verify No.825909239043

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# TEST REPORT

| Eurofins KCTL Co.,Ltd.<br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-70-5008-1021 FAX: 82-505-299-8311<br>www.kctl.co.kr | Report No.:<br>KR25-SRF0107<br>Page (1) of (64) | eurofins KCTL |
|---|---|---|

**1. Client**

- Name : SAM JIN CO., LTD.
- Address : 81, Anyangcheonseo-ro, Manan-gu, Anyang-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2025-03-14

**2. Use of Report** : Certification

**3. Name of Product / Model** : V4 HUB / GP-AEOHUBV4US

**4. Manufacturer / Country of Origin** : SAM JIN CO., LTD. / Indonesia

**5. FCC ID** : 2AF4SGP-AEOHUBV4US

**6. IC Certificate No.** : 20753-GPAEOHUBV4

**7. Date of Test** : 2025-05-14 to 2025-05-22

**8. Location of Test** : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

**9. Test method used** : FCC Part 15 Subpart C, 15.247
RSS-247 Issue 3 August 2023
RSS-Gen Issue 5 February 2021

**10. Test Result** : Refer to the test result in the test report

| Affirmation | Tested by<br>Name : Hosung Lee (Signature) | Technical Manager<br>Name : Harim Lee (Signature) |
|---|---|---|

2025-06-12

## Eurofins KCTL Co.,Ltd.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.

## REPORT REVISION HISTORY

| Date | Revision | Page No |
|---|---|---|
| 2025-06-12 | Originally issued | - |
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## General remarks for test reports

**Statement concerning the uncertainty of the measurement systems used for the tests**

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

**Procedure number, issue date and title:**

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

# CONTENTS

# 1. General information

| | | |
|---|---|---|
| Client | : | SAM JIN CO., LTD. |
| Address | : | 81, Anyangcheonseo-ro, Manan-gu, Anyang-si, Gyeonggi-do, Republic of Korea |
| Manufacturer | : | SAM JIN CO., LTD. |
| Address | : | 81, Anyangcheonseo-ro, Manan-gu, Anyang-si, Gyeonggi-do, Republic of Korea |
| Factory | : | PT.SAMJIN |
| Address | : | Bekasi International Industrial Estate,Jl. Inti Raya Ⅱ Block C2 No. 10, Desa Sukaresmi,Kec, Cikarang Selatan Bekasi 17550 |
| Laboratory | : | Eurofins KCTL Co.,Ltd. |
| Address | : | 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea |
| Accreditations | : | FCC Site Designation No: KR0040, FCC Site Registration No: 687132<br>VCCI Registration No. : R-20080, G-20078, C-20059, T-20056<br>CAB Identifier: KR0040, ISED Number: 8035A<br>KOLAS No.: KT231 |

# 2. Device information

| | | |
|---|---|---|
| Equipment under test | : | V4 HUB |
| Model | : | GP-AEOHUBV4US |
| Derivative Model for FCC | : | IM6001-V4P01, IM6001-V4P02, IM6001-V4P03, IM6001-V4P04, IM6001-V4P05, IM6001-V4P06, IM6001-V4P07, IM6001-V4P08, IM6001-V4P09, IM6001-V4P10, GP-AEOHUBV4EU, GP-AEOHUBV4EU1, GP-AEOHUBV4EU2, GP-AEOHUBV4EU3, GP-AEOHUBV4EU4, GP-AEOHUBV4EU5, GP-AEOHUBV4EU6, GP-AEOHUBV4EU7, GP-AEOHUBV4EU8, GP-AEOHUBV4EU9, GP-AEOHUBV4EU10, GP-AEOHUBV4US1, GP-AEOHUBV4US2, GP-AEOHUBV4US3, GP-AEOHUBV4US4, GP-AEOHUBV4US5, GP-AEOHUBV4US6, GP-AEOHUBV4US7, GP-AEOHUBV4US8, GP-AEOHUBV4US9, GP-AEOHUBV4US10, GP-AEOHUBV4AN, GP-AEOHUBV4CN |
| Modulation technique | : | WLAN(802.11b/g/n)_DSSS, OFDM |
| Number of channels | : | 11 ch (20 ㎒), 7 ch (40 ㎒) |
| Power source | : | DC 5 V |
| Antenna type | : | SMD Antenna |
| Antenna gain | : | 2.4 ㎓ band : 3.77 dBi |
| Frequency range | : | 2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20)<br>2 422 ㎒ ~ 2 452 ㎒ (802.11n_HT40) |
| Software version | : | V1.0 |
| Hardware version | : | V1.0 |
| Test device serial No. | : | Conducted : 503200012<br>Radiated : 503200014 |
| Operation temperature | : | 0 ℃ ~ 40 ℃ |

## 2.1. Information about derivative model

The difference between basic model and alternative model is as below.

| | Derivative Model Name | Information |
|---|---|---|
| FCC | IM6001-V4P01, IM6001-V4P02, IM6001-V4P03, IM6001-V4P04, IM6001-V4P05, IM6001-V4P06, IM6001-V4P07, IM6001-V4P08, IM6001-V4P09, IM6001-V4P10, GP-AEOHUBV4EU, GP-AEOHUBV4EU1, GP-AEOHUBV4EU2, GP-AEOHUBV4EU3, GP-AEOHUBV4EU4, GP-AEOHUBV4EU5, GP-AEOHUBV4EU6, GP-AEOHUBV4EU7, GP-AEOHUBV4EU8, GP-AEOHUBV4EU9, GP-AEOHUBV4EU10, GP-AEOHUBV4US1, GP-AEOHUBV4US2, GP-AEOHUBV4US3, GP-AEOHUBV4US4, GP-AEOHUBV4US5, GP-AEOHUBV4US6, GP-AEOHUBV4US7, GP-AEOHUBV4US8, GP-AEOHUBV4US9, GP-AEOHUBV4US10, GP-AEOHUBV4AN, GP-AEOHUBV4CN | Marketing and External casing difference |

## 2.2. Frequency/channel operations

This device contains the following capabilities:
WLAN 2.4 ㎓_802.11b/g/n(HT20/40)

| Ch. | Frequency (㎒) |
|---|---|
| 01 | 2 412 |
| . . | . . |
| 06 | 2 437 |
| . . | . . |
| 11 | 2 462 |

Table 2.2.1. WLAN 2.4 ㎓(802.11b/g/n HT20)

| Ch. | Frequency (㎒) |
|---|---|
| 03 | 2 422 |
| . . | . . |
| 07 | 2 437 |
| . . | . . |
| 09 | 2 452 |

Table 2.2.2. WLAN 2.4 ㎓(802.11n HT40)

## 2.3. RF power setting in TEST SW

| Test Program | Test mode |
|---|---|
| Qualcomm QRCT v4.1 | 802.11b/g/n_HT20/40 |

| Mode | Frequency [㎒] | RF Power setting value |
|---|---|---|
| 802.11b | 2 412 | 15 |
| | 2 437 | |
| | 2 462 | |
| 802.11g | 2 412 | 16 |
| | 2 437 | |
| | 2 462 | |
| 802.11n_HT20 | 2 412 | 16 |
| | 2 437 | |
| | 2 462 | |
| 802.11n_HT40 | 2 422 | 14 |
| | 2 437 | |
| | 2 452 | |

## 2.4. Simultaneously transmission condition

| Item | Technology | Test Mode | Frequency [㎒] |
|---|---|---|---|
| **Case 1** | Thread | CH26 | 2 480 |
| | Bluetooth Low Energy | 1 Mbps | 2 480 |
| **Case 2** | Thread | CH26 | 2 480 |
| | WLAN 2.4 ㎓ | 802.11n HT40 | 2 422 |
| **Case 3** | Thread | CH26 | 2 480 |
| | WLAN 5 ㎓ | 802.11ac VHT20 | 5 180 |

**Notes.**
Simultaneous condition was performed as a worst case which is configured as a combination of lowest margin for each mode during radiated spurious emission.

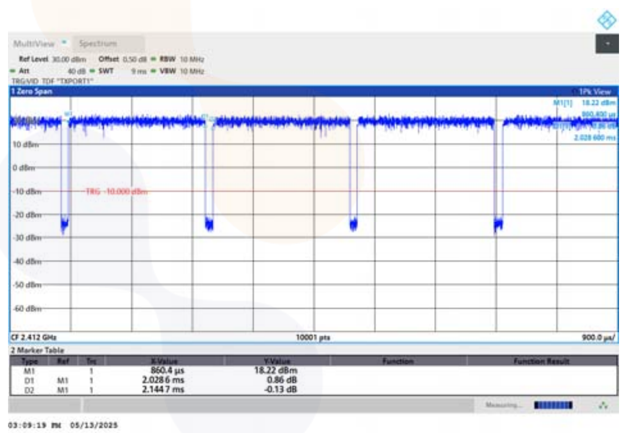
## 2.5. Duty Cycle Factor

| Test mode | Period (㎳) | $T_{On}$ time (㎳) | Duty cycle | | Duty Cycle Factor (dB) |
| --- | --- | --- | --- | --- | --- |
| | | | (Linear) | (%) | |
| 802.11b | 12.318 | 12.208 | 0.991 1 | 99.11 | 0.04 |
| 802.11g | 2.145 | 2.029 | 0.945 9 | 94.59 | 0.24 |
| 802.11n_HT20 | 2.005 | 1.889 | 0.942 1 | 94.21 | 0.26 |
| 802.11n_HT40 | 1.035 | 0.929 | 0.897 5 | 89.75 | 0.47 |

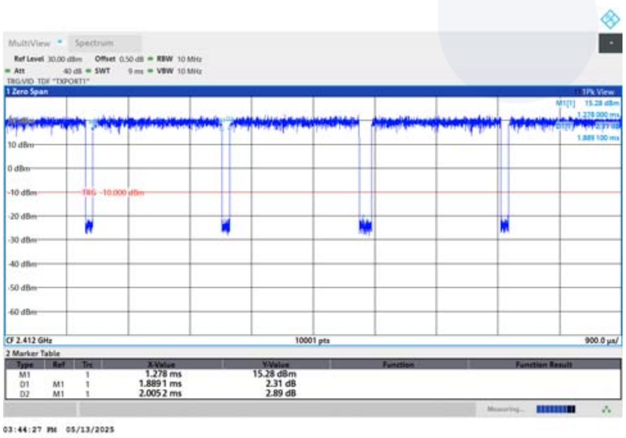
**Notes:**
1. Duty cycle (Linear) = $T_{On}$ time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if the duty cycle is more than 98%

**802.11b**

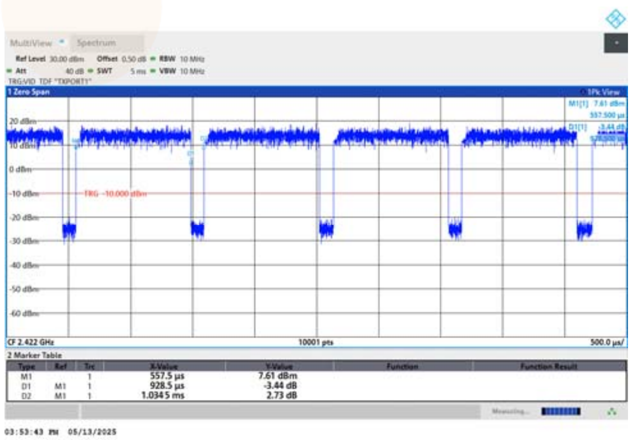
**802.11g**



**802.11n_HT20**



**802.11n_HT40**



# 3. Antenna requirement

**Requirement of FCC part section 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.

**Requirement of RSS-Gen Section 6.8:**

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.
For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).
When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached SMD antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247.

# 4. Summary of tests

| FCC Part section(s) | IC Rule Reference | Parameter | Test Condition | Test results |
|---|---|---|---|---|
| 15.247(b)(3) | RSS-247 (5.4)(d) | Maximum peak output power | Conducted | Pass |
| 15.247(e) | RSS-247 (5.2)(b) | Peak power spectral density | | Pass |
| 15.247(a)(2) | RSS-247 (5.2)(a) | 6 dB channel bandwidth | | Pass |
| - | RSS-Gen (6.7) | Occupied Bandwidth | | Pass |
| 15.207(a) | RSS-Gen (8.8) | AC Conducted Emissions | | Pass |
| 15.247(d) | RSS-247 (5.5) | Conducted Spurious Emissions | | Pass |
| 15.205(a), 15.209(a) | RSS-Gen (8.9), (8.10) | Spurious emission | Radiated | Pass |
| | | Band-edge, restricted band | | Pass |

**Notes:**

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. EUT was investigated in three orthogonal orientations X, Y and Z. it was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation.
4. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 558074 D01 v05r02
   - KDB 662911 D01 v02r01
5. The worst-case data rate were:
   802.11b mode: 1Mbps
   802.11g mode: 6Mbps
   802.11n_HT20 mode: MCS0
   802.11n_HT40 mode: MCS0
6. For Simultaneous radiated spurious emission, please refer to thread test report(KR25-SRF0110).

# 5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of *k*=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the $U_{CISPR}$ measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

| Parameter | Expanded uncertainty (±) | |
|---|---|---|
| Maximum Peak Output Power | 0.9 ㏈ | |
| Peak Power Spectral Density | 1.0 ㏈ | |
| 6 ㏈ Channel Bandwidth | 0.1 % | |
| Occupied Bandwidth | 0.1 % | |
| Conducted spurious emission | 2.0 ㏈ | |
| Radiated spurious Emissions (Bandedge, restricted band) | Below 30 ㎒ | 2.3 ㏈ |
| | 30 ㎒ to 1 000 ㎒ | 2.6 ㏈ |
| | 1 000 ㎒ to 18 000 ㎒ | 4.8 ㏈ |
| | Above 18 000 ㎒ | 4.8 ㏈ |
| Conducted Emissions | 150 ㎑ to 30 ㎒ | 2.9 ㏈ |

# 6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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.

| Frequency (㎒) | Factor(㏈) | Frequency (㎒) | Factor(㏈) |
|---|---|---|---|
| 30 | 9.78 | 9 000 | 12.26 |
| 50 | 9.86 | 10 000 | 12.35 |
| 100 | 9.98 | 11 000 | 12.52 |
| 200 | 10.15 | 12 000 | 12.49 |
| 300 | 10.26 | 13 000 | 12.57 |
| 400 | 10.41 | 14 000 | 12.68 |
| 500 | 10.45 | 15 000 | 12.73 |
| 600 | 10.58 | 16 000 | 12.79 |
| 700 | 10.68 | 17 000 | 12.81 |
| 800 | 10.75 | 18 000 | 13.04 |
| 900 | 10.82 | 19 000 | 13.05 |
| 1 000 | 10.86 | 20 000 | 13.29 |
| 2 000 | 11.41 | 21 000 | 13.23 |
| 3 000 | 11.74 | 22 000 | 13.18 |
| 4 000 | 11.94 | 23 000 | 13.42 |
| 5 000 | 12.01 | 24 000 | 13.11 |
| 6 000 | 12.08 | 25 000 | 13.34 |
| 7 000 | 12.29 | 26 000 | 13.51 |
| 8 000 | 12.23 | 26 500 | 13.52 |

**Note :**
Offset(㏈) = RF cable loss(㏈) + Attenuator(㏈)

# 7. Test results

## 7.1. Maximum peak output power

**Test setup**

| | | |
|---|---|---|
| EUT | Attenuator | Power sensor |

**Limit**

**FCC**

According to §15.247(b)(3), For systems using digital modulation in the 902-928 ㎒, 2 400-2 483.5 ㎒, and 5 725-5 850 ㎒ bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**IC**

According to RSS-247 5.4(d), For DTSs employing digital modulation techniques operating in the bands 902-928 ㎒ and 2400-2483.5 ㎒, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

**Test procedure**

ANSI C63.10 - Section 11.9

Used test method is section 11.9.1.3 and 11.9.2.3.1

## Test settings

**General**

Section 15.247 permits the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for demonstrating compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth (see ANSI C63.10 for measurement guidance).

When using a spectrum analyzer or EMI receiver to perform these measurements, it shall be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW to set a bin-to-bin spacing of ≤ RBW/2 so that narrowband signals are not lost between frequency bins.

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level. The intent is to test at 100 % duty cycle; however a small reduction in duty cycle (to no lower than 98 %) is permitted, if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

If continuous transmission (or at least 98 % duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level, with the transmit duration as long as possible, and the duty cycle as high as possible during which sweep triggering/signal gating techniques may be used to perform the measurement over the transmission duration.

### 11.9.1. Maximum peak conducted output power

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

### 11.9.1.2 Integrated band power method

The following procedure can be used when the maximum available RBW of the instrument is less than the DTS bandwidth:

a) Set the RBW = 1 ㎒
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument’s band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

### 11.9.1.3. PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

**11.9.2 Maximum conducted (average) output power**
**11.9.2.2 Measurement using a spectrum analyzer (SA)**
**11.9.2.2.2 Method AVGSA-1**

Method AVGSA-1 uses trace averaging with the EUT transmitting at full power throughout each sweep.
The procedure for this method is as follows:

a) Set span to at least 1.5 times the OBW.
b) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ [3 × RBW].
d) Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto.
f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
g) If transmit duty cycle < 98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the 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%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
h) Trace average at least 100 traces in power averaging (rms) mode.
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

**11.9.2.3.1. Measurement using a power meter (PM)**

Method AVGPM is a measurement using an RF average power meter, as follows:

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
   1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
   2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
   3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
b) If the transmitter does not transmit continuously, measure the duty cycle, D, of the transmitter output signal as described in 11.6.
c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
d) Adjust the measurement in dBm by adding [10 log(1/D)], where D is the duty cycle

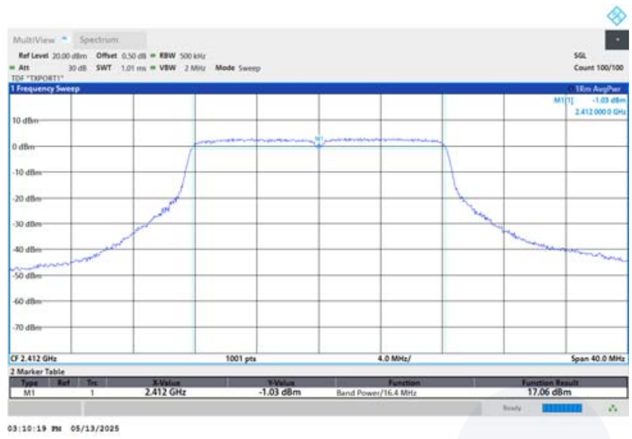
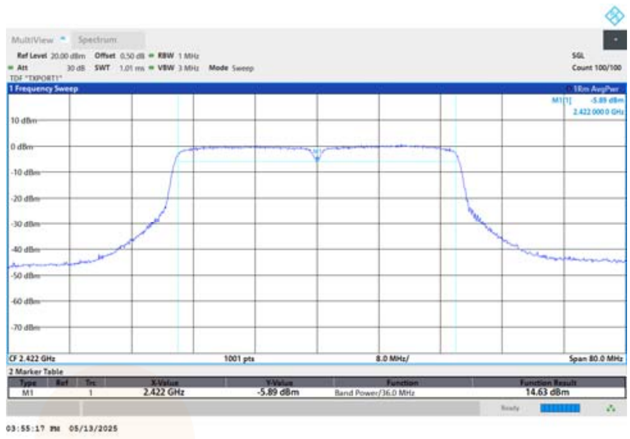
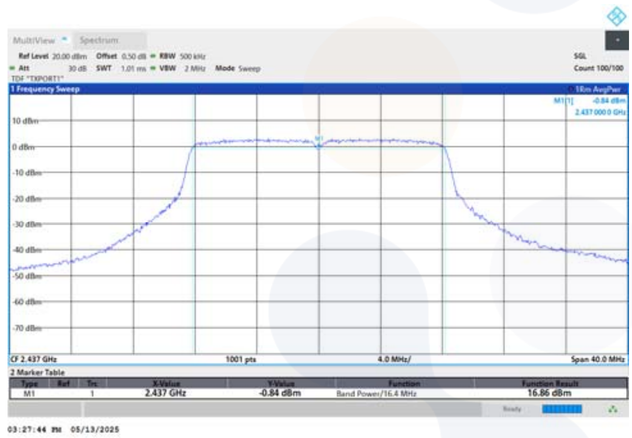
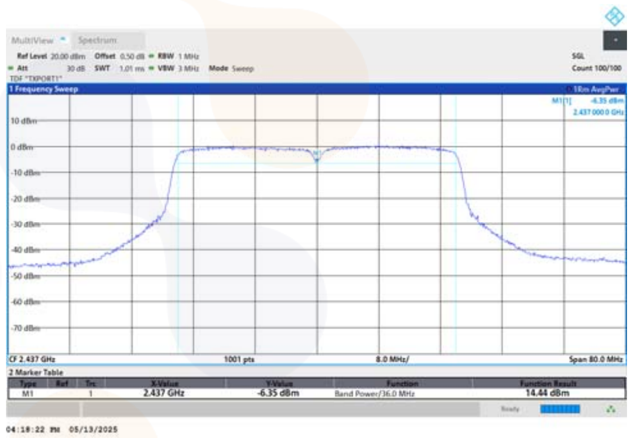
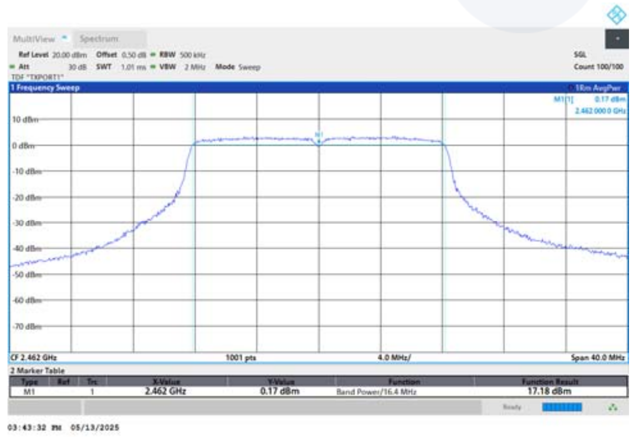
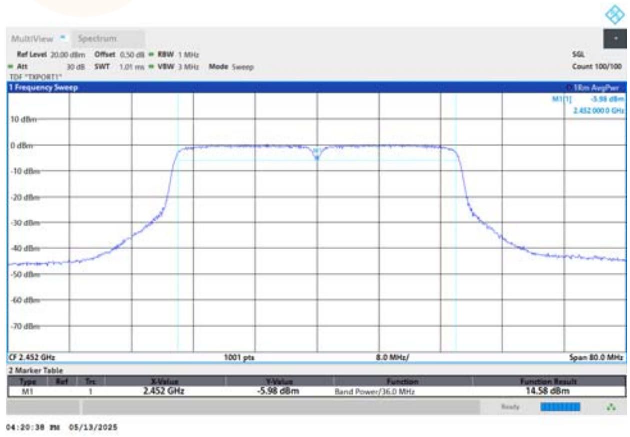
## Test results

| Test mode | Frequency (㎒) | Measured output power | | | | | | Max. e.i.r.p Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| | | Conducted Output Power (dBm) | | Limit (dBm) | ANT Gain (dBi) | Max. e.i.r.p (dBm) | | |
| | | Peak | Average | | | Peak | Average | |
| 802.11b | 2 412 | 19.15 | 16.11 | 30.00 | 3.77 | 22.92 | 19.88 | 36.02 |
| | 2 437 | 19.20 | 16.12 | | | 22.97 | 19.89 | |
| | 2 462 | 19.42 | 16.34 | | | 23.19 | 20.11 | |
| 802.11g | 2 412 | 25.55 | **17.30** | | | 29.32 | 21.07 | |
| | 2 437 | 25.61 | **17.10** | | | 29.38 | 20.87 | |
| | 2 462 | 25.79 | **17.42** | | | 29.56 | 21.19 | |
| 802.11n HT20 | 2 412 | 25.42 | 17.10 | | | 29.19 | 20.87 | |
| | 2 437 | 25.44 | 17.08 | | | 29.21 | 20.85 | |
| | 2 462 | 25.61 | 17.21 | | | 29.38 | 20.98 | |
| 802.11n HT40 | 2 422 | 23.54 | **15.10** | | | 27.31 | 18.87 | |
| | 2 437 | 23.60 | **14.91** | | | 27.37 | 18.68 | |
| | 2 452 | 23.69 | **15.05** | | | 27.46 | 18.82 | |

**Notes:**

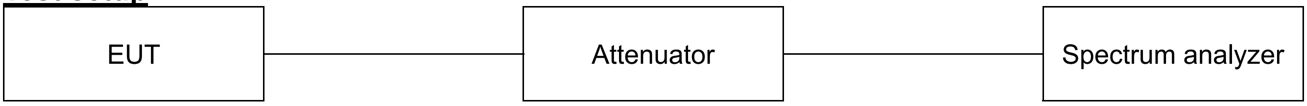
1. Average conducted output power (dBm) = Reading value of average power (dBm) + D.C.F (dB)
2. E.I.R.P. Calculation: E.I.R.P. (dBm) = Conducted output power (dBm) + Antenna gain (dBi)

**In order to simplify the report, attached plots were the worst case per bandwidth**

| 802.11g / Low ch. | 802.11n HT40 / Low ch. |
|---|---|
|  |  |
| **802.11g / Mid ch.** | **802.11n HT40 / Mid ch.** |
|  |  |
| **802.11g / High ch.** | **802.11n HT40 / High ch.** |
|  |  |

## 7.2. Peak Power Spectral Density

**Test setup**




**Limit**

According to §15.247(e) and RSS-247(5.2), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 ㏈m in any 3 ㎑ band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

**Test procedure**

ANSI C63.10 - Section 11.10.2

**Test settings**

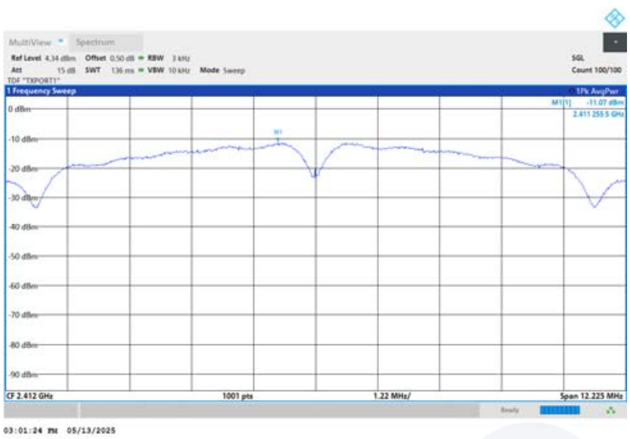
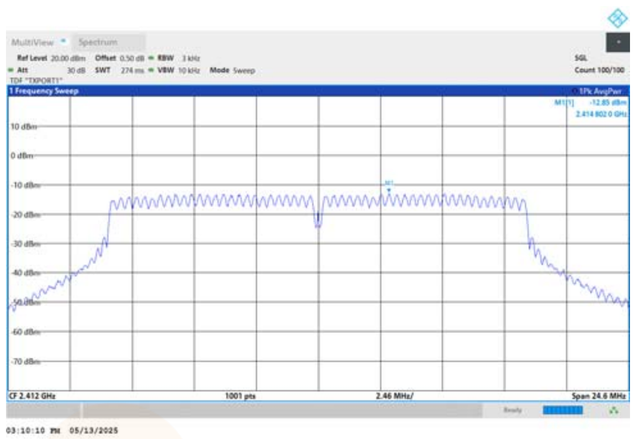
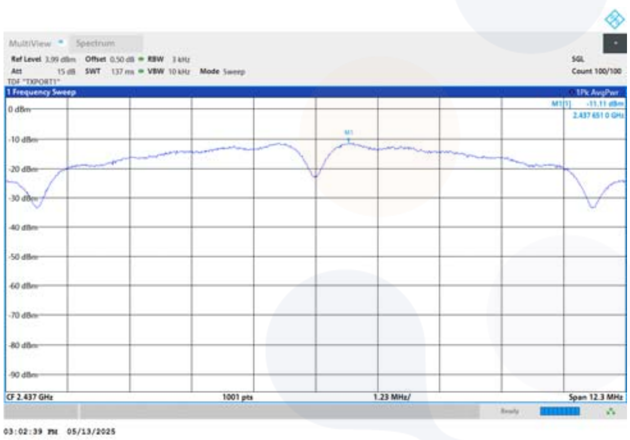
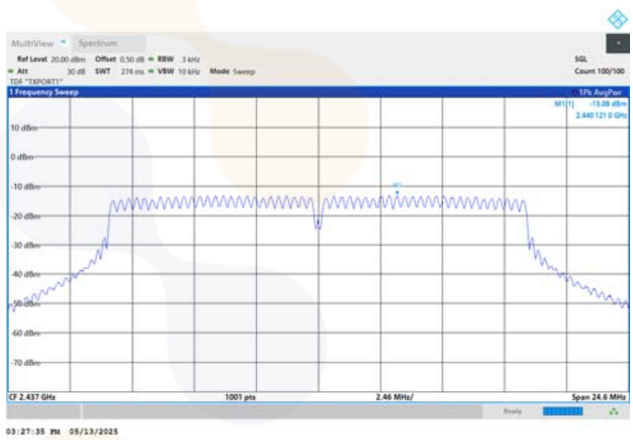
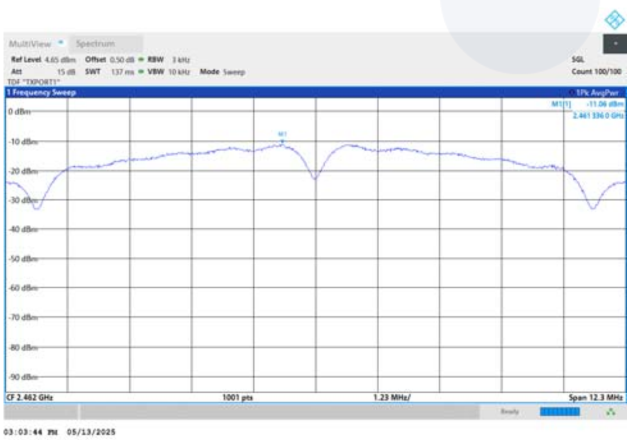
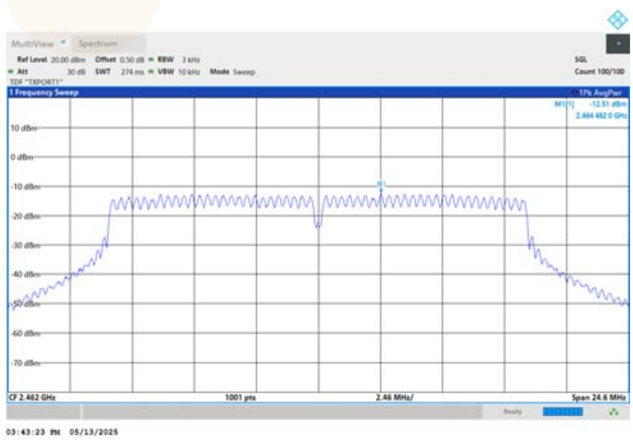
Method PKPSD (peak PSD)

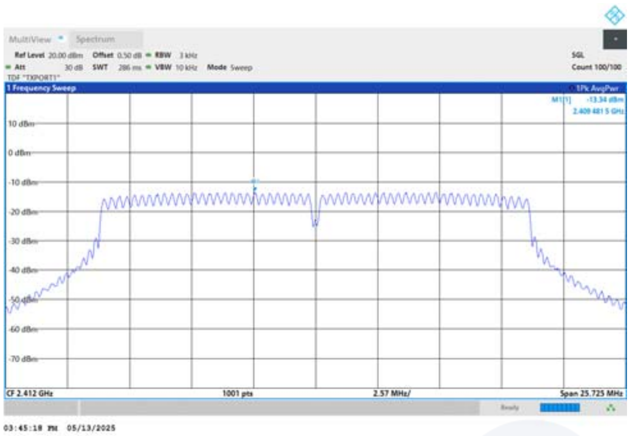
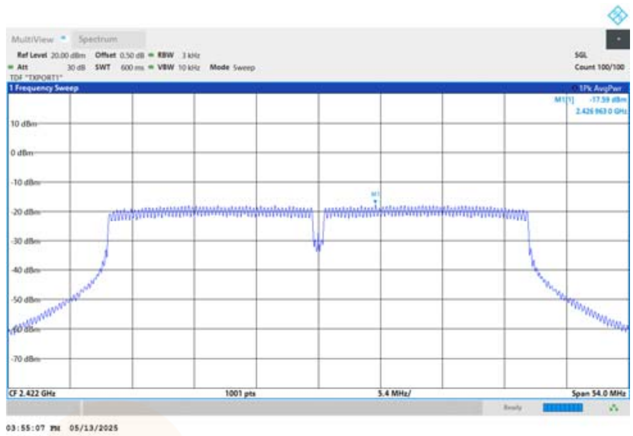
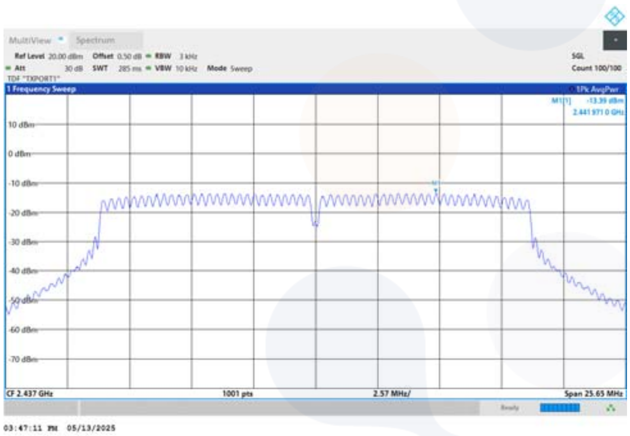
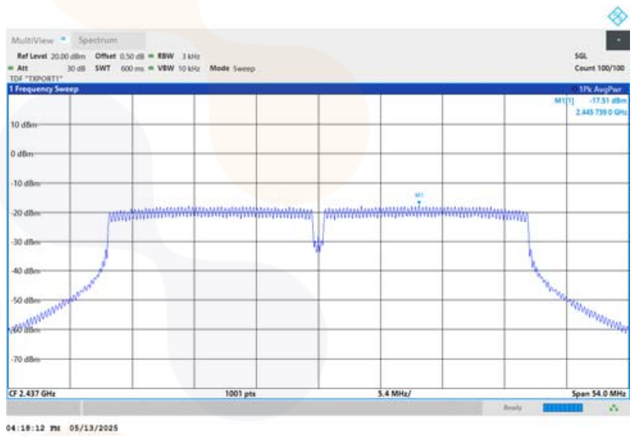
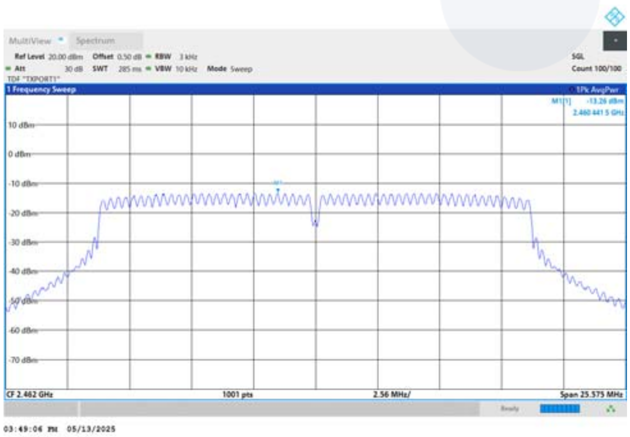
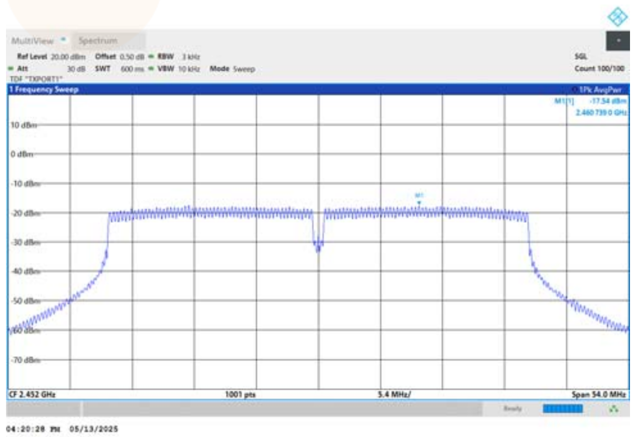
The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

1) Set analyzer center frequency to DTS channel center frequency.
2) Set the span to 1.5 times the DTS bandwidth.
3) Set the RBW to: 3 ㎑ ≤ RBW ≤ 100 ㎑.
4) Set the VBW ≥ 3 x RBW.
5) Detector = peak.
6) Sweep time = auto couple.
7) Trace mode = max hold.
8) Allow trace to fully stabilize.
9) Use the peak marker function to determine the maximum amplitude level within the RBW.
10) If measured value exceeds limit, reduce RBW (no less than 3 ㎑) and repeat.

**Test results**

| Test mode | Frequency (㎒) | Result (㏈m/ 3㎑) | Limit (㏈m/ 3㎑) |
|---|---|---|---|
| 802.11b | 2 412 | -11.07 | 8.00 |
| | 2 437 | -11.11 | |
| | 2 462 | -11.06 | |
| 802.11g | 2 412 | -12.85 | |
| | 2 437 | -13.08 | |
| | 2 462 | -12.51 | |
| 802.11n HT20 | 2 412 | -13.34 | |
| | 2 437 | -13.39 | |
| | 2 462 | -13.26 | |
| 802.11n HT40 | 2 422 | -17.59 | |
| | 2 437 | -17.51 | |
| | 2 452 | -17.54 | |

| 802.11b / 2 412 ㎒ | 802.11g / 2 412 ㎒ |
| --- | --- |
|  |  |
| **802.11b / 2 437 ㎒** | **802.11g / 2 437 ㎒** |
|  |  |
| **802.11b / 2 462 ㎒** | **802.11g / 2 462 ㎒** |
|  |  |

| 802.11n HT20 / 2 412 ㎒ | 802.11n HT40 / 2 422 ㎒ |
| --- | --- |
|   |   |
| **802.11n HT20 / 2 437 ㎒** | **802.11n HT40 / 2 437 ㎒** |
|   |   |
| **802.11n HT20 / 2 462 ㎒** | **802.11n HT40 / 2 452 ㎒** |
|   |   |

## 7.3. 6 ㏈ Bandwidth(DTS Channel Bandwidth) & 99% Bandwidth

**Test setup**


**Limit**

According to §15.247(a)(2) and RSS-247(5.2), Systems using digital modulation techniques may operate in the 902–928 ㎒, 2 400–2 483.5 ㎒, and 5 725–5 850 ㎒ bands. The minimum 6 ㏈ bandwidth shall be at least 500 ㎑.

**Test procedure**

ANSI C63.10 - Section 11.8.2

**Test settings**

**DTS bandwidth**

One of the following procedures may be used to determine the modulated DTS bandwidth.

**Option 1**

1) Set RBW = 100 ㎑.
2) Set the video bandwidth (VBW) ≥ 3 x RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) Sweep = auto couple.
6) Allow the trace to stabilize.
7) 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 6 ㏈ relative to the maximum level measured in the fundamental emission.

**Option 2**

The automatic bandwidth measurement capability of an instrument may be employed using the X ㏈ bandwidth mode with X set to 6 ㏈, if the functionality described in 11.8.1 (i.e., RBW = 100 ㎑, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 ㏈.

**Occupied bandwidth (or 99% emission bandwidth)**

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emissions skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted

**Notes:** it may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms, The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

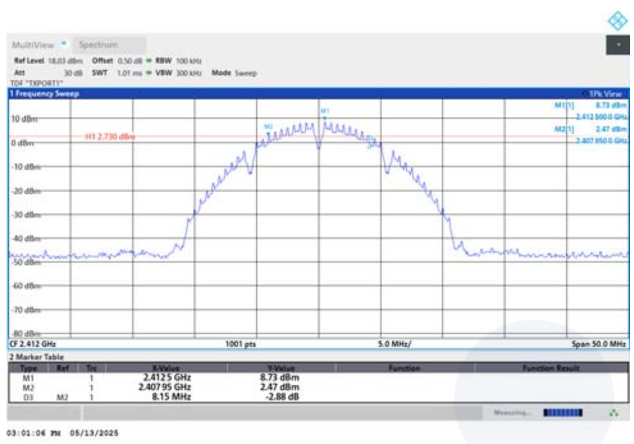
**Test results**

| Test mode | Frequency(㎒) | 6 ㏈ Bandwidth(㎒) | 99% Bandwidth(㎒) | Limit (㎒) |
|---|---|---|---|---|
| 802.11b | 2 412 | 8.150 | 13.054 | 0.500 |
| | 2 437 | 8.200 | 13.074 | |
| | 2 462 | 8.200 | 13.081 | |
| 802.11g | 2 412 | 16.400 | 16.549 | |
| | 2 437 | 16.400 | 16.558 | |
| | 2 462 | 16.400 | 16.559 | |
| 802.11n HT20 | 2 412 | 17.150 | 17.670 | |
| | 2 437 | 17.100 | 17.654 | |
| | 2 462 | 17.050 | 17.654 | |
| 802.11n HT40 | 2 422 | 36.000 | 36.271 | |
| | 2 437 | 36.000 | 36.303 | |
| | 2 452 | 36.000 | 36.334 | |

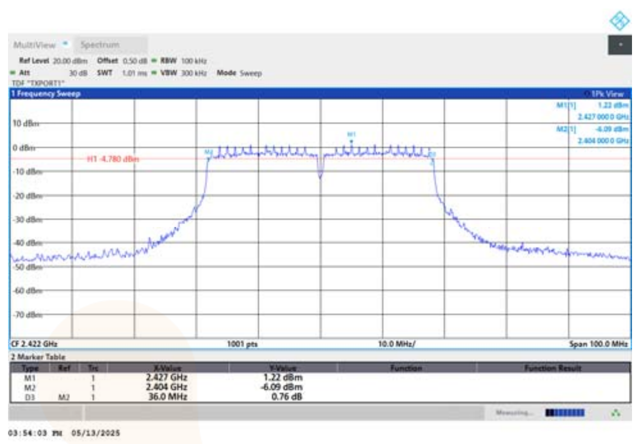
**In order to simplify the report, attached plots were the worst case per channel.**

**6 ㏈ Bandwidth**

**802.11b / 2 412 ㎒**

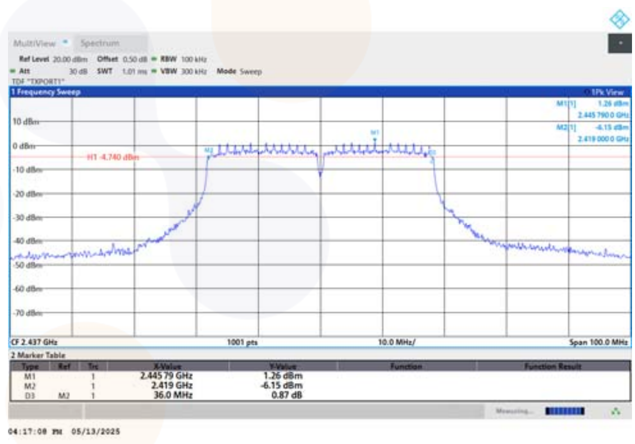



**802.11n HT40 / 2 422 ㎒**

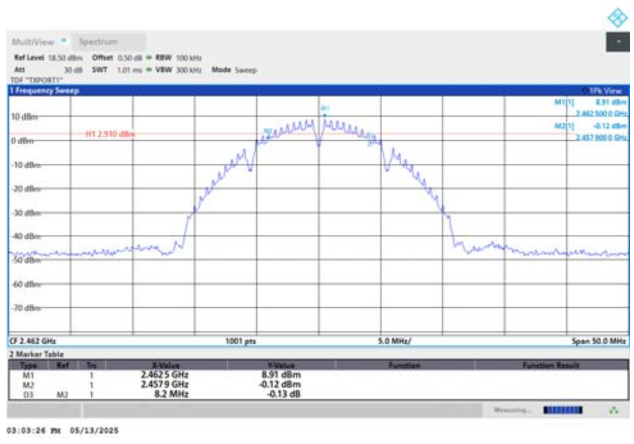



**802.11b / 2 437 ㎒**

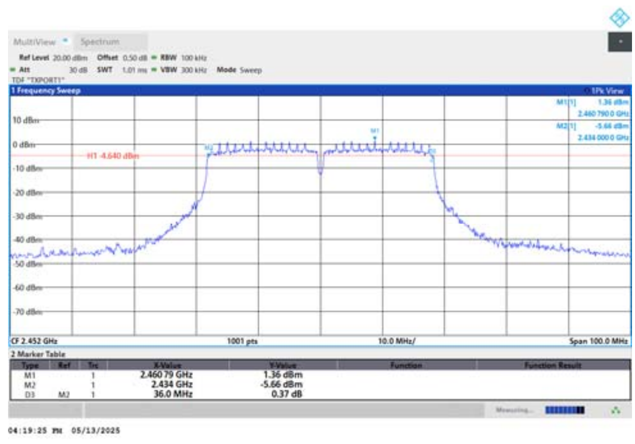

**802.11n HT40 / 2 437 ㎒**




**802.11b / 2 462 ㎒**

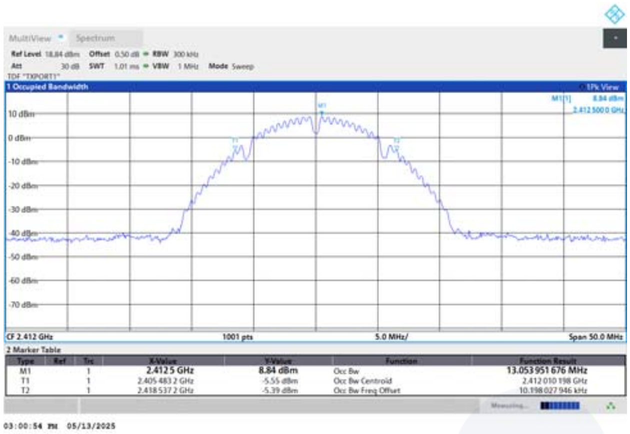



**802.11n HT40 / 2 452 ㎒**

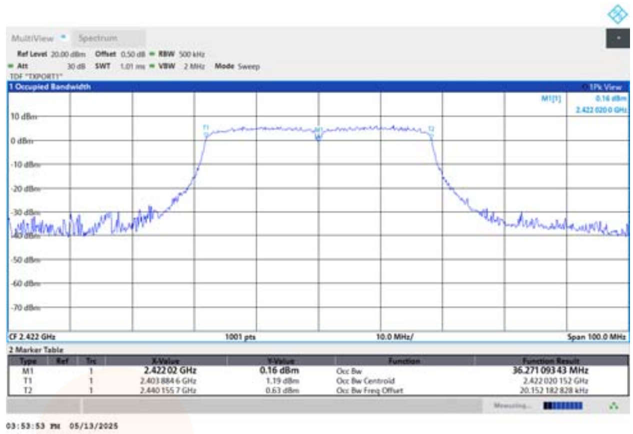


**99% Bandwidth**

**802.11b / 2 412 ㎒**

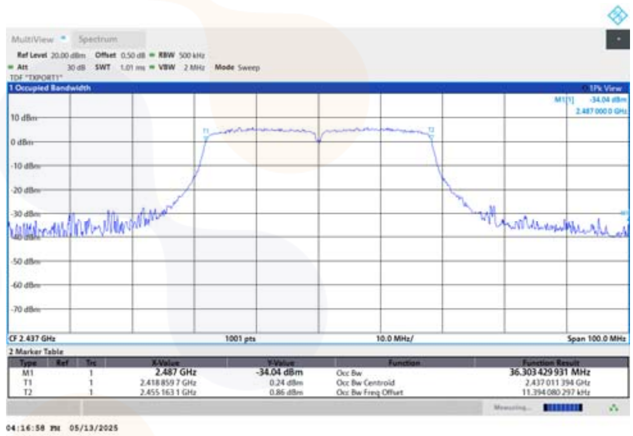



**802.11n HT40 / 2 422 ㎒**



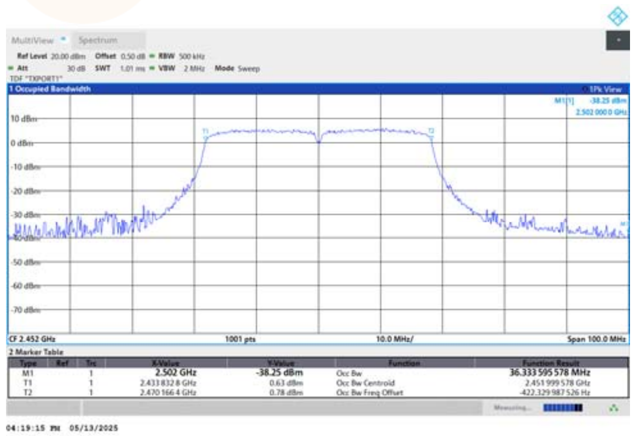

**802.11b / 2 437 ㎒**


**802.11n HT40 / 2 437 ㎒**




**802.11b / 2 462 ㎒**

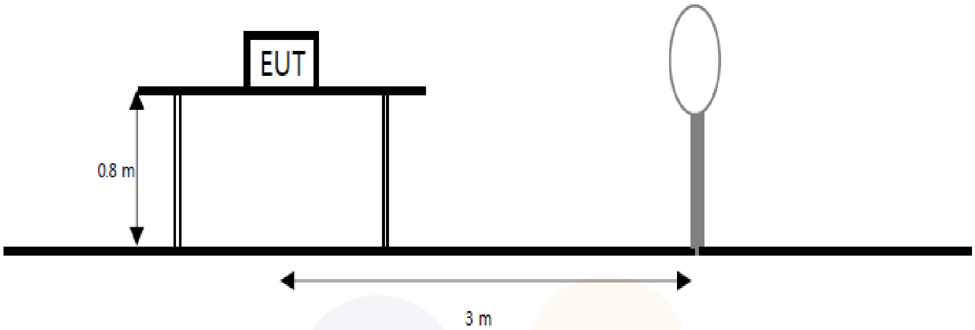

**802.11n HT40 / 2 452 ㎒**



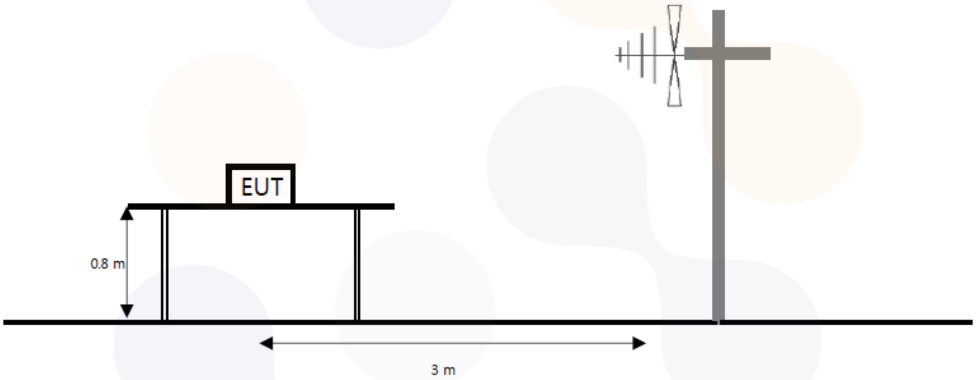
## 7.4. Spurious Emission, Band Edge and Restricted bands

**Test setup**

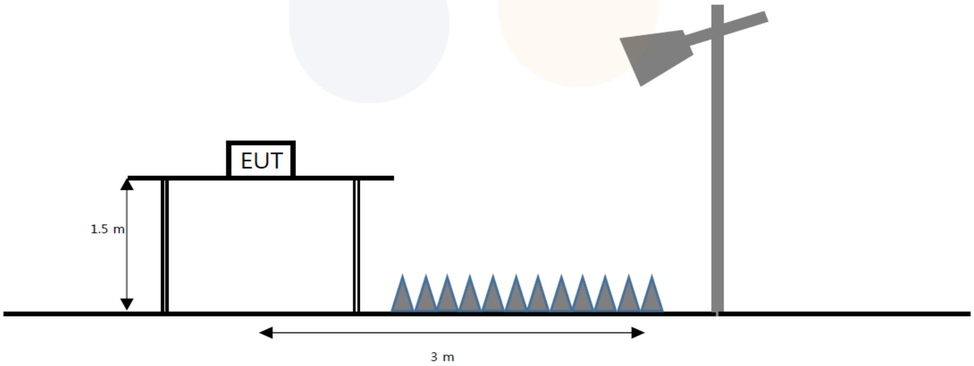
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions




The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



**Limit**

**FCC**

According to section 15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (㎒) | Field strength (㎶/m) | Measurement distance (m) |
|---|---|---|
| 0.009 - 0.490 | 2 400/F(㎑) | 300 |
| 0.490 - 1.705 | 24 000/F(㎑) | 30 |
| 1.705 - 30 | 30 | 30 |
| 30 - 88 | 100** | 3 |
| 88 - 216 | 150** | 3 |
| 216 - 960 | 200** | 3 |
| Above 960 | 500 | 3 |

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

According to section 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

| ㎒ | ㎒ | ㎒ | ㎓ |
|---|---|---|---|
| 0.009 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| 0.495 - 0.505 | 16.694 75 - 16.695 25 | 608 - 614 | 5.35 - 5.46 |
| 2.173 5 - 2.190 5 | 16.804 25 - 16.804 75 | 960 – 1 240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1 300 – 1 427 | 8.025 - 8.5 |
| 4.177 25 - 4.177 75 | 37.5 - 38.25 | 1 435 – 1 626.5 | 9.0 - 9.2 |
| 4.207 25 - 4.207 75 | 73 - 74.6 | 1 645.5 – 1 646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1 660 – 1 710 | 10.6 - 12.7 |
| 6.267 75 - 6.268 25 | 108 - 121.94 | 1 718.8 – 1 722.2 | 13.25 - 13.4 |
| 6.311 75 - 6.312 25 | 123 - 138 | 2 200 – 2 300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2 310 – 2 390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.524 75 - 156.525 | 2 483.5 – 2 500 | 17.7 - 21.4 |
| 8.376 25 - 8.386 75 | 25 | 2 690 – 2 900 | 22.01 - 23.12 |
| 8.414 25 - 8.414 75 | 156.7 - 156.9 | 3 260 – 3 267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 162.012 5 - 167.17 | 3 332 – 3 339 | 31.2 - 31.8 |
| 12.519 75 - 12.520 25 | 167.72 - 173.2 | 3 345.8 – 3 358 | 36.43 - 36.5 |
| 12.576 75 - 12.577 25 | 240 - 285 | 3 600 – 4 400 | Above 38.6 |
| 13.36 - 13.41 | 322 - 335.4 | | |

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 ㎒, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 ㎒, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

**IC**

According to RSS-247(5.5), In any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen(8.9), Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

**Table 5- General field strength limits at frequencies above 30 ㎒**

| Frequency(㎒) | Field strength (㎶/m at 3 m) |
|---|---|
| 30 to 88 | 100 |
| 88 to 216 | 150 |
| 216 to 960 | 200 |
| Above 960 | 500 |

**Table 6- General field strength limits at frequencies below 30 ㎒**

| Frequency | Magnetic field strength (H-Field) (㎂/m) | Measurement distance(m) |
|---|---|---|
| 9 – 490 ㎑ 1) | 6.37/F (F in ㎑) | 300 |
| 490 – 1705 ㎑ | 63.7/F (F in ㎑) | 30 |
| 1.705 - 30 ㎒ | 0.08 | 30 |

**Note 1:** The emission limits for the ranges 9-90 ㎑ and 110-490 ㎑ are based on measurements employing a linear average detector.

According to RSS-Gen(8.10), Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

**Table 7- Restricted frequency bands***

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

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

**Test procedure**
ANSI C63.10-2013

**Test settings**
**Peak field strength measurements**
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW ≥ (3×RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

**Table. RBW as a function of frequency**

| Frequency | RBW |
|---|---|
| 9 ㎑ to 150 ㎑ | 200 ㎐ to 300 ㎐ |
| 0.15 ㎒ to 30 ㎒ | 9 ㎑ to 10 ㎑ |
| 30 ㎒ to 1 000 ㎒ | 100 ㎑ to 120 ㎑ |
| > 1 000 ㎒ | 1 ㎒ |

**Average field strength measurements**

**Trace averaging with continuous EUT transmission at full power**

If the EUT can be configured or modified to transmit continuously (D ≥ 98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):
1. RBW = 1 ㎒ (unless otherwise specified).
2. VBW ≥ (3×RBW).
3. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
4. Averaging type = power (i.e., rms):
   1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode to use linear voltage averaging. Log or ㏈ averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

**Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction**

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:
1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 ㎒ (unless otherwise specified).
4. VBW ≥ [3 × RBW].
5. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
6. Averaging type = power (i.e., rms):

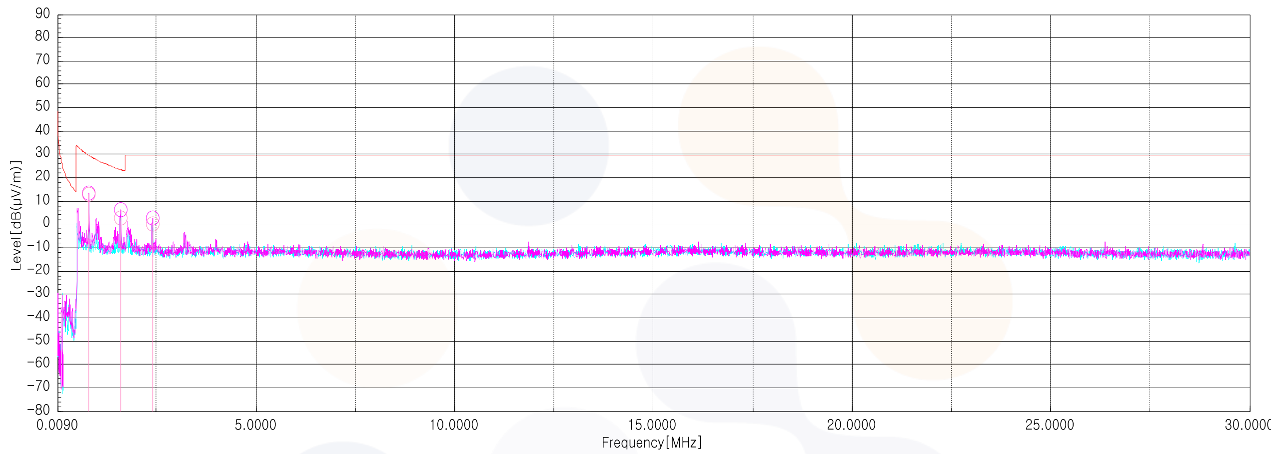
   1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode to use linear voltage averaging. Log or ㏈ averaging shall not be used.
7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
   1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
   2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
   3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

**Notes:**
1. *f* <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/D_s)$
   *f* ≥30 ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m/D_s)$
   Where:
   $F_d$= Distance factor in ㏈
   $D_m$= Measurement distance in meters
   $D_s$= Specification distance in meters
2. Factors(㏈) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈) + or $F_d$(㏈)
3. The worst-case emissions are reported however emissions whose levels were not within 20 ㏈ of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. [1)] means restricted band.
6. Above 1 ㎓ the worst results between two antenna polarizations (H and V) were documented in the test report.
7. Below 30 ㎒ frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 ㏈ of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 ㏈ of the limit.”
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X ㎑ resulted in a level of Y ㏈㎶/m, which is equivalent to Y - 51.5 = Z ㏈㎂/m, which has the same margin, W ㏈, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.
9. In SISO mode, we tested both Ant 1 and Ant 2, but attached only the data of ANT 2 with the highest conducted output power to simplify the report.

### Test results (Below 30 ㎒) – Worst case: 802.11g / 2 462 ㎒

| Frequency | Pol. | Reading | Antenna Factor | Amp. + Cable | DCF | Result | Limit | Margin |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| Quasi peak data | | | | | | | | |
| 0.80 | H | 65.70 | 19.96 | -32.92 | 40.00 | 12.74 | 29.54 | 16.80 |
| 1.60 | H | 55.00 | 20.03 | -32.85 | 40.00 | 2.18 | 23.52 | 21.34 |
| 2.41 | H | 52.80 | 20.07 | -32.79 | 40.00 | 0.08 | 29.54 | 29.46 |

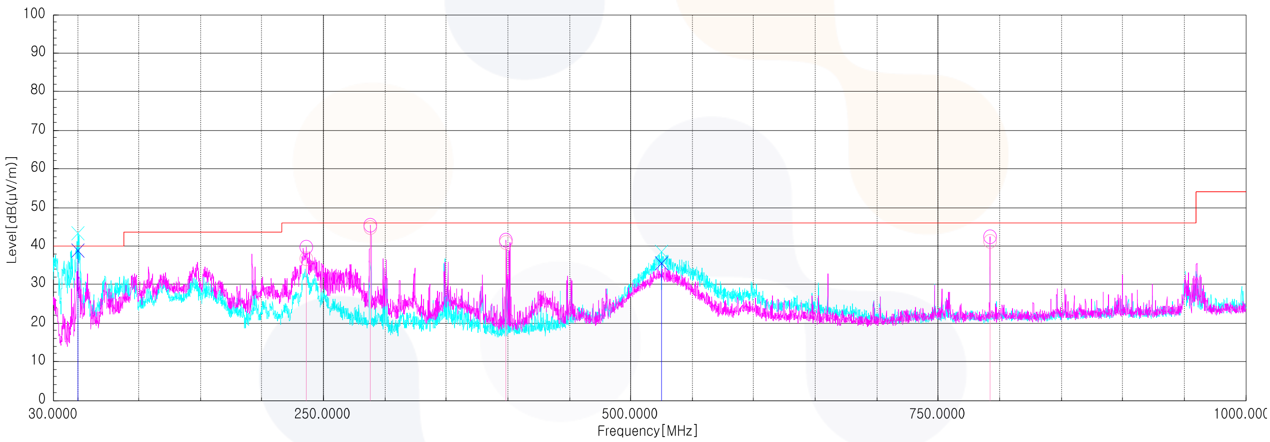
**Horizontal/Vertical**



**Test results (Below 1 000 ㎒) – Worst case: 802.11g / 2 462 ㎒**

| Frequency | Pol. | Reading | Antenna Factor | Amp. + Cable | DCF | Result | Limit | Margin |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Quasi peak data** | | | | | | | | |
| 50.73 | V | 56.90 | 13.76 | -31.99 | - | 38.67 | 40.00 | 1.33 |
| 235.88 | H | 51.30 | 16.69 | -31.29 | - | 36.70 | 46.02 | 9.32 |
| 288.14 | H | 57.00 | 18.90 | -31.16 | - | 44.74 | 46.02 | 1.28 |
| 398.36 | H | 50.70 | 21.42 | -31.09 | - | 41.03 | 46.02 | 4.99 |
| 524.94 | V | 43.10 | 23.30 | -30.90 | - | 35.50 | 46.02 | 10.52 |
| 792.06 | H | 45.60 | 25.80 | -30.23 | - | 41.17 | 46.02 | 4.85 |

**Horizontal/Vertical**

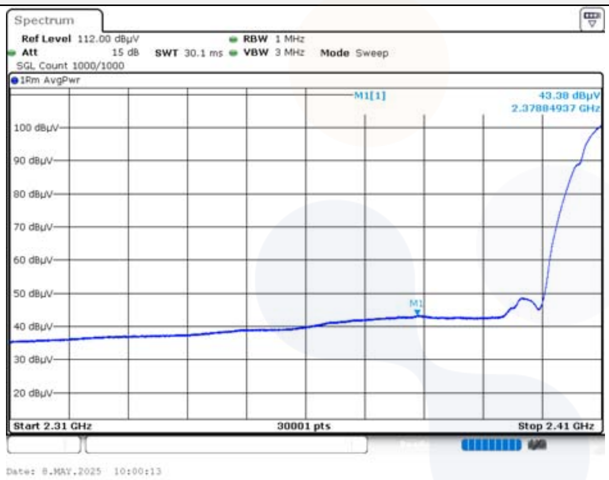


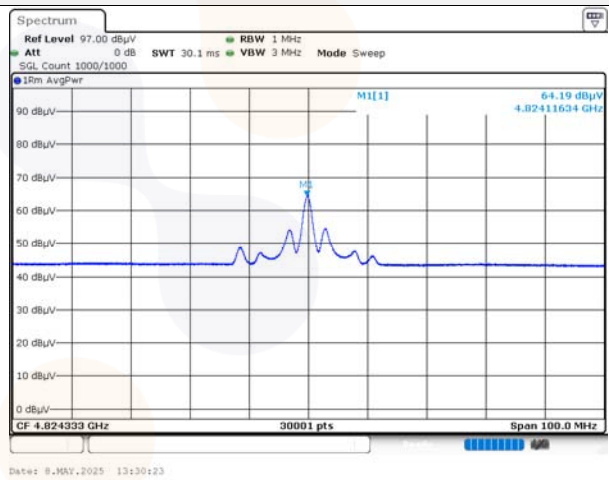
## Test results (Above 1 000 ㎒)

**802.11b_2 412 ㎒**

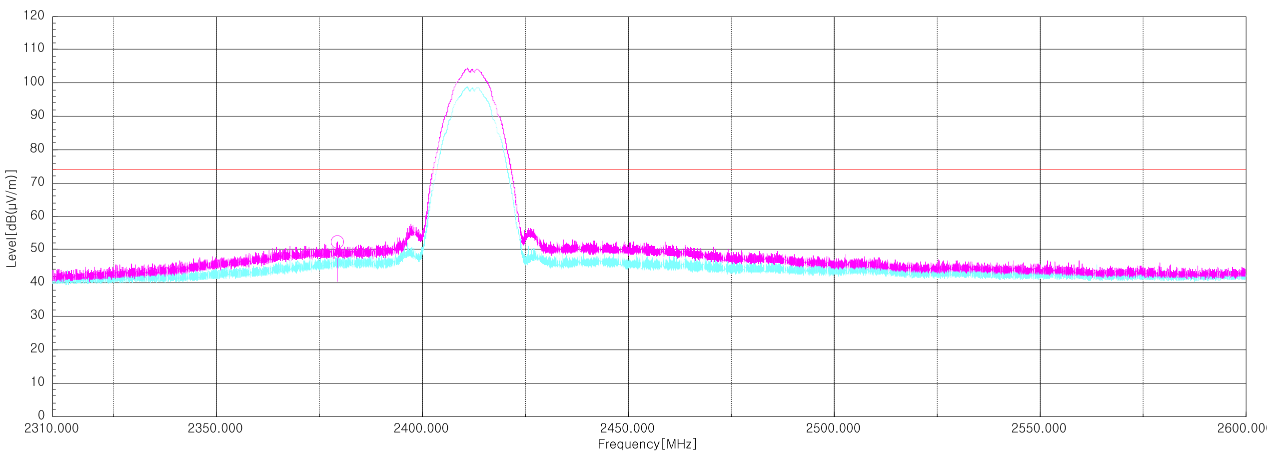
| Frequency | Pol. | Reading | Ant. Factor | Amp. + Cable | DCF | Result | Limit | Margin |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Peak data** | | | | | | | | |
| 2 378.85[1)] | H | 55.20 | 27.19 | -30.06 | - | 52.33 | 74.00 | 21.67 |
| 1 138.42[1)] | V | 69.50 | 25.20 | -48.01 | - | 46.69 | 74.00 | 27.31 |
| 1 329.83[1)] | V | 66.30 | 25.60 | -47.85 | - | 44.05 | 74.00 | 29.95 |
| 4 824.12[1)] | V | 66.10 | 32.34 | -45.70 | - | 52.74 | 74.00 | 21.26 |
| 7 237.13 | H | 54.60 | 37.15 | -43.77 | - | 47.98 | 68.20 | 20.22 |
| **Average Data** | | | | | | | | |
| 2 378.85[1)] | H | 43.38 | 27.19 | -30.06 | - | 40.51 | 54.00 | 13.49 |
| 4 824.12[1)] | V | 64.19 | 32.34 | -45.70 | - | 50.83 | 54.00 | 3.17 |

### Average data

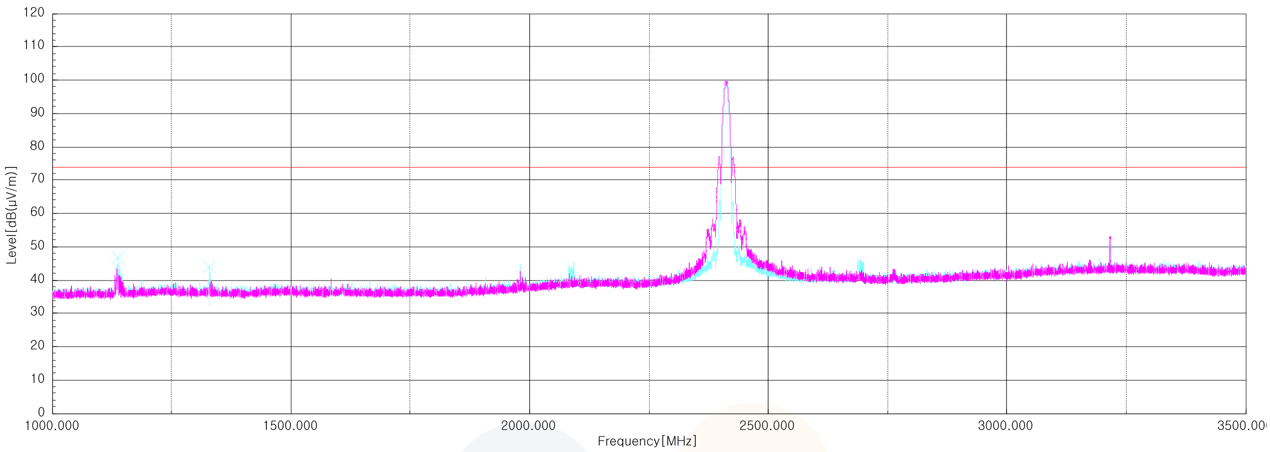


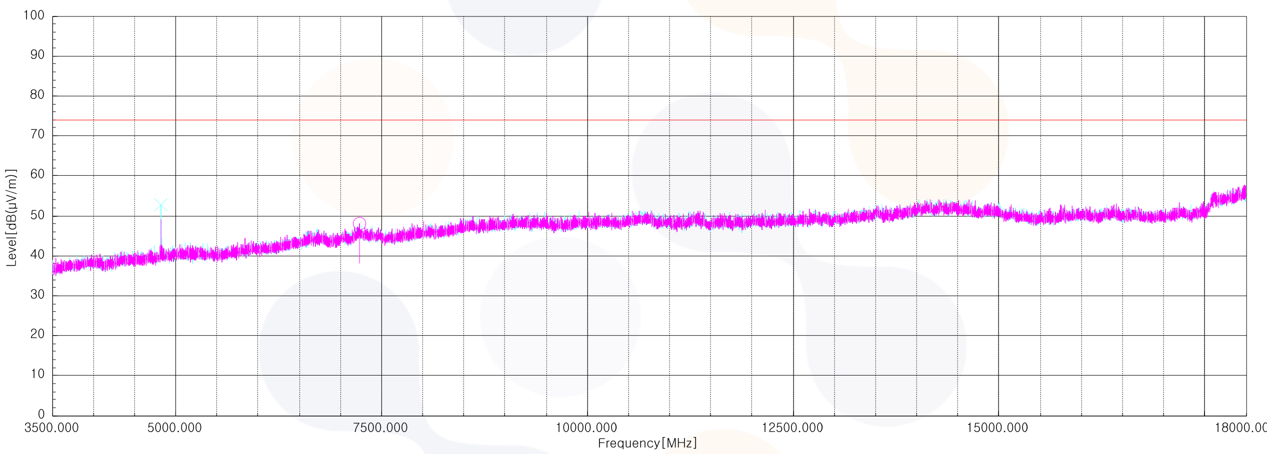

### Horizontal/Vertical for Band-edge



| Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓ |
|---|

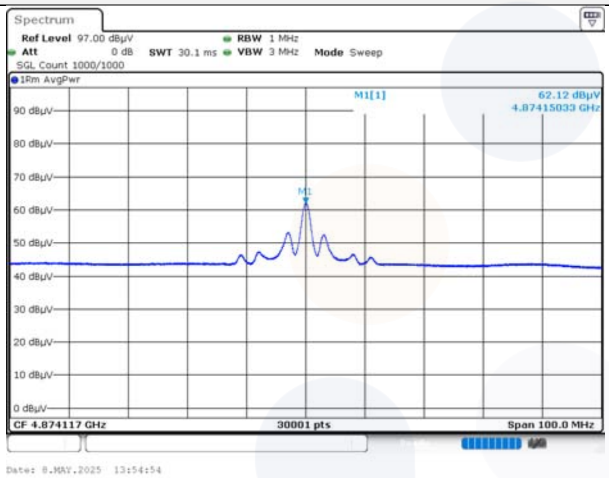



| Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓ |
|---|

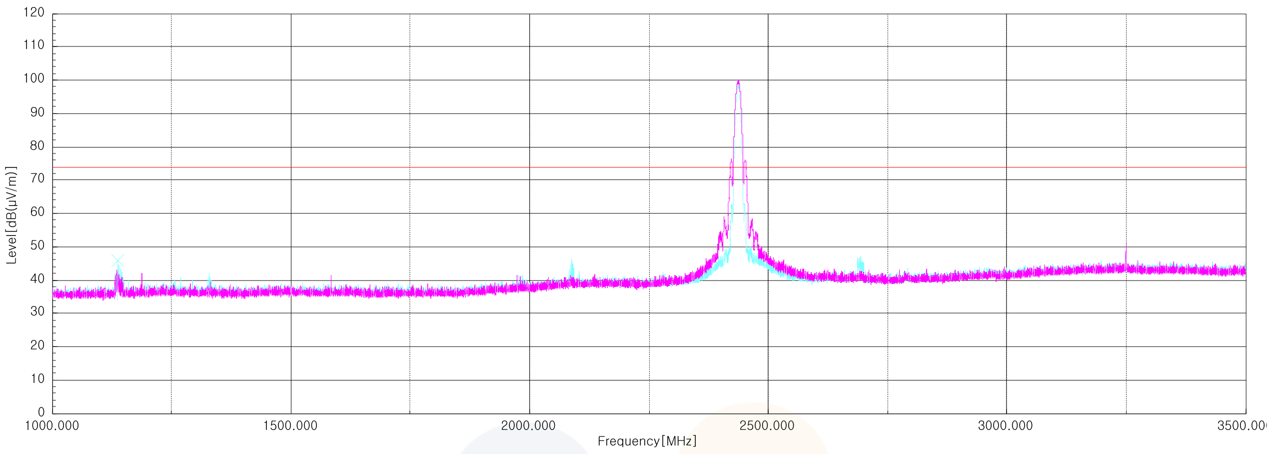


**802.11b_2 437 ㎒**

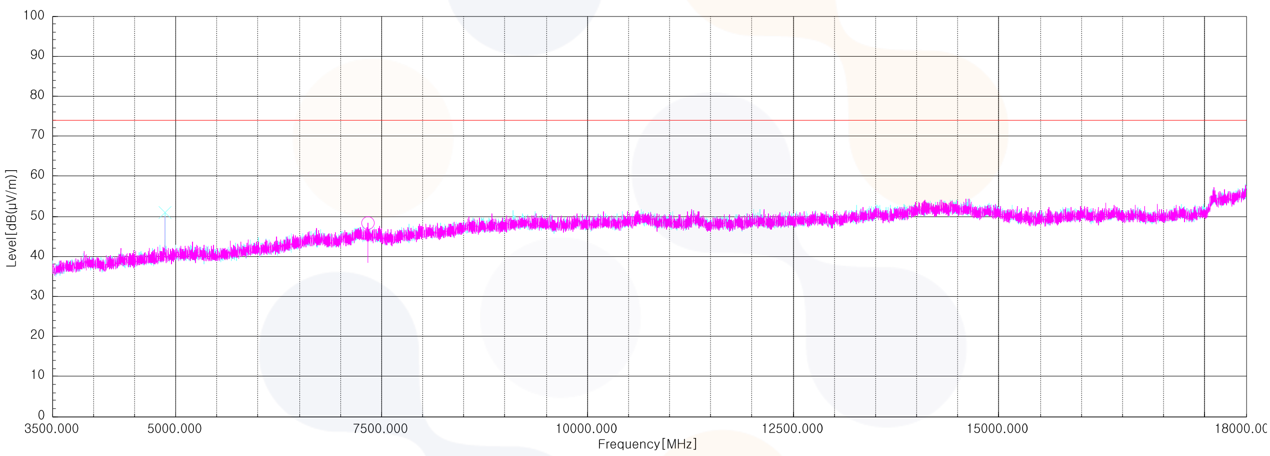
| Frequency | Pol. | Reading | Ant. Factor | Amp. + Cable | DCF | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| s(㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Peak data** | | | | | | | | |
| 1 138.33[1)] | V | 68.70 | 25.20 | -48.01 | - | 45.89 | 74.00 | 28.11 |
| 4 874.15[1)] | V | 63.90 | 32.64 | -45.46 | - | 51.08 | 74.00 | 22.92 |
| 7 333.32[1)] | H | 55.00 | 36.77 | -43.65 | - | 48.12 | 74.00 | 25.88 |
| **Average Data** | | | | | | | | |
| 4 874.15[1)] | V | 62.12 | 32.64 | -45.46 | - | 49.30 | 54.00 | 4.70 |

| Average data | |
|---|---|
|  | Blank |

**Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓**



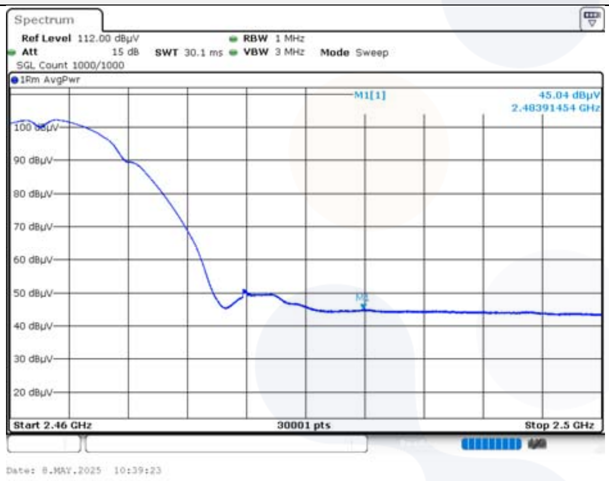

**Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓**

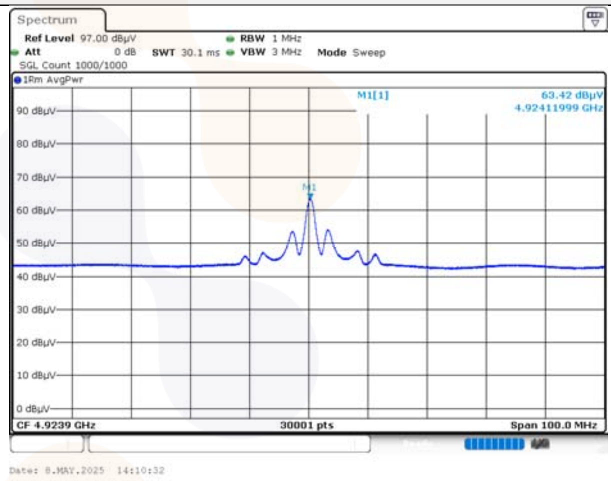


**802.11b_2 462 ㎒**

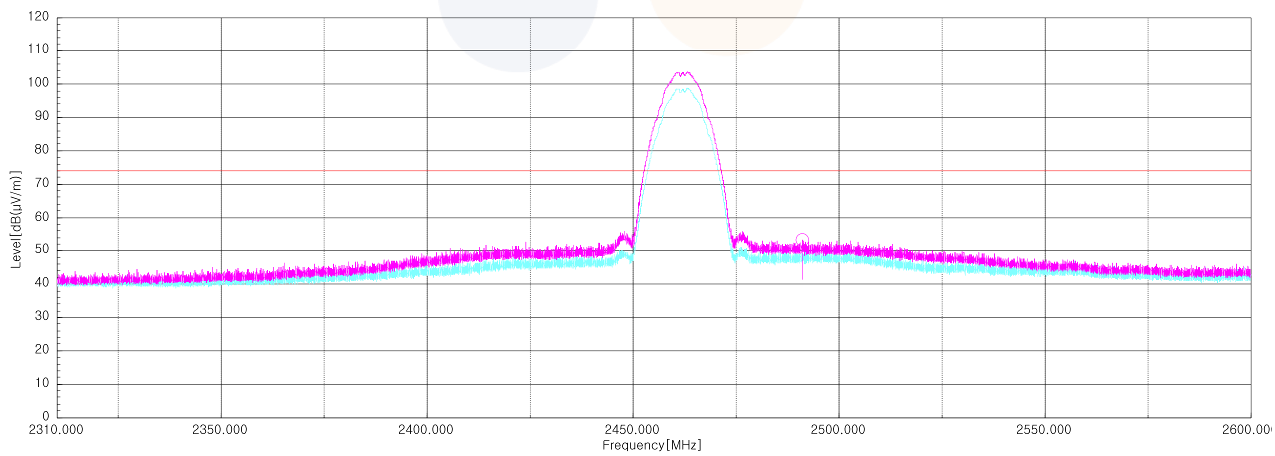
| Frequency | Pol. | Reading | Ant. Factor | Amp. + Cable | DCF | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Peak data** | | | | | | | | |
| 2 483.91[1)] | H | 55.20 | 27.84 | -29.90 | - | 53.14 | 74.00 | 20.86 |
| 1 136.75[1)] | V | 67.40 | 25.20 | -48.01 | - | 44.59 | 74.00 | 29.41 |
| 4 924.12[1)] | V | 64.70 | 32.80 | -45.23 | - | 52.27 | 74.00 | 21.73 |
| 7 410.17[1)] | H | 54.10 | 36.68 | -43.51 | - | 47.27 | 74.00 | 26.73 |
| **Average Data** | | | | | | | | |
| 2 483.91[1)] | H | 45.04 | 27.84 | -29.90 | - | 42.98 | 54.00 | 11.02 |
| 4 924.12[1)] | V | 63.42 | 32.80 | -45.23 | - | 50.99 | 54.00 | 3.01 |

**Average data**

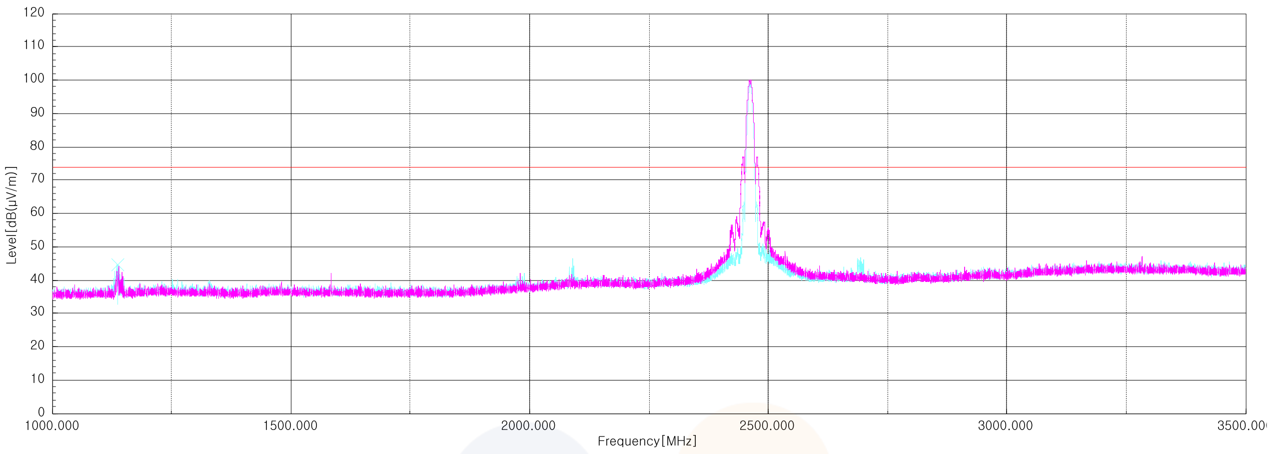


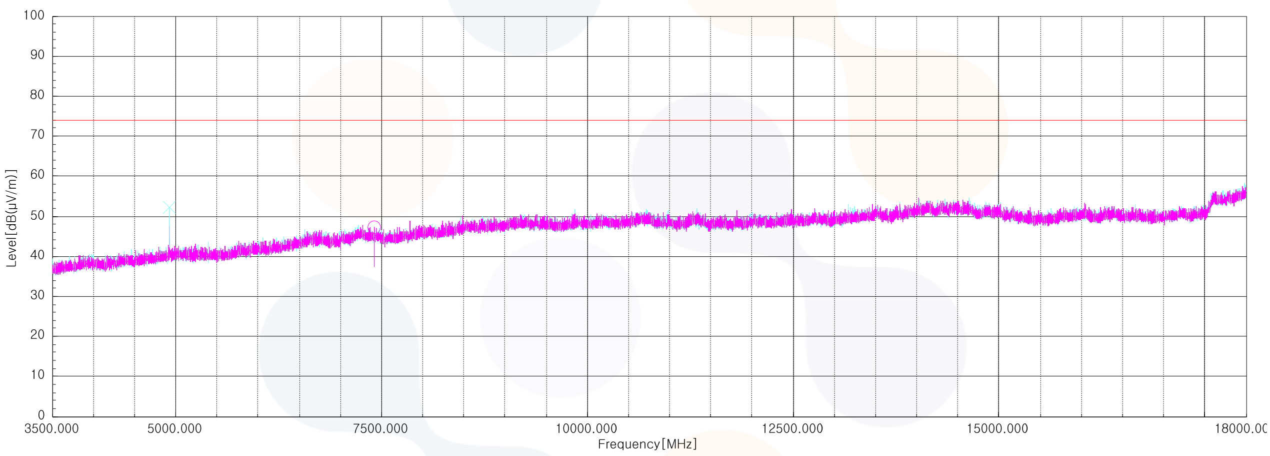

**Horizontal/Vertical for Band-edge**



**Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓**



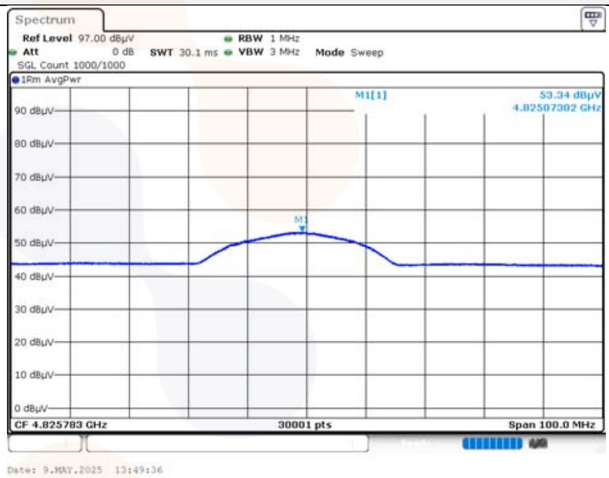

**Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓**



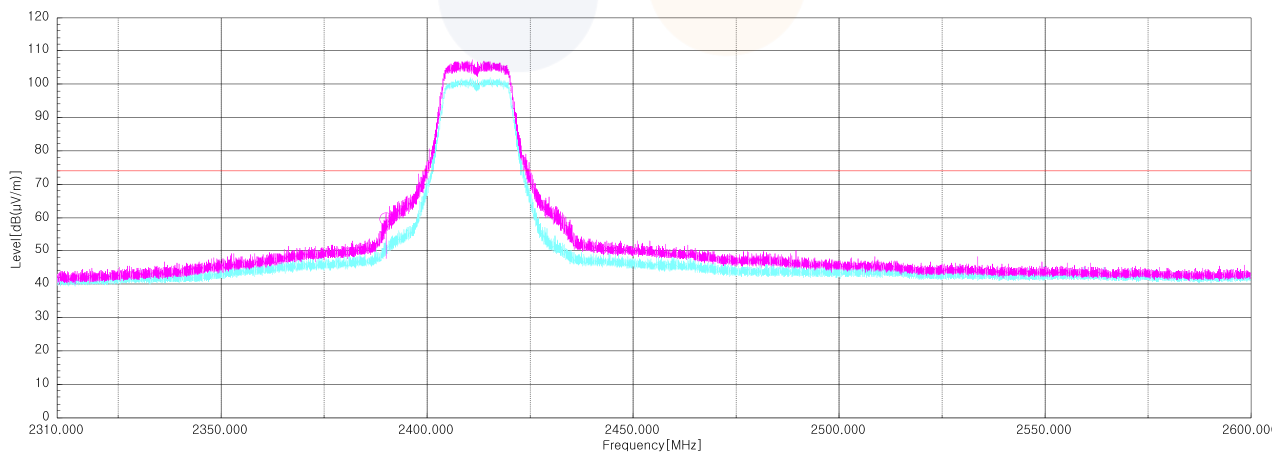
**802.11g_2 412 ㎒**

| Frequency | Pol. | Reading | Ant. Factor | Amp. + Cable | DCF | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Peak data** | | | | | | | | |
| 2 389.97[1)] | H | 62.30 | 27.10 | -30.05 | - | 59.35 | 74.00 | 14.65 |
| 1 135.58[1)] | V | 67.60 | 25.20 | -48.01 | - | 44.79 | 74.00 | 29.21 |
| 4 825.06[1)] | V | 65.30 | 32.35 | -45.69 | - | 51.96 | 74.00 | 22.04 |
| 7 238.58 | H | 54.50 | 37.15 | -43.78 | - | 47.87 | 68.20 | 20.33 |
| **Average Data** | | | | | | | | |
| 2 389.97[1)] | H | 50.55 | 27.10 | -30.05 | - | 47.60 | 54.00 | 6.40 |
| 4 825.07[1)] | V | 53.34 | 32.35 | -45.69 | - | 40.00 | 54.00 | 14.00 |

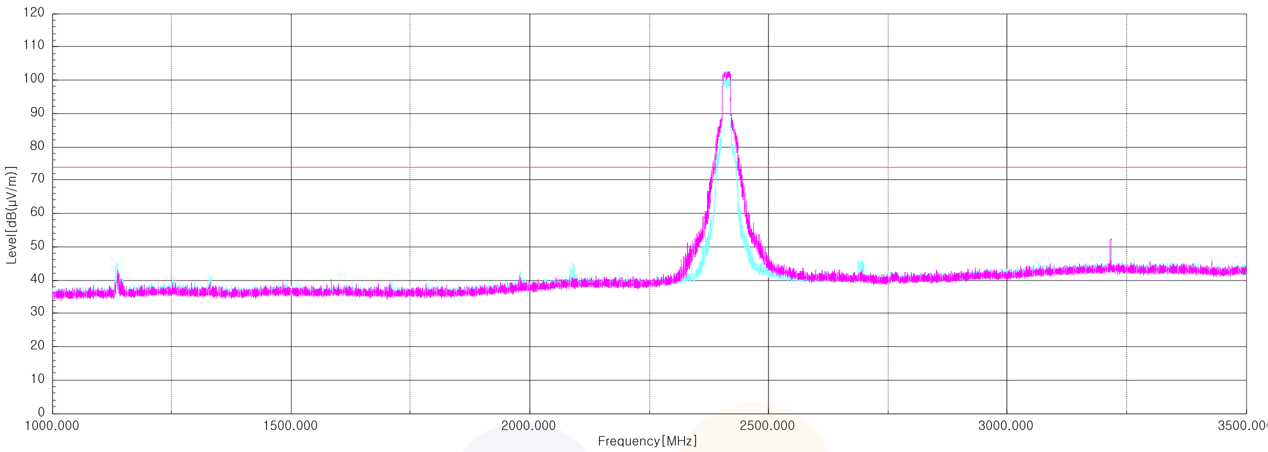
**Average data**

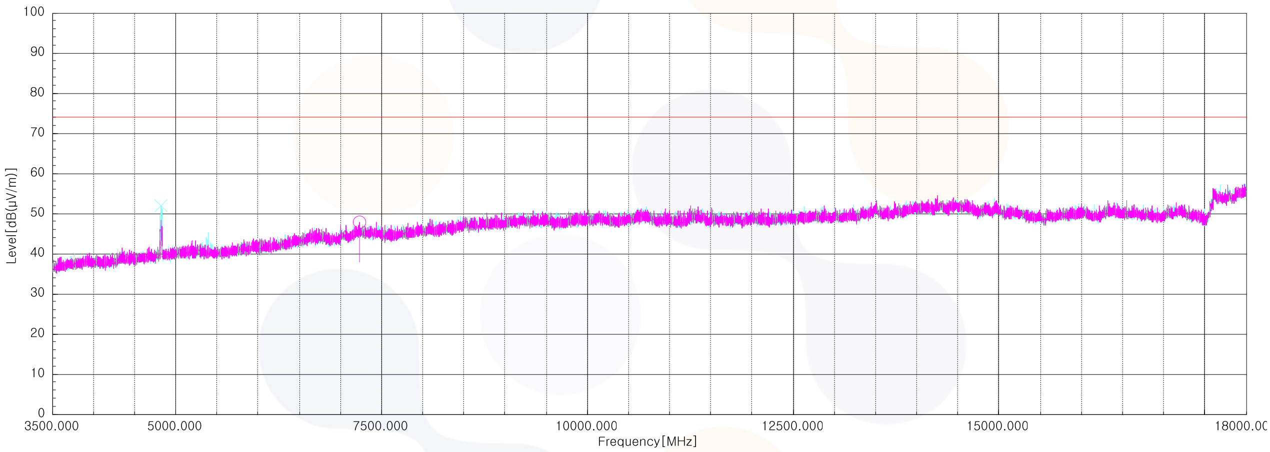

**Horizontal/Vertical for Band-edge**



## Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓

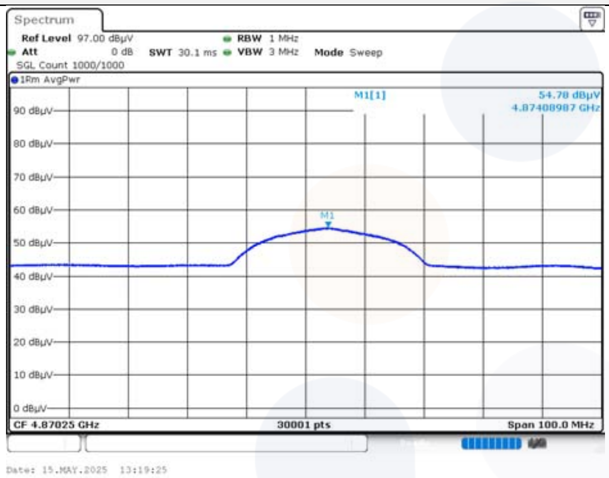



## Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓

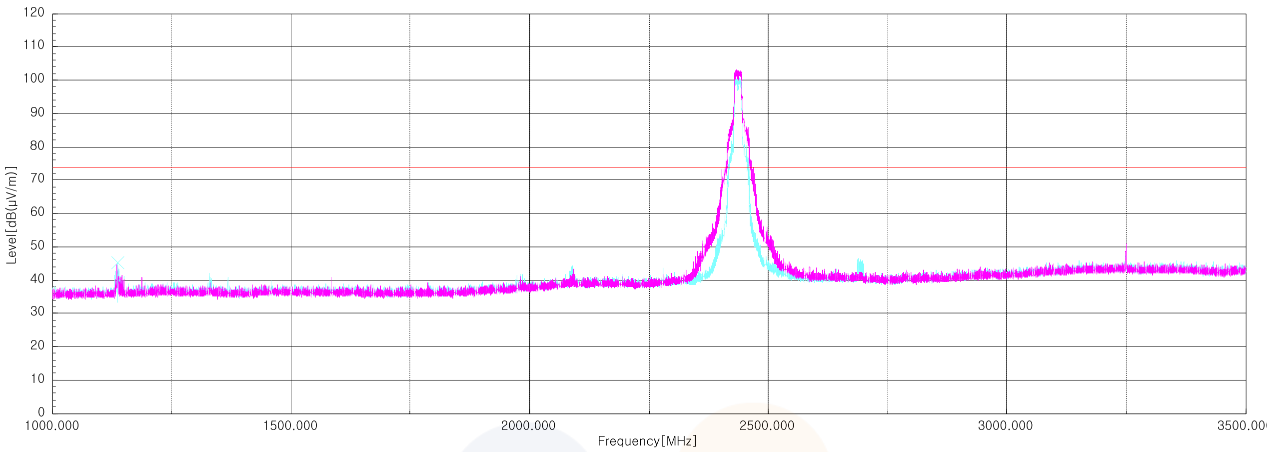


**802.11g_2 437 ㎒**

| Frequency | Pol. | Reading | Ant. Factor | Amp. + Cable | DCF | Result | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| (㎒) | (V/H) | (dB(㎶)) | (dB) | (dB) | (dB) | (dB(㎶/m)) | (dB(㎶/m)) | (dB) |
| **Peak data** | | | | | | | | |
| 1 137.75[1)] | V | 67.90 | 25.20 | -48.01 | - | 45.09 | 74.00 | 28.91 |
| 4 874.09[1)] | V | 64.20 | 32.64 | -45.46 | - | 51.38 | 74.00 | 22.62 |
| 7 284.50[1)] | H | 55.00 | 37.17 | -43.74 | - | 48.43 | 74.00 | 25.57 |
| **Average Data** | | | | | | | | |
| 4 874.09[1)] | V | 54.78 | 32.64 | -45.46 | - | 41.96 | 54.00 | 12.04 |

| Average data | |
|---|---|
|  | Blank |

**Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓**




**Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓**