# TEST REPORT

| | | |
|---|---|---|
| **Reference No.** | : | WTX23X09205054R2W001 |
| **FCC ID** | : | 2AIDW-ZZ-F-1-001 |
| **Applicant** | : | Shenzhen Zero Zero Infinity Technology Co., Ltd |
| **Address** | : | 4F Qianhai Yidu Tower Building, Shenzhen, China |
| **Manufacturer** | : | The same as Applicant |
| **Address** | : | The same as Applicant |
| **Product Name** | : | FALCON Mini |
| **Model No.** | : | ZZ-F-1-001 |
| **Standards** | : | FCC Part 15.407 |
| **Date of Receipt sample** | : | 2023-09-18 |
| **Date of Test** | : | 2023-09-18 to 2023-12-14 |
| **Date of Issue** | : | 2025-02-26 |
| **Test Report Form No.** | : | WTX_Part 15_407W |
| **Test Result** | : | **Pass** |

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

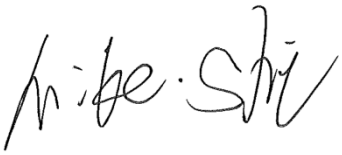

**Prepared By:**

**Waltek Testing Group (Shenzhen) Co., Ltd.**

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road,
Block 70 Bao'an District, Shenzhen, Guangdong, China

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Email: sem@waltek.com.cn


Tested by:



Mike Shi/ Project Engineer

Approved by:

Jason Su/ Manager

# TABLE OF CONTENTS

## Report version

| Version No. | Date of issue | Description |
|---|---|---|
| Rev.00 | 2025-02-26 | Original test report WTX23X09205054R2W001 |
| / | / | / |

# 1. GENERAL INFORMATION

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

| **General Description of EUT** | |
|---|---|
| Product Name: | FALCON Mini |
| Trade Name: | ZERO ZERO ROBOTICS |
| Model No.: | ZZ-F-1-001 |
| Adding Model(s): | / |
| Rated Voltage: | Type-C Port:DC5V<br>Battery:DC7.7V |
| Battery Capacity: | 2330mAh |
| Power Adapter: | / |
| *Note: The test data is gathered from a production sample, provided by the manufacturer.* | |

| **Technical Characteristics of EUT** | |
|---|---|
| Support Standards: | 802.11a, 802.11n(HT20), 802.11n-HT40, 802.11ac-VHT20, 802.11ac-VHT40,802.11ac-VHT80 |
| Frequency Range: | 5180-5240MHz, 5745-5825MHz |
| Max. RF Output Power: | 17.64dBm (Conducted) |
| Type of Modulation: | QPSK, 16QAM, 64QAM,256QAM |
| Type of Antenna: | PCB Antenna |
| Antenna Gain: | 4.04dBi |
| *Note The Antenna Gain is provided by the customer and can affect the validity of results.* | |

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.407:** General technical requirements.
**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices.
**KDB789033 D02 v02r01:** Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-Nii) Devices Part 15, Subparte.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB789033 D02 v02r01
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 1.4 Table for parameters of Test Software setting

Enter “3646631+=” into the calculator to enter the engineer mode, you can start to test. During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

| Mode | Test Frequency (MHz) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NCB: 20MHz | | | | | | | | | | | | |
| | 5180 | 5200 | 5240 | 5260 | 5300 | 5320 | 5500 | 5580 | 5700 | 5720 | 5745 | 5785 | 5825 |
| 802.11a | 70 | 70 | 70 | / | / | / | / | / | / | / | 70 | 70 | 70 |
| 802.11n-HT20 | 65 | 65 | 65 | / | / | / | / | / | / | / | 65 | 65 | 65 |
| 802.11ac-VHT 20 | 75 | 75 | 75 | / | / | / | / | / | / | / | 60 | 60 | 60 |
| Mode | NCB: 40MHz | | | | | | | | | |
| | 5190 | 5230 | 5270 | 5310 | 5510 | 5550 | 5670 | 5710 | 5755 | 5795 |
| 802.11n-HT40 | 70 | 70 | / | / | / | / | / | / | 60 | 60 |
| 802.11ac-VHT 40 | 78 | 78 | / | / | / | / | / | / | 60 | 60 |
| Mode | NCB: 80MHz | | | | | |
| | 5210 | | 5290 | 5530 | 5610 | 5690 | | 5775 | | |
| 802.11ac-VHT 80 | 75 | | / | / | / | / | | 60 | | |

## 1.5 EUT Operating during test

EUT was programmed to be in continuously transmitting mode. During the test, EUT operation to normal function and programs under Android were executed.

## 1.6 Test Facility

**Address of the test laboratory**

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

**FCC – Registration No.: 125990**

Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is mai ntained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

**Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A and the CAB identifier is CN0057.

## 1.7 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

| **Test Mode List** | | |
|---|---|---|
| Test Mode | Description | Remark |
| TM1 | 802.11a | 5180MHz,5200MHz,5240MHz,5745MHz, 5785MHz,5825MHz |
| TM2 | 802.11n-HT20 | 5180MHz,5200MHz,5240MHz,5745MHz, 5785MHz,5825MHz |
| TM3 | 802.11n-HT40 | 5190MHz,5230MHz,5755MHz,5795MHz |
| TM4 | 802.11ac-VH80 | 5210MHz,5775MHz |
| Note: 802.11ac-VHT20, 802.11ac-VHT40 covered by 802.11n-HT20 an802.11n-HT40. | | |

| **Test Conditions** | |
|---|---|
| Temperature: | 22~25 °C |
| Relative Humidity: | 45~55 %. |
| ATM Pressure: | 1019 mbar |

| **EUT Cable List and Details** | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| / | / | / | / |

| **Special Cable List and Details** | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| Type-C Cable | 1.0 | Shielded | With Ferrite |

| **Auxiliary Equipment List and Details** | | | |
|---|---|---|---|
| Description | Manufacturer | Model | Serial Number |
| Adapter | / | XY18W-1375-QC3.0 | / |

## 1.8 Measurement Uncertainty

| **Measurement uncertainty** | | |
|---|---|---|
| Parameter | Conditions | Uncertainty |
| RF Output Power | Conducted | ±0.42dB |
| Occupied Bandwidth | Conducted | ±1.5% |
| Power Spectral Density | Conducted | ±1.8dB |
| Conducted Spurious Emission | Conducted | ±2.17dB |
| Conducted Emissions | Conducted | 9-150kHz ±3.74dB |
| | | 0.15-30MHz ±3.34dB |
| Transmitter Spurious Emissions | Radiated | 30-200MHz ±4.52dB |
| | | 0.2-1GHz ±5.56dB |
| | | 1-6GHz ±3.84dB |
| | | 6-18GHz ±3.92dB |

## 1.9 Test Equipment List and Details

| Fixed asset Number | Description | Manufacturer | Model | Serial No. | Cal Date | Due. Date |
|---|---|---|---|---|---|---|
| WTXE1041A1001 | Communication Tester | Rohde & Schwarz | CMW500 | 148650 | 2023-02-25 | 2024-02-24 |
| WTXE1022A1002 | GSM Tester | Rohde & Schwarz | CMU200 | 114403 | 2023-02-25 | 2024-02-24 |
| WTXE1005A1005 | Spectrum Analyzer | Agilent | N9020A | US47140102 | 2023-02-25 | 2024-02-24 |
| WTXE1084A1001 | Spectrum Analyzer | Agilent | N9020A | MY54320548 | 2023-02-25 | 2024-02-24 |
| WTXE1044A1001 | Signal Generator | Agilent | 83752A | 3610A01453 | 2023-02-25 | 2024-02-24 |
| WTXE1045A1001 | Vector Signal Generator | Agilent | N5182A | MY47070202 | 2023-02-25 | 2024-02-24 |
| WTXE1018A1001 | Power Divider | Weinschel | 1506A | PM204 | 2023-02-25 | 2024-02-24 |
| WTXE1045A1001 | Power Divider | RF-Lambda | RFLT4W5M18G | 14110400027 | 2023-02-25 | 2024-02-24 |
| ☐Chamber A: Below 1GHz | | | | | | |
| WTXE1005A1003 | Spectrum Analyzer | Rohde & Schwarz | FSP30 | 836079/035 | 2023-02-25 | 2024-02-24 |
| WTXE1007A1001 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2023-02-25 | 2024-02-24 |
| WTXE1007A1001 | Amplifier | HP | 8447F | 2805A03475 | 2023-02-25 | 2024-02-24 |
| WTXE1010A1007 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2021-03-20 | 2024-03-19 |
| WTXE1010A1006 | Broadband Antenna | Schwarz beck | VULB9163 | 9163-333 | 2023-03-20 | 2026-03-19 |
| ☐Chamber A: Above 1GHz | | | | | | |
| WTXE1005A1003 | Spectrum Analyzer | Rohde & Schwarz | FSP30 | 836079/035 | 2023-02-25 | 2024-02-24 |
| WTXE1007A1001 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2023-02-25 | 2024-02-24 |
| WTXE1065A1001 | Amplifier | C&D | PAP-1G18 | 14918 | 2023-02-25 | 2024-02-24 |
| WTXE1010A1005 | Horn Antenna | ETS | 3117 | 00086197 | 2021-03-19 | 2024-03-18 |
| WTXE1010A1010 | DRG Horn Antenna | A.H. SYSTEMS | SAS-574 | 571 | 2021-03-19 | 2024-03-18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| WTXE1003A 1001 | Pre-amplifier | Schwarzbeck | BBV 9721 | 9721-031 | 2023-02-25 | 2024-02-24 |
| ☐Chamber B:Below 1GHz | | | | | | |
| WTXE1010A 1006 | Trilog Broadband Antenna | Schwarz beck | VULB9163(B) | 9163-635 | 2021-04-09 | 2024-04-08 |
| WTXE1038A 1001 | Amplifier | Agilent | 8447D | 2944A104 57 | 2023-02-25 | 2024-02-24 |
| WTXE1001A 1002 | EMI Test Receiver | Rohde & Schwarz | ESPI | 101391 | 2023-02-25 | 2024-02-24 |
| ☒Chamber C:Below 1GHz | | | | | | |
| WTXE1093A 1001 | EMI Test Receiver | Rohde & Schwarz | ESIB 26 | 100401 | 2023-02-25 | 2024-02-24 |
| WTXE1010A 1013-1 | Trilog Broadband Antenna | Schwarz beck | VULB 9168 | 1194 | 2021-05-28 | 2024-05-27 |
| WTXE1010A 1007 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2021-03-20 | 2024-03-19 |
| WTXE1007A 1002 | Amplifier | HP | 8447F | 2944A038 69 | 2023-02-25 | 2024-02-24 |
| ☒Chamber C: Above 1GHz | | | | | | |
| WTXE1093A 1001 | EMI Test Receiver | Rohde & Schwarz | ESIB 26 | 100401 | 2023-02-25 | 2024-02-24 |
| WTXE1103A 1005 | Horn Antenna | POAM | RTF-118A | 1820 | 2023-03-10 | 2026-03-09 |
| WTXE1103A 1006 | Amplifier | Tonscend | TAP01018050 | AP22E806 235 | 2023-02-25 | 2024-02-24 |
| WTXE1010A 1010 | DRG Horn Antenna | A.H. SYSTEMS | SAS-574 | 571 | 2021-03-19 | 2024-03-18 |
| WTXE1003A 1001 | Pre-amplifier | Schwarzbeck | BBV 9721 | 9721-031 | 2023-02-25 | 2024-02-24 |
| ☒Conducted Room 1# | | | | | | |
| WTXE1001A 1001 | EMI Test Receiver | Rohde & Schwarz | ESPI | 101611 | 2023-02-25 | 2024-02-24 |
| WTXE1002A 1001 | Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100911 | 2023-02-25 | 2024-02-24 |
| WTXE1003A 1001 | AC LISN | Schwarz beck | NSLK8126 | 8126-279 | 2023-02-25 | 2024-02-24 |
| ☐Conducted Room 2# | | | | | | |
| WTXE1001A 1004 | EMI Test Receiver | Rohde & Schwarz | ESPI | 101259 | 2023-02-25 | 2024-02-24 |
| WTXE1003A | LISN | Rohde & | ENV 216 | 100097 | 2023-02-25 | 2024-02-24 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1003 | | Schwarz | | | | |

| Software List | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Version** |
| EMI Test Software (Radiated Emission)* | Farad | EZ-EMC | RA-03A1 |
| EMI Test Software (Conducted Emission Room 1#)* | Farad | EZ-EMC | RA-03A1 |
| EMI Test Software (Conducted Emission Room 2#)* | SKET | EMC-I | V2.0 |

*Remark: indicates software version used in the compliance certification testing.

# 2. SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test Item | Result |
|---|---|---|
| §15.203; §15.405 | Antenna Requirement | Compliant |
| 15.407 (c) | Automatically Discontinue Transmission | Compliant |
| §15.207; §15.407(b)(6) | Conducted Emission | N/A |
| §15.407(a)(1),(2) | Power Spectral Density | Compliant |
| §15.407(e) | Emission Bandwidth and Occupied Bandwidth | Compliant |
| §15.407(a)(1),(2) | Maximum Conducted Output Power | Compliant |
| §15.407(b)(1),(2),(3),(4) | Undesirable emission | Compliant |
| §15.205; §15.407(b)(1),(2),(3) | Radiated Emission | Compliant |
| §15.407(g) | Frequency Stability | Compliant |
| §15.407(h) | Dynamic Frequency Selection (DFS) | Compliant |

N/A: Not applicable.

# 3. Antenna Requirement

## 3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

## 3.2 Evaluation Information

This product has a PCB antenna, fulfill the requirement of this section.

# 4. Automatically Discontinue Transmission

## 4.1 Standard Applicable

According to FCC Part 15.407(c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

## 4.2 Summary of Test Results

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

# 5. Power Spectral Density

## 5.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25GHz.
(iv) For mobile and portable client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(2) For the 5.25-5.35GHz and 5.47-5.725GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or 11 dBm + 10 log B, where B is the 26dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(3) For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500kHz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

## 5.2 Test Procedure

According to 789033 D02 v02r01 General UNII Test Procedures New Rules v02, the following is the measurement procedure.
For devices operating in the bands 5.15-5.25GHz, 5.25-5.35GHz, and 5.47-5.725GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85GHz, the rules specify a measurement bandwidth of 500kHz. Many spectrum analyzers do not have 500kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500kHz, “provided that the measured power is integrated over the full

reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1MHz, or 500kHz). If measurements are performed using a reduced resolution bandwidth (< 1MHz, or < 500kHz) and integrated over 1 MHz, or 500kHz bandwidth, the following adjustments to the procedures apply:

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

Note: As a practical matter, it is recommended to use reduced RBW of 100kHz for the sections 5.c) and 5.d) above, since RBW=100kHZ is available on nearly all spectrum analyzers.

## 5.3 Summary of Test Results/Plots

**Please refer to Appendix A**

# 6. Emission Bandwidth and Occupied Bandwidth

## 6.1 Standard Applicable

According to 15.407(a) and (e):

(1) For the band 5.15-5.25GHz.
(iv) For mobile and portable client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(2) For the 5.25-5.35GHz and 5.47-5.725GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or 11dBm + 10 log B, where B is the 26dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(3) For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500kHz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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

## 6.2 Test Procedure

According to 789033 D02 v02r0r section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.

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

2. Minimum Emission Bandwidth for the band 5.725-5.85GHz Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth
The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v02r01 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

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

The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

## 6.3 Summary of Test Results/Plots

**Please refer to Appendix B**

# 7. Maximum Conducted Output Power

## 7.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25GHz.
(iv) For mobile and portable client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(2) For the 5.25-5.35GHz and 5.47-5.725GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or 11dBm + 10 log B, where B is the 26dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(3) For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500kHz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

## 7.2 Test Procedure

According to KDB789033 D02 v02r01 section E, the following is the measurement procedure.

(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1MHz.

(iii) Set VBW ≥ 3MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that

narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

## 7.3 Summary of Test Results/Plots

**Please refer to Appendix C**

# 8. Radiated Spurious Emissions

## 8.1 Standard Applicable

According to §15.407(b), undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25GHz band: All emissions outside of the 5.15-5.35GHz band shall not exceed an e.i.r.p. of −27dBm/MHz.

(2) For transmitters operating in the 5.25-5.35GHz band: All emissions outside of the 5.15-5.35GHz band shall not exceed an e.i.r.p. of −27dBm/MHz.

(3) For transmitters operating in the 5.47-5.725GHz band: All emissions outside of the 5.47-5.725GHz band shall not exceed an e.i.r.p. of −27dBm/MHz.

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

(i) All emissions shall be limited to a level of −27dBm/MHz at 75MHz or more above or below the band edge increasing linearly to 10dBm/MHz at 25MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6dBm/MHz at 5MHz above or below the band edge, and from 5MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

According to §15.407(b)(6), Unwanted emissions below 1GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

According to §15.407(b)(7), The provisions of §15.205 apply to intentional radiators operating under this section.

789033 D02 v02r01 General UNII Test Procedures New Rules v01

If radiated measurements are performed, field strength is then converted to EIRP as follows:

EIRP = ((E*d)^2) / 30

where:

• E is the field strength in V/m;

• d is the measurement distance in meters;

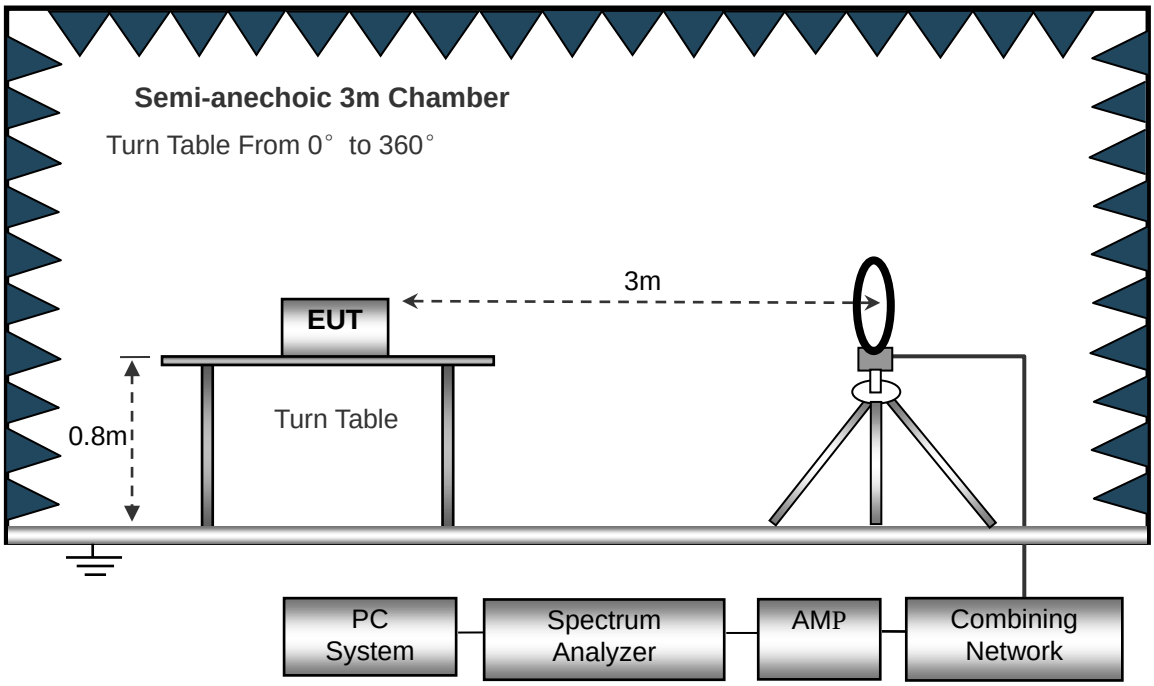
• EIRP is the equivalent isotropically radiated power in watts.

## 8.2 Test Procedure

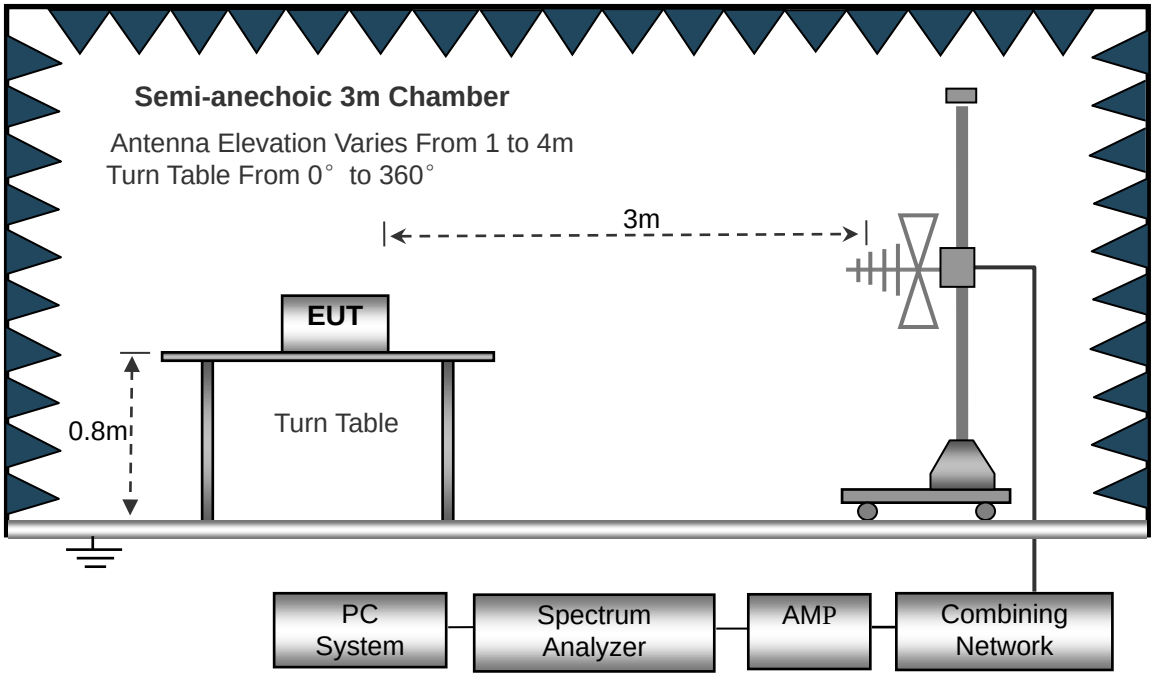
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.407(b)(6) and FCC Part 15.209 Limit..

The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

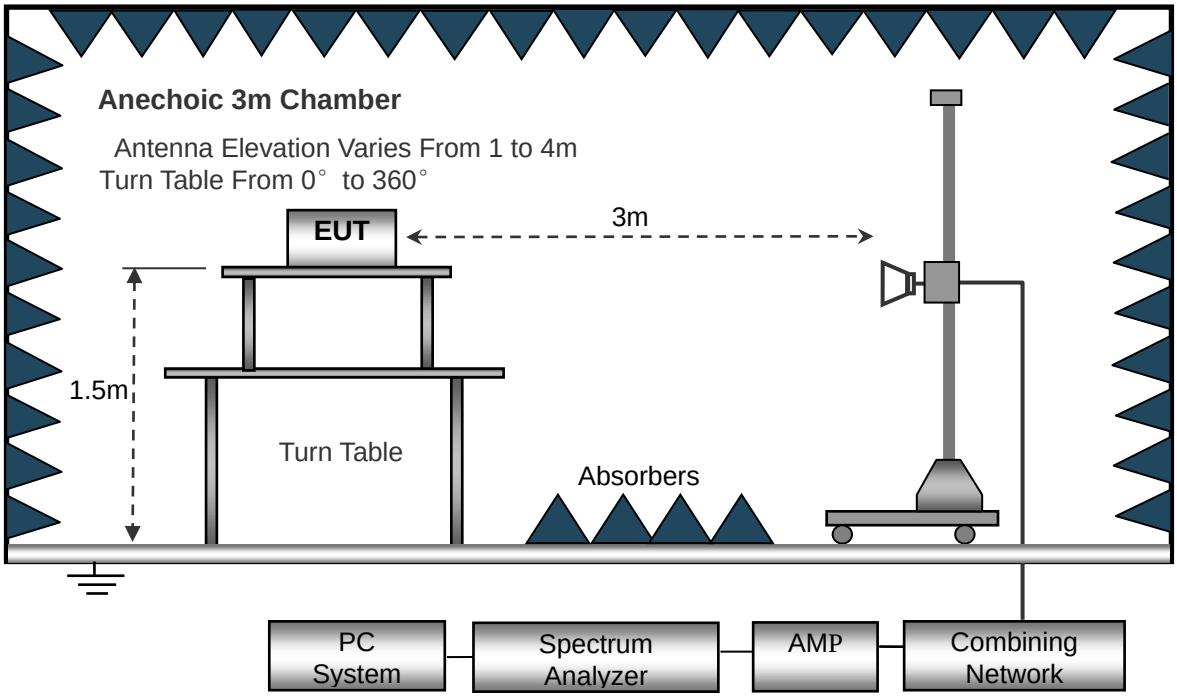
The test setup for emission measurement below 30MHz.




The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1GHz.




## 8.3 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:
RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:
RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

## 8.4 Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

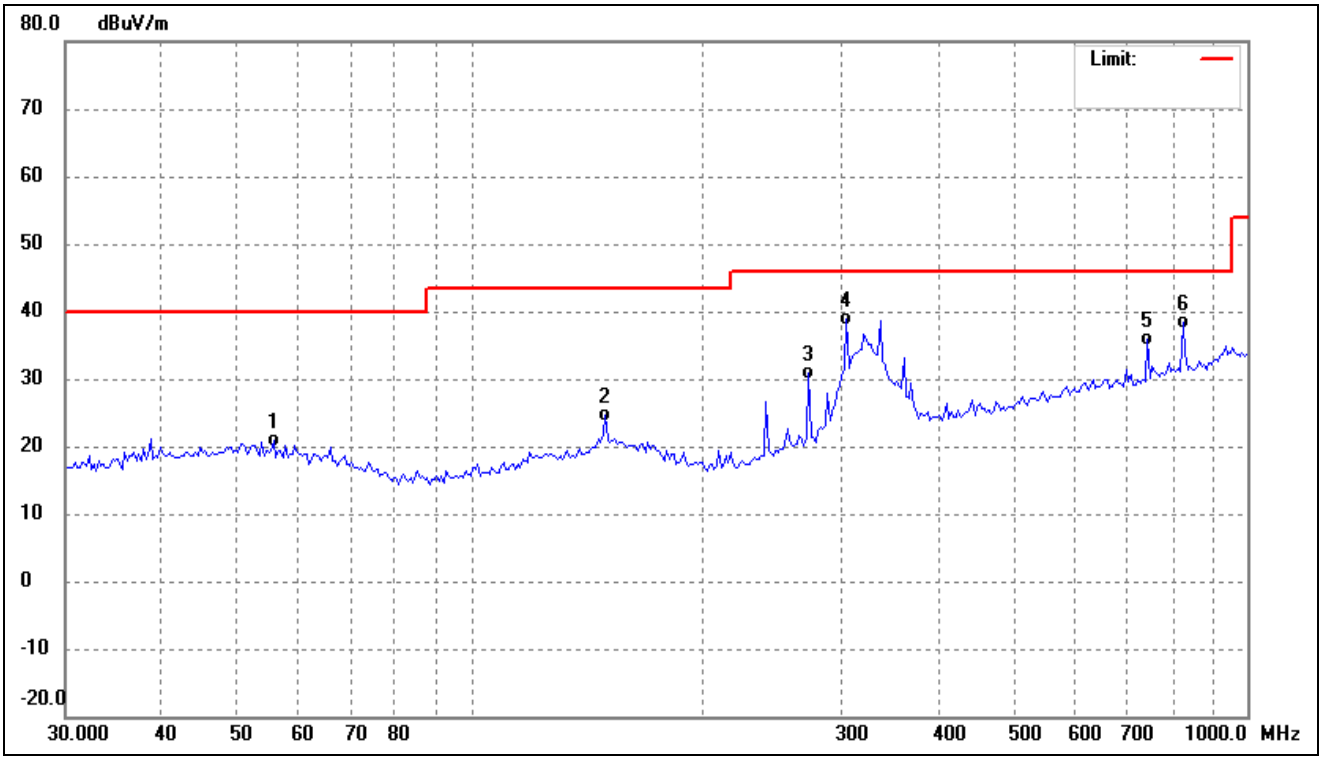
Margin = Corr. Ampl. – FCC Part 15 Limit

## 8.5 Summary of Test Results/Plots

***Note:*** *this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

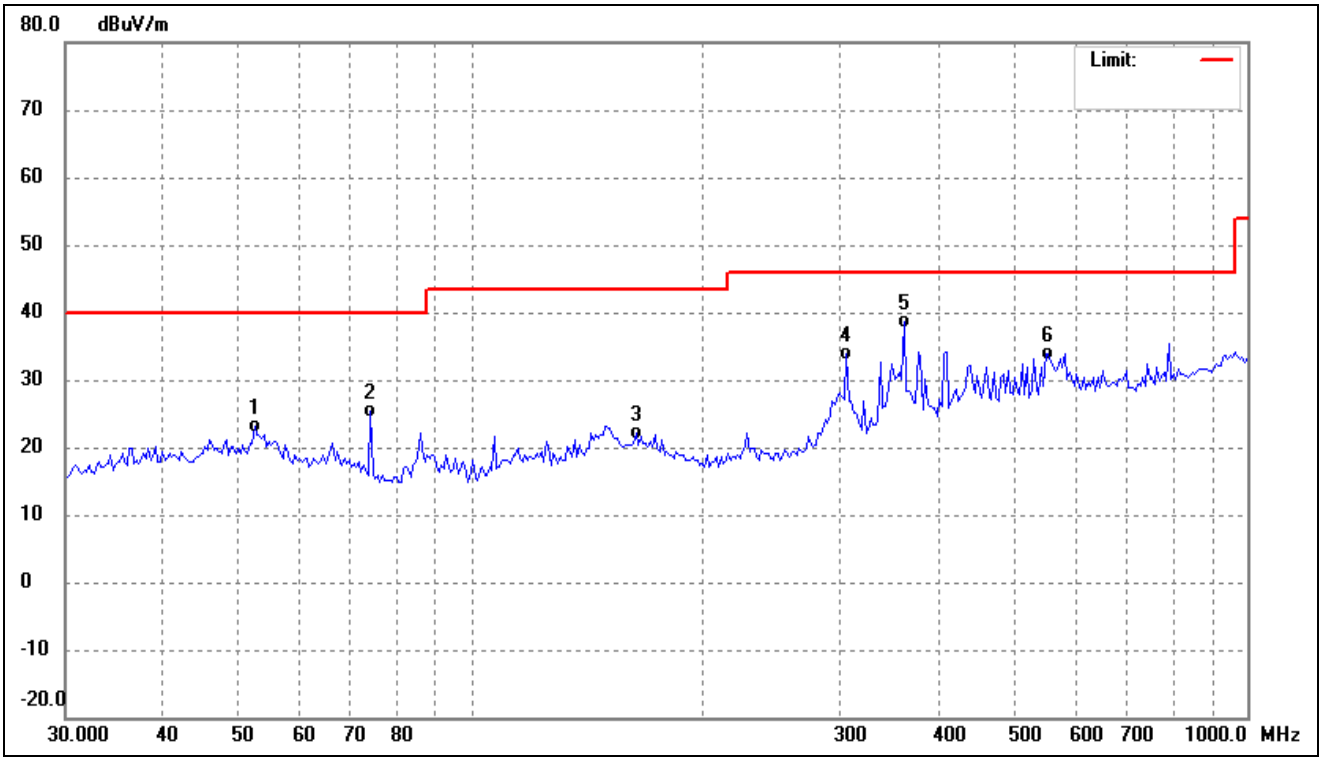
- Spurious Emission From 30MHz to 1GHz
- 5150-5250MHz

| 802.11a(worst case) | | | |
|---|---|---|---|
| Test Channel | 5180MHz(Worst case) | Polarity: | Horizontal |




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 55.6782 | 29.54 | -8.67 | 20.87 | 40.00 | -19.13 | - | - | QP |
| 2 | 148.9175 | 33.39 | -8.68 | 24.71 | 43.50 | -18.79 | - | - | QP |
| 3 | 272.5246 | 40.07 | -9.22 | 30.85 | 46.00 | -15.15 | - | - | QP |
| 4 | 304.9548 | 46.99 | -8.12 | 38.87 | 46.00 | -7.13 | - | - | QP |
| 5 | 744.4265 | 36.03 | -0.27 | 35.76 | 46.00 | -10.24 | - | - | QP |
| 6 | 827.1795 | 37.85 | 0.54 | 38.39 | 46.00 | -7.61 | - | - | QP |

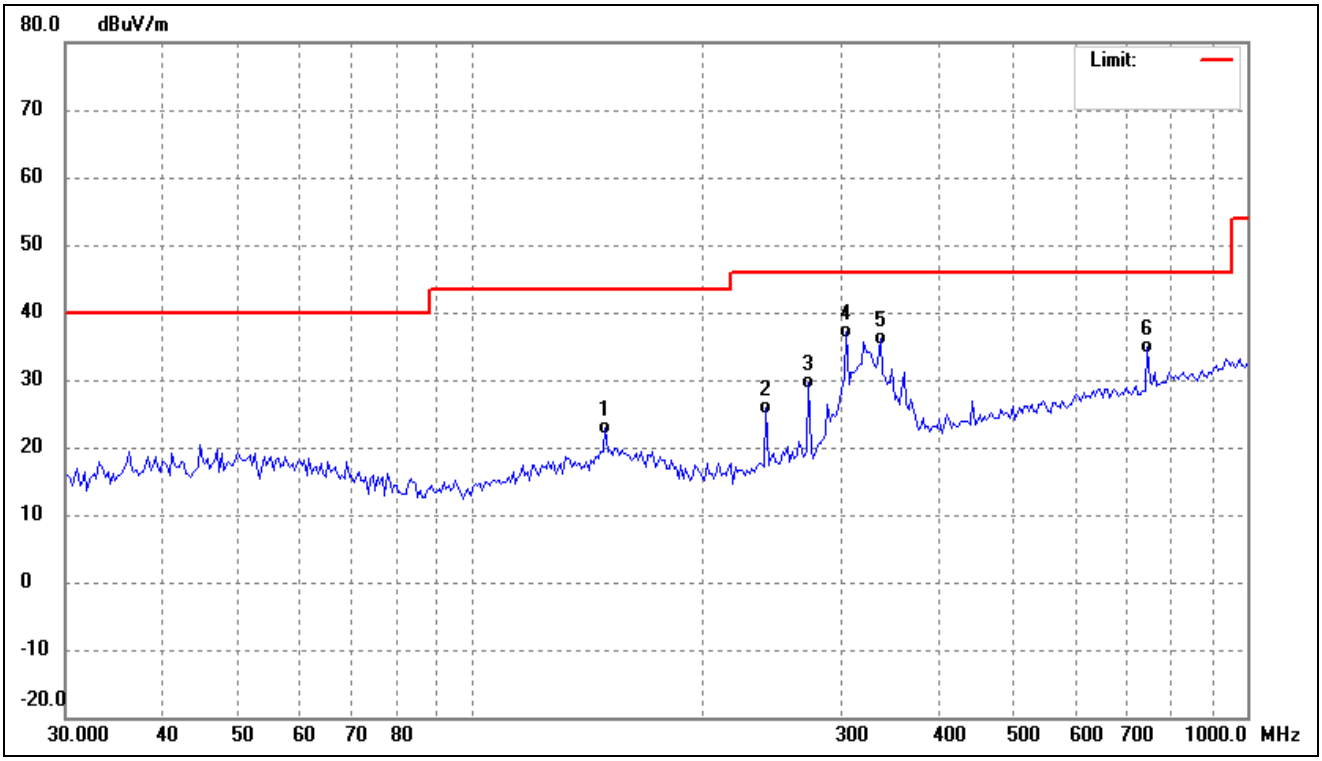
| 802.11a(worst case) | | | |
|---|---|---|---|
| Test Channel | 5180MHz(Worst case) | Polarity: | Vertical |




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 52.6345 | 31.38 | -8.37 | 23.01 | 40.00 | -16.99 | - | - | QP |
| 2 | 74.2696 | 37.18 | -11.70 | 25.48 | 40.00 | -14.52 | - | - | QP |
| 3 | 163.1623 | 30.75 | -8.70 | 22.05 | 43.50 | -21.45 | - | - | QP |
| 4 | 304.9548 | 41.99 | -8.12 | 33.87 | 46.00 | -12.13 | - | - | QP |
| 5 | 360.9775 | 45.42 | -6.83 | 38.59 | 46.00 | -7.41 | - | - | QP |
| 6 | 554.1708 | 36.62 | -2.75 | 33.87 | 46.00 | -12.13 | - | - | QP |

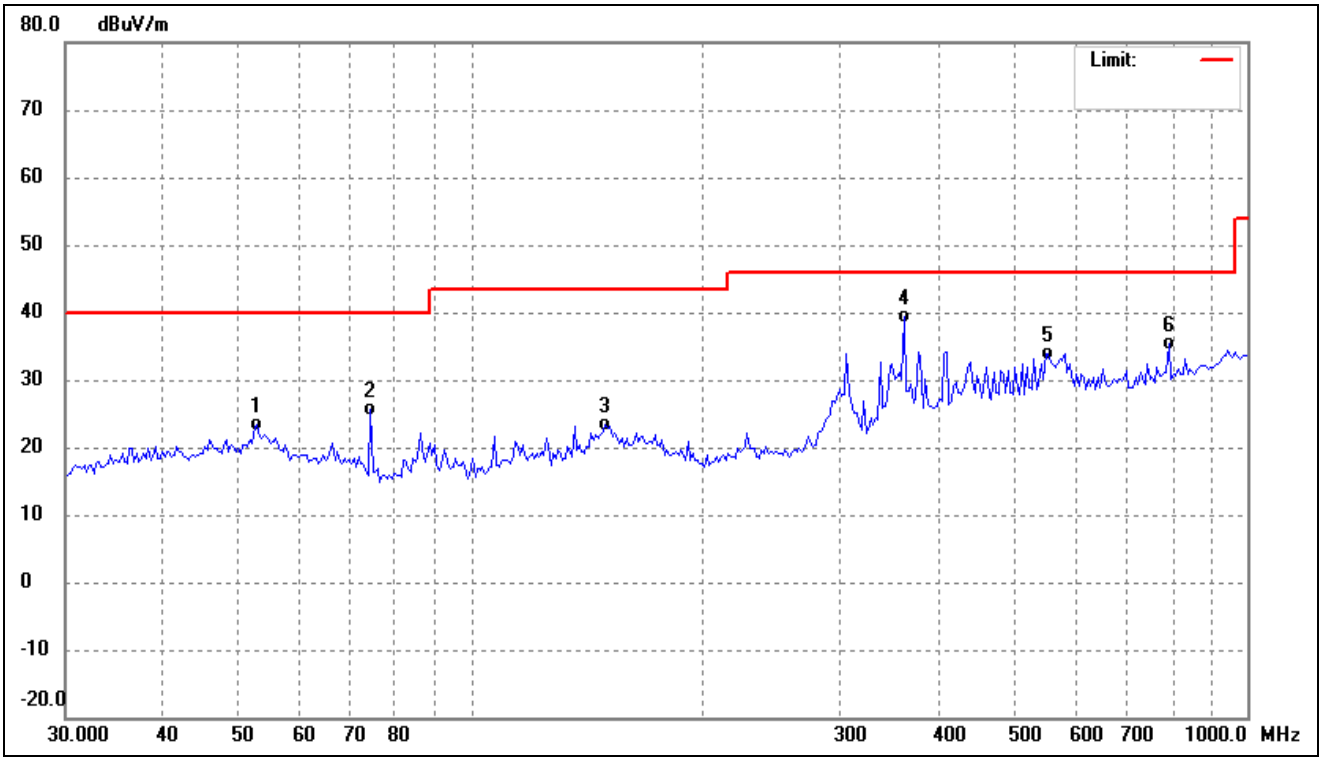
➢ 5725-5850MHz

| 802.11a(worst case) | | | |
|---|---|---|---|
| Test Channel | 5745MHz(worst case) | Polarity: | Horizontal |




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 148.9175 | 31.48 | -8.68 | 22.80 | 43.50 | -20.70 | - | - | QP |
| 2 | 240.1442 | 36.52 | -10.54 | 25.98 | 46.00 | -20.02 | - | - | QP |
| 3 | 272.5246 | 38.89 | -9.22 | 29.67 | 46.00 | -16.33 | - | - | QP |
| 4 | 304.9548 | 45.17 | -8.12 | 37.05 | 46.00 | -8.95 | - | - | QP |
| 5 | 336.4817 | 43.60 | -7.35 | 36.25 | 46.00 | -9.75 | - | - | QP |
| 6 | 744.4265 | 35.24 | -0.27 | 34.97 | 46.00 | -11.03 | - | - | QP |

| 802.11a(worst case) | | | |
|---|---|---|---|
| Test Channel | 5745MHz(worst case) | Polarity: | Vertical |

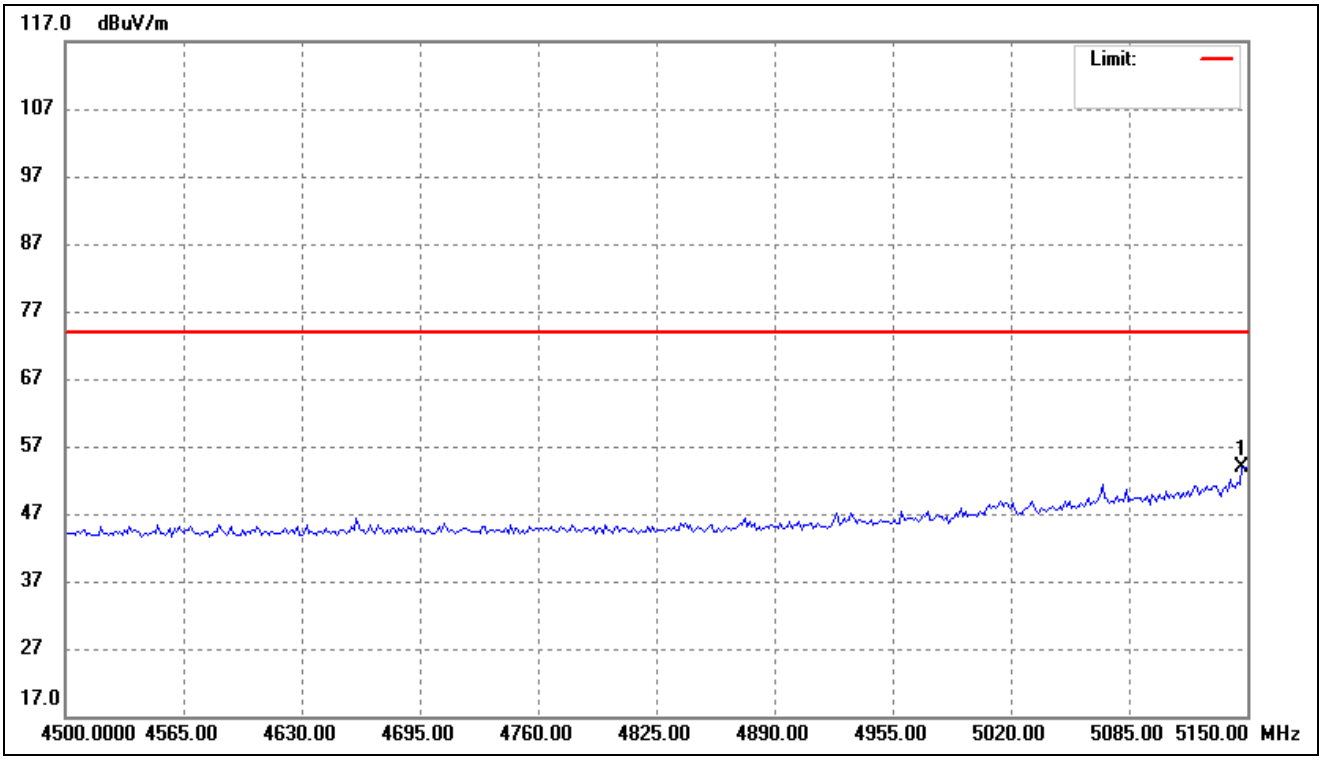



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 53.0056 | 31.75 | -8.41 | 23.34 | 40.00 | -16.66 | - | - | QP |
| 2 | 74.2696 | 37.25 | -11.70 | 25.55 | 40.00 | -14.45 | - | - | QP |
| 3 | 148.9175 | 32.01 | -8.68 | 23.33 | 43.50 | -20.17 | - | - | QP |
| 4 | 360.9775 | 46.29 | -6.83 | 39.46 | 46.00 | -6.54 | - | - | QP |
| 5 | 554.1708 | 36.62 | -2.75 | 33.87 | 46.00 | -12.13 | - | - | QP |
| 6 | 793.0281 | 35.25 | 0.23 | 35.48 | 46.00 | -10.52 | - | - | QP |

Remark: '-'Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

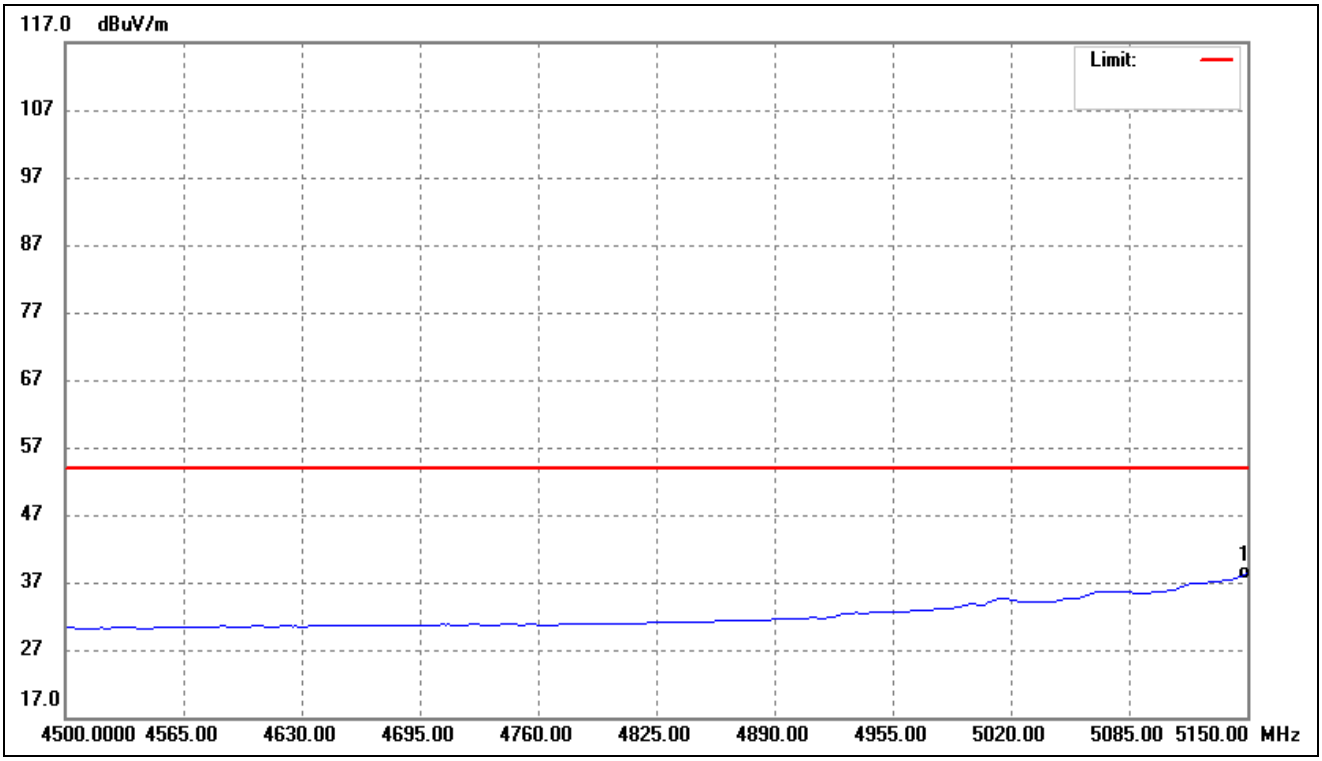
➢ Spurious Emission above 1GHz

| 802.11a- Restricted Bandedge | | | |
|---|---|---|---|
| Test Channel | band 4.50-5.15GHz | Polarity: | Horizontal(worst case) |




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 5147.395 | 65.61 | -11.67 | 53.94 | 74.00 | -20.06 | - | - | peak |

| 802.11a- Restricted Bandedge | | | |
|---|---|---|---|
| Test Channel | band 4.50-5.15GHz | Polarity: | Horizontal(worst case) |




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 5150.000 | 50.10 | -11.66 | 38.44 | 54.00 | -15.56 | - | - | AVG |

*Note: The Restricted Bandedge was tested in Horizontal /Vertical and the worst case position data was reported.*

*Remark: '-'Means' the test Degree and Height is not recorded by the test software and only show the worst case in the test report.*

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11a)
- Harmonics And Spurious Emissions

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| Low Channel (5180MHz) | | | | | | | |
| 10360 | 44.30 | 7.11 | 51.41 | 74 | -22.59 | H | PK |
| 15540 | 38.48 | 7.11 | 45.59 | 54 | -8.41 | H | AV |
| 10360 | 44.33 | 7.11 | 51.44 | 74 | -22.56 | V | PK |
| 15540 | 38.57 | 7.11 | 45.68 | 54 | -8.32 | V | AV |
| Middle Channel (5200MHz) | | | | | | | |
| 10400 | 45.49 | 7.22 | 52.71 | 74 | -21.29 | H | PK |
| 15600 | 39.52 | 7.22 | 46.74 | 54 | -7.26 | H | AV |
| 10400 | 45.63 | 7.22 | 52.85 | 74 | -21.15 | V | PK |
| 15600 | 38.76 | 7.22 | 45.98 | 54 | -8.02 | V | AV |
| High Channel (5240MHz) | | | | | | | |
| 10480 | 45.67 | 7.69 | 53.36 | 74 | -20.64 | H | PK |
| 15720 | 39.87 | 7.69 | 47.56 | 54 | -6.44 | H | AV |
| 10480 | 45.53 | 7.69 | 53.22 | 74 | -20.78 | V | PK |
| 15720 | 39.91 | 7.69 | 47.60 | 54 | -6.40 | V | AV |

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| Low Channel (5745MHz) | | | | | | | |
| 11490 | 43.31 | 9.45 | 52.76 | 74 | -21.24 | H | PK |
| 17235 | 37.58 | 9.45 | 47.03 | 54 | -6.97 | H | AV |
| 11490 | 44.18 | 9.45 | 53.63 | 74 | -20.37 | V | PK |
| 17235 | 37.27 | 9.45 | 46.72 | 54 | -7.28 | V | AV |
| Middle Channel (5785MHz) | | | | | | | |
| 11570 | 43.66 | 9.62 | 53.28 | 74 | -20.72 | H | PK |
| 17355 | 37.98 | 9.62 | 47.60 | 54 | -6.40 | H | AV |
| 11570 | 44.91 | 9.62 | 54.53 | 74 | -19.47 | V | PK |
| 17355 | 37.69 | 9.62 | 47.31 | 54 | -6.69 | V | AV |
| High Channel (5825MHz) | | | | | | | |
| 11650 | 44.45 | 9.84 | 54.29 | 74 | -19.71 | H | PK |
| 17475 | 37.89 | 9.84 | 47.73 | 54 | -6.27 | H | AV |
| 11650 | 43.45 | 9.84 | 53.29 | 74 | -20.71 | V | PK |
| 17475 | 38.00 | 9.84 | 47.84 | 54 | -6.16 | V | AV |

- Out of Band edge for 5150-5250MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5150 | -42.61 | -27 |
| Highest | Above 5350 | -39.98 | -27 |
| Note: the data just list the worst cases | | | |

- Out of Band edge for 5725-5850MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5650 | -46.20 | -27 |
| | 5650 to 5700 | -34.81 | -27 to -17 |
| | 5700 to 5720 | -26.66 | -17 to 15.6 |
| | 5720 to 5725 | -17.58 | 15.6 to 27 |
| Highest | 5850 to 5855 | -15.68 | 27 to 15.6 |
| | 5855 to 5875 | -26.82 | 15.6 to -17 |
| | 5875 to 5925 | -35.76 | -17 to -27 |
| | Above 5925 | -40.35 | -27 |
| Note: the data just list the worst cases | | | |

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11n HT20)
- Harmonics And Spurious Emissions

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| Low Channel (5180MHz) | | | | | | | |
| 10360 | 43.18 | 7.11 | 50.29 | 74 | -23.71 | H | PK |
| 10360 | 37.77 | 7.11 | 44.88 | 54 | -9.12 | H | AV |
| 10360 | 44.19 | 7.11 | 51.30 | 74 | -22.70 | V | PK |
| 10360 | 37.97 | 7.11 | 45.08 | 54 | -8.92 | V | AV |
| Middle Channel (5200MHz) | | | | | | | |
| 10400 | 44.91 | 7.22 | 52.13 | 74 | -21.87 | H | PK |
| 10400 | 37.92 | 7.22 | 45.14 | 54 | -8.86 | H | AV |
| 10400 | 43.50 | 7.22 | 50.72 | 74 | -23.28 | V | PK |
| 10400 | 38.66 | 7.22 | 45.88 | 54 | -8.12 | V | AV |
| High Channel (5240MHz) | | | | | | | |
| 10480 | 44.95 | 7.69 | 52.64 | 74 | -21.36 | H | PK |
| 10480 | 38.47 | 7.69 | 46.16 | 54 | -7.84 | H | AV |
| 10480 | 44.10 | 7.69 | 51.79 | 74 | -22.21 | V | PK |
| 10480 | 38.48 | 7.69 | 46.17 | 54 | -7.83 | V | AV |

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| Low Channel (5745MHz) | | | | | | | |
| 11490 | 44.96 | 9.45 | 54.41 | 74 | -19.59 | H | PK |
| 11490 | 38.33 | 9.45 | 47.78 | 54 | -6.22 | H | AV |
| 11490 | 43.23 | 9.45 | 52.68 | 74 | -21.32 | V | PK |
| 11490 | 37.52 | 9.45 | 46.97 | 54 | -7.03 | V | AV |
| Middle Channel (5785MHz) | | | | | | | |
| 11570 | 43.43 | 9.62 | 53.05 | 74 | -20.95 | H | PK |
| 11570 | 37.95 | 9.62 | 47.57 | 54 | -6.43 | H | AV |
| 11570 | 45.00 | 9.62 | 54.62 | 74 | -19.38 | V | PK |
| 11570 | 37.19 | 9.62 | 46.81 | 54 | -7.19 | V | AV |
| High Channel (5825MHz) | | | | | | | |
| 11650 | 43.21 | 9.84 | 53.05 | 74 | -20.95 | H | PK |
| 11650 | 37.28 | 9.84 | 47.12 | 54 | -6.88 | H | AV |
| 11650 | 44.16 | 9.84 | 54.00 | 74 | -20.00 | V | PK |
| 11650 | 37.45 | 9.84 | 47.29 | 54 | -6.71 | V | AV |

- Out of Band edge 5150-5250MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5150 | -40.40 | -27 |
| Highest | Above 5350 | -40.63 | -27 |
| Note: the data just list the worst cases | | | |

- Out of Band edge for 5725-5850MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5650 | -47.09 | -27 |
| | 5650 to 5700 | -34.94 | -27 to -17 |
| | 5700 to 5720 | -24.83 | -17 to 15.6 |
| | 5720 to 5725 | -17.45 | 15.6 to 27 |
| Highest | 5850 to 5855 | -13.60 | 27 to 15.6 |
| | 5855 to 5875 | -27.51 | 15.6 to -17 |
| | 5875 to 5925 | -36.93 | -17 to -27 |
| | Above 5925 | -38.69 | -27 |
| Note: the data just list the worst cases | | | |

*Note: this EUT was tested in the low, high channel and the worst case position data was reported.*

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11n HT40)
- Harmonics And Spurious Emissions

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| Low Channel (5190MHz) | | | | | | | |
| 10380 | 44.65 | 7.89 | 52.54 | 74 | -21.46 | H | PK |
| 10380 | 37.63 | 7.89 | 45.52 | 54 | -8.48 | H | AV |
| 10380 | 44.90 | 7.89 | 52.79 | 74 | -21.21 | V | PK |
| 10380 | 38.92 | 7.89 | 46.81 | 54 | -7.19 | V | AV |
| High Channel (5230MHz) | | | | | | | |
| 10460 | 43.66 | 7.97 | 51.63 | 74 | -22.37 | H | PK |
| 10460 | 38.70 | 7.97 | 46.67 | 54 | -7.33 | H | AV |
| 10460 | 44.76 | 7.97 | 52.73 | 74 | -21.27 | V | PK |
| 10460 | 37.82 | 7.97 | 45.79 | 54 | -8.21 | V | AV |

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| Low Channel (5755MHz) | | | | | | | |
| 11510 | 43.72 | 9.27 | 52.99 | 74 | -21.01 | H | PK |
| 11510 | 37.86 | 9.27 | 47.13 | 54 | -6.87 | H | AV |
| 11510 | 44.89 | 9.27 | 54.16 | 74 | -19.84 | V | PK |
| 11510 | 38.69 | 9.27 | 47.96 | 54 | -6.04 | V | AV |
| High Channel (5795MHz) | | | | | | | |
| 11590 | 44.18 | 9.45 | 53.63 | 74 | -20.37 | H | PK |
| 11590 | 37.93 | 9.45 | 47.38 | 54 | -6.62 | H | AV |
| 11590 | 44.38 | 9.45 | 53.83 | 74 | -20.17 | V | PK |
| 11590 | 37.55 | 9.45 | 47.00 | 54 | -7.00 | V | AV |

- Out of Band edge for 5150-5250MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5150 | -41.88 | -27 |
| Highest | Above 5350 | -39.67 | -27 |
| Note: the data just list the worst cases | | | |

- Out of Band edge for 5725-5850MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5650 | -46.49 | -27 |
| | 5650 to 5700 | -36.32 | -27 to -17 |
| | 5700 to 5720 | -27.05 | -17 to 15.6 |
| | 5720 to 5725 | -16.27 | 15.6 to 27 |
| Highest | 5850 to 5855 | -14.37 | 27 to 15.6 |
| | 5855 to 5875 | -27.08 | 15.6 to -17 |
| | 5875 to 5925 | -35.27 | -17 to -27 |
| | Above 5925 | -38.57 | -27 |
| Note: the data just list the worst cases | | | |

- For the frequency band 5.15-5.25GHz, 5.725-5.850GHz (802.11ac VH80)
- Harmonics And Spurious Emissions

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| 5210MHz | | | | | | | |
| 10420 | 44.61 | 7.53 | 52.14 | 74 | -21.86 | H | PK |
| 10420 | 38.79 | 7.53 | 46.32 | 54 | -7.68 | H | AV |
| 10420 | 43.79 | 7.53 | 51.32 | 74 | -22.68 | H | PK |
| 10420 | 37.26 | 7.53 | 44.79 | 54 | -9.21 | H | AV |

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|---|---|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | dB | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| 5775MHz | | | | | | | |
| 11550 | 43.19 | 9.93 | 53.12 | 74 | -20.88 | H | PK |
| 11550 | 38.02 | 9.93 | 47.95 | 54 | -6.05 | H | AV |
| 11550 | 44.38 | 9.93 | 54.31 | 74 | -19.69 | V | PK |
| 11550 | 37.84 | 9.93 | 47.77 | 54 | -6.23 | V | AV |

- Out of Band edge for 5150-5250MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5150 | -42.14 | -27 |
| Highest | Above 5350 | -37.65 | -27 |
| Note: the data just list the worst cases | | | |

- Out of Band edge for 5725-5850MHz

| Test CH. | Test Segment | Result | Limit |
|---|---|---|---|
| | MHz | dBm/MHz | dBm/MHz |
| Lowest | Below 5650 | -45.08 | -27 |
| | 5650 to 5700 | -35.86 | -27 to -17 |
| | 5700 to 5720 | -27.33 | -17 to 15.6 |
| | 5720 to 5725 | -17.83 | 15.6 to 27 |
| Highest | 5850 to 5855 | -13.56 | 27 to 15.6 |
| | 5855 to 5875 | -27.64 | 15.6 to -17 |
| | 5875 to 5925 | -34.40 | -17 to -27 |
| | Above 5925 | -38.11 | -27 |
| Note: the data just list the worst cases | | | |

*Note: Testing is carried out with frequency rang 9kHz to 40Ghz, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

# 9. Frequency Stability

## 9.1 Standard Applicable

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

## 9.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

## 9.3 Summary of Test Results/Plots

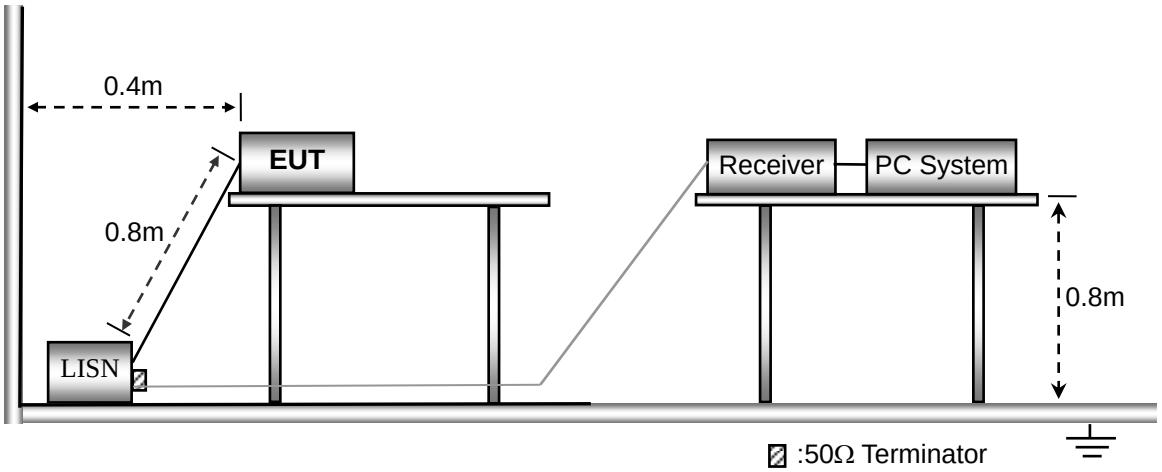
**Please refer to Appendix D**

# 10. Conducted Emissions

## 10.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

## 10.2 Basic Test Setup Block Diagram




## 10.3 Test Receiver Setup

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

Start Frequency ..... 150kHz
Stop Frequency ..... 30MHz
Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Quasi-Peak Adapter Bandwidth ..... 9kHz
Quasi-Peak Adapter Mode ..... Normal

## 10.4 Summary of Test Results/Plots

Not applicable

# APPENDIX SUMMARY

| | | | |
|---|---|---|---|
| Project No. | WTX23X09205054R2W | Test Engineer | BAIdi Zhong |
| Start date | 2023/10/18 | Finish date | 2023/12/13 |
| Temperature | 23℃ | Humidity | 46% |
| RF specifications | U-NII | | |

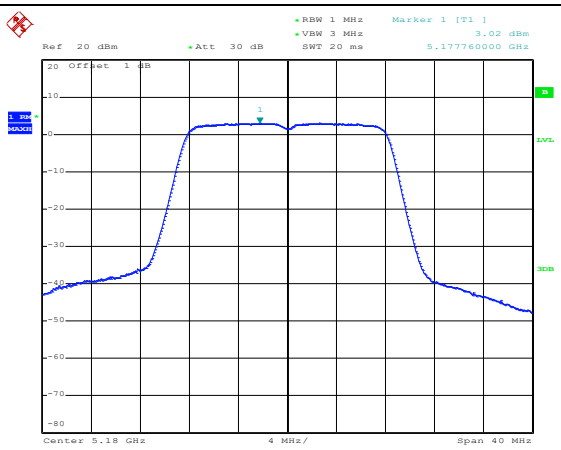
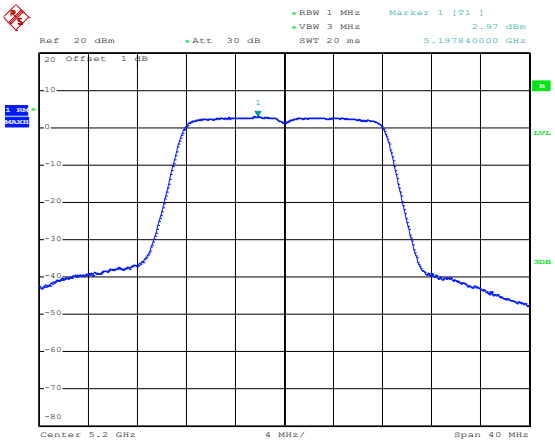
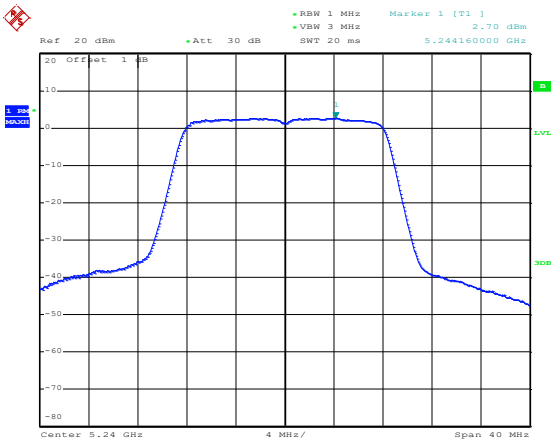
| APPENDIX | Description of Test Item | Result |
|---|---|---|
| A | Power Spectral Density | Compliant |
| B | Emission Bandwidth and Occupied Bandwidth | Compliant |
| C | Maximum Conducted Output Power | Compliant |
| D | Frequency Stability | Compliant |

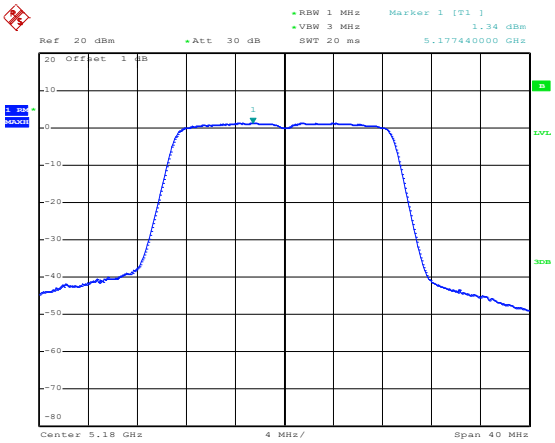
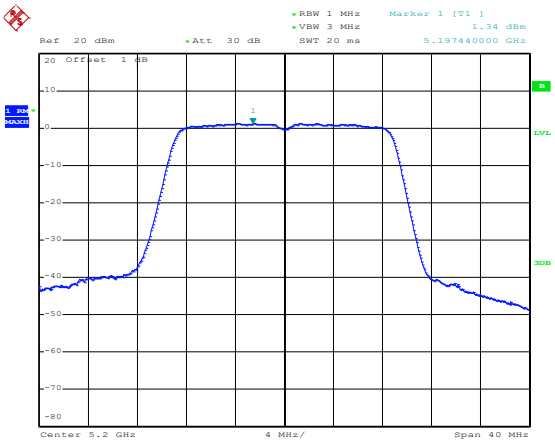
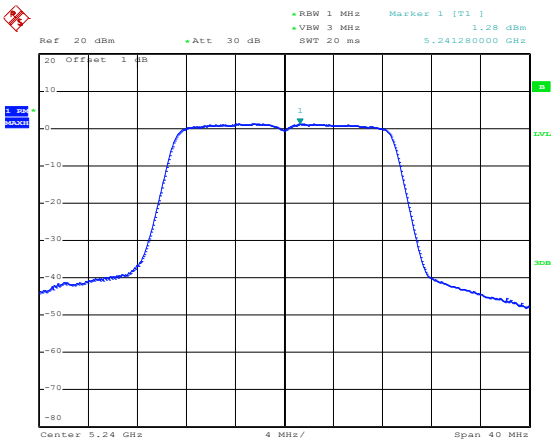
# APPENDIX A

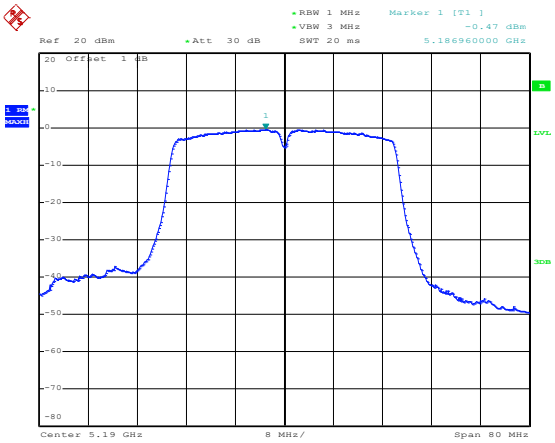
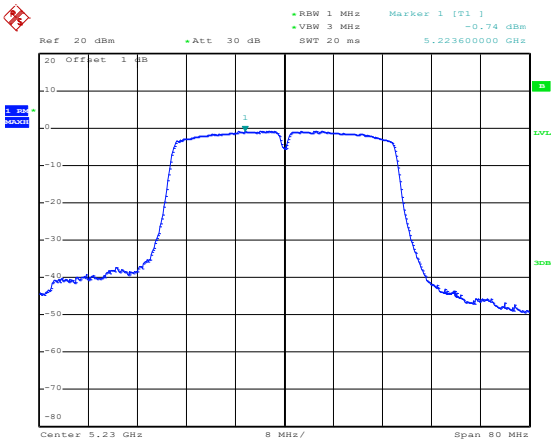
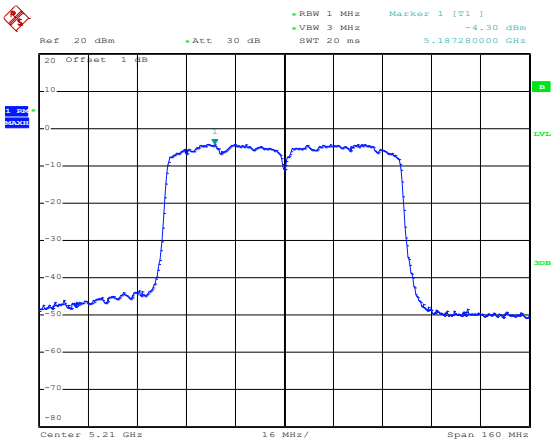
| Power Spectral Density | | | |
|---|---|---|---|
| **U-NII-1:5150-5250MHz** | | | |
| Operating mode | Test Channel | Power Spectral Density dBm/MHz | Limit (dBm/MHz) |
| 802.11a | 5180 | 3.02 | 11 |
| | 5200 | 2.97 | 11 |
| | 5240 | 2.70 | 11 |
| 802.11n-HT20 | 5180 | 1.34 | 11 |
| | 5200 | 1.34 | 11 |
| | 5240 | 1.28 | 11 |
| 802.11n-HT40 | 5190 | -0.47 | 11 |
| | 5230 | -0.74 | 11 |
| 802.11ac-HT80 | 5210 | -4.30 | 11 |

| **U-NII-3: 5725-5850MHz** | | | | | |
|---|---|---|---|---|---|
| Operating mode | Test Channel | Power Spectral Density dBm/300kHz | Factor | Power Spectral Density* dBm/500kHz | Limit dBm/500kHz |
| 802.11a | 5745 | 6.02 | 2.22 | 8.24 | 30 |
| | 5785 | 6.08 | 2.22 | 8.3 | 30 |
| | 5825 | 5.85 | 2.22 | 8.07 | 30 |
| 802.11n-HT20 | 5745 | 6.71 | 2.22 | 8.93 | 30 |
| | 5785 | 6.66 | 2.22 | 8.88 | 30 |
| | 5825 | 6.50 | 2.22 | 8.72 | 30 |
| 802.11n HT40 | 5755 | 1.40 | 2.22 | 3.62 | 30 |
| | 5795 | 1.27 | 2.22 | 3.49 | 30 |
| 802.11ac VH80 | 5775 | -2.17 | 2.22 | 0.05 | 30 |
| *Note: Maximum PSD=PSD(dBm/300kHz)+10log(500kHz/300kHz)=2.22 | | | | | |

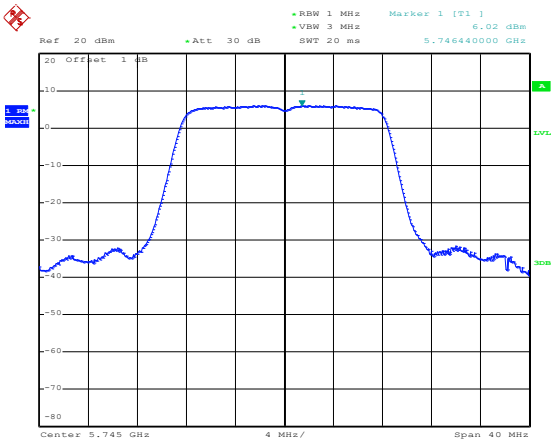
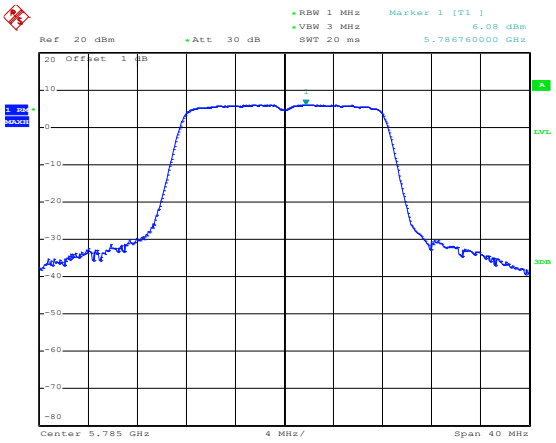
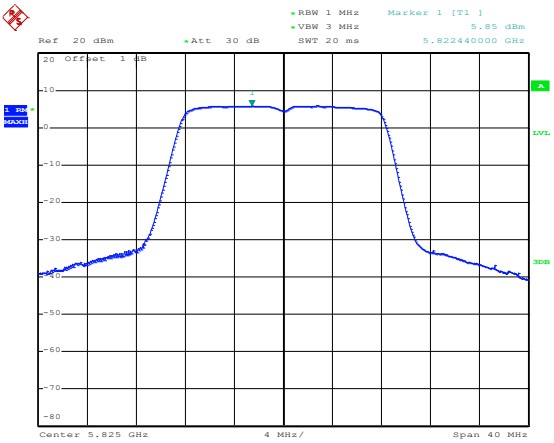
**5150-5250MHz**

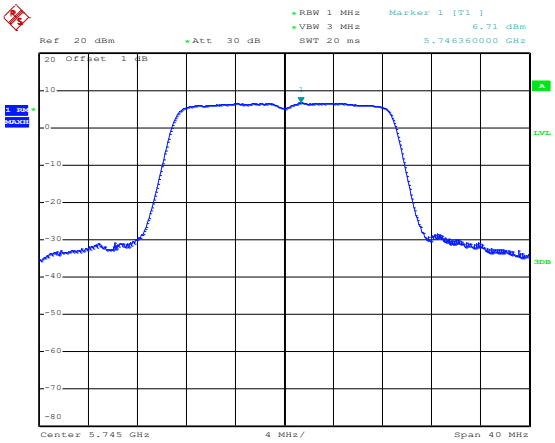
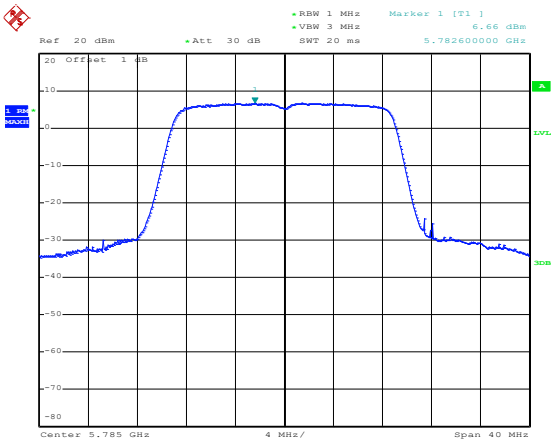
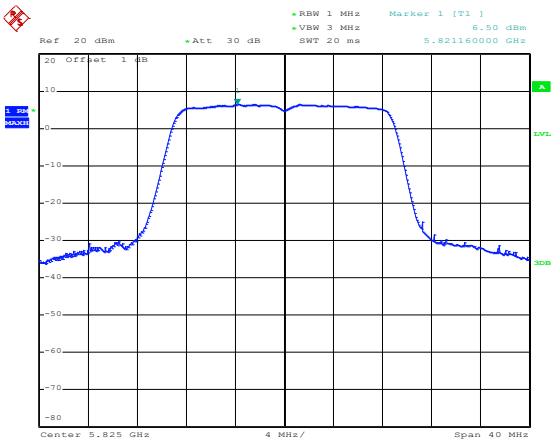
| | |
|---|---|
| 802.11a-Low |  |
| 802.11a-Middle |  |
| 802.11a-High |  |

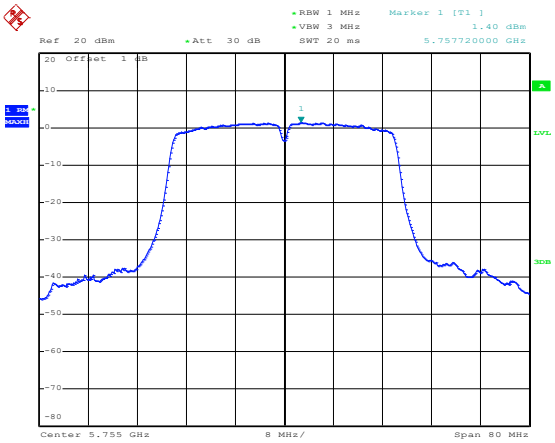
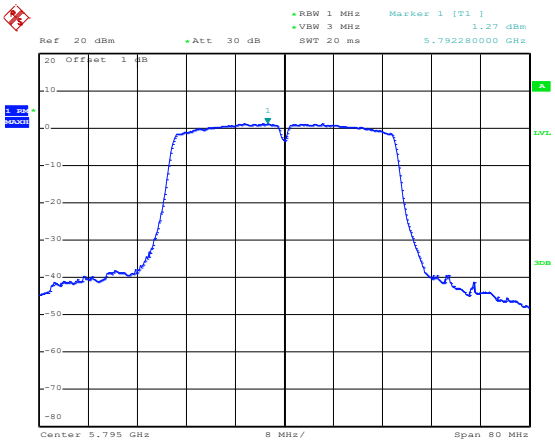
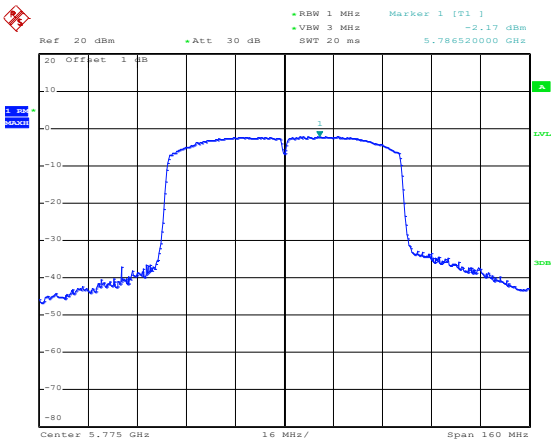
| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 28.OCT.2023 11:39:14 |
| 802.11n-HT20-Middle |  <br>Date: 28.OCT.2023 11:40:04 |
| 802.11n-HT20-High |  <br>Date: 28.OCT.2023 11:41:24 |

| | |
|---|---|
| 802.11n-HT40-Low |  <br>Date: 28.OCT.2023 11:44:22 |
| 802.11n-HT40-High |  <br>Date: 28.OCT.2023 11:44:49 |
| 802.11ac-HT80-Low |  <br>Date: 28.OCT.2023 11:36:31 |

**5725-5850MHz**

| | |
|---|---|
| 802.11a-Low |  <br>Date: 27.SEP.2023 15:17:55 |
| 802.11a-Middle |  <br>Date: 27.SEP.2023 15:18:24 |
| 802.11a-High |  <br>Date: 27.SEP.2023 15:19:32 |

| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 27.SEP.2023 15:21:13 |
| 802.11n-HT20-Middle |  <br>Date: 27.SEP.2023 15:23:15 |
| 802.11n-HT20-High |  <br>Date: 27.SEP.2023 15:24:43 |

| | |
|---|---|
| 802.11n-HT40-Low |  |
| 802.11n-HT40-High |  |
| 802.11ac-HT80-Low |  |

# APPENDIX B

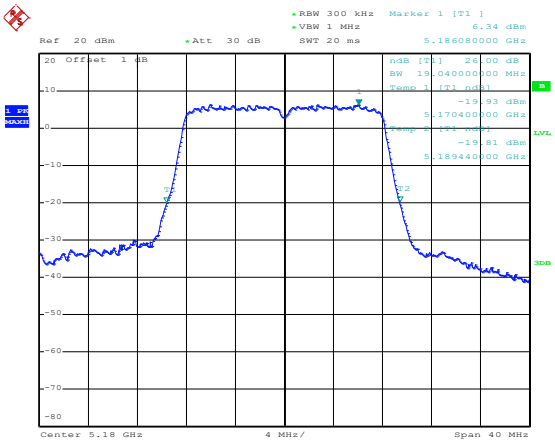
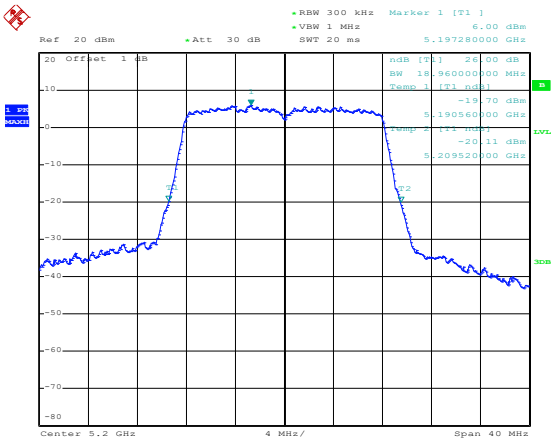
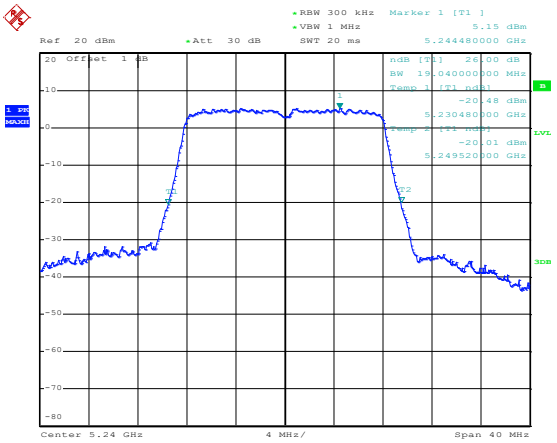
**Emission Bandwidth and Occupied Bandwidth**

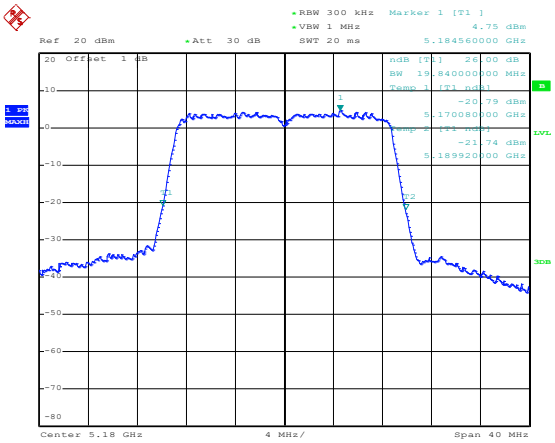
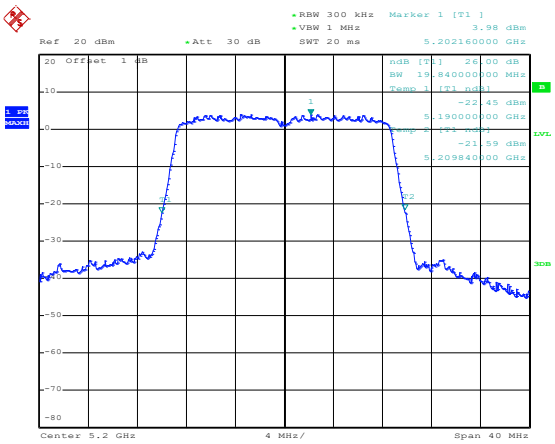
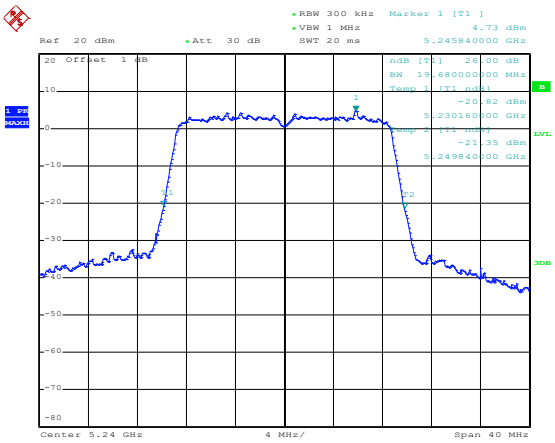
| U-NII-1:5150-5250MHz | | | | |
|---|---|---|---|---|
| **Test Mode** | **Test Channel MHz** | **26 dB Bandwidth MHz** | **99% Bandwidth MHz** | **Limit MHz** |
| 802.11a | 5180 | -19.04 | 16.48 | Pass |
| | 5200 | -18.96 | 16.48 | Pass |
| | 5240 | -19.04 | 16.48 | Pass |
| 802.11n-HT20 | 5180 | -19.84 | 17.68 | Pass |
| | 5200 | -19.84 | 17.68 | Pass |
| | 5240 | -19.68 | 17.60 | Pass |
| 802.11n-HT40 | 5190 | 43.04 | 36.80 | Pass |
| | 5230 | -43.52 | 36.48 | Pass |
| 802.11ac-HT80 | 5210 | 87.36 | 76.80 | Pass |

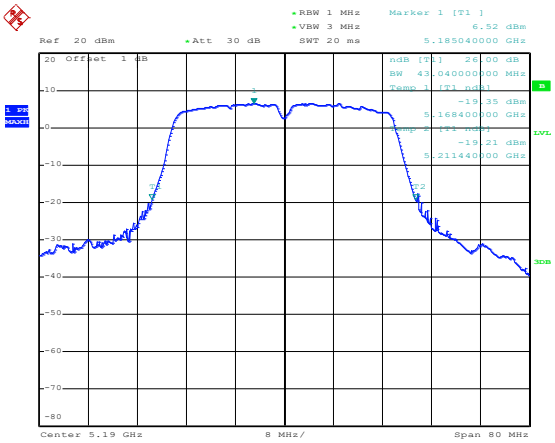
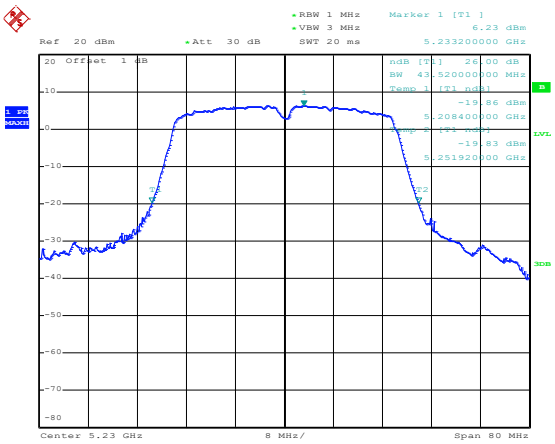
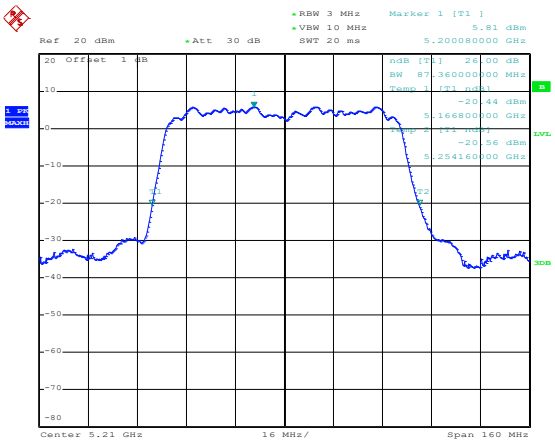
| U-NII-3: 5725-5850MHz | | | | |
|---|---|---|---|---|
| **Test Mode** | **Test Channel MHz** | **6 dB Bandwidth MHz** | **99% Bandwidth MHz** | **Limit MHz** |
| 802.11a | 5745 | 16.56 | 16.48 | ≥500 |
| | 5785 | 16.56 | 16.48 | ≥500 |
| | 5825 | 16.48 | 16.48 | ≥500 |
| 802.11n-HT20 | 5745 | 17.76 | 17.60 | ≥500 |
| | 5785 | 17.68 | 17.68 | ≥500 |
| | 5825 | 17.68 | 17.60 | ≥500 |
| 802.11n-HT40 | 5755 | 35.52 | 36.96 | ≥500 |
| | 5795 | 35.52 | 36.48 | ≥500 |
| 802.11ac VH80 | 5775 | 76.16 | 76.48 | ≥500 |

**26 dB Bandwidth MHz**

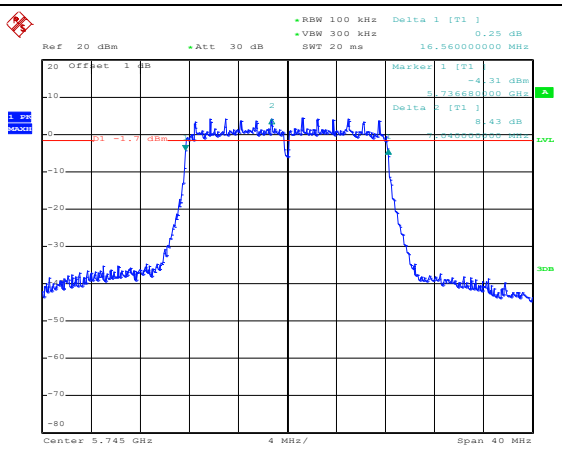
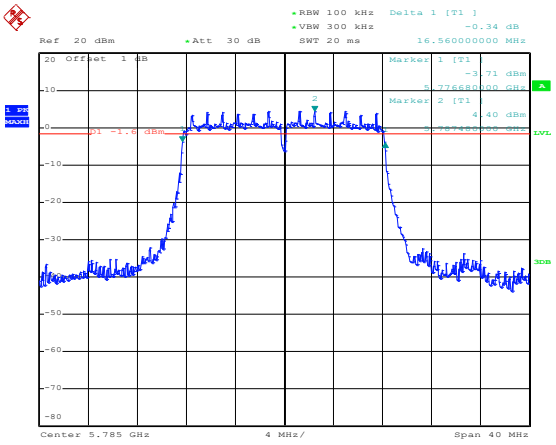
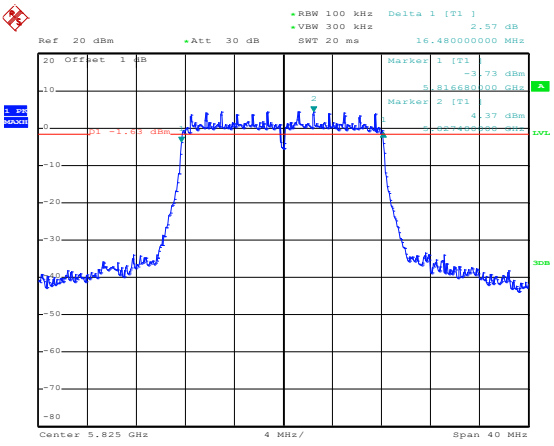
**5150-5250MHz**

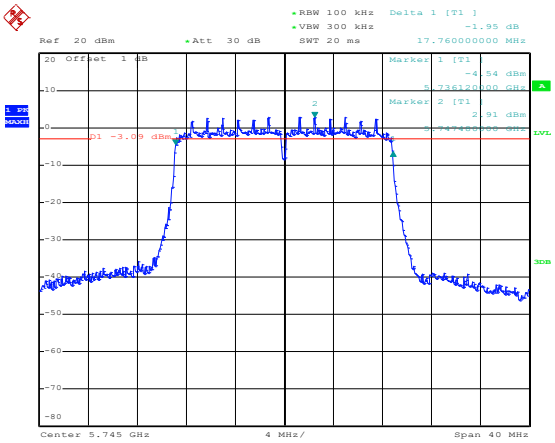
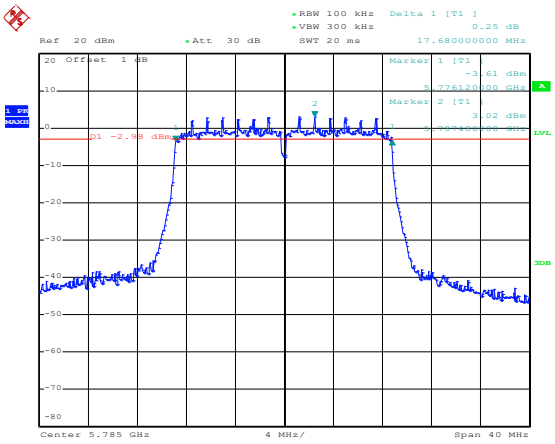
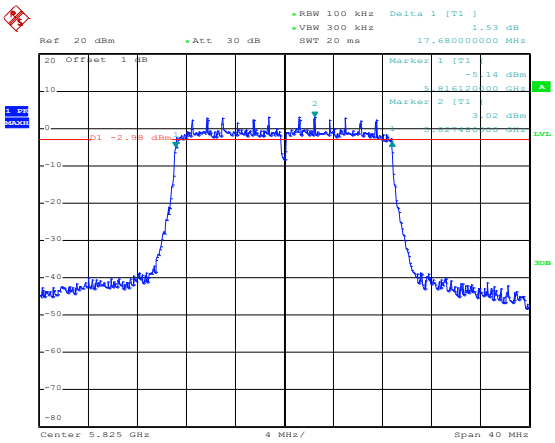
| | |
|---|---|
| 802.11a-Low |  <br>Date: 28.OCT.2023 13:50:45 |
| 802.11a-Middle |  <br>Date: 28.OCT.2023 13:51:11 |
| 802.11a-High |  <br>Date: 28.OCT.2023 13:51:43 |

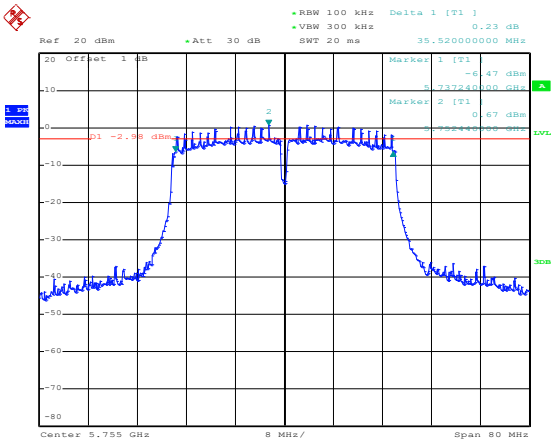
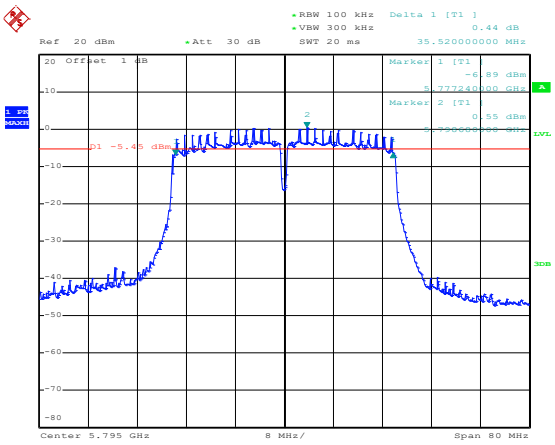
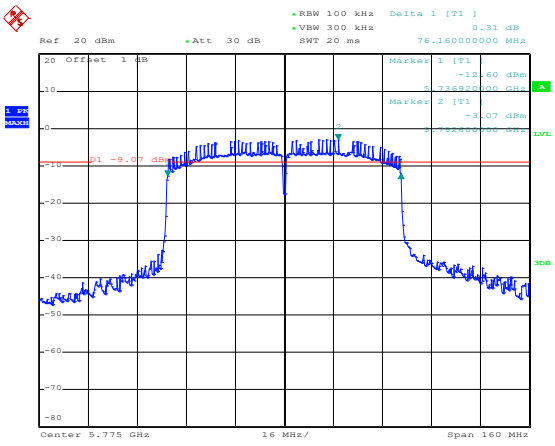
| | |
|---|---|
| 802.11n-HT20-Low |  |
| 802.11n-HT20-Middle |  |
| 802.11n-HT20-High |  |

| | |
|---|---|
| 802.11n-HT40-Low |  <br>Date: 28.OCT.2023 13:59:24 |
| 802.11n-HT40-High |  <br>Date: 28.OCT.2023 14:01:02 |
| 802.11ac-HT80-Low |  <br>Date: 28.OCT.2023 14:04:59 |

**5725-5850MHz**

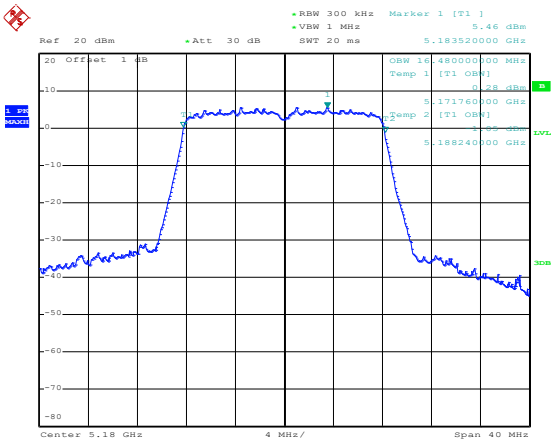
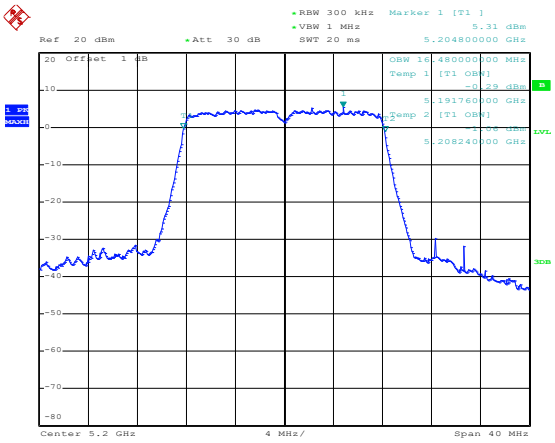
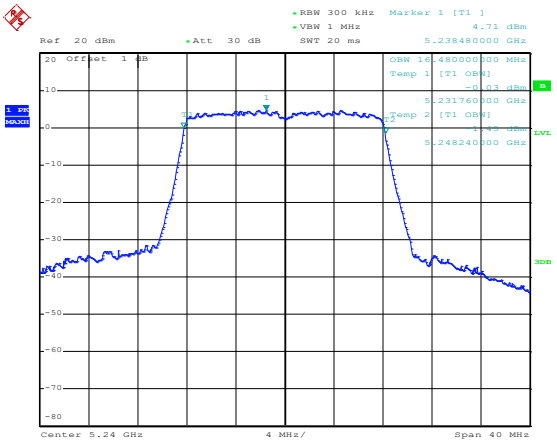
| | |
|---|---|
| 802.11a-Low |  <br>Date: 27.SEP.2023 16:34:20 |
| 802.11a-Middle |  <br>Date: 27.SEP.2023 16:35:44 |
| 802.11a-High |  <br>Date: 27.SEP.2023 16:37:31 |

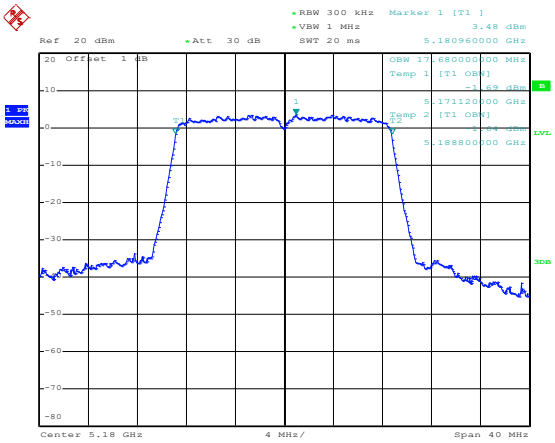
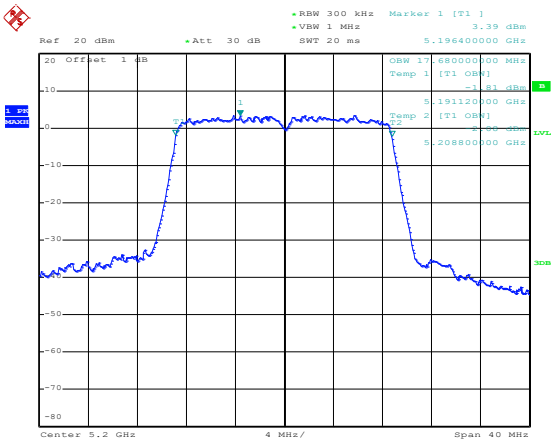
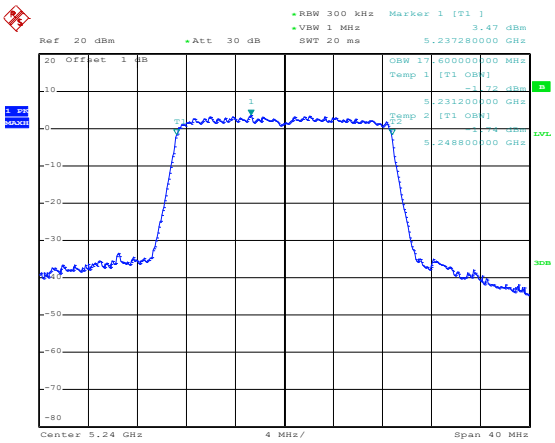
| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 27.SEP.2023 16:38:37 |
| 802.11n-HT20-Middle |  <br>Date: 27.SEP.2023 16:39:26 |
| 802.11n-HT20-High |  <br>Date: 27.SEP.2023 16:41:08 |

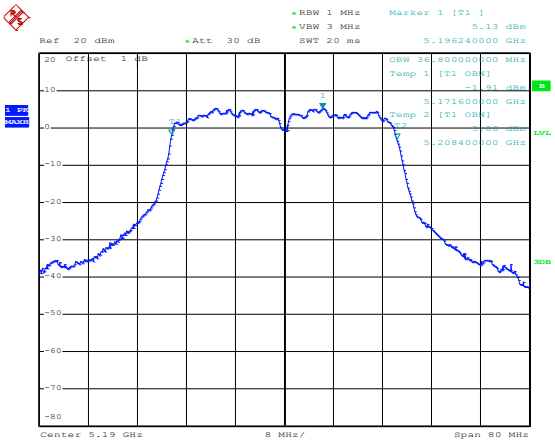
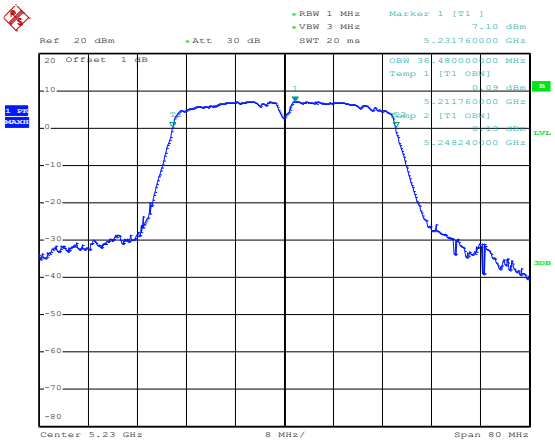
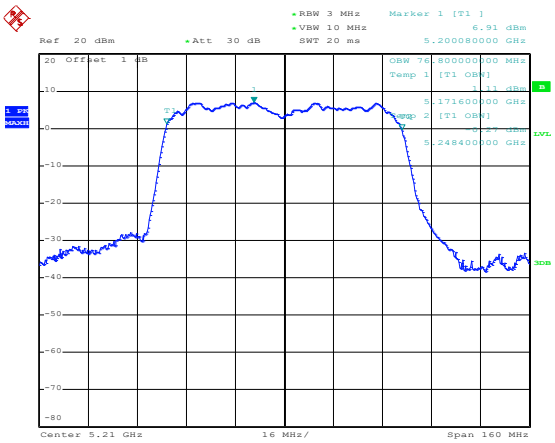
| | |
|---|---|
| 802.11n-HT40-Low |  |
| 802.11n-HT40-High |  |
| 802.11ac-HT80-Low |  |

**99% Bandwidth MHz**

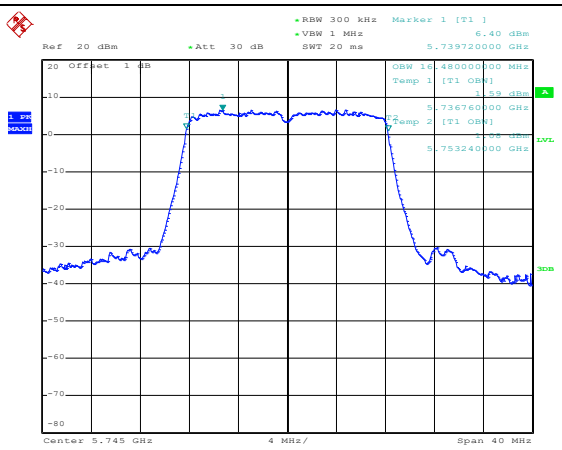
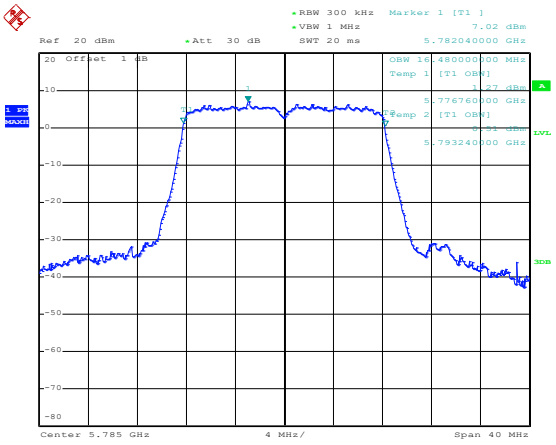
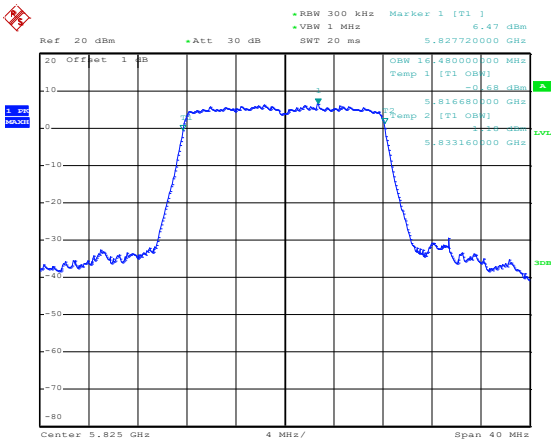
**5150-5250MHz**

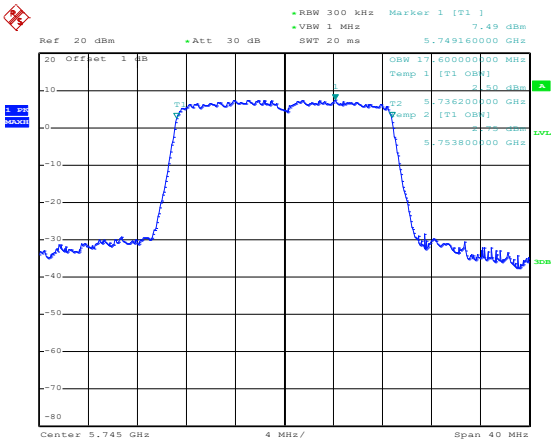
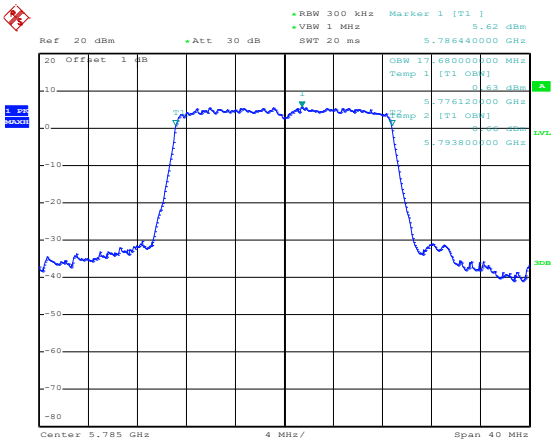
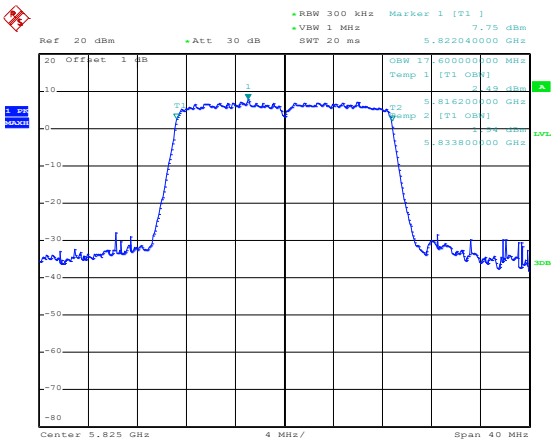
| | |
|---|---|
| 802.11a-Low |  |
| 802.11a-Middle |  |
| 802.11a-High |  |

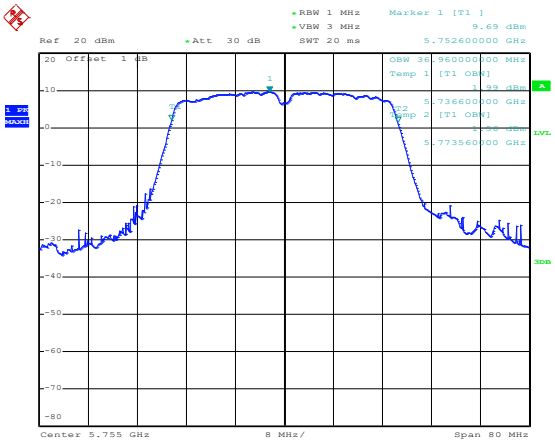
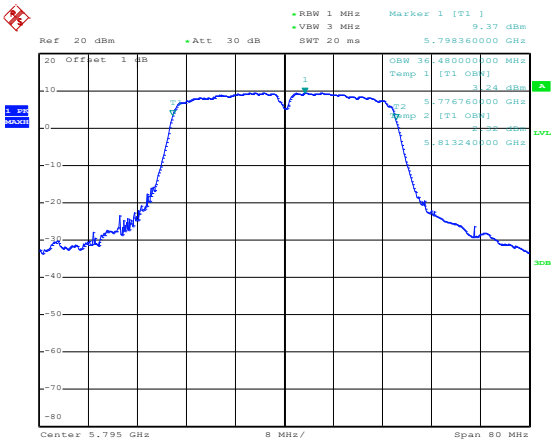
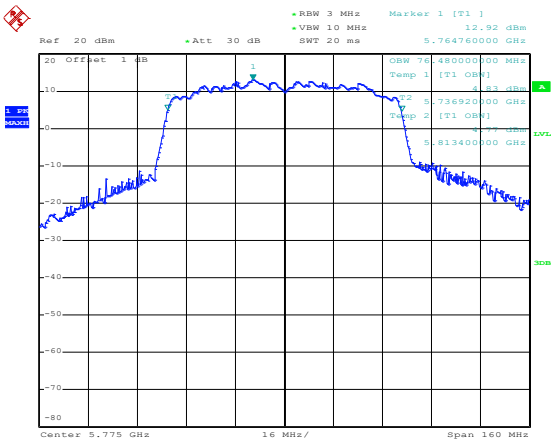
| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 28.OCT.2023 11:50:12 |
| 802.11n-HT20-Middle |  <br>Date: 28.OCT.2023 11:50:43 |
| 802.11n-HT20-High |  <br>Date: 28.OCT.2023 11:51:28 |

| | |
|---|---|
| 802.11n-HT40-Low |  <br>Date: 28.OCT.2023 11:53:42 |
| 802.11n-HT40-High |  <br>Date: 28.OCT.2023 11:54:24 |
| 802.11ac-HT80-Low |  <br>Date: 28.OCT.2023 11:55:35 |

**5725-5850MHz**

| | |
|---|---|
| 802.11a-Low |  |
| 802.11a-Middle |  |
| 802.11a-High |  |

| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 27.SEP.2023 16:22:05 |
| 802.11n-HT20-Middle |  <br>Date: 27.SEP.2023 15:45:51 |
| 802.11n-HT20-High |  <br>Date: 27.SEP.2023 16:23:55 |

| | |
|---|---|
| 802.11n-HT40-Low |  <br>Date: 27.SEP.2023 16:25:28 |
| 802.11n-HT40-High |  <br>Date: 27.SEP.2023 16:27:05 |
| 802.11ac-HT80-Low |  <br>Date: 27.SEP.2023 15:40:01 |

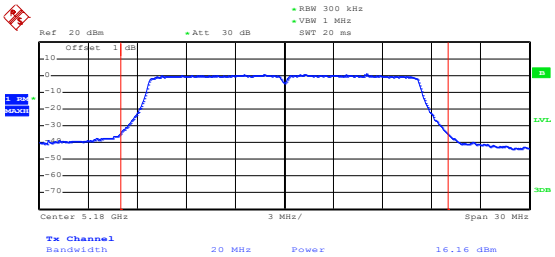
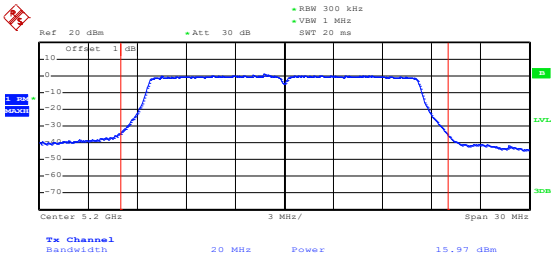
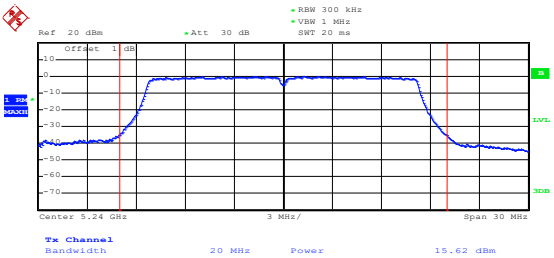
# APPENDIX C

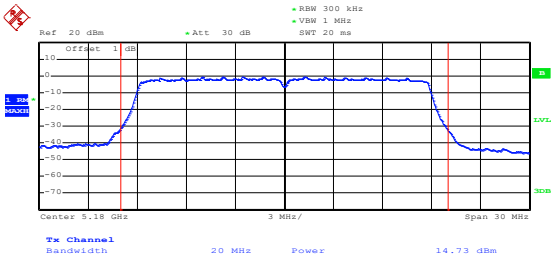
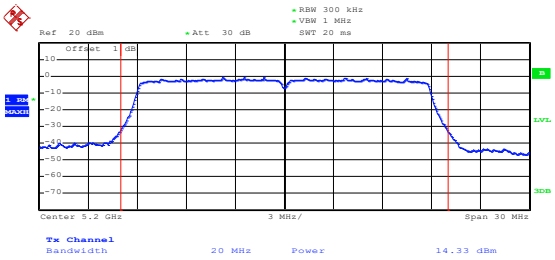
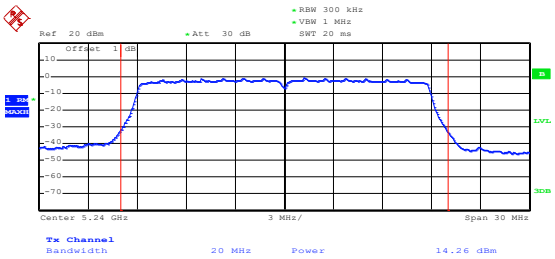
**Maximum Conducted Output Power**

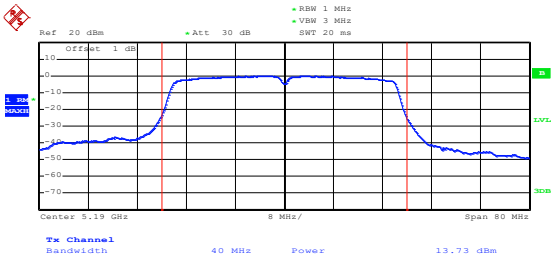
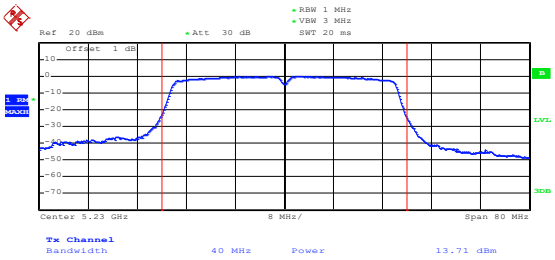
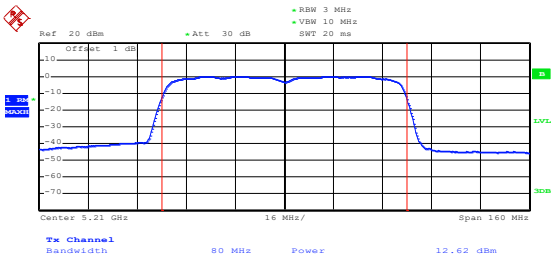
| **U-NII-1:5150-5250MHz** | | | |
|---|---|---|---|
| Test mode | Frequency<br>MHz | Output Power<br>dBm | Limit<br>dBm |
| 802.11a | 5180 | 16.16 | 23.98 |
| | 5200 | 15.97 | 23.98 |
| | 5240 | 15.62 | 23.98 |
| 802.11n-HT20 | 5180 | 14.73 | 23.98 |
| | 5200 | 14.33 | 23.98 |
| | 5240 | 14.26 | 23.98 |
| 802.11n-HT40 | 5190 | 13.73 | 23.98 |
| | 5230 | 13.71 | 23.98 |
| 802.11ac VH80 | 5210 | 12.62 | 23.98 |

| **U-NII-3: 5725-5850MHz** | | | |
|---|---|---|---|
| Test mode | Frequency<br>MHz | Output Power<br>dBm | Limit<br>dBm |
| 802.11a | 5745 | 17.14 | 30.00 |
| | 5785 | 17.41 | 30.00 |
| | 5825 | 17.64 | 30.00 |
| 802.11n-HT20 | 5745 | 15.85 | 30.00 |
| | 5785 | 15.88 | 30.00 |
| | 5825 | 16.15 | 30.00 |
| 802.11n-HT40 | 5755 | 15.77 | 30.00 |
| | 5795 | 15.30 | 30.00 |
| 802.11ac VH80 | 5775 | 15.23 | 30.00 |

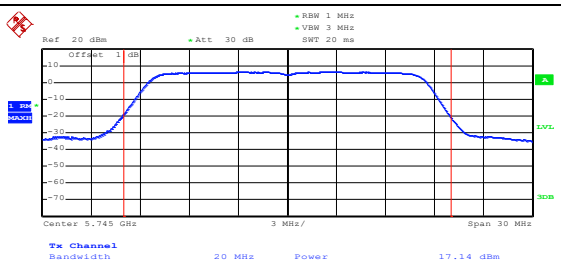
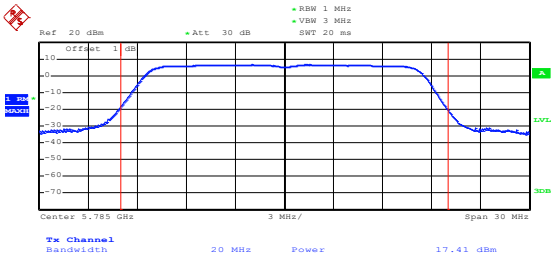
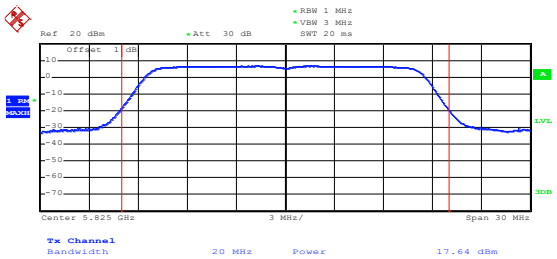
**5150-5250MHz**

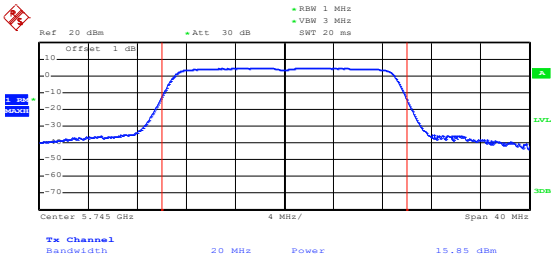
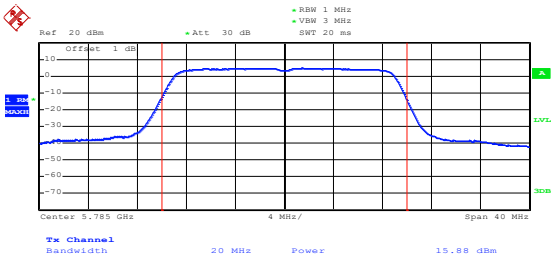
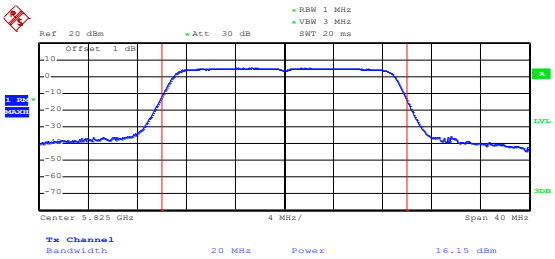
| | |
|---|---|
| 802.11a-Low |  <br>Date: 28.OCT.2023 11:21:11 |
| 802.11a-Middle |  <br>Date: 28.OCT.2023 11:21:34 |
| 802.11a-High |  <br>Date: 28.OCT.2023 11:21:51 |

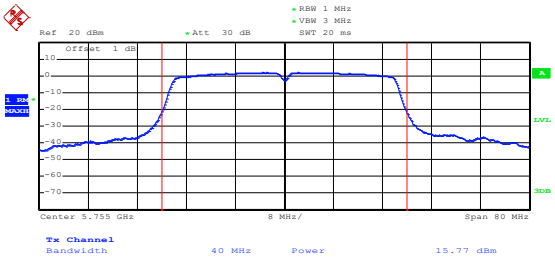
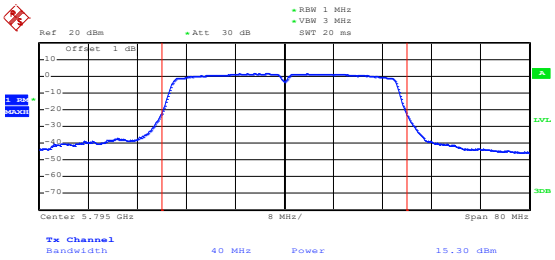
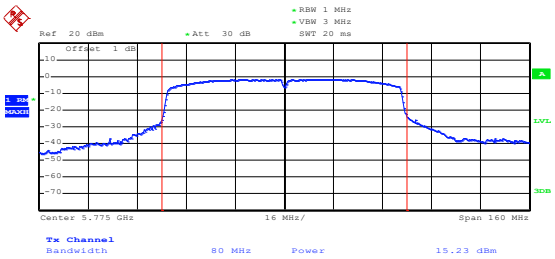
| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 28.OCT.2023 11:23:05 |
| 802.11n-HT20-Middle |  <br>Date: 28.OCT.2023 11:23:31 |
| 802.11n-HT20-High |  <br>Date: 28.OCT.2023 11:24:30 |

| | |
|---|---|
| 802.11n-HT40-Low |  <br>Date: 28.OCT.2023 11:29:43 |
| 802.11n-HT40-High |  <br>Date: 28.OCT.2023 11:30:49 |
| 802.11ac-HT80-Low |  <br>Date: 28.OCT.2023 11:33:48 |

**5725-5850MHz**

| | |
|---|---|
| 802.11a-Low |  <br>Date: 27.SEP.2023 10:46:55 |
| 802.11a-Middle |  <br>Date: 27.SEP.2023 10:56:37 |
| 802.11a-High |  <br>Date: 27.SEP.2023 10:58:34 |

| | |
|---|---|
| 802.11n-HT20-Low |  <br>Date: 27.SEP.2023 11:13:08 |
| 802.11n-HT20-Middle |  <br>Date: 27.SEP.2023 11:14:11 |
| 802.11n-HT20-High |  <br>Date: 27.SEP.2023 11:17:34 |

| | |
|---|---|
| 802.11n-HT40-Low |  <br>Date: 27.SEP.2023 11:36:23 |
| 802.11n-HT40-High |  <br>Date: 27.SEP.2023 11:40:36 |
| 802.11ac-HT80-Low |  <br>Date: 27.SEP.2023 11:45:11 |

# APPENDIX D

**Frequency Stability**

| U-NII-1:5150-5250MHz worst case at 802.11a middle channel | | | | |
|---|---|---|---|---|
| Voltage(%) | Power(VDC) | TEMP(°C) | Freq.Dev(Hz) | Deviation |
| 100% | 7.7 | -30 | 1582 | 0.3042 |
| 100% | | -20 | 1592 | 0.3062 |
| 100% | | -10 | 1597 | 0.3070 |
| 100% | | 0 | 1598 | 0.3073 |
| 100% | | +10 | 1586 | 0.3049 |
| 100% | | +20 | 1585 | 0.3047 |
| 100% | | +30 | 1595 | 0.3067 |
| 100% | | +40 | 1592 | 0.3061 |
| 100% | | +50 | 1591 | 0.3060 |
| Low Battery power | 8.47 | +20 | 1582 | 0.3042 |
| High Battery power | 6.93 | +20 | 1592 | 0.3062 |

| U-NII-1:5725-5850MHz worst case at 802.11a middle channel | | | | |
|---|---|---|---|---|
| Voltage(%) | Power(VDC) | TEMP(°C) | Freq.Dev(Hz) | Deviation |
| 100% | 7.7 | -30 | 1594 | 0.2755 |
| 100% | | -20 | 1590 | 0.2748 |
| 100% | | -10 | 1591 | 0.2751 |
| 100% | | 0 | 1586 | 0.2742 |
| 100% | | +10 | 1581 | 0.2733 |
| 100% | | +20 | 1583 | 0.2737 |
| 100% | | +30 | 1590 | 0.2749 |
| 100% | | +40 | 1594 | 0.2755 |
| 100% | | +50 | 1590 | 0.2749 |
| Low Battery power | 8.47 | +20 | 1594 | 0.2755 |
| High Battery power | 6.93 | +20 | 1590 | 0.2748 |

# APPENDIX PHOTOGRAPHS

**Please refer to “ANNEX”**

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