# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | : | **2AGOZ-P97** |
| **Equipment** | : | **VR Headset** |
| **Brand Name** | : | Meta |
| **Model Name** | : | **P97** |
| **Applicant** | : | **Meta Platforms Technologies, LLC.<br>1 Hacker Way, Menlo Park, CA 94025, USA** |
| **Manufacturer** | : | **Meta Platforms Technologies, LLC.<br>1 Hacker Way, Menlo Park, CA 94025, USA** |
| **Standard** | : | **FCC Part 15 Subpart E §15.407** |

**The product was received on Apr. 03, 2024 and testing was performed from Apr. 10, 2024 to May 18, 2024. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.**

Louis Wu

**Approved by: Louis Wu**

***Sporton International Inc. Wensan Laboratory***
*No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)*

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# History of this test report

| Report No. | Version | Description | Issue Date |
|---|---|---|---|
| FR413013-01F | 01 | Initial issue of report | May 28, 2024 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 3.1 | 15.407(a)(10) | 26dB Emission Bandwidth | Pass | - |
| 3.1 | 2.1049 | 99% Occupied Bandwidth | Reporting only | - |
| 3.2 | 15.407(a)(8) | Fundamental Maximum EIRP | Pass | - |
| 3.3 | 15.407(a)(8) | Fundamental Power Spectral Density | Pass | - |
| 3.4 | 15.407(b)(7) | In-Band Emissions (Channel Mask) | Pass | - |
| 3.5 | 15.407(d)(6) | Contention Based Protocol | Pass | |
| 3.6 | 15.407(b) | Unwanted Emissions | Pass | 6.59 dB under the limit at 58.13 MHz |
| 3.7 | 15.207 | AC Conducted Emission | Pass | 10.34 dB under the limit at 0.15 MHz |
| 3.8 | 15.203 | Antenna Requirement | Pass | - |

**Conformity Assessment Condition:**

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

**Disclaimer:**

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

**Reviewed by: Yun Huang**

**Report Producer: Lucy Wu**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **General Specs** | Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, Wi-Fi 6GHz 802.11ax and nRF. |
| **Sample 1** | E2-C1 |
| **Sample 2** | E2-C2 |
| **Sample 3** | E2-C3 |
| **Sample 4** | E2-C4 |
| **Antenna Type** | Bluetooth:<br><Ant. 0>: Hybrid Slot Monopole Antenna<br><Ant. 1>: Hybrid Slot Monopole Antenna<br>WLAN:<br><Ant. 0>: Hybrid Slot Monopole Antenna<br><Ant. 1>: Hybrid Slot Monopole Antenna<br>nRF: Folded Dipole Antenna |

| Antenna information | | |
|---|---|---|
| **5925 MHz ~ 6425 MHz** | Peak Gain (dBi) | Ant. 0: 5.6<br>Ant. 1: 5.2 |
| **6425 MHz ~ 6525 MHz** | Peak Gain (dBi) | Ant. 0: 4.2<br>Ant. 1: 3.2 |
| **6525 MHz ~ 6875 MHz** | Peak Gain (dBi) | Ant. 0: 5.2<br>Ant. 1: 4.0 |
| **6875 MHz ~ 7125 MHz** | Peak Gain (dBi) | Ant. 0: 7.5<br>Ant. 1: 5.4 |

**Remark:** The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

### 1.1.1 Antenna Directional Gain

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)ii)

Directional gain = $G_{ANT}$ + Array Gain, where Array Gain is as follows:

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

$G_{ANT}$ is set equal to the gain of the antenna having the highest gain.

For PSD measurements, the directional gain calculation.

$$DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

*where*

Each antenna is driven by no more than one spatial stream;
$N_{SS}$ = the number of independent spatial streams of data;
$N_{ANT}$ = the total number of antennas
$g_{j,k} = 10^{G_k / 20}$ if the $k$th antenna is being fed by spatial stream $j$, or zero if it is not;
$G_k$ is the gain in dBi of the kth antenna.

As minimum $N_{SS}$=1 is supported by EUT, the formula can be simplified as:

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Where G1, G2….GN denote single antenna gain.

The directional gain “DG” is calculated as following table.

| | Ant 0 (dBi) | Ant 1 (dBi) | DG for Power (dBi) | DG for PSD (dBi) |
|---|---|---|---|---|
| **5925 MHz ~ 6425 MHz** | 5.60 | 5.20 | 5.60 | 8.41 |
| **6425 MHz ~ 6525 MHz** | 4.20 | 3.20 | 4.20 | 6.72 |
| **6525 MHz ~ 6875 MHz** | 5.20 | 4.00 | 5.20 | 7.63 |
| **6875 MHz ~ 7125 MHz** | 7.50 | 5.40 | 7.50 | 9.52 |

Calculation example:

If a device has two antenna, $G_{ANT0}$= 5.6dBi; $G_{ANT1}$=5.2dBi

Directional gain of power measurement = max(5.6, 5.2) + 0 = 5.6 dBi

Directional gain of PSD derived from formula which is

10 x log { { [ 10^ (5.60 dBi / 20) + 10^ (5.20 dBi / 20) ] ^ 2 } / 2 }

= 8.41 dBi

## 1.2 Modification of EUT

No modifications made to the EUT during the testing.

## 1.3 Testing Location

| | |
|---|---|
| **Test Site** | Sporton International Inc. EMC & Wireless Communications Laboratory |
| **Test Site Location** | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City 333, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| **Test Site No.** | **Sporton Site No.** |
| | DF02-HY (TAF Logo: 1190) |
| **Remark** | The Contention Based Protocol test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory. |

| | |
|---|---|
| **Test Site** | Sporton International Inc. Wensan Laboratory |
| **Test Site Location** | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City 333010, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| **Test Site No.** | **Sporton Site No.** |
| | TH05-HY, CO07-HY, 03CH13-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW3786

## 1.4 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 987594 D02 U-NII 6 GHz EMC Measurement v02r01
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, , the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

b. AC power line Conducted Emission was tested under maximum output power.

## 2.1 Carrier Frequency and Channel

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **BW 20M** | **Channel** | 1 | 5 | 9 | 13 | 17 | 21 | 25 | 29 |
| | **Freq. (MHz)** | 5955 | 5975 | 5995 | 6015 | 6035 | 6055 | 6075 | 6095 |
| **BW 40M** | **Channel** | 3 | | 11 | | 19 | | 27 | |
| | **Freq. (MHz)** | 5965 | | 6005 | | 6045 | | 6085 | |
| **BW 80M** | **Channel** | 7 | | | | 23 | | | |
| | **Freq. (MHz)** | 5985 | | | | 6065 | | | |
| **BW 160M** | **Channel** | 15 | | | | | | | |
| | **Freq. (MHz)** | 6025 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **BW 20M** | **Channel** | 33 | 37 | 41 | 45 | 49 | 53 | 57 | 61 |
| | **Freq. (MHz)** | 6115 | 6135 | 6155 | 6175 | 6195 | 6215 | 6235 | 6255 |
| **BW 40M** | **Channel** | 35 | | 43 | | 51 | | 59 | |
| | **Freq. (MHz)** | 6125 | | 6165 | | 6205 | | 6245 | |
| **BW 80M** | **Channel** | 39 | | | | 55 | | | |
| | **Freq. (MHz)** | 6145 | | | | 6225 | | | |
| **BW 160M** | **Channel** | 47 | | | | | | | |
| | **Freq. (MHz)** | 6185 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BW 20M | Channel | 65 | 69 | 73 | 77 | 81 | 85 | 89 | 93 |
| | Freq. (MHz) | 6275 | 6295 | 6315 | 6335 | 6355 | 6375 | 6395 | 6415 |
| BW 40M | Channel | 67 | | 75 | | 83 | | 91 | |
| | Freq. (MHz) | 6285 | | 6325 | | 6365 | | 6405 | |
| BW 80M | Channel | 71 | | | | 87 | | | |
| | Freq. (MHz) | 6305 | | | | 6385 | | | |
| BW 160M | Channel | 79 | | | | | | | |
| | Freq. (MHz) | 6345 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BW 20M | Channel | 97 | 101 | 105 | 109 | 113 | 117 | 121 | 125 |
| | Freq. (MHz) | 6435 | 6455 | 6475 | 6495 | 6515 | 6535 | 6555 | 6575 |
| BW 40M | Channel | 99 | | 107 | | 115 | | 123 | |
| | Freq. (MHz) | 6445 | | 6485 | | 6525 | | 6565 | |
| BW 80M | Channel | 103 | | | | 119 | | | |
| | Freq. (MHz) | 6465 | | | | 6545 | | | |
| BW 160M | Channel | 111 | | | | | | | |
| | Freq. (MHz) | 6505 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BW 20M | Channel | 129 | 133 | 137 | 141 | 145 | 149 | 153 | 157 |
| | Freq. (MHz) | 6595 | 6615 | 6635 | 6655 | 6675 | 6695 | 6715 | 6735 |
| BW 40M | Channel | 131 | | 139 | | 147 | | 155 | |
| | Freq. (MHz) | 6605 | | 6645 | | 6685 | | 6725 | |
| BW 80M | Channel | 135 | | | | 151 | | | |
| | Freq. (MHz) | 6625 | | | | 6705 | | | |
| BW 160M | Channel | 143 | | | | | | | |
| | Freq. (MHz) | 6665 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BW 20M | Channel | 161 | 165 | 169 | 173 | 177 | 181 | 185 | 189 |
| | Freq. (MHz) | 6755 | 6775 | 6795 | 6815 | 6835 | 6855 | 6875 | 6895 |
| BW 40M | Channel | 163 | | 171 | | 179 | | 187 | |
| | Freq. (MHz) | 6765 | | 6805 | | 6845 | | 6885 | |
| BW 80M | Channel | 167 | | | | 183 | | | |
| | Freq. (MHz) | 6785 | | | | 6865 | | | |
| BW 160M | Channel | 175 | | | | | | | |
| | Freq. (MHz) | 6825 | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **BW 20M** | **Channel** | 193 | 197 | 201 | 205 | 209 | 213 | 217 | 221 |
| | **Freq. (MHz)** | 6915 | 6935 | 6955 | 6975 | 6995 | 7015 | 7035 | 7055 |
| **BW 40M** | **Channel** | 195 | | 203 | | 211 | | 219 | |
| | **Freq. (MHz)** | 6925 | | 6965 | | 7005 | | 7045 | |
| **BW 80M** | **Channel** | 199 | | | | 215 | | | |
| | **Freq. (MHz)** | 6945 | | | | 7025 | | | |
| **BW 160M** | **Channel** | 207 | | | | | | | |
| | **Freq. (MHz)** | 6985 | | | | | | | |

| | | | |
|---|---|---|---|
| **BW 20M** | **Channel** | 225 | 229 |
| | **Freq. (MHz)** | 7075 | 7095 |
| **BW 40M** | **Channel** | 227 | |
| | **Freq. (MHz)** | 7085 | |

## 2.2 Test Mode

This device support 26/52/106/242/484/996-tone RU but does not support 2x996-tone RU on 160MHz channel.

The PSD of partial RU is reduced to be smaller than full RU according to TCB workshop interim guidance Oct. 2022.

The 802.11ax mode is investigated among different tones, full resource units (RU), partial resource units. The partial RU has no higher power than full RU's, thus the full RU is chosen as main test configuration.

The 242-tone RU is covered by 20MHz channel, 484-tone RU is covered by 40MHz channel and 996-tone RU is covered by 80MHz channel.

The SISO mode conducted power is covered by MIMO mode per chain, so only the MIMO mode is tested.

**The final test modes include the worst data rates for each modulation shown in the table below.**

**MIMO Mode**

| Modulation | Data Rate |
|---|---|
| **802.11a** | **6 Mbps** |
| **802.11ax HE20** | **MCS0** |
| **802.11ax HE40** | **MCS0** |
| **802.11ax HE80** | **MCS0** |
| **802.11ax HE160** | **MCS0** |

| Test Cases | |
|---|---|
| **AC Conducted Emission** | Mode 1 : Bluetooth Link + WLAN (6GHz) Link + nRF Link + USB Cable (Charging from AC Adapter) for Sample 1<br>Mode 2 : Bluetooth Link + WLAN (6GHz) Link + nRF Link + USB Cable (Charging from AC Adapter) for Sample 2<br>Mode 3 : Bluetooth Link + WLAN (6GHz) Link + nRF Link + USB Cable (Charging from AC Adapter) for Sample 3 |
| **Remark:** The worst case of Conducted Emission is mode 2; only the test data of it was reported. | |

**<Sample 1>**

| Ch. # | | UNII-5 (5925-6425 MHz) | UNII-6 (6425-6525 MHz) | UNII-7 (6525-6875 MHz) | UNII-8 (6875-7125 MHz) |
|---|---|---|---|---|---|
| | | 802.11a | 802.11a | 802.11a | 802.11a |
| L | Low | 001 | 097 | 117 | 189 |
| M | Middle | 049 | 105 | 149 | 209 |
| H | High | 093 | 113 | 181 | 229 |
| Straddle | | - | - | 185 | - |

| Ch. # | | UNII-5 (5925-6425 MHz) | UNII-6 (6425-6525 MHz) | UNII-7 (6525-6875 MHz) | UNII-8 (6875-7125 MHz) |
|---|---|---|---|---|---|
| | | 802.11ax HE20 | 802.11ax HE20 | 802.11ax HE20 | 802.11ax HE20 |
| L | Low | 001 | 097 | 117 | 189 |
| M | Middle | 049 | 105 | 149 | 209 |
| H | High | 093 | 113 | 181 | 229 |
| Straddle | | - | - | 185 | - |

| Ch. # | | UNII-5 (5925-6425 MHz) | UNII-6 (6425-6525 MHz) | UNII-7 (6525-6875 MHz) | UNII-8 (6875-7125 MHz) |
|---|---|---|---|---|---|
| | | 802.11ax HE40 | 802.11ax HE40 | 802.11ax HE40 | 802.11ax HE40 |
| L | Low | 003 | 099 | 123 | 195 |
| M | Middle | 051 | - | 147 | 211 |
| H | High | 091 | 107 | 179 | 227 |
| Straddle | | - | 115 | 187 | - |

| Ch. # | | UNII-5 (5925-6425 MHz) | UNII-6 (6425-6525 MHz) | UNII-7 (6525-6875 MHz) | UNII-8 (6875-7125 MHz) |
|---|---|---|---|---|---|
| | | 802.11ax HE80 | 802.11ax HE80 | 802.11ax HE80 | 802.11ax HE80 |
| L | Low | 007 | 103 | 135 | 199 |
| M | Middle | 055 | | 151 | - |
| H | High | 087 | | 167 | 215 |
| Straddle | | - | 119 | 183 | - |

| Ch. # | | UNII-5 (5925-6425 MHz) | UNII-6 (6425-6525 MHz) | UNII-7 (6525-6875 MHz) | UNII-8 (6875-7125 MHz) |
|---|---|---|---|---|---|
| | | 802.11ax HE160 | 802.11ax HE160 | 802.11ax HE160 | 802.11ax HE160 |
| L | Low | 015 | - | 143 | 207 |
| M | Middle | 047 | | | |
| H | High | 079 | | | |
| Straddle | | - | 111 | 175 | - |

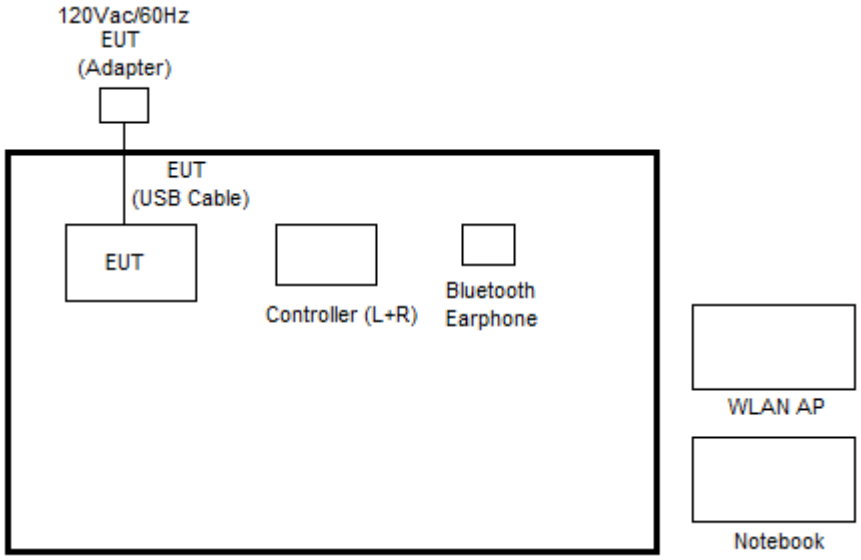
**<Sample 2~4>**

| Ch. # | | UNII-5 (5925-6425 MHz) |
|---|---|---|
| | | 802.11a |
| L | Low | 001 |
| M | Middle | - |
| H | High | - |
| Straddle | | - |

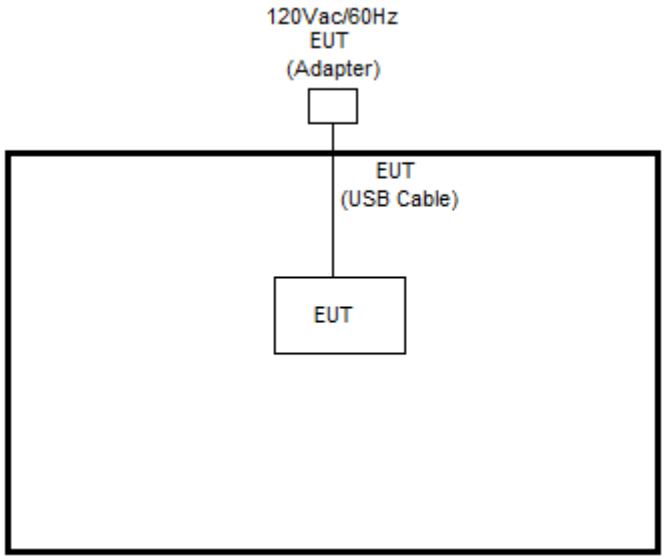
**Remark:** Based on ANSI C63.10 clause 5.6.2.2, b) Spurious emissions, measure the mode with the highest output power and the mode with highest output power spectral density for each modulation family.

## 2.3 Connection Diagram of Test System

**<AC Conducted Emission Mode>**



**<WLAN Tx Mode>**




## 2.4 Support Unit used in test configuration and system

| Item | Equipment | Brand Name | Model Name | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | Bluetooth Earphone | Sony | SBH20 | PY7-RD0010 | N/A | N/A |
| 2. | WLAN AP | Netgear | RAXE500 | PY320300508 | N/A | Unshielded, 1.8 m |
| 3. | Controller | Meta | Rubby | N/A | N/A | N/A |
| 4. | Notebook | Dell | Latitude 3420 | N/A | N/A | AC I/P: Unshielded, 1.2 m<br>DC O/P: Shielded, 1.8 m |

## 2.5 EUT Operation Test Setup

The RF test items, utility “QRCT Version 4.0.211.0” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
*Offset = RF cable loss + attenuator factor.*
Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

*Offset(dB) = RF cable loss(dB) + attenuator factor(dB).*
= 4.2 + 10 = 14.2 (dB)

# 3 Test Result

## 3.1 26dB & 99% Occupied Bandwidth Measurement

### 3.1.1 Limit of 26dB & 99% Occupied Bandwidth

**<FCC 14-30 CFR 15.407>**

(a)(10) The maximum transmitter channel bandwidth for U-NII devices in the 5.925-7.125 GHz band is 320 megahertz.

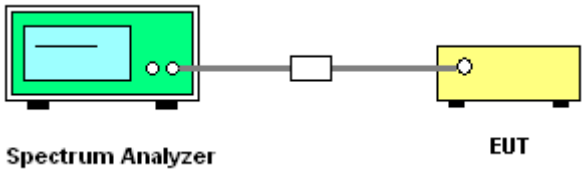
### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section C) Emission bandwidth
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 26 dB down from the peak 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%.
7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
8. Measure and record the results in the test report.

### 3.1.4 Test Setup




### 3.1.5 Test Result of 26dB & 99% Occupied Bandwidth

Please refer to Appendix A.

# 3.2 Fundamental Maximum EIRP Measurement

## 3.2.1 Limit of Fundamental Maximum EIRP

**<FCC 14-30 CFR 15.407>**

(a)(8) For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.

## 3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

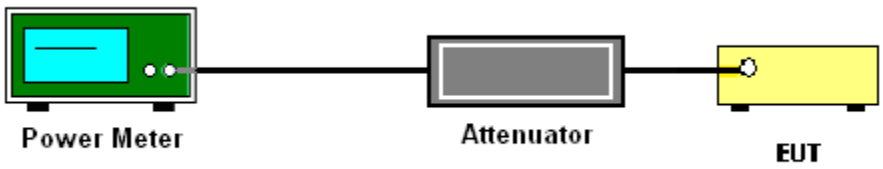
## 3.2.3 Test Procedures

The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter.
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

## 3.2.4 Test Setup




## 3.2.5 Test Result of Fundamental Maximum EIRP

Please refer to Appendix A.

# 3.3 Fundamental Power Spectral Density Measurement

## 3.3.1 Limit of Fundamental Power Spectral Density

**<FCC 14-30 CFR 15.407>**

(a)(8) For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum power spectral density must not exceed −1 dBm e.i.r.p. in any 1-megahertz band..

## 3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

## 3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Section F) Maximum power spectral density.

**# Method SA-2 #**

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

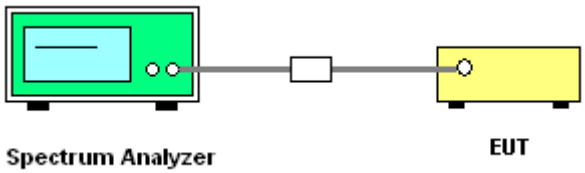
- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

   Method (a): Measure and sum the spectra across the outputs.

   The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points; the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

### 3.3.4 Test Setup




### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

# 3.4 In-Band Emissions (Channel Mask)

## 3.4.1 Limit of Unwanted Emissions

**<FCC 14-30 CFR 15.407>**

(b)(7) For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

## 3.4.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

## 3.4.3 Test Procedures

The testing follows FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01.

Section J) In-Band Emissions.

1. Take nominal bandwidth as reference channel bandwidth provided that 26 dB emission bandwidth is always larger than nominal bandwidth
2. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:

   a) Set the span to encompass the entire 26 dB EBW of the signal.

   b) Set RBW = same RBW used for 26 dB EBW measurement.

   c) Set VBW ≥ 3 X RBW

   d) Number of points in sweep ≥ [2 X span / RBW].

   e) Sweep time = auto.

   f) Detector = RMS (i.e., power averaging)

   g) Trace average at least 100 traces in power averaging (rms) mode.

   h) Use the peak search function on the instrument to find the peak of the spectrum.
3. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:

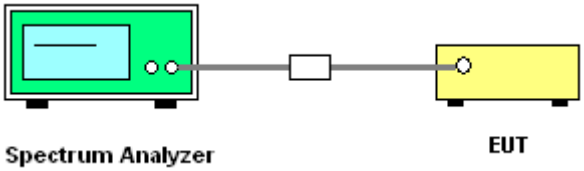
   a. Suppressed by 20 dB at 1 MHz outside of the channel edge.

   b. Suppressed by 28 dB at one channel bandwidth from the channel center.

   c. Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.

4. Adjust the span to encompass the entire mask as necessary.
5. Clear trace.
6. Trace average at least 100 traces in power averaging (rms) mode.
7. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

### 3.4.4 Test Setup




### 3.4.5 Test Result

Please refer to Appendix A.

## 3.5 Contention Based Protocol

### 3.5.1 Limit of Contention Based Protocol

**<FCC 14-30 CFR 15.407>**

(d)(6) Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band must employ a contention-based protocol.

FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain. To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

**Table 1. Criteria to determine number of times detection threshold test may be performed**

| If | Number of Tests | Placement of Incumbent Transmission |
|---|---|---|
| $BW_{EUT} \leq BW_{Inc}$ | Once | Tune incumbent and EUT transmissions ($f_{c1} = f_{c2}$) |
| $BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$ | Once | Incumbent transmission is contained within $BW_{EUT}$ |
| $2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$ | Twice. Incumbent transmission is contained within $BW_{EUT}$ | Incumbent transmission is located as closely as possible to the lower edge and upper edge, respectively, of the EUT channel |
| $BW_{EUT} > 4BW_{Inc}$ | Three times | Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel |

where:

$BWEUT$: Transmission bandwidth of EUT signal

$BWInc$: Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)

$fc1$: Center frequency of EUT transmission

$fc2$: Center frequency of simulated incumbent signal

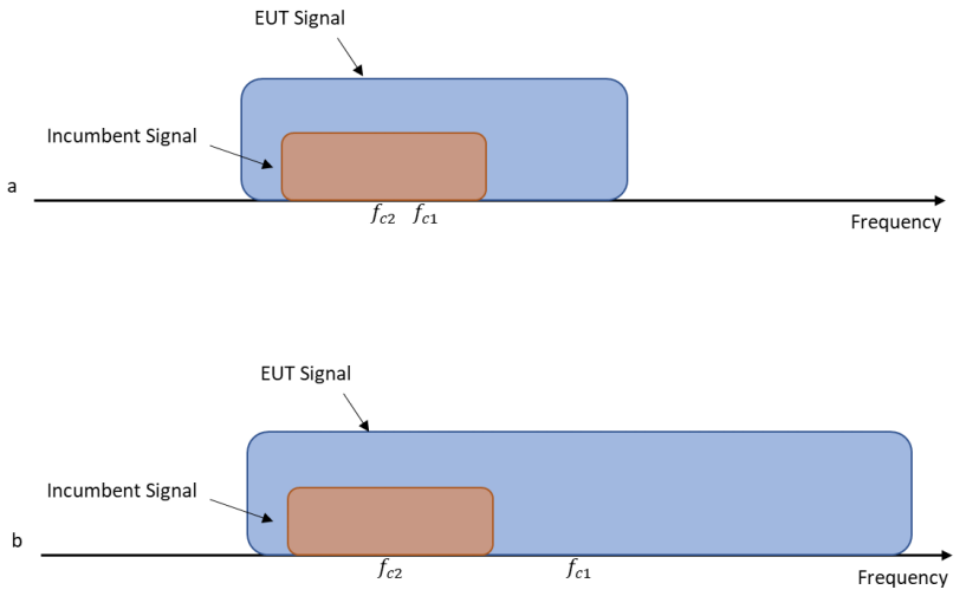



**Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it**

### 3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.5.3 Test Procedures

The testing follows FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01.
Section I) Contention Based Protocol
Conducted method Step-by-Step Procedure, Conducted Setup

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT.
4. Connect the output port of the EUT to the signal analyzer 2, as shown in test setup Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
5. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
6. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
7. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in test setup Figure 2.
8. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.

9. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
10. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
11. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.
12. For the contention-based protocol test where only one channel in each supported sub-band needs to be tested. The narrowest and widest bandwidth in each channel shall be measured EUT was driven in MIMO mode, the interferer level was injected to both chains to monitor the performance, while the interferer level is determined according the lowest antenna gain among both antennas (i.e, lower interferer level).

### 3.5.4 Test Setup

Conducted Setup

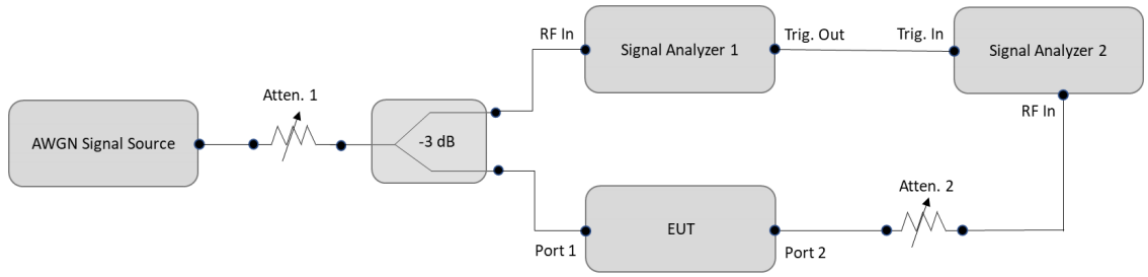



**Figure 2. Contention-based protocol test setup, conducted method Step-by-Step Procedure, Conducted Setup**

### 3.5.5 Support Unit used in test configuration and system

| Instrument | Brand Name | Model No. | Characteristics |
|---|---|---|---|
| WLAN AP | ASUS | GT-AXE11000 | Dual Band AP |
| Notebook | Acer | N15C1 | LAN |

### 3.5.6 Antenna gain for Contention Based Protocol Test

| | |
|---|---|
| CBP Antenna Gain | <UNII-5>: 5.2 dBi<br><UNII-6>: 3.2 dBi<br><UNII-7>: 4.0 dBi<br><UNII-8>: 5.4 dBi |

### 3.5.7 Test Summary of Contention Based Protocol Test

| Test Engineer : | Kai Liao | Temperature : | 24.8~25.6℃ |
|---|---|---|---|
| | | Relative Humidity : | 43.5~55.4% |

| Band | Channel Freq. (MHz) | Channel BW (MHz) | Incumbent freq. (MHz) | Injected AWGN Level (dBm) | Detection Rate (%) | Regulated Threshold level (dBm) | Adjusted Power (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| UNII Band 5 | 6135 | 20 | 6135 | -73.25 | 100 | -62 | -78.45 | 16.45 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.25 | < 90 | -62 | -80.45 | 18.45 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.25 | 0 | -62 | -81.45 | 19.45 |
| | | | | | Result: Normal Operation | | | |
| | 6185 | 160 | 6110 | -70.64 | 100 | -62 | -75.84 | 13.84 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -74.64 | < 90 | -62 | -79.84 | 17.84 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -75.64 | 0 | -62 | -80.84 | 18.84 |
| | | | | | Result: Normal Operation | | | |
| | | | 6185 | -66.52 | 100 | -62 | -71.72 | 9.72 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -69.52 | < 90 | -62 | -74.72 | 12.72 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -70.52 | 0 | -62 | -75.72 | 13.72 |
| | | | | | Result: Normal Operation | | | |
| | | | 6260 | -73.40 | 100 | -62 | -78.60 | 16.60 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.40 | < 90 | -62 | -80.60 | 18.60 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.40 | 0 | -62 | -81.60 | 19.60 |
| | | | | | Result: Normal Operation | | | |

**Note 1:** Adjusted Power = Injected AWGN Level - minimum antenna gain (5.2 dBi).

**Note 2:** The antenna gain has included the path loss between RF connector and antenna.

**Note 3:** Margin = Regulated Threshold level - Adjusted Power.

| Band | Channel Freq. (MHz) | Channel BW (MHz) | Incumbent freq. (MHz) | Injected AWGN Level (dBm) | Detection Rate (%) | Regulated Threshold level (dBm) | Adjusted Power (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| UNII Band 6 | 6455 | 20 | 6455 | -73.57 | 100 | -62 | -76.77 | 14.77 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.57 | < 90 | -62 | -78.77 | 16.77 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.57 | 0 | -62 | -79.77 | 17.77 |
| | | | | | Result: Normal Operation | | | |
| | 6505 | 160 | 6430 | -70.56 | 100 | -62 | -73.76 | 11.76 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -74.56 | < 90 | -62 | -77.76 | 15.76 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -75.56 | 0 | -62 | -78.76 | 16.76 |
| | | | | | Result: Normal Operation | | | |
| | | | 6505 | -67.58 | 100 | -62 | -70.78 | 8.78 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -69.58 | < 90 | -62 | -72.78 | 10.78 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -70.58 | 0 | -62 | -73.78 | 11.78 |
| | | | | | Result: Normal Operation | | | |
| | | | 6580 | -73.56 | 100 | -62 | -76.76 | 14.76 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.56 | < 90 | -62 | -78.76 | 16.76 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.56 | 0 | -62 | -79.76 | 17.76 |
| | | | | | Result: Normal Operation | | | |

**Note 1:** Adjusted Power = Injected AWGN Level - minimum antenna gain (3.2 dBi).

**Note 2:** The antenna gain has included the path loss between RF connector and antenna.

**Note 3:** Margin = Regulated Threshold level - Adjusted Power.

| Band | Channel Freq. (MHz) | Channel BW (MHz) | Incumbent freq. (MHz) | Injected AWGN Level (dBm) | Detection Rate (%) | Regulated Threshold level (dBm) | Adjusted Power (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| UNII Band 7 | 6695 | 20 | 6695 | -74.80 | 100 | -62 | -78.80 | 16.80 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.80 | < 90 | -62 | -79.80 | 17.80 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.80 | 0 | -62 | -80.80 | 18.80 |
| | | | | | Result: Normal Operation | | | |
| | 6665 | 160 | 6590 | -73.49 | 100 | -62 | -77.49 | 15.49 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.49 | < 90 | -62 | -79.49 | 17.49 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.49 | 0 | -62 | -80.49 | 18.49 |
| | | | | | Result: Normal Operation | | | |
| | | | 6665 | -66.69 | 100 | -62 | -70.69 | 8.69 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -70.69 | < 90 | -62 | -74.69 | 12.69 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -71.69 | 0 | -62 | -75.69 | 13.69 |
| | | | | | Result: Normal Operation | | | |
| | | | 6740 | -74.89 | 100 | -62 | -78.89 | 16.89 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -76.89 | < 90 | -62 | -80.89 | 18.89 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -77.89 | 0 | -62 | -81.89 | 19.89 |
| | | | | | Result: Normal Operation | | | |

**Note 1:** Adjusted Power = Injected AWGN Level - minimum antenna gain (4 dBi).

**Note 2:** The antenna gain has included the path loss between RF connector and antenna.

**Note 3:** Margin = Regulated Threshold level - Adjusted Power.

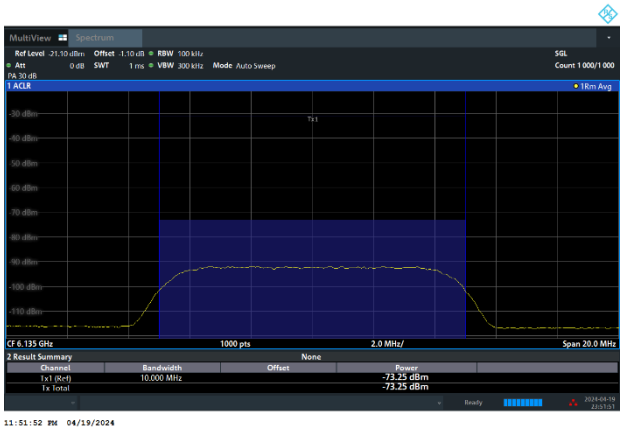
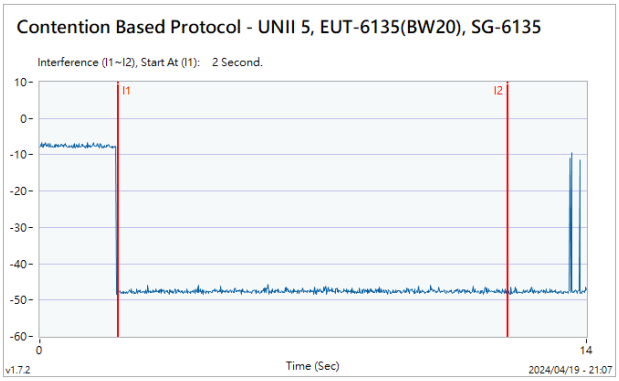
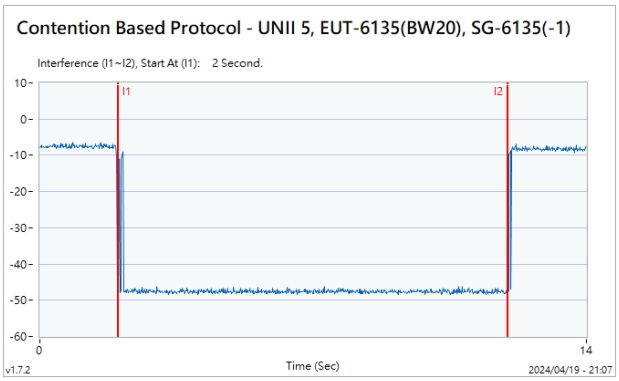
| Band | Channel Freq. (MHz) | Channel BW (MHz) | Incumbent freq. (MHz) | Injected AWGN Level (dBm) | Detection Rate (%) | Regulated Threshold level (dBm) | Adjusted Power (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| UNII Band 8 | 7015 | 20 | 7015 | -74.97 | 100 | -62 | -80.37 | 18.37 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.97 | < 90 | -62 | -81.37 | 19.37 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.97 | 0 | -62 | -82.37 | 20.37 |
| | | | | | Result: Normal Operation | | | |
| | 6985 | 160 | 6910 | -74.03 | 100 | -62 | -79.43 | 17.43 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -76.03 | < 90 | -62 | -81.43 | 19.43 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -77.03 | 0 | -62 | -82.43 | 20.43 |
| | | | | | Result: Normal Operation | | | |
| | | | 6985 | -67.05 | 100 | -62 | -72.45 | 10.45 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -70.05 | < 90 | -62 | -75.45 | 13.45 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -71.05 | 0 | -62 | -76.45 | 14.45 |
| | | | | | Result: Normal Operation | | | |
| | | | 7060 | -72.07 | 100 | -62 | -77.47 | 15.47 |
| | | | | | Result: Stop Transmission | | | |
| | | | | -75.07 | < 90 | -62 | -80.47 | 18.47 |
| | | | | | Result: Minimal Operation | | | |
| | | | | -76.07 | 0 | -62 | -81.47 | 19.47 |
| | | | | | Result: Normal Operation | | | |

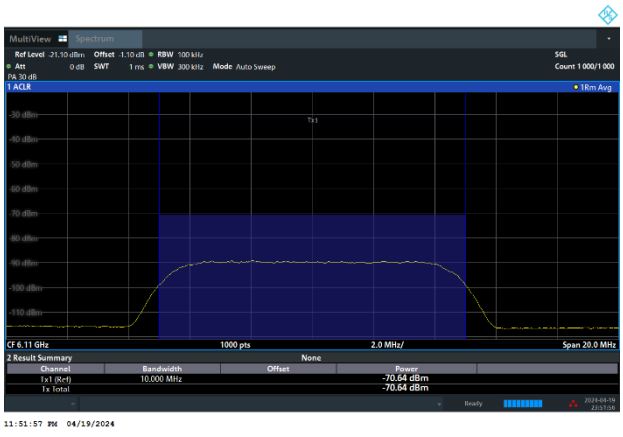
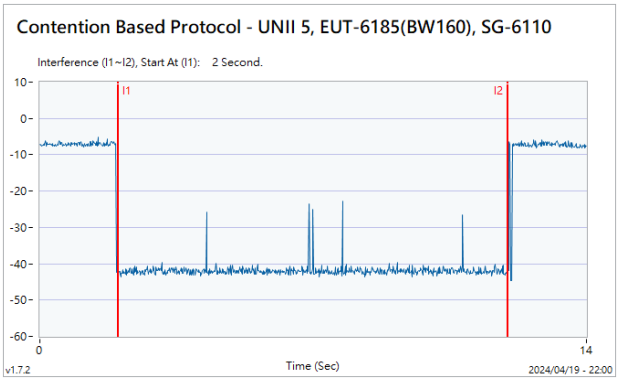
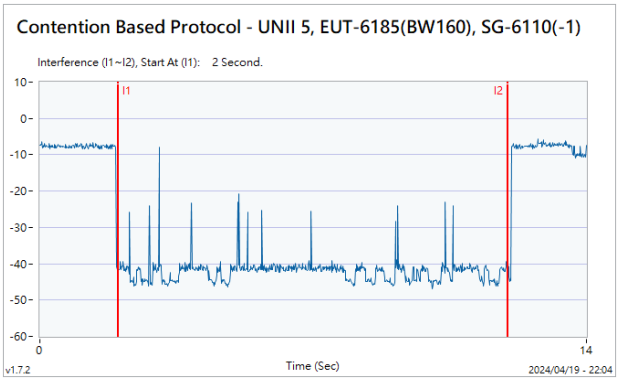
**Note 1:** Adjusted Power = Injected AWGN Level - minimum antenna gain (5.4 dBi).

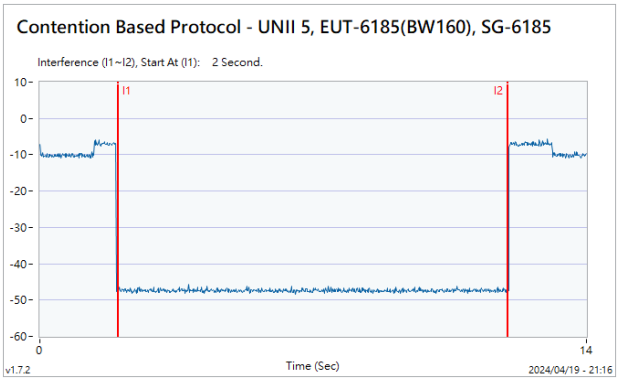
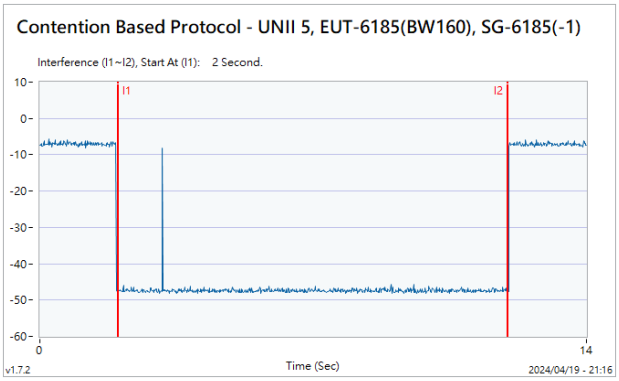
**Note 2:** The antenna gain has included the path loss between RF connector and antenna.

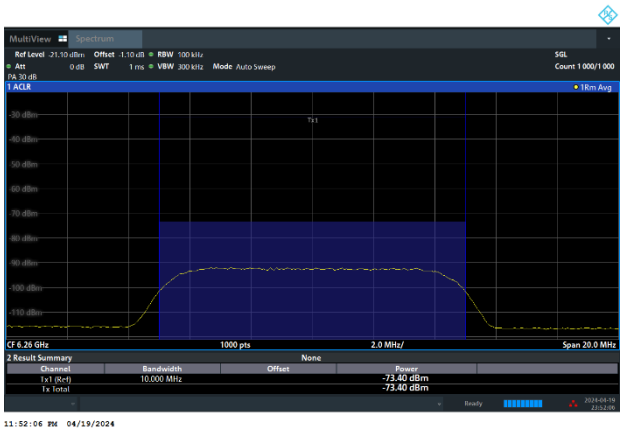
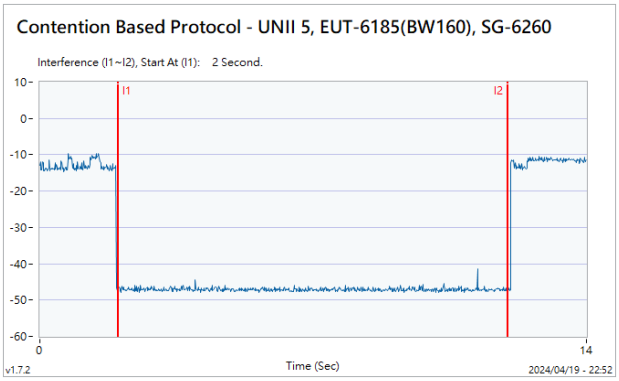
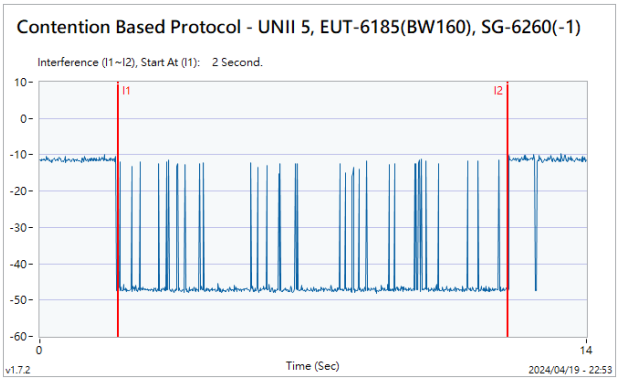
**Note 3:** Margin = Regulated Threshold level - Adjusted Power.

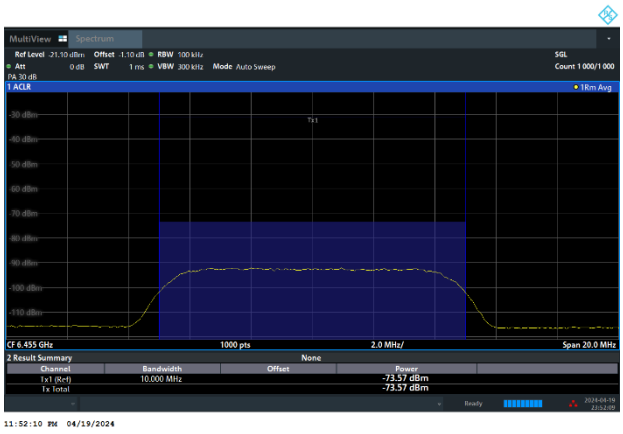
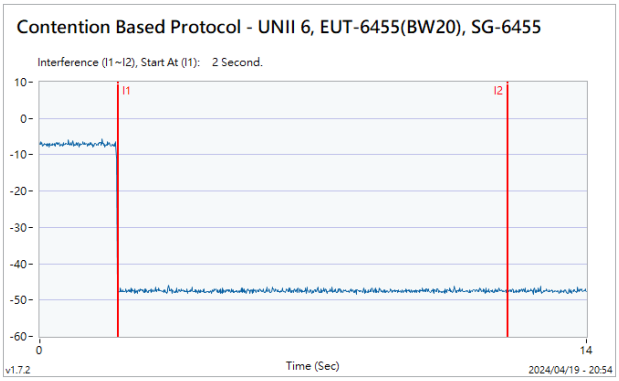
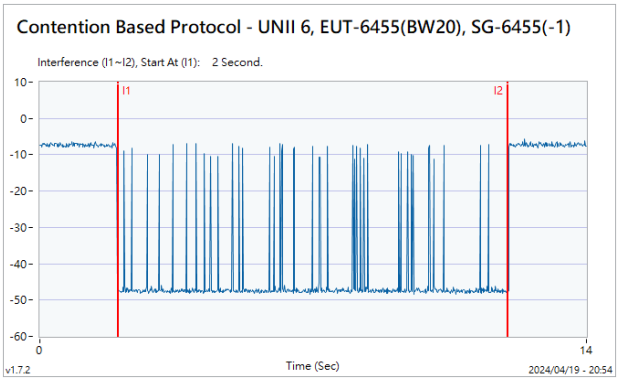
## 3.5.8 Test Plots of Contention Based Protocol Test

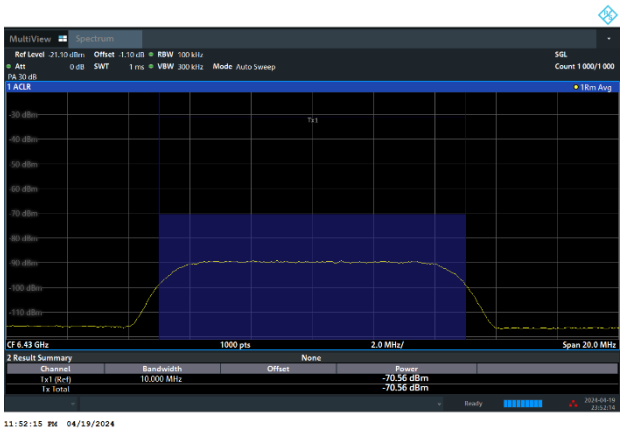
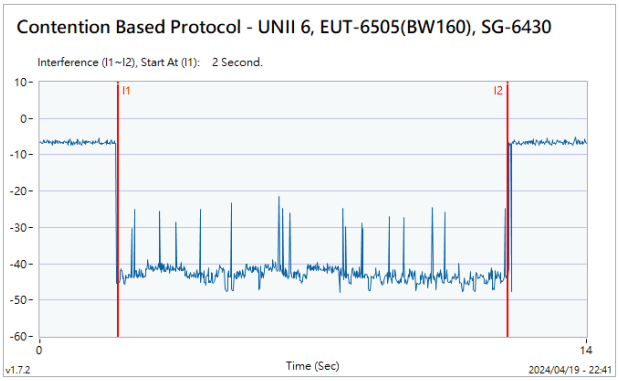
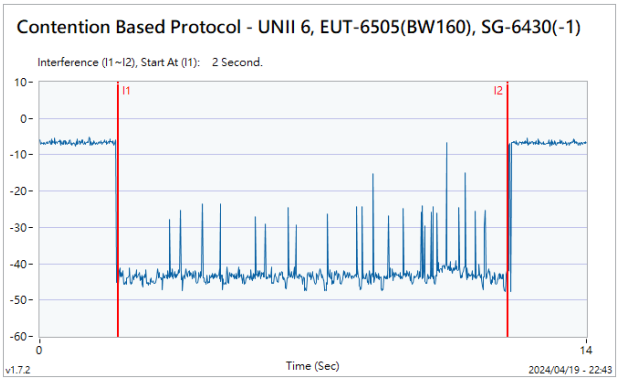
| Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference) | |
|---|---|
| 802.11ax (HE20) / 6135MHz<br>Threshold Level (TL) = -73.25dBm | 802.11ax (HE20) / CH37<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE20) / 6135MHz<br>Threshold Level (TL) = -74.25dBm | 802.11ax (HE20) / CH37<br>Transmit when the interferer is 1dB lower. |
| |  |

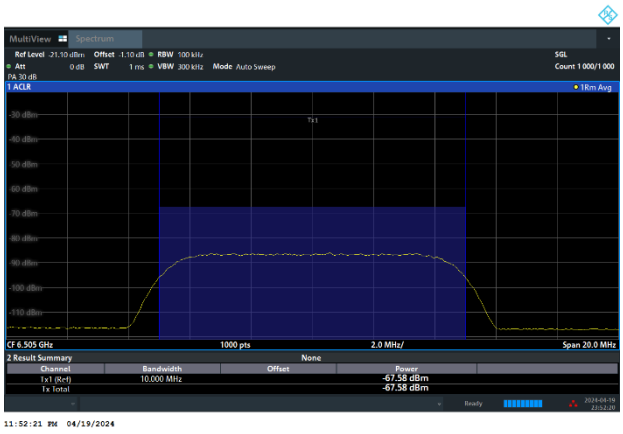
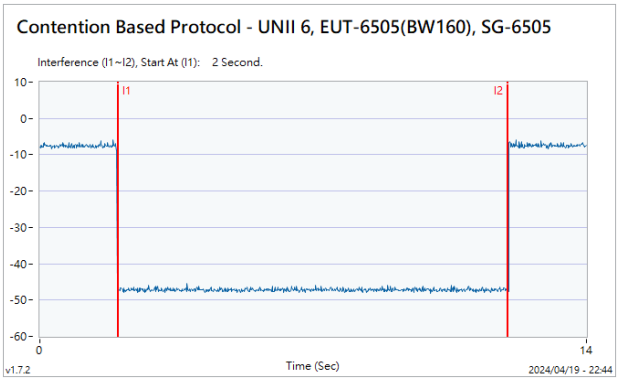
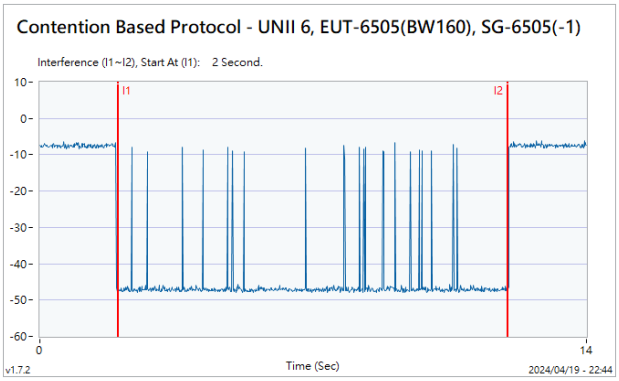
| Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6110MHz (Lower edge)<br>Threshold Level (TL) = -70.64dBm | 802.11ax (HE160) / CH47 (Lower edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6110MHz (Lower edge)<br>Threshold Level (TL) = -71.64dBm | 802.11ax (HE160) / CH47 (Lower edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

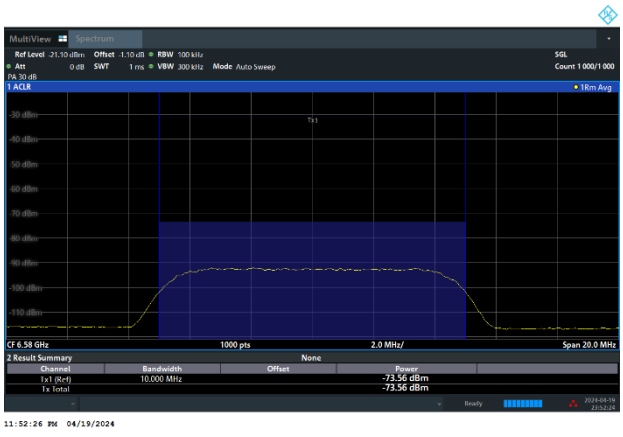
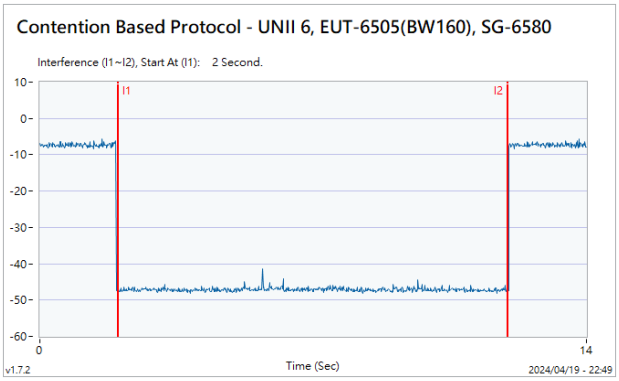
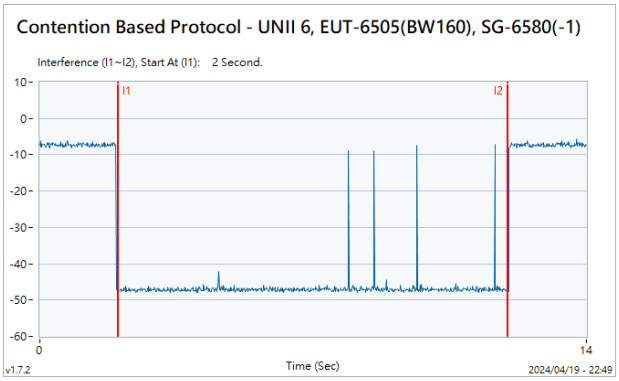
| Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6185MHz (Middle)<br>Threshold Level (TL) = -66.52dBm | 802.11ax (HE160) / CH47 (Middle)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6185MHz (Middle)<br>Threshold Level (TL) = -67.52dBm | 802.11ax (HE160) / CH47 (Middle)<br>Transmit when the interferer is 1dB lower. |
| |  |

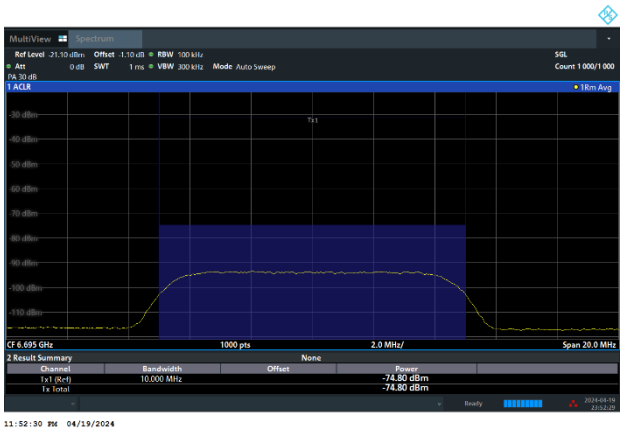
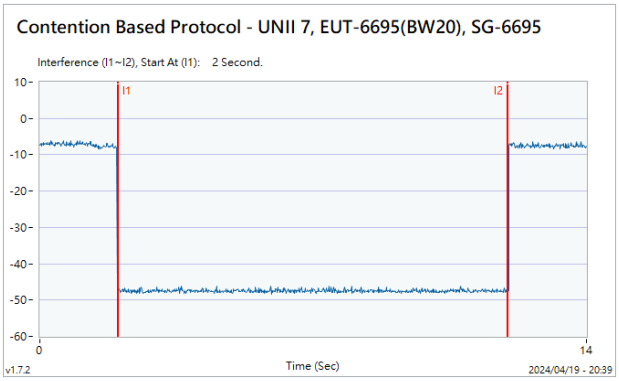
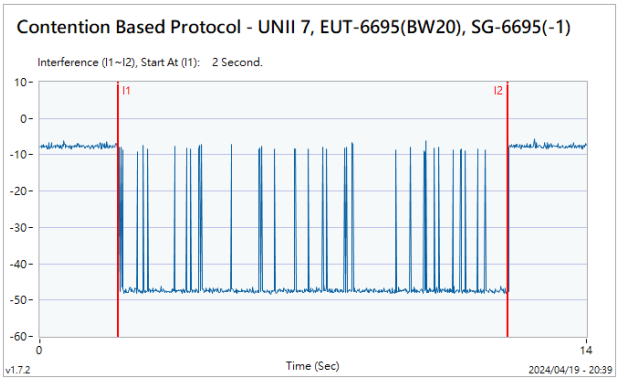
| Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6260MHz (Upper edge)<br>Threshold Level (TL) = -73.40dBm | 802.11ax (HE160) / CH47 (Upper edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6260MHz (Upper edge)<br>Threshold Level (TL) = -74.40dBm | 802.11ax (HE160) / CH47 (Upper edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

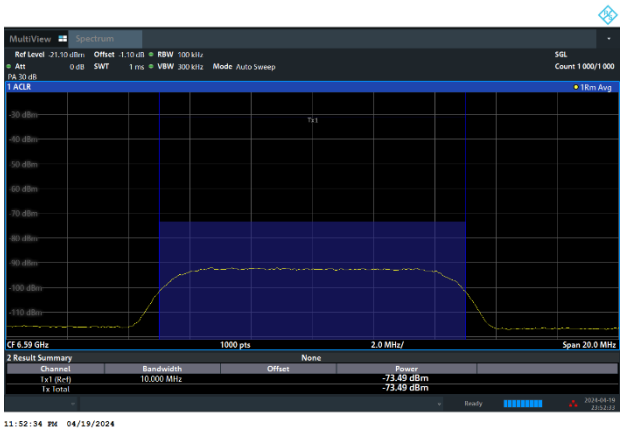
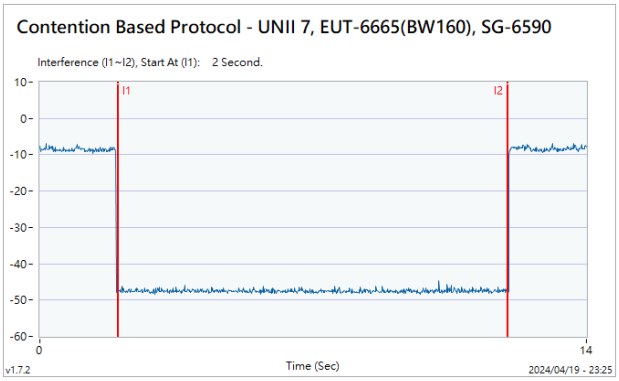
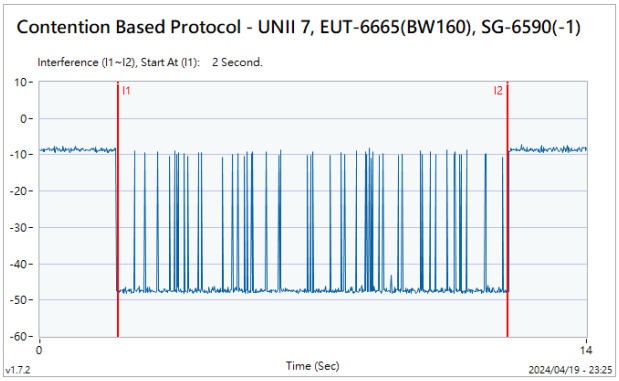
| Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference) | |
|---|---|
| 802.11ax (HE20) / 6455MHz<br>Threshold Level (TL) = -73.57dBm | 802.11ax (HE20) / CH101<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE20) / 6455MHz<br>Threshold Level (TL) = -74.57dBm | 802.11ax (HE20) / CH101<br>Transmit when the interferer is 1dB lower. |
| |  |

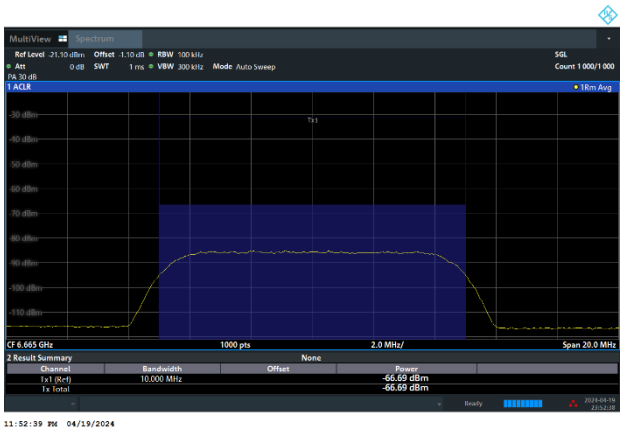
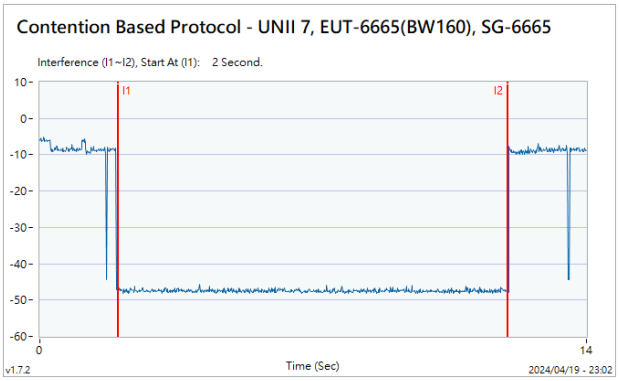
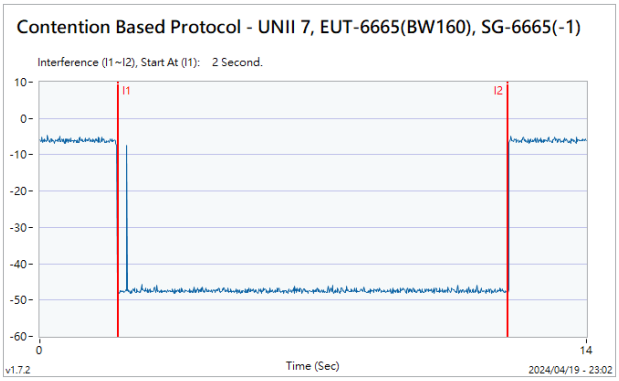
| Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6430MHz (Lower edge)<br>Threshold Level (TL) = -70.56dBm | 802.11ax (HE160) / CH111 (Lower edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6430MHz (Lower edge)<br>Threshold Level (TL) = -71.56dBm | 802.11ax (HE160) / CH111 (Lower edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

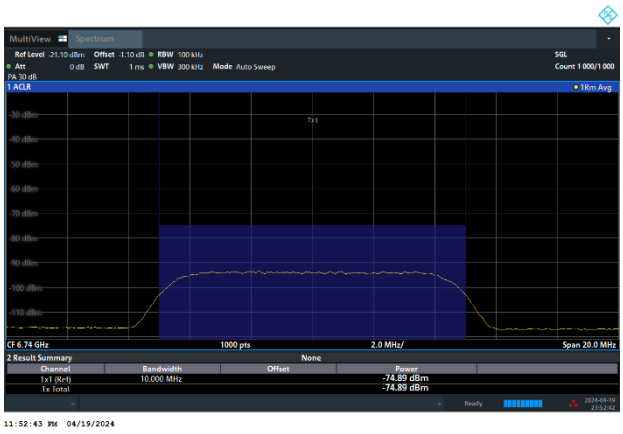
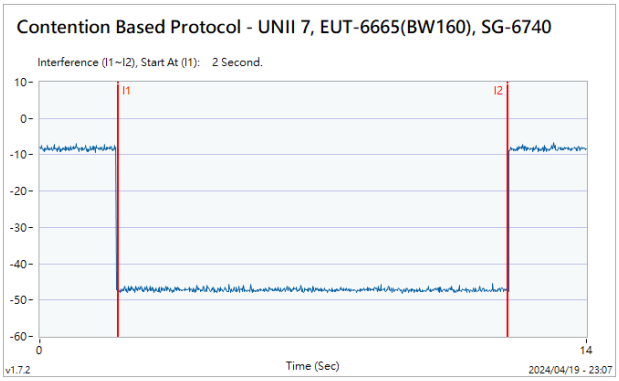
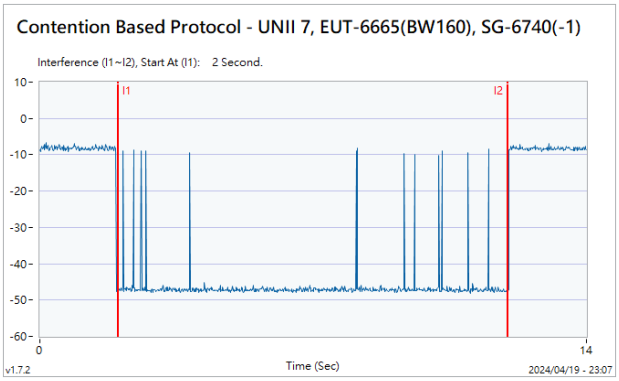
| Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6505MHz (Middle)<br>Threshold Level (TL) = -67.58dBm | 802.11ax (HE160) / CH111 (Middle)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6505MHz (Middle)<br>Threshold Level (TL) = -68.58dBm | 802.11ax (HE160) / CH111 (Middle)<br>Transmit when the interferer is 1dB lower. |
| |  |

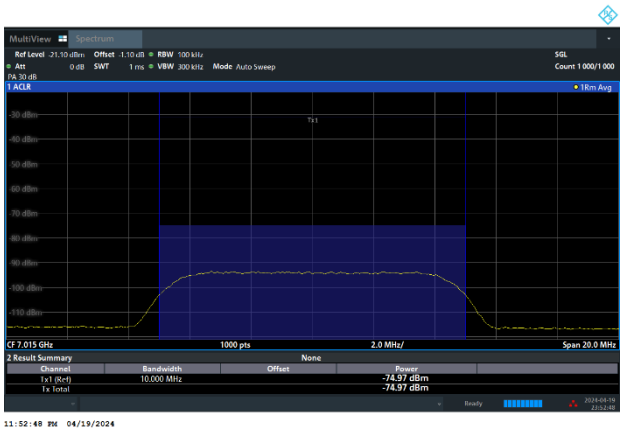
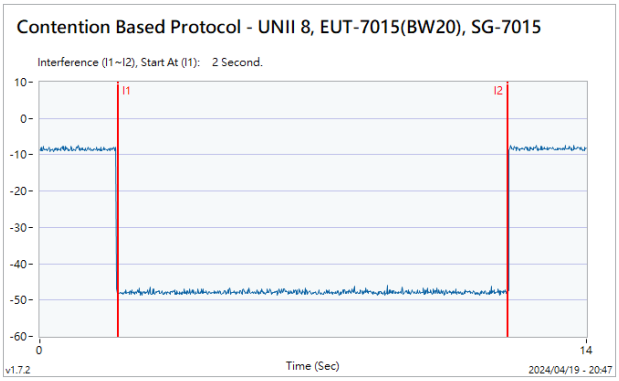
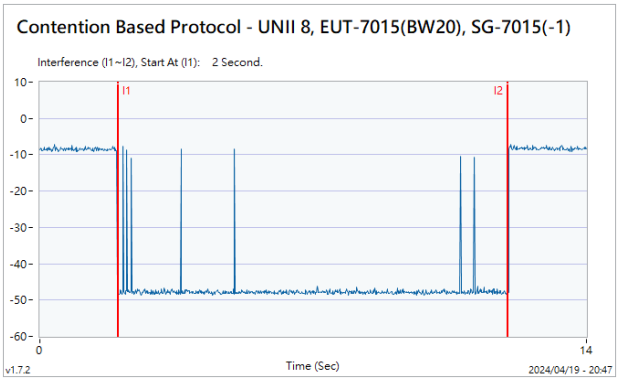
| Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6580MHz (Upper edge)<br>Threshold Level (TL) = -73.56dBm | 802.11ax (HE160) / CH111 (Upper edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6580MHz (Upper edge)<br>Threshold Level (TL) = -74.56dBm | 802.11ax (HE160) / CH111 (Upper edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

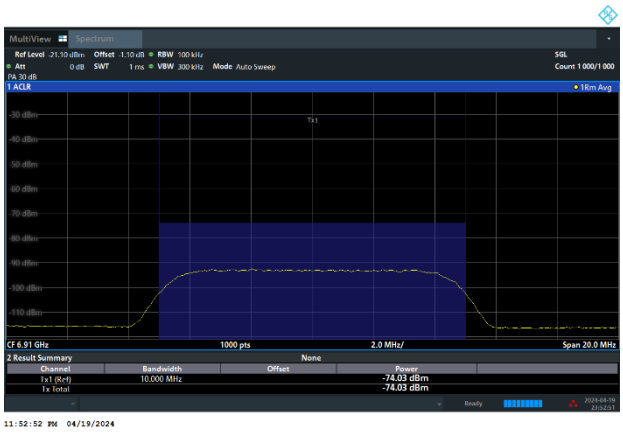
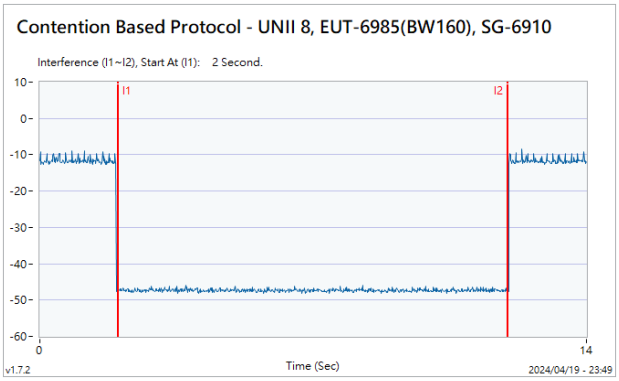
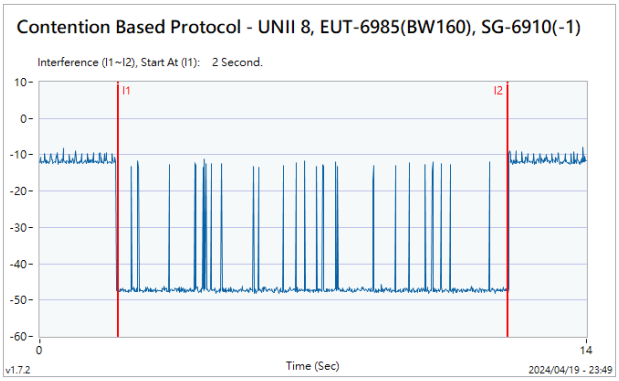
| Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference) | |
|---|---|
| 802.11ax (HE20) / 6695MHz<br>Threshold Level (TL) = -74.80dBm | 802.11ax (HE20) / CH149<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE20) / 6695MHz<br>Threshold Level (TL) = -75.80dBm | 802.11ax (HE20) / CH149<br>Transmit when the interferer is 1dB lower. |
| |  |

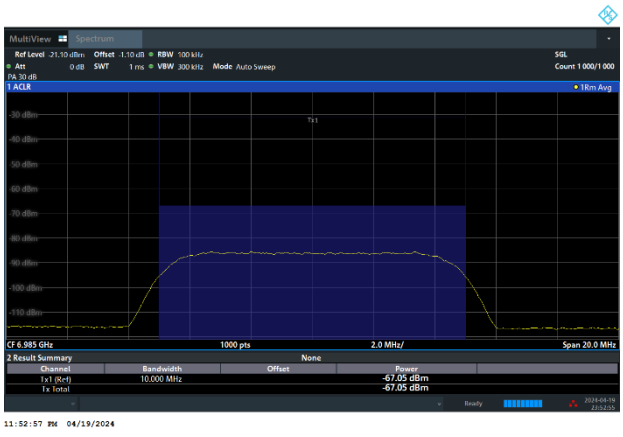
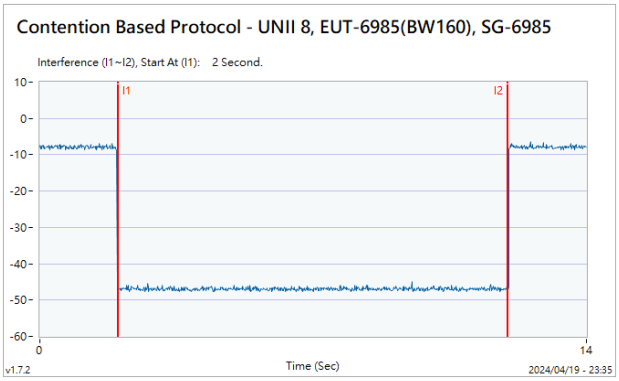
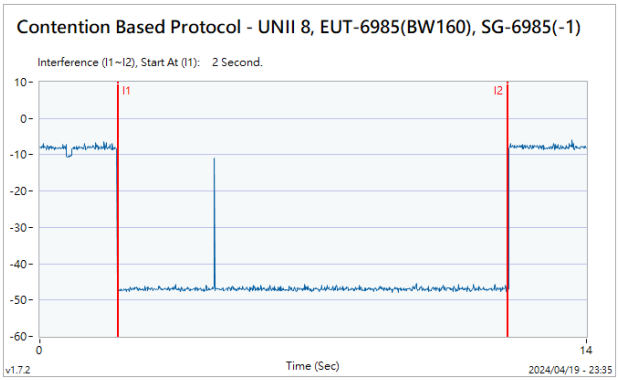
| Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6590MHz (Lower edge)<br>Threshold Level (TL) = -73.49dBm | 802.11ax (HE160) / CH143 (Lower edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6590MHz (Lower edge)<br>Threshold Level (TL) = -74.49dBm | 802.11ax (HE160) / CH143 (Lower edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

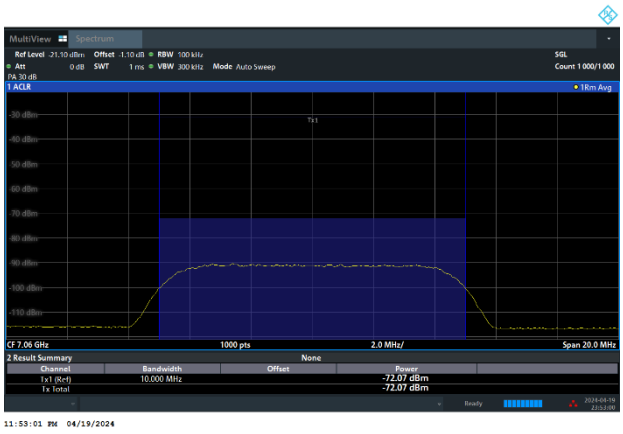
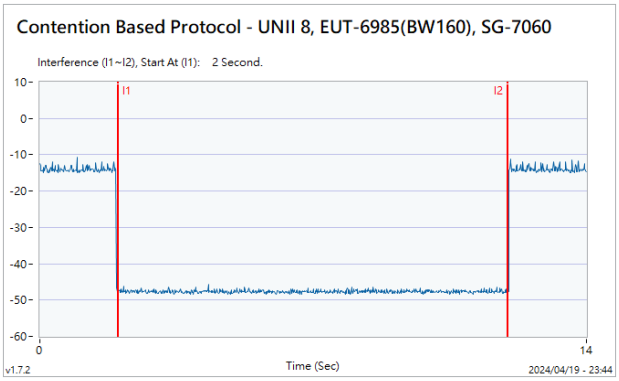
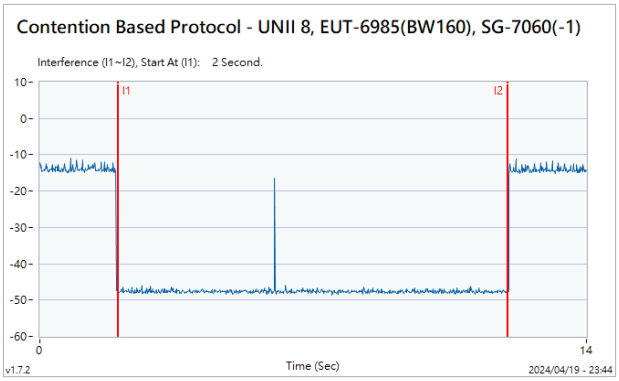
| Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6665MHz (Middle)<br>Threshold Level (TL) = -66.69dBm | 802.11ax (HE160) / CH143 (Middle)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6665MHz (Middle)<br>Threshold Level (TL) = -67.69dBm | 802.11ax (HE160) / CH143 (Middle)<br>Transmit when the interferer is 1dB lower. |
| |  |

| Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6740MHz (Upper edge)<br>Threshold Level (TL) = -74.89dBm | 802.11ax (HE160) / CH143 (Upper edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6740MHz (Upper edge)<br>Threshold Level (TL) = -75.89dBm | 802.11ax (HE160) / CH143 (Upper edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

| Contention Based Protocol Result Plots on U-NII 8 (AWGN Interference) | |
|---|---|
| 802.11ax (HE20) / 7015MHz<br>Threshold Level (TL) = -74.97dBm | 802.11ax (HE20) / CH213<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE20) / 7015MHz<br>Threshold Level (TL) = -75.97dBm | 802.11ax (HE20) / CH213<br>Transmit when the interferer is 1dB lower. |
| |  |

| Contention Based Protocol Result Plots on U-NII 8 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 6910MHz (Lower edge)<br>Threshold Level (TL) = -74.03dBm | 802.11ax (HE160) / CH207 (Lower edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 6910MHz (Lower edge)<br>Threshold Level (TL) = -75.03dBm | 802.11ax (HE160) / CH207 (Lower edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

<table>
<tr><th colspan="2">Contention Based Protocol Result Plots on U-NII 8 (AWGN Interference)</th></tr>
<tr><td>802.11ax (HE160) / 6985MHz (Middle)<br>Threshold Level (TL) = -67.05dBm</td><td>802.11ax (HE160) / CH207 (Middle)<br>Test result is pass due to no transmission occur.</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>802.11ax (HE160) / 6985MHz (Middle)<br>Threshold Level (TL) = -68.05dBm</td><td>802.11ax (HE160) / CH207 (Middle)<br>Transmit when the interferer is 1dB lower.</td></tr>
<tr><td></td><td> 
</td></tr>
</table>

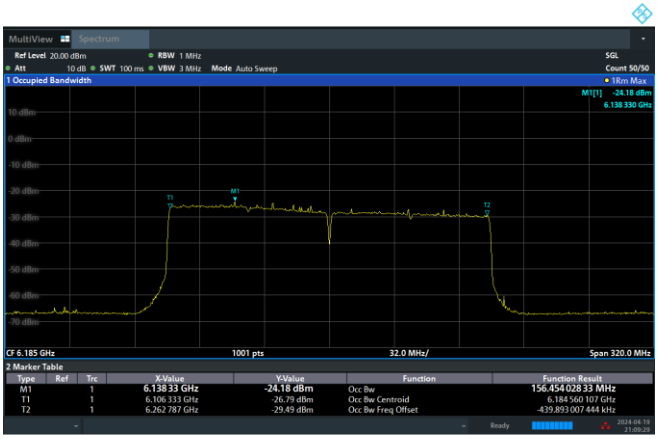
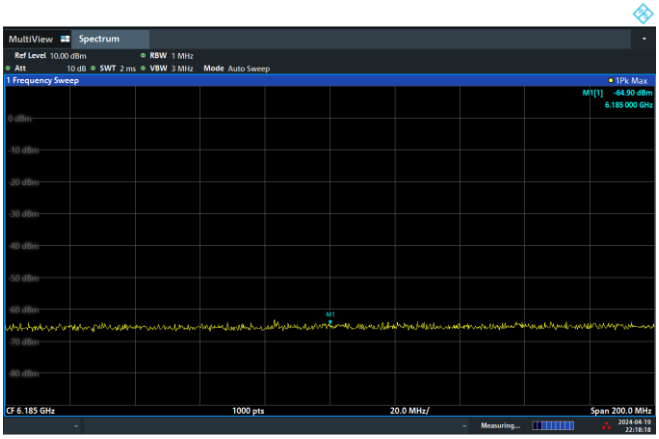
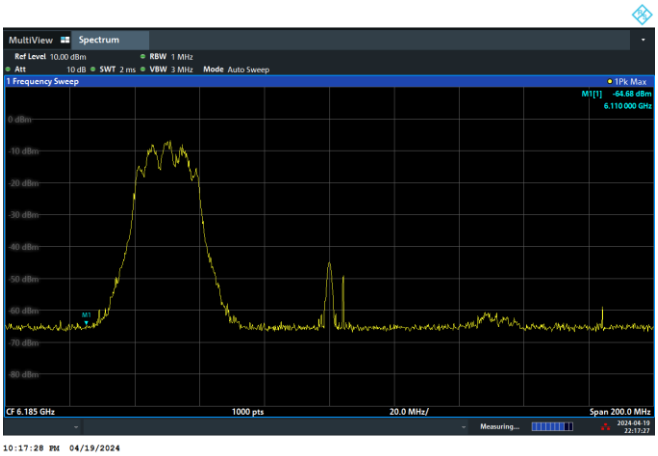
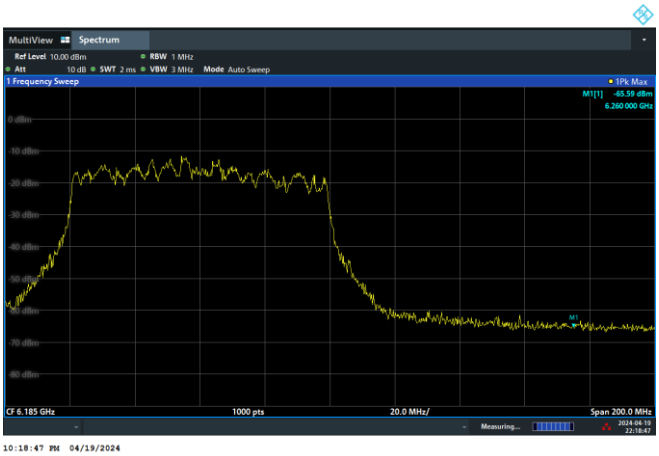
| Contention Based Protocol Result Plots on U-NII 8 (AWGN Interference) | |
|---|---|
| 802.11ax (HE160) / 7060MHz (Upper edge)<br>Threshold Level (TL) = -72.07dBm | 802.11ax (HE160) / CH207 (Upper edge)<br>Test result is pass due to no transmission occur. |
|  |  |
| 802.11ax (HE160) / 7060MHz (Upper edge)<br>Threshold Level (TL) = -73.07dBm | 802.11ax (HE160) / CH207 (Upper edge)<br>Transmit when the interferer is 1dB lower. |
| |  |

CBP verify with frequency domain plots

The device does not support channel puncturing with regards to Contention Based Protocol.

The entire bandwidth 160MHz stops transmission after the incumbent signal appears.

Otherwise, the entire 80MHz bandwidth is reduced to 20MHz or 80MHz.

| Before incumbent injected on 160MHz channel | After 10MHz incumbent injected on center of channel, the entire 160MHz bandwidth stops transmission. |
|---|---|
|  |  |
| After 10MHz incumbent injected on bottom of channel, the EUT bandwidth is reduced from 160MHz to 20MHz channel. | After 10MHz incumbent injected on top of channel, the EUT bandwidth is reduced from 160MHz to 80MHz channel. |
|  |  |

## 3.6 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

### 3.6.1 Limit of Unwanted Emissions

(1) For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

| EIRP (dBm) | Field Strength at 3m (dBμV/m) |
|---|---|
| - 27 (RMS) | 68.3 |
| - 7 (Peak) | 88.3 |

According 987594 D02 U-NII 6GHz EMC Measurement v01 section G:
Unwanted emissions outside of restricted bands are measured with a RMS detector.
In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table:

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

**Note:** The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

### 3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.6.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

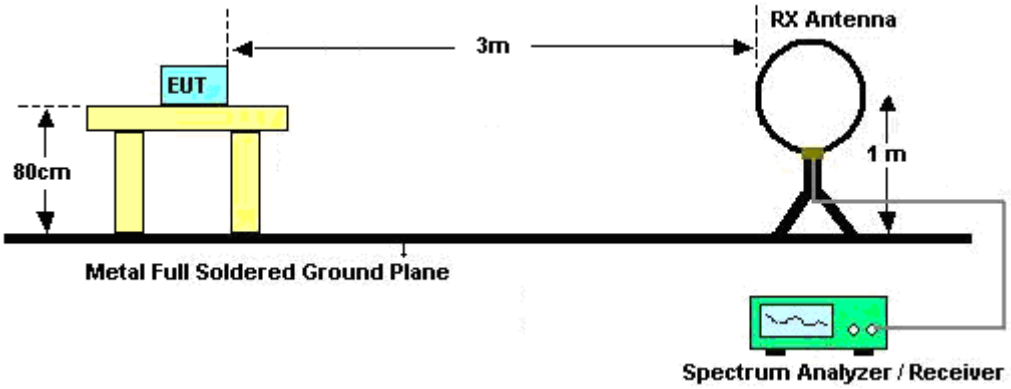
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT is set 3 meters away from the receiving antenna which is mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT is arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".

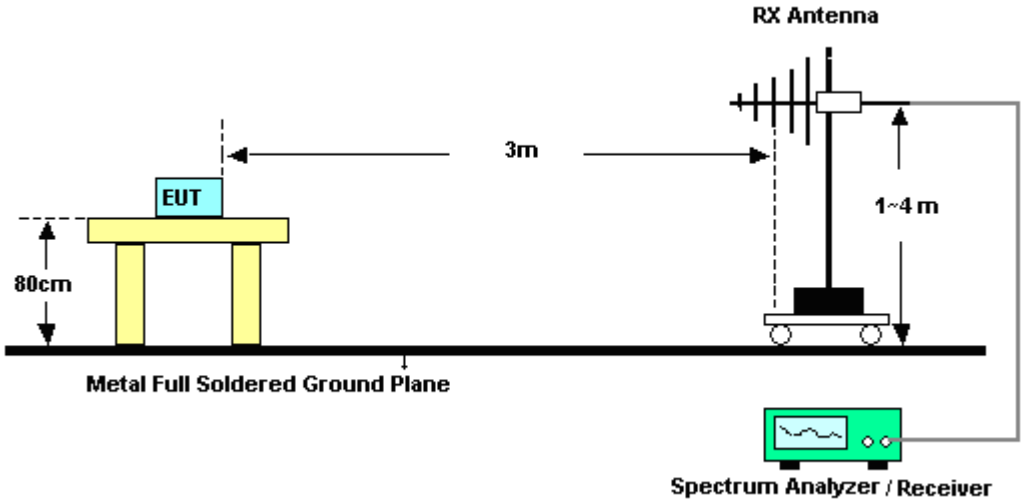
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-"..

### 3.6.4 Test Setup

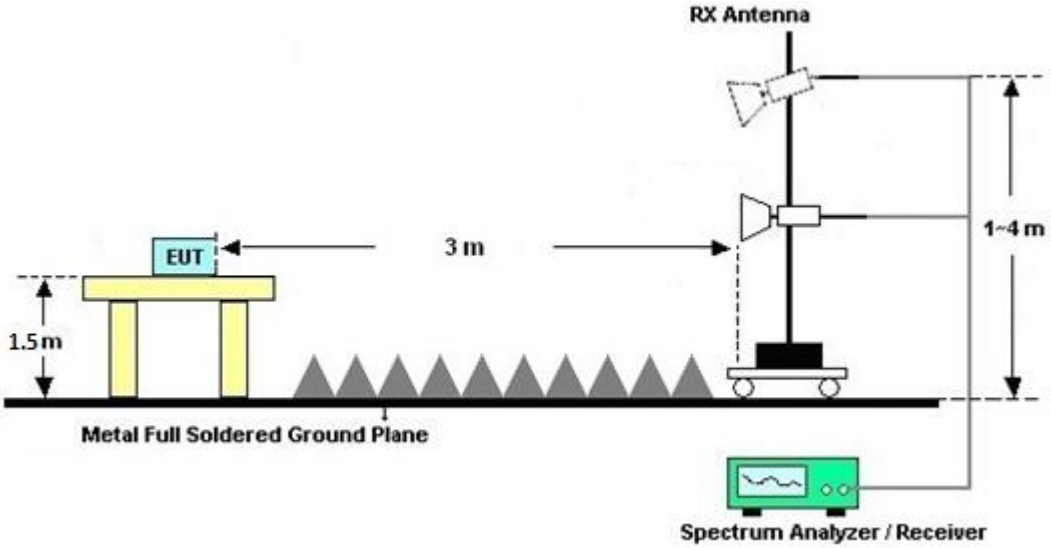
**For radiated emissions below 30MHz**



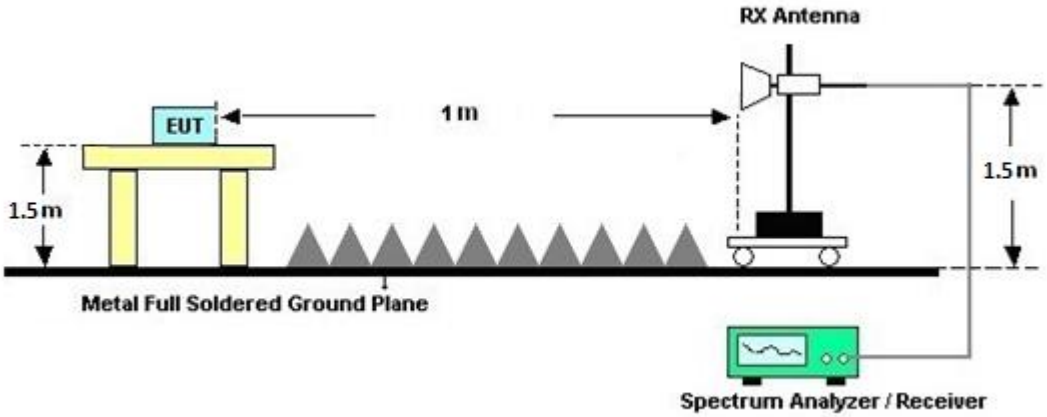

**For radiated emissions from 30MHz to 1GHz**



**For radiated test from 1GHz to 18GHz**




**For radiated test above 18GHz**



### 3.6.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

### 3.6.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

### 3.6.7 Duty Cycle

Please refer to Appendix E.

### 3.6.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

# 3.7 AC Conducted Emission Measurement

## 3.7.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

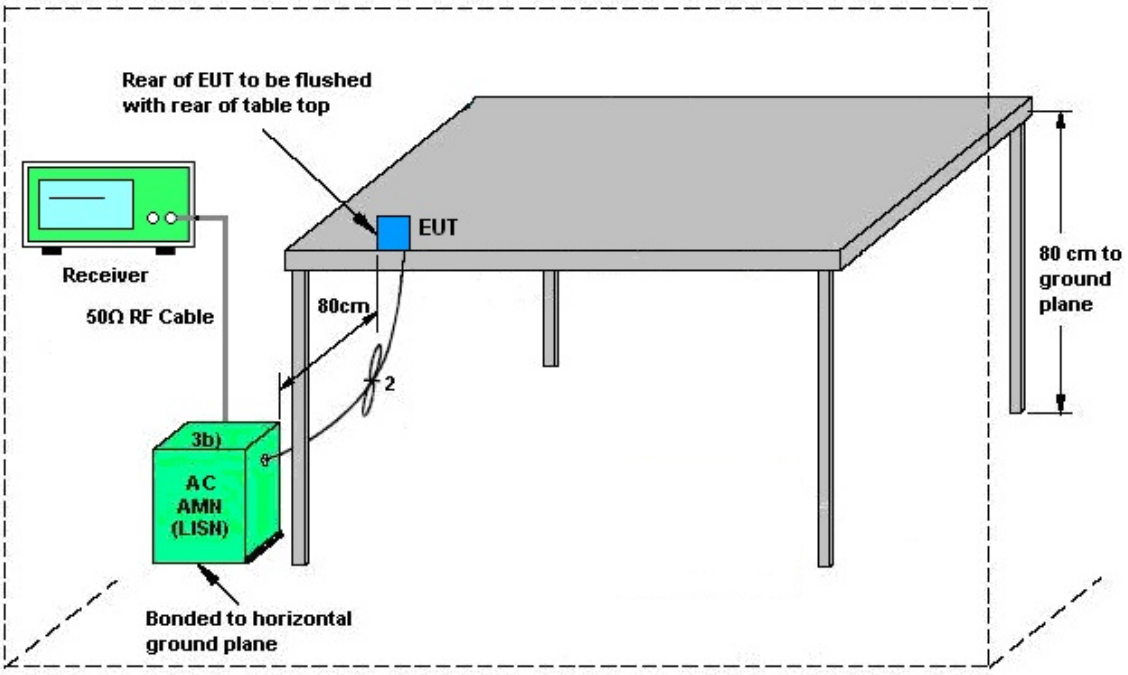
## 3.7.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

## 3.7.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

### 3.7.4 Test Setup




AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

### 3.7.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

# 3.8 Antenna Requirements

## 3.8.1 Standard Applicable

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 rule.

## 3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

# 4 List of Measuring Equipment

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100315 | 9 kHz~30 MHz | Feb. 23, 2024 | Apr. 11, 2024~ May 09, 2024 | Feb. 22, 2025 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 803951/2 | 9k~30M | Mar. 06, 2024 | Apr. 11, 2024~ May 09, 2024 | Mar. 05, 2025 | Radiation (03CH13-HY) |
| Amplifier | SONOMA | 310N | 187282 | 9kHz~1GHz | Dec. 13, 2023 | Apr. 11, 2024~ May 09, 2024 | Dec. 12, 2024 | Radiation (03CH13-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00800N1D01N-06 | 40103 & 07 | 30MHz~1GHz | Apr. 23, 2023 | Apr. 11, 2024 | Apr. 22, 2024 | Radiation (03CH13-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00800N1D01N-06 | 40103 & 07 | 30MHz~1GHz | Apr. 12, 2024 | Apr. 12, 2024~ May 09, 2024 | Apr. 11, 2025 | Radiation (03CH13-HY) |
| EMI Test Receiver | Agilent | N9038A(MXE) | MY53290045 | 20MHz~8.4GHz | Apr. 25, 2023 | Apr. 11, 2024~ Apr. 16, 2024 | Apr. 24, 2024 | Radiation (03CH13-HY) |
| EMI Test Receiver | Agilent | N9038A(MXE) | MY53290045 | 20MHz~8.4GHz | Apr. 17, 2024 | Apr. 17, 2024 ~ May 09, 2024 | Apr. 16, 2025 | Radiation (03CH13-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1326 | 1GHz~18GHz | Aug. 17, 2023 | Apr. 11, 2024~ May 09, 2024 | Aug. 16, 2024 | Radiation (03CH13-HY) |
| Preamplifier | MITEQ | AMF-7D-00101800-30-10P | 1590074 | 1GHz~18GHz | May 16, 2023 | Apr. 11, 2024~ May 09, 2024 | May 15, 2024 | Radiation (03CH13-HY) |
| Preamplifier | EM Electronics | EM01G18G | 060803 | 1GHz~18GHz | Jan. 09, 2024 | Apr. 11, 2024~ May 09, 2024 | Jan. 08, 2025 | Radiation (03CH13-HY) |
| Preamplifier | EMEC | EM18G40G | 060801 | 18GHz~40GHz | Jun. 27, 2023 | Apr. 11, 2024~ May 09, 2024 | Jun. 26, 2024 | Radiation (03CH13-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA9170 | 00993 | 18GHz-40GHz | Nov. 24, 2023 | Apr. 11, 2024~ May 09, 2024 | Nov. 23, 2024 | Radiation (03CH13-HY) |
| Spectrum Analyzer | Keysight | N9010B | MY62170337 | 10Hz~44GHz | Aug. 17, 2023 | Apr. 11, 2024~ May 09, 2024 | Aug. 16, 2024 | Radiation (03CH13-HY) |
| Filter | Wainwright | WLK10-4630-5093-11000-40SS | SN1 | 4.5GHz Low Pass Filter | Sep. 11, 2023 | Apr. 11, 2024~ May 09, 2024 | Sep. 10, 2024 | Radiation (03CH13-HY) |
| Filter | Wainwright | WHKX8-5872.5-6750-18000-40ST | SN5 | 6.75GHz High Pass Filter | Mar. 08, 2024 | Apr. 11, 2024~ May 09, 2024 | Mar. 07, 2025 | Radiation (03CH13-HY) |
| Filter | Wainwright | WHKX6-7268-9200-26500-40CD | SN4 | 9GHz High Pass Filter | May 23, 2023 | Apr. 11, 2024~ May 09, 2024 | May 22, 2024 | Radiation (03CH13-HY) |
| Filter | Wainwright | WLK4-1000-1530-8000-40SS | SN4 | 1.53GHz Low Pass Filter | Jun. 14, 2023 | Apr. 11, 2024~ May 09, 2024 | Jun. 13, 2024 | Radiation (03CH13-HY) |
| Filter | Wainwright | WHKX12-2700-3000-18000-60SS | SN2 | 3GHz High Pass Filter | Jul. 10, 2023 | Apr. 11, 2024~ May 09, 2024 | Jul. 09, 2024 | Radiation (03CH13-HY) |
| Notch Filter | Wainwright | WRCQV14-6025-6425-7125-7525-60SS | SN2 | N/A | Jan. 05, 2024 | Apr. 11, 2024~ May 09, 2024 | Jan. 04, 2025 | Radiation (03CH13-HY) |
| Notch Filter | Wainwright | WRCQV14-5425-5825-6525-6925-60SS | SN1 | N/A | Jan. 05, 2024 | Apr. 11, 2024~ May 09, 2024 | Jan. 04, 2025 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 126E | 0030/126E | 30MHz~18GHz | Feb. 07, 2024 | Apr. 11, 2024~ May 09, 2024 | Feb. 06, 2025 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 804011/2, 804012/2 | 18GHz ~40GHz | Jan. 02, 2024 | Apr. 11, 2024~ May 09, 2024 | Jan. 01, 2025 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | 804793/4 | 30MHz~18GHz | Feb. 07, 2024 | Apr. 11, 2024~ May 09, 2024 | Feb. 06, 2025 | Radiation (03CH13-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY24961/4 | 30MHz~18GHz | Feb. 07, 2024 | Apr. 11, 2024~ May 09, 2024 | Feb. 06, 2025 | Radiation (03CH13-HY) |
| Hygrometer | TECPEL | DTM-303A | TP215159 | N/A | Sep. 13, 2023 | Apr. 11, 2024~ May 09, 2024 | Sep. 12, 2024 | Radiation (03CH13-HY) |
| Controller | EMEC | EM1000 | N/A | Control Turn table & Ant Mast | N/A | Apr. 11, 2024~ May 09, 2024 | N/A | Radiation (03CH13-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1m~4m | N/A | Apr. 11, 2024~ May 09, 2024 | N/A | Radiation (03CH13-HY) |
| Turn Table | EMEC | TT2000 | N/A | 0~360 Degree | N/A | Apr. 11, 2024~ May 09, 2024 | N/A | Radiation (03CH13-HY) |
| Software | Audix | N/A | RK-001124 | N/A | N/A | Apr. 11, 2024~ May 09, 2024 | N/A | Radiation (03CH13-HY) |

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Signal Generator (Interferer) | Rohde & Schwarz | SMW200A | 109425 | 100kHz~7.5GHz | Dec. 20, 2023 | Apr. 19, 2024~ Apr. 20, 2024 | Dec. 19, 2024 | CBP (DF02-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSV3013 | 101549 | 10Hz~13.6GHz | Jan. 30, 2024 | Apr. 19, 2024~ Apr. 20, 2024 | Jan. 29, 2025 | CBP (DF02-HY) |
| Power Divider | Woken | 2Way Divider | DCMB1KW7A2 | 0.5GHz-18GHz | Calibration from System | Apr. 19, 2024~ Apr. 20, 2024 | Calibration from System | CBP (DF02-HY) |
| Power Divider | Woken | 0120A04051801O | DCMB1CW3A7 | 0.5-18GHz | Calibration from System | Apr. 19, 2024~ Apr. 20, 2024 | Calibration from System | CBP (DF02-HY) |
| Power Divider | MVE | A702508 | A702478 | 0.5GHz-6GHz | Calibration from System | Apr. 19, 2024~ Apr. 20, 2024 | Calibration from System | CBP (DF02-HY) |
| Coupler | Woken | 10dB 30W SMA | DOM5CIW3A1 | 0.5-18GHz | Calibration from System | Apr. 19, 2024~ Apr. 20, 2024 | Calibration from System | CBP (DF02-HY) |
| Power Divider | Woken | 3Way SMA Power Divder Rated to 20W | STI08-0010(#3) | 2GHz-8GHz | Calibration from System | Apr. 19, 2024~ Apr. 20, 2024 | Calibration from System | CBP (DF02-HY) |
| Hygrometer | TECPEL | DTM-303A | TP201996 | N/A | Nov. 07, 2023 | Apr. 10, 2024~ May 18, 2024 | Nov. 06, 2024 | Conducted (TH05-HY) |
| USB Power Sensor | DARE | RPR3008W | RPR8W-23010013 (NO:100) | 10MHz~8GHz | Jul. 26, 2023 | Apr. 10, 2024~ May 18, 2024 | Jul. 25, 2024 | Conducted (TH05-HY) |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101564 | 10Hz ~ 40GHz | Sep. 12, 2023 | Apr. 10, 2024~ May 18, 2024 | Sep. 11, 2024 | Conducted (TH05-HY) |
| AC Power Source | ACPOWER | AFC-11003G | F317040033 | N/A | N/A | Apr. 25, 2024 | N/A | Conduction (CO07-HY) |
| Software | Rohde & Schwarz | EMC32 V10.30 | N/A | N/A | N/A | Apr. 25, 2024 | N/A | Conduction (CO07-HY) |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F N | 9561-F N00373 | 9kHz-200MHz | Oct. 20, 2023 | Apr. 25, 2024 | Oct. 19, 2024 | Conduction (CO07-HY) |
| RF Cable | HUBER + SUHNER | RG 214/U | 1358175 | 9kHz~30MHz | Mar. 14, 2024 | Apr. 25, 2024 | Mar. 13, 2025 | Conduction (CO07-HY) |
| Two-Line V-Network | TESEQ | NNB 51 | 45051 | N/A | Mar. 10, 2024 | Apr. 25, 2024 | Mar. 09, 2025 | Conduction (CO07-HY) |
| Four-Line V-Network | TESEQ | NNB 52 | 36122 | N/A | Mar. 07, 2024 | Apr. 25, 2024 | Mar. 06, 2025 | Conduction (CO07-HY) |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 102317 | 9kHz~3.6GHz | Sep. 20, 2023 | Apr. 25, 2024 | Sep. 19, 2024 | Conduction (CO07-HY) |

# 5 Measurement Uncertainty

**Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **3.44 dB** |

**Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **6.5 dB** |

**Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **4.2 dB** |

**Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **4.6 dB** |

**Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.3 dB** |