# FCC Part 15.407

# TEST REPORT

For

# Actiontec Electronics Inc.

3301 Olcott St. Santa Clara, CA 95054

| | |
|---|---|
| **Report Type** | **Original Report** |
| **FCC ID:** | **FCC ID: LNQT3280** |
| **Product Name:** | **WiFi 6 Gateway Router with Bonded VDSL** |
| **Model Name:** | **T3280** |
| **Report Number :** | **RLK200729001-00C** |
| **Report Date :** | **2020/10/06** |
| **Reviewed By :** | **Zeus Chen** 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 | RLK200729001-00C | 2020/10/06 | Original Report |

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# 1 General Information

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

| | |
|---|---|
| **Applicant** | **Actiontec Electronics Inc.**<br>3301 Olcott St. Santa Clara, CA 95054 |
| **Manufacturer** | **Actiontec Electronics Inc.**<br>3301 Olcott St. Santa Clara, CA 95054 |
| **Product (Equipment)** | WiFi 6 Gateway Router with Bonded VDSL |
| **Model Name** | T3280 |
| **Frequency Range** | UNII-1: 5150 MHz - 5250 MHz；UNII-3: 5745 MHz - 5850 MHz |
| **Number of Channels** | **For UNII-1:**<br>IEEE 802.11a/n HT20/ac VHT20/ax HE20: 4 Channels<br>IEEE 802.11n HT40/ac VHT40/ax HE40: 2 Channels<br>IEEE 802.11ac VHT80/ax HE80: 1 Channels<br>**For UNII-3:**<br>IEEE 802.11a/n HT20/ac VHT20/ax HE20: 5 Channels<br>IEEE 802.11n HT40/ac VHT40/ax HE40: 2 Channels<br>IEEE 802.11ac VHT80/ax HE80: 1 Channels |
| **Output Power** | **For UNII-1:**<br>IEEE 802.11a Mode: 26.35 dBm (0.4315 W)<br>IEEE 802.11n HT20 Mode: 26.34 dBm (0.4305 W)<br>IEEE 802.11n HT40 Mode: 27.17 dBm (0.5212 W)<br>IEEE 802.11ac VHT20 Mode: 26.49 dBm (0.4457 W)<br>IEEE 802.11ac VHT40 Mode: 27.40 dBm (0.5495 W)<br>IEEE 802.11ac VHT80 Mode: 22.47 dBm (0.1766 W)<br>IEEE 802.11ax HE20 Mode: 26.64 dBm (0.4613 W)<br>IEEE 802.11ax HE40 Mode: 27.50 dBm (0.5623 W)<br>IEEE 802.11ax HE80 Mode: 21.55 dBm (0.1429 W)<br>**For UNII-3**:<br>IEEE 802.11a Mode: 27.82 dBm (0.6053W)<br>IEEE 802.11n HT20 Mode: 27.56 dBm (0.5702 W)<br>IEEE 802.11n HT40 Mode: 28.85 dBm (0.7674 W)<br>IEEE 802.11ac VHT20 Mode: 27.73 dBm (0.5929 W)<br>IEEE 802.11ac VHT40 Mode: 28.99 dBm (0.7925 W)<br>IEEE 802.11ac VHT80 Mode: 26.77 dBm (0.4753 W)<br>IEEE 802.11ax HE20 Mode: 27.93 dBm (0.6209 W)<br>IEEE 802.11ax HE40 Mode: 29.13 dBm (0.8185 W)<br>IEEE 802.11ax HE80 Mode: 26.90 dBm (0.4898 W) |
| **Modulation Type** | OFDM |
| **Received Date** | 2020/08/19 |
| **Date of Test** | 2020/10/13 - 2020/10/28 |
| **Related Submittal(s)/Grant(s)** | **FCC Part 15.247 DTS with FCC ID: LNQT3280** |

**All measurement and test data in this report was gathered from production sample serial number: 200729001 Assigned by BACL, Linkou Laboratory).*

## 1.2 Operation Condition of EUT

| | |
|---|---|
| **Power Operation (Voltage Range)** | ☒ AC 120 V/60 Hz<br>☒ Adapter<br>*Brand Name: Actiontec*<br>*Model: CSD024T-W120U*<br>*I/P: 120Vac, 50/60Hz, 0.58A*<br>*O/P: 12Vdc, 2A*<br>☐ By Power Cord. |
| | ☐ DC Type<br>☐ DC Power<br>☐ Battery<br>☐ External from USB Cable<br>☐ External DC Adapter |
| | ☐ Host System |

## 1.3 Objective

**The Objective of this Test Report was to document the compliance of the Actiontec Electronics Inc. Appliance (Model:T3280) 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 t American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

## 1.4 Measurement Uncertainty

| Parameter | Expanded Measurement uncertainty |
|---|---|
| RF output power | ± 1.488 dB |
| Occupied Channel Bandwidth | ± 453.927 Hz |
| RF Conducted Emission test | ± 2.77 dB |
| AC Power Line Conducted Emission | ± 2.66 dB |
| Radiated Below 1G | ± 3.57 dB |
| Radiated Above 1G | ± 5.32 dB |

The test results with statement of conformity, the decision rules are based on the specifications and standards. The test results will not take the measurement uncertainty into account.

## 1.5 Environmental Conditions and Test Date

| Test Site | Test Date | Temperature (°C) | Relative Humidity (%) | Test Engineer |
|---|---|---|---|---|
| Conduction (Con-01) | 2020/10/20 | 24.4 | 52 | Brian Chang |
| Radiated (966A) | 2020/10/13 - 2020/10/16 | 21.1 - 22.1 | 54 - 57 | Leo Cheng |
| Conducted (TH-02) | 2020/10/15 - 2020/10/28 | 22.5 - 22.9 | 55 - 57 | Blake Wang |

## 1.6 Test Facility

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

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

Bay Area Compliance Laboratories Corp. (Linkou Laboratory) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) by Mutual Recognition Agreement (MRA). 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.: TW1119. The Test Firm Registration No.: 311381. ISED#: 25102 and CAB identifier is TW3546.

# 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/ax HE20 | | | |
|---|---|---|---|
| **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/ax HE40 | | | |
|---|---|---|---|
| **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/ax HE80 | | | |
|---|---|---|---|
| **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** | **$N_{TX}$** | **Data Rate** | **Worst Data Rate** |
| **802.11a mode** | **4** | 6-54 Mbps | 6 Mbps |
| **802.11n HT20 mode** | **4** | MCS 0-7 | MCS 0 |
| **802.11n HT40 mode** | **4** | MCS 0-7 | MCS 0 |
| **802.11ac VHT20 mode** | **4** | MCS 0-8 NSS4 | MCS 0 |
| **802.11ac VHT40 mode** | **4** | MCS 0-9 NSS4 | MCS 0 |
| **802.11ac VHT80 mode** | **4** | MCS 0-9 NSS4 | MCS 0 |
| **802.11ax HE20 mode** | **4** | MCS 0-11 NSS4 | MCS 0 |
| **802.11ax HE40 mode** | **4** | MCS 0-11 NSS4 | MCS 0 |
| **802.11ax HE80 mode** | **4** | MCS 0-11 NSS4 | MCS 0 |

| Worst Case of Power Setting | | | | | |
|---|---|---|---|---|---|
| EUT Exercise Software | | | EngineerModeaccessMTool_REL_3_1_0_1 | | |
| Configuration | $N_{TX}$ | UNII Band | Low CH | Mid CH | High CH |
| 802.11a mode | 4 | UNII-1 | 82 | 88 | 88 |
| | | UNII-3 | 94 | 94 | 94 |
| 802.11n HT20 mode | 4 | UNII-1 | 82 | 88 | 88 |
| | | UNII-3 | 94 | 94 | 94 |
| 802.11n HT40 mode | 4 | UNII-1 | 69 | - | 93 |
| | | UNII-3 | 96 | - | 96 |
| 802.11ac VHT20 mode | 4 | UNII-1 | 82 | 88 | 88 |
| | | UNII-3 | 94 | 94 | 94 |
| 802.11ac VHT40 mode | 4 | UNII-1 | 69 | - | 93 |
| | | UNII-3 | 96 | - | 96 |
| 802.11ac VHT80 mode | 4 | UNII-1 | - | 66 | - |
| | | UNII-3 | - | 90 | - |
| 802.11ax HE20 mode | 4 | UNII-1 | 82 | 88 | 88 |
| | | UNII-3 | 94 | 94 | 94 |
| 802.11ax HE40 mode | 4 | UNII-1 | 69 | - | 93 |
| | | UNII-3 | 96 | - | 96 |
| 802.11ax HE80 mode | 4 | UNII-1 | - | 66 | - |
| | | UNII-3 | - | 90 | - |

- 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 date rates bandwidths, and modulations. Radiated below 1G were tested worst output power mode.
- Due to 802.11n HT20/n HT40/ac VHT20/ac VHT40/ac VHT80 mode output power are less than 802.11ax HE20/ax HE40/ax HE80. Therefore, 802.11ax HE20/ax HE40/ax HE80 cover 802.11n HT20/n HT40/ac VHT20/ac VHT40/ac VHT80 in the test, Include conducted and radiated, except power test.

## 2.2 Support Equipment and External Cable List

**Equipment List:**

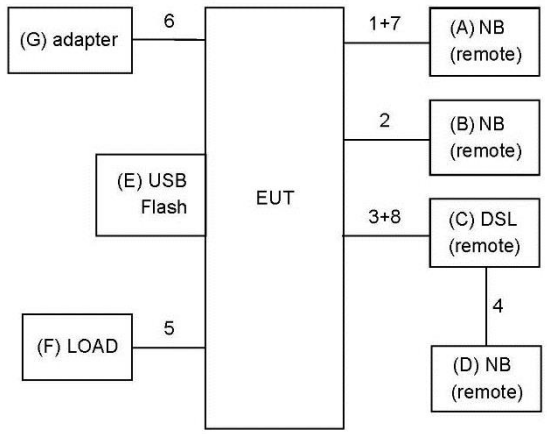
| No. | Description | Manufacturer | Model Number |
|---|---|---|---|
| A | Notebook | DELL | Latitude E6410 |
| B | NB | DELL | Latitude E5470 |
| C | DSL | Broadcom | BCM96358MG-CO |
| D | NB | DELL | Latitude E5470 |
| E | USB Flash | Kingston | 16GB |
| F | LAN LOAD | NA | NA |
| G | ADAPTER | Actiontec | CDS024T-W120U |

**Cable List:**

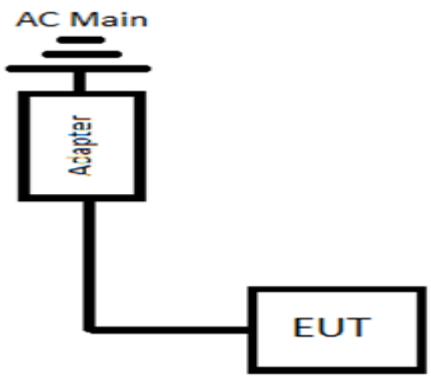
| No. | Description | Shielded Type | Ferrite Core | Length (M) | Remark |
|---|---|---|---|---|---|
| 1 | LAN Cable | Non-Shielded | NA | 1.8 | EUT |
| 2 | LAN Cable | Non-Shielded | NA | 10 | |
| 3 | RJ-11 Cable | Non-Shielded | NA | 3.6 | EUT |
| 4 | LAN Cable | Non-Shielded | NA | 1.8 | |
| 5 | LAN Cable*3 | Non-Shielded | NA | 1.5 | |
| 6 | DC Cable | Non-Shielded | NA | 1.8 | |
| 7 | LAN Cable | Non-Shielded | NA | 10 | |
| 8 | RJ-11 Cable | Non-Shielded | NA | 10 | |

## 2.3 Block Diagram of Test Setup

**Conduction**




**Radiation**



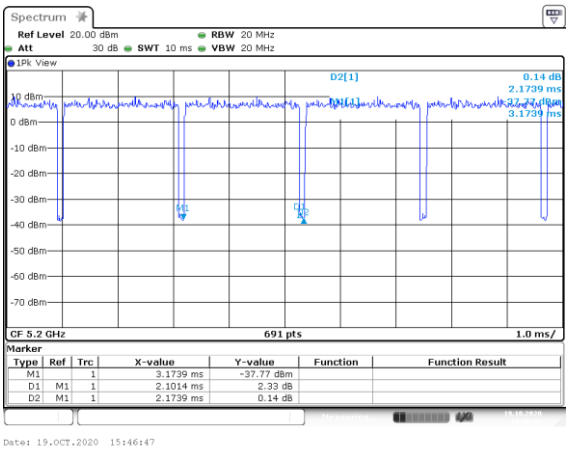
## 2.4 Duty Cycle

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

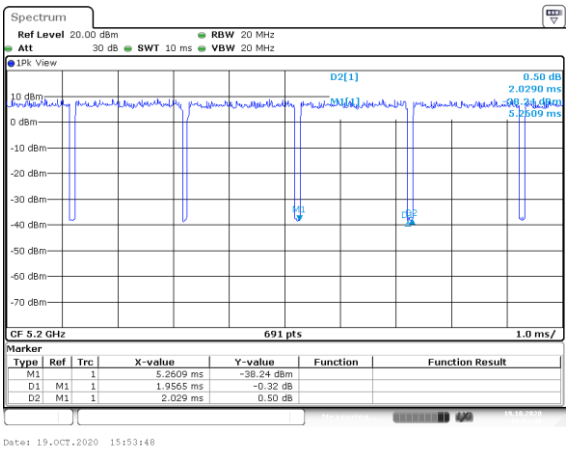
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

| Configuration | Duty Cycle (%) | On Time (ms) | Period (ms) | Duty Factor (dB) |
|---|---|---|---|---|
| **802.11a mode** | 96.66 | 2.10 | 2.17 | 0.15 |
| **802.11n HT20 mode** | 96.43 | 1.96 | 2.03 | 0.16 |
| **802.11n HT40 mode** | 94.44 | 0.99 | 1.04 | 0.25 |
| **802.11ac VHT20 mode** | 99.26 | 1.94 | 1.96 | 0.03 |
| **802.11ac VHT40 mode** | 98.52 | 0.96 | 0.98 | 0.06 |
| **802.11ac VHT80 mode** | 97.01 | 0.47 | 0.49 | 0.13 |
| **802.11ax HE20 mode** | 99.05 | 1.51 | 1.52 | 0.04 |
| **802.11ax HE40 mode** | 98.18 | 0.78 | 0.80 | 0.08 |
| **802.11ax HE80 mode** | 95.00 | 0.41 | 0.43 | 0.22 |

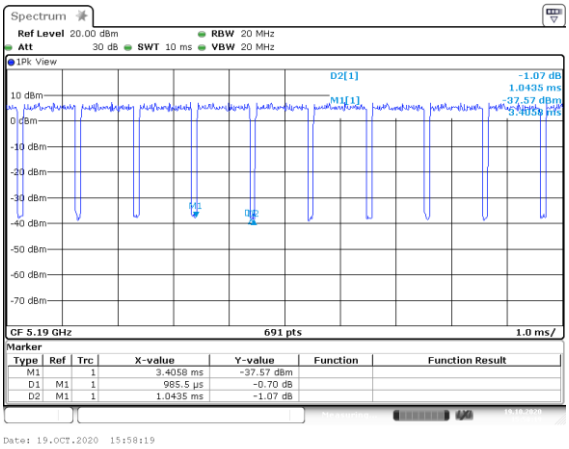
**802.11a mode**



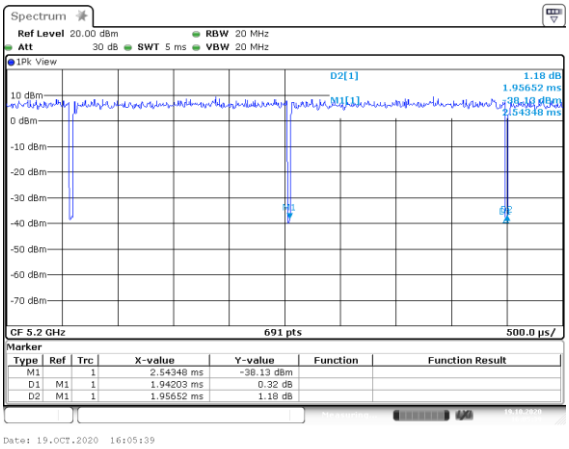

**802.11n HT20 mode**



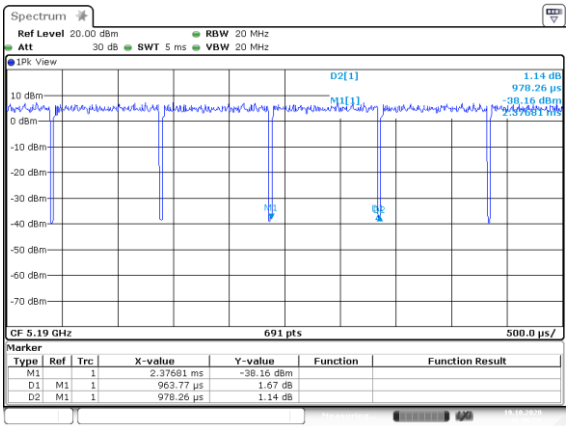

**802.11n HT40 mode**



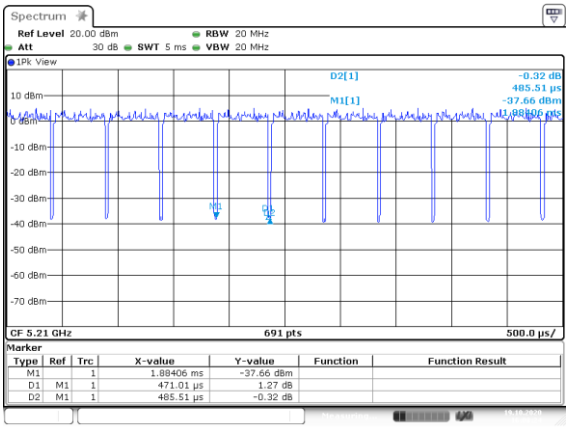

**802.11ac VHT20 mode**



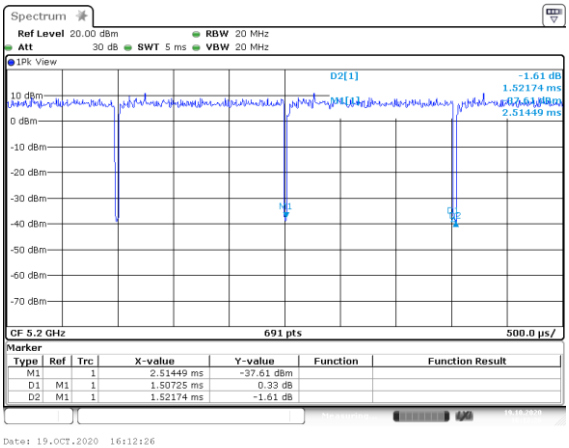
## 802.11ac VHT40 mode



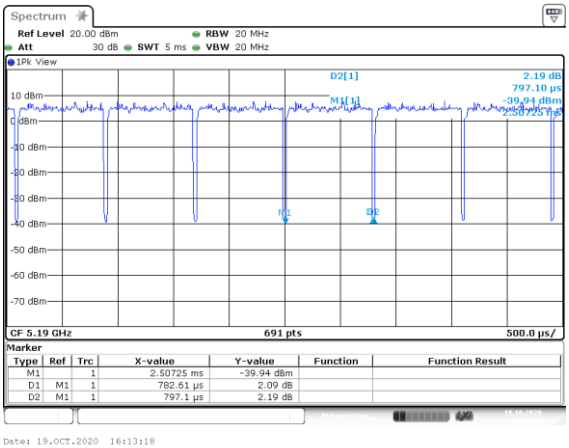

## 802.11ac VHT80 mode



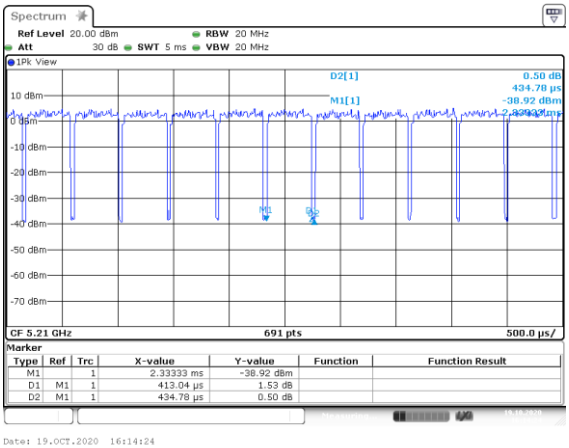

## 802.11ax HE20 mode




## 802.11ax HE40 mode




## 802.11ax HE80 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/cm²)** | **Averaging Time (minutes)** |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *(180/f²) | 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/cm2);

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/cm²) | MPE Limit (mW/cm²) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Wi-Fi 2.4G | 2412-2462 | 3.93 | 2.4717 | 28.50 | 707.9458 | 20 | 0.3483 | 1.0 |
| UNII-1 | 5150-5250 | 4.12 | 2.5823 | 28.00 | 630.9573 | 20 | 0.3243 | 1.0 |
| UNII-2a | 5250-5350 | 4.49 | 2.8119 | 23.00 | 199.5262 | 20 | 0.1117 | 1.0 |
| UNII-2c | 5470-5725 | 4.95 | 3.1261 | 23.00 | 199.5262 | 20 | 0.1242 | 1.0 |
| UNII-3 | 5745-5850 | 4.95 | 3.1261 | 29.50 | 891.2509 | 20 | 0.5546 | 1.0 |

*Note: Wi-Fi 2.4G and Wi-Fi 5G can't simultaneously.*

**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

| Configuration | Antenna Type | Brand | Model | Antenna Gain (dBi) | Result |
|---|---|---|---|---|---|
| UNII-1: | Internal Antenna | CALTRONICS | HB1 | 3.85 | Compliance |
| | Internal Antenna | CALTRONICS | HB2 | 4.12 | Compliance |
| | Internal Antenna | CALTRONICS | HB3 | -10.43 | Compliance |
| | Internal Antenna | CALTRONICS | HB3 | -4.18 | Compliance |
| UNII-3: | Internal Antenna | CALTRONICS | HB1 | 2.70 | Compliance |
| | Internal Antenna | CALTRONICS | HB2 | 4.95 | Compliance |
| | Internal Antenna | CALTRONICS | HB3 | -4.73 | Compliance |
| | Internal Antenna | CALTRONICS | HB3 | -2.63 | Compliance |

*The EUT has an internal dedicated antennas arrangement, fulfill the requirement of this section.*

# 6 FCC §15.207 - AC Line Conducted Emissions

## 6.1 Applicable Standard

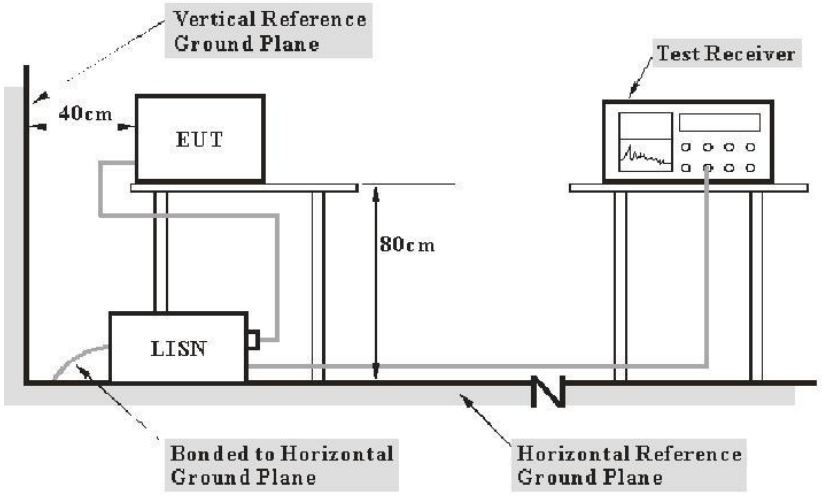
According to FCC §15.207 and §15.407(b)(6),

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 µH/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 Note 1 | 56 to 46 Note 2 |
| 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.

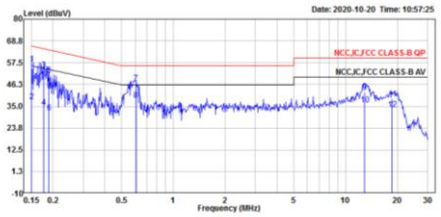
## 6.3 Test Equipment List and Details

| Description | Manufacture | Model | Serial No. | Cal. Date. | Cal. Due. |
|---|---|---|---|---|---|
| **Conduction Room** | | | | | |
| LISN | Rohde & Schwarz | ENV216 | 100010 | 2020/09/14 | 2021/09/13 |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 102430 | 2020/05/07 | 2021/05/06 |
| Pulse Limiter | SCHWARZBECK | VSTD 9561-F | 00432 | 2020/09/11 | 2021/09/10 |
| RF Cable | EMCI | EMCCFD300-BM-BM-8000 | 180526 | 2020/08/18 | 2021/08/17 |
| 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).*

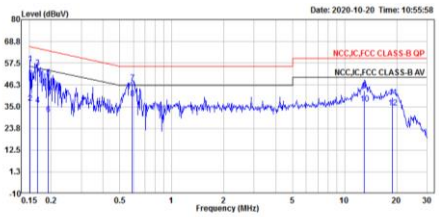
## 6.4 Test Data and Test Plot

**Line**




| | Freq | Read Level | Level | Factor | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | dBuV | dB | |
| 1 | 0.150 | 37.11 | 56.97 | 19.86 | 66.00 | -9.03 | QP |
| 2 | 0.150 | 17.75 | 37.61 | 19.86 | 56.00 | -18.39 | Average |
| 3 | 0.176 | 34.09 | 53.95 | 19.86 | 64.68 | -10.73 | QP |
| 4 | 0.176 | 14.65 | 34.51 | 19.86 | 54.68 | -20.17 | Average |
| 5 | 0.189 | 31.24 | 51.11 | 19.87 | 64.08 | -12.97 | QP |
| 6 | 0.189 | 12.06 | 31.93 | 19.87 | 54.08 | -22.15 | Average |
| 7 | 0.605 | 27.21 | 47.09 | 19.88 | 56.00 | -8.91 | QP |
| 8 | 0.605 | 18.48 | 38.36 | 19.88 | 46.00 | -7.64 | Average |
| 9 | 12.893 | 22.19 | 42.44 | 20.25 | 60.00 | -17.56 | QP |
| 10 | 12.893 | 15.50 | 35.75 | 20.25 | 50.00 | -14.25 | Average |
| 11 | 18.600 | 18.56 | 38.89 | 20.33 | 60.00 | -21.11 | QP |
| 12 | 18.600 | 13.29 | 33.62 | 20.33 | 50.00 | -16.38 | Average |

**Neutral**




| | Freq | Read Level | Level | Factor | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | dBuV | dB | |
| 1 | 0.151 | 37.36 | 57.23 | 19.87 | 65.93 | -8.70 | QP |
| 2 | 0.151 | 16.86 | 36.73 | 19.87 | 55.93 | -19.20 | Average |
| 3 | 0.168 | 35.18 | 55.05 | 19.87 | 65.07 | -10.02 | QP |
| 4 | 0.168 | 15.95 | 35.82 | 19.87 | 55.07 | -19.25 | Average |
| 5 | 0.192 | 30.24 | 50.12 | 19.88 | 63.95 | -13.83 | QP |
| 6 | 0.192 | 11.37 | 31.25 | 19.88 | 53.95 | -22.70 | Average |
| 7 | 0.591 | 27.43 | 47.32 | 19.89 | 56.00 | -8.68 | QP |
| 8 | 0.591 | 19.33 | 39.22 | 19.89 | 46.00 | -6.78 | Average |
| 9 | 12.996 | 23.07 | 43.38 | 20.31 | 60.00 | -16.62 | QP |
| 10 | 12.996 | 16.17 | 36.48 | 20.31 | 50.00 | -13.52 | Average |
| 11 | 18.899 | 19.46 | 39.89 | 20.43 | 60.00 | -20.11 | QP |
| 12 | 18.899 | 13.91 | 34.34 | 20.43 | 50.00 | -15.66 | 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:

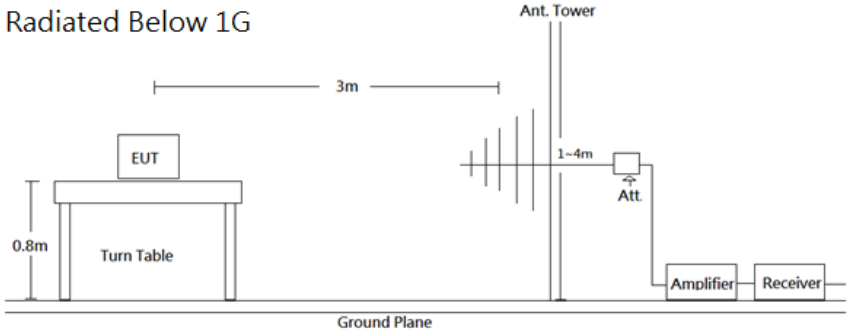
| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 13.36-13.41 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.42-16.423 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.69475-16.69525 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 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 |

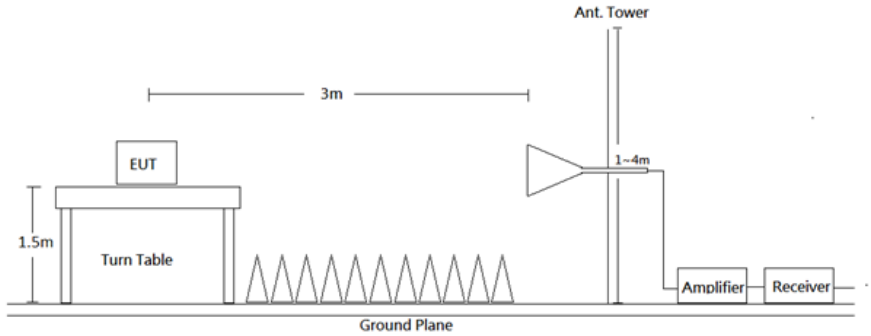
As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| 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 | 10 MHz | PK | >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 | 2020/03/16 | 2021/03/15 |
| Bilog Antenna/6 dB Attenuator | SUNOL SCIENCES & EMEC /EMCI | JB3/N-6-06 | A111513/AT-N0668 | 2020/03/19 | 2021/03/18 |
| Horn Antenna | ETS-Lindgren | 3115 | 00109141 | 2020/07/15 | 2021/07/14 |
| Horn Antenna | ETS-Lindgren | 3160-09 | 00123852 | 2020/07/07 | 2021/07/06 |
| Horn Antenna | ETS-Lindgren | 3160-10 | 00123855 | 2020/07/07 | 2021/07/06 |
| Preamplifier | A.H. Systems | PAM-0118P | 478 | 2020/05/05 | 2021/05/04 |
| Preamplifier | A.H. Systems | PAM-1840VH | 174 | 2020/03/25 | 2021/03/24 |
| Signal and Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101434 | 2020/05/07 | 2021/05/06 |
| Microflex Cable (1m) | EMCI | EMC106-SM-SM-2000 | 180515 | 2020/08/06 | 2021/08/05 |
| Microflex Cable (2m) | MTJ | H0919 | 00000-MT28A-100 | 2020/08/06 | 2021/08/05 |
| Microflex Cable (8m) | UTIFLEX | UFA210A-1-3149-300300 | MFR 64639 232490-001 | 2020/08/06 | 2021/08/05 |
| 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).*

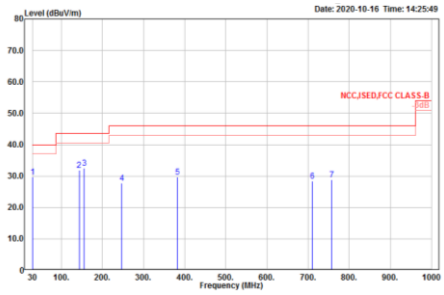
## 7.4 Test Data and Test Plot

**Wi-Fi 5G Mode:**

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

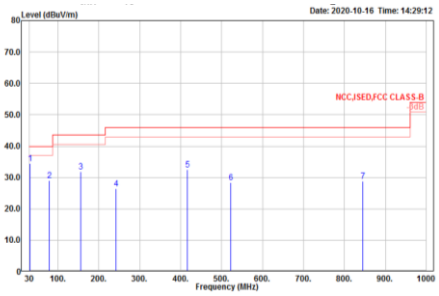
**Below 1G (30 MHz-1 GHz) test the output power worst mode**

**Horizontal**




| | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | 30.000 | 29.69 | 40.00 | -10.31 | 38.45 | -8.76 | Peak |
| 2 | 143.490 | 31.93 | 43.50 | -11.57 | 52.09 | -20.16 | Peak |
| 3 | 155.130 | 32.52 | 43.50 | -10.98 | 53.20 | -20.68 | Peak |
| 4 | 247.280 | 27.74 | 46.00 | -18.26 | 49.57 | -21.83 | Peak |
| 5 | 382.110 | 29.75 | 46.00 | -16.25 | 48.24 | -18.49 | Peak |
| 6 | 709.970 | 28.35 | 46.00 | -17.65 | 40.97 | -12.62 | Peak |
| 7 | 756.530 | 28.74 | 46.00 | -17.26 | 40.85 | -12.11 | Peak |

**Vertical**




| | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | 31.940 | 34.39 | 40.00 | -5.61 | 44.70 | -10.31 | Peak |
| 2 | 79.470 | 29.01 | 40.00 | -10.99 | 53.86 | -24.85 | Peak |
| 3 | 155.130 | 31.91 | 43.50 | -11.59 | 52.59 | -20.68 | Peak |
| 4 | 242.430 | 26.54 | 46.00 | -19.46 | 48.35 | -21.81 | Peak |
| 5 | 417.030 | 32.49 | 46.00 | -13.51 | 50.24 | -17.75 | Peak |
| 6 | 521.790 | 28.41 | 46.00 | -17.59 | 43.97 | -15.56 | Peak |
| 7 | 844.800 | 28.87 | 46.00 | -17.13 | 39.74 | -10.87 | Peak |

*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**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5144.800 | 51.12 | 54.00 | -2.88 | 53.50 | -2.38 | Average |
| 2 | ! | 5144.800 | 68.98 | 74.00 | -5.02 | 71.36 | -2.38 | Peak |
| 3 | * | 5182.750 | 106.15 | | | 108.50 | -2.35 | Average |
| 4 | * | 5182.750 | 115.73 | | | 118.08 | -2.35 | Peak |
| 1 | ! | 10360.000 | 59.56 | 68.20 | -8.64 | 52.86 | 6.70 | Peak |
| 2 | ! | 15540.000 | 50.09 | 54.00 | -3.91 | 40.53 | 9.56 | Average |
| 3 | ! | 15540.000 | 65.02 | 74.00 | -8.98 | 55.46 | 9.56 | Peak |

**Vertical**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5149.000 | 53.42 | 54.00 | -0.58 | 55.79 | -2.37 | Average |
| 2 | ! | 5149.000 | 68.98 | 74.00 | -5.02 | 71.35 | -2.37 | Peak |
| 3 | * | 5181.850 | 105.52 | | | 107.87 | -2.35 | Average |
| 4 | * | 5181.850 | 114.66 | | | 117.01 | -2.35 | Peak |
| 1 | ! | 10360.000 | 59.10 | 68.20 | -9.10 | 52.40 | 6.70 | Peak |
| 2 | ! | 15540.000 | 43.97 | 54.00 | -10.03 | 34.41 | 9.56 | Average |
| 3 | ! | 15540.000 | 56.20 | 74.00 | -17.80 | 46.64 | 9.56 | Peak |

**Middle CH**

**Horizontal**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5098.000 | 49.21 | 54.00 | -4.79 | 51.62 | -2.41 | Average |
| 2 | ! | 5098.000 | 62.11 | 74.00 | -11.89 | 64.52 | -2.41 | Peak |
| 3 | * | 5201.200 | 106.96 | | | 109.30 | -2.34 | Average |
| 4 | * | 5201.200 | 116.57 | | | 118.91 | -2.34 | Peak |
| 5 | ! | 5403.600 | 49.03 | 54.00 | -4.97 | 50.90 | -1.87 | Average |
| 6 | ! | 5403.600 | 62.86 | 74.00 | -11.14 | 64.73 | -1.87 | Peak |
| 1 | ! | 10400.000 | 60.44 | 68.20 | -7.76 | 53.64 | 6.80 | Peak |
| 2 | ! | 15600.000 | 53.56 | 54.00 | -0.44 | 43.93 | 9.63 | Average |
| 3 | ! | 15600.000 | 67.63 | 74.00 | -6.37 | 58.00 | 9.63 | Peak |

**Vertical**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5084.400 | 49.36 | 54.00 | -4.64 | 51.79 | -2.43 | Average |
| 2 | ! | 5084.400 | 62.27 | 74.00 | -11.73 | 64.70 | -2.43 | Peak |
| 3 | * | 5195.600 | 110.02 | | | 112.36 | -2.34 | Average |
| 4 | * | 5195.600 | 119.29 | | | 121.63 | -2.34 | Peak |
| 5 | ! | 5359.600 | 49.28 | 54.00 | -4.72 | 51.28 | -2.00 | Average |
| 6 | ! | 5359.600 | 61.88 | 74.00 | -12.12 | 63.88 | -2.00 | Peak |
| 1 | ! | 10400.000 | 59.29 | 68.20 | -8.91 | 52.49 | 6.80 | Peak |
| 2 | ! | 15600.000 | 47.28 | 54.00 | -6.72 | 37.65 | 9.63 | Average |
| 3 | ! | 15600.000 | 62.32 | 74.00 | -11.68 | 52.69 | 9.63 | Peak |

**High CH**

**Horizontal**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5061.200 | 48.47 | 54.00 | -5.53 | 50.91 | -2.44 | Average |
| 2 | ! | 5061.200 | 62.80 | 74.00 | -11.20 | 65.24 | -2.44 | Peak |
| 3 | * | 5241.600 | 107.05 | | | 109.36 | -2.31 | Average |
| 4 | * | 5241.600 | 116.89 | | | 119.20 | -2.31 | Peak |
| 5 | ! | 5448.000 | 49.39 | 54.00 | -4.61 | 51.13 | -1.74 | Average |
| 6 | ! | 5448.000 | 63.79 | 74.00 | -10.21 | 65.53 | -1.74 | Peak |
| 1 | ! | 10480.000 | 63.87 | 68.20 | -4.33 | 56.85 | 7.02 | Peak |
| 2 | ! | 15720.000 | 53.86 | 54.00 | -0.14 | 44.15 | 9.71 | Average |
| 3 | ! | 15720.000 | 70.03 | 74.00 | -3.97 | 60.32 | 9.71 | Peak |

**Vertical**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5104.800 | 48.89 | 54.00 | -5.11 | 51.30 | -2.41 | Average |
| 2 | ! | 5104.800 | 62.13 | 74.00 | -11.87 | 64.54 | -2.41 | Peak |
| 3 | * | 5235.200 | 110.10 | | | 112.42 | -2.32 | Average |
| 4 | * | 5235.200 | 119.55 | | | 121.87 | -2.32 | Peak |
| 5 | ! | 5446.800 | 49.15 | 54.00 | -4.85 | 50.90 | -1.75 | Average |
| 6 | ! | 5446.800 | 62.55 | 74.00 | -11.45 | 64.30 | -1.75 | Peak |
| 1 | ! | 10480.000 | 62.12 | 68.20 | -6.08 | 55.10 | 7.02 | Peak |
| 2 | ! | 15720.000 | 48.21 | 54.00 | -5.79 | 38.50 | 9.71 | Average |
| 3 | ! | 15720.000 | 62.58 | 74.00 | -11.42 | 52.87 | 9.71 | Peak |

## 802.11ax HE20 mode:

### Low CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5148.550 | 53.00 | 54.00 | -1.00 | 55.38 | -2.38 | Average |
| 2 | ! | 5148.550 | 69.43 | 74.00 | -4.57 | 71.81 | -2.38 | Peak |
| 3 | * | 5173.300 | 103.36 | | | 105.72 | -2.36 | Average |
| 4 | * | 5173.300 | 115.81 | | | 118.17 | -2.36 | Peak |
| 1 | ! | 10360.000 | 61.21 | 68.20 | -6.99 | 54.51 | 6.70 | Peak |
| 2 | ! | 15540.000 | 50.27 | 54.00 | -3.73 | 40.71 | 9.56 | Average |
| 3 | ! | 15540.000 | 64.42 | 74.00 | -9.58 | 54.86 | 9.56 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5149.600 | 53.32 | 54.00 | -0.68 | 55.69 | -2.37 | Average |
| 2 | ! | 5149.600 | 69.05 | 74.00 | -4.95 | 71.42 | -2.37 | Peak |
| 3 | * | 5184.250 | 105.95 | | | 108.30 | -2.35 | Average |
| 4 | * | 5184.250 | 117.98 | | | 120.33 | -2.35 | Peak |
| 1 | ! | 10360.000 | 55.91 | 68.20 | -12.29 | 49.21 | 6.70 | Peak |
| 2 | ! | 15540.000 | 43.77 | 54.00 | -10.23 | 34.21 | 9.56 | Average |
| 3 | ! | 15540.000 | 58.22 | 74.00 | -15.78 | 48.66 | 9.56 | Peak |

### Middle CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5144.400 | 49.96 | 54.00 | -4.04 | 52.34 | -2.38 | Average |
| 2 | ! | 5144.400 | 62.23 | 74.00 | -11.77 | 64.61 | -2.38 | Peak |
| 3 | * | 5205.200 | 105.76 | | | 108.10 | -2.34 | Average |
| 4 | * | 5205.200 | 116.61 | | | 118.95 | -2.34 | Peak |
| 5 | ! | 5426.800 | 49.06 | 54.00 | -4.94 | 50.86 | -1.80 | Average |
| 6 | ! | 5426.800 | 63.19 | 74.00 | -10.81 | 64.99 | -1.80 | Peak |
| 1 | ! | 10400.000 | 61.30 | 68.20 | -6.90 | 54.50 | 6.80 | Peak |
| 2 | ! | 15600.000 | 53.26 | 54.00 | -0.74 | 43.63 | 9.63 | Average |
| 3 | ! | 15600.000 | 66.59 | 74.00 | -7.41 | 56.96 | 9.63 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5146.800 | 50.05 | 54.00 | -3.95 | 52.43 | -2.38 | Average |
| 2 | ! | 5146.800 | 63.13 | 74.00 | -10.87 | 65.51 | -2.38 | Peak |
| 3 | * | 5201.200 | 107.52 | | | 109.86 | -2.34 | Average |
| 4 | * | 5201.200 | 119.97 | | | 122.31 | -2.34 | Peak |
| 5 | ! | 5445.600 | 48.92 | 54.00 | -5.08 | 50.67 | -1.75 | Average |
| 6 | ! | 5445.600 | 62.57 | 74.00 | -11.43 | 64.32 | -1.75 | Peak |
| 1 | ! | 10400.000 | 58.32 | 68.20 | -9.88 | 51.52 | 6.80 | Peak |
| 2 | ! | 15600.000 | 47.03 | 54.00 | -6.97 | 37.40 | 9.63 | Average |
| 3 | ! | 15600.000 | 61.39 | 74.00 | -12.61 | 51.76 | 9.63 | Peak |

### High CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5078.000 | 48.55 | 54.00 | -5.45 | 50.98 | -2.43 | Average |
| 2 | ! | 5078.000 | 61.93 | 74.00 | -12.07 | 64.36 | -2.43 | Peak |
| 3 | * | 5245.200 | 105.53 | | | 107.83 | -2.30 | Average |
| 4 | * | 5245.200 | 116.76 | | | 119.06 | -2.30 | Peak |
| 5 | ! | 5412.400 | 49.02 | 54.00 | -4.98 | 50.86 | -1.84 | Average |
| 6 | ! | 5412.400 | 62.20 | 74.00 | -11.80 | 64.04 | -1.84 | Peak |
| 1 | ! | 10480.000 | 63.45 | 68.20 | -4.75 | 56.43 | 7.02 | Peak |
| 2 | ! | 15720.000 | 53.61 | 54.00 | -0.39 | 43.90 | 9.71 | Average |
| 3 | ! | 15720.000 | 67.37 | 74.00 | -6.63 | 57.66 | 9.71 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5066.000 | 49.19 | 54.00 | -4.81 | 51.62 | -2.43 | Average |
| 2 | ! | 5066.000 | 62.54 | 74.00 | -11.46 | 64.97 | -2.43 | Peak |
| 3 | * | 5236.800 | 108.36 | | | 110.68 | -2.32 | Average |
| 4 | * | 5236.800 | 121.23 | | | 123.55 | -2.32 | Peak |
| 5 | ! | 5427.600 | 49.29 | 54.00 | -4.71 | 51.08 | -1.79 | Average |
| 6 | ! | 5427.600 | 62.78 | 74.00 | -11.22 | 64.57 | -1.79 | Peak |
| 1 | ! | 10480.000 | 61.20 | 68.20 | -7.00 | 54.18 | 7.02 | Peak |
| 2 | ! | 15720.000 | 47.36 | 54.00 | -6.64 | 37.65 | 9.71 | Average |
| 3 | ! | 15720.000 | 61.51 | 74.00 | -12.49 | 51.80 | 9.71 | Peak |

## 802.11ax HE40 mode:

### Low CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5149.680 | 51.68 | 54.00 | -2.32 | 54.05 | -2.37 | Average |
| 2 | ! | 5149.680 | 69.69 | 74.00 | -4.31 | 72.06 | -2.37 | Peak |
| 3 | * | 5200.080 | 98.26 | | | 100.60 | -2.34 | Average |
| 4 | * | 5200.080 | 110.84 | | | 113.18 | -2.34 | Peak |
| 1 | ! | 10380.000 | 56.10 | 68.20 | -12.10 | 49.35 | 6.75 | Peak |
| 2 | ! | 15570.000 | 42.38 | 54.00 | -11.62 | 32.80 | 9.58 | Average |
| 3 | ! | 15570.000 | 55.30 | 74.00 | -18.70 | 45.72 | 9.58 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5149.040 | 53.05 | 54.00 | -0.95 | 55.42 | -2.37 | Average |
| 2 | ! | 5149.040 | 70.50 | 74.00 | -3.50 | 72.87 | -2.37 | Peak |
| 3 | * | 5189.520 | 104.29 | | | 106.63 | -2.34 | Average |
| 4 | * | 5189.520 | 112.65 | | | 114.99 | -2.34 | Peak |
| 1 | ! | 10380.000 | 52.15 | 68.20 | -16.05 | 45.40 | 6.75 | Peak |
| 2 | ! | 15570.000 | 41.10 | 54.00 | -12.90 | 31.52 | 9.58 | Average |
| 3 | | 15570.000 | 53.64 | 74.00 | -20.36 | 44.06 | 9.58 | Peak |

### High CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5150.000 | 53.45 | 54.00 | -0.55 | 55.82 | -2.37 | Average |
| 2 | ! | 5150.000 | 67.17 | 74.00 | -6.83 | 69.54 | -2.37 | Peak |
| 3 | * | 5215.200 | 103.48 | | | 105.81 | -2.33 | Average |
| 4 | * | 5215.200 | 115.96 | | | 118.29 | -2.33 | Peak |
| 5 | ! | 5354.400 | 49.79 | 54.00 | -4.21 | 51.81 | -2.02 | Average |
| 6 | ! | 5354.400 | 62.64 | 74.00 | -11.36 | 64.66 | -2.02 | Peak |
| 1 | ! | 10460.000 | 60.59 | 68.20 | -7.61 | 53.64 | 6.95 | Peak |
| 2 | ! | 15690.000 | 53.35 | 54.00 | -0.65 | 43.68 | 9.67 | Average |
| 3 | ! | 15690.000 | 65.58 | 74.00 | -8.42 | 55.91 | 9.67 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5146.000 | 53.35 | 54.00 | -0.65 | 55.73 | -2.38 | Average |
| 2 | ! | 5146.000 | 66.97 | 74.00 | -7.03 | 69.35 | -2.38 | Peak |
| 3 | * | 5222.000 | 106.18 | | | 108.51 | -2.33 | Average |
| 4 | * | 5222.000 | 116.53 | | | 118.86 | -2.33 | Peak |
| 5 | ! | 5393.600 | 49.73 | 54.00 | -4.27 | 51.64 | -1.91 | Average |
| 6 | ! | 5393.600 | 62.42 | 74.00 | -11.58 | 64.33 | -1.91 | Peak |
| 1 | ! | 10460.000 | 60.58 | 68.20 | -7.62 | 53.63 | 6.95 | Peak |
| 2 | ! | 15690.000 | 47.61 | 54.00 | -6.39 | 37.94 | 9.67 | Average |
| 3 | ! | 15690.000 | 59.42 | 74.00 | -14.58 | 49.75 | 9.67 | Peak |

## 802.11ax HE80 mode:

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5148.200 | 52.56 | 54.00 | -1.44 | 54.94 | -2.38 | Average |
| 2 | ! | 5148.200 | 66.89 | 74.00 | -7.11 | 69.27 | -2.38 | Peak |
| 3 | * | 5200.200 | 95.66 | | | 98.00 | -2.34 | Average |
| 4 | * | 5200.200 | 107.65 | | | 109.99 | -2.34 | Peak |
| 1 | ! | 10420.000 | 53.38 | 68.20 | -14.82 | 46.55 | 6.83 | Peak |
| 2 | ! | 15630.000 | 42.79 | 54.00 | -11.21 | 33.10 | 9.69 | Average |
| 3 | ! | 15630.000 | 54.29 | 74.00 | -19.71 | 44.60 | 9.69 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5149.600 | 53.35 | 54.00 | -0.65 | 55.72 | -2.37 | Average |
| 2 | ! | 5149.600 | 69.97 | 74.00 | -4.03 | 72.34 | -2.37 | Peak |
| 3 | * | 5214.000 | 97.82 | | | 100.15 | -2.33 | Average |
| 4 | * | 5214.000 | 108.53 | | | 110.86 | -2.33 | Peak |
| 1 | ! | 10420.000 | 51.43 | 68.20 | -16.77 | 44.60 | 6.83 | Peak |
| 2 | ! | 15630.000 | 42.65 | 54.00 | -11.35 | 32.96 | 9.69 | Average |
| 3 | ! | 15630.000 | 54.26 | 74.00 | -19.74 | 44.57 | 9.69 | Peak |

## Above 1G (1 GHz-40 GHz) in UNII-3:

### 802.11a mode:

**Low CH**

**Horizontal**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5615.400 | 62.65 | 68.20 | -5.55 | 63.80 | -1.15 | Peak |
| 2 | | 5680.560 | 63.11 | 90.85 | -27.74 | 64.01 | -0.90 | Peak |
| 3 | | 5719.800 | 76.19 | 110.74 | -34.55 | 76.93 | -0.74 | Peak |
| 4 | ! | 5742.480 | 117.77 | 122.20 | -4.43 | 118.42 | -0.65 | Peak |
| 5 | | 5862.000 | 63.68 | 108.84 | -45.16 | 63.84 | -0.16 | Peak |
| 6 | ! | 5919.600 | 64.64 | 72.18 | -7.54 | 64.57 | 0.07 | Peak |
| 7 | ! | 5962.440 | 64.05 | 68.20 | -4.15 | 63.79 | 0.26 | Peak |
| 1 | ! | 11490.000 | 51.44 | 54.00 | -2.56 | 44.11 | 7.33 | Average |
| 2 | ! | 11490.000 | 63.27 | 74.00 | -10.73 | 55.94 | 7.33 | Peak |
| 3 | ! | 17235.000 | 60.68 | 68.20 | -7.52 | 45.87 | 14.81 | Peak |

**Vertical**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5617.560 | 63.91 | 68.20 | -4.29 | 65.05 | -1.14 | Peak |
| 2 | | 5698.920 | 64.28 | 104.40 | -40.12 | 65.10 | -0.82 | Peak |
| 3 | | 5716.920 | 78.15 | 109.94 | -31.79 | 78.90 | -0.75 | Peak |
| 4 | ! | 5749.680 | 120.71 | 122.20 | -1.49 | 121.34 | -0.63 | Peak |
| 5 | | 5857.680 | 64.44 | 110.05 | -45.61 | 64.62 | -0.18 | Peak |
| 6 | ! | 5912.040 | 64.26 | 77.76 | -13.50 | 64.21 | 0.05 | Peak |
| 7 | ! | 5944.800 | 64.08 | 68.20 | -4.12 | 63.91 | 0.17 | Peak |
| 1 | ! | 11490.000 | 52.75 | 54.00 | -1.25 | 45.42 | 7.33 | Average |
| 2 | ! | 11490.000 | 66.04 | 74.00 | -7.96 | 58.71 | 7.33 | Peak |
| 3 | ! | 17235.000 | 58.46 | 68.20 | -9.74 | 43.65 | 14.81 | Peak |

**Middle CH**

**Horizontal**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5633.760 | 62.54 | 68.20 | -5.66 | 63.62 | -1.08 | Peak |
| 2 | | 5685.600 | 63.91 | 94.58 | -30.67 | 64.80 | -0.89 | Peak |
| 3 | | 5706.840 | 63.85 | 107.12 | -43.27 | 64.65 | -0.80 | Peak |
| 4 | ! | 5782.440 | 117.77 | 122.20 | -4.43 | 118.26 | -0.49 | Peak |
| 5 | | 5858.760 | 64.52 | 109.75 | -45.23 | 64.69 | -0.17 | Peak |
| 6 | ! | 5919.240 | 65.19 | 72.45 | -7.26 | 65.12 | 0.07 | Peak |
| 7 | ! | 5964.240 | 63.96 | 68.20 | -4.24 | 63.69 | 0.27 | Peak |
| 1 | ! | 11570.000 | 50.24 | 54.00 | -3.76 | 42.80 | 7.44 | Average |
| 2 | ! | 11570.000 | 63.28 | 74.00 | -10.72 | 55.84 | 7.44 | Peak |
| 3 | ! | 17355.000 | 60.36 | 68.20 | -7.84 | 45.17 | 15.19 | Peak |

**Vertical**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5618.280 | 63.35 | 68.20 | -4.85 | 64.49 | -1.14 | Peak |
| 2 | | 5676.240 | 64.02 | 87.66 | -23.64 | 64.94 | -0.92 | Peak |
| 3 | | 5703.240 | 64.13 | 106.11 | -41.98 | 64.94 | -0.81 | Peak |
| 4 | ! | 5786.760 | 121.36 | 122.20 | -0.84 | 121.83 | -0.47 | Peak |
| 5 | | 5863.440 | 64.90 | 108.43 | -43.53 | 65.06 | -0.16 | Peak |
| 6 | ! | 5917.080 | 64.84 | 74.04 | -9.20 | 64.78 | 0.06 | Peak |
| 7 | ! | 5956.680 | 64.52 | 68.20 | -3.68 | 64.29 | 0.23 | Peak |
| 1 | ! | 11570.000 | 52.07 | 54.00 | -1.93 | 44.63 | 7.44 | Average |
| 2 | ! | 11570.000 | 66.08 | 74.00 | -7.92 | 58.64 | 7.44 | Peak |
| 3 | ! | 17355.000 | 59.14 | 68.20 | -9.06 | 43.95 | 15.19 | Peak |

**High CH**

**Horizontal**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5612.520 | 62.54 | 68.20 | -5.66 | 63.70 | -1.16 | Peak |
| 2 | | 5671.920 | 63.49 | 84.46 | -20.97 | 64.42 | -0.93 | Peak |
| 3 | | 5710.800 | 63.46 | 108.23 | -44.77 | 64.24 | -0.78 | Peak |
| 4 | ! | 5822.400 | 117.08 | 122.20 | -5.12 | 117.41 | -0.33 | Peak |
| 5 | | 5856.240 | 70.12 | 110.45 | -40.33 | 70.30 | -0.18 | Peak |
| 6 | | 5879.280 | 64.87 | 102.02 | -37.15 | 64.96 | -0.09 | Peak |
| 7 | ! | 5937.240 | 64.52 | 68.20 | -3.68 | 64.37 | 0.15 | Peak |
| 1 | ! | 11650.000 | 49.26 | 54.00 | -4.74 | 41.64 | 7.62 | Average |
| 2 | ! | 11650.000 | 62.56 | 74.00 | -11.44 | 54.94 | 7.62 | Peak |
| 3 | ! | 17475.000 | 60.92 | 68.20 | -7.28 | 45.16 | 15.76 | Peak |

**Vertical**

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5636.280 | 63.47 | 68.20 | -4.73 | 64.54 | -1.07 | Peak |
| 2 | | 5676.960 | 63.04 | 88.19 | -25.15 | 63.95 | -0.91 | Peak |
| 3 | | 5705.040 | 63.70 | 106.61 | -42.91 | 64.51 | -0.81 | Peak |
| 4 | ! | 5828.880 | 121.62 | 122.20 | -0.58 | 121.93 | -0.31 | Peak |
| 5 | | 5855.160 | 77.20 | 110.76 | -33.56 | 77.38 | -0.18 | Peak |
| 6 | | 5885.760 | 64.50 | 97.21 | -32.71 | 64.57 | -0.07 | Peak |
| 7 | ! | 5928.240 | 64.90 | 68.20 | -3.30 | 64.80 | 0.10 | Peak |
| 1 | ! | 11650.000 | 50.60 | 54.00 | -3.40 | 42.98 | 7.62 | Average |
| 2 | ! | 11650.000 | 64.47 | 74.00 | -9.53 | 56.85 | 7.62 | Peak |
| 3 | ! | 17475.000 | 58.36 | 68.20 | -9.84 | 42.60 | 15.76 | Peak |

## 802.11ax HE20 mode:

### Low CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5617.920 | 62.93 | 68.20 | -5.27 | 64.07 | -1.14 | Peak |
| 2 | | 5696.400 | 63.80 | 102.55 | -38.75 | 64.64 | -0.84 | Peak |
| 3 | | 5719.440 | 78.87 | 110.64 | -31.77 | 79.62 | -0.75 | Peak |
| 4 | ! | 5746.080 | 119.01 | 122.20 | -3.19 | 119.65 | -0.64 | Peak |
| 5 | | 5865.240 | 63.66 | 107.93 | -44.27 | 63.81 | -0.15 | Peak |
| 6 | | 5883.240 | 64.76 | 99.08 | -34.32 | 64.83 | -0.07 | Peak |
| 7 | ! | 5950.200 | 64.22 | 68.20 | -3.98 | 64.01 | 0.21 | Peak |
| 1 | ! | 11490.000 | 49.93 | 54.00 | -4.07 | 42.60 | 7.33 | Average |
| 2 | ! | 11490.000 | 61.83 | 74.00 | -12.17 | 54.50 | 7.33 | Peak |
| 3 | ! | 17235.000 | 58.42 | 68.20 | -9.78 | 43.61 | 14.81 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5639.160 | 62.92 | 68.20 | -5.28 | 63.98 | -1.06 | Peak |
| 2 | | 5698.200 | 67.15 | 103.87 | -36.72 | 67.99 | -0.84 | Peak |
| 3 | | 5718.360 | 86.95 | 110.34 | -23.39 | 87.70 | -0.75 | Peak |
| 4 | ! | 5738.160 | 121.90 | 122.20 | -0.30 | 122.57 | -0.67 | Peak |
| 5 | | 5863.080 | 64.63 | 108.54 | -43.91 | 64.79 | -0.16 | Peak |
| 6 | | 5899.800 | 64.46 | 86.81 | -22.35 | 64.47 | -0.01 | Peak |
| 7 | ! | 5958.120 | 64.43 | 68.20 | -3.77 | 64.19 | 0.24 | Peak |
| 1 | ! | 11490.000 | 51.98 | 54.00 | -2.02 | 44.65 | 7.33 | Average |
| 2 | ! | 11490.000 | 65.18 | 74.00 | -8.82 | 57.85 | 7.33 | Peak |
| 3 | ! | 17235.000 | 60.40 | 68.20 | -7.80 | 45.59 | 14.81 | Peak |

### Middle CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5613.960 | 62.81 | 68.20 | -5.39 | 63.97 | -1.16 | Peak |
| 2 | | 5685.600 | 62.95 | 94.58 | -31.63 | 63.84 | -0.89 | Peak |
| 3 | | 5709.000 | 63.14 | 107.72 | -44.58 | 63.93 | -0.79 | Peak |
| 4 | ! | 5784.960 | 118.40 | 122.20 | -3.80 | 118.88 | -0.48 | Peak |
| 5 | | 5858.040 | 63.97 | 109.95 | -45.98 | 64.14 | -0.17 | Peak |
| 6 | | 5895.480 | 64.31 | 90.01 | -25.70 | 64.33 | -0.02 | Peak |
| 7 | ! | 5962.440 | 64.63 | 68.20 | -3.57 | 64.37 | 0.26 | Peak |
| 1 | ! | 11570.000 | 49.38 | 54.00 | -4.62 | 41.94 | 7.44 | Average |
| 2 | ! | 11570.000 | 61.14 | 74.00 | -12.86 | 53.70 | 7.44 | Peak |
| 3 | ! | 17335.000 | 59.57 | 68.20 | -8.63 | 44.47 | 15.10 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5619.360 | 62.35 | 68.20 | -5.85 | 63.49 | -1.14 | Peak |
| 2 | | 5691.000 | 63.51 | 98.56 | -35.05 | 64.37 | -0.86 | Peak |
| 3 | | 5708.640 | 64.36 | 107.62 | -43.26 | 65.16 | -0.80 | Peak |
| 4 | ! | 5790.360 | 121.29 | 122.20 | -0.91 | 121.74 | -0.45 | Peak |
| 5 | | 5868.120 | 65.33 | 107.12 | -41.79 | 65.47 | -0.14 | Peak |
| 6 | | 5885.400 | 64.56 | 97.48 | -32.92 | 64.63 | -0.07 | Peak |
| 7 | ! | 5940.120 | 65.29 | 68.20 | -2.91 | 65.13 | 0.16 | Peak |
| 1 | ! | 11570.000 | 51.42 | 54.00 | -2.58 | 43.98 | 7.44 | Average |
| 2 | ! | 11570.000 | 64.01 | 74.00 | -9.99 | 56.57 | 7.44 | Peak |
| 3 | ! | 17355.000 | 59.83 | 68.20 | -8.37 | 44.64 | 15.19 | Peak |

### High CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5625.120 | 63.48 | 68.20 | -4.72 | 64.59 | -1.11 | Peak |
| 2 | | 5688.480 | 63.01 | 96.70 | -33.69 | 63.88 | -0.87 | Peak |
| 3 | | 5714.760 | 63.63 | 109.33 | -45.70 | 64.39 | -0.76 | Peak |
| 4 | ! | 5829.240 | 118.41 | 122.20 | -3.79 | 118.72 | -0.31 | Peak |
| 5 | | 5855.160 | 77.58 | 110.76 | -33.18 | 77.76 | -0.18 | Peak |
| 6 | | 5899.080 | 64.07 | 87.34 | -23.27 | 64.08 | -0.01 | Peak |
| 7 | ! | 5945.520 | 64.38 | 68.20 | -3.82 | 64.20 | 0.18 | Peak |
| 1 | ! | 11650.000 | 49.04 | 54.00 | -4.96 | 41.42 | 7.62 | Average |
| 2 | ! | 11650.000 | 61.73 | 74.00 | -12.27 | 54.11 | 7.62 | Peak |
| 3 | ! | 17475.000 | 58.94 | 68.20 | -9.26 | 43.18 | 15.76 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5647.800 | 63.40 | 68.20 | -4.80 | 64.43 | -1.03 | Peak |
| 2 | | 5688.120 | 63.40 | 96.44 | -33.04 | 64.27 | -0.87 | Peak |
| 3 | | 5708.640 | 63.36 | 107.62 | -44.26 | 64.16 | -0.80 | Peak |
| 4 | ! | 5818.440 | 121.95 | 122.20 | -0.25 | 122.29 | -0.34 | Peak |
| 5 | | 5858.400 | 75.29 | 109.85 | -34.56 | 75.46 | -0.17 | Peak |
| 6 | | 5880.000 | 64.72 | 101.49 | -36.77 | 64.80 | -0.08 | Peak |
| 7 | ! | 5946.600 | 64.79 | 68.20 | -3.41 | 64.61 | 0.18 | Peak |
| 1 | ! | 11650.000 | 50.24 | 54.00 | -3.76 | 42.62 | 7.62 | Average |
| 2 | ! | 11650.000 | 62.38 | 74.00 | -11.62 | 54.76 | 7.62 | Peak |
| 3 | ! | 17475.000 | 60.43 | 68.20 | -7.77 | 44.67 | 15.76 | Peak |

## 802.11ax HE40 mode:

### Low CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5630.160 | 62.86 | 68.20 | -5.34 | 63.95 | -1.09 | Peak |
| 2 | | 5697.840 | 71.84 | 103.61 | -31.77 | 72.68 | -0.84 | Peak |
| 3 | | 5719.800 | 88.49 | 110.74 | -22.25 | 89.23 | -0.74 | Peak |
| 4 | ! | 5769.840 | 116.94 | 122.20 | -5.26 | 117.49 | -0.55 | Peak |
| 5 | | 5856.240 | 64.20 | 110.45 | -46.25 | 64.38 | -0.18 | Peak |
| 6 | | 5893.680 | 64.16 | 91.34 | -27.18 | 64.19 | -0.03 | Peak |
| 7 | ! | 5944.080 | 64.46 | 68.20 | -3.74 | 64.29 | 0.17 | Peak |
| 1 | ! | 11510.000 | 46.30 | 54.00 | -7.70 | 38.95 | 7.35 | Average |
| 2 | ! | 11510.000 | 57.89 | 74.00 | -16.11 | 50.54 | 7.35 | Peak |
| 3 | ! | 17265.000 | 57.22 | 68.20 | -10.98 | 42.30 | 14.92 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5629.800 | 63.54 | 68.20 | -4.66 | 64.64 | -1.10 | Peak |
| 2 | | 5700.000 | 77.50 | 105.20 | -27.70 | 78.32 | -0.82 | Peak |
| 3 | ! | 5719.800 | 93.93 | 110.74 | -16.81 | 94.67 | -0.74 | Peak |
| 4 | ! | 5739.960 | 121.10 | 122.20 | -1.10 | 121.76 | -0.66 | Peak |
| 5 | | 5856.600 | 65.47 | 110.35 | -44.88 | 65.65 | -0.18 | Peak |
| 6 | | 5885.400 | 65.28 | 97.48 | -32.20 | 65.35 | -0.07 | Peak |
| 7 | ! | 5937.600 | 64.50 | 68.20 | -3.70 | 64.35 | 0.15 | Peak |
| 1 | ! | 11510.000 | 49.30 | 54.00 | -4.70 | 41.95 | 7.35 | Average |
| 2 | ! | 11510.000 | 60.75 | 74.00 | -13.25 | 53.40 | 7.35 | Peak |
| 3 | ! | 17265.000 | 58.99 | 68.20 | -9.21 | 44.07 | 14.92 | Peak |

### High CH

#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5648.520 | 63.10 | 68.20 | -5.10 | 64.12 | -1.02 | Peak |
| 2 | | 5685.600 | 63.84 | 94.58 | -30.74 | 64.73 | -0.89 | Peak |
| 3 | | 5719.440 | 66.70 | 110.64 | -43.94 | 67.45 | -0.75 | Peak |
| 4 | ! | 5779.920 | 117.75 | 122.20 | -4.45 | 118.24 | -0.49 | Peak |
| 5 | | 5863.800 | 69.81 | 108.33 | -38.52 | 69.97 | -0.16 | Peak |
| 6 | | 5878.560 | 65.93 | 102.56 | -36.63 | 66.02 | -0.09 | Peak |
| 7 | ! | 5946.960 | 64.77 | 68.20 | -3.43 | 64.59 | 0.18 | Peak |
| 1 | ! | 11590.000 | 47.08 | 54.00 | -6.92 | 39.60 | 7.48 | Average |
| 2 | ! | 11590.000 | 59.43 | 74.00 | -14.57 | 51.95 | 7.48 | Peak |
| 3 | ! | 17385.000 | 57.84 | 68.20 | -10.36 | 42.52 | 15.32 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5619.000 | 63.64 | 68.20 | -4.56 | 64.78 | -1.14 | Peak |
| 2 | | 5694.240 | 65.43 | 100.95 | -35.52 | 66.28 | -0.85 | Peak |
| 3 | | 5719.080 | 70.37 | 110.54 | -40.17 | 71.12 | -0.75 | Peak |
| 4 | ! | 5799.000 | 119.84 | 122.20 | -2.36 | 120.26 | -0.42 | Peak |
| 5 | | 5858.400 | 74.87 | 109.85 | -34.98 | 75.04 | -0.17 | Peak |
| 6 | | 5881.440 | 69.35 | 100.42 | -31.07 | 69.43 | -0.08 | Peak |
| 7 | ! | 5960.640 | 64.86 | 68.20 | -3.34 | 64.62 | 0.24 | Peak |
| 1 | ! | 11590.000 | 48.02 | 54.00 | -5.98 | 40.54 | 7.48 | Average |
| 2 | ! | 11590.000 | 61.06 | 74.00 | -12.94 | 53.58 | 7.48 | Peak |
| 3 | ! | 17385.000 | 58.47 | 68.20 | -9.73 | 43.15 | 15.32 | Peak |

## 802.11ax HE80 mode:

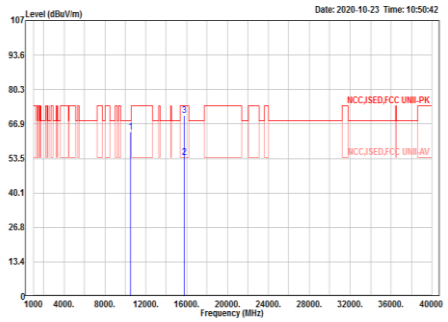
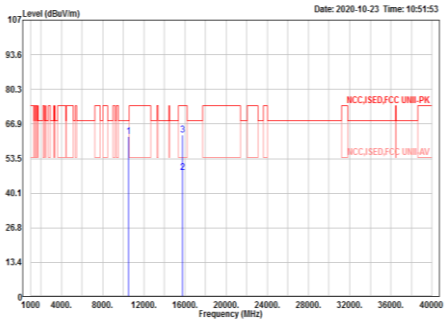
#### Horizontal

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5628.360 | 67.55 | 68.20 | -0.65 | 68.65 | -1.10 | Peak |
| 2 | ! | 5691.000 | 81.69 | 98.56 | -16.87 | 82.55 | -0.86 | Peak |
| 3 | | 5710.440 | 85.36 | 108.13 | -22.77 | 86.14 | -0.78 | Peak |
| 4 | ! | 5766.240 | 112.17 | 122.20 | -10.03 | 112.73 | -0.56 | Peak |
| 5 | | 5858.760 | 78.06 | 109.75 | -31.69 | 78.23 | -0.17 | Peak |
| 6 | | 5878.200 | 72.23 | 102.82 | -30.59 | 72.32 | -0.09 | Peak |
| 7 | ! | 5931.840 | 65.30 | 68.20 | -2.90 | 65.18 | 0.12 | Peak |
| 1 | ! | 11550.000 | 44.93 | 54.00 | -9.07 | 37.51 | 7.42 | Average |
| 2 | ! | 11550.000 | 56.40 | 74.00 | -17.60 | 48.98 | 7.42 | Peak |
| 3 | ! | 17325.000 | 57.67 | 68.20 | -10.53 | 42.60 | 15.07 | Peak |

#### Vertical

| | | Freq | Level | Limit Line | Over Limit | Read Level | Factor | Remark |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | |
| 1 | ! | 5633.040 | 67.33 | 68.20 | -0.87 | 68.41 | -1.08 | Peak |
| 2 | ! | 5651.040 | 68.42 | 68.97 | -0.55 | 69.43 | -1.01 | Peak |
| 3 | | 5714.760 | 88.26 | 109.33 | -21.07 | 89.02 | -0.76 | Peak |
| 4 | ! | 5765.160 | 116.10 | 122.20 | -6.10 | 116.66 | -0.56 | Peak |
| 5 | | 5855.160 | 83.71 | 110.76 | -27.05 | 83.89 | -0.18 | Peak |
| 6 | | 5876.760 | 74.06 | 103.89 | -29.83 | 74.15 | -0.09 | Peak |
| 7 | ! | 5951.280 | 65.60 | 68.20 | -2.60 | 65.39 | 0.21 | Peak |
| 1 | ! | 11550.000 | 47.75 | 54.00 | -6.25 | 40.33 | 7.42 | Average |
| 2 | ! | 11550.000 | 58.35 | 74.00 | -15.65 | 50.93 | 7.42 | Peak |
| 3 | ! | 17325.000 | 58.02 | 68.20 | -10.18 | 42.95 | 15.07 | Peak |

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

| Horizontal | Vertical |
|---|---|
|  <br>Freq Level Limit Line Over Limit Read Level Factor Remark<br>MHz dBuV/m dBuV/m dB dBuV dB/m<br>1 !10480.000 63.87 68.20 -4.33 56.85 7.02 Peak<br>2 !15720.000 53.86 54.00 -0.14 44.15 9.71 Average<br>3 !15720.000 70.03 74.00 -3.97 60.32 9.71 Peak |  <br>Freq Level Limit Line Over Limit Read Level Factor Remark<br>MHz dBuV/m dBuV/m dB dBuV dB/m<br>1 !10480.000 62.12 68.20 -6.08 55.10 7.02 Peak<br>2 !15720.000 48.21 54.00 -5.79 38.50 9.71 Average<br>3 !15720.000 62.58 74.00 -11.42 52.87 9.71 Peak |

*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*

# 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 ≥ 3 · 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. |
|---|---|---|---|---|---|
| **Conducted Room** | | | | | |
| Spectrum Analyzer | Rohde & Schwarz | FSV40-N | 100406 | 2020/03/11 | 2021/03/10 |
| Cable | MTJ | MT40S | 620620-MT40S-100 | Each use | - |

***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 Data and Test Plot

**UNII-1**

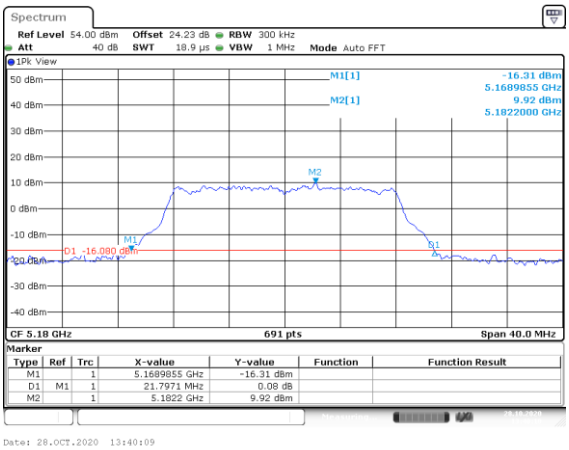
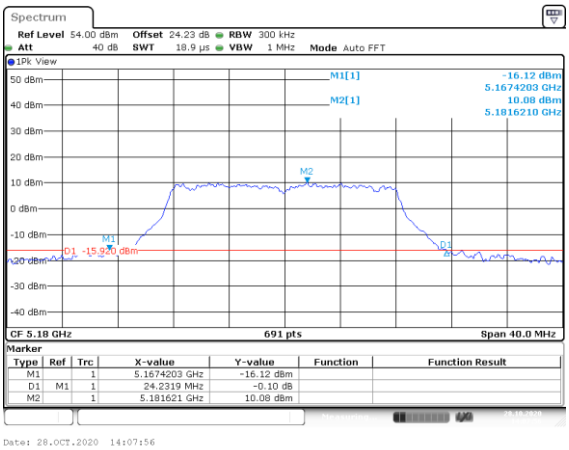
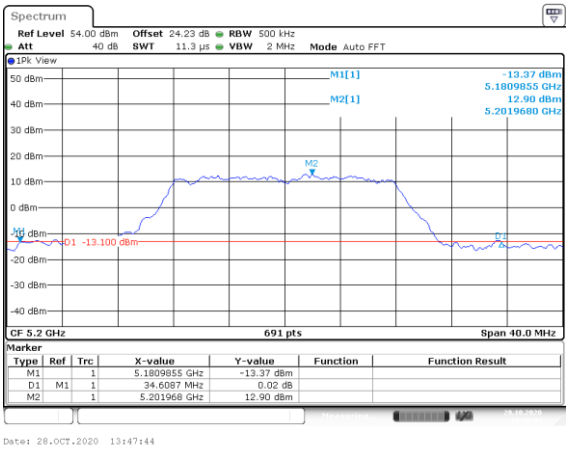
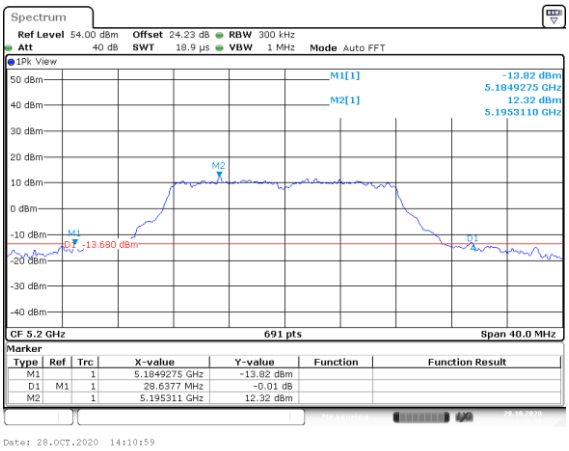
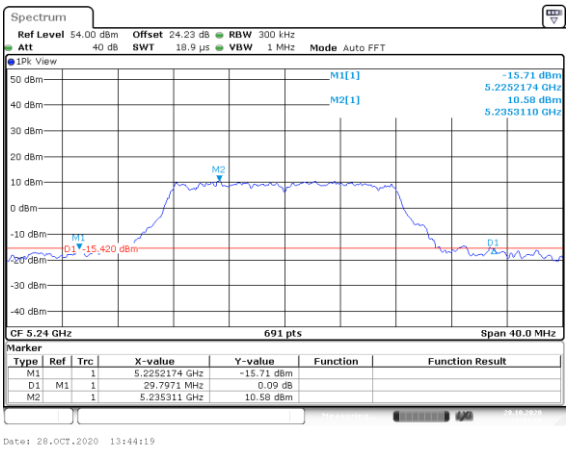
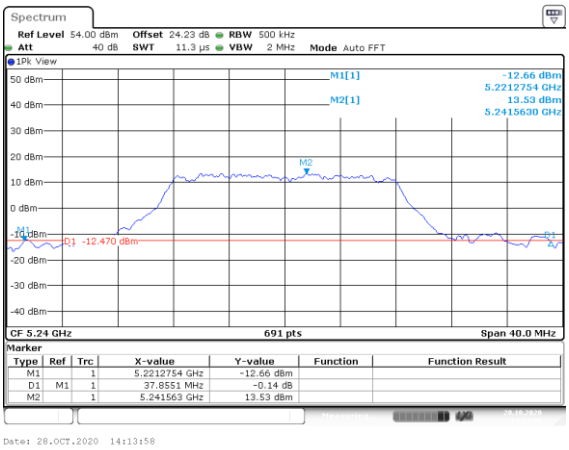
| Mode | Channel | Frequency (MHz) | 26dB Emission Bandwidth (MHz) | | | |
|---|---|---|---|---|---|---|
| | | | Ant. 1 | Ant. 2 | Ant. 3 | Ant. 4 |
| 802.11a | 36 | 5180 | 21.80 | 24.23 | 33.91 | 22.20 |
| | 40 | 5200 | 34.61 | 28.64 | 23.71 | 23.30 |
| | 48 | 5240 | 29.80 | 37.86 | 36.58 | 22.14 |
| 802.11ax HE20 | 36 | 5180 | 24.12 | 25.22 | 33.86 | 21.68 |
| | 40 | 5200 | 28.17 | 34.26 | 35.94 | 22.43 |
| | 48 | 5240 | 27.54 | 33.91 | 39.59 | 23.42 |
| 802.11ax HE40 | 38 | 5190 | 40.35 | 39.88 | 40.00 | 40.46 |
| | 46 | 5230 | 64.81 | 69.80 | 72.12 | 44.64 |
| 802.11ax HE80 | 42 | 5210 | 82.09 | 82.09 | 81.16 | 80.93 |

**UNII-3**

| Mode | Channel | Frequency (MHz) | 6dB Emission Bandwidth (MHz) | | | | Limit (MHz) |
|---|---|---|---|---|---|---|---|
| | | | Ant. 1 | Ant. 2 | Ant. 3 | Ant. 4 | |
| 802.11a | 149 | 5745 | 16.35 | 16.35 | 16.35 | 16.35 | >0.5 |
| | 157 | 5785 | 16.35 | 16.35 | 16.35 | 16.35 | >0.5 |
| | 165 | 5825 | 16.35 | 16.35 | 16.35 | 16.35 | >0.5 |
| 802.11ax HE20 | 149 | 5745 | 18.96 | 19.01 | 18.90 | 18.96 | >0.5 |
| | 157 | 5785 | 18.90 | 19.01 | 18.78 | 18.96 | >0.5 |
| | 165 | 5825 | 18.96 | 19.01 | 18.78 | 19.01 | >0.5 |
| 802.11ax HE40 | 151 | 5755 | 37.57 | 36.99 | 37.57 | 37.33 | >0.5 |
| | 159 | 5795 | 37.68 | 37.57 | 37.57 | 36.64 | >0.5 |
| 802.11ax HE80 | 155 | 5775 | 76.75 | 76.99 | 75.36 | 77.68 | >0.5 |

**For UNII-1**

**802.11a mode**

| Ant. 1 | Ant. 2 |
|---|---|
| **Low CH** | **Low CH** |
|  |  |
| **Middle CH** | **Middle CH** |
|  |  |
| **High CH** | **High CH** |
|  |  |