

FCC PART 15.407  
TEST REPORT

For

**Prodrone Technology (Shenzhen) Co., Ltd**

11th floor, Tower 1, Novel Park, 4078 Dongbin Road, Nanshan District, Shenzhen, China

**FCC ID: 2AKIE-PD-RC03-WF**

|   |   |
|---|---|
| <b>Report Type:</b><br>Original Report  | <b>Product Type:</b><br>GDU Remote controller |
| <b>Report Number:</b> <u>RSZ180109811-00</u>  |   |
| <b>Report Date:</b> <u>2018-02-28</u>   |   |
| <b>Reviewed By:</b> <u>RF Engineer</u>  | <i>Rocky Kang</i>                             |
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen).

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## GENERAL INFORMATION

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

The *Prodrone Technology (Shenzhen) Co., Ltd's* product, model number: *CME03-O2 WF (FCC ID:2AKIE-PD-RC03-WF)* in this report was a *GDU Remote controller*, which was measured approximately: 185 mm (L) × 10 mm (W) × 55 mm (H) , rated with input voltage: DC 7.6 V battery or DC 13.05V from adapter.

Adapter Information:

Model: CPD-BC03

Input: AC 100-240V, 50/60Hz, 1.5A

Output: DC 13.05V, 3.0 A

*\*All measurement and test data in this report was gathered from production sample serial number: 180109811 (Assigned by BACL, shenzhen).The EUT supplied by the applicant was received on 2018-01-09.*

### Objective

This type approval report is prepared on behalf of *Prodrone Technology (Shenzhen) Co., Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions 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)

Submittal with the plane control unit of a system with FCC ID: 2AKIE-PD-O2-WF.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

And KDB 789033 D02 General UNII Test Procedures New Rules v02r01

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

**Measurement Uncertainty**

| Parameter                          | uncertainty |
|------------------------------------|-------------|
| Occupied Channel Bandwidth         | ±5%         |
| RF Output Power with Power meter   | ±0.5dB      |
| RF conducted test with spectrum    | ±1.5dB      |
| AC Power Lines Conducted Emissions | ±1.95dB     |
| All emissions, radiated            | ±4.88dB     |
| Temperature                        | -30~60 °C   |
| Humidity                           | ±6%         |
| Supply voltages                    | ±0.4%       |

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 382179, the FCC Designation No. : CN5001.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

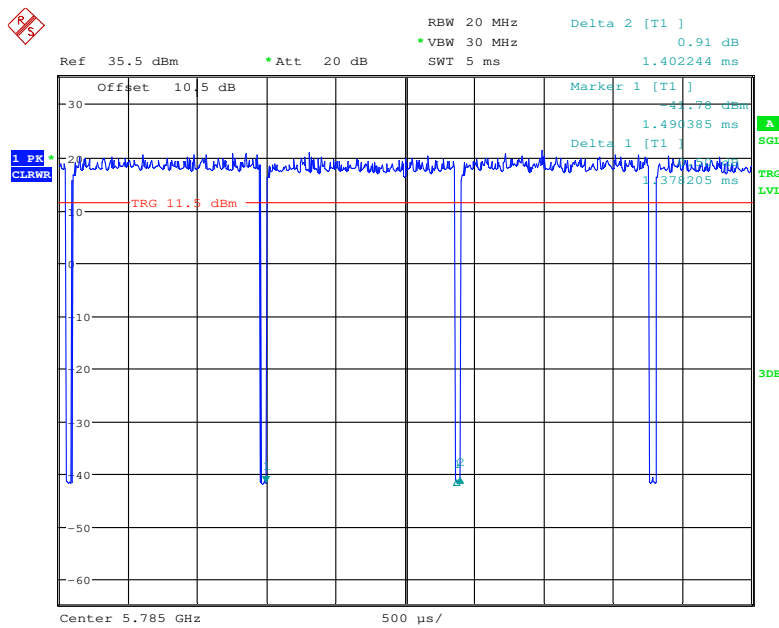
### EUT Exercise Software

“ART.GUI” software was used for wifi testing.

| Mode      | Data rate | Power level |                |              |
|-----------|-----------|-------------|----------------|--------------|
|           |           | Low channel | Middle channel | High channel |
| 802.11a   | 6 Mbps    | 20          | 20             | 20           |
| 802.11n20 | MCS 0     | 20          | 20             | 20           |

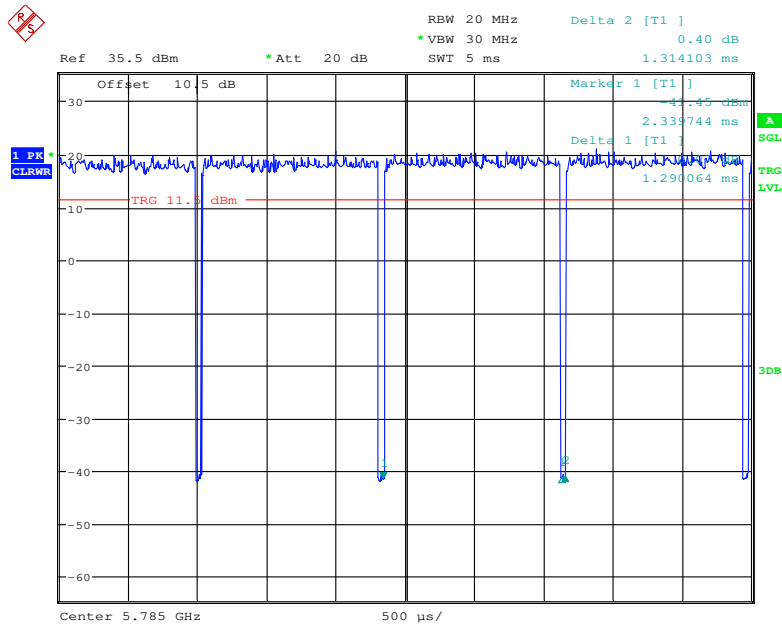
### Duty cycle

#### 802.11a Mode



Date: 24.JAN.2018 20:41:07

**802.11n20 mode**



Date: 24.JAN.2018 20:39:45

| Band      | Duty Cycle (%) | T(ms) | 1/T(kHz) | VBW Setting | 10log(1/ Duty Cycle) |
|-----------|----------------|-------|----------|-------------|----------------------|
| 802.11a   | 98             | -     | -        | 10Hz        | -                    |
| 802.11n20 | 98             | -     | -        | 10Hz        | -                    |

**Equipment Modifications**

No modification was made to the EUT tested.

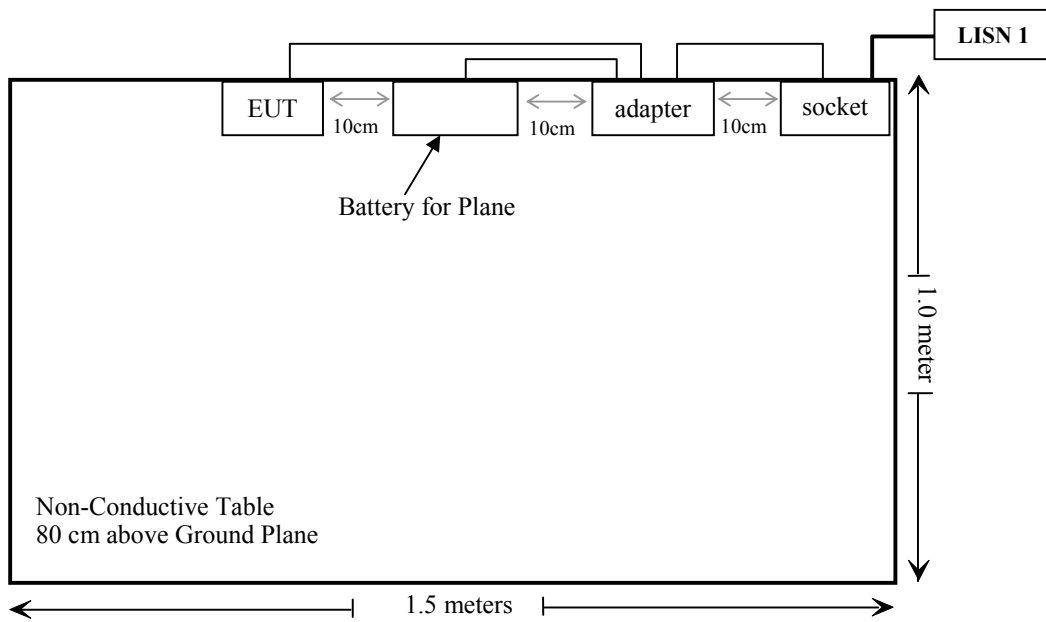
**Support Equipment List and Details**

| Manufacturer | Description       | Model | Serial Number |
|--------------|-------------------|-------|---------------|
| Prodrone     | Battery for Plane | /     | /             |

**External I/O Cable**

| Cable Description                   | Length (m) | From Port | To      |
|-------------------------------------|------------|-----------|---------|
| Un-Shielding Un-Detachable DC Cable | 1.0        | EUT       | Adapter |
| Un-Shielding Un-Detachable AC Cable | 0.5        | Socket    | Adapter |
| Un-Shielding Un-Detachable DC Cable | 0.8        | Battery   | Adapter |

**Block Diagram of Test Setup**





**SUMMARY OF TEST RESULTS**

| <b>FCC Rules</b>                         | <b>Description of Test</b>             | <b>Result</b> |
|--|--|---------------|
| §15.247 (i) & §1.1307 (b) (1) & §2.1093  | RF Exposure                            | Compliance    |
| §15.203                                  | Antenna Requirement                    | Compliance    |
| §15.407(b)(6)& §15.207(a)                | Conducted Emissions                    | Compliance    |
| §15.205& §15.209 &§15.407(b) (4),(6),(7) | Undesirable Emission& Restricted Bands | Compliance    |
| §15.407(b) (4)                           | Out Of Band Emission                   | Compliance    |
| §15.407(e)                               | 6dB Bandwidth                          | Compliance    |
| §15.407(a) (3)                           | Conducted Transmitter Output Power     | Compliance    |
| §15.407 (a) (3)                          | Power Spectral Density                 | Compliance    |

**TEST EQUIPMENT LIST**

| Manufacturer                    | Description              | Model                 | Serial Number          | Calibration Date | Calibration Due Date |
|---------------------------------|--------------------------|-----------------------|------------------------|------------------|----------------------|
| <b>Conducted Emissions Test</b> |                          |                       |                        |                  |                      |
| Rohde & Schwarz                 | EMI Test Receiver        | ESCS30                | 100176                 | 2017-08-04       | 2018-08-04           |
| Rohde & Schwarz                 | LISN                     | ENV216                | 3560.6650.12-101613-Yb | 2017-12-07       | 2018-12-07           |
| Rohde & Schwarz                 | Transient Limiter        | ESH3Z2                | DE25985                | 2017-11-19       | 2018-05-21           |
| Rohde & Schwarz                 | CE Test software         | EMC 32                | V8.53.0                | NCR              | NCR                  |
| N/A                             | Conducted Emission Cable | N/A                   | UF A210B-1-0720-504504 | 2017-11-12       | 2018-05-12           |
| <b>Radiated Emission Test</b>   |                          |                       |                        |                  |                      |
| Sunol Sciences                  | Horn Antenna             | DRH-118               | A052604                | 2017-12-29       | 2020-12-28           |
| Rohde & Schwarz                 | Signal Analyzer          | FSIQ26                | 8386001028             | 2017-04-24       | 2018-04-24           |
| Sunol Sciences                  | Bi-log Antenna           | JB1                   | A040904-2              | 2017-12-17       | 2020-12-16           |
| Mini                            | Pre-amplifier            | ZVA-183-S+            | 5969001149             | 2017-02-14       | 2018-02-14           |
| HP                              | Amplifier                | HP8447E               | 1937A01046             | 2017-11-19       | 2018-05-21           |
| Anritsu                         | Signal Generator         | 68369B                | 004114                 | 2017-12-05       | 2018-12-05           |
| Rohde & Schwarz                 | EMI Test Receiver        | ESCI                  | 101120                 | 2017-12-07       | 2018-12-07           |
| Ducommun technologies           | RF Cable                 | UFA210A-1-4724-30050U | MFR64369 223410-001    | 2017-11-19       | 2018-05-21           |
| Ducommun technologies           | RF Cable                 | 104PEA                | 218124002              | 2017-11-19       | 2018-05-21           |
| Ducommun technologies           | RF Cable                 | RG-214                | 1                      | 2017-11-19       | 2018-05-21           |
| Ducommun technologies           | RF Cable                 | RG-214                | 2                      | 2017-11-22       | 2018-05-22           |
| Ducommun Technologies           | Horn Antenna             | ARH-4223-02           | 1007726-04             | 2017-12-29       | 2020-12-28           |
| Ducommun Technologies           | Horn Antenna             | ARH-2823-02           | 1007726-04             | 2017-12-29       | 2020-12-28           |
| Ducommun Technologies           | Pre-amplifier            | ALN-22093530-01       | 991373-01              | 2017-08-03       | 2018-08-03           |

| Manufacturer             | Description                    | Model     | Serial Number | Calibration Date | Calibration Due Date |
|--------------------------|--------------------------------|-----------|---------------|------------------|----------------------|
| <b>RF Conducted Test</b> |                                |           |               |                  |                      |
| Rohde & Schwarz          | Signal Analyzer                | FSIQ26    | 837405/023    | 2017-04-24       | 2018-04-24           |
| ESPEC                    | Temperature & Humidity Chamber | EL-10KA   | 09107726      | 2017-11-22       | 2018-11-22           |
| Rohde & Schwarz          | SPECTRUM ANALYZER              | FSU26     | 200120        | 2017-12-05       | 2018-12-05           |
| Long Wei                 | DC Power Supply                | TPR-6420D | 398363        | NCR              | NCR                  |
| Fluke                    | Digital Multimeter             | 287       | 19000011      | 2017-04-09       | 2018-04-09           |
| Agilent                  | Power Meter                    | N1912A    | MY5000492     | 2017-11-18       | 2018-11-17           |
| Agilent                  | Power Sensor                   | N1921A    | MY54210024    | 2017-11-18       | 2018-11-17           |
| Ducommun technologies    | RF Cable                       | RG-214    | 3             | 2017-11-22       | 2018-05-22           |
| WEINSCHTEL               | 10dB Attenuator                | 5324      | AU 3842       | 2017-11-22       | 2018-05-23           |

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

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

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### **Applicable Standard**

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

### **Measurement Result**

Please refer to SAR test report: RSZ180109811-20.

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## **FCC §15.203 – ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

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

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

### **Antenna Connector Construction**

This product has two external wifi antenna which was permanently attached with maximum gain 2.0 dBi, fulfill the requirement of this section, and please refer to the EUT photo.

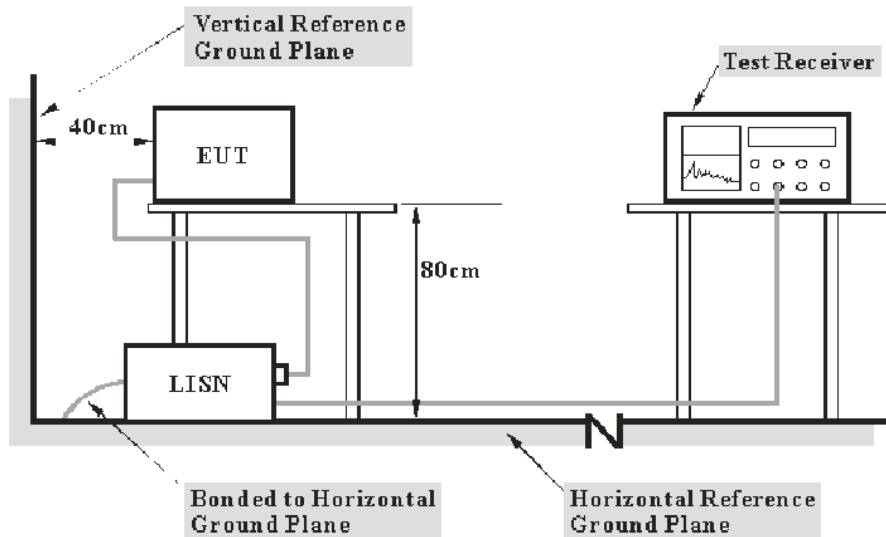
**Result:** Compliance.

**FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSION**

**Applicable Standard**

FCC §15.207, §15.407(b) (6)

**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 a 120 VAC/60 Hz power source.

**EMI Test Receiver Setup**

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

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

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

**Test Procedure**

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

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

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

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

## Test Data

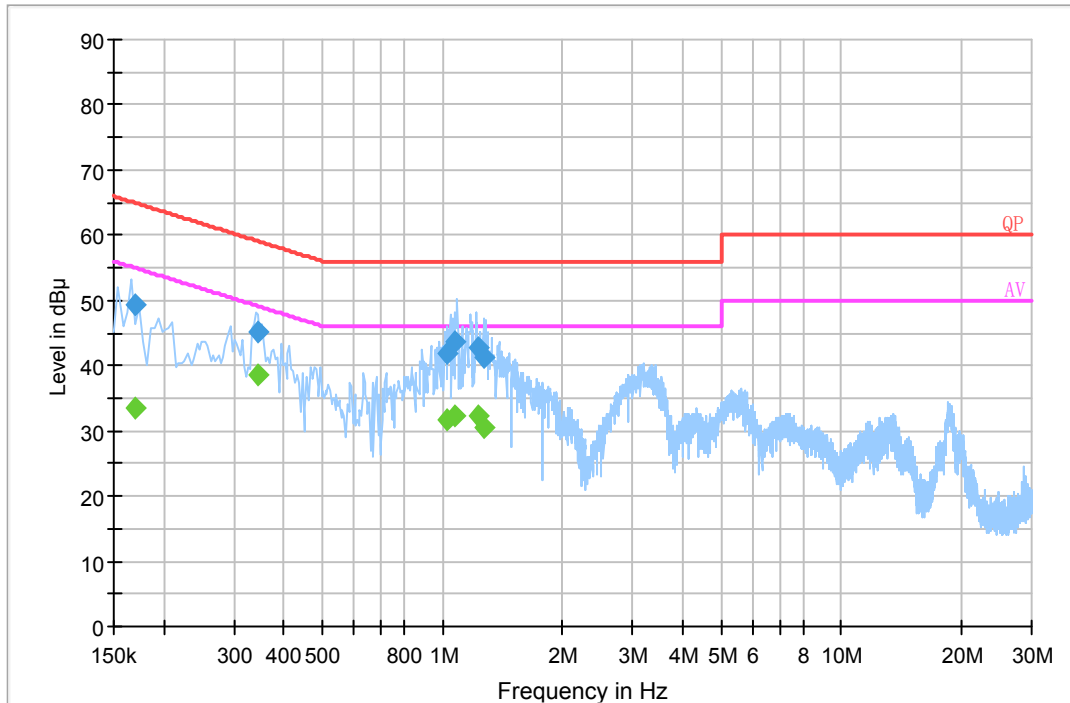
### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 25 °C     |
| Relative Humidity: | 56 %      |
| ATM Pressure:      | 101.0 kPa |

*The testing was performed by Dylan Li on 2018-01-26.*

*EUT operation mode: Transmitting*

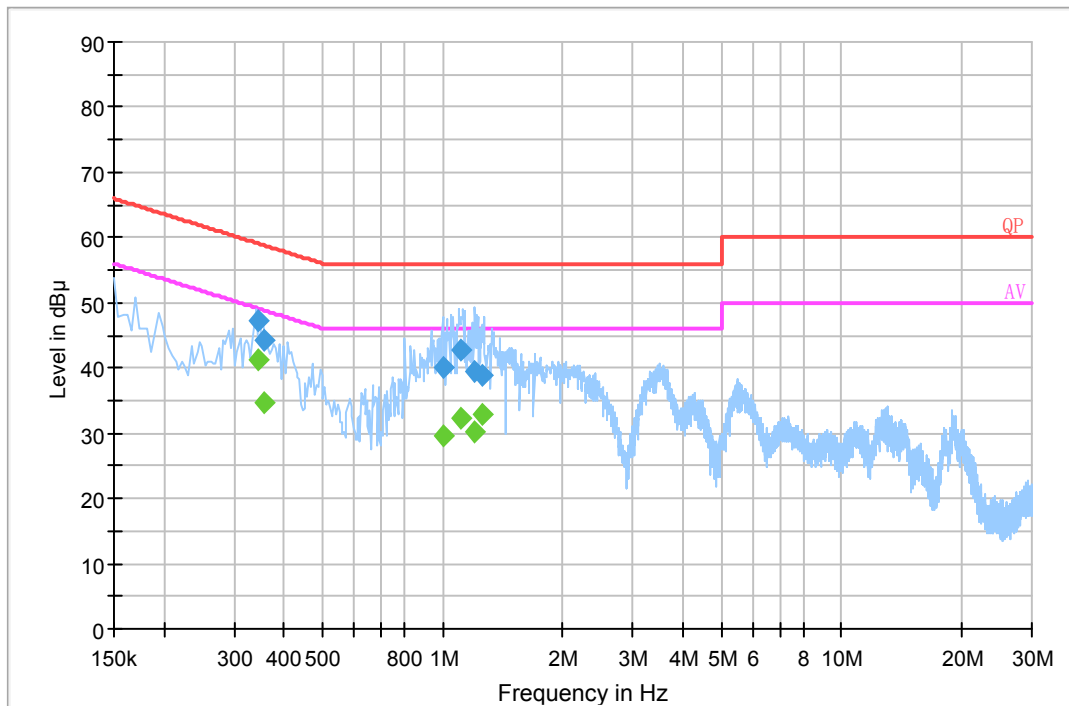
**AC 120V/60 Hz, Line:**



| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.169500        | 49.4                       | 20.2                   | 65.0         | 15.6        | QP                    |
| 0.344810        | 45.2                       | 20.2                   | 59.1         | 13.9        | QP                    |
| 1.022850        | 41.7                       | 20.1                   | 56.0         | 14.3        | QP                    |
| 1.073650        | 43.7                       | 20.1                   | 56.0         | 12.3        | QP                    |
| 1.223730        | 42.7                       | 20.1                   | 56.0         | 13.3        | QP                    |
| 1.274830        | 41.3                       | 20.1                   | 56.0         | 14.7        | QP                    |
| 0.169500        | 33.6                       | 20.2                   | 55.0         | 21.4        | Ave.                  |
| 0.344810        | 38.6                       | 20.2                   | 49.1         | 10.5        | Ave.                  |
| 1.022850        | 31.7                       | 20.1                   | 46.0         | 14.3        | Ave.                  |
| 1.073650        | 32.3                       | 20.1                   | 46.0         | 13.7        | Ave.                  |
| 1.223730        | 32.4                       | 20.1                   | 46.0         | 13.6        | Ave.                  |
| 1.274830        | 30.5                       | 20.1                   | 46.0         | 15.5        | Ave.                  |



**AC120V, 60 Hz, Neutral:**



| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.344870        | 47.3                       | 20.2                   | 59.1         | 11.8        | QP                    |
| 0.356690        | 44.2                       | 20.2                   | 58.8         | 14.6        | QP                    |
| 1.006970        | 40.0                       | 20.1                   | 56.0         | 16.0        | QP                    |
| 1.113530        | 42.9                       | 20.1                   | 56.0         | 13.1        | QP                    |
| 1.199910        | 39.6                       | 20.1                   | 56.0         | 16.4        | QP                    |
| 1.250950        | 38.8                       | 20.1                   | 56.0         | 17.2        | QP                    |
| 0.344870        | 41.4                       | 20.2                   | 49.1         | 7.7         | Ave.                  |
| 0.356690        | 34.7                       | 20.2                   | 48.8         | 14.1        | Ave.                  |
| 1.006970        | 29.6                       | 20.1                   | 46.0         | 16.4        | Ave.                  |
| 1.113530        | 32.4                       | 20.1                   | 46.0         | 13.6        | Ave.                  |
| 1.199910        | 30.2                       | 20.1                   | 46.0         | 15.8        | Ave.                  |
| 1.250950        | 32.9                       | 20.1                   | 46.0         | 13.1        | Ave.                  |

**Note:**

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

**§15.205 & §15.209 & §15.407(B) (4),(6),(7) – UNDESIRABLE EMISSION**

**Applicable Standard**

FCC §15.407 (b) (4), (6), (7); §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:

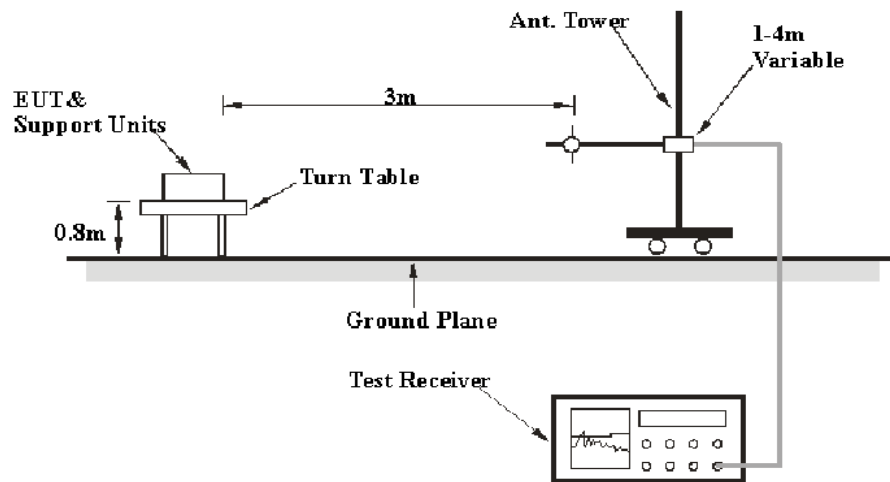
(4) For transmitters operating in the 5.725-5.85 GHz band:

- (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.

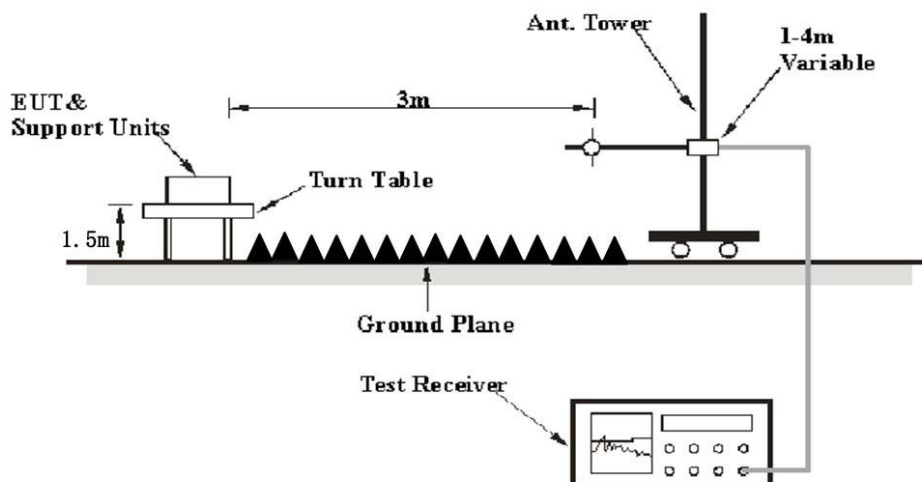
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

**EUT Setup**

**Below 1 GHz:**



**Above 1 GHz:**



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

### EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

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

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

Note 2: when duty cycle is less than 98%

### Test Procedure

#### Radiated Spurious Emission

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

#### Corrected Amplitude & Margin Calculation

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

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

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

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

### Test Results Summary

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

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

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

**Test Data**

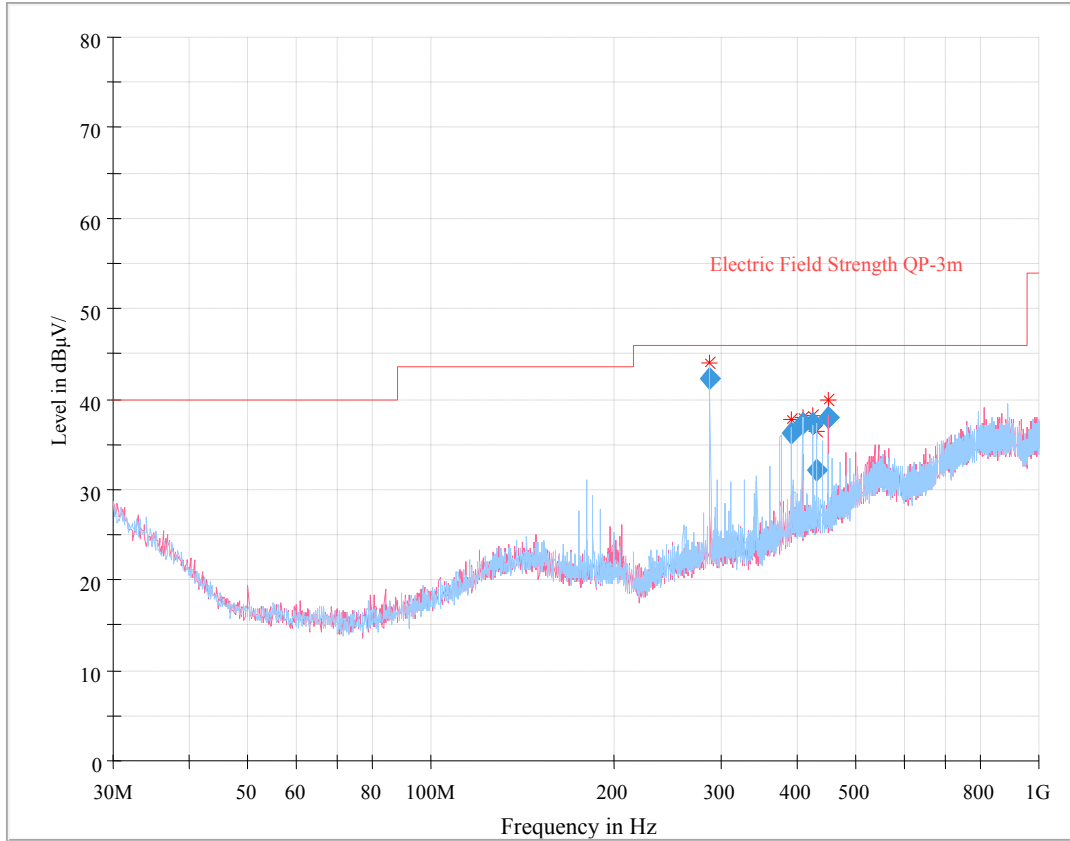
**Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 25 °C     |
| <b>Relative Humidity:</b> | 56 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Dylan Li on 2018-01-23.*

*EUT operation mode: Transmitting*

**30 MHz~1 GHz: (Worst case is 5825MHz in 802.11n20 mode)**



| Frequency (MHz) | Corrected Amplitude (dBµV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBµV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 288.026000      | 42.35                        | 104.0               | H                | 41.0                        | -3.1                     | 46.00          | 3.65        |
| 391.988375      | 36.15                        | 102.0               | H                | 17.0                        | -0.3                     | 46.00          | 9.85        |
| 408.008250      | 37.35                        | 106.0               | H                | 31.0                        | 0.1                      | 46.00          | 8.65        |
| 423.989625      | 37.34                        | 101.0               | H                | 327.0                       | 0.2                      | 46.00          | 8.66        |
| 432.082000      | 32.14                        | 108.0               | H                | 321.0                       | 0.2                      | 46.00          | 13.86       |
| 450.010625      | 37.90                        | 128.0               | V                | 305.0                       | 0.2                      | 46.00          | 8.10        |

**1000 MHz ~ 40 GHz: (5725-5850 MHz)**

**802.11a mode:**

| Frequency (MHz) | Measurement    |              | Turntable Degree | Rx Antenna |             | Corrected Factor (dB/m) | Corrected Amplitude (dBµV/m) | FCC Part 15.407/205/209 |             |
|-----------------|----------------|--------------|------------------|------------|-------------|-------------------------|------------------------------|-------------------------|-------------|
|                 | Reading (dBµV) | (PK/QP/Ave.) |                  | Height (m) | Polar (H/V) |                         |                              | Limit (dBµV/m)          | Margin (dB) |
| 5745 MHz        |                |              |                  |            |             |                         |                              |                         |             |
| 5745.00         | 75.73          | PK           | 60               | 1.1        | H           | 42.15                   | 117.88                       | /                       | /           |
| 5745.00         | 62.78          | Ave.         | 60               | 1.1        | H           | 42.15                   | 104.93                       | /                       | /           |
| 5745.00         | 70.63          | PK           | 295              | 1.9        | V           | 42.15                   | 112.78                       | /                       | /           |
| 5745.00         | 58.33          | Ave.         | 295              | 1.9        | V           | 42.15                   | 100.48                       | /                       | /           |
| 5694.78         | 27.81          | PK           | 182              | 1.1        | H           | 42.15                   | 69.96                        | 101.34                  | 31.38       |
| 5712.78         | 30.57          | PK           | 182              | 1.1        | H           | 42.15                   | 72.72                        | 108.78                  | 36.06       |
| 5723.86         | 40.06          | PK           | 41               | 2.0        | H           | 42.15                   | 82.21                        | 119.6                   | 37.39       |
| 11490.00        | 40.25          | PK           | 316              | 2.0        | H           | 17.56                   | 57.81                        | 74                      | 16.19       |
| 11490.00        | 26.37          | Ave.         | 316              | 2.0        | H           | 17.56                   | 43.93                        | 54                      | 10.07       |
| 5785 MHz        |                |              |                  |            |             |                         |                              |                         |             |
| 5785.00         | 74.23          | PK           | 316              | 1.7        | H           | 42.08                   | 116.31                       | /                       | /           |
| 5785.00         | 59.93          | Ave.         | 316              | 1.7        | H           | 42.08                   | 102.01                       | /                       | /           |
| 5785.00         | 70.06          | PK           | 317              | 2.0        | V           | 42.08                   | 112.14                       | /                       | /           |
| 5785.00         | 56.78          | Ave.         | 317              | 2.0        | V           | 42.08                   | 98.86                        | /                       | /           |
| 11570.00        | 41.35          | PK           | 289              | 2.3        | H           | 18.32                   | 59.67                        | 74                      | 14.33       |
| 11570.00        | 26.51          | Ave.         | 289              | 2.3        | H           | 18.32                   | 44.83                        | 54                      | 9.17        |
| 5825 MHz        |                |              |                  |            |             |                         |                              |                         |             |
| 5825.00         | 74.06          | PK           | 259              | 1.6        | H           | 42.08                   | 116.14                       | /                       | /           |
| 5825.00         | 61.04          | Ave.         | 259              | 1.6        | H           | 42.08                   | 103.12                       | /                       | /           |
| 5825.00         | 69.14          | PK           | 284              | 2.1        | V           | 42.08                   | 111.22                       | /                       | /           |
| 5825.00         | 56.98          | Ave.         | 284              | 2.1        | V           | 42.08                   | 99.06                        | /                       | /           |
| 5851.45         | 28.69          | PK           | 2                | 1.2        | H           | 42.55                   | 71.24                        | 118.89                  | 47.65       |
| 5857.93         | 27.59          | PK           | 130              | 1.5        | H           | 42.55                   | 70.14                        | 109.98                  | 39.84       |
| 5881.32         | 27.81          | PK           | 105              | 2.3        | H           | 42.55                   | 70.36                        | 100.52                  | 30.16       |
| 11650.00        | 41.26          | PK           | 100              | 1.7        | H           | 18.32                   | 59.58                        | 74                      | 14.42       |
| 11650.00        | 26.13          | Ave.         | 100              | 1.7        | H           | 18.32                   | 44.45                        | 54                      | 9.55        |

**802.11n20 mode:**

| Frequency (MHz) | Measurement          |              | Turntable Degree | Rx Antenna |             | Corrected Factor (dB/m) | Corrected Amplitude (dB $\mu$ V/m) | FCC Part 15.407/205/209 |             |
|-----------------|----------------------|--------------|------------------|------------|-------------|-------------------------|------------------------------------|-------------------------|-------------|
|                 | Reading (dB $\mu$ V) | (PK/QP/Ave.) |                  | Height (m) | Polar (H/V) |                         |                                    | Limit (dB $\mu$ V/m)    | Margin (dB) |
| 5745 MHz        |                      |              |                  |            |             |                         |                                    |                         |             |
| 5745.00         | 74.81                | PK           | 14               | 2.1        | H           | 42.15                   | 116.96                             | /                       | /           |
| 5745.00         | 60.47                | Ave.         | 14               | 2.1        | H           | 42.15                   | 102.62                             | /                       | /           |
| 5745.00         | 70.05                | PK           | 93               | 1.9        | V           | 42.15                   | 112.20                             | /                       | /           |
| 5745.00         | 56.52                | Ave.         | 93               | 1.9        | V           | 42.15                   | 98.67                              | /                       | /           |
| 5723.34         | 44.37                | PK           | 87               | 1.8        | H           | 42.15                   | 86.52                              | 118.42                  | 31.90       |
| 5717.63         | 32.19                | PK           | 289              | 1.8        | H           | 42.15                   | 74.34                              | 110.14                  | 35.80       |
| 5689.69         | 28.13                | PK           | 47               | 1.3        | H           | 42.15                   | 70.28                              | 97.57                   | 27.29       |
| 11490.00        | 41.07                | PK           | 113              | 1.2        | H           | 17.56                   | 58.63                              | 74                      | 15.37       |
| 11490.00        | 26.62                | Ave.         | 113              | 1.2        | H           | 17.56                   | 44.18                              | 54                      | 9.82        |
| 5785 MHz        |                      |              |                  |            |             |                         |                                    |                         |             |
| 5785.00         | 72.28                | PK           | 328              | 1.5        | H           | 42.08                   | 114.36                             | /                       | /           |
| 5785.00         | 60.29                | Ave.         | 328              | 1.5        | H           | 42.08                   | 102.37                             | /                       | /           |
| 5785.00         | 69.42                | PK           | 67               | 1.6        | V           | 42.08                   | 111.50                             | /                       | /           |
| 5785.00         | 57.64                | Ave.         | 67               | 1.6        | V           | 42.08                   | 99.72                              | /                       | /           |
| 11570.00        | 40.73                | PK           | 84               | 1.0        | H           | 18.32                   | 59.05                              | 74                      | 14.95       |
| 11570.00        | 26.59                | Ave.         | 84               | 1.0        | H           | 18.32                   | 44.91                              | 54                      | 9.09        |
| 5825 MHz        |                      |              |                  |            |             |                         |                                    |                         |             |
| 5825.00         | 73.54                | PK           | 229              | 2.1        | H           | 42.08                   | 115.62                             | /                       | /           |
| 5825.00         | 60.13                | Ave.         | 229              | 2.1        | H           | 42.08                   | 102.21                             | /                       | /           |
| 5825.00         | 68.51                | PK           | 182              | 1.9        | V           | 42.08                   | 110.59                             | /                       | /           |
| 5825.00         | 56.34                | Ave.         | 182              | 1.9        | V           | 42.08                   | 98.42                              | /                       | /           |
| 5850.15         | 29.87                | PK           | 250              | 2.0        | H           | 42.55                   | 72.42                              | 121.86                  | 49.44       |
| 5856.38         | 27.98                | PK           | 89               | 2.0        | H           | 42.55                   | 70.53                              | 110.41                  | 39.88       |
| 5877.49         | 27.36                | PK           | 210              | 1.5        | H           | 42.55                   | 69.91                              | 103.36                  | 33.45       |
| 11650.00        | 41.44                | PK           | 50               | 1.5        | H           | 18.32                   | 59.76                              | 74                      | 14.24       |
| 11650.00        | 28.51                | Ave.         | 50               | 1.5        | H           | 18.32                   | 46.83                              | 54                      | 7.17        |

**Note:**

Corrected Amplitude = Corrected Factor + Reading

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

Margin = Limit- Corr. Amplitude

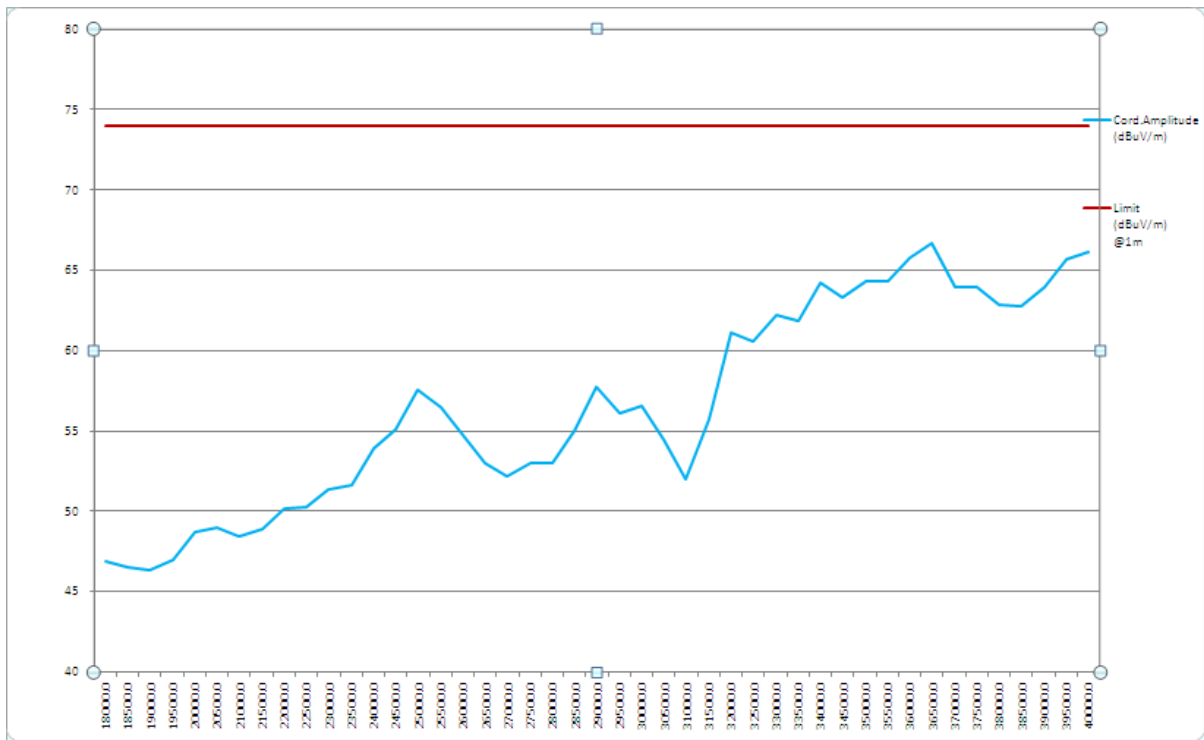
Spurious emissions more than 20 dB below the limit were not reported.



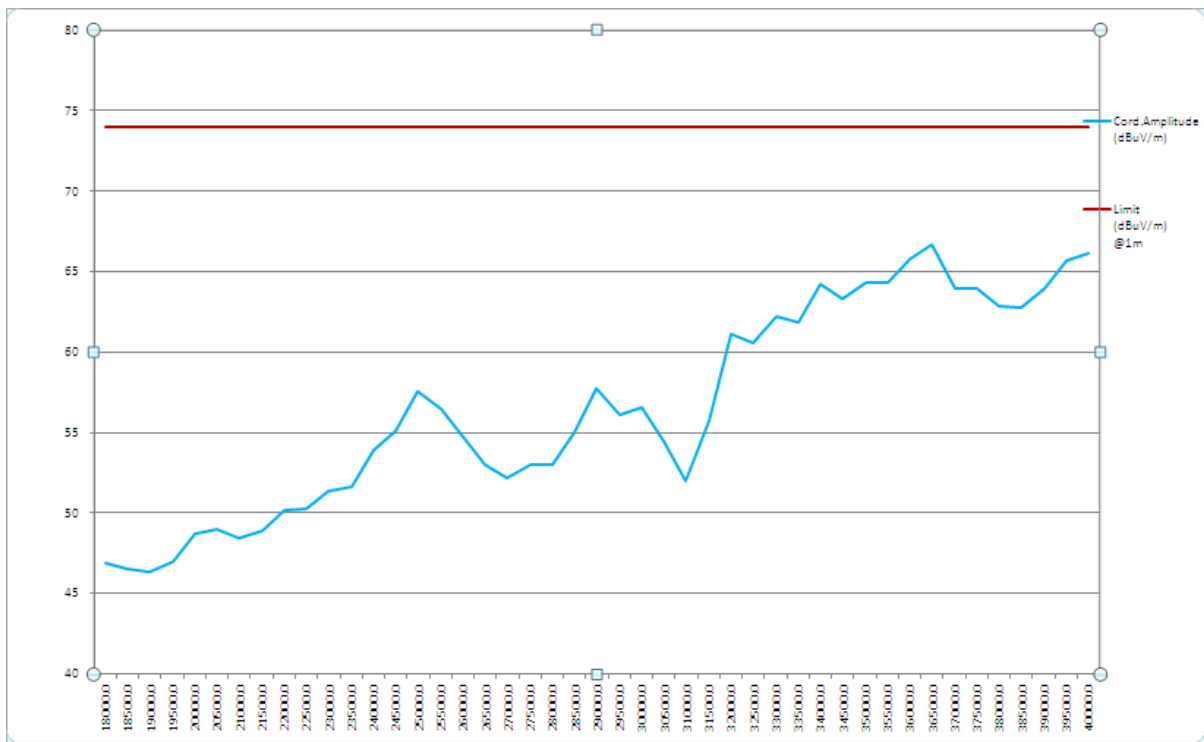




Pre-scan for Above 18 GHz, H



Pre-scan for Above 18 GHz, V



**§15.407(B)(4) –OUT OF BAND EMISSION**

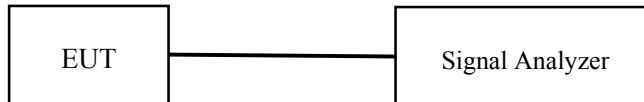
**Applicable Standard**

FCC §15.407 (b) (4);

For transmitters operating in the 5.725–5.825 GHz band: 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.

**Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The Resolution bandwidth is set to 1MHz, The Video bandwidth is set to ≥ 1MHz, report the peak value out of the operating band.
3. Repeat above procedures until all frequencies measured were complete.



**Test Data**

**Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 24 °C     |
| <b>Relative Humidity:</b> | 52 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

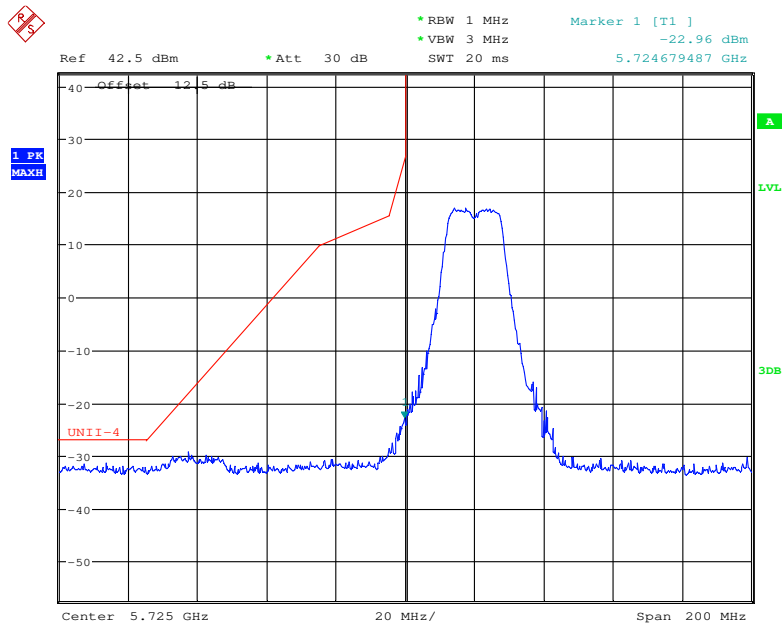
*The testing was performed by Dylan Li on 2018-01-24.*

*EUT operation mode: Transmitting*

Note: The antenna gain had been offset in the plots, the limit is EIRP.

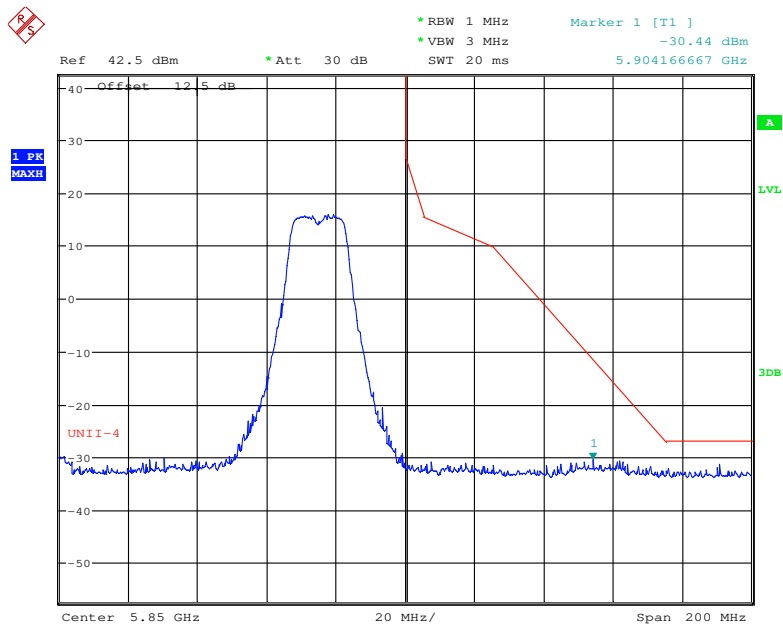
Antenna 0:

802.11a mode, Band Edge, Left Side



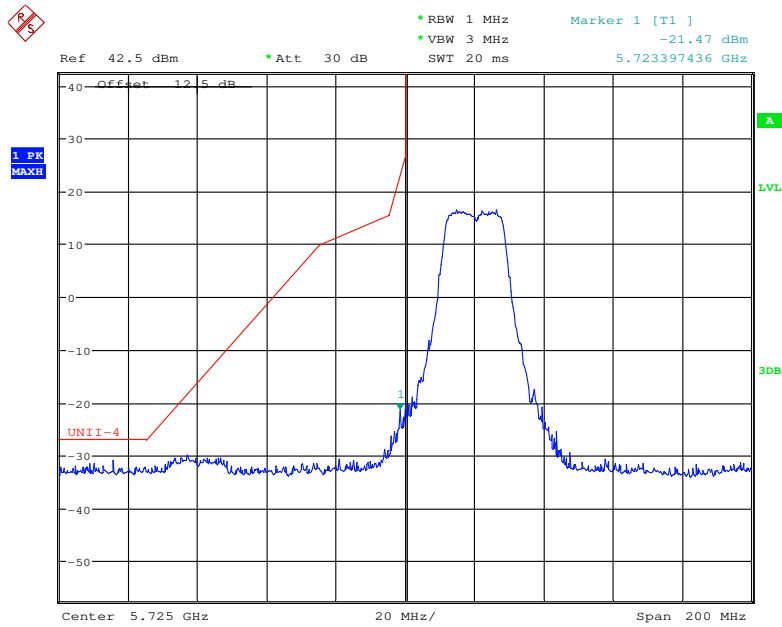
Date: 24.JAN.2018 19:15:15

802.11a mode, Band Edge, Right Side



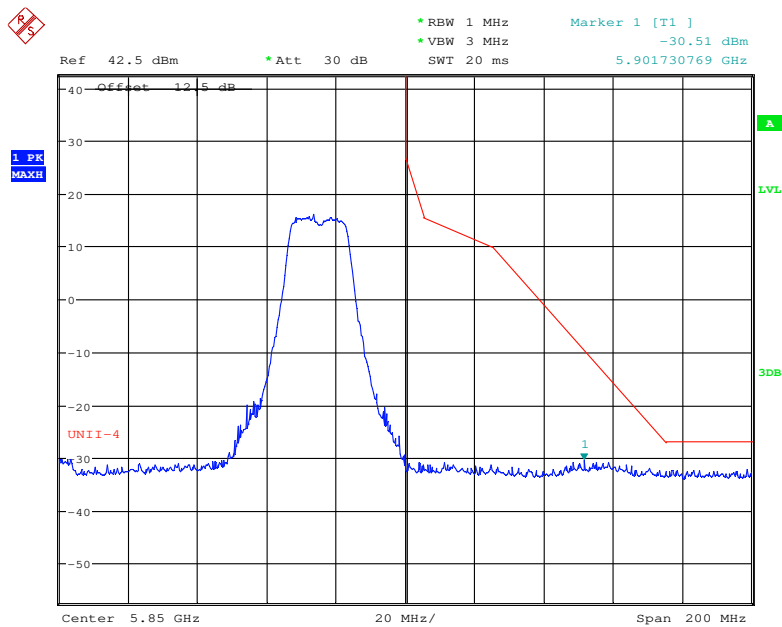
Date: 24.JAN.2018 19:16:53

### 802.11n20 mode, Band Edge, Left Side



Date: 24.JAN.2018 19:13:47

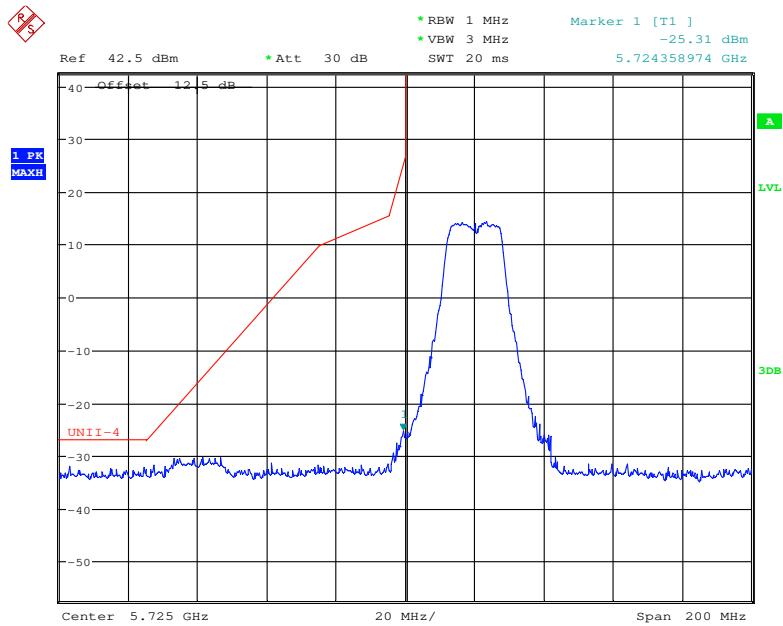
### 802.11n20 mode, Band Edge, Right Side



Date: 24.JAN.2018 19:12:55

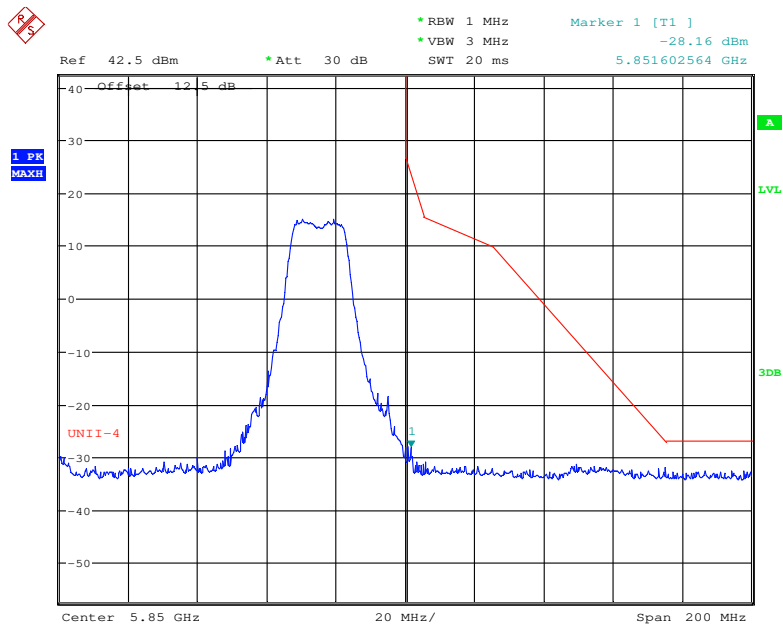
Antenna 1:

802.11a mode, Band Edge, Left Side



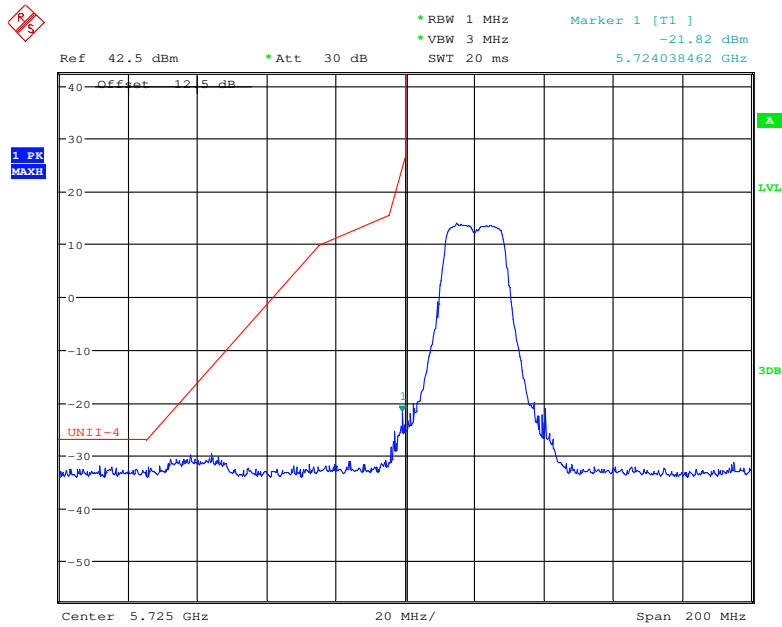
Date: 24.JAN.2018 20:10:37

802.11a mode, Band Edge, Right Side



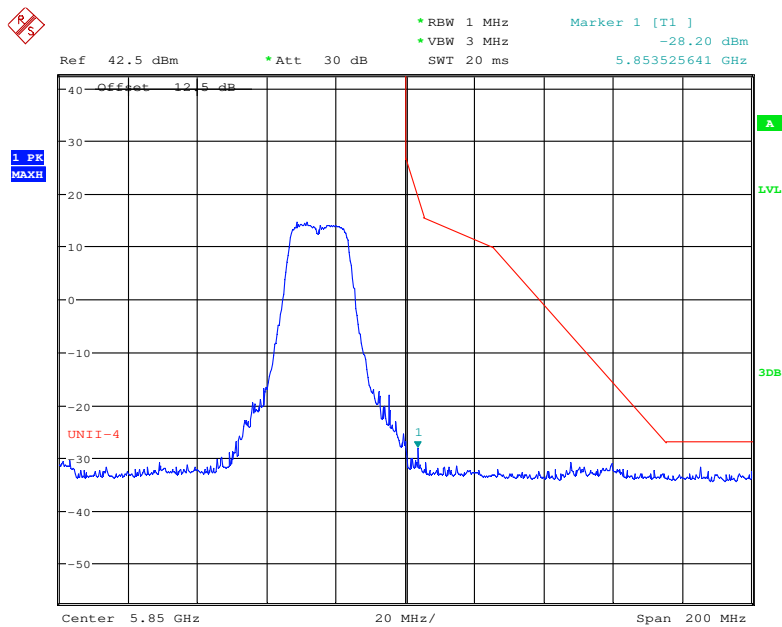
Date: 24.JAN.2018 20:09:43

802.11n20 mode, Band Edge, Left Side



Date: 24.JAN.2018 20:12:06

802.11n20 mode, Band Edge, Right Side



Date: 24.JAN.2018 20:14:00

Note: According the testing data, all the emissions was below the limit 3dB, so the two antennas transmit simultaneously result was pass.

**FCC §15.407(e) –6dB EMISSION BANDWIDTH**

**Applicable Standard**

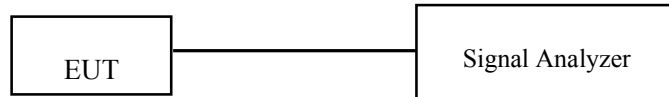
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

**Test Procedure**

**1. Minimum Emission Bandwidth for the band 5.725-5.85 GHz**

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

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



**Test Data**

**Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 24 °C     |
| <b>Relative Humidity:</b> | 50 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Dylan Li on 2018-01-24.*



*EUT operation mode: Transmitting*

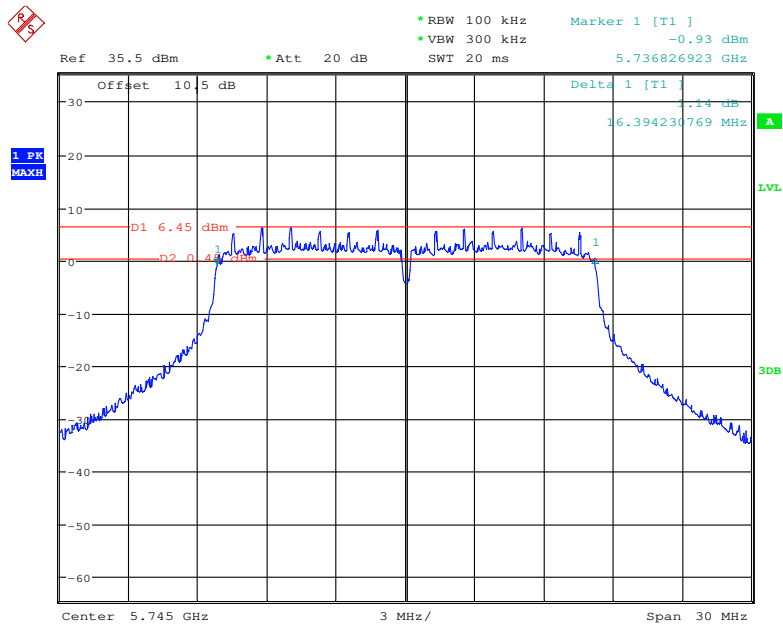
**Test Result:** Pass; please refer to the following tables and plots.

**5725 MHz – 5850 MHz:**

| Frequency (MHz)  | Antenna Port | 6dB Bandwidth (MHz) | 99% bandwidth (MHz) |
|------------------|--------------|---------------------|---------------------|
| <b>802.11a</b>   |              |                     |                     |
| 5745             | 0            | 16.39               | 17.05               |
|                  | 1            | 16.39               | 17.12               |
| 5785             | 0            | 16.39               | 17.05               |
|                  | 1            | 16.44               | 17.12               |
| 5825             | 0            | 16.39               | 17.12               |
|                  | 1            | 16.39               | 16.99               |
| <b>802.11n20</b> |              |                     |                     |
| 5745             | 0            | 17.12               | 18.14               |
|                  | 1            | 17.16               | 18.08               |
| 5785             | 0            | 17.16               | 18.14               |
|                  | 1            | 17.40               | 18.14               |
| 5825             | 0            | 17.21               | 18.14               |
|                  | 1            | 17.16               | 18.14               |

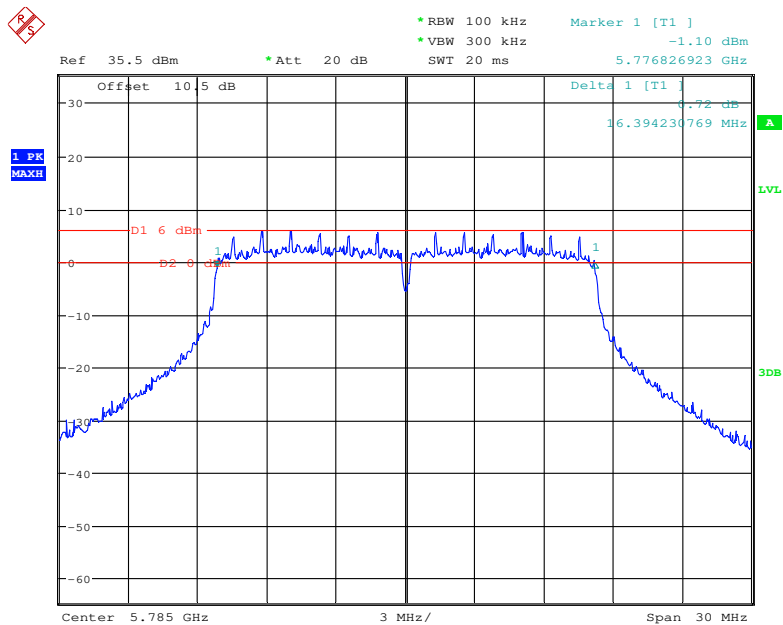
Antenna 0:

802.11a mode, 6dB Emission Bandwidth, 5745 MHz



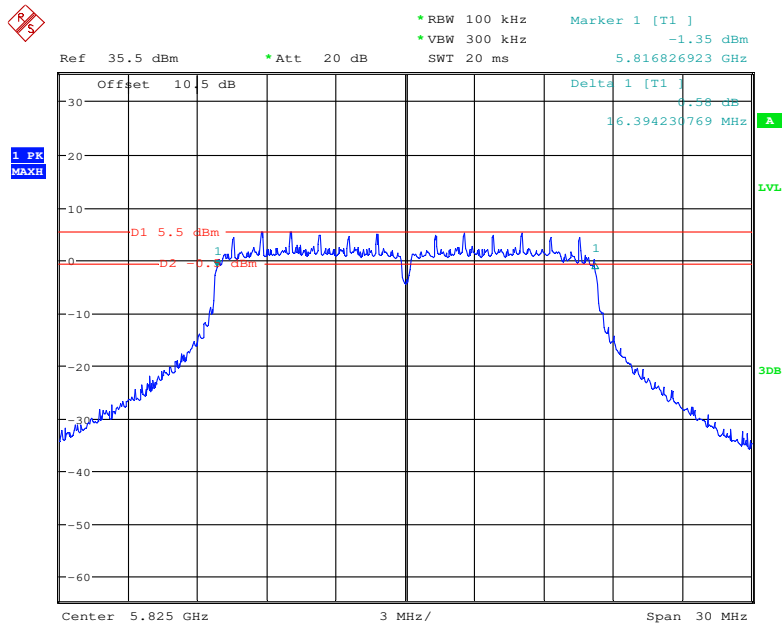
Date: 24.JAN.2018 19:36:54

802.11a mode, 6dB Emission Bandwidth, 5785 MHz



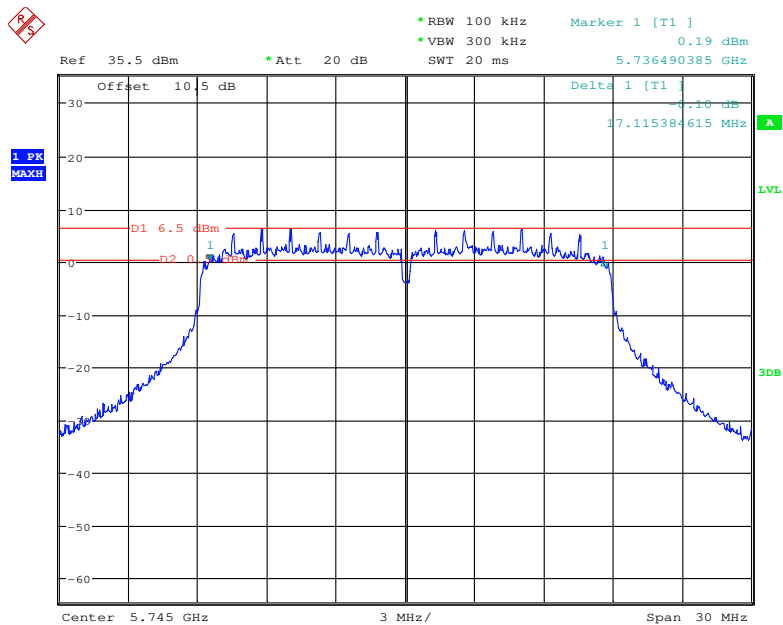
Date: 24.JAN.2018 19:38:42

### 802.11a mode, 6dB Emission Bandwidth, 5825 MHz



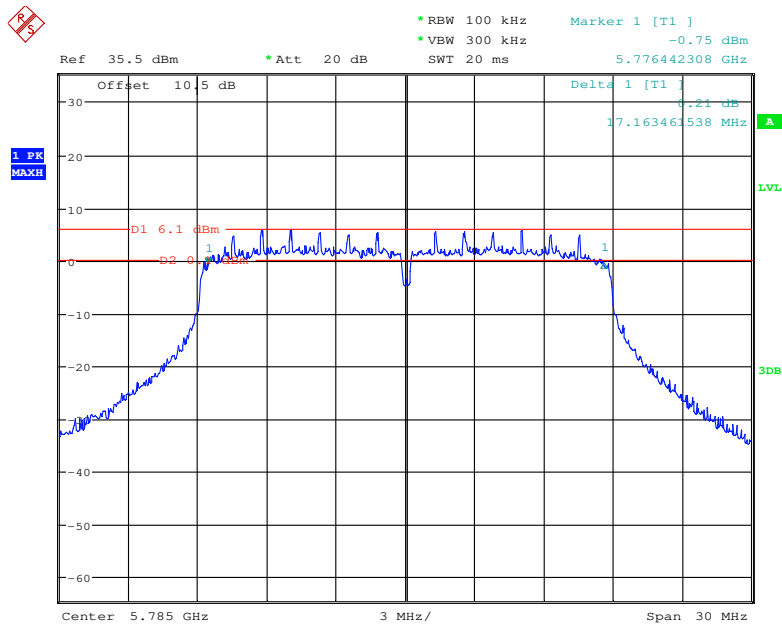
Date: 24.JAN.2018 19:40:28

### 802.11n20 mode, 6dB Emission Bandwidth, 5745 MHz



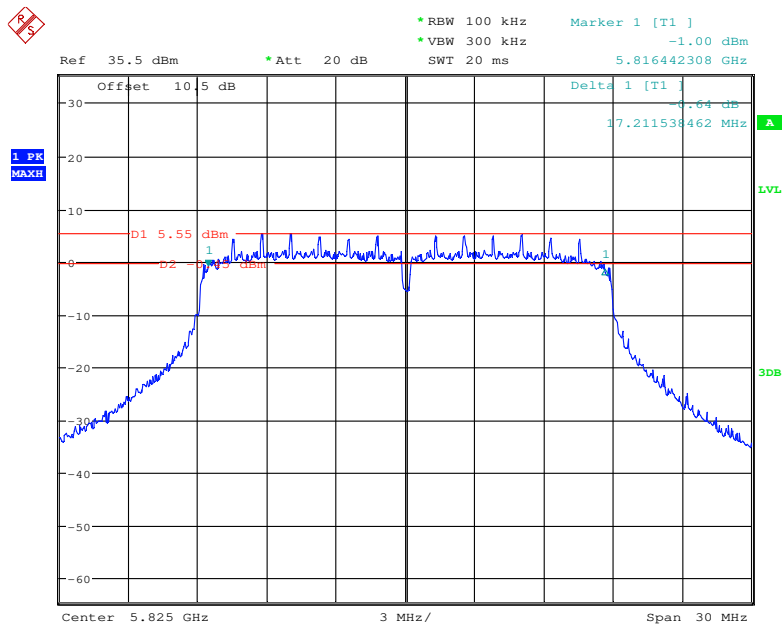
Date: 24.JAN.2018 19:34:27

### 802.11n20 mode, 6dB Emission Bandwidth, 5785 MHz



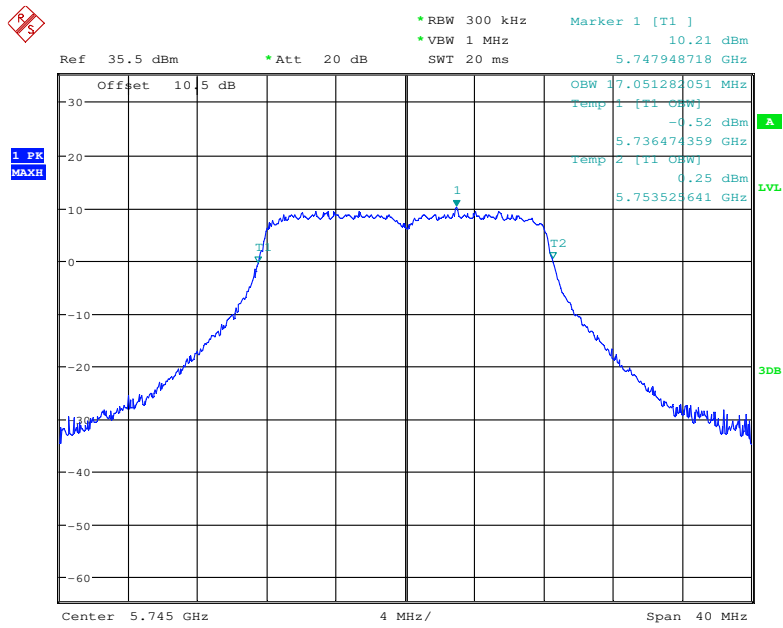
Date: 24.JAN.2018 19:32:05

### 802.11n20 mode, 6dB Emission Bandwidth, 5825 MHz



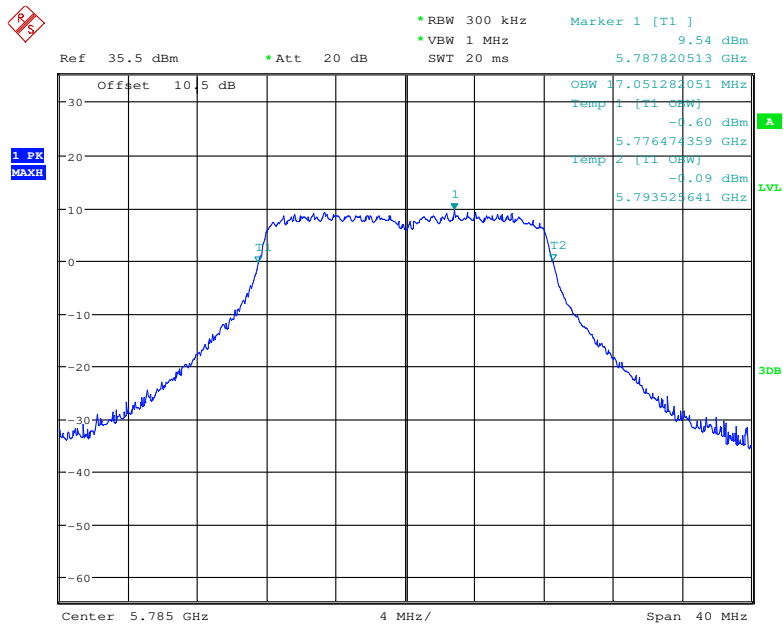
Date: 24.JAN.2018 19:27:38

**802.11a mode, 99% Occupied Bandwidth, 5745 MHz**



Date: 24.JAN.2018 19:22:20

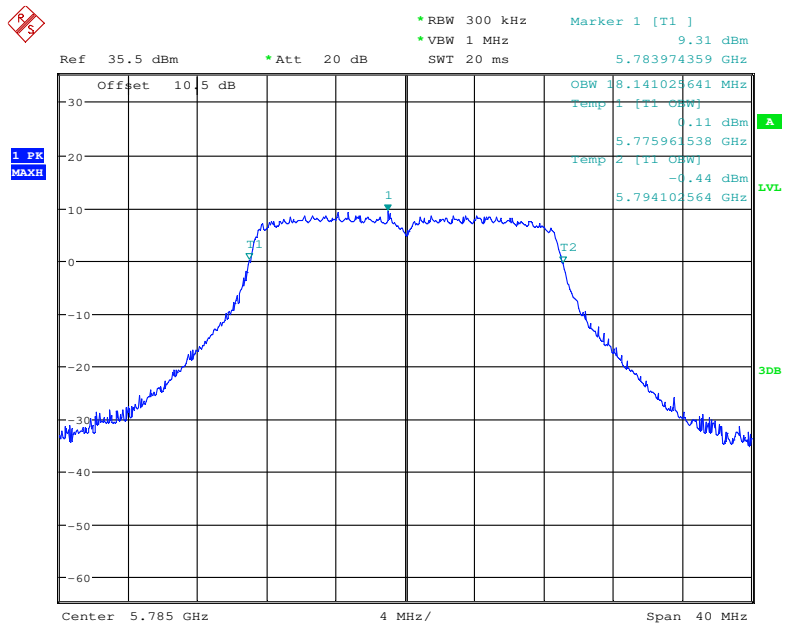
**802.11a mode, 99% Occupied Bandwidth, 5785 MHz**



Date: 24.JAN.2018 19:21:30

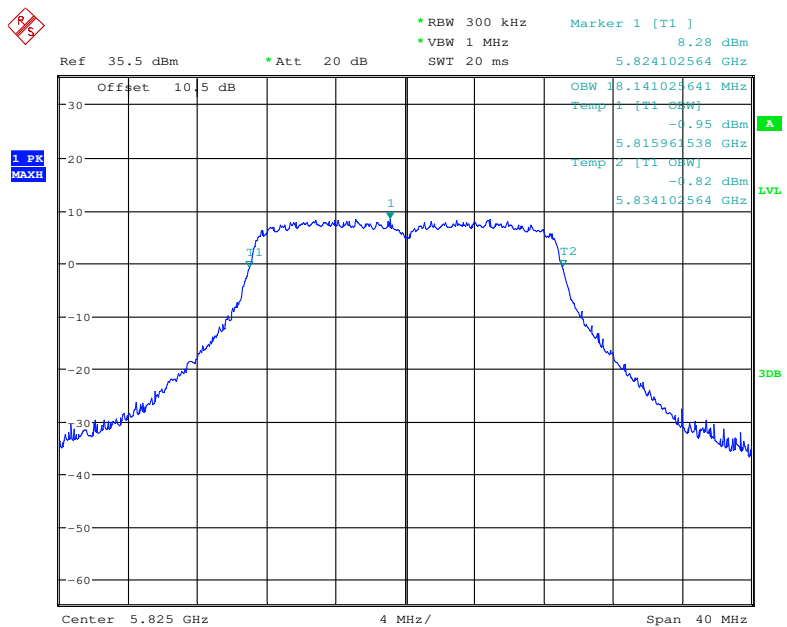


**802.11n20 mode, 99% Occupied Bandwidth, 5785 MHz**



Date: 24.JAN.2018 19:24:30

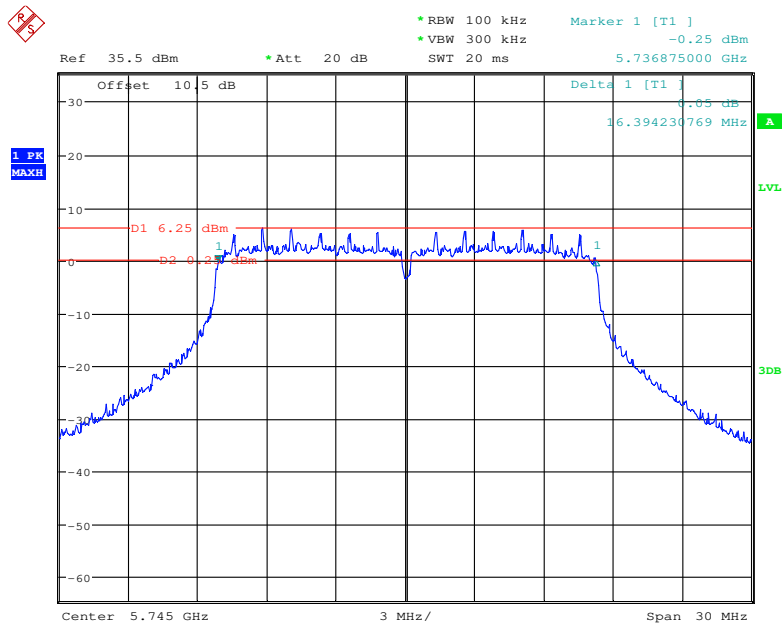
**802.11n20 mode, 99% Occupied Bandwidth, 5825 MHz**



Date: 24.JAN.2018 19:25:30

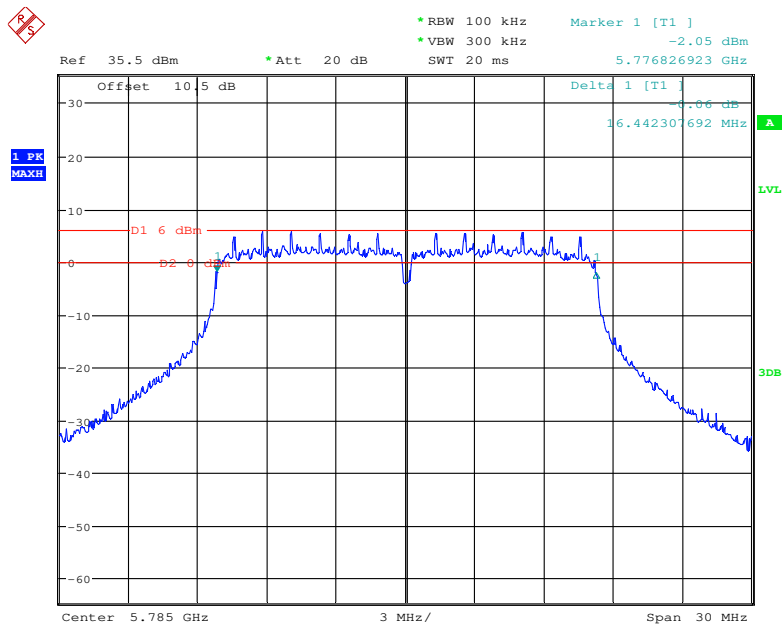
Antenna 1:

802.11a mode, 6dB Emission Bandwidth, 5745 MHz



Date: 24.JAN.2018 19:52:04

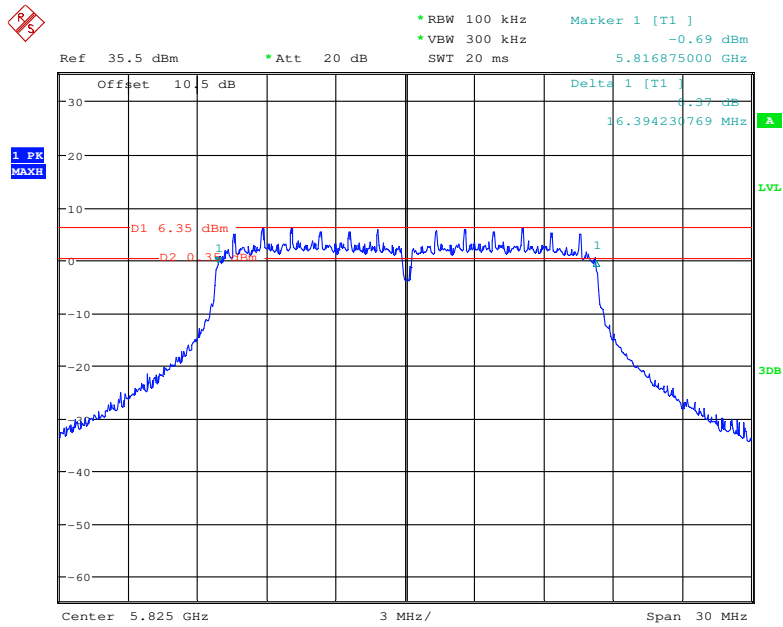
802.11a mode, 6dB Emission Bandwidth, 5785 MHz



Date: 24.JAN.2018 19:50:20

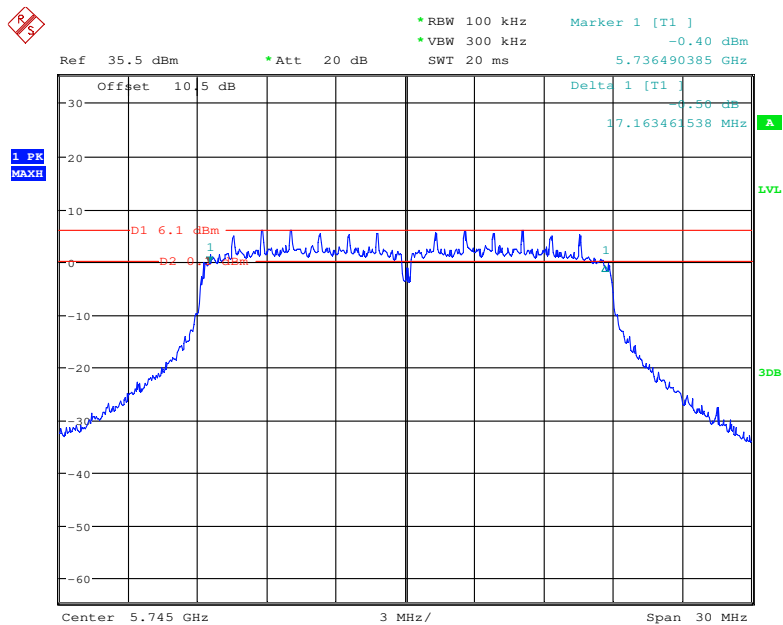


### 802.11a mode, 6dB Emission Bandwidth, 5825 MHz



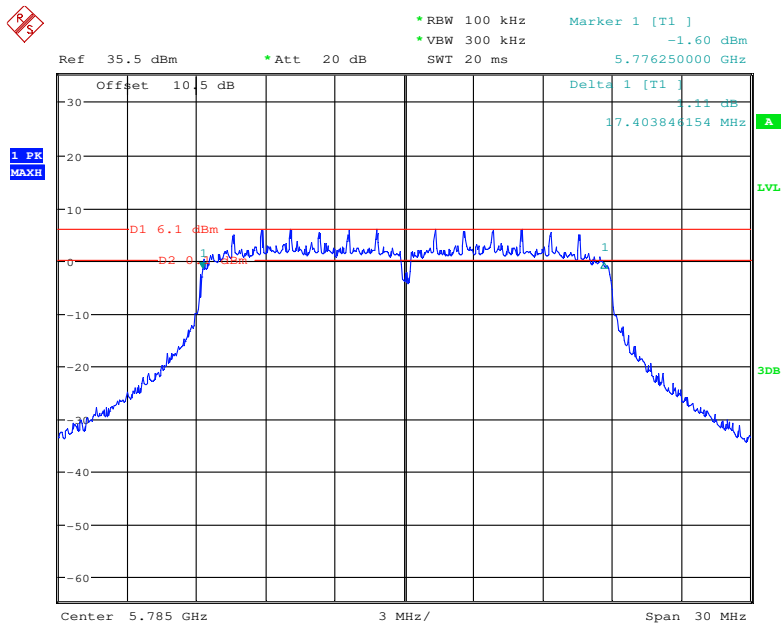
Date: 24.JAN.2018 19:48:55

### 802.11n20 mode, 6dB Emission Bandwidth, 5745 MHz



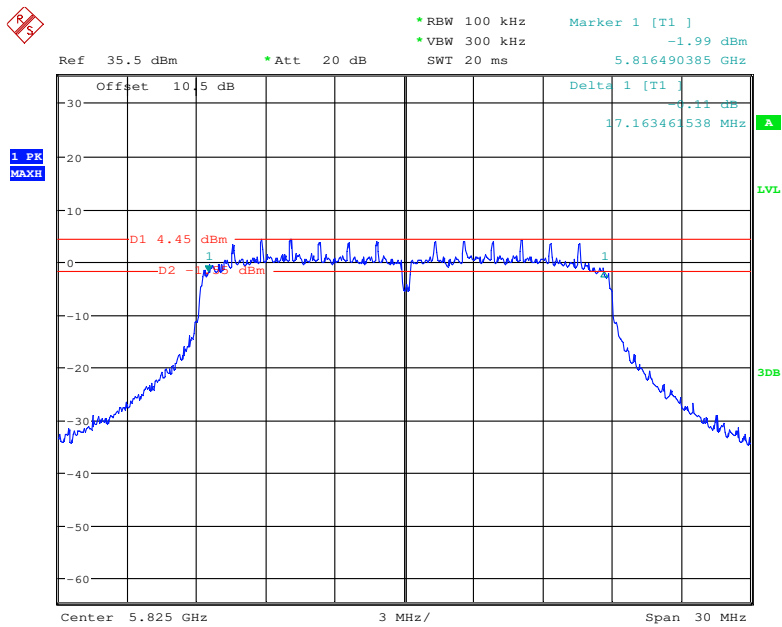
Date: 24.JAN.2018 19:53:51

### 802.11n20 mode, 6dB Emission Bandwidth, 5785 MHz



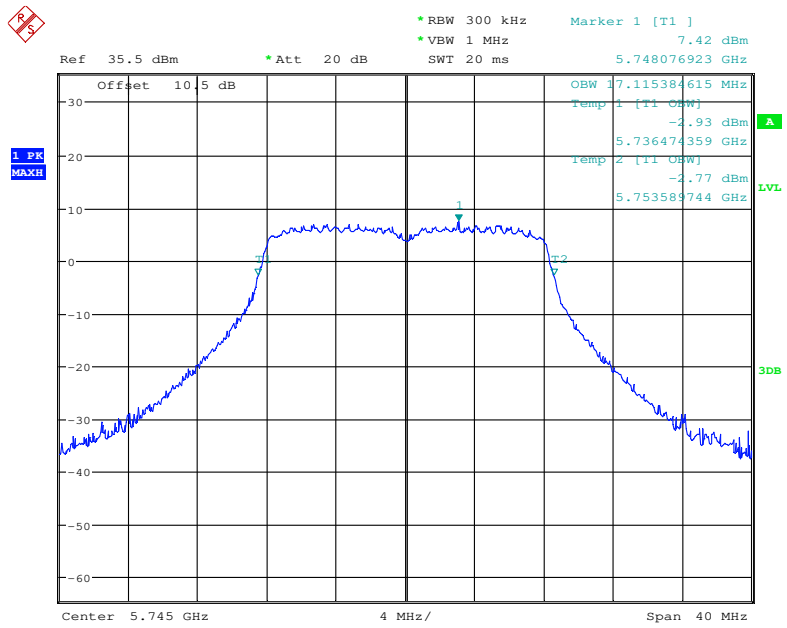
Date: 24.JAN.2018 19:57:17

### 802.11n20 mode, 6dB Emission Bandwidth, 5825 MHz



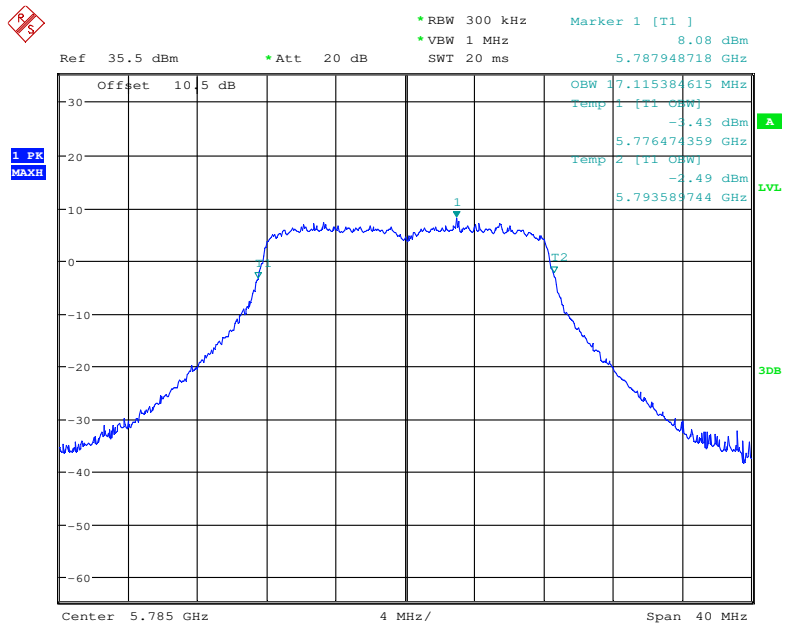
Date: 24.JAN.2018 20:00:18

**802.11a mode, 99% Occupied Bandwidth, 5745 MHz**



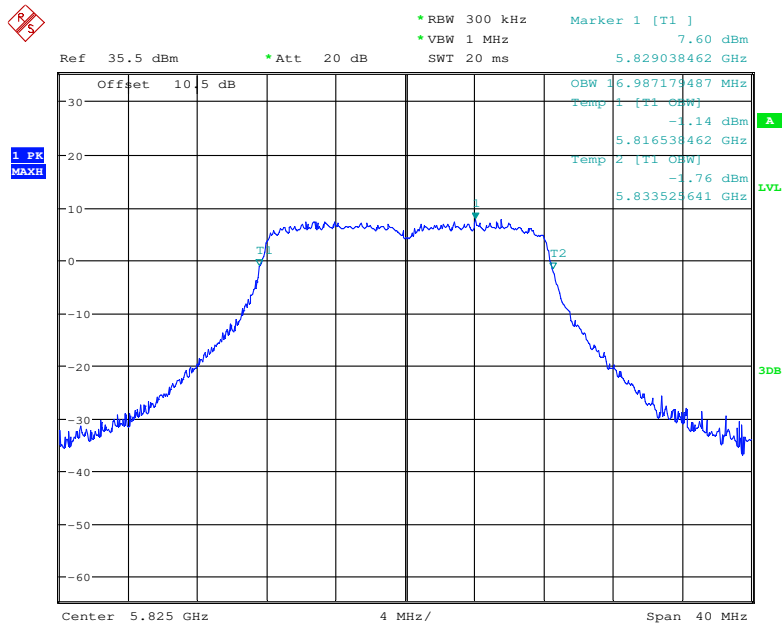
Date: 24.JAN.2018 20:05:49

**802.11a mode, 99% Occupied Bandwidth, 5785 MHz**



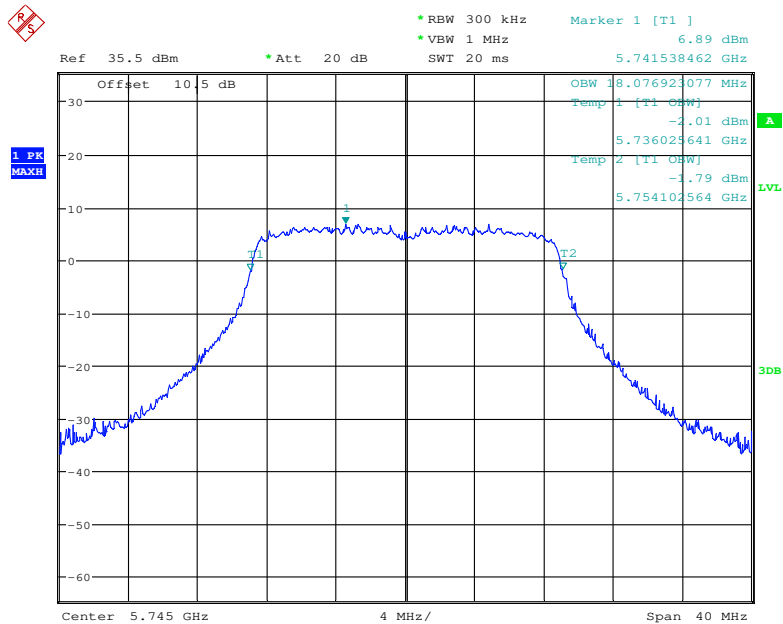
Date: 24.JAN.2018 20:06:49

**802.11a mode, 99% Occupied Bandwidth, 5825 MHz**



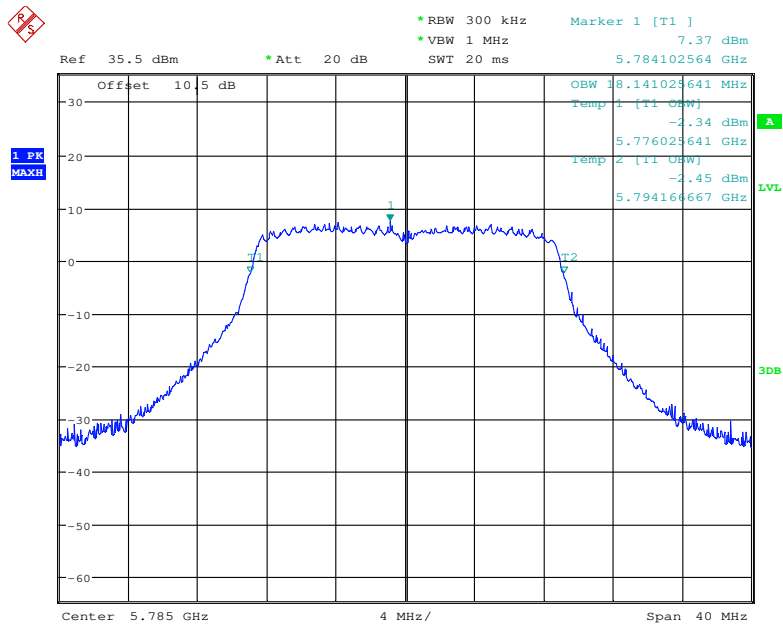
Date: 24.JAN.2018 20:07:48

**802.11n20 mode, 99% Occupied Bandwidth, 5745 MHz**



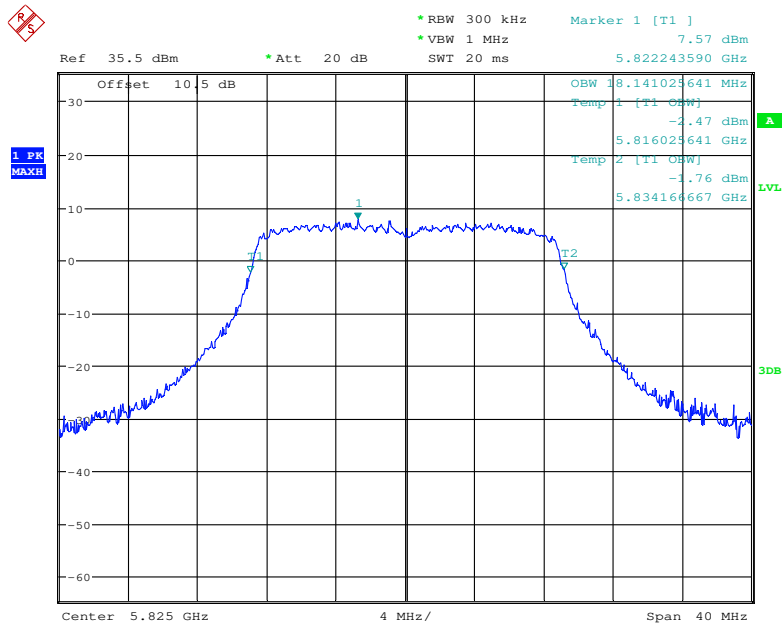
Date: 24.JAN.2018 20:04:50

**802.11n20 mode, 99% Occupied Bandwidth, 5785 MHz**



Date: 24.JAN.2018 20:03:12

**802.11n20 mode, 99% Occupied Bandwidth, 5825 MHz**



Date: 24.JAN.2018 20:01:59

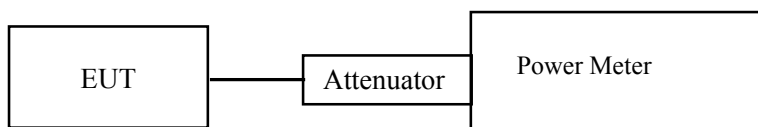
## **FCC §15.407(a) (3)– CONDUCTED TRANSMITTER OUTPUT POWER**

### **Applicable Standard**

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 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.

### **Test Procedure**

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



### **Test Data**

#### **Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 23 °C     |
| <b>Relative Humidity:</b> | 54 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Dylan Li on 2018-01-24.*

*EUT operation mode: Transmitting*

**Test Result:** Pass

Please refer to the following tables.

| Frequency (MHz)  | Antenna Port | Average Output Power (dBm) | Total Output Power (dBm) | Limit (dBm) |
|------------------|--------------|----------------------------|--------------------------|-------------|
| <b>802.11a</b>   |              |                            |                          |             |
| 5745             | 0            | 16.84                      | 20.20                    | 30          |
|                  | 1            | 17.51                      |                          |             |
| 5785             | 0            | 16.53                      | 19.96                    |             |
|                  | 1            | 17.33                      |                          |             |
| 5825             | 0            | 16.42                      | 19.92                    |             |
|                  | 1            | 17.35                      |                          |             |
| <b>802.11n20</b> |              |                            |                          |             |
| 5745             | 0            | 16.89                      | 20.12                    |             |
|                  | 1            | 17.31                      |                          |             |
| 5785             | 0            | 16.51                      | 20.02                    |             |
|                  | 1            | 17.45                      |                          |             |
| 5825             | 0            | 16.37                      | 19.91                    |             |
|                  | 1            | 17.38                      |                          |             |

Note: This Device Emploies Cyclic Delay Diversity.  
 When determining reductions in conducted power limits, array gain is calculated as follows: As to this device,  $N_{ANT} \leq 4$ , Array Gain = 0 dB.  
 Total directional gain (dBi) = gain of individual transmit antennas (dBi) + 0 (dB) = 2dBi.

## **FCC §15.407(a) (3) - POWER SPECTRAL DENSITY**

### **Applicable Standard**

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 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.

### **Test Procedure**

For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set  $RBW \geq 1/T$ , where T is defined in section II.B.1.a).
- b) Set  $VBW \geq 3 RBW$ .
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log(500 \text{ kHz}/RBW)$  to the measured result, whereas  $RBW (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log(1\text{MHz}/RBW)$  to the measured result, whereas  $RBW (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.



**Test Data**

**Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 24 °C     |
| <b>Relative Humidity:</b> | 50 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

The testing was performed by Dylan Li from 2018-01-24 to 2018-02-02.

EUT operation mode: Transmitting

**Test Result:** Pass

Please refer to the following tables and plots.

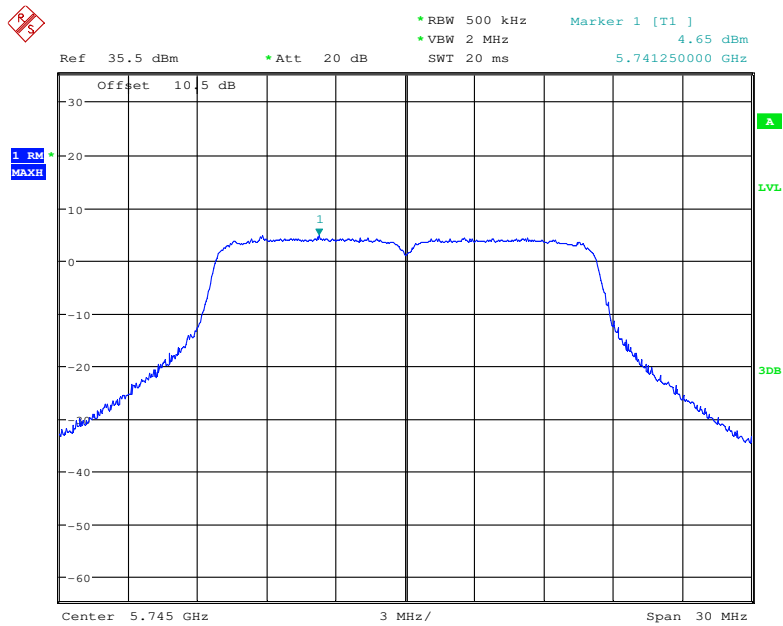
**5725 MHz – 5850 MHz:**

| Frequency (MHz)  | Antenna Port | Power Spectral Density (dBm/500kHz) | Total Power Spectral Density (dBm/500kHz) | Limit (dBm/500kHz) |
|------------------|--------------|-------------------------------------|---|--------------------|
| <b>802.11a</b>   |              |                                     |   |                    |
| 5745             | 0            | 4.65                                | 7.51                                      | 30                 |
|                  | 1            | 4.34                                |   |                    |
| 5785             | 0            | 4.32                                | 7.55                                      |                    |
|                  | 1            | 4.74                                |   |                    |
| 5825             | 0            | 3.58                                | 6.80                                      |                    |
|                  | 1            | 3.99                                |   |                    |
| <b>802.11n20</b> |              |                                     |   |                    |
| 5745             | 0            | 4.58                                | 7.67                                      | 30                 |
|                  | 1            | 4.73                                |   |                    |
| 5785             | 0            | 4.06                                | 7.45                                      |                    |
|                  | 1            | 4.79                                |   |                    |
| 5825             | 0            | 3.85                                | 6.92                                      |                    |
|                  | 1            | 3.96                                |   |                    |

Note: This Device Emploies Cyclic Delay Diversity.  
 When determining reductions in conducted power limits, array gain is calculated as follows: Array gain = 10 log (NANT), where NANT is the number of transmit antennas.  
 Total directional gain (dBi) = gain of individual transmit antennas (dBi) +Array gain (dBi)  
 =2dBi+3dBi=5dBi.

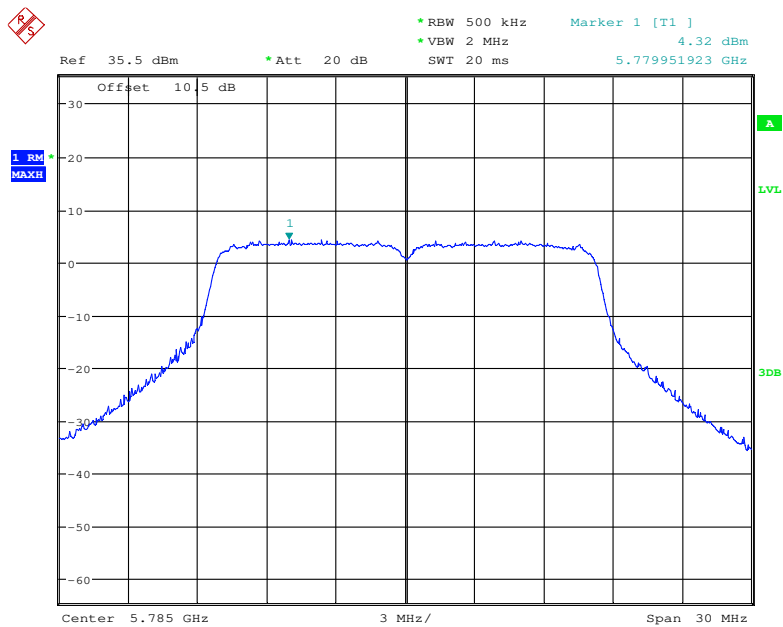
Antenna 0:

802.11a mode, Power Spectral Density, 5745 MHz



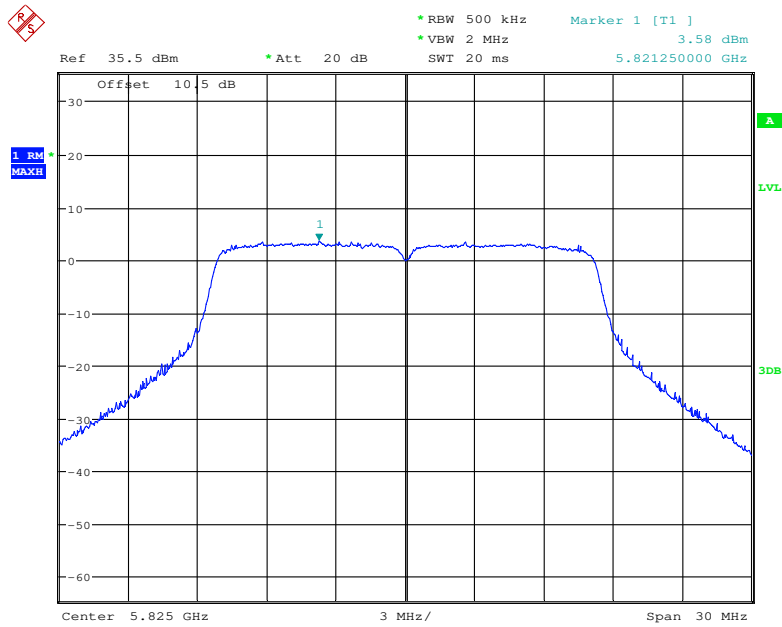
Date: 24.JAN.2018 19:04:55

802.11a mode, Power Spectral Density, 5785 MHz



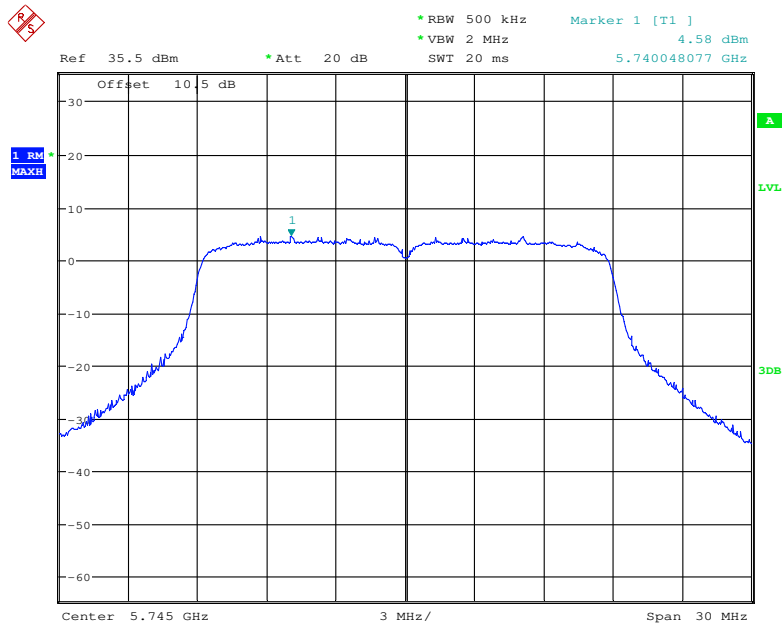
Date: 24.JAN.2018 19:06:11

### 802.11a mode, Power Spectral Density, 5825 MHz



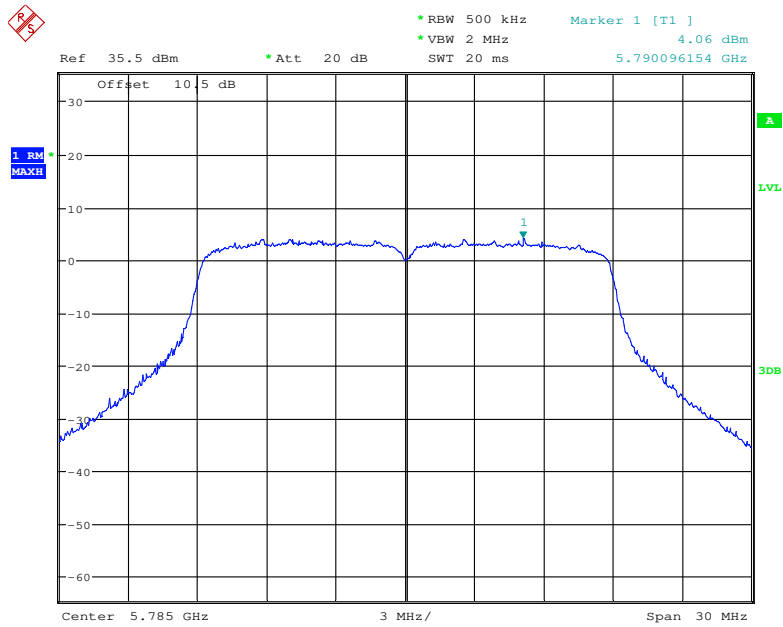
Date: 24.JAN.2018 19:06:56

### 802.11n20 mode, Power Spectral Density, 5745 MHz



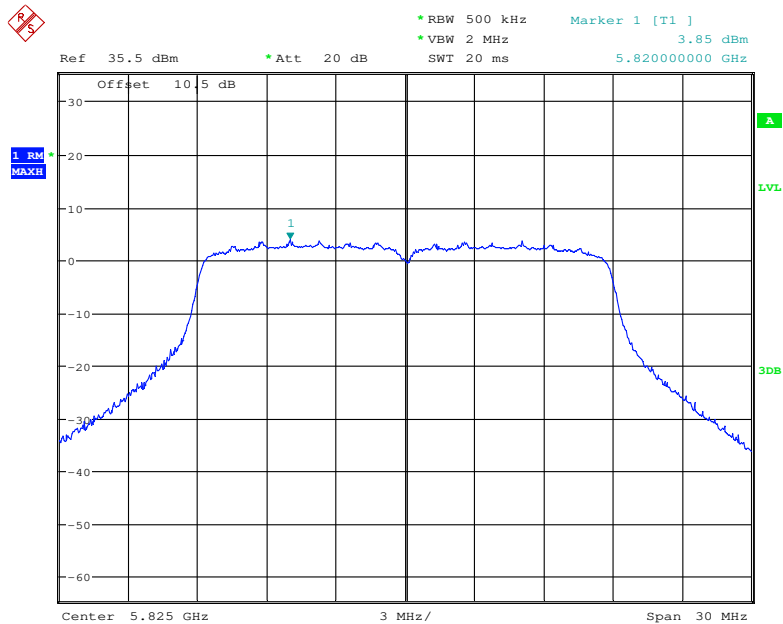
Date: 24.JAN.2018 19:08:18

### 802.11n20 mode, Power Spectral Density, 5785 MHz



Date: 24.JAN.2018 19:08:59

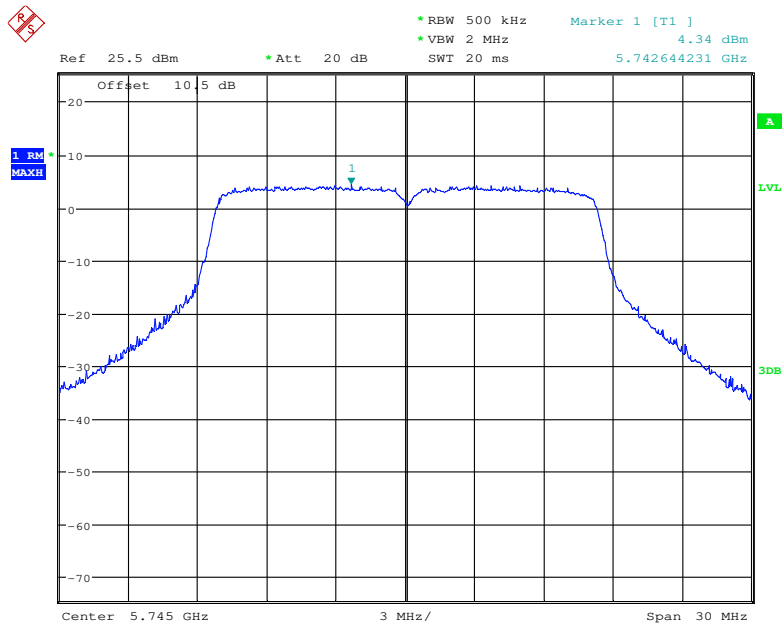
### 802.11n20 mode, Power Spectral Density, 5825 MHz



Date: 24.JAN.2018 19:09:40

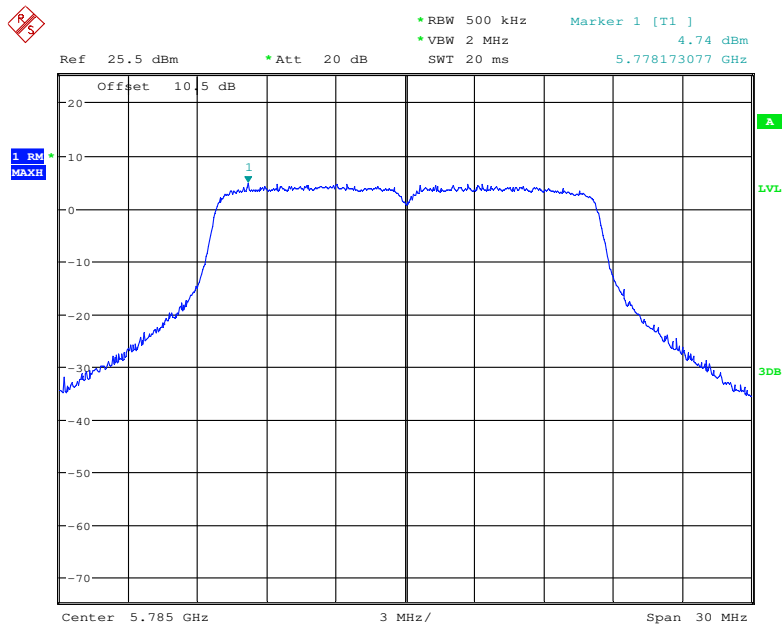
Antenna 1:

802.11a mode, Power Spectral Density, 5745 MHz



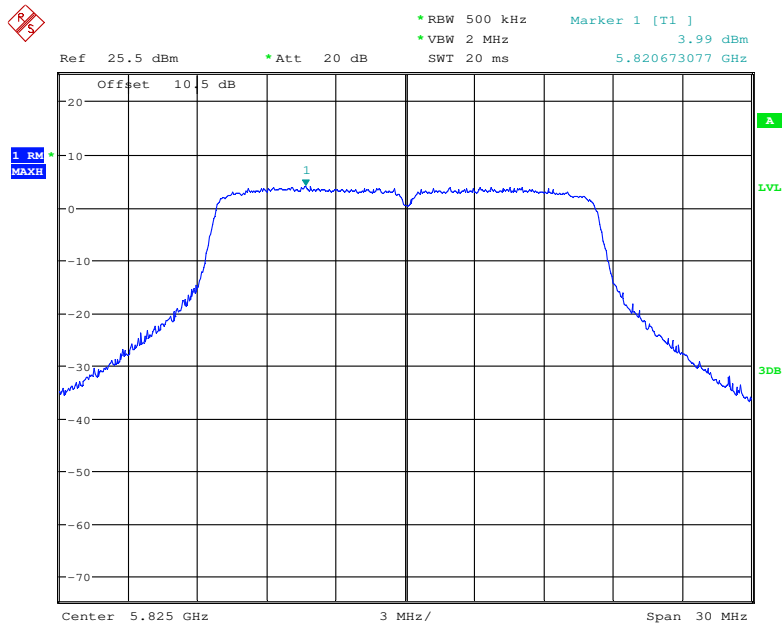
Date: 24.JAN.2018 20:21:35

802.11a mode, Power Spectral Density, 5785 MHz



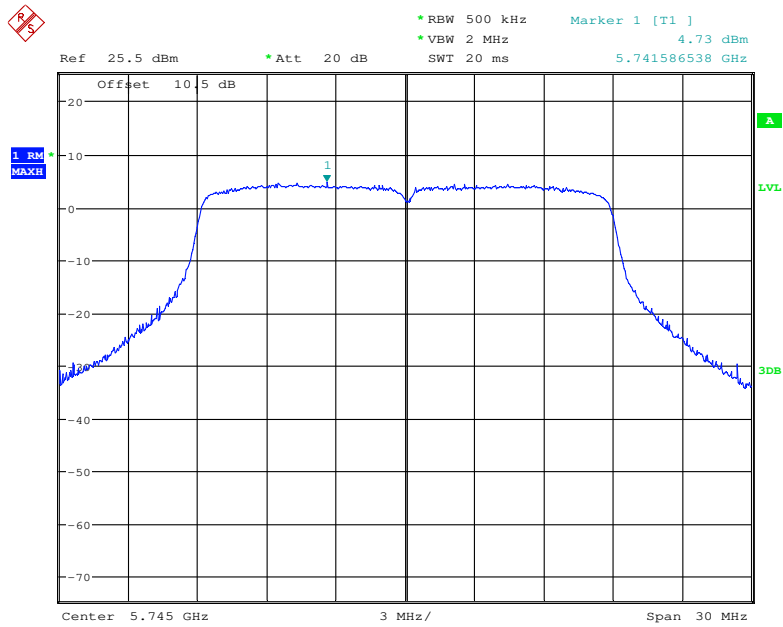
Date: 24.JAN.2018 20:21:01

### 802.11a mode, Power Spectral Density, 5825 MHz



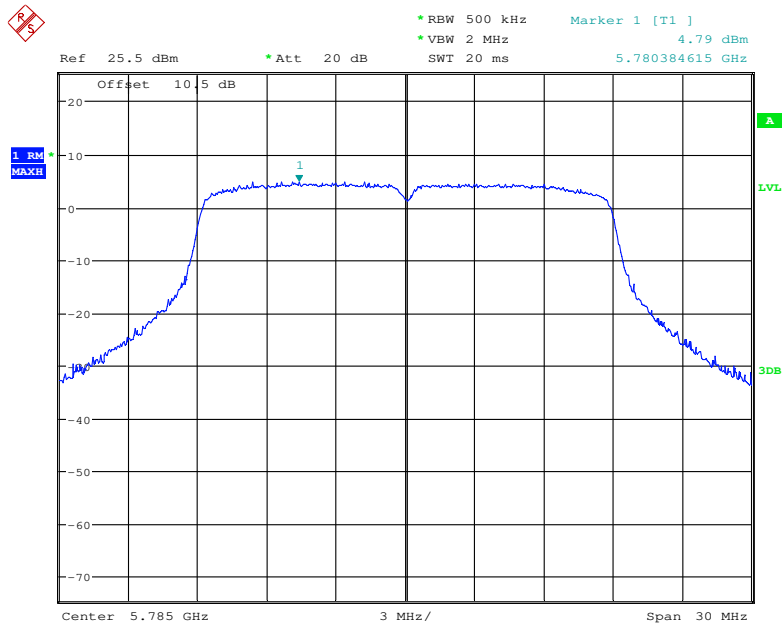
Date: 24.JAN.2018 20:22:26

### 802.11n20 mode, Power Spectral Density, 5745 MHz



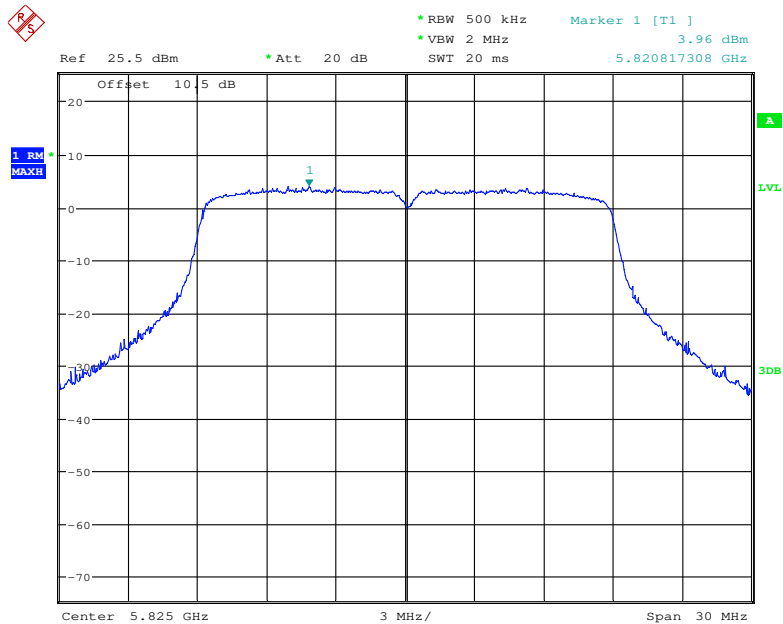
Date: 24.JAN.2018 20:25:27

### 802.11n20 mode, Power Spectral Density, 5785 MHz



Date: 24.JAN.2018 20:24:48

### 802.11n20 mode, Power Spectral Density, 5825 MHz



Date: 24.JAN.2018 20:23:59

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