# MEASUREMENT REPORT

## FCC PART 15C / WLAN 802.11b/g/n/ax

| | |
|---|---|
| **FCC ID:** | LNQWEB7200 |
| **Applicant:** | Actiontec Electronics Inc |
| **Application Type:** | Certification |
| **Product:** | WiFi 6 Extender |
| **Model No.:** | WEB7200 |
| **Brand Name:** | Actiontec |
| **FCC Classification:** | Digital Transmission System (DTS) |
| **FCC Rule Part(s):** | Part 15 Subpart C (Section 15.247) |
| **Test Procedure(s):** | ANSI C63.10-2013 |
| **Test Date:** | April 20 ~ June 08, 2021 |

Reviewed By: Sunny Sun

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

# Revision History

| Report No. | Version | Description | Issue Date | Note |
|---|---|---|---|---|
| 2102RSU047-U2 | Rev. 01 | Initial Report | 07-08-2021 | Valid |
| | | | | |

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# 1. General Information

## 1.1. Applicant

Actiontec Electronics Inc

3301 Olcott St, Santa Clara, CA 95054, United States

## 1.2. Manufacturer

Actiontec Electronics Inc

3301 Olcott St, Santa Clara, CA 95054, United States

## 1.3. Testing Facility

| | | |
|---|---|---|
| ☒ | **Test Site - MRT Suzhou Laboratory** | |
| | **Laboratory Location (Suzhou - Wuzhong)** | |
| | D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China | |
| | **Laboratory Location (Suzhou - SIP)** | |
| | 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China | |
| | **Laboratory Accreditations** | |
| | A2LA: 3628.01 | CNAS: L10551 |
| | FCC: CN1166 | ISED: CN0001 |
| | VCCI: R-20025, G-20034, C-20020, T-20020 | |
| ☐ | **Test Site - MRT Shenzhen Laboratory** | |
| | **Laboratory Location (Shenzhen)** | |
| | 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China | |
| | **Laboratory Accreditations** | |
| | A2LA: 3628.02 | CNAS: L10551 |
| | FCC: CN1284 | ISED: CN0105 |
| ☐ | **Test Site - MRT Taiwan Laboratory** | |
| | **Laboratory Location (Taiwan)** | |
| | No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) | |
| | **Laboratory Accreditations** | |
| | TAF: L3261-190725 | |
| | FCC: 291082, TW3261 | ISED: TW3261 |

## 1.4. Product Information

| | |
|---|---|
| Product Name | WiFi 6 Extender |
| Model No. | WEB7200 |
| Brand Name | Actiontec |
| Operating Temperature | 0 ~ 40°C |
| Wi-Fi Specification | 802.11a/b/g/n/ac/ax |
| Antenna Information | Refer to section 1.6 |
| Accessories | |
| AC/DC Adapter 1# | Model: MS-V1500R120-018H0-US<br>Input: 100-240V ~ 50/60Hz, 0.6A MAX<br>Output: 12V, 1.5A |
| AC/DC Adapter 2# | Model: RD1201500-C55-153MG<br>Input: 100-240V ~ 50-60Hz 0.6A<br>Output: 12V, 1.5A |
| AC/DC Adapter 3# | Model: ADS024T-W 120150<br>Input: 100-240V ~ 50-60Hz 0.6A<br>Output: 12V, 1.5A |

## 1.5. Radio Specification under Test

| | |
|---|---|
| Frequency Range | 802.11b/g/n-HT20/ax-HE20: 2412 ~ 2462 MHz<br>802.11n-HT40/ax-HE40: 2422 ~ 2452 MHz |
| Channel Number | 802.11b/g/n-HT20/ax-HE20: 11<br>802.11n-HT40/ax-HE40: 7 |
| Type of Modulation | 802.11b: DSSS<br>802.11g/n: OFDM<br>802.11ax: OFDMA |
| Data Rate | 802.11b: 1/2/5.5/11Mbps<br>802.11g: 6/9/12/18/24/36/48/54Mbps<br>802.11n: up to 300Mbps<br>802.11ax: up to 573.6Mbps |

## 1.6. Description of Available Antennas

| Antenna Type | Ant Port | Frequency Band (GHz) | $T_X$ Paths | Antenna Gain (dBi) | Directional Gain (dBi) | |
|---|---|---|---|---|---|---|
| | | | | | For Power | For PSD |
| PCB Antenna | DB1 | 2.4 ~ 2.5 | 2 | 4.56 | 4.56 | 7.57 |
| | DB2 | 5.1 ~ 5.85 | | 4.32 | 4.32 | 7.33 |
| Onboard Metal DFS Antenna | DFS | 5.1 ~ 5.85 | N/A | 4.32 | -- | -- |

Remark:
1. The EUT supports Cyclic Delay Diversity (CDD) mode.
2. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.
3. Onboard Metal DFS Antenna only for receive to detect radar signals.

## 1.7. Working Frequencies for this report

802.11b/g/n-HT20/ax-HE20

| 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 | -- | -- |

802.11n-HT40/ax-HE40

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 03 | 2422 MHz | 04 | 2427 MHz | 05 | 2432 MHz |
| 06 | 2437 MHz | 07 | 2442 MHz | 08 | 2447 MHz |
| 09 | 2452 MHz | -- | -- | -- | -- |

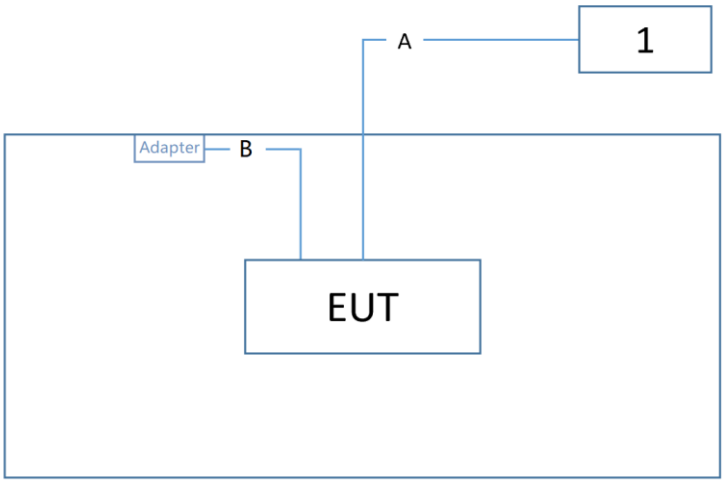
## 1.8. Test Mode

| Test Mode | |
|---|---|
| | Mode 1: Transmit by 802.11b (1Mbps) |
| | Mode 2: Transmit by 802.11g (6Mbps) |
| | Mode 3: Transmit by 802.11n-HT20 (MCS0) |
| | Mode 4: Transmit by 802.11n-HT40 (MCS0) |
| | Mode 5: Transmit by 802.11ax-HE20 (MCS0) |
| | Mode 6: Transmit by 802.11ax-HE40 (MCS0) |

## 1.9. Configuration of Test System

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram - Radiated Emission testing & AC Conducted Emissions




| Cable Type | | Cable Description |
|---|---|---|
| A | LAN Cable | Non shielded, > 10m |
| B | Power Cable | Non shielded, < 2.0m |

Note: We only selected AC/DC Adapter 1# for RF testing.

## 1.10. Test System Details

| Product | | Manufacturer | Model No. |
|---|---|---|---|
| 1 | Notebook | Dell | P62G |

## 1.11. Description of Test Software

The test utility software used during testing was “QATool_Dbg.exe”, and the version was 0.0.2.33. Power parameter value refers to operation description.

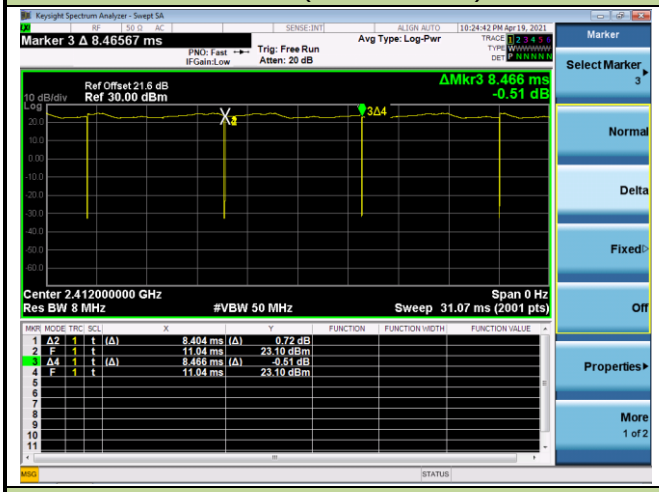
## 1.12. Duty Cycle

2.4GHz WLAN (DTS) operation is possible in 20MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

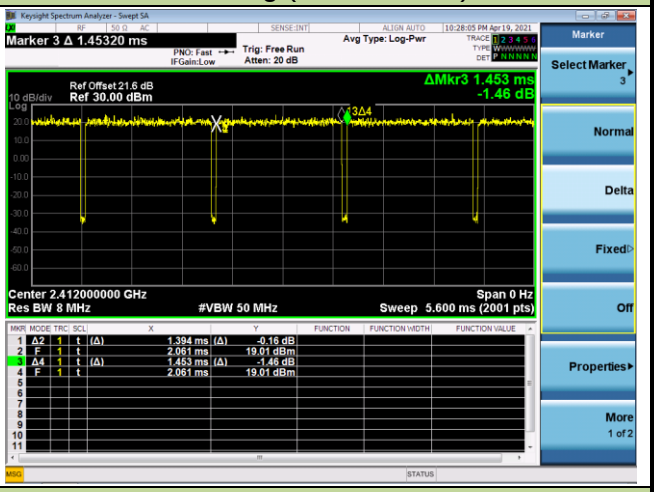
| Test Mode | Duty Cycle |
|---|---|
| 802.11b | 99.03% |
| 802.11g | 95.94% |
| 802.11n-HT20 | 95.75% |
| 802.11n-HT40 | 91.67% |
| 802.1ax-HE20 | 94.52% |
| 802.11ax-HE40 | 90.14% |

**Duty Cycle (T = Transmission Duration)**

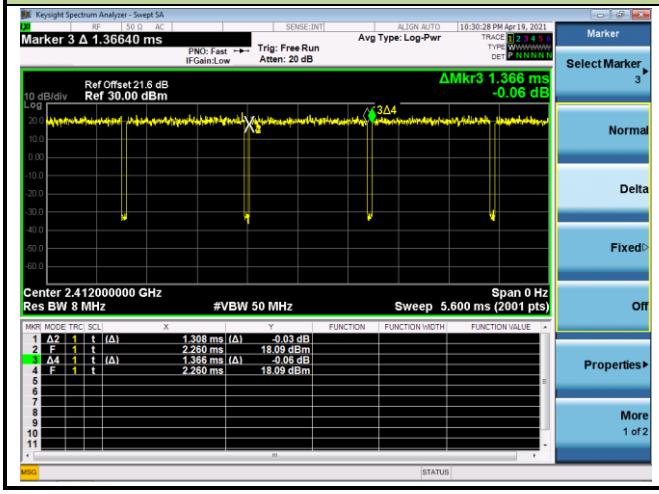
802.11b (T = 8.404ms)



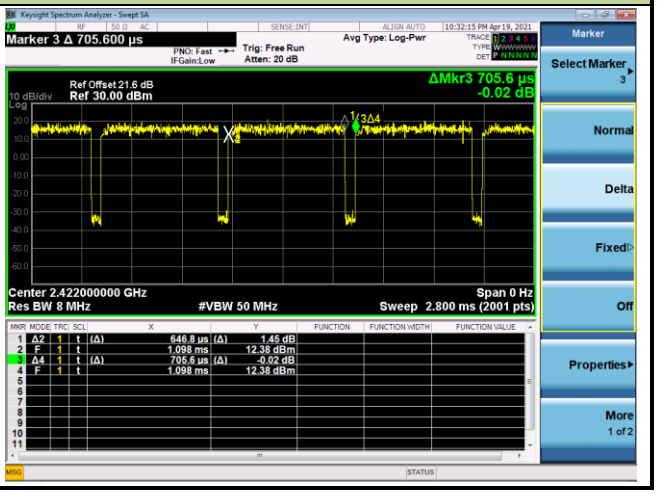

802.11g (T = 1.394ms)

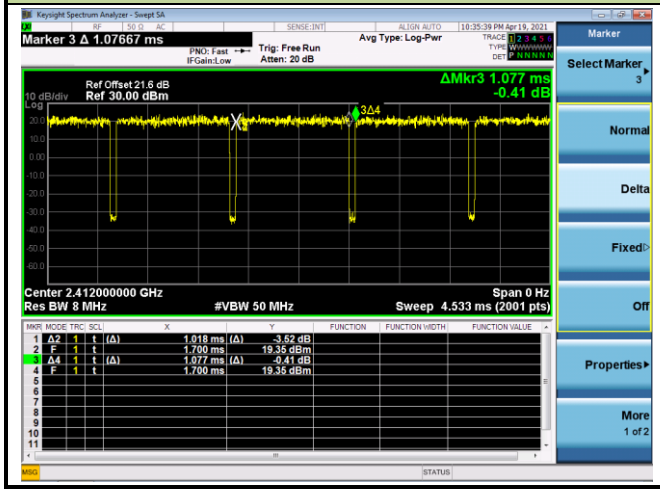
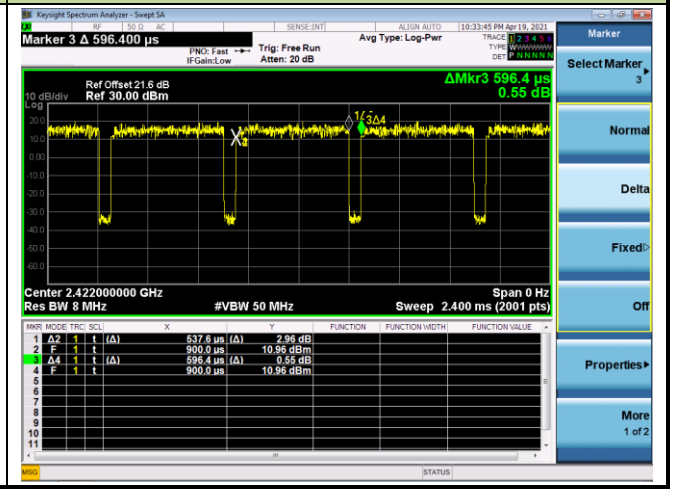



802.11n-HT20 (T = 1.308ms)




802.11n-HT40 (T = 646.8us)



| 802.11ax-HE20 (T = 1.018ms) | 802.11ax-HE40 (T = 537.6us) |
|---|---|
|  |  |



## 1.13. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 1.14. Test Environment Condition

| | |
|---|---|
| Ambient Temp. | 15 ~ 35°C |
| Relative Humidity | 20 ~ 75%RH |

# 2. ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antenna of the device is **permanently attached.**
- There are no provisions for connection to an external antenna.

**Conclusion:**

The unit complies with the requirement of §15.203.

# 3. TEST EQUIPMENT CALIBRATION DATE

Conducted Emission (WZ-SR2)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR3 | MRTSUE06185 | 1 year | 2022/01/12 |
| Two-Line V-Network | R&S | ENV216 | MRTSUE06002 | 1 year | 2021/09/09 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06404 | 1 year | 2021/07/26 |
| Shielding Room | MIX-BEP | Chamber-SR2 | MRTSUE06215 | N/A | N/A |

Conducted Emission (SIP-SR2)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR3 | MRTSUE06613 | 1 year | 2021/07/02 |
| Two-Line V-Network | R&S | ENV216 | MRTSUE06003 | 1 year | 2021/09/09 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06621 | 1 year | 2021/12/03 |

Radiated Emission (WZ-AC1)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR7 | MRTSUE06001 | 1 year | 2022/01/04 |
| PXA Signal Analyzer | Keysight | N9030B | MRTSUE06395 | 1 year | 2021/08/30 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2021/11/08 |
| Bilog Period Antenna | Schwarzbeck | VULB 9168 | MRTSUE06172 | 1 year | 2021/08/08 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | MRTSUE06023 | 1 year | 2021/09/27 |
| Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06597 | 1 year | 2021/12/14 |
| Horn Antenna | ETS.LINDGEN | 3117 | MRTSUE06257 | 1 year | 2021/09/27 |
| Microwave System Amplifier | Agilent | 83017A | MRTSUE06076 | 1 year | 2021/11/14 |
| Preamplifier | Schwarzbeck | BBV 9721 | MRTSUE06121 | 1 year | 2021/06/09 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06403 | 1 year | 2021/07/26 |
| Anechoic Chamber | TDK | Chamber-AC1 | MRTSUE06212 | 1 year | 2021/04/28 |
| Anechoic Chamber | TDK | Chamber-AC1 | MRTSUE06212 | 1 year | 2022/04/29 |

Radiated Emission (WZ-AC2)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| MXE EMI Receiver | Keysight | N9038A | MRTSUE06125 | 1 year | 2021/07/02 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2021/11/08 |
| Bilog Period Antenna | Schwarzbeck | VULB 9162 | MRTSUE06022 | 1 year | 2021/05/23 |
| Bilog Period Antenna | Schwarzbeck | VULB 9162 | MRTSUE06022 | 1 year | 2022/05/24 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA 9120D | MRTSUE06171 | 1 year | 2021/10/25 |
| Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06597 | 1 year | 2021/12/14 |
| Horn Antenna | ETS.LINDGEN | 3117 | MRTSUE06257 | 1 year | 2021/09/27 |
| Broadband Coaxial Preamplifier | Schwarzbeck | BBV 9718 | MRTSUE06176 | 1 year | 2021/11/14 |
| Preamplifier | Schwarzbeck | BBV 9721 | MRTSUE06121 | 1 year | 2021/06/09 |
| Thermal Hygrometer | Minggao | ETH529 | MRTSUE06170 | 1 year | 2021/12/08 |
| Anechoic Chamber | RIKEN | Chamber-AC2 | MRTSUE06213 | 1 year | 2021/04/28 |
| Anechoic Chamber | RIKEN | Chamber-AC2 | MRTSUE06213 | 1 year | 2022/04/29 |

Radiated Emission (SIP-AC1)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR3 | MRTSUE06612 | 1 year | 2021/07/02 |
| EXA Signal Analyzer | Keysight | N9010B | MRTSUE06559 | 1 year | 2021/07/23 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2021/11/08 |
| Bilog Period Antenna | Schwarzbeck | VULB9168 | MRTSUE06645 | 1 year | 2021/08/30 |
| Double Ridged Horn Antenna | R&S | HF907 | MRTSUE06610 | 1 year | 2021/08/30 |
| Preamplifier | EMCI | EMC051845SE | MRTSUE06600 | 1 year | 2021/11/12 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06620 | 1 year | 2021/12/03 |
| Anechoic Chamber | RIKEN | SIP-AC1 | MRTSUE06554 | 1 year | 2021/12/24 |

Radiated Emission (SIP-AC2)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR3 | MRTSUE06613 | 1 year | 2021/07/02 |
| MXA Signal Analyzer | Keysight | N9020B | MRTSUE06604 | 1 year | 2021/09/26 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2021/11/08 |
| Bilog Period Antenna | Schwarzbeck | VULB9168 | MRTSUE06646 | 1 year | 2021/08/30 |
| Horn Antenna | Schwarzbeck | BBHA9120D | MRTSUE06648 | 1 year | 2021/11/26 |
| Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06599 | 1 year | 2021/11/26 |
| Preamplifier | EMCI | EMC051845SE | MRTSUE06644 | 1 year | 2021/11/12 |
| Preamplifier | EMCI | EMC184045SE | MRTSUE06602 | 1 year | 2021/10/13 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06624 | 1 year | 2021/12/03 |
| Anechoic Chamber | RIKEN | SIP-AC2 | MRTSUE06781 | 1 year | 2021/12/24 |

Radiated Emission (SIP-AC3)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR3 | MRTSUE06612 | 1 year | 2021/07/02 |
| EXA Signal Analyzer | Keysight | N9010B | MRTSUE06559 | 1 year | 2021/07/23 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2021/11/08 |
| Bilog Period Antenna | Schwarzbeck | VULB9168 | MRTSUE06647 | 1 year | 2021/08/08 |
| Double Ridged Horn Antenna | R&S | HF907 | MRTSUE06611 | 1 year | 2021/09/13 |
| Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06598 | 1 year | 2021/11/26 |
| Preamplifier | EMCI | EMC012645SE | MRTSUE06642 | 1 year | 2022/01/14 |
| Preamplifier | EMCI | EMC184045SE | MRTSUE06641 | 1 year | 2022/01/14 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06622 | 1 year | 2021/12/03 |
| Anechoic Chamber | RIKEN | SIP-AC3 | MRTSUE06782 | 1 year | 2021/12/24 |

Conducted Test Equipment (WZ-TR3)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EXA Signal Analyzer | Agilent | N9020A | MRTSUE06106 | 1 year | 2021/04/12 |
| EXA Signal Analyzer | Agilent | N9020A | MRTSUE06106 | 1 year | 2022/04/13 |
| EXA Signal Analyzer | Keysight | N9010B | MRTSUE06607 | 1 year | 2022/01/07 |
| Signal Analyzer | R&S | FSV40 | MRTSUE06218 | 1 year | 2021/04/12 |
| Signal Analyzer | R&S | FSV40 | MRTSUE06218 | 1 year | 2022/04/13 |
| Power Meter | Agilent | U2021XA | MRTSUE06030 | 1 year | 2021/10/22 |
| USB wideband power sensor | Keysight | U2021XA | MRTSUE06446 | 1 year | 2021/08/30 |
| USB wideband power sensor | Keysight | U2021XA | MRTSUE06447 | 1 year | 2021/08/08 |
| Attenuator | MVE | 001 | MRTSUE06547 | NA | NA |
| Attenuator | MVE | 001 | MRTSUE06529 | NA | NA |
| Attenuator | MVE | 001 | MRTSUE06540 | NA | NA |
| Bluetooth Test Set | Anritsu | MT8852B-042 | MRTSUE06389 | 1 year | 2021/06/07 |
| Bluetooth Test Set | Anritsu | MT8852B-042 | MRTSUE06389 | 1 year | 2022/06/08 |
| Audio Analyzer | Agilent | U8903B | MRTSUE06143 | 1 year | 202105/18 |
| Audio Analyzer | Agilent | U8903B | MRTSUE06143 | 1 year | 2022/05/19 |
| Modulation Analyzer | HP | HP8901A | MRTSUE06098 | 1 year | 2021/09/26 |
| Wideband Radio Communication Tester | R&S | CMW 500 | MRTSUE06243 | 1 year | 2021/10/20 |
| DC Power Supply | GWINSTEK | DPS-3303C | MRTSUE06064 | N/A | N/A |
| Temperature & Humidity Chamber | BAOYT | BYH-150CL | MRTSUE06051 | 1 year | 2021/10/22 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06401 | 1 year | 2021/07/26 |

Conducted Test Equipment (SIP-SR5)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| Signal Analyzer | R&S | FSV40 | MRTSUE06218 | 1 year | 2021/04/12 |
| Signal Analyzer | R&S | FSV40 | MRTSUE06218 | 1 year | 2022/04/13 |
| PXA Signal Analyzer | Keysight | N9030B | MRTSUE06395 | 1 year | 2021/08/30 |
| USB wideband power sensor | Agilent | U2021XA | MRTSUE06595 | 1 year | 2021/09/26 |
| USB wideband power sensor | Agilent | U2021XA | MRTSUE06596 | 1 year | 2021/09/26 |
| Attenuator | MVE | 001 | MRTSUE06547 | NA | NA |
| Attenuator | MVE | 001 | MRTSUE06529 | NA | NA |
| Attenuator | MVE | 001 | MRTSUE06540 | NA | NA |
| Wideband Radio Communication Tester | R&S | CMW 500 | MRTSUE06243 | 1 year | 2021/10/20 |
| Bluetooth Test Set | Anritsu | MT8852B-042 | MRTSUE06389 | 1 year | 2021/06/07 |
| Bluetooth Test Set | Anritsu | MT8852B-042 | MRTSUE06389 | 1 year | 2022/06/08 |
| Temperature Chamber | BAOYT | BYG-408CS | MRTSUE06847 | 1 year | 2022/02/23 |
| Thermal Hygrometer | testo | 622 | MRTSUE06629 | 1 year | 2021/11/25 |

| Software | Version | Function |
|---|---|---|
| EMI Software | V3 | EMI Test Software |

# 4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| |
|---|
| AC Conducted Emission Measurement |
| Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>9kHz~150kHz: 3.74dB<br>150kHz~30MHz: 3.44dB |
| Radiated Disturbance |
| Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>Horizontal: 30MHz~300MHz: 5.04dB<br>300MHz~1GHz: 4.95dB<br>1GHz~40GHz: 6.40dB<br>Vertical: 30MHz~300MHz: 5.24dB<br>300MHz~1GHz: 6.03dB<br>1GHz~40GHz: 6.40dB |
| Spurious Emissions, Conducted |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.78dB |
| Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>1.13dB |
| Power Spectrum Density |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>1.15dB |
| Occupied Bandwidth |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.28% |

# 5. TEST RESULT

## 5.1. Summary

| FCC Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| 15.247(a)(2) | 6dB Bandwidth | ≥ 500kHz | Conducted | Pass | Section 5.2 |
| 15.247(b)(3) | Output Power | ≤ 1Watt | | Pass | Section 5.3 |
| 15.247(e) | Power Spectral Density | ≤ 8dBm / 3kHz | | Pass | Section 5.4 |
| 15.247(d) | Band Edge / Out-of-Band Emissions | ≥ 30dBc (Average) | | Pass | Section 5.5 |
| 15.205 15.209 | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209 | Radiated | Pass | Section 5.6 & 5.7 |
| 15.207 | AC Conducted Emissions 150kHz - 30MHz | < FCC 15.207 limits | Line Conducted | Pass | Section 5.8 |

**Notes:**

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) Output power test was verified over all data rates of each mode, and then choose the maximum power output (high data rate for 802.11b and low data rate for 802.11g/n/ax) for the final test of each channel.
3) Test Item “General Field Strength Limits (Restricted Bands and Radiated Emission Limits)” choose the low data rate for 802.11b, as the harmonic emissions higher than high data rate.
4) Test Items “6dB Bandwidth” showed the worst test data in this report.
5) EUT supports one configuration only in 802.11ax full RU mode, i.e. 242 tone in 11ax-HE20 and 484 tone in 11ax-HE40.

## 5.2. 6dB Bandwidth Measurement

### 5.2.1.Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

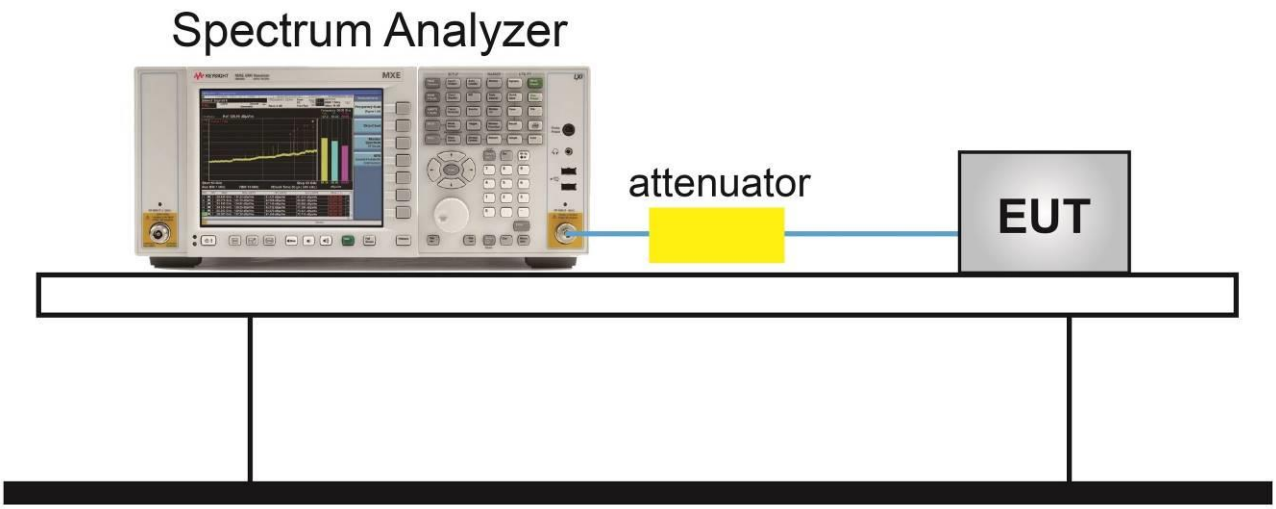
### 5.2.2.Test Procedure used

ANSI C63.10-2013 - Section 11.8

### 5.2.3.Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace was allowed to stabilize

### 5.2.4.Test Setup



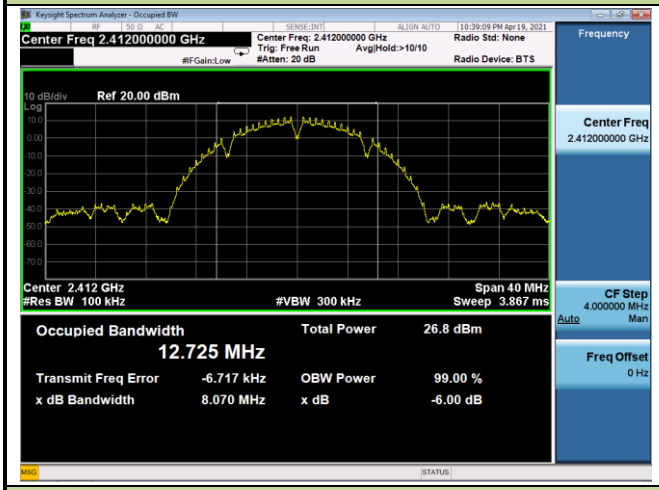
### 5.2.5.Test Result

| | | | |
|---|---|---|---|
| Product | WiFi 6 Extender | Test Engineer | Amy Zhang |
| Test Site | WZ-TR3 | Test Date | 2021/04/19 |

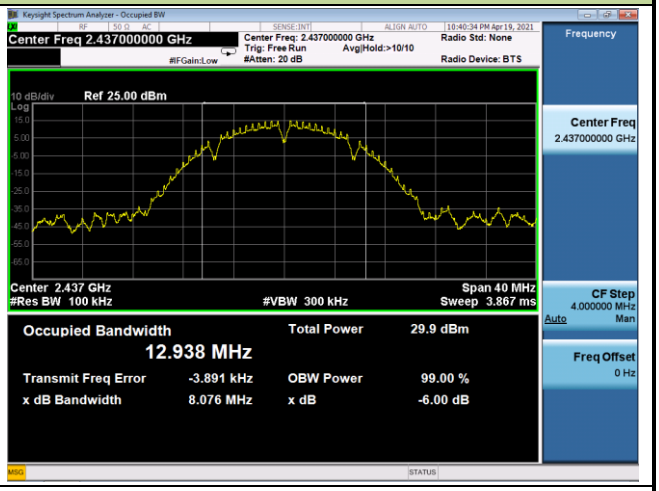
| Test Mode | Data Rate / MCS | Channel No. | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (MHz) | Result |
|---|---|---|---|---|---|---|
| 802.11b | 11Mbps | 01 | 2412 | 8.07 | ≥ 0.5 | Pass |
| 802.11b | 11Mbps | 06 | 2437 | 8.08 | ≥ 0.5 | Pass |
| 802.11b | 11Mbps | 11 | 2462 | 8.07 | ≥ 0.5 | Pass |
| 802.11g | 6Mbps | 01 | 2412 | 15.14 | ≥ 0.5 | Pass |
| 802.11g | 6Mbps | 06 | 2437 | 15.13 | ≥ 0.5 | Pass |
| 802.11g | 6Mbps | 11 | 2462 | 15.14 | ≥ 0.5 | Pass |
| 802.11n-HT20 | MCS0 | 01 | 2412 | 16.88 | ≥ 0.5 | Pass |
| 802.11n-HT20 | MCS0 | 06 | 2437 | 16.27 | ≥ 0.5 | Pass |
| 802.11n-HT20 | MCS0 | 11 | 2462 | 16.30 | ≥ 0.5 | Pass |
| 802.11n-HT40 | MCS0 | 03 | 2422 | 35.13 | ≥ 0.5 | Pass |
| 802.11n-HT40 | MCS0 | 06 | 2437 | 35.12 | ≥ 0.5 | Pass |
| 802.11n-HT40 | MCS0 | 09 | 2452 | 35.12 | ≥ 0.5 | Pass |
| 802.11ax-HE20 | MCS0 | 01 | 2412 | 18.73 | ≥ 0.5 | Pass |
| 802.11ax-HE20 | MCS0 | 06 | 2437 | 18.14 | ≥ 0.5 | Pass |
| 802.11ax-HE20 | MCS0 | 11 | 2462 | 18.82 | ≥ 0.5 | Pass |
| 802.11ax-HE40 | MCS0 | 03 | 2422 | 36.60 | ≥ 0.5 | Pass |
| 802.11ax-HE40 | MCS0 | 06 | 2437 | 36.26 | ≥ 0.5 | Pass |
| 802.11ax-HE40 | MCS0 | 09 | 2452 | 37.13 | ≥ 0.5 | Pass |

## 802.11b 6dB Bandwidth

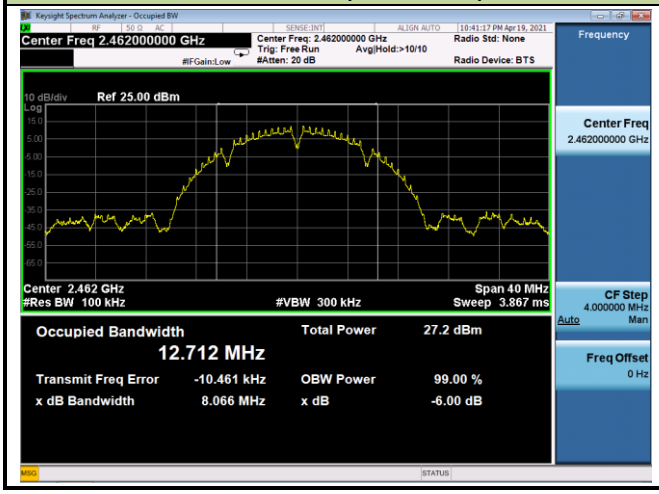
### Channel 01 (2412MHz)




### Channel 06 (2437MHz)

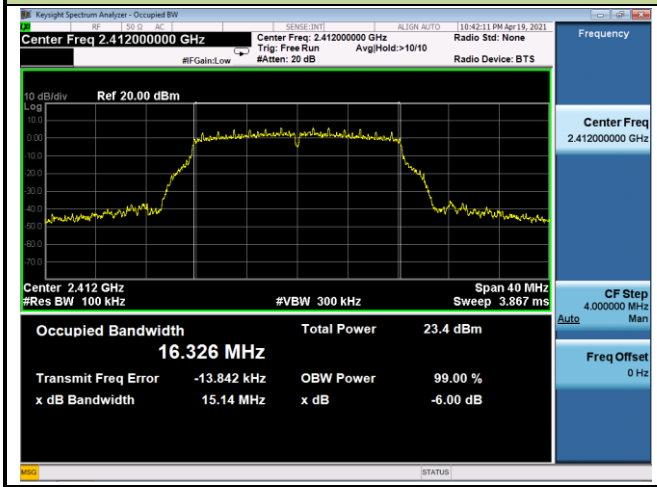



### Channel 11 (2462MHz)

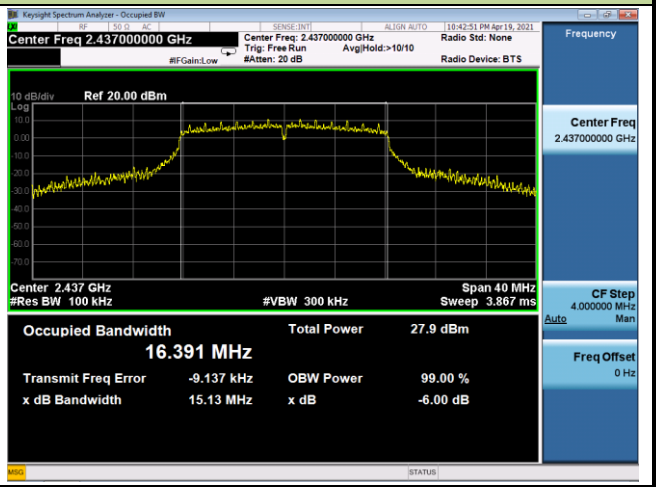


## 802.11g 6dB Bandwidth

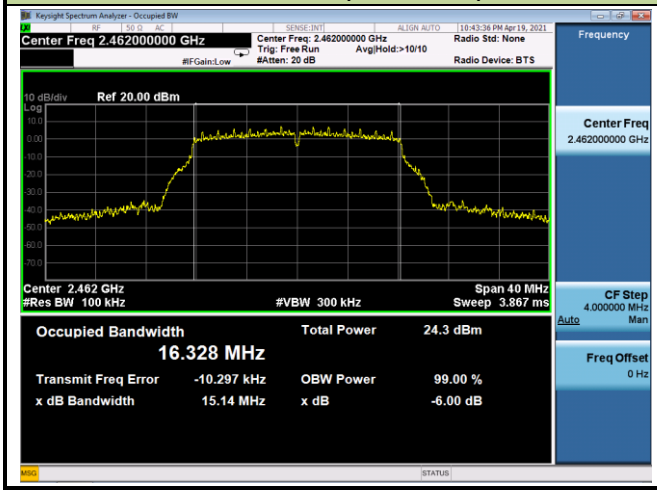
### Channel 01 (2412MHz)




### Channel 06 (2437MHz)

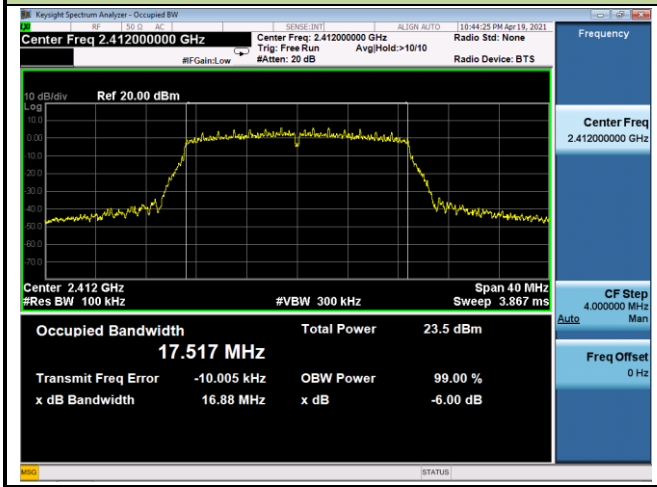



### Channel 11 (2462MHz)

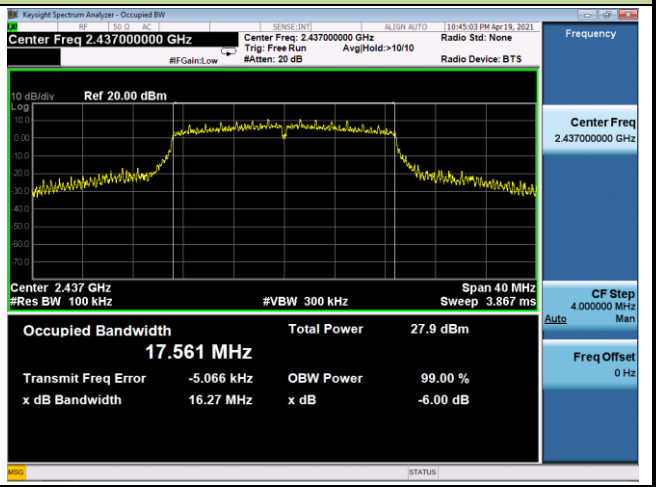


## 802.11n-HT20 6dB Bandwidth

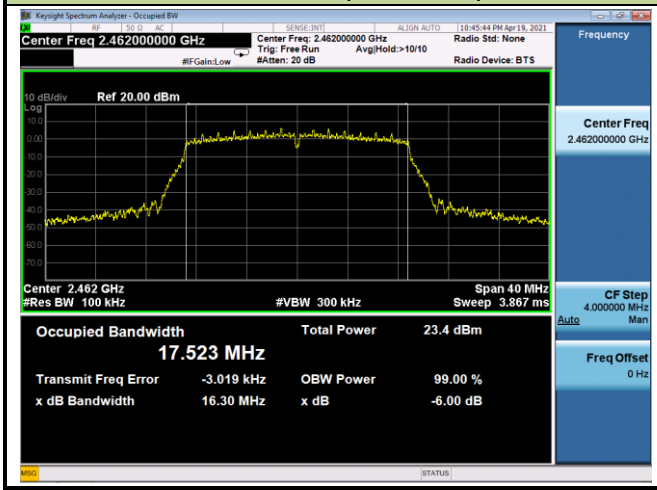
### Channel 01 (2412MHz)




### Channel 06 (2437MHz)

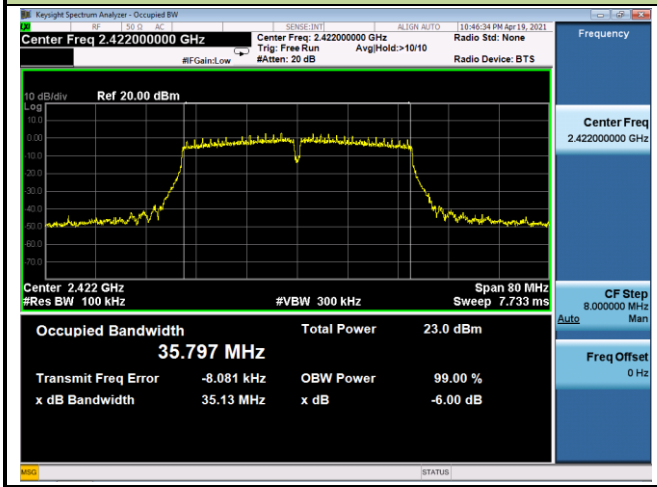



### Channel 11 (2462MHz)

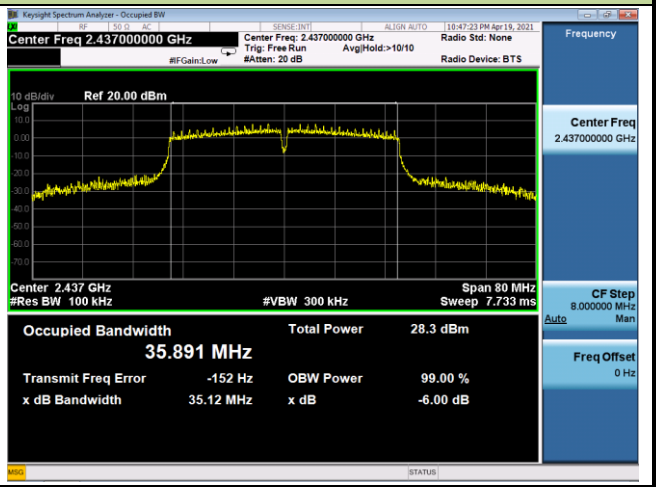


## 802.11n-HT40 6dB Bandwidth

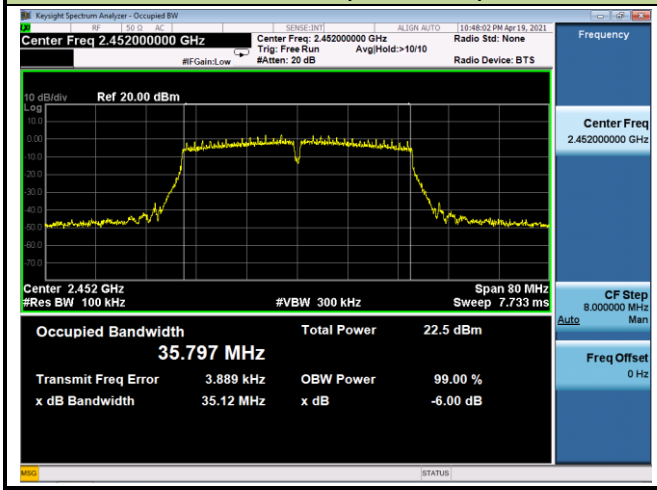
### Channel 03 (2422MHz)




### Channel 06 (2437MHz)

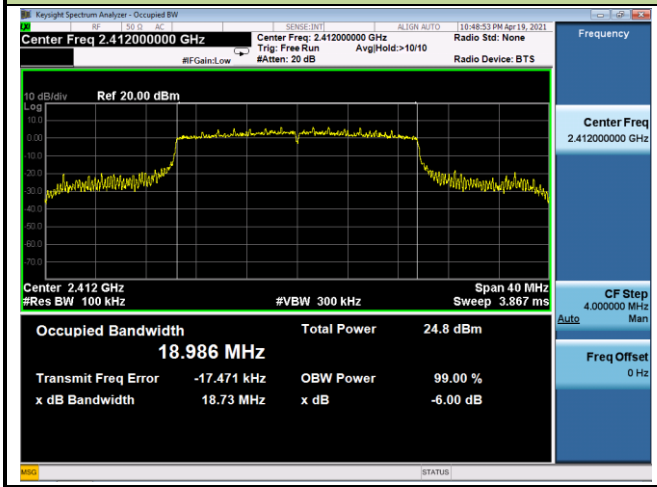



### Channel 09 (2452MHz)

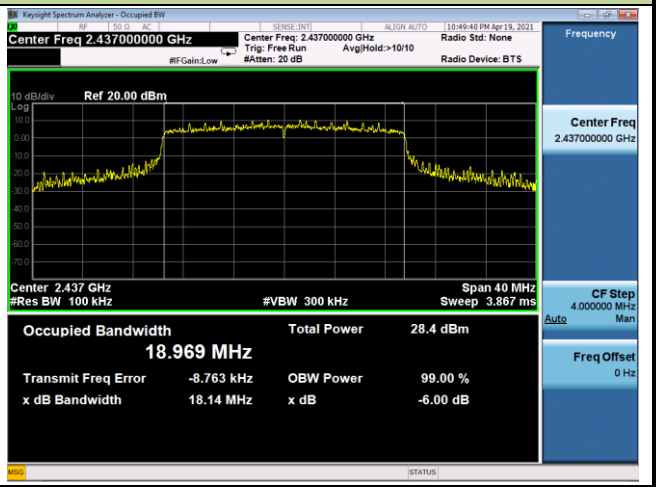


## 802.11ax-HE20 6dB Bandwidth

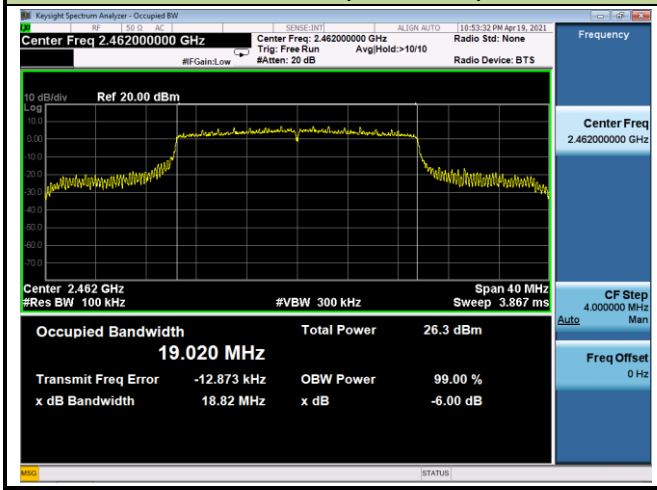
### Channel 01 (2412MHz)




### Channel 06 (2437MHz)

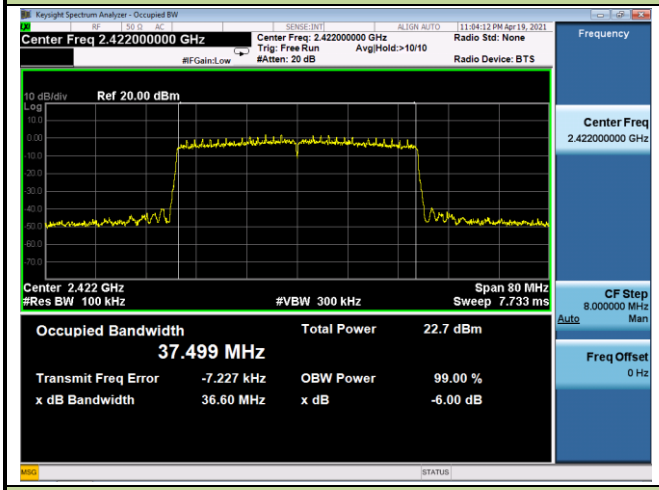



### Channel 11 (2462MHz)

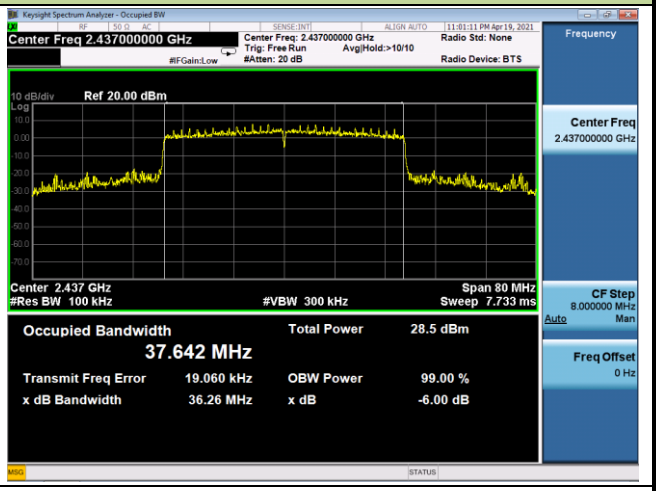


## 802.11ax-HE40 6dB Bandwidth

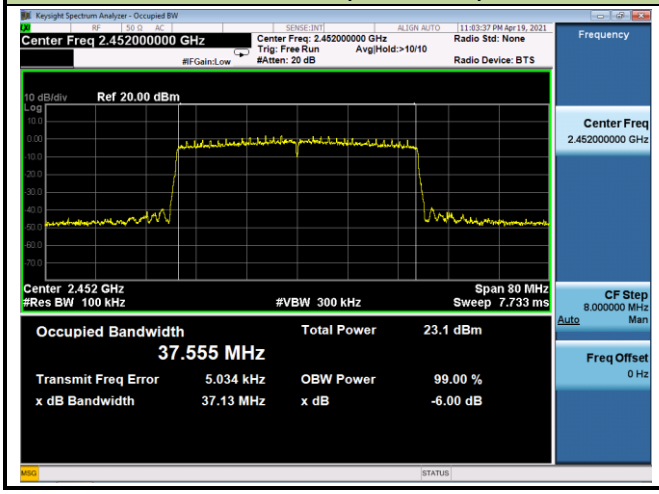
### Channel 03 (2422MHz)




### Channel 06 (2437MHz)




### Channel 09 (2452MHz)



## 5.3. Output Power Measurement

### 5.3.1.Test Limit

The maximum output power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 5.3.2.Test Procedure Used

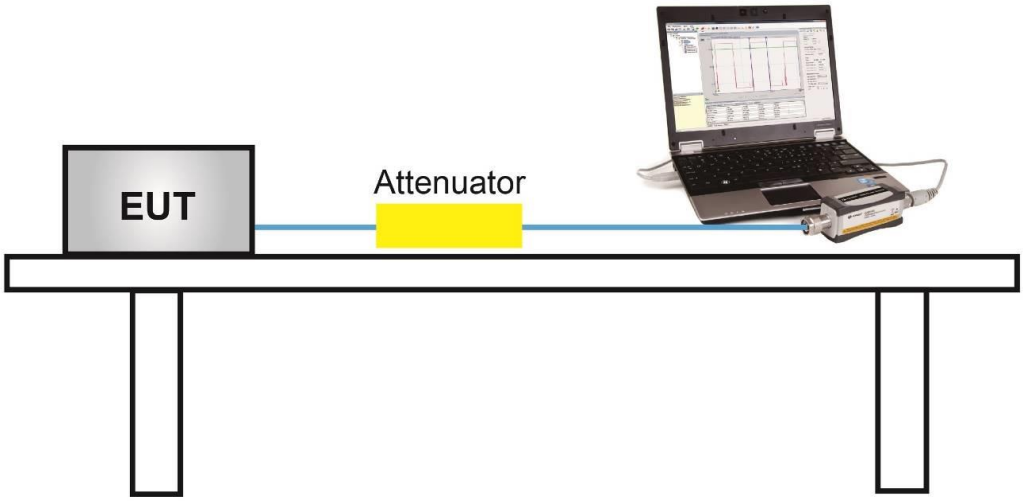
ANSI C63.10-2013 - Section 11.9.2.3.2

### 5.3.3.Test Setting

**Average Power Measurement**

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

### 5.3.4.Test Setup



### 5.3.5.Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (gray marker) for final test of each channel.

| Test Mode | Bandwidth (MHz) | Channel No. | Frequency (MHz) | Data Rate / MCS | Average Power (dBm) |
|---|---|---|---|---|---|
| 802.11b | 20 | 6 | 2437 | 1Mbps | 22.39 |
| | | | | 5.5Mbps | 22.45 |
| | | | | 11Mbps | 22.59 |
| 802.11g | 20 | 6 | 2437 | 6Mbps | 20.22 |
| | | | | 24Mbps | 20.16 |
| | | | | 54Mbps | 19.89 |
| 802.11n | 20 | 6 | 2437 | MCS0 | 20.33 |
| | | | | MCS3 | 20.26 |
| | | | | MCS7 | 20.14 |
| 802.11n | 40 | 6 | 2437 | MCS0 | 17.13 |
| | | | | MCS3 | 17.05 |
| | | | | MCS7 | 16.98 |
| 802.11ax | 20 | 6 | 2437 | MCS0 | 18.92 |
| | | | | MCS3 | 18.74 |
| | | | | MCS7 | 18.67 |
| 802.11ax | 40 | 6 | 2437 | MCS0 | 16.21 |
| | | | | MCS3 | 16.17 |
| | | | | MCS7 | 16.09 |

| Product | WiFi 6 Extender | Test Engineer | Amy Zhang |
|---|---|---|---|
| Test Site | WZ-TR3 | Test Date | 2021/04/20 |

| Test Mode | Data Rate / MCS | Channel No. | Freq. (MHz) | Average Power (dBm) | | Total Average Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|---|---|---|
| | | | | Ant 0 | Ant 1 | | | |
| 11b | 11Mbps | 01 | 2412 | 19.64 | 19.67 | 22.67 | ≤ 30.00 | Pass |
| 11b | 11Mbps | 06 | 2437 | 22.59 | 22.82 | 25.72 | ≤ 30.00 | Pass |
| 11b | 11Mbps | 11 | 2462 | 19.88 | 20.04 | 22.97 | ≤ 30.00 | Pass |
| 11g | 6Mbps | 01 | 2412 | 16.45 | 16.47 | 19.47 | ≤ 30.00 | Pass |
| 11g | 6Mbps | 06 | 2437 | 20.22 | 20.43 | 23.34 | ≤ 30.00 | Pass |
| 11g | 6Mbps | 11 | 2462 | 17.28 | 17.28 | 20.29 | ≤ 30.00 | Pass |
| 11n-HT20 | MCS0 | 01 | 2412 | 16.34 | 16.36 | 19.36 | ≤ 30.00 | Pass |
| 11n-HT20 | MCS0 | 06 | 2437 | 20.33 | 20.46 | 23.41 | ≤ 30.00 | Pass |
| 11n-HT20 | MCS0 | 11 | 2462 | 16.10 | 16.39 | 19.26 | ≤ 30.00 | Pass |
| 11n-HT40 | MCS0 | 03 | 2422 | 15.52 | 15.63 | 18.59 | ≤ 30.00 | Pass |
| 11n-HT40 | MCS0 | 06 | 2437 | 17.13 | 16.98 | 20.07 | ≤ 30.00 | Pass |
| 11n-HT40 | MCS0 | 09 | 2452 | 14.98 | 15.03 | 18.02 | ≤ 30.00 | Pass |
| 11ax-HE20 | MCS0 | 01 | 2412 | 15.33 | 14.56 | 19.97 | ≤ 30.00 | Pass |
| 11ax-HE20 | MCS0 | 06 | 2437 | 18.92 | 18.34 | 21.65 | ≤ 30.00 | Pass |
| 11ax-HE20 | MCS0 | 11 | 2462 | 17.66 | 18.14 | 20.92 | ≤ 30.00 | Pass |
| 11ax-HE40 | MCS0 | 03 | 2422 | 15.19 | 15.43 | 18.32 | ≤ 30.00 | Pass |
| 11ax-HE40 | MCS0 | 06 | 2437 | 16.21 | 15.72 | 18.98 | ≤ 30.00 | Pass |
| 11ax-HE40 | MCS0 | 09 | 2452 | 15.09 | 15.27 | 18.19 | ≤ 30.00 | Pass |

Note: Total Average Power (dBm) = $10*\log\{10^{(\text{ANT 0 Average Power }/10)} + 10^{(\text{ANT 1 Average Power }/10)}\}$ (dBm).

## 5.4. Power Spectral Density Measurement

### 5.4.1.Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

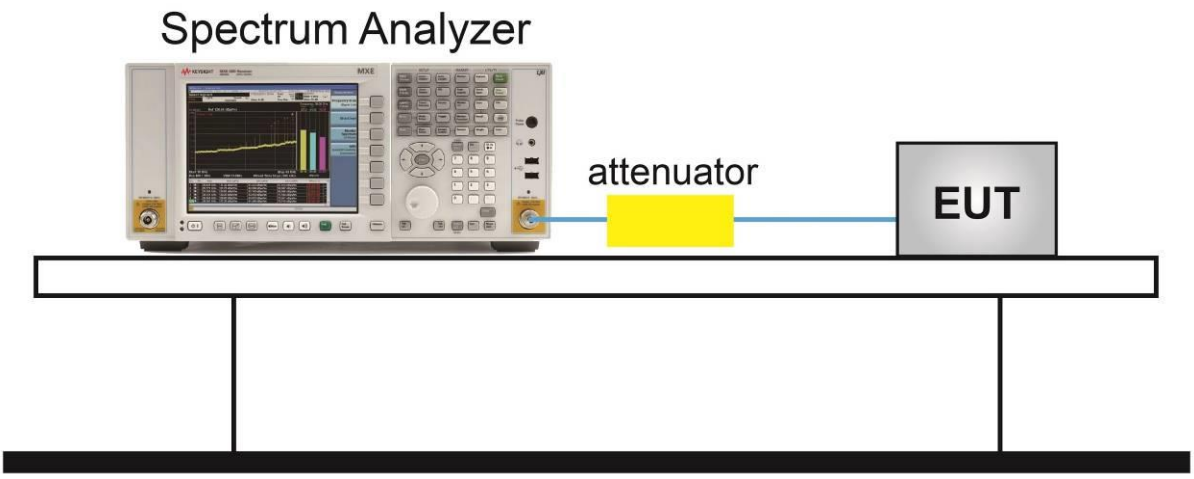
### 5.4.2.Test Procedure Used

ANSI C63.10-2013 - Section 11.10.3 & 11.10.5

### 5.4.3.Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the OBW
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = RMS
6. Employ trace averaging (rms) mode over a minimum of 100 traces.
7. Sweep time = auto couple
8. Trace mode = max hold
9. Trace was allowed to stabilize

### 5.4.4.Test Setup



### 5.4.5.Test Result

| Product | WiFi 6 Extender | Test Engineer | Amy Zhang |
|---|---|---|---|
| Test Site | WZ-TR3 | Test Date | 2021/04/20 |

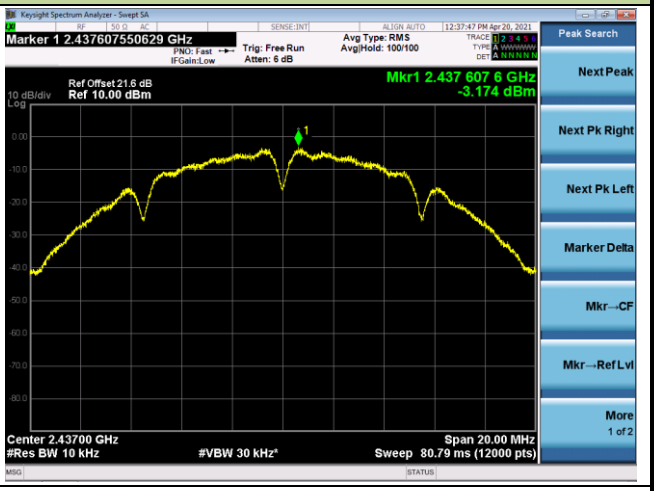
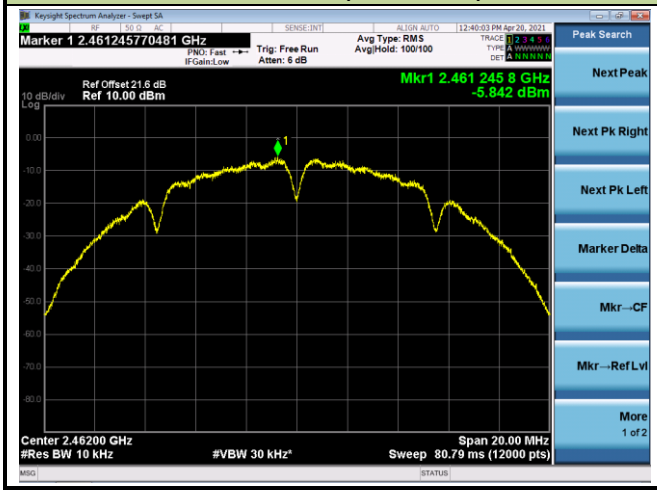
| Test Mode | Data Rate/ MCS | Channel No. | Freq. (MHz) | AVGPSD (dBm / 10kHz) | | Duty Cycle (%) | Total AVGPSD (dBm / 10kHz) | Limit (dBm / 3kHz) | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | ANT 0 | ANT 1 | | | | |
| 11b | 11Mbps | 01 | 2412 | -5.71 | -5.88 | 99.03 | -2.78 | ≤ 6.43 | Pass |
| 11b | 11Mbps | 06 | 2437 | -3.17 | -3.29 | 99.03 | -0.22 | ≤ 6.43 | Pass |
| 11b | 11Mbps | 11 | 2462 | -5.84 | -6.01 | 99.03 | -2.91 | ≤ 6.43 | Pass |
| 11g | 6Mbps | 01 | 2412 | -11.59 | -11.97 | 95.94 | -8.59 | ≤ 6.43 | Pass |
| 11g | 6Mbps | 06 | 2437 | -7.21 | -7.44 | 95.94 | -4.13 | ≤ 6.43 | Pass |
| 11g | 6Mbps | 11 | 2462 | -11.07 | -10.94 | 95.94 | -7.81 | ≤ 6.43 | Pass |
| 11n-HT20 | MCS0 | 01 | 2412 | -11.71 | -11.88 | 95.75 | -8.59 | ≤ 6.43 | Pass |
| 11n-HT20 | MCS0 | 06 | 2437 | -7.67 | -7.42 | 95.75 | -4.35 | ≤ 6.43 | Pass |
| 11n-HT20 | MCS0 | 11 | 2462 | -12.23 | -11.71 | 95.75 | -8.76 | ≤ 6.43 | Pass |
| 11n-HT40 | MCS0 | 03 | 2422 | -15.57 | -14.99 | 91.67 | -11.88 | ≤ 6.43 | Pass |
| 11n-HT40 | MCS0 | 06 | 2437 | -10.02 | -9.69 | 91.67 | -6.46 | ≤ 6.43 | Pass |
| 11n-HT40 | MCS0 | 09 | 2452 | -15.96 | -15.85 | 91.67 | -12.52 | ≤ 6.43 | Pass |
| 11ax-HE20 | MCS0 | 01 | 2412 | -12.81 | -12.51 | 94.52 | -9.40 | ≤ 6.43 | Pass |
| 11ax-HE20 | MCS0 | 06 | 2437 | -8.88 | -8.32 | 94.52 | -5.34 | ≤ 6.43 | Pass |
| 11ax-HE20 | MCS0 | 11 | 2462 | -11.41 | -10.73 | 94.52 | -7.80 | ≤ 6.43 | Pass |
| 11ax-HE40 | MCS0 | 03 | 2422 | -16.35 | -16.28 | 90.14 | -12.85 | ≤ 6.43 | Pass |
| 11ax-HE40 | MCS0 | 06 | 2437 | -10.63 | -10.78 | 90.14 | -7.24 | ≤ 6.43 | Pass |
| 11ax-HE40 | MCS0 | 09 | 2452 | -16.60 | -16.70 | 90.14 | -13.19 | ≤ 6.43 | Pass |

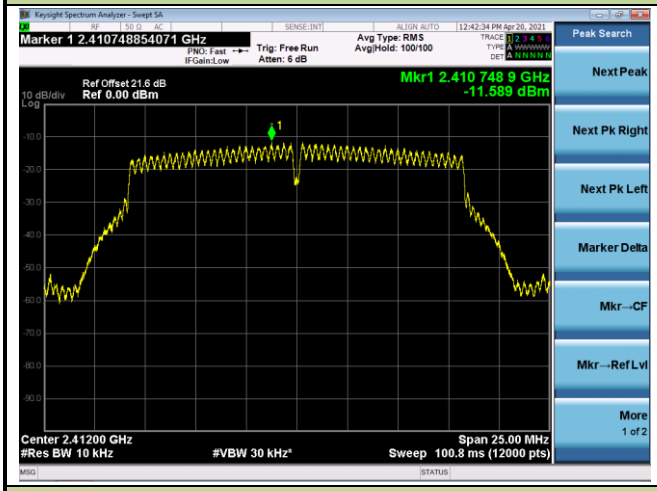
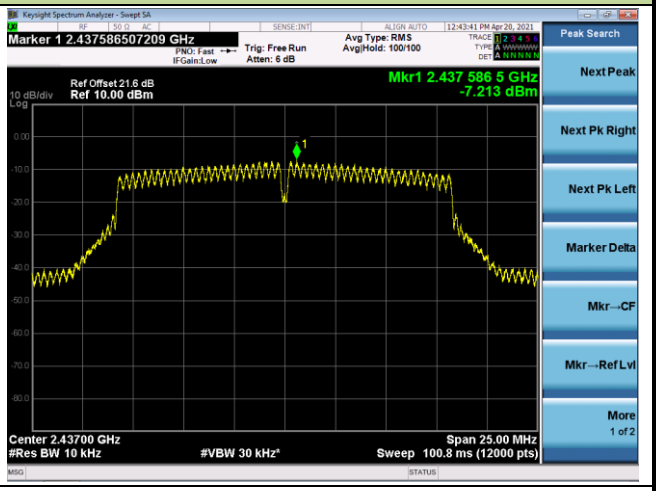
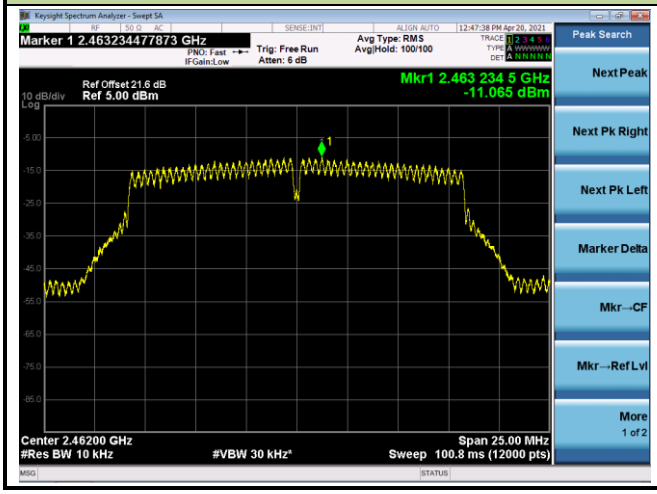
Note:

When EUT duty cycle > 98%, Total AVGPSD = 10*log {$10^{(\text{Ant 0 AVGPSD}/10)}$ + $10^{(\text{Ant 1 AVGPSD}/10)}$ + $10^{(\text{Ant 2 AVGPSD}/10)}$}.

When EUT duty cycle ≤ 98%, Total AVGPSD = 10*log {$10^{(\text{Ant 0 AVGPSD}/10)}$ + $10^{(\text{Ant 1 AVGPSD}/10)}$ + $10^{(\text{Ant 2 AVGPSD}/10)}$} + 10*log (1/Duty Cycle).

PSD Limit = 8 dBm/3kHz - (7.57 - 6) = 6.43 dBm/3kHz.

| 802.11b AVGPSD - Ant 0 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
| |  |
| Channel 11 (2462MHz) | |
|  | |

| 802.11g - AVGPSD- Ant 0 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 11 (2462MHz) | |
|  | |

| 802.11n-HT20 - AVGPSD - Ant 0 | |
|---|---|
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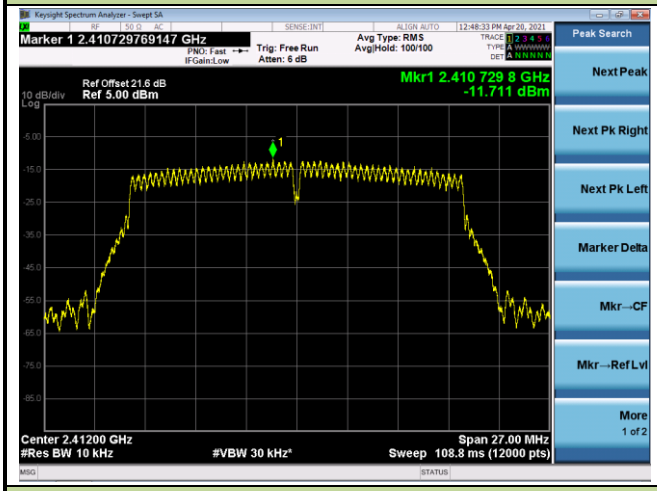
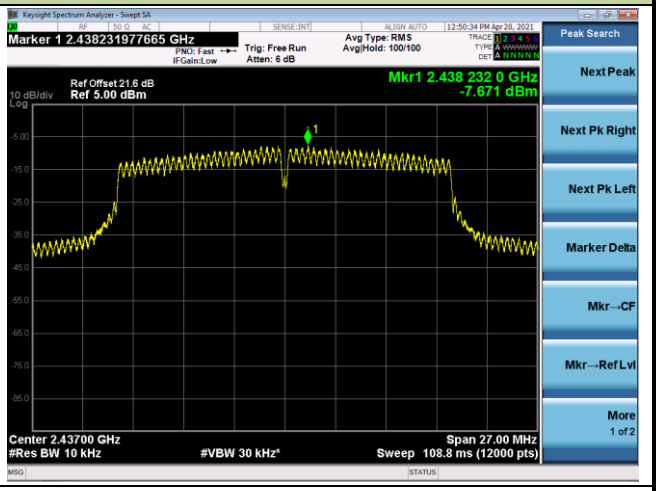
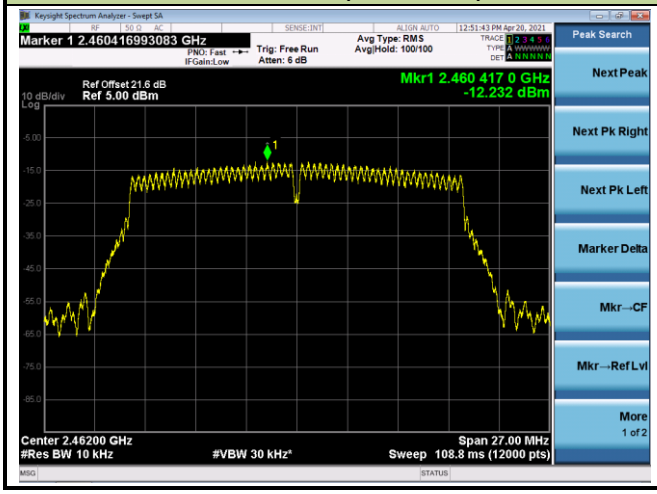
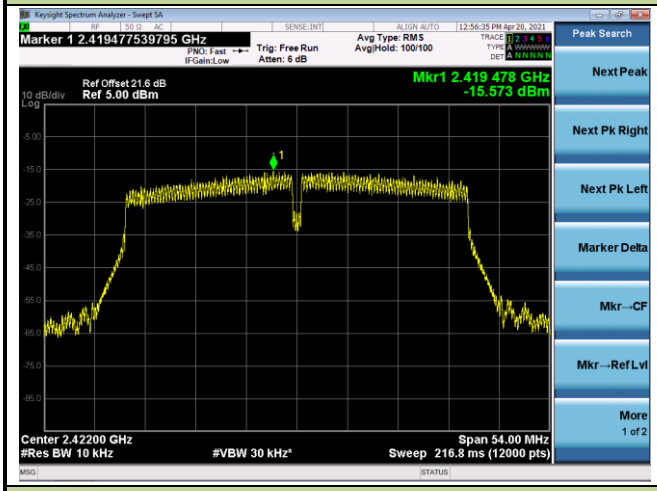
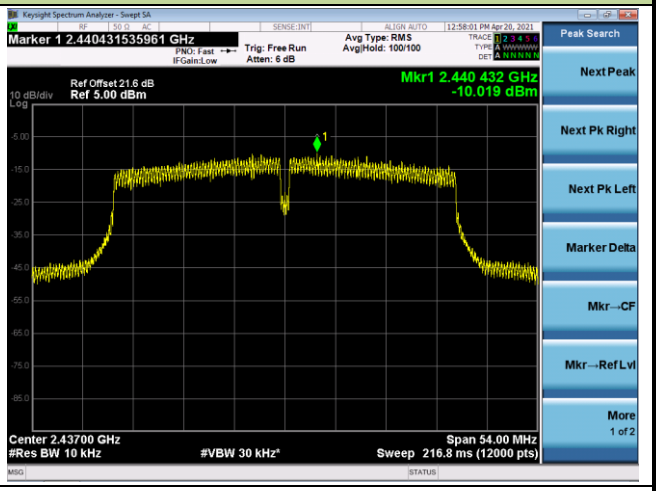
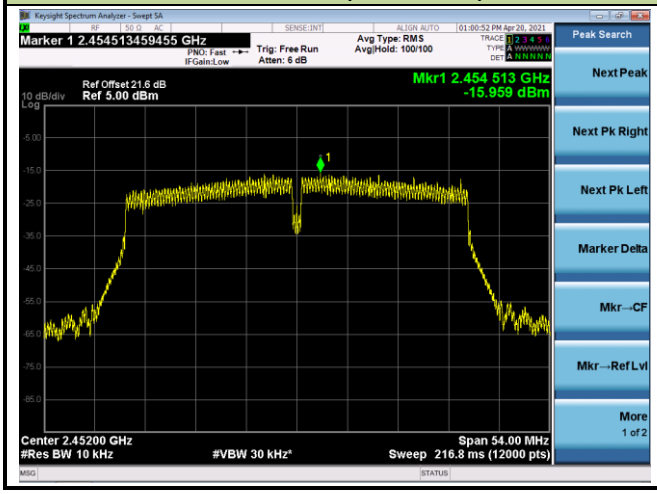
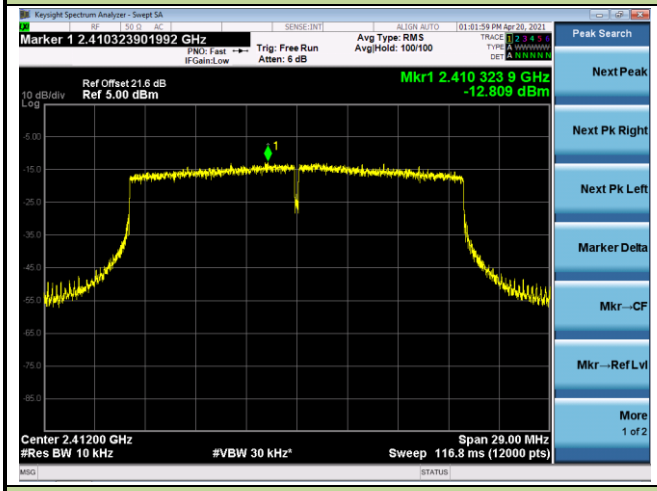
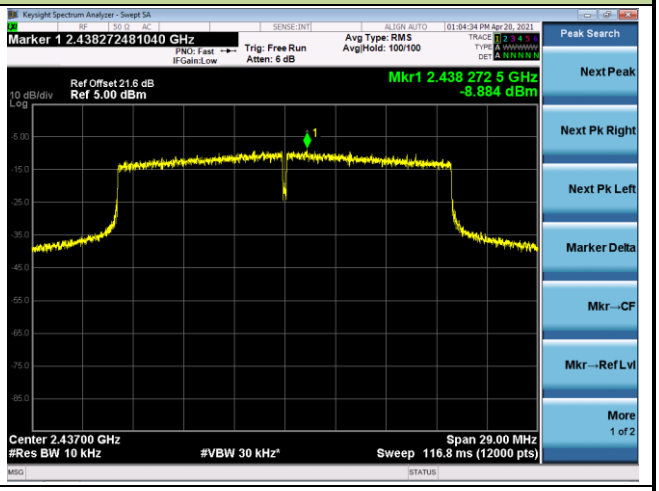
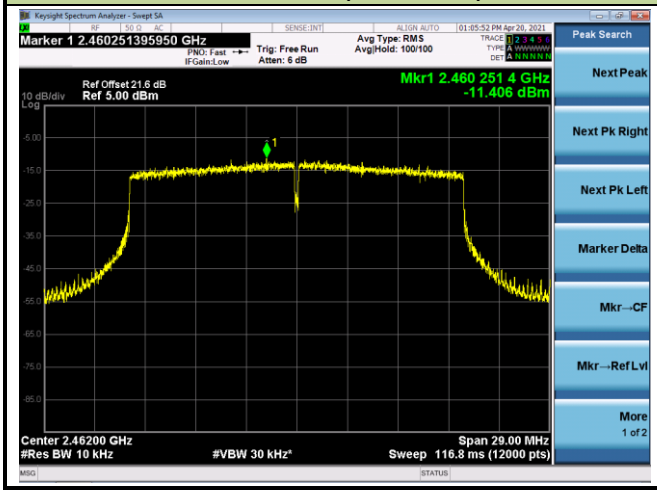
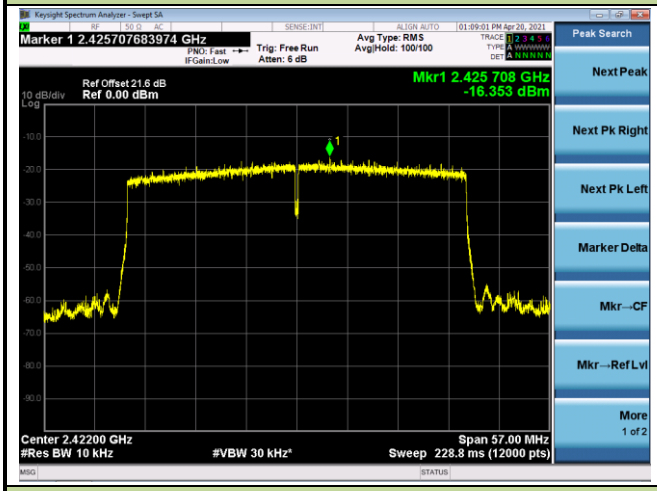
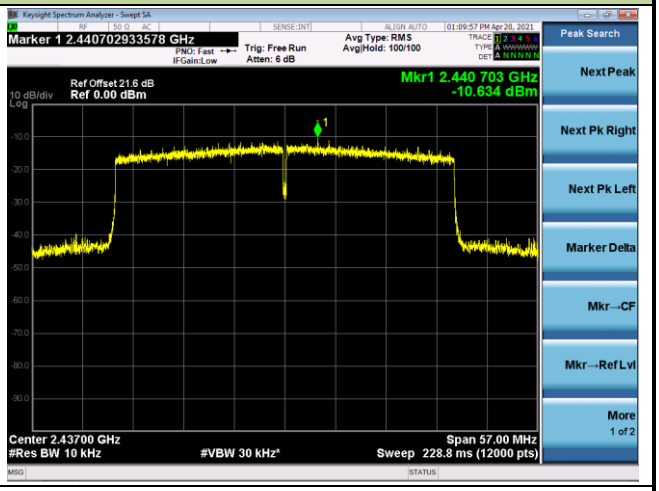
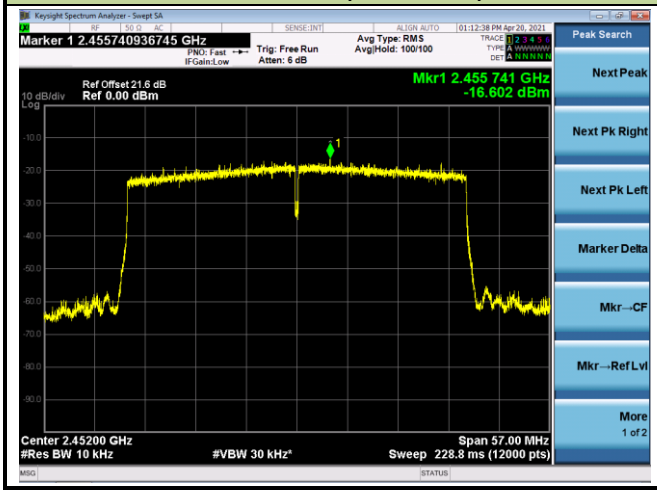
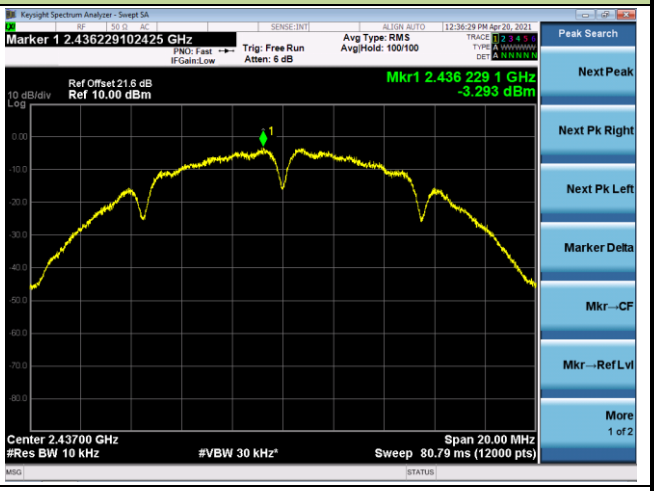
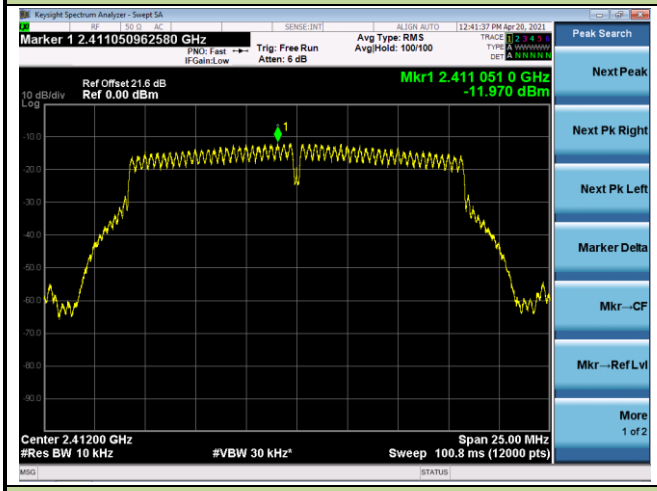
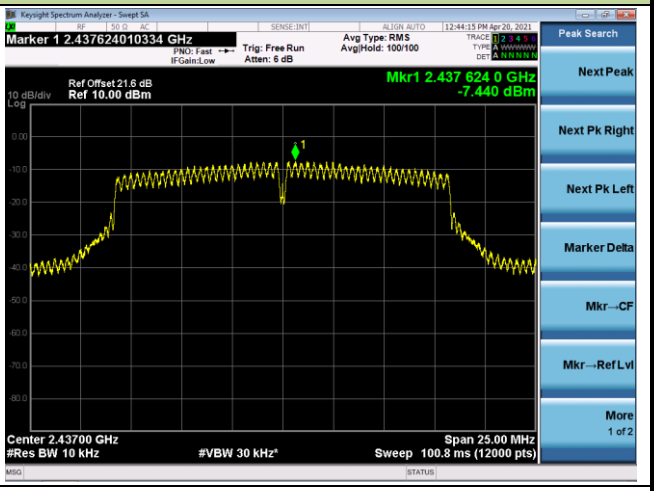
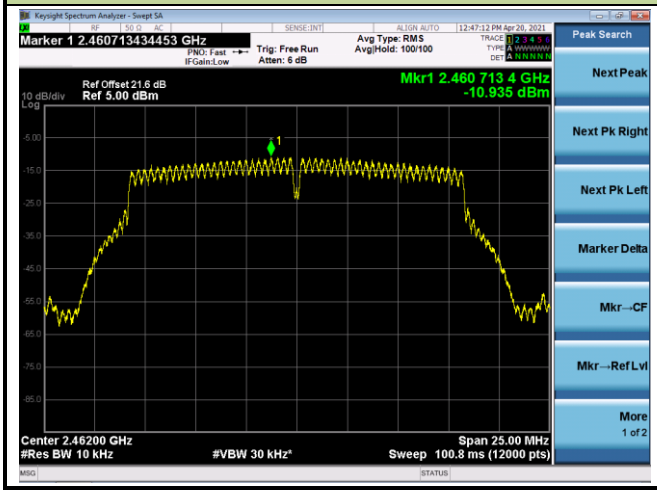
|  |  |
| Channel 11 (2462MHz) | |
|  | |

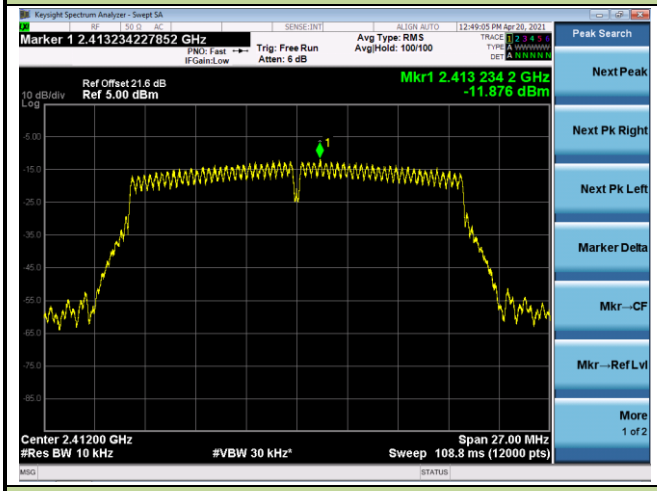
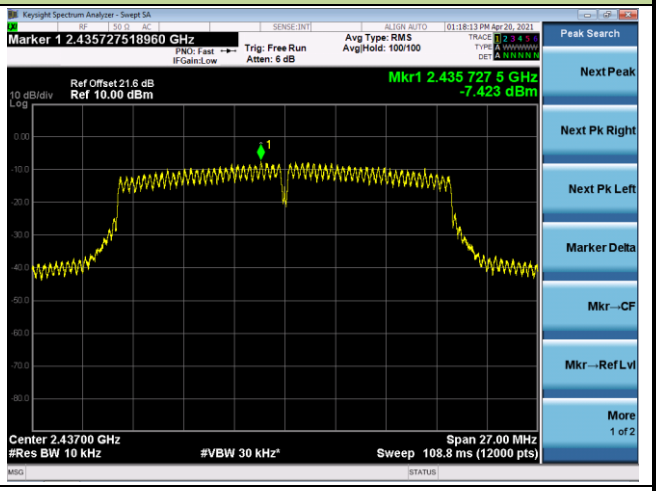
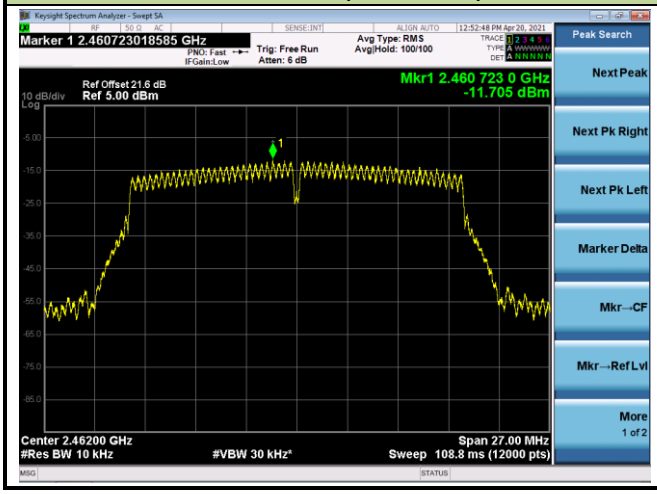
| 802.11n-HT40 - AVGPSD - Ant 0 | |
|---|---|
| Channel 03 (2422MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 09 (2452MHz) | |
|  | |

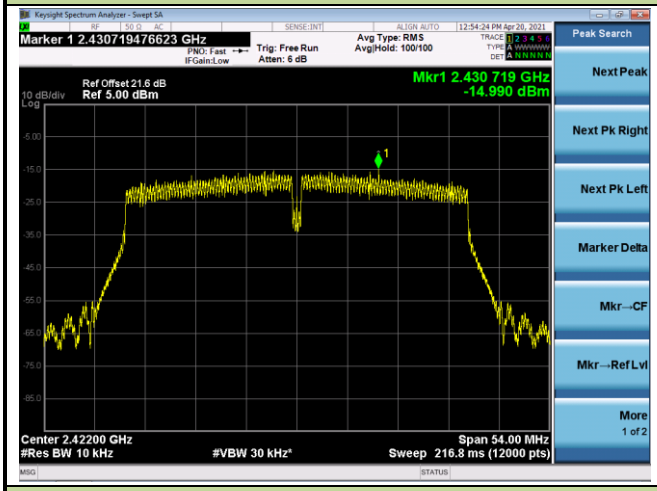
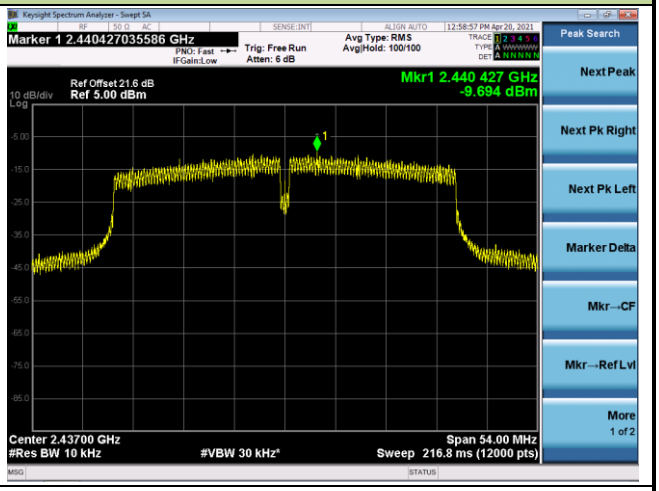
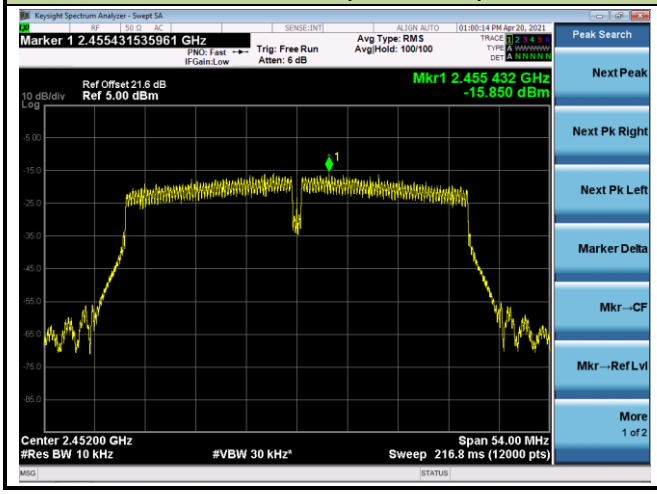
| 802.11ax-HE20 - AVGPSD - Ant 0 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 11 (2462MHz) | |
|  | |

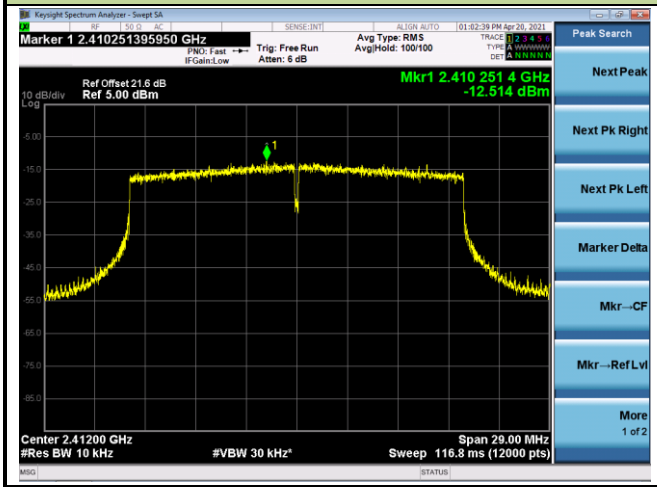
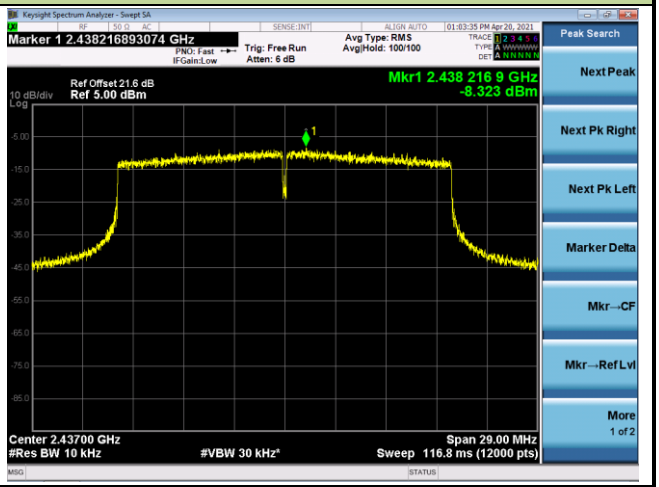
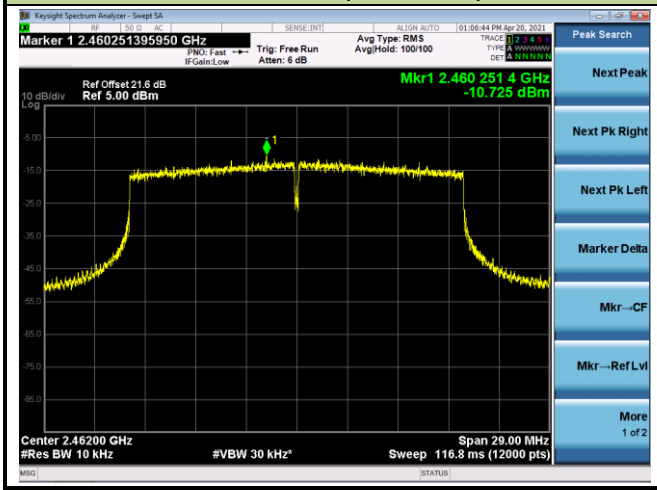
| 802.11ax-HE40 - AVGPSD - Ant 0 | |
|---|---|
| Channel 03 (2422MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 09 (2452MHz) | |
|  | |

| 802.11b - AVGPSD - Ant 1 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
| |  |
| Channel 11 (2462MHz) | |
| | |

| 802.11g - AVGPSD- Ant 1 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 11 (2462MHz) | |
|  | |

| 802.11n-HT20 - AVGPSD - Ant 1 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 11 (2462MHz) | |
|  | |

| 802.11n-HT40 - AVGPSD - Ant 1 | |
|---|---|
| Channel 03 (2422MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 09 (2452MHz) | |
|  | |

| 802.11ax-HE20 - AVGPSD - Ant 1 | |
|---|---|
| Channel 01 (2412MHz) | Channel 06 (2437MHz) |
|  |  |
| Channel 11 (2462MHz) | |
|  | |