



## FCC PART 15.407

## TEST REPORT

For

### SZ DJI TECHNOLOGY CO., LTD

14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave,  
Nanshan, Shenzhen, Guangdong, China

**FCC ID: SS3-MM1A1702**

|                                                     |                                                                                                                                                                                                           |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report              | <b>Product Name:</b><br>Spark                                                                                                                                                                             |
| <b>Test Engineer:</b> <u>Kevin Hu</u>               | <i>Kevin Hu</i>                                                                                                                                                                                           |
| <b>Report Number:</b> <u>RDG170226002C</u>          |                                                                                                                                                                                                           |
| <b>Report Date:</b> <u>2017-03-22</u>               |                                                                                                                                                                                                           |
| <b>Reviewed By:</b> <u>Henry Ding</u><br>EMC Leader | <i>Henry Ding</i>                                                                                                                                                                                         |
| <b>Test Laboratory:</b>                             | Bay Area Compliance Laboratories Corp. (Chengdu)<br>No.5040, Huilongwan Plaza, No.1, Shawan Road,<br>Jinniu District, Chengdu, Sichuan, China<br>Tel: 028-65523123, Fax: 028-65525125<br>www.baclcorp.com |

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## GENERAL INFORMATION

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

The **SZ DJI TECHNOLOGY CO., LTD**'s product, model number: **MM1A (FCC ID: SS3-MM1A1702)** (the "EUT") in this report was a **Spark**, which was measured approximately: 14.3 cm (L) × 14.3 cm (W) × 5.3 cm (H), rated input voltage: DC11.4V from battery or DC5V charging from adapter.

Adapter information:

MODEL: QC18-EU

INPUT: 100-240V~50/60HZ, 0.5A

OUTPUT: DC5V, 3A/DC9V, 2A/DC12V, 1.5A

*\*All measurement and test data in this report was gathered from final production sample, serial number: 170226002 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-02-26, and EUT conformed to test requirement.*

### Objective

This type approval report is prepared on behalf of **SZ DJI TECHNOLOGY CO., LTD** in accordance with Part 2-Subpart J, Part 15-Subparts A, and E of the Federal Communications Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

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

FCC Part 15B JBP submissions with FCC ID: SS3-MM1A1702.

FCC Part 15C DTS submissions with FCC ID: SS3-MM1A1702.

Part of system submissions with FCC ID: SS3-GL100A1704.

### 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 and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

| Parameter                         | Measurement Uncertainty                                                                                                                            |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Occupied Channel Bandwidth        | ±5 %                                                                                                                                               |
| RF output power, conducted        | ±0.62dB                                                                                                                                            |
| Power Spectral Density, conducted | ±0.62 dB                                                                                                                                           |
| Unwanted Emissions, radiated      | 30M~200MHz: 4.7 dB for Horizontal, 4.7 dB for Vertical<br>200M~1GHz:6.0 dB for Horizontal, 6.0 for Vertical<br>1G~6GHz: 5.13 dB, 6G~18GHz: 5.47 dB |
| Temperature                       | ±1℃                                                                                                                                                |
| Humidity                          | ±5%                                                                                                                                                |
| DC and low frequency voltages     | ±0.4%                                                                                                                                              |
| Duty Cycle                        | 1%                                                                                                                                                 |
| AC Power Lines Conducted Emission | 3.17 dB (150 kHz to 30 MHz)                                                                                                                        |

## Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.:560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

For 5725~5850MHz band, 802.11a and n ht20 modes, 5 channels are provided for testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 149     | 5745            | 161     | 5805            |
| 153     | 5765            | 165     | 5825            |
| 157     | 5785            | /       | /               |

Channel 149, 157 and 165 were tested.

For 5 MHz modes, 17 channels are provided for testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 1       | 5745            | 7       | 5775            | 13      | 5805            |
| 2       | 5750            | 8       | 5780            | 14      | 5810            |
| 3       | 5755            | 9       | 5785            | 15      | 5815            |
| 4       | 5760            | 10      | 5790            | 16      | 5820            |
| 5       | 5765            | 11      | 5795            | 17      | 5825            |
| 6       | 5770            | 12      | 5800            | /       | /               |

Channel 1, 9 and 17 were tested.

### EUT Exercise Software

The software "DJI-RF Certification" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

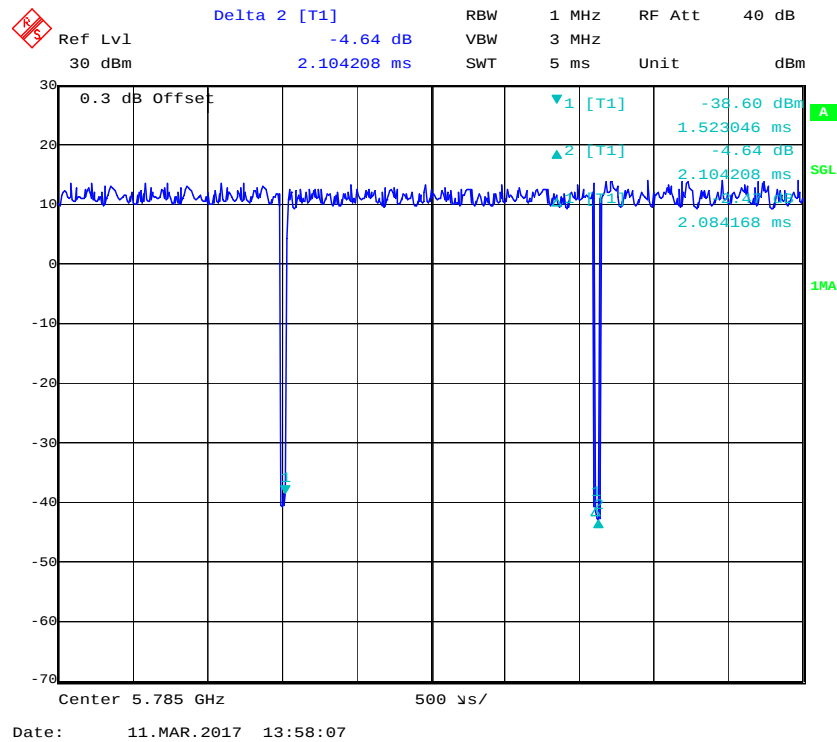
For 802.11a/n ht20 and 5M modes, the maximum power was as below setting, the power setting was provided by the manufacturer:

| Test Mode    | Antenna 0&1           |                      |         |         |
|--------------|-----------------------|----------------------|---------|---------|
|              | Test Software Version | DJI-RF Certification |         |         |
| 802.11a      | Test Frequency(MHz)   | 5745MHz              | 5785MHz | 5825MHz |
|              | Data Rate             | 6Mbps                | 6Mbps   | 6Mbps   |
|              | Power Level Setting   | 27                   | 27      | 27      |
| 802.11n ht20 | Test Frequency(MHz)   | 5745MHz              | 5785MHz | 5825MHz |
|              | Data Rate             | MCS0                 | MCS0    | MCS0    |
|              | Power Level Setting   | 27                   | 27      | 27      |
| 5M           | Test Frequency(MHz)   | 5745MHz              | 5785MHz | 5825MHz |
|              | Power Level Setting   | 25                   | 25      | 25      |

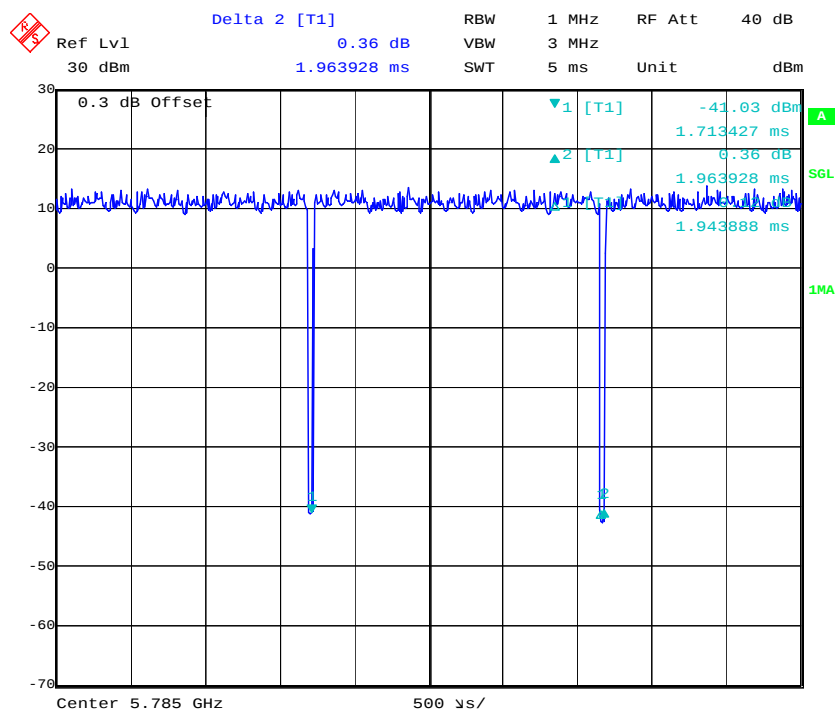
The software configured maximum duty cycle as below:

| Mode         | T <sub>on</sub><br>(ms) | T <sub>on+off</sub><br>(ms) | Duty Cycle<br>(%) | Duty Cycle Factor<br>(10*log(1/x))<br>(dB) |
|--------------|-------------------------|-----------------------------|-------------------|--------------------------------------------|
| 802.11a      | 2.084                   | 2.104                       | 99                | /                                          |
| 802.11n ht20 | 1.944                   | 1.964                       | 99                | /                                          |
| 5M           | 1.022                   | 1.743                       | 59                | 2.32                                       |

### 802.11a mode

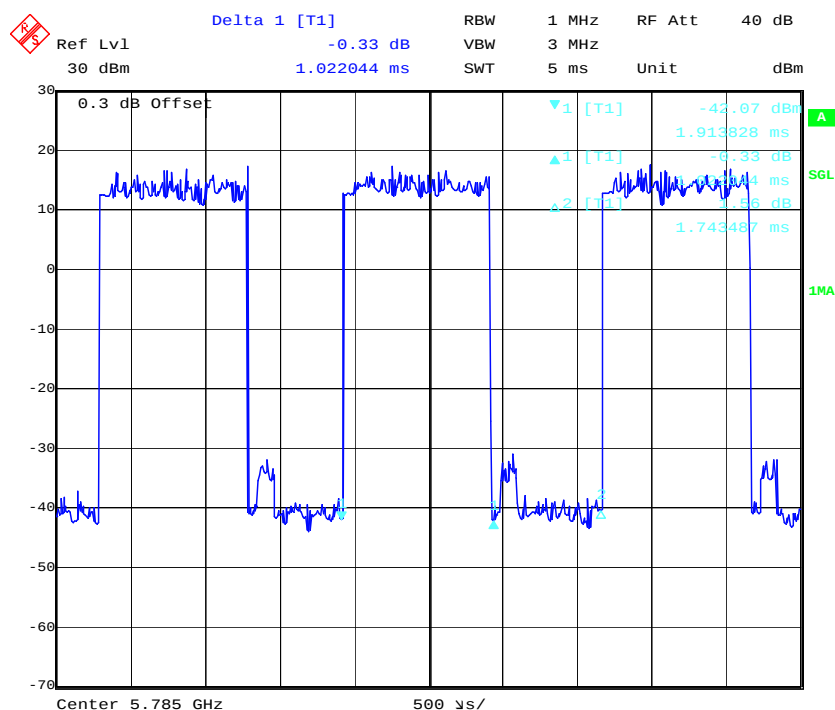


### 802.11n ht20 mode



Date: 11.MAR.2017 13:57:20

### 5M mode



Date: 21.MAR.2017 22:10:12

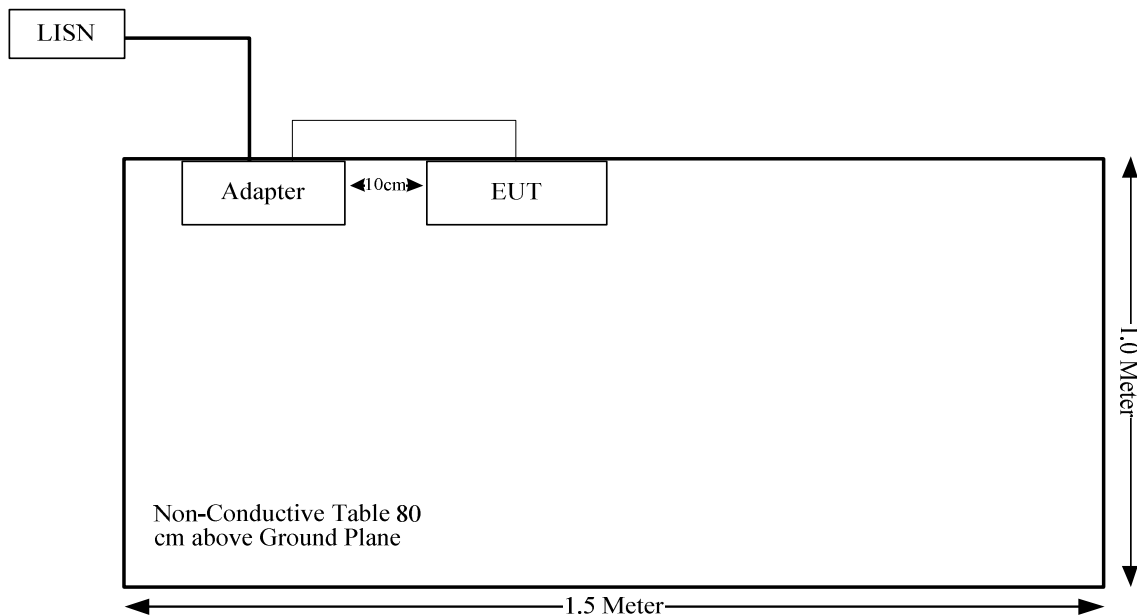
### Equipment Modifications

No modification was made to the EUT.

### External Cable

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port           | To  |
|-------------------|----------------|--------------|------------|---------------------|-----|
| USB Cable         | yes            | no           | 0.8        | USB port of Adapter | EUT |

### Block Diagram of Test Setup



## **SUMMARY OF TEST RESULTS**

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| <b>FCC Rules</b>                       | <b>Description of Test</b>         | <b>Result</b> |
|----------------------------------------|------------------------------------|---------------|
| FCC §15.407 (f) & §1.1310<br>& §2.1091 | Maximum Permissible Exposure (MPE) | Compliance    |
| §15.203                                | Antenna Requirement                | Compliance    |
| §15.407(b)(6)& §15.207(a)              | Conducted Emissions                | Compliance    |
| §15.205& §15.209<br>&§15.407(b)        | Unwanted Emission                  | Compliance    |
| §15.407(b)                             | Out Of Band Emissions              | Compliance    |
| §15.407(a)                             | Emission Bandwidth                 | Compliance    |
| §15.407(g)                             | Frequency stability                | Compliance    |
| §15.407(a)                             | Maximum Conducted Output Power     | Compliance    |
| §15.407 (a)                            | Power Spectral Density             | Compliance    |

## FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

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

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

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

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

According to §1.1310 and §2.1091 RF exposure is calculated.

### Calculated Formula:

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**Calculated Data:**

| Frequency<br>(MHz) | Antenna Gain |           | Tune-up Power |        | Evaluation Distance<br>(cm) | Power Density<br>(mW/cm <sup>2</sup> ) | MPE Limit<br>(mW/cm <sup>2</sup> ) |
|--------------------|--------------|-----------|---------------|--------|-----------------------------|----------------------------------------|------------------------------------|
|                    | (dBi)        | (numeric) | (dBm)         | (mW)   |                             |                                        |                                    |
| 2400-2483.5        | 1.09         | 1.29      | 25            | 316.23 | 20.00                       | 0.0809                                 | 1.0                                |
| 5725-5850          | 3.57         | 2.28      | 23            | 199.53 | 20.00                       | 0.0904                                 | 1.0                                |

The 2.4GHz and 5GHz band can't transmit simultaneously:

**Result:** The device meet FCC MPE at 20 cm distance

## **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 use of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.407 (a)(1), if transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT have two internal antennas. For both antennas, the Maximum gains are 1.09dBi in 2.4GHz band, 3.57dBi in 5.8GHz band, compliance the requirements, Please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207(a), §15.407(b) (6).

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 1, then:

–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;  
 –non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 1, then:

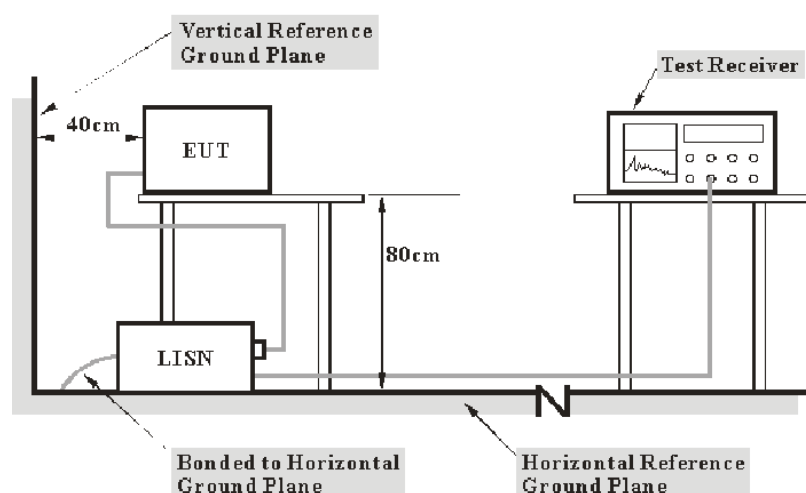
–compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;  
 –non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is  $\pm 3.17$  dB (150 kHz to 30 MHz).

Table 1 – Values of  $U_{cispr}$

| Measurement                                                       | $U_{cispr}$ |
|-------------------------------------------------------------------|-------------|
| Conducted disturbance at mains port using AMN (150 kHz to 30 MHz) | 3.4 dB      |

### 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.

The adapter was connected to the Main LISN with AC 120 V/60 Hz power

### 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  |

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

$V_C$  (cord. Reading): corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN

$C_f$ : Correction Factor

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

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

## Test Equipment List and Details

| Manufacturer    | Description       | Model   | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|---------|---------------|------------------|----------------------|
| Rohde & Schwarz | EMI Test Receiver | ESCS 30 | 836858/0016   | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | L.I.S.N.          | ENV216  | 100018        | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz | PULSE LIMITER     | ESH3Z2  | DE14781       | 2016-10-31       | 2017-10-30           |
| N/A             | Conducted Cable   | NO.5    | N/A           | 2016-11-10       | 2017-11-09           |
| R&S             | Test Software     | EMC32   | Version8.53.0 | N/A              | N/A                  |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Procedure

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

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

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

## Test Results Summary

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

## Test Data

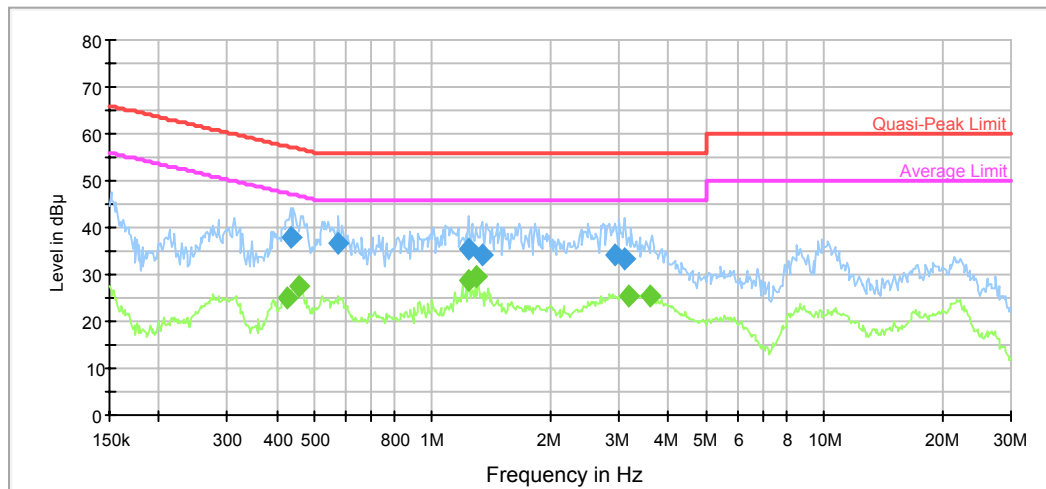
### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 19 °C    |
| Relative Humidity: | 56 %     |
| ATM Pressure:      | 95.6 kPa |

*The testing was performed by Kevin Hu on 2017-03-08.*

*Test Mode: Charging*

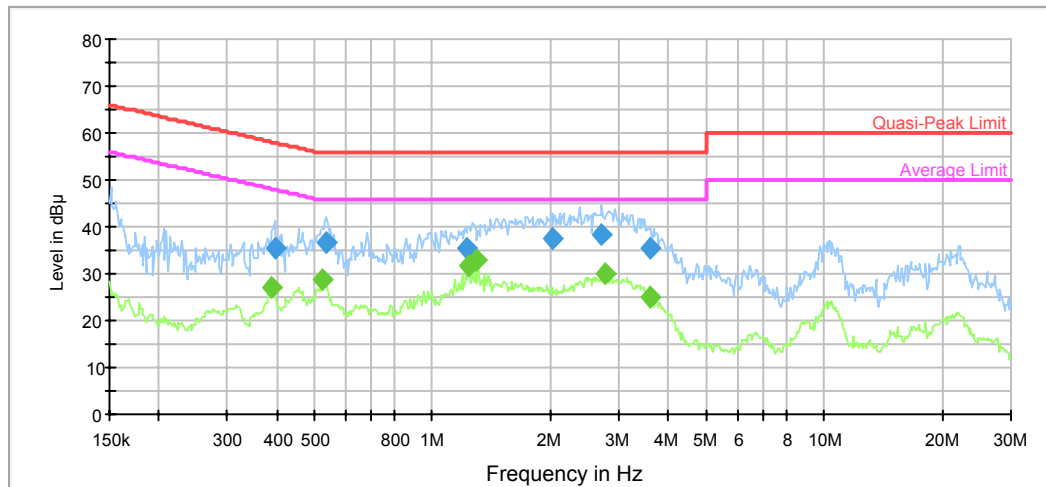
**AC120 V, 60 Hz, Line:**



| Frequency (MHz) | QuasiPeak (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.436318        | 37.9             | 9.000           | L1   | 19.7       | 19.2        | 57.1         | Compliance |
| 0.576662        | 36.5             | 9.000           | L1   | 19.8       | 19.5        | 56.0         | Compliance |
| 1.239175        | 35.4             | 9.000           | L1   | 19.7       | 20.6        | 56.0         | Compliance |
| 1.341955        | 34.2             | 9.000           | L1   | 19.7       | 21.8        | 56.0         | Compliance |
| 2.930016        | 34.0             | 9.000           | L1   | 19.7       | 22.0        | 56.0         | Compliance |
| 3.098088        | 33.5             | 9.000           | L1   | 19.7       | 22.5        | 56.0         | Compliance |

| Frequency (MHz) | Average (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|------------|
| 0.426011        | 24.9           | 9.000           | L1   | 19.7       | 22.4        | 47.3         | Compliance |
| 0.454052        | 27.5           | 9.000           | L1   | 19.7       | 19.3        | 46.8         | Compliance |
| 1.239175        | 28.8           | 9.000           | L1   | 19.7       | 17.2        | 46.0         | Compliance |
| 1.289541        | 29.6           | 9.000           | L1   | 19.7       | 16.4        | 46.0         | Compliance |
| 3.173039        | 25.4           | 9.000           | L1   | 19.7       | 20.6        | 46.0         | Compliance |
| 3.604490        | 25.3           | 9.000           | L1   | 19.7       | 20.7        | 46.0         | Compliance |

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



| Frequency (MHz) | QuasiPeak (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|------------------|-----------------|------|------------|-------------|--------------|------------|
| 0.396530        | 35.5             | 9.000           | N    | 19.6       | 22.4        | 57.9         | Compliance |
| 0.536756        | 36.5             | 9.000           | N    | 19.6       | 19.5        | 56.0         | Compliance |
| 1.229340        | 35.4             | 9.000           | N    | 19.6       | 20.6        | 56.0         | Compliance |
| 2.014768        | 37.6             | 9.000           | N    | 19.7       | 18.4        | 56.0         | Compliance |
| 2.705607        | 38.4             | 9.000           | N    | 19.7       | 17.6        | 56.0         | Compliance |
| 3.604490        | 35.3             | 9.000           | N    | 19.7       | 20.7        | 56.0         | Compliance |

| Frequency (MHz) | Average (dBμV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment    |
|-----------------|----------------|-----------------|------|------------|-------------|--------------|------------|
| 0.390261        | 27.2           | 9.000           | N    | 19.6       | 20.9        | 48.1         | Compliance |
| 0.524077        | 28.6           | 9.000           | N    | 19.6       | 17.4        | 46.0         | Compliance |
| 1.239175        | 31.7           | 9.000           | N    | 19.6       | 14.3        | 46.0         | Compliance |
| 1.289541        | 32.9           | 9.000           | N    | 19.6       | 13.1        | 46.0         | Compliance |
| 2.749070        | 30.2           | 9.000           | N    | 19.7       | 15.8        | 46.0         | Compliance |
| 3.604490        | 25.1           | 9.000           | N    | 19.7       | 20.9        | 46.0         | Compliance |

## **FCC §15.209, §15.205 & §15.407(b) –UNWANTED EMISSION**

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### **Applicable Standard**

FCC §15.407; §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

## Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:

30M~200MHz:  $\pm 4.7$  dB;

200M~1GHz:  $\pm 6.0$  dB;

1G~6GHz:  $\pm 5.13$  dB;

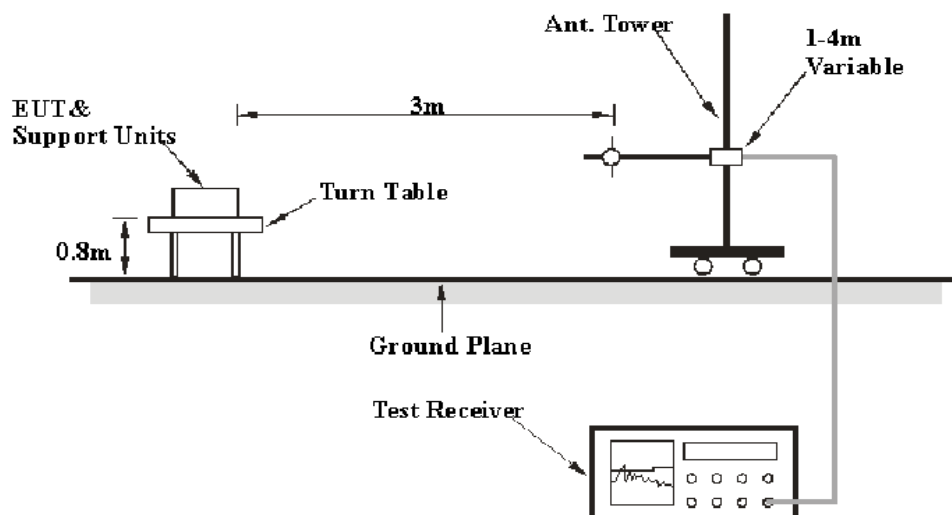
6G~25GHz:  $\pm 5.47$  dB;

Table 2 – Values of  $U_{cispr}$

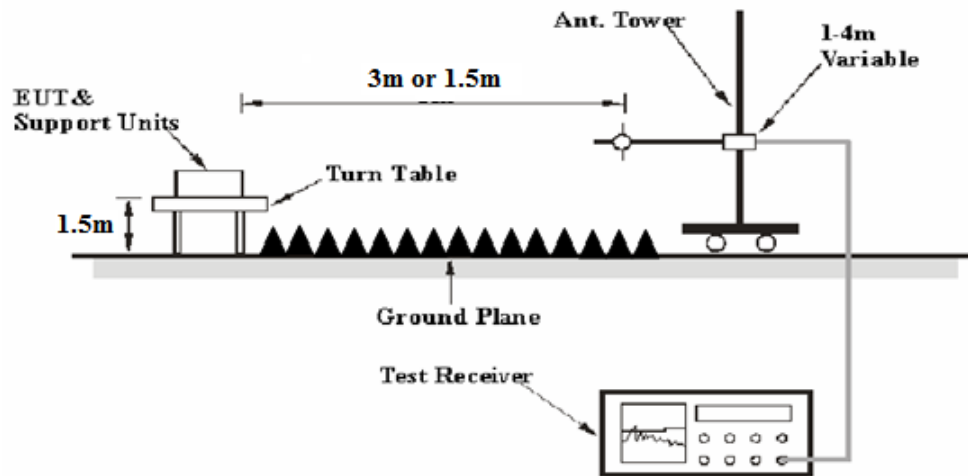
| Measurement                                                                                | $U_{cispr}$ |
|--------------------------------------------------------------------------------------------|-------------|
| Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz) | 6.3 dB      |
| Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)                   | 5.2 dB      |
| Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)                  | 5.5 dB      |

## EUT Setup

Below 1 GHz:



## Above 1 GHz:



The radiated emission tests were performed in the 3 meters chamber, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

30MHz-1000MHz:

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

1GHz- 25GHz:

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

Note: T is minimum transmission duration

## Test Procedure

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

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

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r03, emission shall be computed as:  $E [dB\mu V/m] = EIRP[dBm] + 95.2$ , for  $d = 3$  meters.

According to C63.10, the above 1G test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m

Distance extrapolation factor  $= 20 \log (\text{specific distance } [3m] / \text{test distance } [1.5m])$  dB

Extrapolation result = Corrected Amplitude (dB $\mu$ V/m) - distance extrapolation factor (6dB)

## Corrected Amplitude & Margin Calculation

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

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

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:

$$\text{Margin} = \text{Limit} - \text{Extrapolation result}$$

## Test Equipment List and Details

| Manufacturer          | Description           | Model           | Serial Number   | Calibration Date | Calibration Due Date |
|-----------------------|-----------------------|-----------------|-----------------|------------------|----------------------|
| Agilent               | Amplifier             | 8447D           | 2944A10442      | 2016-12-02       | 2017-12-01           |
| Rohde & Schwarz       | EMI Test Receiver     | ESCI            | 100028          | 2016-12-02       | 2017-12-01           |
| Sunol Sciences        | Broadband Antenna     | JB3             | A121808         | 2016-04-10       | 2019-04-09           |
| Rohde & Schwarz       | Spectrum Analyzer     | FSEM30          | 100018          | 2016-12-02       | 2017-12-01           |
| ETS                   | Horn Antenna          | 3115            | 003-6076        | 2016-12-02       | 2017-12-01           |
| Ducommun Technologies | Horn Antenna          | ARH-4223-02     | 1007726-0113024 | 2014-06-16       | 2017-06-15           |
| Mini-circuits         | Amplifier             | ZVA-183-S+      | 771001215       | 2016-05-20       | 2017-05-19           |
| EMCT                  | Semi-Anechoic Chamber | 966             | N/A             | 2015-04-24       | 2018-04-23           |
| N/A                   | RF Cable (below 1GHz) | NO.1            | N/A             | 2016-11-10       | 2017-11-09           |
| N/A                   | RF Cable (below 1GHz) | NO.4            | N/A             | 2016-11-10       | 2017-11-09           |
| N/A                   | RF Cable (above 1GHz) | NO.2            | N/A             | 2016-11-10       | 2017-11-09           |
| Ducommun Technologies | Horn Antenna          | ARH-2823-02     | 1007726-011312  | 2016-08-18       | 2017-08-18           |
| Quinstar              | Amplifier             | QLW-18405536-JO | 15964001032     | 2016-08-18       | 2017-08-18           |
| Agilent               | Spectrum Analyzer     | 8564E           | 5943A01752      | 2016-08-18       | 2017-08-18           |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 19.5 °C  |
| <b>Relative Humidity:</b> | 53 %     |
| <b>ATM Pressure:</b>      | 95.8 kPa |

*The testing was performed by Kevin Hu on 2017-02-28.*

*Test Mode: Transmitting*

**30MHz-40G** (For above 1GHz, test performed at 1.5m distance from EUT to antenna)

**5725-5850MHz**

802.11a mode (2TX was the worst)

| Frequency<br>(MHz)      | Receiver          |                        | Rx Antenna     |                | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Extrapolation<br>Result<br>dBμV/m | Limit<br>(dBμV/m) | Margin<br>(dB) |
|-------------------------|-------------------|------------------------|----------------|----------------|-----------------------|---------------------------|------------------------------------|-----------------------------------|-------------------|----------------|
|                         | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Polar<br>(H/V) | Factor<br>(dB) |                       |                           |                                    |                                   |                   |                |
| Low Channel:5745 MHz    |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5745                    | 66.53             | PK                     | H              | 32.59          | 5.74                  | 0.00                      | 104.86                             | 98.86                             | N/A               | N/A            |
| 5745                    | 56.19             | AV                     | H              | 32.59          | 5.74                  | 0.00                      | 94.52                              | 88.52                             | N/A               | N/A            |
| 5745                    | 74.78             | PK                     | V              | 32.59          | 5.74                  | 0.00                      | 113.11                             | 107.11                            | N/A               | N/A            |
| 5745                    | 63.63             | AV                     | V              | 32.59          | 5.74                  | 0.00                      | 101.96                             | 95.96                             | N/A               | N/A            |
| 5725                    | 48.78             | PK                     | V              | 32.57          | 5.72                  | 0.00                      | 87.07                              | 81.07                             | 122.20            | 41.13          |
| 5720                    | 35.86             | PK                     | V              | 32.56          | 5.71                  | 0.00                      | 74.13                              | 68.13                             | 110.80            | 42.67          |
| 5700                    | 28.01             | PK                     | V              | 32.54          | 5.70                  | 0.00                      | 66.25                              | 60.25                             | 105.20            | 44.95          |
| 5650                    | 27.1              | PK                     | V              | 32.48          | 5.65                  | 0.00                      | 65.23                              | 59.23                             | 68.20             | 8.97           |
| 11490                   | 35.06             | PK                     | V              | 37.99          | 8.22                  | 26.02                     | 55.25                              | 49.25                             | 74.00             | 24.75          |
| 11490                   | 24.34             | AV                     | V              | 37.99          | 8.22                  | 26.02                     | 44.53                              | 38.53                             | 54.00             | 15.47          |
| 17235                   | 33.63             | PK                     | V              | 42.98          | 10.82                 | 25.99                     | 61.44                              | 55.44                             | 74.00             | 18.56          |
| 17235                   | 22.48             | AV                     | V              | 42.98          | 10.82                 | 25.99                     | 50.29                              | 44.29                             | 54.00             | 9.71           |
| 1526                    | 34.34             | PK                     | V              | 24.14          | 2.69                  | 26.36                     | 34.81                              | 28.81                             | 74.00             | 45.19          |
| 1526                    | 24.02             | AV                     | V              | 24.14          | 2.69                  | 26.36                     | 24.49                              | 18.49                             | 54.00             | 35.51          |
| 4118                    | 33.59             | PK                     | V              | 29.19          | 5.00                  | 26.62                     | 41.16                              | 35.16                             | 74.00             | 38.84          |
| 4118                    | 22.32             | AV                     | V              | 29.19          | 5.00                  | 26.62                     | 29.89                              | 23.89                             | 54.00             | 30.11          |
| 270.56                  | 43.2              | QP                     | V              | 13.71          | 1.30                  | 27.48                     | 30.73                              | 30.73                             | 46.00             | 15.27          |
| 290.93                  | 44.6              | QP                     | V              | 14.01          | 1.10                  | 27.53                     | 32.18                              | 32.18                             | 46.00             | 13.82          |
| Middle Channel:5785 MHz |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5785                    | 66.44             | PK                     | H              | 32.64          | 5.77                  | 0.00                      | 104.85                             | 98.85                             | N/A               | N/A            |
| 5785                    | 55.53             | AV                     | H              | 32.64          | 5.77                  | 0.00                      | 93.94                              | 87.94                             | N/A               | N/A            |
| 5785                    | 74.04             | PK                     | V              | 32.64          | 5.77                  | 0.00                      | 112.45                             | 106.45                            | N/A               | N/A            |
| 5785                    | 62.36             | AV                     | V              | 32.64          | 5.77                  | 0.00                      | 100.77                             | 94.77                             | N/A               | N/A            |
| 11570                   | 35.04             | PK                     | V              | 38.03          | 8.21                  | 26.00                     | 55.28                              | 49.28                             | 74.00             | 24.72          |
| 11570                   | 24.19             | AV                     | V              | 38.03          | 8.21                  | 26.00                     | 44.43                              | 38.43                             | 54.00             | 15.57          |
| 17355                   | 33.65             | PK                     | V              | 43.53          | 11.03                 | 26.16                     | 62.05                              | 56.05                             | 74.00             | 17.95          |
| 17355                   | 22.93             | AV                     | V              | 43.53          | 11.03                 | 26.16                     | 51.33                              | 45.33                             | 54.00             | 8.67           |
| 1569                    | 34.06             | PK                     | V              | 24.21          | 2.72                  | 26.40                     | 34.59                              | 28.59                             | 74.00             | 45.41          |
| 1569                    | 22.5              | AV                     | V              | 24.21          | 2.72                  | 26.40                     | 23.03                              | 17.03                             | 54.00             | 36.97          |
| 4153                    | 33.35             | PK                     | V              | 29.24          | 5.03                  | 26.64                     | 40.98                              | 34.98                             | 74.00             | 39.02          |
| 4153                    | 22.14             | AV                     | V              | 29.24          | 5.03                  | 26.64                     | 29.77                              | 23.77                             | 54.00             | 30.23          |
| 270.56                  | 43.3              | QP                     | V              | 13.71          | 1.30                  | 27.48                     | 30.83                              | 30.83                             | 46.00             | 15.17          |
| 290.93                  | 44.6              | QP                     | V              | 14.01          | 1.10                  | 27.53                     | 32.18                              | 32.18                             | 46.00             | 13.82          |

| High Channel:5825 MHz |       |    |   |       |       |       |        |        |        |       |
|-----------------------|-------|----|---|-------|-------|-------|--------|--------|--------|-------|
| 5825                  | 66.8  | PK | H | 32.69 | 5.81  | 0.00  | 105.30 | 99.30  | N/A    | N/A   |
| 5825                  | 55.01 | AV | H | 32.69 | 5.81  | 0.00  | 93.51  | 87.51  | N/A    | N/A   |
| 5825                  | 72.13 | PK | V | 32.69 | 5.81  | 0.00  | 110.63 | 104.63 | N/A    | N/A   |
| 5825                  | 60.74 | AV | V | 32.69 | 5.81  | 0.00  | 99.24  | 93.24  | N/A    | N/A   |
| 5850                  | 35.07 | PK | V | 32.72 | 5.83  | 0.00  | 73.62  | 67.62  | 122.20 | 54.58 |
| 5855                  | 31.46 | PK | V | 32.73 | 5.83  | 0.00  | 70.02  | 64.02  | 110.80 | 46.78 |
| 5875                  | 26.98 | PK | V | 32.75 | 5.85  | 0.00  | 65.58  | 59.58  | 105.20 | 45.62 |
| 5925                  | 26.8  | PK | V | 32.81 | 5.89  | 0.00  | 65.50  | 59.50  | 68.20  | 8.70  |
| 11650                 | 35.45 | PK | V | 38.06 | 8.20  | 25.98 | 55.73  | 49.73  | 74.00  | 24.27 |
| 11650                 | 23.9  | AV | V | 38.06 | 8.20  | 25.98 | 44.18  | 38.18  | 54.00  | 15.82 |
| 17475                 | 33.69 | PK | V | 44.09 | 11.23 | 26.33 | 62.68  | 56.68  | 74.00  | 17.32 |
| 17475                 | 23.03 | AV | V | 44.09 | 11.23 | 26.33 | 52.02  | 46.02  | 54.00  | 7.98  |
| 1608                  | 34.42 | PK | V | 24.27 | 2.75  | 26.44 | 35.00  | 29.00  | 74.00  | 45.00 |
| 1608                  | 23.29 | AV | V | 24.27 | 2.75  | 26.44 | 23.87  | 17.87  | 54.00  | 36.13 |
| 4205                  | 33.14 | PK | V | 29.33 | 5.06  | 26.67 | 40.86  | 34.86  | 74.00  | 39.14 |
| 4205                  | 22.35 | AV | V | 29.33 | 5.06  | 26.67 | 30.07  | 24.07  | 54.00  | 29.93 |
| 270.56                | 43.4  | QP | V | 13.71 | 1.30  | 27.48 | 30.93  | 30.93  | 46.00  | 15.07 |
| 290.93                | 44.6  | QP | V | 14.01 | 1.10  | 27.53 | 32.18  | 32.18  | 46.00  | 13.82 |

802.11n ht20 mode (2TX was the worst)

| Frequency<br>(MHz)      | Receiver          |                        | Rx Antenna     |                | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Extrapolation<br>Result<br>dBμV/m | Limit<br>(dBμV/m) | Margin<br>(dB) |
|-------------------------|-------------------|------------------------|----------------|----------------|-----------------------|---------------------------|------------------------------------|-----------------------------------|-------------------|----------------|
|                         | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Polar<br>(H/V) | Factor<br>(dB) |                       |                           |                                    |                                   |                   |                |
| Low Channel:5745 MHz    |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5745                    | 69.89             | PK                     | H              | 32.59          | 5.74                  | 0.00                      | 108.22                             | 102.22                            | N/A               | N/A            |
| 5745                    | 57.51             | AV                     | H              | 32.59          | 5.74                  | 0.00                      | 95.84                              | 89.84                             | N/A               | N/A            |
| 5745                    | 76.53             | PK                     | V              | 32.59          | 5.74                  | 0.00                      | 114.86                             | 108.86                            | N/A               | N/A            |
| 5745                    | 64.84             | AV                     | V              | 32.59          | 5.74                  | 0.00                      | 103.17                             | 97.17                             | N/A               | N/A            |
| 5725                    | 49.1              | PK                     | V              | 32.57          | 5.72                  | 0.00                      | 87.39                              | 81.39                             | 122.20            | 40.81          |
| 5720                    | 39.61             | PK                     | V              | 32.56          | 5.71                  | 0.00                      | 77.88                              | 71.88                             | 110.80            | 38.92          |
| 5700                    | 28.31             | PK                     | V              | 32.54          | 5.70                  | 0.00                      | 66.55                              | 60.55                             | 105.20            | 44.65          |
| 5650                    | 26.64             | PK                     | V              | 32.48          | 5.65                  | 0.00                      | 64.77                              | 58.77                             | 68.20             | 9.43           |
| 11490                   | 35.68             | PK                     | V              | 37.99          | 8.22                  | 26.02                     | 55.87                              | 49.87                             | 74.00             | 24.13          |
| 11490                   | 24.83             | AV                     | V              | 37.99          | 8.22                  | 26.02                     | 45.02                              | 39.02                             | 54.00             | 14.98          |
| 17235                   | 33.23             | PK                     | V              | 42.98          | 10.82                 | 25.99                     | 61.04                              | 55.04                             | 74.00             | 18.96          |
| 17235                   | 23.17             | AV                     | V              | 42.98          | 10.82                 | 25.99                     | 50.98                              | 44.98                             | 54.00             | 9.02           |
| 3152                    | 40.64             | PK                     | V              | 25.05          | 3.66                  | 26.46                     | 42.89                              | 36.89                             | 74.00             | 37.11          |
| 3152                    | 30.3              | AV                     | V              | 25.05          | 3.66                  | 26.46                     | 32.55                              | 26.55                             | 54.00             | 27.45          |
| 4218                    | 33.51             | PK                     | V              | 29.35          | 5.07                  | 26.68                     | 41.25                              | 35.25                             | 74.00             | 38.75          |
| 4218                    | 22.79             | AV                     | V              | 29.35          | 5.07                  | 26.68                     | 30.53                              | 24.53                             | 54.00             | 29.47          |
| 270.56                  | 43.4              | QP                     | V              | 13.71          | 1.30                  | 27.48                     | 30.93                              | 30.93                             | 46.00             | 15.07          |
| 290.93                  | 44.6              | QP                     | V              | 14.01          | 1.10                  | 27.53                     | 32.18                              | 32.18                             | 46.00             | 13.82          |
| Middle Channel:5785 MHz |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5785                    | 68.97             | PK                     | H              | 32.64          | 5.77                  | 0.00                      | 107.38                             | 101.38                            | N/A               | N/A            |
| 5785                    | 56.83             | AV                     | H              | 32.64          | 5.77                  | 0.00                      | 95.24                              | 89.24                             | N/A               | N/A            |
| 5785                    | 75.24             | PK                     | V              | 32.64          | 5.77                  | 0.00                      | 113.65                             | 107.65                            | N/A               | N/A            |
| 5785                    | 63.14             | AV                     | V              | 32.64          | 5.77                  | 0.00                      | 101.55                             | 95.55                             | N/A               | N/A            |
| 11570                   | 35.63             | PK                     | V              | 38.03          | 8.21                  | 26.00                     | 55.87                              | 49.87                             | 74.00             | 24.13          |
| 11570                   | 24.34             | AV                     | V              | 38.03          | 8.21                  | 26.00                     | 44.58                              | 38.58                             | 54.00             | 15.42          |
| 17355                   | 33.61             | PK                     | V              | 43.53          | 11.03                 | 26.16                     | 62.01                              | 56.01                             | 74.00             | 17.99          |
| 17355                   | 21.5              | AV                     | V              | 43.53          | 11.03                 | 26.16                     | 49.90                              | 43.90                             | 54.00             | 10.10          |
| 1569                    | 34.04             | PK                     | V              | 24.21          | 2.72                  | 26.40                     | 34.57                              | 28.57                             | 74.00             | 45.43          |
| 1569                    | 24.09             | AV                     | V              | 24.21          | 2.72                  | 26.40                     | 24.62                              | 18.62                             | 54.00             | 35.38          |
| 4153                    | 33.8              | PK                     | V              | 29.24          | 5.03                  | 26.64                     | 41.43                              | 35.43                             | 74.00             | 38.57          |
| 4153                    | 22.34             | AV                     | V              | 29.24          | 5.03                  | 26.64                     | 29.97                              | 23.97                             | 54.00             | 30.03          |
| 270.56                  | 43                | QP                     | V              | 13.71          | 1.30                  | 27.48                     | 30.53                              | 30.53                             | 46.00             | 15.47          |
| 290.93                  | 44.7              | QP                     | V              | 14.01          | 1.10                  | 27.53                     | 32.28                              | 32.28                             | 46.00             | 13.72          |

| High Channel:5825 MHz |       |    |   |       |       |       |        |        |        |       |
|-----------------------|-------|----|---|-------|-------|-------|--------|--------|--------|-------|
| 5825                  | 66.29 | PK | H | 32.69 | 5.81  | 0.00  | 104.79 | 98.79  | N/A    | N/A   |
| 5825                  | 55.15 | AV | H | 32.69 | 5.81  | 0.00  | 93.65  | 87.65  | N/A    | N/A   |
| 5825                  | 73.24 | PK | V | 32.69 | 5.81  | 0.00  | 111.74 | 105.74 | N/A    | N/A   |
| 5825                  | 62.36 | AV | V | 32.69 | 5.81  | 0.00  | 100.86 | 94.86  | N/A    | N/A   |
| 5850                  | 36.63 | PK | V | 32.72 | 5.83  | 0.00  | 75.18  | 69.18  | 122.20 | 53.02 |
| 5855                  | 30.16 | PK | V | 32.73 | 5.83  | 0.00  | 68.72  | 62.72  | 110.80 | 48.08 |
| 5875                  | 27.49 | PK | V | 32.75 | 5.85  | 0.00  | 66.09  | 60.09  | 105.20 | 45.11 |
| 5925                  | 26.91 | PK | V | 32.81 | 5.89  | 0.00  | 65.61  | 59.61  | 68.20  | 8.59  |
| 11650                 | 36    | PK | V | 38.06 | 8.20  | 25.98 | 56.28  | 50.28  | 74.00  | 23.72 |
| 11650                 | 24.49 | AV | V | 38.06 | 8.20  | 25.98 | 44.77  | 38.77  | 54.00  | 15.23 |
| 17475                 | 33.38 | PK | V | 44.09 | 11.23 | 26.33 | 62.37  | 56.37  | 74.00  | 17.63 |
| 17475                 | 21.9  | AV | V | 44.09 | 11.23 | 26.33 | 50.89  | 44.89  | 54.00  | 9.11  |
| 1608                  | 34.18 | PK | V | 24.27 | 2.75  | 26.44 | 34.76  | 28.76  | 74.00  | 45.24 |
| 1608                  | 23.33 | AV | V | 24.27 | 2.75  | 26.44 | 23.91  | 17.91  | 54.00  | 36.09 |
| 4205                  | 34.19 | PK | V | 29.33 | 5.06  | 26.67 | 41.91  | 35.91  | 74.00  | 38.09 |
| 4205                  | 22.57 | AV | V | 29.33 | 5.06  | 26.67 | 30.29  | 24.29  | 54.00  | 29.71 |
| 270.56                | 43.2  | QP | V | 13.71 | 1.30  | 27.48 | 30.73  | 30.73  | 46.00  | 15.27 |
| 290.93                | 44.4  | QP | V | 14.01 | 1.10  | 27.53 | 31.98  | 31.98  | 46.00  | 14.02 |

5M(2TX was the worst):

| Frequency<br>(MHz)      | Receiver          |                        | Rx Antenna     |                | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Extrapolation<br>Result<br>dBμV/m | Limit<br>(dBμV/m) | Margin<br>(dB) |
|-------------------------|-------------------|------------------------|----------------|----------------|-----------------------|---------------------------|------------------------------------|-----------------------------------|-------------------|----------------|
|                         | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Polar<br>(H/V) | Factor<br>(dB) |                       |                           |                                    |                                   |                   |                |
| Low Channel:5745 MHz    |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5745                    | 80.87             | PK                     | H              | 32.59          | 5.74                  | 0.00                      | 119.20                             | 113.20                            | N/A               | N/A            |
| 5745                    | 67.14             | AV                     | H              | 32.59          | 5.74                  | 0.00                      | 105.47                             | 99.47                             | N/A               | N/A            |
| 5745                    | 85.41             | PK                     | V              | 32.59          | 5.74                  | 0.00                      | 123.74                             | 117.74                            | N/A               | N/A            |
| 5745                    | 71.62             | AV                     | V              | 32.59          | 5.74                  | 0.00                      | 109.95                             | 103.95                            | N/A               | N/A            |
| 5725                    | 29                | PK                     | V              | 32.57          | 5.72                  | 0.00                      | 67.29                              | 61.29                             | 122.20            | 60.91          |
| 5720                    | 28.69             | PK                     | V              | 32.56          | 5.71                  | 0.00                      | 66.96                              | 60.96                             | 110.80            | 49.84          |
| 5700                    | 28.33             | PK                     | V              | 32.54          | 5.70                  | 0.00                      | 66.57                              | 60.57                             | 105.20            | 44.63          |
| 5650                    | 26.81             | PK                     | V              | 32.48          | 5.65                  | 0.00                      | 64.94                              | 58.94                             | 68.20             | 9.26           |
| 11490                   | 37.02             | PK                     | V              | 37.99          | 8.22                  | 26.02                     | 57.21                              | 51.21                             | 74.00             | 22.79          |
| 11490                   | 25.37             | AV                     | V              | 37.99          | 8.22                  | 26.02                     | 45.56                              | 39.56                             | 54.00             | 14.44          |
| 17235                   | 35.8              | PK                     | V              | 42.98          | 10.82                 | 25.99                     | 63.61                              | 57.61                             | 74.00             | 16.39          |
| 17235                   | 23.59             | AV                     | V              | 42.98          | 10.82                 | 25.99                     | 51.40                              | 45.40                             | 54.00             | 8.60           |
| 2204                    | 37.35             | PK                     | V              | 24.21          | 3.03                  | 26.85                     | 37.74                              | 31.74                             | 74.00             | 42.26          |
| 2204                    | 25.1              | AV                     | V              | 24.21          | 3.03                  | 26.85                     | 25.49                              | 19.49                             | 54.00             | 34.51          |
| 3516                    | 36.9              | PK                     | V              | 27.06          | 4.20                  | 26.59                     | 41.57                              | 35.57                             | 74.00             | 38.43          |
| 3516                    | 24.73             | AV                     | V              | 27.06          | 4.20                  | 26.59                     | 29.40                              | 23.40                             | 54.00             | 30.60          |
| 314.21                  | 45.1              | QP                     | V              | 14.46          | 1.17                  | 27.59                     | 33.14                              | 33.14                             | 46.00             | 12.86          |
| 540.22                  | 37                | QP                     | V              | 18.50          | 1.71                  | 28.83                     | 28.38                              | 28.38                             | 46.00             | 17.62          |
| Middle Channel:5785 MHz |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5785                    | 80.67             | PK                     | H              | 32.64          | 5.77                  | 0.00                      | 119.08                             | 113.08                            | N/A               | N/A            |
| 5785                    | 66.61             | AV                     | H              | 32.64          | 5.77                  | 0.00                      | 105.02                             | 99.02                             | N/A               | N/A            |
| 5785                    | 85.63             | PK                     | V              | 32.64          | 5.77                  | 0.00                      | 124.04                             | 118.04                            | N/A               | N/A            |
| 5785                    | 71.96             | AV                     | V              | 32.64          | 5.77                  | 0.00                      | 110.37                             | 104.37                            | N/A               | N/A            |
| 11570                   | 37.6              | PK                     | V              | 38.03          | 8.21                  | 26.00                     | 57.84                              | 51.84                             | 74.00             | 22.16          |
| 11570                   | 24.99             | AV                     | V              | 38.03          | 8.21                  | 26.00                     | 45.23                              | 39.23                             | 54.00             | 14.77          |
| 17355                   | 35.56             | PK                     | V              | 43.53          | 11.03                 | 26.16                     | 63.96                              | 57.96                             | 74.00             | 16.04          |
| 17355                   | 23.1              | AV                     | V              | 43.53          | 11.03                 | 26.16                     | 51.50                              | 45.50                             | 54.00             | 8.50           |
| 2243                    | 37.48             | PK                     | V              | 24.07          | 3.02                  | 26.85                     | 37.72                              | 31.72                             | 74.00             | 42.28          |
| 2243                    | 25.18             | AV                     | V              | 24.07          | 3.02                  | 26.85                     | 25.42                              | 19.42                             | 54.00             | 34.58          |
| 3548                    | 36.44             | PK                     | V              | 27.19          | 4.25                  | 26.59                     | 41.29                              | 35.29                             | 74.00             | 38.71          |
| 3548                    | 24.73             | AV                     | V              | 27.19          | 4.25                  | 26.59                     | 29.58                              | 23.58                             | 54.00             | 30.42          |
| 314.21                  | 44.8              | QP                     | V              | 14.46          | 1.17                  | 27.59                     | 32.84                              | 32.84                             | 46.00             | 13.16          |
| 540.22                  | 37.2              | QP                     | V              | 18.50          | 1.71                  | 28.83                     | 28.58                              | 28.58                             | 46.00             | 17.42          |
| High Channel:5825 MHz   |                   |                        |                |                |                       |                           |                                    |                                   |                   |                |
| 5825                    | 80.57             | PK                     | H              | 32.69          | 5.81                  | 0.00                      | 119.07                             | 113.07                            | N/A               | N/A            |
| 5825                    | 67.98             | AV                     | H              | 32.69          | 5.81                  | 0.00                      | 106.48                             | 100.48                            | N/A               | N/A            |
| 5825                    | 85.33             | PK                     | V              | 32.69          | 5.81                  | 0.00                      | 123.83                             | 117.83                            | N/A               | N/A            |
| 5825                    | 71.99             | AV                     | V              | 32.69          | 5.81                  | 0.00                      | 110.49                             | 104.49                            | N/A               | N/A            |
| 5850                    | 29.58             | PK                     | V              | 32.72          | 5.83                  | 0.00                      | 68.13                              | 62.13                             | 122.20            | 60.07          |
| 5855                    | 28.63             | PK                     | V              | 32.73          | 5.83                  | 0.00                      | 67.19                              | 61.19                             | 110.80            | 49.61          |
| 5875                    | 28.21             | PK                     | V              | 32.75          | 5.85                  | 0.00                      | 66.81                              | 60.81                             | 105.20            | 44.39          |
| 5925                    | 26.6              | PK                     | V              | 32.81          | 5.89                  | 0.00                      | 65.30                              | 59.30                             | 68.20             | 8.90           |
| 11650                   | 37.32             | PK                     | V              | 38.06          | 8.20                  | 25.98                     | 57.60                              | 51.60                             | 74.00             | 22.40          |
| 11650                   | 25.58             | AV                     | V              | 38.06          | 8.20                  | 25.98                     | 45.86                              | 39.86                             | 54.00             | 14.14          |
| 17475                   | 34.63             | PK                     | V              | 44.09          | 11.23                 | 26.33                     | 63.62                              | 57.62                             | 74.00             | 16.38          |
| 17475                   | 22.65             | AV                     | V              | 44.09          | 11.23                 | 26.33                     | 51.64                              | 45.64                             | 54.00             | 8.36           |
| 2296                    | 37.66             | PK                     | V              | 23.89          | 3.01                  | 26.86                     | 37.70                              | 31.70                             | 74.00             | 42.30          |
| 2296                    | 25.52             | AV                     | V              | 23.89          | 3.01                  | 26.86                     | 25.56                              | 19.56                             | 54.00             | 34.44          |
| 3583                    | 36.86             | PK                     | V              | 27.33          | 4.30                  | 26.58                     | 41.91                              | 35.91                             | 74.00             | 38.09          |
| 3583                    | 24.42             | AV                     | V              | 27.33          | 4.30                  | 26.58                     | 29.47                              | 23.47                             | 54.00             | 30.53          |
| 314.21                  | 45.4              | QP                     | V              | 14.46          | 1.17                  | 27.59                     | 33.44                              | 33.44                             | 46.00             | 12.56          |
| 540.22                  | 37                | QP                     | V              | 18.50          | 1.71                  | 28.83                     | 28.38                              | 28.38                             | 46.00             | 17.62          |

## **FCC §15.407(b)–OUT- OF-BAND EMISSIONS**

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### **Applicable Standard**

FCC §15.407

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

### **Test Procedure**

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r03

### Test Equipment List and Details

| Manufacturer    | Description     | Model  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-----------------|--------|---------------|------------------|----------------------|
| Rohde & Schwarz | Signal Analyzer | FSEM30 | 100018        | 2016-12-02       | 2017-12-01           |
| N/A             | RF Cable        | N/A    | N/A           | Each Time        | /                    |
| N/A             | 10dB Attenuator | 10dB   | 10dB-1        | Each Time        | /                    |
| N/A             | 3dB Attenuator  | 10dB   | 3dB-1         | Each Time        | /                    |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

|                           |               |
|---------------------------|---------------|
| <b>Temperature:</b>       | 18~18.5 °C    |
| <b>Relative Humidity:</b> | 52~54 %       |
| <b>ATM Pressure:</b>      | 96.2~96.5 kPa |

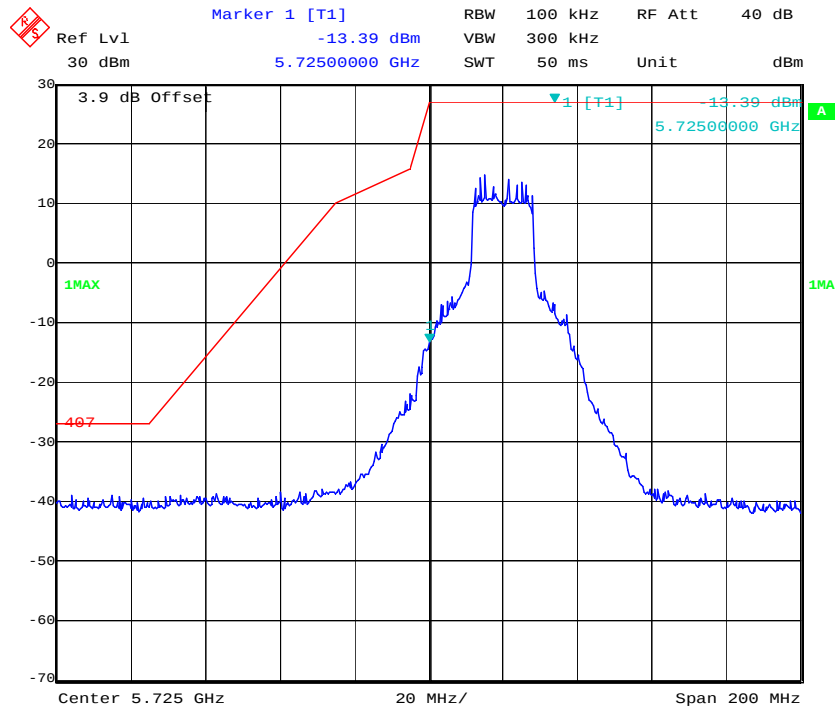
*The testing was performed by Kevin Hu on 2017-02-27&2017-03-11.*

**Test Result:** Pass.

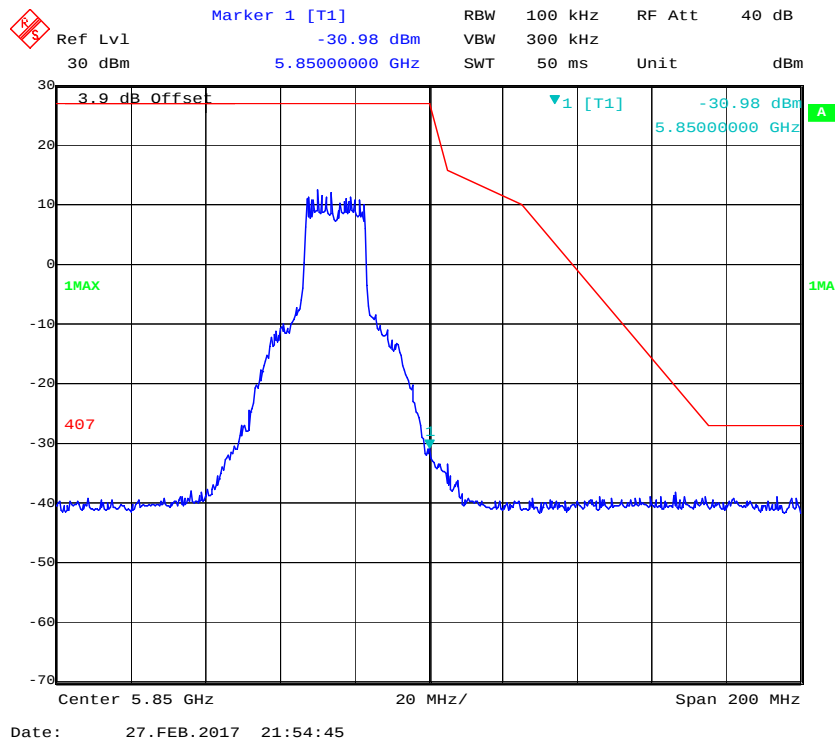
Please refer to the following tables and plots.

Chain 0:

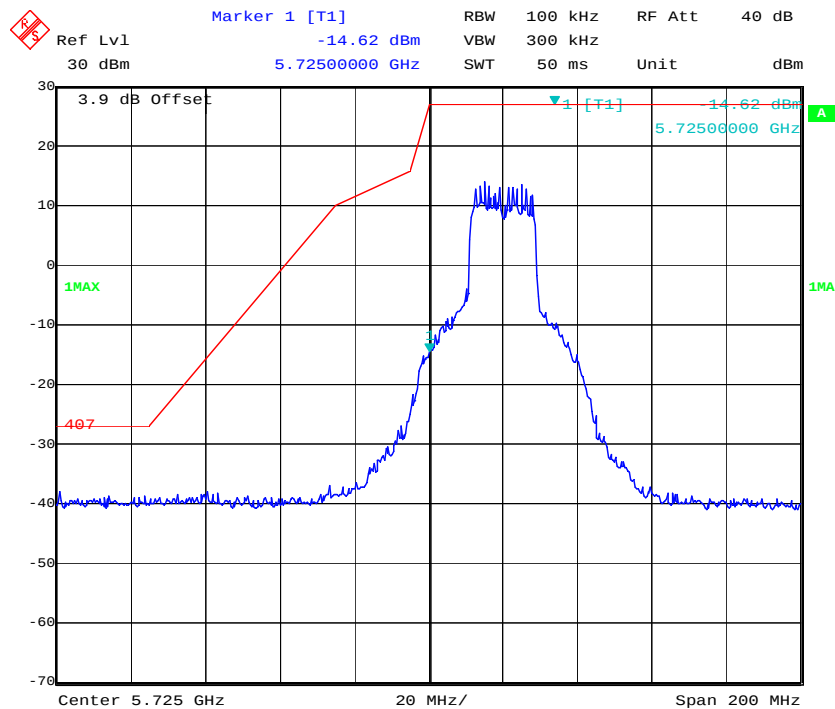
### 802.11a Low Channel



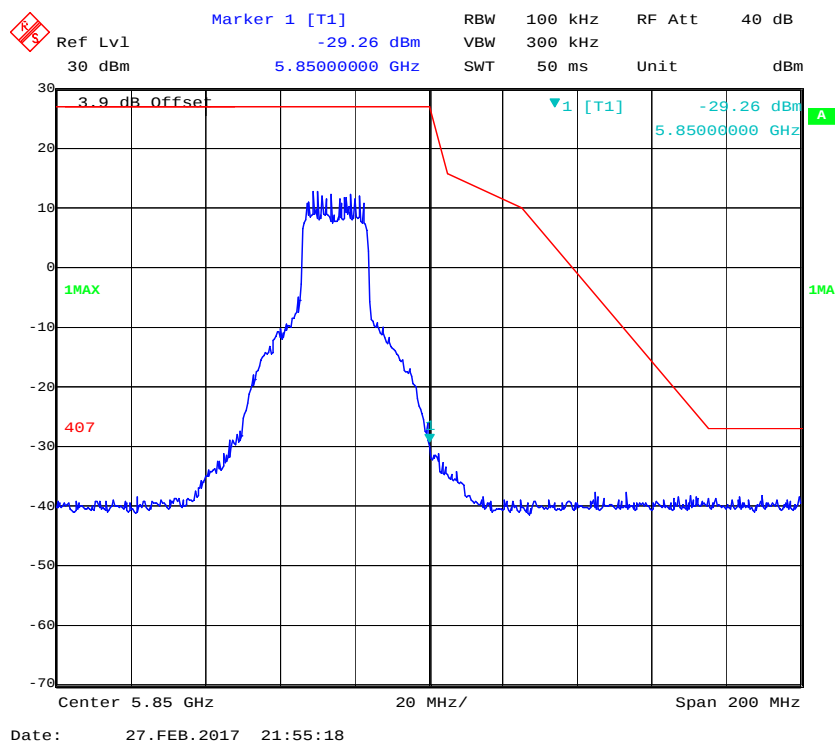
### 802.11a High Channel



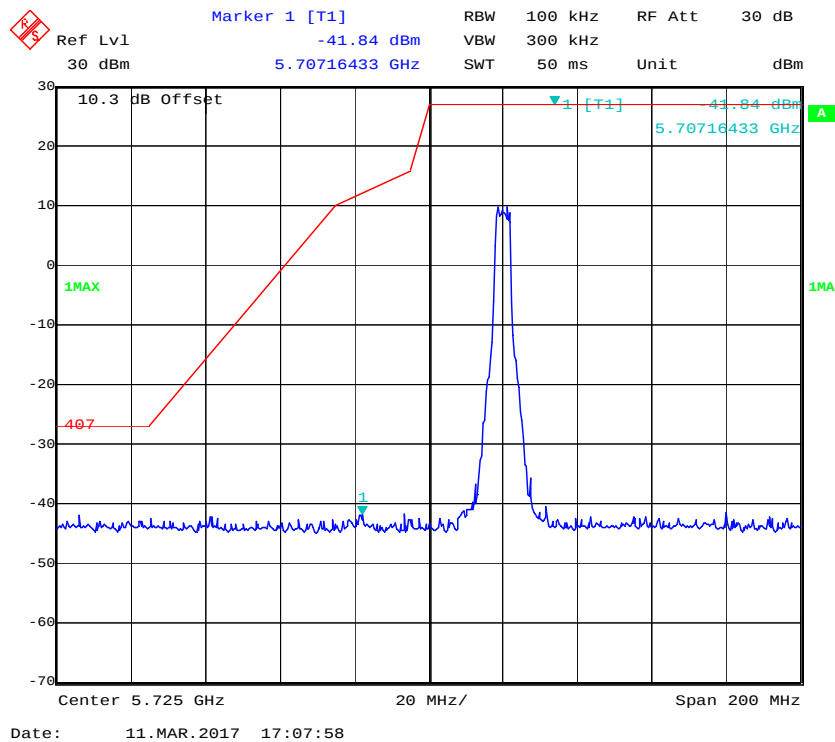
### 802.11n ht20 Low Channel



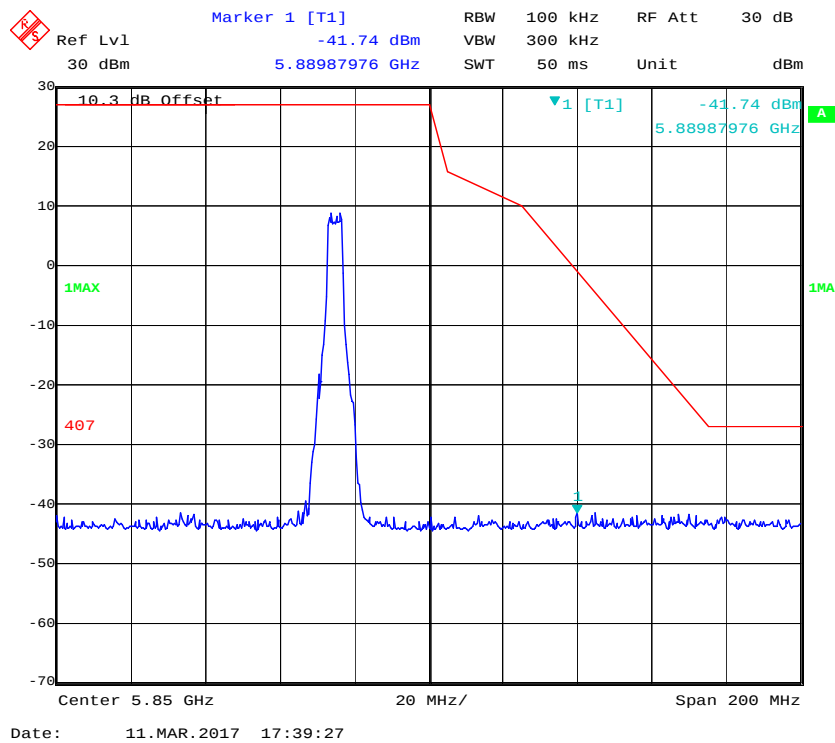
### 802.11n ht20 High Channel



### 5M Low Channel

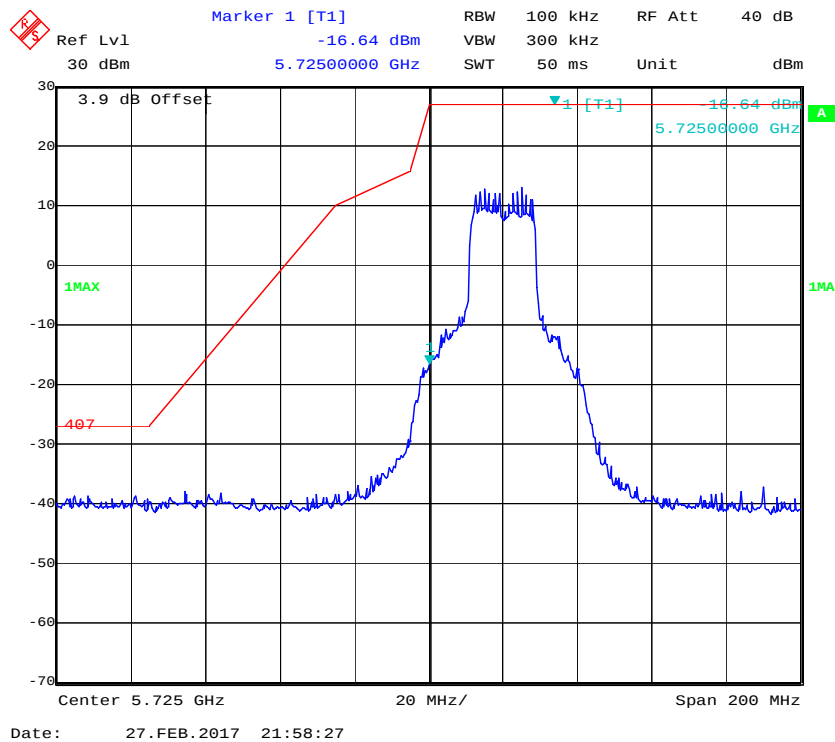


### 5M High Channel

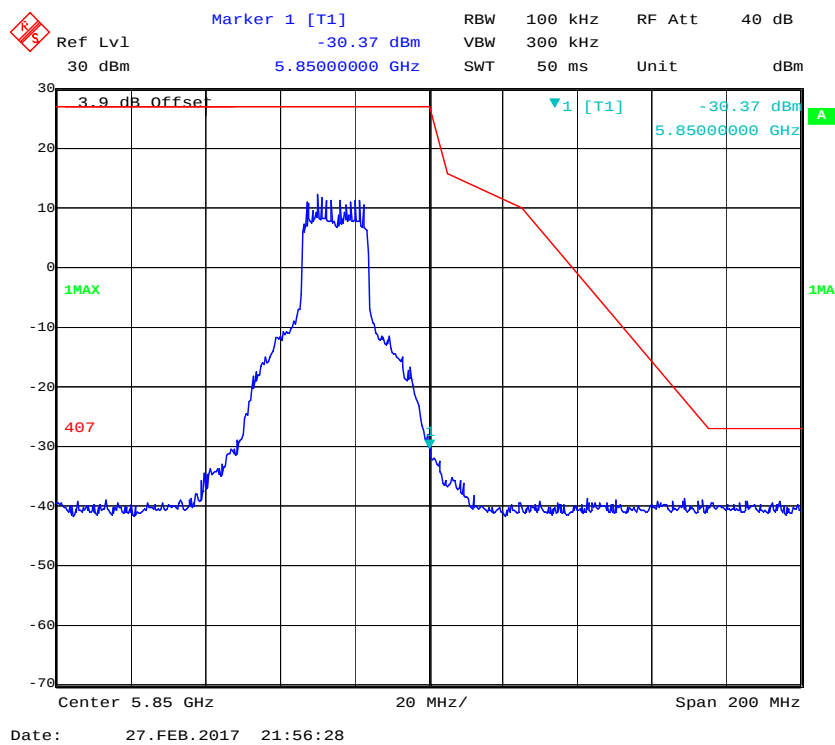




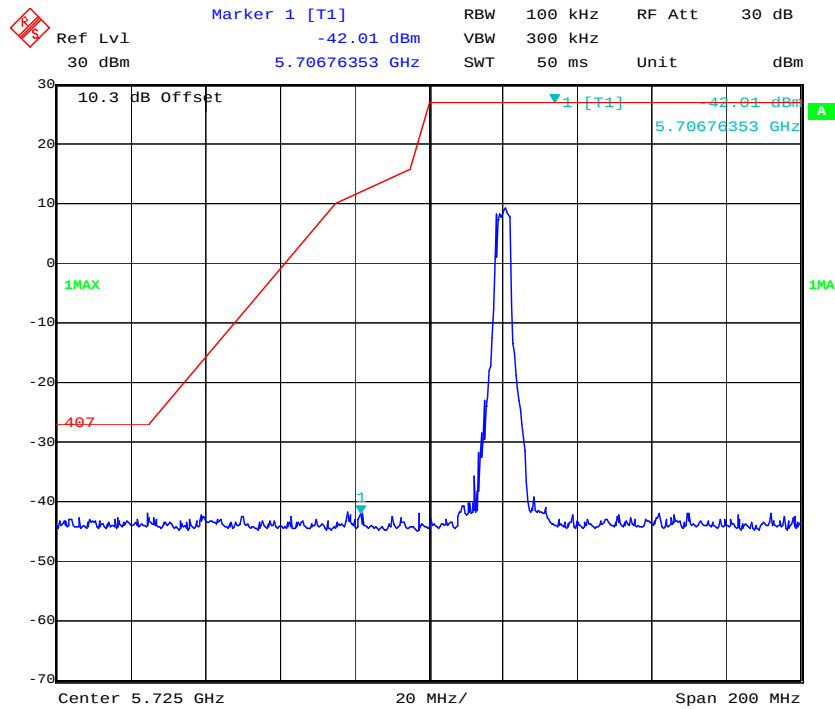
### 802.11n ht20 Low Channel



### 802.11n ht20 High Channel

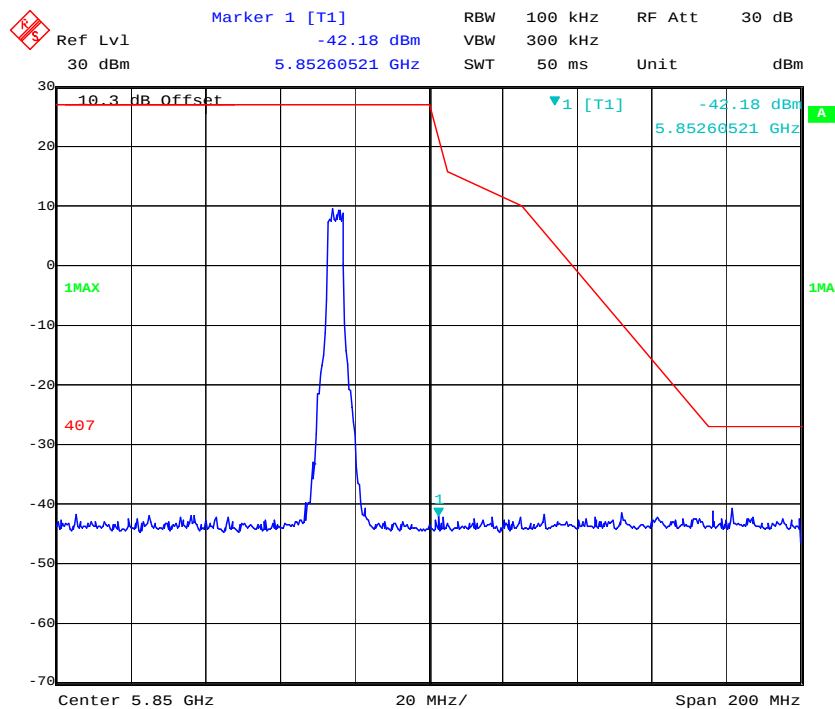


### 5M Low Channel



Date: 11.MAR.2017 17:09:02

### 5M High Channel



Date: 11.MAR.2017 17:46:23

## FCC §15.407(a) –EMISSION BANDWIDTH

### Applicable Standard

15.407(a)

### Test Equipment List and Details

| Manufacturer    | Description     | Model  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-----------------|--------|---------------|------------------|----------------------|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 831929/005    | 2016-09-21       | 2017-09-20           |
| N/A             | RF Cable        | N/A    | N/A           | Each Time        | /                    |
| N/A             | 10dB Attenuator | 10dB   | 10dB-1        | Each Time        | /                    |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r03

### Test Data

#### Environmental Conditions

|                    |               |
|--------------------|---------------|
| Temperature:       | 18~18.5 °C    |
| Relative Humidity: | 52~54 %       |
| ATM Pressure:      | 96.2~96.5 kPa |

*The testing was performed by Kevin Hu on 2017-02-27&2017-03-11.*

**Test Result:** Pass.

Please refer to the following tables and plots.

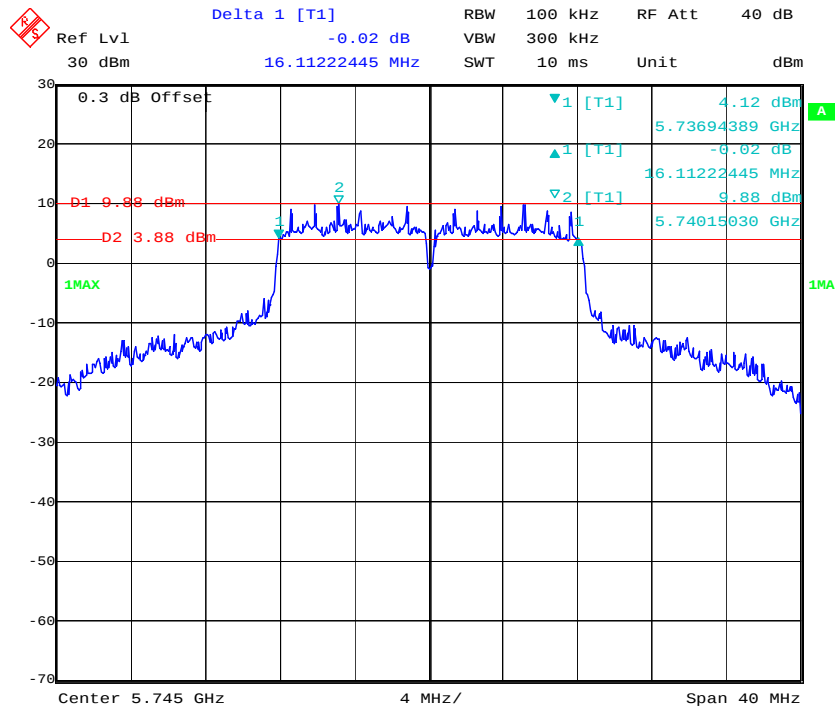
Test mode: Transmitting (Test was performed at chain 0)

| UNII Band    | Mode          | Channel | Frequency (MHz) | 6 dB Emission Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) | 6 dB Emission Bandwidth Limits (MHz) |
|--------------|---------------|---------|-----------------|-------------------------------|------------------------------|--------------------------------------|
| 5725-5850MHz | 802.11 a      | Low     | 5745            | 16.11                         | 20.84                        | ≥0.5                                 |
|              |               | Middle  | 5785            | 15.95                         | 25.81                        | ≥0.5                                 |
|              |               | High    | 5825            | 15.63                         | 23.49                        | ≥0.5                                 |
|              | 802.11 n ht20 | Low     | 5745            | 16.43                         | 21.24                        | ≥0.5                                 |
|              |               | Middle  | 5785            | 16.35                         | 22.61                        | ≥0.5                                 |
|              |               | High    | 5825            | 16.67                         | 20.6                         | ≥0.5                                 |
|              | 5M            | Low     | 5745            | 4.168                         | 4.529                        | ≥0.5                                 |
|              |               | Middle  | 5785            | 4.188                         | 4.429                        | ≥0.5                                 |
|              |               | High    | 5825            | 4.148                         | 4.629                        | ≥0.5                                 |

Note: the 99% Occupied Bandwidth have not fall into 5470-5725MHz, please refer to the test plots of 99% Occupied Bandwidth.

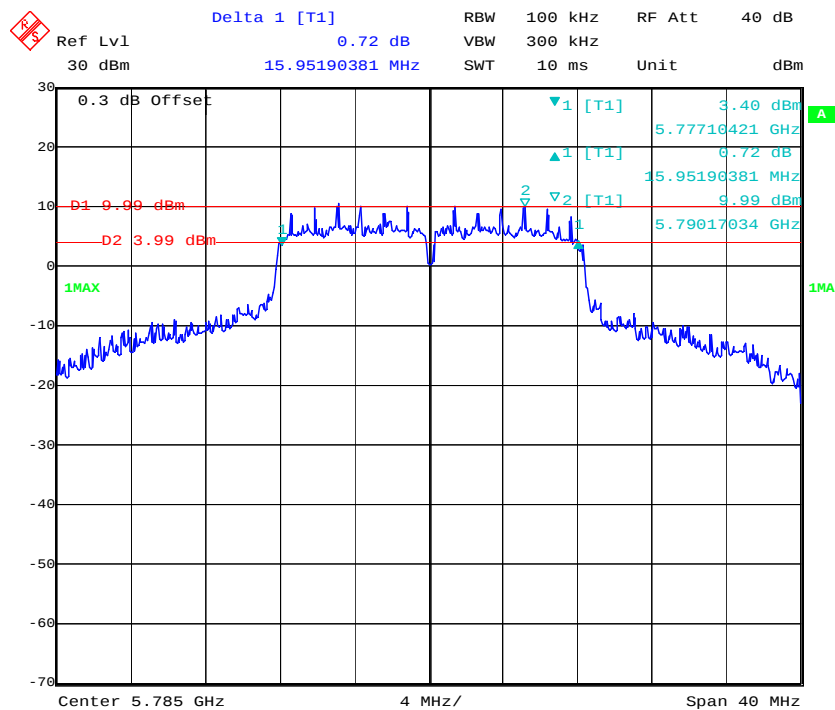
5725-5850MHz  
6dB Bandwidth:

### 802.11a Low Channel



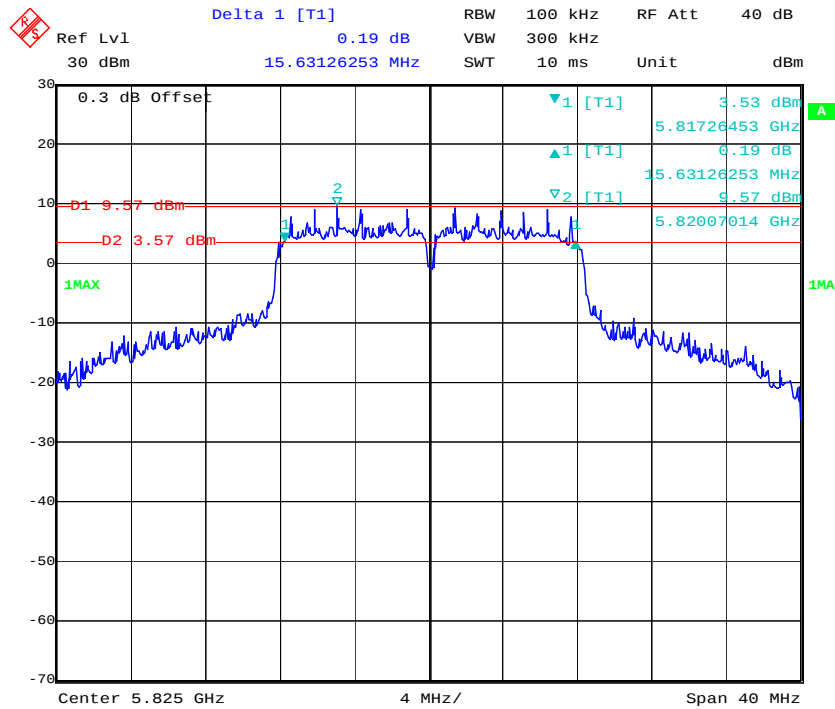
Date: 27.FEB.2017 21:22:54

### 802.11a Middle Channel



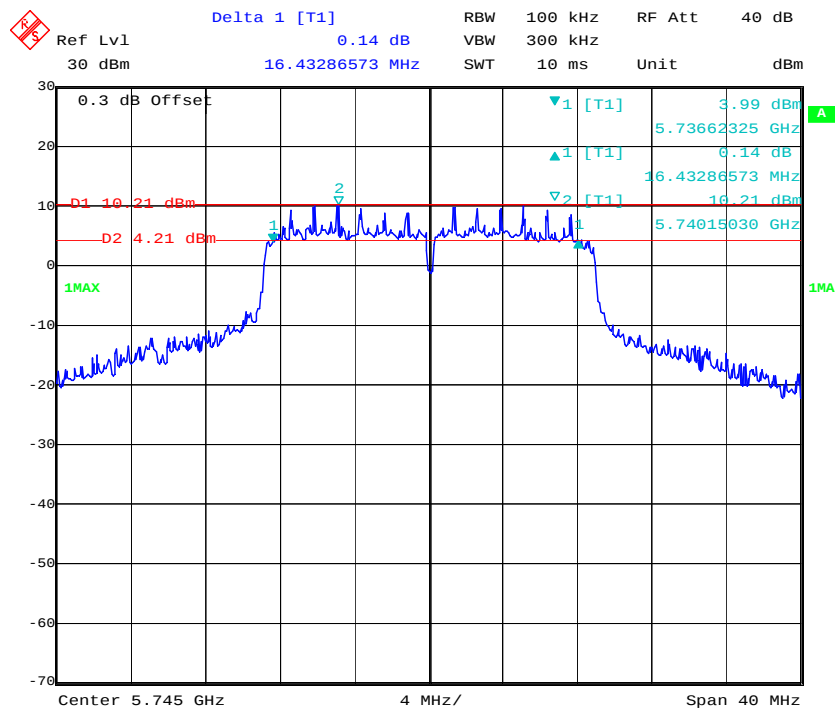
Date: 27.FEB.2017 21:25:39

### 802.11a High Channel



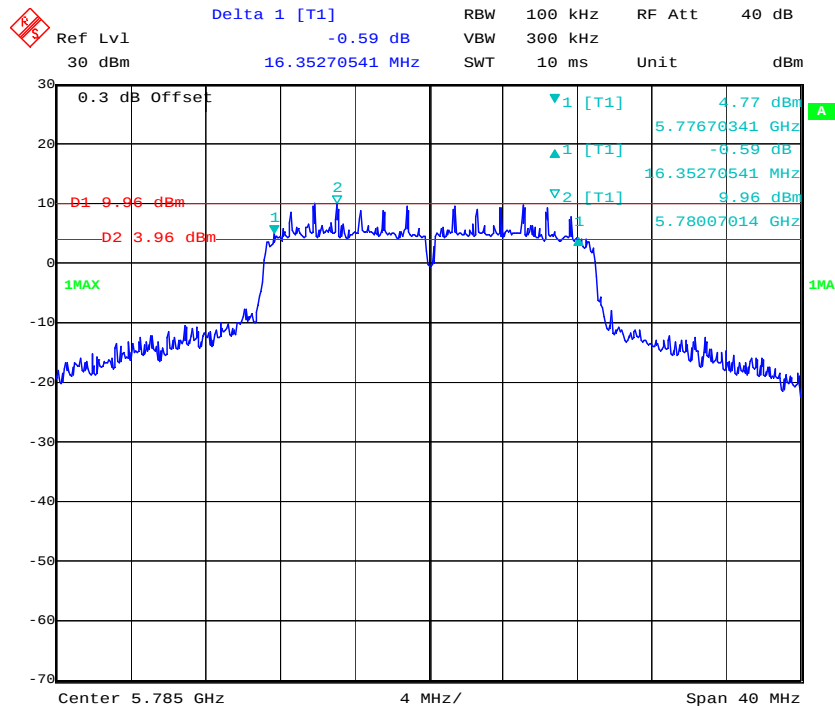
Date: 27.FEB.2017 21:27:27

### 802.11n ht20 Low Channel

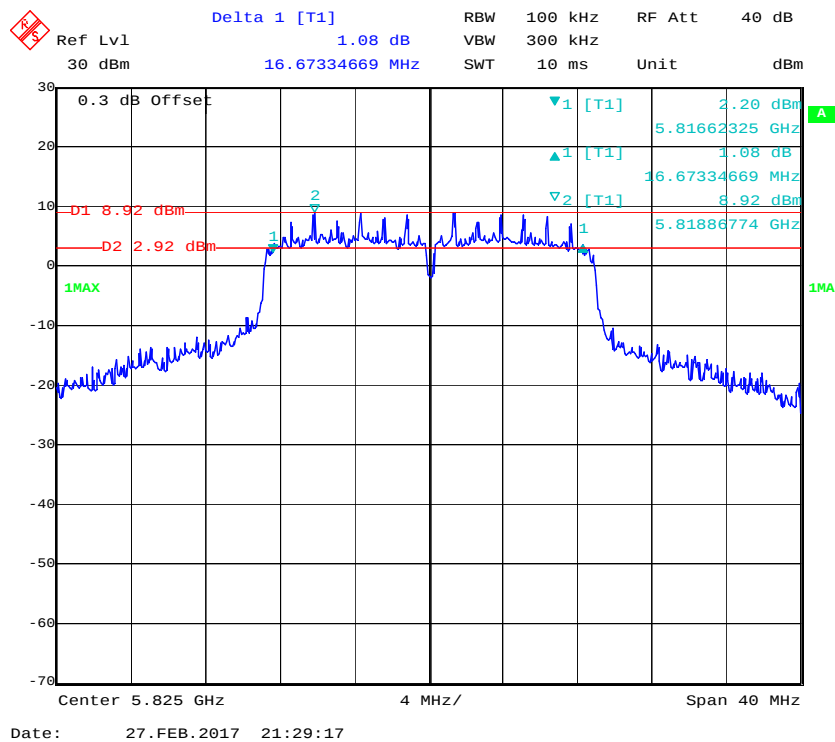


Date: 27.FEB.2017 21:49:41

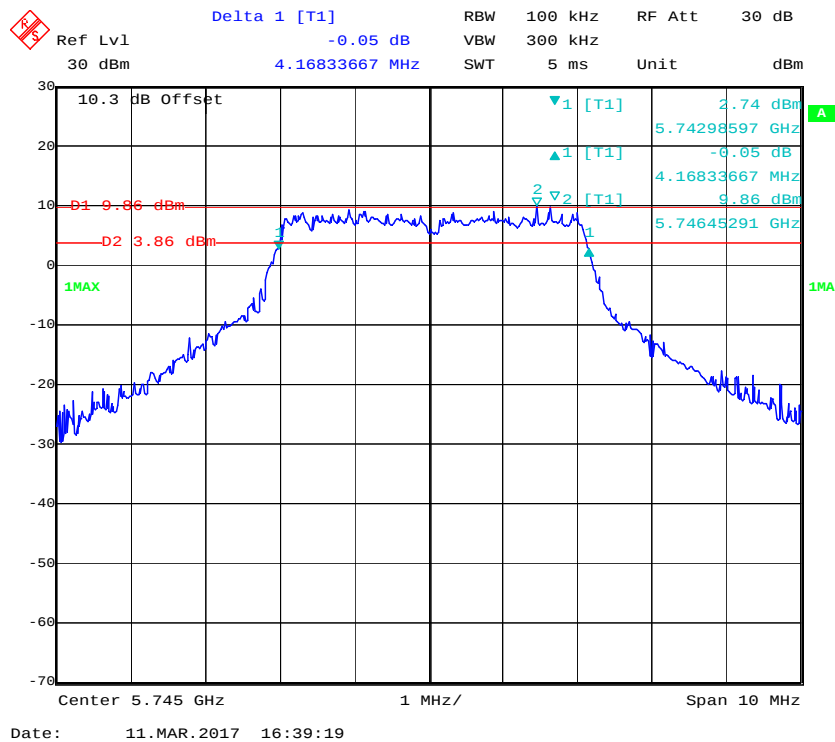
### 802.11n ht20 Middle Channel



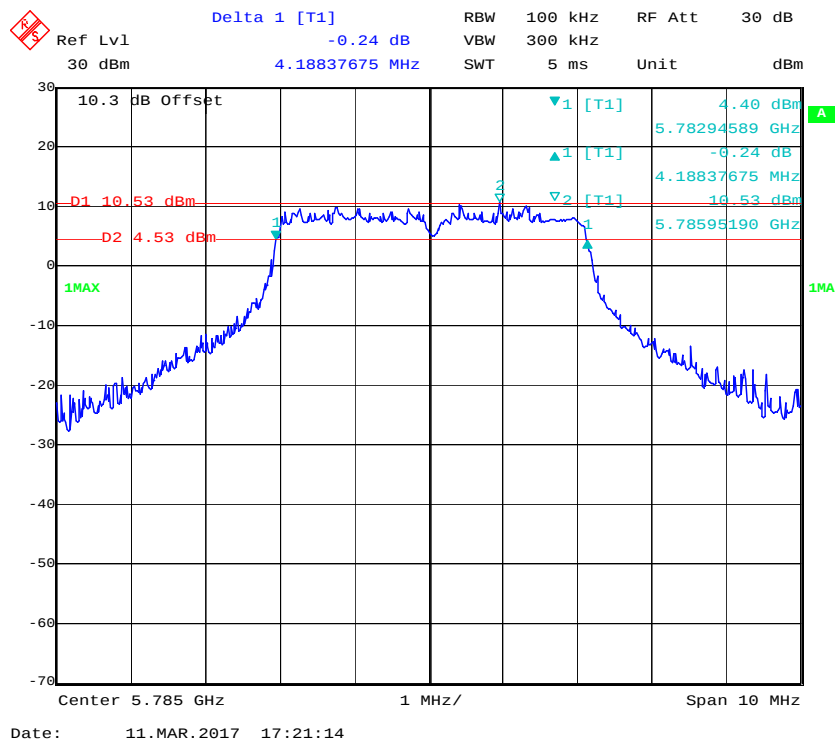
### 802.11n ht20 High Channel



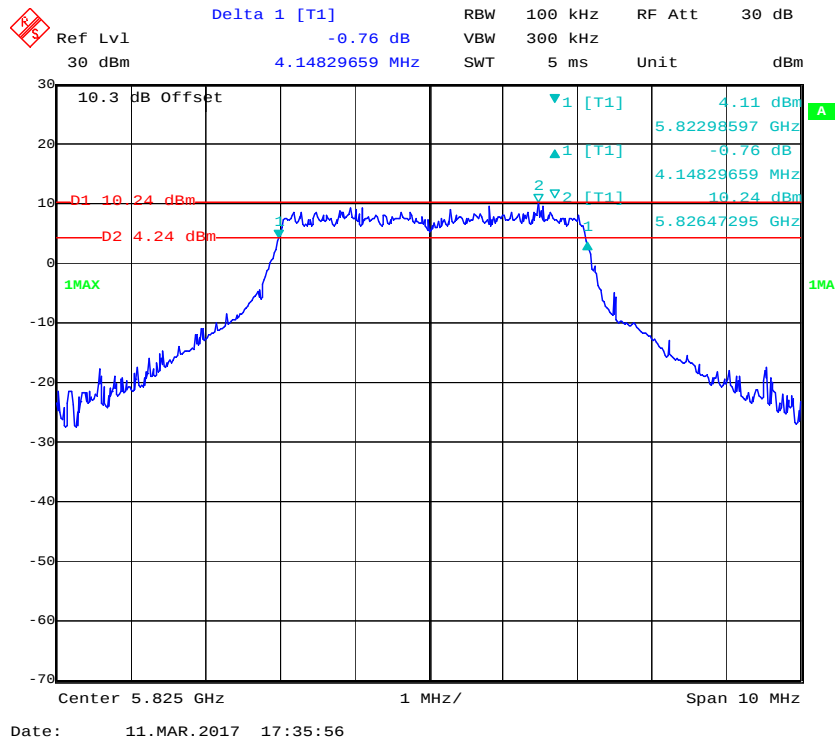
### 5M Low Channel



### 5M Middle Channel

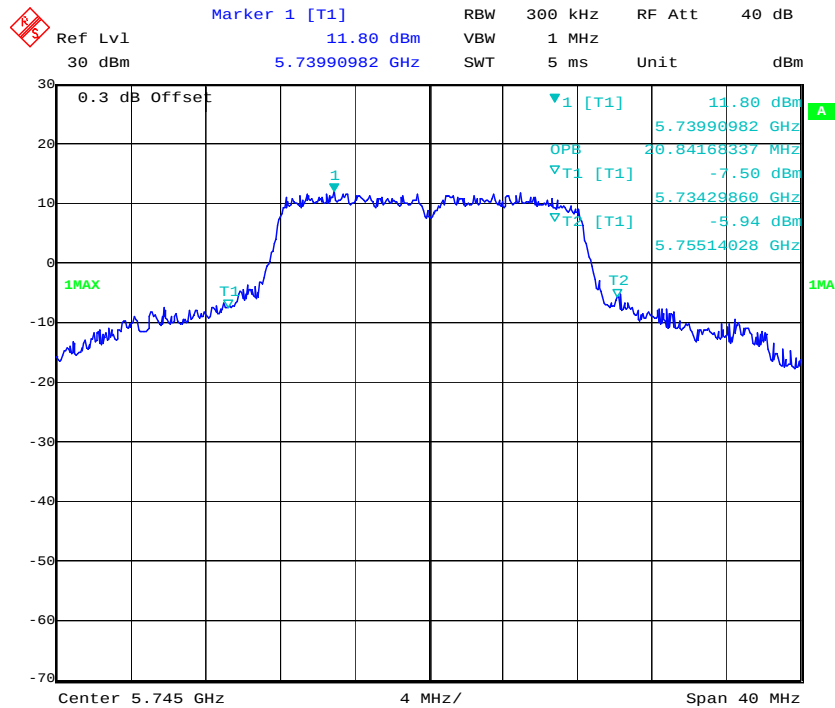


### 5M High Channel



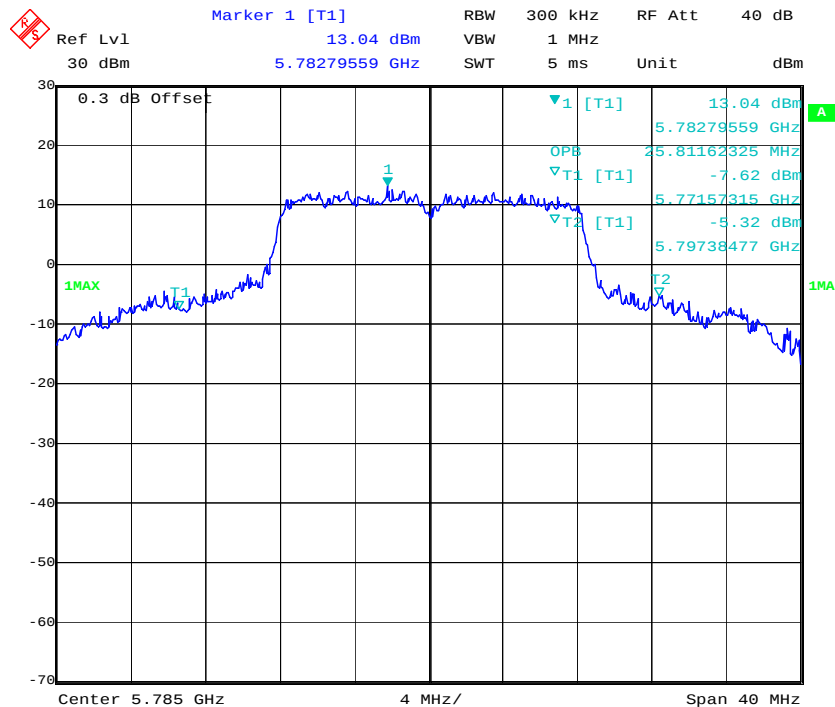
99% Occupied Bandwidth:

802.11a Low Channel



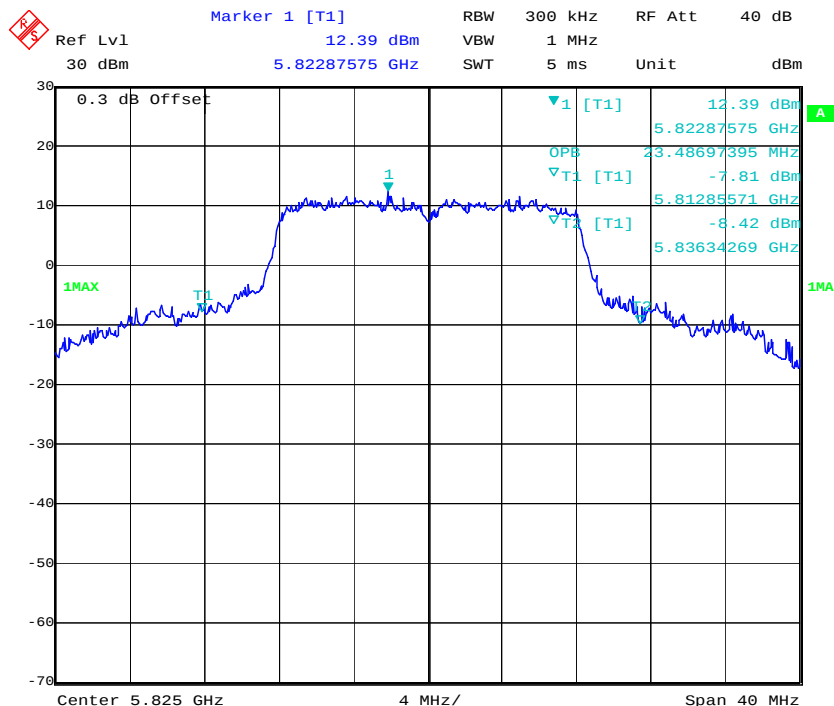
Date: 27.FEB.2017 21:23:11

802.11a Middle Channel



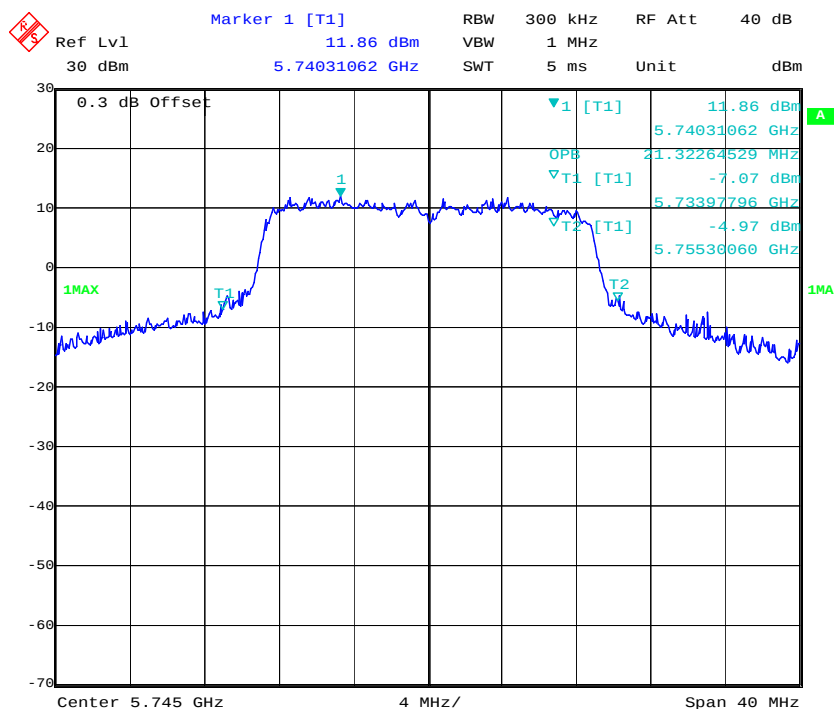
Date: 27.FEB.2017 21:25:56

### 802.11a High Channel



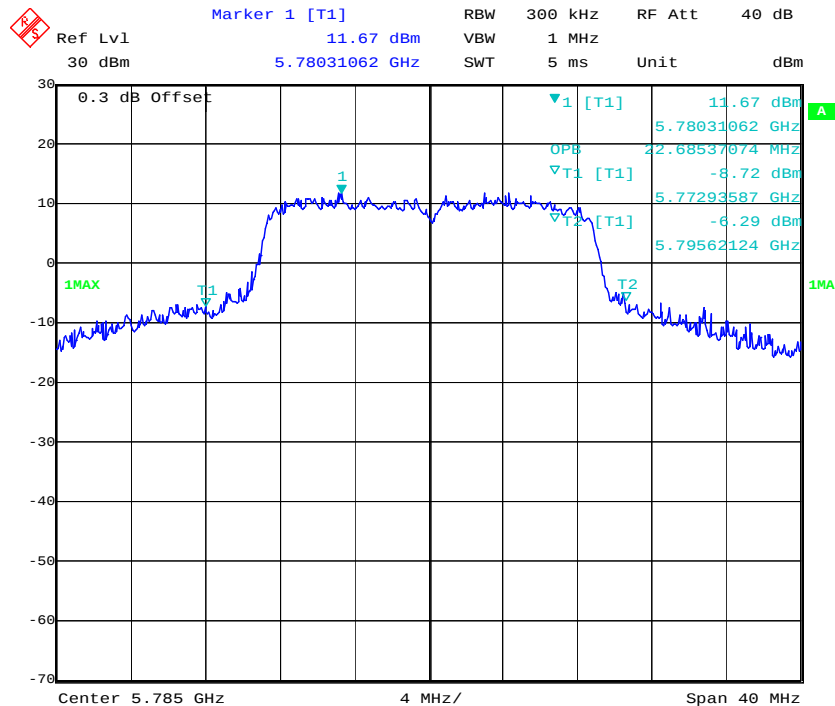
Date: 27.FEB.2017 21:27:45

### 802.11n ht20 Low Channel

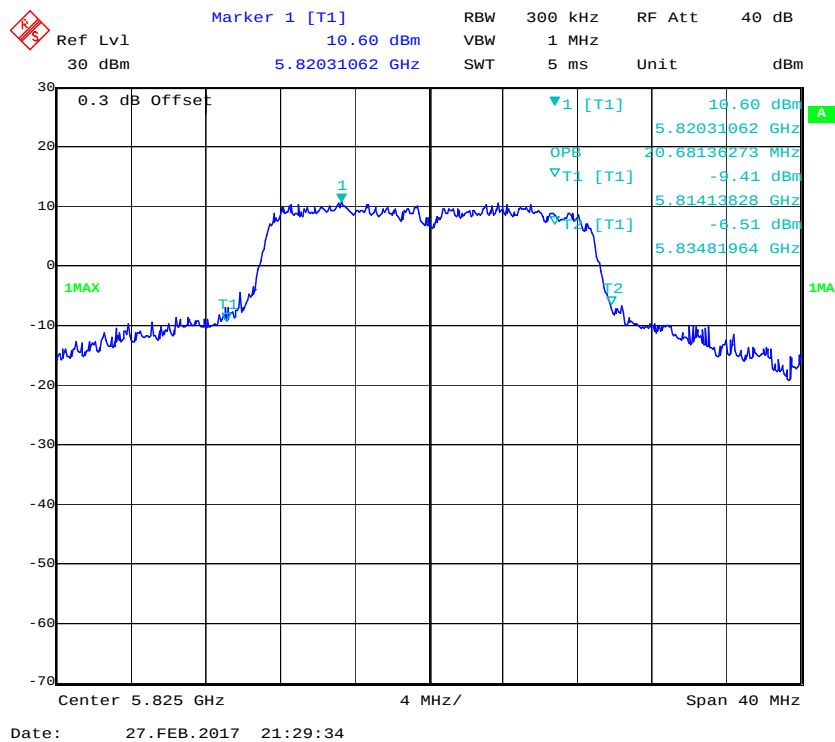


Date: 27.FEB.2017 21:49:58

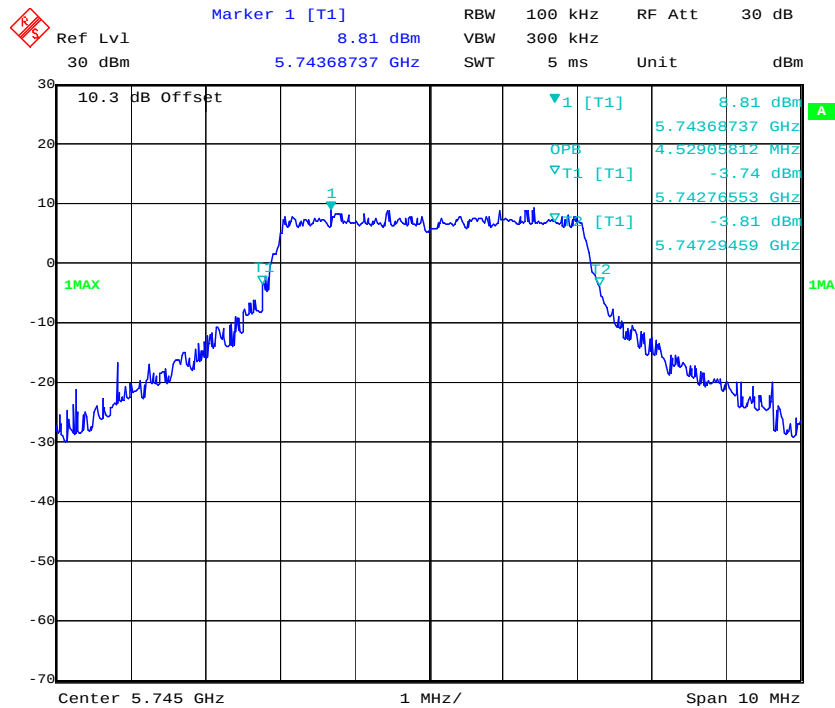
### 802.11n ht20 Middle Channel



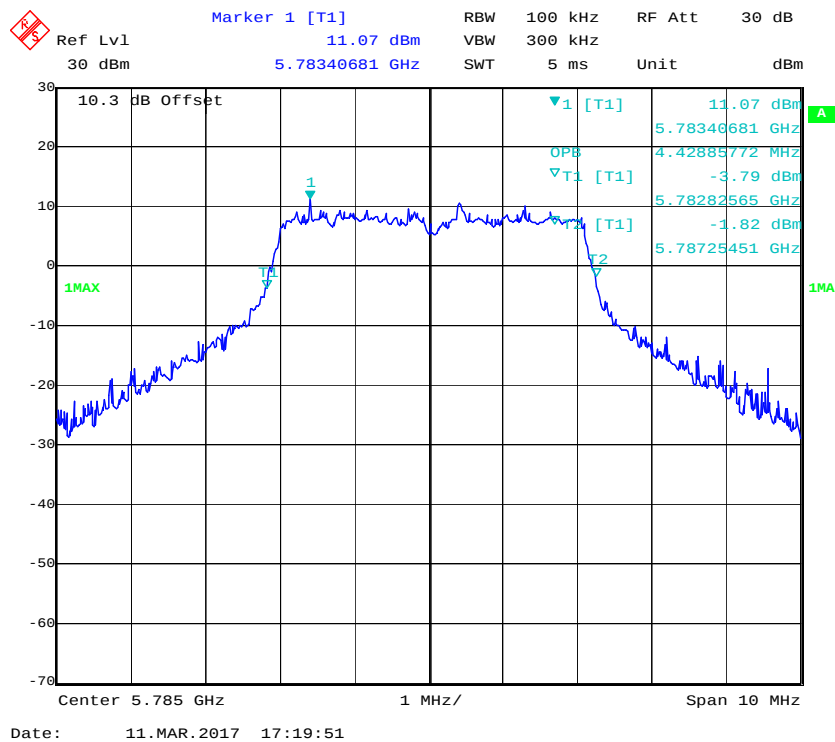
### 802.11n ht20 High Channel



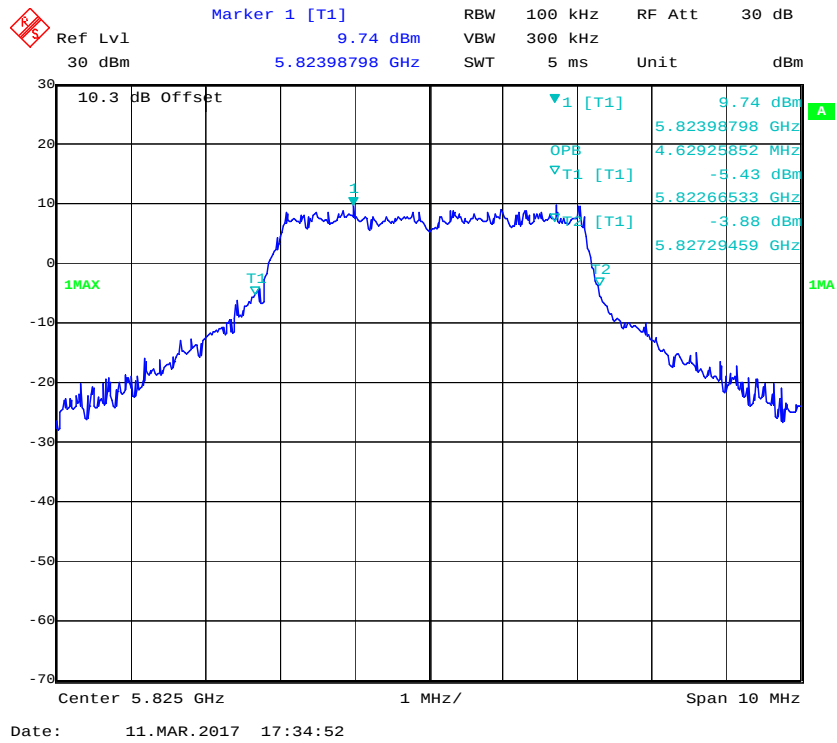
### 5M Low Channel



### 5M Middle Channel



### 5M High Channel



## FCC §15.407(g) – FREQUENCY STABILITY

### Applicable Standard

FCC §15.407

(g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

### Test Procedure

According to C63.10-2013 clause 6.8.

### Test Equipment List and Details

| Manufacturer    | Description                   | Model   | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------------------|---------|---------------|------------------|----------------------|
| Rohde & Schwarz | Signal Analyzer               | FSIQ26  | 831929/005    | 2016-09-21       | 2017-09-20           |
| N/A             | RF Cable                      | N/A     | N/A           | Each Time        | /                    |
| FLUKE           | Multimeter                    | 1587    | 27870099      | 2016-12-30       | 2017-12-29           |
| BACL            | High Temperature Test Chamber | BTH-150 | 30024         | 2016-12-02       | 2017-12-01           |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 26.3 °C  |
| Relative Humidity: | 39 %     |
| ATM Pressure:      | 95.5 kPa |

*The testing was performed by Kevin Hu on 2017-03-11.*

**Test Result:** Pass.

| Un-modulation, channel 5745 MHz |                 |                    |        |
|---------------------------------|-----------------|--------------------|--------|
| Temperature                     | Voltage         | Measured Frequency | Result |
| °C                              | V <sub>DC</sub> | MHz                |        |
| -20                             | 11.4            | 5745.008           | Pass   |
| -10                             |                 | 5745.006           |        |
| 10                              |                 | 5745.004           |        |
| 20                              |                 | 5745.010           |        |
| 30                              |                 | 5745.002           |        |
| 40                              |                 | 5745.002           |        |
| 25                              | 13.05           | 5745.010           |        |
| 25                              | 9.7             | 5745.002           |        |

Note: Based on the frequency stability and emission bandwidth, the emission is maintained within the band of operation.

## **FCC §15.407(a) –MAXIMUM CONDUCTED OUTPUT POWER**

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### **Applicable Standard**

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $10 \log B$  dBm, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output

power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

### Test Equipment List and Details

| Manufacturer | Description           | Model  | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-----------------------|--------|---------------|------------------|----------------------|
| Agilent      | Wideband Power Sensor | N1921A | MY54170074    | 2017-01-03       | 2018-01-03           |
| Agilent      | P-Series Power Meter  | N1912A | MY5000798     | 2017-01-03       | 2018-01-03           |
| N/A          | RF Cable              | N/A    | N/A           | Each Time        | /                    |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r03

### Test Data

#### Environmental Conditions

|                           |        |
|---------------------------|--------|
| <b>Temperature:</b>       | 19 °C  |
| <b>Relative Humidity:</b> | 54 %   |
| <b>ATM Pressure:</b>      | 96 kPa |

*The testing was performed by Kevin Hu on 2017-03-14.*

Test Mode: Transmitting

| UNII Band    | Mode         | Frequency (MHz) | RMS Channel Power (dBm) |         | Total (dBm) | Limits (dBm) | Result |
|--------------|--------------|-----------------|-------------------------|---------|-------------|--------------|--------|
|              |              |                 | Chain 0                 | Chain 1 |             |              |        |
| 5725-5850MHz | 802.11a      | 5745            | 20.31                   | 19.34   | 22.86       | 30           | PASS   |
|              |              | 5785            | 19.97                   | 19.58   | 22.79       | 30           | PASS   |
|              |              | 5825            | 18.97                   | 18.68   | 21.84       | 30           | PASS   |
|              | 802.11n ht20 | 5745            | 20.19                   | 19.31   | 22.78       | 30           | PASS   |
|              |              | 5785            | 19.91                   | 19.34   | 22.64       | 30           | PASS   |
|              |              | 5825            | 18.86                   | 18.43   | 21.66       | 30           | PASS   |
|              | 5M           | 5745            | 18.25                   | 18.38   | 21.33       | 30           | PASS   |
|              |              | 5785            | 17.84                   | 17.67   | 20.77       | 30           | PASS   |
|              |              | 5825            | 17.23                   | 17.53   | 20.39       | 30           | PASS   |

Note 1: Duty cycle corrected factor has been added in the test result for 5M mode.

Note 2: the 2 antenna maximum antenna gains are 3.57 dBi, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ ;

So:

Directional gain =  $G_{ANT} + \text{Array Gain} = 3.57 \text{ dBi} < 6 \text{ dBi}$

## **FCC §15.407(a) - POWER SPECTRAL DENSITY**

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### **Applicable Standard**

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output

power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

## Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r03

## Test Equipment List and Details

| Manufacturer    | Description     | Model  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-----------------|--------|---------------|------------------|----------------------|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 831929/005    | 2016-09-21       | 2017-09-20           |
| N/A             | RF Cable        | N/A    | N/A           | Each Time        | /                    |
| N/A             | 10dB Attenuator | 10dB   | 10dB-1        | Each Time        | /                    |

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

|                           |               |
|---------------------------|---------------|
| <b>Temperature:</b>       | 18~18.5 °C    |
| <b>Relative Humidity:</b> | 52~54 %       |
| <b>ATM Pressure:</b>      | 96.2~96.5 kPa |

*The testing was performed by Kevin Hu on 2017-02-27&2017-03-11.*

*Test Mode: Transmitting*

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

**5725-5850MHz:**

| Mode            | Channel | Frequency<br>MHz | PSD<br>(dBm/300kHz) |            | Total<br>(dBm/500kHz) | Result<br>Corrected<br>Duty Cycle<br>Factor<br>(dBm/500kHz) | Limit<br>(dBm/500kHz) |
|-----------------|---------|------------------|---------------------|------------|-----------------------|-------------------------------------------------------------|-----------------------|
|                 |         |                  | Chain<br>0          | Chain<br>1 |                       |                                                             |                       |
| 802.11a         | Low     | 5745             | 9                   | 7.73       | 13.64                 | 13.64                                                       | 29.43                 |
|                 | Middle  | 5785             | 8.76                | 7.71       | 13.5                  | 13.5                                                        | 29.43                 |
|                 | High    | 5825             | 7.67                | 7.73       | 12.93                 | 12.93                                                       | 29.43                 |
| 802.11n<br>ht20 | Low     | 5745             | 8.74                | 7.29       | 13.3                  | 13.3                                                        | 29.43                 |
|                 | Middle  | 5785             | 9.2                 | 7.35       | 13.6                  | 13.6                                                        | 29.43                 |
|                 | High    | 5825             | 7.35                | 8.1        | 12.97                 | 12.97                                                       | 29.43                 |
| 5M              | Low     | 5745             | 8.88                | 9.96       | 12.46                 | 14.13                                                       | 29.43                 |
|                 | Middle  | 5785             | 10.36               | 11.19      | 13.81                 | 15.48                                                       | 29.43                 |
|                 | High    | 5825             | 10.15               | 10.24      | 13.21                 | 14.88                                                       | 29.43                 |

Note: For 802.11a/n and 5M mode, the device employed Cyclic Delay Diversity (CDD) for MIMO transmitting, per C63.10-2013 clause 14.4.3.2.5 a,

For power density measurements,

$$\text{Array Gain} = 10 \log(N_{\text{ANT}}/N_{\text{SS}}) \text{ dB.}$$

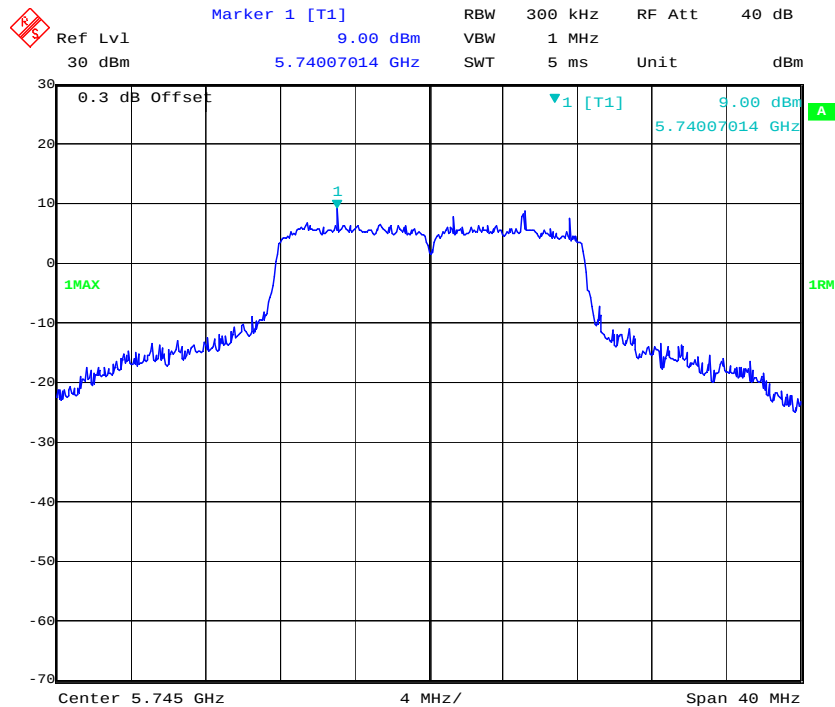
So:

$$\text{Directional gain} = \text{GANT} + \text{Array Gain} = 3.57 + 10 \cdot \log(2) = 6.57 \text{ dBi}$$

The measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log(500 \text{ kHz} / \text{RBW})$  to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

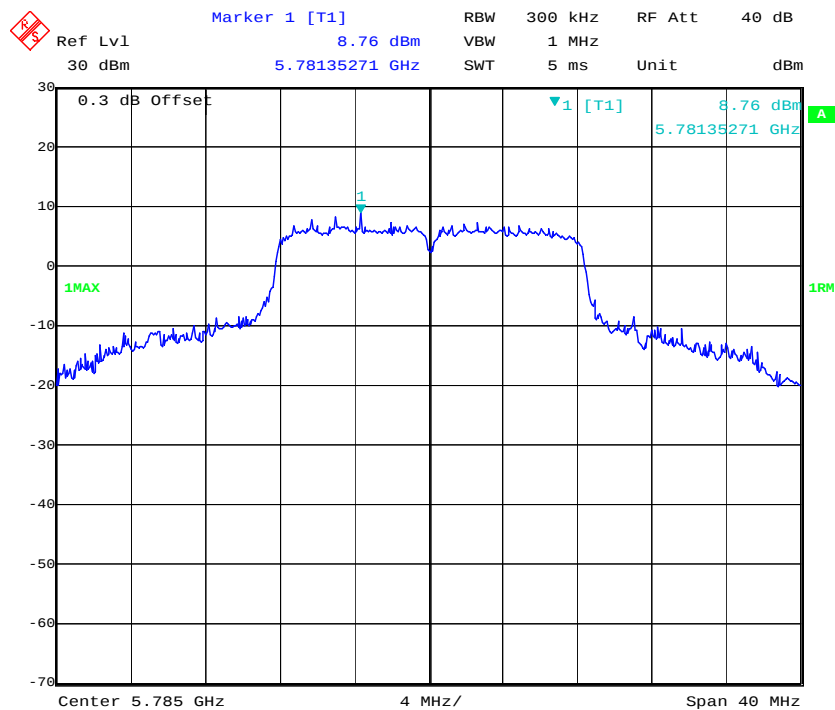
5725MHz-5850MHz:  
Chain 0:

### 802.11a Low Channel



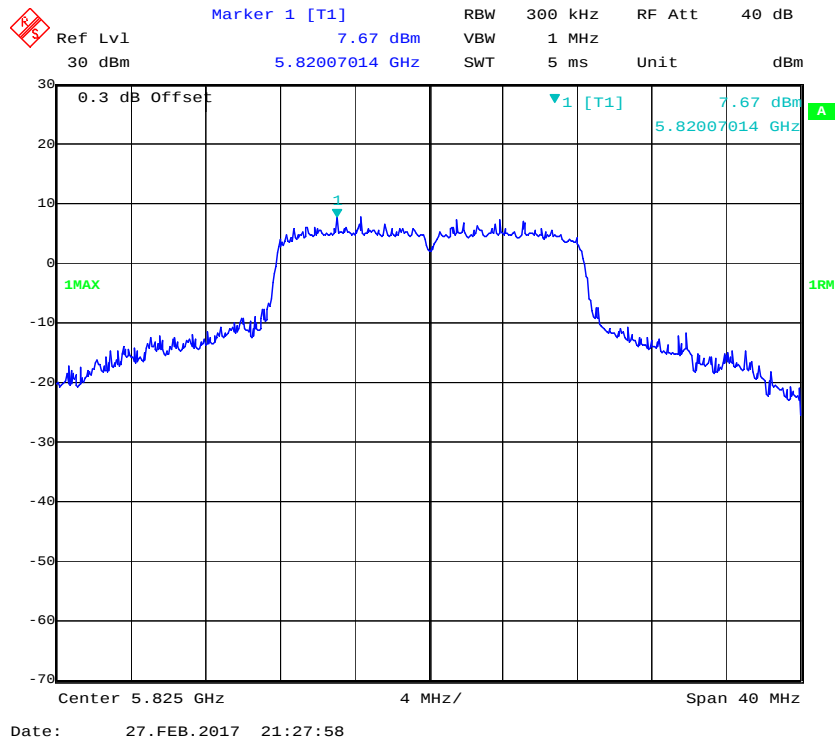
Date: 27.FEB.2017 21:23:25

### 802.11a Middle Channel

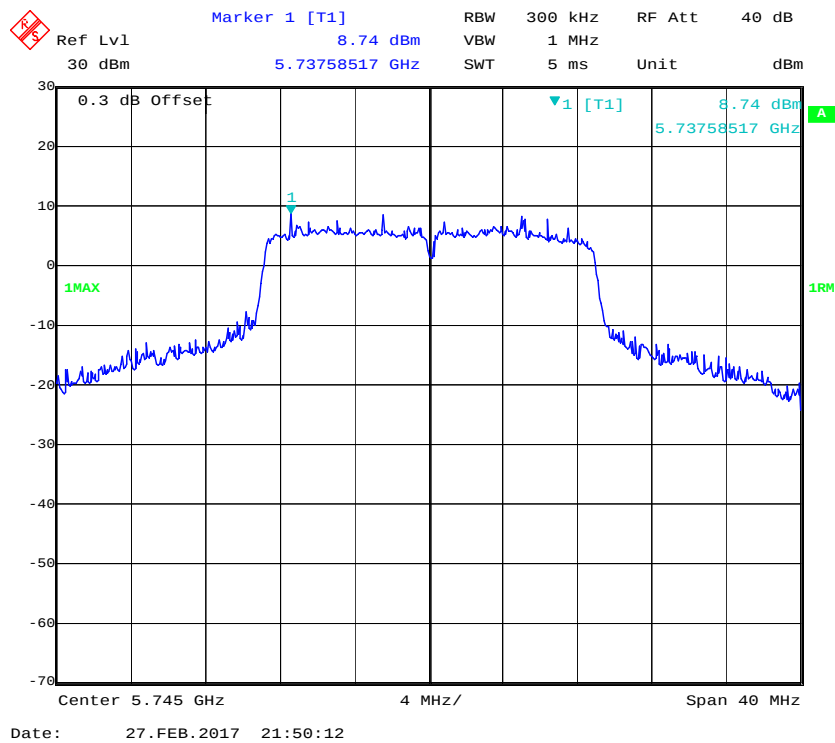


Date: 27.FEB.2017 21:26:10

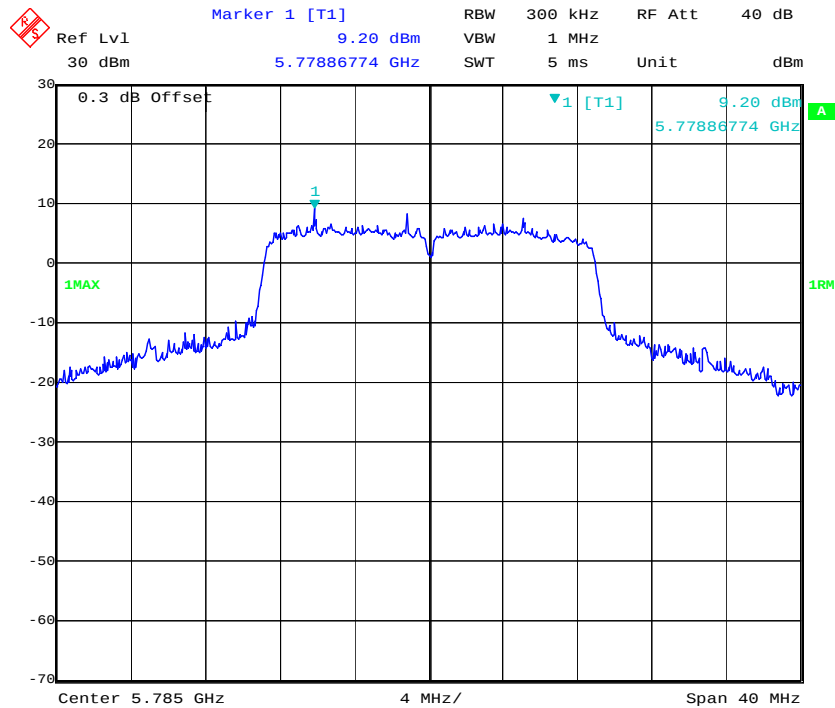
### 802.11a High Channel



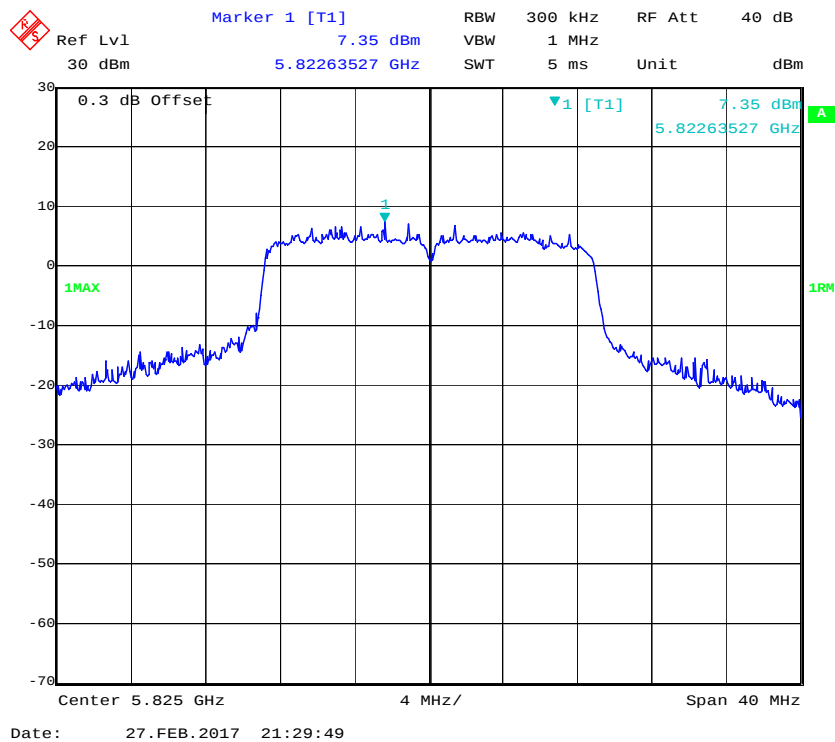
### 802.11n ht20 Low Channel



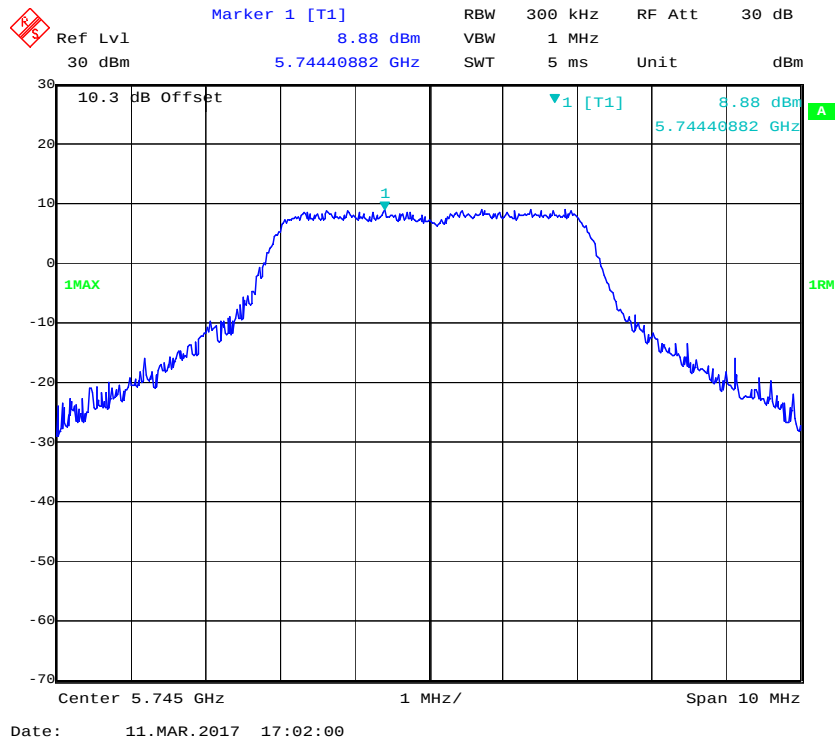
### 802.11n ht20 Middle Channel



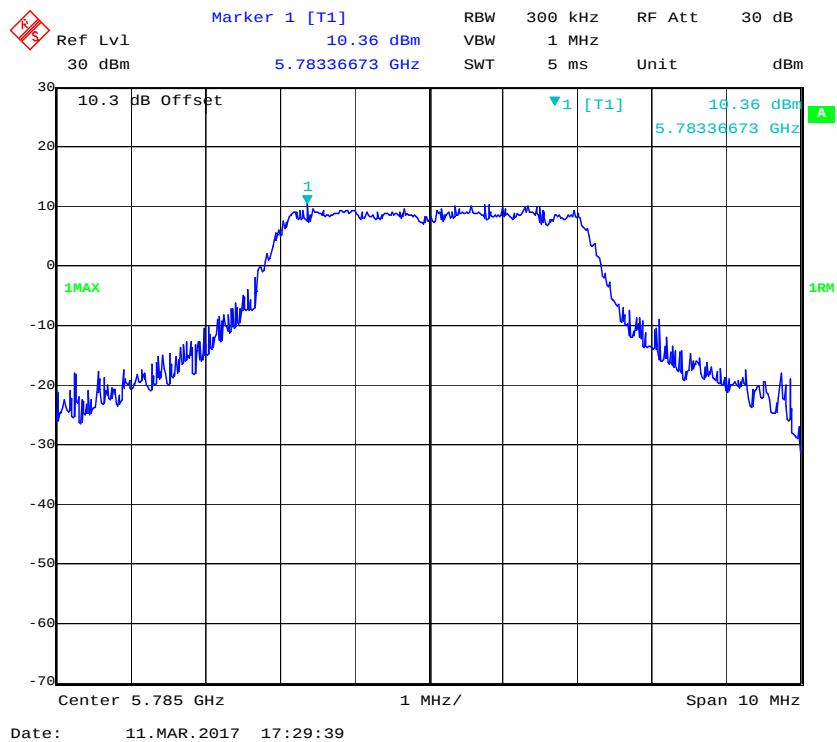
### 802.11n ht20 High Channel



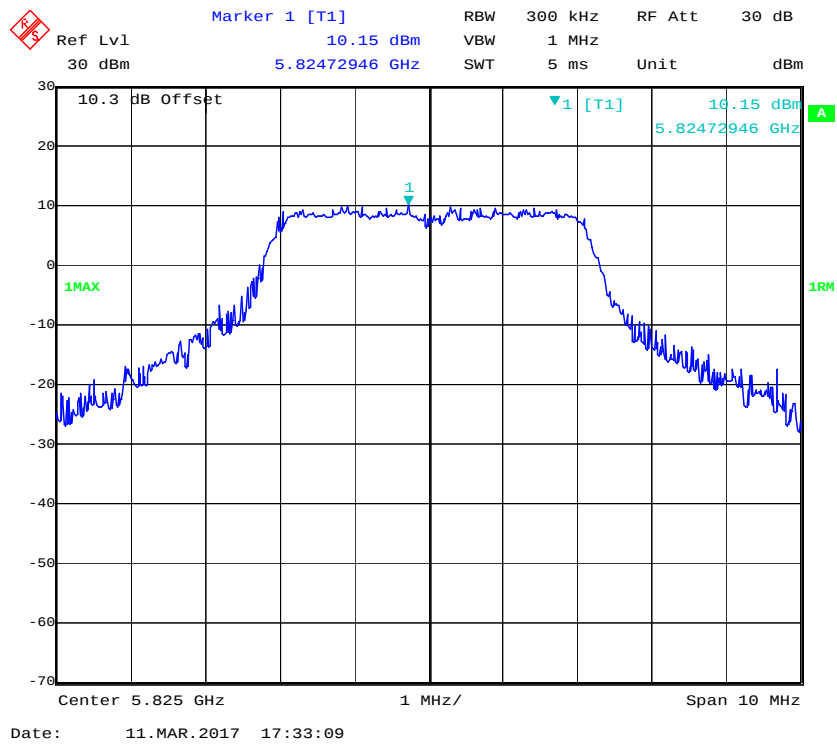
### 5M Low Channel



### 5M Middle Channel

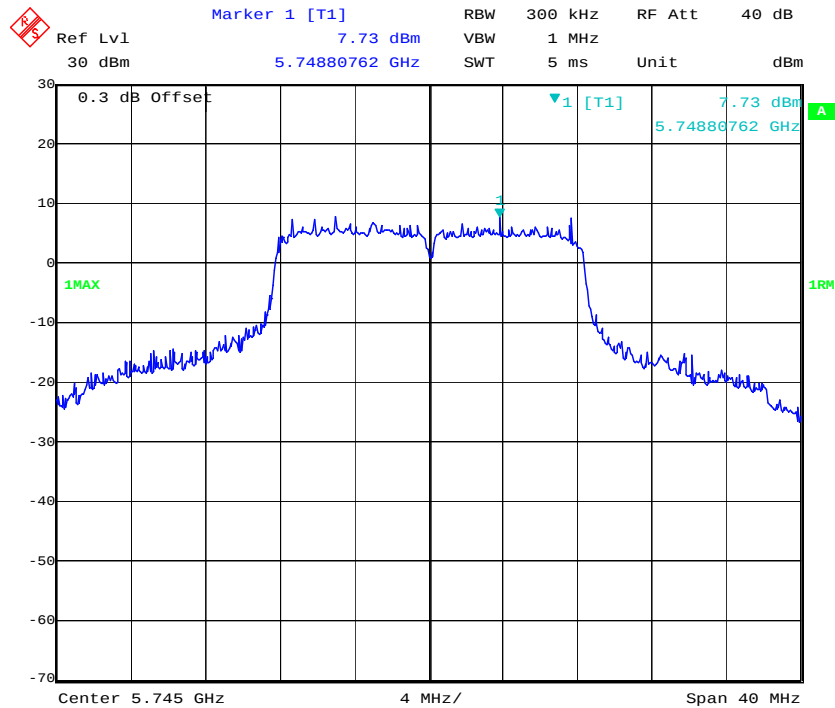


### 5M High Channel

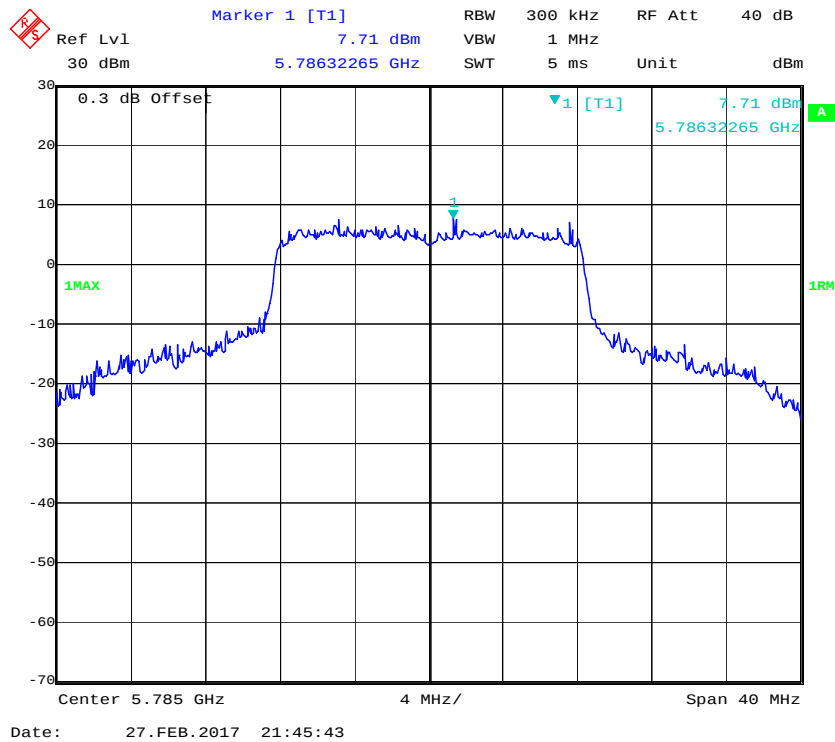


Chain 1:

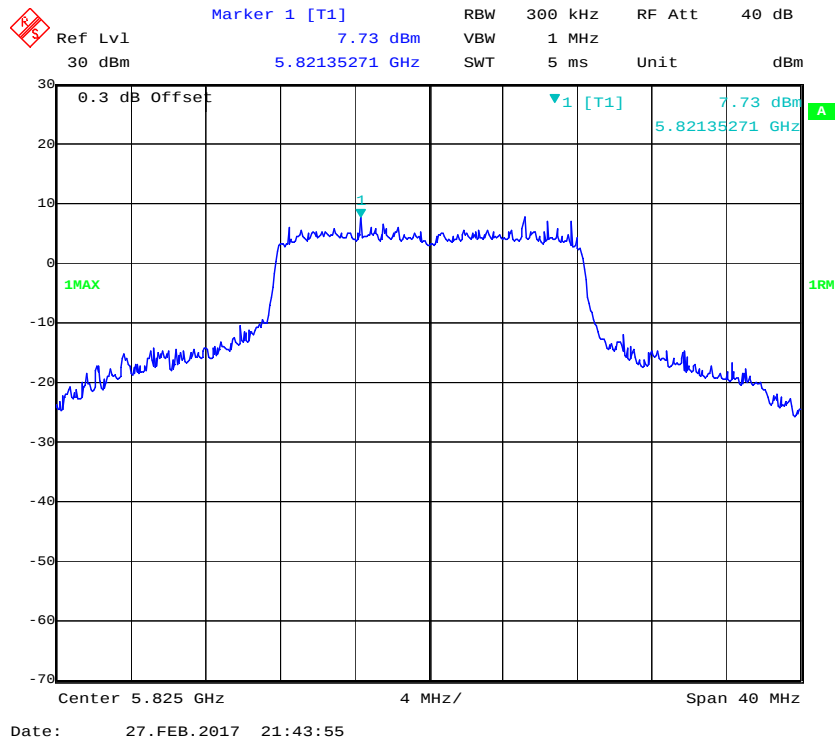
802.11a Low Channel



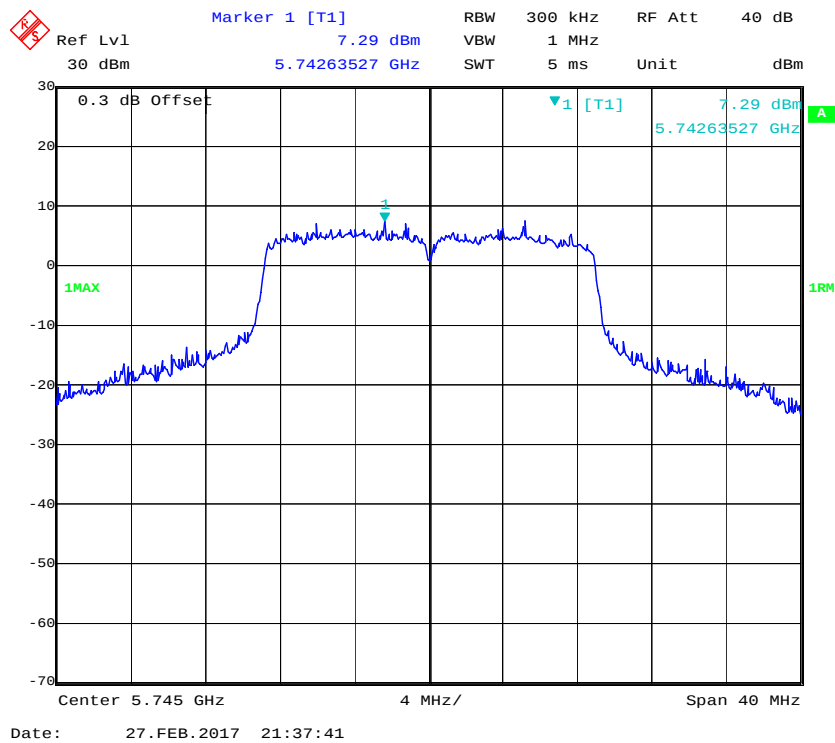
802.11a Middle Channel



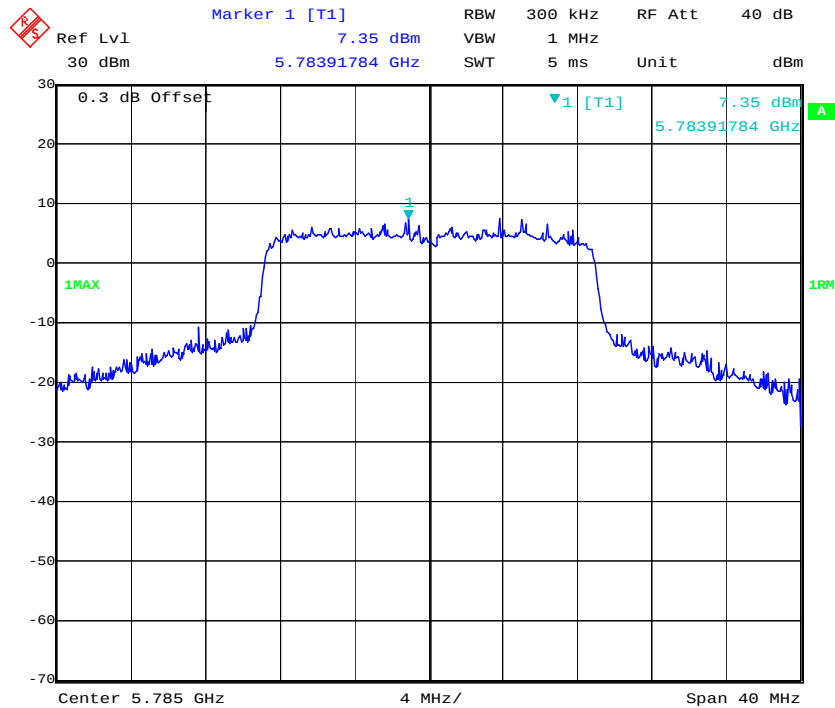
### 802.11a High Channel



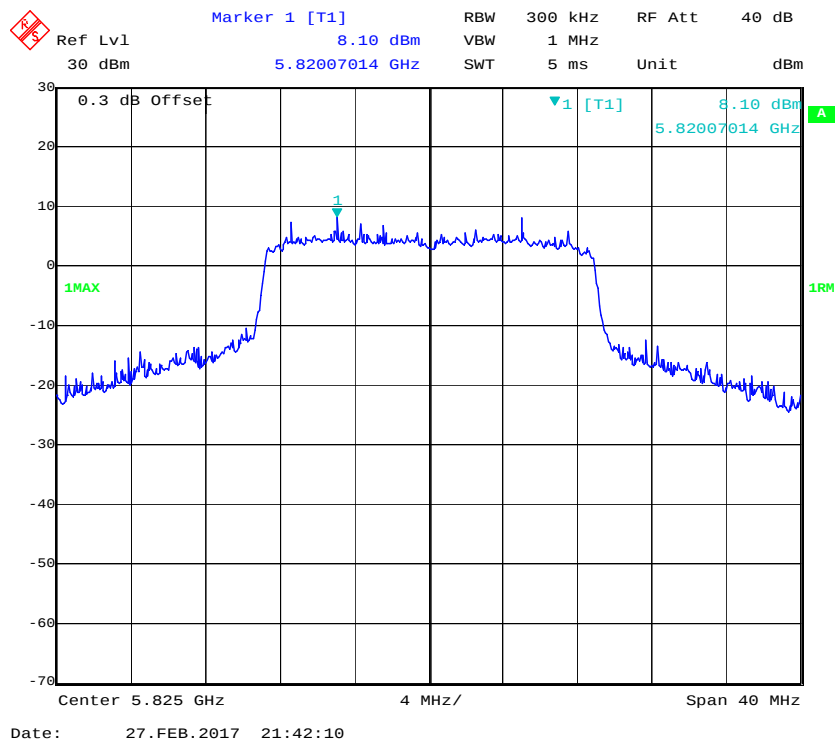
### 802.11n ht20 Low Channel



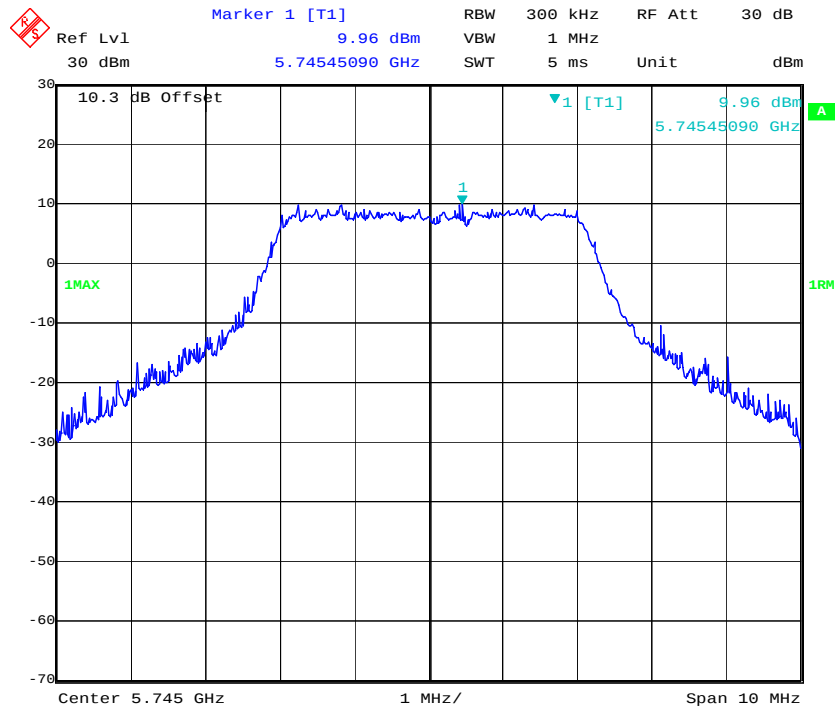
### 802.11n ht20 Middle Channel



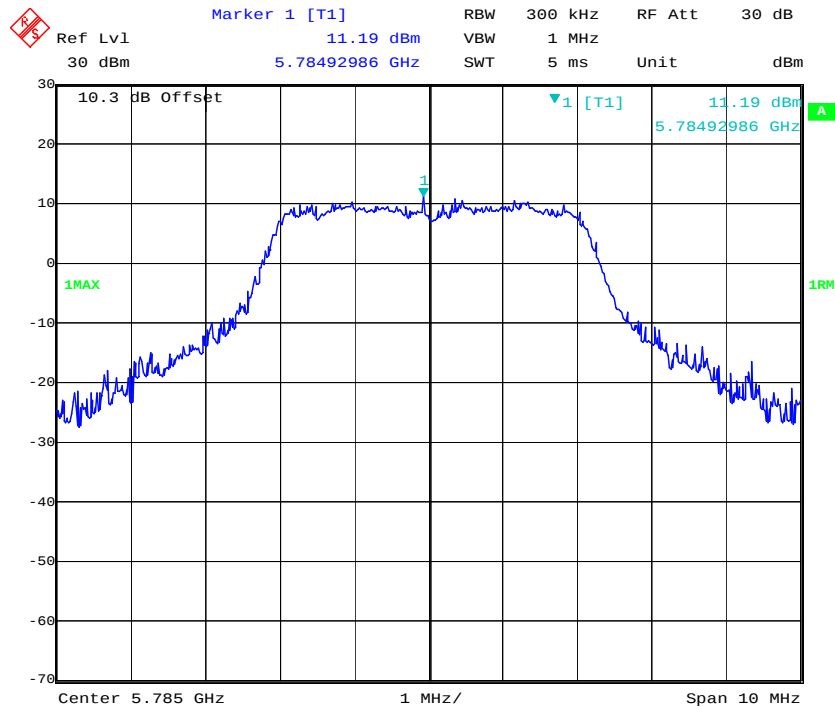
### 802.11n ht20 High Channel



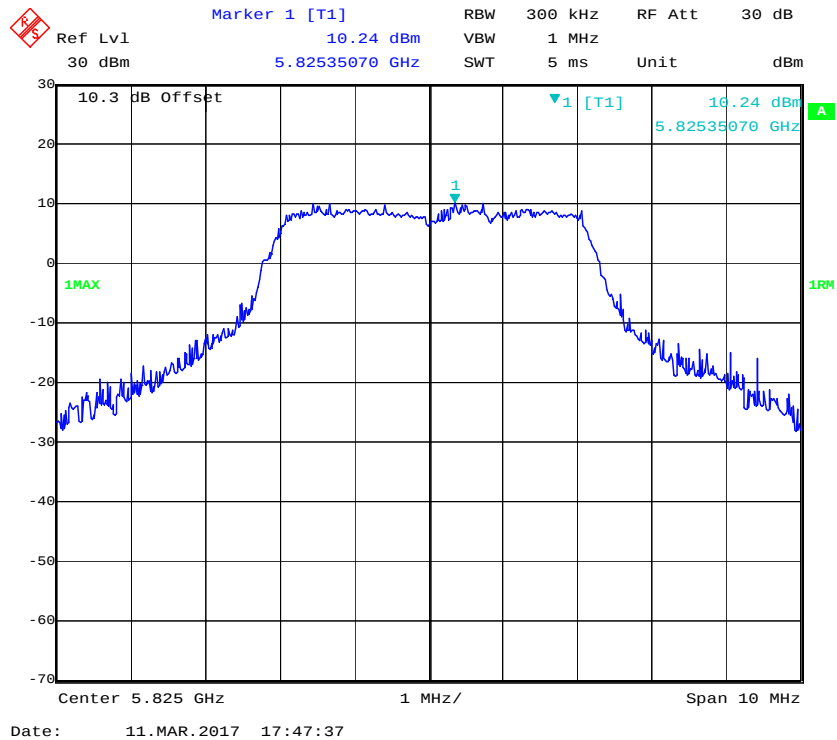
### 5M Low Channel



### 5M Middle Channel



### 5M High Channel



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