



## FCC Part 15.407

### TEST REPORT

For

**Chengdu Vantron Technology, Ltd.**

No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China

**FCC ID: 2AAGE-VTDONGLE**

|                                                                                                                                                                                                                                                           |                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Report Type                                                                                                                                                                                                                                               | Original Report                                                                                 |
| Product Name:                                                                                                                                                                                                                                             | Gateway                                                                                         |
| Model Name:                                                                                                                                                                                                                                               | VT-IoT-Dongle                                                                                   |
| Series Model Name:                                                                                                                                                                                                                                        | VT-IoT-Dongle-CATM                                                                              |
| Report Number :                                                                                                                                                                                                                                           | RLK190919004-00C                                                                                |
| Report Date :                                                                                                                                                                                                                                             | 2019/10/05                                                                                      |
| Reviewed By :                                                                                                                                                                                                                                             | Zeus Chen  |
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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. (Linkou Laboratory)

## Revision History

| Revision | Report Number    | Issue Date | Description     |
|----------|------------------|------------|-----------------|
| 1.0      | RLK190919004-00C | 2019/10/05 | Original Report |

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## 1 General Information

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

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>                     | <b>Chengdu Vantron Technology, Ltd.</b><br>No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Manufacturer</b>                  | <b>Chengdu Vantron Technology, Ltd.</b><br>No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Product (Equipment)</b>           | <b>Gateway</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Model Name</b>                    | <b>VT-IoT-Dongle</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Series Model Name</b>             | <b>VT-IoT-Dongle-CATM</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>EUT Function</b>                  | IEEE 802.11 an(HT20/HT40) + ac(VHT20/VHT40/VHT80)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Frequency Range</b>               | UNII-1: 5150 MHz ~ 5250 MHz<br>UNII-3: 5745 MHz ~ 5850 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Number of Channels</b>            | <b>For UNII-1:</b><br>IEEE 802.11a/n HT20/ac VHT20: 4 Channels<br>IEEE 802.11n HT40/ac VHT40: 2 Channels<br>IEEE 802.11ac VHT80: 1 Channels<br><b>For UNII-3:</b><br>IEEE 802.11a/n HT20/ac VHT20: 5 Channels<br>IEEE 802.11n HT40/ac VHT40: 2 Channels<br>IEEE 802.11ac VHT80: 1 Channels                                                                                                                                                                                                                                                                                                                                                 |
| <b>Output Power</b>                  | <b>For UNII-1:</b><br>IEEE 802.11a Mode: 19.01 dBm (0.0796 W)<br>IEEE 802.11n HT20 Mode: 18.87 dBm (0.0771 W)<br>IEEE 802.11n HT40 Mode: 18.24 dBm (0.0667 W)<br>IEEE 802.11ac VHT20 Mode: 18.95 dBm (0.0785 W)<br>IEEE 802.11ac VHT40 Mode: 18.41 dBm (0.0693 W)<br>IEEE 802.11ac VHT80 Mode: 14.97 dBm (0.0314 W)<br><b>For UNII-3:</b><br>IEEE 802.11a Mode: 20.15 dBm (0.1035 W)<br>IEEE 802.11n HT20 Mode: 19.88 dBm (0.0973 W)<br>IEEE 802.11n HT40 Mode: 19.81 dBm (0.0957 W)<br>IEEE 802.11ac VHT20 Mode: 19.96 dBm (0.0991 W)<br>IEEE 802.11ac VHT40 Mode: 20.02 dBm (0.1005 W)<br>IEEE 802.11ac VHT80 Mode: 14.44 dBm (0.0278 W) |
| <b>Modulation Type</b>               | OFDM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Received Date</b>                 | Sep. 23, 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Date of Test</b>                  | Sep. 25, 2019 - Oct. 03, 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Submittal(s)/Grant(s)</b> | <b>FCC Part 15.247 DSS with FCC ID : 2AAGE-VTDONGLE</b><br><b>FCC Part 15.247 DTS with FCC ID : 2AAGE-VTDONGLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

\*All measurement and test data in this report was gathered from production sample serial number: 1803009 (Assigned by BACL, Linkou).

*\*Model Discrepancy: Difference was LTE module use and contain FCC ID (Card Plug-in)*

| Model Name         | Discrepancy                                                |
|--------------------|------------------------------------------------------------|
| VT-IoT-Dongle      | Contain LTE module FCC ID RI7LE910NAV2 <sup>Note 1</sup>   |
| VT-IoT-Dongle-CATM | Contain LTE module FCC ID 2AJYU-SIM7000A <sup>Note 1</sup> |

*Note 1: LTE Module have already get FCC Grants*

*The major electrical and mechanical constructions of series models are identical to the basic model, except different Market segmentation. The model, VT-IoT-Dongle is the testing sample, and the final test data are shown on this test report.*

## 1.2 Operation Condition of EUT

|                                    |                                                                                                                                                                                                                                                                         |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Operation<br>(Voltage Range) | <input checked="" type="checkbox"/> AC 120 V/60 Hz<br><input checked="" type="checkbox"/> Adapter (Not for Sale) via power Cable to connector port<br><input type="checkbox"/> By Power Cord.                                                                           |
|                                    | <input checked="" type="checkbox"/> DC Type<br><input checked="" type="checkbox"/> DC Power Supply: 5Vdc to connector port<br><input type="checkbox"/> Battery<br><input type="checkbox"/> External from USB Cable 5Vdc<br><input type="checkbox"/> External DC Adapter |
|                                    | <input type="checkbox"/> Host System                                                                                                                                                                                                                                    |

## 1.3 Objective

***The Objective of this Test Report was to document the compliance of the Chengdu Vantron Technology, Ltd. Appliance (Model: VT-IoT-Dongle, Series Model: VT-IoT-Dongle-CATM) to the requirements of the following Standards:***

*-Part 2, Subpart J, Part 15 Subparts A and E of the Federal Communication Commission's rules.*

*-KDB 662911 D01 Multiple Transmitter Output v02r01*

*-KDB 789033 D02 General U-NII Test Procedures New Rules v02r01*

*- ANSI C63.10-2013 of the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.*

## 1.4 Measurement Uncertainty

| Parameter                        | Expanded Measurement uncertainty |
|----------------------------------|----------------------------------|
| RF output power with Power Meter | $\pm 0.55$ dB                    |
| Occupied Channel Bandwidth       | $\pm 4.54$ Hz                    |
| RF Conducted test with Spectrum  | $\pm 1.45$ dB                    |
| AC Power Line Conducted Emission | $\pm 2.66$ dB                    |
| Radiated Below 1G                | $\pm 3.57$ dB                    |
| Radiated Above 1G-18G            | $\pm 4.29$ dB                    |
| Radiated Above 18G-40G           | $\pm 4.67$ dB                    |

## 1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou) to collect test data is located on

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

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. The FCC Registration No.: 0027578244. Designation No.: TW3546. The Test Firm Registration No.: 181430.

## 2 System Test Configuration

### 2.1 Description of Test Configuration

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

No special accessory, No modification was made to the EUT and No special equipment used during test.

| IEEE 802.11 a/n HT20/ac VHT20 |                 |         |                 |
|-------------------------------|-----------------|---------|-----------------|
| Channel                       | Frequency (MHz) | Channel | Frequency (MHz) |
| 36                            | 5180            | 149     | 5745            |
| 40                            | 5200            | 153     | 5765            |
| 44                            | 5220            | 157     | 5785            |
| 48                            | 5240            | 161     | 5805            |
| -                             | -               | 165     | 5825            |

For UNII-1: Channel 36, 40 and 48 were tested.

For UNII-3: Channel 149, 157 and 165 were tested.

| IEEE 802.11 n HT40/ac VHT40 |                 |         |                 |
|-----------------------------|-----------------|---------|-----------------|
| Channel                     | Frequency (MHz) | Channel | Frequency (MHz) |
| 38                          | 5190            | 151     | 5755            |
| 46                          | 5230            | 159     | 5795            |

For UNII-1: Channel 38 and 46 were tested.

For UNII-3: Channel 151 and 159 were tested.

| IEEE 802.11 ac VHT80 |                 |         |                 |
|----------------------|-----------------|---------|-----------------|
| Channel              | Frequency (MHz) | Channel | Frequency (MHz) |
| 42                   | 5210            | 155     | 5775            |

For UNII-1: Channel 42 was tested. For UNII-3: Channel 155 was tested.

| Modulation Used for Conformance Test |                 |               |                 |
|--------------------------------------|-----------------|---------------|-----------------|
| Configuration                        | N <sub>TX</sub> | Data Rate     | Worst Data Rate |
| 802.11a mode                         | 1               | 6-54 Mbps     | 6 Mbps          |
| 802.11n HT20 mode                    | 4               | MCS 0-32      | MCS 0           |
| 802.11n HT40 mode                    | 4               | MCS 0-32      | MCS 0           |
| 802.11ac VHT20 mode                  | 4               | MCS 0-10 NSS4 | MCS 0           |
| 802.11ac VHT40 mode                  | 4               | MCS 0-10 NSS4 | MCS 0           |
| 802.11ac VHT80 mode                  | 4               | MCS 0-10 NSS4 | MCS 0           |

| Worst Case of Power Setting |                 |           |                   |        |         |
|-----------------------------|-----------------|-----------|-------------------|--------|---------|
| EUT Exercise Software       |                 |           | Command via Putty |        |         |
| Configuration               | N <sub>TX</sub> | UNII Band | Low CH            | Mid CH | High CH |
| 802.11a mode                | 1               | UNII-1    | 16                | 18     | 17      |
|                             |                 | UNII-3    | 20                | 20     | 20      |
| 802.11n HT20 mode           | 1               | UNII-1    | 16                | 18     | 17      |
|                             |                 | UNII-3    | 20                | 20     | 20      |
| 802.11n HT40 mode           | 1               | UNII-1    | 15                | -      | 17      |
|                             |                 | UNII-3    | 17                | -      | 20      |
| 802.11ac VHT20 mode         | 1               | UNII-1    | 16                | 18     | 17      |
|                             |                 | UNII-3    | 20                | 20     | 20      |
| 802.11ac VHT40 mode         | 1               | UNII-1    | 15                | -      | 17      |
|                             |                 | UNII-3    | 17                | -      | 20      |
| 802.11ac VHT80 mode         | 1               | UNII-1    | -                 | 14     | -       |
|                             |                 | UNII-3    | -                 | 17     | -       |

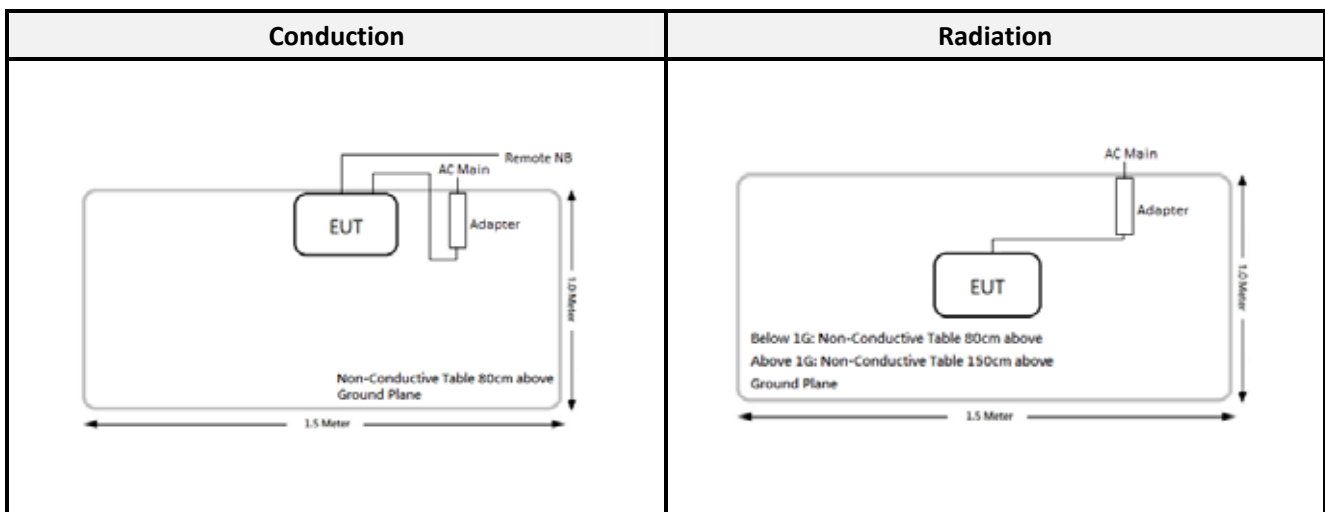
- The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the Peak power and PSD across all data rates bandwidths, and modulations. Radiated below 1G were tested worst output power mode.
- Due to 802.11n HT20/T40 mode output power are less than 802.11ac VHT20/40. Therefore, 802.11ac VHT20/VHT40 cover 802.11n HT20/40 in the test, Include conducted and radiated, except power test.
- VT-IoT-Dongle and VT-IoT-Dongle-CATM all have two mode Wlan + WWan or BT + WWan for Co-location. AC Line put the worst case co-location mode in the report. Radiation co-location we put the worst case co-location mode (Wlan +WWan (FCC ID: R17LE910NAV2)) in this Report.

## 2.2 Support Equipment and External Cable List

| No. | Description     | Manufacturer  | Model Number         |
|-----|-----------------|---------------|----------------------|
| A   | Notebook PC     | DELL          | Latitude E6410       |
| B   | Notebook PC     | Lenovo        | Y520-151KBN          |
| C   | Notebook PC     | APPLE         | A1706                |
| D   | Adapter         | FLEX          | A1718 (Apple)        |
| E   | Adapter         | Chicony Power | ADL135NCC3A (Lenovo) |
| F   | Adapter         | MYCELL        | AC-B04               |
| G   | DC Power Source | GW Instek     | SPS-2415             |

| No. | Cable Description | Shielding Type | Length (m) | From | To          |
|-----|-------------------|----------------|------------|------|-------------|
| 1   | Connector Cable   | Non-Shielded   | 1          | EUT  | Power Apply |

## 2.3 Block Diagram of Test Setup

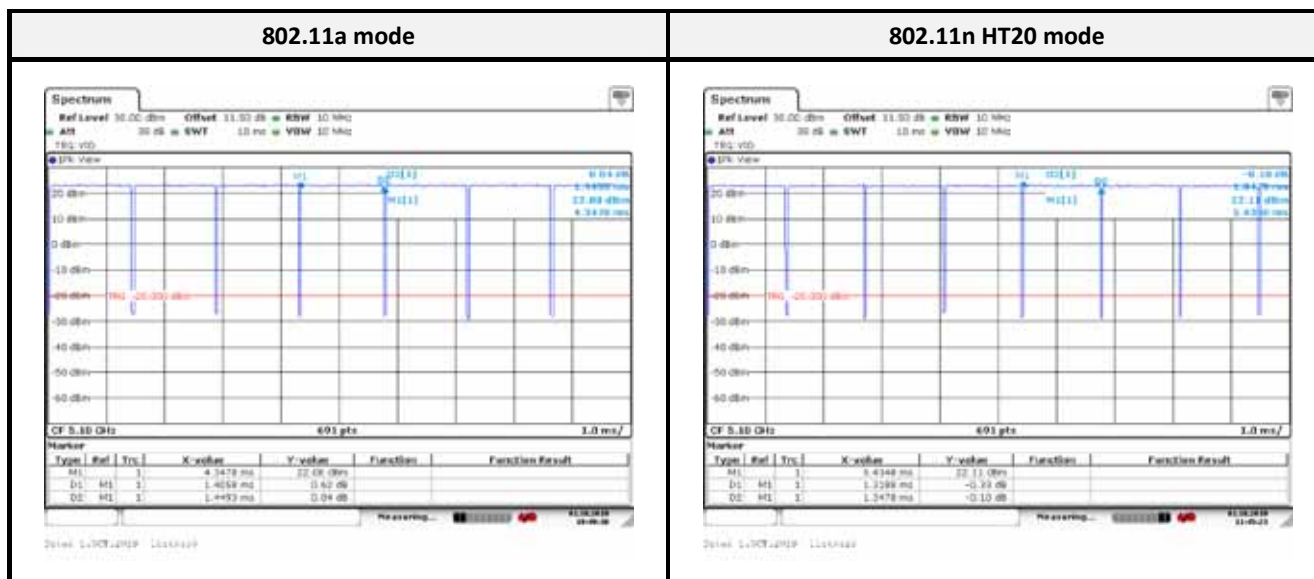


## 2.4 Duty Cycle

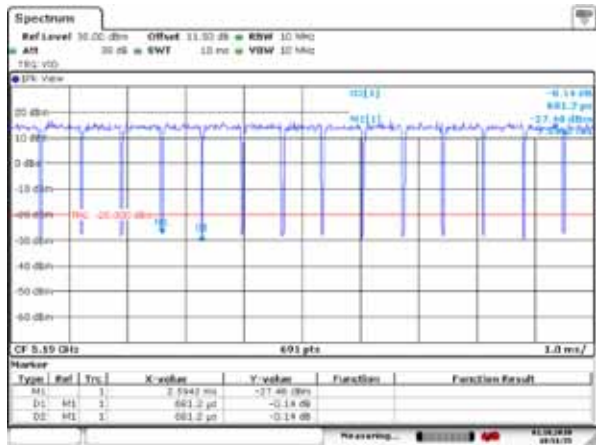
According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 section B:

All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

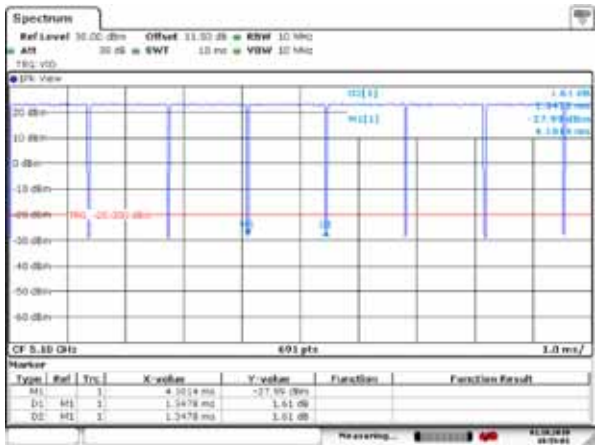
| Configuration          | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Factor (dB) |
|------------------------|--------------|-------------|----------------|------------------|
| 802.11a mode           | 1.40         | 1.44        | 97.22          | 0.12             |
| 802.11n HT20-BF mode   | 1.31         | 1.34        | 97.76          | 0.10             |
| 802.11n HT40-BF mode   | 0.62         | 0.69        | 89.86          | 0.46             |
| 802.11ac VHT20-BF mode | 1.31         | 1.34        | 97.76          | 0.10             |
| 802.11ac VHT40-BF mode | 0.62         | 0.69        | 89.86          | 0.46             |
| 802.11ac VHT80-BF mode | 0.27         | 0.33        | 81.82          | 0.87             |



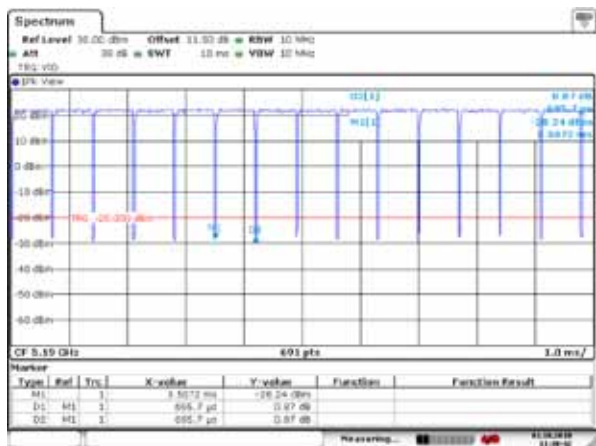
802.11n HT40 mode



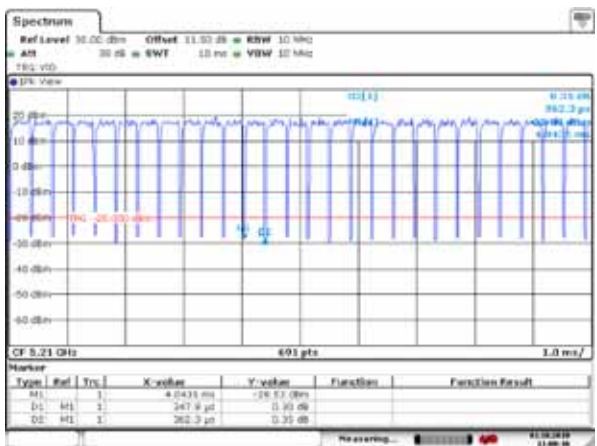
802.11ac VHT20 mode



802.11ac VHT40 mode



802.11ac VHT80 mode



### 3 Summary of Test Results

| FCC Rules                     | Description of Test                | Result     |
|-------------------------------|------------------------------------|------------|
| §1.1310, §2.1091, §15.407 (f) | Maximum Permissible Exposure (MPE) | Compliance |
| §15.203                       | Antenna Requirement                | Compliance |
| §15.207(a), §15.407(b)(6)     | AC Line Conducted Emissions        | Compliance |
| §15.205, §15.209, §15.407(b)  | Spurious Emissions                 | Compliance |
| §15.407(a)(e)                 | Emission Bandwidth                 | Compliance |
| §15.407(a)(1)                 | Maximum Peak Output Power          | Compliance |
| §15.407(a)(1)(5)              | Power Spectral Density             | Compliance |

## 4 FCC §1.1310, §2.1091, §15.407(f) - Maximum Permissible Exposure (MPE)

### 4.1 Applicable Standard

According to §15.407(f), U-NII devices are subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), and 2.1091 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request

### 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 Formulary:** Predication of MPE limit at a given distance

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

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

## 4.2 RF Exposure Evaluation Result

### MPE Evaluation:

| Mode            | Frequency Range (MHz) | Antenna Gain |           | Target Power |          | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|-----------------|-----------------------|--------------|-----------|--------------|----------|--------------------------|-------------------------------------|---------------------------------|
|                 |                       | (dBi)        | (numeric) | (dBm)        | (mW)     |                          |                                     |                                 |
| Wi-Fi 2.4G      | 2412-2462             | 3.00         | 1.995     | 25.00        | 316.2278 | 20                       | 0.1256                              | 1.0                             |
| BLE             | 2402-2480             | 3.00         | 1.995     | 4.00         | 2.5119   | 20                       | 0.0010                              | 1.0                             |
| BR+EDR          | 2402-2480             | 3.00         | 1.995     | 9.00         | 7.9433   | 20                       | 0.0032                              | 1.0                             |
| Wi-Fi 5G UNII-1 | 5150-5250             | 3.00         | 1.995     | 20.00        | 100.0000 | 20                       | 0.0397                              | 1.0                             |
| Wi-Fi 5G UNII-3 | 5745-5850             | 3.00         | 1.995     | 21.00        | 125.8925 | 20                       | 0.0500                              | 1.0                             |

### LTE module FCC ID: 2AJYU-SIM7000A

| Mode    | Frequency Range (MHz) | Antenna Gain |           | Target Power |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|---------|-----------------------|--------------|-----------|--------------|--------|--------------------------|-------------------------------------|---------------------------------|
|         |                       | (dBi)        | (numeric) | (dBm)        | (mW)   |                          |                                     |                                 |
| LTE B2  | 1850-1910             | 0.48         | 1.117     | 25.70        | 371.54 | 20                       | 0.0826                              | 1.0                             |
| LTE B4  | 1710-1755             | -0.73        | 0.845     | 25.70        | 371.54 | 20                       | 0.0625                              | 1.0                             |
| LTE B12 | 699-716               | 2.11         | 1.626     | 25.70        | 371.54 | 20                       | 0.1202                              | 0.466                           |
| LTE B13 | 777-787               | 2.11         | 1.626     | 25.70        | 371.54 | 20                       | 0.1202                              | 0.518                           |

### LTE module FCC ID: RI7LE910NAV2

| Mode    | Frequency Range (MHz) | Antenna Gain |           | Target Power |         | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|---------|-----------------------|--------------|-----------|--------------|---------|--------------------------|-------------------------------------|---------------------------------|
|         |                       | (dBi)        | (numeric) | (dBm)        | (mW)    |                          |                                     |                                 |
| LTE B2  | 1850-1910             | 0.48         | 1.117     | 24.00        | 251.189 | 20                       | 0.0558                              | 1.0                             |
| LTE B4  | 1710-1755             | -0.73        | 0.845     | 24.00        | 251.189 | 20                       | 0.0422                              | 1.0                             |
| LTE B5  | 824-849               | 2.65         | 1.841     | 24.00        | 251.189 | 20                       | 0.0920                              | 0.550                           |
| LTE B12 | 699-716               | 2.11         | 0.845     | 24.00        | 251.189 | 20                       | 0.0812                              | 0.466                           |
| LTE B13 | 777-787               | 2.11         | 1.626     | 24.00        | 251.189 | 20                       | 0.0812                              | 0.518                           |
| LTE B17 | 704-716               | 2.11         | 0.845     | 24.00        | 251.189 | 20                       | 0.0812                              | 0.469                           |

### MPE evaluation for simultaneous transmission:

#### Note:

1. Wi-Fi (2.4G) or Wi-Fi 5G and BT can't transmit simultaneously.
2. Wi-Fi (2.4G) and Wi-Fi 5G can't transmit simultaneously

Wi-Fi or BT & WWAN can transmit simultaneously , MPE evaluation is as below formula:

$$PD1/Limit1 + PD2/Limit2 + \dots < 1, \text{ PD (Power Density)}$$

**The worst case is as below:**

Max MPE of Wi-Fi + Max MPE of LTE  
=  $0.1256/1.0 + 0.1202/0.466 = 0.3835 < 1.0$

**Result:** MPE evaluation of single and simultaneous transmission meet the requirement of standard.

## 5 FCC §15.203 – Antenna Requirements

### 5.1 Applicable Standard

According to § 15.203 and § 15.407(a)(3),

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.

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.

### 5.2 Antenna List and Details

| Brand    | Model  | Antenna Type | Antenna Gain | Result     |
|----------|--------|--------------|--------------|------------|
| Jinchang | JCW425 | PIFA         | 3.00 dBi     | Compliance |

*The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.*

## 6 FCC §15.207 - AC Line Conducted Emissions

### 6.1 Applicable Standard

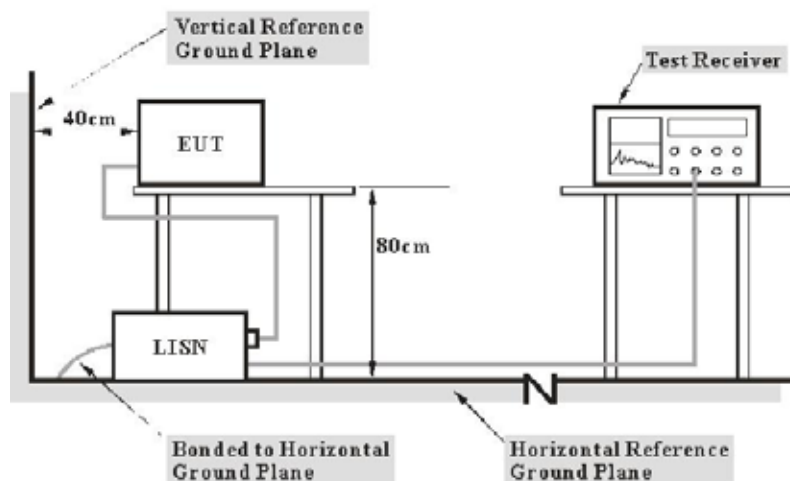
According to FCC §15.207 and §15.407(b)(6),

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

| Frequency (MHz) | Conducted Limit (dBuV)     |                            |
|-----------------|----------------------------|----------------------------|
|                 | Quasi-Peak                 | Average                    |
| 0.15-0.5        | 66 to 56 <sup>Note 1</sup> | 56 to 46 <sup>Note 2</sup> |
| 0.5-5           | 56                         | 46                         |
| 5-30            | 60                         | 50                         |

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

### 6.2 EUT Setup and Test Procedure



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 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  | Receiver RBW |
|------------------|--------------|
| 150 kHz - 30 MHz | 9 kHz        |

During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

### 6.3 Test Equipment List and Details

| Description       | Manufacture     | Model                | Serial No. | Cal. Date. | Cal. Due.  |
|-------------------|-----------------|----------------------|------------|------------|------------|
| Conduction Room   |                 |                      |            |            |            |
| LISN              | Rohde & Schwarz | ENV216               | 100010     | 2019/09/02 | 2020/09/01 |
| EMI Test Receiver | Rohde & Schwarz | ESR3                 | 102430     | 2019/03/27 | 2020/03/26 |
| Pulse Limiter     | SCHWARZBECK     | VSTD 9561-F          | 00432      | 2019/08/28 | 2020/08/27 |
| RF Cable          | EMCI            | EMCCFD300-BM-BM-8000 | 180526     | 2019/08/08 | 2020/08/07 |
| Software          | Audix           | e3 v9                | E3LK-03    | N.C.R      | N.C.R      |

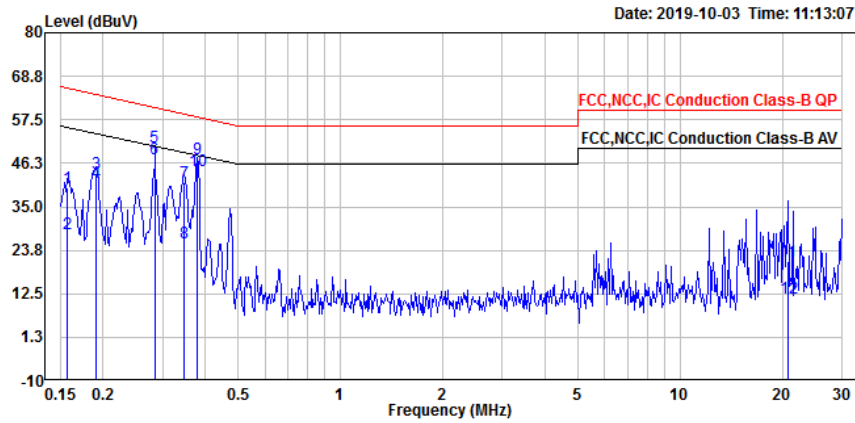
**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 6.4 Test Environmental Conditions

|               |            |                    |           |
|---------------|------------|--------------------|-----------|
| Temperature:  | 25         | Relative Humidity: | 62 %      |
| ATM Pressure: | 1010 hPa   | Test Engineer:     | Ray Huang |
| Test Date:    | 2019-10-03 |                    |           |

## 6.5 Test Data and Test Plot

Mode: AC 120 V/60 Hz, Co-location mode (Wi-Fi + WWan(FCC ID: R17LE910NAV2)), Line



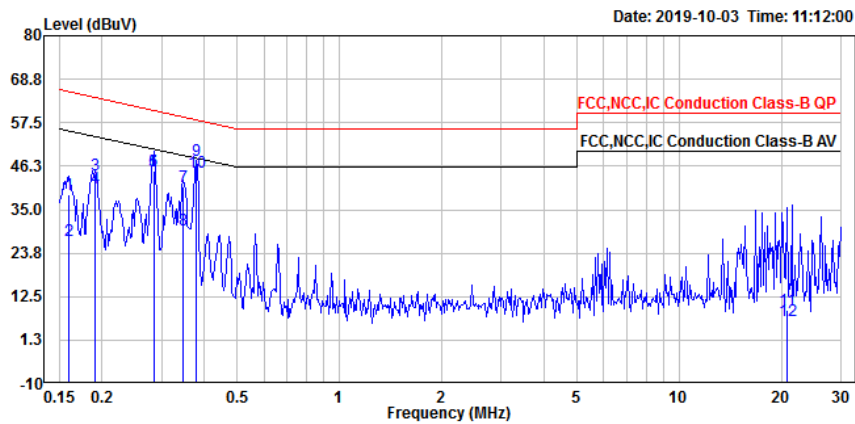
|    | Freq   | Read Level | Level | Factor | Limit Line | Over Limit | Remark  |
|----|--------|------------|-------|--------|------------|------------|---------|
|    | MHz    | dBuV       | dBuV  | dB     | dBuV       | dB         |         |
| 1  | 0.157  | 20.04      | 39.98 | 19.94  | 65.60      | -25.62     | QP      |
| 2  | 0.157  | 8.02       | 27.96 | 19.94  | 55.60      | -27.64     | Average |
| 3  | 0.191  | 23.75      | 43.69 | 19.94  | 64.01      | -20.32     | QP      |
| 4  | 0.191  | 21.18      | 41.12 | 19.94  | 54.01      | -12.89     | Average |
| 5  | 0.284  | 30.40      | 50.33 | 19.93  | 60.71      | -10.38     | QP      |
| 6  | 0.284  | 27.45      | 47.38 | 19.93  | 50.71      | -3.33      | Average |
| 7  | 0.346  | 21.29      | 41.24 | 19.95  | 59.05      | -17.81     | QP      |
| 8  | 0.346  | 5.76       | 25.71 | 19.95  | 49.05      | -23.34     | Average |
| 9  | 0.378  | 27.50      | 47.46 | 19.96  | 58.32      | -10.86     | QP      |
| 10 | 0.378  | 24.40      | 44.36 | 19.96  | 48.32      | -3.96      | Average |
| 11 | 20.795 | 0.63       | 20.80 | 20.17  | 60.00      | -39.20     | QP      |
| 12 | 20.795 | -8.63      | 11.54 | 20.17  | 50.00      | -38.46     | Average |

Note:

$Level = Read\ Level + Factor$

$Over\ Limit\ (Margin) = Level - Limit\ Line$

$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

**Mode: AC 120V/60 Hz, Co-location mode (Wi-Fi + WWan(FCC ID: R17LE910NAV2)), Neutral**

|    | Freq   | Read Level | Level | Factor | Limit Line | Over Limit | Remark  |
|----|--------|------------|-------|--------|------------|------------|---------|
|    | MHz    | dBuV       | dBuV  | dB     | dBuV       | dB         |         |
| 1  | 0.160  | 18.90      | 38.85 | 19.95  | 65.47      | -26.62     | QP      |
| 2  | 0.160  | 6.93       | 26.88 | 19.95  | 55.47      | -28.59     | Average |
| 3  | 0.191  | 24.02      | 43.96 | 19.94  | 64.01      | -20.05     | QP      |
| 4  | 0.191  | 20.53      | 40.47 | 19.94  | 54.01      | -13.54     | Average |
| 5  | 0.284  | 25.22      | 45.16 | 19.94  | 60.71      | -15.55     | QP      |
| 6  | 0.284  | 25.00      | 44.94 | 19.94  | 50.71      | -5.77      | Average |
| 7  | 0.346  | 21.04      | 41.00 | 19.96  | 59.05      | -18.05     | QP      |
| 8  | 0.346  | 9.83       | 29.79 | 19.96  | 49.05      | -19.26     | Average |
| 9  | 0.378  | 27.69      | 47.66 | 19.97  | 58.32      | -10.66     | QP      |
| 10 | 0.378  | 24.73      | 44.70 | 19.97  | 48.32      | -3.62      | Average |
| 11 | 20.795 | -11.22     | 9.10  | 20.32  | 60.00      | -50.90     | QP      |
| 12 | 20.795 | -13.94     | 6.38  | 20.32  | 50.00      | -43.62     | Average |

Note:

$Level = Read\ Level + Factor$

$Over\ Limit\ (Margin) = Level - Limit\ Line$

$Factor = (LISN, ISN, PLC\ or\ current\ probe)\ Factor + Cable\ Loss + Attenuator$

## 7 FCC §15.209, §15.205 & §15.407(b) – Unwanted Emission

### 7.1 Applicable Standard

According to 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.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz. As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

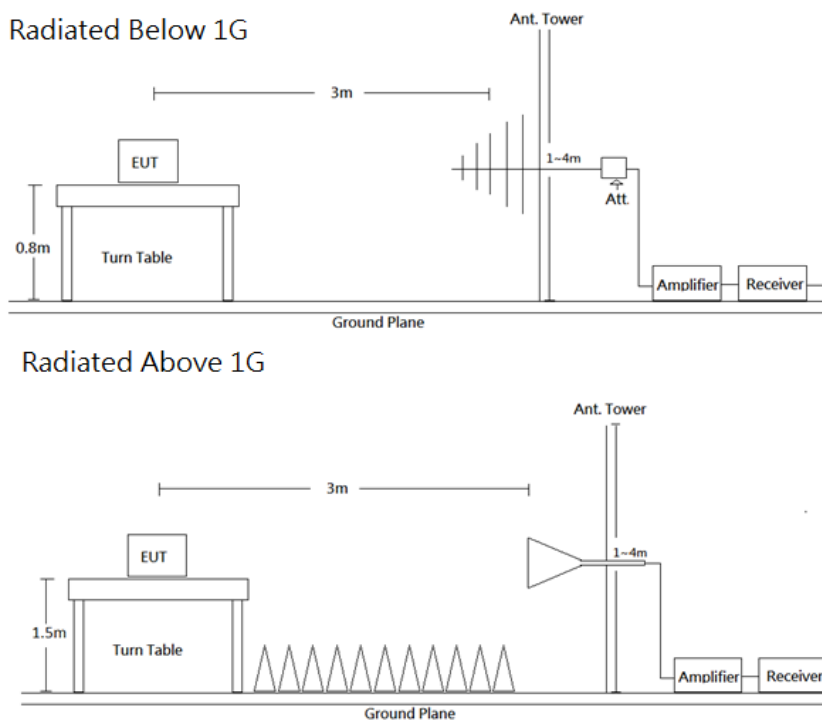
| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 13.36-13.41         | 399.9-410     | 4.5-5.15    |
| 0.495-0.505       | 16.42-16.423        | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.69475-16.69525   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | Above 38.6  |

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

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

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

## 7.2 EUT Setup and Test Procedure



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

The system was investigated from 30 MHz to 40 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10-2013.

| Frequency Range | RBW     | VBW   | Detector | Duty cycle | Measurement method |
|-----------------|---------|-------|----------|------------|--------------------|
| 30-1000 MHz     | 120 kHz | /     | QP       | -          | QP                 |
| Above 1 GHz     | 1 MHz   | 3 MHz | PK       | -          | PK                 |
|                 | 1 MHz   | 3 MHz | RMS      | >98%       | Ave                |
|                 | 1 MHz   | 1/T   | PK       | <98%       | Ave                |

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

### 7.3 Test Equipment List and Details

| Description                   | Manufacture                 | Model                 | Serial No.           | Cal. Date. | Cal. Due.  |
|-------------------------------|-----------------------------|-----------------------|----------------------|------------|------------|
| 966A Room                     |                             |                       |                      |            |            |
| Active Loop Antenna           | EMCO                        | 6502                  | 0001-3322            | 2019/03/15 | 2020/03/14 |
| Bilog Antenna/6 dB Attenuator | SUNOL SCIENCES & EMEC /EMCI | JB3/N-6-06            | A111513/AT-N0668     | 2019/03/29 | 2020/03/28 |
| Horn Antenna                  | ETS-Lindgren                | 3115                  | 00109141             | 2019/07/05 | 2020/07/04 |
| Horn Antenna                  | ETS-Lindgren                | 3160-09               | 00123852             | 2019/07/11 | 2020/07/10 |
| Horn Antenna                  | ETS-Lindgren                | 3160-10               | 00123855             | 2019/07/12 | 2020/07/11 |
| Preamplifier                  | A.H. Systems                | PAM-0118P             | 478                  | 2019/03/28 | 2020/03/27 |
| Preamplifier                  | A.H. Systems                | PAM-1840VH            | 174                  | 2019/02/18 | 2020/02/17 |
| Signal and Spectrum Analyzer  | Rohde & Schwarz             | FSV40                 | 101434               | 2019/04/17 | 2019/04/16 |
| Microflex Cable (1m)          | EMCI                        | EMC106-SM-SM-2000     | 180515               | 2019/08/07 | 2019/08/06 |
| Microflex Cable (2m)          | MTJ                         | H0919                 | 00000-MT28A-100      | 2019/08/07 | 2019/08/06 |
| Microflex Cable (8m)          | UTIFLEX                     | UFA210A-1-3149-300300 | MFR 64639 232490-001 | 2019/08/07 | 2019/08/06 |
| Turn Table                    | Chaintek                    | T-200-S-1             | 003501               | N.C.R      | N.C.R      |
| Antenna Tower                 | Chaintek                    | MBD-400-1             | 003504               | N.C.R      | N.C.R      |
| Controller                    | Chaintek                    | 3000-1                | 003507               | N.C.R      | N.C.R      |
| Software                      | Audix                       | e3 v9                 | E3LK-01              | N.C.R      | N.C.R      |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 7.4 Test Environmental Conditions

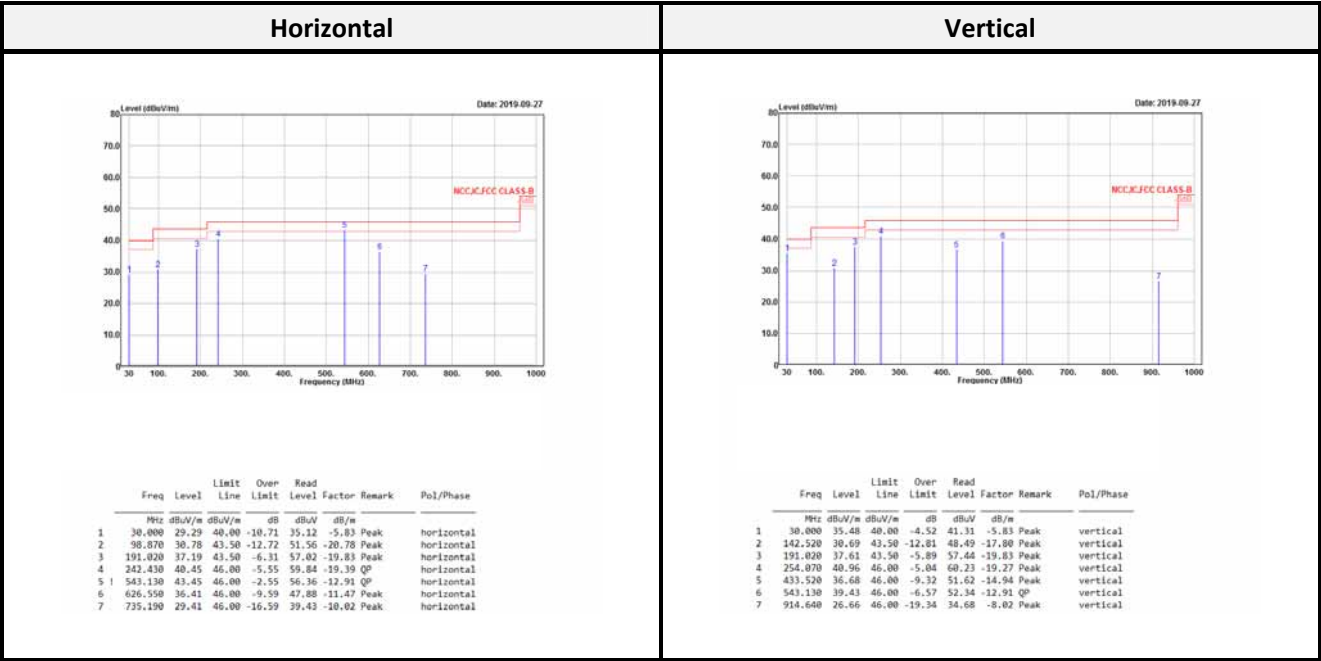
|               |                          |                    |           |
|---------------|--------------------------|--------------------|-----------|
| Temperature:  | 25                       | Relative Humidity: | 55 %      |
| ATM Pressure: | 1011hPa                  | Test Engineer:     | Leo Chang |
| Test Date:    | 2019-09-25 to 2019-09-27 | -                  | -         |

7.5 Test Data and Test Plot

Wi-Fi 5G Mode:

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Y axis)

Below 1G (30 MHz-1 GHz) test the output power worst mode



$Level = Read\ Level + Factor$

$Over\ Limit = Level - Limit$

$Correct\ Factor = Antenna\ Factor + Cable\ Loss - Amplifier\ Gain$

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

**Above 1G (1 GHz-40 GHz) in UNII-1:****802.11a mode:**

| Low CH     |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5147.217   | 52.90  | 54.00      | -1.10      | 52.55      | 0.35   | Average | 5146.696  | 52.05  | 54.00      | -1.95      | 51.70      | 0.35   | Average |
| 5147.217   | 69.39  | 74.00      | -4.61      | 69.04      | 0.35   | Peak    | 5146.696  | 67.50  | 74.00      | -6.50      | 67.15      | 0.35   | Peak    |
| 5178.391   | 96.94  |            |            | 96.69      | 0.25   | Average | 5178.391  | 96.17  |            |            | 95.92      | 0.25   | Average |
| 5178.391   | 107.05 |            |            | 106.80     | 0.25   | Peak    | 5178.391  | 106.29 |            |            | 106.04     | 0.25   | Peak    |
| 2020.000   | 42.73  | 68.20      | -25.47     | 50.26      | -7.53  | Peak    | 2020.000  | 41.00  | 68.20      | -27.20     | 48.53      | -7.53  | Peak    |
| 10360.000  | 47.45  | 68.20      | -20.75     | 38.18      | 9.27   | Peak    | 10360.000 | 48.45  | 68.20      | -19.75     | 39.18      | 9.27   | Peak    |
| 15540.000  | 44.67  | 54.00      | -9.33      | 30.48      | 14.19  | Average | 15540.000 | 44.59  | 54.00      | -9.41      | 30.40      | 14.19  | Average |
| 15540.000  | 56.33  | 74.00      | -17.67     | 42.14      | 14.19  | Peak    | 15540.000 | 56.09  | 74.00      | -17.91     | 41.90      | 14.19  | Peak    |

| Middle CH  |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5150.000   | 51.73  | 54.00      | -2.27      | 51.39      | 0.34   | Average | 5150.000  | 50.82  | 54.00      | -3.18      | 50.48      | 0.34   | Average |
| 5150.000   | 65.69  | 74.00      | -8.31      | 65.35      | 0.34   | Peak    | 5150.000  | 64.73  | 74.00      | -9.27      | 64.39      | 0.34   | Peak    |
| 5198.261   | 100.23 |            |            | 99.97      | 0.26   | Average | 5198.261  | 99.78  |            |            | 99.52      | 0.26   | Average |
| 5198.261   | 110.14 |            |            | 109.88     | 0.26   | Peak    | 5198.261  | 109.66 |            |            | 109.40     | 0.26   | Peak    |
| 5383.478   | 47.03  | 54.00      | -6.97      | 46.86      | 0.17   | Average | 5385.652  | 46.92  | 54.00      | -7.08      | 46.77      | 0.15   | Average |
| 5383.478   | 60.60  | 74.00      | -13.40     | 60.43      | 0.17   | Peak    | 5385.652  | 60.88  | 74.00      | -13.12     | 60.73      | 0.15   | Peak    |
| 2020.000   | 42.69  | 68.20      | -25.51     | 50.22      | -7.53  | Peak    | 2020.000  | 41.18  | 68.20      | -27.02     | 48.71      | -7.53  | Peak    |
| 10400.000  | 47.34  | 68.20      | -20.86     | 37.95      | 9.39   | Peak    | 10400.000 | 47.13  | 68.20      | -21.07     | 37.74      | 9.39   | Peak    |
| 15600.000  | 44.22  | 54.00      | -9.78      | 30.05      | 14.17  | Average | 15600.000 | 44.38  | 54.00      | -9.62      | 30.21      | 14.17  | Average |
| 15600.000  | 57.25  | 74.00      | -16.75     | 43.08      | 14.17  | Peak    | 15600.000 | 57.40  | 74.00      | -16.60     | 43.23      | 14.17  | Peak    |

| High CH    |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5144.783   | 47.62  | 54.00      | -6.38      | 47.26      | 0.36   | Average | 5146.087  | 47.61  | 54.00      | -6.39      | 47.25      | 0.36   | Average |
| 5144.783   | 61.26  | 74.00      | -12.74     | 60.90      | 0.36   | Peak    | 5146.087  | 61.40  | 74.00      | -12.60     | 61.04      | 0.36   | Peak    |
| 5238.261   | 101.61 |            |            | 101.37     | 0.24   | Average | 5238.261  | 100.15 |            |            | 99.91      | 0.24   | Average |
| 5238.261   | 111.61 |            |            | 111.37     | 0.24   | Peak    | 5238.261  | 110.15 |            |            | 109.91     | 0.24   | Peak    |
| 5356.087   | 47.44  | 54.00      | -6.56      | 47.24      | 0.20   | Average | 5377.391  | 47.11  | 54.00      | -6.89      | 46.93      | 0.18   | Average |
| 5356.087   | 60.60  | 74.00      | -13.40     | 60.40      | 0.20   | Peak    | 5377.391  | 60.56  | 74.00      | -13.44     | 60.38      | 0.18   | Peak    |
| 2020.000   | 44.08  | 68.20      | -24.12     | 51.61      | -7.53  | Peak    | 2020.000  | 40.37  | 68.20      | -27.83     | 47.90      | -7.53  | Peak    |
| 10480.000  | 48.19  | 68.20      | -20.01     | 39.00      | 9.19   | Peak    | 10480.000 | 48.29  | 68.20      | -19.91     | 39.10      | 9.19   | Peak    |
| 15720.000  | 44.43  | 54.00      | -9.57      | 30.13      | 14.30  | Average | 15720.000 | 45.82  | 54.00      | -8.18      | 31.52      | 14.30  | Average |
| 15720.000  | 59.67  | 74.00      | -14.33     | 45.37      | 14.30  | Peak    | 15720.000 | 60.66  | 74.00      | -13.34     | 46.36      | 14.30  | Peak    |

**802.11ac VHT20 mode:**

| Low CH     |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5148.240   | 52.77  | 54.00      | -1.23      | 52.42      | 0.35   | Average | 5149.320  | 51.05  | 54.00      | -2.95      | 50.70      | 0.35   | Average |
| 5148.240   | 69.72  | 74.00      | -4.28      | 69.37      | 0.35   | Peak    | 5149.320  | 66.83  | 74.00      | -7.17      | 66.48      | 0.35   | Peak    |
| 5182.170   | 96.01  |            |            | 95.76      | 0.25   | Average | 5178.030  | 93.57  |            | 7          | 93.32      | 0.25   | Average |
| 5182.170   | 107.41 |            |            | 107.16     | 0.25   | Peak    | 5178.030  | 105.58 |            | 8          | 105.33     | 0.25   | Peak    |
| 2020.000   | 41.29  | 68.20      | -26.91     | 48.82      | -7.53  | Peak    | 2020.000  | 40.83  | 68.20      | -27.37     | 48.36      | -7.53  | Peak    |
| 10360.000  | 48.36  | 68.20      | -19.84     | 39.14      | 9.22   | Peak    | 10360.000 | 47.98  | 68.20      | -20.22     | 38.76      | 9.22   | Peak    |
| 15540.000  | 44.62  | 54.00      | -9.38      | 30.43      | 14.19  | Average | 15540.000 | 44.68  | 54.00      | -9.32      | 30.49      | 14.19  | Average |
| 15540.000  | 56.54  | 74.00      | -17.46     | 42.35      | 14.19  | Peak    | 15540.000 | 56.55  | 74.00      | -17.45     | 42.36      | 14.19  | Peak    |

| Middle CH  |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5147.700   | 51.69  | 54.00      | -2.31      | 51.34      | 0.35   | Average | 5149.200  | 49.86  | 54.00      | -4.14      | 49.51      | 0.35   | Average |
| 5147.700   | 66.11  | 74.00      | -7.89      | 65.76      | 0.35   | Peak    | 5149.200  | 63.86  | 74.00      | -10.14     | 63.51      | 0.35   | Peak    |
| 5198.400   | 99.67  |            |            | 99.42      | 0.25   | Average | 5199.600  | 97.10  |            | 9          | 96.85      | 0.25   | Average |
| 5198.400   | 110.34 |            |            | 110.09     | 0.25   | Peak    | 5199.600  | 107.99 |            | 9          | 107.74     | 0.25   | Peak    |
| 5388.000   | 46.67  | 54.00      | -7.33      | 46.52      | 0.15   | Average | 5380.200  | 46.67  | 54.00      | -7.33      | 46.49      | 0.18   | Average |
| 5388.000   | 60.53  | 74.00      | -13.47     | 60.38      | 0.15   | Peak    | 5380.200  | 60.74  | 74.00      | -13.26     | 60.56      | 0.18   | Peak    |
| 2020.000   | 41.52  | 68.20      | -26.68     | 49.05      | -7.53  | Peak    | 2020.000  | 38.44  | 68.20      | -29.76     | 45.97      | -7.53  | Peak    |
| 10400.000  | 49.20  | 68.20      | -19.00     | 39.81      | 9.39   | Peak    | 10400.000 | 48.49  | 68.20      | -19.71     | 39.10      | 9.39   | Peak    |
| 15600.000  | 44.50  | 54.00      | -9.50      | 30.33      | 14.17  | Average | 15600.000 | 45.50  | 54.00      | -8.50      | 31.33      | 14.17  | Average |
| 15600.000  | 57.55  | 74.00      | -16.45     | 43.38      | 14.17  | Peak    | 15600.000 | 57.51  | 74.00      | -16.49     | 43.34      | 14.17  | Peak    |

| High CH    |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5148.900   | 47.61  | 54.00      | -6.39      | 47.26      | 0.35   | Average | 5149.200  | 47.45  | 54.00      | -6.55      | 47.10      | 0.35   | Average |
| 5148.900   | 62.72  | 74.00      | -11.28     | 62.37      | 0.35   | Peak    | 5149.200  | 62.15  | 74.00      | -11.85     | 61.80      | 0.35   | Peak    |
| 5238.300   | 100.42 |            |            | 100.18     | 0.24   | Average | 5237.700  | 98.44  |            | 4          | 98.20      | 0.24   | Average |
| 5238.300   | 111.42 |            |            | 111.18     | 0.24   | Peak    | 5237.700  | 109.64 |            | 4          | 109.40     | 0.24   | Peak    |
| 5354.700   | 46.74  | 54.00      | -7.26      | 46.52      | 0.22   | Average | 5369.400  | 46.92  | 54.00      | -7.08      | 46.74      | 0.18   | Average |
| 5354.700   | 61.30  | 74.00      | -12.70     | 61.08      | 0.22   | Peak    | 5369.400  | 61.50  | 74.00      | -12.50     | 61.32      | 0.18   | Peak    |
| 2020.000   | 41.91  | 68.20      | -26.29     | 49.44      | -7.53  | Peak    | 2020.000  | 40.63  | 68.20      | -27.57     | 48.16      | -7.53  | Peak    |
| 10480.000  | 48.66  | 68.20      | -19.54     | 39.47      | 9.19   | Peak    | 10480.000 | 47.97  | 68.20      | -20.23     | 38.78      | 9.19   | Peak    |
| 15720.000  | 45.44  | 54.00      | -8.56      | 31.14      | 14.30  | Average | 15720.000 | 45.93  | 54.00      | -8.07      | 31.63      | 14.30  | Average |
| 15720.000  | 59.24  | 74.00      | -14.76     | 44.94      | 14.30  | Peak    | 15720.000 | 59.90  | 74.00      | -14.10     | 45.60      | 14.30  | Peak    |

**802.11ac VHT40 mode:**

| Low CH     |        |               |               |               |        |         |           |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|-----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical  |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq      | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz       | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 5146.310   | 52.26  | 54.00         | -1.74         | 51.90         | 0.36   | Average | 5146.420  | 50.68  | 54.00         | -3.32         | 50.32         | 0.36   | Average |
| 5146.310   | 70.45  | 74.00         | -3.55         | 70.09         | 0.36   | Peak    | 5146.420  | 69.03  | 74.00         | -4.97         | 68.67         | 0.36   | Peak    |
| 5192.070   | 91.89  | 68.20         |               |               | 0.25   | Average | 5187.780  | 89.35  |               |               | 89.10         | 0.25   | Average |
| 5192.070   | 104.10 | 68.20         |               |               | 0.25   | Peak    | 5187.780  | 101.67 |               |               | 101.42        | 0.25   | Peak    |
| 2020.000   | 40.46  | 68.20         | -27.74        | 47.99         | -7.53  | Peak    | 2020.000  | 40.89  | 68.20         | -27.31        | 48.42         | -7.53  | Peak    |
| 10380.000  | 48.41  | 68.20         | -19.79        | 39.05         | 9.36   | Peak    | 10380.000 | 49.56  | 68.20         | -18.64        | 40.20         | 9.36   | Peak    |
| 15570.000  | 44.86  | 54.00         | -9.14         | 30.68         | 14.18  | Average | 15570.000 | 45.13  | 54.00         | -8.87         | 30.95         | 14.18  | Average |
| 15570.000  | 57.44  | 74.00         | -16.56        | 43.26         | 14.18  | Peak    | 15570.000 | 57.14  | 74.00         | -16.86        | 42.96         | 14.18  | Peak    |

| High CH    |        |               |               |               |        |         |           |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|-----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical  |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq      | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz       | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 5149.500   | 50.89  | 54.00         | -3.11         | 50.54         | 0.35   | Average | 5147.700  | 49.16  | 54.00         | -4.84         | 48.81         | 0.35   | Average |
| 5149.500   | 65.58  | 74.00         | -8.42         | 65.23         | 0.35   | Peak    | 5147.700  | 62.54  | 74.00         | -11.46        | 62.19         | 0.35   | Peak    |
| 5226.000   | 95.08  | 68.20         |               |               | 0.28   | Average | 5226.000  | 92.58  | 68.20         |               |               | 0.28   | Average |
| 5226.000   | 107.51 | 68.20         |               |               | 0.28   | Peak    | 5226.000  | 104.93 | 68.20         |               |               | 0.28   | Peak    |
| 5373.000   | 46.73  | 54.00         | -7.27         | 46.55         | 0.18   | Average | 5365.800  | 46.73  | 54.00         | -7.27         | 46.54         | 0.19   | Average |
| 5373.000   | 60.91  | 74.00         | -13.09        | 60.73         | 0.18   | Peak    | 5365.800  | 60.60  | 74.00         | -13.40        | 60.41         | 0.19   | Peak    |
| 2020.000   | 40.19  | 68.20         | -28.01        | 47.72         | -7.53  | Peak    | 2020.000  | 39.40  | 68.20         | -28.80        | 46.93         | -7.53  | Peak    |
| 10460.000  | 48.82  | 68.20         | -19.38        | 39.54         | 9.28   | Peak    | 10460.000 | 48.78  | 68.20         | -19.42        | 39.50         | 9.28   | Peak    |
| 15690.000  | 45.78  | 54.00         | -8.22         | 31.48         | 14.30  | Average | 15690.000 | 45.42  | 54.00         | -8.58         | 31.12         | 14.30  | Average |
| 15690.000  | 59.89  | 74.00         | -14.11        | 45.59         | 14.30  | Peak    | 15690.000 | 59.47  | 74.00         | -14.53        | 45.17         | 14.30  | Peak    |

**802.11ac VHT80 mode:**

| Horizontal |        |               |               |               |        |         | Vertical  |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|-----------|--------|---------------|---------------|---------------|--------|---------|
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq      | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz       | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 5147.850   | 52.52  | 54.00         | -1.48         | 52.17         | 0.35   | Average | 5139.900  | 50.73  | 54.00         | -3.27         | 50.35         | 0.38   | Average |
| 5147.850   | 68.25  | 74.00         | -5.75         | 67.90         | 0.35   | Peak    | 5139.900  | 66.24  | 74.00         | -7.76         | 65.86         | 0.38   | Peak    |
| 5212.650   | 86.02  |               |               | 85.76         | 0.26   | Average | 5213.400  | 83.24  |               |               | 82.97         | 0.27   | Average |
| 5212.650   | 100.51 |               |               | 100.25        | 0.26   | Peak    | 5213.400  | 97.04  |               |               | 96.77         | 0.27   | Peak    |
| 2020.000   | 41.86  | 68.20         | -26.34        | 49.39         | -7.53  | Peak    | 2020.000  | 40.67  | 68.20         | -27.53        | 48.20         | -7.53  | Peak    |
| 10420.000  | 49.68  | 68.20         | -18.52        | 40.25         | 9.43   | Peak    | 10420.000 | 49.12  | 68.20         | -19.08        | 39.69         | 9.43   | Peak    |
| 15630.000  | 45.29  | 54.00         | -8.71         | 31.13         | 14.16  | Average | 15630.000 | 45.33  | 54.00         | -8.67         | 31.17         | 14.16  | Average |
| 15630.000  | 57.98  | 74.00         | -16.02        | 43.82         | 14.16  | Peak    | 15630.000 | 57.88  | 74.00         | -16.12        | 43.72         | 14.16  | Peak    |

**Above 1G (1 GHz-40 GHz) in UNII-3:****802.11a mode:**

| Low CH     |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5649.960   | 61.16  | 68.20      | -7.04      | 60.14      | 1.02   | Peak    | 5643.840  | 61.97  | 68.20      | -6.23      | 60.99      | 0.98   | Peak    |
| 5652.120   | 61.59  | 69.78      | -8.19      | 60.56      | 1.03   | Peak    | 5651.040  | 61.33  | 68.97      | -7.64      | 60.30      | 1.03   | Peak    |
| 5702.520   | 74.44  | 105.91     | -31.47     | 73.12      | 1.32   | Peak    | 5701.800  | 69.30  | 105.70     | -36.40     | 67.98      | 1.32   | Peak    |
| 5745.720   | 110.96 | 122.20     | -11.24     | 109.68     | 1.28   | Peak    | 5743.200  | 107.58 | 122.20     | -14.62     | 106.30     | 1.28   | Peak    |
| 5874.240   | 64.35  | 105.41     | -41.06     | 62.23      | 2.12   | Peak    | 5874.960  | 63.64  | 105.21     | -41.57     | 61.51      | 2.13   | Peak    |
| 5925.000   | 64.22  | 68.20      | -3.98      | 61.74      | 2.48   | Peak    | 5924.280  | 63.54  | 68.73      | -5.19      | 61.06      | 2.48   | Peak    |
| 5967.120   | 64.39  | 68.20      | -3.81      | 61.95      | 2.44   | Peak    | 5967.120  | 64.17  | 68.20      | -4.03      | 61.73      | 2.44   | Peak    |
| 2020.000   | 42.71  | 68.20      | -25.49     | 50.24      | -7.53  | Peak    | 2020.000  | 41.87  | 68.20      | -26.33     | 49.40      | -7.53  | Peak    |
| 11490.000  | 40.55  | 54.00      | -13.45     | 29.85      | 10.70  | Average | 11490.000 | 39.84  | 54.00      | -14.16     | 29.14      | 10.70  | Average |
| 11490.000  | 51.52  | 74.00      | -22.48     | 40.82      | 10.70  | Peak    | 11490.000 | 50.84  | 74.00      | -23.16     | 40.14      | 10.70  | Peak    |
| 17235.000  | 57.93  | 68.20      | -10.27     | 40.96      | 16.97  | Peak    | 17235.000 | 57.06  | 68.20      | -11.14     | 40.09      | 16.97  | Peak    |

| Middle CH  |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5639.880   | 61.69  | 68.20      | -6.51      | 60.74      | 0.95   | Peak    | 5633.760  | 61.68  | 68.20      | -6.52      | 60.77      | 0.91   | Peak    |
| 5650.680   | 60.98  | 68.71      | -7.73      | 59.95      | 1.03   | Peak    | 5651.040  | 61.74  | 68.97      | -7.23      | 60.71      | 1.03   | Peak    |
| 5701.440   | 62.36  | 105.60     | -43.24     | 61.04      | 1.32   | Peak    | 5700.720  | 62.28  | 105.40     | -43.12     | 60.95      | 1.33   | Peak    |
| 5783.520   | 109.95 | 122.20     | -12.25     | 108.61     | 1.34   | Peak    | 5783.520  | 107.19 | 122.20     | -15.01     | 105.85     | 1.34   | Peak    |
| 5874.600   | 63.76  | 105.31     | -41.55     | 61.63      | 2.13   | Peak    | 5874.960  | 64.39  | 105.21     | -40.82     | 62.26      | 2.13   | Peak    |
| 5923.920   | 64.84  | 69.00      | -4.16      | 62.36      | 2.48   | Peak    | 5925.000  | 64.00  | 68.20      | -4.20      | 61.52      | 2.48   | Peak    |
| 5959.560   | 64.28  | 68.20      | -3.92      | 61.84      | 2.44   | Peak    | 5940.120  | 64.95  | 68.20      | -3.25      | 62.47      | 2.48   | Peak    |
| 2020.000   | 41.51  | 68.20      | -26.69     | 49.04      | -7.53  | Peak    | 2020.000  | 39.25  | 68.20      | -28.95     | 46.78      | -7.53  | Peak    |
| 11570.000  | 41.02  | 54.00      | -12.98     | 30.26      | 10.76  | Average | 11570.000 | 40.92  | 54.00      | -13.08     | 30.16      | 10.76  | Average |
| 11570.000  | 50.56  | 74.00      | -23.44     | 39.80      | 10.76  | Peak    | 11570.000 | 51.62  | 74.00      | -22.38     | 40.86      | 10.76  | Peak    |
| 17355.000  | 58.00  | 68.20      | -10.20     | 40.29      | 17.71  | Peak    | 17355.000 | 57.22  | 68.20      | -10.98     | 39.51      | 17.71  | Peak    |

| High CH    |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5643.480   | 61.74  | 68.20      | -6.46      | 60.76      | 0.98   | Peak    | 5632.320  | 62.08  | 68.20      | -6.12      | 61.17      | 0.91   | Peak    |
| 5651.040   | 60.76  | 68.97      | -8.21      | 59.73      | 1.03   | Peak    | 5651.040  | 60.83  | 68.97      | -8.14      | 59.80      | 1.03   | Peak    |
| 5701.080   | 61.09  | 105.50     | -44.41     | 59.76      | 1.33   | Peak    | 5700.360  | 62.01  | 105.30     | -43.29     | 60.68      | 1.33   | Peak    |
| 5823.480   | 109.53 | 122.20     | -12.67     | 108.02     | 1.51   | Peak    | 5823.840  | 106.35 | 122.20     | -15.85     | 104.83     | 1.52   | Peak    |
| 5874.960   | 66.93  | 105.21     | -38.28     | 64.80      | 2.13   | Peak    | 5874.600  | 65.00  | 105.31     | -40.31     | 62.87      | 2.13   | Peak    |
| 5924.640   | 63.73  | 68.47      | -4.74      | 61.25      | 2.48   | Peak    | 5923.560  | 64.16  | 69.26      | -5.10      | 61.68      | 2.48   | Peak    |
| 5931.480   | 64.61  | 68.20      | -3.59      | 62.12      | 2.49   | Peak    | 5934.360  | 64.50  | 68.20      | -3.70      | 62.02      | 2.48   | Peak    |
| 2020.000   | 42.00  | 68.20      | -26.20     | 49.53      | -7.53  | Peak    | 2020.000  | 41.03  | 68.20      | -27.17     | 48.56      | -7.53  | Peak    |
| 11650.000  | 41.27  | 54.00      | -12.73     | 30.37      | 10.90  | Average | 11650.000 | 41.47  | 54.00      | -12.53     | 30.57      | 10.90  | Average |
| 11650.000  | 51.39  | 74.00      | -22.61     | 40.49      | 10.90  | Peak    | 11650.000 | 51.51  | 74.00      | -22.49     | 40.61      | 10.90  | Peak    |
| 17475.000  | 57.13  | 68.20      | -11.07     | 39.07      | 18.06  | Peak    | 17475.000 | 58.02  | 68.20      | -10.18     | 39.96      | 18.06  | Peak    |

**802.11ac VHT20 mode:**

| Low CH     |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5648.520   | 61.99  | 68.20      | -6.21      | 60.98      | 1.01   | Peak    | 5630.880  | 61.88  | 68.20      | -6.32      | 60.99      | 0.89   | Peak    |
| 5653.200   | 61.86  | 70.58      | -8.72      | 60.81      | 1.05   | Peak    | 5650.680  | 60.90  | 68.71      | -7.81      | 59.87      | 1.03   | Peak    |
| 5700.720   | 74.18  | 105.40     | -31.22     | 72.85      | 1.33   | Peak    | 5701.800  | 70.80  | 105.70     | -34.90     | 69.48      | 1.32   | Peak    |
| 5743.200   | 111.01 | 122.20     | -11.19     | 109.73     | 1.28   | Peak    | 5746.080  | 107.93 | 122.20     | -14.27     | 106.65     | 1.28   | Peak    |
| 5872.800   | 63.98  | 105.82     | -41.84     | 61.89      | 2.09   | Peak    | 5874.960  | 63.71  | 105.21     | -41.50     | 61.58      | 2.13   | Peak    |
| 5924.640   | 63.56  | 68.47      | -4.91      | 61.08      | 2.48   | Peak    | 5924.280  | 63.82  | 68.73      | -4.91      | 61.34      | 2.48   | Peak    |
| 5947.320   | 64.80  | 68.20      | -3.40      | 62.33      | 2.47   | Peak    | 5950.200  | 64.68  | 68.20      | -3.52      | 62.22      | 2.46   | Peak    |
| 2020.000   | 41.74  | 68.20      | -26.46     | 49.27      | -7.53  | Peak    | 2020.000  | 40.68  | 68.20      | -27.52     | 48.21      | -7.53  | Peak    |
| 11490.000  | 41.53  | 54.00      | -12.47     | 30.83      | 10.70  | Average | 11490.000 | 41.18  | 54.00      | -12.82     | 30.48      | 10.70  | Average |
| 11490.000  | 51.59  | 74.00      | -22.41     | 40.89      | 10.70  | Peak    | 11490.000 | 51.45  | 74.00      | -22.55     | 40.75      | 10.70  | Peak    |
| 17235.000  | 57.08  | 68.20      | -11.12     | 40.11      | 16.97  | Peak    | 17235.000 | 57.16  | 68.20      | -11.04     | 40.19      | 16.97  | Peak    |

| Middle CH  |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5636.280   | 61.65  | 68.20      | -6.55      | 60.71      | 0.94   | Peak    | 5649.960  | 61.78  | 68.20      | -6.42      | 60.76      | 1.02   | Peak    |
| 5654.280   | 61.16  | 71.38      | -10.22     | 60.10      | 1.06   | Peak    | 5652.120  | 61.22  | 69.78      | -8.56      | 60.19      | 1.03   | Peak    |
| 5701.440   | 64.26  | 105.60     | -41.34     | 62.94      | 1.32   | Peak    | 5703.960  | 62.60  | 106.31     | -43.71     | 61.28      | 1.32   | Peak    |
| 5787.480   | 110.25 | 122.20     | -11.95     | 108.93     | 1.32   | Peak    | 5787.480  | 107.00 | 122.20     | -15.20     | 105.68     | 1.32   | Peak    |
| 5874.600   | 63.47  | 105.31     | -41.84     | 61.34      | 2.13   | Peak    | 5874.960  | 62.82  | 105.21     | -42.39     | 60.69      | 2.13   | Peak    |
| 5924.640   | 63.77  | 68.47      | -4.70      | 61.29      | 2.48   | Peak    | 5922.840  | 63.68  | 69.79      | -6.11      | 61.20      | 2.48   | Peak    |
| 5927.880   | 65.25  | 68.20      | -2.95      | 62.76      | 2.49   | Peak    | 5949.120  | 64.72  | 68.20      | -3.48      | 62.26      | 2.46   | Peak    |
| 2020.000   | 42.33  | 68.20      | -25.87     | 49.86      | -7.53  | Peak    | 2020.000  | 40.20  | 68.20      | -28.00     | 47.73      | -7.53  | Peak    |
| 11570.000  | 41.22  | 54.00      | -12.78     | 30.46      | 10.76  | Average | 11570.000 | 41.20  | 54.00      | -12.80     | 30.44      | 10.76  | Average |
| 11570.000  | 51.47  | 74.00      | -22.53     | 40.71      | 10.76  | Peak    | 11570.000 | 51.91  | 74.00      | -22.09     | 41.15      | 10.76  | Peak    |
| 17355.000  | 57.35  | 68.20      | -10.85     | 39.64      | 17.71  | Peak    | 17355.000 | 57.31  | 68.20      | -10.89     | 39.60      | 17.71  | Peak    |

| High CH    |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 5647.800   | 62.04  | 68.20      | -6.16      | 61.03      | 1.01   | Peak    | 5643.480  | 61.74  | 68.20      | -6.46      | 60.76      | 0.98   | Peak    |
| 5650.680   | 61.58  | 68.71      | -7.13      | 60.55      | 1.03   | Peak    | 5650.680  | 60.98  | 68.71      | -7.73      | 59.95      | 1.03   | Peak    |
| 5702.520   | 62.89  | 105.91     | -43.02     | 61.57      | 1.32   | Peak    | 5701.800  | 61.59  | 105.70     | -44.11     | 60.27      | 1.32   | Peak    |
| 5826.000   | 110.28 | 122.20     | -11.92     | 108.74     | 1.54   | Peak    | 5823.840  | 106.43 | 122.20     | -15.77     | 104.91     | 1.52   | Peak    |
| 5873.880   | 68.69  | 105.51     | -36.82     | 66.57      | 2.12   | Peak    | 5873.520  | 64.33  | 105.61     | -41.28     | 62.22      | 2.11   | Peak    |
| 5923.200   | 64.30  | 69.53      | -5.23      | 61.82      | 2.48   | Peak    | 5924.640  | 63.35  | 68.47      | -5.12      | 60.87      | 2.48   | Peak    |
| 5950.200   | 64.83  | 68.20      | -3.37      | 62.37      | 2.46   | Peak    | 5942.640  | 64.35  | 68.20      | -3.85      | 61.88      | 2.47   | Peak    |
| 2020.000   | 41.71  | 68.20      | -26.49     | 49.24      | -7.53  | Peak    | 2020.000  | 39.77  | 68.20      | -28.43     | 47.30      | -7.53  | Peak    |
| 11650.000  | 42.18  | 54.00      | -11.82     | 31.28      | 10.90  | Average | 11650.000 | 42.59  | 54.00      | -11.41     | 31.69      | 10.90  | Average |
| 11650.000  | 51.56  | 74.00      | -22.44     | 40.66      | 10.90  | Peak    | 11650.000 | 51.70  | 74.00      | -22.30     | 40.80      | 10.90  | Peak    |
| 17475.000  | 57.73  | 68.20      | -10.47     | 39.67      | 18.06  | Peak    | 17475.000 | 57.65  | 68.20      | -10.55     | 39.59      | 18.06  | Peak    |

**802.11ac VHT40 mode:**

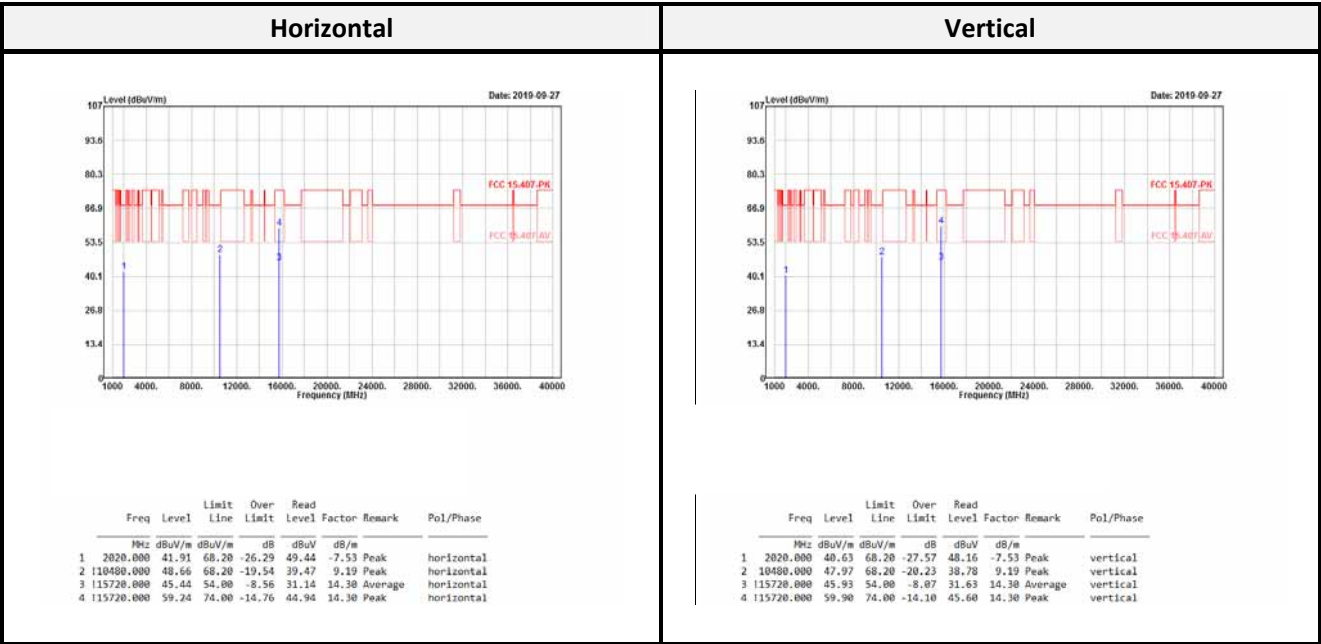
| Low CH     |        |               |               |               |        |         |           |        |               |               |               |               |
|------------|--------|---------------|---------------|---------------|--------|---------|-----------|--------|---------------|---------------|---------------|---------------|
| Horizontal |        |               |               |               |        |         | Vertical  |        |               |               |               |               |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq      | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor Remark |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz       | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m          |
| 5647.440   | 64.70  | 68.20         | -3.50         | 63.69         | 1.01   | Peak    | 5647.440  | 63.28  | 68.20         | -4.92         | 62.27         | 1.01 Peak     |
| 5650.320   | 65.10  | 68.44         | -3.34         | 64.07         | 1.03   | Peak    | 5653.200  | 63.54  | 70.58         | -7.04         | 62.49         | 1.05 Peak     |
| 5705.400   | 83.24  | 106.71        | -23.47        | 81.91         | 1.33   | Peak    | 5706.840  | 82.26  | 107.12        | -24.86        | 80.94         | 1.32 Peak     |
| 5753.640   | 107.60 | 122.20        | -14.60        | 106.31        | 1.29   | Peak    | 5753.640  | 105.03 | 122.20        | -17.17        | 103.74        | 1.29 Peak     |
| 5878.920   | 63.72  | 102.29        | -38.57        | 61.54         | 2.18   | Peak    | 5874.600  | 65.09  | 105.31        | -40.22        | 62.96         | 2.13 Peak     |
| 5923.560   | 63.82  | 69.26         | -5.44         | 61.34         | 2.48   | Peak    | 5923.560  | 63.88  | 69.26         | -5.38         | 61.40         | 2.48 Peak     |
| 5929.320   | 65.15  | 68.20         | -3.05         | 62.66         | 2.49   | Peak    | 5938.320  | 64.28  | 68.20         | -3.92         | 61.80         | 2.48 Peak     |
| 2020.000   | 41.71  | 68.20         | -26.49        | 49.24         | -7.53  | Peak    | 2020.000  | 40.97  | 68.20         | -27.23        | 48.50         | -7.53 Peak    |
| 11510.000  | 41.87  | 54.00         | -12.13        | 31.14         | 10.73  | Average | 11510.000 | 41.58  | 54.00         | -12.42        | 30.85         | 10.73 Average |
| 11510.000  | 51.37  | 74.00         | -22.63        | 40.64         | 10.73  | Peak    | 11510.000 | 51.17  | 74.00         | -22.83        | 40.44         | 10.73 Peak    |
| 17265.000  | 57.86  | 68.20         | -10.34        | 40.77         | 17.09  | Peak    | 17265.000 | 57.51  | 68.20         | -10.69        | 40.42         | 17.09 Peak    |

| High CH    |        |               |               |               |        |         |           |        |               |               |               |               |
|------------|--------|---------------|---------------|---------------|--------|---------|-----------|--------|---------------|---------------|---------------|---------------|
| Horizontal |        |               |               |               |        |         | Vertical  |        |               |               |               |               |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq      | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor Remark |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz       | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m          |
| 5645.640   | 63.17  | 68.20         | -5.03         | 62.18         | 0.99   | Peak    | 5647.440  | 61.81  | 68.20         | -6.39         | 60.80         | 1.01 Peak     |
| 5652.120   | 62.38  | 69.78         | -7.40         | 61.35         | 1.03   | Peak    | 5651.400  | 61.77  | 69.24         | -7.47         | 60.74         | 1.03 Peak     |
| 5700.000   | 70.50  | 105.20        | -34.70        | 69.17         | 1.33   | Peak    | 5700.720  | 67.69  | 105.40        | -37.71        | 66.36         | 1.33 Peak     |
| 5793.960   | 107.49 | 122.20        | -14.71        | 106.18        | 1.31   | Peak    | 5796.840  | 104.41 | 122.20        | -17.79        | 103.09        | 1.32 Peak     |
| 5872.440   | 68.45  | 105.92        | -37.47        | 66.36         | 2.09   | Peak    | 5872.440  | 65.61  | 105.92        | -40.31        | 63.52         | 2.09 Peak     |
| 5922.480   | 65.16  | 70.06         | -4.90         | 62.68         | 2.48   | Peak    | 5921.040  | 64.12  | 71.12         | -7.00         | 61.65         | 2.47 Peak     |
| 5925.720   | 65.76  | 68.20         | -2.44         | 63.28         | 2.48   | Peak    | 5925.000  | 65.16  | 68.20         | -3.04         | 62.68         | 2.48 Peak     |
| 2020.000   | 41.52  | 68.20         | -26.68        | 49.05         | -7.53  | Peak    | 2020.000  | 40.65  | 68.20         | -27.55        | 48.18         | -7.53 Peak    |
| 11590.000  | 41.76  | 54.00         | -12.24        | 30.99         | 10.77  | Average | 11590.000 | 41.83  | 54.00         | -12.17        | 31.06         | 10.77 Average |
| 11590.000  | 51.70  | 74.00         | -22.30        | 40.93         | 10.77  | Peak    | 11590.000 | 51.83  | 74.00         | -22.17        | 41.06         | 10.77 Peak    |
| 17385.000  | 58.21  | 68.20         | -9.99         | 40.42         | 17.79  | Peak    | 17385.000 | 58.58  | 68.20         | -9.62         | 40.79         | 17.79 Peak    |

**802.11ac VHT80 mode:**

| Horizontal |        |               |               |               |        |         | Vertical  |        |               |               |               |               |
|------------|--------|---------------|---------------|---------------|--------|---------|-----------|--------|---------------|---------------|---------------|---------------|
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq      | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor Remark |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz       | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m          |
| 5648.880   | 64.06  | 68.20         | -4.14         | 63.04         | 1.02   | Peak    | 5646.000  | 63.49  | 68.20         | -4.71         | 62.50         | 0.99 Peak     |
| 5648.880   | 64.06  | 68.20         | -4.14         | 63.04         | 1.02   | Peak    | 5651.400  | 62.24  | 69.24         | -7.00         | 61.21         | 1.03 Peak     |
| 5651.760   | 63.27  | 69.51         | -6.24         | 62.24         | 1.03   | Peak    | 5703.600  | 74.05  | 106.21        | -32.16        | 72.72         | 1.33 Peak     |
| 5651.760   | 63.27  | 69.51         | -6.24         | 62.24         | 1.03   | Peak    | 5777.400  | 99.81  | 122.20        | -22.39        | 98.48         | 1.33 Peak     |
| 5704.680   | 77.75  | 106.51        | -28.76        | 76.43         | 1.32   | Peak    | 5875.680  | 65.46  | 104.69        | -39.23        | 63.33         | 2.13 Peak     |
| 5777.400   | 102.47 | 122.20        | -19.73        | 101.14        | 1.33   | Peak    | 5921.400  | 64.15  | 70.85         | -6.70         | 61.69         | 2.46 Peak     |
| 5864.160   | 72.05  | 108.23        | -36.18        | 70.05         | 2.00   | Peak    | 5947.680  | 64.81  | 68.20         | -3.39         | 62.35         | 2.46 Peak     |
| 5922.840   | 64.38  | 69.79         | -5.41         | 61.90         | 2.48   | Peak    | 2020.000  | 41.34  | 68.20         | -26.86        | 48.87         | -7.53 Peak    |
| 5928.240   | 64.74  | 68.20         | -3.46         | 62.25         | 2.49   | Peak    | 11550.000 | 41.52  | 54.00         | -12.48        | 30.77         | 10.75 Average |
| 2020.000   | 41.34  | 68.20         | -26.86        | 48.87         | -7.53  | Peak    | 11550.000 | 50.79  | 74.00         | -23.21        | 40.04         | 10.75 Peak    |
| 11550.000  | 42.17  | 54.00         | -11.83        | 31.42         | 10.75  | Average | 17325.000 | 57.63  | 68.20         | -10.57        | 40.04         | 17.59 Peak    |
| 11550.000  | 51.73  | 74.00         | -22.27        | 40.98         | 10.75  | Peak    |           |        |               |               |               |               |
| 17325.000  | 57.93  | 68.20         | -10.27        | 40.34         | 17.59  | Peak    |           |        |               |               |               |               |

Above 1G (1 GHz-40 GHz): test the worst mode:

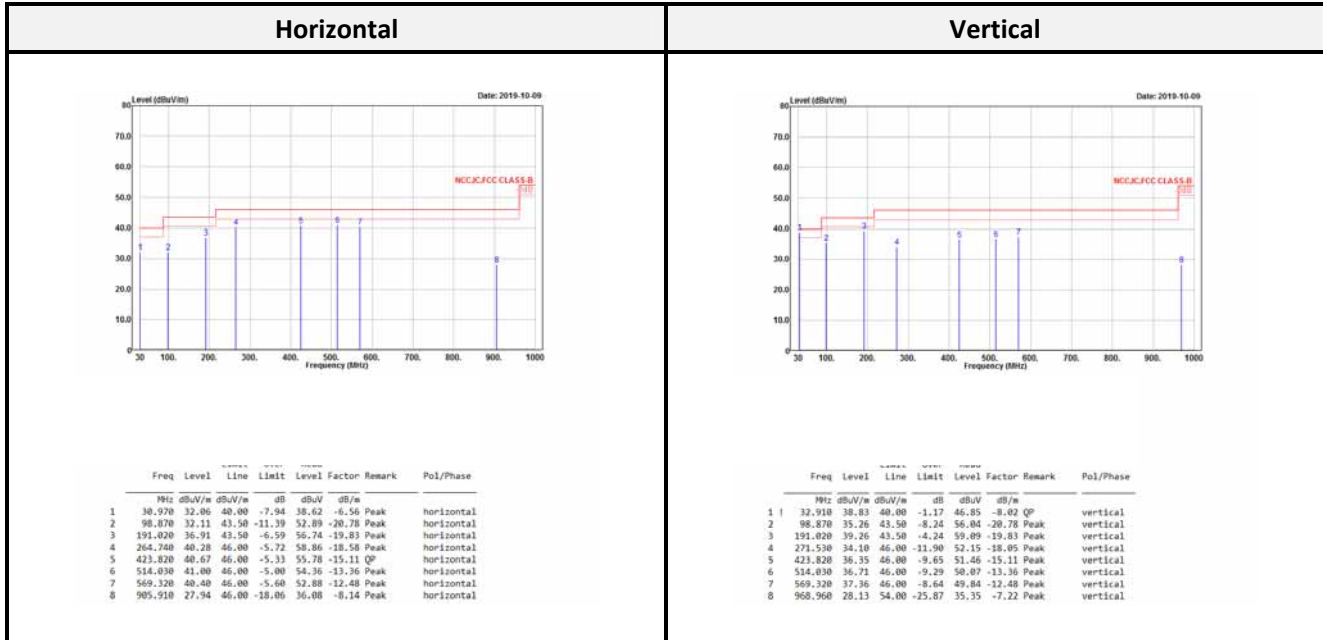
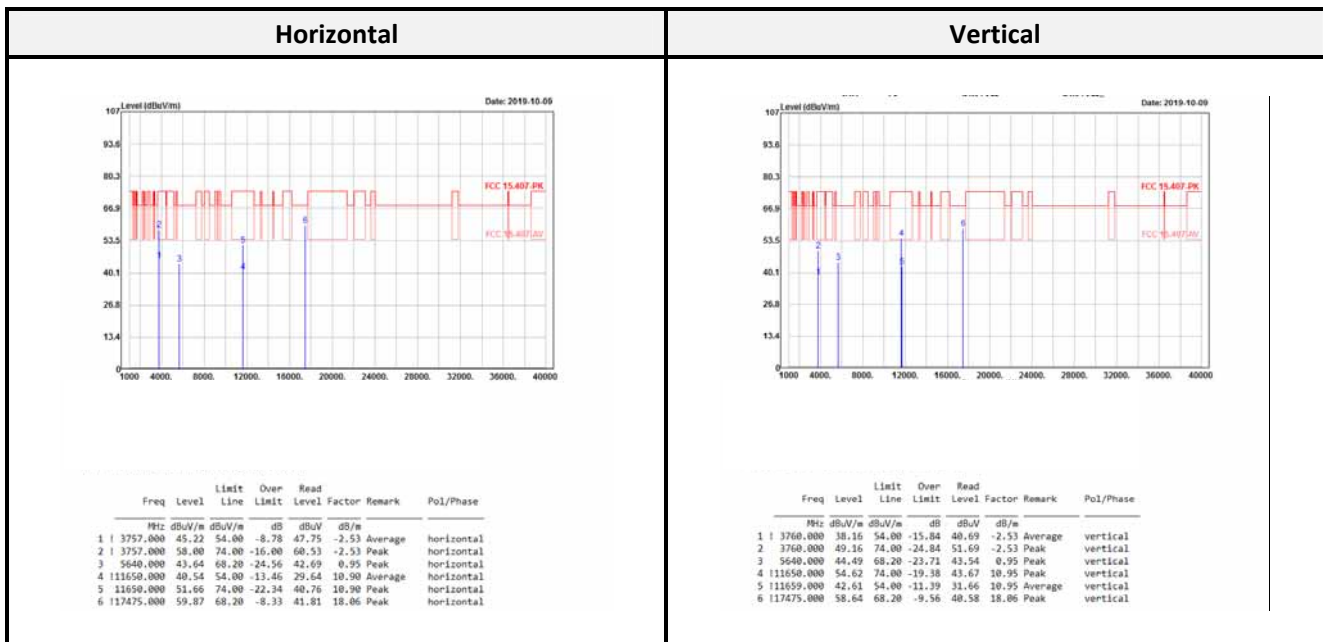


Level = Read Level + Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

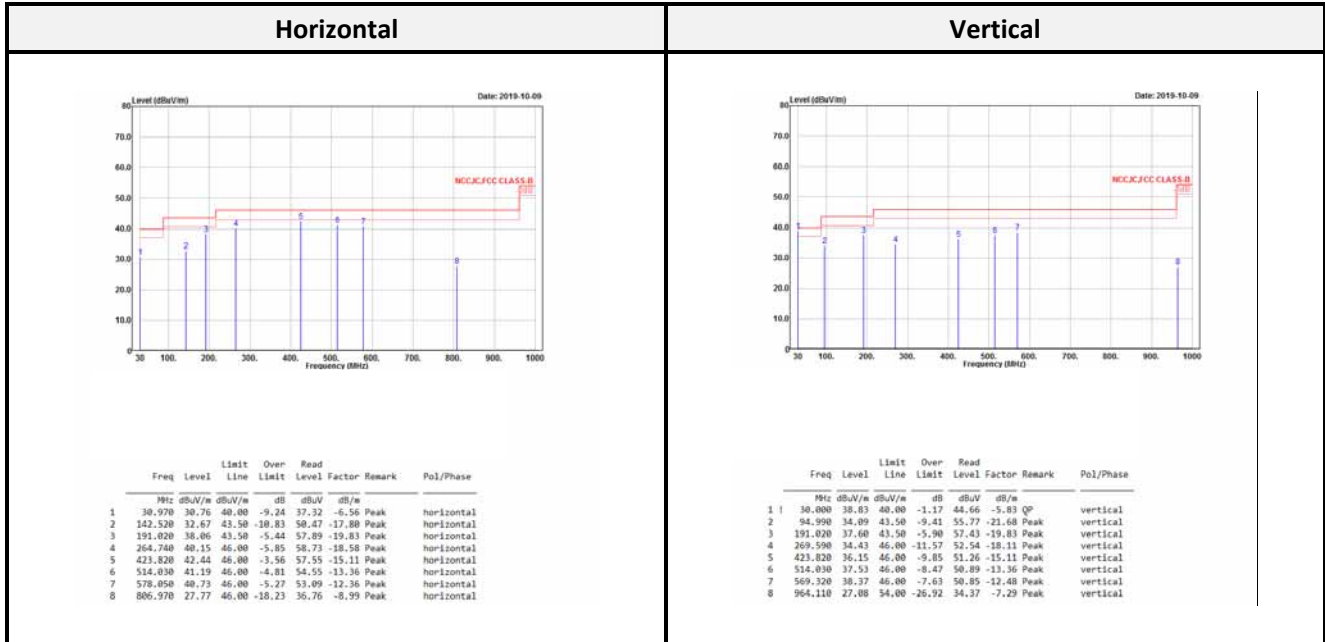
Spurious emissions more than 20 dB below the limit were not reported

**Co-location mode (Wi-Fi +WWan (FCC ID: R17LE910NAV2)):****VT-IoT-Dongle:****Below 1G****Above 1G**

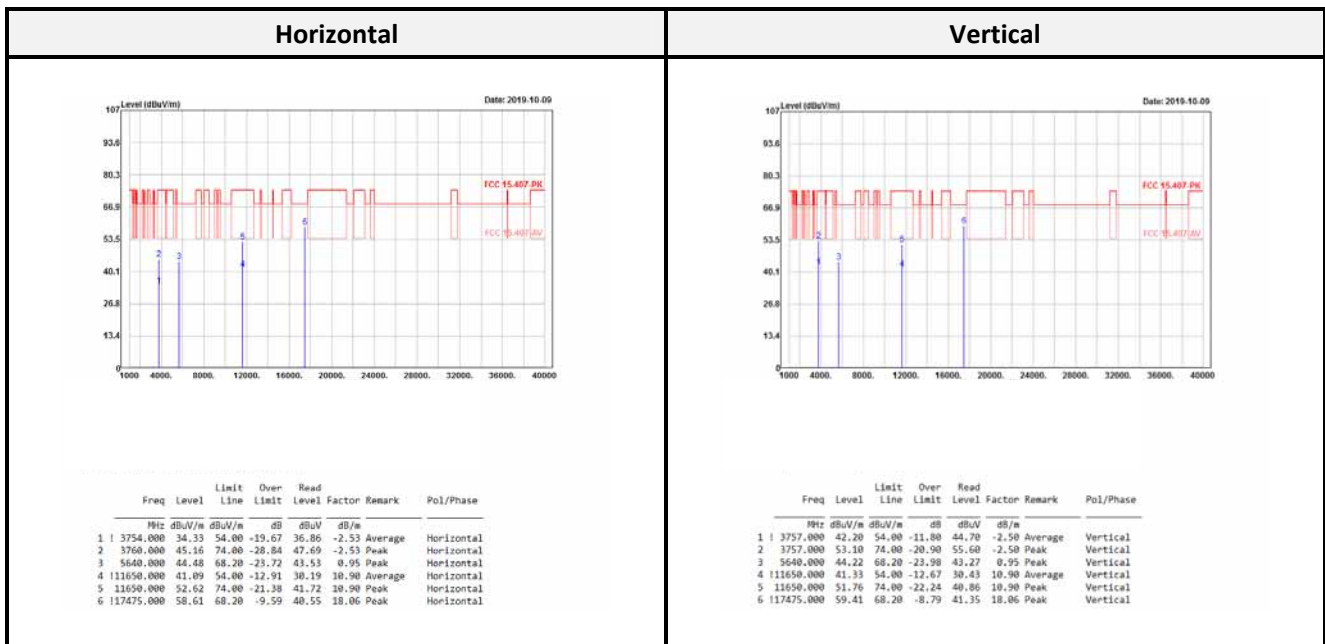
## Co-location mdoe (Wi-Fi +WWan (FCC ID 2AJYU-SIM7000A))

## VT-IoT-Dongle-CATM:

## Below 1G



## Above 1G



## 8 FCC §15.407(a)(e) –Emission Bandwidth and Occupied Bandwidth

### 8.1 Applicable Standard

According to FCC §15.407(a),

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

As per FCC §15.407(e): for equipment operating in the band 5725 – 5850 MHz, the minimum 6 dB bandwidth of U-NII devices shall be 500 kHz.

### 8.2 Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01,

#### Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth; b) Set the VBW > RBW; c) Detector = Peak;
- d) Trace mode = max hold; e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%;

#### 99% Occupied Bandwidth

The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is *required* only as a condition for using the optional band-edge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW  $\geq 3 \cdot$  RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

### 8.3 Test Equipment List and Details

| Description           | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|---------|------------------|------------|------------|
| <b>Conducted Room</b> |                 |         |                  |            |            |
| Spectrum Analyzer     | Rohde & Schwarz | FSV40-N | 100406           | 2019/09/11 | 2019/09/10 |
| Cable                 | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/28 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 8.4 Test Environmental Conditions

|               |            |                    |        |
|---------------|------------|--------------------|--------|
| Temperature:  | 22.9°C     | Relative Humidity: | 57 %   |
| ATM Pressure: | 1015hPa    | Test Engineer:     | Ian Tu |
| Test Date:    | 2019-10-01 | -                  | -      |

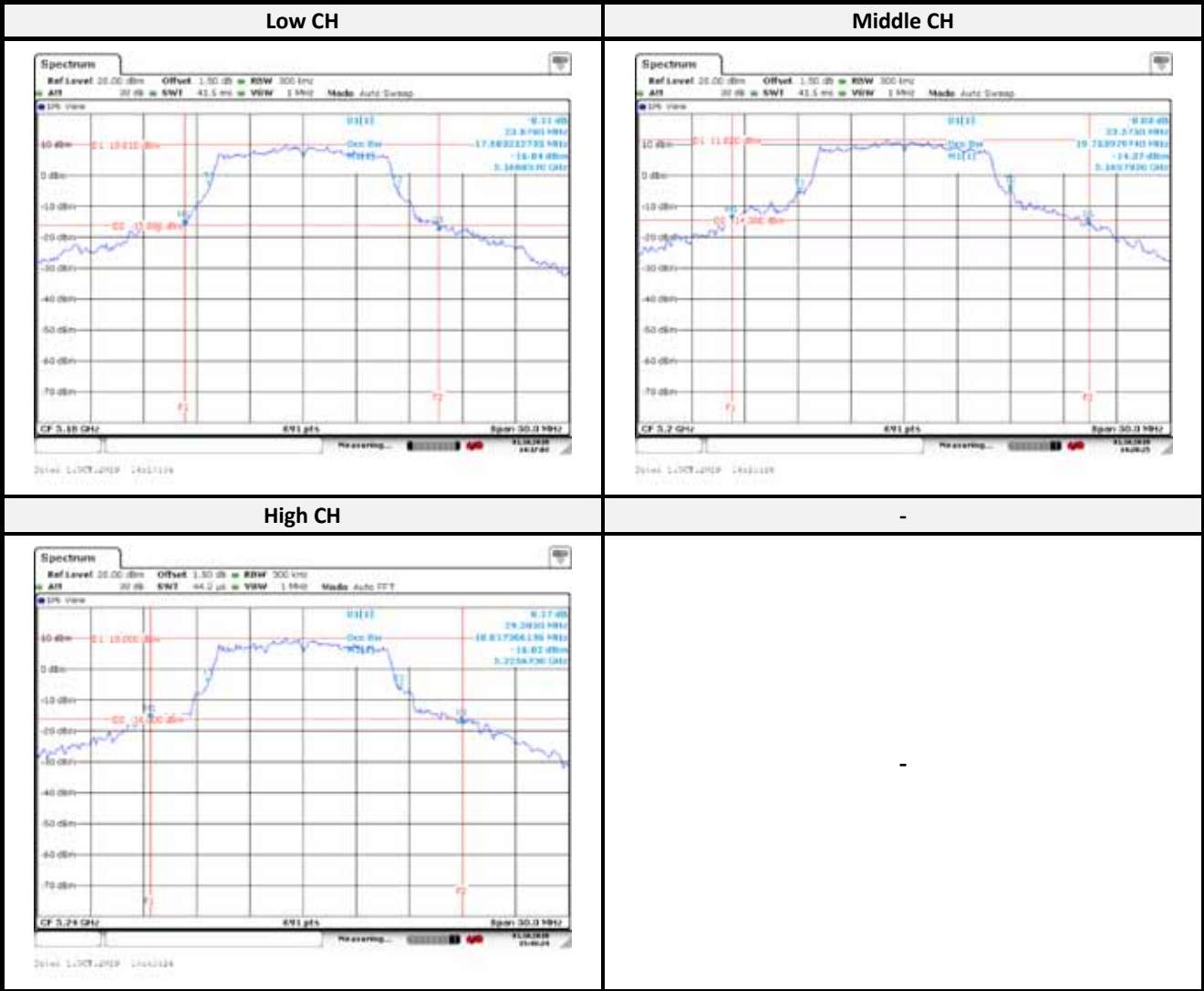
**8.5 Test Data and Test Plot**

| UNII Band | Mode        | Channel | Frequency (MHz) | 26dB Emission Bandwidth (MHz) |
|-----------|-------------|---------|-----------------|-------------------------------|
| UNII-1    | 802.11a     | 36      | 5180            | 23.8780                       |
|           |             | 40      | 5200            | 33.5750                       |
|           |             | 48      | 5240            | 29.3050                       |
| UNII-1    | 802.11ac20  | 36      | 5180            | 28.5820                       |
|           |             | 40      | 5200            | 37.3370                       |
|           |             | 48      | 5240            | 31.9100                       |
| UNII-1    | 802.11ac 40 | 38      | 5190            | 58.0000                       |
|           |             | 46      | 5230            | 75.1100                       |
| UNII-1    | 802.11ac 80 | 42      | 5210            | 91.0000                       |

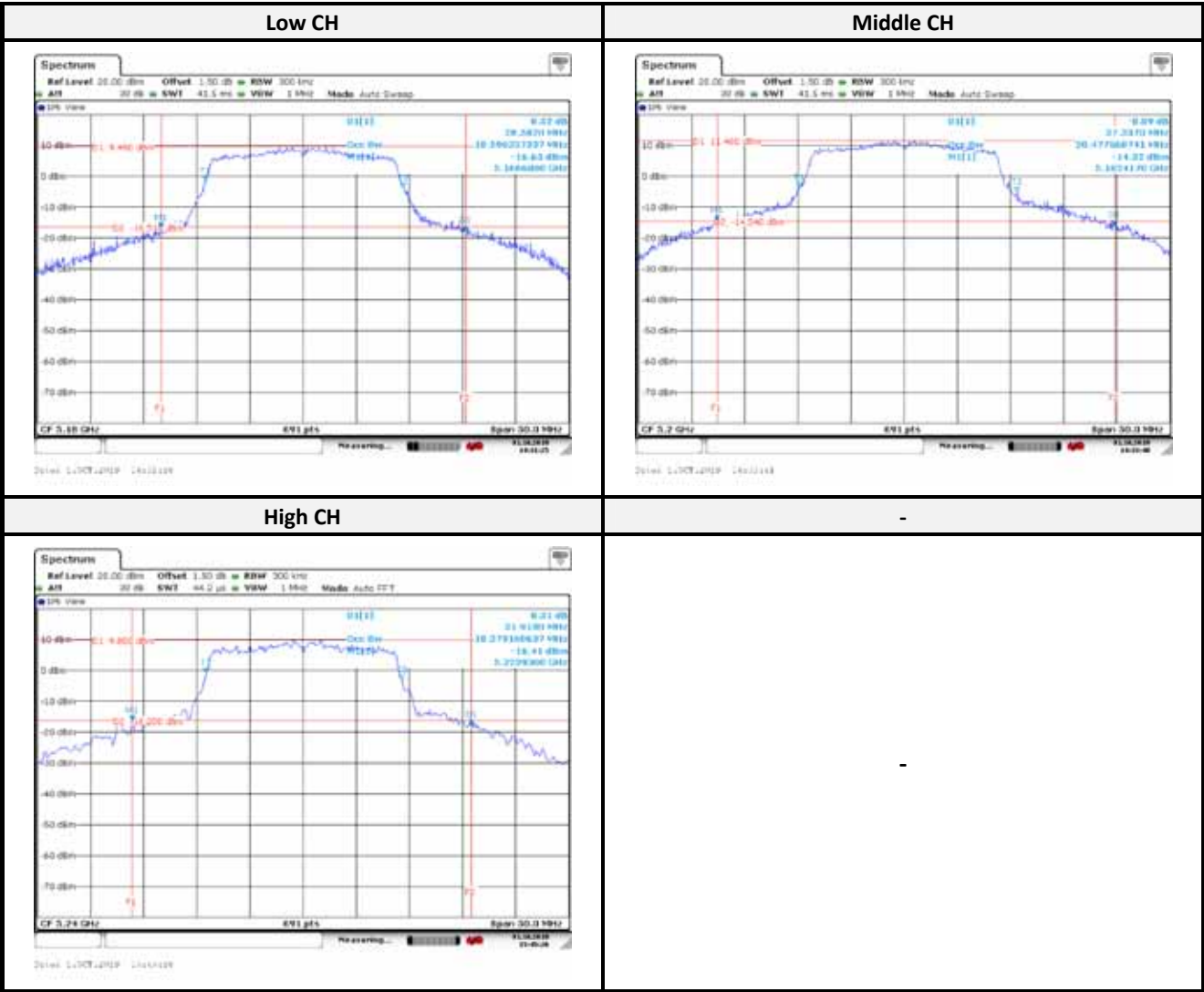
| UNII Band | Mode        | Channel | Frequency (MHz) | 6dB Emission Bandwidth (MHz) | Limit (MHz) |
|-----------|-------------|---------|-----------------|------------------------------|-------------|
| UNII-3    | 802.11a     | 149     | 5745            | 16.3240                      | >0.5        |
|           |             | 157     | 5785            | 16.3240                      | >0.5        |
|           |             | 165     | 5825            | 16.3240                      | >0.5        |
|           | 802.11ac20  | 149     | 5745            | 17.5980                      | >0.5        |
|           |             | 157     | 5785            | 17.5980                      | >0.5        |
|           |             | 165     | 5825            | 17.5400                      | >0.5        |
|           | 802.11ac 40 | 151     | 5755            | 36.2100                      | >0.5        |
|           |             | 159     | 5795            | 36.2400                      | >0.5        |
|           | 802.11ac 80 | 155     | 5775            | 75.5700                      | >0.5        |

| UNII Band | Mode        | Channel | Frequency (MHz) | 99% Emission Bandwidth (MHz) |
|-----------|-------------|---------|-----------------|------------------------------|
| UNII-1    | 802.11a     | 36      | 5180            | 17.5832                      |
|           |             | 40      | 5200            | 19.7540                      |
|           |             | 48      | 5240            | 18.0174                      |
| UNII-3    |             | 149     | 5745            | 31.4038                      |
|           |             | 157     | 5785            | 30.3907                      |
|           |             | 165     | 5825            | 31.0420                      |
| UNII-1    | 802.11ac20  | 36      | 5180            | 18.5962                      |
|           |             | 40      | 5200            | 20.4476                      |
|           |             | 48      | 5240            | 18.3792                      |
| UNII-3    |             | 149     | 5745            | 33.6469                      |
|           |             | 157     | 5785            | 33.2851                      |
|           |             | 165     | 5825            | 34.2258                      |
| UNII-1    | 802.11ac 40 | 38      | 5190            | 37.2793                      |
|           |             | 46      | 5230            | 40.6657                      |
| UNII-3    |             | 151     | 5755            | 42.1129                      |
|           |             | 159     | 5795            | 65.7019                      |
| UNII-1    | 802.11ac 80 | 42      | 5210            | 76.4110                      |
| UNII-3    |             | 155     | 5775            | 78.1476                      |

For UNII-1  
802.11a mode



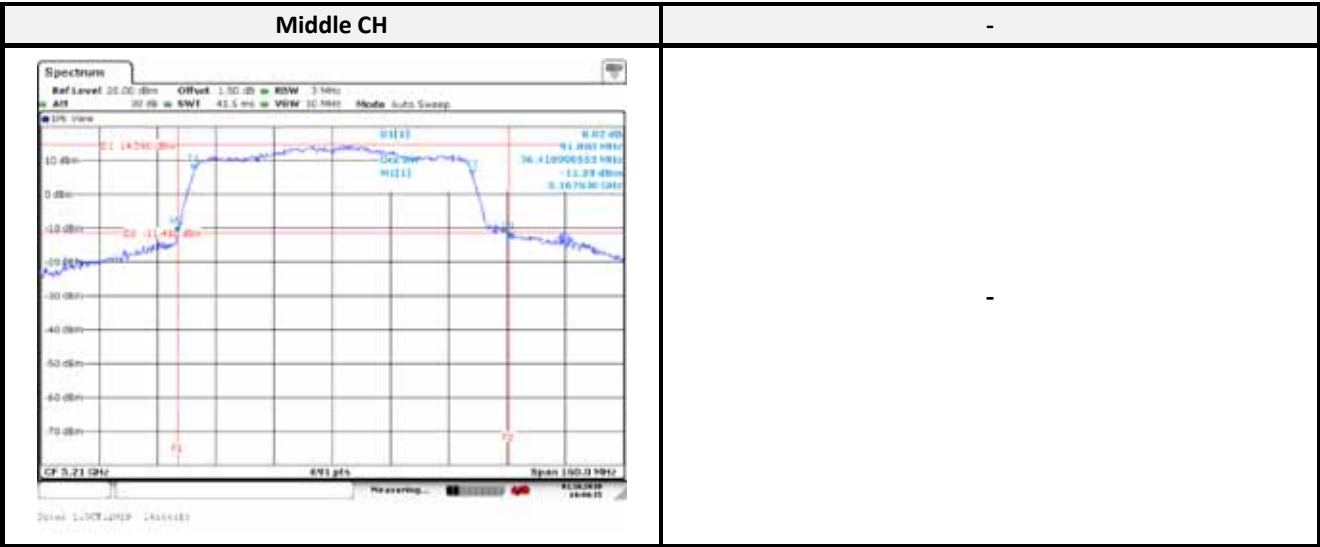
802.11ac VHT20 mode:



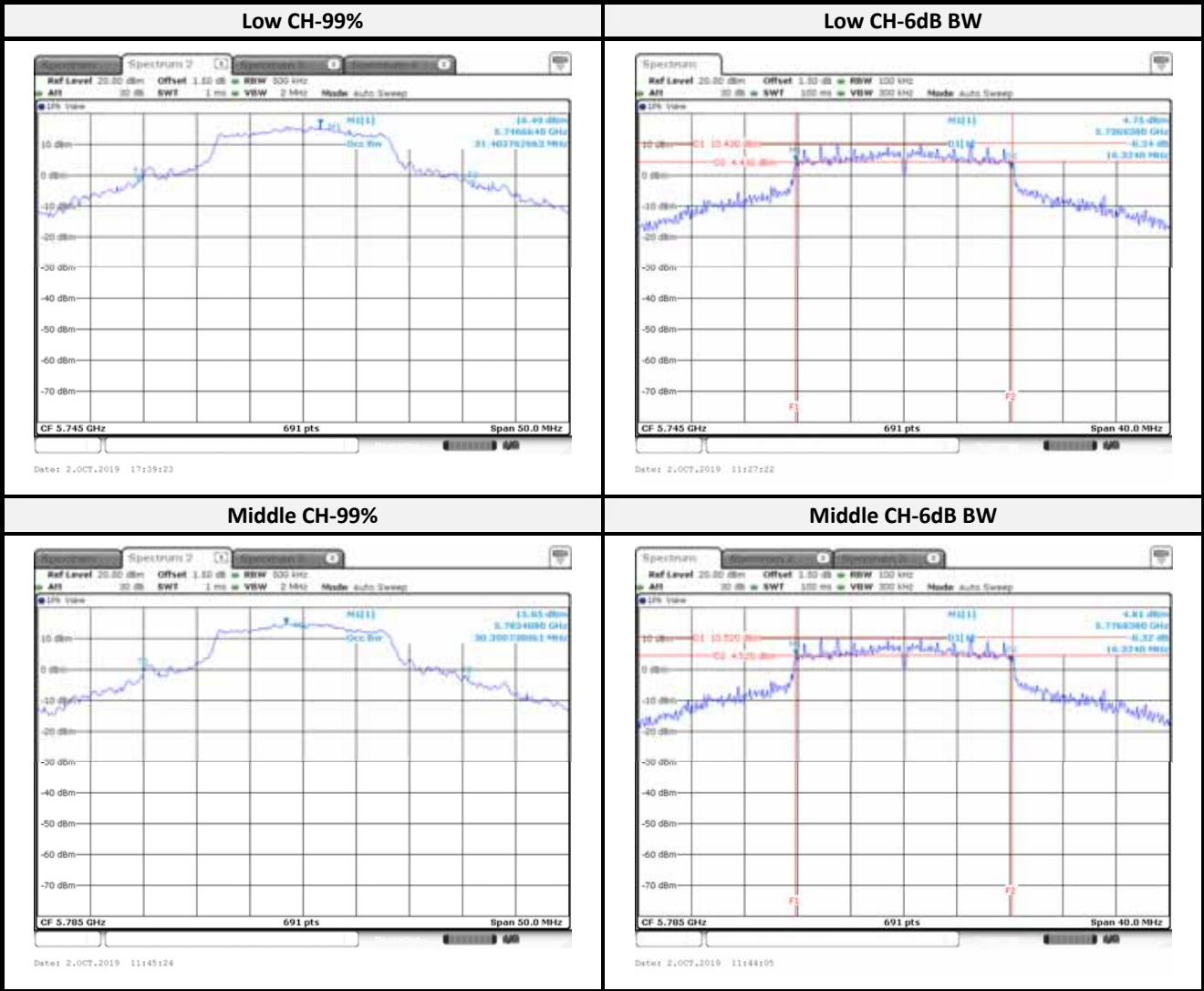
802.11ac VHT40 mode:



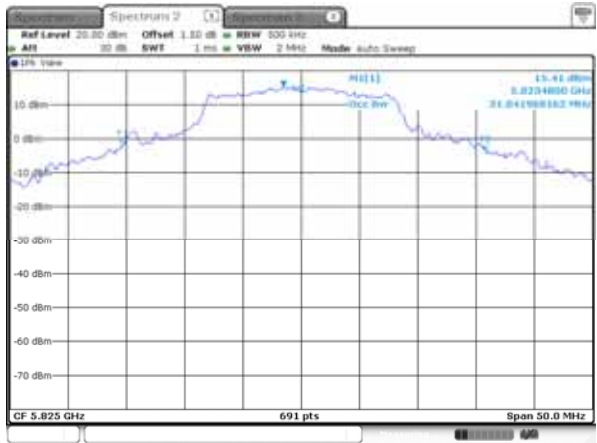
802.11ac VHT80 mode:



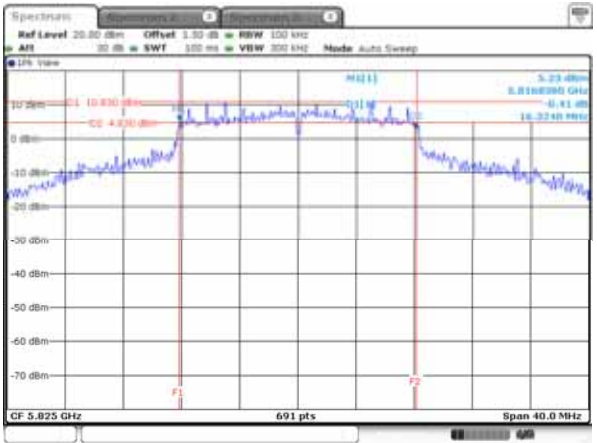
For UNII-3  
802.11a mode



High CH-99%

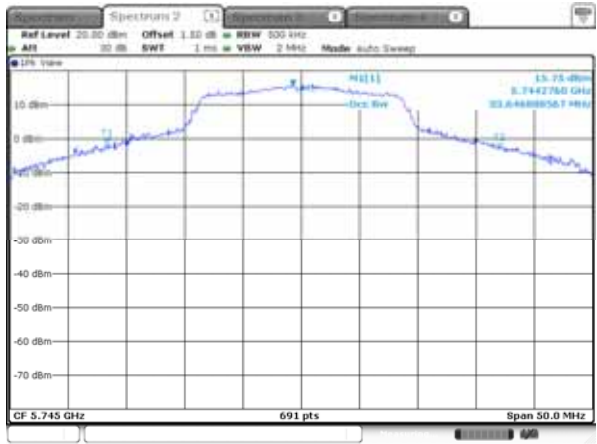


High CH-6dB BW

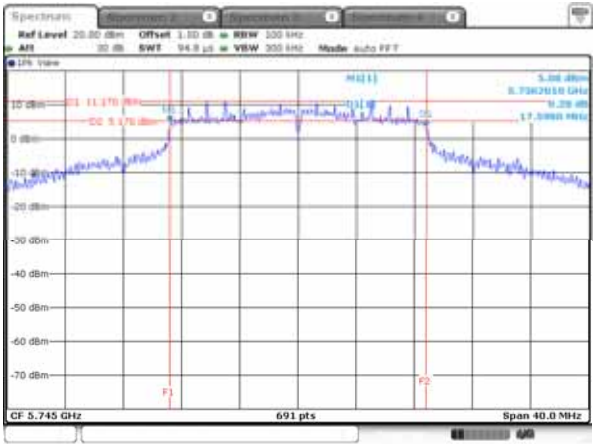


802.11ac VHT20 mode:

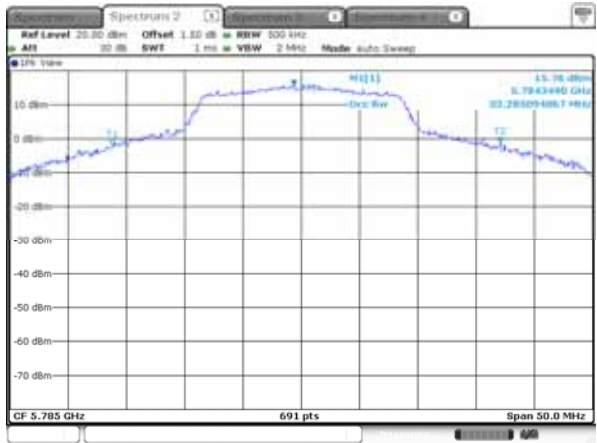
Low CH-99%



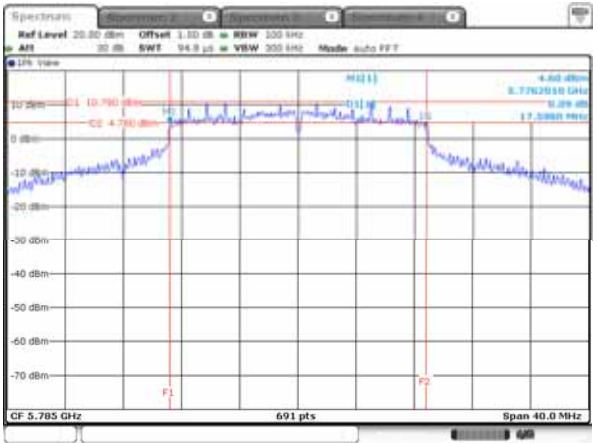
Low CH-6dB BW



Middle CH-99%



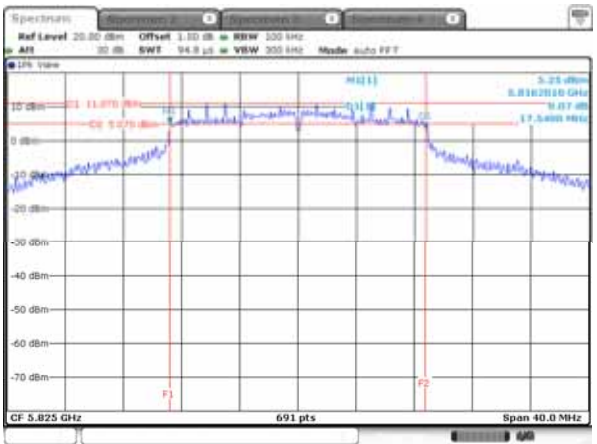
Middle CH-6dB BW



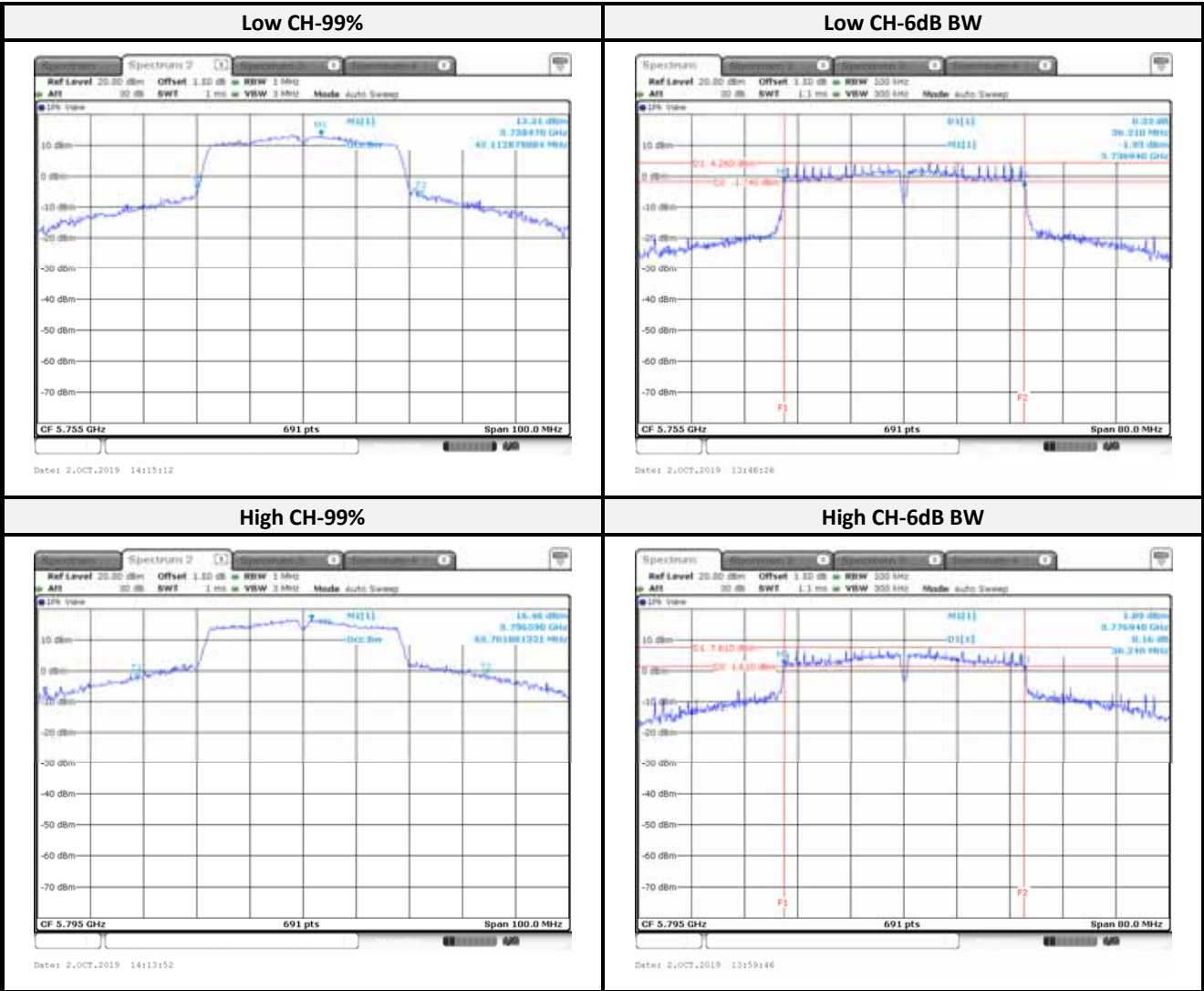
High CH-99%



High CH-6dB BW



802.11ac VHT40 mode:



The figure consists of two side-by-side spectrum analyzer plots. The left plot is titled "High CH-99%" and shows a spectrum with a sharp peak at 5.775 GHz. The right plot is titled "High CH-6dB BW" and shows a spectrum with a peak at 5.775 GHz and a 6 dB bandwidth measurement.

## **9 FCC §15.407(a)(1) – Maximum Output Power**

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### **9.1 Applicable Standard**

According to FCC §15.407(a),

For 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.

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.

### **9.2 Test Procedure**

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01,

The use Power Meter

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 a Power sensor.

### 9.3 Test Equipment List and Details

| Description       | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-------------------|-----------------|---------|------------------|------------|------------|
| Conducted Room    |                 |         |                  |            |            |
| Spectrum Analyzer | Rohde & Schwarz | FSV40-N | 100406           | 2019/09/11 | 2019/09/10 |
| Cable             | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/28 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 9.4 Test Environmental Conditions

|               |            |                    |        |
|---------------|------------|--------------------|--------|
| Temperature:  | 22.9°C     | Relative Humidity: | 57 %   |
| ATM Pressure: | 1015hPa    | Test Engineer:     | Ian Tu |
| Test Date:    | 2019-10-01 | -                  | -      |

**9.5 Test Data**

| Channel                       | Frequency (MHz) | Average Output Power (dBm) | Limit (dBm) |
|-------------------------------|-----------------|----------------------------|-------------|
| <b>IEEE 802.11a mode</b>      |                 |                            |             |
| 36                            | 5180            | 17.23                      | 24.00       |
| 40                            | 5200            | 19.01                      | 24.00       |
| 48                            | 5240            | 17.96                      | 24.00       |
| 149                           | 5745            | 20.08                      | 30.00       |
| 157                           | 5785            | 19.97                      | 30.00       |
| 165                           | 5825            | 20.15                      | 30.00       |
| <b>IEEE 802.11n HT20 mode</b> |                 |                            |             |
| 36                            | 5180            | 16.71                      | 24.00       |
| 40                            | 5200            | 18.87                      | 24.00       |
| 48                            | 5240            | 17.75                      | 24.00       |
| 149                           | 5745            | 19.75                      | 30.00       |
| 157                           | 5785            | 19.77                      | 30.00       |
| 165                           | 5825            | 19.88                      | 30.00       |
| <b>IEEE 802.11n HT40 mode</b> |                 |                            |             |
| 38                            | 5190            | 16.01                      | 24.00       |
| 46                            | 5230            | 18.24                      | 24.00       |
| 151                           | 5755            | 17.59                      | 30.00       |
| 159                           | 5795            | 19.81                      | 30.00       |

| Channel                  | Frequency<br>(MHz) | Average<br>Output Power<br>(dBm) | Limit<br>(dBm) |
|--------------------------|--------------------|----------------------------------|----------------|
| IEEE 802.11ac VHT20 mode |                    |                                  |                |
| 36                       | 5180               | 16.83                            | 24.00          |
| 40                       | 5200               | 18.95                            | 24.00          |
| 48                       | 5240               | 17.89                            | 24.00          |
| 149                      | 5745               | 19.86                            | 30.00          |
| 157                      | 5785               | 19.91                            | 30.00          |
| 165                      | 5825               | 19.96                            | 30.00          |
| IEEE 802.11ac VHT40 mode |                    |                                  |                |
| 38                       | 5190               | 16.08                            | 24.00          |
| 46                       | 5230               | 18.41                            | 24.00          |
| 151                      | 5755               | 17.80                            | 30.00          |
| 159                      | 5795               | 20.02                            | 30.00          |
| IEEE 802.11ac VHT80 mode |                    |                                  |                |
| 42                       | 5210               | 14.97                            | 24.00          |
| 155                      | 5775               | 14.44                            | 30.00          |

## 10 FCC §15.407(a) – Power Spectral Density

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### 10.1 Applicable Standard

According to FCC §15.407(a),

For 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.

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.

### 10.2 Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and ANSI 63.10: 2013 Sec 10.3.7.

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). 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 the RBW to 1 MHz.
- b) Set the VBW to be at least 1 MHz (a VBW of 3 MHz is desirable).
- c) Set the frequency span to examine the spectrum across a convenient frequency segment (e.g., 600 MHz).
- d) Select the power averaging (rms) detector.
- e) Set the sweep time so that there is no more than a 1 ms integration period over each measurement bin.
- f) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

### 10.3 Test Equipment List and Details

| Description           | Manufacture     | Model  | Serial No.    | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|--------|---------------|------------|------------|
| <b>Conducted Room</b> |                 |        |               |            |            |
| Spectrum Analyzer     | Rohde & Schwarz | FSV40  | 101140        | 2018/11/14 | 2019/11/13 |
| Cable                 | WOKEN           | SFL402 | S02-160323-07 | 2019/02/11 | 2020/02/10 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

### 10.4 Test Environmental Conditions

|                      |            |                           |        |
|----------------------|------------|---------------------------|--------|
| <b>Temperature:</b>  | 22.9°C     | <b>Relative Humidity:</b> | 57 %   |
| <b>ATM Pressure:</b> | 1015hPa    | <b>Test Engineer:</b>     | Ian Tu |
| <b>Test Date:</b>    | 2019-10-01 | -                         | -      |

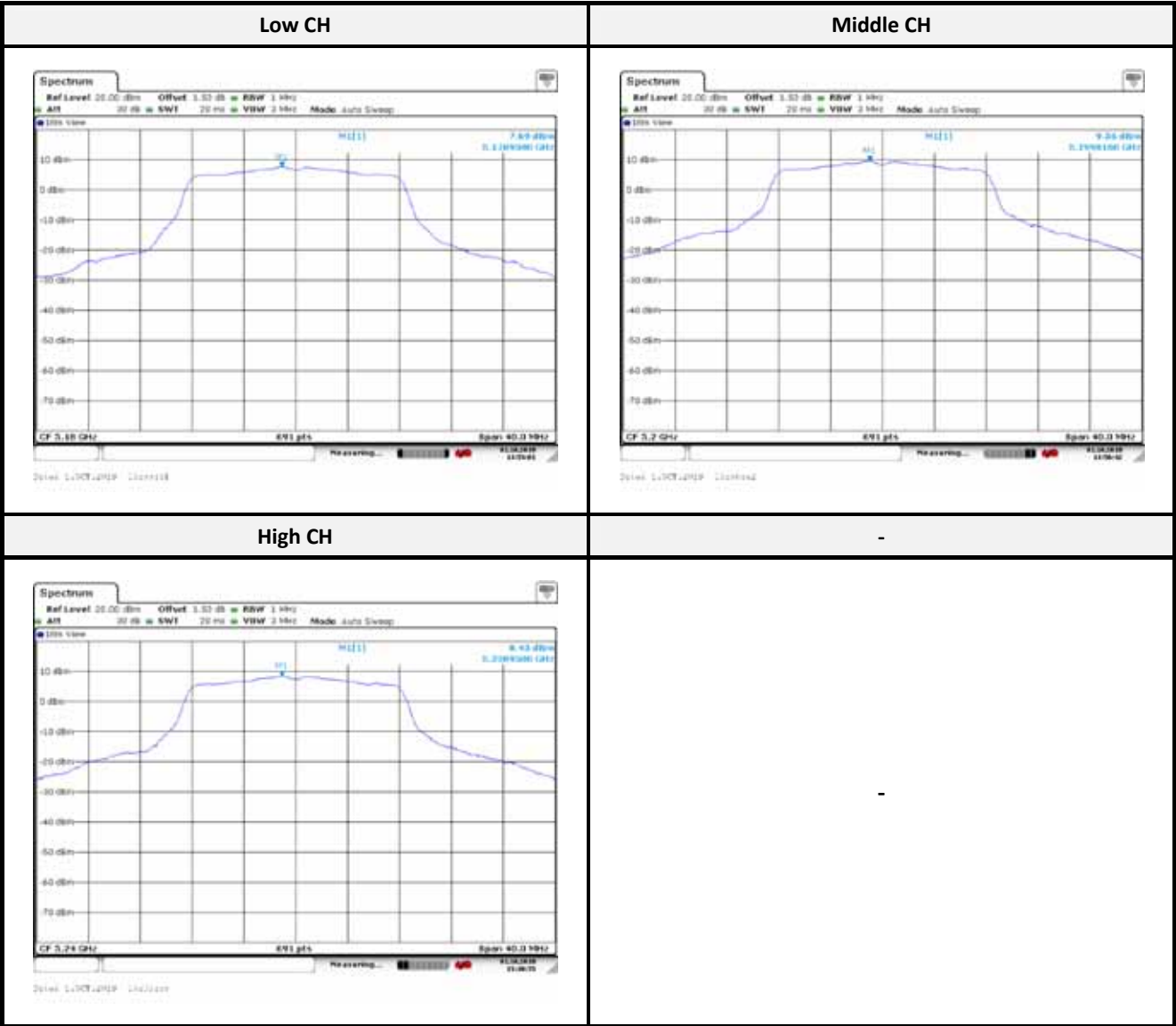
## 10.5 Test Data and Test Plot

| UNII Band | Mode           | Channel | Frequency (MHz) | Power Spectral Density (dBm/MHz) | Duty Factor (dB) | Total Power Spectral Density (dBm/MHz) | Limit (dBm/MHz) |
|-----------|----------------|---------|-----------------|----------------------------------|------------------|----------------------------------------|-----------------|
| UNII-1    | 802.11a        | 36      | 5180            | 7.69                             | 0.12             | 7.81                                   | 11.00           |
|           |                | 40      | 5200            | 9.56                             | 0.12             | 9.68                                   | 11.00           |
|           |                | 48      | 5240            | 8.43                             | 0.12             | 8.55                                   | 11.00           |
| UNII-1    | 802.11ac VHT20 | 36      | 5180            | 7.30                             | 0.10             | 7.40                                   | 11.00           |
|           |                | 40      | 5200            | 9.32                             | 0.10             | 9.42                                   | 11.00           |
|           |                | 48      | 5240            | 8.28                             | 0.10             | 8.38                                   | 11.00           |
| UNII-1    | 802.11ac VHT40 | 38      | 5190            | 3.46                             | 0.46             | 3.92                                   | 11.00           |
|           |                | 46      | 5230            | 5.67                             | 0.46             | 6.13                                   | 11.00           |
| UNII-1    | 802.11ac VHT80 | 42      | 5210            | -0.79                            | 0.87             | 0.08                                   | 11.00           |

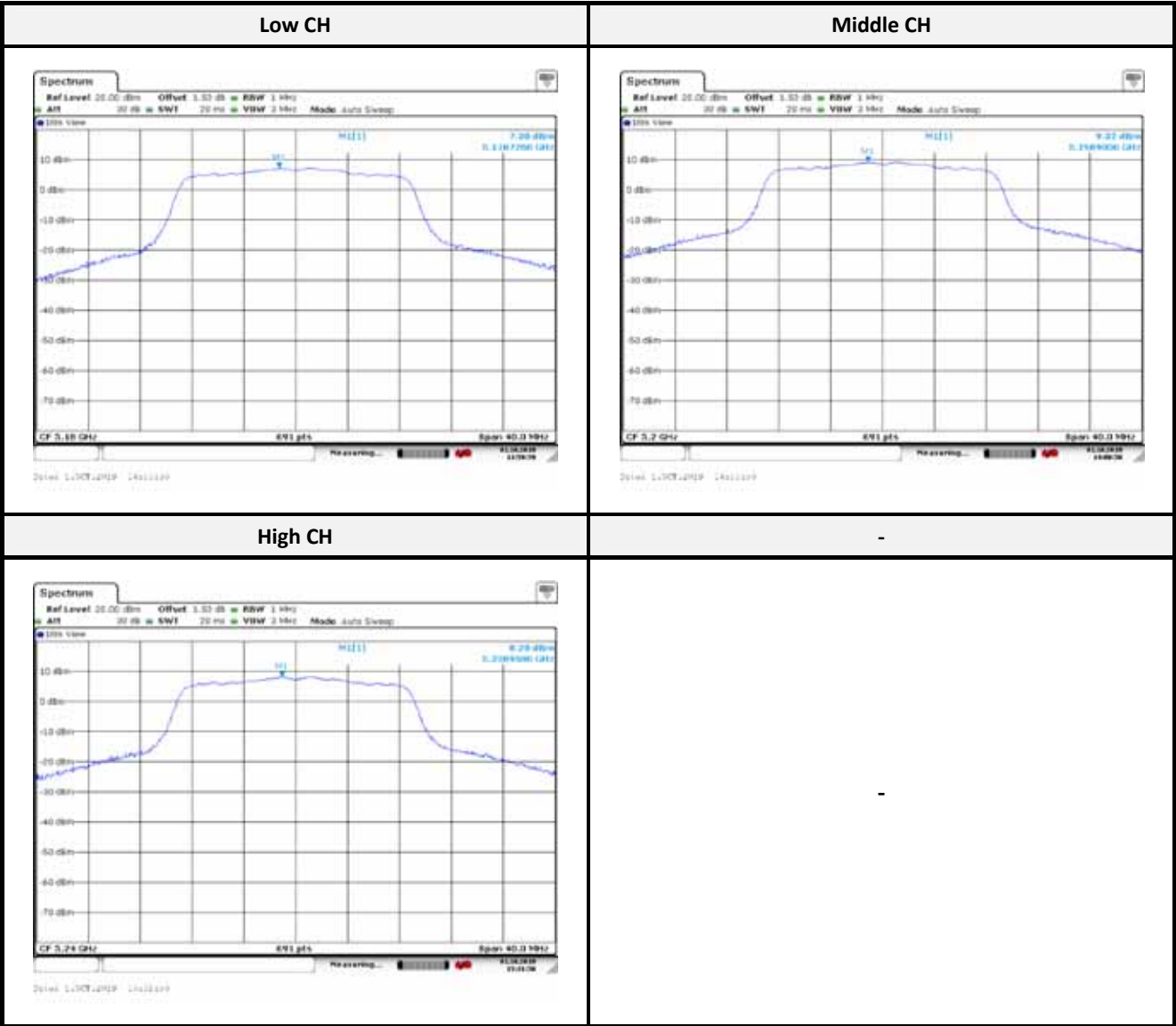
| UNII Band | Mode           | Channel | Frequency (MHz) | Power Spectral Density (dBm/500 kHz) | Limit (dBm/500 kHz) |
|-----------|----------------|---------|-----------------|--------------------------------------|---------------------|
| UNII-3    | 802.11a        | 149     | 5745            | 15.07                                | 30.00               |
|           |                | 157     | 5785            | 15.15                                | 30.00               |
|           |                | 165     | 5825            | 15.75                                | 30.00               |
| UNII-3    | 802.11ac VHT20 | 149     | 5745            | 15.65                                | 30.00               |
|           |                | 157     | 5785            | 15.91                                | 30.00               |
|           |                | 165     | 5825            | 16.21                                | 30.00               |
| UNII-3    | 802.11ac VHT40 | 151     | 5755            | 9.51                                 | 30.00               |
|           |                | 159     | 5795            | 12.80                                | 30.00               |
| UNII-3    | 802.11ac VHT80 | 155     | 5775            | 6.70                                 | 30.00               |

For UNII-1:

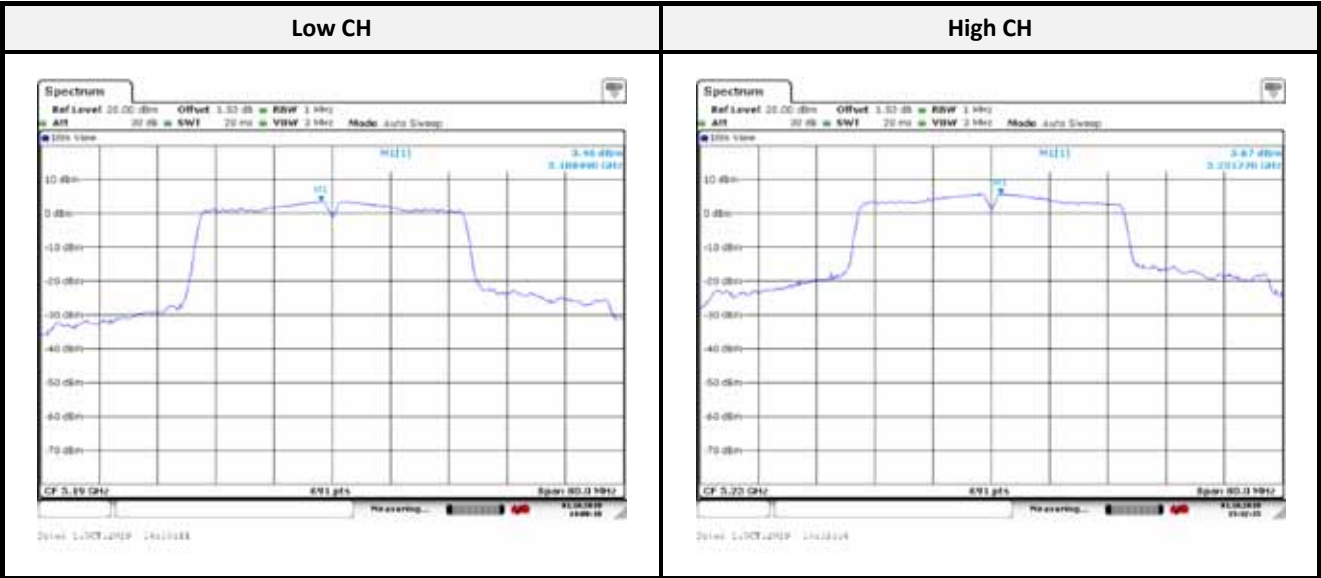
802.11a mode



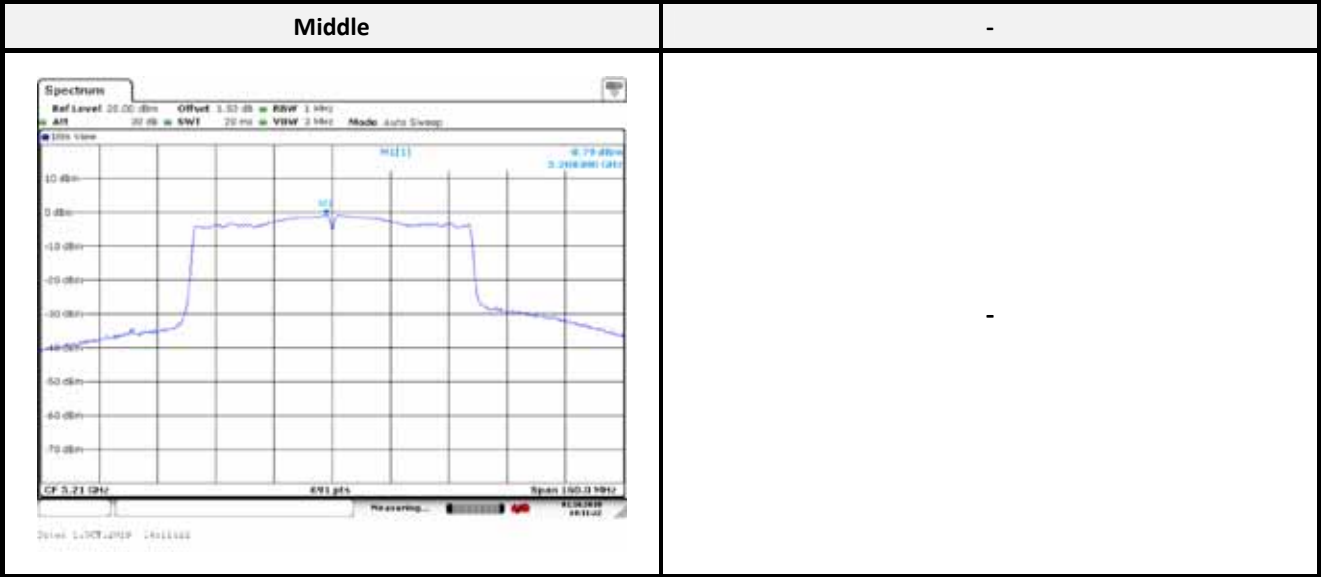
802.11ac VHT20 mode:



802.11ac VHT40 mode:

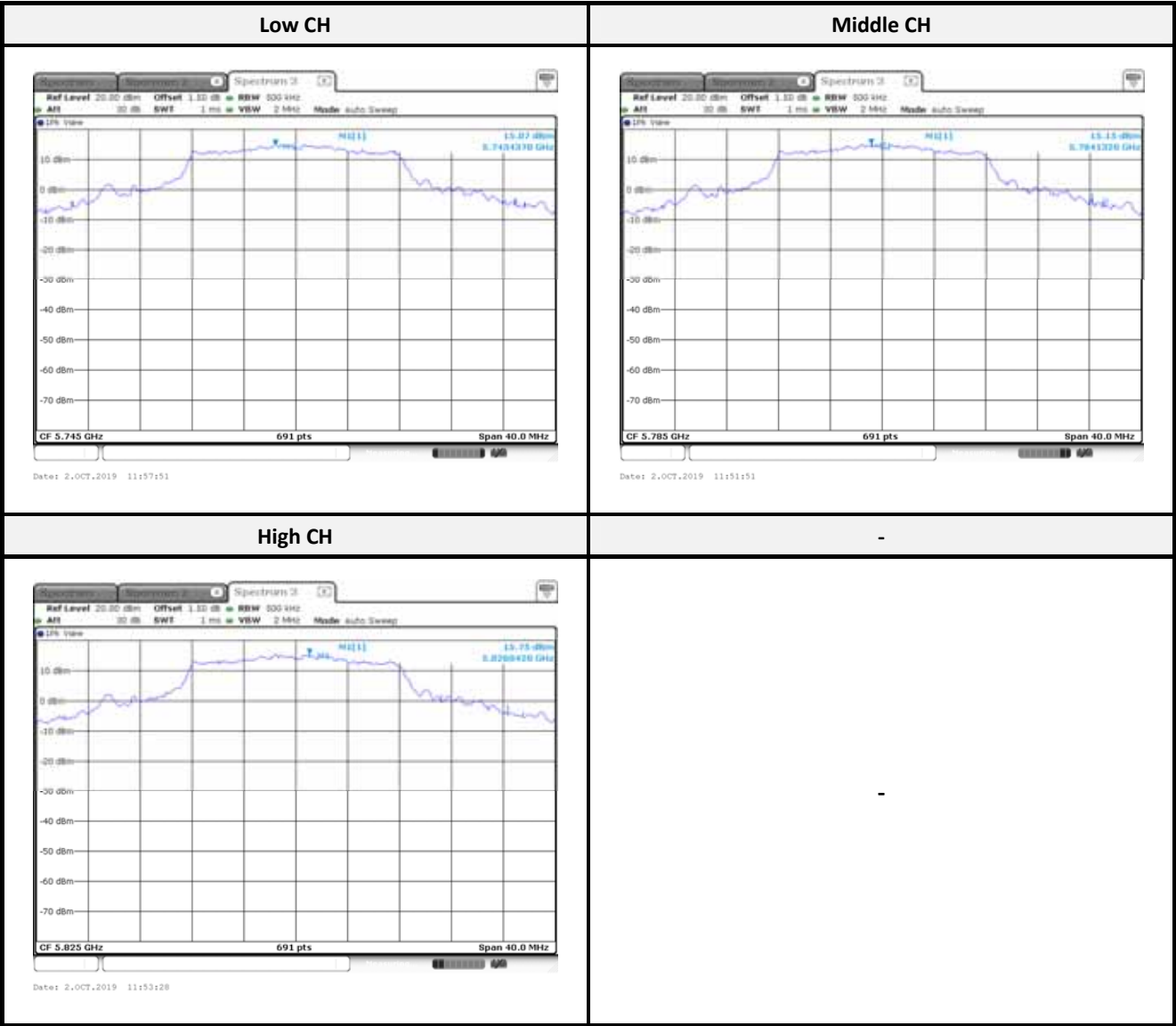


802.11ac VHT80 mode

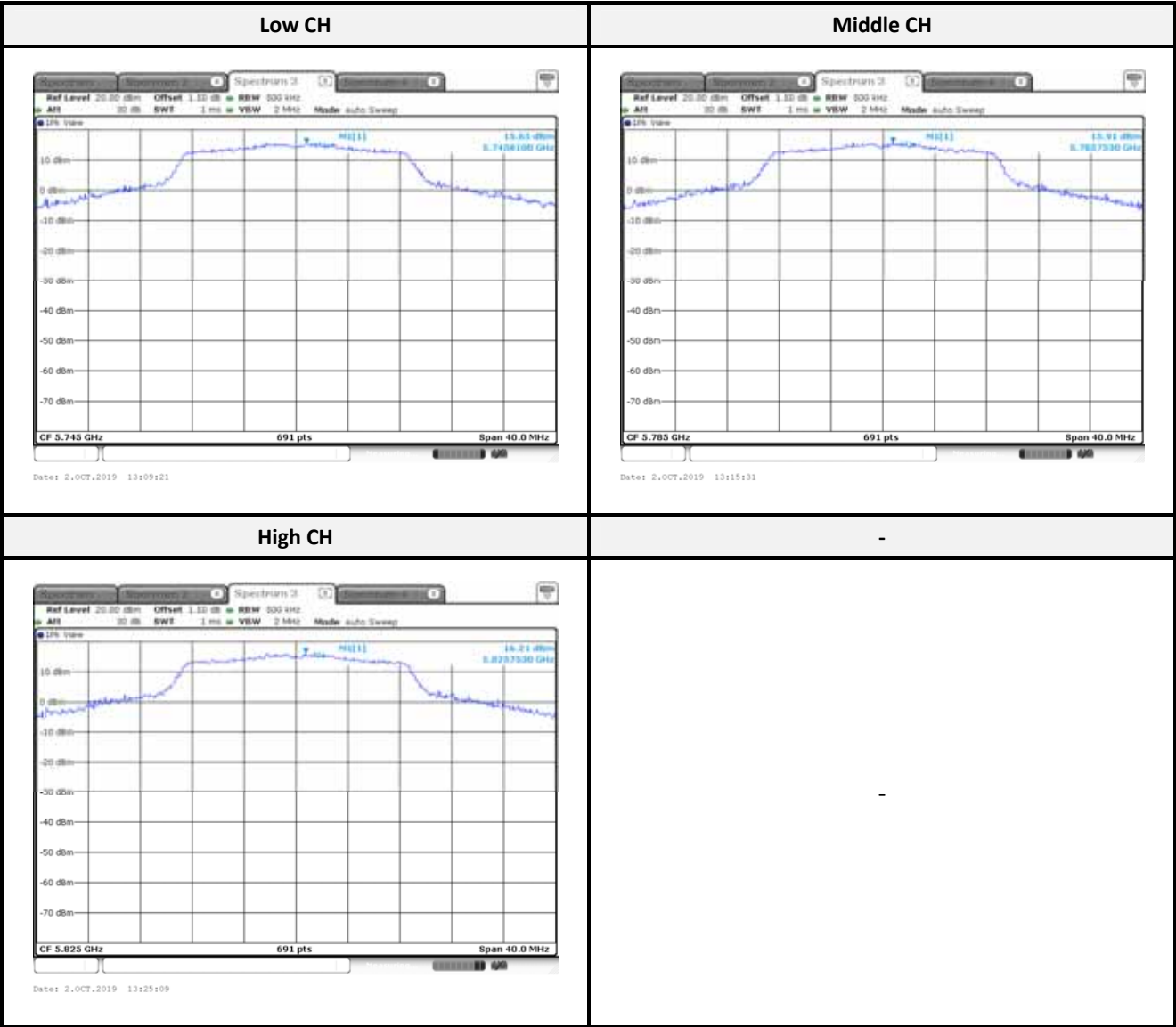


For UNII-3:

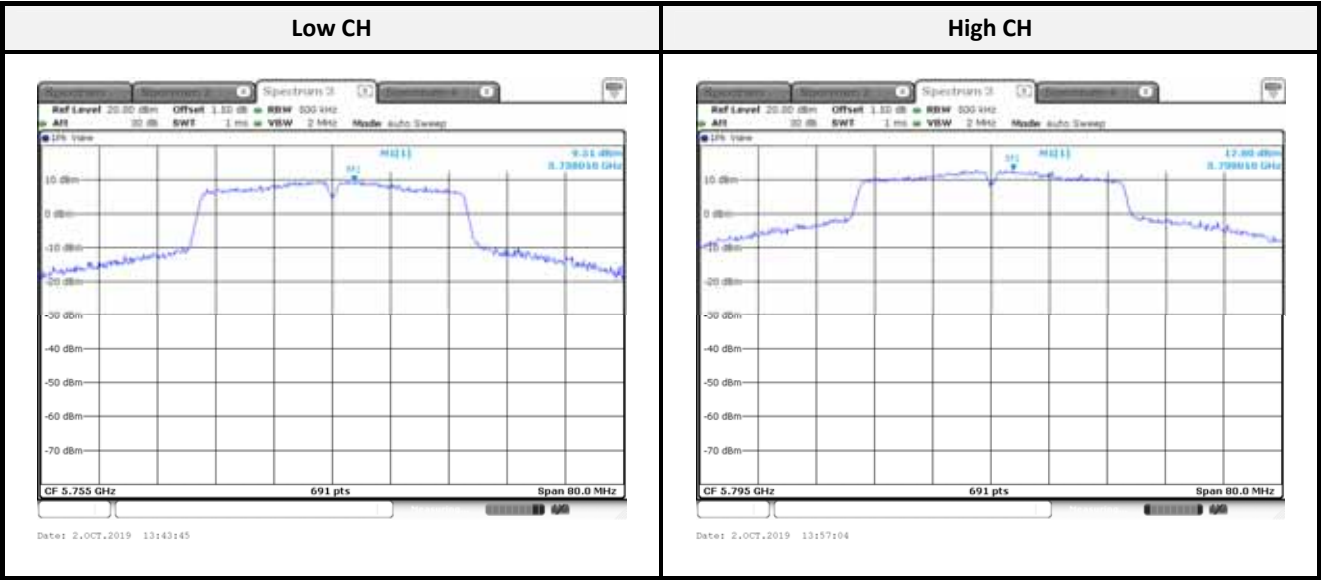
802.11a mode:



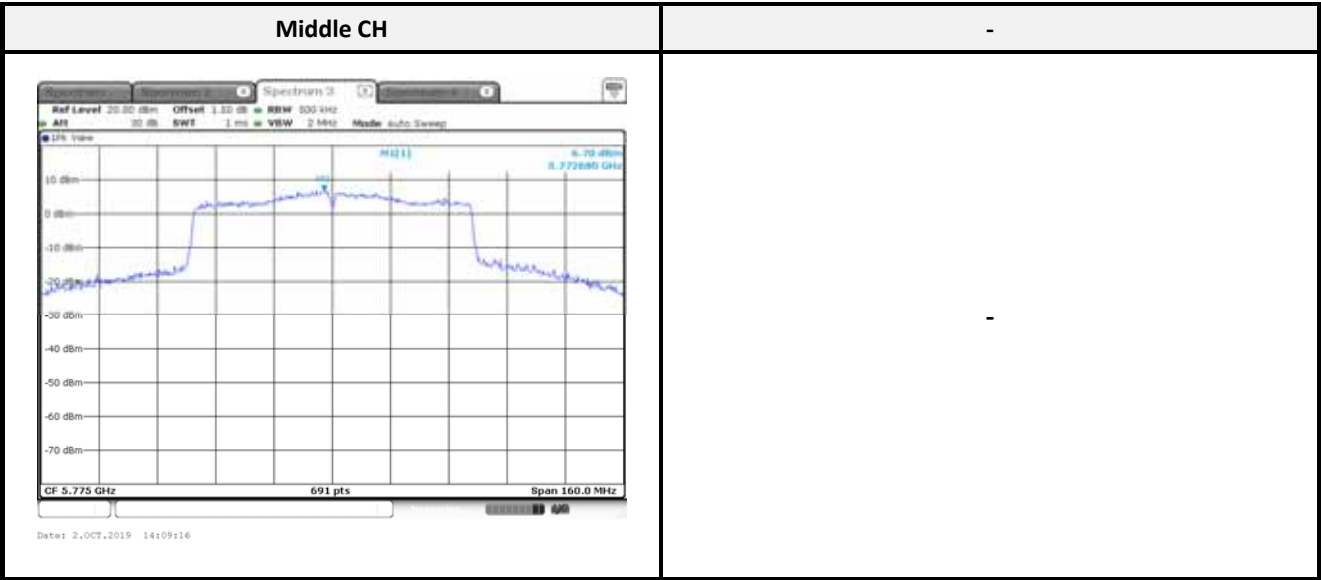
802.11ac VHT20 mode:



802.11ac VHT40 mode:



802.11ac VHT80 mode



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