# Test Report

**FCC Part15 Subpart C & RSS-247 Issue 2**

| | | |
|---|---|---|
| Product Name | : | Wireless Access Point |
| Model No. | : | AP410C |
| FCC ID | : | QXO-AP410C |
| IC | : | 4141B-AP410C |

| | | |
|---|---|---|
| Applicant | : | Extreme Networks, Inc |
| Address | : | 6480 Via Del Oro, San Jose, CA 95119 |

| | | |
|---|---|---|
| Date of Receipt | : | Sep. 20, 2019 |
| Test Date | : | Oct. 14, 2019~ Nov. 27, 2019 |
| Issued Date | : | Dec. 30, 2019 |
| Report No. | : | 1992128R-RF-US-P06V01 |
| Report Version | : | V1.1 |

# Test Report Certification

Issued Date: Dec. 30, 2019
Report No. : 1992128R-RF-US-P06V01

| | | |
|---|---|---|
| Product Name | : | Wireless Access Point |
| Applicant | : | Extreme Networks, Inc |
| Address | : | 6480 Via Del Oro, San Jose, CA 95119 |
| Manufacturer | : | Extreme Networks, Inc |
| Address | : | 6480 Via Del Oro, San Jose, CA 95119 |
| Model No. | : | AP410C |
| Brand | : | Extreme Networks |
| FCC ID | : | QXO-AP410C |
| IC | : | 4141B-AP410C |
| EUT Voltage | : | DC 37~57V |
| Test Voltage | : | AC 120V/60Hz |
| Applicable Standard | : | FCC CFR Title 47 Part 15 Subpart C<br>ANSI C63.10:2013;<br>KDB 558074 D01v05r02<br>KDB 662911 D01 Multiple Transmitter Output v02r01<br>RSS-Gen Issue 5 / RSS-247 Issue 2 |
| Test Result | : | Complied |
| Performed Location | : | DEKRA Testing and Certification (Suzhou) Co., Ltd.<br>No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China<br>TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098<br>FCC Designation Number: CN1199<br>ISED CAB identifier: CN0040 |

Documented By : Kitty Li

( Adm. Specialist: Kitty Li )

Reviewed By : Frank he

(Technical Supervisor: Frank He)

Approved By : Jack zhang

(Engineer Supervisor: Jack Zhang )

# TABLE OF CONTENTS

## History of This Test Report

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| 1992128R-RF-US-P06V01 | V1.0 | Initial Issued Report | Dec. 24, 2019 |
| 1992128R-RF-US-P06V01 | V1.1 | Modified some typos in the report. | Dec. 30, 2019 |
| | | | |
| | | | |

# 1. General Information

## 1.1. EUT Description

| | |
|---|---|
| Product Name | Wireless Access Point |
| Model No. | AP410C |
| EUT Voltage | DC 37~57V |
| Frequency Range | For 2.4GHz Band<br>802.11b/g/n/ax(20MHz): 2412~2462MHz |
| Channel Number | For 2.4GHz Band<br>802.11b/g/n/ax(20MHz): 11 |
| Type of Modulation | 802.11b: DSSS-DBPSK, DQPSK, CCK |
| | 802.11g/n: OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM |
| Data Rate | 802.11b: 1/2/5.5/11 Mbps |
| | 802.11g: 6/9/12/18/24/36/48/54 Mbps |
| | 802.11n: up to 144.4 Mbps |
| | 802.11ax: up to 286 Mbps |
| Channel Control | Auto |

## 1.2. Working Frequency of Each Channel:

| 802.11b/g/n/ax Working Frequency of Each Channel: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 01 | 2412 MHz | 02 | 2417 MHz | 03 | 2422 MHz | 04 | 2427 MHz |
| 05 | 2432 MHz | 06 | 2437 MHz | 07 | 2442 MHz | 08 | 2447 MHz |
| 09 | 2452 MHz | 10 | 2457 MHz | 11 | 2462 MHz | N/A | N/A |

## 1.3. Antenna information

**AP410C:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Antenna Model No. | N/A | | | | | |
| Antenna Manufacturer | N/A | | | | | |
| Antenna Delivery | ☒ | 1*TX+1*RX | ☒ | 2*TX+2*RX | ☐ | 3*TX+3*RX |
| Antenna Technology | ☒ | SISO | | | | |
| | ☒ | MIMO | ☐ | Basic methodology | | |
| | | | ☐ | Sectorized antenna systems | | |
| | | | ☐ | Cross-polarized antennas | | |
| | | | ☐ | Unequal antenna gains, with equal transmit powers | | |
| | | | ☒ | Spatial Multiplexing | | |
| | | | ☒ | Cyclic Delay Diversity (CDD) | | |
| Antenna Type | PIFA | | | | | |
| Antenna Gain(Radio 1) | | | | | | |
| Antenna Technology | Ant Gain (dBi) | | | | | |
| Ant 4(Radio 1) | 4.00 | | | | | |
| Antenna Gain(Radio 2) | | | | | | |
| Antenna Technology | Ant Gain (dBi) | | | | | |
| ☒ SISO | ☒ Ant1 (Radio 2) | 3.80 | | | | |
| | ☒ Ant2 (Radio 2) | 3.90 | | | | |
| ☒ CDD | 3.90dBi for Power; 6.91dBi for PSD | | | | | |
| ☒ Beam-forming | 6.91dBi for Power; 6.91dBi for PSD | | | | | |

Note: The device supports 3 radios, radio 1(1*1 2.4GHz & 1*1 5GHz full band); radio 2(2*2 2.4GHz & 2*2 5GHz low band); radio 3(4*4 5GHz full band & 1*1 BLE), and radio 2 & 3 can works with Dual 2.4GHz & 5GHz mode and Dual 5GHz mode. As the 5GHz high band filter is different between two modes, additional Radio 3 5GHz high band mode is tested for compliance.

Dual 2.4GHz & 5GHz mode: Radio 2(2.4GHz 2*2) + Radio 3(5GHz full band 4*4)

Dual 5GHz mode: Radio 2(5GHz low band 2*2) + Radio 3(5GHz high band 4*4)

## 1.4. Mode of Operation

| Test Modes List |
|---|
| Mode 1: Transmit by 802.11b |
| Mode 2: Transmit by 802.11g |
| Mode 3: Transmit by 802.11n(20MHz) |
| Mode 4: Transmit by 802.11ax(20MHz) |
| Mode 5: Transmit by 802.11n(20MHz) by Beam-forming |
| Mode 6: Transmit by 802.11ax(20MHz) by Beam-forming |

Note 1: Regards to the frequency band operation: the lowest, middle and highest frequency channel were selected to perform the test, then shown on this report.

Note 2: For portable device, radiated tests was verified over X, Y, Z axis, and shown the worst case on this report.

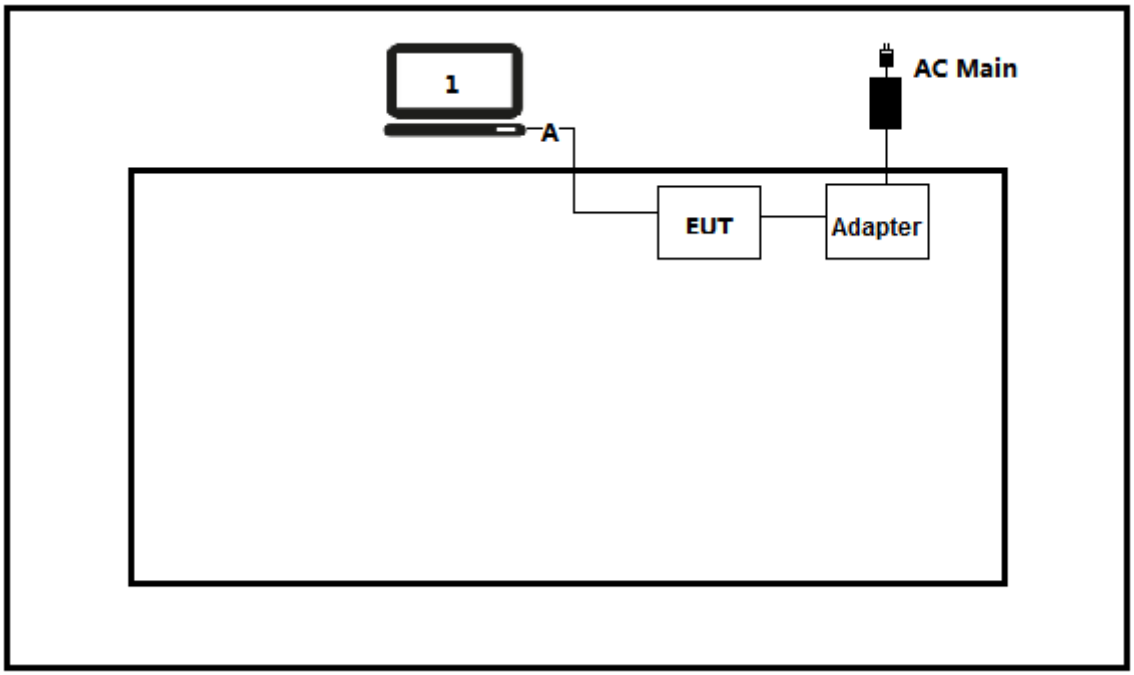
## 1.5. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

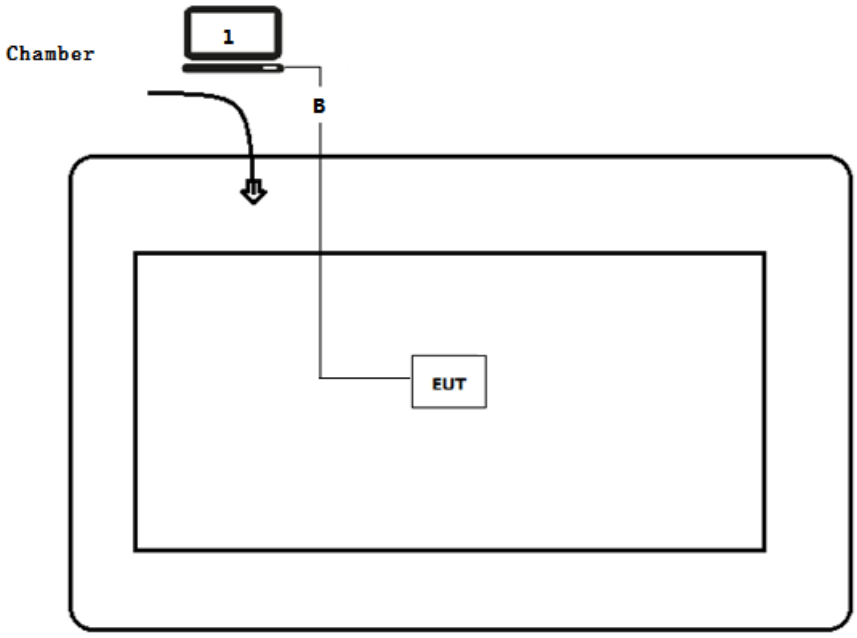
| No. | Product | Manufacturer | Model No. | Serial No. | Power Cord |
|---|---|---|---|---|---|
| 1 | Notebook | Lenovo | Think pad x220 | SUA0600195 | Non-shielded |
| A | LAN cable | N/A | N/A | N/A | Shielded, 0.5m |
| B | LAN cable | N/A | N/A | N/A | Shielded, 10m |

## 1.6. Configuration of Tested System

Test setup Diagram- AC Line Conducted Emission Test




Test setup Diagram- Radiated Emission



## 1.7. EUT Exercise Software

| | |
|---|---|
| 1 | Setup the EUT and simulators as shown on above. |
| 2 | Turn on the power of equipment. |
| 3 | Run RF software [MTool], and set the test mode and channel, then press OK to start to continue transmit. |

# 2. Technical Test

## 2.1. Summary of Test Result

**For FCC rule:**

| Performed Test Item | Normative References | Limit | Result |
|---|---|---|---|
| AC Power Line Conducted Emission | FCC CFR Title 47 Part 15 Subpart C: Section 15.207 | FCC 15.207 | PASS |
| Emissions in restricted frequency bands | FCC CFR Title 47 Part 15 Subpart C: Section 15.209 | FCC 15.209 | PASS |
| Emissions in non-restricted frequency bands | FCC CFR Title 47 Part 15 Subpart C: Section 15.247(d) | ⩾30dBc | PASS |
| Radiated Emission Band Edge | FCC CFR Title 47 Part 15 Subpart C: Section 15.205 | FCC 15.209 | PASS |
| Occupied Bandwidth | FCC CFR Title 47 Part 15 Subpart C: Section 15.247(a)(2) | ⩾500kHz | PASS |
| Fundamental emission output power | FCC CFR Title 47 Part 15 Subpart C: Section 15.247(b)(3) | ⩽30dBm | PASS |
| Power Spectral Density | FCC CFR Title 47 Part 15 Subpart C: Section 15.247(e) | ⩽8dBm/3kHz | PASS |
| Antenna Requirement | FCC CFR Title 47 Part 15 Subpart C: Section 15.203 | FCC 15.203 | PASS |

**For ISED rule:**

| Performed Test Item | Normative References | Limit | Result |
|---|---|---|---|
| AC Power Line Conducted Emission | RSS-Gen Issue 5 Section 8.8 | RSS-Gen | N/A |
| Emissions in restricted frequency bands | RSS-Gen Issue 5 Section 8.9 | RSS-Gen | PASS |
| Emissions in non-restricted frequency bands | RSS-247 Issue 2 Section 5.5 | ⩾30dBc | PASS |
| Radiated Emission Band Edge | RSS-Gen Issue 5 Section 8.10 | RSS-247 | PASS |
| Occupied Bandwidth | RSS-Gen Issue 5 Section 6.7 RSS-247 Issue 2 Section 5.2(a) | Within Band ⩾500kHz | PASS |
| Fundamental emission output power | RSS-247 Issue 2 Section 5.4(d) | ⩽30dBm | PASS |
| Power Spectral Density | RSS-247 Issue 2 Section 5.2(b) | ⩽8dBm/3kHz | PASS |
| Antenna Requirement | RSS-Gen Issue 5 Section 6.8 | RSS-Gen Issue 5 | PASS |

## 2.2. Test Frequency configuration:

| Modulation Mode | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|---|
| **802.11b** | 01 | 2412 MHz | 06 | 2437MHz | 11 | 2462MHz |
| **802.11g** | 01 | 2412 MHz | 06 | 2437MHz | 11 | 2462MHz |
| **802.11n(20MHz)** | 01 | 2412 MHz | 06 | 2437MHz | 11 | 2462MHz |
| **802.11ax(20MHz)** | 01 | 2412 MHz | 06 | 2437MHz | 11 | 2462MHz |

## 2.3. Power vs Data Rate

| MCS Index for 802.11n | Spatial Streams (Note1) | Data Rate (Mbps) | | | |
|---|---|---|---|---|---|
| | | 802.11b | 802.11g | 20MHz Bandwidth | |
| | | | | 800ns GI | 400ns GI |
| 0 | 1 | 1 | 6 | 6.5 | 7.2 |
| 1 | 1 | 2 | 9 | 13.0 | 14.4 |
| 2 | 1 | 5.5 | 12 | 19.5 | 21.7 |
| 3 | 1 | 11 | 18 | 26.0 | 28.9 |
| 4 | 1 | --- | 24 | 39.0 | 43.3 |
| 5 | 1 | --- | 36 | 52.0 | 57.8 |
| 6 | 1 | --- | 48 | 58.5 | 65.0 |
| 7 | 1 | --- | 54 | 65.0 | 72.2 |
| 8 | 2 | --- | --- | 13.0 | 14.4 |
| 9 | 2 | --- | --- | 26.0 | 28.9 |
| 10 | 2 | --- | --- | 39.0 | 43.3 |
| 11 | 2 | --- | --- | 52.0 | 57.8 |
| 12 | 2 | --- | --- | 78.0 | 86.7 |
| 13 | 2 | --- | --- | 104.0 | 115.6 |
| 14 | 2 | --- | --- | 117.0 | 130.0 |
| 15 | 2 | --- | --- | 130.0 | 144.0 |

**Note 1: The EUT supports all data rate above. The blue form is the maximum power data rate**

**Note 2: The EUT has two spatial Streams**

| MCS Index | Spatial Streams (Note1) | Modulation type | Coding rate | Data Rate(Mb/s) | |
|---|---|---|---|---|---|
| | | | | 20MHz | |
| | | | | Guard Interval | |
| | | | | 1600 ns GI | 800 ns GI |
| 0 | 1 | BPSK | 1/2 | 8 | 8 |
| 1 | 1 | QPSK | 1/2 | 16 | 17 |
| 2 | 1 | QPSK | 3/4 | 24 | 26 |
| 3 | 1 | 16-QAM | 1/2 | 33 | 34 |
| 4 | 1 | 16-QAM | 3/4 | 49 | 52 |
| 5 | 1 | 64-QAM | 2/3 | 65 | 69 |
| 6 | 1 | 64-QAM | 3/4 | 73 | 77 |
| 7 | 1 | 64-QAM | 5/6 | 81 | 86 |
| 8 | 1 | 256-QAM | 3/4 | 98 | 103 |
| 9 | 1 | 256-QAM | 5/6 | 108 | 115 |
| 10 | 1 | 1024-QAM | 3/4 | 122 | 129 |
| 11 | 1 | 1024-QAM | 5/6 | 135 | 143 |
| 12 | 2 | BPSK | 1/2 | 16 | 16 |
| 13 | 2 | QPSK | 1/2 | 32 | 34 |
| 14 | 2 | QPSK | 3/4 | 48 | 52 |
| 15 | 2 | 16-QAM | 1/2 | 66 | 68 |
| 16 | 2 | 16-QAM | 3/4 | 98 | 104 |
| 17 | 2 | 64-QAM | 2/3 | 130 | 138 |
| 18 | 2 | 64-QAM | 3/4 | 146 | 154 |
| 19 | 2 | 64-QAM | 5/6 | 162 | 172 |
| 20 | 2 | 256-QAM | 3/4 | 196 | 206 |
| 21 | 2 | 256-QAM | 5/6 | 216 | 230 |
| 22 | 2 | 1024-QAM | 3/4 | 244 | 258 |
| 23 | 2 | 1024-QAM | 5/6 | 270 | 286 |

**Note 1: The EUT supports all data rate above. The blue form is the maximum power data rate**

**Note 2: The EUT has two spatial Streams**

## 2.4. Test Environment

| Items | Required (IEC 68-1) | Actual |
|---|---|---|
| Temperature (°C) | 15-35 | 21 |
| Humidity (%RH) | 25-75 | 50 |
| Barometric pressure (mbar) | 860-1060 | 950-1000 |

## 2.5. Measurement Uncertainty

| Test Items | Uncertainty |
|---|---|
| AC Power Line Conducted Emission | ±2.02dB |
| Radiated Emission | Below 1GHz ±3.8 dB |
| | Above 1GHz ±3.9 dB |
| RF Antenna Port Conducted Emission | ±1.27dB |
| Radiated Emission Band Edge | ±3.9dB |
| Occupied Bandwidth | ±1kHz |
| Power Spectral Density | ±1.27dB |

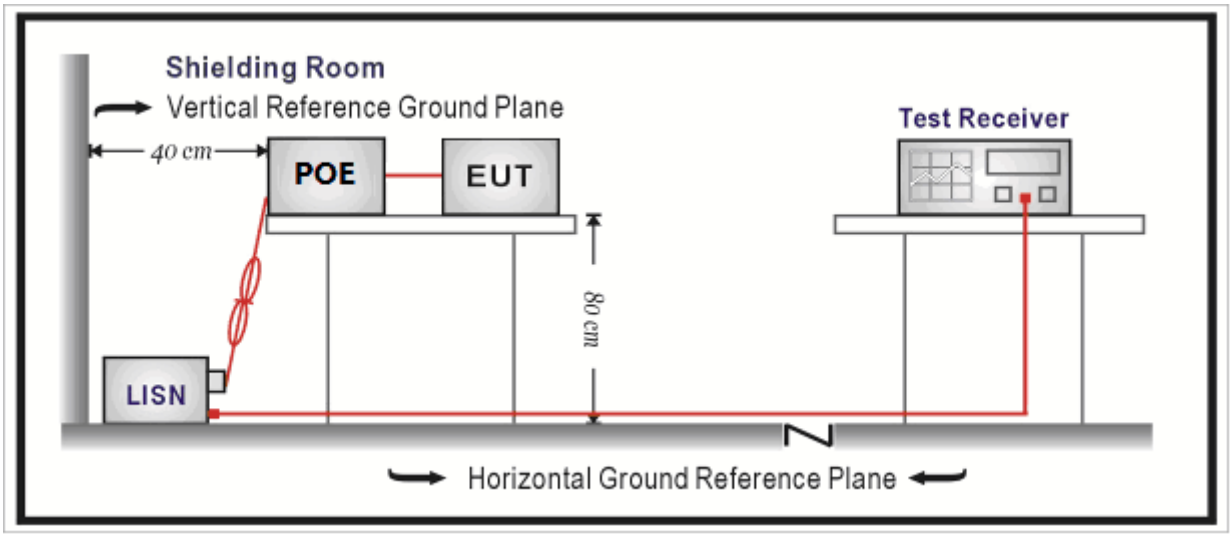
# 3. AC Power Line Conducted Emission

## 3.1. Test Equipment

| AC Power Line Conducted Emission / TR-1 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| EMI Test Receiver | R&S | ESCI | 100726 | 2019.03.29 | 2020.03.28 |
| Two-Line V-Network | R&S | ENV216 | 100043 | 2019.03.29 | 2020.03.28 |
| Two-Line V-Network | R&S | ENV216 | 100044 | 2019.09.17 | 2020.09.16 |
| 50ohm Coaxial Switch | Anritsu | MP59B | 6200464462 | 2019.03.02 | 2020.03.01 |
| 50ohm Termination | SHX | TF2 | 07081401 | 2019.09.17 | 2020.09.16 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR1-TH | 2019.01.04 | 2020.01.03 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 3.2. Test Setup

AC Power Line Conducted Emission test setup



## 3.3. Limit

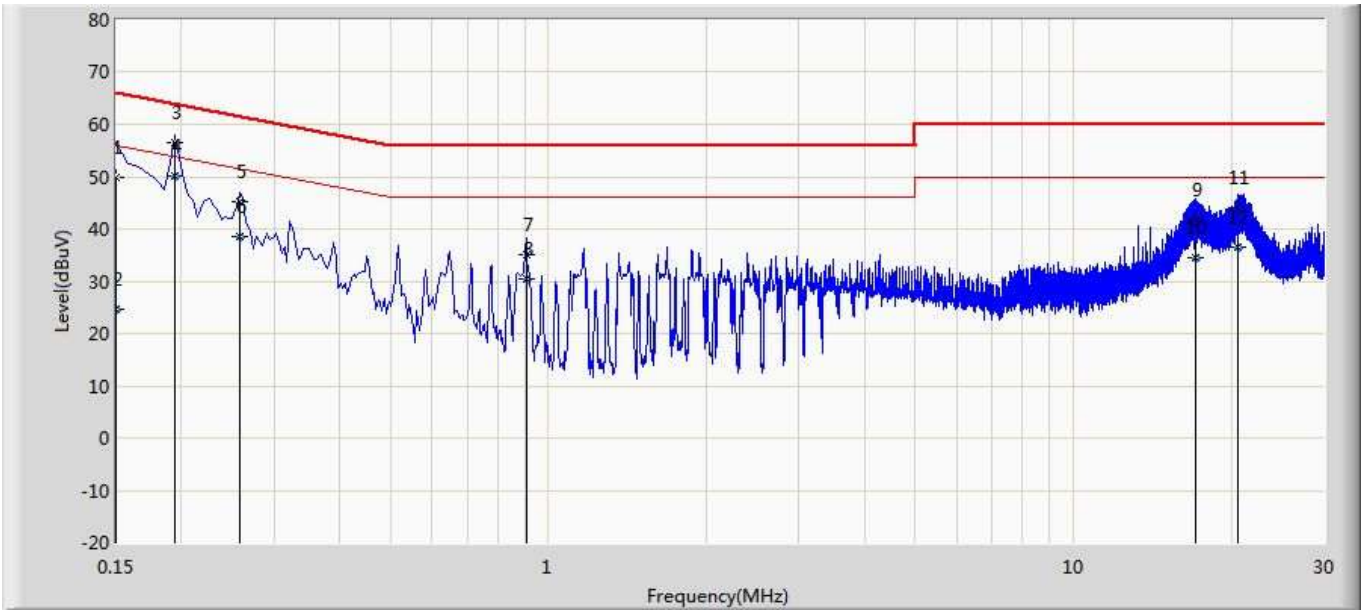
| Frequency of Emission (MHz) | Conducted Limit | |
|---|---|---|
| | Quasi-peak (dBμV) | Average(dBμV) |
| 0.15-0.5 | 66 to 56 | 56 to 46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| Note 1: The lower limit shall apply at the transition frequencies.<br>Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. | | |

## 3.4. Test Procedure

| Test Method | | | |
|---|---|---|---|
| | References Rule | Chapter | Item |
| ☒ | ANSI C63.10-2013 | 6.2 | Standard test method for ac power-line conducted emissions from unlicensed wireless devices |

## 3.5. Test Result

| | |
|---|---|
| Site: TR1 | Time: 2019/11/20 |
| Limit: FCC_Part15.207_CE_AC Power | Margin: 0 |
| Probe: ENV216_101190(0.009-30MHz) | Polarity: Line |
| EUT: Wireless Access Point | Power: AC 120V/60Hz |
| Note: Simultaneous transmission with 2.4G WIFI + 5G WIFI + BLE | |

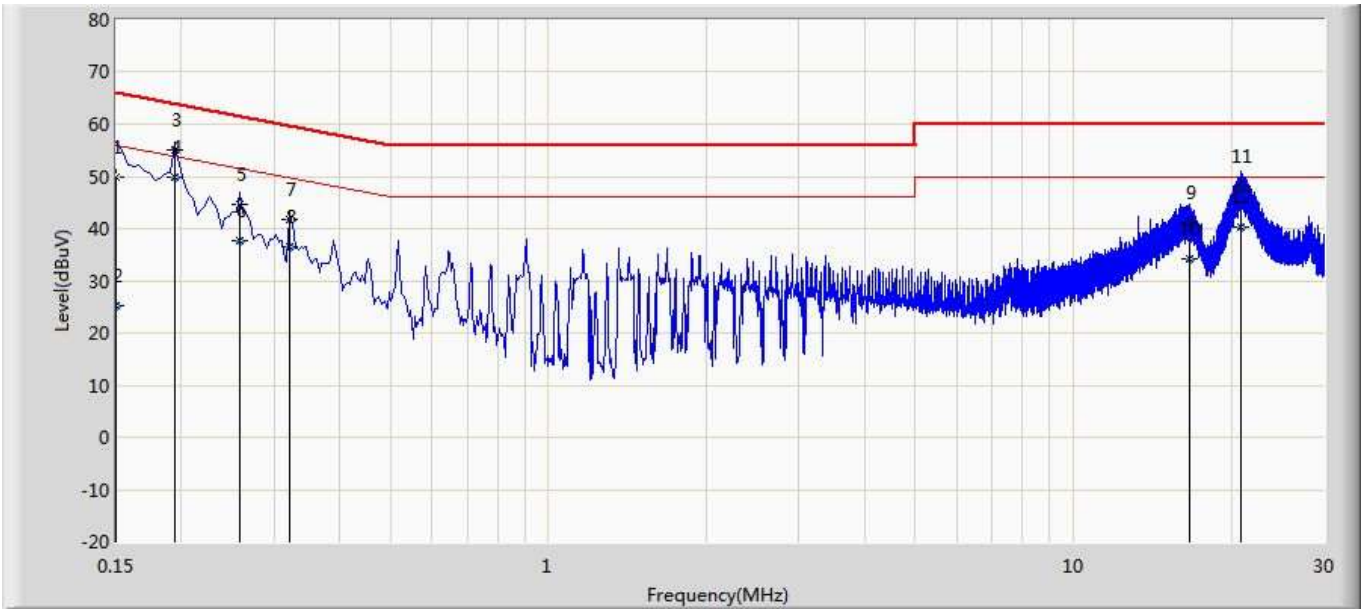



| No | Mark | Frequency (MHz) | Measure Level (dBuV) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV) | Probe (dB) | Cable (dB) | Amp (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0.150 | 49.896 | 40.296 | -16.104 | 66.000 | 9.570 | 0.029 | 0.000 | QP |
| 2 | | 0.150 | 24.774 | 15.174 | -31.226 | 56.000 | 9.570 | 0.029 | 0.000 | AV |
| 3 | | 0.194 | 56.574 | 46.959 | -7.290 | 63.864 | 9.587 | 0.028 | 0.000 | QP |
| 4 | * | 0.194 | 50.011 | 40.396 | -3.852 | 53.864 | 9.587 | 0.028 | 0.000 | AV |
| 5 | | 0.258 | 45.104 | 35.478 | -16.392 | 61.496 | 9.594 | 0.032 | 0.000 | QP |
| 6 | | 0.258 | 38.532 | 28.906 | -12.964 | 51.496 | 9.594 | 0.032 | 0.000 | AV |
| 7 | | 0.906 | 35.115 | 25.432 | -20.885 | 56.000 | 9.627 | 0.057 | 0.000 | QP |
| 8 | | 0.906 | 30.304 | 20.621 | -15.696 | 46.000 | 9.627 | 0.057 | 0.000 | AV |
| 9 | | 17.138 | 41.883 | 31.681 | -18.117 | 60.000 | 9.936 | 0.266 | 0.000 | QP |
| 10 | | 17.138 | 34.557 | 24.355 | -15.443 | 50.000 | 9.936 | 0.266 | 0.000 | AV |
| 11 | | 20.626 | 44.123 | 33.834 | -15.877 | 60.000 | 9.996 | 0.293 | 0.000 | QP |
| 12 | | 20.626 | 36.523 | 26.233 | -13.477 | 50.000 | 9.996 | 0.293 | 0.000 | AV |

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

| | |
|---|---|
| Site: TR1 | Time: 2019/11/20 |
| Limit: FCC_Part15.207_CE_AC Power | Margin: 0 |
| Probe: ENV216_101190(0.009-30MHz) | Polarity: Neutral |
| EUT: Wireless Access Point | Power: AC 120V/60Hz |
| Note: Simultaneous transmission with 2.4G WIFI + 5G WIFI + BLE | |




| No | Mark | Frequency (MHz) | Measure Level (dBuV) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV) | Probe (dB) | Cable (dB) | Amp (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0.150 | 49.990 | 40.391 | -16.010 | 66.000 | 9.570 | 0.029 | 0.000 | QP |
| 2 | | 0.150 | 25.204 | 15.604 | -30.796 | 56.000 | 9.570 | 0.029 | 0.000 | AV |
| 3 | | 0.194 | 55.046 | 45.431 | -8.817 | 63.864 | 9.587 | 0.028 | 0.000 | QP |
| 4 | * | 0.194 | 49.937 | 40.322 | -3.926 | 53.864 | 9.587 | 0.028 | 0.000 | AV |
| 5 | | 0.258 | 44.677 | 35.051 | -16.819 | 61.496 | 9.594 | 0.032 | 0.000 | QP |
| 6 | | 0.258 | 37.732 | 28.106 | -13.764 | 51.496 | 9.594 | 0.032 | 0.000 | AV |
| 7 | | 0.322 | 41.694 | 32.062 | -17.961 | 59.655 | 9.598 | 0.035 | 0.000 | QP |
| 8 | | 0.322 | 36.449 | 26.816 | -13.206 | 49.655 | 9.598 | 0.035 | 0.000 | AV |
| 9 | | 16.618 | 41.150 | 30.912 | -18.850 | 60.000 | 9.976 | 0.262 | 0.000 | QP |
| 10 | | 16.618 | 34.167 | 23.929 | -15.833 | 50.000 | 9.976 | 0.262 | 0.000 | AV |
| 11 | | 20.822 | 48.030 | 37.667 | -11.970 | 60.000 | 10.068 | 0.295 | 0.000 | QP |
| 12 | | 20.822 | 40.153 | 29.790 | -9.847 | 50.000 | 10.068 | 0.295 | 0.000 | AV |

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

# 4. Emissions in restricted frequency bands

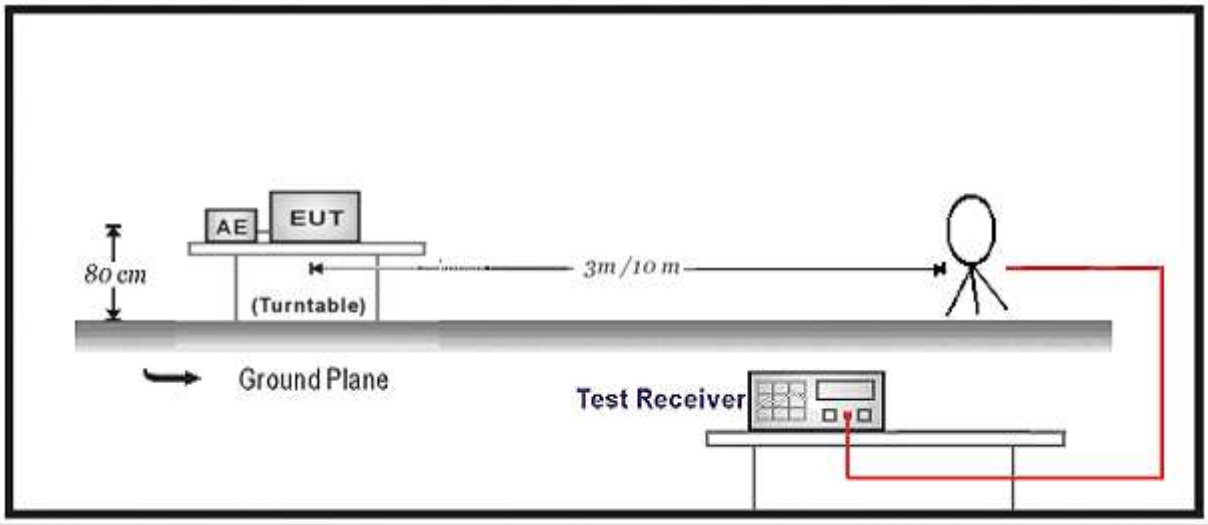
## 4.1. Test Equipment

| Radiated Emission(Below 1GHz) / AC-2 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| EMI Test Receiver | R&S | ESCI | 100573 | 2019.03.29 | 2020.03.28 |
| Loop Antenna | R&S | HFH2-Z2 | 833799/003 | 2019.11.16 | 2020.11.15 |
| Bilog Antenna | Teseq GmbH | CBL6112D | 27611 | 2019.10.16 | 2020.10.15 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC2-C | 2019.03.02 | 2020.03.01 |
| Temperature/Humidity Meter | Zhichen | ZC1-2 | AC2-TH | 2019.01.04 | 2020.01.03 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

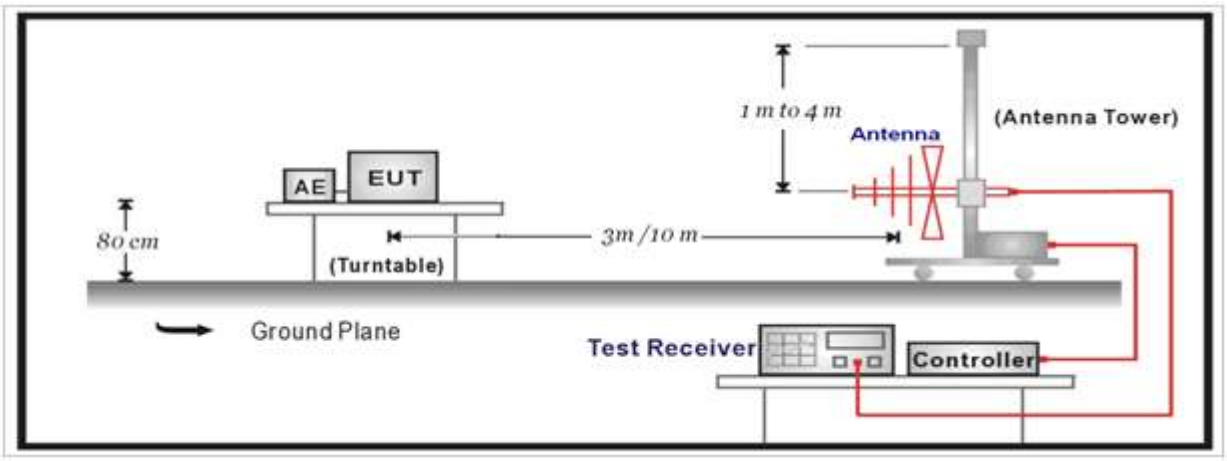
| Radiated Emission(Above 1GHz) / AC-5 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | E4446A | MY45300103 | 2019.01.04 | 2020.01.03 |
| Preamplifier | Miteq | NSP1800-25 | 1364185 | 2019.05.06 | 2020.05.05 |
| Preamplifier | QuieTek | AP-040G | CHM-0906001 | 2019.05.06 | 2020.05.05 |
| DRG Horn | ETS-Lindgren | 3117 | 00123988 | 2019.01.22 | 2020.01.21 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA9170 | 294 | 2019.11.25 | 2020.11.24 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC5-C1 | 2019.03.02 | 2020.03.01 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC5-C2 | 2019.03.02 | 2020.03.01 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 102 | AC5-C3 | 2019.03.02 | 2020.03.01 |
| EMI Receiver | Agilent | N9038A | MY51210196 | 2019.06.10 | 2020.06.09 |
| Temperature/Humidity Meter | Zhichen | ZC1-2 | AC5-TH | 2019.01.04 | 2020.01.03 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 4.2. Test Setup

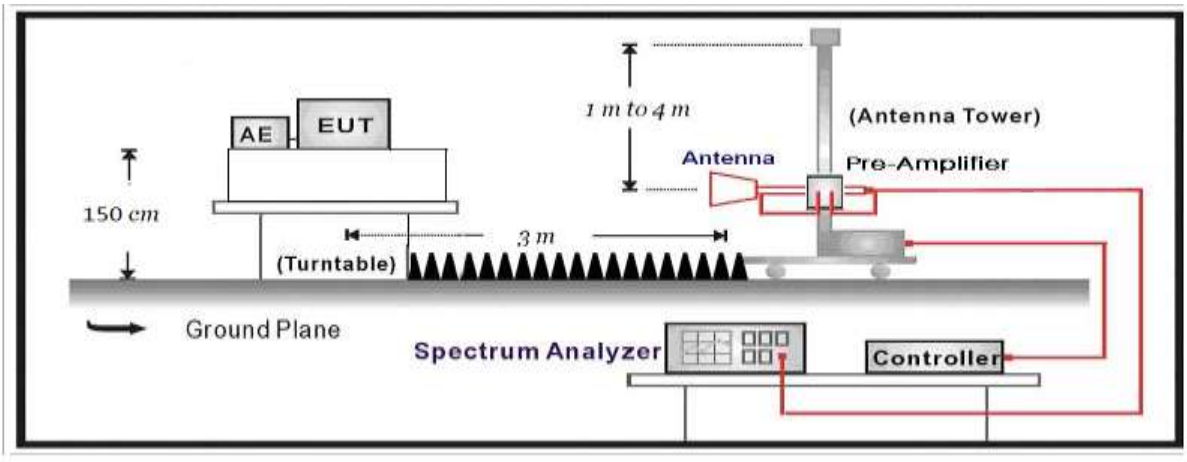
Below 30MHz Test Setup:




30MHz-1GHz Test Setup:




Above 1GHz Test Setup:



## 4.3. Limit

**For FCC**

| Restricted Bands of operation | | | |
|---|---|---|---|
| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (GHz) |
| 0.090 – 0.110 | 16.42 – 16.423 | 399.9 – 410 | 4.5 – 5.15 |
| 0.495 – 0.505 | 16.69475 –16.69525 | 608 – 614 | 5.35 – 5.46 |
| 2.1735 – 2.1905 | 16.80425 – 16.80475 | 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 |
| 8.81425 – 8.81475 | 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 | |
| 13.36 – 13.41 | | | |

**For ISED:**

| MHz | MHz | GHz |
|---|---|---|
| 0.090 - 0.110 | 149.9 - 150.05 | 9.0 - 9.2 |
| 0.495 - 0.505 | 156.52475 - 156.52525 | 9.3 - 9.5 |
| 2.1735 - 2.1905 | 156.7 - 156.9 | 10.6 - 12.7 |
| 3.020 - 3.026 | 162.0125 - 167.17 | 13.25 - 13.4 |
| 4.125 - 4.128 | 167.72 - 173.2 | 14.47 - 14.5 |
| 4.17725 - 4.17775 | 240 – 285 | 15.35 - 16.2 |
| 4.20725 - 4.20775 | 322 - 335.4 | 17.7 - 21.4 |
| 5.677 - 5.683 | 399.9 - 410 | 22.01 - 23.12 |
| 6.215 - 6.218 | 608 - 614 | 23.6 - 24.0 |
| 6.26775 - 6.26825 | 960 - 1427 | 31.2 - 31.8 |
| 6.31175 - 6.31225 | 1435 - 1626.5 | 36.43 - 36.5 |
| 8.291 - 8.294 | 1645.5 - 1646.5 | Above 38.6 |
| 8.362 - 8.366 | 1660 - 1710 | |
| 8.37625 - 8.38675 | 1718.8 - 1722.2 | |
| 8.41425 - 8.41475 | 2200 - 2300 | |
| 12.29 - 12.293 | 2310 - 2390 | |
| 12.51975 - 12.52025 | 2483.5 - 2500 | |
| 12.57675 - 12.57725 | 2655 - 2900 | |
| 13.36 - 13.41 | 3260 – 3267 | |
| 16.42 - 16.423 | 3332 - 3339 | |
| 16.69475 - 16.69525 | 3345.8 - 3358 | |
| 16.80425 - 16.80475 | 3500 - 4400 | |
| 25.5 - 25.67 | 4500 - 5150 | |
| 37.5 - 38.25 | 5350 - 5460 | |
| 73 - 74.6 | 7250 - 7750 | |
| 74.8 - 75.2 | 8025 – 8500 | |
| 108 – 138 | | |

| Restricted Band Emissions Limit | | | |
|---|---|---|---|
| Frequency (MHz) | Field strength ($\mu$V/m) | Field strength (dB$\mu$V/m) | Measurement distance (m) |
| 0.009 - 0.49 | 2400/F(kHz) | 48.5 – 13.8 | 300(Note 1) |
| 0.49 - 1.705 | 24000/F(kHz) | 33.8 - 23 | 30(Note 1) |
| 1.705 - 30 | 30 | 29.5 | 30(Note 1) |
| 30 - 88 | 100 | 40 | 3(Note 2) |
| 88 - 216 | 150 | 43.5 | 3(Note 2) |
| 216 - 960 | 200 | 46 | 3(Note 2) |
| Above 960 | 500 | 54 | 3(Note 2) |

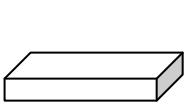
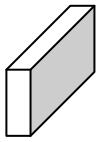
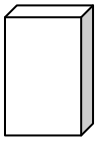
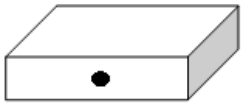
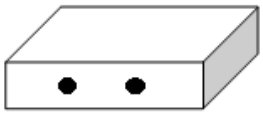
Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

## 4.4. Test Procedure

| Test Method | | | | | | |
|---|---|---|---|---|---|---|
| | References Rule | | | | Chapter | Description |
| ☐ | ANSI C63.10 | | | | 11.11 | Emissions in non-restricted frequency bands |
| | ☐ | ANSI C63.10 | | | 11.11.2 | Reference level measurement |
| | ☐ | ANSI C63.10 | | | 11.11.3 | Emission level measurement |
| ☒ | ANSI C63.10 | | | | 11.12 | Emissions in restricted frequency bands |
| | ☒ | ANSI C63.10 | | | 11.12.1 | Radiated emission measurements |
| | ☒ | ANSI C63.10 | | | 11.12.2.7 | Radiated spurious emission test |
| | | ☒ | ANSI C63.10 | | 6.4 | Radiated emissions from unlicensed wireless devices below 30 MHz |
| | | ☒ | ANSI C63.10 | | 6.5 | Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz |
| | | ☒ | ANSI C63.10 | | 6.6 | Radiated emissions from unlicensed wireless devices above 1 GHz |
| | ☐ | ANSI C63.10 | | | 11.12.2 | Antenna-port conducted measurements |
| | | ☐ | ANSI C63.10 | | 11.12.2.3 | Quasi-peak measurement procedure |
| | | ☐ | ANSI C63.10 | | 11.12.2.4 | Peak power measurement procedure |
| | | ☐ | ANSI C63.10 | | 11.12.2.5 | Average power measurement procedures |
| | | | ☐ | ANSI C63.10 | 11.12.2.5.1 | Trace averaging with continuous EUT transmission at full power |
| | | | ☐ | ANSI C63.10 | 11.12.2.5.2 | Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction |
| | | | ☐ | ANSI C63.10 | 11.12.2.5.3 | Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold |

## 4.5. EUT test Axis definition

<table>
<tr><th>Item</th><th colspan="4">Emissions in restricted frequency bands</th></tr>
<tr><td rowspan="3">Device Category</td><td>☐</td><td colspan="3">Fixed point-to-point</td></tr>
<tr><td>☐</td><td colspan="3">Emit multiple directional beams, simultaneously or sequentially</td></tr>
<tr><td>☒</td><td colspan="3">Other cases</td></tr>
<tr><td>Test mode</td><td colspan="4">Mode 1~4</td></tr>
<tr><td rowspan="11">Test method</td><td>☒</td><td colspan="3">Radiated</td></tr>
<tr><td rowspan="3"></td><td>X Axis</td><td>Y Axis</td><td>Z Axis</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Worst Axis ☒</td><td>Worst Axis ☐</td><td>Worst Axis ☐</td></tr>
<tr><td>☐</td><td colspan="3">Conducted</td></tr>
<tr><td>☐</td><td colspan="3">Chain 1</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td colspan="2">Chain 2</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td>Chain 2</td><td>Chain 3</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
</table>

## 4.6. Test Result

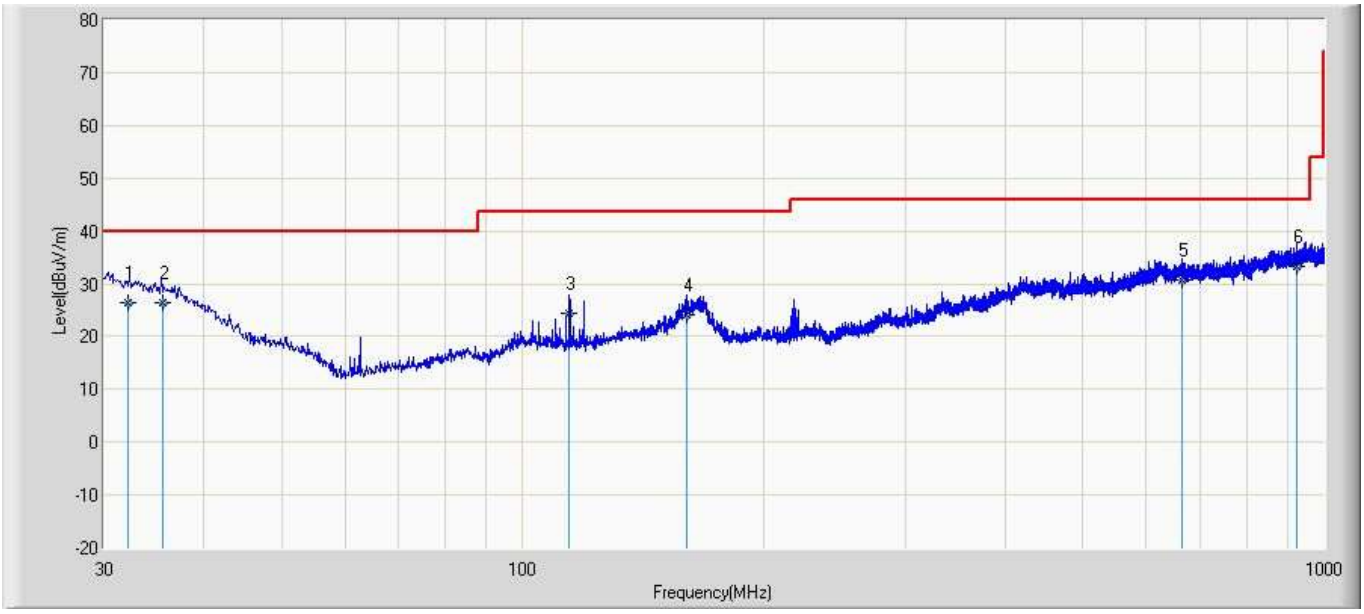
**Pass.**

Note: 1. Measure Level = Reading Level + Factor.
2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.
4. As the radiated emission was performed, so conducted emission was not tested.
5. The data was too large so was showed in below attached files.

**Appendix 1: 2.4GHz Radiated spurious emission**

## The worst case of Radiated Emission below 1GHz:

| | |
|---|---|
| Site: AC2 | Time: 2019/11/21 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: AC3_3m (30-1000MHz) | Polarity: Horizontal |
| EUT: Wireless Access Point | Power: AC 120V/60Hz |
| Note: Simultaneous transmission with 2.4G WIFI +5G WIFI + BLE | |

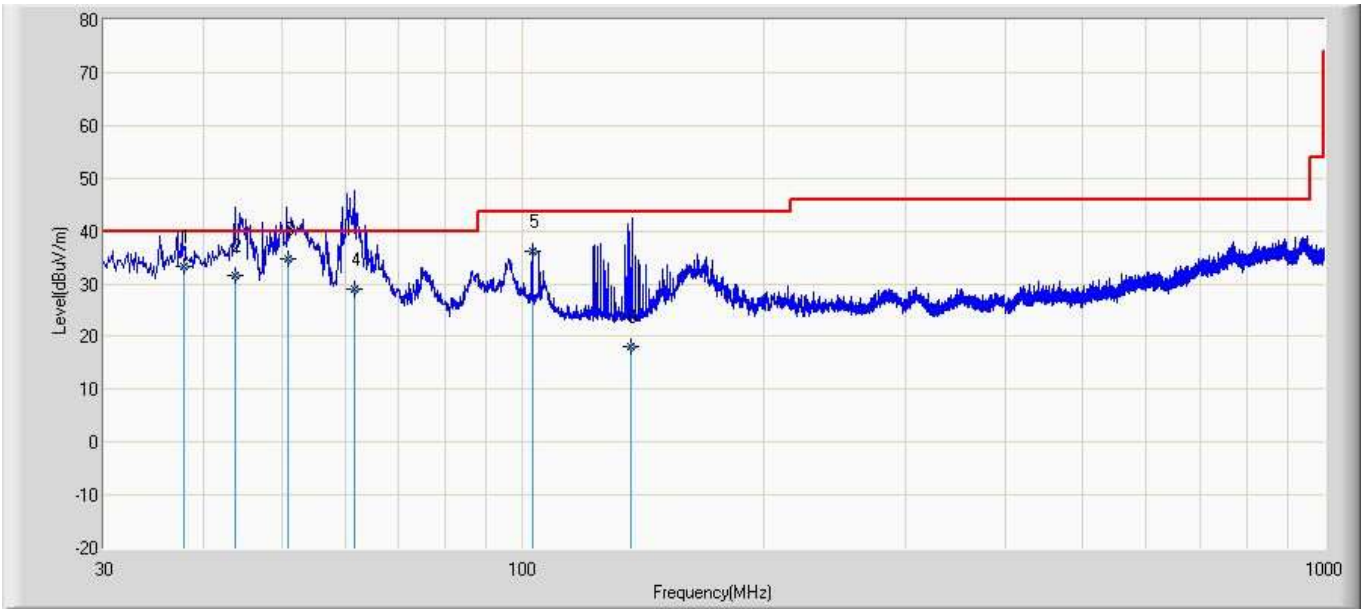



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Probe (dB/m) | Cable (dB) | Amp (dB) | Ant Pos (cm) | Table Pos (deg) | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 32.104 | 26.446 | -0.300 | -13.554 | 40.000 | 20.281 | 6.465 | 0.000 | 100 | 0 | QP |
| 2 | | 35.463 | 26.378 | 0.700 | -13.622 | 40.000 | 19.184 | 6.494 | 0.000 | 100 | 121 | QP |
| 3 | | 114.365 | 24.431 | 8.600 | -19.069 | 43.500 | 8.911 | 6.920 | 0.000 | 100 | 310 | QP |
| 4 | | 160.234 | 24.114 | 6.800 | -19.386 | 43.500 | 10.187 | 7.127 | 0.000 | 100 | 144 | QP |
| 5 | | 663.850 | 30.768 | 1.300 | -15.232 | 46.000 | 20.883 | 8.585 | 0.000 | 166 | 360 | QP |
| 6 | * | 924.362 | 33.239 | 0.900 | -12.761 | 46.000 | 23.189 | 9.150 | 0.000 | 100 | 221 | QP |

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

| | |
|---|---|
| Site: AC2 | Time: 2019/11/21 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: AC3_3m (30-1000MHz) | Polarity: Vertical |
| EUT: Wireless Access Point | Power: AC 120V/60Hz |
| Note: Simultaneous transmission with 2.4G WIFI +5G WIFI + BLE | |



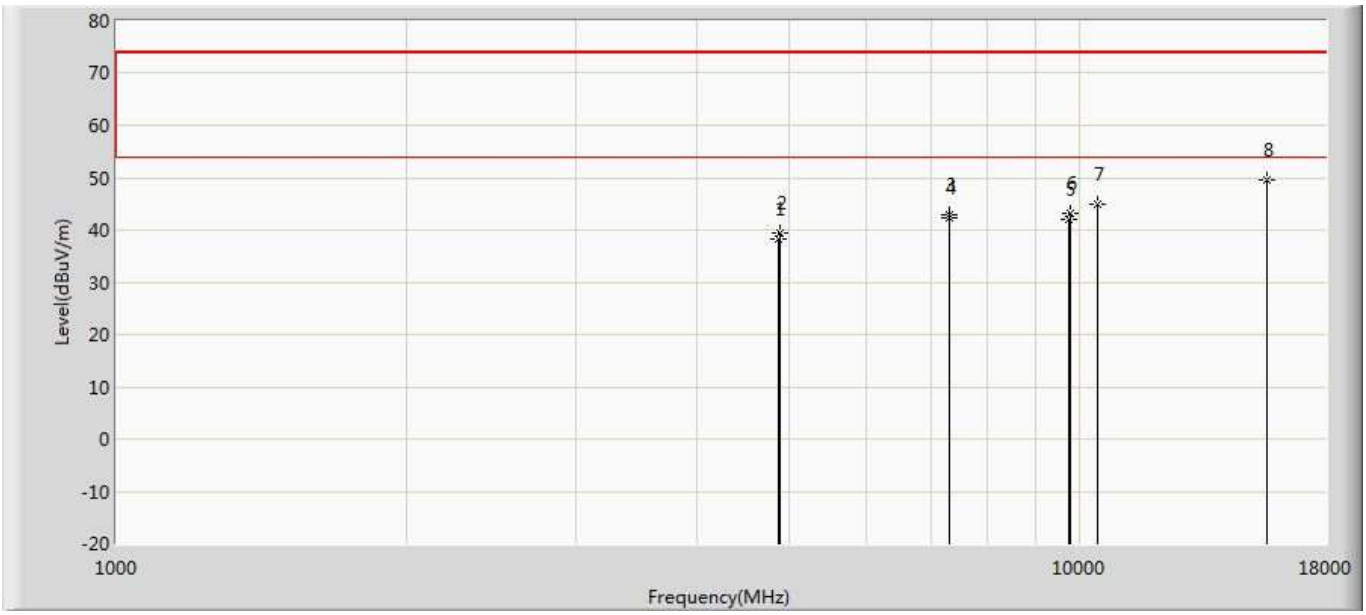

| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Probe (dB/m) | Cable (dB) | Amp (dB) | Ant Pos (cm) | Table Pos (deg) | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 37.831 | 33.304 | 12.200 | -6.696 | 40.000 | 14.594 | 6.511 | 0.000 | 100 | 306 | QP |
| 2 | | 43.837 | 31.557 | 13.900 | -8.443 | 40.000 | 11.104 | 6.552 | 0.000 | 100 | 232 | QP |
| 3 | * | 50.867 | 34.721 | 16.700 | -5.279 | 40.000 | 11.429 | 6.592 | 0.000 | 100 | 137 | QP |
| 4 | | 61.647 | 29.018 | 13.100 | -10.982 | 40.000 | 9.262 | 6.656 | 0.000 | 100 | 186 | QP |
| 5 | | 102.801 | 36.075 | 14.000 | -7.425 | 43.500 | 15.208 | 6.867 | 0.000 | 100 | 0 | QP |
| 6 | | 136.607 | 18.142 | -2.100 | -25.358 | 43.500 | 13.221 | 7.021 | 0.000 | 200 | 217 | QP |

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

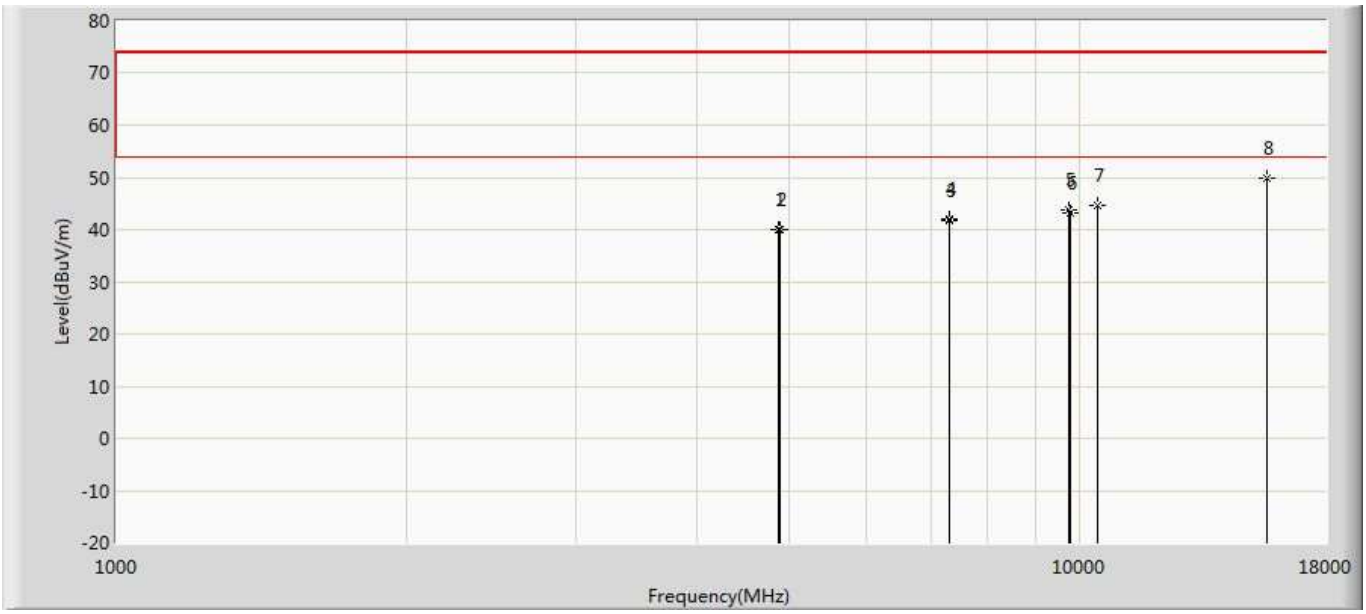
## The worst case of Simultaneous Radiated Emission:

| | |
|---|---|
| Engineer: Simon | |
| Site: AC5 | Time: 2019/11/19 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: Wireless Access Point | Power: AC 120V/60Hz |
| Note: Simultaneous transmission with 2.4G WIFI +5G WIFI + BLE | |




| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|
| 1 | | 4874.000 | 38.212 | 33.365 | -35.788 | 74.000 | 4.846 | PK |
| 2 | | 4880.000 | 39.457 | 34.678 | -34.543 | 74.000 | 4.778 | PK |
| 3 | | 7311.000 | 42.834 | 34.843 | -31.166 | 74.000 | 7.991 | PK |
| 4 | | 7320.000 | 42.419 | 34.349 | -31.581 | 74.000 | 8.071 | PK |
| 5 | | 9748.000 | 42.062 | 32.357 | -31.938 | 74.000 | 9.705 | PK |
| 6 | | 9760.000 | 43.252 | 33.348 | -30.748 | 74.000 | 9.904 | PK |
| 7 | | 10440.000 | 44.864 | 32.513 | -29.136 | 74.000 | 12.351 | PK |
| 8 | * | 15660.000 | 49.517 | 31.990 | -24.483 | 74.000 | 17.527 | PK |

| | |
|---|---|
| Engineer: Simon | |
| Site: AC5 | Time: 2019/11/19 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: Wireless Access Point | Power: AC 120V/60Hz |
| Note: Simultaneous transmission with 2.4G WIFI +5G WIFI + BLE | |



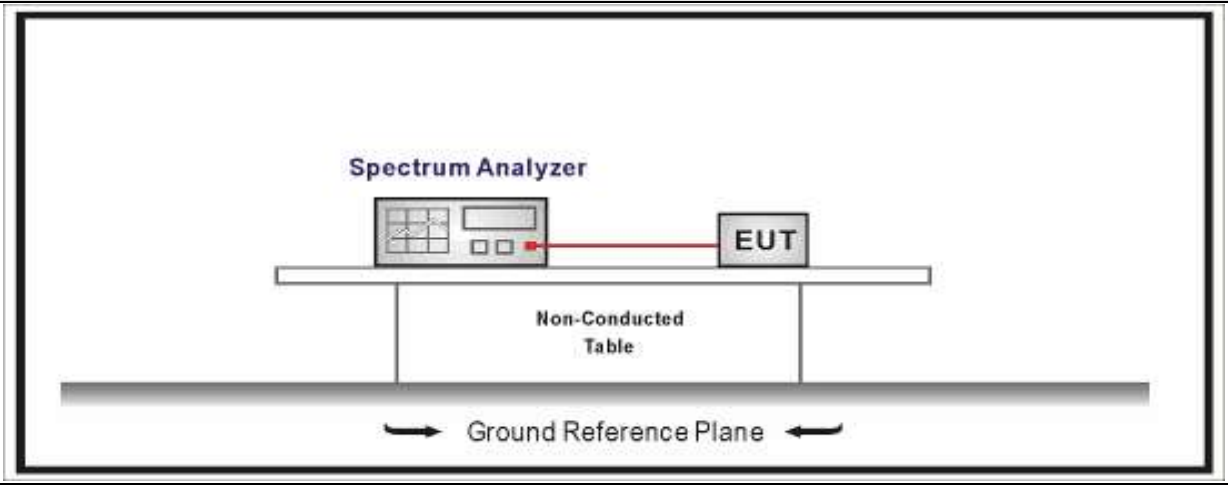

| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|
| 1 | | 4874.000 | 40.134 | 35.287 | -33.866 | 74.000 | 4.846 | PK |
| 2 | | 4880.000 | 39.918 | 35.139 | -34.082 | 74.000 | 4.778 | PK |
| 3 | | 7311.000 | 41.825 | 33.834 | -32.175 | 74.000 | 7.991 | PK |
| 4 | | 7320.000 | 42.024 | 33.954 | -31.976 | 74.000 | 8.071 | PK |
| 5 | | 9748.000 | 43.739 | 34.034 | -30.261 | 74.000 | 9.705 | PK |
| 6 | | 9760.000 | 43.207 | 33.303 | -30.793 | 74.000 | 9.904 | PK |
| 7 | | 10440.000 | 44.715 | 32.364 | -29.285 | 74.000 | 12.351 | PK |
| 8 | * | 15660.000 | 49.772 | 32.245 | -24.228 | 74.000 | 17.527 | PK |

# 5. Emissions in non-restricted frequency bands

## 5.1. Test Equipment

| Emissions in non-restricted frequency bands / TR-8 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2019.02.04 | 2020.02.03 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2019.04.09 | 2020.04.08 |
| MXA Signal Analyzer | Keysight | N9020A | MY56060147 | 2019.04.09 | 2020.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2019.04.10 | 2020.04.09 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 5.2. Test Setup

| Emissions in non-restricted frequency bands |
| --- |
|  |

## 5.3. Limit

| Un-Restricted Band Emissions Limit | |
|---|---|
| RF Output power (Detection methods) | Limit(dB) |
| RF Output power(Average detector) | 30c(Note1) |
| RF Output power(PK detector) | 20c(Note2) |

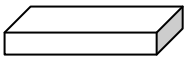
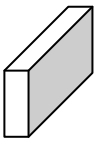
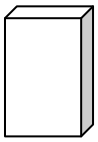
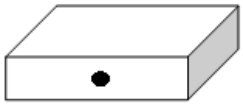
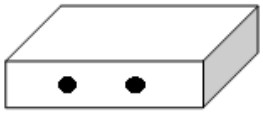
Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

## 5.4. Test Procedure

| Test Method | | | | | |
|---|---|---|---|---|---|
| | References Rule | | | Chapter | Description |
| ☒ | ANSI C63.10 | | | 11.11 | Emissions in non-restricted frequency bands |
| | ☒ | ANSI C63.10 | | 11.11.2 | Reference level measurement |
| | ☒ | ANSI C63.10 | | 11.11.3 | Emission level measurement |
| ☐ | ANSI C63.10 | | | 11.12 | Emissions in restricted frequency bands |
| | ☐ | ANSI C63.10 | | 11.12.1 | Radiated emission measurements |
| | ☐ | ANSI C63.10 | | 11.12.2.7 | Radiated spurious emission test |
| ☐ | ANSI C63.10 | | | 6.4 | Radiated emissions from unlicensed wireless devices below 30 MHz |
| ☐ | ANSI C63.10 | | | 6.5 | Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz |
| ☐ | ANSI C63.10 | | | 6.6 | Radiated emissions from unlicensed wireless devices above 1 GHz |
| | ☐ | ANSI C63.10 | | 11.12.2 | Antenna-port conducted measurements |
| | | ☐ | ANSI C63.10 | 11.12.2.3 | Quasi-peak measurement procedure |
| | | ☐ | ANSI C63.10 | 11.12.2.4 | Peak power measurement procedure |
| | | ☐ | ANSI C63.10 | 11.12.2.5 | Average power measurement procedures |
| | | | ☐ ANSI C63.10 | 11.12.2.5.1 | Trace averaging with continuous EUT transmission at full power |
| | | | ☐ ANSI C63.10 | 11.12.2.5.2 | Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction |
| | | | ☐ ANSI C63.10 | 11.12.2.5.3 | Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold |

## 5.5. EUT test Axis definition

<table>
<tr><th>Item</th><th colspan="4">Emissions in non-restricted frequency bands</th></tr>
<tr><td rowspan="3">Device Category</td><td>☐</td><td colspan="3">Fixed point-to-point</td></tr>
<tr><td>☐</td><td colspan="3">Emit multiple directional beams, simultaneously or sequentially</td></tr>
<tr><td>☒</td><td colspan="3">Other cases</td></tr>
<tr><td>Test mode</td><td colspan="4">Mode 1~4</td></tr>
<tr><td rowspan="12">Test method</td><td>☐</td><td colspan="3">Radiated</td></tr>
<tr><td rowspan="3"></td><td>X Axis</td><td>Y Axis</td><td>Z Axis</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Worst Axis ☐</td><td>Worst Axis ☐</td><td>Worst Axis ☐</td></tr>
<tr><td>☒</td><td colspan="3">Conducted</td></tr>
<tr><td>☒</td><td colspan="3">Chain 1</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☒</td><td>Chain 1</td><td colspan="2">Chain 2</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td>Chain 2</td><td>Chain 3</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
</table>

## 5.6. Test Result

| | | | | | |
|---|---|---|---|---|---|
| Product Name | : | Wireless Access Point | Power | : | AC 120V/60Hz |
| Test Mode | : | Mode 1~4(Radio 1) | Test Site | : | TR8 |
| Test Date | : | 2019.11.09 | Test Engineer | : | Eric |

| Mode | Channel | Test Frequency (MHz) | Maximum In-Band PSD[a] (dBm/100kHz) | Frequency (MHz) | Out-Band PSD[b] (dBm/100kHz) | [a]-[b] (dB) | Limit (dB) | Result |
|---|---|---|---|---|---|---|---|---|
| 1 | 01 | 2412 | 15.013 | 2398.501 | -21.815 | 36.828 | >30 | Pass |
| 1 | 11 | 2462 | 15.172 | 2554.194 | -54.738 | 69.910 | >30 | Pass |
| 2 | 01 | 2412 | 7.562 | 2399.176 | -25.055 | 32.617 | >30 | Pass |
| 2 | 11 | 2462 | 8.376 | 2577.948 | -55.246 | 63.622 | >30 | Pass |
| 3 | 01 | 2412 | 7.540 | 2399.878 | -22.780 | 30.320 | >30 | Pass |
| 3 | 11 | 2462 | 8.218 | 2532.845 | -54.427 | 62.645 | >30 | Pass |
| 4 | 01 | 2412 | 7.533 | 2399.653 | -22.933 | 30.466 | >30 | Pass |
| 4 | 11 | 2462 | 8.229 | 2586.014 | -53.611 | 61.840 | >30 | Pass |

Note: The worst case of emissions in non-restricted frequency bands as below:

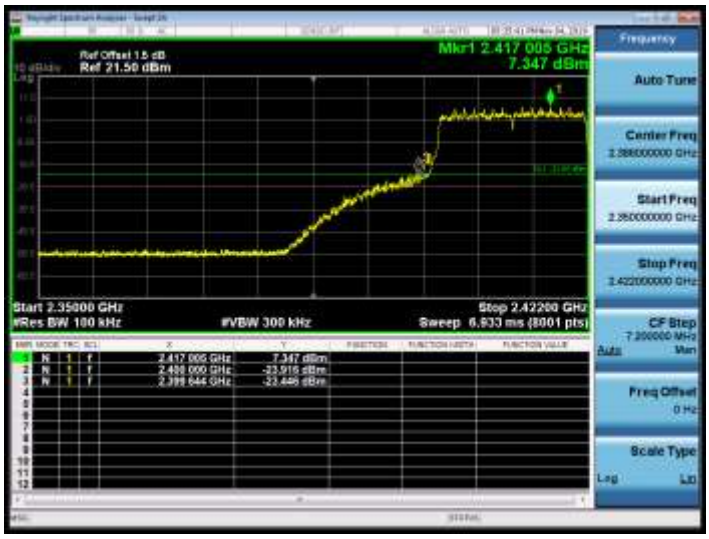
Mode 3 CH01(2412MHz)

| | | | | | |
|---|---|---|---|---|---|
| Product Name | : | Wireless Access Point | Power | : | AC 120V/60Hz |
| Test Mode | : | Mode 1~4(Radio 2) | Test Site | : | TR8 |
| Test Date | : | 2019.11.09 | Test Engineer | : | Eric |

| Mode | Channel | Test Frequency (MHz) | Maximum In-Band PSD[a] (dBm/100kHz) | Frequency (MHz) | Out-Band PSD[b] (dBm/100kHz) | [a]-[b] (dB) | Limit (dB) | Result |
|---|---|---|---|---|---|---|---|---|
| 1 | 01 | 2412 | 14.900 | 2398.519 | -22.144 | 37.044 | >30 | Pass |
| 1 | 11 | 2462 | 15.067 | 2519.266 | -55.876 | 70.943 | >30 | Pass |
| 2 | 01 | 2412 | 7.558 | 2399.176 | -25.376 | 32.934 | >30 | Pass |
| 2 | 11 | 2462 | 8.340 | 2536.491 | -55.717 | 64.057 | >30 | Pass |
| 3 | 01 | 2412 | 7.612 | 2399.383 | -24.098 | 31.710 | >30 | Pass |
| 3 | 11 | 2462 | 8.292 | 2578.669 | -55.245 | 63.537 | >30 | Pass |
| 4 | 01 | 2412 | 7.347 | 2399.644 | -23.446 | 30.793 | >30 | Pass |
| 4 | 11 | 2462 | 8.129 | 2503.467 | -56.196 | 64.325 | >30 | Pass |

Note: The worst case of emissions in non-restricted frequency bands as below:

Mode 4 CH01(2412MHz)

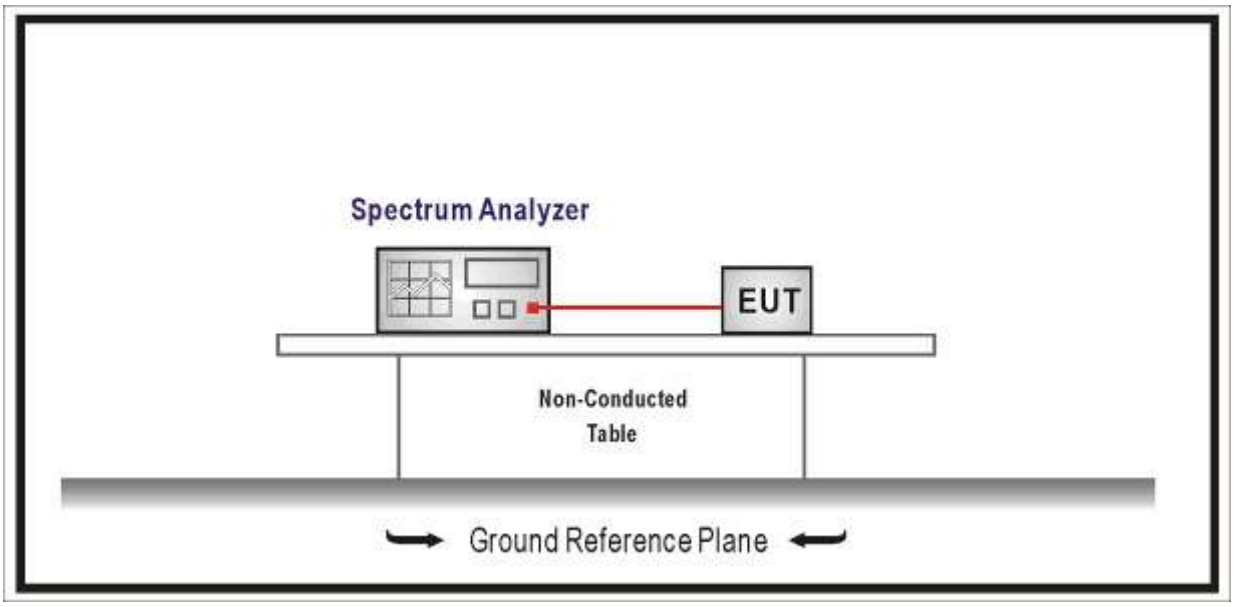


# 6. Band Edge

## 6.1. Test Equipment

| Emissions in non-restricted frequency bands / TR-8 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2019.02.04 | 2020.02.03 |
| Signal Analyzer | R&S | FSV | 104212 | 2019.02.23 | 2020.02.22 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2019.04.09 | 2020.04.08 |
| MXA Signal Analyzer | Keysight | N9020A | MY56060147 | 2019.04.09 | 2020.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2019.04.10 | 2020.04.09 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 6.2. Test Setup



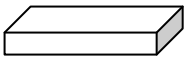
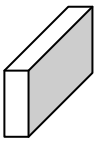
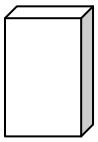
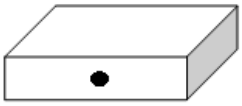
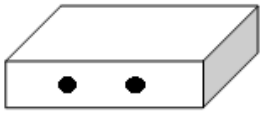

## 6.3. Limit

| Band edge Limit | | | | |
|---|---|---|---|---|
| Frequency bands (MHz) | Detector | Limit (dB $\mu$ V/m) | RBW (MHz) | Distance (m) |
| 2310-2390<br>2483.5-2500 | PK | 74 | 1 | 3 |
| | AV | 54 | 1 | 3 |
| Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits. | | | | |

## 6.4. Test Procedure

| Test Method | | | | | | |
|---|---|---|---|---|---|---|
| | References Rule | | | | Chapter | Description |
| ☒ | ANSI C63.10 | | | | 6.10 | Band-edge testing |
| | ☒ | ANSI C63.10 | | | 6.10.5 | Restricted-band band-edge measurements |
| | ☐ | ANSI C63.10 | | | 6.10.6 | Marker-delta method |
| ☐ | ANSI C63.10 | | | | 11.12 | Emissions in restricted frequency bands |
| | ☐ | ANSI C63.10 | | | 11.12.1 | Radiated emission measurements |
| | ☐ | ANSI C63.10 | | | 11.12.2.7 | Radiated spurious emission test |
| ☐ | ANSI C63.10 | | | | 6.4 | Radiated emissions from unlicensed wireless devices below 30 MHz |
| ☐ | ANSI C63.10 | | | | 6.5 | Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz |
| ☒ | ANSI C63.10 | | | | 6.6 | Radiated emissions from unlicensed wireless devices above 1 GHz |
| | ☒ | ANSI C63.10 | | | 11.12.2 | Antenna-port conducted measurements |
| | | ☐ | ANSI C63.10 | | 11.12.2.3 | Quasi-peak measurement procedure |
| | | ☒ | ANSI C63.10 | | 11.12.2.4 | Peak power measurement procedure |
| | | ☒ | ANSI C63.10 | | 11.12.2.5 | Average power measurement procedures |
| | | | ☐ | ANSI C63.10 | 11.12.2.5.1 | Trace averaging with continuous EUT transmission at full power |
| | | | ☐ | ANSI C63.10 | 11.12.2.5.2 | Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction |
| | | | ☐ | ANSI C63.10 | 11.12.2.5.3 | Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold |

## 6.5. EUT test definition

<table>
<tr><th>Item</th><th colspan="4">Radiated Emission Band Edge</th></tr>
<tr><td rowspan="3">Device Category</td><td>☐</td><td colspan="3">Fixed point-to-point</td></tr>
<tr><td>☐</td><td colspan="3">Emit multiple directional beams, simultaneously or sequentially</td></tr>
<tr><td>☒</td><td colspan="3">Other cases</td></tr>
<tr><td>Test mode</td><td colspan="4">Mode 1~4</td></tr>
<tr><td rowspan="14">Test method</td><td>☐</td><td colspan="3">Radiated</td></tr>
<tr><td rowspan="3"></td><td>X Axis</td><td>Y Axis</td><td>Z Axis</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Worst Axis ☐</td><td>Worst Axis ☐</td><td>Worst Axis ☐</td></tr>
<tr><td>☒</td><td colspan="3">Conducted</td></tr>
<tr><td>☒</td><td colspan="3">Chain 1</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☒</td><td>Chain 1</td><td colspan="2">Chain 2</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td>Chain 2</td><td>Chain 3</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
</table>

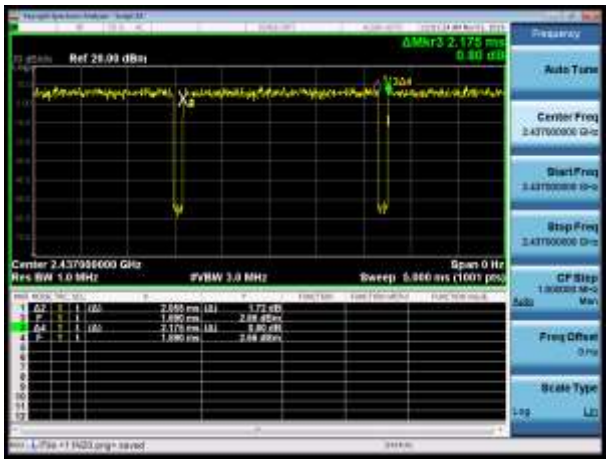
## 6.6. Duty Cycle

**Radio 1**

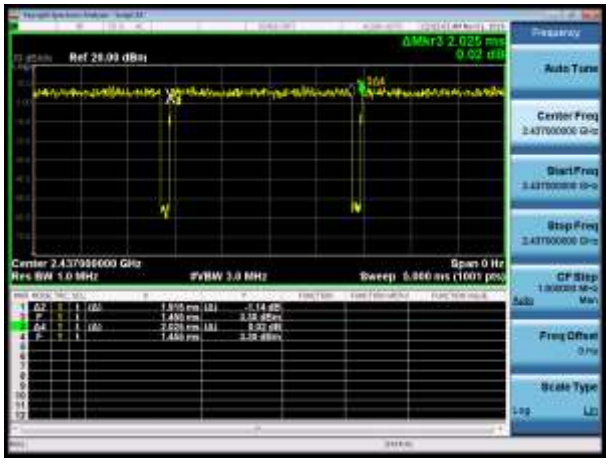
| Test Mode | Tx On (ms) | Tx Off (ms) | VBW | Tx On + Tx Off (ms) | Duty Cycle (%) |
|---|---|---|---|---|---|
| 802.11b | N/A | N/A | 10Hz | N/A | 100.00 |
| 802.11g | 2.055 | 0.120 | 500Hz | 2.175 | 94.48 |
| 802.11n(20MHz) | 1.915 | 0.110 | 1kHz | 2.025 | 94.57 |
| 802.11ax(20MHz) | 1.476 | 0.048 | 1kHz | 1.524 | 96.85 |

802.11b

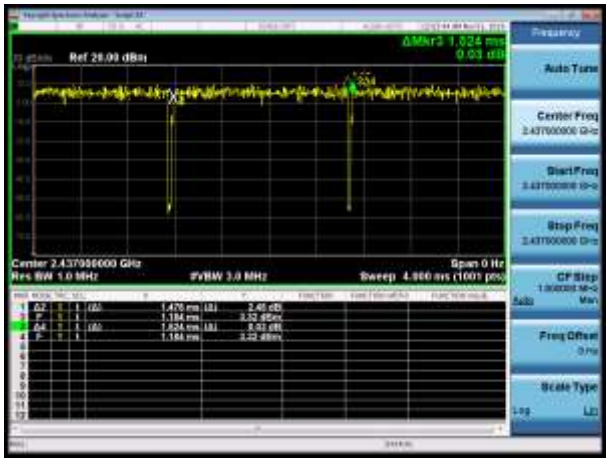
802.11g



802.11n(20MHz)



802.11ax(20MHz)

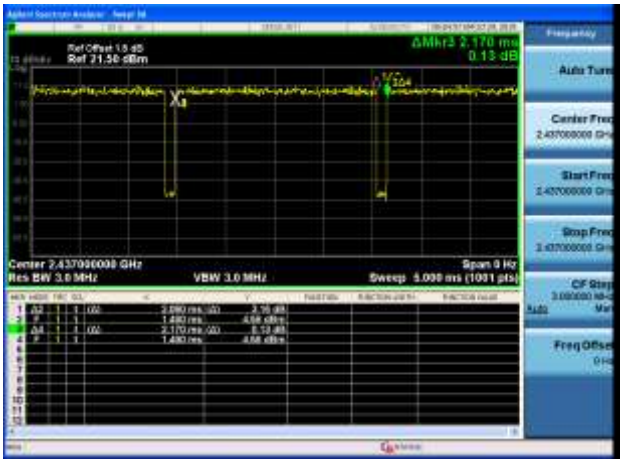


**Radio 2**

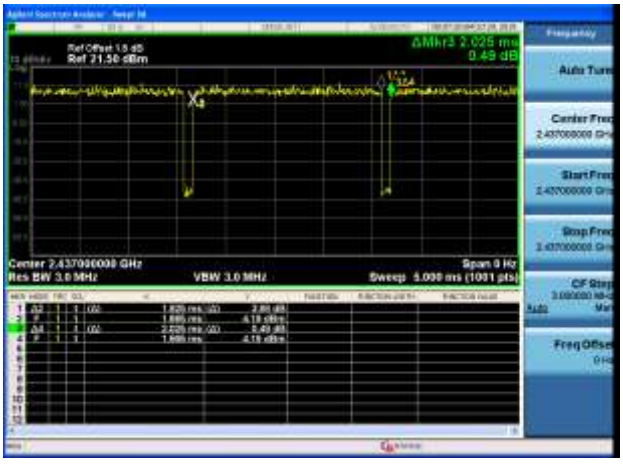
| Test Mode | Tx On (ms) | Tx Off (ms) | VBW | Tx On + Tx Off (ms) | Duty Cycle (%) |
|---|---|---|---|---|---|
| 802.11b | N/A | N/A | 10Hz | N/A | 100.00 |
| 802.11g | 2.060 | 0.110 | 500Hz | 2.170 | 94.93 |
| 802.11n(20MHz) | 1.925 | 0.100 | 1kHz | 2.025 | 95.06 |
| 802.11ax(20MHz) | 1.488 | 0.032 | 1kHz | 1.520 | 97.89 |
| 802.11n(20MHz) with Beamforming | 1.915 | 0.110 | 1kHz | 2.025 | 94.57 |
| 802.11ax(20MHz) with Beamforming | 1.480 | 0.040 | 1kHz | 1.520 | 97.37 |

802.11b

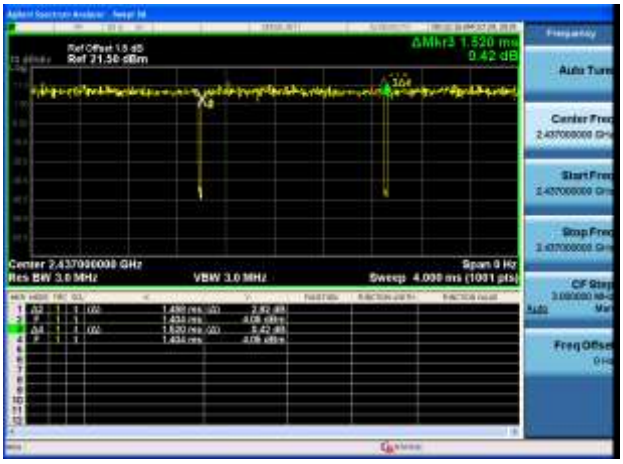
802.11g

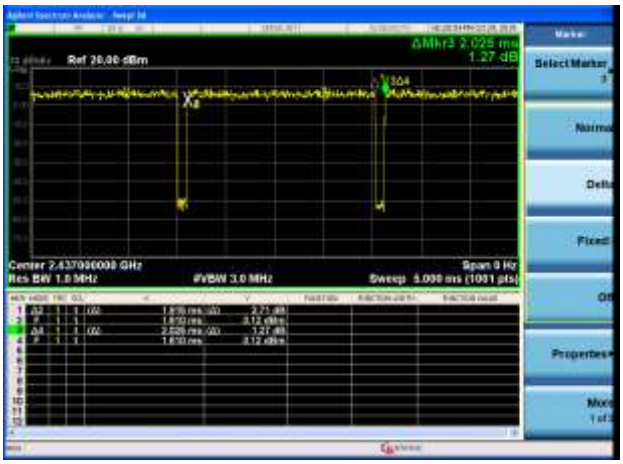
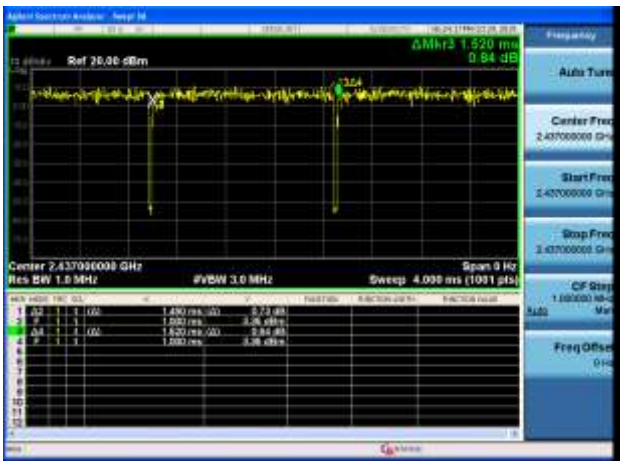


802.11n(20MHz)



802.11ax(20MHz)



| 802.11n(20MHz) with Beamforming | 802.11ax(20MHz) with Beamforming |
| --- | --- |
|  |  |

## 6.7. Test Result

**Radio 1：**

**SISO PK Limit=74dBuV/m-95.2-4(Antenna Gain)=-25.2dBm**

**SISO AV Limit=54dBuV/m-95.2-4(Antenna Gain)=-45.2dBm**

**Radio 2：**

**SISO PK Limit=74dBuV/m-95.2-3.9(Antenna Gain)=-25.1dBm**

**SISO AV Limit=54dBuV/m-95.2-3.9(Antenna Gain)=-45.1dBm**

**CDD/Beamforming PK Limit=74dBuV/m-95.2-10lg2(2Tx)-6.91(Directional Gain)=-31.12dBm**

**CDD/Beamforming AV Limit=54dBuV/m-95.2-10lg2(2Tx)-6.91(Directional Gain)=-51.12dBm**

Note: Above limit is the worst case of AP410C.

**Radio 1:**

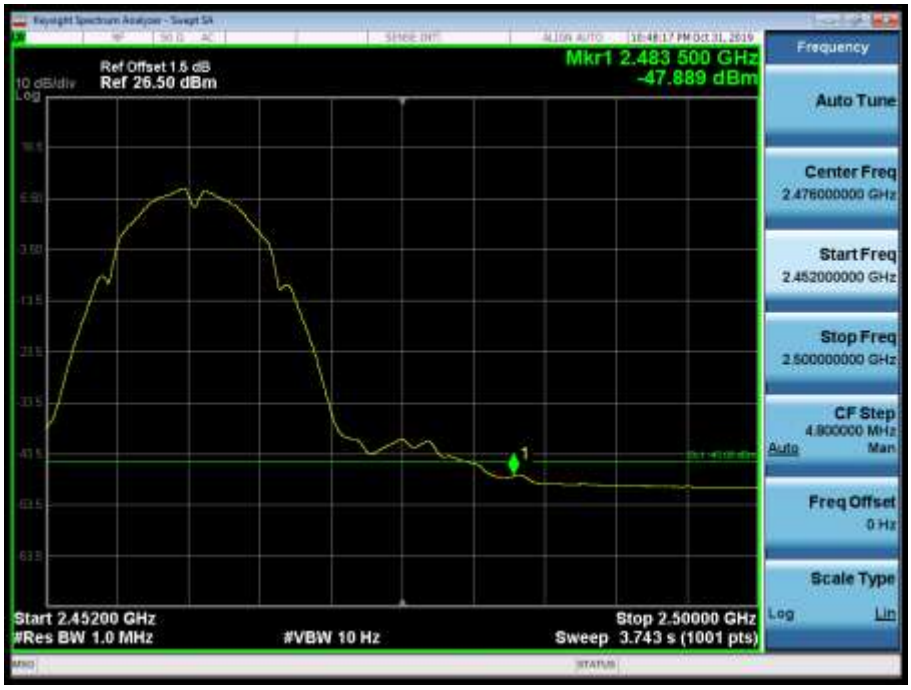
**2412MHz by 802.11b:**


**2417MHz by 802.11b:**

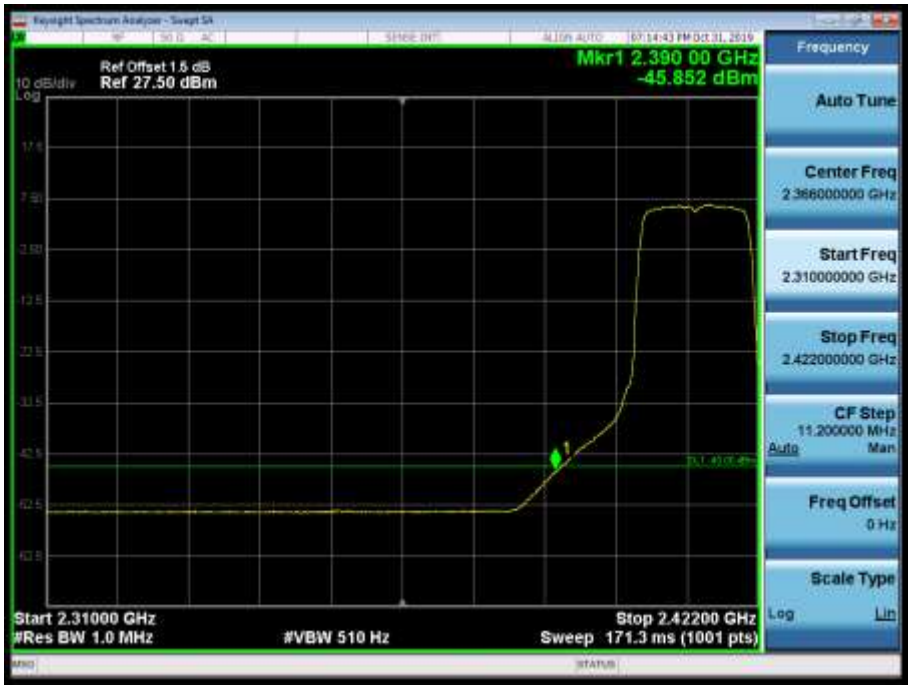
**2437MHz by 802.11b:**


**2457MHz by 802.11b:**

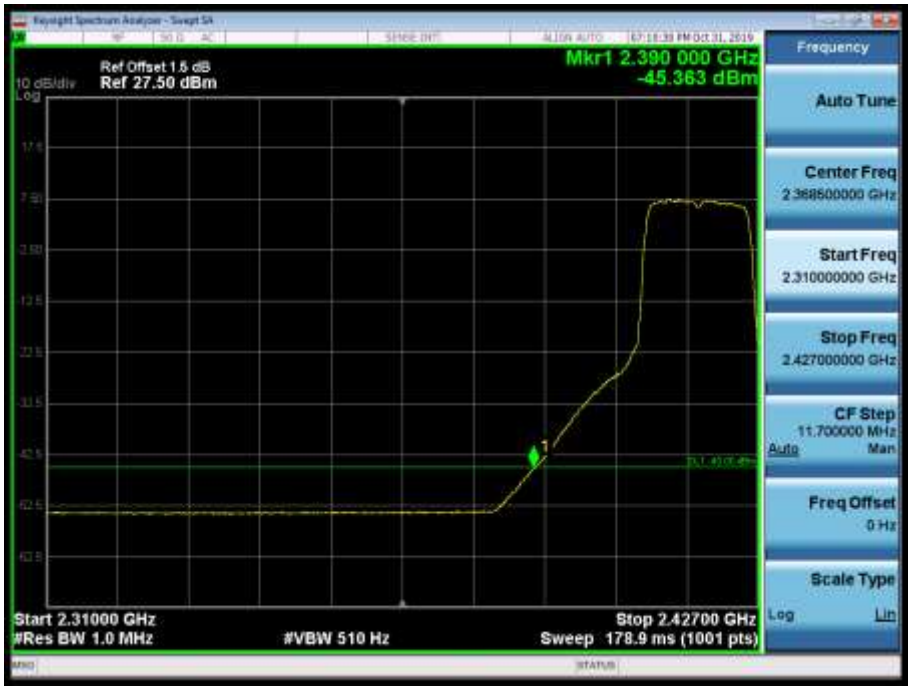
**2462MHz by 802.11b:**



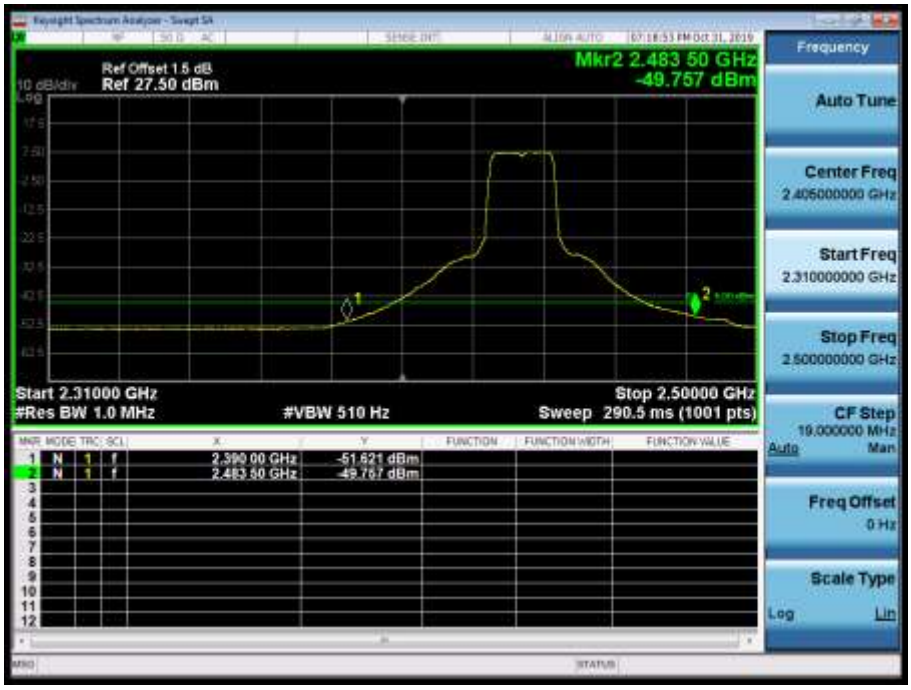
**2412MHz by 802.11g:**



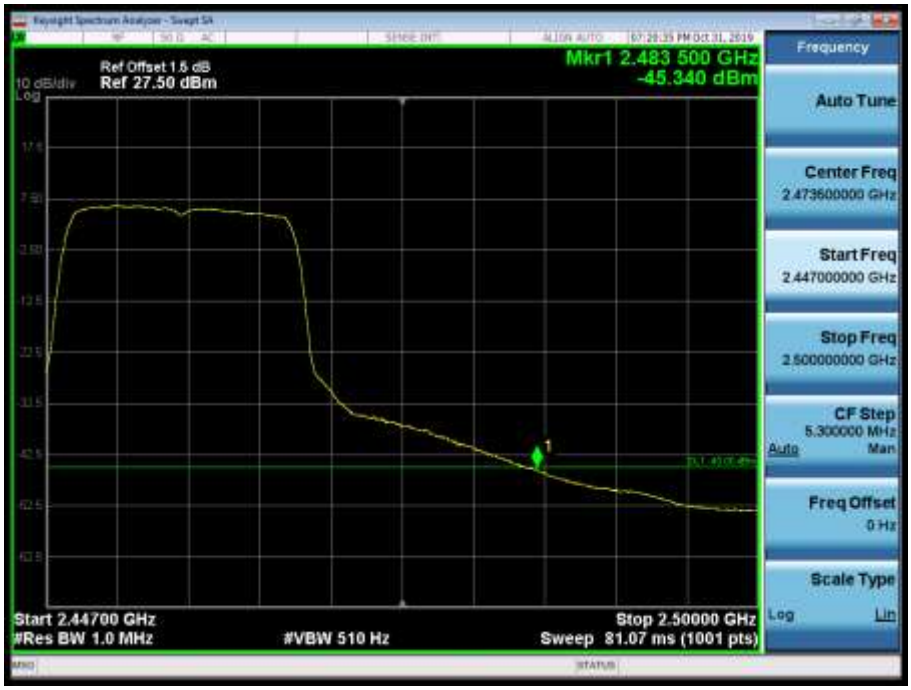

**2417MHz by 802.11g:**



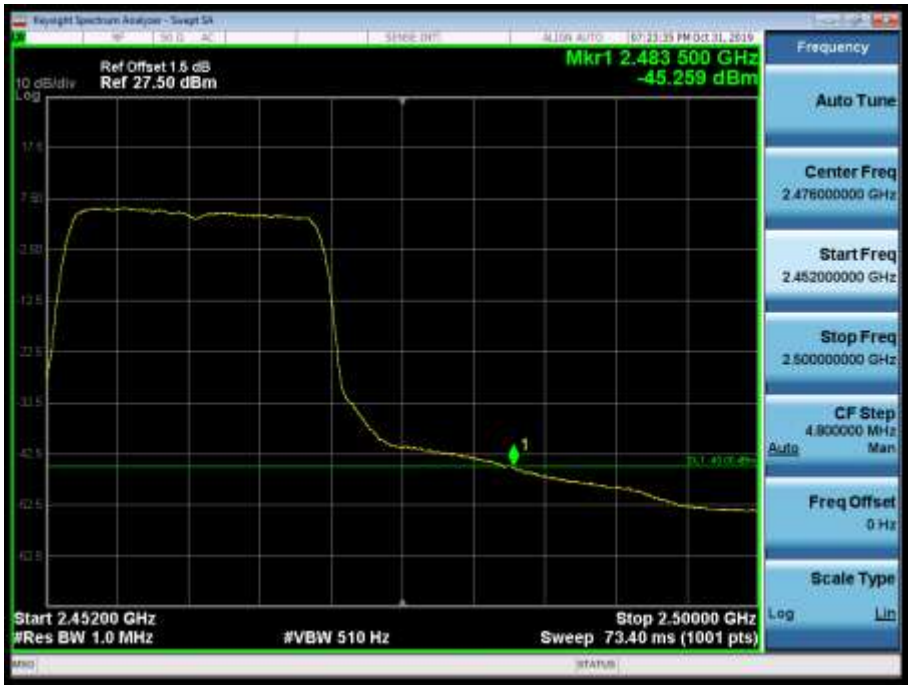
**2437MHz by 802.11g:**



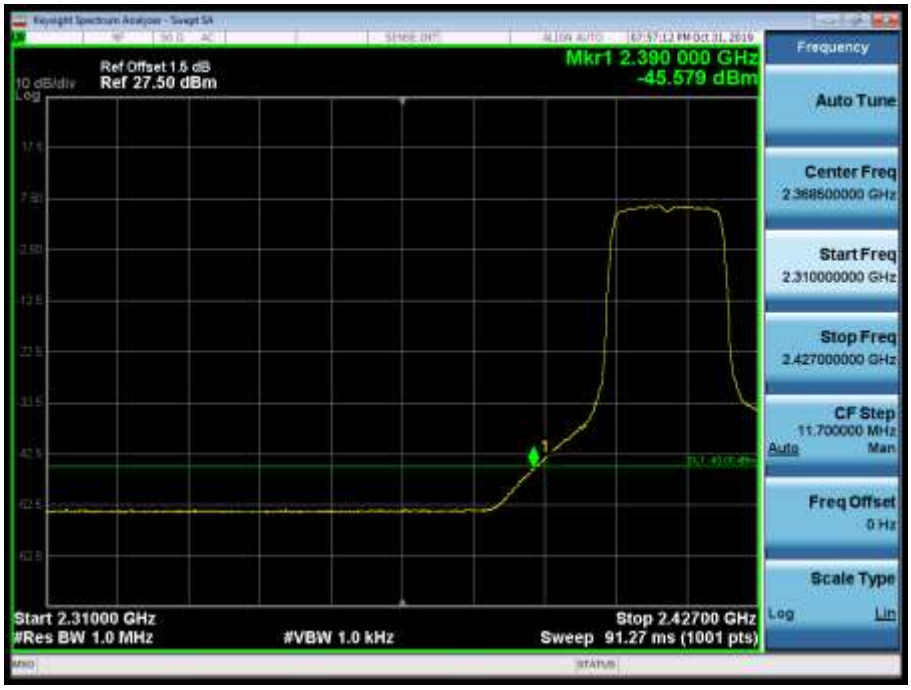

**2457MHz by 802.11g:**



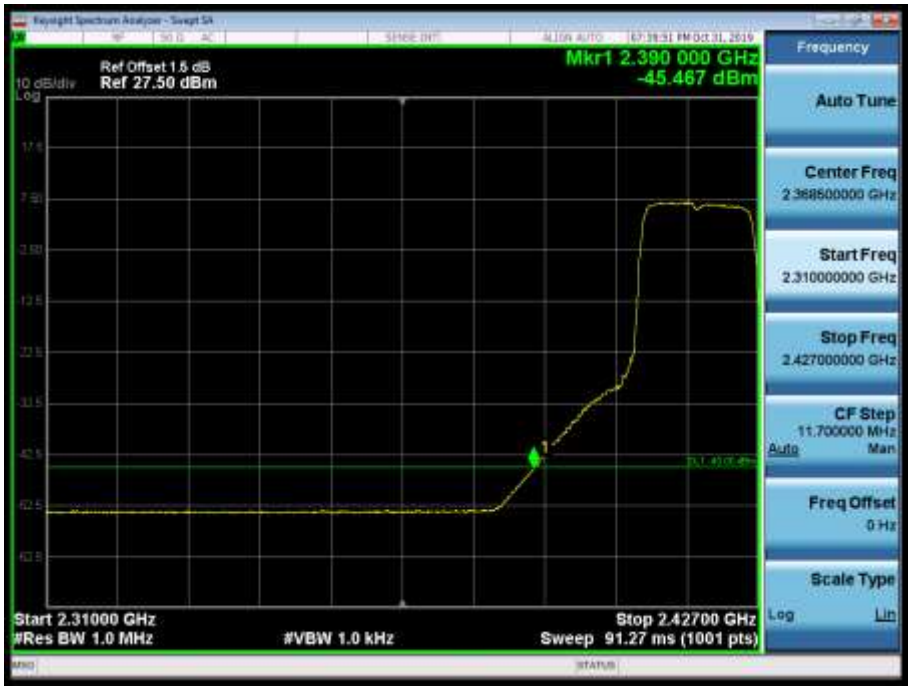
**2462MHz by 802.11g:**



**2412MHz by 802.11n(20MHz):**

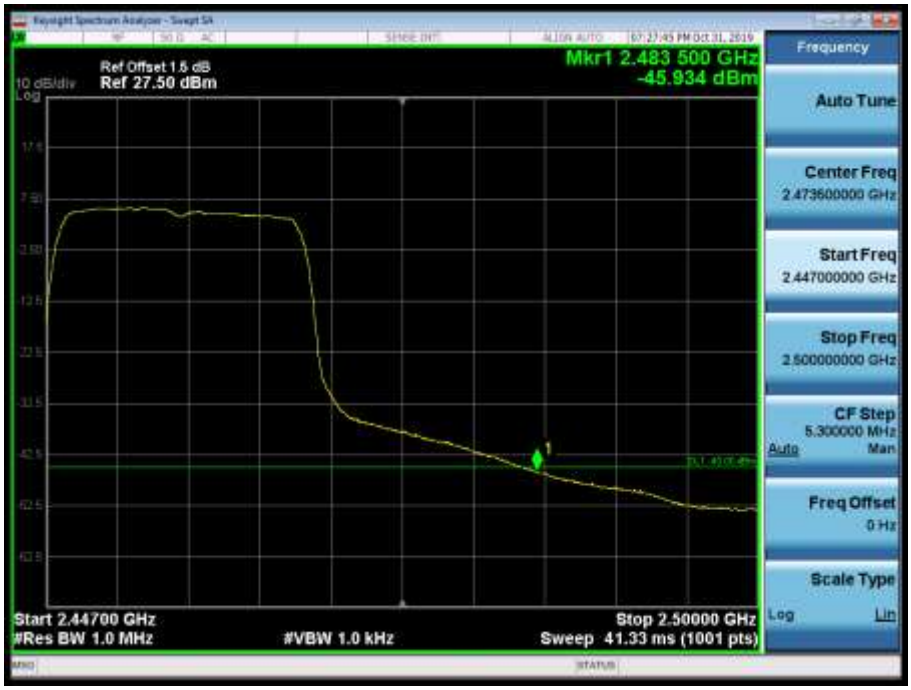



**2417MHz by 802.11n(20MHz):**

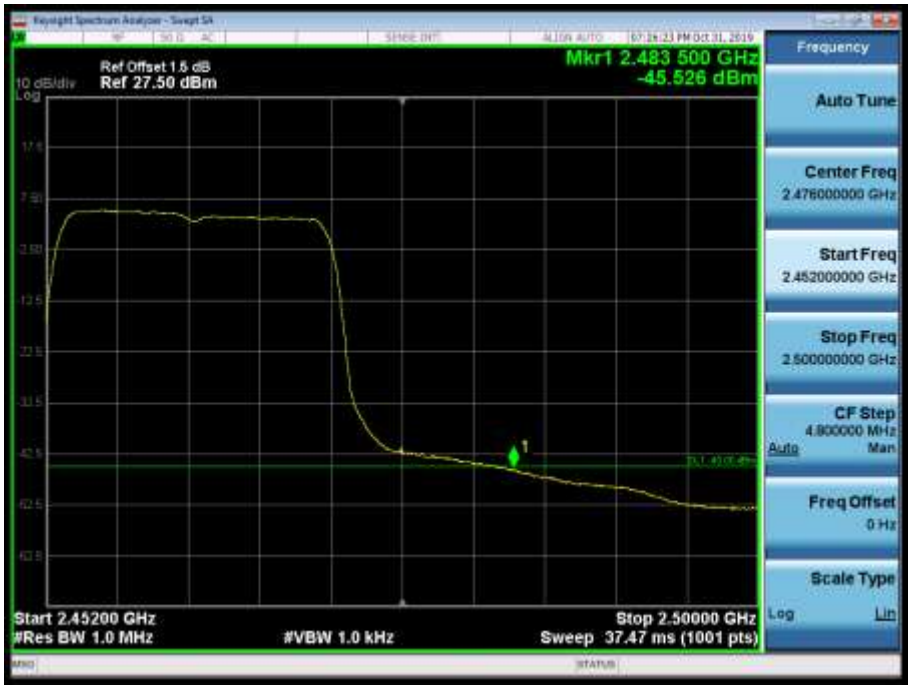


**2437MHz by 802.11n(20MHz):**

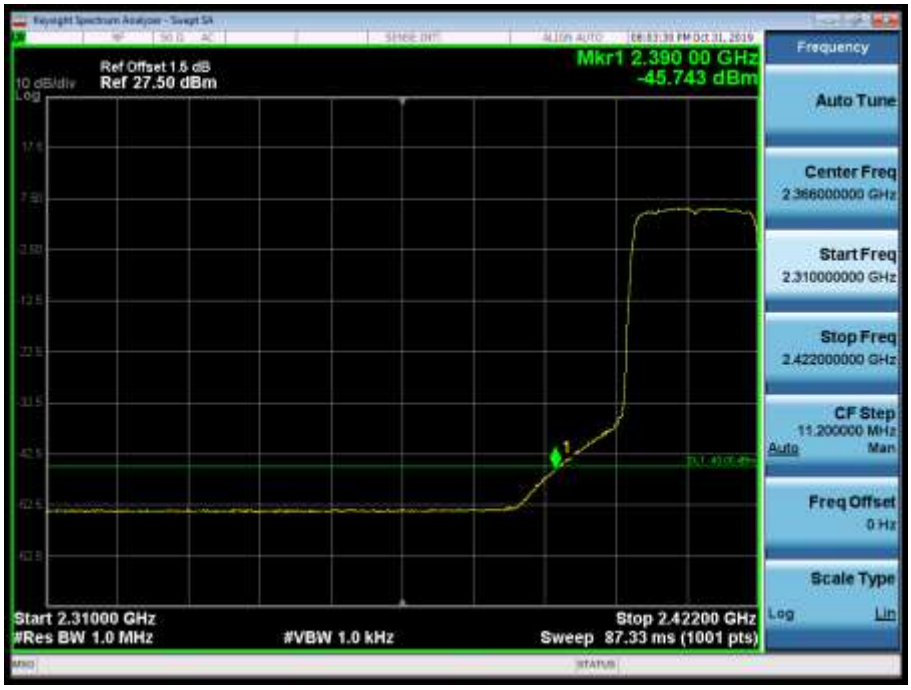

**2457MHz by 802.11n(20MHz):**



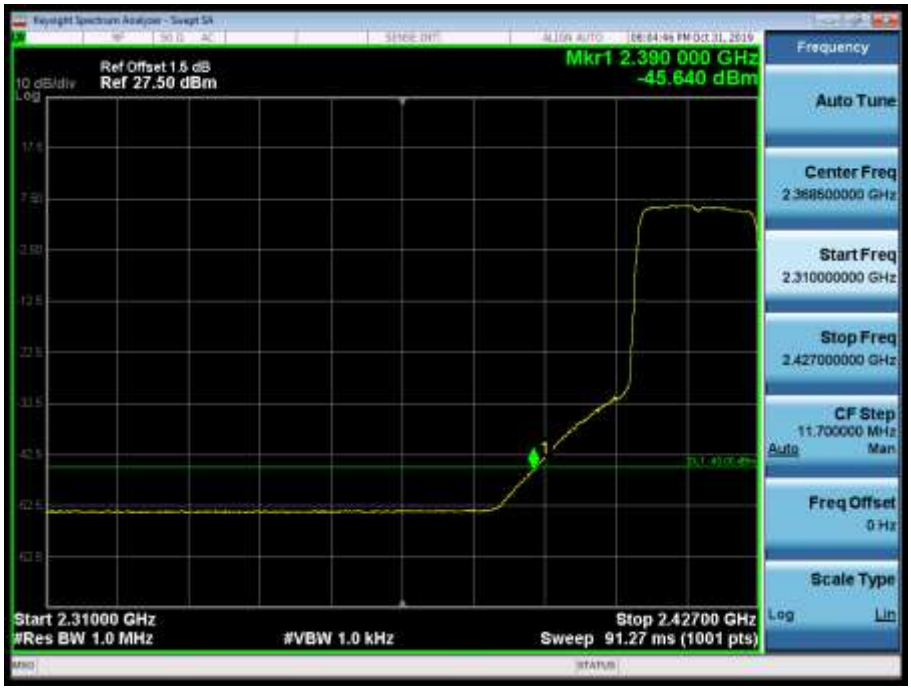
**2462MHz by 802.11n(20MHz):**



**2412MHz by 802.11ax(20MHz):**

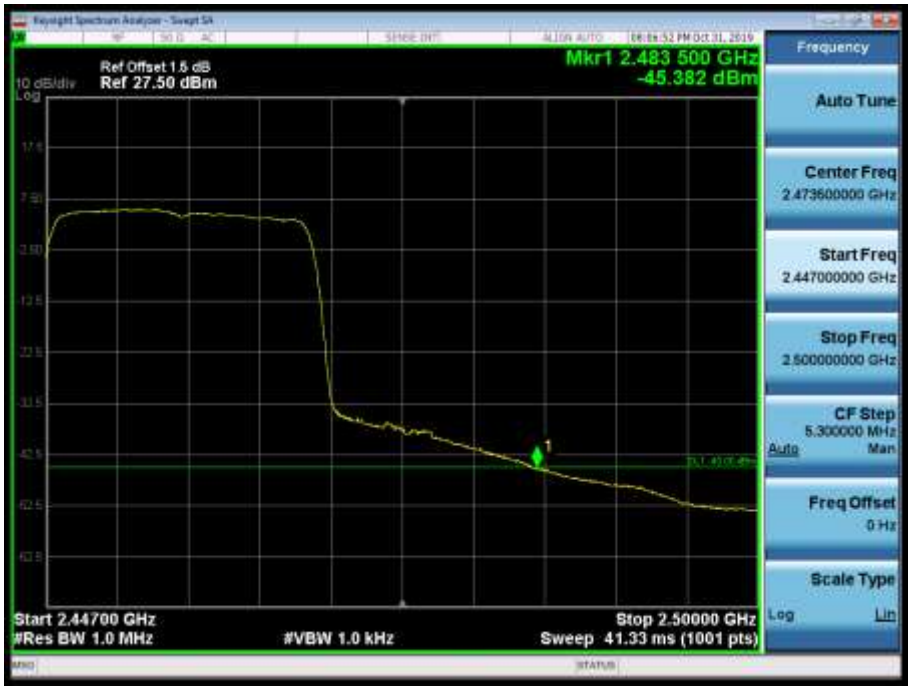



**2417MHz by 802.11ax(20MHz):**

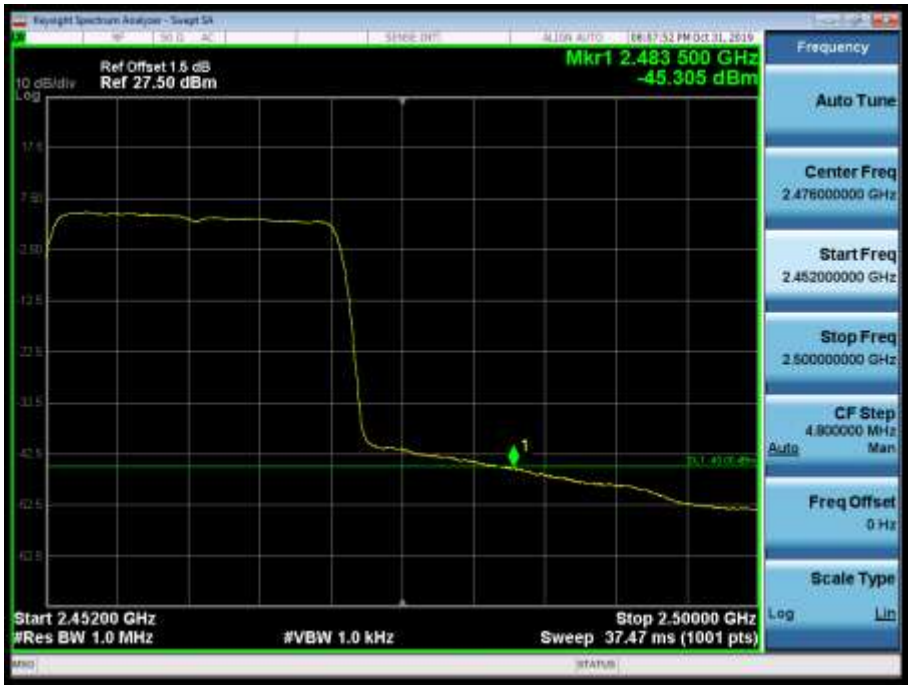


**2437MHz by 802.11ax(20MHz):**


**2457MHz by 802.11ax(20MHz):**

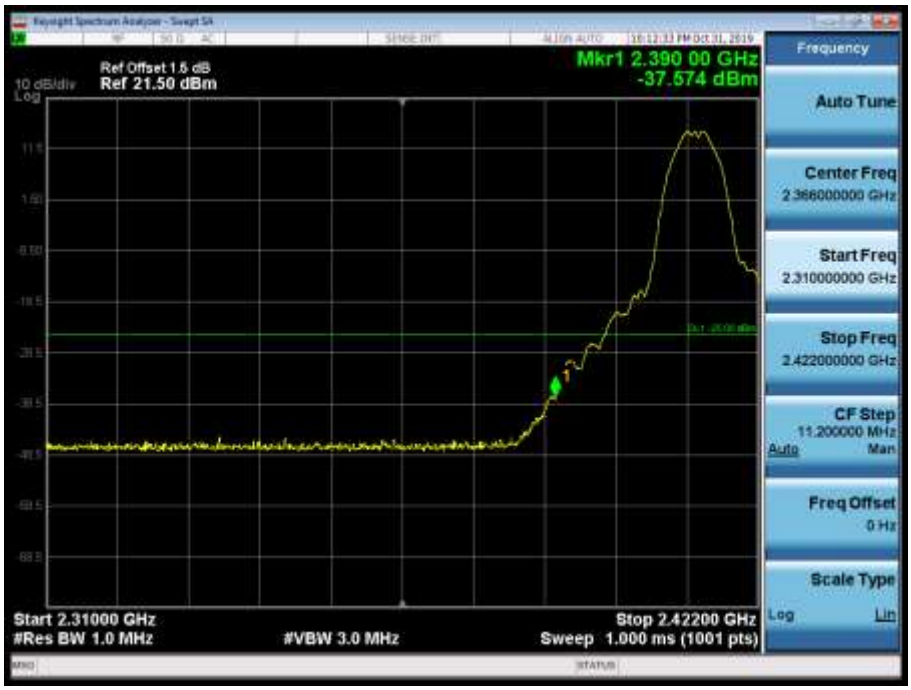


**2462MHz by 802.11ax(20MHz):**

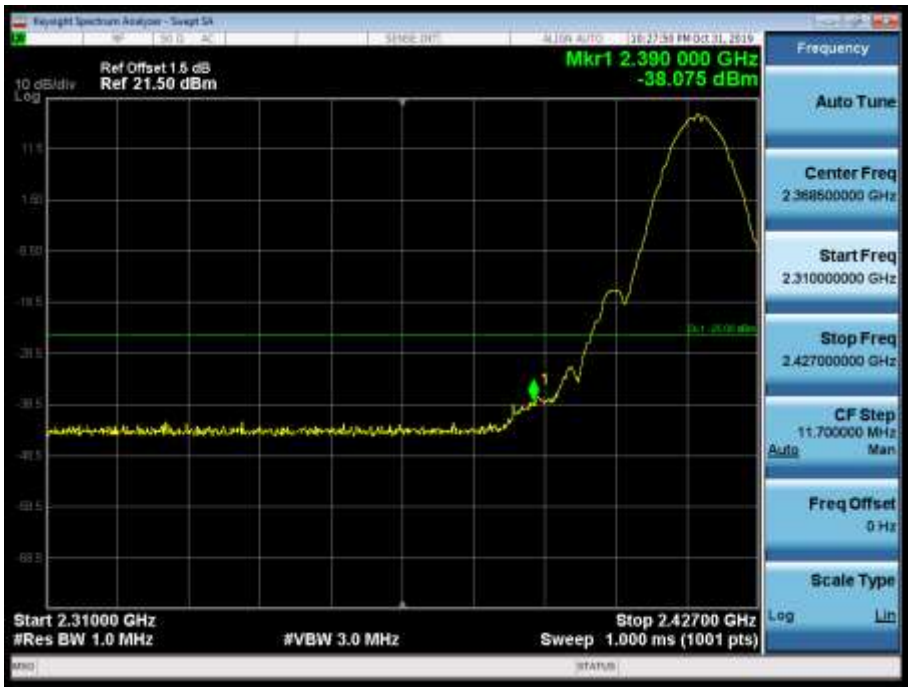


**PK Limit-SISO:**

**2412MHz by 802.11b:**

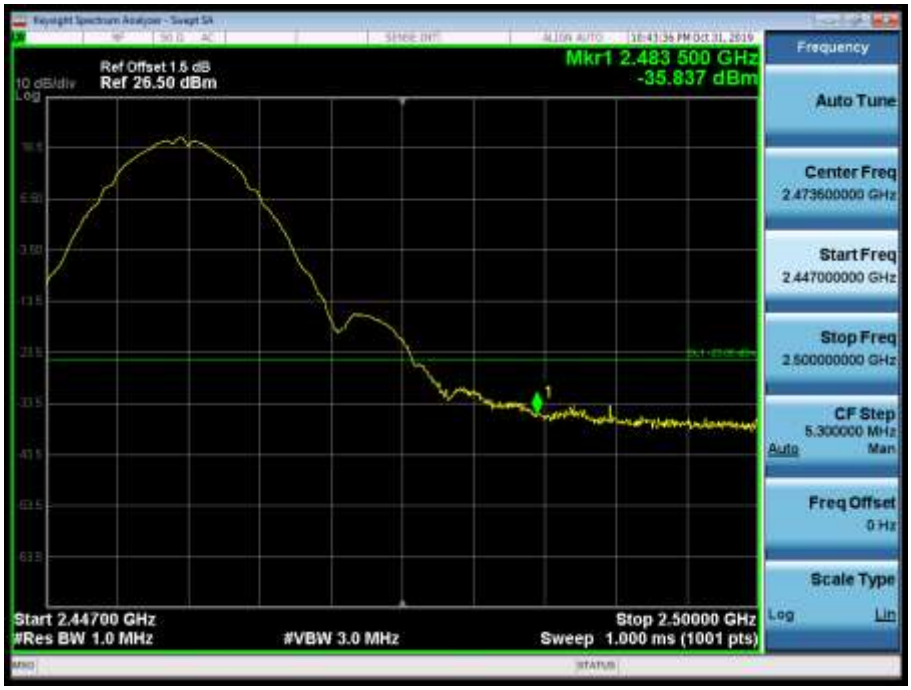



**2417MHz by 802.11b:**

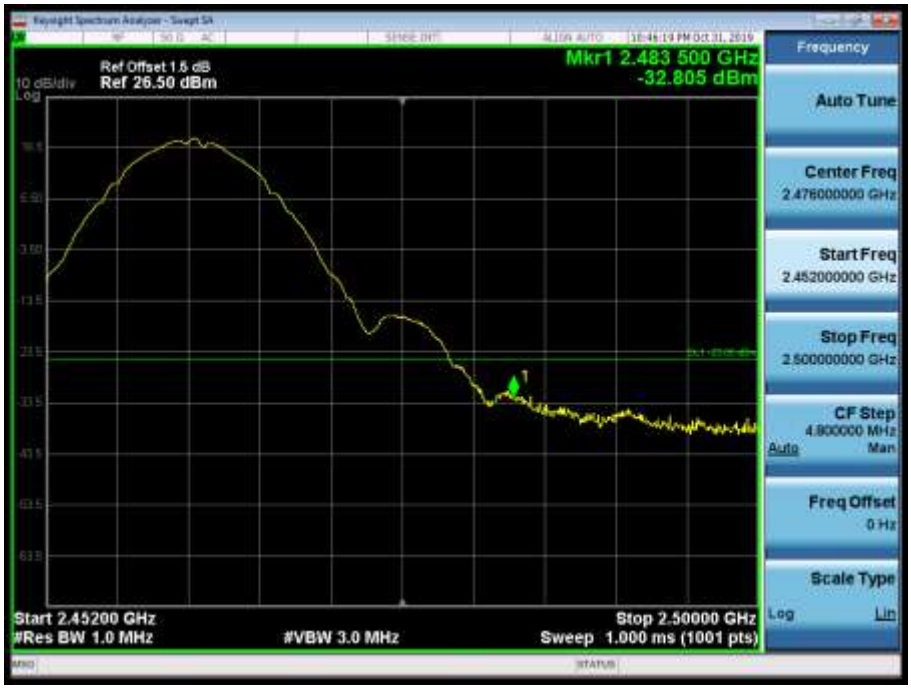


**2437MHz by 802.11b:**

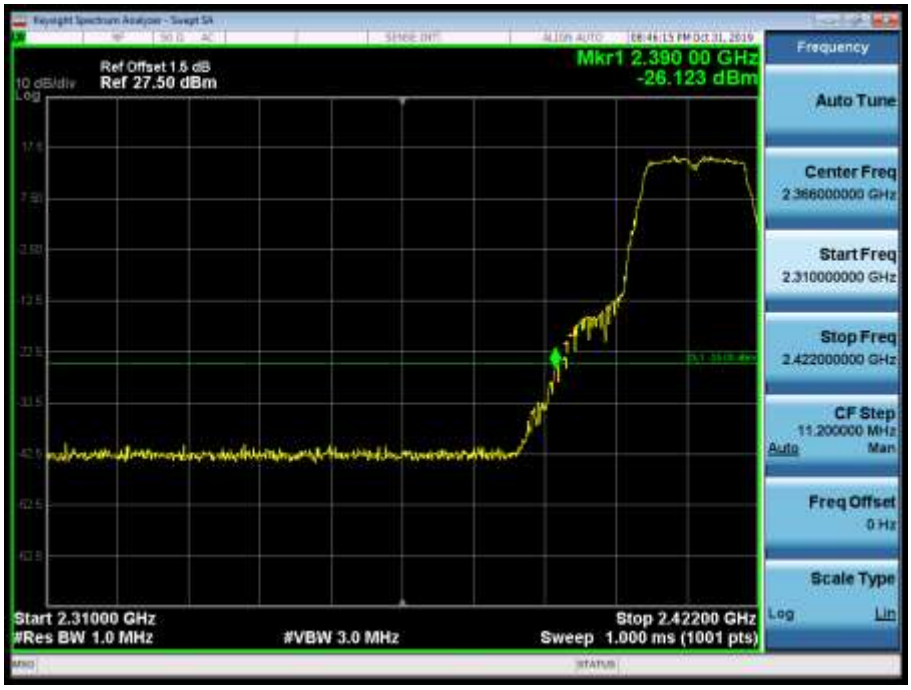

**2457MHz by 802.11b:**



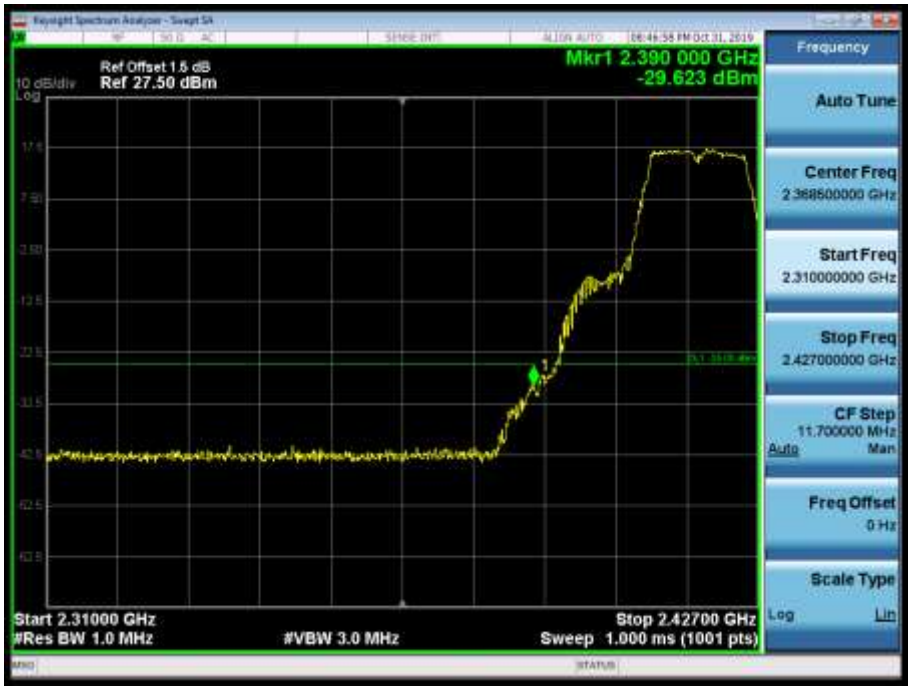
**2462MHz by 802.11b:**



**2412MHz by 802.11g:**



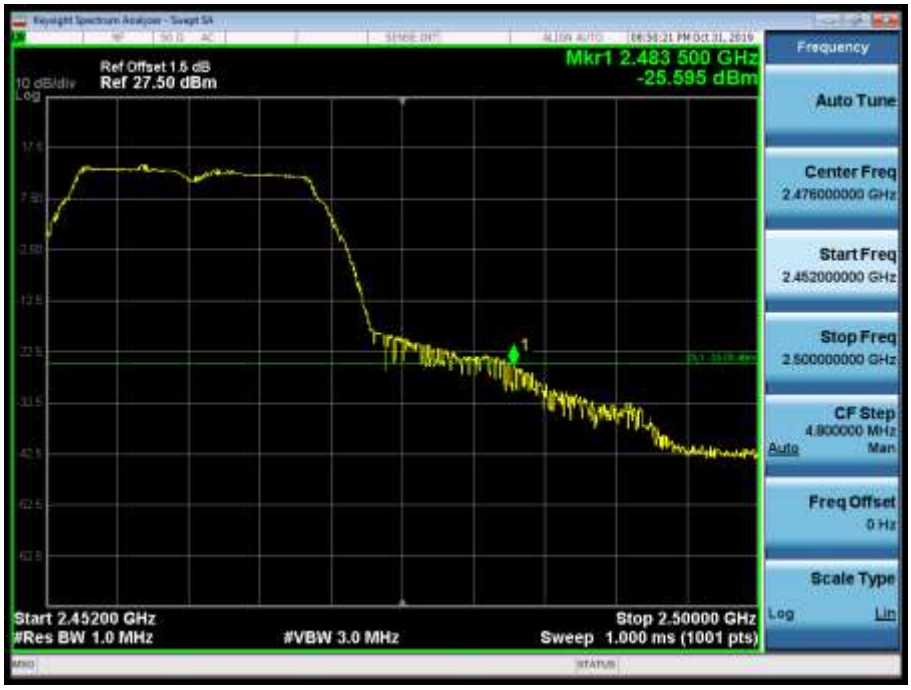

**2417MHz by 802.11g:**



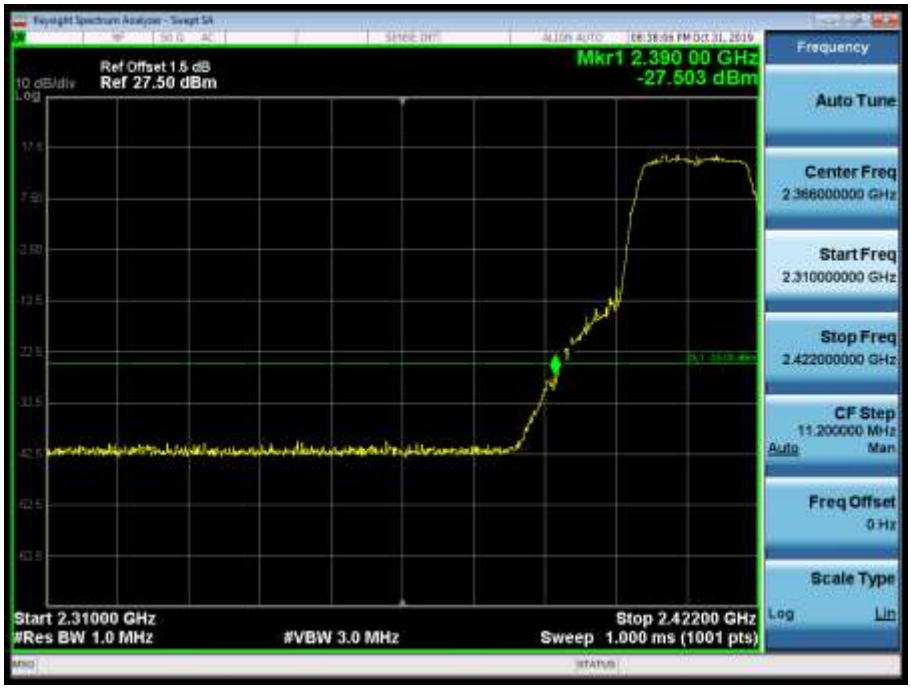
**2437MHz by 802.11g:**


**2457MHz by 802.11g:**

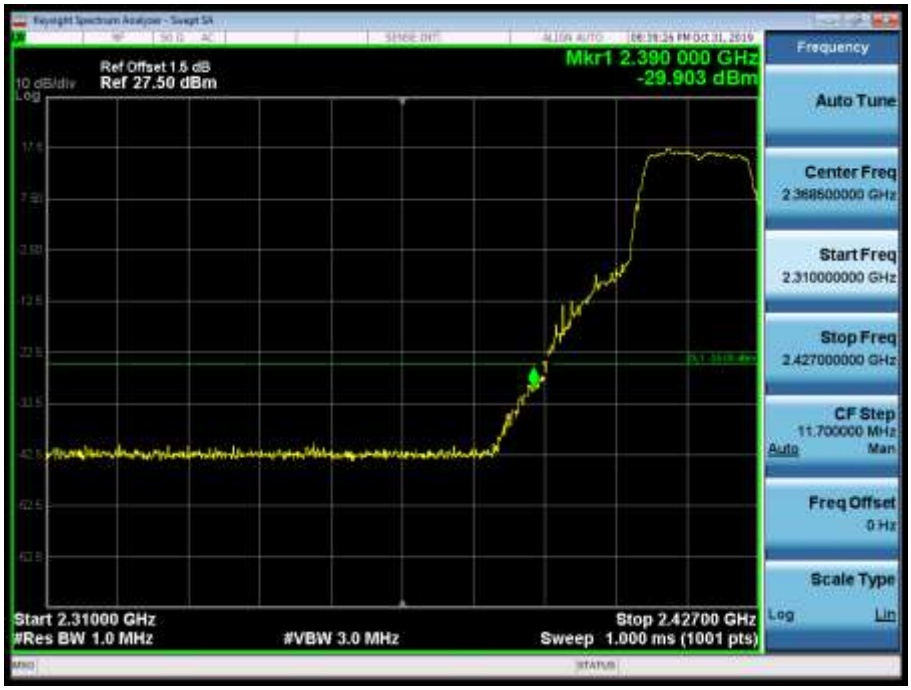
**2462MHz by 802.11g:**



**2412MHz by 802.11n(20MHz):**




**2417MHz by 802.11n(20MHz):**

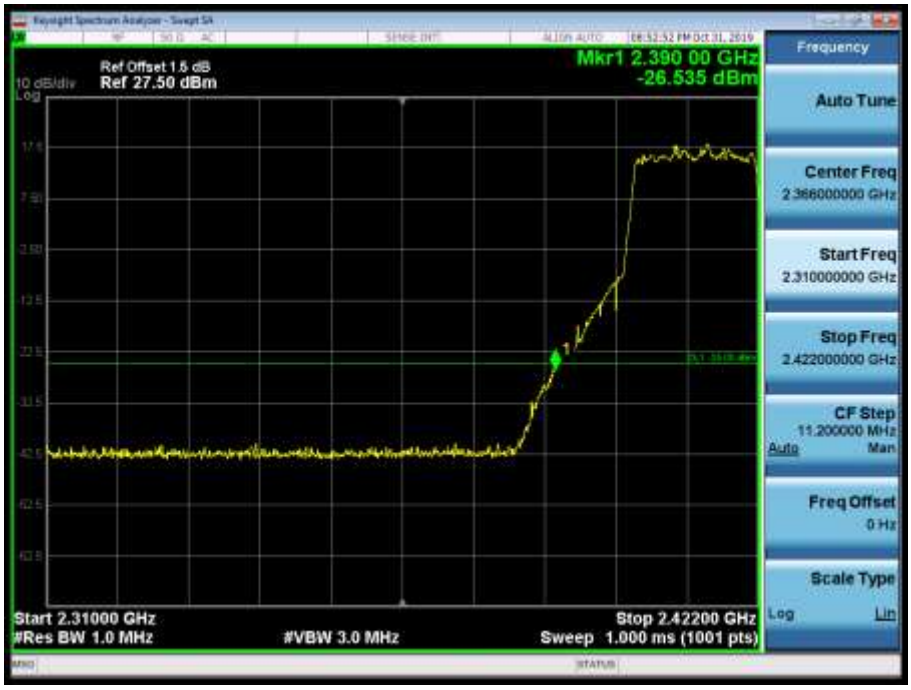


**2437MHz by 802.11n(20MHz):**


**2457MHz by 802.11n(20MHz):**

**2462MHz by 802.11n(20MHz):**

**2412MHz by 802.11ax(20MHz):**




**2417MHz by 802.11ax(20MHz):**

**2437MHz by 802.11ax(20MHz):**

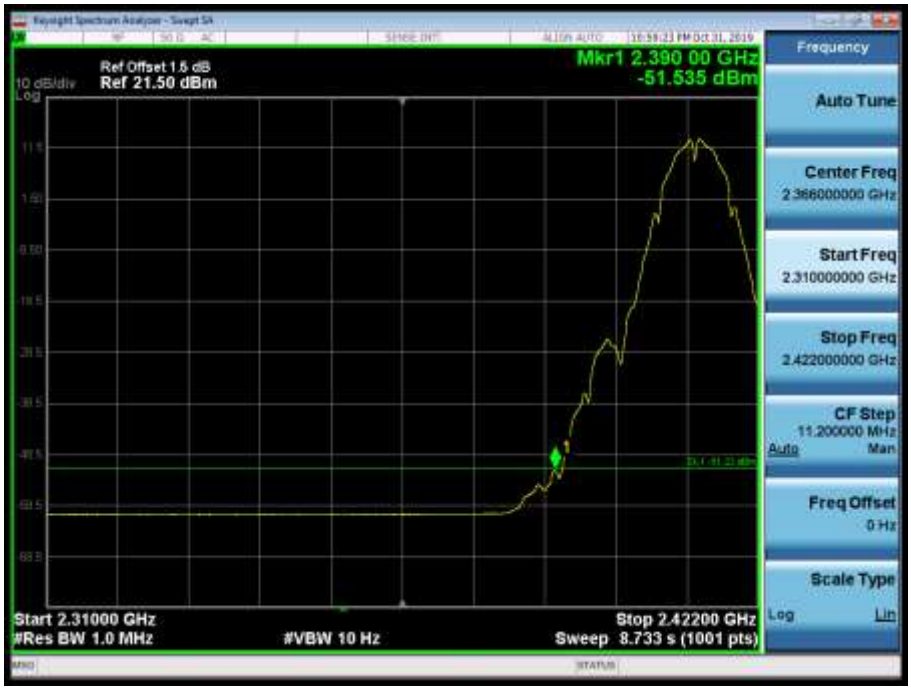

**2457MHz by 802.11ax(20MHz):**

**2462MHz by 802.11ax(20MHz):**

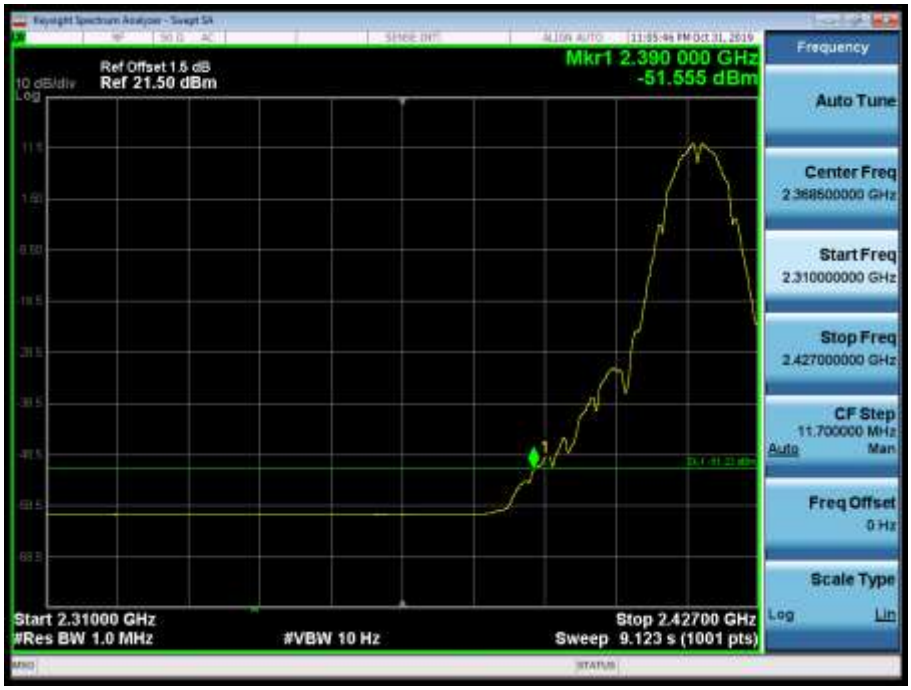
**Radio 2**

**AV Limit-CDD:**

**2412MHz by 802.11b:**




**2417MHz by 802.11b:**



**2437MHz by 802.11b:**

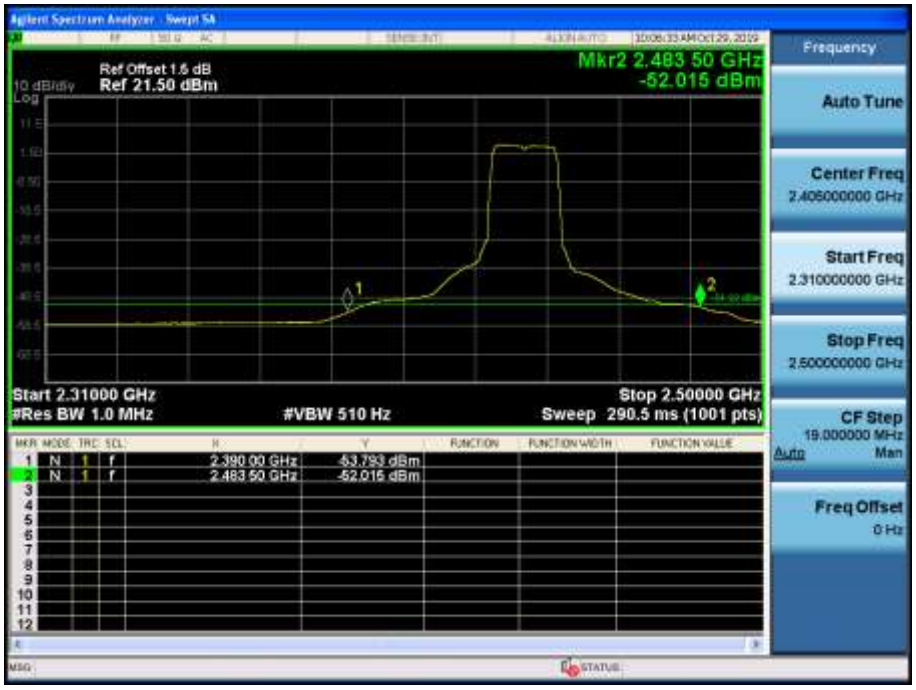

**2457MHz by 802.11b:**

**2462MHz by 802.11b:**

**2412MHz by 802.11g:**

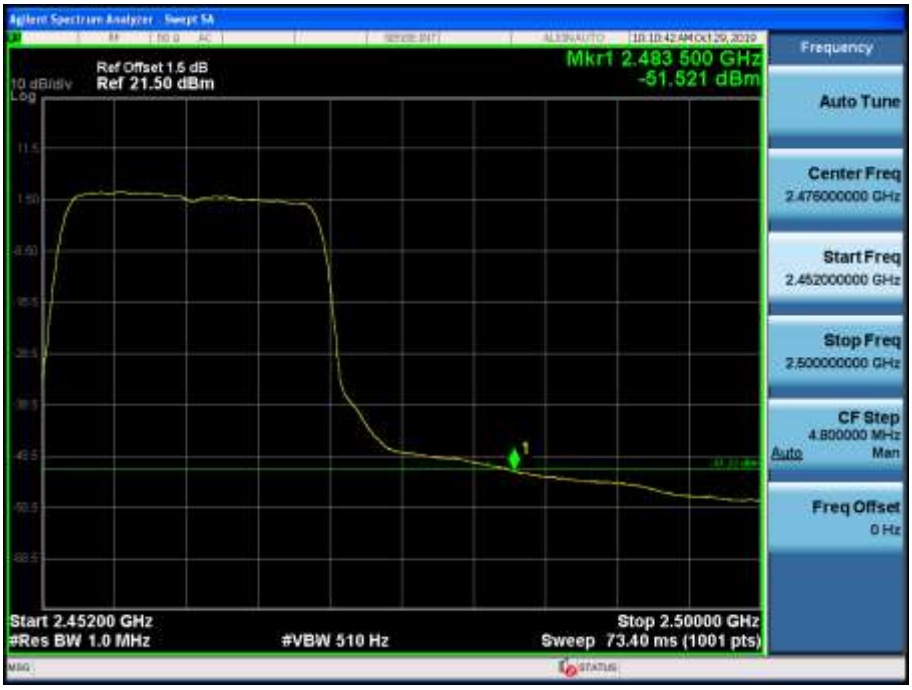

**2417MHz by 802.11g:**

**2437MHz by 802.11g:**

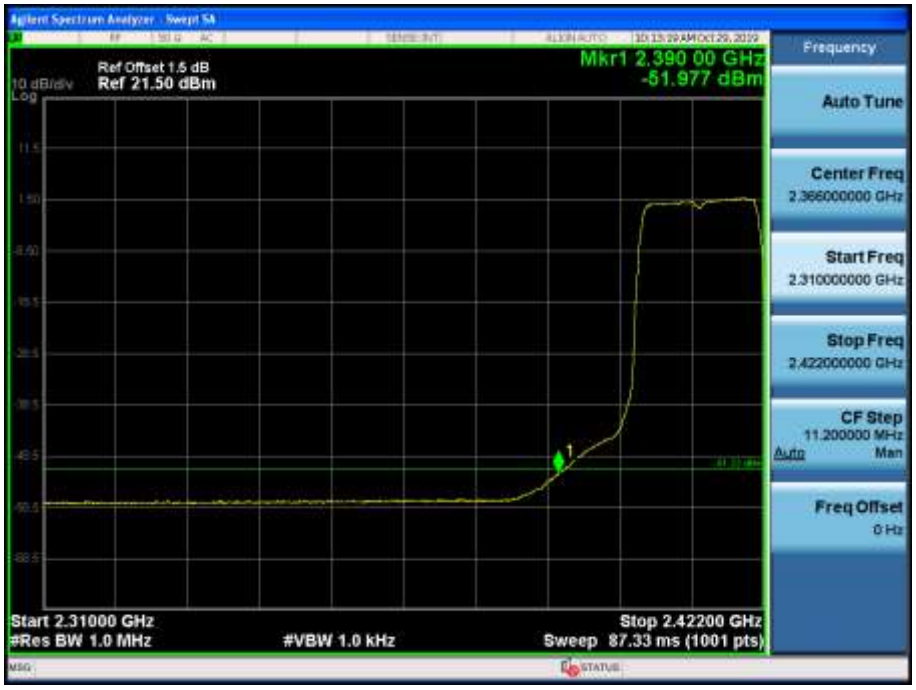



**2457MHz by 802.11g:**

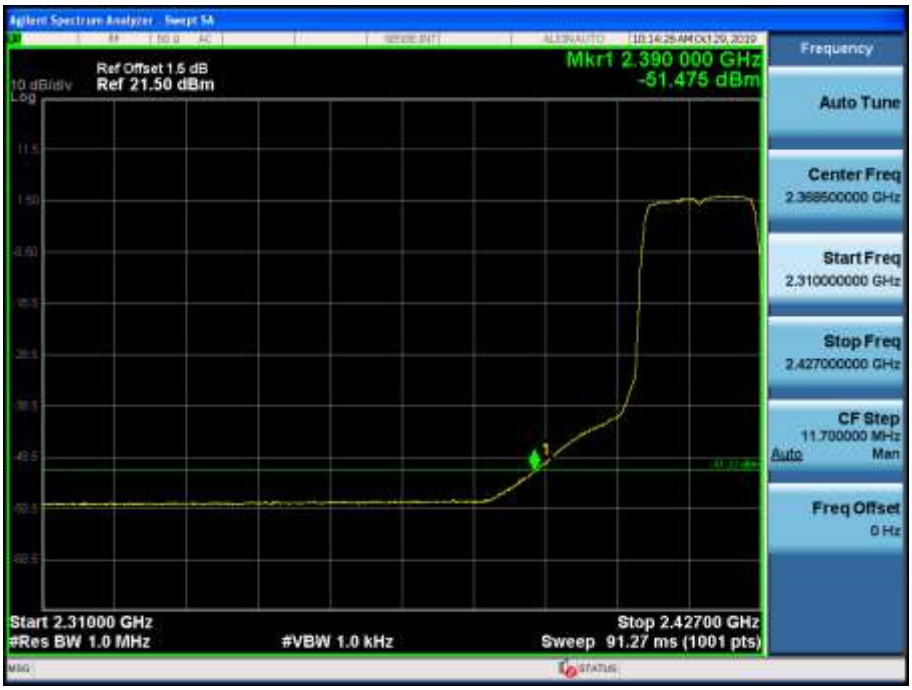
**2462MHz by 802.11g:**



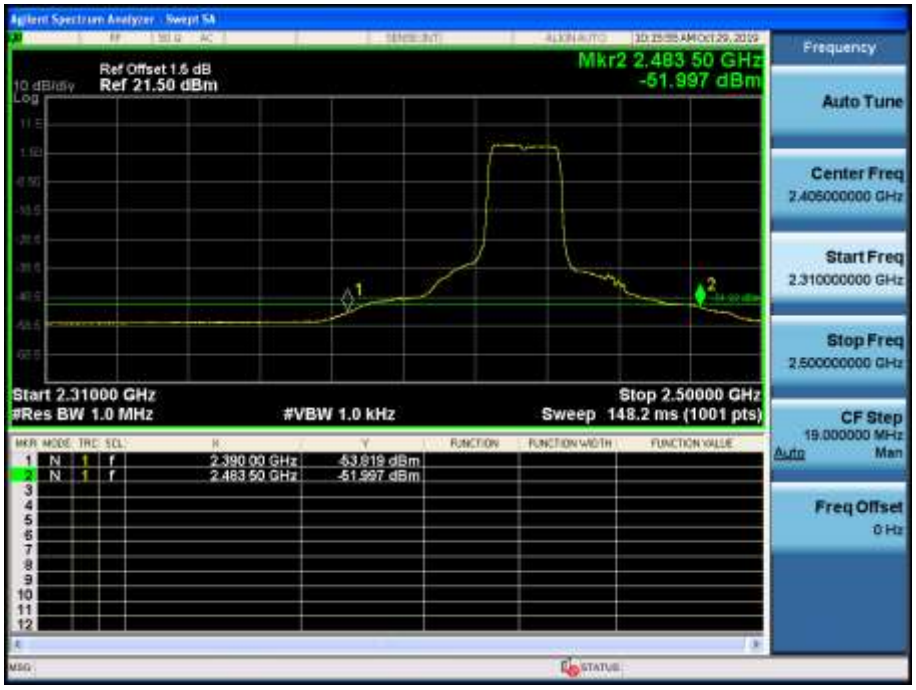
**2412MHz by 802.11n(20MHz):**



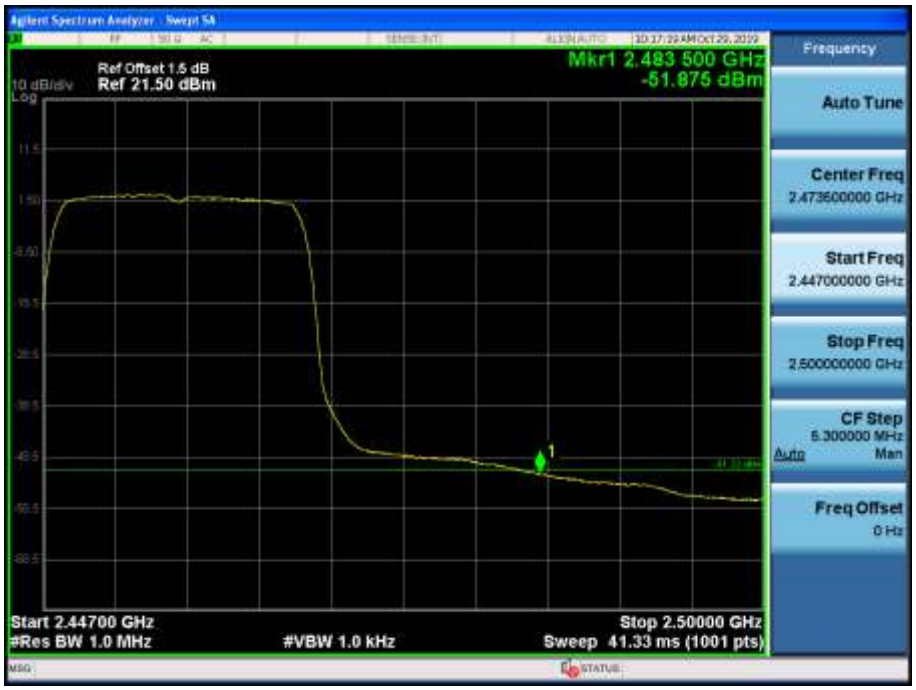

**2417MHz by 802.11n(20MHz):**



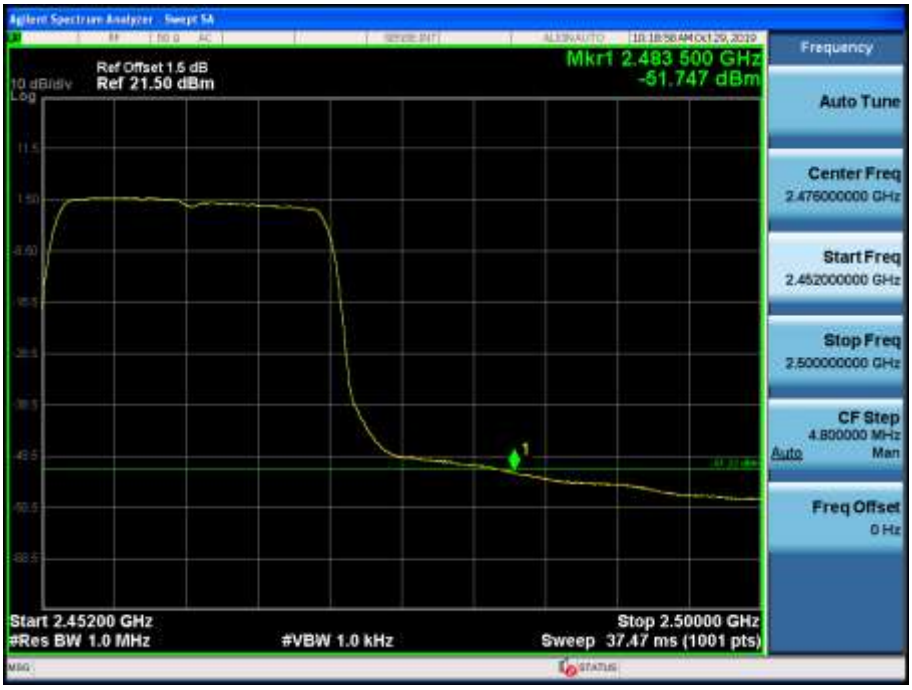
**2437MHz by 802.11n(20MHz):**



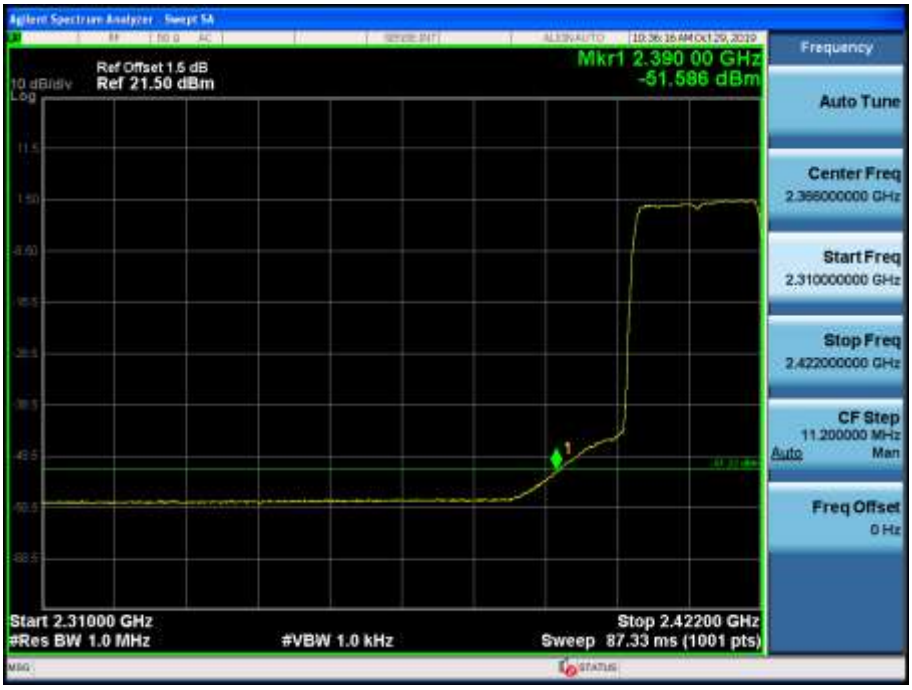

**2457MHz by 802.11n(20MHz):**



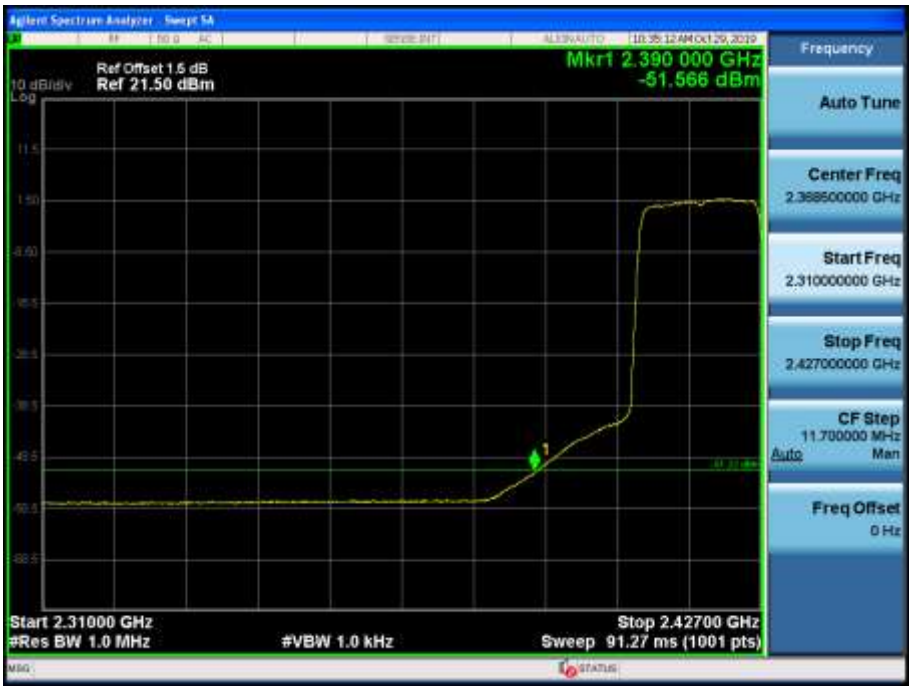
**2462MHz by 802.11n(20MHz):**



**2412MHz by 802.11ax(20MHz):**

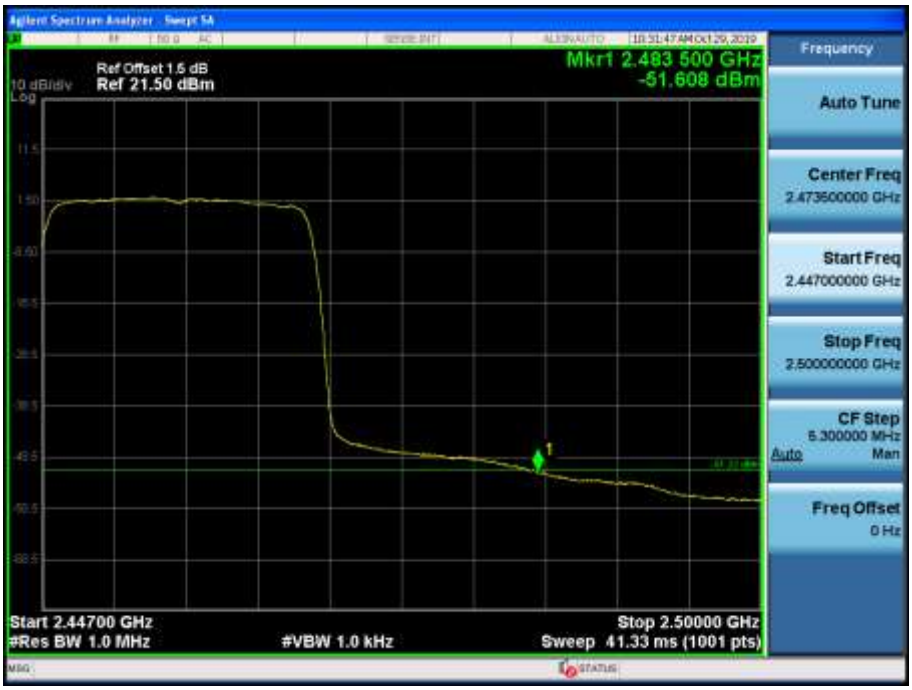



**2417MHz by 802.11ax(20MHz):**

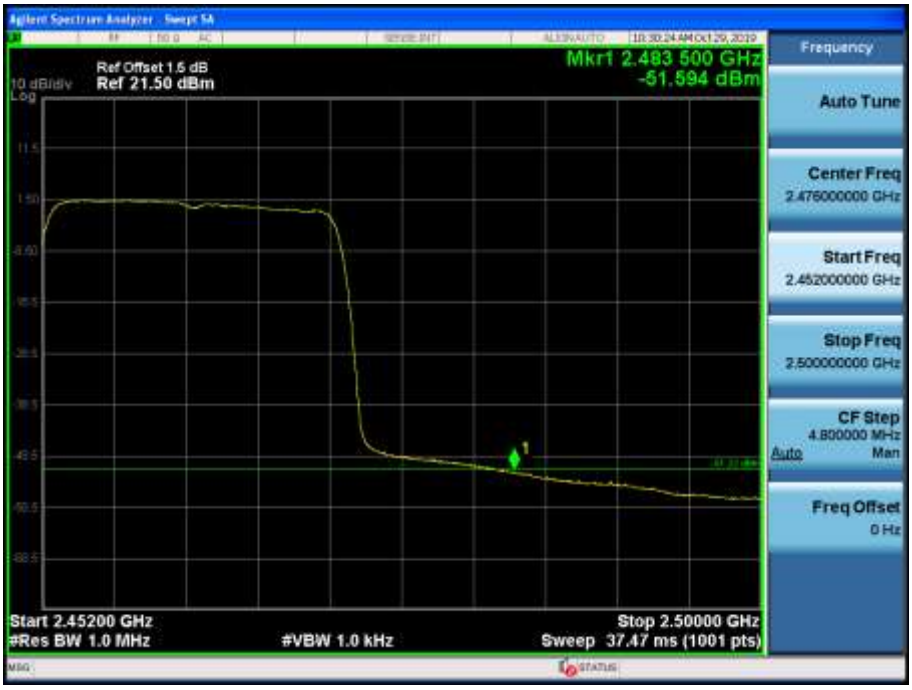


**2437MHz by 802.11ax(20MHz):**


**2457MHz by 802.11ax(20MHz):**

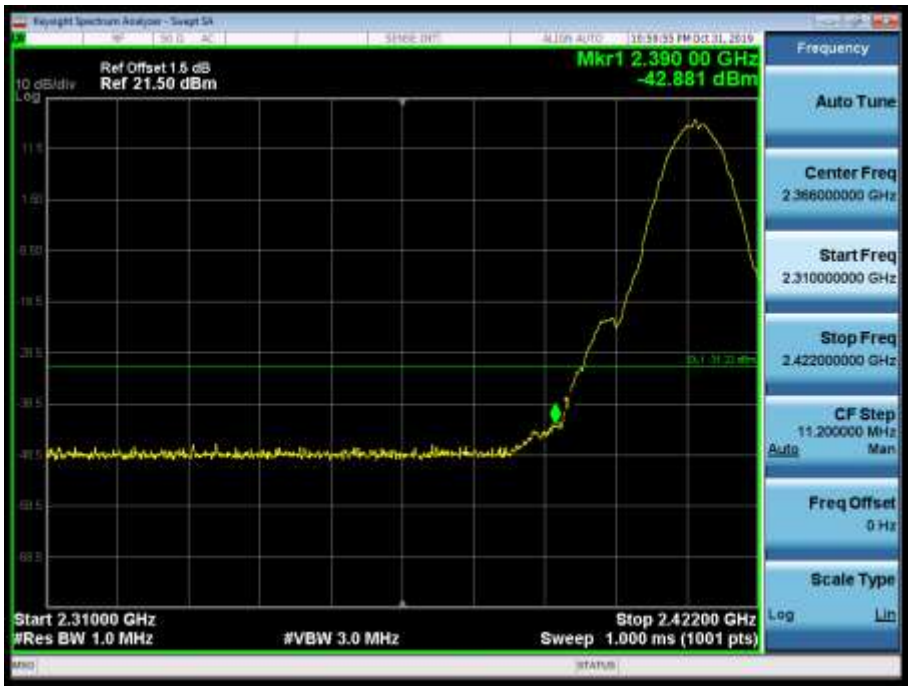


**2462MHz by 802.11ax(20MHz):**

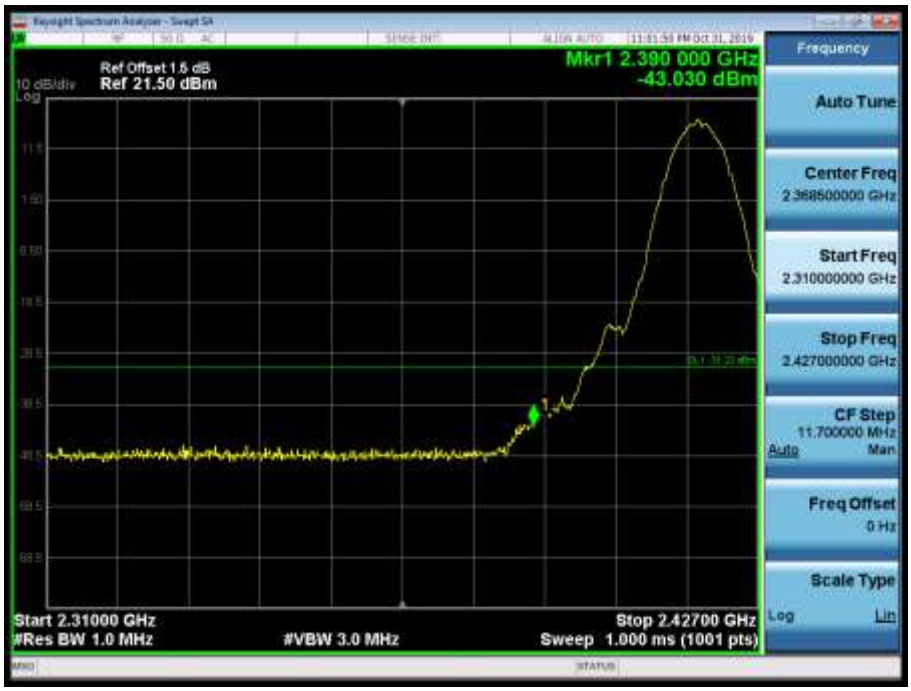


**PK Limit-CDD:**

**2412MHz by 802.11b:**

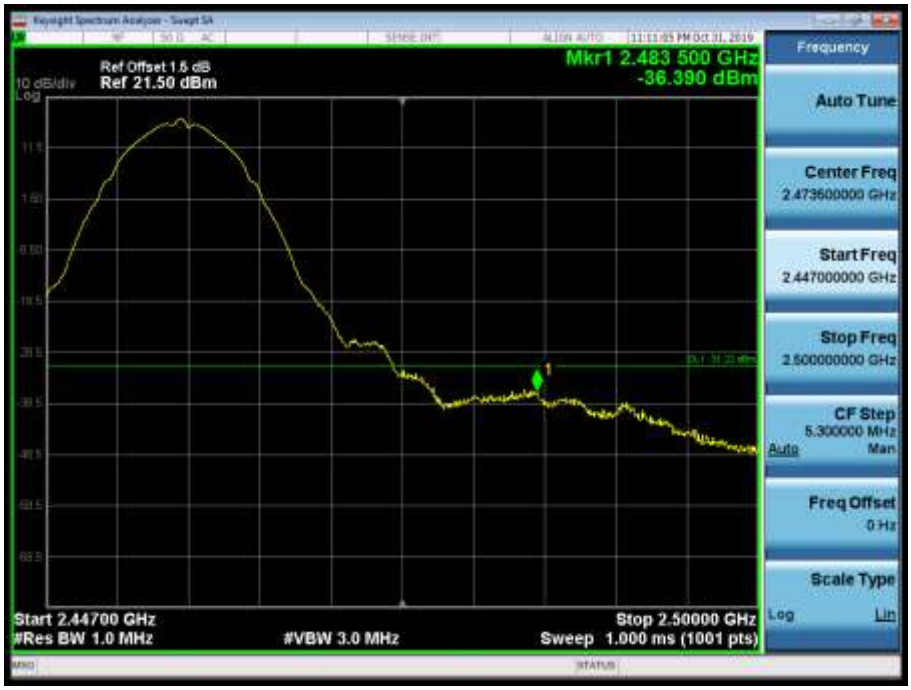



**2417MHz by 802.11b:**

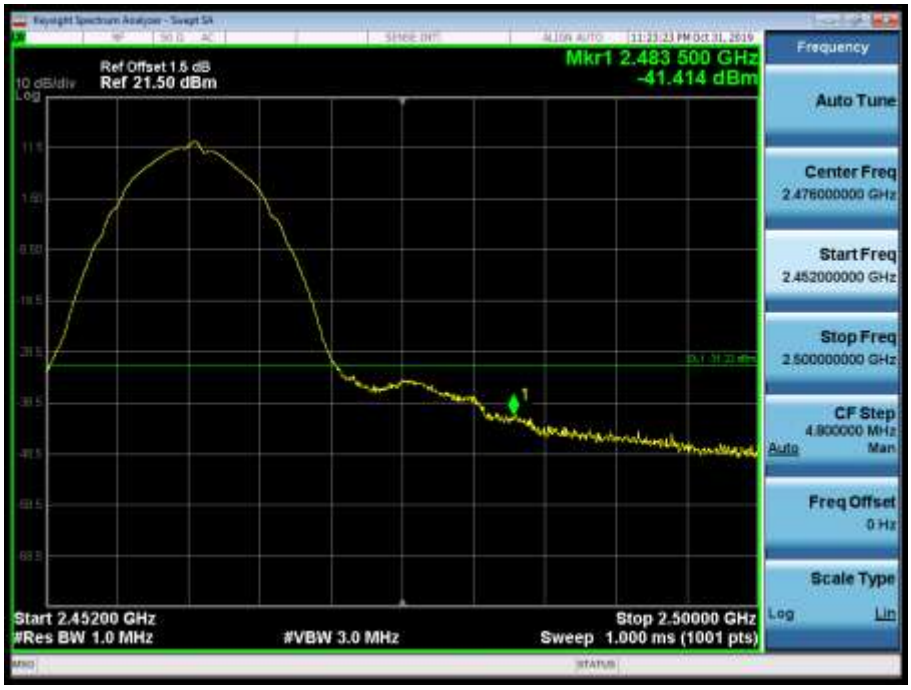


**2437MHz by 802.11b:**

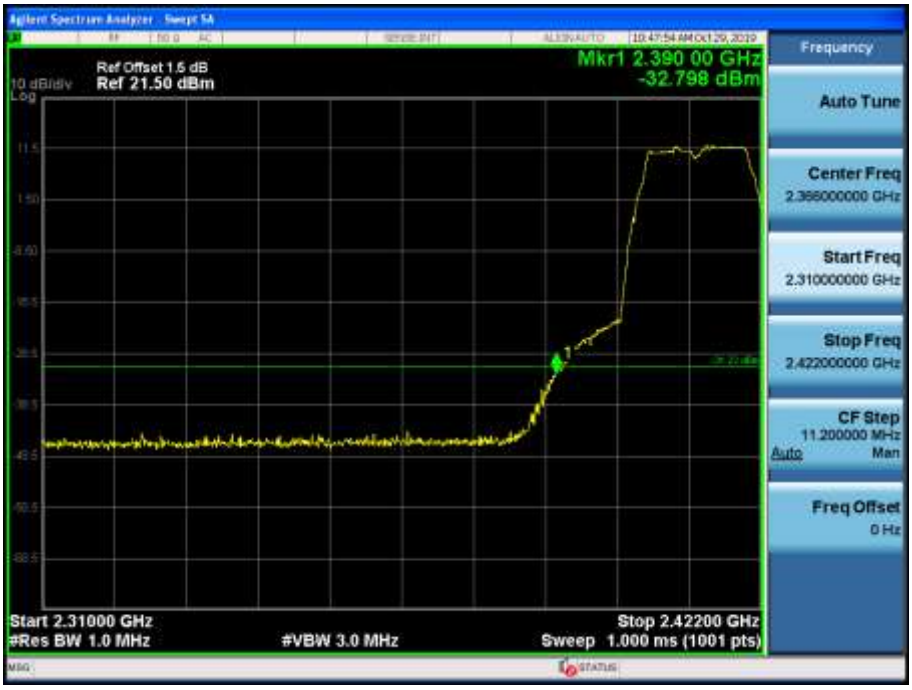

**2457MHz by 802.11b:**



**2462MHz by 802.11b:**



**2412MHz by 802.11g:**




**2417MHz by 802.11g:**

**2437MHz by 802.11g:**

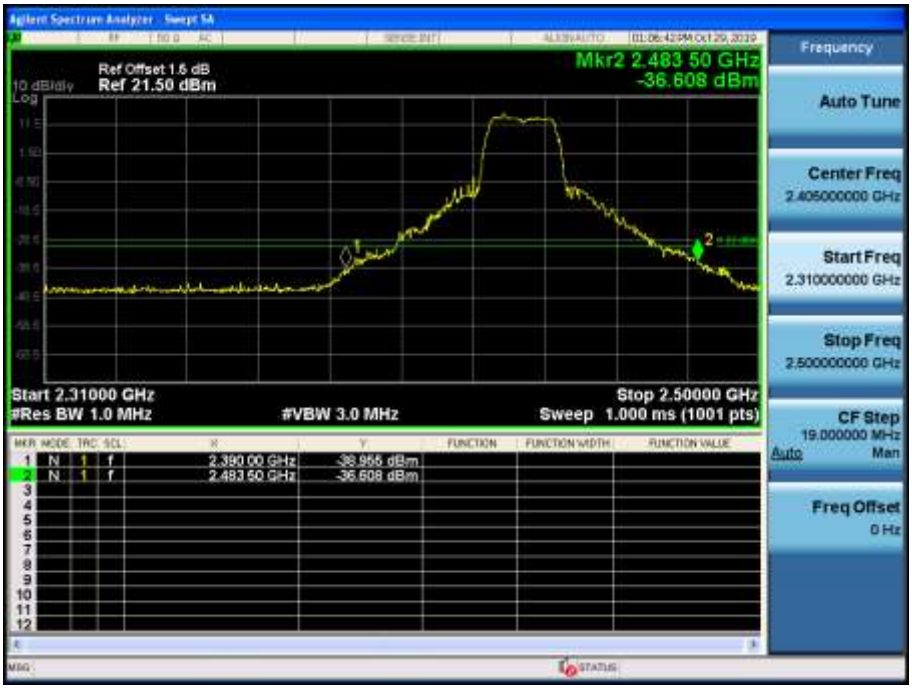

**2457MHz by 802.11g:**

**2462MHz by 802.11g:**

**2412MHz by 802.11n(20MHz):**

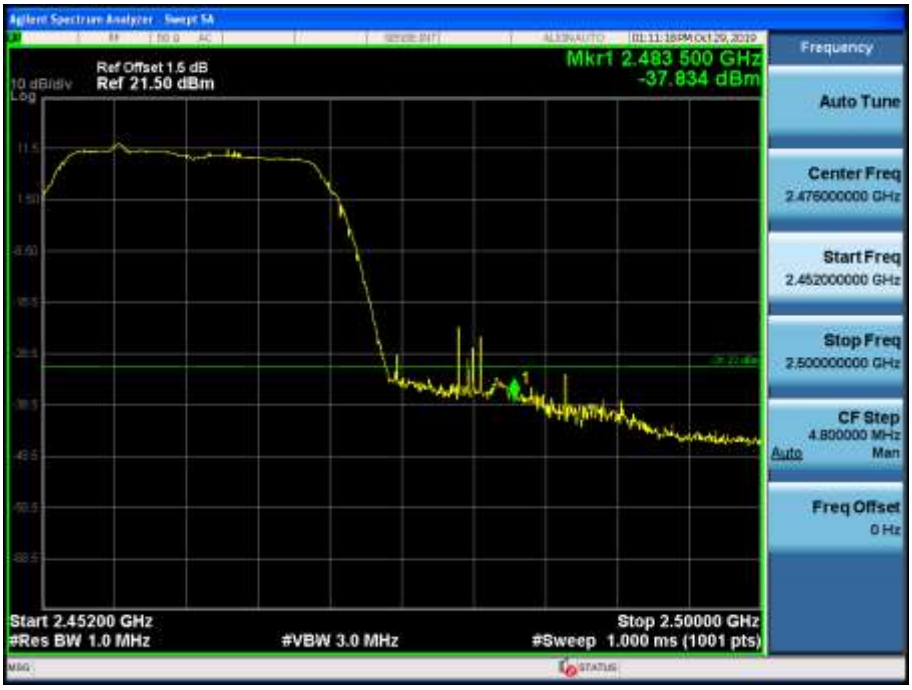

**2417MHz by 802.11n(20MHz):**

**2437MHz by 802.11n(20MHz):**




**2457MHz by 802.11n(20MHz):**

**2462MHz by 802.11n(20MHz):**



**2412MHz by 802.11ax(20MHz):**


**2417MHz by 802.11ax(20MHz):**

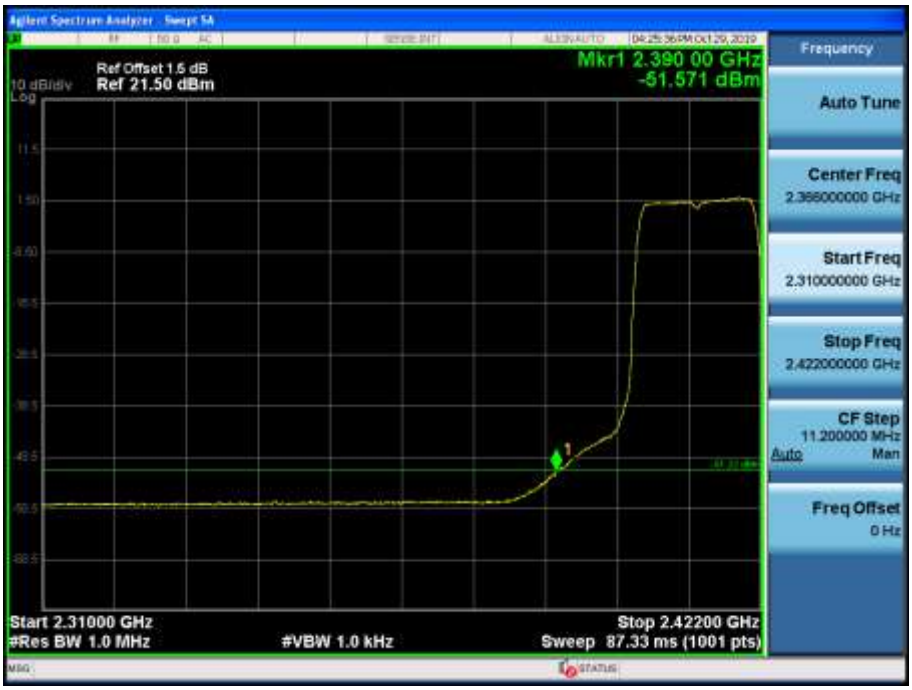
**2437MHz by 802.11ax(20MHz):**


**2457MHz by 802.11ax(20MHz):**

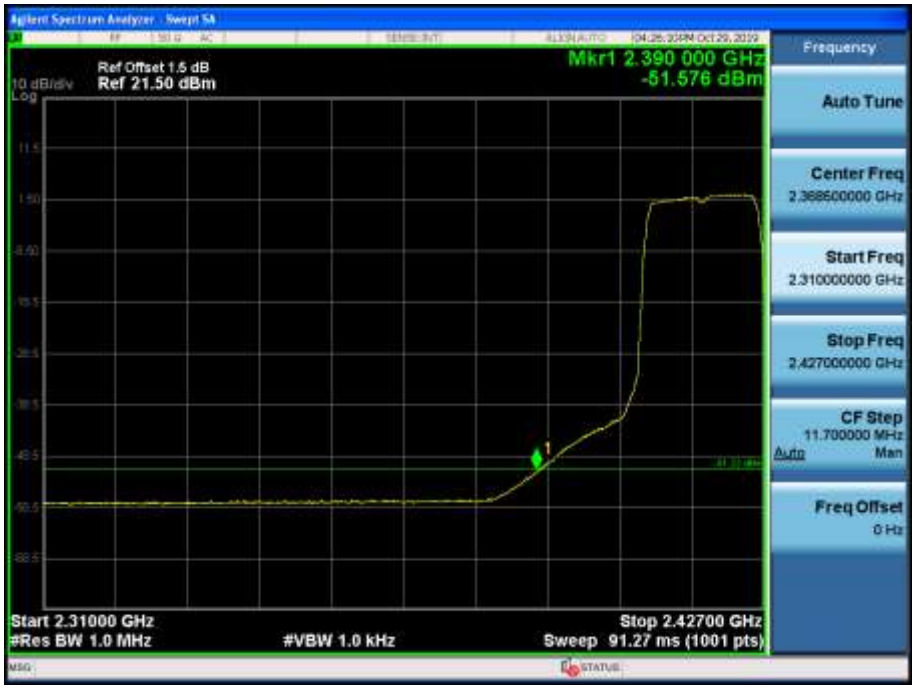
**2462MHz by 802.11ax(20MHz):**

**AV Limit-Beamforming:**

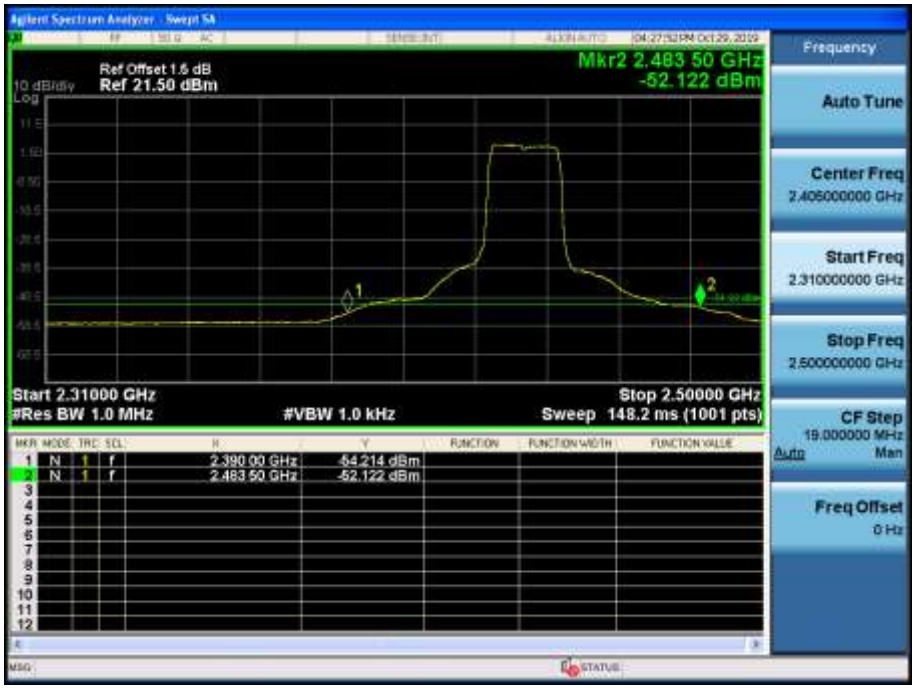
**2412MHz by 802.11n(20MHz):**




**2417MHz by 802.11n(20MHz):**

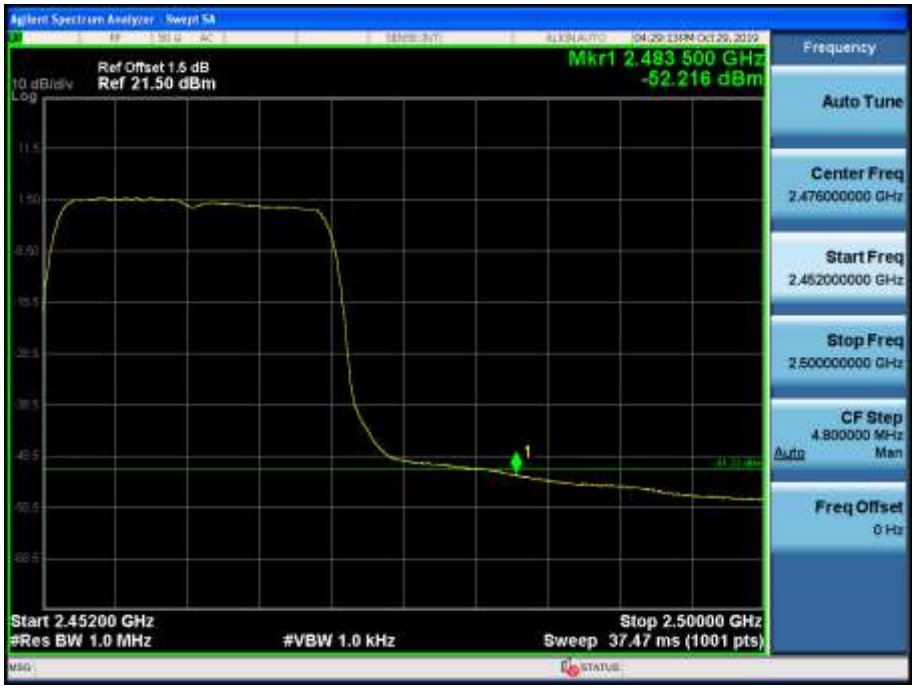


**2437MHz by 802.11n(20MHz):**

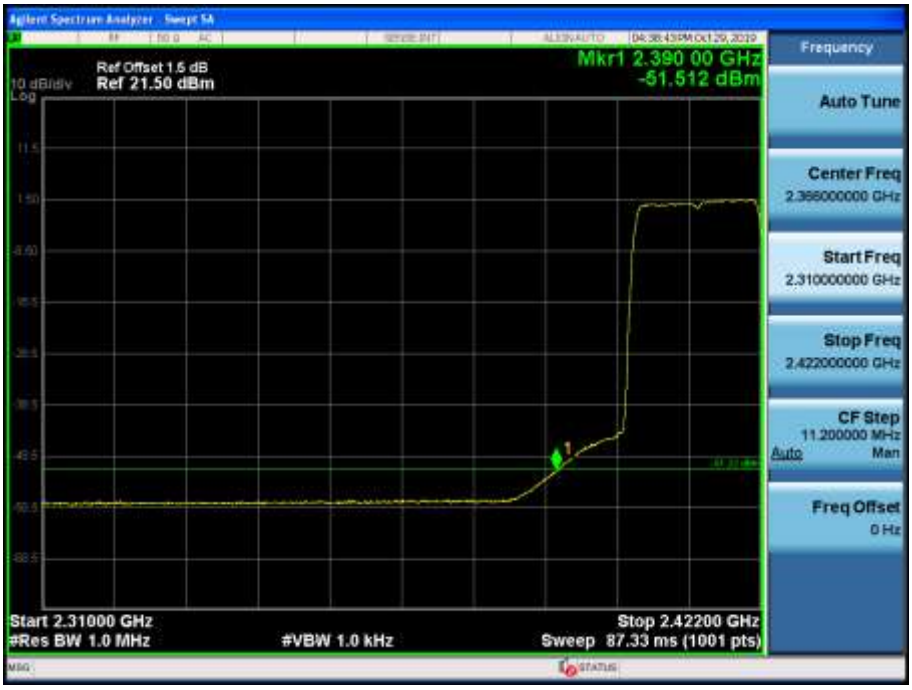



**2457MHz by 802.11n(20MHz):**

**2462MHz by 802.11n(20MHz):**



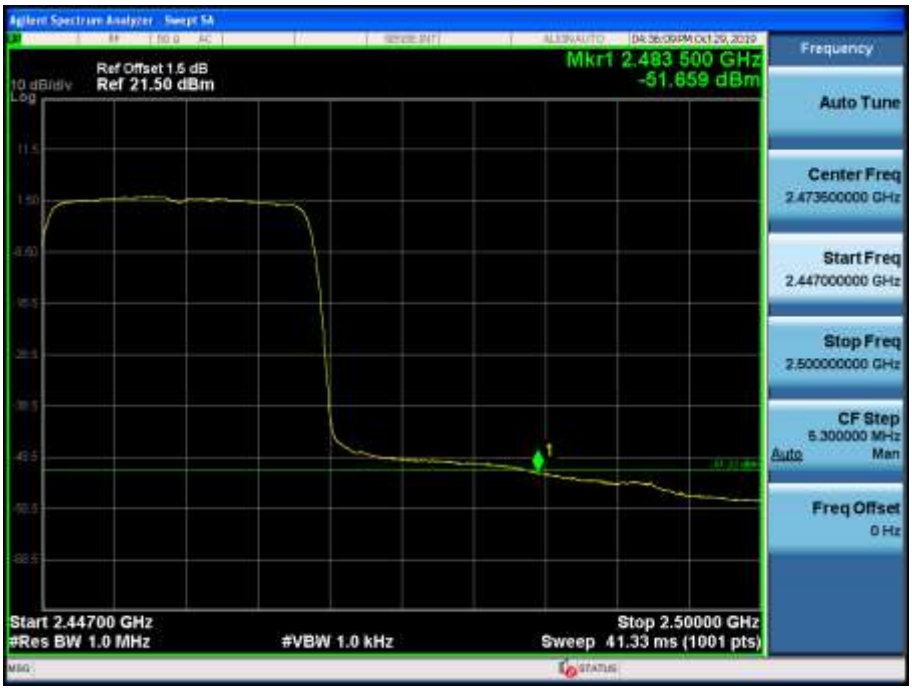
**2412MHz by 802.11ax(20MHz):**



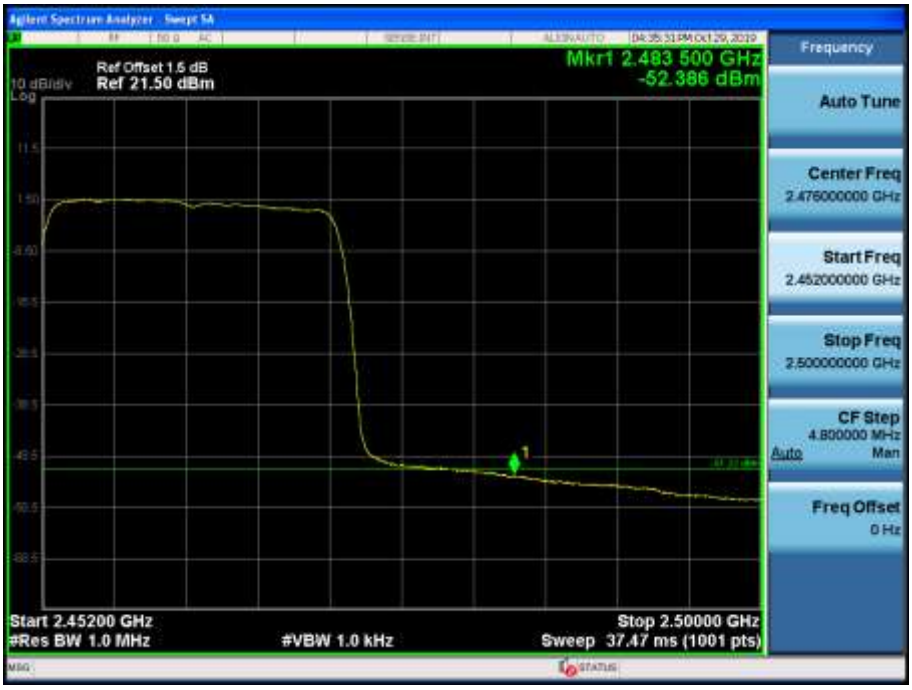

**2417MHz by 802.11ax(20MHz):**

**2437MHz by 802.11ax(20MHz):**


**2457MHz by 802.11ax(20MHz):**



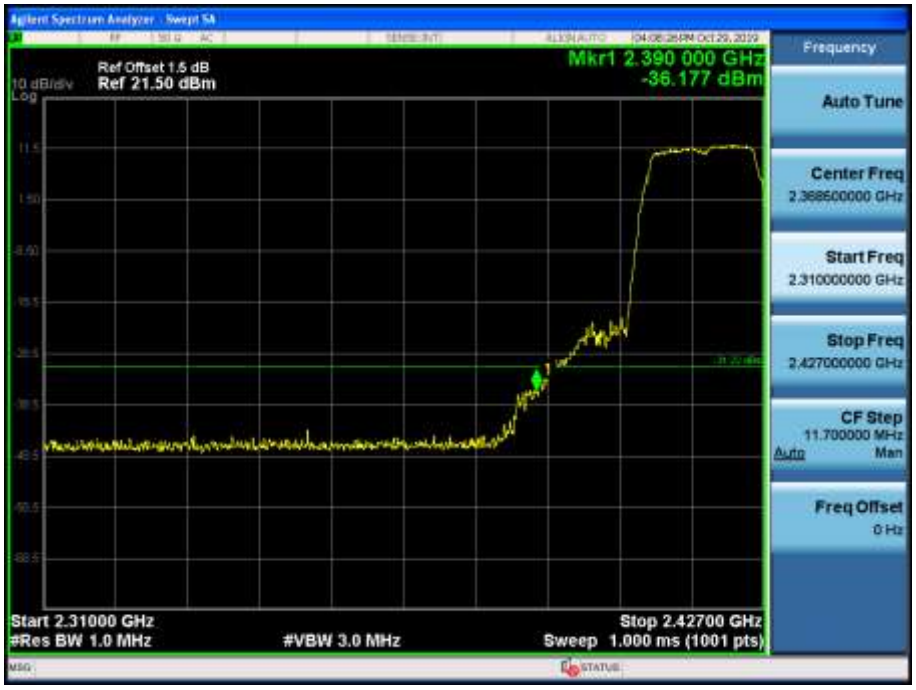
**2462MHz by 802.11ax(20MHz):**



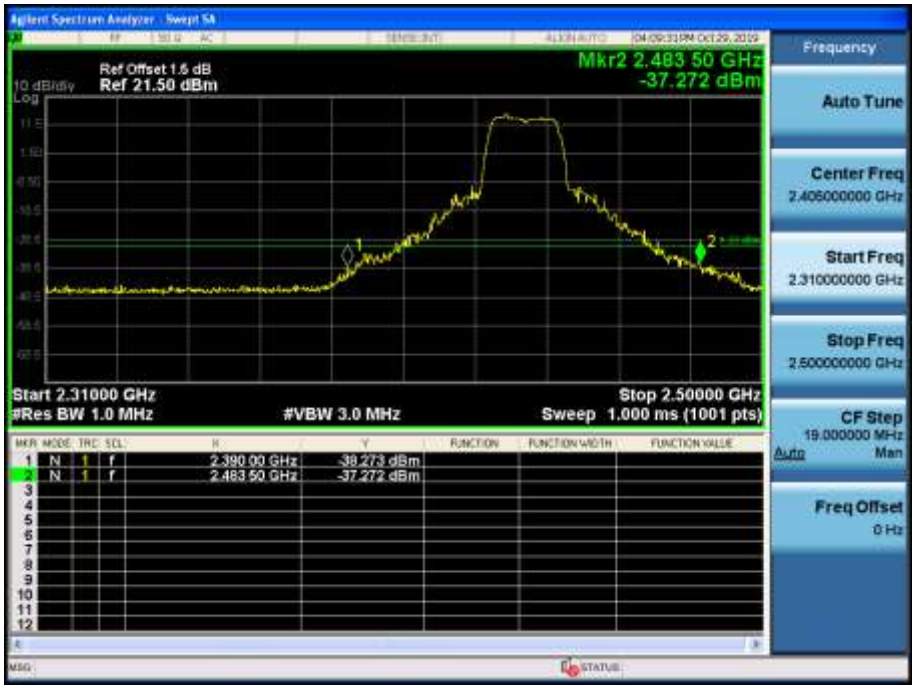
**PK Limit-Beamforming**

**2412MHz by 802.11n(20MHz):**


**2417MHz by 802.11n(20MHz):**



**2437MHz by 802.11n(20MHz):**




**2457MHz by 802.11n(20MHz):**

**2462MHz by 802.11n(20MHz):**

**2412MHz by 802.11ax(20MHz):**


**2417MHz by 802.11ax(20MHz):**

**2437MHz by 802.11ax(20MHz):**


**2457MHz by 802.11ax(20MHz):**

**2462MHz by 802.11ax(20MHz):**

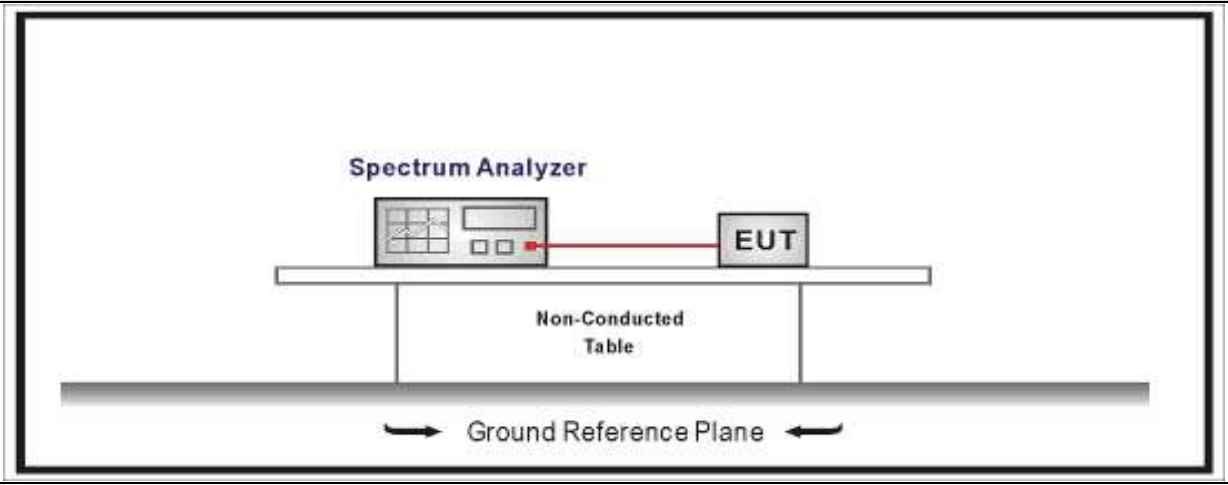
# 7. Occupied Bandwidth

## 7.1. Test Equipment

| Occupied Bandwidth / TR-8 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2019.02.04 | 2020.02.03 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2019.04.09 | 2020.04.08 |
| MXA Signal Anlyzer | Keysight | N9020A | MY56060147 | 2019.04.09 | 2020.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2019.04.10 | 2020.04.09 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 7.2. Test Setup

Occupied Bandwidth test setup:



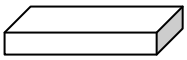
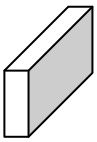
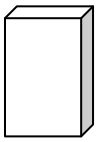
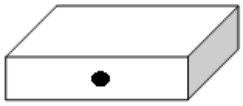
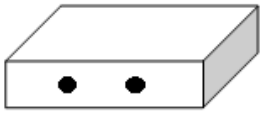
## 7.3. Limit

| Occupied Bandwidth |
|---|
| Systems using digital modulation techniques operate in the2400-2483.5 MHz .The minimum 6 dB bandwidth shall be at least 500 kHz |

## 7.4. Test Procedure

| Test Method | | | | |
|---|---|---|---|---|
| | Reference Rule | | Chapter | Description |
| ☒ | ANSI C63.10 | | 11.8 | DTS bandwidth |
| | ☐ | ANSI C63.10 | 11.8.1 | Option 1 |
| | ☒ | ANSI C63.10 | 11.8.2 | Option 2 |

## 7.5. EUT test definition

<table>
<tr><th>Item</th><th colspan="4">Occupied Bandwidth</th></tr>
<tr><td rowspan="3">Device Category</td><td>☐</td><td colspan="3">Fixed point-to-point</td></tr>
<tr><td>☐</td><td colspan="3">Emit multiple directional beams, simultaneously or sequentially</td></tr>
<tr><td>☒</td><td colspan="3">Other cases</td></tr>
<tr><td>Test mode</td><td colspan="4">Mode 1~4</td></tr>
<tr><td rowspan="12">Test method</td><td>☐</td><td colspan="3">Radiated</td></tr>
<tr><td rowspan="3"></td><td>X Axis</td><td>Y Axis</td><td>Z Axis</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Worst Axis ☐</td><td>Worst Axis ☐</td><td>Worst Axis ☐</td></tr>
<tr><td>☒</td><td colspan="3">Conducted</td></tr>
<tr><td>☒</td><td colspan="3">Chain 1</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☒</td><td>Chain 1</td><td colspan="2">Chain 2</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td>Chain 2</td><td>Chain 3</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
</table>

## 7.6. Test Result

| Product Name | : | Wireless Access Point | Power | : | AC 120V/60Hz |
|---|---|---|---|---|---|
| Test Mode | : | Mode 1~4 | Test Site | : | TR8 |
| Test Date | : | 2019.11.19 | Test Engineer | : | Eric |

| Mode | CH. | Test Freq. (MHz) | 99% Occupied Bandwidth (MHz) | 6dB Occupied Bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|---|---|
| 1 | 01 | 2412 | 13.265 | 7.583 | >500 | Pass |
| 1 | 06 | 2437 | 13.569 | 7.555 | >500 | Pass |
| 1 | 11 | 2462 | 13.583 | 7.087 | >500 | Pass |
| 2 | 01 | 2412 | 17.551 | 16.35 | >500 | Pass |
| 2 | 06 | 2437 | 17.439 | 16.39 | >500 | Pass |
| 2 | 11 | 2462 | 17.393 | 16.39 | >500 | Pass |
| 3 | 01 | 2412 | 18.517 | 17.57 | >500 | Pass |
| 3 | 06 | 2437 | 18.539 | 17.64 | >500 | Pass |
| 3 | 11 | 2462 | 18.446 | 17.59 | >500 | Pass |
| 4 | 01 | 2412 | 19.193 | 18.83 | >500 | Pass |
| 4 | 06 | 2437 | 19.194 | 19.02 | >500 | Pass |
| 4 | 11 | 2462 | 19.171 | 18.97 | >500 | Pass |

Note : The worst case of Occupied Bandwidth as below in next page:

**Mode 1 CH11 (2462MHz)**

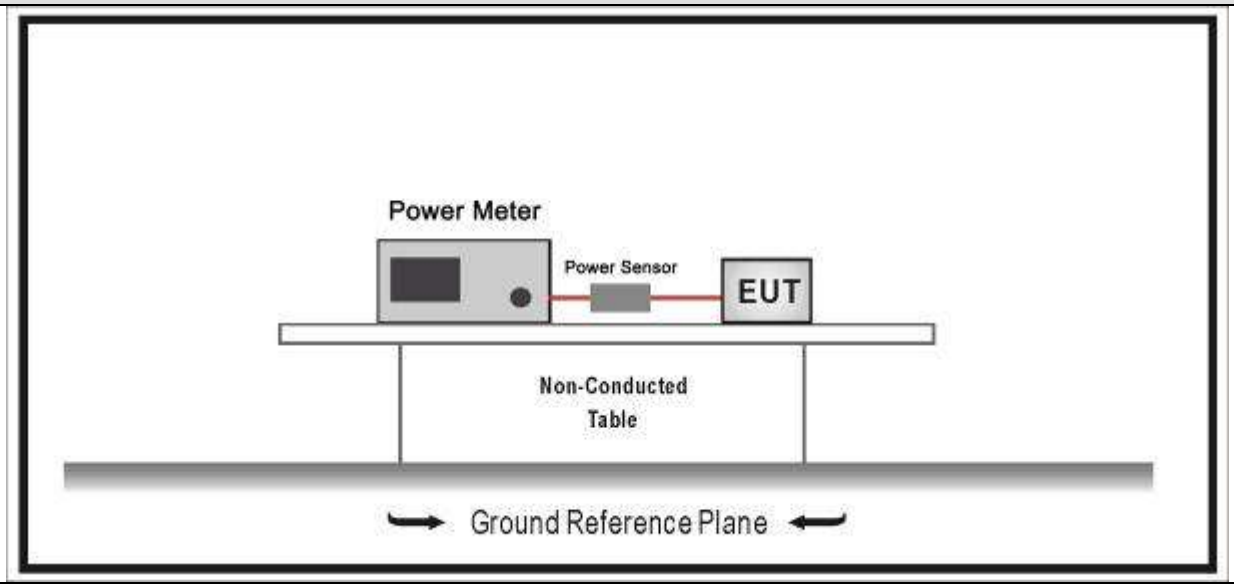
# 8. Fundamental emission output power

## 8.1. Test Equipment

| Fundamental emission output power/ TR-8 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | E4446A | MY45300103 | 2019.01.04 | 2020.01.03 |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2019.02.04 | 2020.02.03 |
| Wideband Peak Power Meter | Anritsu | ML2495A | 0905006 | 2019.10.14 | 2020.10.13 |
| Power Sensor | Anritsu | MA2411B | 0846014 | 2019.10.14 | 2020.10.13 |
| Temperature/Humidity Meter | zhicheng | ZC1-2 | TR8-TH | 2019.04.10 | 2020.04.09 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 8.2. Test Setup

Fundamental emission output power test setup



## 8.3. Limit

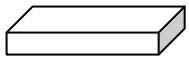
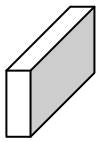
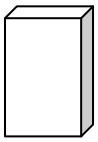
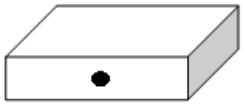
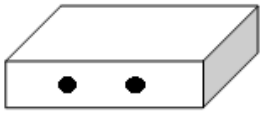
| Fundamental emission output power Limit | | | |
|---|---|---|---|
| ☒ | $G_{TX}$ ＜6dBi | | $P_{out}$≤30dBm |
| ☒ | $G_{TX}$ ＞6dBi | | |
| | ☒ | Non-Fix point-point | $P_{out}$≤30-( $G_{TX}$ -6) |
| | ☐ | Fix point-point | $P_{out}$≤30-[($G_{TX}$-6)]/3 |
| | ☐ | Point-to-multipoint | Pout≤30-(GTX-6) |
| | ☐ | Overlap Beams | $P_{out}$≤30-[($G_{TX}$-6)]/3 |
| | ☐ | Aggregate power transmitted simultaneously on all beams | $P_{out}$≤30-[($G_{TX}$-6)]/3 |
| | ☐ | single directional beam | $P_{out}$≤30-[($G_{TX}$-6)]/3+8dB |
| Note 1 : $G_{TX}$ directional gain of transmitting antennas.<br>Note 2 : $P_{out}$ is maximum peak conducted output power . | | | |

## 8.4. Test Procedure

| Fundamental emission output power Test Method | | | | | | |
|---|---|---|---|---|---|---|
| | References Rule | | | | Chapter | Description |
| ☒ | ANSI C63.10 | | | | 11.9 | Fundamental emission output power |
| | ☐ | ANSI C63.10 | | | 11.9.1 | Maximum peak conducted output power |
| | | ☐ | ANSI C63.10 | | 11.9.1.1 | RBW ≥ DTS bandwidth |
| | | ☐ | ANSI C63.10 | | 11.9.1.2 | Integrated band power method |
| | | ☐ | ANSI C63.10 | | 11.9.1.3 | PKPM1 Peak power meter method |
| | ☒ | ANSI C63.10 | | | 11.9.2 | Maximum conducted (average) output power |
| | | ☐ | ANSI C63.10 | | 11.9.2.2 | Measurement using a spectrum analyzer (SA) |
| | | | ☐ | ANSI C63.10 | 11.9.2.2.2 | Method AVGSA-1(Duty cycle≥98%) |
| | | | ☐ | ANSI C63.10 | 11.9.2.2.3 | Method AVGSA-1A(Duty cycle≥98%) |
| | | | ☐ | ANSI C63.10 | 11.9.2.2.4 | Method AVGSA-2(Duty cycle≤98%) |
| | | | ☐ | ANSI C63.10 | 11.9.2.2.5 | Method AVGSA-2A(Duty cycle≤98%) |
| | | | ☐ | ANSI C63.10 | 11.9.2.2.4 | Method AVGSA-3 |
| | | | ☐ | ANSI C63.10 | 11.9.2.2.5 | Method AVGSA-3A |
| | | ☒ | ANSI C63.10 | | 11.9.2.3 | Measurement using a power meter (PM) |
| | | | ☒ | ANSI C63.10 | 11.9.2.3.1 | Method AVGPM |
| | | | ☐ | ANSI C63.10 | 11.9.2.3.2 | Method AVGPM-G |

| Directional Gain Calculations for In-Band test method | | | | |
|---|---|---|---|---|
| | References Rule | | Chapter | Description |
| ☐ | KDB 662911 | | F2)a) | Basic methodology |
| | ☐ | KDB 662911 | F2)a) (i) | transmit signals are correlated |
| | ☐ | KDB 662911 | F2)a) (ii) | transmit signals are uncorrelated |
| ☐ | KDB 662911 | | F2)b) | Sectorized antenna systems. |
| ☐ | KDB 662911 | | F2)c) | Cross-polarized antennas |
| | ☐ | ANSI C63.10 | F2)c) (i) | Cross-polarized antennas |
| | ☐ | ANSI C63.10 | F2)c) (ii) | Multiple antennas |
| ☒ | KDB 662911 | | F2)e) | Spatial Multiplexing |
| | ☐ | KDB 662911 | F2)e) (i) | Antennas have the same gain |
| | ☐ | KDB 662911 | F2)e) (ii) | Antenna have the different gain with one spatial stream |
| | ☒ | KDB 662911 | F2)e) (iii) | Antenna have the different gain with more than one spatial stream |
| ☒ | KDB 662911 | | F2)f) | Cyclic Delay Diversity (CDD) |
| | ☐ | KDB 662911 | F2)f) (i) | Antennas have the same gain |
| | ☐ | KDB 662911 | F2)f) (ii) | Antenna have the different gain with one spatial stream |
| | ☒ | KDB 662911 | F2)f) (iii) | Antenna have the different gain with more than one spatial stream |

## 8.5. EUT test definition

<table>
<tr><th>Item</th><th colspan="4">Fundamental emission output power</th></tr>
<tr><td rowspan="3">Device Category</td><td>☐</td><td colspan="3">Fixed point-to-point</td></tr>
<tr><td>☐</td><td colspan="3">Emit multiple directional beams, simultaneously or sequentially</td></tr>
<tr><td>☒</td><td colspan="3">Other cases</td></tr>
<tr><td>Test mode</td><td colspan="4">Mode 1~4</td></tr>
<tr><td rowspan="12">Test method</td><td>☐</td><td colspan="3">Radiated</td></tr>
<tr><td rowspan="3"></td><td>X Axis</td><td>Y Axis</td><td>Z Axis</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Worst Axis ☐</td><td>Worst Axis ☐</td><td>Worst Axis ☐</td></tr>
<tr><td>☒</td><td colspan="3">Conducted</td></tr>
<tr><td>☒</td><td colspan="3">Chain 1</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☒</td><td>Chain 1</td><td colspan="2">Chain 2</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td>Chain 2</td><td>Chain 3</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
</table>

## 8.6. Test Result

Pass

The test data please refer to the files attached.

**Appendix 2: 2.4GHz FCC RF output power**

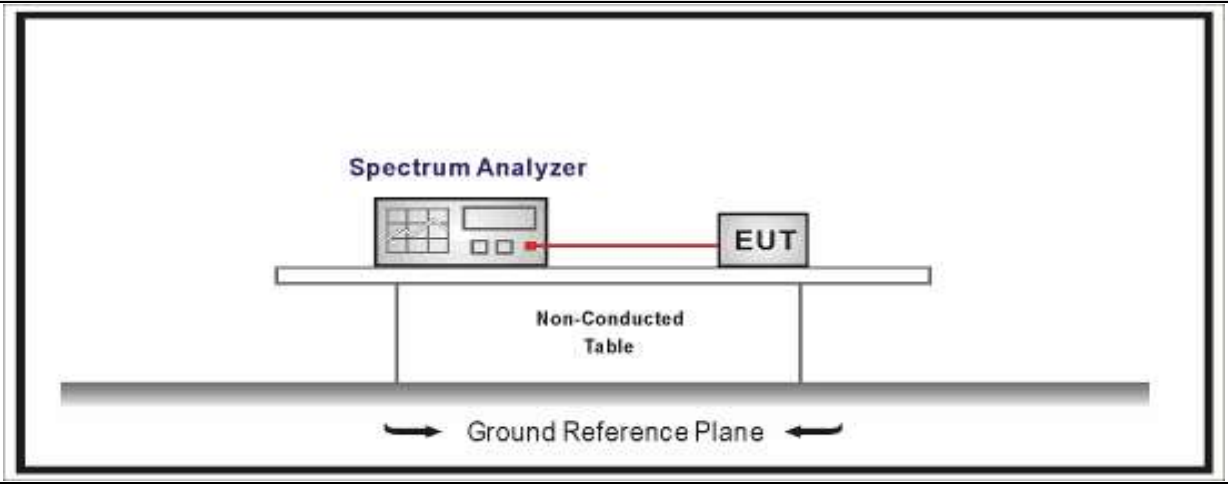
# 9. Power Spectral Density

## 9.1. Test Equipment

| Power Spectral Density / TR-8 | | | | | |
|---|---|---|---|---|---|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2019.02.04 | 2020.02.03 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2019.04.09 | 2020.04.08 |
| MXA Signal Anlyzer | Keysight | N9020A | MY56060147 | 2019.04.09 | 2020.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2019.04.10 | 2020.04.09 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

## 9.2. Test Setup

Power Spectral Density test setup




## 9.3. Limit

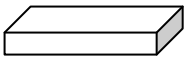
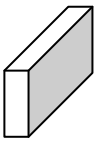
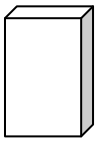
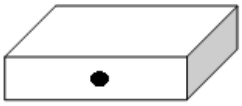
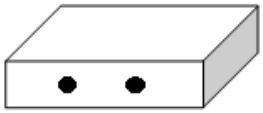
| Power Spectral Density Limit |
|---|
| Power Spectral Density≤8dBm/3kHz |

## 9.4. Test Procedure

| Power Spectral Density Test Method | | | | |
|---|---|---|---|---|
| | References Rule | | Chapter | Description |
| ☒ | ANSI C63.10 | | 11.10 | Maximum power spectral density level in the fundamental emission |
| | ☒ | ANSI C63.10 | 11.10.2 | Method PKPSD (peak PSD) |
| | ☐ | ANSI C63.10 | 11.10.3 | Method AVGPSD-1(Duty cycle≥98%) |
| | ☐ | ANSI C63.10 | 11.10.4 | Method AVGPSD-1A(Duty cycle≥98%) |
| | ☐ | ANSI C63.10 | 11.10.5 | Method AVGPSD-2(Duty cycle＜98%) |
| | ☐ | ANSI C63.10 | 11.10.6 | Method AVGPSD-2A(Duty cycle＜98%) |
| | ☐ | ANSI C63.10 | 11.10.7 | Method AVGPSD-3 |
| | ☐ | ANSI C63.10 | 11.10.8 | Method AVGPSD-3A |

| Directional Gain Calculations for In-Band test method | | | | |
|---|---|---|---|---|
| | Referred Rule | | Chapter | Description |
| ☐ | KDB 662911 | | F2)a) | Basic methodology |
| | ☐ | KDB 662911 | F2)a) (i) | transmit signals are correlated |
| | ☐ | KDB 662911 | F2)a) (ii) | transmit signals are uncorrelated |
| ☐ | KDB 662911 | | F2)b) | Sectorized antenna systems. |
| ☐ | KDB 662911 | | F2)c) | Cross-polarized antennas |
| | ☐ | ANSI C63.10 | F2)c) (i) | Cross-polarized antennas |
| | ☐ | ANSI C63.10 | F2)c) (ii) | Multiple antennas |
| ☒ | KDB 662911 | | F2)e) | Spatial Multiplexing |
| | ☐ | KDB 662911 | F2)e) (i) | Antennas have the same gain |
| | ☐ | KDB 662911 | F2)e) (ii) | Antenna have the different gain with one spatial stream |
| | ☒ | KDB 662911 | F2)e) (iii) | Antenna have the different gain with more than one spatial stream |
| ☒ | KDB 662911 | | F2)f) | Cyclic Delay Diversity (CDD) |
| | ☐ | KDB 662911 | F2)f) (i) | Antennas have the same gain |
| | ☐ | KDB 662911 | F2)f) (ii) | Antenna have the different gain with one spatial stream |
| | ☒ | KDB 662911 | F2)f) (iii) | Antenna have the different gain with more than one spatial stream |

## 9.5. EUT test definition

<table>
<tr><th>Item</th><th colspan="4">Power Spectral Density Test Method</th></tr>
<tr><td rowspan="3">Device Category</td><td>☐</td><td colspan="3">Fixed point-to-point</td></tr>
<tr><td>☐</td><td colspan="3">Emit multiple directional beams, simultaneously or sequentially</td></tr>
<tr><td>☒</td><td colspan="3">Other cases</td></tr>
<tr><td>Test mode</td><td colspan="4">Mode 1~4</td></tr>
<tr><td rowspan="14">Test method</td><td>☐</td><td colspan="3">Radiated</td></tr>
<tr><td rowspan="3"></td><td>X Axis</td><td>Y Axis</td><td>Z Axis</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Worst Axis ☐</td><td>Worst Axis ☐</td><td>Worst Axis ☐</td></tr>
<tr><td>☒</td><td colspan="3">Conducted</td></tr>
<tr><td>☒</td><td colspan="3">Chain 1</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☒</td><td>Chain 1</td><td colspan="2">Chain 2</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
<tr><td>☐</td><td>Chain 1</td><td>Chain 2</td><td>Chain 3</td></tr>
<tr><td></td><td colspan="3">  </td></tr>
</table>

## 9.6. Test Result

| | | | | | |
|---|---|---|---|---|---|
| Product Name | : | Wireless Access Point | Power | : | AC 120V/60Hz |
| Test Mode | : | Mode 1~4 | Test Site | : | TR8 |
| Test Date | : | 2019.11.06 | Test Engineer | : | Eric |

**Radio 1:**

| Mode | Channel | Test Frequency (MHz) | Measurement PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|---|
| | | | Worst Chain | | |
| 1 | 01 | 2412 | -9.457 | 8.0 | Pass |
| 1 | 06 | 2437 | -8.643 | 8.0 | Pass |
| 1 | 11 | 2462 | -8.770 | 8.0 | Pass |
| 2 | 01 | 2412 | -13.652 | 8.0 | Pass |
| 2 | 06 | 2437 | -12.821 | 8.0 | Pass |
| 2 | 11 | 2462 | -12.960 | 8.0 | Pass |
| 3 | 01 | 2412 | -15.180 | 8.0 | Pass |
| 3 | 06 | 2437 | -13.773 | 8.0 | Pass |
| 3 | 11 | 2462 | -15.018 | 8.0 | Pass |
| 4 | 01 | 2412 | -14.793 | 8.0 | Pass |
| 4 | 06 | 2437 | -13.681 | 8.0 | Pass |
| 4 | 11 | 2462 | -15.164 | 8.0 | Pass |

Note1: Both of two chains are tested and only the worst chain of the PSD was showed.

**Radio 2(CDD):**

| Mode | Channel | Test Frequency (MHz) | Measurement PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|---|
| | | | Worst Chain | | |
| 1 | 01 | 2412 | -9.485 | 4.08 | Pass |
| 1 | 06 | 2437 | -9.618 | 4.08 | Pass |
| 1 | 11 | 2462 | -9.027 | 4.08 | Pass |
| 2 | 01 | 2412 | -14.026 | 4.08 | Pass |
| 2 | 06 | 2437 | -15.437 | 4.08 | Pass |
| 2 | 11 | 2462 | -13.043 | 4.08 | Pass |
| 3 | 01 | 2412 | -14.484 | 4.08 | Pass |
| 3 | 06 | 2437 | -14.272 | 4.08 | Pass |
| 3 | 11 | 2462 | -13.964 | 4.08 | Pass |
| 4 | 01 | 2412 | -15.027 | 4.08 | Pass |
| 4 | 06 | 2437 | -14.161 | 4.08 | Pass |
| 4 | 11 | 2462 | -15.307 | 4.08 | Pass |

Note1: Both of two chains are tested and only the worst chain of the PSD was showed.

2: PSD limit = 8dBm/3kHz – 10Log(2) – (3.9 + 10Log(2) - 6)

**Radio 2(Beamforming):**

| Mode | Channel | Test Frequency (MHz) | Measurement PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|---|
| | | | Worst Chain | | |
| 5 | 01 | 2412 | -13.280 | 4.08 | Pass |
| 5 | 06 | 2437 | -13.437 | 4.08 | Pass |
| 5 | 11 | 2462 | -14.871 | 4.08 | Pass |
| 6 | 01 | 2412 | -14.685 | 4.08 | Pass |
| 6 | 06 | 2437 | -14.453 | 4.08 | Pass |
| 6 | 11 | 2462 | -14.788 | 4.08 | Pass |

Note1: Both of two chains are tested and only the worst chain of the PSD was showed.

2: PSD limit = 8dBm/3kHz – 10Log(2) – (3.9 + 10Log(2) - 6)

# 10. Antenna Requirement

## 10.1. Limit

| Antenna Requirement Limit |
|---|
| An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. |

## 10.2. Antenna Connector Construction

| Antenna Connector Construction | |
|---|---|
| ☐ | The use of a permanently attached antenna |
| ☐ | The antenna use of a unique coupling to the intentional radiator |
| ☒ | The use of a nonstandard antenna jack or electrical connector |
| Please refer to the attached document “Internal Photograph” to show the antenna connector. | |

The End