# FCC Part 15.247

# TEST REPORT

For

## Cisco Systems, Inc.

**125 West Tasman Drive, San Jose, CA 95134, USA**

**FCC ID: LDKPVDEO2618**

| **Report Type:** Original Report | **Product Type:** Cisco Catalyst 9120AX Series Wi-Fi 6 Access Points |
|---|---|

**Report Producer :** Eva Kao

**Report Number :** RXZ220627003RF01

**Report Date :** 2022-7-8

**Reviewed By:** Andy Shih

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# Revision History

| Revision | No. | Report Number | Issue Date | Description | Author/ Revised by |
|---|---|---|---|---|---|
| 0.0 | RXZ220627003 | RXZ220627003RF01 | 2022-7-8 | Original Report | Eva Kao |

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# 1 General Information

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

| | |
|---|---|
| Manufacturer | Cisco Systems, Inc. |
| | 125 West Tasman Drive, San Jose, CA 95134, USA |
| Brand(Trade) Name | CISCO |
| Product (Equipment) | Cisco Catalyst 9120AX Series Wi-Fi 6 Access Points |
| Main Model Name | C9120AXP-B |
| Frequency Range | BLE Mode: 2402 ~ 2480 MHz |
| Channel Number | 40 |
| Transmit Power | 4.66 dBm |
| Modulation Technique | BLE Mode: GFSK |
| Transmit Data Rate | BLE Mode: 1Mbps |
| Power Operation (Voltage Range) | 55Vdc from PoE port |
| Received Date | 2022/6/27 |
| Date of Test | 2022/6/30 ~ 2022/7/4 |

*All measurement and test data in this report was gathered from production sample serial number: RXZ220627003-01 (Assigned by BACL, New Taipei Laboratory).

## 1.2 Objective

This report is prepared on behalf of *Cisco Systems, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

## 1.3 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.
KDB 558074 D01 15.247 Meas Guidance v05r02

## 1.4 Statement

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


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.

## 1.5 Measurement Uncertainty

| Parameter | | Uncertainty |
|---|---|---|
| AC Mains | | ±2.36 (dB) |
| RF output power, conducted | | ±0.93 (dB) |
| Power Spectral Density, conducted | | ±0.92 (dBm/kHz) |
| Occupied Bandwidth | | ±0.35 (MHz) |
| Unwanted Emissions, conducted | | ±1.69 (dB) |
| Emissions, radiated | 30 MHz~1GHz | ±5.22(dB) |
| | 1 GHz~18 GHz | ±6.12(dB) |
| | 18 GHz~40 GHz | ±4.99(dB) |
| Temperature | | +/- 1.27 °C |
| Humidity | | +/- 3 % |

## 1.6 Environmental Conditions

| Test Site | Test Date | Temperature (℃) | Relative Humidity (%) | ATM Pressure (hPa) | Test Engineer |
|---|---|---|---|---|---|
| AC Line Conducted Emissions | 2022/7/4 | 23 | 51 | 1010 | Andy Cheng |
| Radiation Spurious Emissions | 2022/6/30 ~ 2022/7/4 | 22 | 47 | 1010 | Aaron Pan |
| Conducted Spurious Emissions | 2022/7/4 | 22.5 | 58 | 1010 | Jim Chen |
| 6 dB Emission Bandwidth | 2022/7/4 | 22.5 | 58 | 1010 | Jim Chen |
| Maximum Output Power | 2022/7/4 | 22.5 | 58 | 1010 | Jim Chen |
| 100 kHz Bandwidth of Frequency Band Edge | 2022/7/4 | 22.5 | 58 | 1010 | Jim Chen |
| Power Spectral Density | 2022/7/4 | 22.5 | 58 | 1010 | Jim Chen |

## 1.7 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

For BLE mode, there are totally 40 channels.

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 0 | 2402 | 20 | 2442 |
| 1 | 2404 | -- | -- |
| 2 | 2406 | -- | -- |
| 3 | 2408 | 37 | 2476 |
| -- | -- | 38 | 2478 |
| 19 | 2440 | 39 | 2480 |

For BLE Modes were tested with channel 0, 19 and 39.

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

## 2.2 Equipment Modifications

No modification was made to the EUT.

## 2.3 EUT Exercise Software

The test software was used “Putty.exe v0.7”

| Test Frequency | | Low | Middle | High |
|---|---|---|---|---|
| Power Level Setting | BLE 1M | 5 | 5 | 5 |

## 2.4 Support Equipment List and Details

| Description | Manufacturer | Model Number | S/N |
|---|---|---|---|
| POE Adapter | CISCO | SB-PWR-INJ2 | C18426663000003170 |
| NB | DELL | E6410 | 8N7PXN1 |

## 2.5 External Cable List and Details

| Cable Description | Length (m) | From | To |
|---|---|---|---|
| RJ-45 Cable | 1 | EUT | POE Adapter |
| RJ-45 to USB Serial Cable | 2 | EUT | NB |

## 2.6 Test Mode

Mode 1: BLE ONLY

Mode 2: WIFI 2.4GHz XOR + WIFI 5GHz Regular + WIFI 2.4GHz Aux + BLE

Mode 3: WIFI 2.4G XOR + WIFI 5GHz Regular + WIFI 5GHz Aux + BLE

Mode 4: WIFI 5G XOR + WIFI 5GHz Regular + WIFI 2.4GHz Aux + BLE

Mode 5: WIFI 5G XOR + WIFI 5GHz Regular + WIFI 5GHz Aux + BLE

Radiated spurious emissions for Transmitting simultaneously test: Mode 2-5.

Full System (Mode 1: BLE ONLY) for all test item.

Conducted output power for worst case :

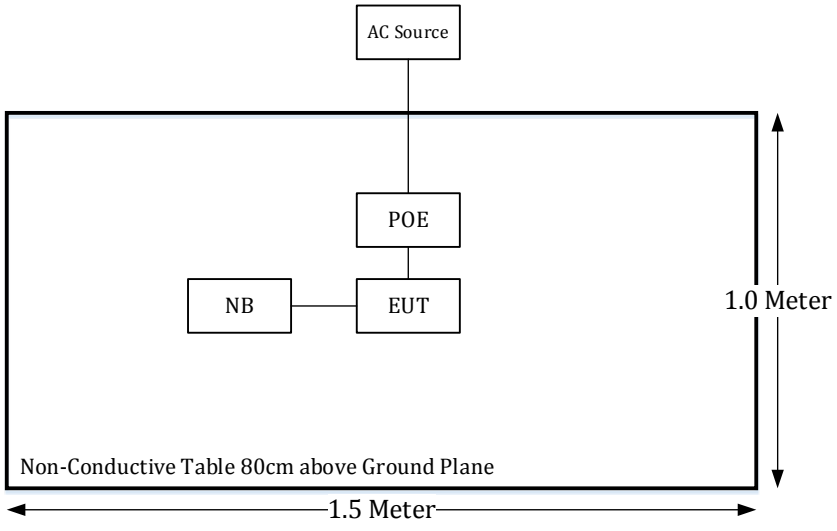
| Worst case mode | | Output power dBm |
|---|---|---|
| XOR WIFI-2.4GHz | N20 Mode, 2437MHz | 21.60 |
| XOR WIFI-5GHz | AX40 Mode, 5230MHz | 19.91 |
| Regular WIFI-5GHz | AX20 Mode, 5745 MHz | 22.82 |
| AUX WIFI-2.4GHz | G Mode, 2437MHz | 15.99 |
| AUX WIFI-5GHz | A Mode, 5220MHz | 14.80 |

## 2.7 Block Diagram of Test Setup

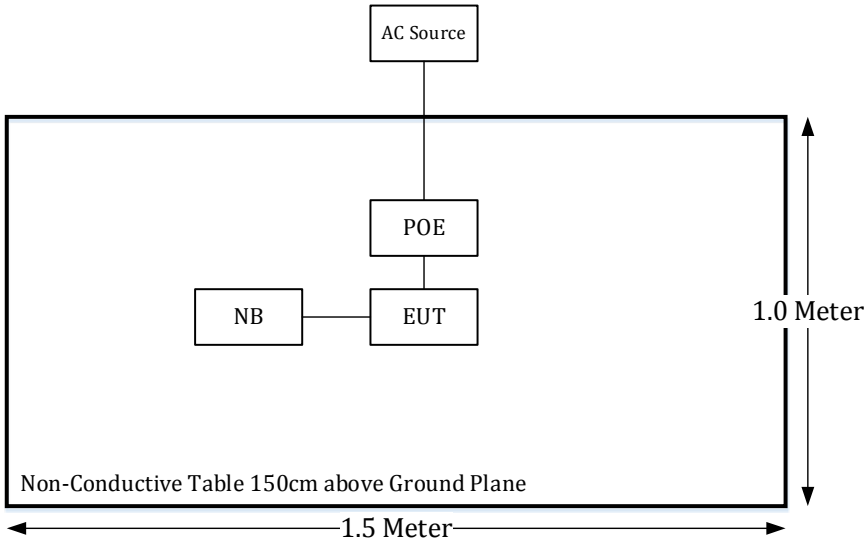
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

**Radiation:**

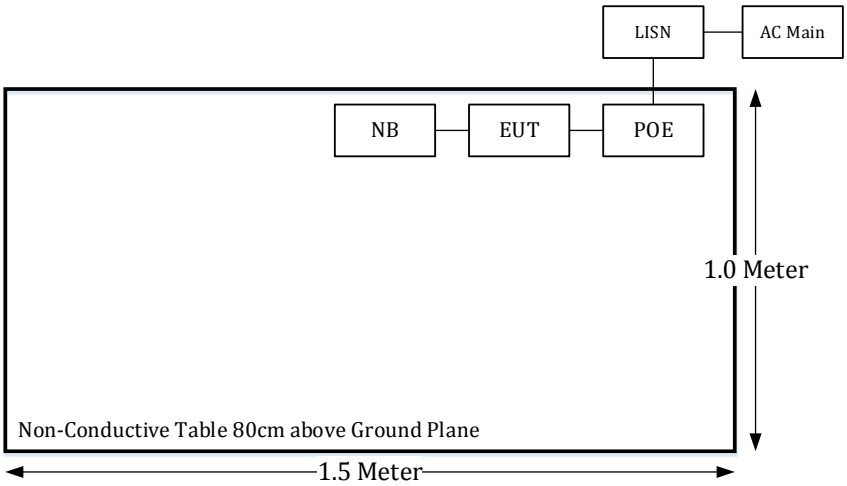
Below 1GHz:



Above 1GHz:




## Conduction:



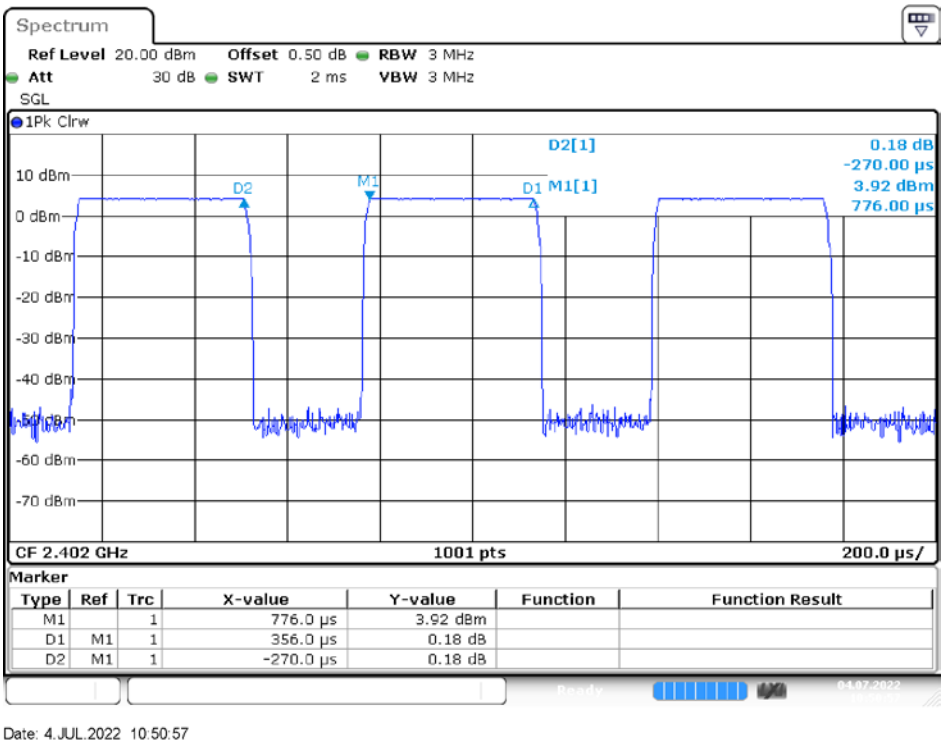
## 2.8 Duty Cycle

The duty cycle as below:

| Radio Mode | $T_{on}$ (ms) | $T_{on}+T_{off}$ (ms) | Duty Cycle (%) |
|---|---|---|---|
| BLE | 0.356 | 0.626 | 0.57 |

Please refer to the following plots.

**BLE Mode**



# 3 Summary of Test Results

| FCC Rules | Description of Test | Results |
|---|---|---|
| §15.247(i), §1.1307(b)(3)(i) | RF Exposure | Compliance |
| §15.203 | Antenna Requirement | Compliance |
| §15.207(a) | AC Line Conducted Emissions | Compliance |
| §15.205, §15.209, §15.247(d) | Spurious Emissions | Compliance |
| §15.247(a)(2) | 6 dB Emission Bandwidth | Compliance |
| §15.247(b)(3) | Maximum Peak Output Power | Compliance |
| §15.247(d) | 100 kHz Bandwidth of Frequency Band Edge | Compliance |
| §15.247(e) | Power Spectral Density | Compliance |

# 4 Test Equipment List and Details

| Description | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| AC Line Conduction Room (CON-A) | | | | | |
| LISN | Rohde & Schwarz | ENV216 | 101612 | 2022/01/14 | 2023/01/13 |
| EMI Test Receiver | Rohde & Schwarz | ESW8 | 100947 | 2021/7/23 | 2022/7/22 |
| Pulse Limiter | Rohde & Schwarz | ESH3Z2 | TXZEM104 | 2021/7/29 | 2022/7/28 |
| RF Cable | EMEC | EM-CB5D | 1 | 2022/6/7 | 2023/6/6 |
| Software | AUDIX | E3 | V9.150826k | N.C.R | N.C.R |
| Radiation 3M Room (966-A) | | | | | |
| Bilog Antenna with 6 dB Attenuator | SUNOL SCIENCES & MINI-CIRCUITS | JB6/UNAT-6+ | A050115/15542_01 | 2022/02/14 | 2023/02/13 |
| Horn Antenna | EMCO | 3115 | 9809-55583 | 2021/8/26 | 2022/8/25 |
| Horn Antenna | ETS-Lindgren | 3116 | 62638 | 2021/8/11 | 2022/8/10 |
| Preamplifier | Sonoma | 310N | 130602 | 2022/6/8 | 2023/6/7 |
| Preamplifier | A.H. system Inc. | PAM-0118P | 466 | 2021/11/4 | 2022/11/3 |
| Microware Preamplifier | EM Electronics Corporation | EM18G40G | 60656 | 2021/12/27 | 2022/12/26 |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101435 | 2021/12/27 | 2022/12/26 |
| EMI Test Receiver | Rohde & Schwarz | ESR7 | 101419 | 2021/11/9 | 2022/11/8 |
| Micro flex Cable | UTIFLEX | UFB197C-1-2362-70U-70U | 225757-001 | 2022/1/24 | 2023/1/23 |
| Coaxial Cable | COMMATE | PEWC | 8Dr | 2021/12/24 | 2022/12/23 |
| Coaxial Cable | UTIFLEX | UFB311A-Q-1440-300300 | 220490-006 | 2022/1/24 | 2023/1/23 |
| Coaxial Cable | JUNFLON | J12J102248-00-B-5 | AUG-07-15-044 | 2021/12/24 | 2022/12/23 |
| Cable | EMC | EMC105-SM-SM-10000 | 201003 | 2022/1/24 | 2023/1/23 |
| Coaxial Cable | ROSNOL | K1K50-UP0264-K1K50-450CM | 160309-1 | 2022/1/24 | 2023/1/23 |
| Coaxial Cable | ROSNOL | K1K50-UP0264-K1K50-50CM | 15120-1 | 2022/1/18 | 2023/1/17 |
| Software | Audix | e3 | 18621a bacl | N.C.R | N.C.R |
| Conducted Room | | | | | |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101435 | 2022/1/13 | 2023/1/12 |
| Cable | UTIFLEX | UFA210A | 9435 | 2021/10/5 | 2022/10/4 |
| Power Sensor | KEYSIGHT | U2021XA | MY54080018 | 2022/01/24 | 2023/01/23 |

***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 §15.247(i), §1.1307(b)(3)(i) - RF Exposure

## 5.1 Applicable Standard

According to subpart 15.247(i) 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 *Pth* (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). *Pth* is given by:

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

Where

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

and

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

## 5.2 RF Exposure Evaluation Result

The EUT can be used in the following modes, selecting the worst mode for evaluation.

Mode 2: 2.4G XOR + 5G Regular + 2.4G Aux + BLE

Mode 3: 2.4G XOR + 5G Regular + 5G Aux + BLE

Mode 4: 5G XOR + 5G Regular + 2.4G Aux + BLE

Mode 5: 5G XOR + 5G Regular + 5G Aux + BLE

**Worst case is Mode 2 :**

Project info

| Band | Freq (MHz) | Tune-up Power (dBm) | Ant Gain (dBi) | Distances (mm) | Duty (%) | Tune-up Power (mW) | ERP (dBm) | ERP (mW) |
|---|---|---|---|---|---|---|---|---|
| BLE | 2480 | 5 | 13 | 300 | 100% | 3.16 | 15.85 | 38.46 |
| do0 2.4GHz XOR | 2462 | 22 | 13 | 300 | 100% | 158.49 | 32.85 | 1927.52 |
| d01 5GHz Regualr | 5850 | 23 | 13 | 300 | 100% | 199.53 | 33.85 | 2426.61 |
| do4 2.4G Aux | 2462 | 16 | 13 | 300 | 100% | 39.81 | 26.85 | 484.17 |

Option A

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

| Band | Freq (MHz) | Result Option A |
|---|---|---|
| BLE | 2480 | not exempt |
| do0 2.4GHz XOR | 2462 | not exempt |
| d01 5GHz Regualr | 5850 | not exempt |
| do4 2.4G Aux | 2462 | not exempt |

Option B

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater.

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).

| Band | Freq (MHz) | Pth (mW) | X | ERP 20cm (mW) | Ratio | Result Option B |
|---|---|---|---|---|---|---|
| BLE | 2480 | 3060.00 | 1.905 | 3060 | 0.01 | exempt |
| do0 2.4GHz XOR | 2462 | 3060.00 | 1.903 | 3060 | 0.63 | exempt |
| d01 5GHz Regualr | 5850 | 3060.00 | 2.091 | 3060 | 0.79 | exempt |
| do4 2.4G Aux | 2462 | 3060.00 | 1.903 | 3060 | 0.16 | exempt |

**Simultaneous Analysis :**

| Band | Freq (MHz) | PSD Require | PSD ($mW/cm^2$) | PSD Limit ($mW/cm^2$) | Simultaneous TX | Ratio |
|---|---|---|---|---|---|---|
| BLE | 2480 | exempt | 0.006 | 1.000 | O | 0.006 |
| do0 2.4GHz XOR | 2462 | exempt | 0.280 | 1.000 | O | 0.280 |
| d01 5GHz Regualr | 5850 | exempt | 0.352 | 1.000 | O | 0.352 |
| do4 2.4G Aux | 2462 | exempt | 0.070 | 1.000 | O | 0.070 |
| Simultaneous Analysis (Limit 1) | | | | | | 0.708 |

**Result:** The EUT meets exemption requirement- RF exposure evaluation greater than **30cm** distance.

# 6 FCC §15.203 – Antenna Requirements

## 6.1 Applicable Standard

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

## 6.2 Antenna Information

| Manufacturer | Type | Antenna Gain |
|---|---|---|
| N/A | Patch antenna | 13 dBi |

**Result: Compliance**

# 7 FCC §15.207(a) – AC Line Conducted Emissions

## 7.1 Applicable Standard

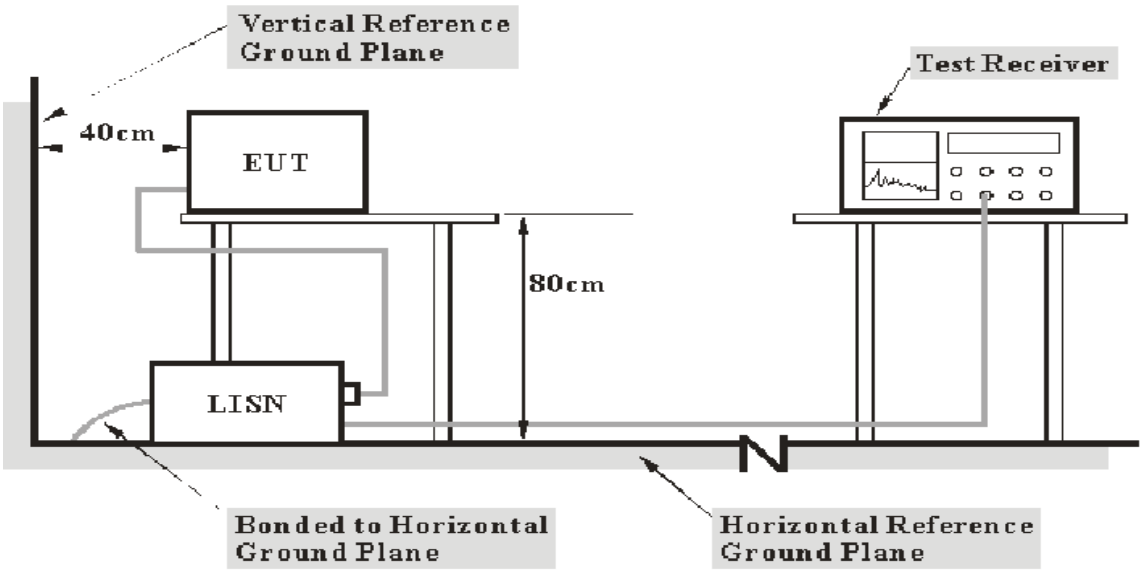
According to §15.207

For an intentional radiator 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, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-Peak | Average |
| 0.15-0.5 | 66 to 56 Note 1 | 56 to 46 Note 1 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Note 1: Decreases with the logarithm of the frequency.*

## 7.2 EUT Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

## 7.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

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

| Frequency Range | IF B/W |
|---|---|
| 150kHz – 30MHz | 9kHz |

## 7.4 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## 7.5 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

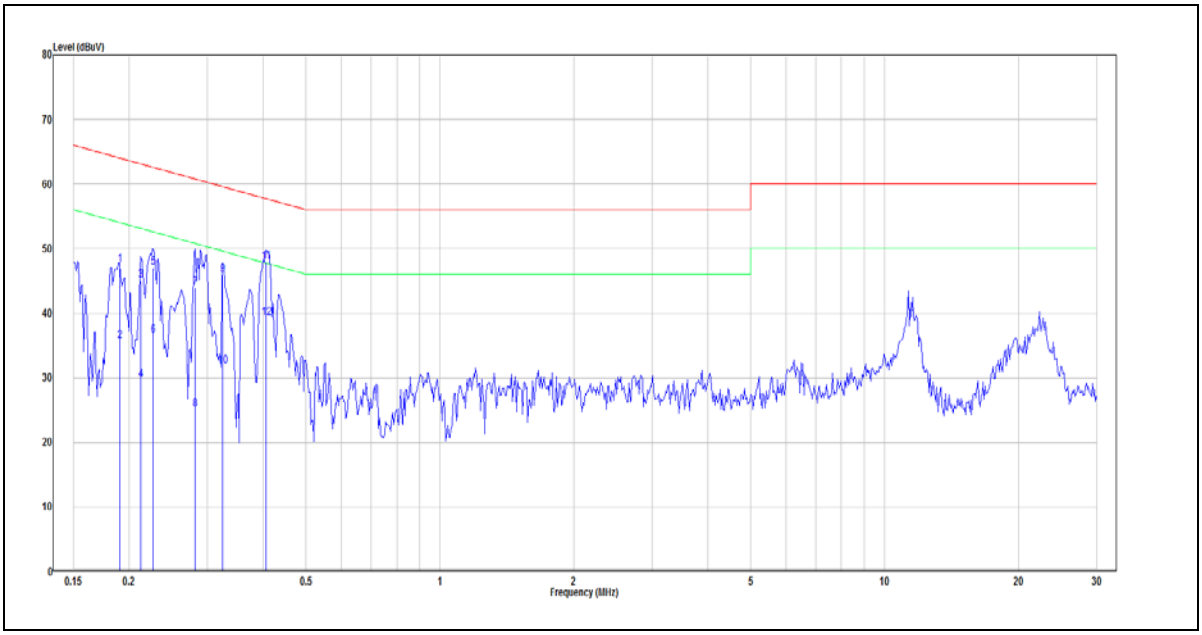
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

## 7.6 Test Results

Test Mode: Transmitting

**Main: AC120 V, 60 Hz, Line**




| No. | Frequency | Reading | Correct | Result | Limit | Over limit | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | dBuV | Factor(dB) | dBuV | dBuV | (dB) | |
| 1 | 0.190 | 27.97 | 19.52 | 47.49 | 64.02 | -16.53 | QP |
| 2 | 0.190 | 16.15 | 19.52 | 35.67 | 54.02 | -18.35 | Average |
| 3 | 0.213 | 25.50 | 19.52 | 45.02 | 63.10 | -18.08 | QP |
| 4 | 0.213 | 10.09 | 19.52 | 29.61 | 53.10 | -23.49 | Average |
| 5 | 0.227 | 27.47 | 19.52 | 46.99 | 62.57 | -15.58 | QP |
| 6 | 0.227 | 16.96 | 19.52 | 36.48 | 52.57 | -16.09 | Average |
| 7 | 0.282 | 24.43 | 19.52 | 43.95 | 60.76 | -16.81 | QP |
| 8 | 0.282 | 5.56 | 19.52 | 25.08 | 50.76 | -25.68 | Average |
| 9 | 0.325 | 26.44 | 19.52 | 45.96 | 59.57 | -13.61 | QP |
| 10 | 0.325 | 12.23 | 19.52 | 31.75 | 49.57 | -17.82 | Average |
| 11 | 0.406 | 28.45 | 19.53 | 47.98 | 57.73 | -9.75 | QP |
| 12 | 0.406 | 19.65 | 19.53 | 39.18 | 47.73 | -8.55 | Average |

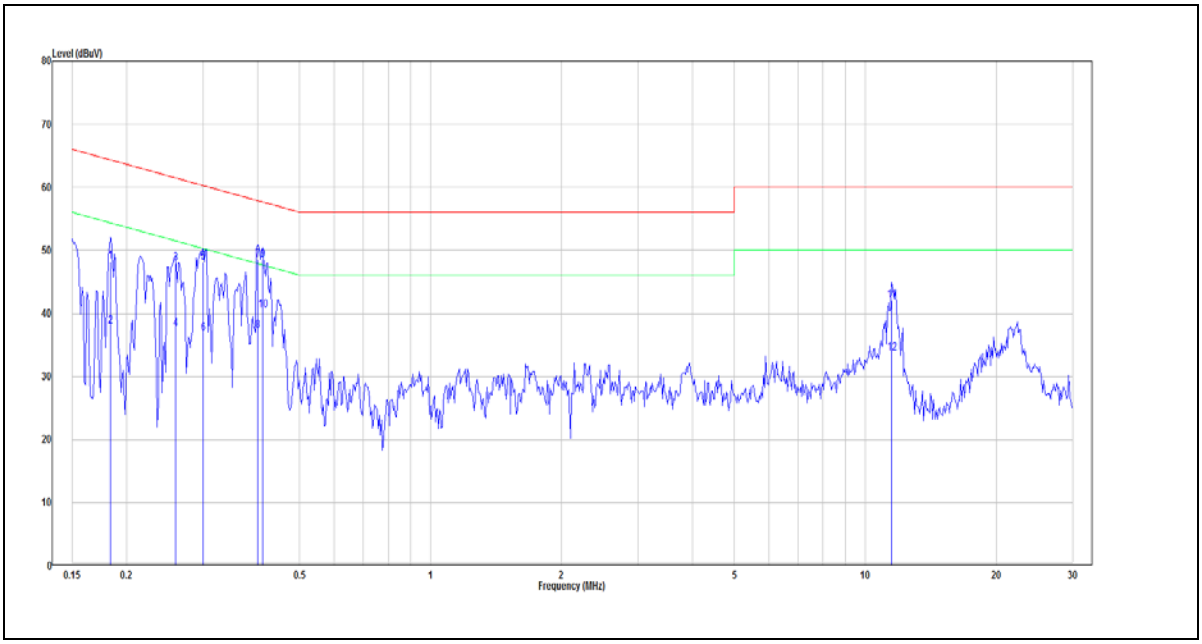
Note:

Level (Result) = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

**Main: AC120 V, 60 Hz, Neutral**




| No. | Frequency | Reading | Correct | Result | Limit | Over limit | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | dBuV | Factor(dB) | dBuV | dBuV | (dB) | |
| 1 | 0.183 | 28.62 | 19.51 | 48.13 | 64.33 | -16.20 | QP |
| 2 | 0.183 | 18.43 | 19.51 | 37.94 | 54.33 | -16.39 | Average |
| 3 | 0.259 | 28.41 | 19.51 | 47.92 | 61.47 | -13.55 | QP |
| 4 | 0.259 | 17.98 | 19.51 | 37.49 | 51.47 | -13.98 | Average |
| 5 | 0.300 | 28.48 | 19.52 | 48.00 | 60.24 | -12.24 | QP |
| 6 | 0.300 | 17.22 | 19.52 | 36.74 | 50.24 | -13.50 | Average |
| 7 | 0.400 | 28.90 | 19.53 | 48.43 | 57.86 | -9.43 | QP |
| 8 | 0.400 | 17.75 | 19.53 | 37.28 | 47.86 | -10.58 | Average |
| 9 | 0.410 | 28.91 | 19.53 | 48.44 | 57.64 | -9.20 | QP |
| 10 | 0.410 | 20.97 | 19.53 | 40.50 | 47.64 | -7.14 | Average |
| 11 | 11.498 | 22.26 | 19.81 | 42.07 | 60.00 | -17.93 | QP |
| 12 | 11.498 | 13.88 | 19.81 | 33.69 | 50.00 | -16.31 | Average |

Note:

Level (Result) = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

# 8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

## 8.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 – 0.110 | 16.42 – 16.423 | 608 – 614 | 4. 5 – 5. 15 |
| 0.495 – 0.505 | 16.69475 – 16.69525 | 960 – 1240 | 5. 35 – 5. 46 |
| 2.1735 – 2.1905 | 16.80425 – 16.80475 | 1300 – 1427 | 7.25 – 7.75 |
| 4.125 – 4.128 | 25.5 – 25.67 | 1435 – 1626.5 | 8.025 – 8.5 |
| 4.17725 – 4.17775 | 37.5 – 38.25 | 1645.5 – 1646.5 | 9.0 – 9.2 |
| 4.20725 – 4.20775 | 73 – 74.6 | 1660 – 1710 | 9.3 – 9.5 |
| 6.215 – 6.218 | 74.8 – 75.2 | 1718.8 – 1722.2 | 10.6 – 12.7 |
| 6.26775 – 6.26825 | 108 – 121.94 | 2200 – 2300 | 13.25 – 13.4 |
| 6.31175 – 6.31225 | 123 – 138 | 2310 – 2390 | 14.47 – 14.5 |
| 8.291 – 8.294 | 149.9 – 150.05 | 2483.5 – 2500 | 15.35 – 16.2 |
| 8.362 – 8.366 | 156.52475 – 156.52525 | 2690 – 2900 | 17.7 – 21.4 |
| 8.37625 – 8.38675 | 156.7 – 156.9 | 3260 – 3267 | 22.01 – 23.12 |
| 8.41425 – 8.41475 | 162.0125 –167.17 | 3.332 – 3.339 | 23.6 – 24.0 |
| 12.29 – 12.293 | 167.72 – 173.2 | 3 3458 – 3 358 | 31.2 – 31.8 |
| 12.51975 – 12.52025 | 240 – 285 | 3.600 – 4.400 | 36.43 – 36.5 |
| 12.57675 – 12.57725 | 322 – 335.4 | | Above 38.6 |
| 13.36 – 13.41 | 399.9 – 410 | | |

As per FCC §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:

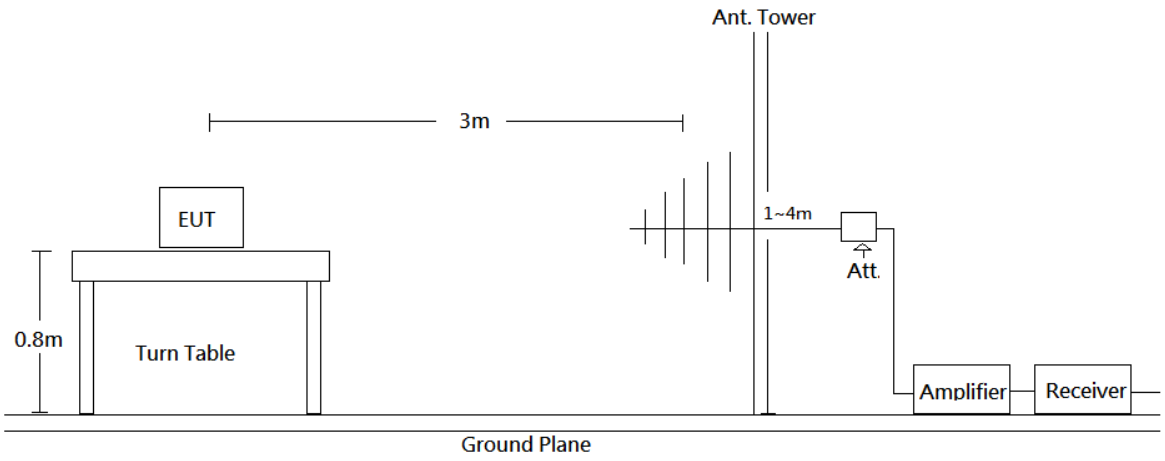
| Frequency (MHz) | Field Strength (micro volts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100** | 3 |
| 88 - 216 | 150** | 3 |
| 216 - 960 | 200** | 3 |
| Above 960 | 500 |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

** 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 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

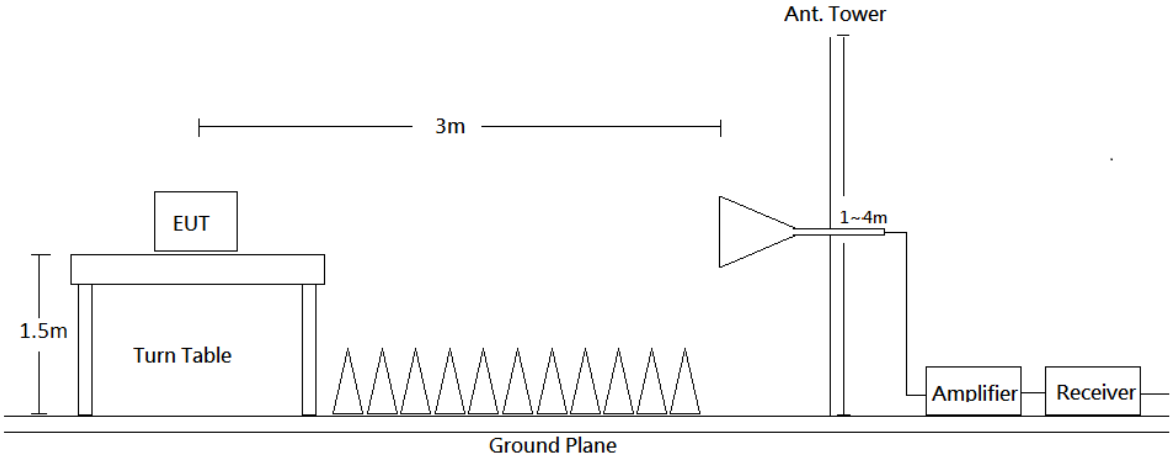
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

## 8.2 EUT Setup

Below 1 GHz:




Above 1 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 Part 15.209 and FCC 15.247 Limits.

## 8.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

| Frequency Range | RBW | VBW | Duty cycle | Measurement method |
|---|---|---|---|---|
| 30-1000 MHz | 120 kHz | / | / | QP |
| Above 1 GHz | 1 MHz | 3 MHz | / | PK |
| | 1 MHz | 10 Hz | >98% | Ave |
| | 1 MHz | 1/T | <98% | Ave |

Note: T is minimum transmission duration

## 8.4 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.

## 8.5 Corrected Factor & Margin Calculation

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

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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

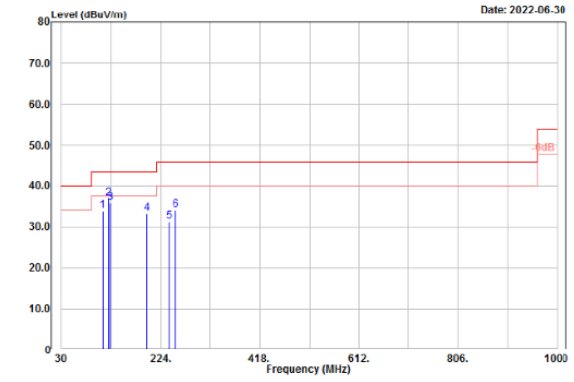
Margin = Result – Limit

## 8.6 Test Results

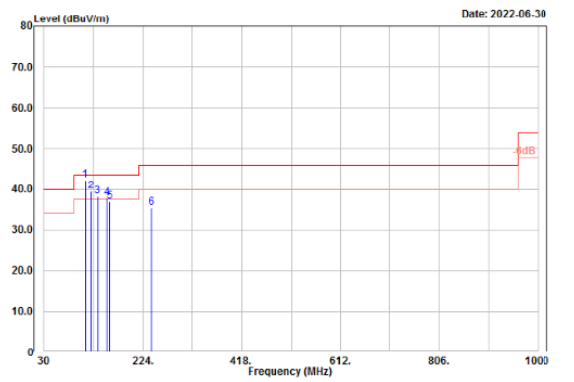
Test Mode: **BLE Mode** (Worst case is BLE mode high channel)

30MHz-1GHz:

| BLE Mode / Horizontal | BLE Mode / Vertical |
|---|---|




| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 110.510 | 43.74 | -9.85 | 33.89 | 43.50 | -9.61 | 100 | 346 | QP |
| 122.150 | 44.98 | -8.21 | 36.77 | 43.50 | -6.73 | 100 | 271 | QP |
| 126.030 | 43.85 | -8.08 | 35.77 | 43.50 | -7.73 | 100 | 68 | QP |
| 195.870 | 42.94 | -9.76 | 33.18 | 43.50 | -10.32 | 100 | 333 | QP |
| 239.520 | 41.00 | -9.83 | 31.17 | 46.00 | -14.83 | 100 | 114 | QP |
| 251.160 | 43.82 | -9.85 | 33.97 | 46.00 | -12.03 | 100 | 95 | QP |



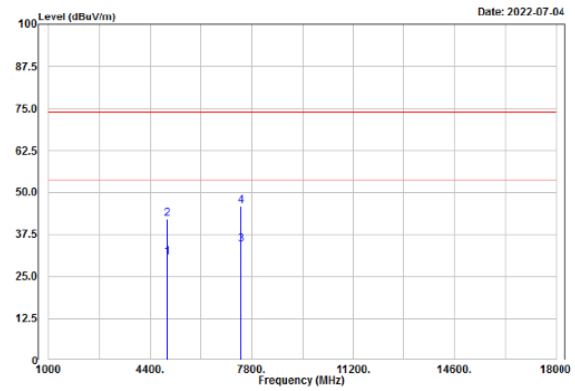
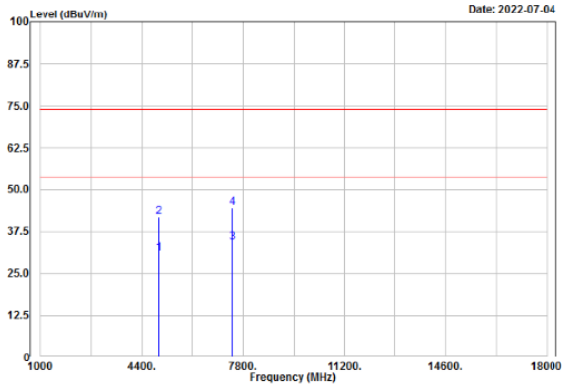
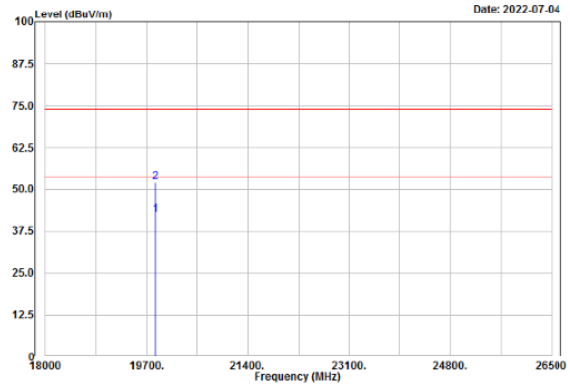
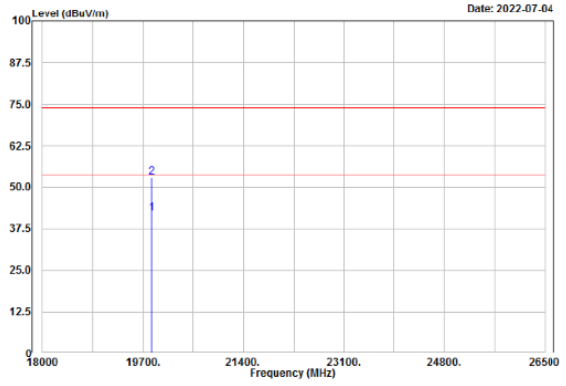

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 110.510 | 52.22 | -9.85 | 42.37 | 43.50 | -1.13 | 100 | 110 | QP |
| 122.150 | 47.66 | -8.21 | 39.45 | 43.50 | -4.05 | 100 | 310 | QP |
| 134.760 | 46.67 | -8.49 | 38.18 | 43.50 | -5.32 | 100 | 104 | QP |
| 153.190 | 47.19 | -9.57 | 37.62 | 43.50 | -5.88 | 100 | 76 | QP |
| 159.010 | 46.25 | -9.50 | 36.75 | 43.50 | -6.75 | 100 | 61 | QP |
| 239.520 | 45.23 | -9.83 | 35.40 | 46.00 | -10.60 | 100 | 236 | QP |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

| BLE Mode / Horizontal (1GHz-18GHz) | BLE Mode / Vertical (1GHz-18GHz) |
|---|---|
|  |  |
| **BLE Mode / Horizontal (18GHz – 26.5GHz)** | **BLE Mode / Vertical (18GHz – 26.5GHz)** |
|  |  |

## Above 1GHz

## Horizontal

**Low channel**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 32.55 | -2.47 | 30.08 | 54.00 | -23.92 | 154 | 142 | Average |
| 4804.000 | 43.77 | -2.47 | 41.30 | 74.00 | -32.70 | 154 | 142 | Peak |
| 7206.000 | 30.88 | 3.03 | 33.91 | 54.00 | -20.09 | 147 | 154 | Average |
| 7206.000 | 41.40 | 3.03 | 44.43 | 74.00 | -29.57 | 147 | 154 | Peak |

**Middle channel**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4880.000 | 32.64 | -2.24 | 30.40 | 54.00 | -23.60 | 151 | 0 | Average |
| 4880.000 | 44.13 | -2.24 | 41.89 | 74.00 | -32.11 | 151 | 0 | Peak |
| 7320.000 | 30.75 | 3.34 | 34.09 | 54.00 | -19.91 | 146 | 303 | Average |
| 7320.000 | 41.02 | 3.34 | 44.36 | 74.00 | -29.64 | 146 | 303 | Peak |

**High channel**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4960.000 | 32.78 | -2.04 | 30.74 | 54.00 | -23.26 | 152 | 29 | Average |
| 4960.000 | 44.16 | -2.04 | 42.12 | 74.00 | -31.88 | 152 | 29 | Peak |
| 7440.000 | 30.91 | 3.38 | 34.29 | 54.00 | -19.71 | 149 | 317 | Average |
| 7440.000 | 42.33 | 3.38 | 45.71 | 74.00 | -28.29 | 149 | 317 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

## Vertical

**Low channel**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 32.56 | -2.47 | 30.09 | 54.00 | -23.91 | 153 | 102 | Average |
| 4804.000 | 43.53 | -2.47 | 41.06 | 74.00 | -32.94 | 153 | 102 | Peak |
| 7206.000 | 30.88 | 3.03 | 33.91 | 54.00 | -20.09 | 149 | 252 | Average |
| 7206.000 | 40.76 | 3.03 | 43.79 | 74.00 | -30.21 | 149 | 252 | Peak |

**Middle channel**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4880.000 | 32.66 | -2.24 | 30.42 | 54.00 | -23.58 | 151 | 57 | Average |
| 4880.000 | 43.05 | -2.24 | 40.81 | 74.00 | -33.19 | 151 | 57 | Peak |
| 7320.000 | 30.72 | 3.34 | 34.06 | 54.00 | -19.94 | 146 | 296 | Average |
| 7320.000 | 41.25 | 3.34 | 44.59 | 74.00 | -29.41 | 146 | 296 | Peak |

**High channel**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4960.000 | 32.85 | -2.04 | 30.81 | 54.00 | -23.19 | 153 | 273 | Average |
| 4960.000 | 43.78 | -2.04 | 41.74 | 74.00 | -32.26 | 153 | 273 | Peak |
| 7440.000 | 30.84 | 3.38 | 34.22 | 54.00 | -19.78 | 148 | 1 | Average |
| 7440.000 | 41.17 | 3.38 | 44.55 | 74.00 | -29.45 | 148 | 1 | Peak |

Level (Result) = Reading + Factor.

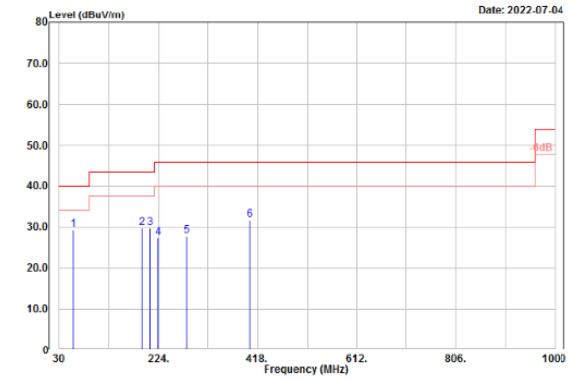
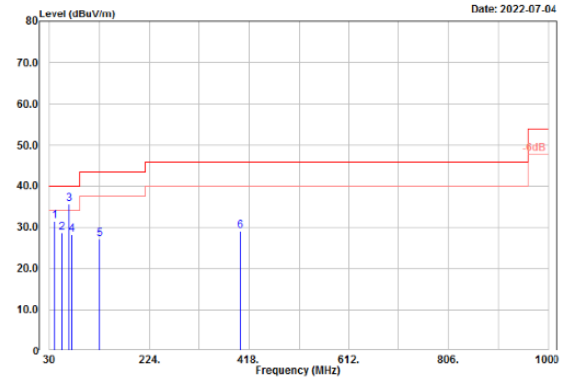
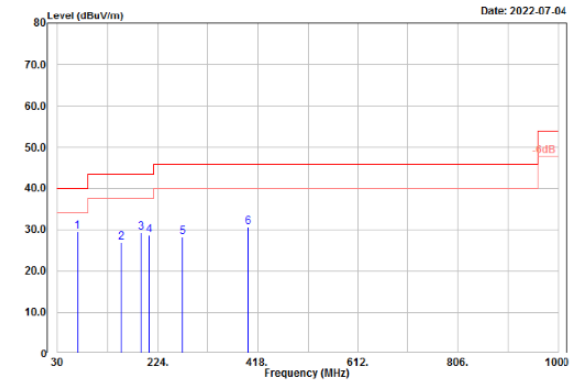
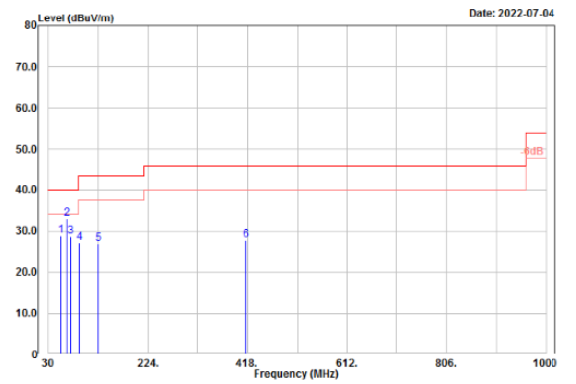
Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Transmitting simultaneously test:**

30MHz-1GHz:

| Mode 2 / Horizontal | Mode 2 / Vertical |
|---|---|
|  |  |
|  |  |



Mode 2 / Horizontal

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 57.160 | 44.79 | -15.58 | 29.21 | 40.00 | -10.79 | 100 | 0 | QP |
| 191.020 | 40.08 | -10.35 | 29.73 | 43.50 | -13.77 | 100 | 45 | QP |
| 206.540 | 40.56 | -10.95 | 29.61 | 43.50 | -13.89 | 100 | 30 | QP |
| 223.030 | 37.98 | -10.68 | 27.30 | 46.00 | -18.70 | 100 | 32 | QP |
| 278.320 | 35.71 | -7.89 | 27.82 | 46.00 | -18.18 | 100 | 349 | QP |
| 402.480 | 36.38 | -4.72 | 31.66 | 46.00 | -14.34 | 100 | 72 | QP |

Mode 2 / Vertical

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 40.670 | 41.61 | -10.12 | 31.49 | 40.00 | -8.51 | 100 | 74 | QP |
| 53.280 | 44.14 | -15.47 | 28.67 | 40.00 | -11.33 | 100 | 205 | QP |
| 67.830 | 50.07 | -14.54 | 35.53 | 40.00 | -4.47 | 100 | 44 | QP |
| 72.680 | 42.86 | -14.58 | 28.28 | 40.00 | -11.72 | 100 | 129 | QP |
| 127.000 | 35.09 | -8.07 | 27.02 | 43.50 | -16.48 | 100 | 2 | QP |
| 401.510 | 33.91 | -4.76 | 29.15 | 46.00 | -16.85 | 100 | 28 | QP |

Mode 3 / Horizontal

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 68.800 | 44.19 | -14.66 | 29.53 | 40.00 | -10.47 | 100 | 197 | QP |
| 152.220 | 36.55 | -9.58 | 26.97 | 43.50 | -15.53 | 100 | 85 | QP |
| 191.020 | 39.66 | -10.35 | 29.31 | 43.50 | -14.19 | 100 | 33 | QP |
| 206.540 | 39.58 | -10.95 | 28.63 | 43.50 | -14.87 | 100 | 15 | QP |
| 270.560 | 36.35 | -8.11 | 28.24 | 46.00 | -17.76 | 100 | 343 | QP |
| 399.570 | 35.48 | -4.86 | 30.62 | 46.00 | -15.38 | 100 | 301 | QP |

Mode 3 / Vertical

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 54.250 | 44.35 | -15.62 | 28.73 | 40.00 | -11.27 | 100 | 0 | QP |
| 65.890 | 47.94 | -15.04 | 32.90 | 40.00 | -7.10 | 100 | 339 | QP |
| 72.680 | 43.26 | -14.58 | 28.68 | 40.00 | -11.32 | 100 | 104 | QP |
| 90.140 | 41.80 | -14.68 | 27.12 | 43.50 | -16.38 | 100 | 113 | QP |
| 127.000 | 34.99 | -8.07 | 26.92 | 43.50 | -16.58 | 100 | 23 | QP |
| 415.090 | 31.85 | -4.15 | 27.70 | 46.00 | -18.30 | 100 | 36 | QP |

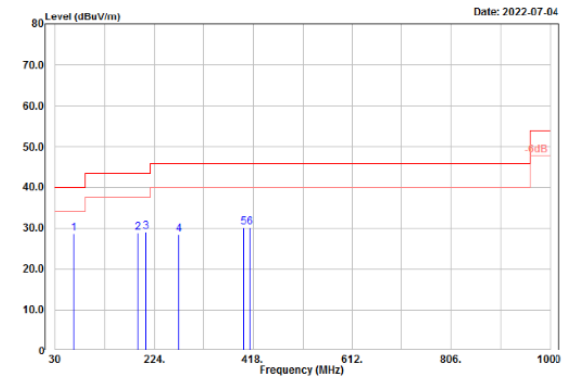
Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

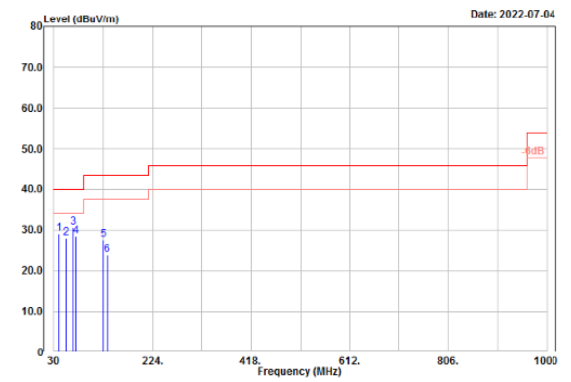
Spurious emissions more than 20 dB below the limit were not reported.

## Mode 4 / Horizontal



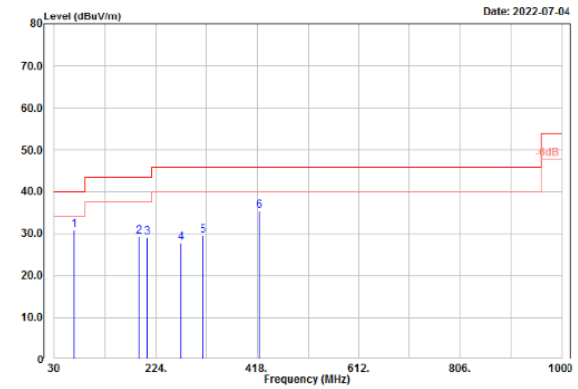

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 65.890 | 43.68 | -15.04 | 28.64 | 40.00 | -11.36 | 100 | 134 | QP |
| 191.020 | 39.24 | -10.35 | 28.89 | 43.50 | -14.61 | 100 | 35 | QP |
| 206.540 | 39.93 | -10.95 | 28.98 | 43.50 | -14.52 | 100 | 40 | QP |
| 270.560 | 36.41 | -8.11 | 28.30 | 46.00 | -17.70 | 100 | 351 | QP |
| 399.570 | 34.94 | -4.86 | 30.08 | 46.00 | -15.92 | 100 | 83 | QP |
| 411.210 | 34.46 | -4.29 | 30.17 | 46.00 | -15.83 | 100 | 74 | QP |

## Mode 4 / Vertical



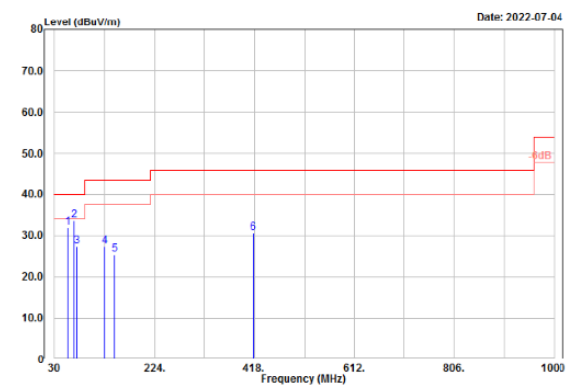

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 39.700 | 38.39 | -9.35 | 29.04 | 40.00 | -10.96 | 100 | 129 | QP |
| 53.280 | 43.54 | -15.47 | 28.07 | 40.00 | -11.93 | 100 | 56 | QP |
| 67.830 | 45.18 | -14.54 | 30.64 | 40.00 | -9.36 | 100 | 151 | QP |
| 73.650 | 42.99 | -14.69 | 28.30 | 40.00 | -11.70 | 100 | 245 | QP |
| 127.000 | 35.65 | -8.07 | 27.58 | 43.50 | -15.92 | 100 | 360 | QP |
| 134.760 | 32.43 | -8.49 | 23.94 | 43.50 | -19.56 | 100 | 357 | QP |

## Mode 5 / Horizontal




| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remar |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 67.830 | 45.28 | -14.54 | 30.74 | 40.00 | -9.26 | 100 | 2 | QP |
| 191.020 | 39.61 | -10.35 | 29.26 | 43.50 | -14.24 | 100 | 27 | QP |
| 206.540 | 40.09 | -10.95 | 29.14 | 43.50 | -14.36 | 100 | 42 | QP |
| 270.560 | 35.88 | -8.11 | 27.77 | 46.00 | -18.23 | 100 | 350 | QP |
| 314.210 | 36.59 | -7.05 | 29.54 | 46.00 | -16.46 | 100 | 261 | QP |
| 421.880 | 39.34 | -4.03 | 35.31 | 46.00 | -10.69 | 100 | 322 | QP |

## Mode 5 / Vertical




| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 56.190 | 47.42 | -15.58 | 31.84 | 40.00 | -8.16 | 100 | 360 | QP |
| 67.830 | 48.20 | -14.54 | 33.66 | 40.00 | -6.34 | 100 | 262 | QP |
| 73.650 | 41.95 | -14.69 | 27.26 | 40.00 | -12.74 | 100 | 205 | QP |
| 127.000 | 35.31 | -8.07 | 27.24 | 43.50 | -16.26 | 100 | 19 | QP |
| 145.430 | 34.86 | -9.48 | 25.38 | 43.50 | -18.12 | 100 | 272 | QP |
| 416.060 | 34.59 | -4.13 | 30.46 | 46.00 | -15.54 | 100 | 12 | QP |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

## Above 1GHz

## Mode 2 :

**Horizontal**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 38.15 | -2.47 | 35.68 | 54.00 | -18.32 | 169 | 167 | Average |
| 4804.000 | 43.38 | -2.47 | 40.91 | 74.00 | -33.09 | 169 | 167 | Peak |
| 4874.000 | 35.33 | -2.25 | 33.08 | 54.00 | -20.92 | 199 | 71 | Average |
| 4874.000 | 44.39 | -2.25 | 42.14 | 74.00 | -31.86 | 199 | 71 | Peak |
| 7206.000 | 35.63 | 3.03 | 38.66 | 54.00 | -15.34 | 203 | 263 | Average |
| 7206.000 | 44.40 | 3.03 | 47.43 | 74.00 | -26.57 | 203 | 263 | Peak |
| 7311.000 | 34.77 | 3.34 | 38.11 | 54.00 | -15.89 | 143 | 315 | Average |
| 7311.000 | 41.76 | 3.34 | 45.10 | 74.00 | -28.90 | 143 | 315 | Peak |
| 11490.000 | 35.58 | 8.62 | 44.20 | 54.00 | -9.80 | 154 | 192 | Average |
| 11490.000 | 40.80 | 8.62 | 49.42 | 74.00 | -24.58 | 154 | 192 | Peak |
| 17235.000 | 31.51 | 13.26 | 44.77 | 54.00 | -9.23 | 171 | 185 | Average |
| 17235.000 | 41.42 | 13.26 | 54.68 | 74.00 | -19.32 | 171 | 185 | Peak |
| 19216.000 | 41.54 | -0.57 | 40.97 | 54.00 | -13.03 | 150 | 257 | Average |
| 19216.000 | 51.58 | -0.57 | 51.01 | 74.00 | -22.99 | 150 | 257 | Peak |
| 19496.000 | 41.60 | 0.25 | 41.85 | 54.00 | -12.15 | 150 | 323 | Average |
| 19496.000 | 51.66 | 0.25 | 51.91 | 74.00 | -22.09 | 150 | 323 | Peak |
| 22980.000 | 38.98 | 2.57 | 41.55 | 54.00 | -12.45 | 150 | 357 | Average |
| 22980.000 | 49.03 | 2.57 | 51.60 | 74.00 | -22.40 | 150 | 357 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Vertical**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 37.21 | -2.47 | 34.74 | 54.00 | -19.26 | 161 | 102 | Average |
| 4804.000 | 43.27 | -2.47 | 40.80 | 74.00 | -33.20 | 161 | 102 | Peak |
| 4874.000 | 34.10 | -2.25 | 31.85 | 54.00 | -22.15 | 177 | 84 | Average |
| 4874.000 | 44.17 | -2.25 | 41.92 | 74.00 | -32.08 | 177 | 84 | Peak |
| 7206.000 | 35.44 | 3.03 | 38.47 | 54.00 | -15.53 | 185 | 318 | Average |
| 7206.000 | 40.83 | 3.03 | 43.86 | 74.00 | -30.14 | 185 | 318 | Peak |
| 7311.000 | 34.54 | 3.34 | 37.88 | 54.00 | -16.12 | 152 | 273 | Average |
| 7311.000 | 41.40 | 3.34 | 44.74 | 74.00 | -29.26 | 152 | 273 | Peak |
| 11490.000 | 34.91 | 8.62 | 43.53 | 54.00 | -10.47 | 204 | 0 | Average |
| 11490.000 | 40.68 | 8.62 | 49.30 | 74.00 | -24.70 | 204 | 0 | Peak |
| 17235.000 | 31.42 | 13.26 | 44.68 | 54.00 | -9.32 | 169 | 201 | Average |
| 17235.000 | 41.21 | 13.26 | 54.47 | 74.00 | -19.53 | 150 | 201 | Peak |
| 19216.000 | 40.30 | -0.57 | 39.73 | 54.00 | -14.27 | 150 | 243 | Average |
| 19216.000 | 50.18 | -0.57 | 49.61 | 74.00 | -24.39 | 150 | 243 | Peak |
| 19496.000 | 41.37 | 0.25 | 41.62 | 54.00 | -12.38 | 150 | 104 | Average |
| 19496.000 | 51.39 | 0.25 | 51.64 | 74.00 | -22.36 | 150 | 104 | Peak |
| 22980.000 | 38.32 | 2.57 | 40.89 | 54.00 | -13.11 | 150 | 80 | Average |
| 22980.000 | 48.82 | 2.57 | 51.39 | 74.00 | -22.61 | 150 | 80 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Mode 3:**

**Horizontal**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 37.18 | -2.47 | 34.71 | 54.00 | -19.29 | 149 | 18 | Average |
| 4804.000 | 44.19 | -2.47 | 41.72 | 74.00 | -32.28 | 149 | 18 | Peak |
| 4874.000 | 34.79 | -2.25 | 32.54 | 54.00 | -21.46 | 169 | 292 | Average |
| 4874.000 | 43.44 | -2.25 | 41.19 | 74.00 | -32.81 | 169 | 292 | Peak |
| 7206.000 | 32.42 | 3.03 | 35.45 | 54.00 | -18.55 | 201 | 173 | Average |
| 7206.000 | 41.54 | 3.03 | 44.57 | 74.00 | -29.43 | 201 | 173 | Peak |
| 7311.000 | 31.50 | 3.34 | 34.84 | 54.00 | -19.16 | 170 | 142 | Average |
| 7311.000 | 41.36 | 3.34 | 44.70 | 74.00 | -29.30 | 170 | 142 | Peak |
| 10440.000 | 32.92 | 7.97 | 40.89 | 54.00 | -13.11 | 152 | 228 | Average |
| 10440.000 | 43.26 | 7.97 | 51.23 | 74.00 | -22.77 | 152 | 228 | Peak |
| 11490.000 | 33.01 | 8.62 | 41.63 | 54.00 | -12.37 | 203 | 292 | Average |
| 11490.000 | 41.11 | 8.62 | 49.73 | 74.00 | -24.27 | 203 | 292 | Peak |
| 15660.000 | 39.66 | 11.11 | 50.77 | 54.00 | -3.23 | 150 | 228 | Average |
| 15660.000 | 43.38 | 11.11 | 54.49 | 74.00 | -19.51 | 150 | 228 | Peak |
| 17235.000 | 31.57 | 13.26 | 44.83 | 54.00 | -9.17 | 149 | 228 | Average |
| 17235.000 | 41.23 | 13.26 | 54.49 | 74.00 | -19.51 | 149 | 228 | Peak |
| 19216.000 | 42.32 | -0.57 | 41.75 | 54.00 | -12.25 | 150 | 321 | Average |
| 19216.000 | 52.13 | -0.57 | 51.56 | 74.00 | -22.44 | 150 | 321 | Peak |
| 19496.000 | 41.61 | 0.25 | 41.86 | 54.00 | -12.14 | 150 | 264 | Average |
| 19496.000 | 51.63 | 0.25 | 51.88 | 74.00 | -22.12 | 150 | 264 | Peak |
| 20880.000 | 40.19 | 1.85 | 42.04 | 54.00 | -11.96 | 150 | 32 | Average |
| 20880.000 | 50.54 | 1.85 | 52.39 | 74.00 | -21.61 | 150 | 32 | Peak |
| 22980.000 | 39.76 | 2.57 | 42.33 | 54.00 | -11.67 | 150 | 32 | Average |
| 22980.000 | 49.82 | 2.57 | 52.39 | 74.00 | -21.61 | 150 | 32 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Vertical**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 36.30 | -2.47 | 33.83 | 54.00 | -20.17 | 149 | 0 | Average |
| 4804.000 | 43.17 | -2.47 | 40.70 | 74.00 | -33.30 | 149 | 0 | Peak |
| 4874.000 | 34.58 | -2.25 | 32.33 | 54.00 | -21.67 | 201 | 153 | Average |
| 4874.000 | 43.38 | -2.25 | 41.13 | 74.00 | -32.87 | 201 | 153 | Peak |
| 7206.000 | 32.30 | 3.03 | 35.33 | 54.00 | -18.67 | 171 | 107 | Average |
| 7206.000 | 41.22 | 3.03 | 44.25 | 74.00 | -29.75 | 171 | 107 | Peak |
| 7311.000 | 30.92 | 3.34 | 34.26 | 54.00 | -19.74 | 188 | 7 | Average |
| 7311.000 | 40.70 | 3.34 | 44.04 | 74.00 | -29.96 | 188 | 7 | Peak |
| 10440.000 | 32.86 | 7.97 | 40.83 | 54.00 | -13.17 | 144 | 0 | Average |
| 10440.000 | 42.13 | 7.97 | 50.10 | 74.00 | -23.90 | 144 | 0 | Peak |
| 11490.000 | 32.88 | 8.62 | 41.50 | 54.00 | -12.50 | 167 | 72 | Average |
| 11490.000 | 40.90 | 8.62 | 49.52 | 74.00 | -24.48 | 167 | 72 | Peak |
| 15660.000 | 29.72 | 11.11 | 40.83 | 54.00 | -13.17 | 147 | 0 | Average |
| 15660.000 | 38.51 | 11.11 | 49.62 | 74.00 | -24.38 | 147 | 0 | Peak |
| 17235.000 | 30.87 | 13.26 | 44.13 | 54.00 | -9.87 | 155 | 360 | Average |
| 17235.000 | 41.02 | 13.26 | 54.28 | 74.00 | -19.72 | 155 | 360 | Peak |
| 19216.000 | 42.12 | -0.57 | 41.55 | 54.00 | -12.45 | 150 | 18 | Average |
| 19216.000 | 52.09 | -0.57 | 51.52 | 74.00 | -22.48 | 150 | 18 | Peak |
| 19496.000 | 41.29 | 0.25 | 41.54 | 54.00 | -12.46 | 150 | 95 | Average |
| 19496.000 | 51.18 | 0.25 | 51.43 | 74.00 | -22.57 | 150 | 95 | Peak |
| 20880.000 | 40.04 | 1.85 | 41.89 | 54.00 | -12.11 | 150 | 18 | Average |
| 20880.000 | 50.25 | 1.85 | 52.10 | 74.00 | -21.90 | 150 | 18 | Peak |
| 22980.000 | 39.44 | 2.57 | 42.01 | 54.00 | -11.99 | 150 | 161 | Average |
| 22980.000 | 49.40 | 2.57 | 51.97 | 74.00 | -22.03 | 150 | 161 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Mode 4:**

**Horizontal**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 38.15 | -2.47 | 35.68 | 54.00 | -18.32 | 169 | 167 | Average |
| 4804.000 | 43.38 | -2.47 | 40.91 | 74.00 | -33.09 | 169 | 167 | Peak |
| 4874.000 | 35.33 | -2.25 | 33.08 | 54.00 | -20.92 | 199 | 71 | Average |
| 4874.000 | 44.39 | -2.25 | 42.14 | 74.00 | -31.86 | 199 | 71 | Peak |
| 7206.000 | 35.62 | 3.03 | 38.65 | 54.00 | -15.35 | 203 | 263 | Average |
| 7206.000 | 41.37 | 3.03 | 44.40 | 74.00 | -29.60 | 203 | 263 | Peak |
| 7311.000 | 34.78 | 3.34 | 38.12 | 54.00 | -15.88 | 143 | 315 | Average |
| 7311.000 | 41.77 | 3.34 | 45.11 | 74.00 | -28.89 | 143 | 315 | Peak |
| 10460.000 | 36.14 | 8.06 | 44.20 | 54.00 | -9.80 | 154 | 192 | Average |
| 10460.000 | 41.36 | 8.06 | 49.42 | 74.00 | -24.58 | 154 | 192 | Peak |
| 11490.000 | 32.15 | 8.62 | 40.77 | 54.00 | -13.23 | 178 | 185 | Average |
| 11490.000 | 40.39 | 8.62 | 49.01 | 74.00 | -24.99 | 178 | 185 | Peak |
| 15690.000 | 33.47 | 11.30 | 44.77 | 54.00 | -9.23 | 171 | 185 | Average |
| 15690.000 | 43.38 | 11.30 | 54.68 | 74.00 | -19.32 | 171 | 185 | Peak |
| 17235.000 | 31.51 | 13.26 | 44.77 | 54.00 | -9.23 | 200 | 185 | Average |
| 17235.000 | 41.00 | 13.26 | 54.26 | 74.00 | -19.74 | 200 | 185 | Peak |
| 19216.000 | 42.67 | -0.57 | 42.10 | 54.00 | -11.90 | 150 | 76 | Average |
| 19216.000 | 52.25 | -0.57 | 51.68 | 74.00 | -22.32 | 150 | 76 | Peak |
| 19496.000 | 41.67 | 0.25 | 41.92 | 54.00 | -12.08 | 150 | 350 | Average |
| 19496.000 | 51.46 | 0.25 | 51.71 | 74.00 | -22.29 | 150 | 350 | Peak |
| 20920.000 | 39.40 | 1.81 | 41.21 | 54.00 | -12.79 | 150 | 360 | Average |
| 20920.000 | 49.55 | 1.81 | 51.36 | 74.00 | -22.64 | 150 | 360 | Peak |
| 22980.000 | 39.60 | 2.57 | 42.17 | 54.00 | -11.83 | 150 | 360 | Average |
| 22980.000 | 49.63 | 2.57 | 52.20 | 74.00 | -21.80 | 150 | 360 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Vertical**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 33.17 | -2.47 | 30.70 | 54.00 | -23.30 | 169 | 137 | Average |
| 4804.000 | 43.99 | -2.47 | 41.52 | 74.00 | -32.48 | 169 | 137 | Peak |
| 4874.000 | 33.26 | -2.25 | 31.01 | 54.00 | -22.99 | 151 | 201 | Average |
| 4874.000 | 43.23 | -2.25 | 40.98 | 74.00 | -33.02 | 151 | 201 | Peak |
| 7206.000 | 31.59 | 3.03 | 34.62 | 54.00 | -19.38 | 144 | 161 | Average |
| 7206.000 | 41.21 | 3.03 | 44.24 | 74.00 | -29.76 | 144 | 161 | Peak |
| 7311.000 | 31.80 | 3.34 | 35.14 | 54.00 | -18.86 | 209 | 327 | Average |
| 7311.000 | 41.04 | 3.34 | 44.38 | 74.00 | -29.62 | 209 | 327 | Peak |
| 10460.000 | 30.68 | 8.06 | 38.74 | 54.00 | -15.26 | 175 | 271 | Average |
| 10460.000 | 40.77 | 8.06 | 48.83 | 74.00 | -25.17 | 175 | 271 | Peak |
| 11490.000 | 30.80 | 8.62 | 39.42 | 54.00 | -14.58 | 160 | 271 | Average |
| 11490.000 | 40.59 | 8.62 | 49.21 | 74.00 | -24.79 | 160 | 271 | Peak |
| 15690.000 | 33.20 | 11.30 | 44.50 | 54.00 | -9.50 | 183 | 283 | Average |
| 15690.000 | 43.18 | 11.30 | 54.48 | 74.00 | -19.52 | 183 | 283 | Peak |
| 17235.000 | 30.95 | 13.26 | 44.21 | 54.00 | -9.79 | 167 | 149 | Average |
| 17235.000 | 41.11 | 13.26 | 54.37 | 74.00 | -19.63 | 167 | 149 | Peak |
| 19216.000 | 42.42 | -0.57 | 41.85 | 54.00 | -12.15 | 150 | 189 | Average |
| 19216.000 | 51.88 | -0.57 | 51.31 | 74.00 | -22.69 | 150 | 189 | Peak |
| 19496.000 | 41.38 | 0.25 | 41.63 | 54.00 | -12.37 | 150 | 11 | Average |
| 19496.000 | 51.40 | 0.25 | 51.65 | 74.00 | -22.35 | 150 | 11 | Peak |
| 20920.000 | 38.32 | 1.81 | 40.13 | 54.00 | -13.87 | 150 | 317 | Average |
| 20920.000 | 49.23 | 1.81 | 51.04 | 74.00 | -22.96 | 150 | 317 | Peak |
| 22980.000 | 39.42 | 2.57 | 41.99 | 54.00 | -12.01 | 150 | 253 | Average |
| 22980.000 | 48.63 | 2.57 | 51.20 | 74.00 | -22.80 | 150 | 253 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

## Mode 5:

**Horizontal**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4804.000 | 32.88 | -2.47 | 30.41 | 54.00 | -23.59 | 149 | 65 | Average |
| 4804.000 | 42.93 | -2.47 | 40.46 | 74.00 | -33.54 | 149 | 65 | Peak |
| 7206.000 | 31.28 | 3.03 | 34.31 | 54.00 | -19.69 | 181 | 219 | Average |
| 7206.000 | 41.20 | 3.03 | 44.23 | 74.00 | -29.77 | 181 | 219 | Peak |
| 10440.000 | 32.49 | 7.97 | 40.46 | 54.00 | -13.54 | 200 | 65 | Average |
| 10440.000 | 42.13 | 7.97 | 50.10 | 74.00 | -23.90 | 200 | 65 | Peak |
| 10460.000 | 30.51 | 8.06 | 38.57 | 54.00 | -15.43 | 199 | 359 | Average |
| 10460.000 | 40.55 | 8.06 | 48.61 | 74.00 | -25.39 | 199 | 359 | Peak |
| 11490.000 | 29.80 | 8.62 | 38.42 | 54.00 | -15.58 | 175 | 133 | Average |
| 11490.000 | 40.18 | 8.62 | 48.80 | 74.00 | -25.20 | 175 | 133 | Peak |
| 15660.000 | 29.31 | 11.11 | 40.42 | 54.00 | -13.58 | 150 | 65 | Average |
| 15660.000 | 32.35 | 11.11 | 43.46 | 74.00 | -30.54 | 150 | 65 | Peak |
| 15690.000 | 31.67 | 11.30 | 42.97 | 54.00 | -11.03 | 158 | 327 | Average |
| 15690.000 | 41.89 | 11.30 | 53.19 | 74.00 | -20.81 | 158 | 327 | Peak |
| 17235.000 | 30.77 | 13.26 | 44.03 | 54.00 | -9.97 | 166 | 296 | Average |
| 17235.000 | 41.04 | 13.26 | 54.30 | 74.00 | -19.70 | 166 | 296 | Peak |
| 19216.000 | 43.11 | -0.57 | 42.54 | 54.00 | -11.46 | 150 | 194 | Average |
| 19216.000 | 53.30 | -0.57 | 52.73 | 74.00 | -21.27 | 150 | 194 | Peak |
| 20880.000 | 40.69 | 1.85 | 42.54 | 54.00 | -11.46 | 150 | 194 | Average |
| 20880.000 | 50.22 | 1.85 | 52.07 | 74.00 | -21.93 | 150 | 194 | Peak |
| 20920.000 | 39.29 | 1.81 | 41.10 | 54.00 | -12.90 | 150 | 109 | Average |
| 20920.000 | 51.66 | 1.81 | 53.47 | 74.00 | -20.53 | 150 | 109 | Peak |
| 22980.000 | 38.82 | 2.57 | 41.39 | 54.00 | -12.61 | 150 | 84 | Average |
| 22980.000 | 49.56 | 2.57 | 52.13 | 74.00 | -21.87 | 150 | 84 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Vertical**

| Freq. | Reading | Factor | Level | Limit | Margin | Height | Degree | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | (cm) | (°) | |
| 4804.000 | 32.03 | -2.47 | 29.56 | 54.00 | -24.44 | 201 | 288 | Average |
| 4804.000 | 42.65 | -2.47 | 40.18 | 74.00 | -33.82 | 201 | 288 | Peak |
| 7206.000 | 31.21 | 3.03 | 34.24 | 54.00 | -19.76 | 168 | 151 | Average |
| 7206.000 | 40.09 | 3.03 | 43.12 | 74.00 | -30.88 | 168 | 151 | Peak |
| 10440.000 | 32.22 | 7.97 | 40.19 | 54.00 | -13.81 | 177 | 346 | Average |
| 10440.000 | 41.38 | 7.97 | 49.35 | 74.00 | -24.65 | 177 | 346 | Peak |
| 10460.000 | 30.44 | 8.06 | 38.50 | 54.00 | -15.50 | 152 | 334 | Average |
| 10460.000 | 40.15 | 8.06 | 48.21 | 74.00 | -25.79 | 152 | 334 | Peak |
| 11490.000 | 29.68 | 8.62 | 38.30 | 54.00 | -15.70 | 144 | 205 | Average |
| 11490.000 | 39.80 | 8.62 | 48.42 | 74.00 | -25.58 | 144 | 205 | Peak |
| 15660.000 | 29.07 | 11.11 | 40.18 | 54.00 | -13.82 | 180 | 346 | Average |
| 15660.000 | 31.24 | 11.11 | 42.35 | 74.00 | -31.65 | 180 | 346 | Peak |
| 15690.000 | 31.51 | 11.30 | 42.81 | 54.00 | -11.19 | 191 | 24 | Average |
| 15690.000 | 41.27 | 11.30 | 52.57 | 74.00 | -21.43 | 191 | 24 | Peak |
| 17235.000 | 30.79 | 13.26 | 44.05 | 54.00 | -9.95 | 211 | 346 | Average |
| 17235.000 | 40.56 | 13.26 | 53.82 | 74.00 | -20.18 | 211 | 346 | Peak |
| 19216.000 | 42.83 | -0.57 | 42.26 | 54.00 | -11.74 | 150 | 196 | Average |
| 19216.000 | 52.74 | -0.57 | 52.17 | 74.00 | -21.83 | 150 | 196 | Peak |
| 20880.000 | 39.51 | 1.85 | 41.36 | 54.00 | -12.64 | 150 | 51 | Average |
| 20880.000 | 48.64 | 1.85 | 50.49 | 74.00 | -23.51 | 150 | 51 | Peak |
| 20920.000 | 39.18 | 1.81 | 40.99 | 54.00 | -13.01 | 150 | 1 | Average |
| 20920.000 | 50.31 | 1.81 | 52.12 | 74.00 | -21.88 | 150 | 1 | Peak |
| 22980.000 | 38.76 | 2.57 | 41.33 | 54.00 | -12.67 | 150 | 51 | Average |
| 22980.000 | 47.92 | 2.57 | 50.49 | 74.00 | -23.51 | 150 | 51 | Peak |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

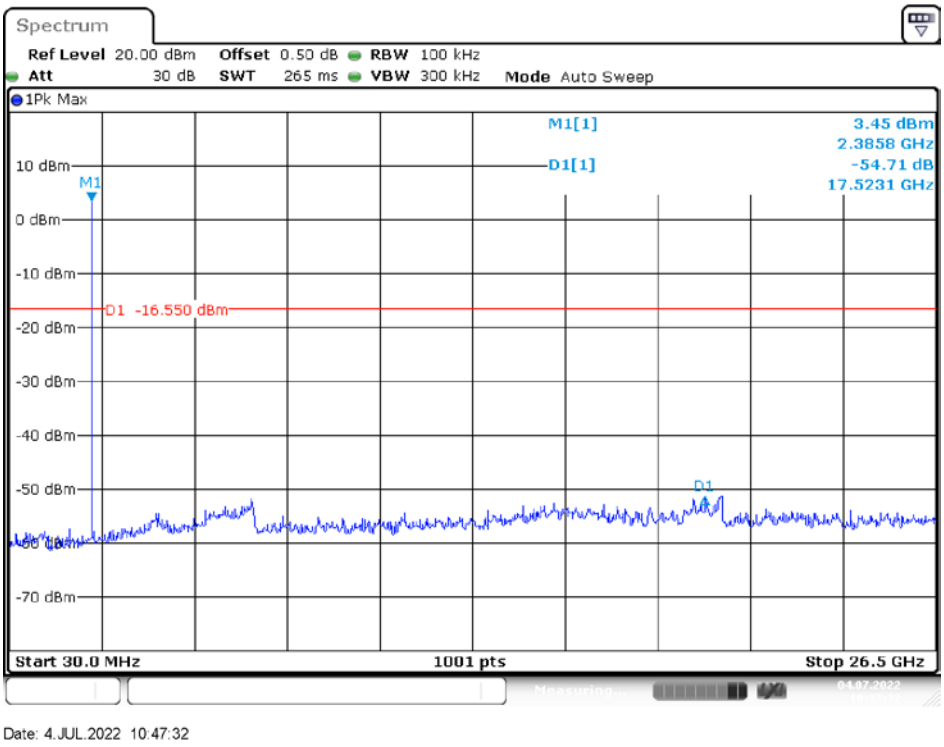
Spurious emissions more than 20 dB below the limit were not reported.

## Conducted Spurious Emissions:

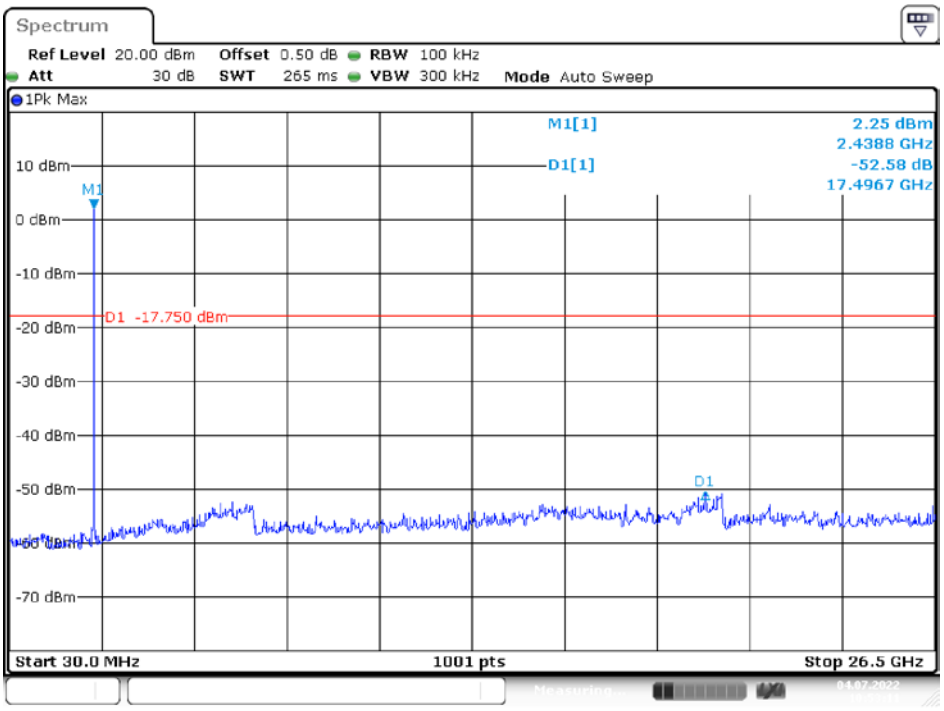
| Channel | Frequency (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Result |
|---|---|---|---|---|
| Low | 2402 | 54.71 | ≥ 20 | PASS |
| Middle | 2440 | 52.58 | ≥ 20 | PASS |
| High | 2480 | 54.32 | ≥ 20 | PASS |

### BLE Mode

### Low Channel

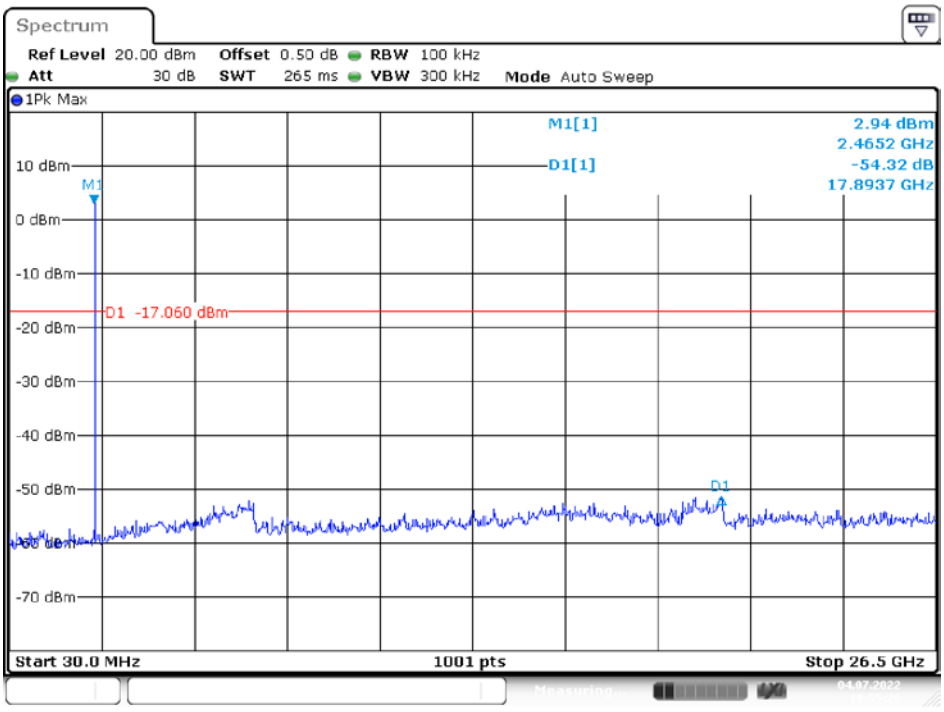


## Middle Channel




Date: 4.JUL.2022 10:53:11

## High Channel

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# 9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

## 9.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

## 9.2 Test Procedure

The steps for the first option are as follows:

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

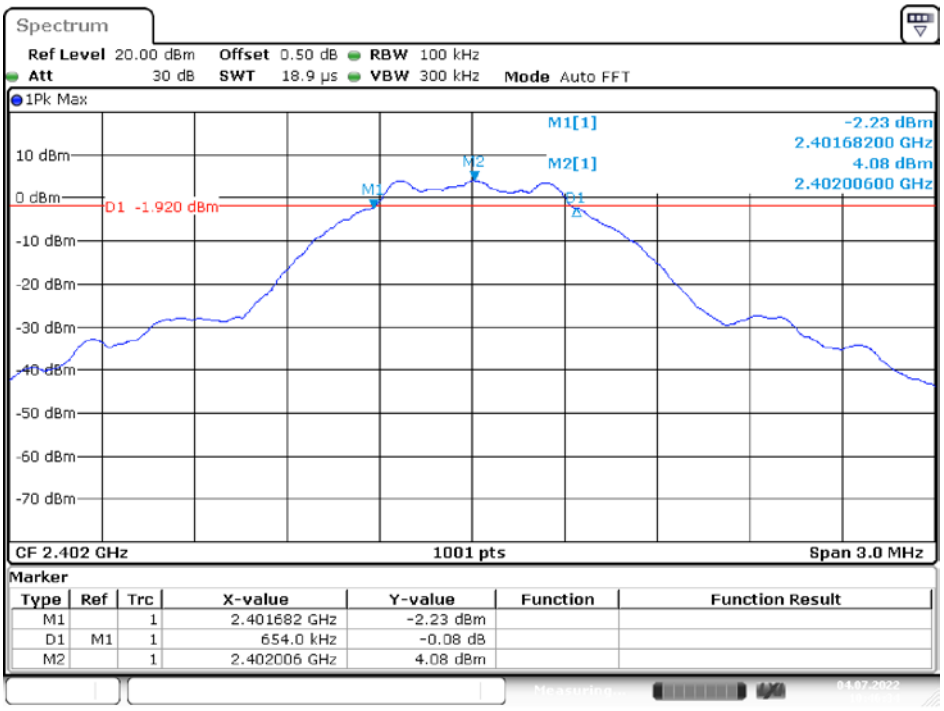
## 9.3 Test Results

| Channel | Frequency (MHz) | 6 dB Emission Bandwidth (kHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| Low | 2402 | 654 | > 500 | Compliance |
| Middle | 2440 | 648 | > 500 | Compliance |
| High | 2480 | 648 | > 500 | Compliance |

Please refer to the following plots

## BLE Mode

### Low Channel

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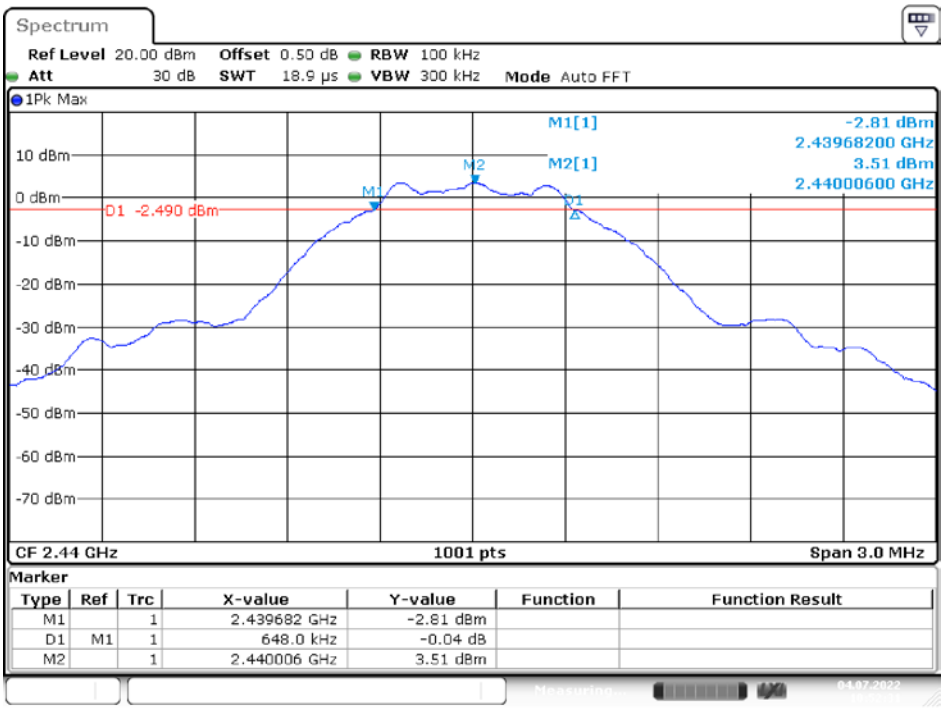
### Middle Channel

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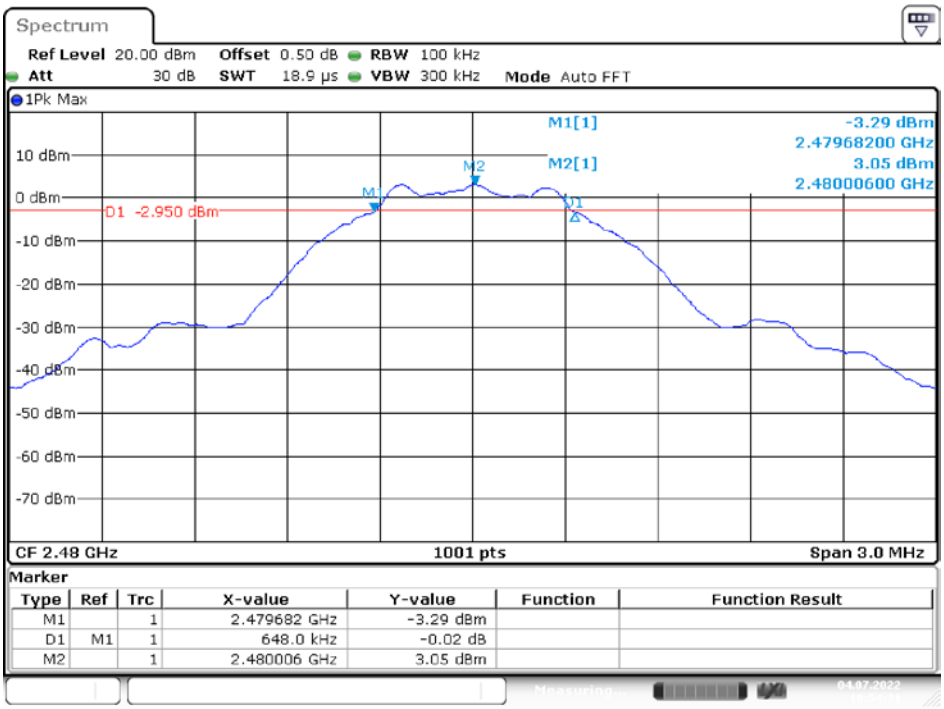
## High Channel

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# 10 FCC §15.247(b)(3) – Maximum Output Power

## 10.1 Applicable Standard

According to FCC §15.247(b) (3).

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz 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.

## 10.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

## 10.3 Test Results

### Conducted Peak Output Power

| Channel | Frequency (MHz) | Conducted Peak Output Power (dBm) | Power (W) | Limit (W) | Result |
|---|---|---|---|---|---|
| BLE Mode | | | | | |
| Low | 2402 | 4.66 | 0.003 | 1 | PASS |
| Middle | 2440 | 3.66 | 0.002 | 1 | PASS |
| High | 2480 | 3.14 | 0.002 | 1 | PASS |

# 11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

## 11.1 Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## 11.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.

4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

5. Repeat above procedures until all measured frequencies were complete.

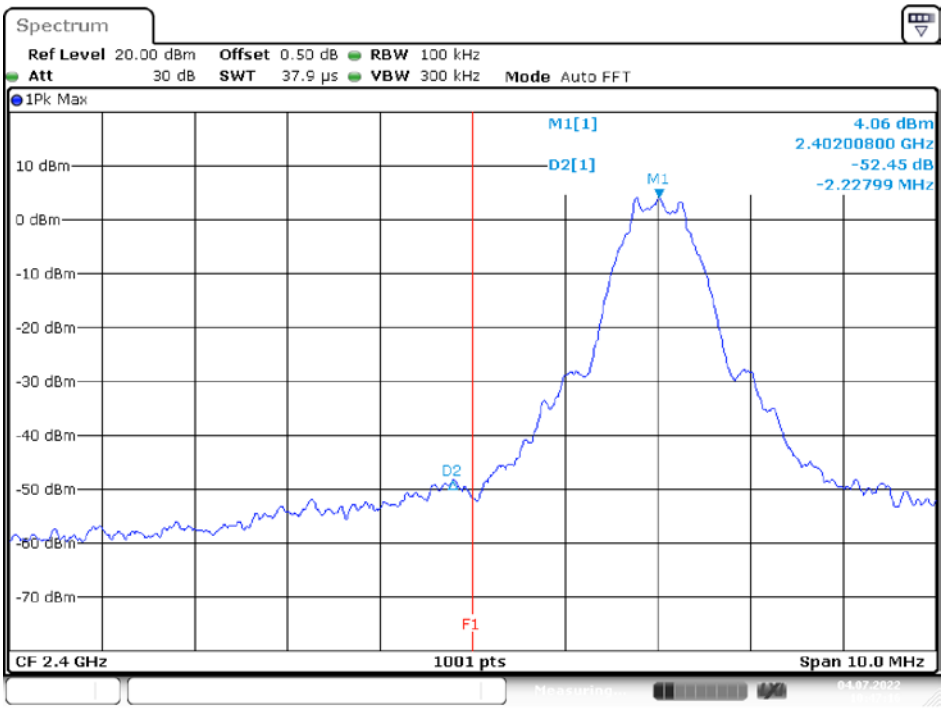
## 11.3 Test Results

| Channel | Frequency (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Result |
|---|---|---|---|---|
| Low | 2402 | 52.45 | ≥ 20 | PASS |
| High | 2480 | 57.34 | ≥ 20 | PASS |

Please refer to the following plots

## BLE Mode

## Band Edge, Left Side

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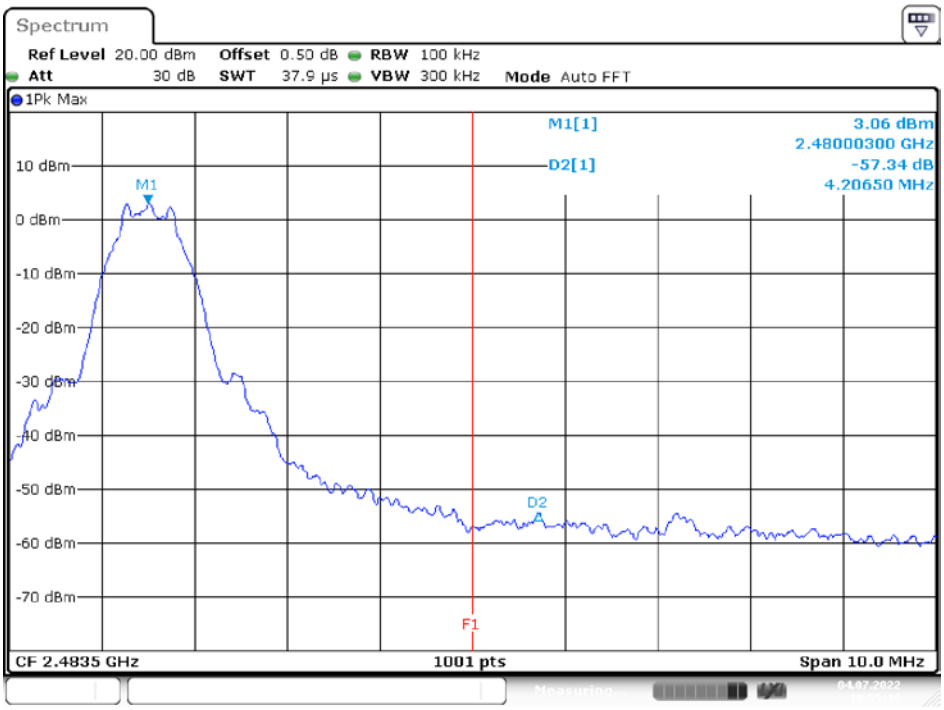
## Band Edge, Right Side

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# 12 FCC §15.247(e) – Power Spectral Density

## 12.1 Applicable Standard

According to FCC §15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz 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.

## 12.2 Test Procedure

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

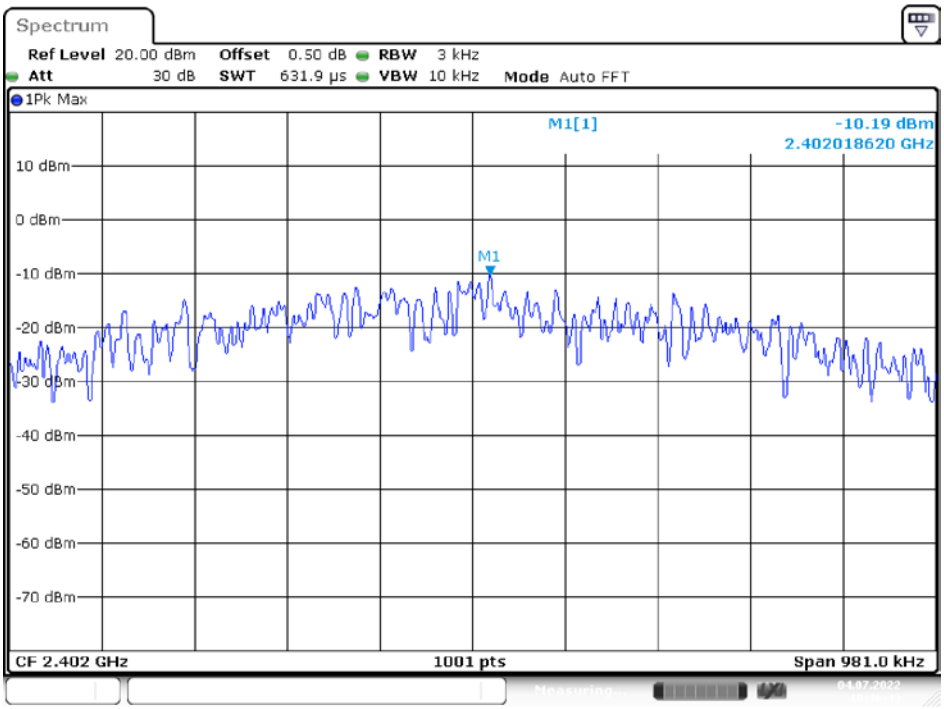
## 12.3 Test Results

| Channel | Frequency (MHz) | Power Spectral Density (dBm/3 kHz) | Limit (dBm/3 kHz) | Result |
|---|---|---|---|---|
| Low | 2402 | -10.19 | 8 | Compliance |
| Middle | 2440 | -10.75 | 8 | Compliance |
| High | 2480 | -11.19 | 8 | Compliance |

Please refer to the following plots

## BLE Mode

### Low Channel

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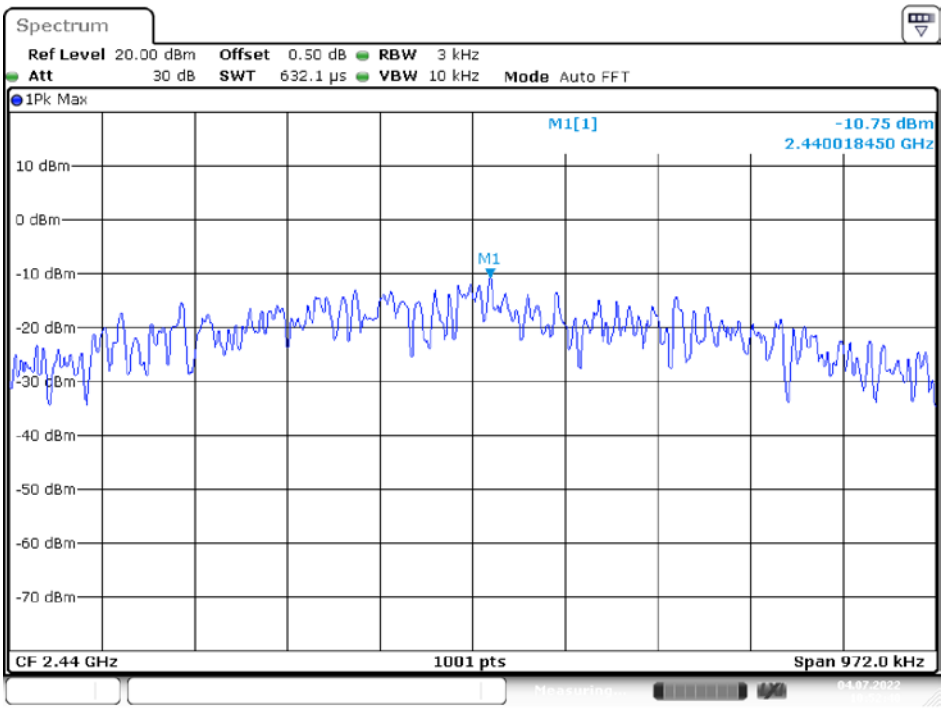
### Middle Channel

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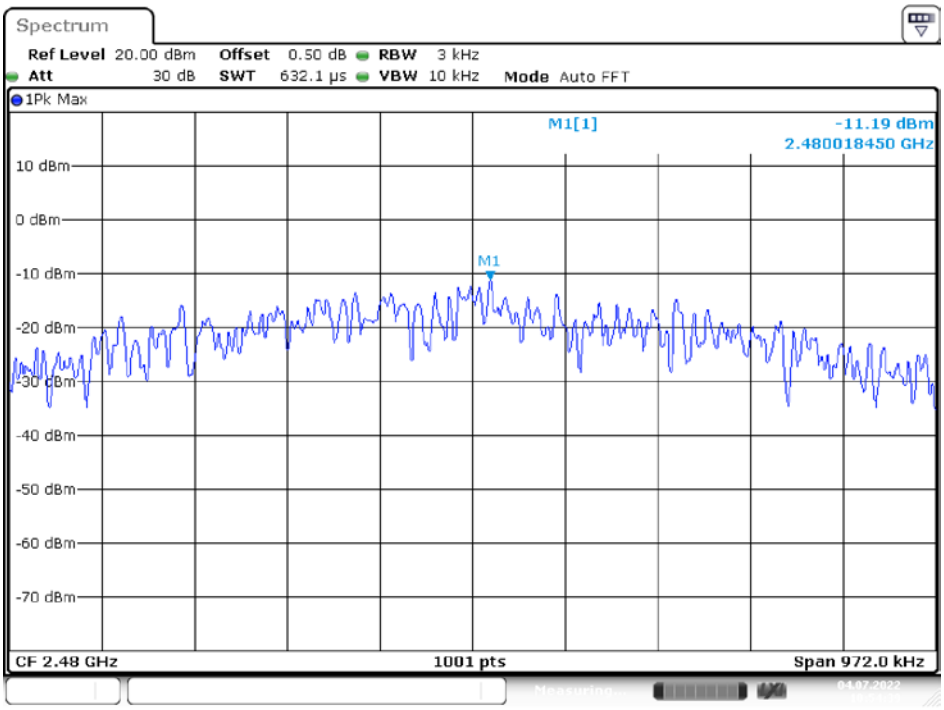
## High Channel

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