# RADIO TEST REPORT

## Test Report No. 15182434H-A-R2

| | |
|---|---|
| **Customer** | **DENSO TEN Limited** |
| **Description of EUT** | **Car Audio** |
| **Model Number of EUT** | **TN0023A** |
| **FCC ID** | **BABTN0023A** |
| **Test Regulation** | **FCC Part 15 Subpart C** |
| **Test Result** | **Complied** |
| **Issue Date** | **June 5, 2024** |
| **Remarks** | **Wireless LAN (2.4 GHz band) and Bluetooth Low Energy part(s)**<br>**Radiated Spurious Emission only**<br>*** For permissive change** |

| **Representative Test Engineer** | **Approved By** |
|---|---|
| Yuichiro Yamazaki<br>Engineer | Ryota Yamanaka<br>Engineer |

CERTIFICATE 5107.02

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.

☒ There is no testing item of "Non-accreditation".

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# REVISION HISTORY

## Original Test Report No.: 15182434H-A

This report is a revised version of 15182434H-A-R1. 15182434H-A-R1 is replaced with this report.

| Revision | Test Report No. | Date | Page Revised Contents |
|---|---|---|---|
| -<br>(Original) | 15182434H-A | March 26, 2024 | - |
| 1 | 15182434H-A-R1 | June 3, 2024 | Correction of following pages by re-test<br>- SECTION 2.1 Test Date (Last day)<br>- SECTION 3.2 Worst Margin<br>- APPENDIX 1 Test data<br>- APPENDIX 2 Test Instruments |
| 2 | 15182434H-A-R2 | June 5, 2024 | P.16, 19, 21, 24<br>Correction of the Frequency applied to Duty factor, and recalculation of Result and Margin for them |

## Reference: Abbreviations (Including words undescribed in this report)

| | | | |
|---|---|---|---|
| A2LA | The American Association for Laboratory Accreditation | ICES | Interference-Causing Equipment Standard |
| AC | Alternating Current | IEC | International Electrotechnical Commission |
| AFH | Adaptive Frequency Hopping | IEEE | Institute of Electrical and Electronics Engineers |
| AM | Amplitude Modulation | IF | Intermediate Frequency |
| Amp, AMP | Amplifier | ILAC | International Laboratory Accreditation Conference |
| ANSI | American National Standards Institute | ISED | Innovation, Science and Economic Development Canada |
| Ant, ANT | Antenna | ISO | International Organization for Standardization |
| AP | Access Point | JAB | Japan Accreditation Board |
| ASK | Amplitude Shift Keying | LAN | Local Area Network |
| Atten., ATT | Attenuator | LIMS | Laboratory Information Management System |
| AV | Average | MCS | Modulation and Coding Scheme |
| BPSK | Binary Phase-Shift Keying | MRA | Mutual Recognition Arrangement |
| BR | Bluetooth Basic Rate | N/A | Not Applicable |
| BT | Bluetooth | NIST | National Institute of Standards and Technology |
| BT LE | Bluetooth Low Energy | NS | No signal detect. |
| BW | BandWidth | NSA | Normalized Site Attenuation |
| Cal Int | Calibration Interval | NVLAP | National Voluntary Laboratory Accreditation Program |
| CCK | Complementary Code Keying | OBW | Occupied Band Width |
| Ch., CH | Channel | OFDM | Orthogonal Frequency Division Multiplexing |
| CISPR | Comite International Special des Perturbations Radioelectriques | P/M | Power meter |
| CW | Continuous Wave | PCB | Printed Circuit Board |
| DBPSK | Differential BPSK | PER | Packet Error Rate |
| DC | Direct Current | PHY | Physical Layer |
| D-factor | Distance factor | PK | Peak |
| DFS | Dynamic Frequency Selection | PN | Pseudo random Noise |
| DQPSK | Differential QPSK | PRBS | Pseudo-Random Bit Sequence |
| DSSS | Direct Sequence Spread Spectrum | PSD | Power Spectral Density |
| EDR | Enhanced Data Rate | QAM | Quadrature Amplitude Modulation |
| EIRP, e.i.r.p. | Equivalent Isotropically Radiated Power | QP | Quasi-Peak |
| EMC | ElectroMagnetic Compatibility | QPSK | Quadri-Phase Shift Keying |
| EMI | ElectroMagnetic Interference | RBW | Resolution Band Width |
| EN | European Norm | RDS | Radio Data System |
| ERP, e.r.p. | Effective Radiated Power | RE | Radio Equipment |
| EU | European Union | RF | Radio Frequency |
| EUT | Equipment Under Test | RMS | Root Mean Square |
| Fac. | Factor | RSS | Radio Standards Specifications |
| FCC | Federal Communications Commission | Rx | Receiving |
| FHSS | Frequency Hopping Spread Spectrum | SA, S/A | Spectrum Analyzer |
| FM | Frequency Modulation | SG | Signal Generator |
| Freq. | Frequency | SVSWR | Site-Voltage Standing Wave Ratio |
| FSK | Frequency Shift Keying | TR | Test Receiver |
| GFSK | Gaussian Frequency-Shift Keying | Tx | Transmitting |
| GNSS | Global Navigation Satellite System | VBW | Video BandWidth |
| GPS | Global Positioning System | Vert. | Vertical |
| Hori. | Horizontal | WLAN | Wireless LAN |

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# SECTION 1: Customer Information

| | |
|---|---|
| Company Name | DENSO TEN Limited |
| Address | 2-28, Gosho-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 Japan |
| Telephone Number | +81-78-682-2159 |
| Contact Person | Kaoru Abe |

The information provided by the customer is as follows;
- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

# SECTION 2: Equipment Under Test (EUT)

## 2.1 Identification of EUT

| | |
|---|---|
| Description | Car Audio |
| Model Number | TN0023A |
| Serial Number | Refer to SECTION 4.2 |
| Condition | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification | No Modification by the test lab |
| Receipt Date | February 19, 2024 |
| Test Date | February 20 to May 30, 2024 |

## 2.2 Product Description

**General Specification**

| | |
|---|---|
| Rating | DC 12 V |
| Operating Temperature | -30 deg. C to 65 deg. C |

## Radio Specification

**WLAN (IEEE802.11b/11g/11n-20)**

| | |
|---|---|
| Equipment Type | Transceiver |
| Frequency of Operation | 2412 MHz to 2462 MHz |
| Type of Modulation | DSSS, OFDM |
| Antenna Gain | -0.98 dBi |

**Bluetooth (BR / EDR / Low Energy)**

| | |
|---|---|
| Equipment Type | Transceiver |
| Frequency of Operation | 2402 MHz to 2480 MHz |
| Type of Modulation | BT: FHSS (GFSK, π/4 DQPSK, 8 DPSK)<br>BT LE: GFSK |
| Antenna Gain | -0.56 dBi |

**WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)**

| | | |
|---|---|---|
| Equipment Type | Transceiver | |
| Frequency of Operation | 20 MHz Band | 5180 MHz to 5240 MHz<br>5745 MHz to 5825 MHz |
| | 40 MHz Band | 5190 MHz to 5230 MHz<br>5755 MHz to 5795 MHz |
| | 80 MHz Band | 5210 MHz<br>5775 MHz |
| Type of Modulation | OFDM | |
| Antenna Gain | 2.69 dBi (ANT 1) / 3.40 dBi (ANT 2) | |

**[AM, HD_AM / FM, RBDS/HD_FM / SDARS]**

| | |
|---|---|
| Equipment Type | Receiver |
| Frequency of Operation | AM, HD_AM: 530 kHz to 1710 kHz<br>FM, RBDS/HD_FM: 87.75 MHz to 107.9 MHz<br>SDARS: 2320 MHz to 2345 MHz |

# SECTION 3: Test Specification, Procedures & Results

## 3.1 Test Specification

| | |
|---|---|
| Test Specification | FCC Part 15 Subpart C<br>The latest version on the first day of the testing period |
| Title | FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.207 Conducted limits<br>Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz |

## 3.2 Procedures and Results

| Item | Test Procedure | Specification | Worst Margin | Results | Remarks |
|---|---|---|---|---|---|
| Spurious Emission Restricted Band Edges | **FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 | **FCC:** Section15.247(d) | 5.2 dB<br>10000.0 MHz,<br>AV, Horizontal | Complied | Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1) |
| | **ISED:** RSS-Gen 6.13 | **ISED:** RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | | | |

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

**FCC Part 15.31 (e)**
This EUT provides the stable voltage constantly to RF Module regardless of input voltage.
Therefore, this EUT complies with the requirement.

**FCC Part 15.203 Antenna requirement**
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

## 3.3 Addition to Standard

No addition, exclusion nor deviation has been made from the standard.

## 3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement. Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k* = 2.

**Radiated Emission**

| Measurement distance | Frequency range | | Unit | Calculated Uncertainty (+/-) |
|---|---|---|---|---|
| 3 m | 9 kHz to 30 MHz | | dB | 3.3 |
| 10 m | | | dB | 3.1 |
| 3 m | 30 MHz to 200 MHz | Horizontal | dB | 4.8 |
| | | Vertical | dB | 5.0 |
| | 200 MHz to 1000 MHz | Horizontal | dB | 5.1 |
| | | Vertical | dB | 6.2 |
| 10 m | 30 MHz to 200 MHz | Horizontal | dB | 4.8 |
| | | Vertical | dB | 4.8 |
| | 200 MHz to 1000 MHz | Horizontal | dB | 4.9 |
| | | Vertical | dB | 5.0 |
| 3 m | 1 GHz to 6 GHz | Test Receiver | dB | 5.1 |
| | | Spectrum Analyzer | dB | 4.9 |
| | 6 GHz to 18 GHz | Test Receiver | dB | 5.4 |
| | | Spectrum Analyzer | dB | 5.2 |
| 1 m | 10 GHz to 18 GHz | Spectrum analyzer | dB | 5.0 |
| | 18 GHz to 26.5 GHz | Spectrum analyzer | dB | 5.6 |
| | 26.5 GHz to 40 GHz | Spectrum analyzer | dB | 4.9 |
| 0.5 m | 26.5 GHz to 40 GHz | Spectrum analyzer | dB | 4.9 |
| 10 m | 1 GHz to 18 GHz | Test Receiver | dB | 5.4 |

## 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone: +81-596-24-8999
A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919
ISED Lab Company Number: 2973C / CAB identifier: JP0002

| Test site | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms | Maximum measurement distance |
|---|---|---|---|---|
| No.1 semi-anechoic chamber | 19.2 x 11.2 x 7.7 | 7.0 x 6.0 | No.1 Power source room | 10 m |
| No.2 semi-anechoic chamber | 7.5 x 5.8 x 5.2 | 4.0 x 4.0 | - | 3 m |
| No.3 semi-anechoic chamber | 12.0 x 8.5 x 5.9 | 6.8 x 5.75 | No.3 Preparation room | 3 m |
| No.3 shielded room | 4.0 x 6.0 x 2.7 | N/A | - | - |
| No.4 semi-anechoic chamber | 12.0 x 8.5 x 5.9 | 6.8 x 5.75 | No.4 Preparation room | 3 m |
| No.4 shielded room | 4.0 x 6.0 x 2.7 | N/A | - | - |
| No.5 semi-anechoic chamber | 6.0 x 6.0 x 3.9 | 6.0 x 6.0 | - | - |
| No.5 measurement room | 6.4 x 6.4 x 3.0 | 6.4 x 6.4 | - | - |
| No.6 shielded room | 4.0 x 4.5 x 2.7 | 4.0 x 4.5 | - | - |
| No.6 measurement room | 4.75 x 5.4 x 3.0 | 4.75 x 4.15 | - | - |
| No.7 shielded room | 4.7 x 7.5 x 2.7 | 4.7 x 7.5 | - | - |
| No.8 measurement room | 3.1 x 5.0 x 2.7 | 3.1 x 5.0 | - | - |
| No.9 measurement room | 8.8 x 4.6 x 2.8 | 2.4 x 2.4 | - | - |
| No.10 shielded room | 3.8 x 2.8 x 2.8 | 3.8 x 2.8 | - | - |
| No.11 measurement room | 4.0 x 3.4 x 2.5 | N/A | - | - |
| No.12 measurement room | 2.6 x 3.4 x 2.5 | N/A | - | - |
| Large Chamber | 16.9 x 22.1 x 10.17 | 16.9 x 22.1 | - | 10 m |
| Small Chamber | 5.3 x 6.69 x 3.59 | 5.3 x 6.69 | - | - |

## 3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

# SECTION 4: Operation of EUT During Testing

## 4.1 Operating Mode(s)

| Mode | Remarks* |
|---|---|
| IEEE 802.11b (11b) | 5.5 Mbps, PN9 |
| IEEE 802.11n MIMO 20 MHz BW (11n-20) | MCS 7 (Short GI, 3 Streams), PN9 |
| *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) | |
| *Power of the EUT was set by the software as follows;<br>Power Setting: 11b: 14 dBm<br>11n: 6 dBm<br>Software: QCA RCT Ver 3.0.144.0<br>(Date: October 9, 2017, Storage location: Driven by connected PC)<br>*This setting of software is the worst case.<br>Any conditions under the normal use do not exceed the condition of setting.<br>In addition, end users cannot change the settings of the output power of the product.<br>Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009. | |

*The Details of Operating Mode(s)

| Test Item | Operating Mode | Tested Frequency |
|---|---|---|
| Radiated Spurious Emission (Below 1 GHz) | 11n-20 Tx | 2437 MHz *1) |
| Radiated Spurious Emission (Above 1 GHz) | 11b Tx<br>11n-20 Tx*2) | 2412 MHz<br>2437 MHz<br>2462 MHz |
| *1) The mode was tested as a representative, because it had the highest power at antenna terminal test.<br>*2) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power. | | |

| Mode | Remarks* |
|---|---|
| Bluetooth Low Energy (BT LE) | Maximum Packet Size, PRBS9 |
| *Power of the EUT was set by the software as follows;<br>Power Setting: 0 dBm<br>Software: BSDT Ver 5.2.0<br>(Date: October 9, 2019, Storage location: Driven by connected PC)<br>*This setting of software is the worst case.<br>Any conditions under the normal use do not exceed the condition of setting.<br>In addition, end users cannot change the settings of the output power of the product. | |

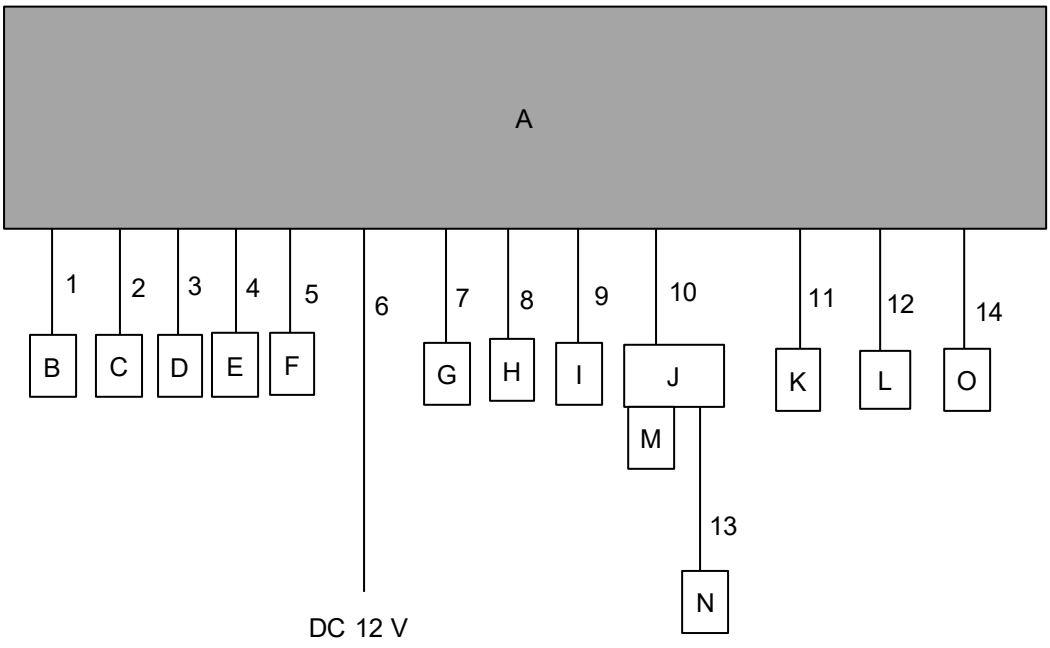
*The Details of Operating Mode(s)

| Test Item | Operating Mode | Tested Frequency |
|---|---|---|
| Radiated Spurious Emission (Below 1 GHz) | Tx BT LE | 2440 MHz *1) |
| Radiated Spurious Emission (Above 1 GHz) | Tx BT LE | 2402 MHz<br>2440 MHz<br>2480 MHz |

**Simultaneous Transmission**

| Test Item | Mode *1) | Tested Antenna |
|---|---|---|
| Radiated Spurious Emission | Tx BT LE 2440 MHz + Tx 11a 5180 MHz | BT LE (Antenna 2) +<br>11a (Antenna 2) |
| *1) The test was conducted on representative mode, the worst mode at Spurious emission test for BT LE and the test was performed on the mode as a representative,<br>because it had the highest power (11a mode /Antenna 2) of 5 GHz band at antenna terminal test.<br>(*The highest power is regarding high power setting in original report.) | | |

## 4.2 Configuration and Peripherals




* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

**Description of EUT and Support Equipment**

| No. | Item | Model number | Serial Number | Manufacturer | Remarks |
|---|---|---|---|---|---|
| A | Car Audio | TN0023A | MX100017 | DENSO TEN Limited | EUT |
| B | Switch | - | - | - | - |
| C | DCM | 19MC_DCM | E-033720026/004 | DENSO Corporation. | - |
| D | Steering Switch | 84250-33500 | No.3 | TOYOTA | - |
| E | Low noise Amp | ZX60-242GLN-S+ | S 2036302044 | Mini-Circuits | - |
| F | GPS Antenna | 23D90064 | No.3 | DENSO TEN Limited | - |
| G | FM/AM connector (Main) | 86300-30C30 | PTA00490 | DENSO TEN Limited | - |
| H | FM/AM connector (Sub) | 86300-30C70 | PU106543 | DENSO TEN Limited | - |
| I | Back Camera | 86780-78080 | 07SD00006 | KYOCERA CORPORATION | - |
| J | USB/AUX socket | 86910-12040 | No.3 | Kojima Industries Corporation | - |
| K | Mic | 86730-11010 | E-033720014/022 | Panasonic | - |
| L | Mic | 86730-11010 | E-033720014/024 | Panasonic | - |
| M | USB Memory | RUF3-K16GB | P10416 | Buffalo.Inc | - |
| N | iPod touch | A1367 | CCQ50WDDCPC | Apple | - |
| O | Speaker Dummy | - | - | - | - |

**List of Cables Used**

| No. | Name | Length (m) | Shield | | Remarks |
|---|---|---|---|---|---|
| | | | Cable | Connector | |
| 1 | Signal Cable | 2.4 | Unshielded | Unshielded | - |
| 2 | Signal Cable | 2.4 | Unshielded | Unshielded | - |
| 3 | Signal Cable | 2.4 | Unshielded | Unshielded | - |
| 4 | Signal Cable | 1.0 | Unshielded | Unshielded | - |
| 5 | GNSS Antenna Cable | 8.0 | Shielded | Shielded | - |
| 6 | DC Cable | 4.4 | Unshielded | Unshielded | - |
| 7 | Signal Cable | 2.6 | Unshielded | Unshielded | - |
| 8 | Signal Cable | 2.6 | Unshielded | Unshielded | - |
| 9 | Signal Cable | 6.8 | Unshielded | Unshielded | - |
| 10 | USB Cable | 2.5 | Shielded | Shielded | - |
| 11 | Signal Cable | 2.7 | Unshielded | Unshielded | - |
| 12 | Signal Cable | 2.7 | Unshielded | Unshielded | - |
| 13 | Audio Cable | 1.5 | Shielded | Shielded | - |
| 14 | Speaker Cable | 3.2 | Unshielded | Unshielded | - |

## SECTION 5: Radiated Spurious Emission

**Test Procedure**

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

**Test Antennas are used as below;**

| Frequency | 30 MHz to 200 MHz | 200 MHz to 1 GHz | Above 1 GHz |
|---|---|---|---|
| Antenna Type | Biconical | Logperiodic | Horn |

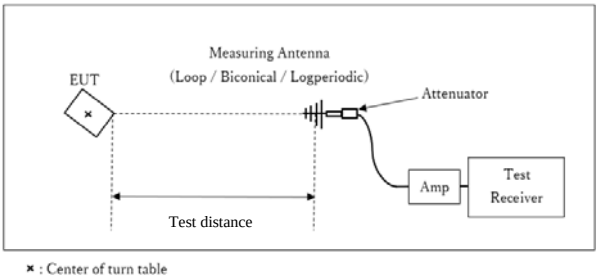
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

**20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).**

| Frequency | Below 1 GHz | Above 1 GHz | | 20 dBc |
|---|---|---|---|---|
| Instrument Used | Test Receiver | Spectrum Analyzer | | Spectrum Analyzer |
| Detector | QP | PK | AV | PK |
| IF Bandwidth | BW 120 kHz | RBW: 1 MHz<br>VBW: 3 MHz | 11.12.2.5.1<br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (RMS)<br>Trace: 100 traces<br>11.12.2.5.2<br>The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results. | RBW: 100 kHz<br>VBW: 300 kHz |

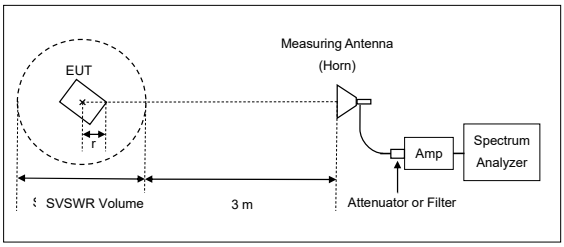
**Figure 1: Test Setup**

Below 1 GHz




Test Distance: 3 m

1 GHz to 6 GHz

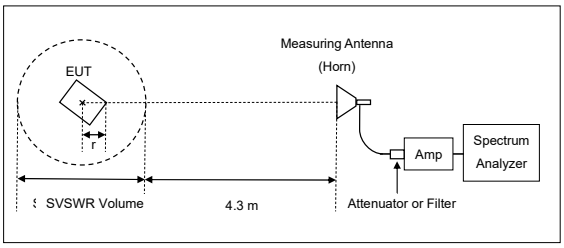



r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.80 m / 3.0 m) = 2.06 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.80 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.2 m

6 GHz to 10 GHz

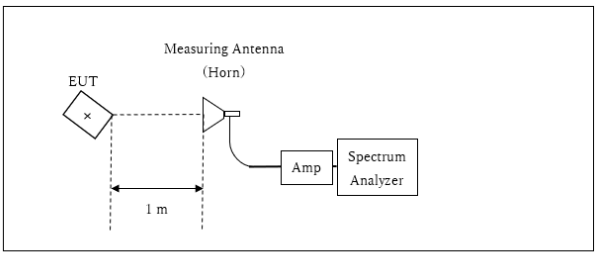



r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.8 m / 3.0 m) = 4.09 dB
* Test Distance: (4.3 + SVSWR Volume /2) - r = 4.80 m

SVSWR Volume : 1.4 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.2 m

10 GHz to 26.5 GHz




× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The test was made on EUT at the normal use position.

Test results are rounded off and limit are rounded down, so some differences might be observed.

**Measurement Range : 30 MHz to 26.5 GHz**
**Test Data : APPENDIX**
**Test Result : Pass**

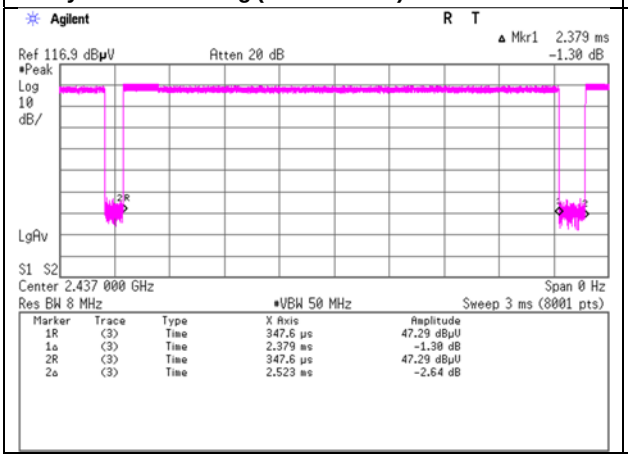
# APPENDIX 1: Test Data

## Burst Rate Confirmation

| | | |
|---|---|---|
| Test place | Ise EMC Lab. No.4 Semi Anechoic Chamber | |
| Date | February 20, 2024 | February 20, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH | 24 deg. C / 56 % RH |
| Engineer | Junki Nagatomi | Yuichiro Yamazaki |
| Mode | Tx | |

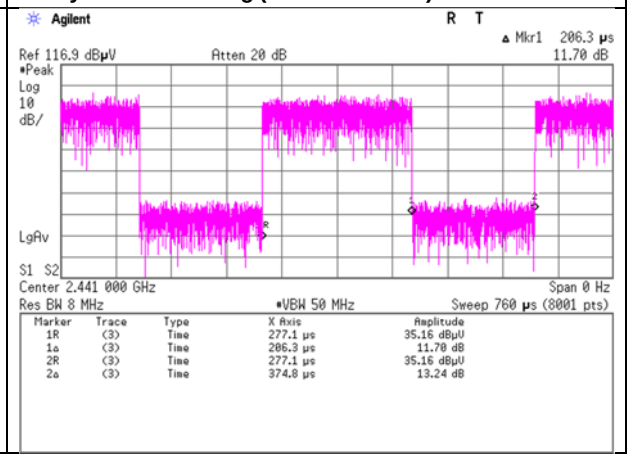
### 11b 5.5 Mbps

| | |
|---|---|
| Tx on / (Tx on + Tx off) = | 0.943 |
| Tx on / (Tx on + Tx off) * 100 = | 94.3 % |
| Duty factor = 10 * log (2.523 / 2.379) = | 0.26 dB |



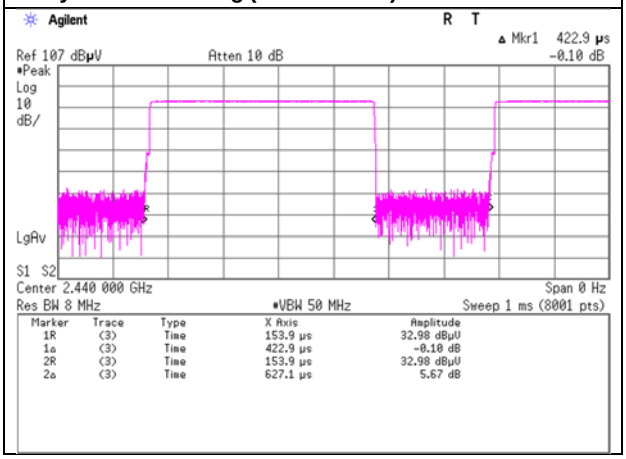

### 11n-20 MCS 7 Short GI

| | |
|---|---|
| Tx on / (Tx on + Tx off) = | 0.550 |
| Tx on / (Tx on + Tx off) * 100 = | 55.0 % |
| Duty factor = 10 * log (0.3748 / 0.2063) = | 2.59 dB |




### BT LE

| | |
|---|---|
| Tx on / (Tx on + Tx off) = | 0.674 |
| Tx on / (Tx on + Tx off) * 100 = | 67.4 % |
| Duty factor = 10 * log (627.1 / 422.9) = | 1.71 dB |




* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11b 2412 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 52.7 | 43.7 | 25.0 | 4.5 | 33.1 | - | 49.0 | 40.1 | 73.9 | 53.9 | 24.9 | 13.8 | |
| Hori. | 2225.3 | 46.2 | 40.3 | 28.2 | 5.0 | 31.9 | - | 47.5 | 41.6 | 73.9 | 53.9 | 26.4 | 12.3 | |
| Hori. | 2390.0 | 45.1 | 35.5 | 27.8 | 5.1 | 31.8 | 0.3 | 46.2 | 36.9 | 73.9 | 53.9 | 27.7 | 17.0 | *1) |
| Hori. | 4824.0 | 40.5 | 32.8 | 31.4 | 7.2 | 30.8 | - | 48.3 | 40.5 | 73.9 | 53.9 | 25.6 | 13.4 | Floor noise |
| Hori. | 5000.0 | 43.4 | 37.3 | 31.8 | 7.3 | 30.8 | - | 51.6 | 45.5 | 73.9 | 53.9 | 22.3 | 8.4 | |
| Hori. | 7236.0 | 42.2 | 33.7 | 35.7 | 10.4 | 32.3 | - | 55.9 | 47.4 | 73.9 | 53.9 | 18.0 | 6.5 | Floor noise |
| Hori. | 9648.0 | 41.6 | 33.9 | 35.8 | 10.9 | 33.0 | - | 55.3 | 47.6 | 73.9 | 53.9 | 18.6 | 6.3 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.2 | 36.1 | 9.2 | 32.8 | - | 54.9 | 48.7 | 73.9 | 53.9 | 19.0 | 5.2 | |
| Vert. | 1579.9 | 53.4 | 44.4 | 25.0 | 4.5 | 33.1 | - | 49.8 | 40.7 | 73.9 | 53.9 | 24.1 | 13.2 | |
| Vert. | 2225.3 | 46.0 | 39.9 | 28.2 | 5.0 | 31.9 | - | 47.2 | 41.1 | 73.9 | 53.9 | 26.7 | 12.8 | |
| Vert. | 2390.0 | 45.8 | 36.8 | 27.8 | 5.1 | 31.8 | 0.3 | 46.9 | 38.2 | 73.9 | 53.9 | 27.0 | 15.7 | *1) |
| Vert. | 4824.0 | 40.8 | 32.4 | 31.4 | 7.2 | 30.8 | - | 48.5 | 40.2 | 73.9 | 53.9 | 25.4 | 13.7 | Floor noise |
| Vert. | 5000.0 | 43.6 | 37.5 | 31.8 | 7.3 | 30.8 | - | 51.8 | 45.7 | 73.9 | 53.9 | 22.1 | 8.2 | |
| Vert. | 7236.0 | 42.1 | 33.7 | 35.7 | 10.4 | 32.3 | - | 55.8 | 47.4 | 73.9 | 53.9 | 18.1 | 6.5 | Floor noise |
| Vert. | 9648.0 | 41.5 | 33.8 | 35.8 | 10.9 | 33.0 | - | 55.2 | 47.5 | 73.9 | 53.9 | 18.7 | 6.4 | Floor noise |
| Vert. | 10000.0 | 43.5 | 35.9 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.4 | 73.9 | 53.9 | 17.9 | 5.5 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

**20dBc Data Sheet**

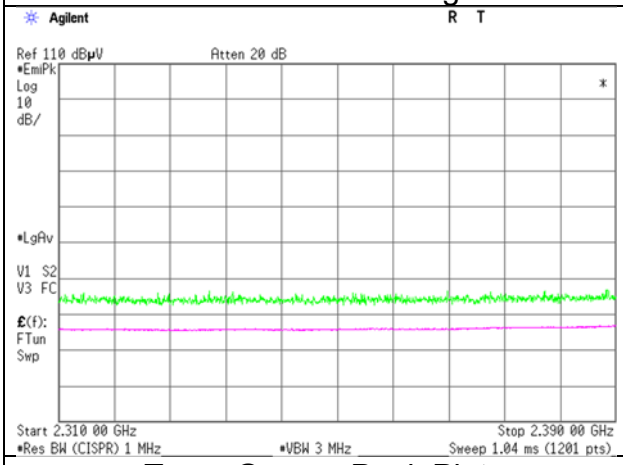
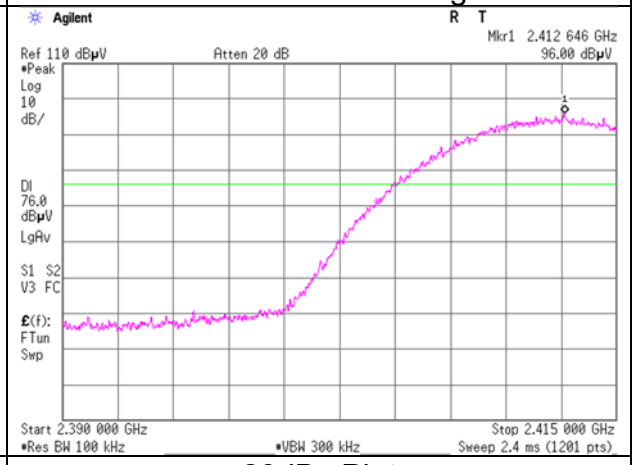
| Polarity [Hori/Vert] | Frequency [MHz] | Reading (PK) [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|
| Hori. | 2412.0 | 96.0 | 27.8 | 5.1 | 31.8 | 97.1 | - | - | Carrier |
| Hori. | 2400.0 | 42.5 | 27.8 | 5.1 | 31.8 | 43.6 | 77.1 | 33.5 | |
| Vert. | 2412.0 | 95.9 | 27.8 | 5.1 | 31.8 | 97.0 | - | - | Carrier |
| Vert. | 2400.0 | 42.2 | 27.8 | 5.1 | 31.8 | 43.4 | 77.0 | 33.6 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

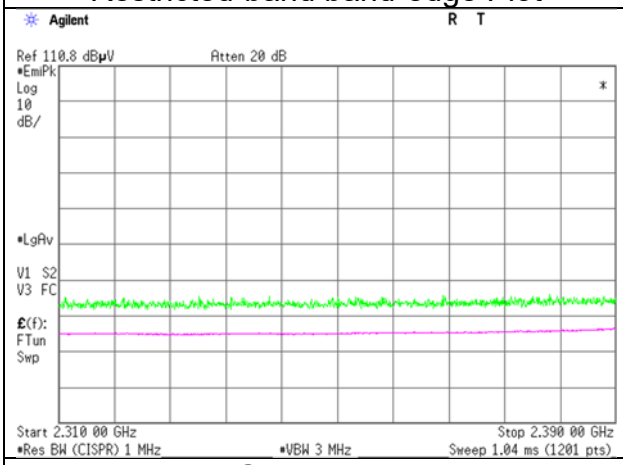
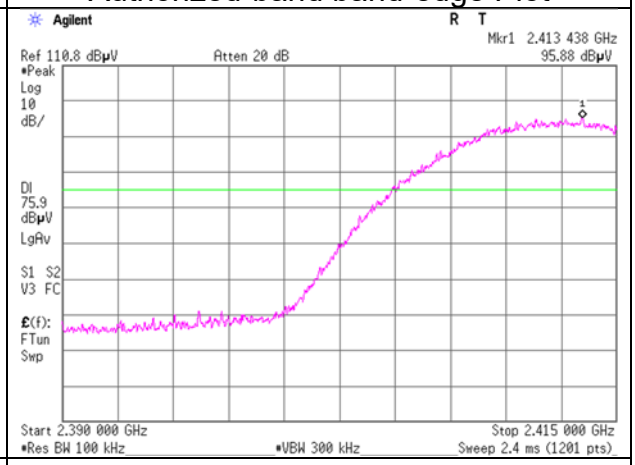
# Radiated Spurious Emission
## (Reference Plot for Band-edge)

| | |
|---|---|
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | February 20, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH |
| Engineer | Yuichiro Yamazaki<br>(1 GHz to 6 GHz) |
| Mode | Tx 11b 2412 MHz |

| Horizontal | |
|---|---|
| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|  |  |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |





| Vertical | |
|---|---|
| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|  |  |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |





* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge and authorized band edge were shown in tabular data.

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11b 2437 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 52.5 | 44.0 | 25.0 | 4.5 | 33.1 | - | 48.8 | 40.3 | 73.9 | 53.9 | 25.1 | 13.6 | |
| Hori. | 2225.3 | 46.2 | 40.6 | 28.2 | 5.0 | 31.9 | - | 47.4 | 41.9 | 73.9 | 53.9 | 26.5 | 12.0 | |
| Hori. | 4874.0 | 41.1 | 32.4 | 31.4 | 7.2 | 30.8 | - | 48.9 | 40.2 | 73.9 | 53.9 | 25.0 | 13.7 | Floor noise |
| Hori. | 5000.0 | 43.1 | 37.3 | 31.8 | 7.3 | 30.8 | - | 51.3 | 45.5 | 73.9 | 53.9 | 22.6 | 8.4 | |
| Hori. | 7311.0 | 42.0 | 34.0 | 35.6 | 10.4 | 32.3 | - | 55.7 | 47.7 | 73.9 | 53.9 | 18.2 | 6.2 | Floor noise |
| Hori. | 9748.0 | 41.6 | 33.9 | 36.0 | 10.9 | 33.0 | - | 55.5 | 47.8 | 73.9 | 53.9 | 18.4 | 6.1 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.1 | 36.1 | 9.2 | 32.8 | - | 54.9 | 48.6 | 73.9 | 53.9 | 19.0 | 5.3 | |
| Vert. | 1579.9 | 54.9 | 44.5 | 25.0 | 4.5 | 33.1 | - | 51.2 | 40.9 | 73.9 | 53.9 | 22.7 | 13.1 | |
| Vert. | 2225.3 | 46.4 | 40.1 | 28.2 | 5.0 | 31.9 | - | 47.6 | 41.4 | 73.9 | 53.9 | 26.3 | 12.5 | |
| Vert. | 4874.0 | 41.4 | 32.3 | 31.4 | 7.2 | 30.8 | - | 49.2 | 40.1 | 73.9 | 53.9 | 24.7 | 13.8 | Floor noise |
| Vert. | 5000.0 | 43.3 | 37.5 | 31.8 | 7.3 | 30.8 | - | 51.6 | 45.7 | 73.9 | 53.9 | 22.3 | 8.2 | |
| Vert. | 7311.0 | 42.0 | 33.8 | 35.6 | 10.4 | 32.3 | - | 55.7 | 47.5 | 73.9 | 53.9 | 18.2 | 6.4 | Floor noise |
| Vert. | 9748.0 | 41.6 | 33.8 | 36.0 | 10.9 | 33.0 | - | 55.5 | 47.7 | 73.9 | 53.9 | 18.4 | 6.2 | Floor noise |
| Vert. | 10000.0 | 43.5 | 35.9 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11b 2462 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 52.5 | 43.4 | 25.0 | 4.5 | 33.1 | - | 48.9 | 39.8 | 73.9 | 53.9 | 25.1 | 14.1 | |
| Hori. | 2225.3 | 46.8 | 40.5 | 28.2 | 5.0 | 31.9 | - | 48.1 | 41.8 | 73.9 | 53.9 | 25.8 | 12.2 | |
| Hori. | 2483.5 | 48.8 | 38.6 | 27.7 | 5.1 | 31.7 | 0.3 | 49.9 | 39.9 | 73.9 | 53.9 | 24.0 | 14.0 | *1) |
| Hori. | 2500.0 | 47.1 | 38.0 | 27.7 | 5.2 | 31.7 | - | 48.2 | 39.2 | 73.9 | 53.9 | 25.7 | 14.7 | |
| Hori. | 4924.0 | 41.3 | 32.5 | 31.5 | 7.3 | 30.8 | - | 49.2 | 40.4 | 73.9 | 53.9 | 24.7 | 13.5 | Floor noise |
| Hori. | 5000.0 | 43.9 | 37.8 | 31.8 | 7.3 | 30.8 | - | 52.1 | 46.1 | 73.9 | 53.9 | 21.8 | 7.8 | |
| Hori. | 7386.0 | 41.9 | 33.7 | 35.6 | 10.4 | 32.4 | - | 55.5 | 47.3 | 73.9 | 53.9 | 18.4 | 6.6 | Floor noise |
| Hori. | 9848.0 | 41.3 | 33.4 | 36.2 | 10.9 | 33.0 | - | 55.4 | 47.5 | 73.9 | 53.9 | 18.6 | 6.5 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.1 | 36.1 | 9.2 | 32.8 | - | 54.8 | 48.6 | 73.9 | 53.9 | 19.1 | 5.3 | |
| Vert. | 1579.9 | 57.3 | 44.2 | 25.0 | 4.5 | 33.1 | - | 53.7 | 40.6 | 73.9 | 53.9 | 20.2 | 13.4 | |
| Vert. | 2225.3 | 46.2 | 39.3 | 28.2 | 5.0 | 31.9 | - | 47.4 | 40.6 | 73.9 | 53.9 | 26.5 | 13.3 | |
| Vert. | 2483.5 | 50.7 | 42.3 | 27.7 | 5.1 | 31.7 | 0.3 | 51.8 | 43.7 | 73.9 | 53.9 | 22.1 | 10.2 | *1) |
| Vert. | 2500.0 | 47.1 | 39.0 | 27.7 | 5.2 | 31.7 | - | 48.2 | 40.1 | 73.9 | 53.9 | 25.7 | 13.8 | |
| Vert. | 4924.0 | 40.6 | 32.3 | 31.5 | 7.3 | 30.8 | - | 48.5 | 40.2 | 73.9 | 53.9 | 25.4 | 13.7 | Floor noise |
| Vert. | 5000.0 | 43.3 | 37.7 | 31.8 | 7.3 | 30.8 | - | 51.5 | 45.9 | 73.9 | 53.9 | 22.4 | 8.0 | |
| Vert. | 7386.0 | 41.9 | 33.6 | 35.6 | 10.4 | 32.4 | - | 55.5 | 47.2 | 73.9 | 53.9 | 18.4 | 6.7 | Floor noise |
| Vert. | 9848.0 | 41.1 | 33.3 | 36.2 | 10.9 | 33.0 | - | 55.2 | 47.4 | 73.9 | 53.9 | 18.8 | 6.6 | Floor noise |
| Vert. | 10000.0 | 43.6 | 35.8 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

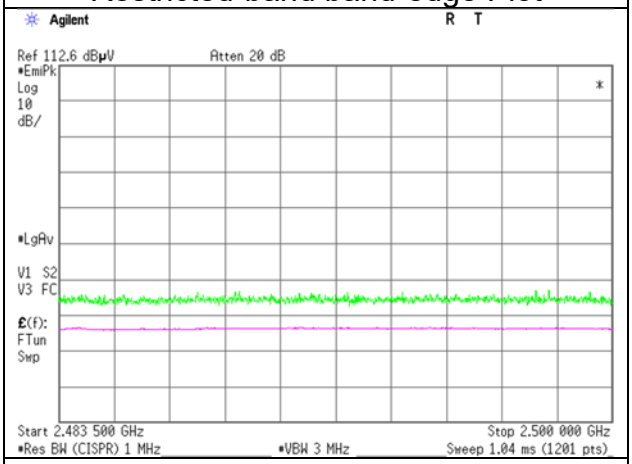
| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission
## (Reference Plot for Band-edge)

| | |
|---|---|
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | February 20, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH |
| Engineer | Yuichiro Yamazaki<br>(1 GHz to 6 GHz) |
| Mode | Tx 11b 2462 MHz |

Horizontal

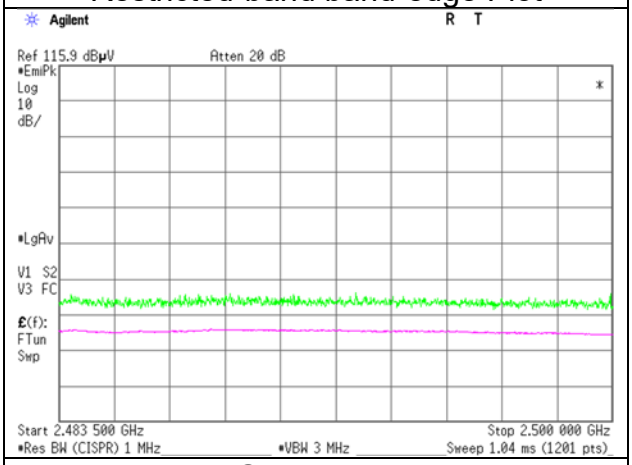
Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11n-20 2412 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 54.2 | 43.6 | 25.0 | 4.5 | 33.1 | - | 50.6 | 39.9 | 73.9 | 53.9 | 23.3 | 14.0 | |
| Hori. | 2225.3 | 46.6 | 40.6 | 28.2 | 5.0 | 31.9 | - | 47.9 | 41.9 | 73.9 | 53.9 | 26.0 | 12.0 | |
| Hori. | 2390.0 | 45.0 | 34.5 | 27.8 | 5.1 | 31.8 | 2.6 | 46.1 | 38.2 | 73.9 | 53.9 | 27.8 | 15.7 | *1) |
| Hori. | 4824.0 | 40.5 | 32.8 | 31.4 | 7.2 | 30.8 | - | 48.3 | 40.5 | 73.9 | 53.9 | 25.6 | 13.4 | Floor noise |
| Hori. | 5000.0 | 43.6 | 37.9 | 31.8 | 7.3 | 30.8 | - | 51.8 | 46.1 | 73.9 | 53.9 | 22.1 | 7.8 | |
| Hori. | 7236.0 | 41.6 | 33.8 | 35.7 | 10.4 | 32.3 | - | 55.3 | 47.5 | 73.9 | 53.9 | 18.6 | 6.4 | Floor noise |
| Hori. | 9648.0 | 41.8 | 33.8 | 35.8 | 10.9 | 33.0 | - | 55.5 | 47.5 | 73.9 | 53.9 | 18.4 | 6.4 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.2 | 36.1 | 9.2 | 32.8 | - | 54.9 | 48.6 | 73.9 | 53.9 | 19.0 | 5.3 | |
| Vert. | 1579.9 | 56.7 | 44.2 | 25.0 | 4.5 | 33.1 | - | 53.1 | 40.6 | 73.9 | 53.9 | 20.9 | 13.4 | |
| Vert. | 2225.3 | 45.9 | 39.4 | 28.2 | 5.0 | 31.9 | - | 47.1 | 40.7 | 73.9 | 53.9 | 26.8 | 13.2 | |
| Vert. | 2390.0 | 45.1 | 34.6 | 27.8 | 5.1 | 31.8 | 2.6 | 46.2 | 38.3 | 73.9 | 53.9 | 27.7 | 15.6 | *1) |
| Vert. | 4824.0 | 40.8 | 32.4 | 31.4 | 7.2 | 30.8 | - | 48.5 | 40.2 | 73.9 | 53.9 | 25.4 | 13.7 | Floor noise |
| Vert. | 5000.0 | 43.6 | 37.6 | 31.8 | 7.3 | 30.8 | - | 51.8 | 45.8 | 73.9 | 53.9 | 22.1 | 8.1 | |
| Vert. | 7236.0 | 41.5 | 33.7 | 35.7 | 10.4 | 32.3 | - | 55.2 | 47.4 | 73.9 | 53.9 | 18.7 | 6.5 | Floor noise |
| Vert. | 9648.0 | 41.7 | 33.8 | 35.8 | 10.9 | 33.0 | - | 55.4 | 47.5 | 73.9 | 53.9 | 18.5 | 6.4 | Floor noise |
| Vert. | 10000.0 | 43.5 | 35.9 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

**20dBc Data Sheet**

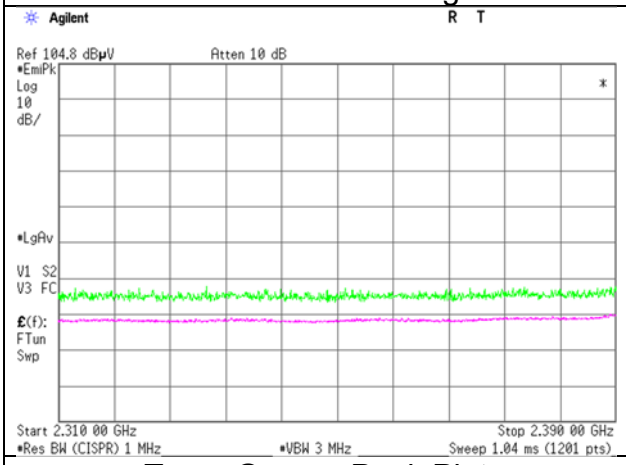
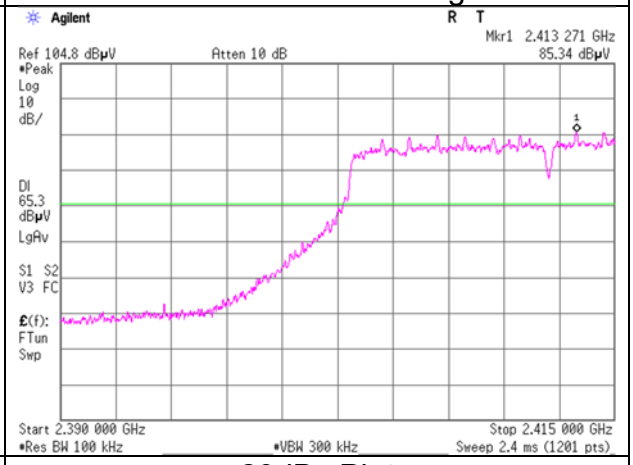
| Polarity [Hori/Vert] | Frequency [MHz] | Reading (PK) [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|
| Hori. | 2412.0 | 85.3 | 27.8 | 5.1 | 31.8 | 86.4 | - | - | Carrier |
| Hori. | 2400.0 | 50.1 | 27.8 | 5.1 | 31.8 | 51.2 | 66.4 | 15.2 | |
| Vert. | 2412.0 | 84.8 | 27.8 | 5.1 | 31.8 | 85.9 | - | - | Carrier |
| Vert. | 2400.0 | 50.7 | 27.8 | 5.1 | 31.8 | 51.8 | 65.9 | 14.1 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

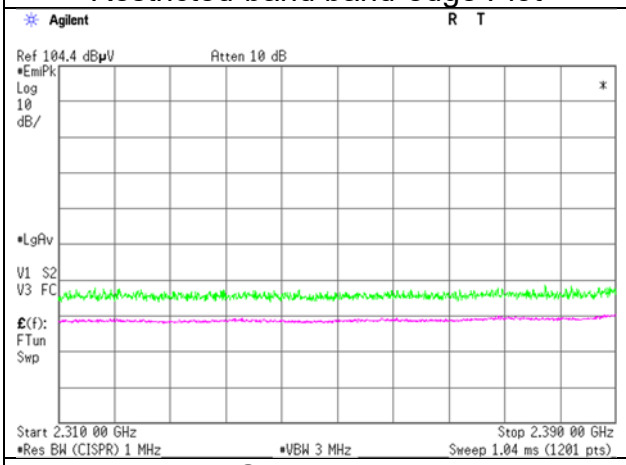
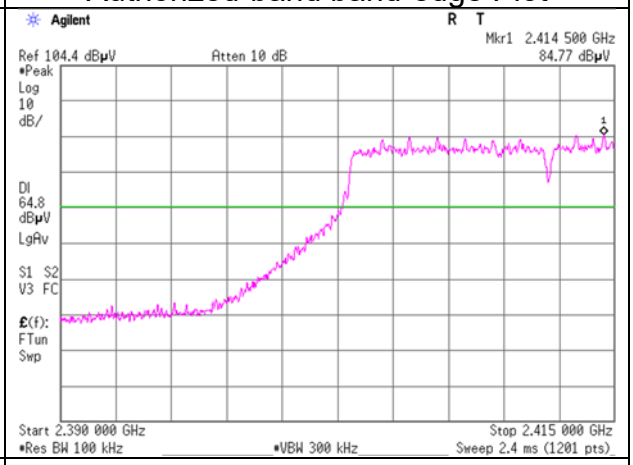
# Radiated Spurious Emission
## (Reference Plot for Band-edge)

| | |
|---|---|
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | February 20, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH |
| Engineer | Yuichiro Yamazaki<br>(1 GHz to 6 GHz) |
| Mode | Tx 11n-20 2412 MHz |

| Horizontal | |
|---|---|
| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|  |  |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |





| Vertical | |
|---|---|
| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|  |  |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |





* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge and authorized band edge were shown in tabular data.

# Radiated Spurious Emission

| | | | | | |
|---|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH | 22 deg. C / 44 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) | Takumi Nishida (Below 1 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11n-20 2437 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 36.8 | 26.4 | - | 12.0 | 7.0 | 32.2 | - | 13.2 | - | 40.0 | - | 26.8 | - | |
| Hori. | 49.2 | 29.3 | - | 10.0 | 7.2 | 32.2 | - | 14.4 | - | 40.0 | - | 25.6 | - | |
| Hori. | 66.5 | 27.5 | - | 9.0 | 7.5 | 32.2 | - | 11.8 | - | 40.0 | - | 28.2 | - | |
| Hori. | 80.0 | 29.2 | - | 9.1 | 7.7 | 32.2 | - | 13.8 | - | 40.0 | - | 26.2 | - | |
| Hori. | 262.7 | 31.0 | - | 12.4 | 9.4 | 32.0 | - | 20.7 | - | 46.0 | - | 25.3 | - | |
| Hori. | 279.4 | 36.5 | - | 13.3 | 9.5 | 32.0 | - | 27.3 | - | 46.0 | - | 18.8 | - | |
| Hori. | 1579.9 | 53.1 | 43.9 | 25.0 | 4.5 | 33.1 | - | 49.4 | 40.2 | 73.9 | 53.9 | 24.5 | 13.7 | |
| Hori. | 2225.3 | 46.5 | 40.5 | 28.2 | 5.0 | 31.9 | - | 47.8 | 41.7 | 73.9 | 53.9 | 26.1 | 12.2 | |
| Hori. | 4874.0 | 41.2 | 32.4 | 31.4 | 7.2 | 30.8 | - | 49.0 | 40.2 | 73.9 | 53.9 | 24.9 | 13.7 | Floor noise |
| Hori. | 5000.0 | 43.1 | 37.8 | 31.8 | 7.3 | 30.8 | - | 51.4 | 46.0 | 73.9 | 53.9 | 22.5 | 7.9 | |
| Hori. | 7311.0 | 42.1 | 34.1 | 35.6 | 10.4 | 32.3 | - | 55.8 | 47.8 | 73.9 | 53.9 | 18.1 | 6.1 | Floor noise |
| Hori. | 9748.0 | 41.3 | 33.5 | 36.0 | 10.9 | 33.0 | - | 55.2 | 47.4 | 73.9 | 53.9 | 18.7 | 6.5 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.2 | 36.1 | 9.2 | 32.8 | - | 54.8 | 48.7 | 73.9 | 53.9 | 19.1 | 5.2 | |
| Vert. | 36.8 | 37.3 | - | 12.0 | 7.0 | 32.2 | - | 24.1 | - | 40.0 | - | 15.9 | - | |
| Vert. | 49.2 | 28.4 | - | 10.0 | 7.2 | 32.2 | - | 13.5 | - | 40.0 | - | 26.5 | - | |
| Vert. | 66.5 | 28.5 | - | 9.0 | 7.5 | 32.2 | - | 12.8 | - | 40.0 | - | 27.2 | - | |
| Vert. | 80.0 | 29.2 | - | 9.1 | 7.7 | 32.2 | - | 13.8 | - | 40.0 | - | 26.2 | - | |
| Vert. | 262.7 | 27.8 | - | 12.4 | 9.4 | 32.0 | - | 17.5 | - | 46.0 | - | 28.5 | - | |
| Vert. | 279.4 | 33.4 | - | 13.3 | 9.5 | 32.0 | - | 24.2 | - | 46.0 | - | 21.8 | - | |
| Vert. | 1579.9 | 56.3 | 44.4 | 25.0 | 4.5 | 33.1 | - | 52.7 | 40.7 | 73.9 | 53.9 | 21.2 | 13.2 | |
| Vert. | 2225.3 | 46.0 | 39.6 | 28.2 | 5.0 | 31.9 | - | 47.3 | 40.8 | 73.9 | 53.9 | 26.6 | 13.1 | |
| Vert. | 4874.0 | 41.3 | 32.2 | 31.4 | 7.2 | 30.8 | - | 49.1 | 40.0 | 73.9 | 53.9 | 24.8 | 13.9 | Floor noise |
| Vert. | 5000.0 | 43.2 | 37.5 | 31.8 | 7.3 | 30.8 | - | 51.4 | 45.7 | 73.9 | 53.9 | 22.5 | 8.2 | |
| Vert. | 7311.0 | 42.0 | 34.0 | 35.6 | 10.4 | 32.3 | - | 55.7 | 47.7 | 73.9 | 53.9 | 18.2 | 6.2 | Floor noise |
| Vert. | 9748.0 | 41.4 | 33.6 | 36.0 | 10.9 | 33.0 | - | 55.3 | 47.5 | 73.9 | 53.9 | 18.6 | 6.4 | Floor noise |
| Vert. | 10000.0 | 43.6 | 35.8 | 36.1 | 9.2 | 32.8 | - | 56.1 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11n-20 2462 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 52.7 | 44.2 | 25.0 | 4.5 | 33.1 | - | 49.1 | 40.5 | 73.9 | 53.9 | 24.8 | 13.4 | |
| Hori. | 2225.3 | 46.8 | 40.3 | 28.2 | 5.0 | 31.9 | - | 48.1 | 41.6 | 73.9 | 53.9 | 25.8 | 12.3 | |
| Hori. | 2483.5 | 46.0 | 34.9 | 27.7 | 5.1 | 31.7 | 2.6 | 47.2 | 38.6 | 73.9 | 53.9 | 26.8 | 15.3 | *1) |
| Hori. | 2500.0 | 44.2 | 37.0 | 27.7 | 5.2 | 31.7 | - | 45.3 | 38.2 | 73.9 | 53.9 | 28.6 | 15.7 | |
| Hori. | 4924.0 | 41.3 | 32.2 | 31.5 | 7.3 | 30.8 | - | 49.2 | 40.1 | 73.9 | 53.9 | 24.7 | 13.8 | Floor noise |
| Hori. | 5000.0 | 43.4 | 37.5 | 31.8 | 7.3 | 30.8 | - | 51.6 | 45.7 | 73.9 | 53.9 | 22.3 | 8.2 | |
| Hori. | 7386.0 | 41.8 | 33.6 | 35.6 | 10.4 | 32.4 | - | 55.4 | 47.2 | 73.9 | 53.9 | 18.5 | 6.7 | Floor noise |
| Hori. | 9848.0 | 41.4 | 33.5 | 36.2 | 10.9 | 33.0 | - | 55.5 | 47.6 | 73.9 | 53.9 | 18.5 | 6.4 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.1 | 36.1 | 9.2 | 32.8 | - | 54.9 | 48.6 | 73.9 | 53.9 | 19.0 | 5.3 | |
| Vert. | 1579.9 | 56.0 | 44.4 | 25.0 | 4.5 | 33.1 | - | 52.4 | 40.7 | 73.9 | 53.9 | 21.6 | 13.2 | |
| Vert. | 2225.3 | 46.1 | 39.8 | 28.2 | 5.0 | 31.9 | - | 47.4 | 41.1 | 73.9 | 53.9 | 26.5 | 12.8 | |
| Vert. | 2483.5 | 47.6 | 36.3 | 27.7 | 5.1 | 31.7 | 2.6 | 48.8 | 40.0 | 73.9 | 53.9 | 25.2 | 13.9 | *1) |
| Vert. | 2500.0 | 44.3 | 37.8 | 27.7 | 5.2 | 31.7 | - | 45.4 | 38.9 | 73.9 | 53.9 | 28.5 | 15.0 | |
| Vert. | 4924.0 | 40.5 | 32.1 | 31.5 | 7.3 | 30.8 | - | 48.5 | 40.0 | 73.9 | 53.9 | 25.5 | 13.9 | Floor noise |
| Vert. | 5000.0 | 43.4 | 37.6 | 31.8 | 7.3 | 30.8 | - | 51.6 | 45.8 | 73.9 | 53.9 | 22.3 | 8.1 | |
| Vert. | 7386.0 | 41.9 | 33.7 | 35.6 | 10.4 | 32.4 | - | 55.5 | 47.3 | 73.9 | 53.9 | 18.4 | 6.6 | Floor noise |
| Vert. | 9848.0 | 41.2 | 33.4 | 36.2 | 10.9 | 33.0 | - | 55.3 | 47.5 | 73.9 | 53.9 | 18.7 | 6.5 | Floor noise |
| Vert. | 10000.0 | 43.5 | 35.8 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

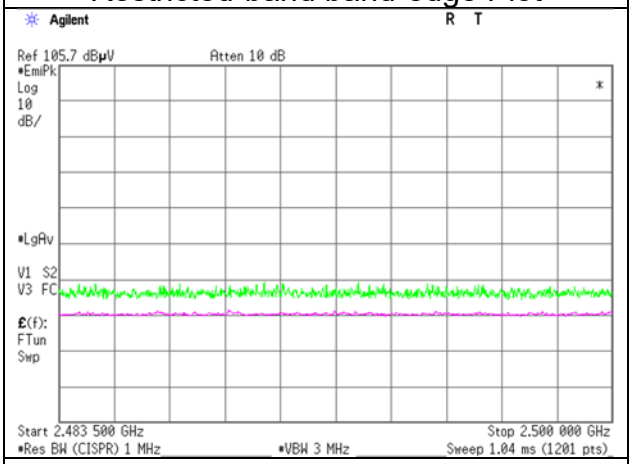
| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission
## (Reference Plot for Band-edge)

| | |
|---|---|
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | February 20, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH |
| Engineer | Yuichiro Yamazaki<br>(1 GHz to 6 GHz) |
| Mode | Tx 11n-20 2462 MHz |

Horizontal

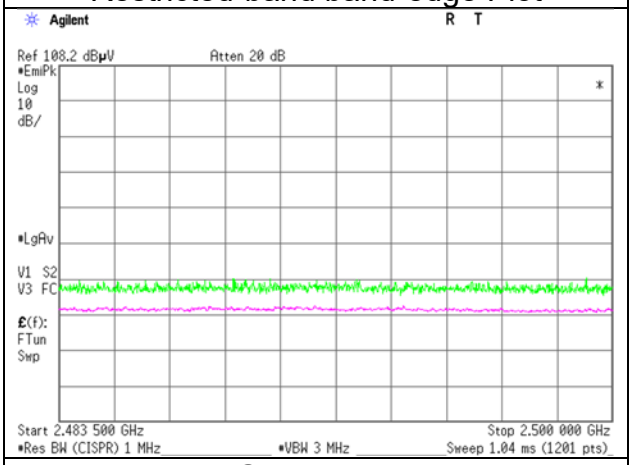
Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | March 6, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH | 20 deg. C / 40 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Junki Nagatomi (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx BT LE 2402 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 55.9 | 44.3 | 25.0 | 4.5 | 33.1 | - | 52.3 | 40.7 | 73.9 | 53.9 | 21.6 | 13.3 | |
| Hori. | 2225.4 | 46.7 | 39.5 | 28.2 | 5.0 | 31.9 | - | 48.0 | 40.8 | 73.9 | 53.9 | 25.9 | 13.1 | |
| Hori. | 2390.0 | 42.5 | 33.5 | 27.8 | 5.1 | 31.8 | 1.7 | 43.6 | 36.3 | 73.9 | 53.9 | 30.3 | 17.6 | *1) |
| Hori. | 4804.0 | 41.9 | 32.3 | 31.3 | 7.2 | 30.9 | - | 49.6 | 40.0 | 73.9 | 53.9 | 24.3 | 13.9 | Floor noise |
| Hori. | 5000.1 | 43.6 | 36.7 | 31.8 | 7.3 | 30.8 | - | 51.9 | 44.9 | 73.9 | 53.9 | 22.1 | 9.0 | |
| Hori. | 7206.0 | 42.4 | 33.6 | 35.6 | 10.4 | 32.3 | - | 56.1 | 47.3 | 73.9 | 53.9 | 17.8 | 6.6 | Floor noise |
| Hori. | 9608.0 | 42.3 | 33.3 | 35.7 | 10.8 | 32.9 | - | 55.9 | 46.9 | 73.9 | 53.9 | 18.0 | 7.0 | Floor noise |
| Hori. | 10000.0 | 42.3 | 36.2 | 36.1 | 9.2 | 32.8 | - | 54.8 | 48.6 | 73.9 | 53.9 | 19.1 | 5.3 | |
| Vert. | 1579.9 | 56.9 | 45.3 | 25.0 | 4.5 | 33.1 | - | 53.3 | 41.6 | 73.9 | 53.9 | 20.7 | 12.3 | |
| Vert. | 2225.4 | 46.0 | 38.0 | 28.2 | 5.0 | 31.9 | - | 47.3 | 39.3 | 73.9 | 53.9 | 26.6 | 14.6 | |
| Vert. | 2390.0 | 44.6 | 33.9 | 27.8 | 5.1 | 31.8 | 1.7 | 45.7 | 36.7 | 73.9 | 53.9 | 28.2 | 17.2 | *1) |
| Vert. | 4804.0 | 41.9 | 32.3 | 31.3 | 7.2 | 30.9 | - | 49.6 | 40.0 | 73.9 | 53.9 | 24.3 | 13.9 | Floor noise |
| Vert. | 5000.1 | 44.3 | 37.8 | 31.8 | 7.3 | 30.8 | - | 52.5 | 46.0 | 73.9 | 53.9 | 21.4 | 7.9 | |
| Vert. | 7206.0 | 42.3 | 33.2 | 35.6 | 10.4 | 32.3 | - | 56.0 | 46.9 | 73.9 | 53.9 | 17.9 | 7.0 | Floor noise |
| Vert. | 9608.0 | 42.4 | 33.5 | 35.7 | 10.8 | 32.9 | - | 56.0 | 47.1 | 73.9 | 53.9 | 17.9 | 6.8 | Floor noise |
| Vert. | 10000.0 | 43.6 | 35.9 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

**20dBc Data Sheet**

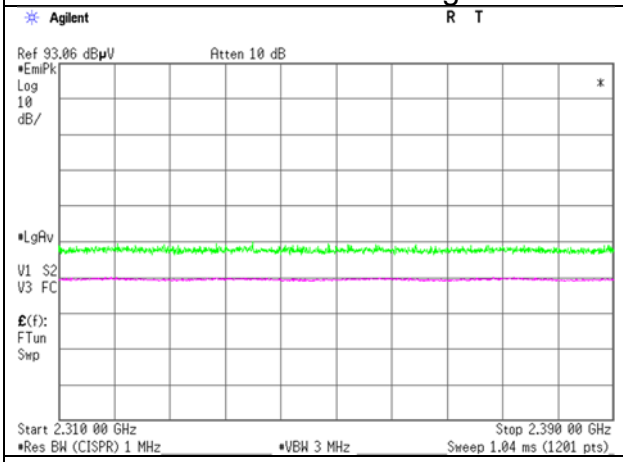
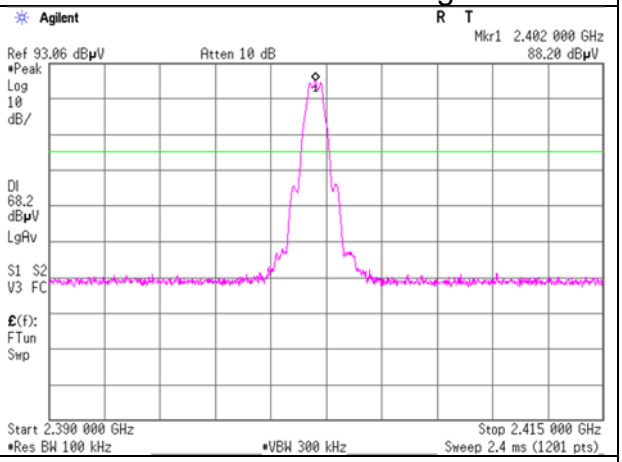
| Polarity [Hori/Vert] | Frequency [MHz] | Reading (PK) [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|
| Hori. | 2402.0 | 88.2 | 27.8 | 5.1 | 31.8 | 89.3 | - | - | Carrier |
| Hori. | 2400.0 | 37.0 | 27.8 | 5.1 | 31.8 | 38.1 | 69.3 | 31.2 | |
| Vert. | 2402.0 | 88.0 | 27.8 | 5.1 | 31.8 | 89.2 | - | - | Carrier |
| Vert. | 2400.0 | 36.5 | 27.8 | 5.1 | 31.8 | 37.7 | 69.2 | 31.5 | |

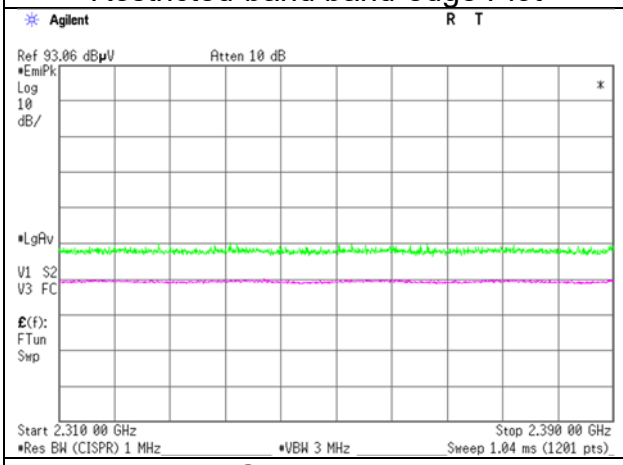
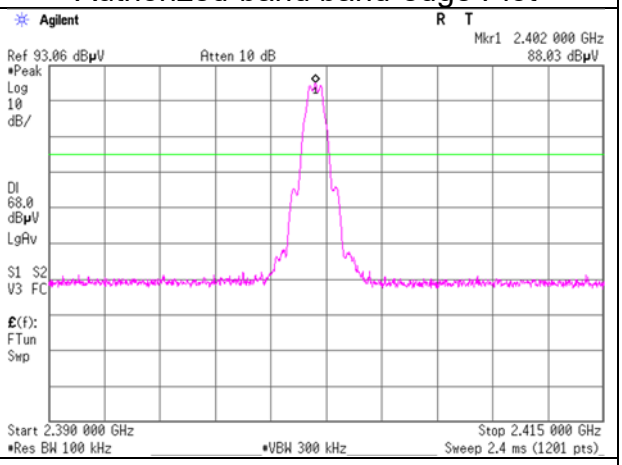
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission
## (Reference Plot for Band-edge)

| | |
|---|---|
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | February 20, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH |
| Engineer | Junki Nagatomi<br>(1 GHz to 6 GHz) |
| Mode | Tx BT LE 2402 MHz |

| Horizontal | |
|---|---|
| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|   |   |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |

| Vertical | |
|---|---|
| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|   |   |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge and authorized band edge were shown in tabular data.

# Radiated Spurious Emission

| | | | | | |
|---|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | March 6, 2024 | March 5, 2024 | March 7, 2024 | March 7, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH | 20 deg. C / 40 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH | 22 deg. C / 44 % RH |
| Engineer | Junki Nagatomi (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) | Takumi Nishida (Below 1 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx BT LE 2440 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 36.8 | 26.7 | - | 12.0 | 7.0 | 32.2 | - | 13.5 | - | 40.0 | - | 26.5 | - | |
| Hori. | 49.2 | 29.3 | - | 10.0 | 7.2 | 32.2 | - | 14.4 | - | 40.0 | - | 25.6 | - | |
| Hori. | 66.6 | 27.4 | - | 9.0 | 7.5 | 32.2 | - | 11.8 | - | 40.0 | - | 28.2 | - | |
| Hori. | 79.9 | 29.4 | - | 9.1 | 7.7 | 32.2 | - | 14.0 | - | 40.0 | - | 26.0 | - | |
| Hori. | 262.8 | 31.5 | - | 12.4 | 9.4 | 32.0 | - | 21.2 | - | 46.0 | - | 24.8 | - | |
| Hori. | 279.5 | 36.6 | - | 13.3 | 9.5 | 32.0 | - | 27.4 | - | 46.0 | - | 18.6 | - | |
| Hori. | 1579.9 | 55.9 | 44.1 | 25.0 | 4.5 | 33.1 | - | 52.3 | 40.4 | 73.9 | 53.9 | 21.6 | 13.5 | |
| Hori. | 2225.4 | 46.5 | 39.9 | 28.2 | 5.0 | 31.9 | - | 47.8 | 41.1 | 73.9 | 53.9 | 26.1 | 12.8 | |
| Hori. | 4880.0 | 41.5 | 32.2 | 31.4 | 7.2 | 30.8 | - | 49.3 | 40.0 | 73.9 | 53.9 | 24.6 | 13.9 | Floor noise |
| Hori. | 5000.1 | 43.6 | 36.4 | 31.8 | 7.3 | 30.8 | - | 51.8 | 44.6 | 73.9 | 53.9 | 22.1 | 9.3 | |
| Hori. | 7320.0 | 41.6 | 33.2 | 35.6 | 10.4 | 32.3 | - | 55.3 | 46.9 | 73.9 | 53.9 | 18.6 | 7.0 | Floor noise |
| Hori. | 9760.0 | 41.1 | 32.5 | 36.0 | 10.9 | 33.0 | - | 55.0 | 46.4 | 73.9 | 53.9 | 18.9 | 7.5 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.1 | 36.1 | 9.2 | 32.8 | - | 54.8 | 48.6 | 73.9 | 53.9 | 19.1 | 5.3 | |
| Vert. | 36.8 | 37.4 | - | 12.0 | 7.0 | 32.2 | - | 24.3 | - | 40.0 | - | 15.8 | - | |
| Vert. | 49.2 | 28.1 | - | 10.0 | 7.2 | 32.2 | - | 13.2 | - | 40.0 | - | 26.8 | - | |
| Vert. | 66.6 | 28.6 | - | 9.0 | 7.5 | 32.2 | - | 12.9 | - | 40.0 | - | 27.1 | - | |
| Vert. | 79.9 | 29.8 | - | 9.1 | 7.7 | 32.2 | - | 14.4 | - | 40.0 | - | 25.7 | - | |
| Vert. | 262.8 | 28.0 | - | 12.4 | 9.4 | 32.0 | - | 17.7 | - | 46.0 | - | 28.3 | - | |
| Vert. | 279.5 | 33.8 | - | 13.3 | 9.5 | 32.0 | - | 24.6 | - | 46.0 | - | 21.4 | - | |
| Vert. | 1579.9 | 55.9 | 45.4 | 25.0 | 4.5 | 33.1 | - | 52.2 | 41.8 | 73.9 | 53.9 | 21.7 | 12.1 | |
| Vert. | 2225.4 | 45.8 | 40.0 | 28.2 | 5.0 | 31.9 | - | 47.1 | 41.3 | 73.9 | 53.9 | 26.9 | 12.6 | |
| Vert. | 4880.0 | 41.5 | 32.2 | 31.4 | 7.2 | 30.8 | - | 49.3 | 40.0 | 73.9 | 53.9 | 24.6 | 13.9 | Floor noise |
| Vert. | 5000.1 | 44.2 | 38.2 | 31.8 | 7.3 | 30.8 | - | 52.4 | 46.4 | 73.9 | 53.9 | 21.5 | 7.5 | |
| Vert. | 7323.0 | 41.7 | 33.3 | 35.6 | 10.4 | 32.4 | - | 55.4 | 47.0 | 73.9 | 53.9 | 18.5 | 6.9 | Floor noise |
| Vert. | 9764.0 | 41.2 | 32.6 | 36.0 | 10.9 | 33.0 | - | 55.1 | 46.5 | 73.9 | 53.9 | 18.8 | 7.4 | Floor noise |
| Vert. | 10000.0 | 43.5 | 35.8 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission

| | | | | |
|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | March 6, 2024 | March 5, 2024 | March 7, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH | 20 deg. C / 40 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH |
| Engineer | Junki Nagatomi (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx BT LE 2480 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 1579.9 | 51.5 | 43.8 | 25.0 | 4.5 | 33.1 | - | 47.9 | 40.1 | 73.9 | 53.9 | 26.0 | 13.8 | |
| Hori. | 2225.4 | 46.8 | 40.6 | 28.2 | 5.0 | 31.9 | - | 48.0 | 41.8 | 73.9 | 53.9 | 25.9 | 12.1 | |
| Hori. | 2483.5 | 46.7 | 34.3 | 27.7 | 5.1 | 31.7 | 1.7 | 47.8 | 37.1 | 73.9 | 53.9 | 26.1 | 16.8 | *1) |
| Hori. | 4960.0 | 41.4 | 32.0 | 31.6 | 7.3 | 30.8 | - | 49.5 | 40.1 | 73.9 | 53.9 | 24.4 | 13.8 | Floor noise |
| Hori. | 5000.1 | 43.9 | 37.1 | 31.8 | 7.3 | 30.8 | - | 52.1 | 45.3 | 73.9 | 53.9 | 21.8 | 8.6 | |
| Hori. | 7440.0 | 42.2 | 33.2 | 35.5 | 10.4 | 32.4 | - | 55.7 | 46.7 | 73.9 | 53.9 | 18.2 | 7.2 | Floor noise |
| Hori. | 9920.0 | 41.7 | 33.3 | 36.2 | 10.9 | 33.1 | - | 55.8 | 47.4 | 73.9 | 53.9 | 18.1 | 6.5 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.2 | 36.1 | 9.2 | 32.8 | - | 54.9 | 48.6 | 73.9 | 53.9 | 19.1 | 5.3 | |
| Vert. | 1579.9 | 57.8 | 45.2 | 25.0 | 4.5 | 33.1 | - | 54.2 | 41.5 | 73.9 | 53.9 | 19.7 | 12.4 | |
| Vert. | 2225.4 | 46.8 | 39.8 | 28.2 | 5.0 | 31.9 | - | 48.0 | 41.1 | 73.9 | 53.9 | 25.9 | 12.8 | |
| Vert. | 2483.5 | 46.3 | 34.2 | 27.7 | 5.1 | 31.7 | 1.7 | 47.4 | 37.1 | 73.9 | 53.9 | 26.5 | 16.9 | *1) |
| Vert. | 4960.0 | 41.4 | 32.0 | 31.6 | 7.3 | 30.8 | - | 49.4 | 40.1 | 73.9 | 53.9 | 24.5 | 13.8 | Floor noise |
| Vert. | 5000.1 | 44.5 | 38.6 | 31.8 | 7.3 | 30.8 | - | 52.7 | 46.9 | 73.9 | 53.9 | 21.2 | 7.0 | |
| Vert. | 7440.0 | 42.3 | 33.3 | 35.5 | 10.4 | 32.4 | - | 55.8 | 46.8 | 73.9 | 53.9 | 18.1 | 7.1 | Floor noise |
| Vert. | 9920.0 | 41.8 | 33.4 | 36.2 | 10.9 | 33.1 | - | 55.9 | 47.5 | 73.9 | 53.9 | 18.0 | 6.4 | Floor noise |
| Vert. | 10000.0 | 43.6 | 35.9 | 36.1 | 9.2 | 32.8 | - | 56.1 | 48.4 | 73.9 | 53.9 | 17.9 | 5.6 | |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

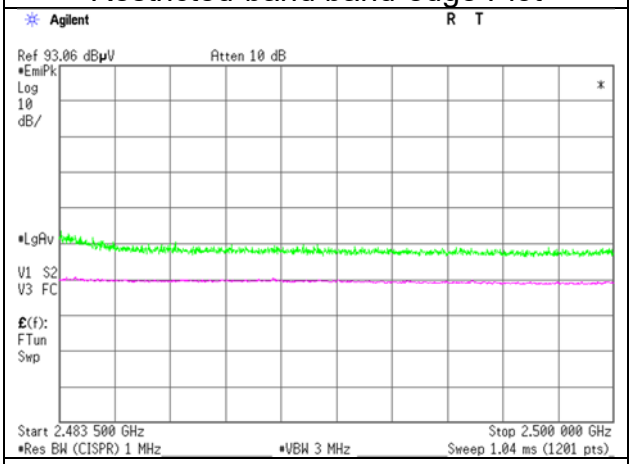
| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission
## (Reference Plot for Band-edge)

| | |
|---|---|
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | February 20, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH |
| Engineer | Junki Nagatomi<br>(1 GHz to 6 GHz) |
| Mode | Tx BT LE 2480 MHz |

Horizontal

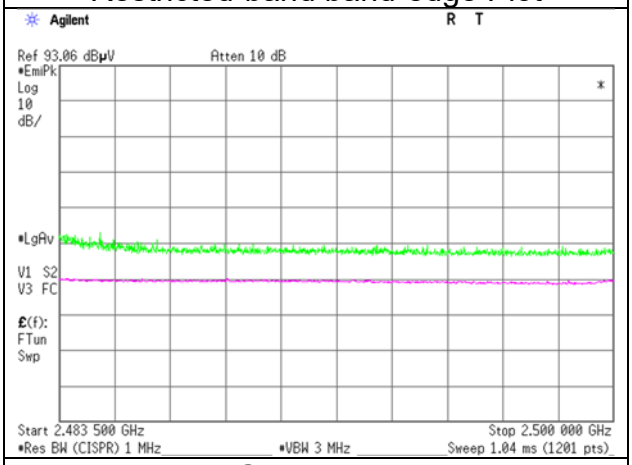
Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

# Radiated Spurious Emission

| | | | | | |
|---|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | | |
| Semi Anechoic Chamber | No.3 | No.3 | No.3 | No.3 | No.3 |
| Date | March 5, 2024 | March 6, 2024 | March 6, 2024 | March 7, 2024 | March 7, 2024 |
| Temperature / Humidity | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH | 22 deg. C / 44 % RH | 23 deg. C / 43 % RH | 22 deg. C / 44 % RH |
| Engineer | Takumi Nishida (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) | Takumi Nishida (Below 1 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx BT LE 2440 MHz + Tx 11a 5180 MHz |

| Polarity [Hori/Vert] | Frequency [MHz] | Reading (QP / PK) [dBuV] | Reading (AV) [dBuV] | Ant. Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result (QP / PK) [dBuV/m] | Result (AV) [dBuV/m] | Limit (QP / PK) [dBuV/m] | Limit (AV) [dBuV/m] | Margin (QP / PK) [dB] | Margin (AV) [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 36.8 | 26.4 | - | 12.0 | 7.0 | 32.2 | - | 13.2 | - | 40.0 | - | 26.8 | - | |
| Hori. | 49.2 | 29.3 | - | 10.0 | 7.2 | 32.2 | - | 14.4 | - | 40.0 | - | 25.6 | - | |
| Hori. | 66.6 | 27.1 | - | 9.0 | 7.5 | 32.2 | - | 11.5 | - | 40.0 | - | 28.6 | - | |
| Hori. | 79.9 | 29.1 | - | 9.1 | 7.7 | 32.2 | - | 13.7 | - | 40.0 | - | 26.3 | - | |
| Hori. | 262.7 | 31.5 | - | 12.3 | 9.4 | 32.0 | - | 21.2 | - | 46.0 | - | 24.9 | - | |
| Hori. | 279.4 | 36.3 | - | 13.3 | 9.5 | 32.0 | - | 27.1 | - | 46.0 | - | 18.9 | - | |
| Hori. | 1580.0 | 50.0 | 43.6 | 25.1 | 3.9 | 33.6 | - | 45.4 | 39.0 | 73.9 | 53.9 | 28.5 | 14.9 | |
| Hori. | 4880.0 | 40.7 | 32.1 | 31.4 | 5.5 | 31.4 | - | 46.2 | 37.6 | 73.9 | 53.9 | 27.7 | 16.3 | Floor noise |
| Hori. | 5000.0 | 43.6 | 38.4 | 31.7 | 5.6 | 31.4 | - | 49.4 | 44.2 | 73.9 | 53.9 | 24.5 | 9.7 | |
| Hori. | 7320.0 | 41.7 | 33.3 | 35.6 | 10.4 | 32.3 | - | 55.4 | 47.0 | 73.9 | 53.9 | 18.5 | 6.9 | Floor noise |
| Hori. | 9760.0 | 41.2 | 32.6 | 36.0 | 10.9 | 33.0 | - | 55.1 | 46.5 | 73.9 | 53.9 | 18.8 | 7.4 | Floor noise |
| Hori. | 10000.0 | 42.4 | 36.2 | 36.1 | 9.2 | 32.8 | - | 54.9 | 48.6 | 73.9 | 53.9 | 19.1 | 5.3 | |
| Vert. | 36.8 | 37.5 | - | 12.0 | 7.0 | 32.2 | - | 24.3 | - | 40.0 | - | 15.7 | - | |
| Vert. | 49.2 | 28.4 | - | 10.0 | 7.2 | 32.2 | - | 13.4 | - | 40.0 | - | 26.6 | - | |
| Vert. | 66.6 | 28.6 | - | 9.0 | 7.5 | 32.2 | - | 12.9 | - | 40.0 | - | 27.1 | - | |
| Vert. | 79.9 | 29.6 | - | 9.1 | 7.7 | 32.2 | - | 14.2 | - | 40.0 | - | 25.8 | - | |
| Vert. | 262.7 | 27.8 | - | 12.3 | 9.4 | 32.0 | - | 17.5 | - | 46.0 | - | 28.5 | - | |
| Vert. | 279.4 | 33.3 | - | 13.3 | 9.5 | 32.0 | - | 24.1 | - | 46.0 | - | 21.9 | - | |
| Vert. | 1580.0 | 56.5 | 46.6 | 25.1 | 3.9 | 33.6 | - | 51.9 | 42.0 | 73.9 | 53.9 | 22.0 | 11.9 | |
| Vert. | 4880.0 | 41.0 | 32.2 | 31.4 | 5.5 | 31.4 | - | 46.5 | 37.7 | 73.9 | 53.9 | 27.4 | 16.2 | Floor noise |
| Vert. | 5000.0 | 43.4 | 37.5 | 31.7 | 5.6 | 31.4 | - | 49.2 | 43.3 | 73.9 | 53.9 | 24.7 | 10.6 | |
| Vert. | 7320.0 | 41.8 | 33.3 | 35.6 | 10.4 | 32.3 | - | 55.5 | 47.0 | 73.9 | 53.9 | 18.4 | 6.9 | Floor noise |
| Vert. | 9760.0 | 41.3 | 32.7 | 36.0 | 10.9 | 33.0 | - | 55.2 | 46.6 | 73.9 | 53.9 | 18.7 | 7.3 | Floor noise |
| Vert. | 10000.0 | 43.5 | 35.9 | 36.1 | 9.2 | 32.8 | - | 56.0 | 48.3 | 73.9 | 53.9 | 17.9 | 5.6 | |

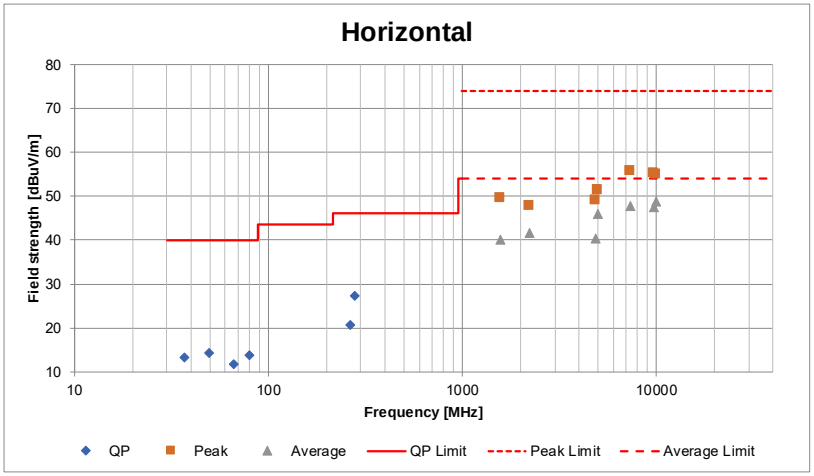
Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

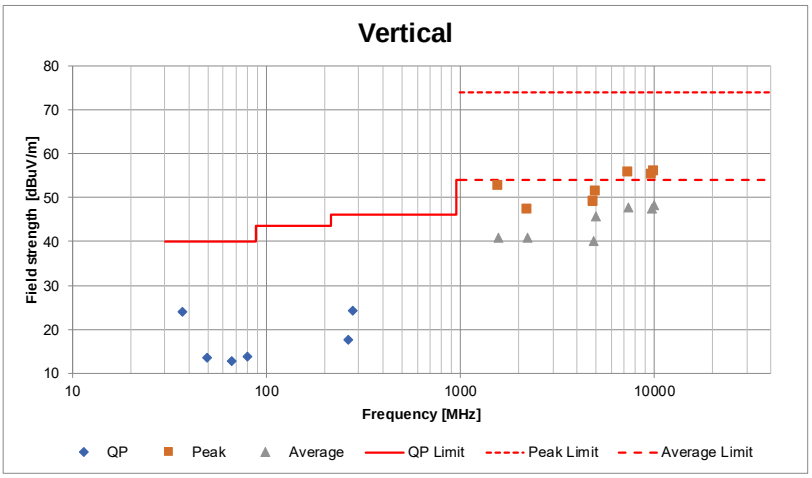
| | | |
|---|---|---|
| Distance factor: | 1 GHz - 6 GHz | 20log (3.8 m / 3.0 m) = 2.06 dB |
| | 6 GHz - 10 GHz | 20log (4.8 m / 3.0 m) = 4.09 dB |
| | 10 GHz - 26.5 GHz | 20log (1.0 m / 3.0 m) = -9.5 dB |

# Radiated Spurious Emission
## (Plot data, Worst Case Mode for Maximum Peak Output Power)

| | | | | | |
|---|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | February 25, 2024 | March 5, 2024 | March 7, 2024 | March 7, 2024 |
| Temperature / Humidity | 24 deg. C / 56 % RH | 22 deg. C / 39 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH | 22 deg. C / 44 % RH |
| Engineer | Yuichiro Yamazaki (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) | Takumi Nishida (Below 1 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx 11n-20 2437 MHz |



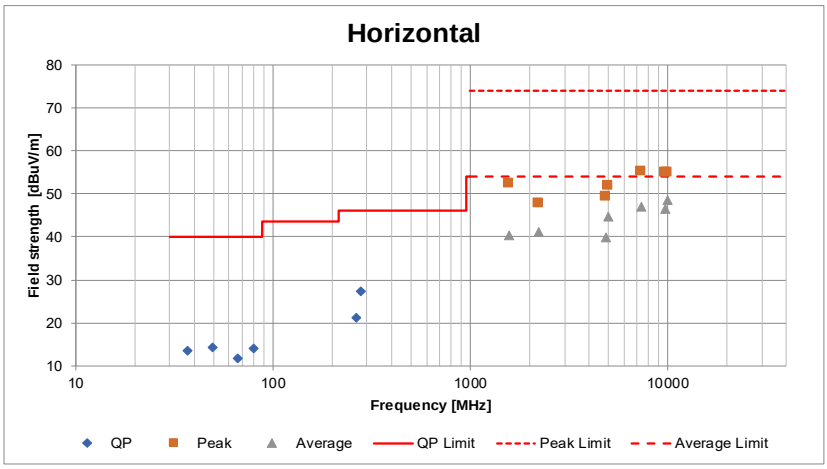



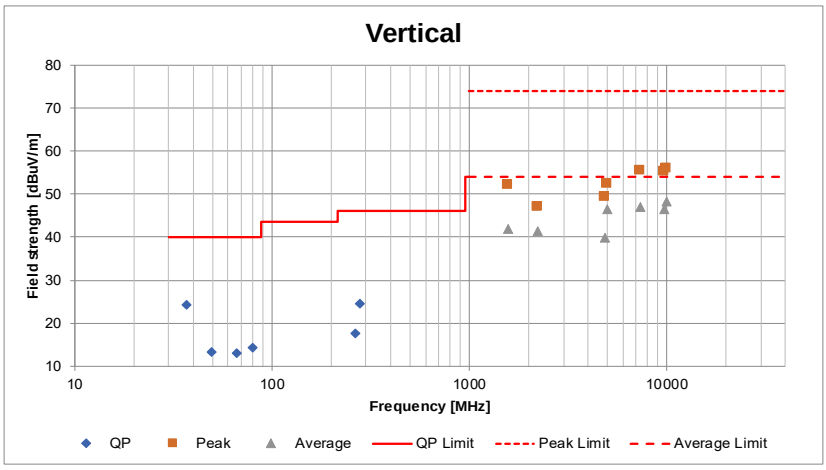

*These plots data contain sufficient number to show the trend of characteristic features for EUT.

# Radiated Spurious Emission
## (Plot data, Worst Case Mode for Maximum Peak Output Power)

| | | | | | |
|---|---|---|---|---|---|
| Test place | Ise EMC Lab. | | | | |
| Semi Anechoic Chamber | No.4 | No.3 | No.3 | No.3 | No.3 |
| Date | February 20, 2024 | March 6, 2024 | March 5, 2024 | March 7, 2024 | March 7, 2024 |
| Temperature / Humidity | 22 deg. C / 66 % RH | 20 deg. C / 40 % RH | 23 deg. C / 45 % RH | 23 deg. C / 43 % RH | 22 deg. C / 44 % RH |
| Engineer | Junki Nagatomi (1 GHz to 6 GHz) | Hiroyuki Furutaka (6 GHz to 10 GHz) | Takumi Nishida (10 GHz to 18 GHz) | Hiroyuki Furutaka (18 GHz to 26.5 GHz) | Takumi Nishida (Below 1 GHz) |

| | |
|---|---|
| Semi Anechoic Chamber | No.3 |
| Date | May 30, 2024 |
| Temperature / Humidity | 23 deg. C / 42 % RH |
| Engineer | Tetsuro Yoshida (10 GHz to 18 GHz) |
| Mode | Tx BT LE 2440 MHz |




*These plots data contain sufficient number to show the trend of characteristic features for EUT.

# APPENDIX 2: Test Instruments

## Test Equipment

| Test Item | LIMS ID | Description | Manufacturer | Model | Serial | Last Calibration Date | Cal Int |
|---|---|---|---|---|---|---|---|
| RE | 141232 | High Pass Filter 3.5-18.0GHz | UL Japan | HPF SELECTOR | 001 | 09/04/2023 | 12 |
| RE | 141266 | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess-Elektronik OHG | VUSLP9111B | 9111B-191 | 08/10/2023 | 12 |
| RE | 141296 | High Pass Filter 3.5-18.0GHz | UL Japan | HPF SELECTOR | 002 | 09/01/2023 | 12 |
| RE | 141323 | Coaxial cable | UL Japan | - | - | 09/10/2023 | 12 |
| RE | 141503 | Horn Antenna 18-26.5GHz | EMCO | 3160-09 | 1265 | 06/23/2023 | 12 |
| RE | 141507 | Horn Antenna 1-18GHz | Schwarzbeck Mess-Elektronik OHG | BBHA9120D | 258 | 11/20/2023 | 12 |
| RE | 141508 | Horn Antenna 1-18GHz | Schwarzbeck Mess-Elektronik OHG | BBHA9120D | 557 | 05/17/2023 | 12 |
| RE | 141532 | DIGITAL HiTESTER | HIOKI E.E. CORPORATION | 3805 | 051201197 | 01/31/2024 | 12 |
| RE | 141545 | DIGITAL HiTESTER | HIOKI E.E. CORPORATION | 3805 | 51201148 | 02/01/2024 | 12 |
| RE | 141554 | Thermo-Hygrometer | CUSTOM. Inc | CTH-201 | 1301 | - | - |
| RE | 141580 | MicroWave System Amplifier | Keysight Technologies Inc | 83017A | MY39500779 | 03/08/2024 | 12 |
| RE | 141581 | MicroWave System Amplifier | Keysight Technologies Inc | 83017A | 00650 | 10/05/2023 | 12 |
| RE | 141582 | Pre Amplifier | SONOMA INSTRUMENT | 310 | 260834 | 02/17/2024 | 12 |
| RE | 141884 | Spectrum Analyzer | Keysight Technologies Inc | E4448A | MY44020357 | 05/09/2024 | 12 |
| RE | 141899 | Spectrum Analyzer | Keysight Technologies Inc | E4448A | MY46180655 | 05/09/2024 | 12 |
| RE | 141901 | Spectrum Analyzer | Keysight Technologies Inc | E4440A | MY48250080 | 01/26/2024 | 12 |
| RE | 141950 | EMI Test Receiver | Rohde & Schwarz | ESU26 | 100412 | 11/20/2023 | 12 |
| RE | 142008 | AC3_Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | 12/11/2023 | 24 |
| RE | 142013 | AC3_Semi Anechoic Chamber(SVSWR) | TDK | Semi Anechoic Chamber 3m | DA-10005 | 10/18/2023 | 12 |
| RE | 142017 | AC4_Semi Anechoic Chamber(SVSWR) | TDK | Semi Anechoic Chamber 3m | DA-10005 | 10/11/2023 | 12 |
| RE | 142183 | Measure | KOMELON | KMC-36 | - | 10/20/2023 | 12 |
| RE | 142230 | Measure, Tape, Steel | KOMELON | KMC-36 | - | - | - |
| RE | 142314 | Attenuator | Pasternack Enterprises | PE7390-6 | D/C 1504 | 06/23/2023 | 12 |
| RE | 178648 | EMI measurement program | TSJ (Techno Science Japan) | TEPTO-DV | - | - | - |
| RE | 197990 | Biconical Antenna | Schwarzbeck Mess-Elektronik OHG | VHBB 9124 + BBA 9106 | 01365 | 11/29/2023 | 12 |
| RE | 234602 | Microwave Cable | Huber+Suhner | SF126E/11PC35/ 11PC35/1000M,5000M | 537063/126E / 537074/126E | 03/08/2024 | 12 |
| RE | 238713 | Double Ridge Horn Antenna | Schwarzbeck Mess-Elektronik OHG | BBHA 9120 C | 688 | 08/10/2023 | 12 |
| RE | 244709 | Thermo-Hygrometer | HIOKI E.E. CORPORATION | LR5001 | 231202103 | 01/25/2024 | 12 |
| RE | 244710 | Thermo-Hygrometer | HIOKI E.E. CORPORATION | LR5001 | 231202104 | 01/25/2024 | 12 |
| RE | 245787 | Double Ridge Horn Antenna | Schwarzbeck Mess-Elektronik OHG | BBHA 9120 C | 689 | 03/06/2024 | 12 |
| RE | 246001 | Microwave Cable | Huber+Suhner | SF103/11PC35/ 11PC35/1000mm / SF126E/5000mm | 800673(1m) / 610204(5m) | 03/06/2024 | 12 |

***Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

**The expiration date of the calibration is the end of the expired month.**
**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**
**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

**Test item:**
**RE: Radiated Emission**