| 159.0100 | 30.16 | QP | -6.56 | 23.60 | 43.50 | 19.90 |
| 272.5000 | 25.13 | QP | -3.83 | 21.30 | 46.00 | 24.70 |
| 361.7400 | 29.00 | QP | -2.90 | 26.10 | 46.00 | 19.90 |
| 483.9600 | 25.56 | QP | -1.06 | 24.50 | 46.00 | 21.50 |

**2) 1-25GHz:**

802.11b Mode:

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2412 MHz | | | | | | | | | |
| 2412.00 | 70.24 | PK | H | 28.12 | 1.81 | 0.00 | 100.17 | N/A | N/A |
| 2412.00 | 65.78 | AV | H | 28.12 | 1.81 | 0.00 | 95.71 | N/A | N/A |
| 2412.00 | 67.94 | PK | V | 28.12 | 1.81 | 0.00 | 97.87 | N/A | N/A |
| 2412.00 | 62.48 | AV | V | 28.12 | 1.81 | 0.00 | 92.41 | N/A | N/A |
| 2390.00 | 24.36 | PK | H | 28.08 | 1.80 | 0.00 | 54.24 | 74.00 | 19.76 |
| 2390.00 | 13.57 | AV | H | 28.08 | 1.80 | 0.00 | 43.45 | 54.00 | 10.55 |
| 4824.00 | 56.36 | PK | H | 32.95 | 3.19 | 37.20 | 55.3 | 74.00 | 18.7 |
| 4824.00 | 43.28 | AV | H | 32.95 | 3.19 | 37.20 | 42.22 | 54.00 | 11.78 |
| 7236.00 | 55.44 | PK | H | 35.81 | 4.77 | 37.27 | 58.75 | 74.00 | 15.25 |
| 7236.00 | 42.31 | AV | H | 35.81 | 4.77 | 37.27 | 45.62 | 54.00 | 8.38 |
| 5875.00 | 46.87 | PK | H | 34.25 | 3.77 | 37.24 | 47.65 | 74.00 | 26.35 |
| 5875.00 | 33.42 | AV | H | 34.25 | 3.77 | 37.24 | 34.2 | 54.00 | 19.8 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437.00 | 71.49 | PK | H | 28.17 | 1.82 | 0.00 | 101.48 | N/A | N/A |
| 2437.00 | 65.53 | AV | H | 28.17 | 1.82 | 0.00 | 95.52 | N/A | N/A |
| 2437.00 | 67.72 | PK | V | 28.17 | 1.82 | 0.00 | 97.71 | N/A | N/A |
| 2437.00 | 62.54 | AV | V | 28.17 | 1.82 | 0.00 | 92.53 | N/A | N/A |
| 4874.00 | 57.54 | PK | H | 33.05 | 3.26 | 37.21 | 56.64 | 74.00 | 17.36 |
| 4874.00 | 44.31 | AV | H | 33.05 | 3.26 | 37.21 | 43.41 | 54.00 | 10.59 |
| 7311.00 | 56.46 | PK | H | 36.01 | 4.64 | 37.36 | 59.75 | 74.00 | 14.25 |
| 7311.00 | 43.12 | AV | H | 36.01 | 4.64 | 37.36 | 46.41 | 54.00 | 7.59 |
| 5899.00 | 46.74 | PK | H | 34.26 | 3.79 | 37.22 | 47.57 | 74.00 | 26.43 |
| 5899.00 | 33.49 | AV | H | 34.26 | 3.79 | 37.22 | 34.32 | 54.00 | 19.68 |
| 6125.00 | 46.35 | PK | H | 34.28 | 4.06 | 37.27 | 47.42 | 74.00 | 26.58 |
| 6125.00 | 33.27 | AV | H | 34.28 | 4.06 | 37.27 | 34.34 | 54.00 | 19.66 |
| High Channel: 2462 MHz | | | | | | | | | |
| 2462.00 | 71.42 | PK | H | 28.22 | 1.83 | 0.00 | 101.47 | N/A | N/A |
| 2462.00 | 67.25 | AV | H | 28.22 | 1.83 | 0.00 | 97.3 | N/A | N/A |
| 2462.00 | 68.84 | PK | V | 28.22 | 1.83 | 0.00 | 98.89 | N/A | N/A |
| 2462.00 | 63.75 | AV | V | 28.22 | 1.83 | 0.00 | 93.8 | N/A | N/A |
| 2483.50 | 26.94 | PK | H | 28.27 | 1.84 | 0.00 | 57.05 | 74.00 | 16.95 |
| 2483.50 | 13.78 | AV | H | 28.27 | 1.84 | 0.00 | 43.89 | 54.00 | 10.11 |
| 4924.00 | 57.59 | PK | H | 33.15 | 3.27 | 37.22 | 56.79 | 74.00 | 17.21 |
| 4924.00 | 44.22 | AV | H | 33.15 | 3.27 | 37.22 | 43.42 | 54.00 | 10.58 |
| 7386.00 | 56.37 | PK | H | 36.20 | 4.51 | 37.46 | 59.62 | 74.00 | 14.38 |
| 7386.00 | 43.32 | AV | H | 36.20 | 4.51 | 37.46 | 46.57 | 54.00 | 7.43 |
| 5698.00 | 46.98 | PK | H | 34.18 | 3.68 | 37.35 | 47.49 | 74.00 | 26.51 |
| 5698.00 | 33.52 | AV | H | 34.18 | 3.68 | 37.35 | 34.03 | 54.00 | 19.97 |

802.11g Mode:

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2412 MHz | | | | | | | | | |
| 2412.00 | 71.02 | PK | H | 28.12 | 1.81 | 0.00 | 100.95 | N/A | N/A |
| 2412.00 | 61.63 | AV | H | 28.12 | 1.81 | 0.00 | 91.56 | N/A | N/A |
| 2412.00 | 67.57 | PK | V | 28.12 | 1.81 | 0.00 | 97.5 | N/A | N/A |
| 2412.00 | 57.34 | AV | V | 28.12 | 1.81 | 0.00 | 87.27 | N/A | N/A |
| 2390.00 | 27.45 | PK | H | 28.08 | 1.80 | 0.00 | 57.33 | 74.00 | 16.67 |
| 2390.00 | 13.72 | AV | H | 28.08 | 1.80 | 0.00 | 43.6 | 54.00 | 10.4 |
| 4824.00 | 53.68 | PK | H | 32.95 | 3.19 | 37.20 | 52.62 | 74.00 | 21.38 |
| 4824.00 | 39.49 | AV | H | 32.95 | 3.19 | 37.20 | 38.43 | 54.00 | 15.57 |
| 7236.00 | 54.37 | PK | H | 35.81 | 4.77 | 37.27 | 57.68 | 74.00 | 16.32 |
| 7236.00 | 40.58 | AV | H | 35.81 | 4.77 | 37.27 | 43.89 | 54.00 | 10.11 |
| 5965.00 | 47.26 | PK | H | 34.29 | 3.82 | 37.29 | 48.08 | 74.00 | 25.92 |
| 5965.00 | 33.45 | AV | H | 34.29 | 3.82 | 37.29 | 34.27 | 54.00 | 19.73 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437.00 | 71.82 | PK | H | 28.17 | 1.82 | 0.00 | 101.81 | N/A | N/A |
| 2437.00 | 62.79 | AV | H | 28.17 | 1.82 | 0.00 | 92.78 | N/A | N/A |
| 2437.00 | 68.63 | PK | V | 28.17 | 1.82 | 0.00 | 98.62 | N/A | N/A |
| 2437.00 | 58.52 | AV | V | 28.17 | 1.82 | 0.00 | 88.51 | N/A | N/A |
| 4874.00 | 53.57 | PK | H | 33.05 | 3.26 | 37.21 | 52.67 | 74.00 | 21.33 |
| 4874.00 | 39.65 | AV | H | 33.05 | 3.26 | 37.21 | 38.75 | 54.00 | 15.25 |
| 7311.00 | 54.53 | PK | H | 36.01 | 4.64 | 37.36 | 57.82 | 74.00 | 16.18 |
| 7311.00 | 40.67 | AV | H | 36.01 | 4.64 | 37.36 | 43.96 | 54.00 | 10.04 |
| 5899.00 | 47.14 | PK | H | 34.26 | 3.79 | 37.22 | 47.97 | 74.00 | 26.03 |
| 5899.00 | 33.56 | AV | H | 34.26 | 3.79 | 37.22 | 34.39 | 54.00 | 19.61 |
| 6125.00 | 46.48 | PK | H | 34.28 | 4.06 | 37.27 | 47.55 | 74.00 | 26.45 |
| 6125.00 | 33.28 | AV | H | 34.28 | 4.06 | 37.27 | 34.35 | 54.00 | 19.65 |
| High Channel: 2462 MHz | | | | | | | | | |
| 2462.00 | 72.58 | PK | H | 28.22 | 1.83 | 0.00 | 102.63 | N/A | N/A |
| 2462.00 | 63.72 | AV | H | 28.22 | 1.83 | 0.00 | 93.77 | N/A | N/A |
| 2462.00 | 69.54 | PK | V | 28.22 | 1.83 | 0.00 | 99.59 | N/A | N/A |
| 2462.00 | 59.15 | AV | V | 28.22 | 1.83 | 0.00 | 89.2 | N/A | N/A |
| 2483.50 | 29.34 | PK | H | 28.27 | 1.84 | 0.00 | 59.45 | 74.00 | 14.55 |
| 2483.50 | 13.84 | AV | H | 28.27 | 1.84 | 0.00 | 43.95 | 54.00 | 10.05 |
| 4924.00 | 53.55 | PK | H | 33.15 | 3.27 | 37.22 | 52.75 | 74.00 | 21.25 |
| 4924.00 | 39.49 | AV | H | 33.15 | 3.27 | 37.22 | 38.69 | 54.00 | 15.31 |
| 7386.00 | 54.56 | PK | H | 36.20 | 4.51 | 37.46 | 57.81 | 74.00 | 16.19 |
| 7386.00 | 40.47 | AV | H | 36.20 | 4.51 | 37.46 | 43.72 | 54.00 | 10.28 |
| 6256.00 | 47.15 | PK | H | 34.25 | 4.30 | 37.20 | 48.5 | 74.00 | 25.5 |
| 6256.00 | 33.52 | AV | H | 34.25 | 4.30 | 37.20 | 34.87 | 54.00 | 19.13 |

802.11n ht20 Mode:

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2412 MHz | | | | | | | | | |
| 2412.00 | 71.62 | PK | H | 28.12 | 1.81 | 0.00 | 101.55 | N/A | N/A |
| 2412.00 | 61.61 | AV | H | 28.12 | 1.81 | 0.00 | 91.54 | N/A | N/A |
| 2412.00 | 68.54 | PK | V | 28.12 | 1.81 | 0.00 | 98.47 | N/A | N/A |
| 2412.00 | 58.41 | AV | V | 28.12 | 1.81 | 0.00 | 88.34 | N/A | N/A |
| 2390.00 | 27.55 | PK | H | 28.08 | 1.80 | 0.00 | 57.43 | 74.00 | 16.57 |
| 2390.00 | 13.59 | AV | H | 28.08 | 1.80 | 0.00 | 43.47 | 54.00 | 10.53 |
| 4824.00 | 53.85 | PK | H | 32.95 | 3.19 | 37.20 | 52.79 | 74.00 | 21.21 |
| 4824.00 | 39.54 | AV | H | 32.95 | 3.19 | 37.20 | 38.48 | 54.00 | 15.52 |
| 7236.00 | 54.19 | PK | H | 35.81 | 4.77 | 37.27 | 57.5 | 74.00 | 16.5 |
| 7236.00 | 40.47 | AV | H | 35.81 | 4.77 | 37.27 | 43.78 | 54.00 | 10.22 |
| 5965.00 | 47.38 | PK | H | 34.29 | 3.82 | 37.29 | 48.2 | 74.00 | 25.8 |
| 5965.00 | 33.26 | AV | H | 34.29 | 3.82 | 37.29 | 34.08 | 54.00 | 19.92 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437.00 | 72.15 | PK | H | 28.17 | 1.82 | 0.00 | 102.14 | N/A | N/A |
| 2437.00 | 62.26 | AV | H | 28.17 | 1.82 | 0.00 | 92.25 | N/A | N/A |
| 2437.00 | 68.82 | PK | V | 28.17 | 1.82 | 0.00 | 98.81 | N/A | N/A |
| 2437.00 | 58.63 | AV | V | 28.17 | 1.82 | 0.00 | 88.62 | N/A | N/A |
| 4874.00 | 53.56 | PK | H | 33.05 | 3.26 | 37.21 | 52.66 | 74.00 | 21.34 |
| 4874.00 | 39.81 | AV | H | 33.05 | 3.26 | 37.21 | 38.91 | 54.00 | 15.09 |
| 7311.00 | 54.75 | PK | H | 36.01 | 4.64 | 37.36 | 58.04 | 74.00 | 15.96 |
| 7311.00 | 40.82 | AV | H | 36.01 | 4.64 | 37.36 | 44.11 | 54.00 | 9.89 |
| 5899.00 | 47.17 | PK | H | 34.26 | 3.79 | 37.22 | 48 | 74.00 | 26 |
| 5899.00 | 33.69 | AV | H | 34.26 | 3.79 | 37.22 | 34.52 | 54.00 | 19.48 |
| 6125.00 | 46.36 | PK | H | 34.28 | 4.06 | 37.27 | 47.43 | 74.00 | 26.57 |
| 6125.00 | 33.22 | AV | H | 34.28 | 4.06 | 37.27 | 34.29 | 54.00 | 19.71 |
| High Channel: 2462 MHz | | | | | | | | | |
| 2462.00 | 72.45 | PK | H | 28.22 | 1.83 | 0.00 | 102.5 | N/A | N/A |
| 2462.00 | 62.77 | AV | H | 28.22 | 1.83 | 0.00 | 92.82 | N/A | N/A |
| 2462.00 | 69.42 | PK | V | 28.22 | 1.83 | 0.00 | 99.47 | N/A | N/A |
| 2462.00 | 59.29 | AV | V | 28.22 | 1.83 | 0.00 | 89.34 | N/A | N/A |
| 2483.50 | 29.42 | PK | H | 28.27 | 1.84 | 0.00 | 59.53 | 74.00 | 14.47 |
| 2483.50 | 13.97 | AV | H | 28.27 | 1.84 | 0.00 | 44.08 | 54.00 | 9.92 |
| 4924.00 | 53.82 | PK | H | 33.15 | 3.27 | 37.22 | 53.02 | 74.00 | 20.98 |
| 4924.00 | 39.53 | AV | H | 33.15 | 3.27 | 37.22 | 38.73 | 54.00 | 15.27 |
| 7386.00 | 54.31 | PK | H | 36.20 | 4.51 | 37.46 | 57.56 | 74.00 | 16.44 |
| 7386.00 | 40.55 | AV | H | 36.20 | 4.51 | 37.46 | 43.8 | 54.00 | 10.2 |
| 7265.00 | 47.46 | PK | H | 35.89 | 4.72 | 37.30 | 50.77 | 74.00 | 23.23 |
| 7265.00 | 33.35 | AV | H | 35.89 | 4.72 | 37.30 | 36.66 | 54.00 | 17.34 |

802.11n ht40 Mode:

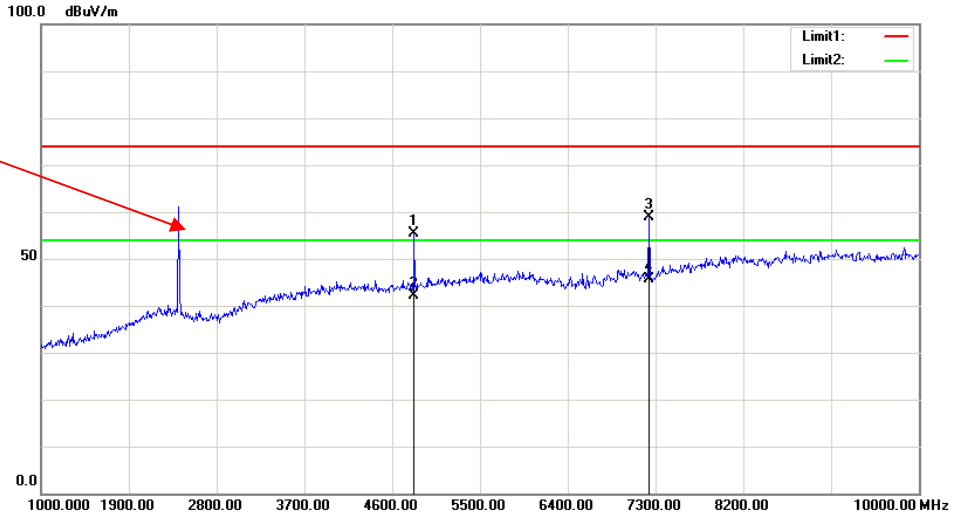
| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2422 MHz | | | | | | | | | |
| 2422.00 | 60.88 | PK | V | 28.14 | 1.81 | 0.00 | 100.83 | N/A | N/A |
| 2422.00 | 50.72 | AV | V | 28.14 | 1.81 | 0.00 | 90.67 | N/A | N/A |
| 2422.00 | 66.25 | PK | H | 28.14 | 1.81 | 0.00 | 96.2 | N/A | N/A |
| 2422.00 | 56.57 | AV | H | 28.14 | 1.81 | 0.00 | 86.52 | N/A | N/A |
| 2390.00 | 36.43 | PK | H | 28.08 | 1.80 | 0.00 | 66.31 | 74.00 | 7.69 |
| 2390.00 | 20.84 | AV | H | 28.08 | 1.80 | 0.00 | 50.72 | 54.00 | 3.28 |
| 4844.00 | 51.78 | PK | H | 32.99 | 3.22 | 37.20 | 50.79 | 74.00 | 23.21 |
| 4844.00 | 37.52 | AV | H | 32.99 | 3.22 | 37.20 | 36.53 | 54.00 | 17.47 |
| 7266.00 | 51.46 | PK | H | 35.89 | 4.72 | 37.31 | 54.76 | 74.00 | 19.24 |
| 7266.00 | 37.33 | AV | H | 35.89 | 4.72 | 37.31 | 40.63 | 54.00 | 13.37 |
| 5965.00 | 46.75 | PK | H | 34.29 | 3.82 | 37.29 | 47.57 | 74.00 | 26.43 |
| 5965.00 | 33.26 | AV | H | 34.29 | 3.82 | 37.29 | 34.08 | 54.00 | 19.92 |
| Middle Channel: 2437 MHz | | | | | | | | | |
| 2437.00 | 60.72 | PK | V | 28.17 | 1.82 | 0.00 | 100.71 | N/A | N/A |
| 2437.00 | 50.48 | AV | V | 28.17 | 1.82 | 0.00 | 90.47 | N/A | N/A |
| 2437.00 | 67.46 | PK | H | 28.17 | 1.82 | 0.00 | 97.45 | N/A | N/A |
| 2437.00 | 57.35 | AV | H | 28.17 | 1.82 | 0.00 | 87.34 | N/A | N/A |
| 4874.00 | 53.47 | PK | H | 33.05 | 3.26 | 37.21 | 52.57 | 74.00 | 21.43 |
| 4874.00 | 39.45 | AV | H | 33.05 | 3.26 | 37.21 | 38.55 | 54.00 | 15.45 |
| 7311.00 | 54.48 | PK | H | 36.01 | 4.64 | 37.36 | 57.77 | 74.00 | 16.23 |
| 7311.00 | 40.55 | AV | H | 36.01 | 4.64 | 37.36 | 43.84 | 54.00 | 10.16 |
| 5899.00 | 47.07 | PK | H | 34.26 | 3.79 | 37.22 | 47.9 | 74.00 | 26.1 |
| 5899.00 | 33.55 | AV | H | 34.26 | 3.79 | 37.22 | 34.38 | 54.00 | 19.62 |
| 6125.00 | 46.42 | PK | H | 34.28 | 4.06 | 37.27 | 47.49 | 74.00 | 26.51 |
| 6125.00 | 33.43 | AV | H | 34.28 | 4.06 | 37.27 | 34.5 | 54.00 | 19.5 |
| High Channel: 2452 MHz | | | | | | | | | |
| 2452.00 | 60.28 | PK | V | 28.20 | 1.83 | 0.00 | 100.31 | N/A | N/A |
| 2452.00 | 50.67 | AV | V | 28.20 | 1.83 | 0.00 | 90.7 | N/A | N/A |
| 2452.00 | 66.24 | PK | H | 28.20 | 1.83 | 0.00 | 96.27 | N/A | N/A |
| 2452.00 | 56.36 | AV | H | 28.20 | 1.83 | 0.00 | 86.39 | N/A | N/A |
| 2483.50 | 39.48 | PK | H | 28.27 | 1.84 | 0.00 | 69.59 | 74.00 | 4.41 |
| 2483.50 | 20.67 | AV | H | 28.27 | 1.84 | 0.00 | 50.78 | 54.00 | 3.22 |
| 4904.00 | 51.67 | PK | H | 33.11 | 3.30 | 37.21 | 50.87 | 74.00 | 23.13 |
| 4904.00 | 37.39 | AV | H | 33.11 | 3.30 | 37.21 | 36.59 | 54.00 | 17.41 |
| 7356.00 | 51.52 | PK | H | 36.13 | 4.56 | 37.42 | 54.79 | 74.00 | 19.21 |
| 7356.00 | 37.43 | AV | H | 36.13 | 4.56 | 37.42 | 40.7 | 54.00 | 13.3 |
| 5489.00 | 46.89 | PK | H | 34.08 | 3.55 | 37.34 | 47.18 | 74.00 | 26.82 |
| 5489.00 | 33.17 | AV | H | 34.08 | 3.55 | 37.34 | 33.46 | 54.00 | 20.54 |

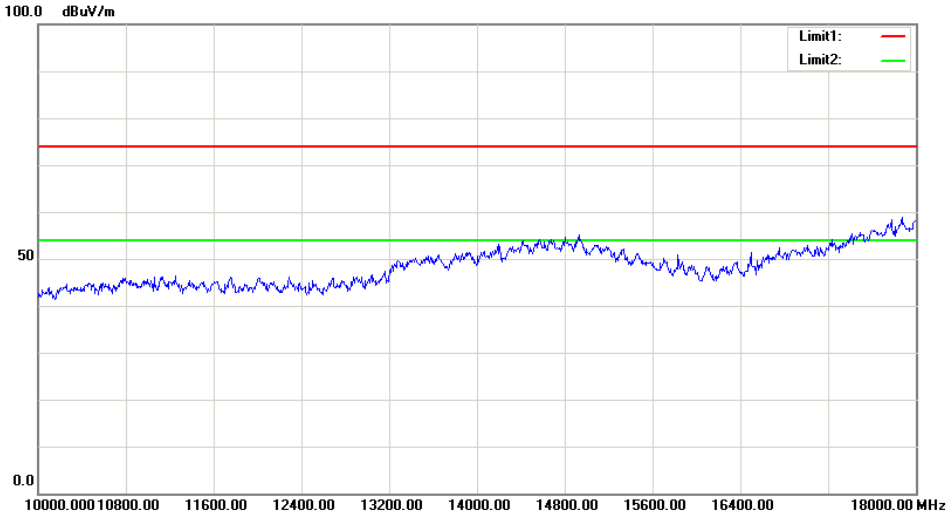
BLE Mode

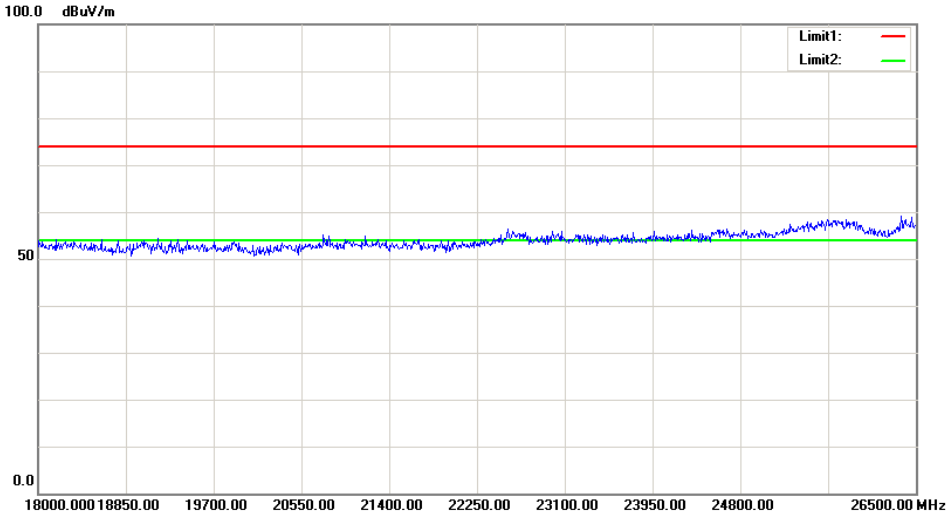
| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector | Polar (H/V) | Factor (dB) | | | | | |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402.00 | 65.94 | PK | H | 28.10 | 1.80 | 0.00 | 95.84 | N/A | N/A |
| 2402.00 | 59.75 | AV | H | 28.10 | 1.80 | 0.00 | 89.65 | N/A | N/A |
| 2402.00 | 62.58 | PK | V | 28.10 | 1.80 | 0.00 | 92.48 | N/A | N/A |
| 2402.00 | 56.46 | AV | V | 28.10 | 1.80 | 0.00 | 86.36 | N/A | N/A |
| 2390.00 | 24.63 | PK | H | 28.08 | 1.80 | 0.00 | 54.51 | 74.00 | 19.49 |
| 2390.00 | 13.42 | AV | H | 28.08 | 1.80 | 0.00 | 43.3 | 54.00 | 10.7 |
| 4804.00 | 48.69 | PK | H | 32.91 | 3.17 | 37.20 | 47.57 | 74.00 | 26.43 |
| 4804.00 | 33.54 | AV | H | 32.91 | 3.17 | 37.20 | 32.42 | 54.00 | 21.58 |
| 7206.00 | 57.66 | PK | H | 35.74 | 4.82 | 37.23 | 60.99 | 74.00 | 13.01 |
| 7206.00 | 44.58 | AV | H | 35.74 | 4.82 | 37.23 | 47.91 | 54.00 | 6.09 |
| 5965.00 | 46.75 | PK | H | 34.29 | 3.82 | 37.29 | 47.57 | 74.00 | 26.43 |
| 5965.00 | 32.43 | AV | H | 34.29 | 3.82 | 37.29 | 33.25 | 54.00 | 20.75 |
| Middle Channel: 2440 MHz | | | | | | | | | |
| 2440.00 | 66.86 | PK | H | 28.18 | 1.82 | 0.00 | 96.86 | N/A | N/A |
| 2440.00 | 59.34 | AV | H | 28.18 | 1.82 | 0.00 | 89.34 | N/A | N/A |
| 2440.00 | 62.48 | PK | V | 28.18 | 1.82 | 0.00 | 92.48 | N/A | N/A |
| 2440.00 | 56.33 | AV | V | 28.18 | 1.82 | 0.00 | 86.33 | N/A | N/A |
| 4880.00 | 48.57 | PK | H | 33.06 | 3.27 | 37.21 | 47.69 | 74.00 | 26.31 |
| 4880.00 | 33.34 | AV | H | 33.06 | 3.27 | 37.21 | 32.46 | 54.00 | 21.54 |
| 7320.00 | 57.38 | PK | H | 36.03 | 4.62 | 37.37 | 60.66 | 74.00 | 13.34 |
| 7320.00 | 44.45 | AV | H | 36.03 | 4.62 | 37.37 | 47.73 | 54.00 | 6.27 |
| 5899.00 | 46.95 | PK | H | 34.26 | 3.79 | 37.22 | 47.78 | 74.00 | 26.22 |
| 5899.00 | 32.63 | AV | H | 34.26 | 3.79 | 37.22 | 33.46 | 54.00 | 20.54 |
| 6125.00 | 46.57 | PK | H | 34.28 | 4.06 | 37.27 | 47.64 | 74.00 | 26.36 |
| 6125.00 | 32.36 | AV | H | 34.28 | 4.06 | 37.27 | 33.43 | 54.00 | 20.57 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480.00 | 67.13 | PK | H | 28.26 | 1.84 | 0.00 | 97.23 | N/A | N/A |
| 2480.00 | 60.86 | AV | H | 28.26 | 1.84 | 0.00 | 90.96 | N/A | N/A |
| 2480.00 | 63.49 | PK | V | 28.26 | 1.84 | 0.00 | 93.59 | N/A | N/A |
| 2480.00 | 57.54 | AV | V | 28.26 | 1.84 | 0.00 | 87.64 | N/A | N/A |
| 2483.50 | 26.87 | PK | H | 28.27 | 1.84 | 0.00 | 56.98 | 74.00 | 17.02 |
| 2483.50 | 14.35 | AV | H | 28.27 | 1.84 | 0.00 | 44.46 | 54.00 | 9.54 |
| 4960.00 | 48.45 | PK | H | 33.22 | 3.23 | 37.25 | 47.65 | 74.00 | 26.35 |
| 4960.00 | 33.53 | AV | H | 33.22 | 3.23 | 37.25 | 32.73 | 54.00 | 21.27 |
| 7440.00 | 57.42 | PK | H | 36.34 | 4.41 | 37.52 | 60.65 | 74.00 | 13.35 |
| 7440.00 | 44.37 | AV | H | 36.34 | 4.41 | 37.52 | 47.6 | 54.00 | 6.4 |
| 5985.00 | 46.64 | PK | H | 34.29 | 3.82 | 37.31 | 47.44 | 74.00 | 26.56 |
| 5985.00 | 32.49 | AV | H | 34.29 | 3.82 | 37.31 | 33.29 | 54.00 | 20.71 |

**Worst plots(802.11b Middle channel)**
**Horizontal**

Fundamental Test with Band Rejection Filter

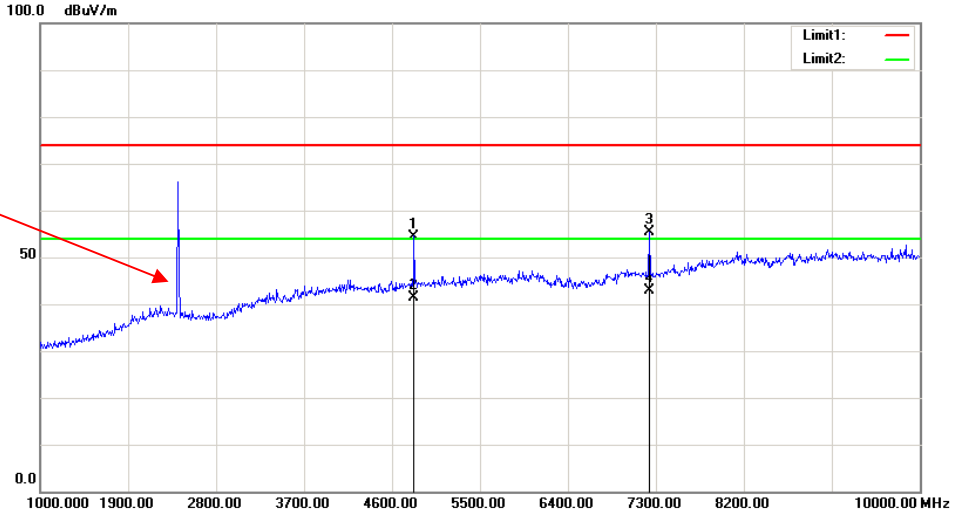


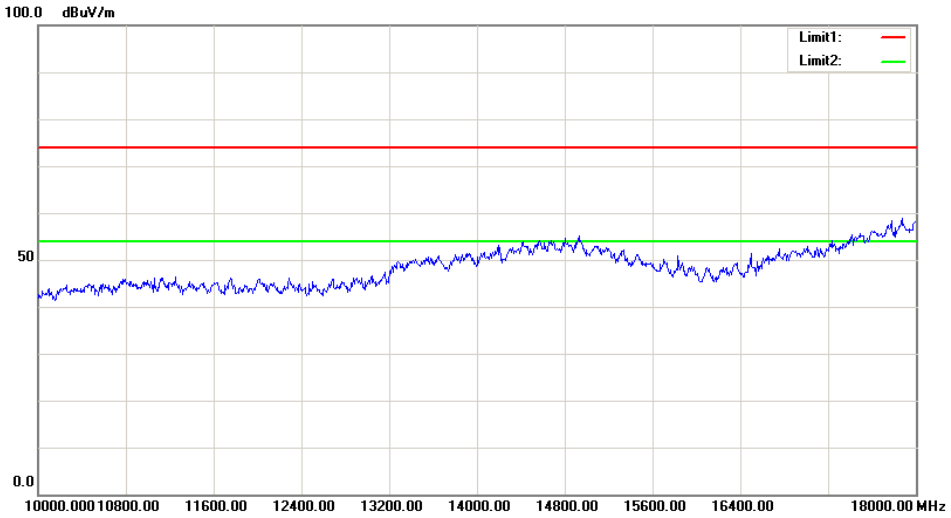



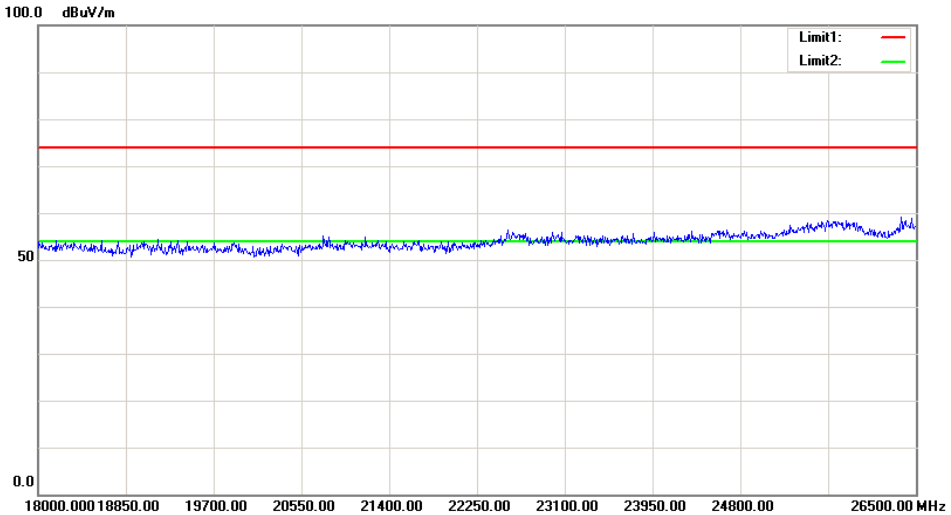



**Vertical**

Fundamental Test with Band Rejection Filter



# FCC §15.247(a) (2)–6 dB EMISSION BANDWIDTH

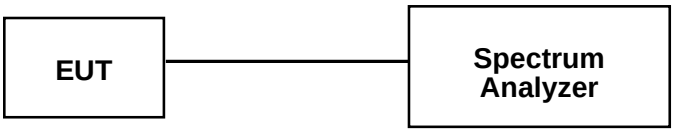
## Applicable Standard

According to FCC §15.247(a) (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

## Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.




## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSIQ 26 | 831929/005 | 2017-08-31 | 2018-08-31 |
| Unknown | Coaxial Cable | C-SJ00-0010 | C0010/03 | Each Time | / |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.4~24.6 °C |
| **Relative Humidity:** | 41~50 % |
| **ATM Pressure:** | 101.4 kPa |

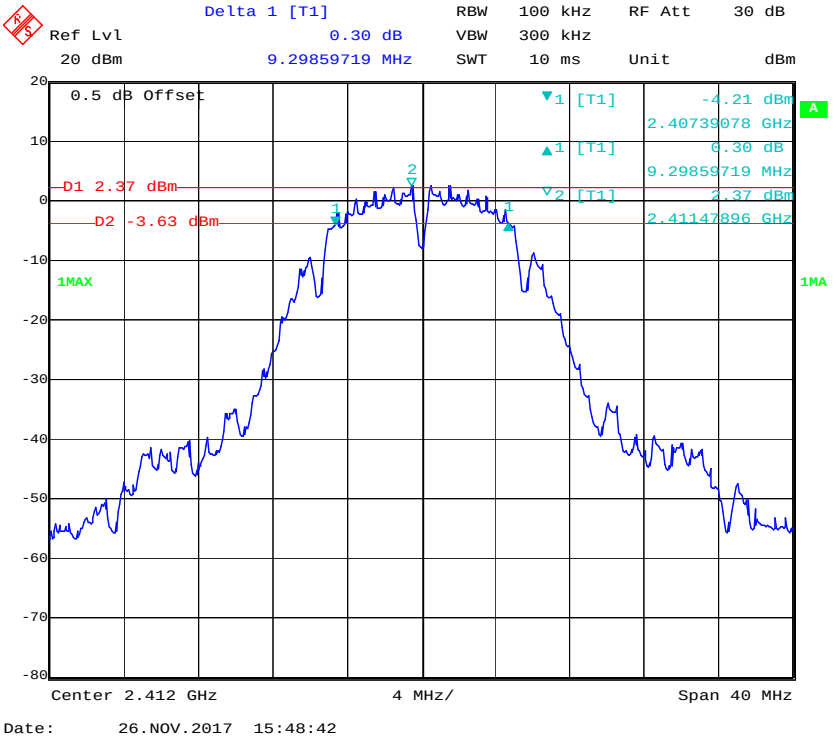
** The testing was performed by Peam Zhu from 2017-11-26 to 2017-11-27.*

*Test Mode: Transmitting*

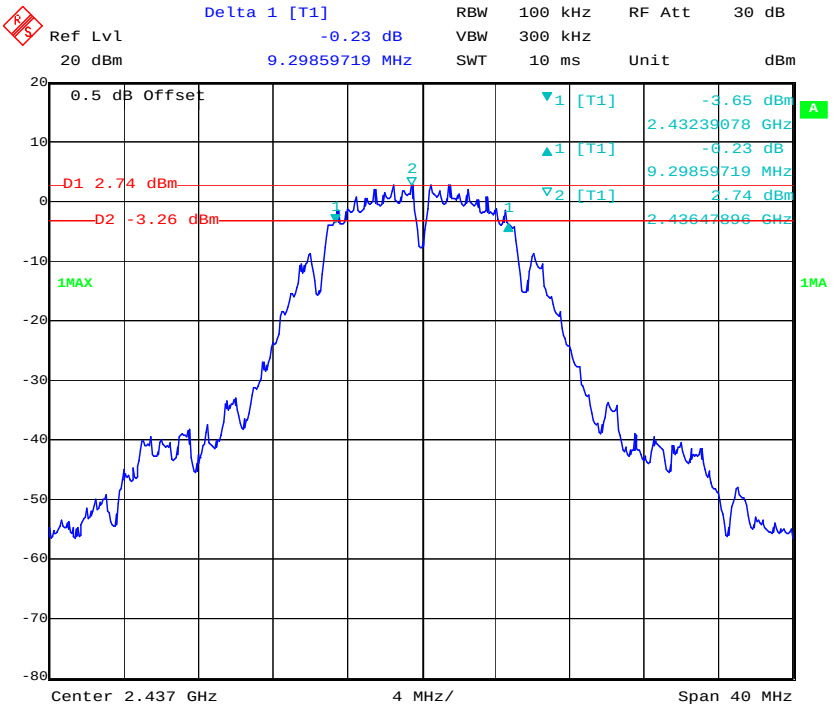
*Test Result: Compliant. Please refer to the following table and plots.*

| Test mode | Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) |
|---|---|---|---|---|
| 802.11b | Low | 2412 | 9.3 | ≥0.5 |
| | Middle | 2437 | 9.3 | ≥0.5 |
| | High | 2462 | 9.3 | ≥0.5 |
| 802.11g | Low | 2412 | 16.35 | ≥0.5 |
| | Middle | 2437 | 16.35 | ≥0.5 |
| | High | 2462 | 16.43 | ≥0.5 |
| 802.11n ht20 | Low | 2412 | 17.72 | ≥0.5 |
| | Middle | 2437 | 17.72 | ≥0.5 |
| | High | 2462 | 17.72 | ≥0.5 |
| 802.11n ht40 | Low | 2422 | 36.23 | ≥0.5 |
| | Middle | 2437 | 36.39 | ≥0.5 |
| | High | 2452 | 36.23 | ≥0.5 |
| BLE | Low | 2402 | 0.73 | ≥0.5 |
| | Middle | 2440 | 0.73 | ≥0.5 |
| | High | 2480 | 0.74 | ≥0.5 |

**802.11b Low Channel**

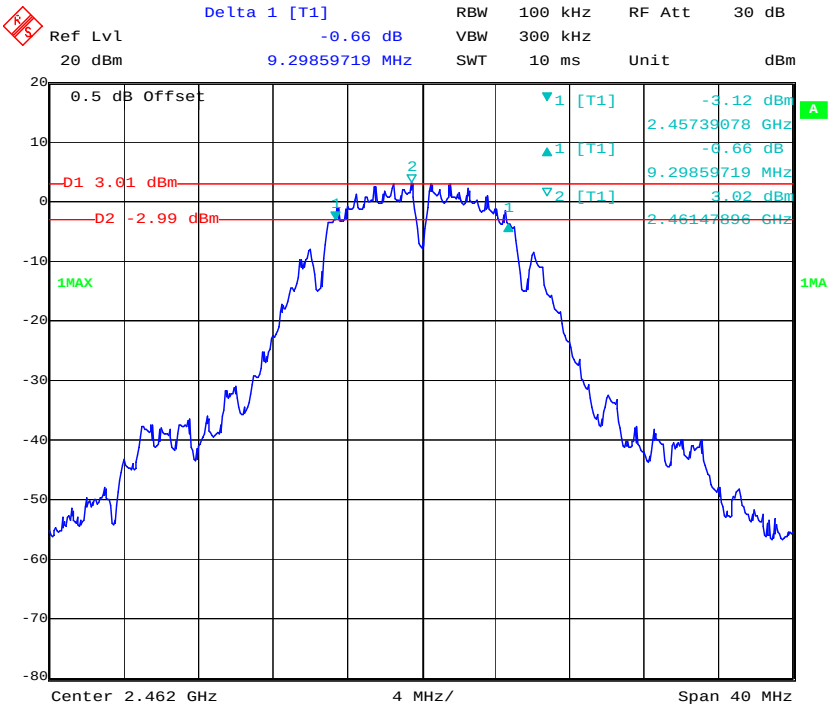


## 802.11b Middle Channel



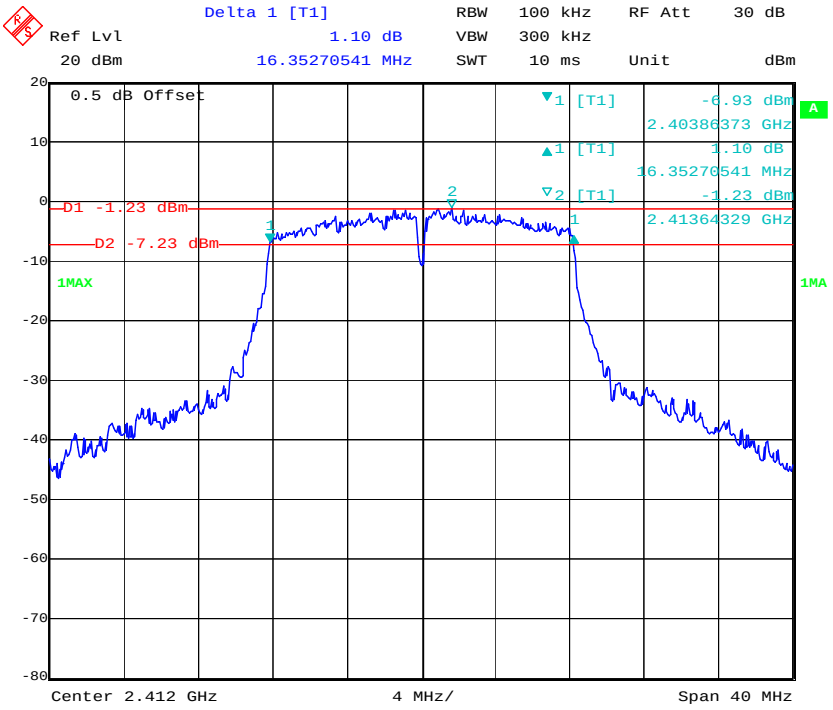

Date: 26.NOV.2017 15:53:39

## 802.11b High Channel

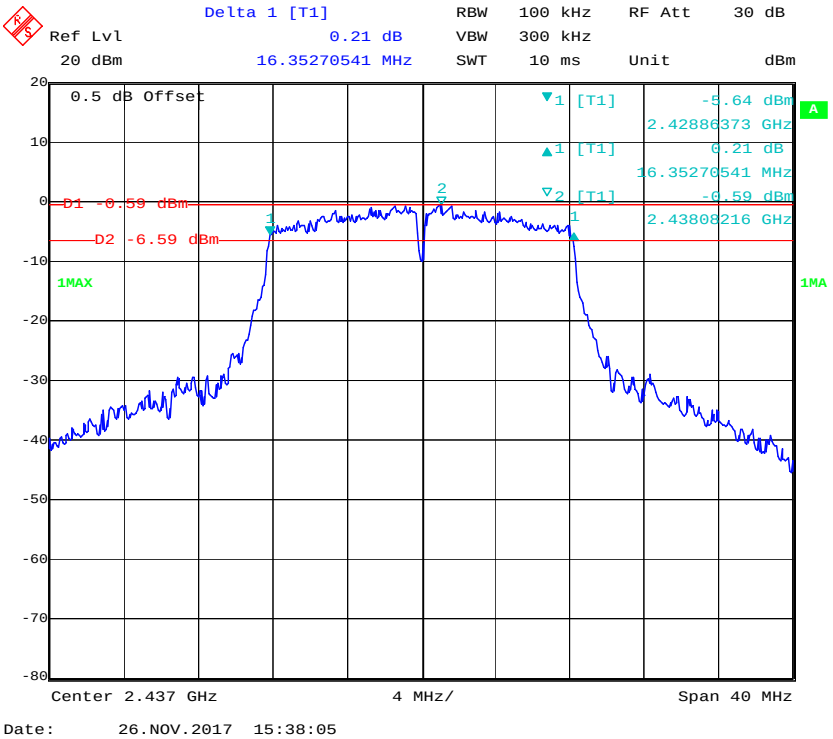



Date: 26.NOV.2017 16:24:32

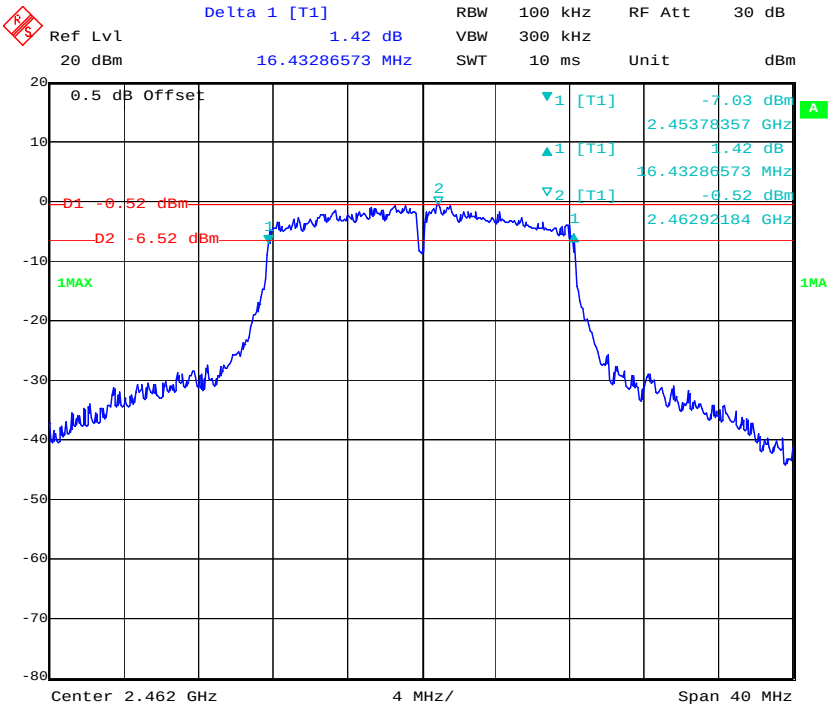
## 802.11g Low Channel




## 802.11g Middle Channel

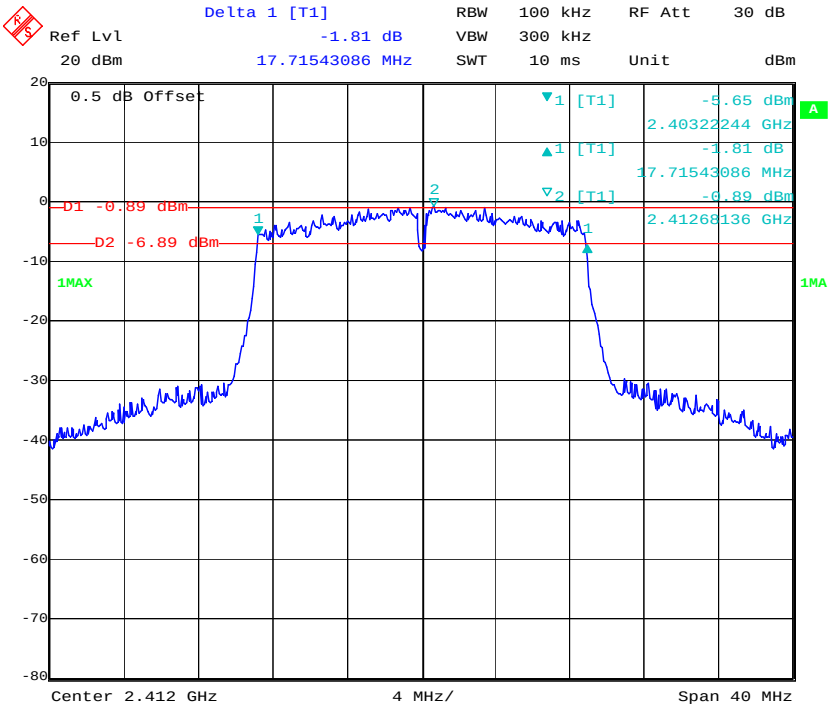


## 802.11g High Channel



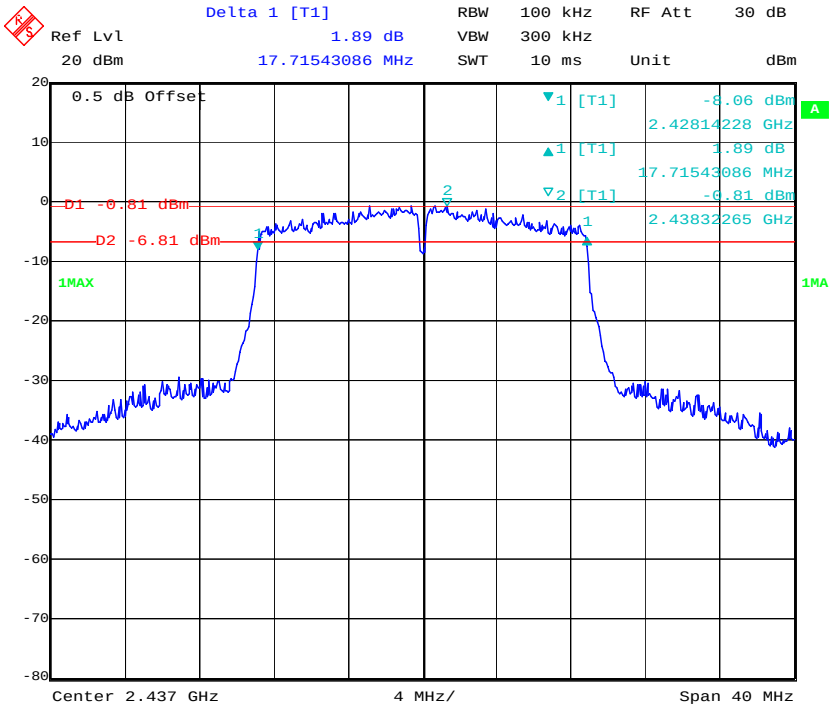

Date: 26.NOV.2017 15:41:50

## 802.11n ht20 Low Channel



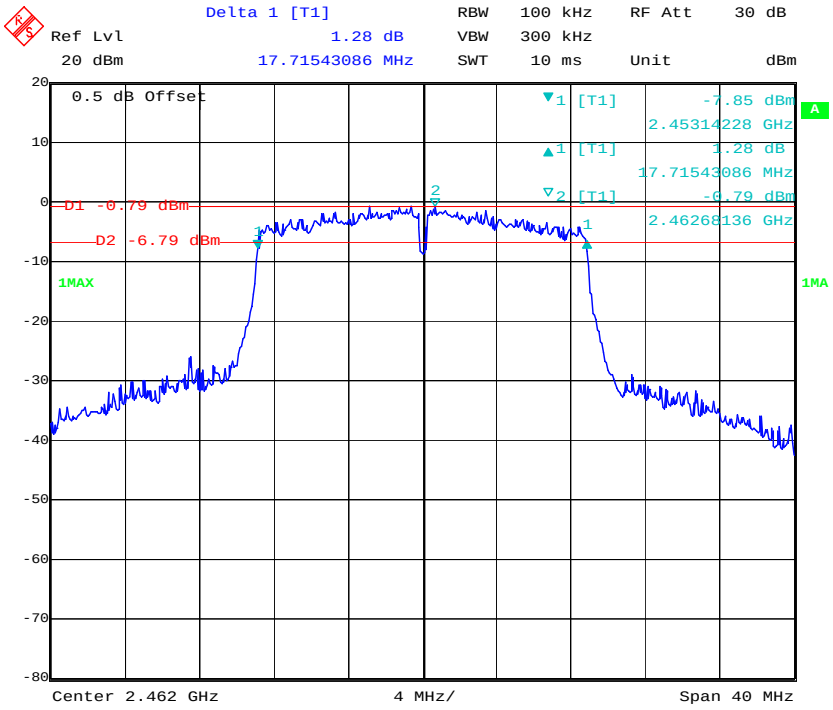

Date: 26.NOV.2017 15:59:56

## 802.11n ht20 Middle Channel



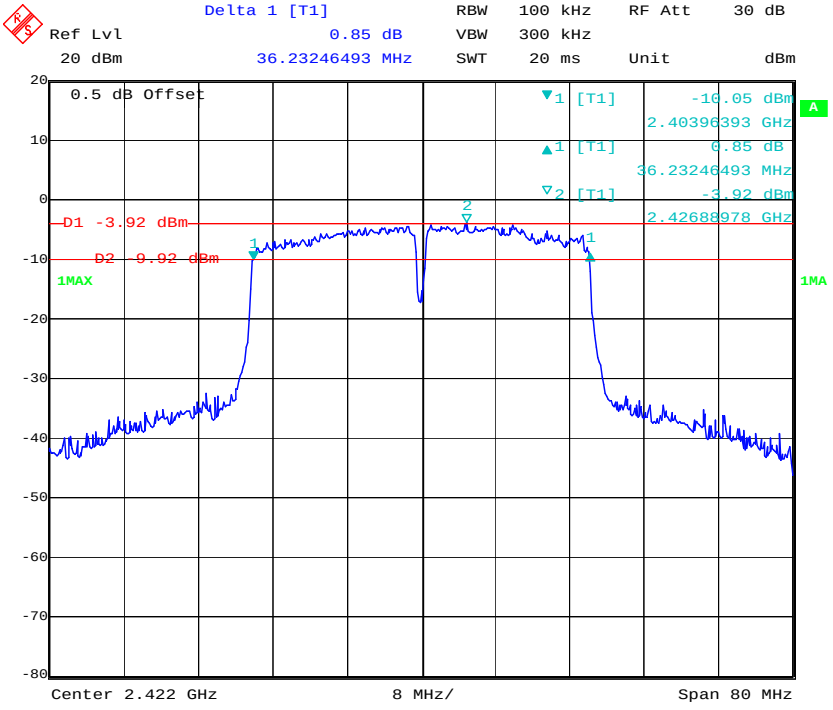

Date: 26.NOV.2017 16:02:43

## 802.11n ht20 High Channel



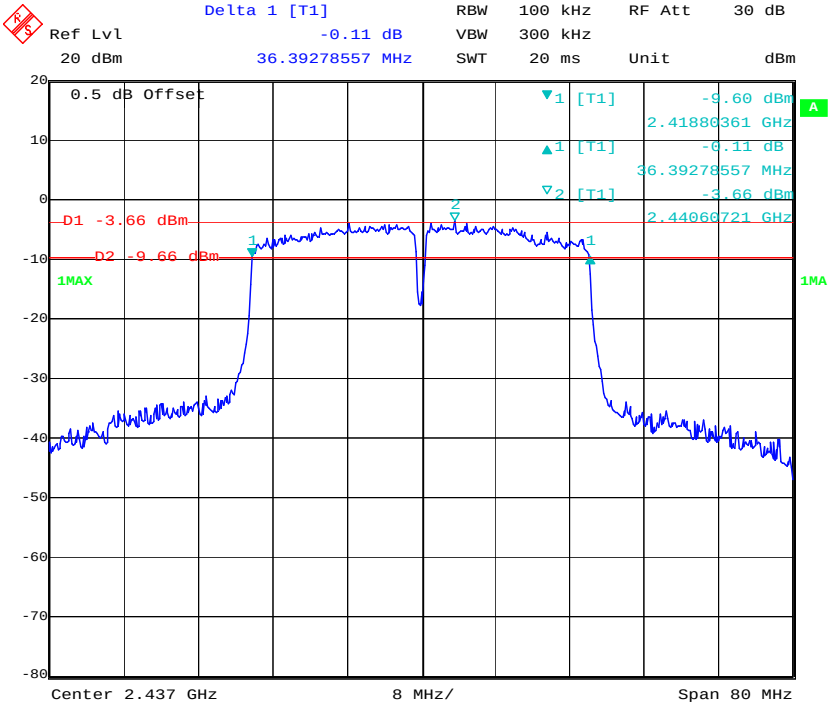

Date: 26.NOV.2017 16:05:41

## 802.11n ht40 Low Channel



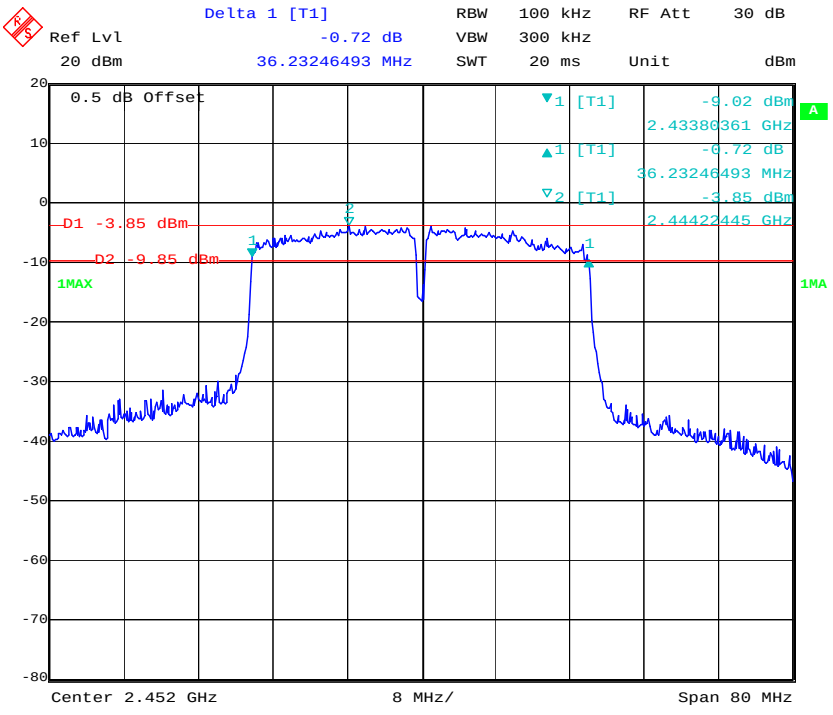

Date: 26.NOV.2017 16:08:40

## 802.11n ht40 Middle Channel



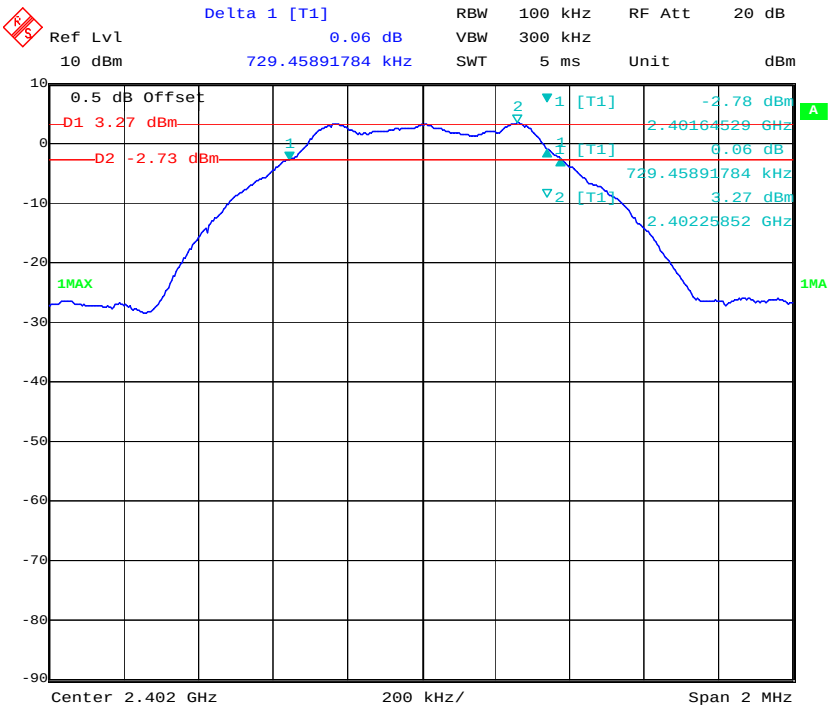

Date: 26.NOV.2017 16:12:23

## 802.11n ht40 High Channel



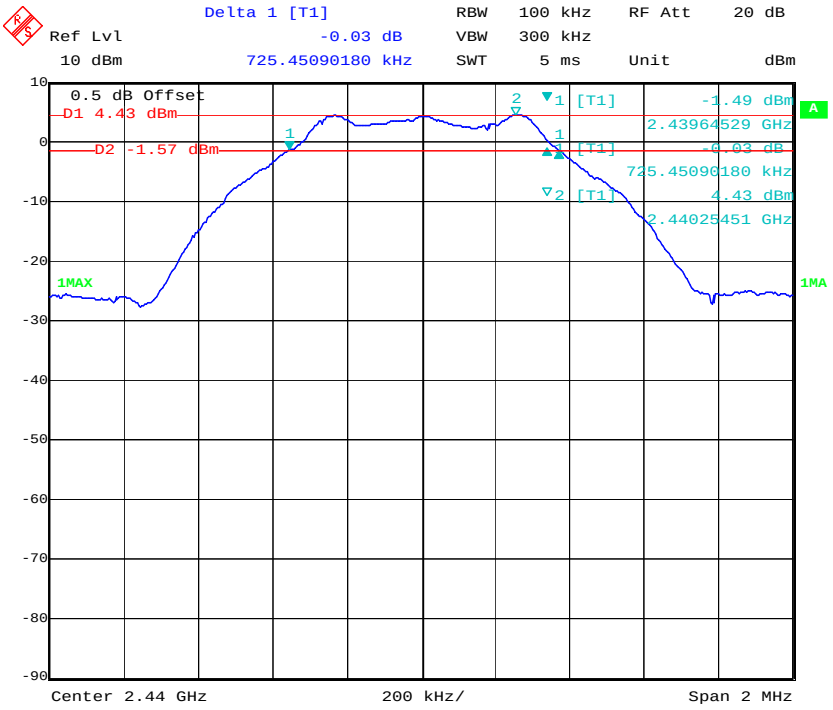

Date: 26.NOV.2017 16:15:56

## BLE Low Channel



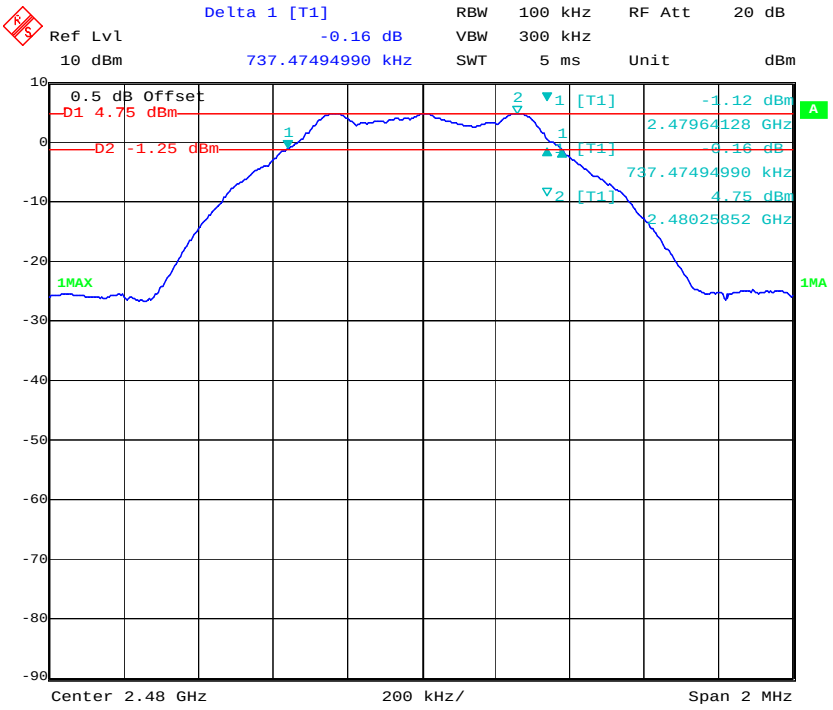

Date: 27.NOV.2017 01:31:12

## BLE Middle Channel




Date: 27.NOV.2017 01:33:11

## BLE High Channel




Date: 27.NOV.2017 01:34:30

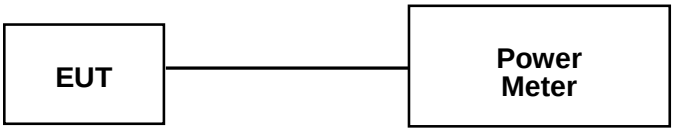
# FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER

## Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

## Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.
4. Set the power Meter to test Peak output power, record the result as peak power.
5. Set the power meter to test average output power, record the result as average power.




## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Agilent | Wideband Power Sensor | N1921A | MY54210016 | 2017-11-03 | 2018-11-03 |
| Agilent | Wideband Power Sensor | N1921A | MY54170013 | 2017-11-03 | 2018-11-03 |
| Agilent | P-Series Power Meter | N1912A | MY5000448 | 2017-11-03 | 2018-11-03 |
| Unknown | Coaxial Cable | C-SJ00-0010 | C0010/03 | Each Time | / |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.6 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.4 kPa |

** The testing was performed by Peam Zhu on 2017-11-27.*

*Test Mode: Transmitting*

*Test Result: Compliant. Please refer to the following table.*

| Test mode | Channel | Frequency (MHz) | Max Peak Conducted Output Power (dBm) | Max Conducted Average Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| 802.11b | Low | 2412 | 15.31 | 12.07 | 30 |
| | Middle | 2437 | 15.61 | 12.15 | 30 |
| | High | 2462 | 15.92 | 12.28 | 30 |
| 802.11g | Low | 2412 | 19.27 | 11.49 | 30 |
| | Middle | 2437 | 19.8 | 12.08 | 30 |
| | High | 2462 | 19.85 | 12.15 | 30 |
| 802.11n ht20 | Low | 2412 | 20.22 | 12.18 | 30 |
| | Middle | 2437 | 20.18 | 12.17 | 30 |
| | High | 2462 | 20.05 | 12.09 | 30 |
| 802.11n ht40 | Low | 2422 | 20.2 | 12.18 | 30 |
| | Middle | 2437 | 20.33 | 12.31 | 30 |
| | High | 2452 | 20.31 | 12.3 | 30 |
| BLE | Low | 2402 | 3.81 | / | 30 |
| | Middle | 2440 | 4.89 | / | 30 |
| | High | 2480 | 5.26 | / | 30 |

# FCC §15.247(d)– 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

## Applicable Standard

According to 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)).

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSIQ 26 | 831929/005 | 2017-08-31 | 2018-08-31 |
| Unknown | Coaxial Cable | C-SJ00-0010 | C0010/03 | Each Time | / |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

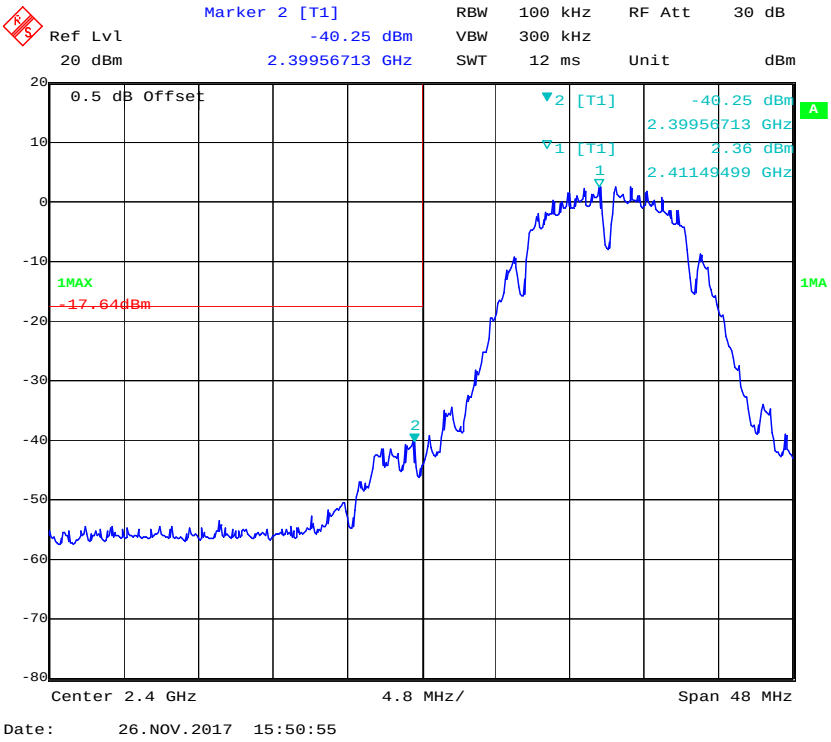
| | |
|---|---|
| **Temperature:** | 23.4~24.6 °C |
| **Relative Humidity:** | 41~50 % |
| **ATM Pressure:** | 101.4 kPa |

** The testing was performed by Peam Zhu from 2017-11-26 to 2017-11-27.*

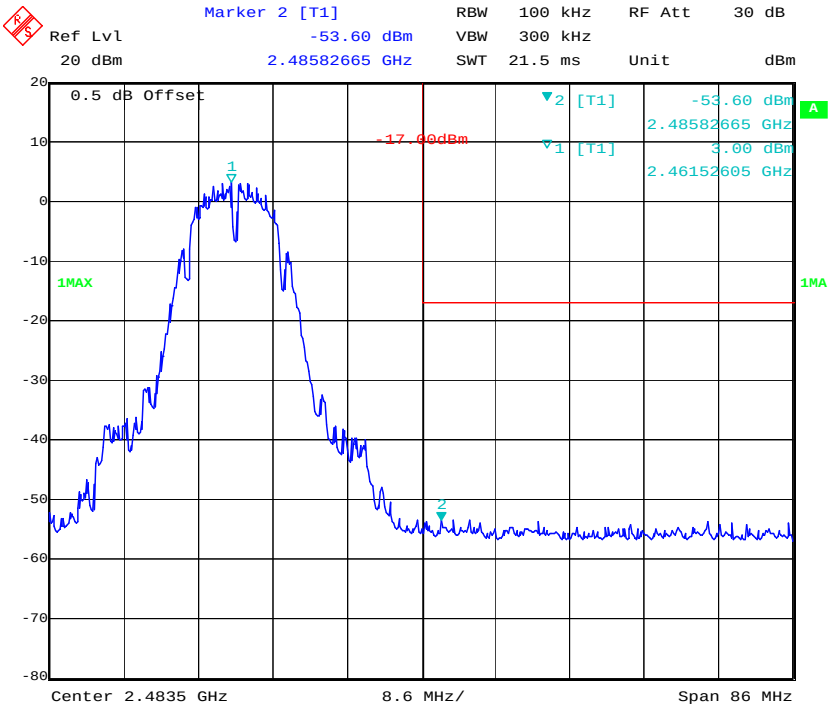
*Test mode: Transmitting*

*Test Result: Compliant. Please refer to following plots.*

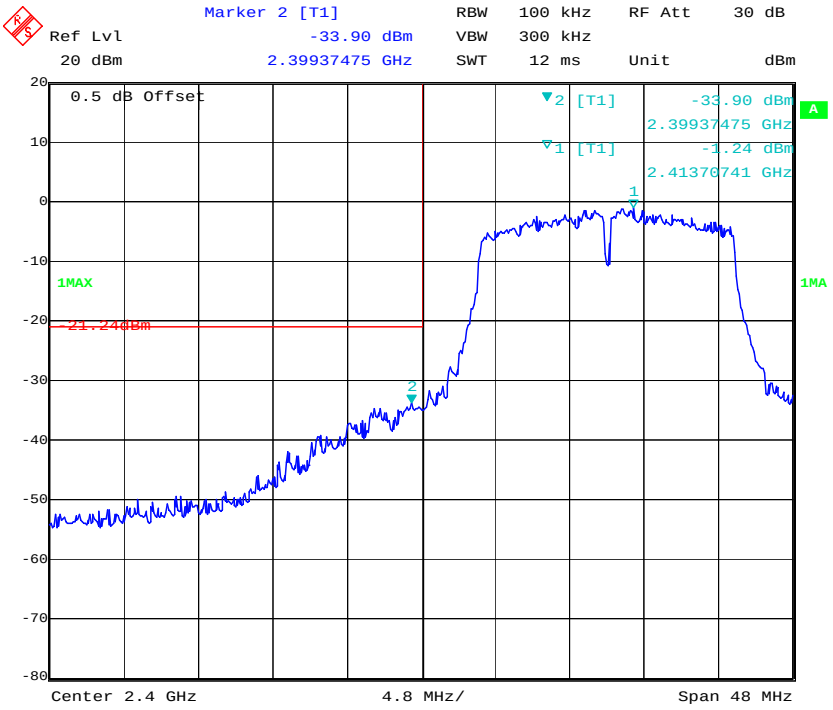
**802.11b: Band Edge, Left Side**



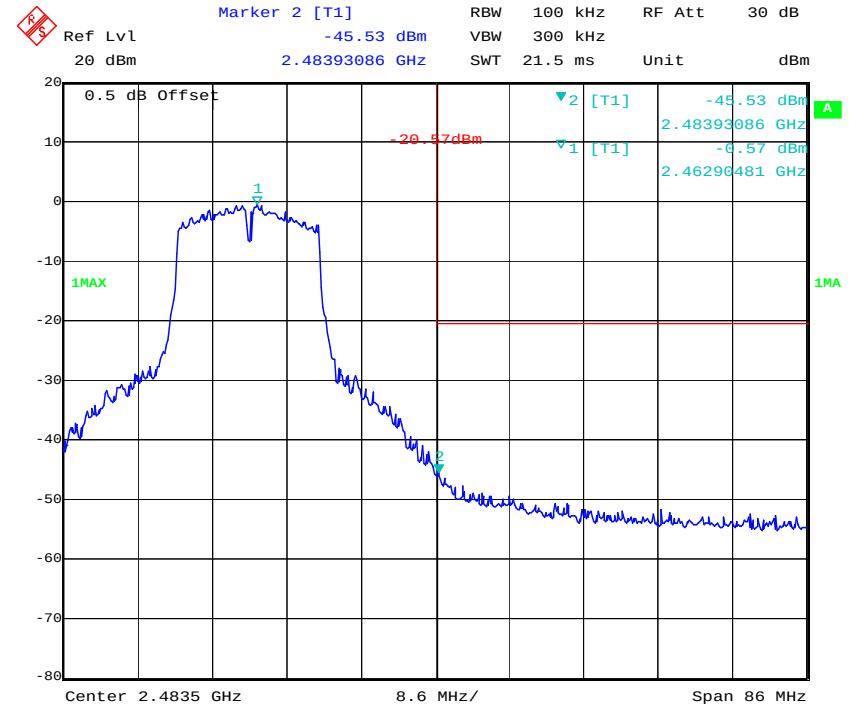
## 802.11b: Band Edge, Right Side



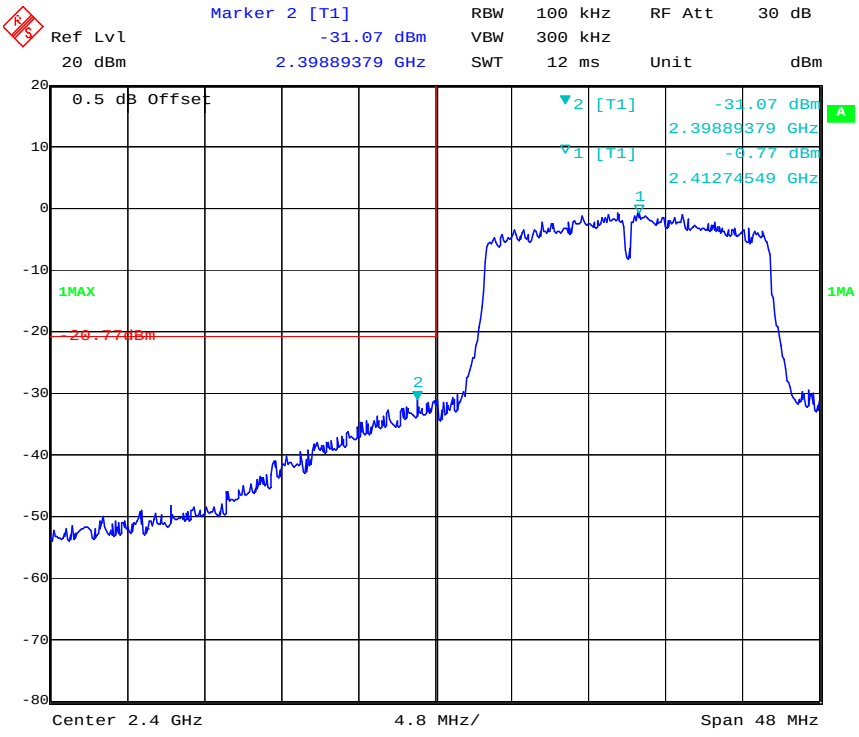

## 802.11g: Band Edge, Left Side



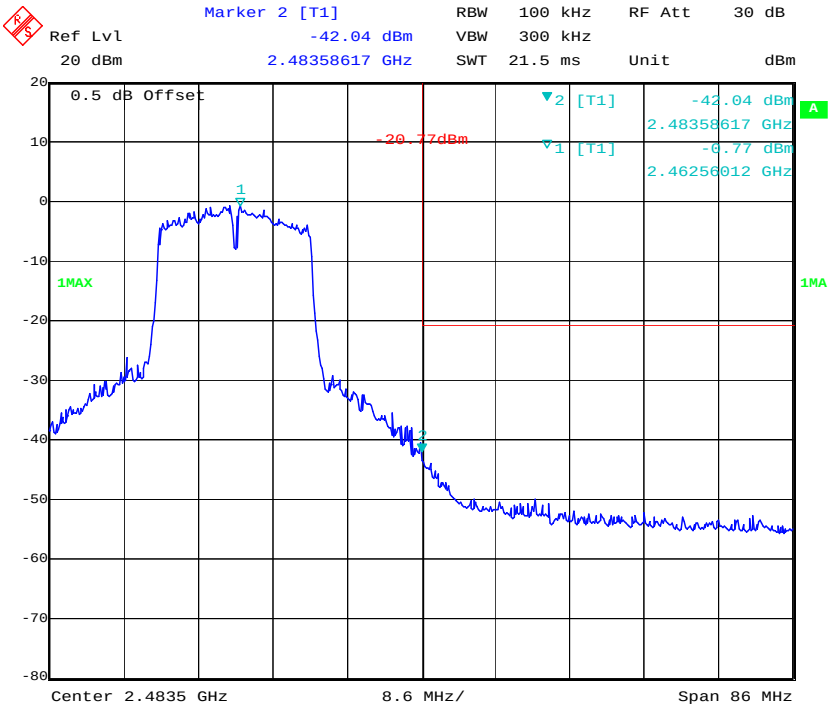
## 802.11g: Band Edge, Right Side



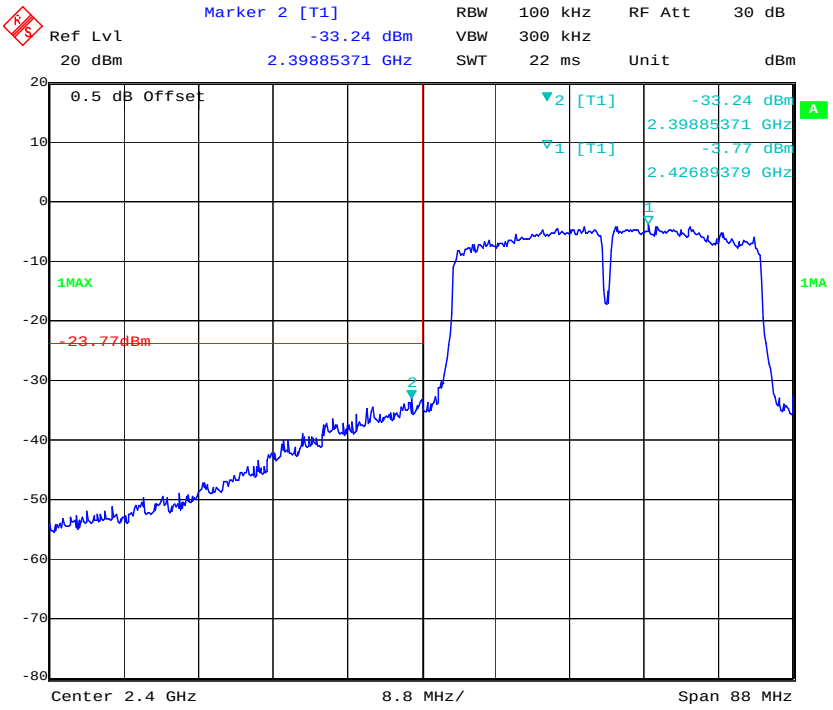

## 802.11n ht20 Band Edge, Left Side



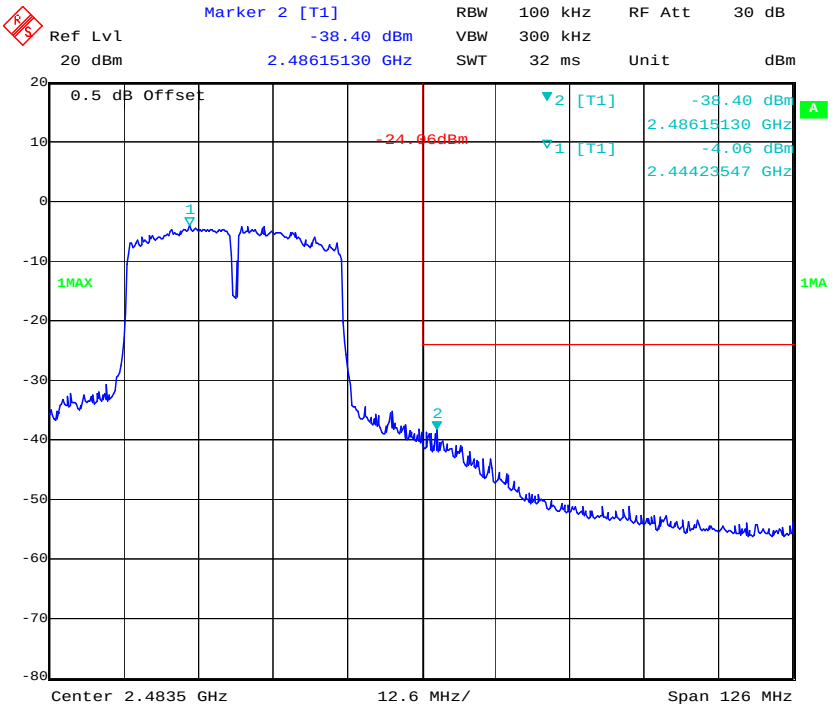
## 802.11n ht20 Band Edge, Right Side



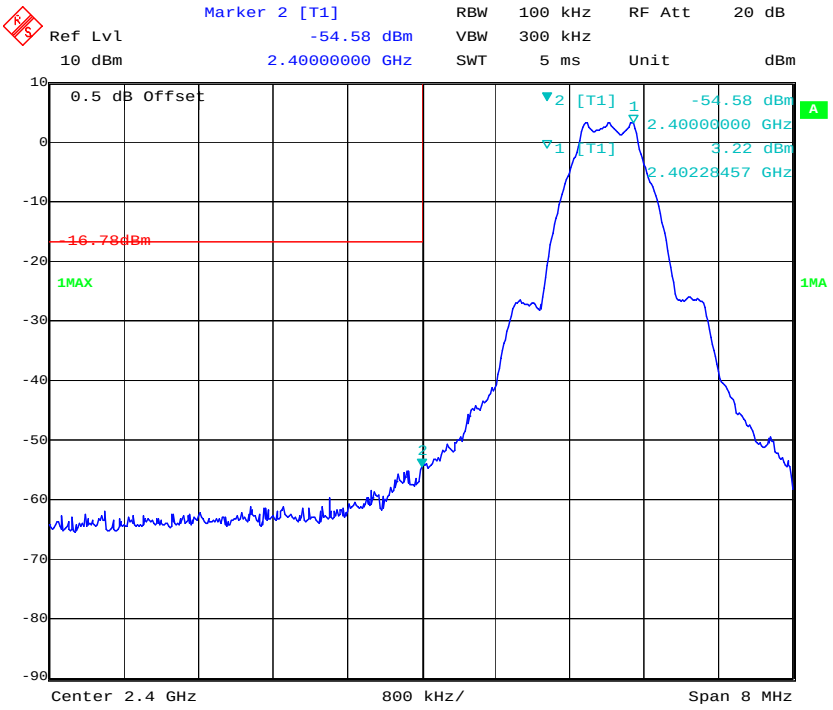

## 802.11n ht40 Band Edge, Left Side



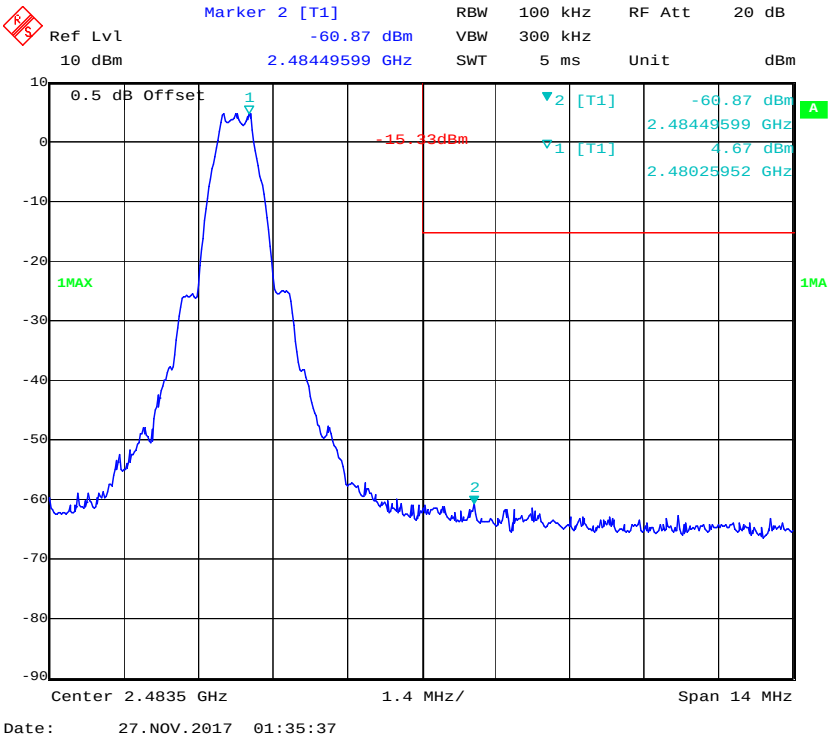
## 802.11n ht40 Band Edge, Right Side




## BLE Band Edge， Left Side



**BLE Band Edge, Right Side**



# FCC §15.247(e) - POWER SPECTRAL DENSITY

## Applicable Standard

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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSIQ 26 | 831929/005 | 2017-08-31 | 2018-08-31 |
| Unknown | Coaxial Cable | C-SJ00-0010 | C0010/03 | Each Time | / |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.4~24.6 °C |
| **Relative Humidity:** | 41~50 % |
| **ATM Pressure:** | 101.4 kPa |

** The testing was performed by Peam Zhu from 2017-11-26 to 2017-11-27.*

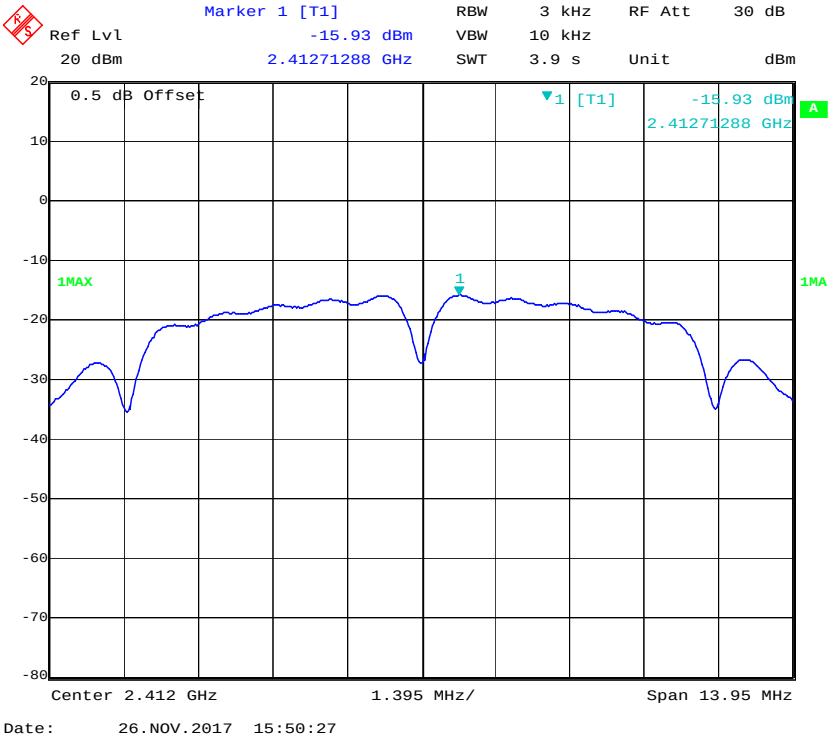
**Test Result:** Compliance

*Test Mode: Transmitting*

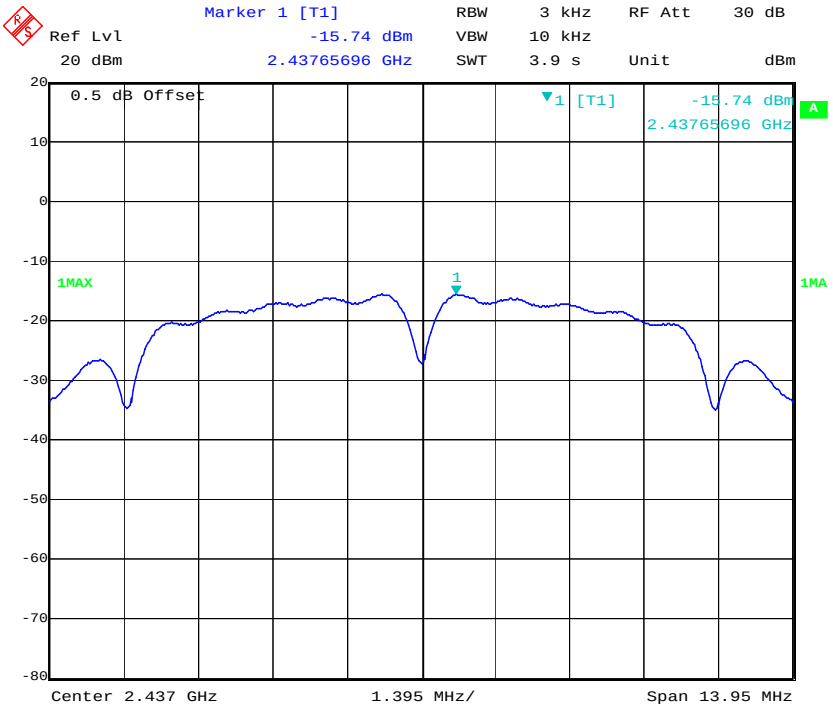
*Test Result: Compliant. Please refer to the following table and plots*

| Test mode | Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) |
|---|---|---|---|---|
| 802.11b | Low | 2412 | -15.93 | ≤8 |
| | Middle | 2437 | -15.74 | ≤8 |
| | High | 2462 | -15.4 | ≤8 |
| 802.11g | Low | 2412 | -16.09 | ≤8 |
| | Middle | 2437 | -15.26 | ≤8 |
| | High | 2462 | -15.38 | ≤8 |
| 802.11n ht20 | Low | 2412 | -14.66 | ≤8 |
| | Middle | 2437 | -14.72 | ≤8 |
| | High | 2462 | -14.66 | ≤8 |
| 802.11n ht40 | Low | 2422 | -16.82 | ≤8 |
| | Middle | 2437 | -16.44 | ≤8 |
| | High | 2452 | -16.98 | ≤8 |
| BLE | Low | 2402 | -11.26 | ≤8 |
| | Middle | 2440 | -10.33 | ≤8 |
| | High | 2480 | -9.89 | ≤8 |

**Power Spectral Density, 802.11b Low Channel**

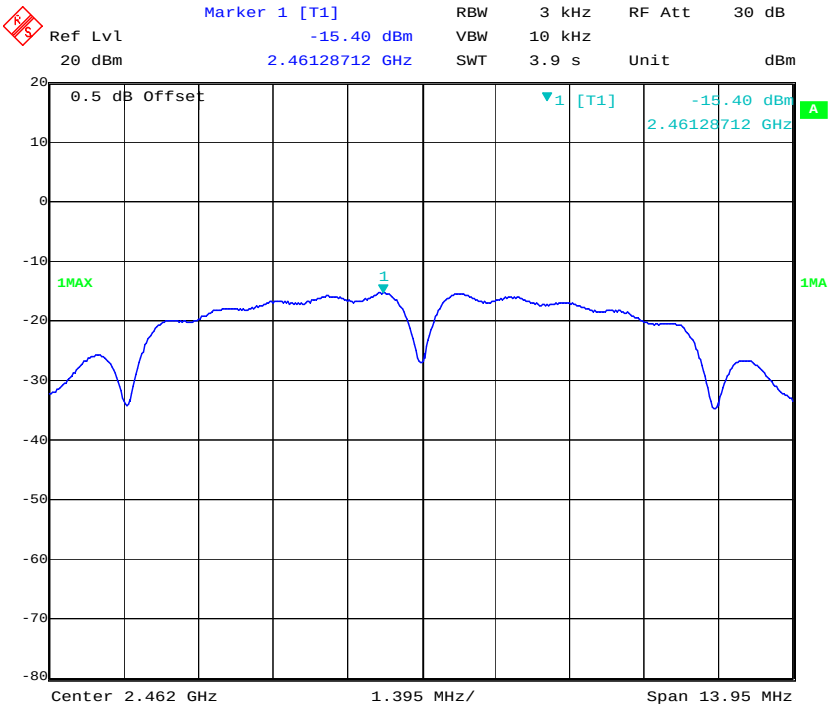


## Power Spectral Density, 802.11b Middle Channel



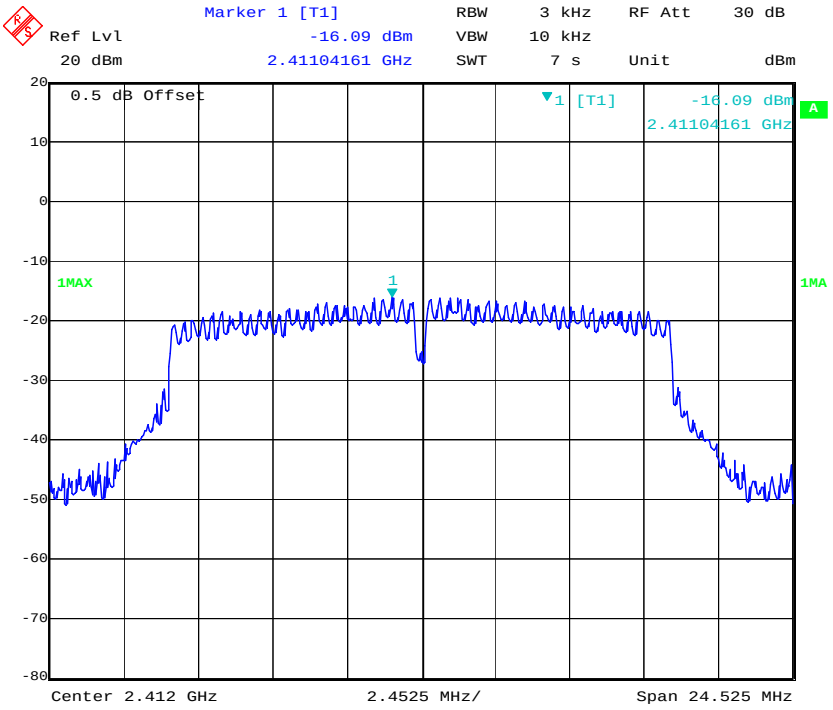

Date: 26.NOV.2017 15:54:56

## Power Spectral Density, 802.11b High Channel



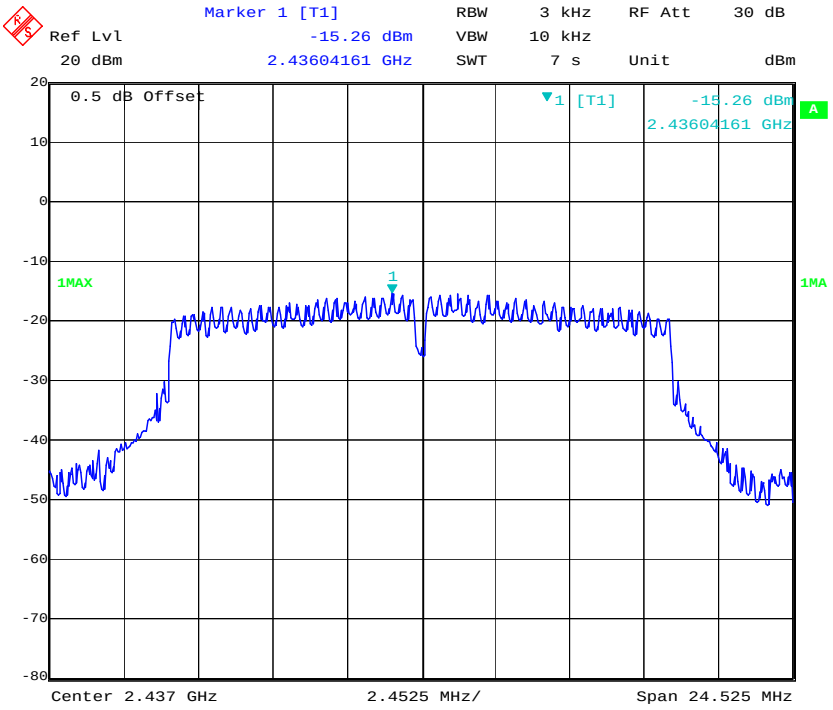

Date: 26.NOV.2017 16:25:44

## Power Spectral Density, 802.11g Low Channel



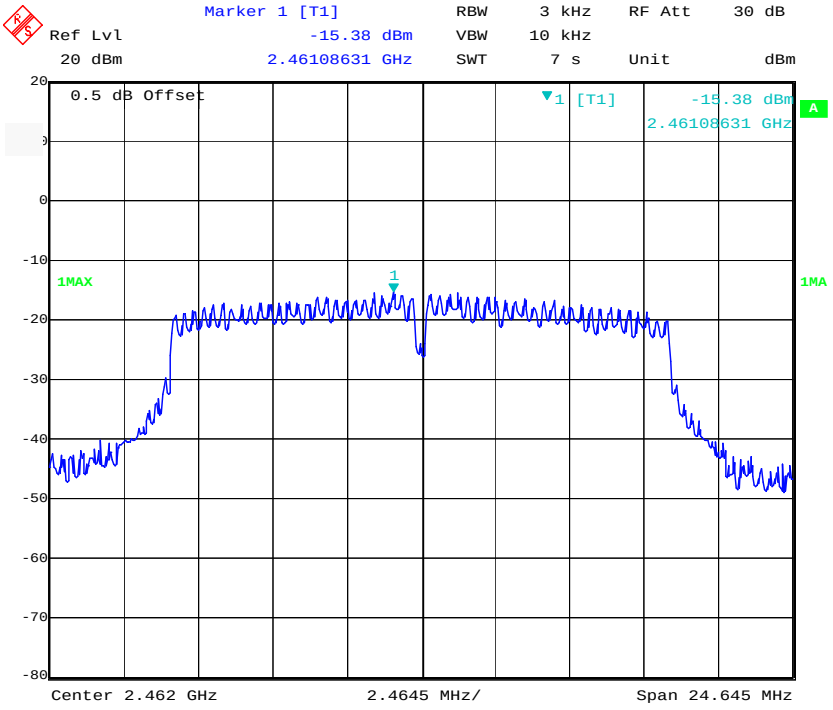

Date: 26.NOV.2017 15:36:37

## Power Spectral Density, 802.11g Middle Channel



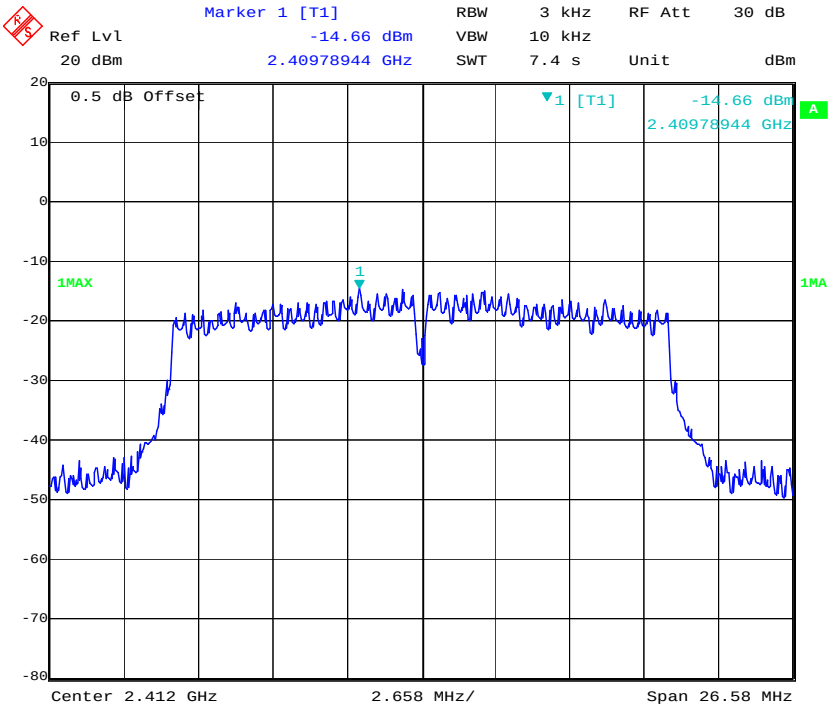

Date: 26.NOV.2017 15:40:42

## Power Spectral Density, 802.11g High Channel



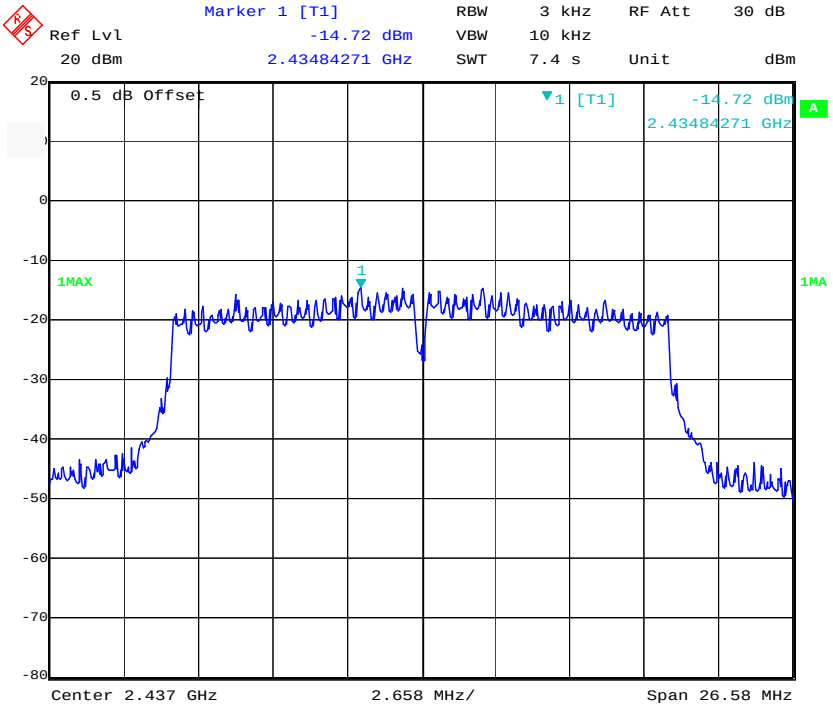

Date: 26.NOV.2017 15:43:12

## Power Spectral Density, 802.11n ht20 Low Channel



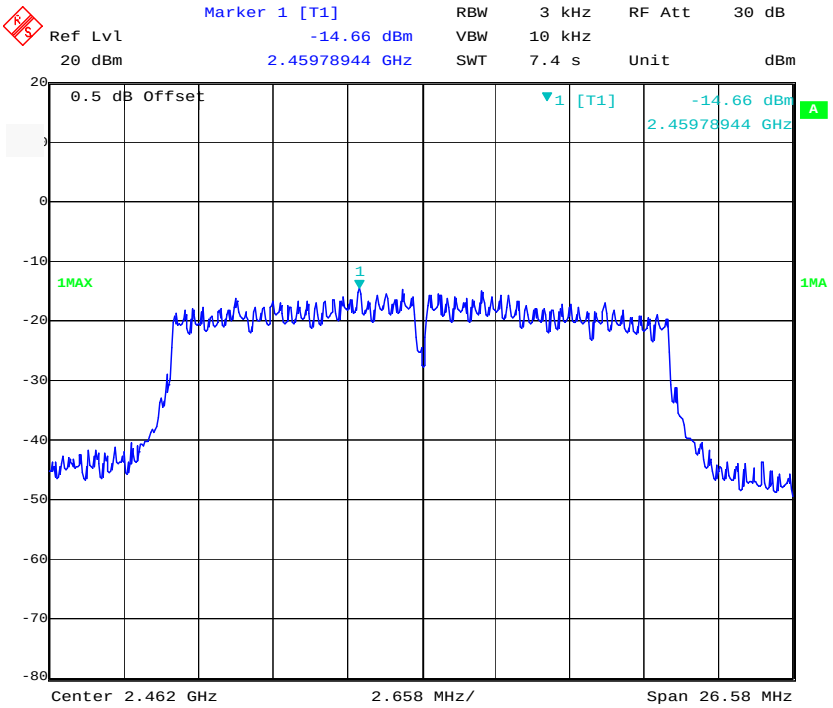

Date: 26.NOV.2017 16:01:30

## Power Spectral Density, 802.11n ht20 Middle Channel



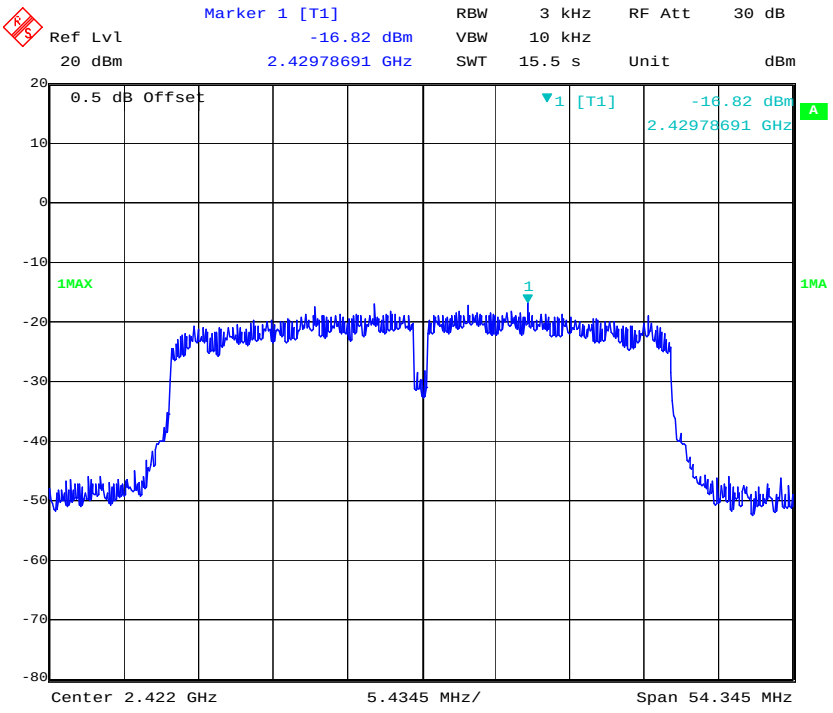

Date: 26.NOV.2017 16:04:48

## Power Spectral Density, 802.11n ht20 High Channel



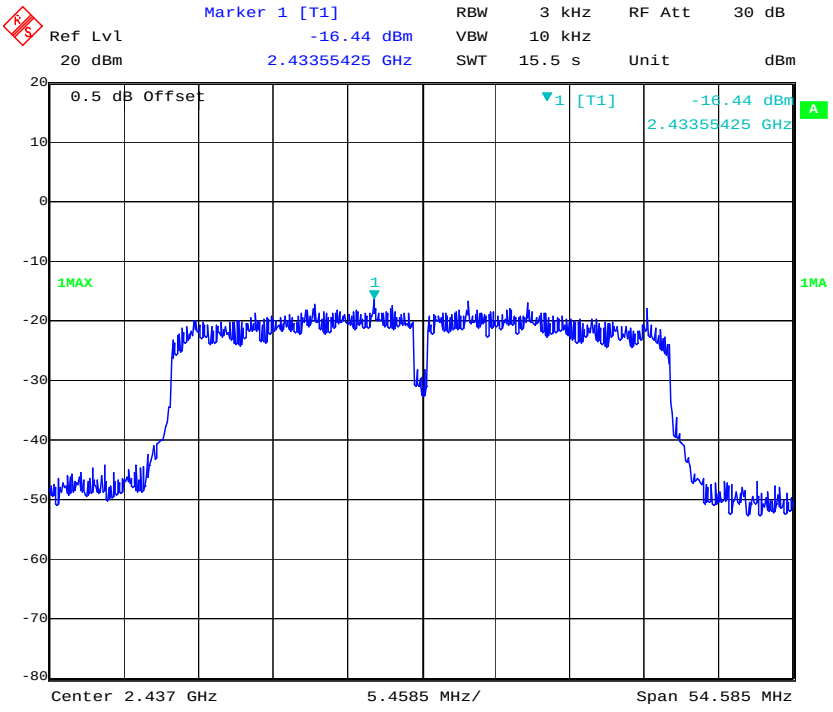

Date: 26.NOV.2017 16:07:16

## Power Spectral Density, 802.11n ht40 Low Channel



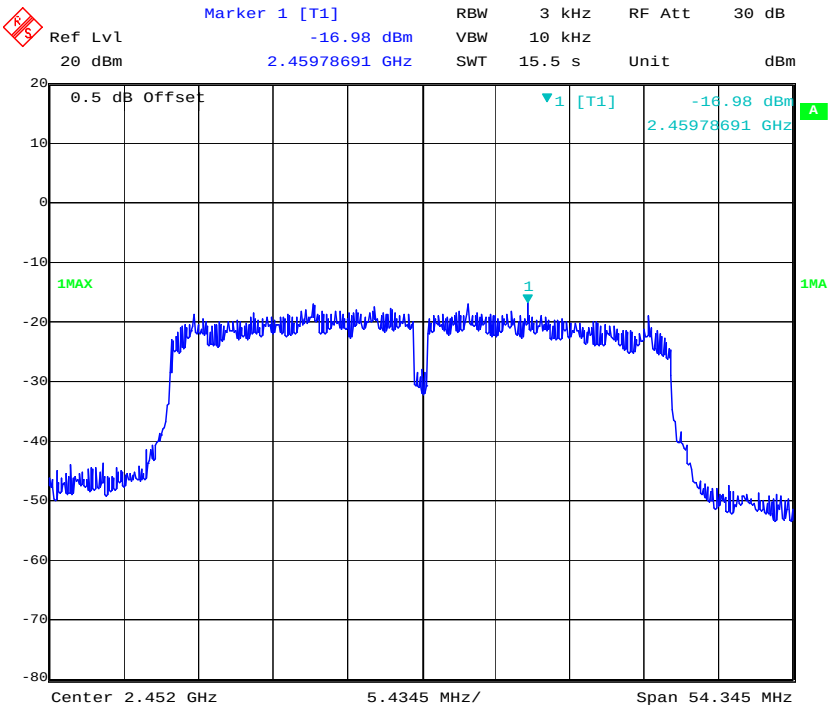

Date: 26.NOV.2017 16:10:43

## Power Spectral Density, 802.11n ht40 Middle Channel



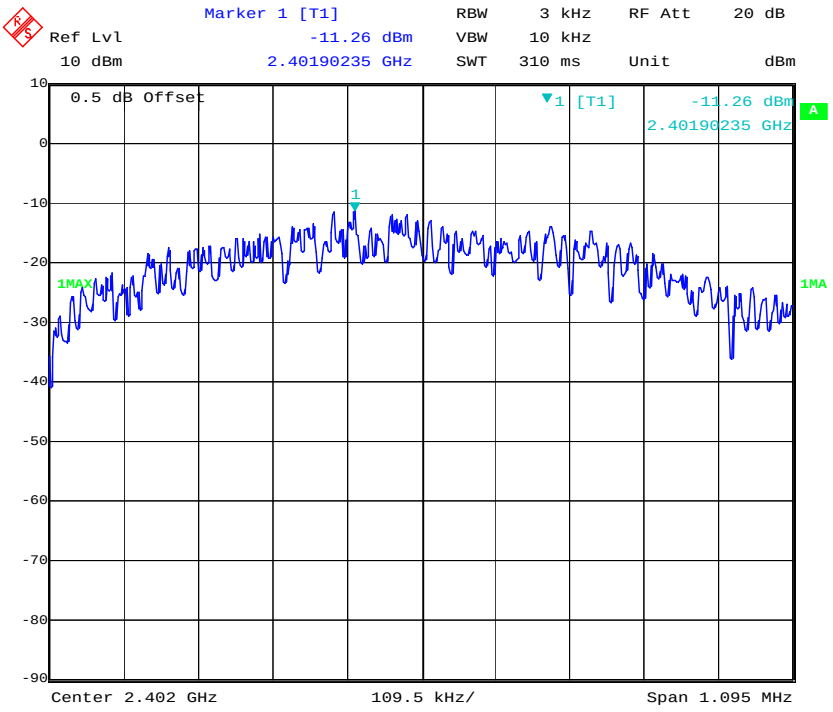

Date: 26.NOV.2017 16:14:51

## Power Spectral Density, 802.11n ht40 High Channel



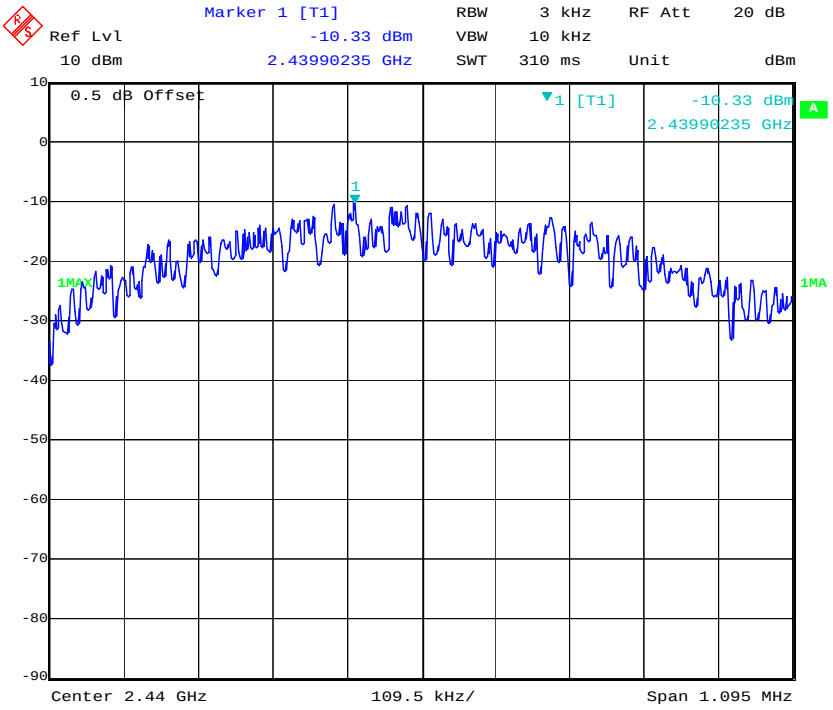

Date: 26.NOV.2017 16:18:23

## Power Spectral Density, BLE Low Channel



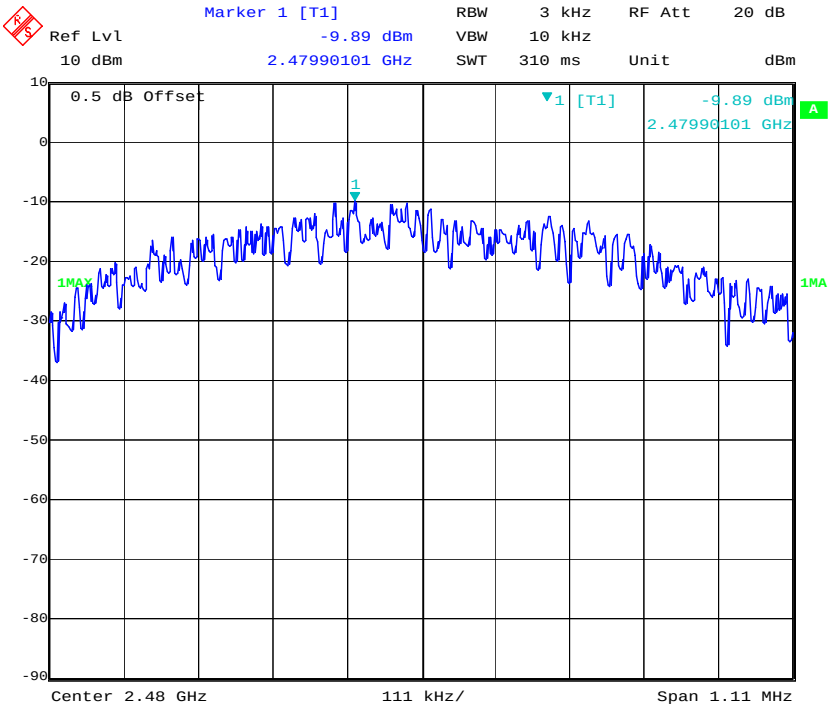

Date: 27.NOV.2017 01:31:56

## Power Spectral Density, BLE Middle Channel




Date: 27.NOV.2017 01:33:55

## Power Spectral Density, BLE High Channel




Date: 27.NOV.2017 01:35:13

******* END OF REPORT *******