



FCC PART 15.247

## TEST REPORT

For

### Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen,  
518057 China

**FCC ID: YAMPDC760UXB1**

|                                                                                                                                                                                                                                                         |                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                                                                                                                                  | <b>Product Type:</b><br>Multi-mode Advanced Radio |
| <b>Report Number:</b> RDG170313007-00C                                                                                                                                                                                                                  |                                                   |
| <b>Report Date:</b> 2017-05-16                                                                                                                                                                                                                          |                                                   |
| Oscar Ye                                                                                                                                                                                                                                                |                                                   |
| <b>Reviewed By:</b> Engineer                                                                                                                                                                                                                            | <i>Oscar Ye</i>                                   |
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The Hytera Communications Corporation Limited's product, model number: PDC760 UxB1 (FCC ID: YAMPDC760UXB1) in this report is a Multi-mode Advanced Radio which was measured approximately: 24 cm (L) \* 7.0 cm (W) \* 2.5 cm (H), rated with input voltage: DC 7.4 V battery or DC 12.0V from adapter.

#### Adapter Information:

Model: S024WM1200200

Input: AC 100-240V, 50/60Hz, 600 mA

Output: DC 12.0V, 2000mA

*Notes: This series products model: PDC760 U1B1, PDC760 U2B1 and PDC760 UxB1 are identical; they have the identical schematics, only named and frequency differently. Model PDC760 UxB1 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.*

*\* All measurement and test data in this report was gathered from production sample serial number: 170313007 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2017-03-13.*

### Objective

This report is prepared on behalf of Amgoo Telecom Co., Ltd. in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

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

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

Part 15.247 DSS, FCC Part 15.225 DXX, Part 22&74&80&90 TNF and Part 22H & 24E&27&90 PCE submissions with FCC ID: YAMPDC760UXB1.

### 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.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

**Measurement Uncertainty**

| Item                               |            | Uncertainty |
|------------------------------------|------------|-------------|
| AC Power Lines Conducted Emissions |            | ±3.26 dB    |
| RF conducted test with spectrum    |            | ±0.9dB      |
| RF Output Power with Power meter   |            | ±0.5dB      |
| Radiated emission                  | 30MHz~1GHz | ±5.91dB     |
|                                    | Above 1G   | ±4.92dB     |
| Occupied Bandwidth                 |            | ±0.5kHz     |
| Temperature                        |            | ±1.0℃       |
| Humidity                           |            | ±6%         |

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China

Bay Area Compliance Laboratories Corp. (Kunshan) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L9963). And accredited to ISO/IEC 17025 by A2LA(Lab code: 4323.01), the FCC Designation No. CN1185 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. 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. (Kunshan) was registered with ISED Canada under ISED Canada Registration Number 3062E.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

For 802.11b, 802.11g and 802.11n-HT20 mode, 13 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1       | 2412            | 8       | 2447            |
| 2       | 2417            | 9       | 2452            |
| 3       | 2422            | 10      | 2457            |
| 4       | 2427            | 11      | 2462            |
| 5       | 2432            | 12      | 2467            |
| 6       | 2437            | 13      | 2472            |
| 7       | 2442            | /       | /               |

For 802.11b, 802.11g, 802.11n-HT20 mode, EUT was tested with Channel 1, 7 and 13

### Equipment Modifications

No modification was made to the EUT tested.

### EUT Exercise Software

BLE & Wi-Fi test in the engineer mode.

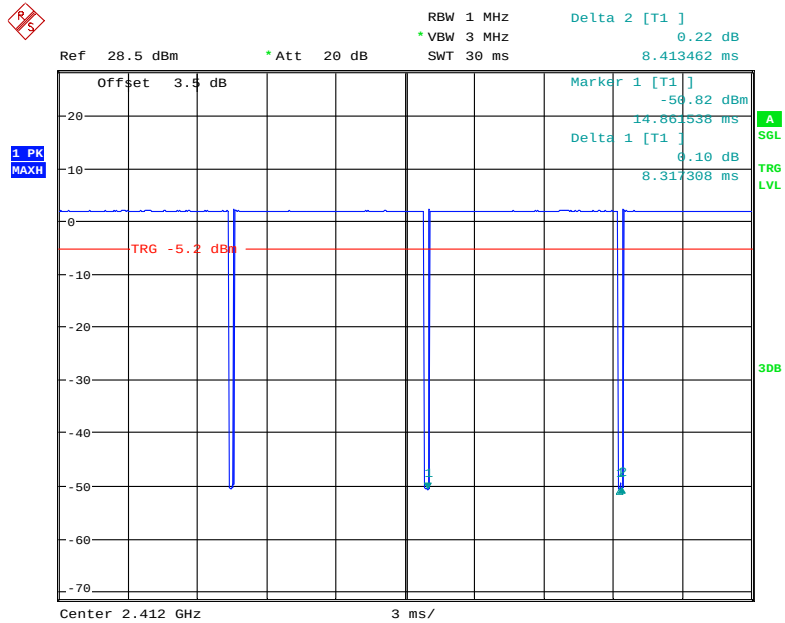
The software “QRCT” was used and the worst case was performed as below:

|              | Low channel | Middle channel | High channel |
|--------------|-------------|----------------|--------------|
| 802.11b      |             |                |              |
| Power level  | 13          | 12             | 9            |
| Data rate    | 1 Mbps      | 1 Mbps         | 1 Mbps       |
| 802.11g      |             |                |              |
| Power level  | 13          | 9              | 9            |
| Data rate    | 6 Mbps      | 6 Mbps         | 6 Mbps       |
| 802.11n-HT20 |             |                |              |
| Power level  | 13          | 12             | 9            |
| Data rate    | MCS0        | MCS0           | MCS0         |

Pre-scan with all the data rates, the above data rate is the worst case for Wi-Fi test.

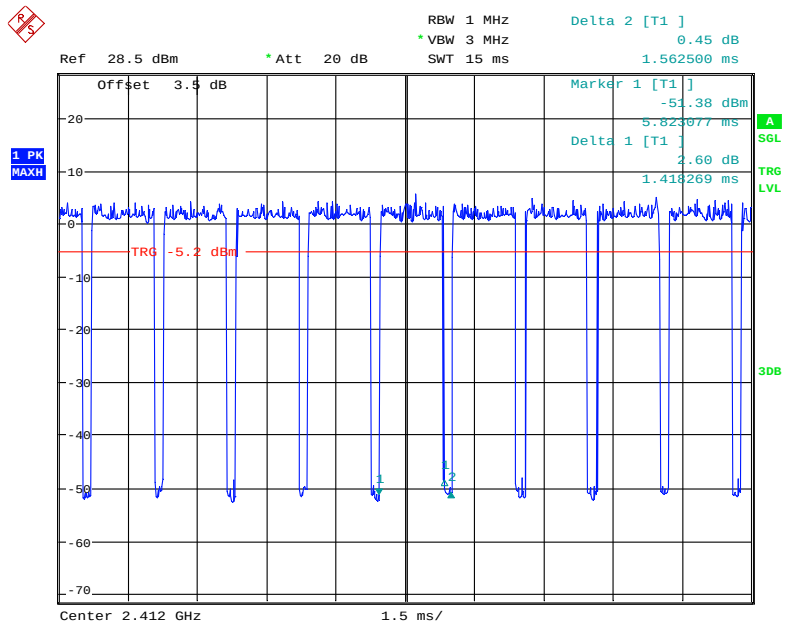
# Duty cycle

## 802.11b mode



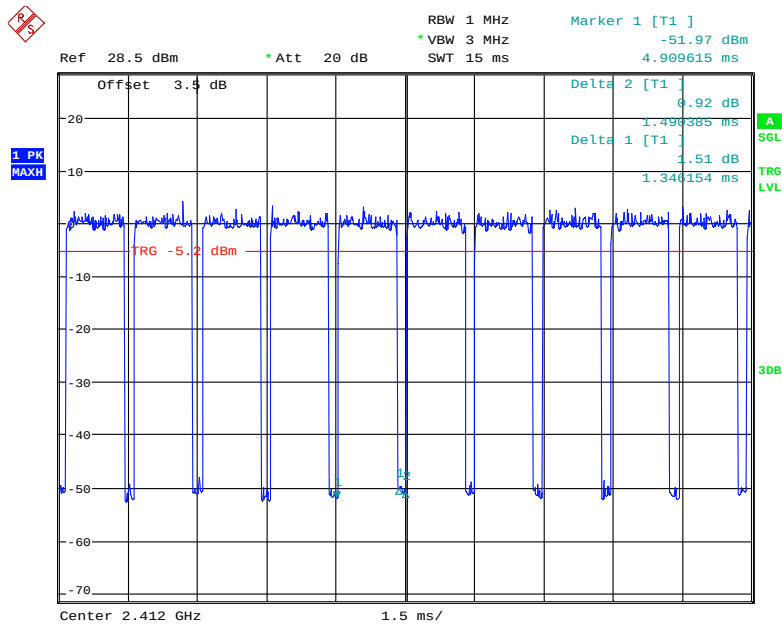
Date: 23.MAR.2017 13:58:39

## 802.11g mode



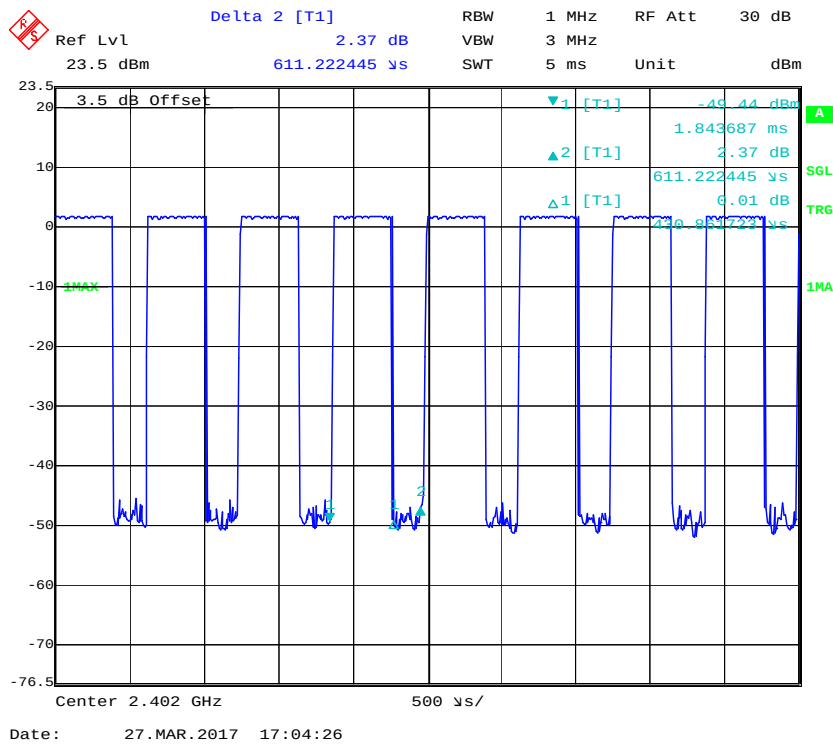
Date: 23.MAR.2017 13:51:22

### 802.11n-HT20 Mode



Date: 23.MAR.2017 13:44:59

### BLE Mode





| Band         | Duty Cycle (%) | T(us) | 1/T(kHz) | VBW Setting | 10log(1/x) |
|--------------|----------------|-------|----------|-------------|------------|
| 802.11b      | 99             | 8317  | -        | 10Hz        | 0          |
| 802.11g      | 94             | 1416  | 0.70     | 1kHz        | 0.27       |
| 802.11n-HT20 | 90             | 1346  | 0.74     | 1kHz        | 0.46       |
| BLE          | 71             | 430.9 | 2.32     | 3kHz        | 1.49       |

### Support Equipment List and Details

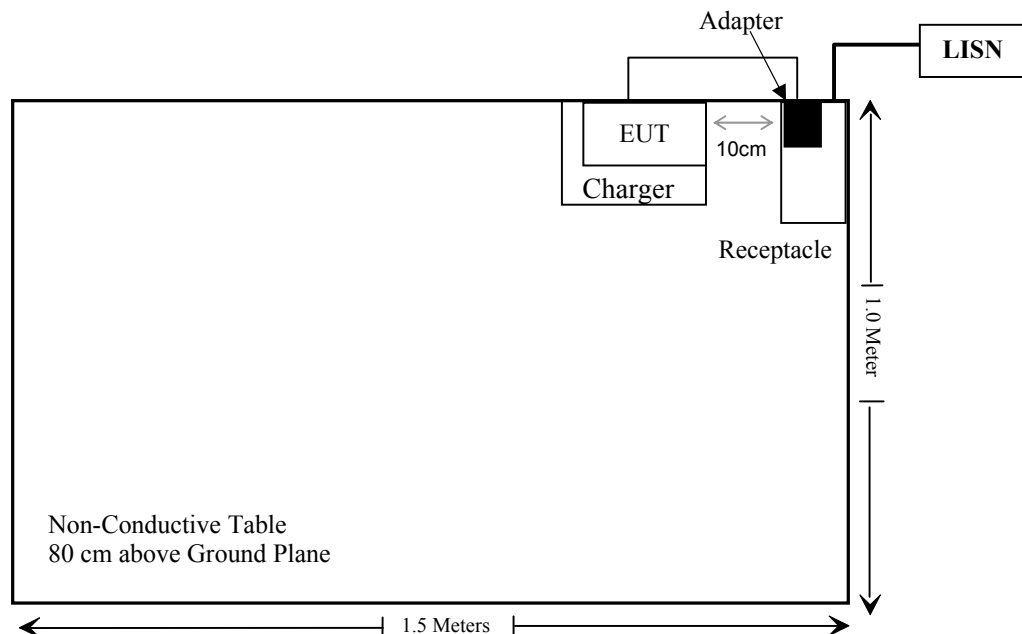
| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|-------|---------------|
| /            | /           | /     | /             |

### External I/O Cable

| Cable Description                 | Length (m) | From Port | To      |
|-----------------------------------|------------|-----------|---------|
| Un-shielding Detachable USB Cable | 1.5        | charger   | Adapter |

### Block Diagram of Test Setup

For conducted emission



**SUMMARY OF TEST RESULTS**

| FCC Rules                             | Description of Test                      | Result     |
|---------------------------------------|------------------------------------------|------------|
| §15.247 (i), §1.1307 (b) (1)& §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 Emission 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 |

**TEST EQUIPMENT LIST**

| Manufacturer                  | Description        | Model                 | Serial Number | Calibration Date | Calibration Due Date |
|-------------------------------|--------------------|-----------------------|---------------|------------------|----------------------|
| <b>AC Line Conducted test</b> |                    |                       |               |                  |                      |
| Rohde & Schwarz               | EMI Test Receiver  | ESCS30                | 834115/007    | 2016-11-25       | 2017-11-25           |
| Rohde & Schwarz               | LISN               | ESH3-Z5               | 862770/011    | 2016-10-10       | 2017-10-10           |
| Rohde & Schwarz               | Pulse limiter      | ESH3-Z2               | 879940/0058   | 2016-06-19       | 2017-06-18           |
| MICRO-COAX                    | Coaxial line       | UFB-293B-1-0480-50X50 | 97F0173       | 2016-09-08       | 2017-09-08           |
| Rohde & Schwarz               | CE Test software   | EMC 32                | V 09.10.0     | NCR              | NCR                  |
| <b>Radiation test</b>         |                    |                       |               |                  |                      |
| Sonoma Instrunent             | Amplifier          | 330                   | 171377        | 2016-12-12       | 2017-12-12           |
| Rohde & Schwarz               | EMI Test Receiver  | ESCI                  | 100195        | 2016-11-25       | 2017-11-25           |
| Sunol Sciences                | Broadband Antenna  | JB3                   | A090314-2     | 2016-01-09       | 2019-01-08           |
| Narda                         | Pre-amplifier      | AFS42-00101800        | 2001270       | 2016-09-08       | 2017-09-08           |
| EMCO                          | Horn Antenna       | 3116                  | 00084159      | 2016-10-18       | 2019-10-17           |
| Rohde & Schwarz               | Signal Analyzer    | FSIQ26                | 100048        | 2016-11-25       | 2017-11-25           |
| ETS                           | Horn Antenna       | 3115                  | 6229          | 2016-01-11       | 2019-01-10           |
| R&S                           | Auto test Software | EMC32                 | V 09.10.0     | NCR              | NCR                  |
| haojintech                    | Coaxial Cable      | Cable-1               | 001           | 2016-12-12       | 2017-12-12           |
| haojintech                    | Coaxial Cable      | Cable-2               | 002           | 2016-12-12       | 2017-12-12           |
| haojintech                    | Coaxial Cable      | Cable-3               | 003           | 2016-12-12       | 2017-12-12           |
| MICRO-COAX                    | Coaxial Cable      | Cable-4               | 004           | 2016-12-12       | 2017-12-12           |
| MICRO-COAX                    | Coaxial Cable      | Cable-5               | 005           | 2016-12-12       | 2017-12-12           |
| <b>RF Conducted test</b>      |                    |                       |               |                  |                      |
| BACL                          | TS 8997 Cable-01   | T-KS-EMC086           | T-KS-EMC086   | 2016-12-09       | 2017-12-08           |
| BACL                          | RF cable           | KS-LAB-012            | KS-LAB-012    | 2016-12-15       | 2017-12-15           |
| WEINSCHL                      | 3dB Attenuator     | 5326                  | N/A           | 2016-06-18       | 2017-06-18           |
| Agilent                       | Power Meter        | N1912A                | MY5000492     | 2016-11-17       | 2017-11-16           |
| Agilent                       | Power Sensor       | N1921A                | MY54210024    | 2016-11-17       | 2017-11-16           |
| Rohde & Schwarz               | Signal Analyzer    | FSIQ26                | 836131/009    | 2016-09-21       | 2017-09-21           |

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

## **FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE**

### **Applicable Standard**

According to FCC §2.1093 and §1.1307(b) (1), 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 KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot$

$[\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

1.  $f(\text{GHz})$  is the RF channel transmit frequency in GHz.

2. Power and distance are rounded to the nearest mW and mm before calculation.

3. The result is rounded to one decimal place for comparison.

4. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test Exclusion.

### **Measurement Result**

**For worst case:**

| Mode | Frequency (MHz) | Max Tune-up Conducted Power (dBm) | Max Tune-up Conducted Power (mW) | Calculated Distance (mm) | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion |
|------|-----------------|-----------------------------------|----------------------------------|--------------------------|------------------|---------------------|--------------------|
| BLE  | 2480            | 3                                 | 2.0                              | 5                        | 0.6              | 3.0                 | Yes                |

**Result: No SAR test is required**

Wifi:

Please refer to SAR Report Number: RDG170313007-20A.

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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has an internal antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

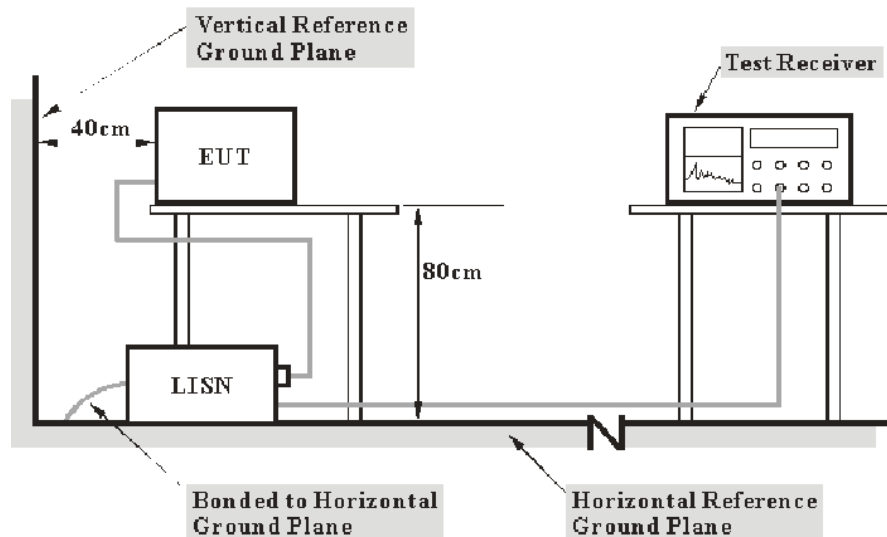
**Result:** Compliance.

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

### Applicable Standard

FCC§15.207

### 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 limits.

The spacing between the peripherals was 10 cm.

### 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 outlet of the LISN.

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

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

## Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 26 °C     |
| Relative Humidity: | 54 %      |
| ATM Pressure:      | 101.0 kPa |

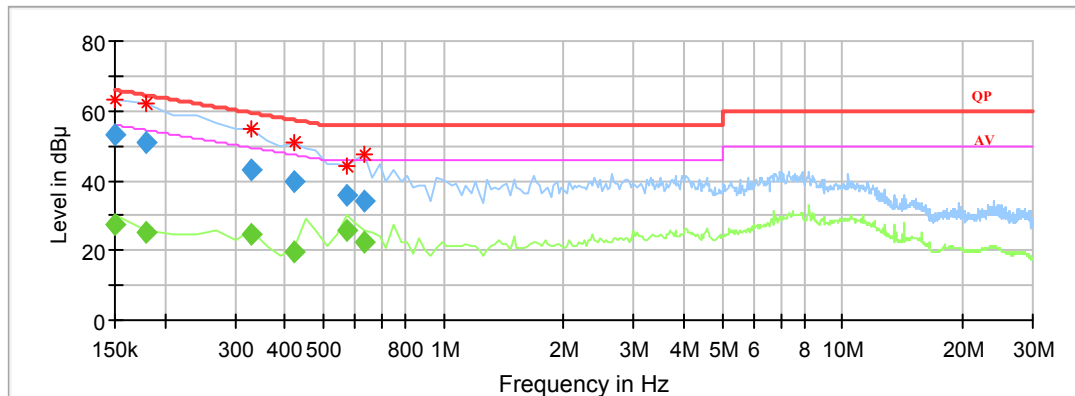
*The testing was performed by Layne Li on 2017-05-01.*

EUT operation mode: Transmitting

**BLE Mode:**

**AC 120V/60 Hz, Line**

Full Spectrum

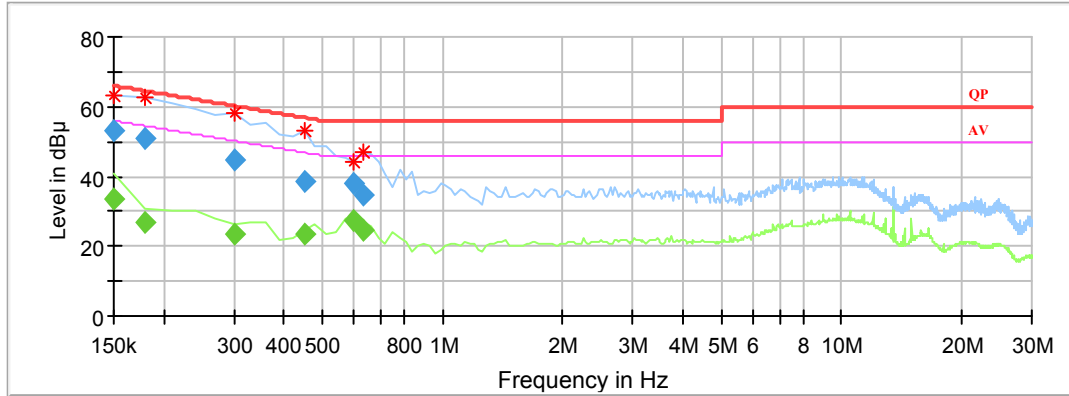


| Frequency (MHz) | QuasiPeak (dBμV) | Average (dB μ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.150000        | ---              | 27.19            | 9.000           | L1   | 10.1       | 28.81       | 56.00        | Compliance |
| 0.150000        | 52.87            | ---              | 9.000           | L1   | 10.1       | 13.13       | 66.00        | Compliance |
| 0.180000        | ---              | 25.19            | 9.000           | L1   | 10.0       | 29.30       | 54.49        | Compliance |
| 0.180000        | 51.02            | ---              | 9.000           | L1   | 10.0       | 13.47       | 64.49        | Compliance |
| 0.330000        | ---              | 24.77            | 9.000           | L1   | 10.0       | 24.68       | 49.45        | Compliance |
| 0.330000        | 42.97            | ---              | 9.000           | L1   | 10.0       | 16.48       | 59.45        | Compliance |
| 0.420000        | 39.77            | ---              | 9.000           | L1   | 10.1       | 17.68       | 57.45        | Compliance |
| 0.420000        | ---              | 19.37            | 9.000           | L1   | 10.1       | 28.08       | 47.45        | Compliance |
| 0.570000        | 35.66            | ---              | 9.000           | L1   | 10.0       | 20.34       | 56.00        | Compliance |
| 0.570000        | ---              | 25.56            | 9.000           | L1   | 10.0       | 20.44       | 46.00        | Compliance |
| 0.630000        | 34.09            | ---              | 9.000           | L1   | 10.0       | 21.91       | 56.00        | Compliance |
| 0.630000        | ---              | 22.35            | 9.000           | L1   | 10.0       | 23.65       | 46.00        | Compliance |



**AC 120V/60 Hz, Neutral**

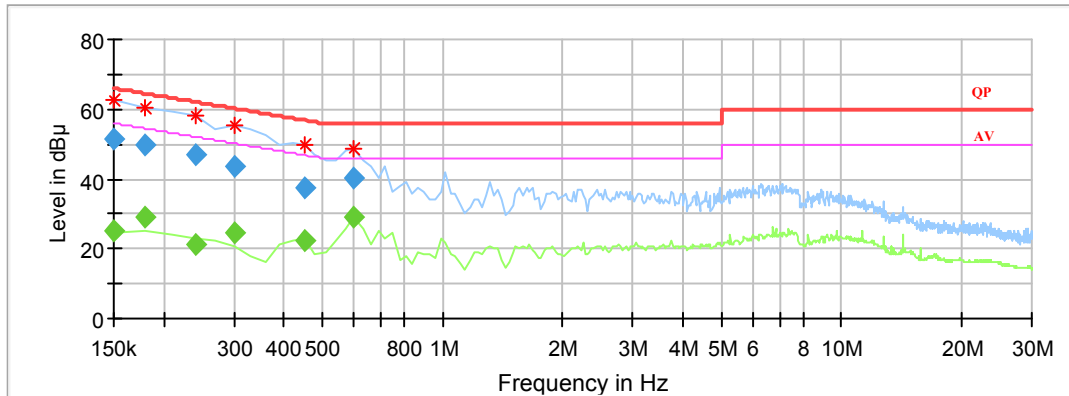
Full Spectrum



| Frequency (MHz) | QuasiPeak (dBμV) | Average (dB μ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.150000        | ---              | 33.73            | 9.000           | N    | 10.1       | 22.27       | 56.00        | Compliance |
| 0.150000        | 52.89            | ---              | 9.000           | N    | 10.1       | 13.11       | 66.00        | Compliance |
| 0.180000        | ---              | 27.01            | 9.000           | N    | 10.1       | 27.48       | 54.49        | Compliance |
| 0.180000        | 51.08            | ---              | 9.000           | N    | 10.1       | 13.41       | 64.49        | Compliance |
| 0.300000        | ---              | 23.64            | 9.000           | N    | 10.1       | 26.60       | 50.24        | Compliance |
| 0.300000        | 44.83            | ---              | 9.000           | N    | 10.1       | 15.41       | 60.24        | Compliance |
| 0.450000        | ---              | 23.61            | 9.000           | N    | 10.1       | 23.27       | 46.88        | Compliance |
| 0.450000        | 38.40            | ---              | 9.000           | N    | 10.1       | 18.48       | 56.88        | Compliance |
| 0.600000        | ---              | 27.17            | 9.000           | N    | 10.0       | 18.83       | 46.00        | Compliance |
| 0.600000        | 38.11            | ---              | 9.000           | N    | 10.0       | 17.89       | 56.00        | Compliance |
| 0.630000        | ---              | 24.88            | 9.000           | N    | 10.0       | 21.12       | 46.00        | Compliance |
| 0.630000        | 34.83            | ---              | 9.000           | N    | 10.0       | 21.17       | 56.00        | Compliance |

**Wi-Fi Mode:****AC 120V/60 Hz, Line:**

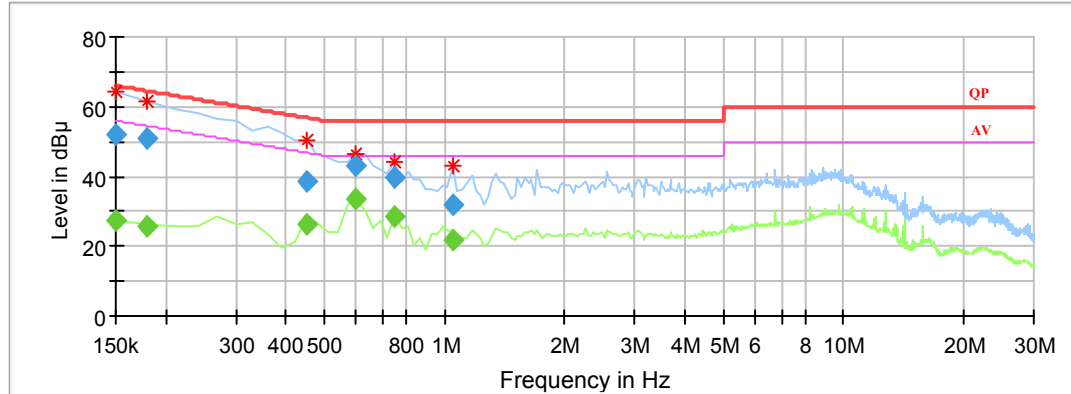
Full Spectrum



| Frequency (MHz) | QuasiPeak (dBμV) | Average (dB μ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.150000        | ---              | 25.29            | 9.000           | L1   | 10.1       | 30.71       | 56.00        | Compliance |
| 0.150000        | 51.33            | ---              | 9.000           | L1   | 10.1       | 14.67       | 66.00        | Compliance |
| 0.180000        | ---              | 29.03            | 9.000           | L1   | 10.0       | 25.46       | 54.49        | Compliance |
| 0.180000        | 49.56            | ---              | 9.000           | L1   | 10.0       | 14.93       | 64.49        | Compliance |
| 0.240000        | ---              | 21.15            | 9.000           | L1   | 10.0       | 30.95       | 52.10        | Compliance |
| 0.240000        | 46.80            | ---              | 9.000           | L1   | 10.0       | 15.30       | 62.10        | Compliance |
| 0.300000        | ---              | 24.83            | 9.000           | L1   | 10.0       | 25.41       | 50.24        | Compliance |
| 0.300000        | 43.75            | ---              | 9.000           | L1   | 10.0       | 16.49       | 60.24        | Compliance |
| 0.450000        | ---              | 22.36            | 9.000           | L1   | 10.1       | 24.52       | 46.88        | Compliance |
| 0.450000        | 37.45            | ---              | 9.000           | L1   | 10.1       | 19.43       | 56.88        | Compliance |
| 0.600000        | ---              | 28.91            | 9.000           | L1   | 10.0       | 17.09       | 46.00        | Compliance |
| 0.600000        | 40.31            | ---              | 9.000           | L1   | 10.0       | 15.69       | 56.00        | Compliance |

**AC 120V/60 Hz, Neutral**

Full Spectrum



| Frequency (MHz) | QuasiPeak (dBμV) | Average (dB μ V) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.150000        | ---              | 27.60            | 9.000           | N    | 10.1       | 28.40       | 56.00        | Compliance |
| 0.150000        | 52.23            | ---              | 9.000           | N    | 10.1       | 13.77       | 66.00        | Compliance |
| 0.180000        | ---              | 25.52            | 9.000           | N    | 10.1       | 28.97       | 54.49        | Compliance |
| 0.180000        | 50.86            | ---              | 9.000           | N    | 10.1       | 13.63       | 64.49        | Compliance |
| 0.450000        | ---              | 26.48            | 9.000           | N    | 10.1       | 20.40       | 46.88        | Compliance |
| 0.450000        | 38.74            | ---              | 9.000           | N    | 10.1       | 18.14       | 56.88        | Compliance |
| 0.600000        | ---              | 33.63            | 9.000           | N    | 10.0       | 12.37       | 46.00        | Compliance |
| 0.600000        | 42.95            | ---              | 9.000           | N    | 10.0       | 13.05       | 56.00        | Compliance |
| 0.750000        | ---              | 28.32            | 9.000           | N    | 10.0       | 17.68       | 46.00        | Compliance |
| 0.750000        | 39.70            | ---              | 9.000           | N    | 10.0       | 16.30       | 56.00        | Compliance |
| 1.050000        | ---              | 21.71            | 9.000           | N    | 9.9        | 24.29       | 46.00        | Compliance |
| 1.050000        | 31.73            | ---              | 9.000           | N    | 9.9        | 24.27       | 56.00        | Compliance |

**Note:**

- 1) Corrected Amplitude = Reading + Correction Factor
- 2) Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
- 3) Margin = Limit – Corrected Amplitude

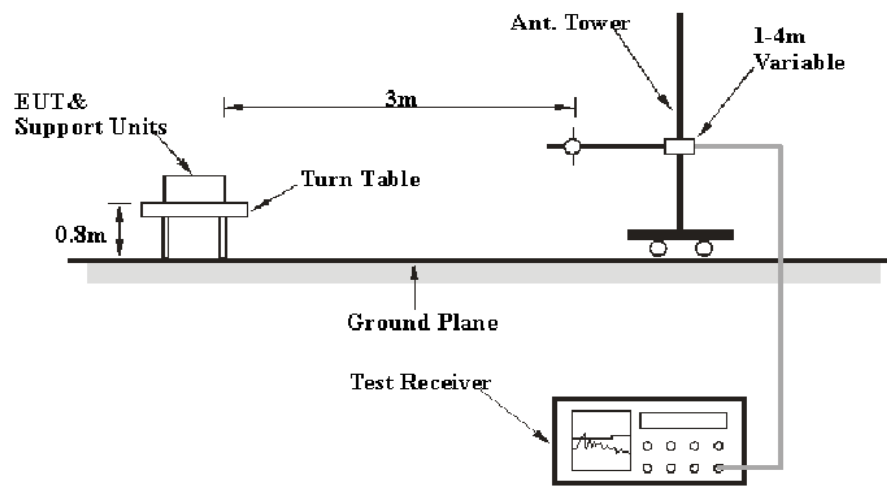
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

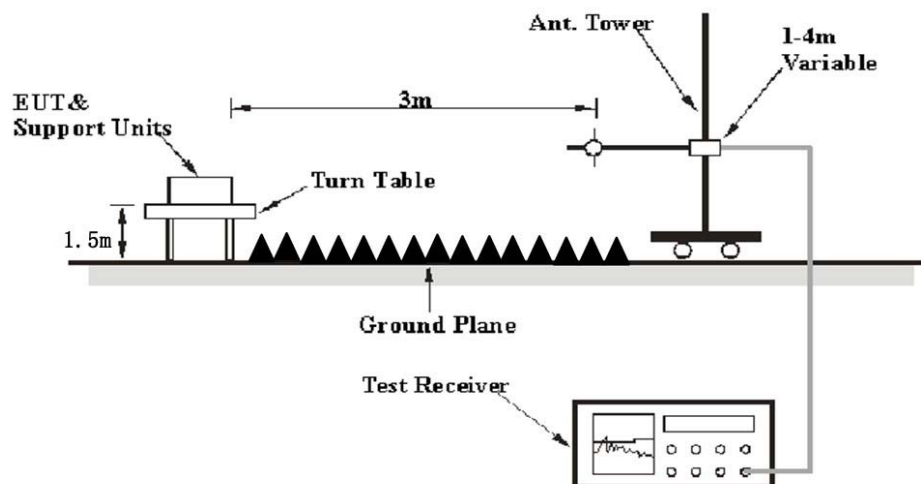
FCC §15.247 (d); §15.209; §15.205;

### EUT Setup

#### Below 1 GHz:



#### Above 1GHz:



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

## 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:

| Frequency Range   | RBW     | Video B/W               | IF B/W  | Detector |
|-------------------|---------|-------------------------|---------|----------|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz                 | 120 kHz | QP       |
| Above 1 GHz       | 1MHz    | 3 MHz                   | /       | PK       |
|                   | 1MHz    | 10 Hz <sup>Note 1</sup> | /       | PK       |
|                   | 1MHz    | 10 Hz <sup>Note 2</sup> | /       | PK       |

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

## 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

**Test Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 26 °C     |
| <b>Relative Humidity:</b> | 54 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

The testing was performed by Layne Li on 2017-05-01.

EUT operation mode: Transmitting

**30 MHz-25 GHz:****For Wi-Fi:****802.11b Mode:**

| Frequency<br>(MHz)     | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                        | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| Low Channel (2412 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                  | 43.17             | QP         | 99                  | 1.2           | H              | -11.97                      | 31.20                              | 46                         | 14.8           |
| 2412.00                | 107.86            | PK         | 33                  | 1.2           | H              | -6.19                       | 101.67                             | /                          | /              |
| 2412.00                | 102.01            | Ave.       | 33                  | 1.2           | H              | -6.19                       | 95.82                              | /                          | /              |
| 2412.00                | 101.45            | PK         | 208                 | 2.1           | V              | -6.19                       | 95.26                              | /                          | /              |
| 2412.00                | 96.62             | Ave.       | 208                 | 2.1           | V              | -6.19                       | 90.43                              | /                          | /              |
| 2331.96                | 69.15             | PK         | 63                  | 2.2           | H              | -6.42                       | 62.73                              | 74                         | 11.27          |
| 2331.96                | 54.41             | Ave.       | 63                  | 2.2           | H              | -6.42                       | 47.99                              | 54                         | 6.01           |
| 2364.52                | 67.91             | PK         | 279                 | 1.5           | H              | -6.19                       | 61.72                              | 74                         | 12.28          |
| 2364.52                | 54.18             | Ave.       | 279                 | 1.5           | H              | -6.19                       | 47.99                              | 54                         | 6.01           |
| 2487.33                | 67.4              | PK         | 96                  | 2.0           | H              | -5.97                       | 61.43                              | 74                         | 12.57          |
| 2487.33                | 54.02             | Ave.       | 96                  | 2.0           | H              | -5.97                       | 48.05                              | 54                         | 5.95           |
| 4824.00                | 50.56             | PK         | 319                 | 1.6           | H              | 1.6                         | 52.16                              | 74                         | 21.84          |
| 4824.00                | 35.86             | Ave.       | 319                 | 1.6           | H              | 1.6                         | 37.46                              | 54                         | 16.54          |

| Frequency<br>(MHz)        | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|---------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                           | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| Middle Channel (2442 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                     | 43.13             | QP         | 201                 | 1.2           | H              | -11.97                      | 31.16                              | 46                         | 14.84          |
| 2442.00                   | 109.74            | PK         | 61                  | 1.3           | H              | -6.19                       | 103.55                             | /                          | /              |
| 2442.00                   | 103.82            | Ave.       | 61                  | 1.3           | H              | -6.19                       | 97.63                              | /                          | /              |
| 2442.00                   | 103.06            | PK         | 334                 | 2.0           | V              | -6.19                       | 96.87                              | /                          | /              |
| 2442.00                   | 97.17             | Ave.       | 334                 | 2.0           | V              | -6.19                       | 90.98                              | /                          | /              |
| 2333.72                   | 68.07             | PK         | 286                 | 2.2           | H              | -6.42                       | 61.65                              | 74                         | 12.35          |
| 2333.72                   | 54.54             | Ave.       | 286                 | 2.2           | H              | -6.42                       | 48.12                              | 54                         | 5.88           |
| 2371.72                   | 68.35             | PK         | 234                 | 1.5           | H              | -6.19                       | 62.16                              | 74                         | 11.84          |
| 2371.72                   | 54.31             | Ave.       | 234                 | 1.5           | H              | -6.19                       | 48.12                              | 54                         | 5.88           |
| 2497.52                   | 67.99             | PK         | 254                 | 1.8           | H              | -5.97                       | 62.02                              | 74                         | 11.98          |
| 2497.52                   | 54.02             | Ave.       | 254                 | 1.8           | H              | -5.97                       | 48.05                              | 54                         | 5.95           |
| 4884.00                   | 50.5              | PK         | 8                   | 1.4           | H              | 1.83                        | 52.33                              | 74                         | 21.67          |
| 4884.00                   | 36.28             | Ave.       | 8                   | 1.4           | H              | 1.83                        | 38.11                              | 54                         | 15.89          |
| High Channel (2472 MHz)   |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                     | 43.28             | QP         | 75                  | 1.1           | H              | -11.97                      | 31.31                              | 46                         | 14.69          |
| 2472.00                   | 102.94            | PK         | 70                  | 1.5           | H              | -5.97                       | 96.97                              | /                          | /              |
| 2472.00                   | 97.34             | Ave.       | 70                  | 1.5           | H              | -5.97                       | 91.37                              | /                          | /              |
| 2472.00                   | 98.14             | PK         | 21                  | 1.3           | V              | -5.97                       | 92.17                              | /                          | /              |
| 2472.00                   | 92.85             | Ave.       | 21                  | 1.3           | V              | -5.97                       | 86.88                              | /                          | /              |
| 2358.41                   | 68.15             | PK         | 272                 | 2.5           | H              | -6.19                       | 61.96                              | 74                         | 12.04          |
| 2358.41                   | 54.32             | Ave.       | 272                 | 2.5           | H              | -6.19                       | 48.13                              | 54                         | 5.87           |
| 2484.22                   | 69.19             | PK         | 154                 | 1.7           | H              | -5.97                       | 63.22                              | 74                         | 10.78          |
| 2484.22                   | 55.86             | Ave.       | 154                 | 1.7           | H              | -5.97                       | 49.89                              | 54                         | 4.11           |
| 2483.73                   | 67.71             | PK         | 357                 | 1.2           | H              | -5.97                       | 61.74                              | 74                         | 12.26          |
| 2483.73                   | 55.78             | Ave.       | 357                 | 1.2           | H              | -5.97                       | 49.81                              | 54                         | 4.19           |
| 4944.00                   | 49.32             | PK         | 23                  | 1.3           | H              | 1.83                        | 51.15                              | 74                         | 22.85          |
| 4944.00                   | 34.29             | Ave.       | 23                  | 1.3           | H              | 1.83                        | 36.12                              | 54                         | 17.88          |

**802.11g Mode:**

| Frequency<br>(MHz)       | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|--------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                          | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| Low Channel (2412 MHz)   |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                    | 43.25             | QP         | 140                 | 1.3           | H              | -11.97                      | 31.28                              | 46                         | 14.72          |
| 2412.00                  | 104.08            | PK         | 183                 | 2.0           | H              | -6.19                       | 97.89                              | /                          | /              |
| 2412.00                  | 92.86             | Ave.       | 183                 | 2.0           | H              | -6.19                       | 86.67                              | /                          | /              |
| 2412.00                  | 97.11             | PK         | 16                  | 1.7           | V              | -6.19                       | 90.92                              | /                          | /              |
| 2412.00                  | 85.81             | Ave.       | 16                  | 1.7           | V              | -6.19                       | 79.62                              | /                          | /              |
| 2371.24                  | 67.94             | PK         | 153                 | 1.0           | H              | -6.19                       | 61.75                              | 74                         | 12.25          |
| 2371.24                  | 54.32             | Ave.       | 153                 | 1.0           | H              | -6.19                       | 48.13                              | 54                         | 5.87           |
| 2327.78                  | 68.04             | PK         | 323                 | 2.4           | H              | -6.42                       | 61.62                              | 74                         | 12.38          |
| 2327.78                  | 54.39             | Ave.       | 323                 | 2.4           | H              | -6.42                       | 47.97                              | 54                         | 6.03           |
| 2492.62                  | 68.16             | PK         | 286                 | 1.2           | H              | -5.97                       | 62.19                              | 74                         | 11.81          |
| 2492.62                  | 54.01             | Ave.       | 286                 | 1.2           | H              | -5.97                       | 48.04                              | 54                         | 5.96           |
| 4824.00                  | 51.2              | PK         | 54                  | 2.0           | H              | 1.6                         | 52.80                              | 74                         | 21.20          |
| 4824.00                  | 35.66             | Ave.       | 54                  | 2.0           | H              | 1.6                         | 37.26                              | 54                         | 16.74          |
| Middle Channel(2442 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                    | 43.21             | QP         | 145                 | 1.2           | H              | -11.97                      | 31.24                              | 46                         | 14.76          |
| 2442.00                  | 104.72            | PK         | 106                 | 1.5           | H              | -6.19                       | 98.53                              | /                          | /              |
| 2442.00                  | 93.36             | Ave.       | 106                 | 1.5           | H              | -6.19                       | 87.17                              | /                          | /              |
| 2442.00                  | 100.08            | PK         | 175                 | 1.5           | V              | -6.19                       | 93.89                              | /                          | /              |
| 2442.00                  | 89.11             | Ave.       | 175                 | 1.5           | V              | -6.19                       | 82.92                              | /                          | /              |
| 2340.78                  | 68.48             | PK         | 28                  | 2.5           | H              | -6.42                       | 62.06                              | 74                         | 11.94          |
| 2340.78                  | 54.44             | Ave.       | 28                  | 2.5           | H              | -6.42                       | 48.02                              | 54                         | 5.98           |
| 2338.37                  | 68.09             | PK         | 124                 | 2.3           | H              | -6.42                       | 61.67                              | 74                         | 12.33          |
| 2338.37                  | 54.37             | Ave.       | 124                 | 2.3           | H              | -6.42                       | 47.95                              | 54                         | 6.05           |
| 2491.93                  | 68.93             | PK         | 227                 | 2.4           | H              | -5.97                       | 62.96                              | 74                         | 11.04          |
| 2491.93                  | 54.04             | Ave.       | 227                 | 2.4           | H              | -5.97                       | 48.07                              | 54                         | 5.93           |
| 4884.00                  | 50.73             | PK         | 65                  | 1.6           | H              | 1.83                        | 52.56                              | 74                         | 21.44          |
| 4884.00                  | 36.97             | Ave.       | 65                  | 1.6           | H              | 1.83                        | 38.80                              | 54                         | 15.20          |



| Frequency<br>(MHz)      | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|-------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                         | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| High Channel (2472 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                   | 43.24             | QP         | 87                  | 1.2           | H              | -11.97                      | 31.27                              | 46                         | 14.73          |
| 2472.00                 | 101.51            | PK         | 194                 | 1.2           | H              | -5.97                       | 95.54                              | /                          | /              |
| 2472.00                 | 90.25             | Ave.       | 194                 | 1.2           | H              | -5.97                       | 84.28                              | /                          | /              |
| 2472.00                 | 96.77             | PK         | 247                 | 1.8           | V              | -5.97                       | 90.80                              | /                          | /              |
| 2472.00                 | 85.75             | Ave.       | 247                 | 1.8           | V              | -5.97                       | 79.78                              | /                          | /              |
| 2380.06                 | 68.47             | PK         | 114                 | 1.5           | H              | -6.19                       | 62.28                              | 74                         | 11.72          |
| 2380.06                 | 54.41             | Ave.       | 114                 | 1.5           | H              | -6.19                       | 48.22                              | 54                         | 5.78           |
| 2483.50                 | 74.92             | PK         | 56                  | 1.4           | H              | -5.97                       | 68.95                              | 74                         | 5.05           |
| 2483.50                 | 55.63             | Ave.       | 56                  | 1.4           | H              | -5.97                       | 49.66                              | 54                         | 4.34           |
| 2483.53                 | 76.31             | PK         | 159                 | 2.1           | H              | -5.97                       | 70.34                              | 74                         | 3.66           |
| 2483.53                 | 55.62             | Ave.       | 159                 | 2.1           | H              | -5.97                       | 49.65                              | 54                         | 4.35           |
| 4944.00                 | 48.87             | PK         | 99                  | 1.0           | H              | 1.83                        | 50.70                              | 74                         | 23.30          |
| 4944.00                 | 34.39             | Ave.       | 99                  | 1.0           | H              | 1.83                        | 36.22                              | 54                         | 17.78          |

**802.11n-HT20 Mode:**

| Frequency<br>(MHz)       | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|--------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                          | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| Low Channel (2412 MHz)   |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                    | 43.14             | QP         | 72                  | 1.3           | H              | -11.97                      | 31.17                              | 46                         | 14.83          |
| 2412.00                  | 106.37            | PK         | 338                 | 1.3           | H              | -6.19                       | 100.18                             | /                          | /              |
| 2412.00                  | 94.64             | Ave.       | 338                 | 1.3           | H              | -6.19                       | 88.45                              | /                          | /              |
| 2412.00                  | 99.41             | PK         | 131                 | 1.4           | V              | -6.19                       | 93.22                              | /                          | /              |
| 2412.00                  | 85.86             | Ave.       | 131                 | 1.4           | V              | -6.19                       | 79.67                              | /                          | /              |
| 2379.89                  | 67.96             | PK         | 184                 | 1.2           | H              | -6.19                       | 61.77                              | 74                         | 12.23          |
| 2379.89                  | 54.43             | Ave.       | 184                 | 1.2           | H              | -6.19                       | 48.24                              | 54                         | 5.76           |
| 2364.03                  | 68.48             | PK         | 19                  | 2.4           | H              | -6.19                       | 62.29                              | 74                         | 11.71          |
| 2364.03                  | 54.28             | Ave.       | 19                  | 2.4           | H              | -6.19                       | 48.09                              | 54                         | 5.91           |
| 2491.01                  | 67.91             | PK         | 357                 | 1.8           | H              | -5.97                       | 61.94                              | 74                         | 12.06          |
| 2491.01                  | 54.03             | Ave.       | 357                 | 1.8           | H              | -5.97                       | 48.06                              | 54                         | 5.94           |
| 4824.00                  | 50.46             | PK         | 332                 | 1.7           | H              | 1.6                         | 52.06                              | 74                         | 21.94          |
| 4824.00                  | 35.82             | Ave.       | 332                 | 1.7           | H              | 1.6                         | 37.42                              | 54                         | 16.58          |
| Middle Channel(2442 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                    | 43.19             | QP         | 27                  | 1.1           | H              | -11.97                      | 31.22                              | 46                         | 14.78          |
| 2442.00                  | 107               | PK         | 25                  | 1.3           | H              | -6.19                       | 100.81                             | /                          | /              |
| 2442.00                  | 95.69             | Ave.       | 25                  | 1.3           | H              | -6.19                       | 89.50                              | /                          | /              |
| 2442.00                  | 101.84            | PK         | 274                 | 2.0           | V              | -6.19                       | 95.65                              | /                          | /              |
| 2442.00                  | 90.65             | Ave.       | 274                 | 2.0           | V              | -6.19                       | 84.46                              | /                          | /              |
| 2330.04                  | 68.4              | PK         | 182                 | 1.3           | H              | -6.42                       | 61.98                              | 74                         | 12.02          |
| 2330.04                  | 54.41             | Ave.       | 182                 | 1.3           | H              | -6.42                       | 47.99                              | 54                         | 6.01           |
| 2321.06                  | 68.45             | PK         | 122                 | 1.4           | H              | -6.42                       | 62.03                              | 74                         | 11.97          |
| 2321.06                  | 54.43             | Ave.       | 122                 | 1.4           | H              | -6.42                       | 48.01                              | 54                         | 5.99           |
| 2490.57                  | 67.07             | PK         | 231                 | 1.8           | H              | -5.97                       | 61.10                              | 74                         | 12.90          |
| 2490.57                  | 54.03             | Ave.       | 231                 | 1.8           | H              | -5.97                       | 48.06                              | 54                         | 5.94           |
| 4884.00                  | 50.37             | PK         | 319                 | 2.3           | H              | 1.83                        | 52.20                              | 74                         | 21.80          |
| 4884.00                  | 35.78             | Ave.       | 319                 | 2.3           | H              | 1.83                        | 37.61                              | 54                         | 16.39          |

| Frequency<br>(MHz)      | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|-------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                         | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| High Channel (2472 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 267.9                   | 43.32             | QP         | 85                  | 1.2           | H              | -11.97                      | 31.35                              | 46                         | 14.65          |
| 2472.00                 | 100.48            | PK         | 114                 | 1.5           | H              | -5.97                       | 94.51                              | /                          | /              |
| 2472.00                 | 86.85             | Ave.       | 114                 | 1.5           | H              | -5.97                       | 80.88                              | /                          | /              |
| 2472.00                 | 92.25             | PK         | 356                 | 1.6           | V              | -5.97                       | 86.28                              | /                          | /              |
| 2472.00                 | 78.97             | Ave.       | 356                 | 1.6           | V              | -5.97                       | 73.00                              | /                          | /              |
| 2385.50                 | 66.64             | PK         | 158                 | 1.4           | H              | -6.19                       | 60.45                              | 74                         | 13.55          |
| 2385.50                 | 52.97             | Ave.       | 158                 | 1.4           | H              | -6.19                       | 46.78                              | 54                         | 7.22           |
| 2483.50                 | 76.74             | PK         | 107                 | 2.4           | H              | -5.97                       | 70.77                              | 74                         | 3.23           |
| 2483.50                 | 57.09             | Ave.       | 107                 | 2.4           | H              | -5.97                       | 51.12                              | 54                         | 2.88           |
| 2483.53                 | 75.45             | PK         | 64                  | 2.4           | H              | -5.97                       | 69.48                              | 74                         | 4.52           |
| 2483.53                 | 55.68             | Ave.       | 64                  | 2.4           | H              | -5.97                       | 49.71                              | 54                         | 4.29           |
| 4944.00                 | 50.61             | PK         | 288                 | 1.8           | H              | 1.83                        | 52.44                              | 74                         | 21.56          |
| 4944.00                 | 34.33             | Ave.       | 288                 | 1.8           | H              | 1.83                        | 36.16                              | 54                         | 17.84          |

**BLE Mode:**

| Frequency<br>(MHz)      | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|-------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                         | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| Low Channel (2402 MHz)  |                   |            |                     |               |                |                             |                                    |                            |                |
| 271.2                   | 42.29             | QP         | 240                 | 1.1           | H              | -11.97                      | 30.32                              | 46                         | 15.68          |
| 2402.00                 | 98.67             | PK         | 218                 | 1.9           | H              | -6.19                       | 92.48                              | /                          | /              |
| 2402.00                 | 93.34             | Ave.       | 218                 | 1.9           | H              | -6.19                       | 87.15                              | /                          | /              |
| 2402.00                 | 91.56             | PK         | 156                 | 2.0           | V              | -6.19                       | 85.37                              | /                          | /              |
| 2402.00                 | 86.49             | Ave.       | 156                 | 2.0           | V              | -6.19                       | 80.30                              | /                          | /              |
| 2316.79                 | 67.97             | PK         | 356                 | 1.6           | H              | -6.42                       | 61.55                              | 74                         | 12.45          |
| 2316.79                 | 54.49             | Ave.       | 356                 | 1.6           | H              | -6.42                       | 48.07                              | 54                         | 5.93           |
| 2308.92                 | 68.1              | PK         | 320                 | 1.2           | H              | -6.42                       | 61.68                              | 74                         | 12.32          |
| 2308.92                 | 54.46             | Ave.       | 320                 | 1.2           | H              | -6.42                       | 48.04                              | 54                         | 5.96           |
| 2486.64                 | 67.71             | PK         | 322                 | 1.8           | H              | -5.97                       | 61.74                              | 74                         | 12.26          |
| 2486.64                 | 54.09             | Ave.       | 322                 | 1.8           | H              | -5.97                       | 48.12                              | 54                         | 5.88           |
| 4804.00                 | 50                | PK         | 325                 | 1.4           | H              | 1.6                         | 51.60                              | 74                         | 22.40          |
| 4804.00                 | 35.47             | Ave.       | 325                 | 1.4           | H              | 1.6                         | 37.07                              | 54                         | 16.93          |
| Middle Channel(2440MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 271.2                   | 42.16             | QP         | 163                 | 1.1           | H              | -11.97                      | 30.19                              | 46                         | 15.81          |
| 2440.00                 | 97.37             | PK         | 185                 | 1.8           | H              | -6.19                       | 91.18                              | /                          | /              |
| 2440.00                 | 92.23             | Ave.       | 185                 | 1.8           | H              | -6.19                       | 86.04                              | /                          | /              |
| 2440.00                 | 90.5              | PK         | 107                 | 1.9           | V              | -6.19                       | 84.31                              | /                          | /              |
| 2440.00                 | 85.12             | Ave.       | 107                 | 1.9           | V              | -6.19                       | 78.93                              | /                          | /              |
| 2370.44                 | 68.58             | PK         | 284                 | 1.2           | H              | -6.19                       | 62.39                              | 74                         | 11.61          |
| 2370.44                 | 54.28             | Ave.       | 284                 | 1.2           | H              | -6.19                       | 48.09                              | 54                         | 5.91           |
| 2332.28                 | 67.8              | PK         | 286                 | 1.9           | H              | -6.42                       | 61.38                              | 74                         | 12.62          |
| 2332.28                 | 54.38             | Ave.       | 286                 | 1.9           | H              | -6.42                       | 47.96                              | 54                         | 6.04           |
| 2486.83                 | 67.34             | PK         | 340                 | 1.2           | H              | -5.97                       | 61.37                              | 74                         | 12.63          |
| 2486.83                 | 54.02             | Ave.       | 340                 | 1.2           | H              | -5.97                       | 48.05                              | 54                         | 5.95           |
| 4880.00                 | 50.74             | PK         | 298                 | 1.7           | H              | 1.83                        | 52.57                              | 74                         | 21.43          |
| 4880.00                 | 35.87             | Ave.       | 298                 | 1.7           | H              | 1.83                        | 37.70                              | 54                         | 16.30          |

| Frequency<br>(MHz)      | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part<br>15.247/205/209 |                |
|-------------------------|-------------------|------------|---------------------|---------------|----------------|-----------------------------|------------------------------------|----------------------------|----------------|
|                         | Reading<br>(dBμV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                             |                                    | Limit<br>(dBμV/m)          | Margin<br>(dB) |
| High Channel (2480 MHz) |                   |            |                     |               |                |                             |                                    |                            |                |
| 271.2                   | 42.25             | QP         | 281                 | 1.2           | H              | -11.97                      | 30.28                              | 46                         | 15.72          |
| 2480.00                 | 95.83             | PK         | 208                 | 1.3           | H              | -5.97                       | 89.86                              | /                          | /              |
| 2480.00                 | 90.81             | Ave.       | 208                 | 1.3           | H              | -5.97                       | 84.84                              | /                          | /              |
| 2480.00                 | 91.45             | PK         | 318                 | 2.3           | V              | -5.97                       | 85.48                              | /                          | /              |
| 2480.00                 | 86.09             | Ave.       | 318                 | 2.3           | V              | -5.97                       | 80.12                              | /                          | /              |
| 2379.25                 | 68.46             | PK         | 135                 | 1.1           | H              | -6.19                       | 62.27                              | 74                         | 11.73          |
| 2379.25                 | 54.32             | Ave.       | 135                 | 1.1           | H              | -6.19                       | 48.13                              | 54                         | 5.87           |
| 2499.53                 | 67.52             | PK         | 222                 | 2.4           | H              | -5.97                       | 61.55                              | 74                         | 12.45          |
| 2499.53                 | 54.03             | Ave.       | 222                 | 2.4           | H              | -5.97                       | 48.06                              | 54                         | 5.94           |
| 2495.04                 | 67.54             | PK         | 107                 | 1.8           | H              | -5.97                       | 61.57                              | 74                         | 12.43          |
| 2495.04                 | 54.41             | Ave.       | 107                 | 1.8           | H              | -5.97                       | 48.44                              | 54                         | 5.56           |
| 4960.00                 | 50.74             | PK         | 305                 | 2.5           | H              | 2.06                        | 52.80                              | 74                         | 21.20          |
| 4960.00                 | 37.23             | Ave.       | 305                 | 2.5           | H              | 2.06                        | 39.29                              | 54                         | 14.71          |

**Note:**

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

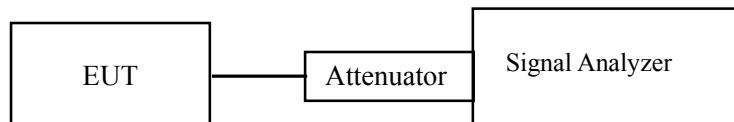
## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### Applicable Standard

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

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



### Test Data

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 24 °C     |
| Relative Humidity: | 55 %      |
| ATM Pressure:      | 101.0 kPa |

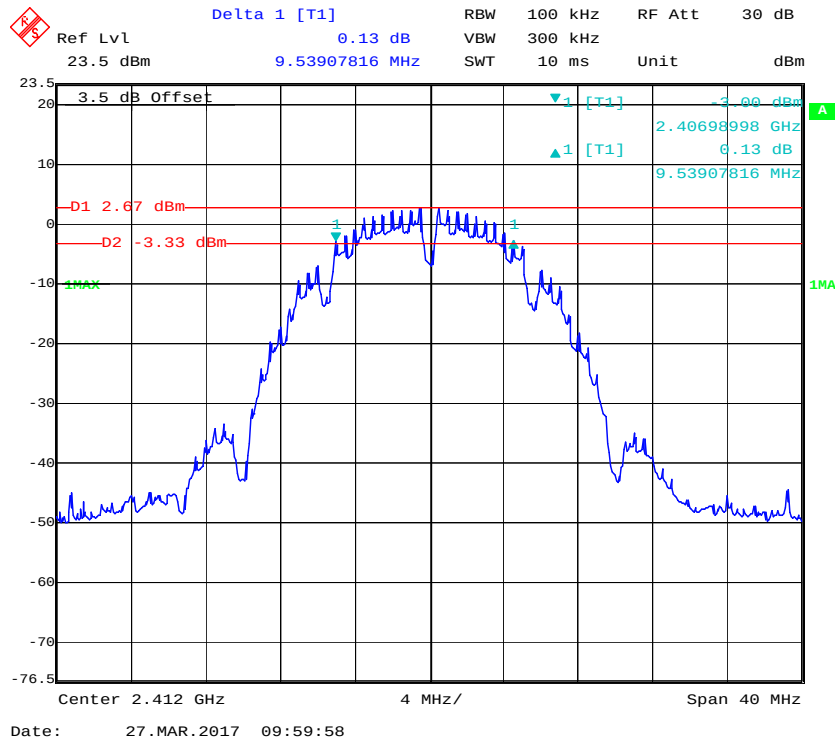
*The testing was performed by Phil Zhu on 2017-03-27.*

*EUT operation mode: Transmitting*

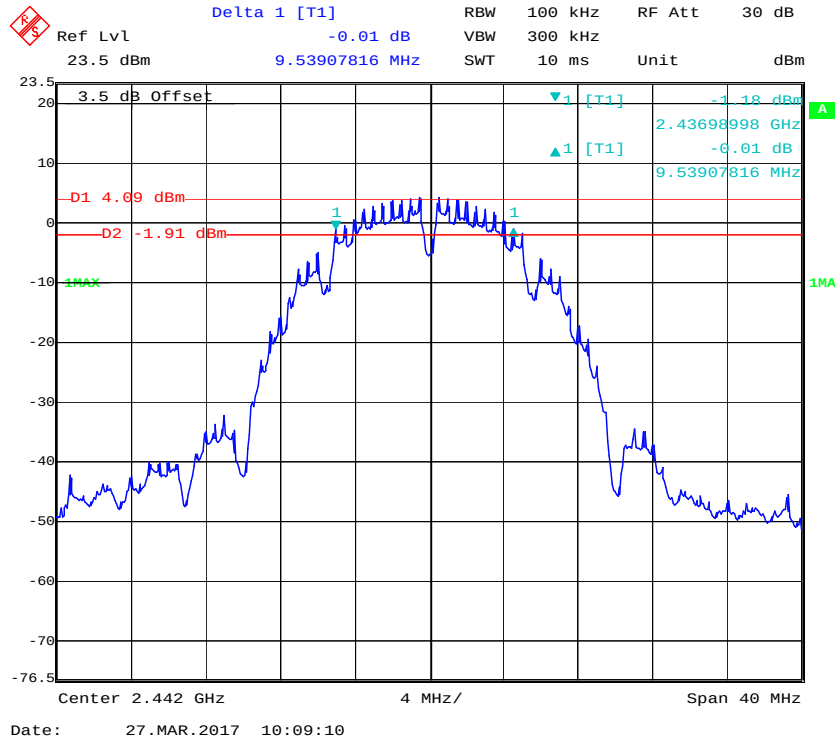
*Test Result: Compliance. Please refer to following table and plots.*

| Channel           | Frequency (MHz) | 6 dB Emission Bandwidth (MHz) | Limit (kHz) |
|-------------------|-----------------|-------------------------------|-------------|
| 802.11b mode      |                 |                               |             |
| Low               | 2412            | 9.54                          | $\geq 500$  |
| Middle            | 2442            | 9.54                          | $\geq 500$  |
| High              | 2472            | 9.06                          | $\geq 500$  |
| 802.11g           |                 |                               |             |
| Low               | 2412            | 17.39                         | $\geq 500$  |
| Middle            | 2442            | 16.35                         | $\geq 500$  |
| High              | 2472            | 16.19                         | $\geq 500$  |
| 802.11n-HT20 mode |                 |                               |             |
| Low               | 2412            | 17.64                         | $\geq 500$  |
| Middle            | 2442            | 17.47                         | $\geq 500$  |
| High              | 2472            | 16.75                         | $\geq 500$  |
| BLE mode          |                 |                               |             |
| Low               | 2402            | 0.725                         | $\geq 500$  |
| Middle            | 2440            | 0.729                         | $\geq 500$  |
| High              | 2480            | 0.729                         | $\geq 500$  |

### 802.11b Low Channel

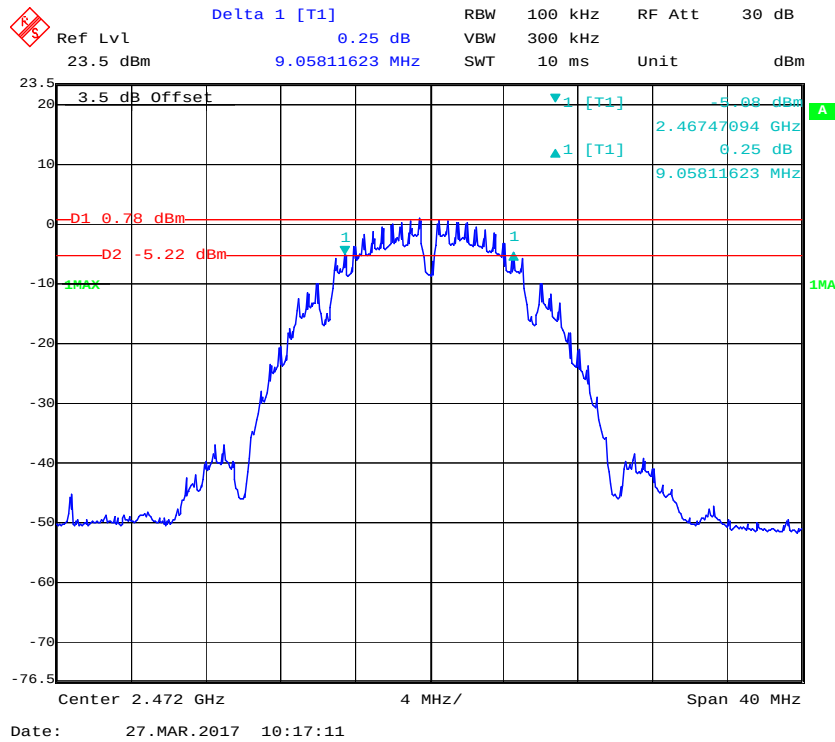


### 802.11b Middle Channel

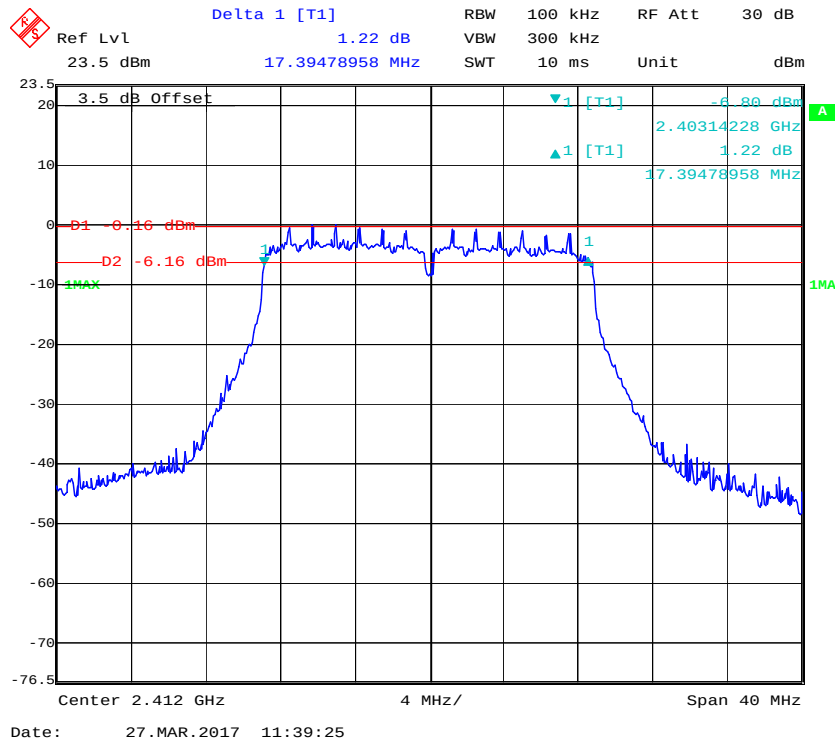




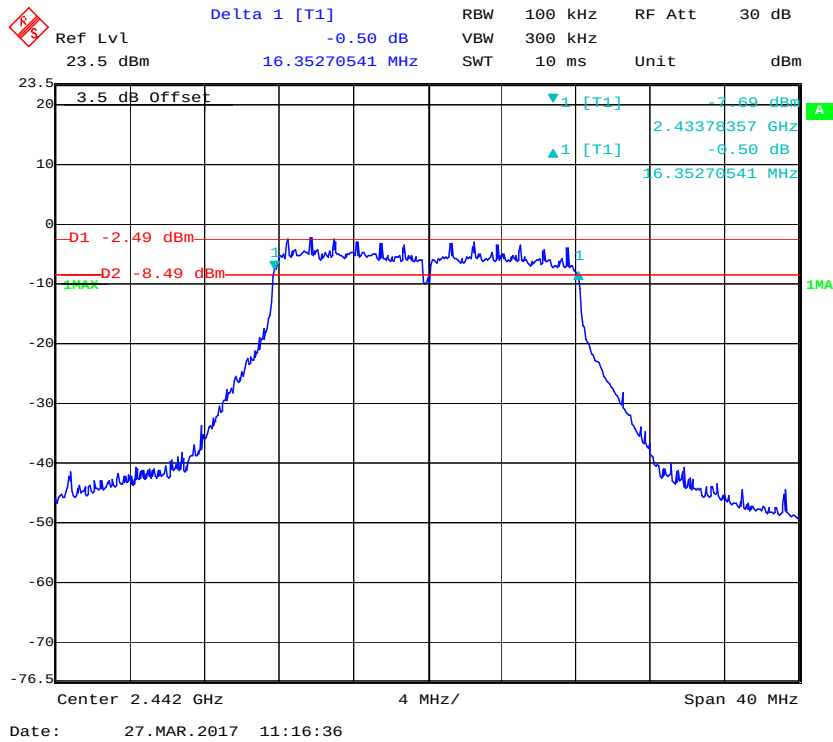
### 802.11b High Channel



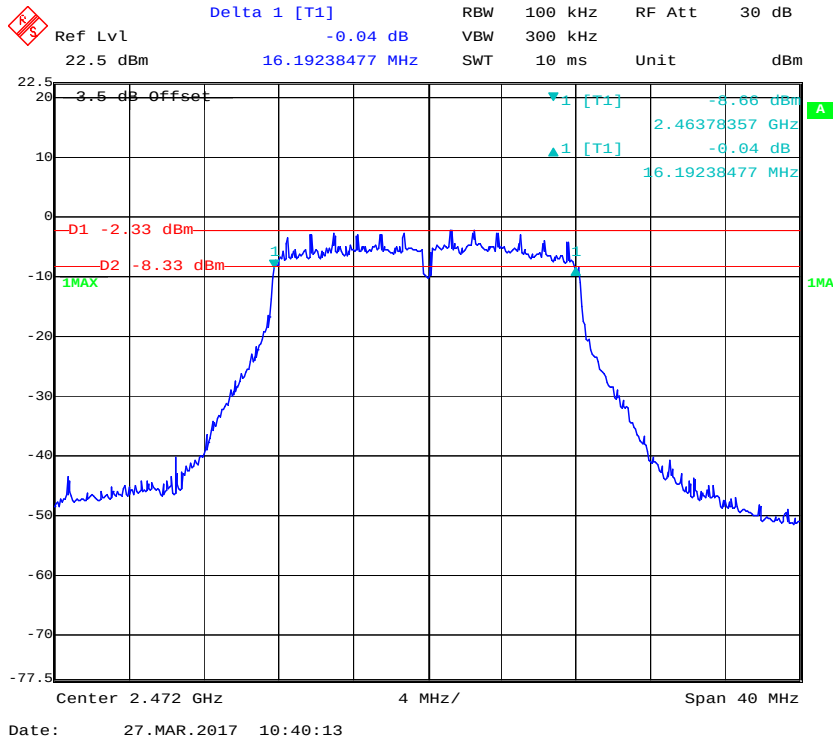
### 802.11g Low Channel



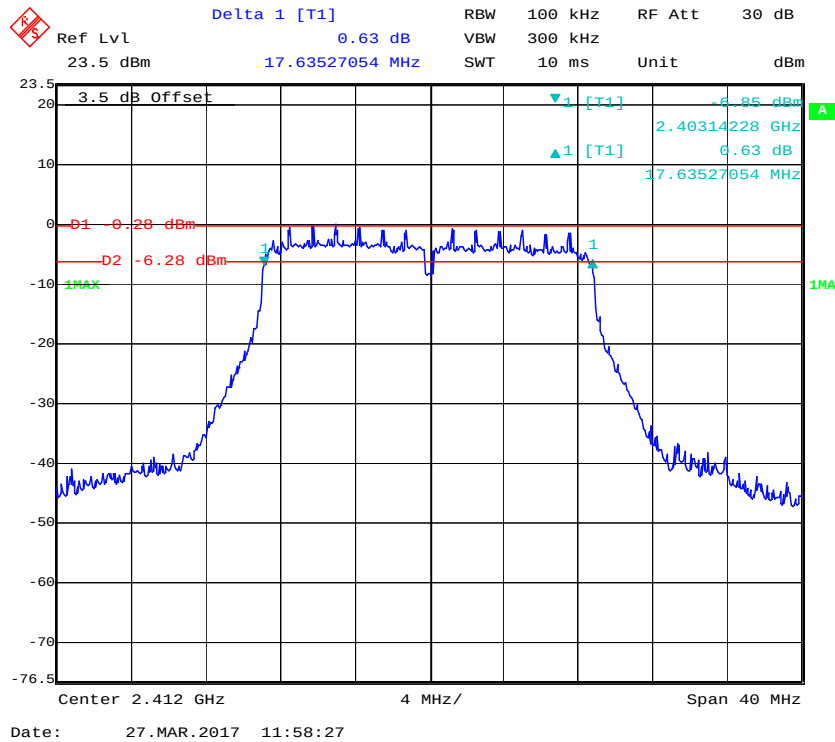
### 802.11g Middle Channel



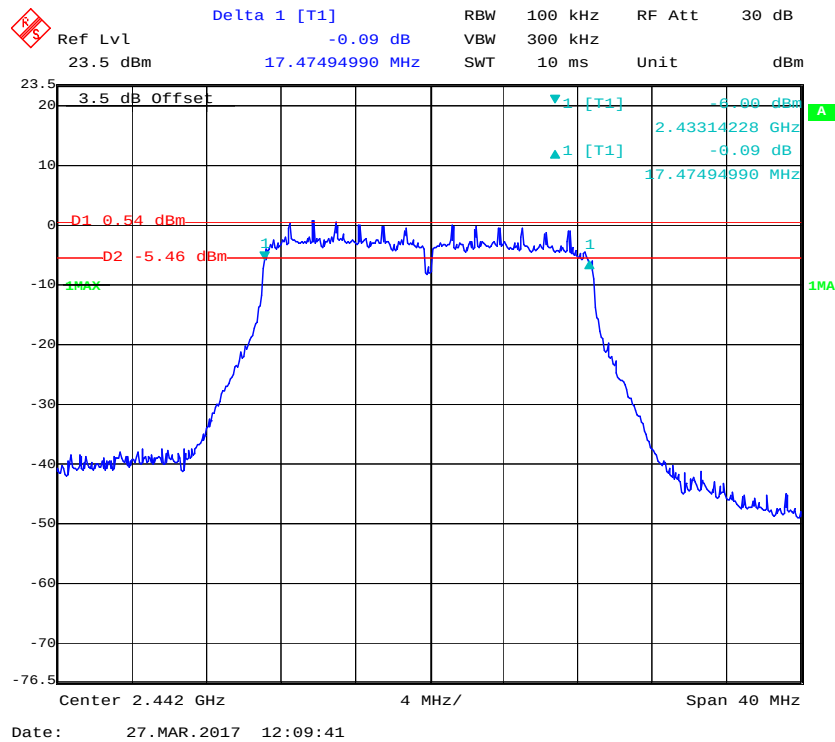
### 802.11g High Channel



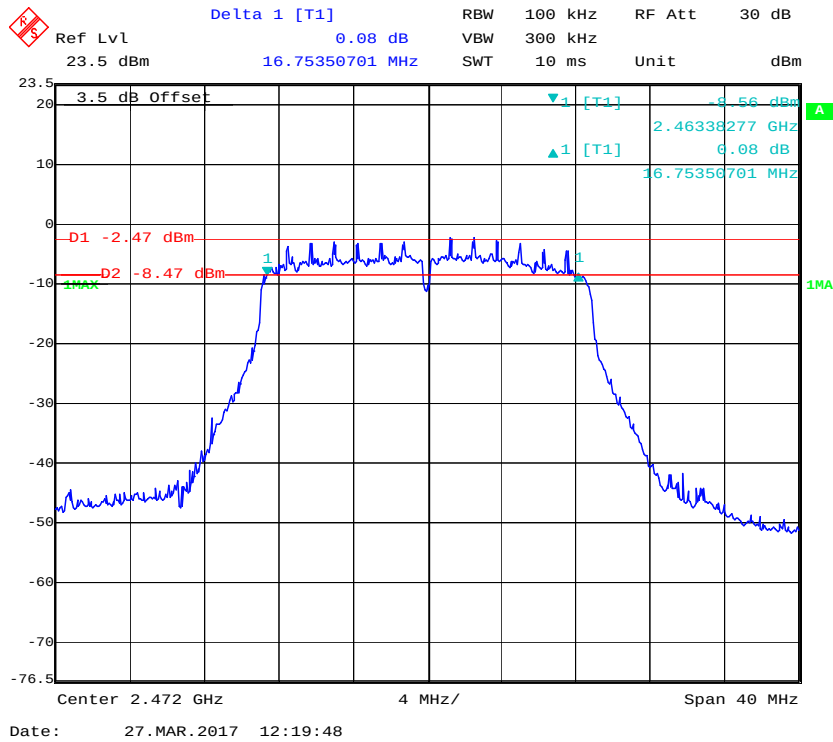
### 802.11n-HT20 Low Channel



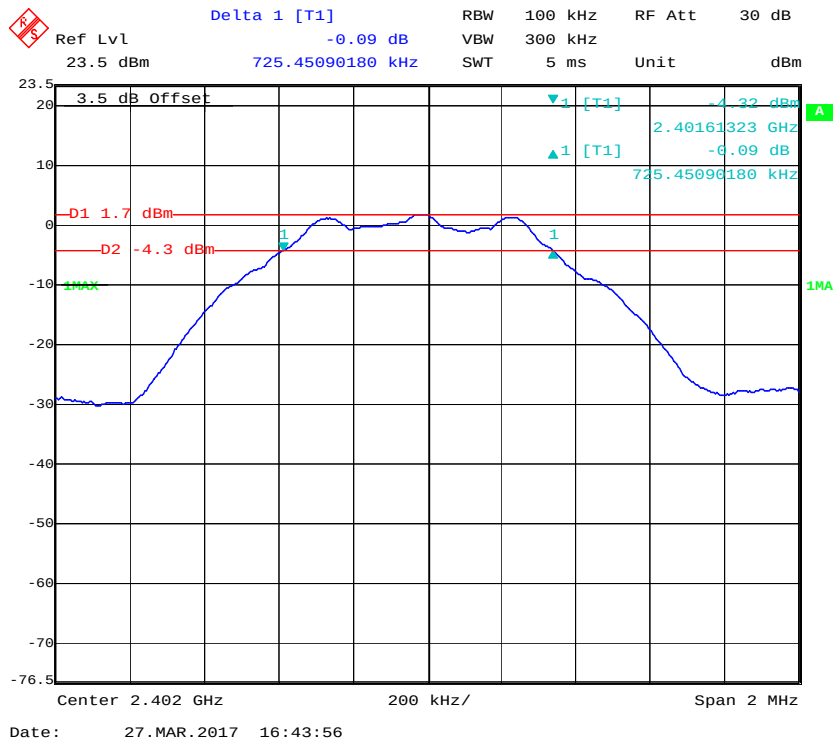
### 802.11n-HT20 Middle Channel



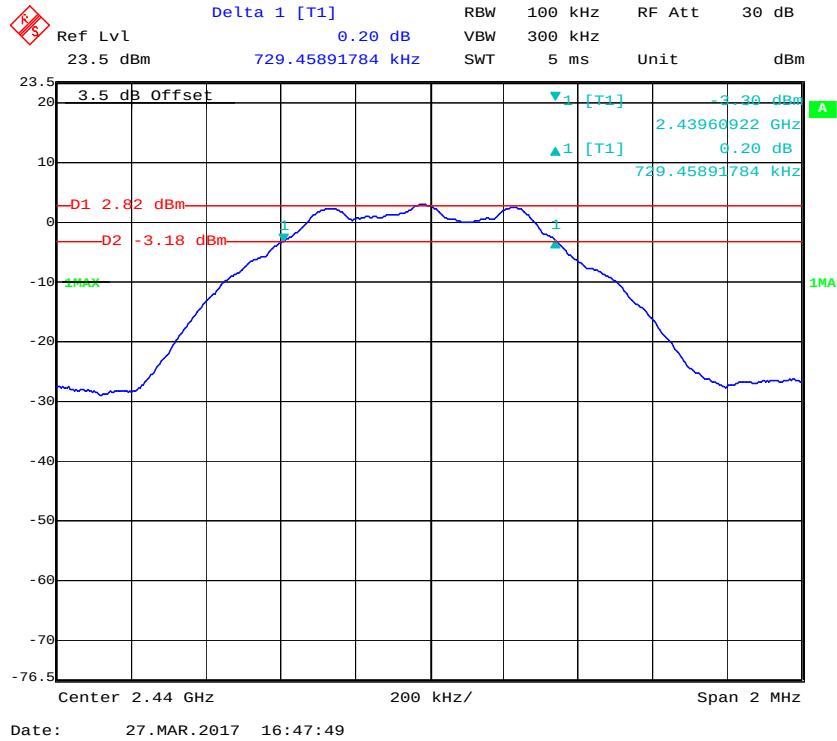
## 802.11n-HT20 High Channel



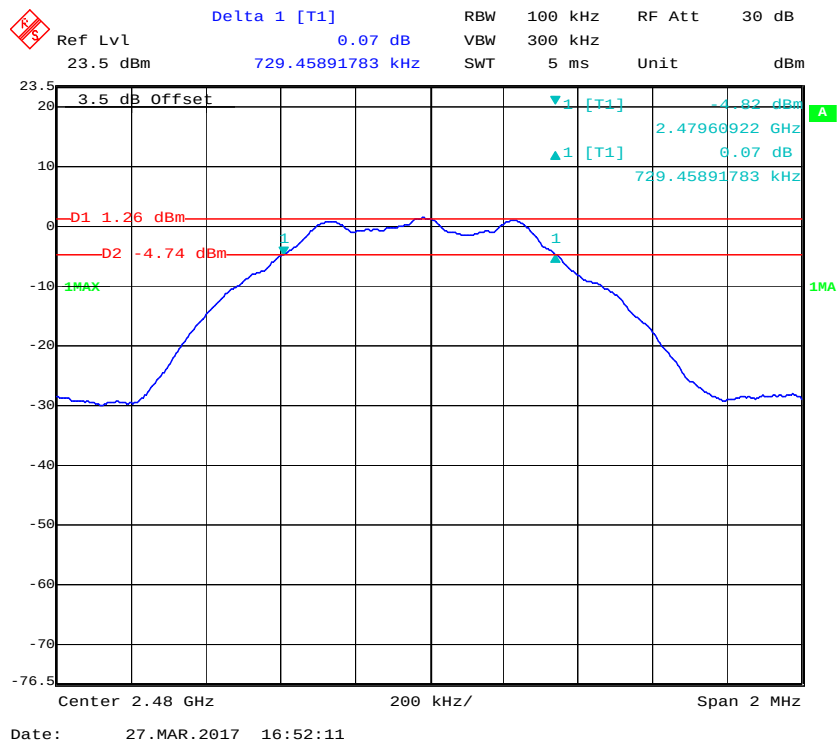
## BLE Low Channel



### BLE Middle Channel



### BLE High Channel



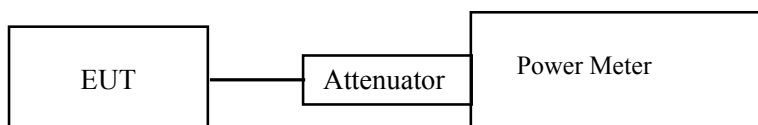
## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### 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. Connected EUT to the power sensor with a low loss RF cable, Add a correction factor to the power meter.
3. Set power meter detector to peak and record the value for Peak Output Power, Set power meter detector to Average and record the value for Average Output Power.
4. Repeated 3 until this measurement was finished.



### Test Data

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 24 °C     |
| Relative Humidity: | 55 %      |
| ATM Pressure:      | 101.0 kPa |

*The testing was performed by Phil Zhu on 2017-03-27.*

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

*EUT operation mode: Transmitting*

**Wi-Fi mode**

| Channel      | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Max Conducted Average Output Power (dBm) | Limit (dBm) |
|--------------|-----------------|---------------------------------------|------------------------------------------|-------------|
| 802.11b      |                 |                                       |                                          |             |
| Low          | 2412            | 13.55                                 | 10.53                                    | 30          |
| Middle       | 2442            | 14.26                                 | 11.22                                    | 30          |
| High         | 2472            | 11.57                                 | 8.70                                     | 30          |
| 802.11g      |                 |                                       |                                          |             |
| Low          | 2412            | 18.48                                 | 11.26                                    | 30          |
| Middle       | 2442            | 16.05                                 | 9.05                                     | 30          |
| High         | 2472            | 16.25                                 | 9.27                                     | 30          |
| 802.11n HT20 |                 |                                       |                                          |             |
| Low          | 2412            | 18.23                                 | 11.20                                    | 30          |
| Middle       | 2442            | 18.77                                 | 11.70                                    | 30          |
| High         | 2472            | 16.37                                 | 9.09                                     | 30          |

**BLE mode**

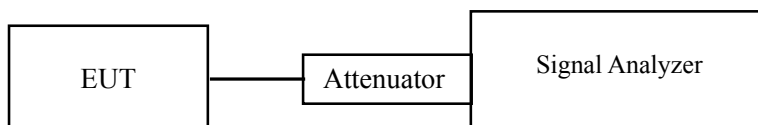
| Channel | Frequency (MHz) | Max Peak Output Power (dBm) | Limit (dBm) | Result |
|---------|-----------------|-----------------------------|-------------|--------|
| Low     | 2402            | 1.87                        | 30          | Pass   |
| Middle  | 2440            | 2.92                        | 30          | Pass   |
| High    | 2480            | 1.34                        | 30          | Pass   |

**FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE****Applicable Standard**

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 Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 24 °C     |
| <b>Relative Humidity:</b> | 55 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

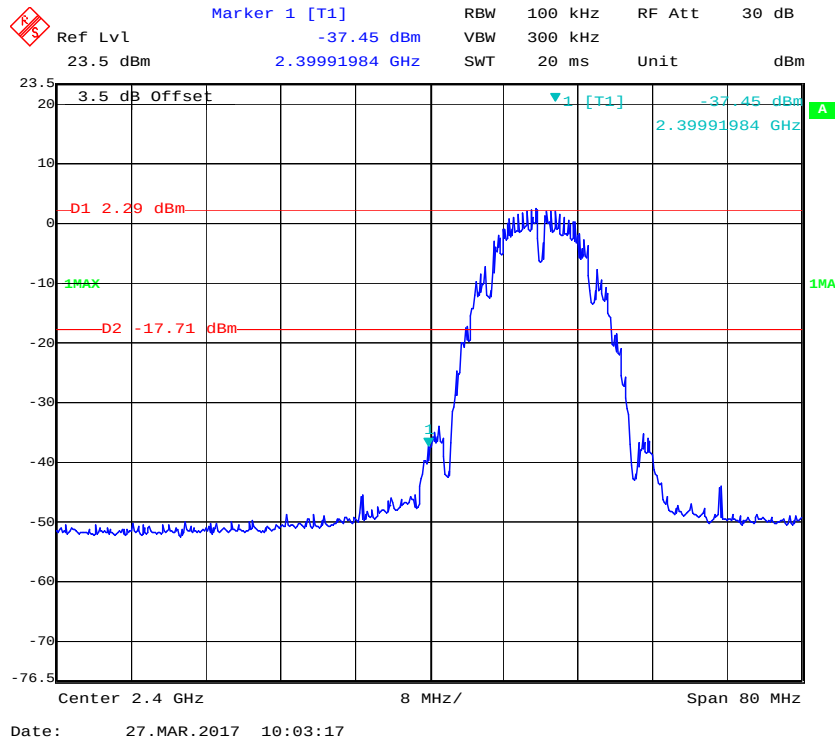
*The testing was performed by Phil Zhu on 2017-03-27.*

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

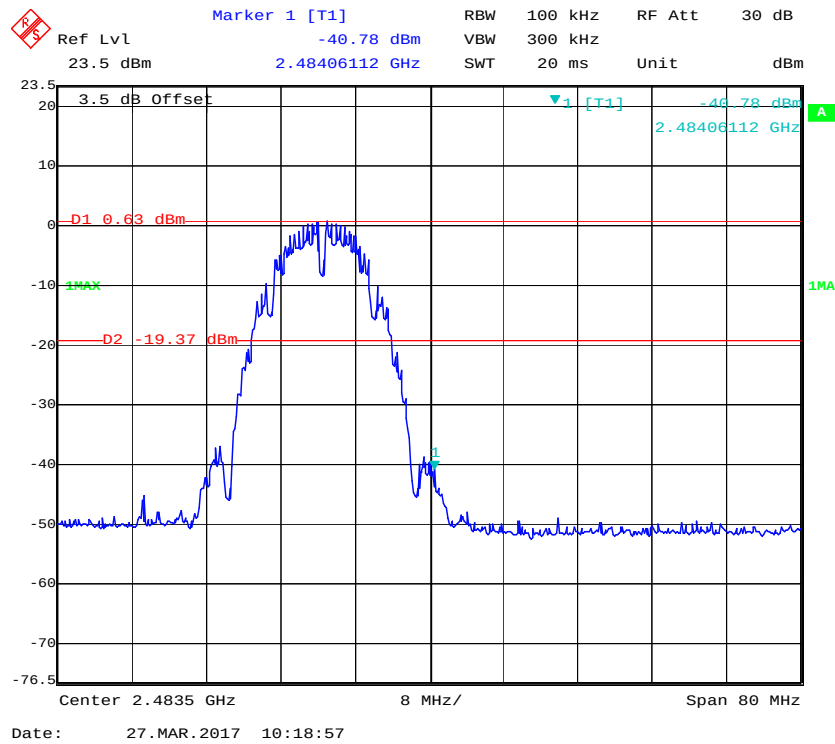
*EUT operation mode: Transmitting*



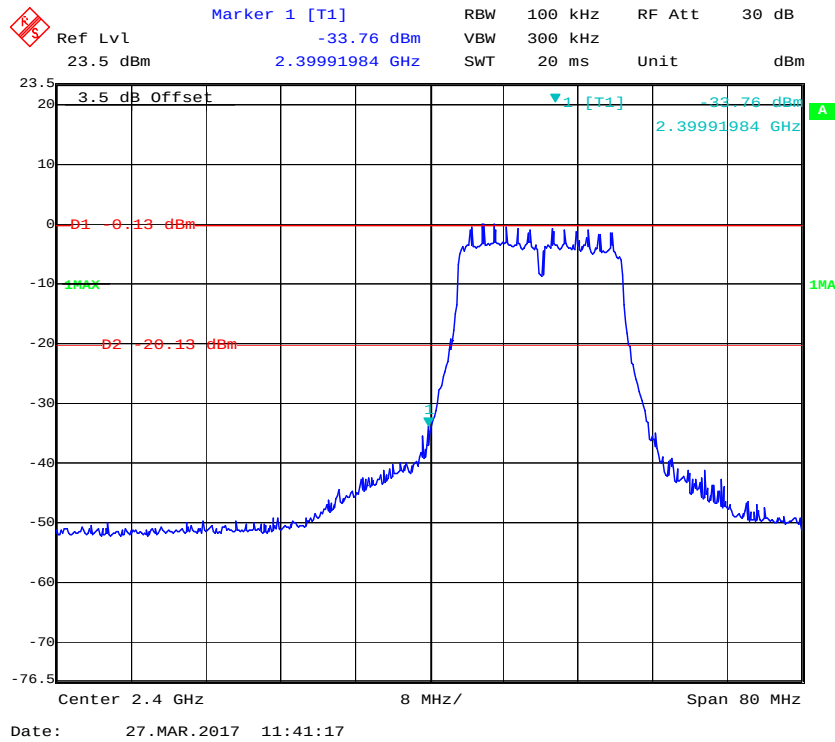
### 802.11b: Band Edge, Left Side



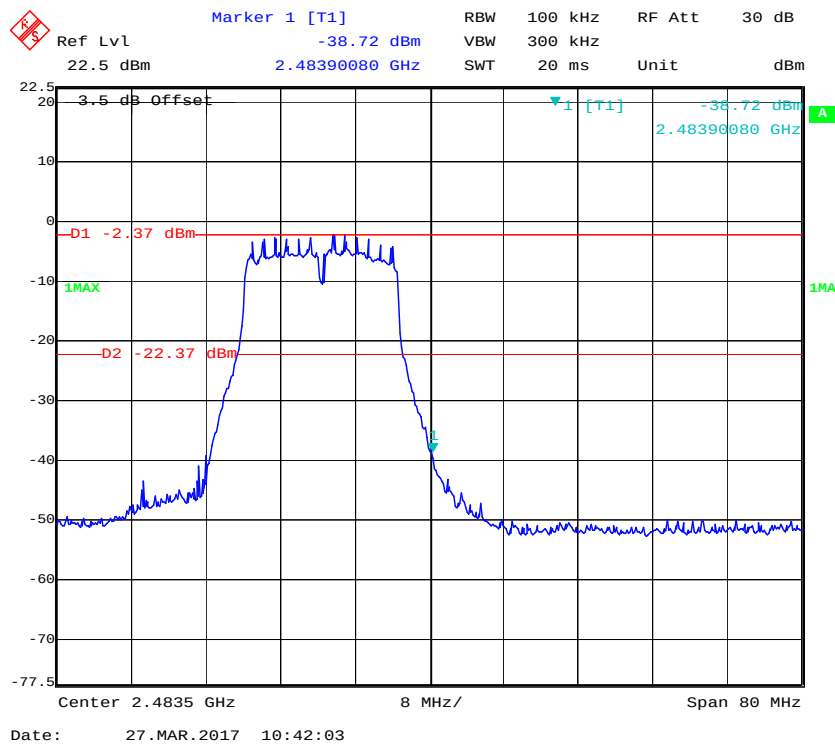
### 802.11b: Band Edge, Right Side



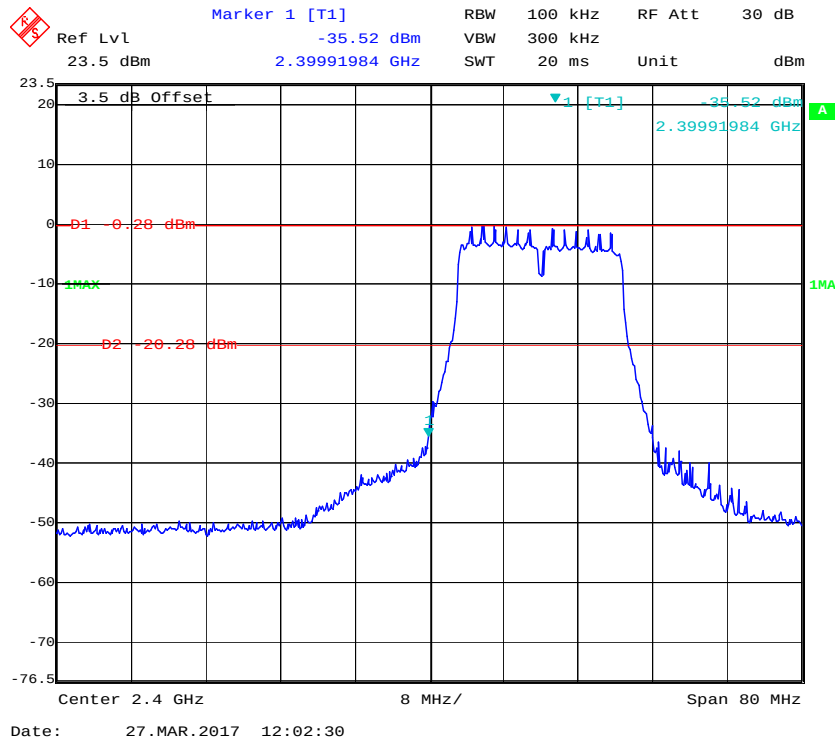
### 802.11g: Band Edge, Left Side



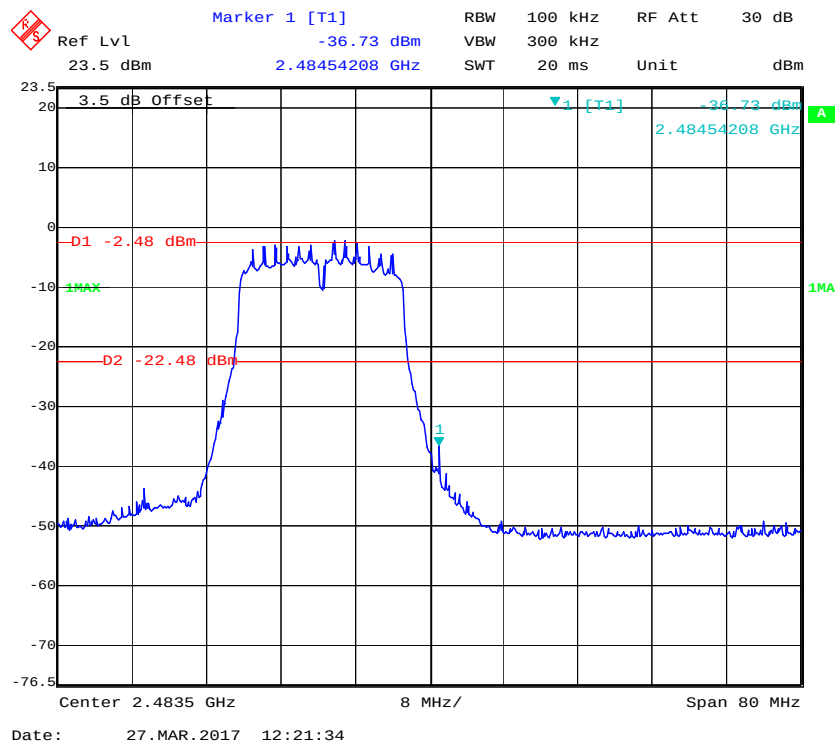
### 802.11g: Band Edge, Right Side



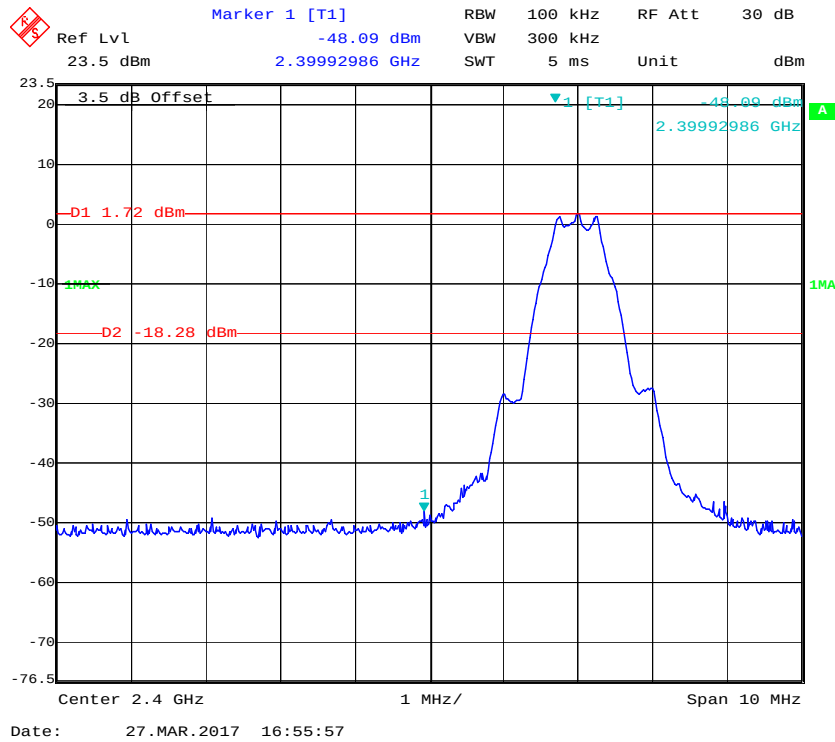
### 802.11n-HT20: Band Edge, Left Side



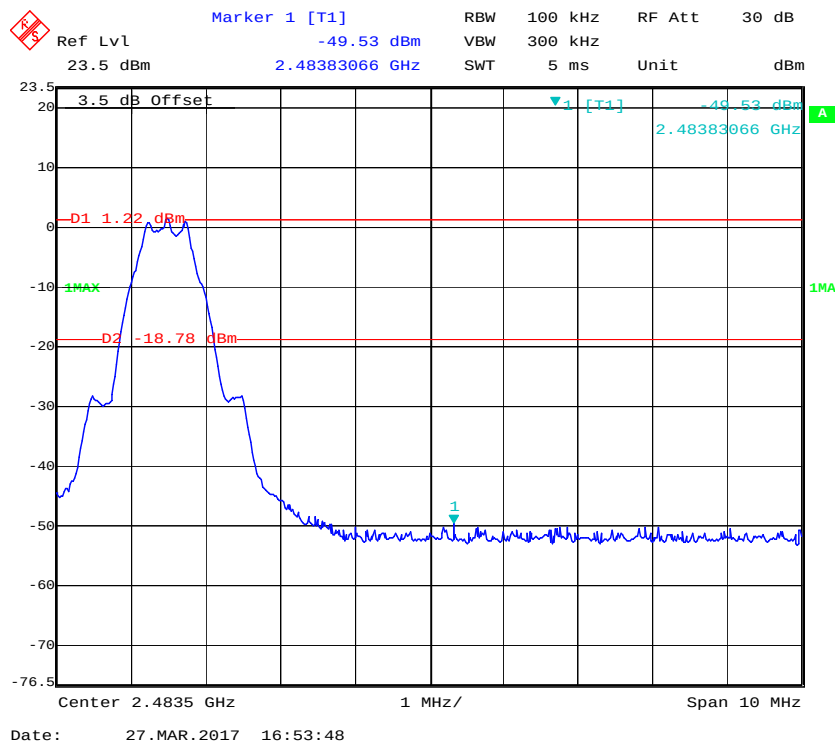
### 802.11n-HT20: Band Edge, Right Side



### BLE: Band Edge, Left Side



### BLE: Band Edge, Right Side



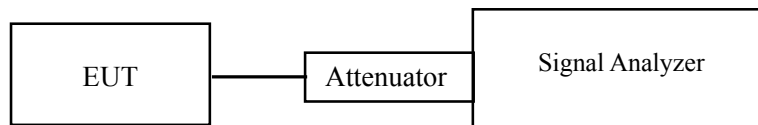
## FCC §15.247(e) - POWER SPECTRAL DENSITY

### 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. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to:  $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
3. Set the VBW  $\geq 3 \times \text{RBW}$ .
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



### Test Data

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 24 °C     |
| Relative Humidity: | 55 %      |
| ATM Pressure:      | 101.0 kPa |

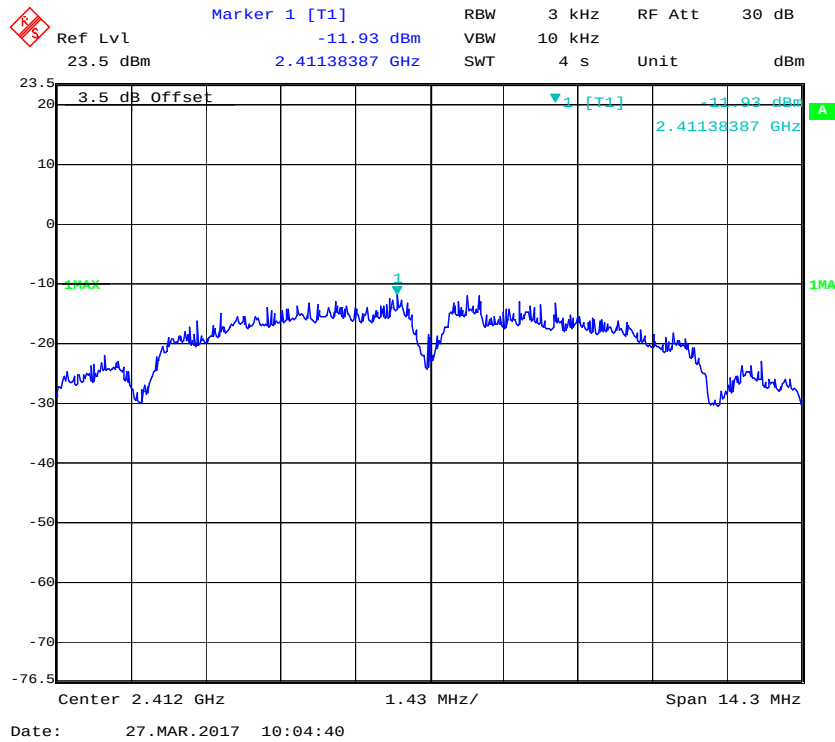
*The testing was performed by Phil Zhu on 2017-03-27.*

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

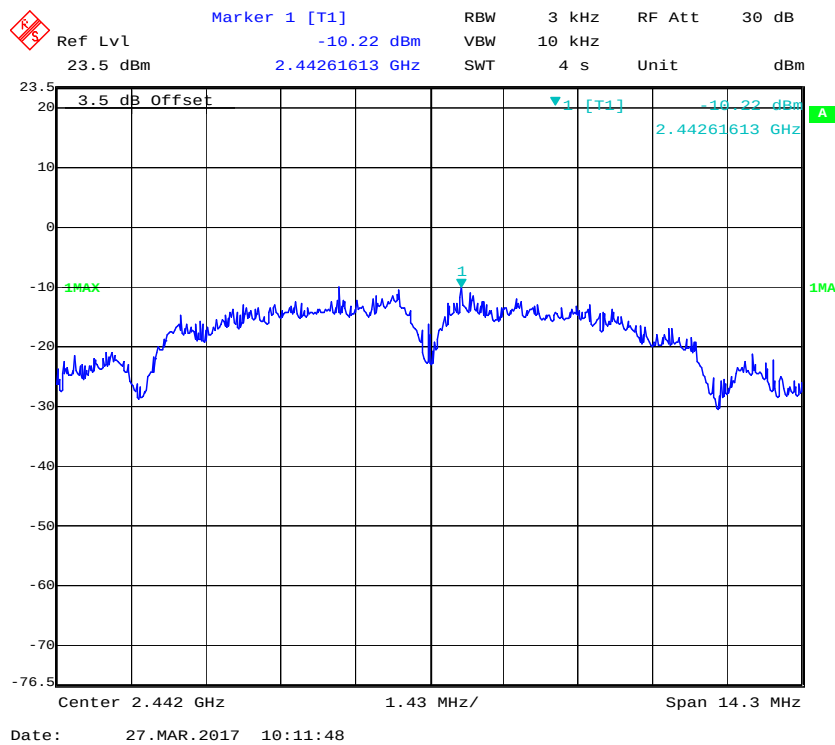
*EUT operation mode: Transmitting*

| Channel           | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) |
|-------------------|-----------------|----------------|------------------|
| 802.11b mode      |                 |                |                  |
| Low               | 2412            | -11.93         | $\leq 8$         |
| Middle            | 2442            | -10.22         | $\leq 8$         |
| High              | 2472            | -13.77         | $\leq 8$         |
| 802.11g mode      |                 |                |                  |
| Low               | 2412            | -14.81         | $\leq 8$         |
| Middle            | 2442            | -17.01         | $\leq 8$         |
| High              | 2472            | -17.07         | $\leq 8$         |
| 802.11n-HT20 mode |                 |                |                  |
| Low               | 2412            | -15.36         | $\leq 8$         |
| Middle            | 2442            | -14.18         | $\leq 8$         |
| High              | 2472            | -17.34         | $\leq 8$         |
| BLE mode          |                 |                |                  |
| Low               | 2402            | -13.93         | $\leq 8$         |
| Middle            | 2440            | -12.79         | $\leq 8$         |
| High              | 2480            | -14.40         | $\leq 8$         |

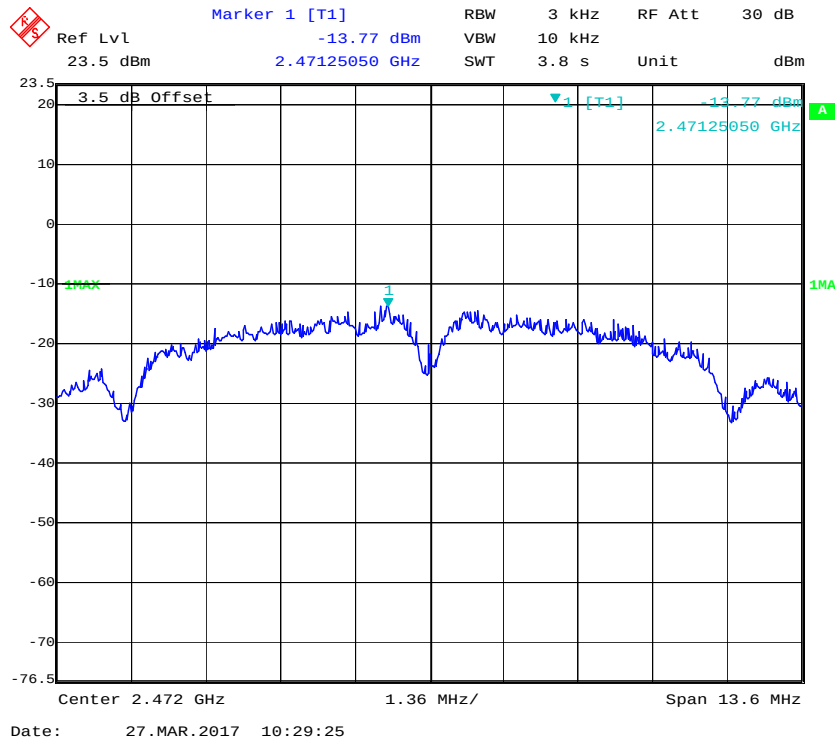
### Power Spectral Density, 802.11b Low Channel



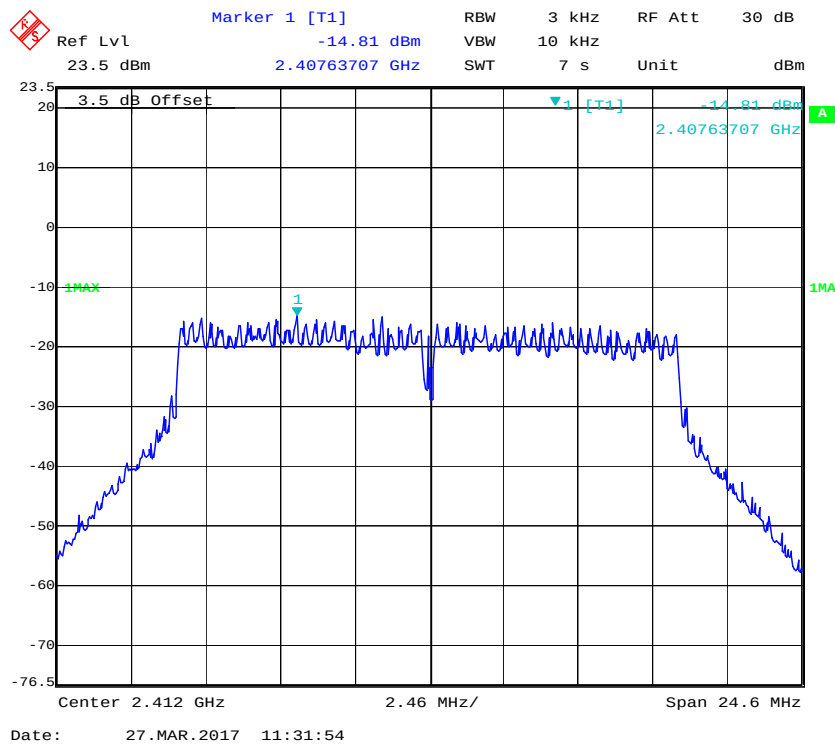
### Power Spectral Density, 802.11b Middle Channel



### Power Spectral Density, 802.11b High Channel

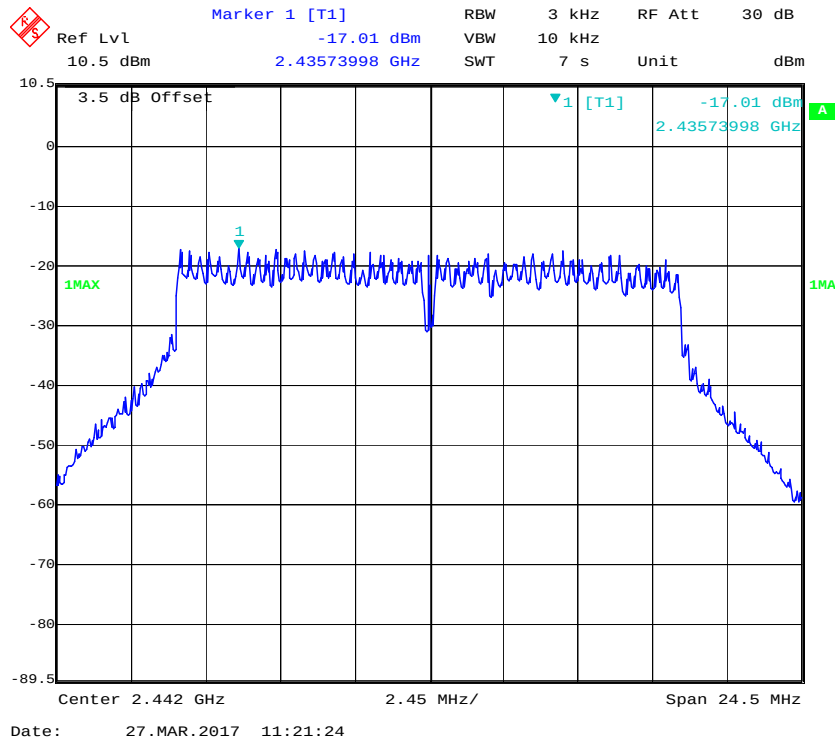


### Power Spectral Density, 802.11g Low Channel

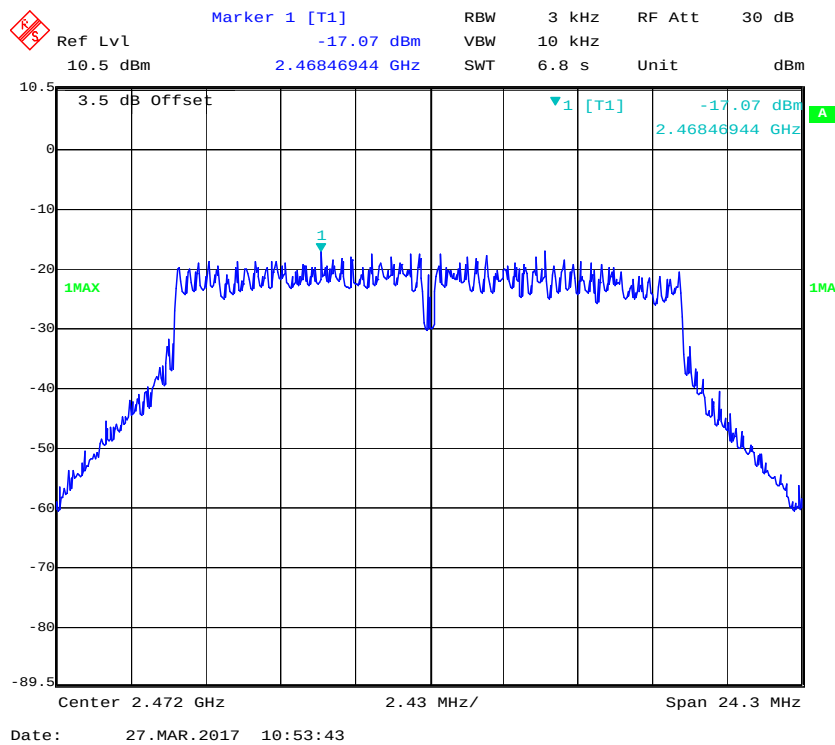




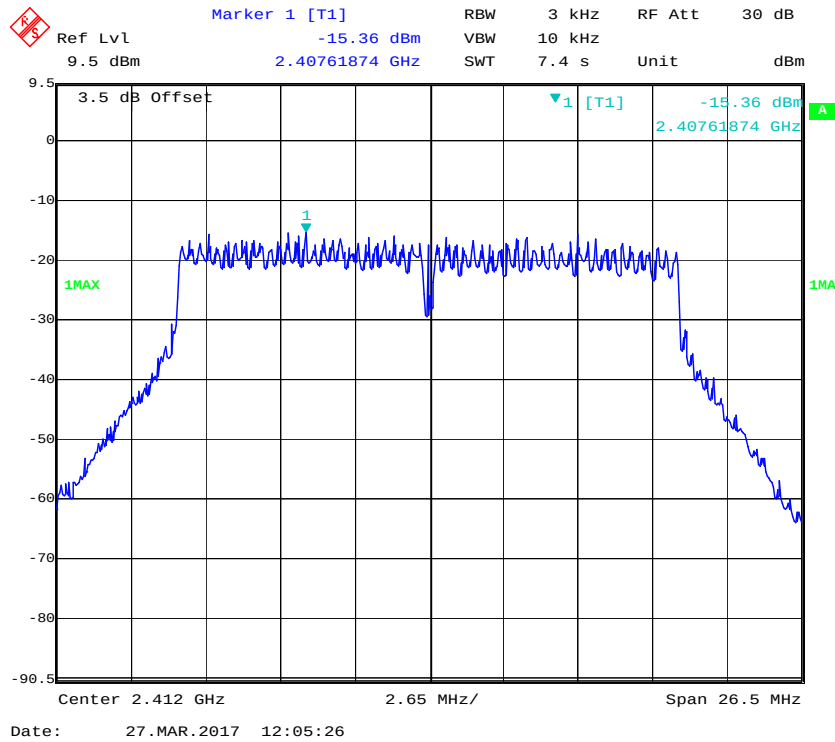
### Power Spectral Density, 802.11g Middle Channel



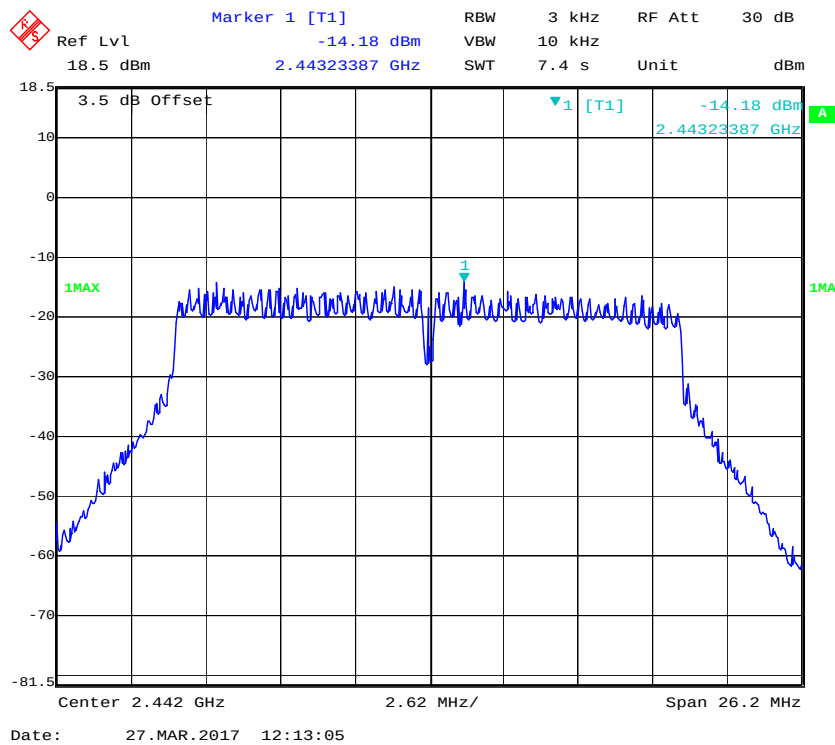
### Power Spectral Density, 802.11g High Channel



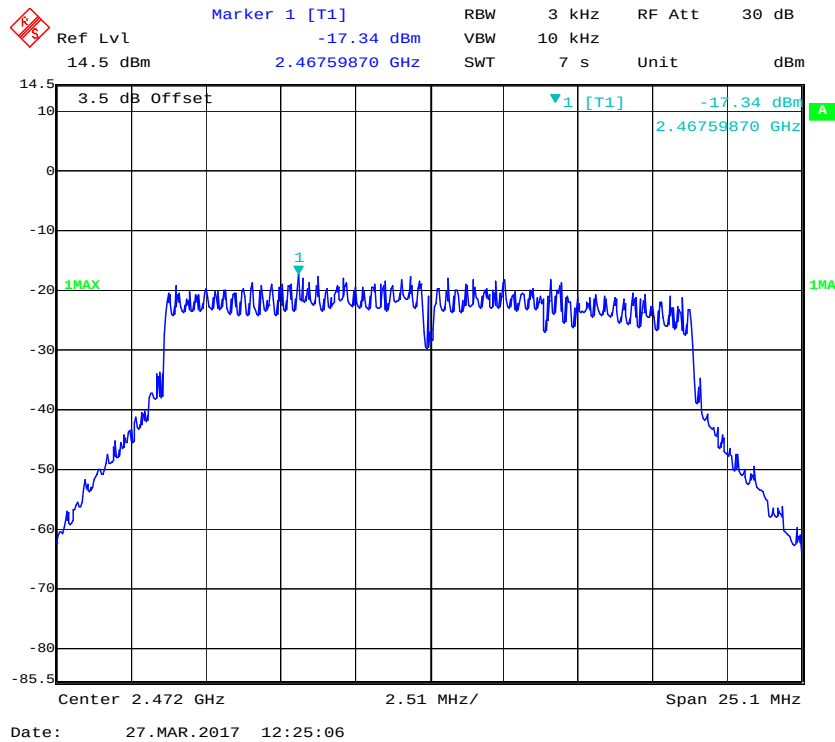
### Power Spectral Density, 802.11n-HT20 Low Channel



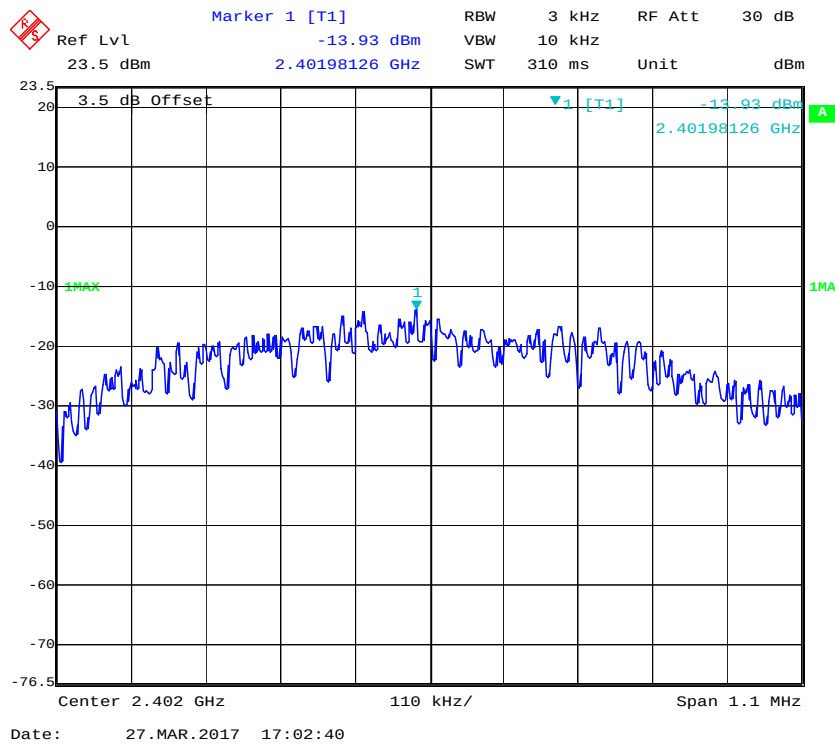
### Power Spectral Density, 802.11n-HT20 Middle Channel



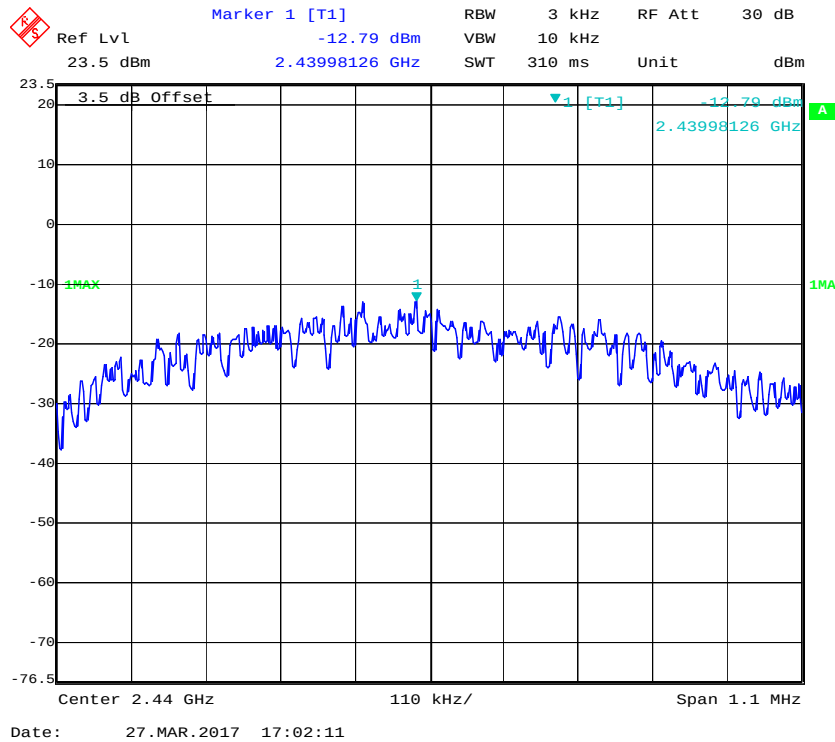
### Power Spectral Density, 802.11n-HT20 High Channel



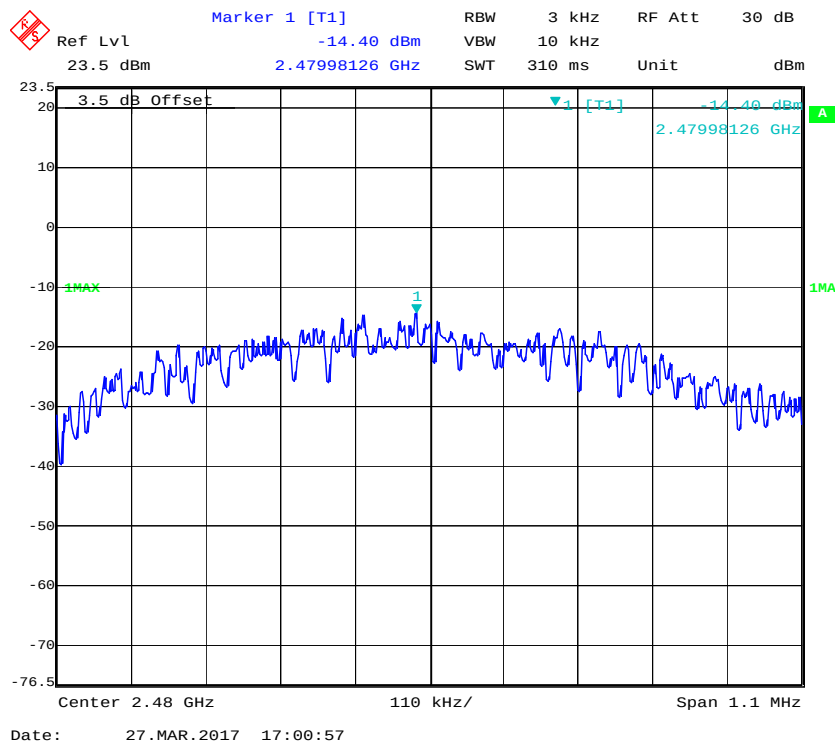
### Power Spectral Density, BLE Low Channel



### Power Spectral Density, BLE Middle Channel



### Power Spectral Density, BLE High Channel



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