

FCC Part 15.249

TEST REPORT

For

PENPOWER TECHNOLOGY LTD.

7F, NO.47, Lane 2, Sec.2, Kuang-Fu Rd.,, Hsinchu City, 300 Taiwan

FCC ID: QIC-EZGOW01

| | |
|---|---|
| Report Type: Original Report | Product Type: PenPower EZGoRF Jr. |
| Report Producer : <u>Coco Lin</u> | |
| Report Number : <u>RXZ231003013RF03</u> | |
| Report Date : <u>2024-04-22</u> | |
| Reviewed By: <u>Andy Shih</u> <i>Andy Shih</i> | |
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Revision History

| Revision | No. | Report Number | Issue Date | Description | Author/ Revised by |
|----------|--------------|------------------|------------|-----------------|-----------------------|
| 0.0 | RXZ231003013 | RXZ231003013RF03 | 2024-04-22 | Original Report | Coco Lin |

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

| | |
|------------------------------------|---|
| Applicant | PENPOWER TECHNOLOGY LTD. |
| | 7F, NO.47, Lane 2, Sec.2, Kuang-Fu Rd.,, Hsinchu City, 300 Taiwan |
| Brand(Trade) Name | PenPower |
| Product (Equipment) | PenPower EZGoRF Jr. |
| Main Model Name | EZGoW01 |
| Frequency Range | 2408~2474 MHz |
| Modulation Technique | GFSK |
| Power Operation (Voltage Range) | <input type="checkbox"/> AC <input type="checkbox"/> Adapter <input type="checkbox"/> By AC Power Cord <input type="checkbox"/> PoE |
| | <input checked="" type="checkbox"/> DC Type 3V <input checked="" type="checkbox"/> Battery*2 <input type="checkbox"/> DC Power Supply <input type="checkbox"/> External from USB Cable <input type="checkbox"/> External DC Adapter |
| | <input type="checkbox"/> Host System |
| | |
| Received Date | 2023/10/04 |
| Date of Test | 2024/01/12 ~ 2024/04/20 |

*All measurement and test data in this report was gathered from production sample serial number: RXZ231003013-2 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of *PENPOWER TECHNOLOGY LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission’s rules.

1.3 Related Submittal(s)/Grant(s)

N/A.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.5 Statement

Decision Rule: No, (The test results do not include MU judgment)

It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory).

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.6 Measurement Uncertainty

| Parameter | | Uncertainty |
|---------------------|---------------|-------------|
| Emissions Bandwidth | | +/- 0.09% |
| Emissions, radiated | 9 kHz~30 MHz | +/- 3.54 dB |
| | 30 MHz~1GHz | +/- 4.99 dB |
| | 1 GHz~18 GHz | +/- 7.56 dB |
| | 18 GHz~40 GHz | +/- 5.06 dB |
| Temperature | | +/- 0.79 °C |
| Humidity | | +/- 0.44 % |

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty

1.7 Environmental Conditions

| Test Site | Test Date | Temperature (°C) | Relative Humidity (%) | ATM Pressure (hPa) | Test Engineer |
|------------------------------|---------------------|------------------|-----------------------|--------------------|---------------|
| Radiation Spurious Emissions | 2024/1/20~2024/4/20 | 23.2~23.8 | 66~68 | 1010 | Jim Chen |
| 20 dB Emission Bandwidth | 2024/1/12 | 20.7 | 49 | 1010 | Jim Chen |

1.8 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

2 System Test Configuration

2.1 Description of Test Configuration

Channel list:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 0 | 2408 | 12 | 2432 | 24 | 2456 |
| 1 | 2410 | 13 | 2434 | 25 | 2458 |
| 2 | 2412 | 14 | 2436 | 26 | 2460 |
| 3 | 2414 | 15 | 2438 | 27 | 2462 |
| 4 | 2416 | 16 | 2440 | 28 | 2464 |
| 5 | 2418 | 17 | 2442 | 29 | 2466 |
| 6 | 2420 | 18 | 2444 | 30 | 2468 |
| 7 | 2422 | 19 | 2446 | 31 | 2470 |
| 8 | 2424 | 20 | 2448 | 32 | 2472 |
| 9 | 2426 | 21 | 2450 | 33 | 2474 |
| 10 | 2428 | 22 | 2452 | / | / |
| 11 | 2430 | 23 | 2454 | / | / |

Tested with channel 0, 16 and 33.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

No test software was used.

The system was configured for testing in an engineering mode, which was provided by manufacturer.

| Test Frequency | Low | Middle | High |
|---------------------|---------|---------|---------|
| Power Level Setting | Default | Default | Default |

2.4 Support Equipment List and Details

N/A

2.5 External Cable List and Details

N/A

2.6 Test Mode

Full System (model: EZGoW01) test item.

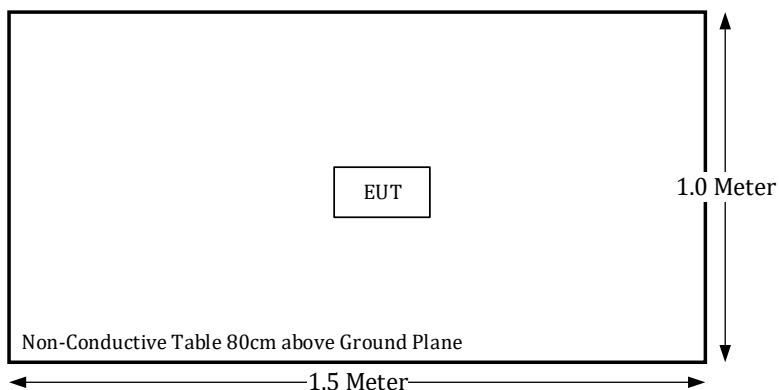
Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

2.7 Block Diagram of Test Setup

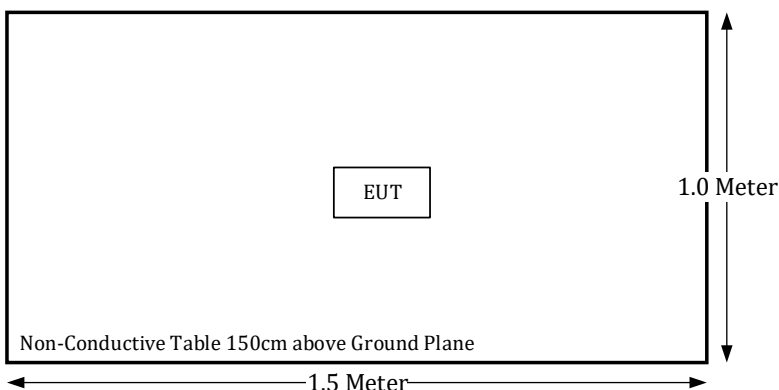
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

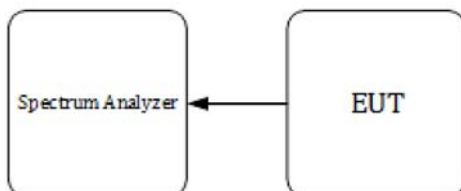
Below 1GHz:



Above 1GHz:



Conducted



3 Summary of Test Results

| FCC Rules | Description of Test | Results |
|---------------------------|-----------------------------|----------------|
| §1.1307(b)(3)(i) | RF Exposure | Compliance |
| §15.203 | Antenna Requirement | Compliance |
| §15.207 (a) | AC Line Conducted Emissions | Not applicable |
| §15.205, §15.209, §15.249 | Radiated Emissions | Compliance |
| §15.215 (c) | 20 dB Emission Bandwidth | Compliance |

Not Applicable: The device was powered by battery.

4 Test Equipment List and Details

| Description | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due Date |
|------------------------------------|--------------------------------|--------------------------|------------------|------------------|----------------------|
| Radiation 3M Room (966-A) | | | | | |
| Active Loop Antenna | ETS-Lindgren | 6502 | 35796 | 2024/3/27 | 2025/3/26 |
| Bilog Antenna with 6 dB Attenuator | SUNOL SCIENCES & MINI-CIRCUITS | JB6/UNAT-6+ | A050115/15542_01 | 2023/1/31 | 2024/1/30 |
| Horn Antenna | EMCO | SAS-571 | 1020 | 2023/5/18 | 2024/5/17 |
| Horn Antenna | ETS-Lindgren | 3116 | 62638 | 2023/8/25 | 2024/8/24 |
| Preamplifier | Sonoma | 310N | 130602 | 2023/6/16 | 2024/6/15 |
| Preamplifier | Channel | ERA-100M-18G-01D1748 | EC2300051 | 2023/4/1 | 2024/3/31 |
| Preamplifier | A.H. Systems | PAM-1840VH | 174 | 2023/3/24 | 2024/3/23 |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101939 | 2024/3/23 | 2024/3/23 |
| | | | | 2024/3/27 | 2025/3/27 |
| | | | | | |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 102099 | 2023/6/16 | 2024/6/15 |
| Micro flex Cable | UTIFLEX | UFB197C-1-2362-70U-70U | 225757-001 | 2023/1/24 | 2024/1/23 |
| | | | | 2024/1/23 | 2025/1/23 |
| Coaxial Cable | COMMATE | PEWC | 8Dr | 2023/12/23 | 2024/12/22 |
| Coaxial Cable | UTIFLEX | UFB311A-Q-1440-300300 | 220490-006 | 2023/1/24 | 2024/1/23 |
| | | | | 2024/1/23 | 2025/1/23 |
| Coaxial Cable | JUNFLON | J12J102248-00-B-5 | AUG-07-15-044 | 2023/12/23 | 2024/12/22 |
| Cable | EMC | EMC105-SM-SM-10000 | 201003 | 2023/1/24 | 2024/1/23 |
| | | | | 2024/1/23 | 2025/1/23 |
| Coaxial Cable | ROSNOL | K1K50-UP0264-K1K50-450CM | 160309-1 | 2023/1/24 | 2024/1/23 |
| Coaxial Cable | ROSNOL | K1K50-UP0264-K1K50-50CM | 15120-1 | 2023/2/1 | 2024/1/31 |
| Software | AUDIX | E3 | 18621a | N.C.R | N.C.R |
| Conducted Room | | | | | |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101140 | 2023/2/9 | 2024/2/8 |
| Cable | UTIFLEX | UFA210A | 9435 | 2023/10/2 | 2024/10/1 |

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

5 FCC §1.1307(b)(3)(i) – RF EXPOSURE

5.1 Applicable Standard

According to subpart 15.249 and subpart §1.1307(b)(3)(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

For single RF sources (*i.e.*, any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold *P_{th}* (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). *P_{th}* is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

| RF Source frequency (MHz) | Threshold ERP (watts) |
|---------------------------|--|
| 0.3-1.34 | 1,920 R ² . |
| 1.34-30 | 3,450 R ² /f ² . |
| 30-300 | 3.83 R ² . |
| 300-1,500 | 0.0128 R ² f. |
| 1,500-100,000 | 19.2R ² . |

5.2 RF Exposure Evaluation Result

Calculate the ERP from the radiated field strength in the far field using Equation

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

$$EIRP = 84.46 \text{ dB}\mu\text{V/m} - 95.2 = -10.74 \text{ dBm}$$

$$ERP = EIRP - 2.15 \text{ dB}$$

Project info

| Freq (MHz) | EIRP (dBm) | ERP (dBm) | ERP (mW) |
|------------|------------|-----------|----------|
| 2408~2474 | -10.74 | -12.89 | 0.05 |

§ 1.1307(b)(3)(i)(A)

The available maximum time-averaged power is no more than 1 mW

Result: The device meets the exemption requirement.

6 FCC §15.203 – Antenna Requirements

6.1 Applicable Standard

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.

6.2 Antenna Information

| Manufacturer | Model | Type | Antenna Gain |
|--------------|------------|------|--------------|
| MOSART | 09-D0990-C | PCB | -1.5561 dBi |

The antenna is permanently attached to the device.

Result: Compliance.

7 FCC §15.209, §15.205 , §15.249 - Radiated Emissions

7.1 Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (millivolts/meter) |
|-----------------------|--|--|
| 920-928 MHz | 50 | 500 |
| 2400-2483.5 MHz | 50 | 500 |
| 5725-5875 MHz | 50 | 500 |
| 24.0-24.25 GHz | 250 | 2500 |

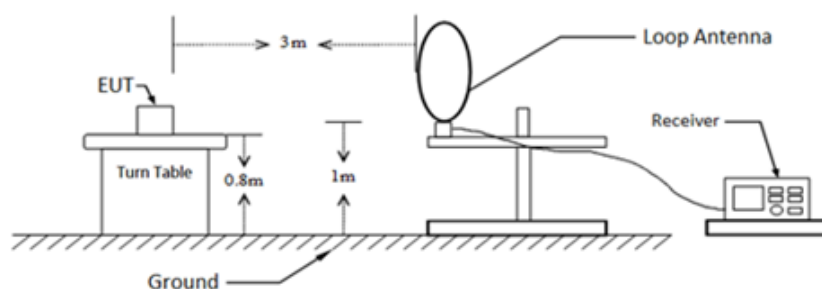
As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

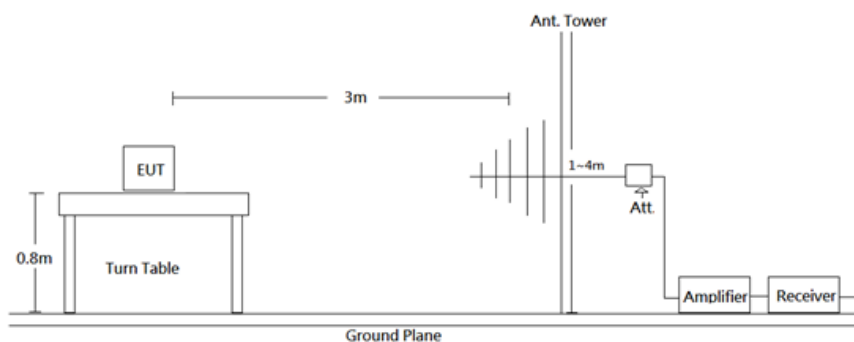
According to ANSI C63.10-2013, section 5.3.3 Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field, and the emissions to be measured can be detected by the measurement equipment (see 4.3.4). Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. Measurements from 18 GHz to 40 GHz are typically made at distances significantly less than 3 m from the EUT. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade of distance (inverse of linear distance for field-strength measurements or inverse of linear distance-squared for power-density measurements).

7.2 EUT Setup

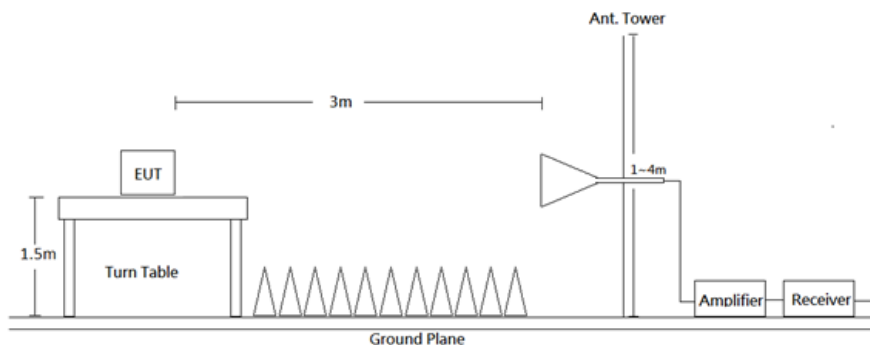
9kHz-30MHz:



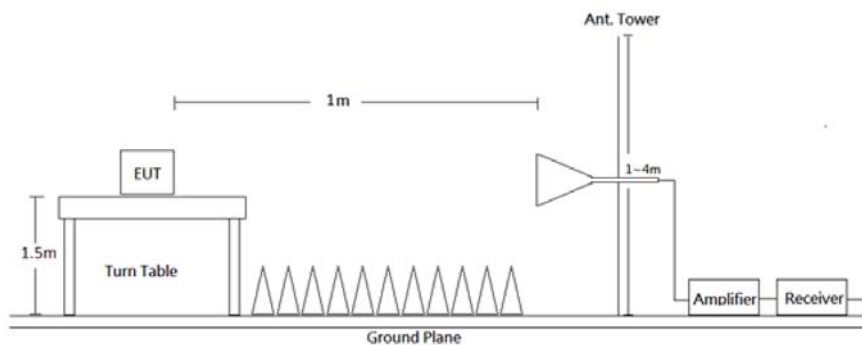
30MHz-1GHz:



1-18 GHz:



18-26.5 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.249 limits.

7.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | RBW | VBW | Measurement method |
|------------------|---------|---------|--------------------|
| 9 kHz - 150 kHz | 300 Hz | 1 kHz | QP/AV |
| 150 kHz - 30 MHz | 10 kHz | 30 kHz | QP/AV |
| 30-1000 MHz | 120 kHz | 300 kHz | QP |
| Above 1 GHz | 1 MHz | 3 MHz | PK |
| Above 1 GHz | 1 MHz | 10 Hz | AVG |

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

7.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

Prescan using three directional polarities. (parallel, vertical and ground parallel)

7.5 Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit line. For example, The Over Limit of -7 dB means the emission is 7 dB below the limit line. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Level} - \text{Limit}$$

7.6 Test Results

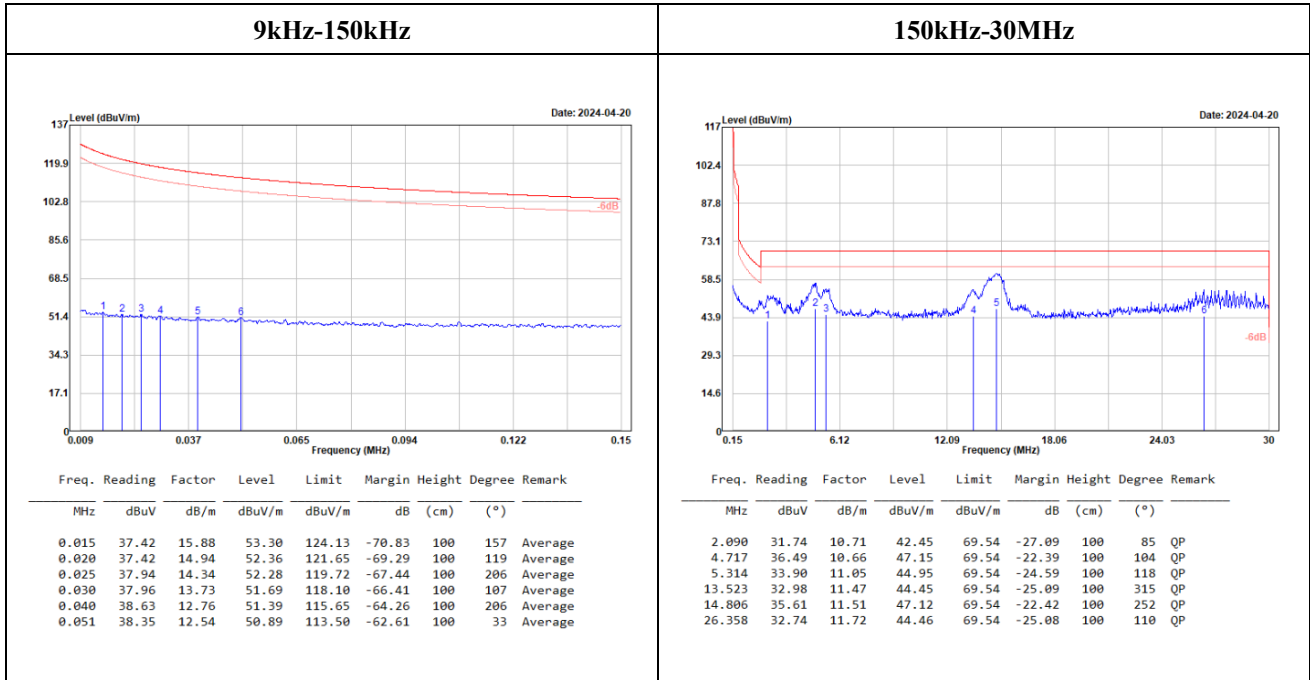
Test Mode: Transmitting

(worse case as Z axis.)

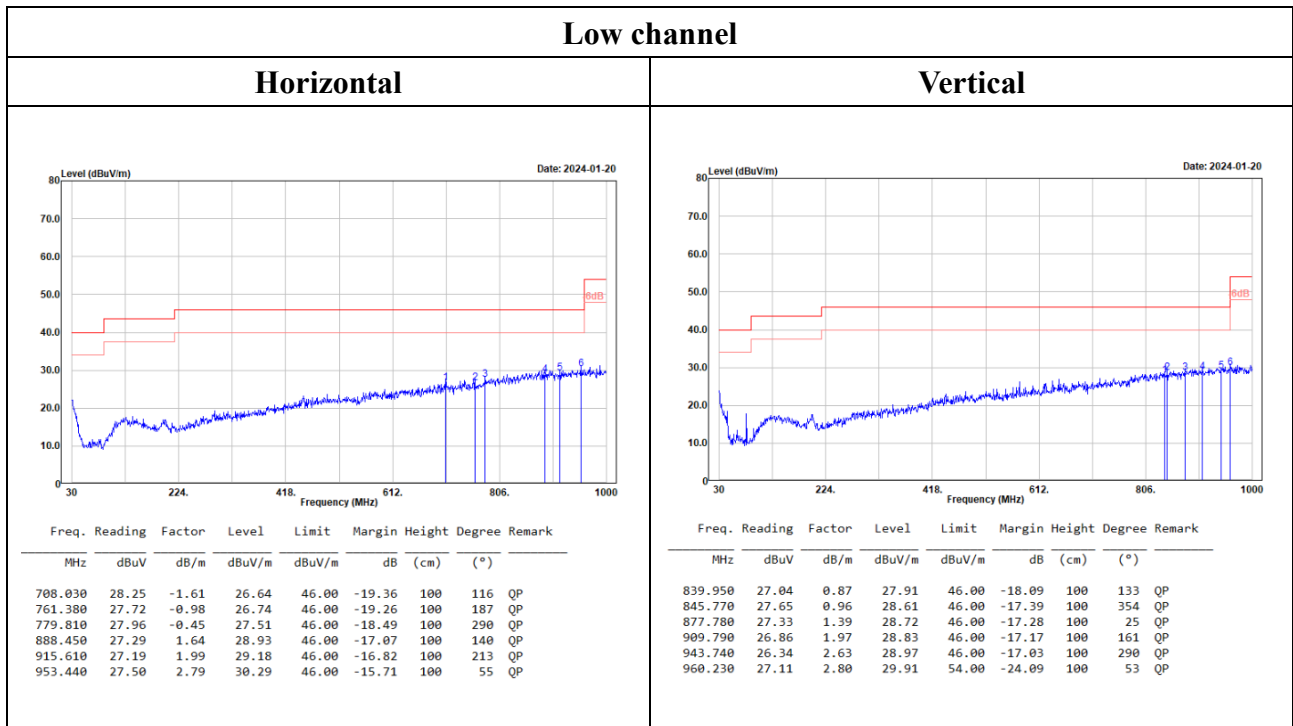
9kHz-30MHz:

(worst case is low channel)

(Prescan using three directional polarities, worst case parallel.)

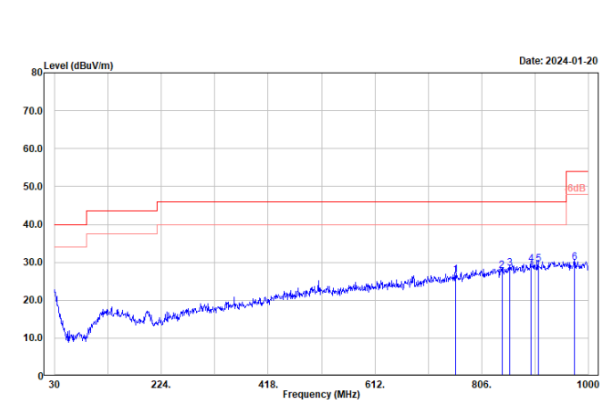


30MHz-1GHz:



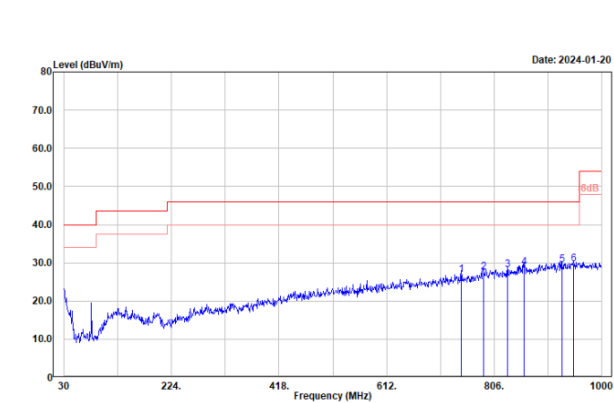
Middle channel

Horizontal



| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 758.470 | 27.73 | -1.00 | 26.73 | 46.00 | -19.27 | 100 | 124 | QP |
| 842.860 | 26.76 | 0.91 | 27.67 | 46.00 | -18.33 | 100 | 240 | QP |
| 857.410 | 26.98 | 1.32 | 28.30 | 46.00 | -17.70 | 100 | 197 | QP |
| 895.240 | 27.58 | 1.88 | 29.46 | 46.00 | -16.54 | 100 | 360 | QP |
| 908.820 | 27.53 | 1.95 | 29.48 | 46.00 | -16.52 | 100 | 323 | QP |
| 974.780 | 27.37 | 2.46 | 29.83 | 54.00 | -24.17 | 100 | 313 | QP |

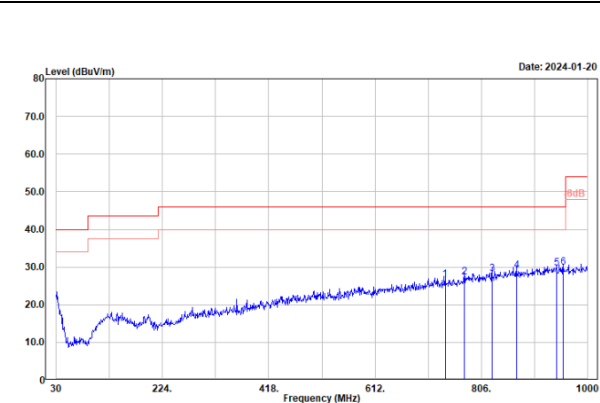
Vertical



| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 746.830 | 27.95 | -1.08 | 26.87 | 46.00 | -19.13 | 100 | 97 | QP |
| 786.600 | 27.73 | -0.13 | 27.60 | 46.00 | -18.40 | 100 | 44 | QP |
| 830.250 | 27.49 | 0.66 | 28.15 | 46.00 | -17.85 | 100 | 226 | QP |
| 860.320 | 27.50 | 1.40 | 28.90 | 46.00 | -17.10 | 100 | 254 | QP |
| 928.220 | 27.01 | 2.38 | 29.39 | 46.00 | -16.61 | 100 | 246 | QP |
| 949.560 | 27.03 | 2.76 | 29.79 | 46.00 | -16.21 | 100 | 85 | QP |

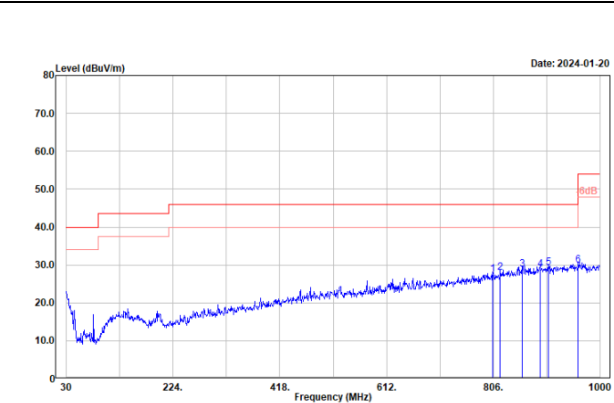
High channel

Horizontal



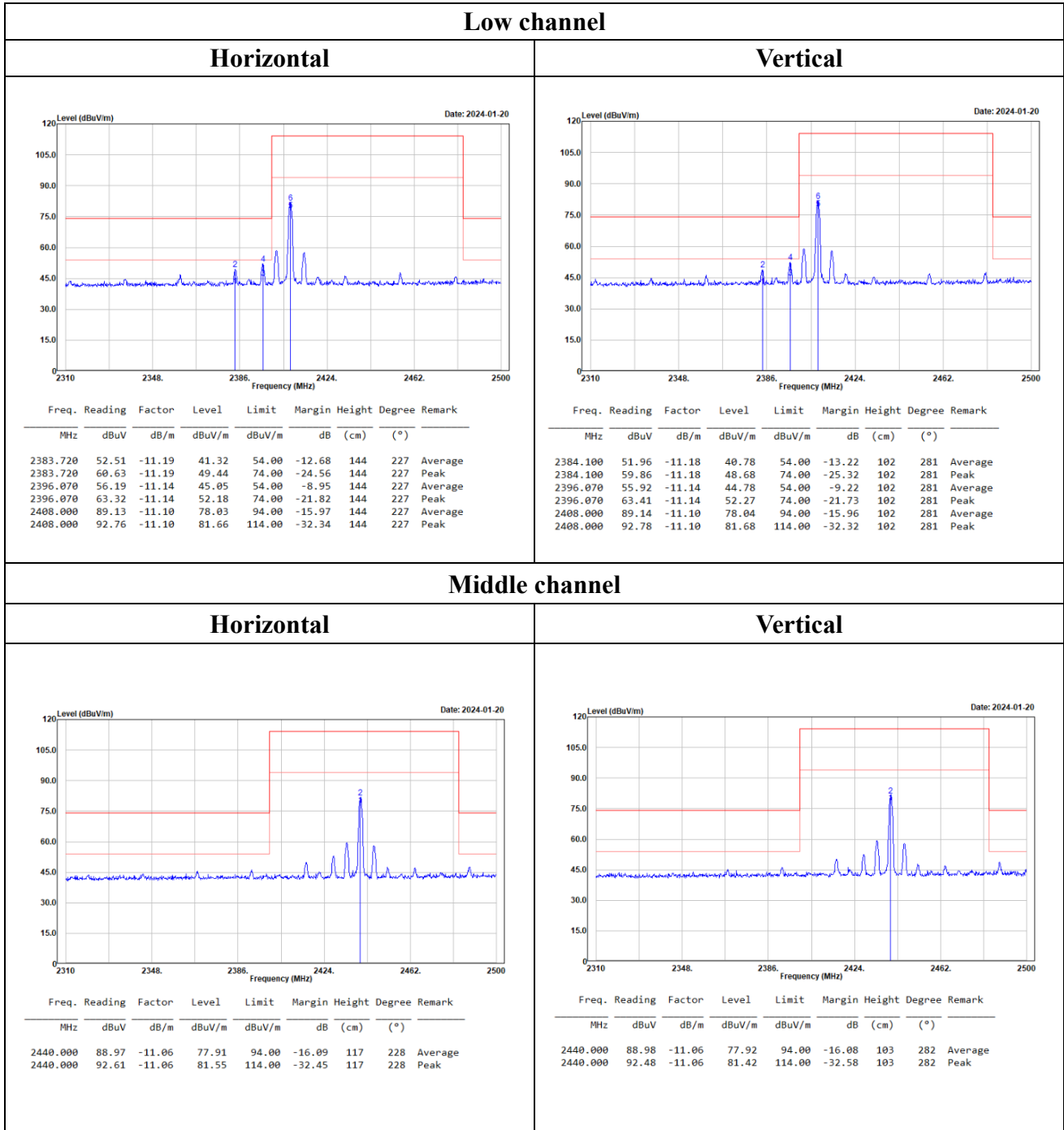
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 740.040 | 27.83 | -1.23 | 26.60 | 46.00 | -19.40 | 100 | 169 | QP |
| 774.960 | 27.99 | -0.68 | 27.31 | 46.00 | -18.69 | 100 | 208 | QP |
| 825.400 | 27.58 | 0.51 | 28.09 | 46.00 | -17.91 | 100 | 266 | QP |
| 870.020 | 27.78 | 1.31 | 29.09 | 46.00 | -16.91 | 100 | 354 | QP |
| 942.770 | 27.11 | 2.62 | 29.73 | 46.00 | -16.27 | 100 | 135 | QP |
| 955.380 | 27.04 | 2.79 | 29.83 | 46.00 | -16.17 | 100 | 360 | QP |

Vertical



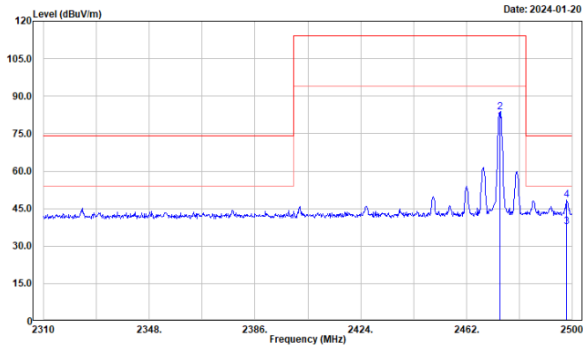
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 805.030 | 27.19 | 0.27 | 27.46 | 46.00 | -18.54 | 100 | 2 | QP |
| 818.610 | 27.44 | 0.43 | 27.87 | 46.00 | -18.13 | 100 | 135 | QP |
| 858.380 | 27.39 | 1.34 | 28.73 | 46.00 | -17.27 | 100 | 329 | QP |
| 891.360 | 27.13 | 1.70 | 28.83 | 46.00 | -17.17 | 100 | 294 | QP |
| 905.910 | 27.34 | 1.87 | 29.21 | 46.00 | -16.79 | 100 | 18 | QP |
| 960.230 | 27.02 | 2.80 | 29.82 | 54.00 | -24.18 | 100 | 250 | QP |

Band-Edge:



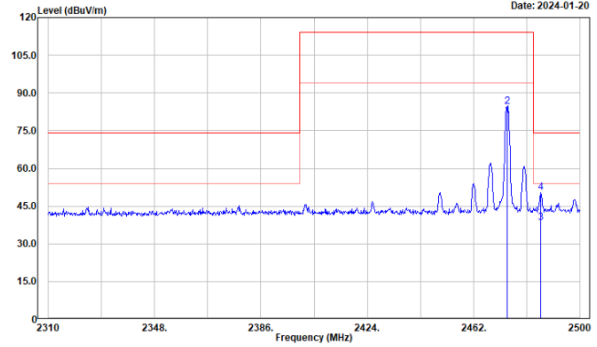
High channel

Horizontal



| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|----------|---------|--------|--------|--------|--------|--------|--------|---------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 2474.000 | 90.77 | -10.72 | 80.05 | 94.00 | -13.95 | 132 | 225 | Average |
| 2474.000 | 94.23 | -10.72 | 83.51 | 114.00 | -30.49 | 132 | 225 | Peak |
| 2498.100 | 48.28 | -10.40 | 37.88 | 54.00 | -16.12 | 132 | 225 | Average |
| 2498.100 | 58.92 | -10.40 | 48.52 | 74.00 | -25.48 | 132 | 225 | Peak |

Vertical

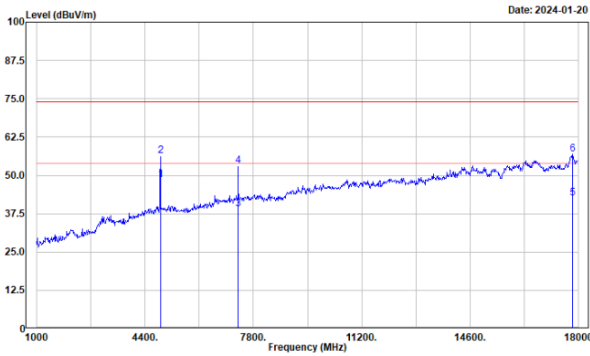


| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|----------|---------|--------|--------|--------|--------|--------|--------|---------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 2474.000 | 91.80 | -10.72 | 81.08 | 94.00 | -12.92 | 103 | 273 | Average |
| 2474.000 | 95.18 | -10.72 | 84.46 | 114.00 | -29.54 | 103 | 273 | Peak |
| 2486.130 | 49.08 | -10.56 | 38.52 | 54.00 | -15.48 | 103 | 273 | Average |
| 2486.130 | 60.93 | -10.56 | 50.37 | 74.00 | -23.63 | 103 | 273 | Peak |

(worst case is middle channel)

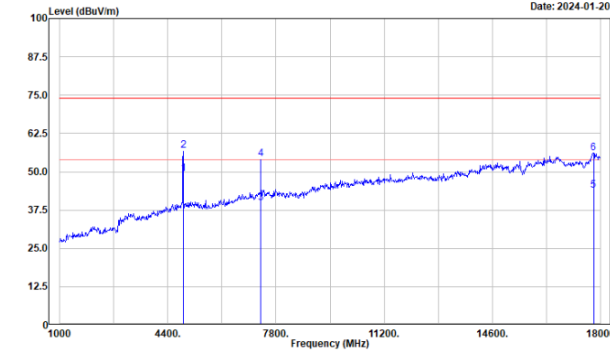
1GHz-18GHz:

Horizontal



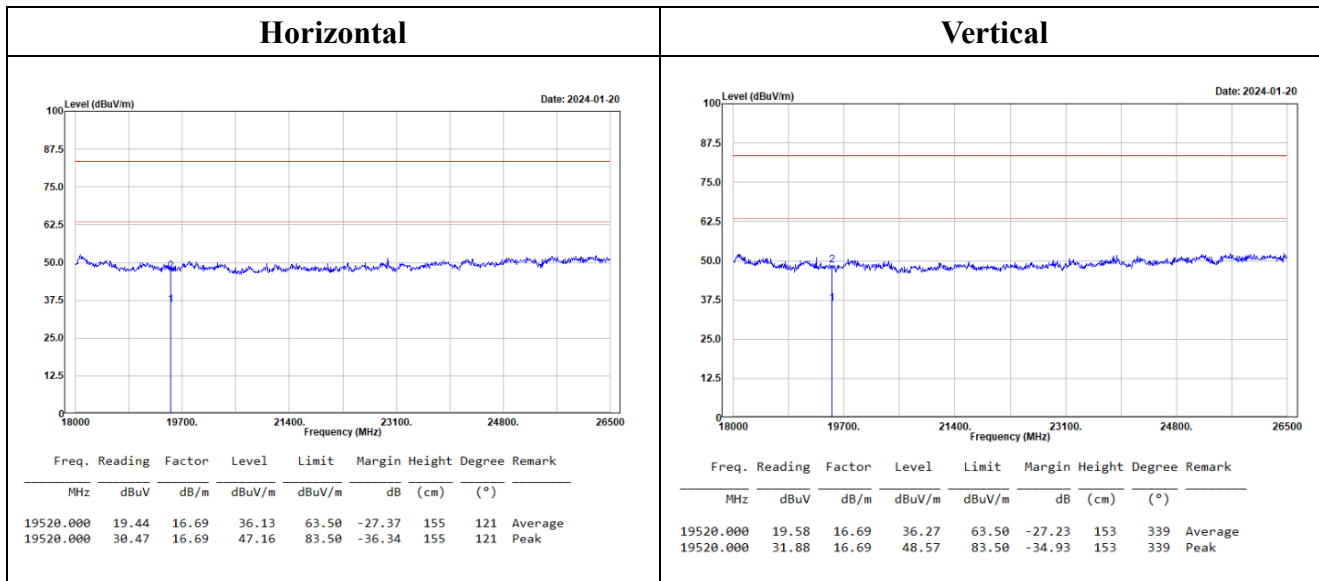
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|-----------|---------|--------|--------|--------|--------|--------|--------|---------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4880.000 | 53.51 | -4.89 | 48.62 | 54.00 | -5.38 | 106 | 10 | Average |
| 4880.000 | 61.21 | -4.89 | 56.32 | 74.00 | -17.68 | 106 | 10 | Peak |
| 7320.000 | 39.12 | 0.02 | 39.14 | 54.00 | -14.86 | 135 | 170 | Average |
| 7320.000 | 53.20 | 0.02 | 53.22 | 74.00 | -20.78 | 135 | 170 | Peak |
| 17830.000 | 29.55 | 13.09 | 42.64 | 54.00 | -11.36 | 150 | 155 | Average |
| 17830.000 | 43.77 | 13.09 | 56.86 | 74.00 | -17.14 | 150 | 155 | Peak |

Vertical



| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|-----------|---------|--------|--------|--------|--------|--------|--------|---------|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4880.000 | 54.12 | -4.89 | 49.23 | 54.00 | -4.77 | 110 | 284 | Average |
| 4880.000 | 61.87 | -4.89 | 56.98 | 74.00 | -17.02 | 110 | 284 | Peak |
| 7320.000 | 39.71 | 0.02 | 39.73 | 54.00 | -14.27 | 133 | 30 | Average |
| 7320.000 | 54.11 | 0.02 | 54.13 | 74.00 | -19.87 | 133 | 30 | Peak |
| 17779.000 | 31.00 | 12.86 | 43.86 | 54.00 | -10.14 | 150 | 155 | Average |
| 17779.000 | 43.33 | 12.86 | 56.19 | 74.00 | -17.81 | 150 | 155 | Peak |

18GHz-26.5GHz:



Note:

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

For 18-26.5GHz Convert the test distance limit of 3 meters to a limit of 1 meter:

Conversion factor = $20 \log(1m/3m) = 9.5 \text{ dB}$, Limit = $54+9.5 = 63.50 \text{ dBuV/m @ 1m}$

Above 1GHz

| Low channel | | | | | | | | | |
|-------------|---------|--------|--------|--------|----------|--------|--------|---------|--|
| Horizontal | | | | | Vertical | | | | |
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark | |
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | | |
| 2383.720 | 52.51 | -11.19 | 41.32 | 54.00 | -12.68 | 144 | 227 | Average | |
| 2383.720 | 60.63 | -11.19 | 49.44 | 74.00 | -24.56 | 144 | 227 | Peak | |
| 2396.070 | 56.19 | -11.14 | 45.05 | 54.00 | -8.95 | 144 | 227 | Average | |
| 2396.070 | 63.32 | -11.14 | 52.18 | 74.00 | -21.82 | 144 | 227 | Peak | |
| 2408.000 | 89.13 | -11.10 | 78.03 | 94.00 | -15.97 | 144 | 227 | Average | |
| 2408.000 | 92.76 | -11.10 | 81.66 | 114.00 | -32.34 | 144 | 227 | Peak | |
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark | |
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | | |
| 4816.000 | 53.25 | -4.97 | 48.28 | 54.00 | -5.72 | 106 | 23 | Average | |
| 4816.000 | 62.15 | -4.97 | 57.18 | 74.00 | -16.82 | 106 | 23 | Peak | |
| 7224.000 | 40.74 | 0.04 | 40.78 | 54.00 | -13.22 | 128 | 186 | Average | |
| 7224.000 | 52.24 | 0.04 | 52.28 | 74.00 | -21.72 | 128 | 186 | Peak | |

| Middle channel | | | | | | | | | |
|----------------|---------|--------|--------|--------|----------|--------|--------|---------|--|
| Horizontal | | | | | Vertical | | | | |
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark | |
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | | |
| 2440.000 | 88.97 | -11.06 | 77.91 | 94.00 | -16.09 | 117 | 228 | Average | |
| 2440.000 | 92.61 | -11.06 | 81.55 | 114.00 | -32.45 | 117 | 228 | Peak | |
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark | |
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | | |
| 4880.000 | 53.51 | -4.89 | 48.62 | 54.00 | -5.38 | 106 | 10 | Average | |
| 4880.000 | 61.21 | -4.89 | 56.32 | 74.00 | -17.68 | 106 | 10 | Peak | |
| 7320.000 | 39.12 | 0.02 | 39.14 | 54.00 | -14.86 | 135 | 170 | Average | |
| 7320.000 | 53.20 | 0.02 | 53.22 | 74.00 | -20.78 | 135 | 170 | Peak | |
| 17830.000 | 29.55 | 13.09 | 42.64 | 54.00 | -11.36 | 150 | 155 | Average | |
| 17830.000 | 43.77 | 13.09 | 56.86 | 74.00 | -17.14 | 150 | 155 | Peak | |

| High channel | | | | | | | | | |
|--------------|---------|--------|--------|--------|----------|--------|--------|---------|--|
| Horizontal | | | | | Vertical | | | | |
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark | |
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | | |
| 2474.000 | 90.77 | -10.72 | 80.05 | 94.00 | -13.95 | 132 | 225 | Average | |
| 2474.000 | 94.23 | -10.72 | 83.51 | 114.00 | -30.49 | 132 | 225 | Peak | |
| 2498.100 | 48.28 | -10.40 | 37.88 | 54.00 | -16.12 | 132 | 225 | Average | |
| 2498.100 | 58.92 | -10.40 | 48.52 | 74.00 | -25.48 | 132 | 225 | Peak | |
| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark | |
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | | |
| 4948.000 | 45.50 | -4.63 | 40.87 | 54.00 | -13.13 | 105 | 355 | Average | |
| 4948.000 | 57.10 | -4.63 | 52.47 | 74.00 | -21.53 | 105 | 355 | Peak | |
| 7422.000 | 40.31 | 0.37 | 40.68 | 54.00 | -13.32 | 123 | 19 | Average | |
| 7422.000 | 51.95 | 0.37 | 52.32 | 74.00 | -21.68 | 123 | 19 | Peak | |

Note:

Level = Reading + Factor.

Margin = Level - Limit.

Factor = Antenna Factor + Cable Loss - Amplifier Gain.

8 FCC §15.215(c) –20 dB Bandwidth Testing

8.1 Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

8.2 Test Procedure

According to ANSI C63.10-2013 Section 6.9.2

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

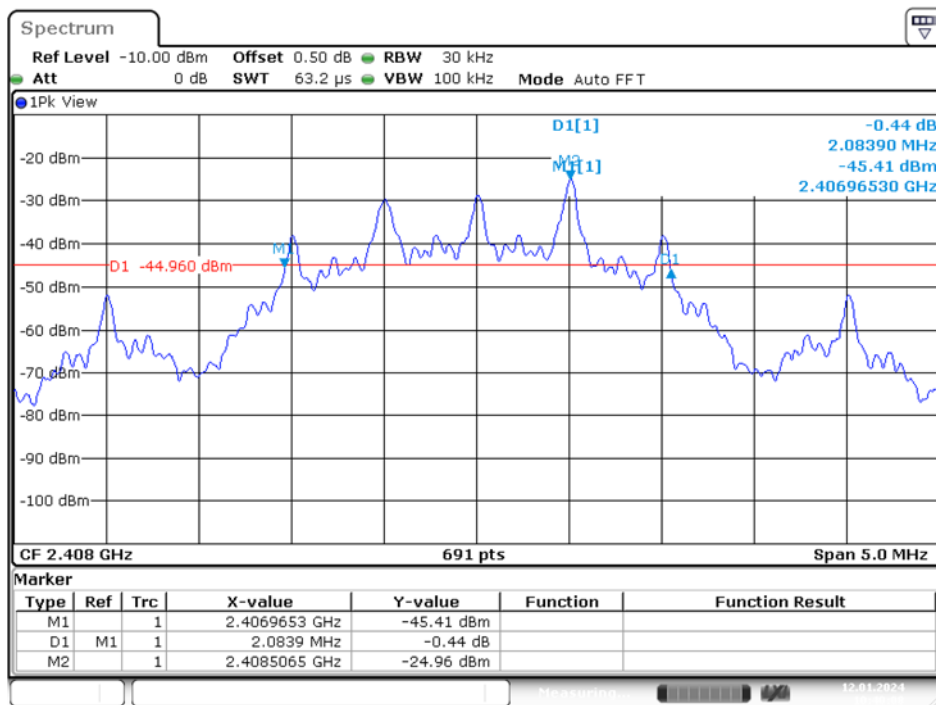
8.3 Test Results

| Channel | Frequency (MHz) | 20 dB Emission Bandwidth (MHz) |
|---------|-----------------|--------------------------------|
| Low | 2408 | 2.08 |
| Middle | 2440 | 2.08 |
| High | 2474 | 2.08 |

Please refer to the following plots

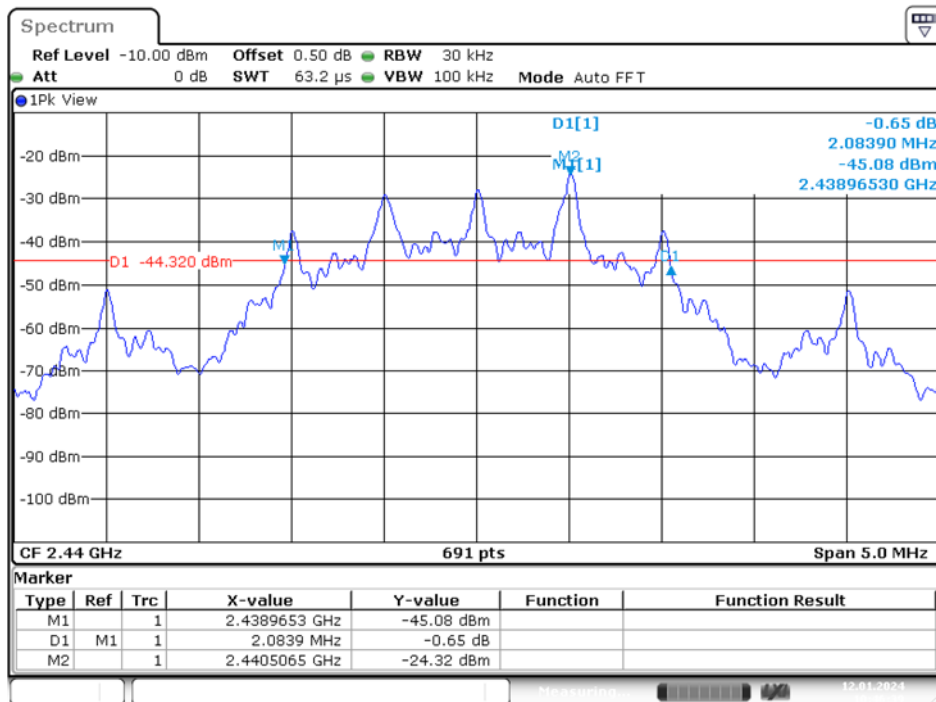
20 dB Emission Bandwidth

Low Channel



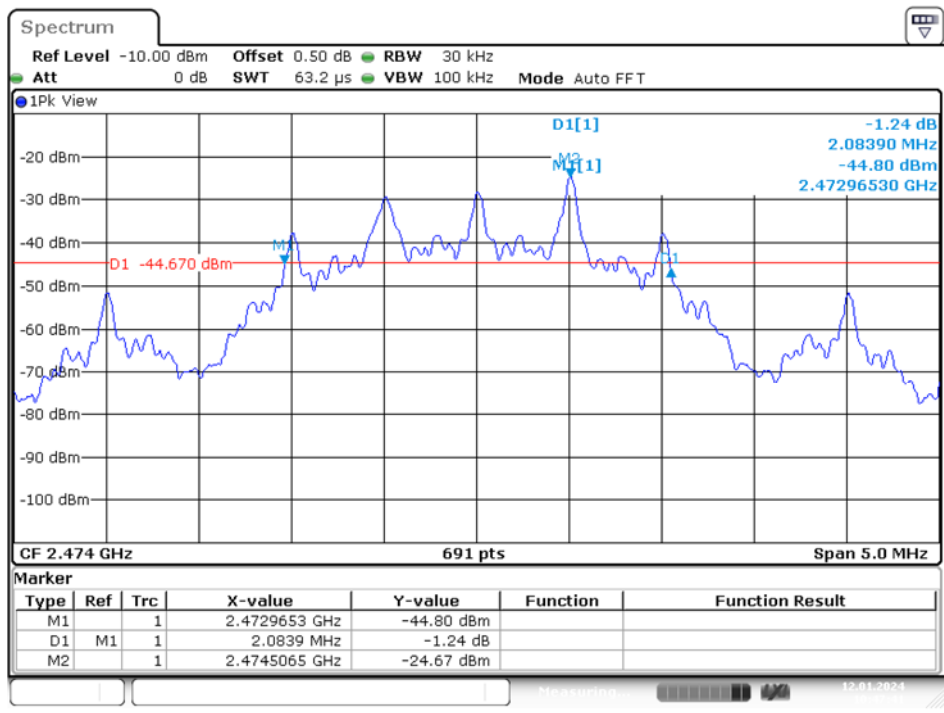
Date: 12.JAN.2024 10:40:09

Middle Channel



Date: 12.JAN.2024 10:46:39

High Channel



Date: 12.JAN.2024 10:47:41

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