



Test report No.  
Page  
Issued date  
FCC ID

: 13977035M-A-R1  
: 1 of 59  
: March 15, 2022  
: A269ZUA165

# **RADIO TEST REPORT**

**Test Report No. : 13977035M-A-R1**

**Applicant** : ALPS ALPINE CO., LTD.  
**Type of EUT** : Head unit  
**Model Number of EUT** : AH00ICB  
**FCC ID** : A269ZUA165  
**Test regulation** : FCC Part 15 Subpart C: 2021  
\* Wireless LAN 2.4 GHz band and Bluetooth low energy part  
**Test item** : Radiated Spurious Emission test  
**Test result** : Complied (Refer to SECTION 3)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
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6. This test report covers Radio technical requirements.  
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Kashima EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13977035M-A. 13977035M-A is replaced with this report.
11. For original test report(s) referred in this report, the latest version (including any revisions) is always referred.

**Date of test:** October 20 to December 20, 2021

**Representative test engineer:**

Kazuhiro Ando  
Engineer

**Approved by:**

Kenichi Suda  
Manager



CERTIFICATE 1266.01

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
☒ There is no testing item of "Non-accreditation".

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Report Cover Page - 13-EM-F0429 Issue # 19.0

## **REVISION HISTORY**

### **Original Test Report No.: 13977035M-A**

| Revision        | Test report No. | Date             | Page revised | Contents                                                                                                                                                   |
|-----------------|-----------------|------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -<br>(Original) | 13977035M-A     | January 31, 2022 | -            | -                                                                                                                                                          |
| 1               | 13977035M-A-R1  | March 15, 2022   | P.14, P.15   | Add the following description;<br>* This Burst rate confirmation data is quoted from the data of Report No.13977035S-A (Antenna Terminal Conducted Tests). |

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

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

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## **SECTION 1: Customer information**

Company Name : ALPS ALPINE CO., LTD.  
Address : 20-1 Yoshima Industrial park, Iwaki, Fukushima Prefecture 970-1192 Japan  
Telephone Number : +81-246-36-4111  
Contact Person : Kenji Nagase

The information provided from the customer is as follows;

- Applicant, Type 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
  - SECTION 4: Operation of EUT during testing
- \* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

## **SECTION 2: Equipment under test (EUT)**

### **2.1 Identification of EUT**

Type : Head unit  
Model Number : AH00ICB  
Serial Number : Refer to SECTION 4.2  
Receipt Date : October 19, 2021  
Condition : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification : No Modification by the test lab.

### **2.2 Product Description**

Model: AH00ICB (referred to as the EUT in this report) is a Head unit.

The EUT has following similar model:

| Model Name    | Details                  |
|---------------|--------------------------|
| AH00ICB (EUT) | External amplifier model |
| AH00ICB 1     | Internal amplifier model |

### **General Specification**

Rating : DC 13.2 V  
Operating Temperature : -30 deg. C - +70 deg. C

## **Radio Specification**

### **Bluetooth**

|                        |   |                                    |
|------------------------|---|------------------------------------|
| Radio Type             | : | Transceiver                        |
| Frequency of Operation | : | 2402 MHz - 2480 MHz                |
| Antenna type           | : | Internal Chip Antenna              |
| Modulation             | : | FHSS (GFSK, $\pi/4$ -DQPSK, 8DPSK) |
| Antenna Gain           | : | -0.2 dBi                           |

### **Bluetooth Low Energy**

|                        |   |                       |
|------------------------|---|-----------------------|
| Radio Type             | : | Transceiver           |
| Frequency of Operation | : | 2402 MHz - 2480 MHz   |
| Antenna type           | : | Internal Chip Antenna |
| Modulation             | : | GFSK                  |
| Antenna Gain           | : | -0.2 dBi              |

### **WLAN 2.4 GHz (IEEE802.11b/g/n-20)**

|                        |   |                                                             |
|------------------------|---|-------------------------------------------------------------|
| Radio Type             | : | Transceiver                                                 |
| Frequency of Operation | : | 2412 MHz - 2462 MHz                                         |
| Antenna type           | : | Internal Chip Antenna                                       |
| Modulation             | : | DSSS (CCK, DQPSK, DBPSK)<br>OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Antenna Gain           | : | -0.2 dBi                                                    |

### **WLAN 5 GHz (IEEE802.11a/n-20/n-40/ac-20/ac-40/ac-80)**

|                        |   |                                            |
|------------------------|---|--------------------------------------------|
| Radio Type             | : | Transceiver                                |
| Frequency of Operation | : | 5180 MHz - 5825 MHz                        |
| Antenna type           | : | Internal Chip Antenna                      |
| Modulation             | : | OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)    |
| Antenna Gain           | : | +2.71 dBi (Chain 1)<br>+2.71 dBi (Chain 2) |

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,  
and 5725-5850 MHz

\* Also the EUT complies with FCC Part 15 Subpart B.

### **3.2 Procedures and results**

| Item                                                                                                                                                                                                                                                                            | Test Procedure                                                              | Specification                                                                 | Worst margin                      | Results         | Remarks                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------|-----------------|-----------------------------------|
| Spurious Emission<br>Restricted Band<br>Edges                                                                                                                                                                                                                                   | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.13 | FCC: Section15.247(d)<br><br>ISED: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 4.0 dB<br>2483.500 MHz, AV, Hori. | Complied#<br>a) | Radiated<br>(above 30 MHz)<br>*1) |
| Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.<br>*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.<br>a) Refer to APPENDIX 1 (data of Radiated Spurious Emission) |                                                                             |                                                                               |                                   |                 |                                   |
| Symbols:<br>Complied The data of this test item has enough margin, more than the measurement uncertainty.<br>Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.                                              |                                                                             |                                                                               |                                   |                 |                                   |

\* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

#### **FCC Part 15.31 (e)**

The EUT provides stable voltage constantly to the RF Part regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the 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

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether laboratory uncertainty is applied.

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     | Required Uncertainty (+/-) | Uncertainty (+/-) |
|----------------------|---------------------|----------------------------|-------------------|
| 3 m                  | 9 kHz to 30 MHz     | Not Defined                | 2.9 dB            |
|                      | 30 MHz to 200 MHz   | 6.3 dB                     | 6.1 dB            |
|                      | 200 MHz to 1000 MHz |                            | 6.2 dB            |
|                      | 1 GHz to 6 GHz      | 5.2 dB                     | 5.0 dB            |
|                      | 6 GHz to 18 GHz     | 5.5 dB                     | 5.4 dB            |
|                      | 18 GHz to 40 GHz    | Not Defined                | 5.5 dB            |
| 1 m                  | 1 GHz to 18 GHz     | Not Defined                | 5.4 dB            |
|                      | 18 GHz to 40 GHz    |                            | 5.6 dB            |
| 0.5 m                | 26.5 GHz to 40 GHz  | Not Defined                | 5.9 dB            |

### 3.5 Test Location

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A2LA Certificate Number: 1266.01 / FCC Test Firm Registration Number: 910230

ISED Lab Company Number: 4659A / CAB identifier: JP0006

| Test site                   | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|-----------------------------|----------------------------|------------------------------------------------------------------|------------------------------|
| No.1 Open site              | 6.0 x 5.5 x 2.5            | 20 x 40                                                          | 10 m                         |
| No.5 Open site              | 8.6 x 7.1 x 2.4            | 18 x 23                                                          | 10 m                         |
| No.1 Shielded room          | 5.4 x 4.5 x 2.3            | -                                                                | -                            |
| No.5 Shielded Room          | 4.2 x 3.1 x 2.5            | -                                                                | -                            |
| No.9 Shielded Room          | 6.1 x 3.6 x 2.8            | -                                                                | -                            |
| No.6 Semi-anechoic Chamber  | 8.5 x 5.5 x 5.2            | -                                                                | 3 m                          |
| No.10 Semi-anechoic Chamber | 18.4 x 9.9 x 7.7           | -                                                                | 10 m                         |
| No.11 Semi-anechoic Chamber | 9.0 x 6.5 x 5.2            | -                                                                | 3 m                          |
| No.1 Measurement room       | 5.0 x 3.7 x 2.6            | -                                                                | -                            |
| No.2 Measurement room       | 4.3 x 4.4 x 2.7            | -                                                                | -                            |
| No.3 Measurement room       | 4.5 x 5.3 x 2.7            | -                                                                | -                            |

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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## SECTION 4: Operation of EUT during testing

### 4.1 Operating Mode(s)

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.

| Mode                                                                                                                                                                                                                                                               | Remarks*              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| IEEE 802.11b (11b)                                                                                                                                                                                                                                                 | 5.5 Mbps (Short), PN9 |
| IEEE 802.11g (11g)                                                                                                                                                                                                                                                 | 36 Mbps, PN9          |
| IEEE 802.11n 20 MHz BW SISO (11n-20)                                                                                                                                                                                                                               | MCS 5, PN9            |
| Bluetooth Low Energy (BT LE)                                                                                                                                                                                                                                       | PRBS9                 |
| *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 settings: 11b: 14 dBm, 11g/n-20: 11 dBm<br>BT LE: 8 (setting value)<br>Software: QRCT (Qualcomm Radio Control Toolkit) v4.0.00195.0<br>(Date: 2021.10.19, Storage location: Driven by connected PC) |                       |
| *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 Antenna *2) | Tested frequency                         |
|------------------------------------------|---------------------------------------------------------------|--------------------|------------------------------------------|
| Radiated Spurious Emission (Below 1 GHz) | Tx 11g<br>Tx 11g with Tx 11a 5700 MHz                         | Chain 1            | 2462 MHz *1)                             |
|                                          | Tx BT LE                                                      | Chain 2            | 2402 MHz<br>2440 MHz<br>2480 MHz         |
|                                          | Tx BT LE with Tx 11a 5785 MHz                                 | Chain 2            | 2440 MHz *1)                             |
| Radiated Spurious Emission (Above 1 GHz) | Tx 11b<br>Tx 11g<br>Tx 11n-20                                 | Chain 1            | 2412 MHz<br>2437 MHz<br>2462 MHz         |
|                                          | Tx BT LE                                                      | Chain 2            | 2402 MHz<br>2440 MHz<br>2480 MHz         |
|                                          | Tx 11g with Tx 11a 5700 MHz                                   | Chain 1            | 2412 MHz *3)<br>2462 MHz                 |
|                                          | Tx 11b with Tx 11a 5700 MHz<br>Tx 11n-20 with Tx 11a 5700 MHz | Chain 1            | 2412 MHz *3)<br>2462 MHz *3)             |
|                                          | Tx BT LE with Tx 11a 5785 MHz                                 | Chain 2            | 2402 MHz *3)<br>2440 MHz<br>2480 MHz *3) |
|                                          |                                                               |                    |                                          |

\*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.

\*2) The test was performed with the antenna that had higher power as a representative.

Wireless LAN 2.4 GHz is transmitted with only Test antenna (Chain 1).

Bluetooth low energy is transmitted with only Test antenna (Chain 2).

\*3) Band-edge only

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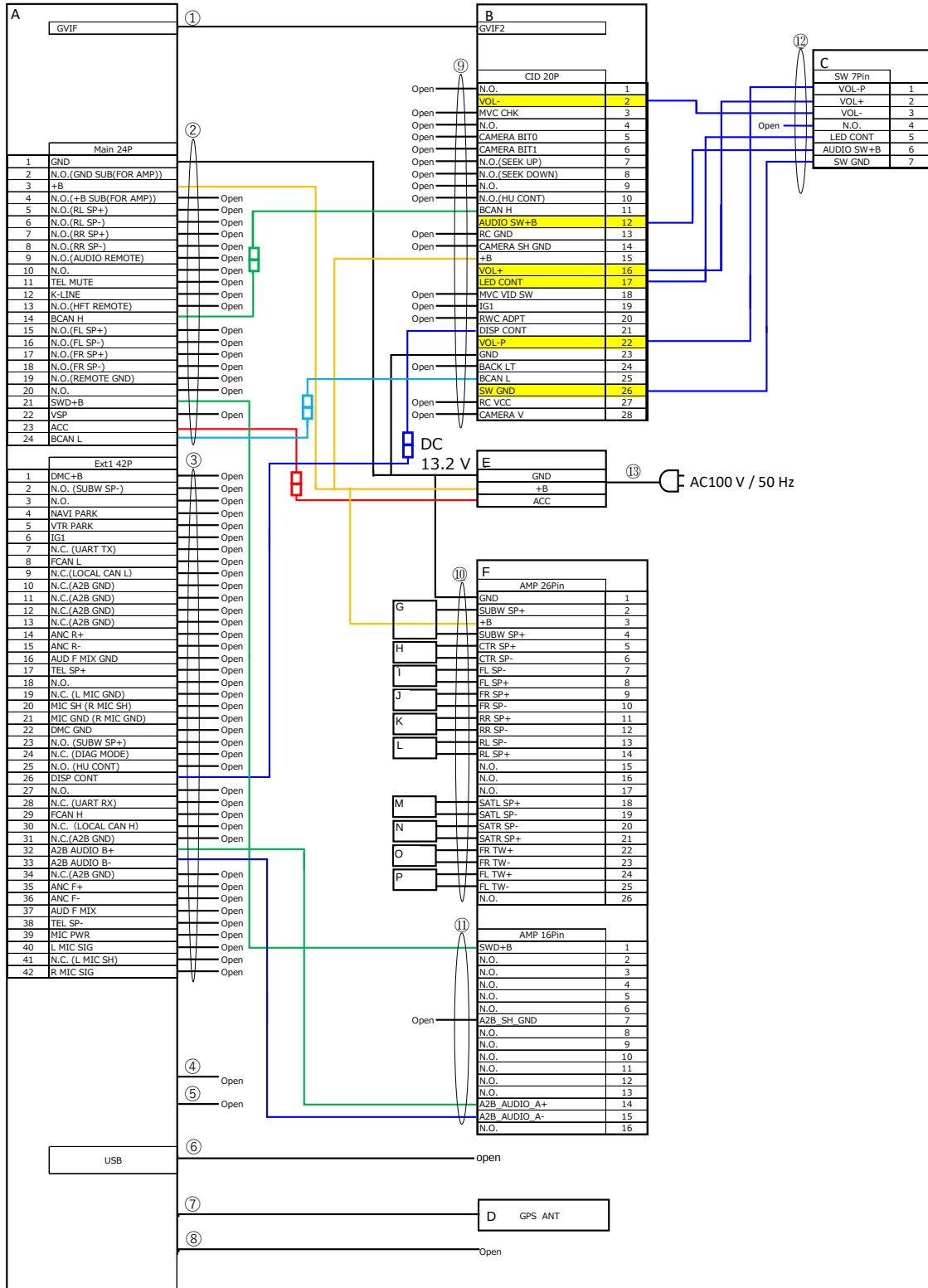
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## 4.2 Configuration and peripherals



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

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#### Description of EUT and Support equipment

| No. | Item            | Model number      | Serial number           | Manufacturer          | Remark |
|-----|-----------------|-------------------|-------------------------|-----------------------|--------|
| A   | Head unit       | AH00ICB           | 60                      | ALPS ALPINE CO., LTD. | EUT    |
| B   | Display         | QH00159A          | 109                     | ALPS ALPINE CO., LTD. | -      |
| C   | Switch Unit     | SP008GB           | -                       | ALPS ALPINE CO., LTD. | -      |
| D   | GPS Antenna     | 8B550-T20-A11     | 0993                    | YOKOWO                | -      |
| E   | DC Power Supply | GSV3000           | 2010221559              | DIAMOND ANTENNA       | -      |
| F   | Amplifier       | 8A400-30AA-A01-M1 | 86427800200496-21118119 | BOSE                  | -      |
| G   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| H   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| I   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| J   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| K   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| L   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| M   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| N   | Speaker         | KFC-RS101         | -                       | JVC KENWOOD           | -      |
| O   | Speaker         | VSP-10            | -                       | AUTOBACS              | -      |
| P   | Speaker         | VSP-10            | -                       | AUTOBACS              | -      |

#### List of cables used

| No. | Name                   | Length (m) | Shielded   | Remark |
|-----|------------------------|------------|------------|--------|
| 1   | GVIF Cable             | 2.4        | Shielded   | -      |
| 2   | Main Harness           | 2.0        | Unshielded | -      |
| 3   | EXT1 Harness           | 2.0        | Unshielded | -      |
| 4   | Ethernet Cable         | 2.0        | Unshielded | -      |
| 5   | EXT2 Cable             | 2.0        | Unshielded | -      |
| 6   | USB Cable              | 2.3        | Shielded   | -      |
| 7   | GPS Antenna Cable      | 7.2        | Shielded   | -      |
| 8   | Tuner Cable (Main/Sub) | 2.2        | Shielded   | -      |
| 9   | Display Harness        | 0.5        | Shielded   | -      |
| 10  | Amplifier Harness      | 0.5        | Unshielded | -      |
| 11  | Amplifier Harness      | 0.5        | Unshielded | -      |
| 12  | Switch Unit Harness    | 0.5        | Unshielded | -      |
| 13  | AC Power Cable         | 2.0        | Unshielded | -      |

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## **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, 1.0 m by 1.5 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.

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.

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 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    | Below 1 GHz | Above 1 GHz |
| Antenna Type | Hybrid      | 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 *1)                                                                                                                                                                                                                                      | PK                           |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz | <u>11.12.2.5.1</u><br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (RMS)<br>Trace: 100 traces<br><u>11.12.2.5.2</u><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 |

\*1) Average Power Measurement was performed based on ANSI C63.10-2013.

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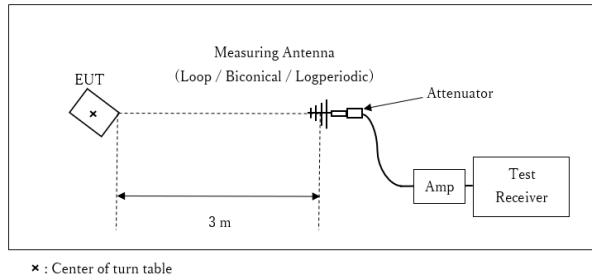
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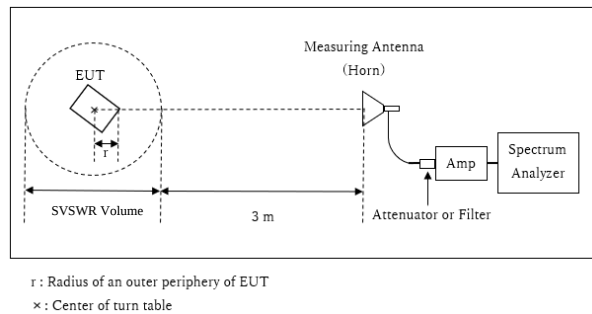
**Figure 1: Test Setup**

Below 1 GHz



Test Distance: 3 m

1 GHz to 10 GHz



[No.10 Test site]

Distance Factor:  $20 \times \log (4.39 \text{ m} / 3 \text{ m}) = 3.31 \text{ dB}$

\*Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 4.39 \text{ m}$

SVSWR Volume: 3 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4,  
 $r = 0.11 \text{ m}$ )

[No.11 Test site]

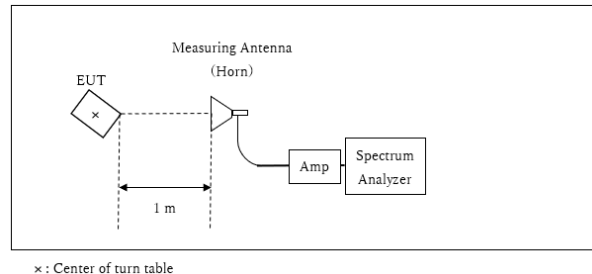
Distance Factor:  $20 \times \log (3.89 \text{ m} / 3 \text{ m}) = 2.26 \text{ dB}$

\*Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.89 \text{ m}$

SVSWR Volume: 2 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4,  
 $r = 0.11 \text{ m}$ )

10 GHz to 26.5 GHz



Distance Factor:  $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

\*Test Distance: 1 m

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

The test results and limit are rounded off to one decimal place, so some differences might be observed.

|                   |                      |
|-------------------|----------------------|
| Measurement range | : 30 MHz to 26.5 GHz |
| Test data         | : APPENDIX           |
| Test result       | : Pass               |

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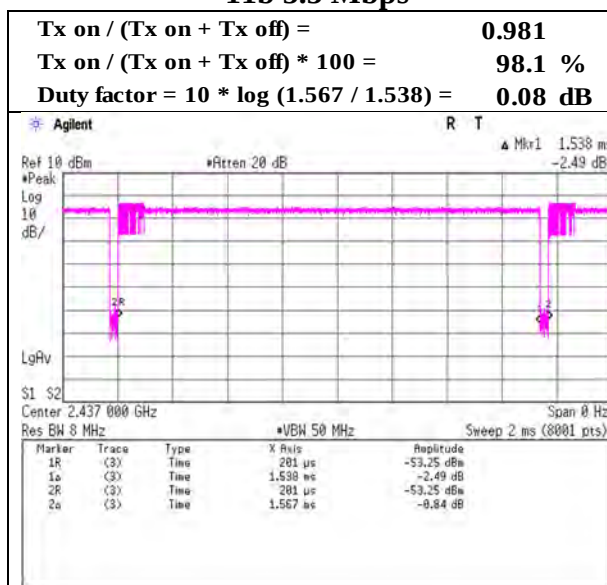
Facsimile : +81 478 82 3373

## APPENDIX 1: Test data

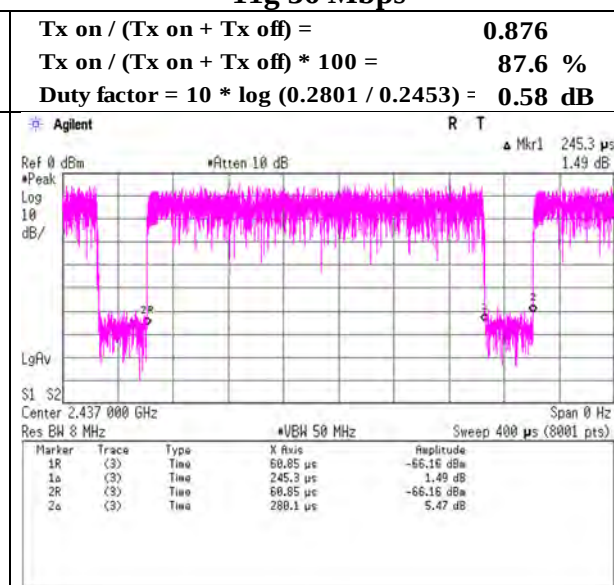
### Burst rate confirmation

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Shonan EMC Lab. No.1 Measurement Room |
| Date                   | October 20, 2021                      |
| Temperature / Humidity | 23 deg. C / 46 % RH                   |
| Engineer               | Kenichi Adachi                        |
| Mode                   | Tx                                    |

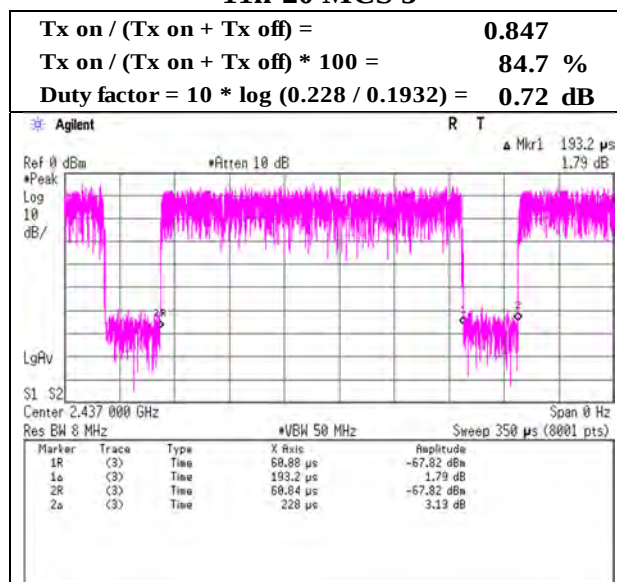
#### 11b 5.5 Mbps



#### 11g 36 Mbps



#### 11n-20 MCS 5



\* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.  
 \* This Burst rate confirmation data is quoted from the data of Report No.13977035S-A (Antenna Terminal Conducted Tests).

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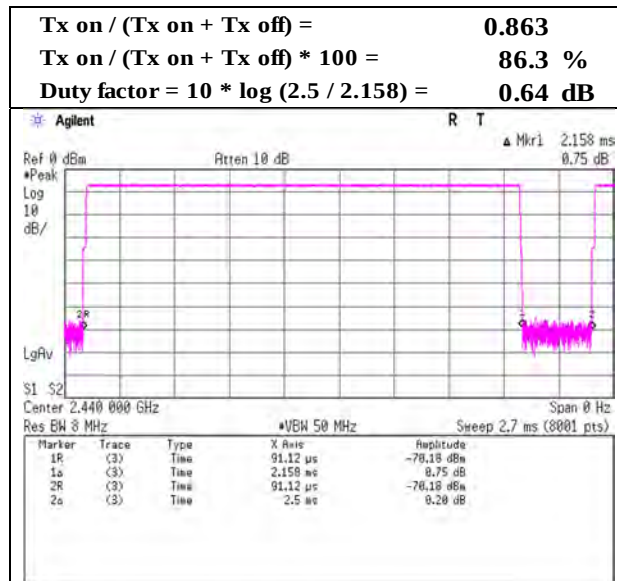
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Facsimile : +81 478 82 3373

## Burst rate confirmation

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13977035M-A                        |
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Date                   | November 11, 2021                  |
| Temperature / Humidity | 24 deg. C / 30 % RH                |
| Engineer               | Shiro Kobayashi                    |
| Mode                   | Tx                                 |

### BT LE 1M-PHY



- \* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.
- \* This Burst rate confirmation data is quoted from the data of Report No.13977035S-A (Antenna Terminal Conducted Tests).

## Radiated Spurious Emission

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11b 2412 MHz     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2390.000        | PK       | 50.30          | 27.61           | 13.54     | 43.88     | 3.31                 | 50.88           | 73.9           | 23.0        | 148         | 54          |             |
| Hori.    | 4824.000        | PK       | 51.20          | 32.63           | 5.58      | 45.19     | 3.31                 | 47.53           | 73.9           | 26.3        | 150         | 0           | Floor noise |
| Hori.    | 7236.000        | PK       | 48.60          | 37.38           | 6.89      | 44.01     | 3.31                 | 52.17           | 73.9           | 21.7        | 150         | 0           | Floor noise |
| Hori.    | 9648.000        | PK       | 45.40          | 37.95           | 7.76      | 41.94     | 3.31                 | 52.48           | 73.9           | 21.4        | 150         | 0           | Floor noise |
| Hori.    | 2390.000        | AV       | 41.20          | 27.61           | 13.54     | 43.88     | 3.31                 | 41.78           | 53.9           | 12.1        | 148         | 54          |             |
| Hori.    | 4824.000        | AV       | 42.20          | 32.63           | 5.58      | 45.19     | 3.31                 | 38.53           | 53.9           | 15.3        | 150         | 0           | Floor noise |
| Hori.    | 7236.000        | AV       | 38.80          | 37.38           | 6.89      | 44.01     | 3.31                 | 42.37           | 53.9           | 11.5        | 150         | 0           | Floor noise |
| Hori.    | 9648.000        | AV       | 36.20          | 37.95           | 7.76      | 41.94     | 3.31                 | 43.28           | 53.9           | 10.6        | 150         | 0           | Floor noise |
| Vert.    | 2390.000        | PK       | 51.00          | 27.61           | 13.54     | 43.88     | 3.31                 | 51.58           | 73.9           | 22.3        | 154         | 343         |             |
| Vert.    | 4824.000        | PK       | 50.90          | 32.63           | 5.58      | 45.19     | 3.31                 | 47.23           | 73.9           | 26.6        | 150         | 0           | Floor noise |
| Vert.    | 7236.000        | PK       | 48.50          | 37.38           | 6.89      | 44.01     | 3.31                 | 52.07           | 73.9           | 21.8        | 150         | 0           | Floor noise |
| Vert.    | 9648.000        | PK       | 45.70          | 37.95           | 7.76      | 41.94     | 3.31                 | 52.78           | 73.9           | 21.1        | 150         | 0           | Floor noise |
| Vert.    | 2390.000        | AV       | 41.40          | 27.61           | 13.54     | 43.88     | 3.31                 | 41.98           | 53.9           | 11.9        | 154         | 343         |             |
| Vert.    | 4824.000        | AV       | 42.10          | 32.63           | 5.58      | 45.19     | 3.31                 | 38.43           | 53.9           | 15.4        | 150         | 0           | Floor noise |
| Vert.    | 7236.000        | AV       | 39.10          | 37.38           | 6.89      | 44.01     | 3.31                 | 42.67           | 53.9           | 11.2        | 150         | 0           | Floor noise |
| Vert.    | 9648.000        | AV       | 36.40          | 37.95           | 7.76      | 41.94     | 3.31                 | 43.48           | 53.9           | 10.4        | 150         | 0           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2412.000        | PK       | 96.60          | 27.65           | 13.56     | 43.87     | 3.31                 | 97.25           | -              | -           | Carrier |
| Hori.    | 2399.475        | PK       | 52.00          | 27.60           | 13.55     | 43.88     | 3.31                 | 52.58           | 77.25          | 24.6        |         |
| Hori.    | 2400.000        | PK       | 50.00          | 27.60           | 13.55     | 43.88     | 3.31                 | 50.58           | 77.25          | 26.6        |         |
| Vert.    | 2412.000        | PK       | 98.40          | 27.65           | 13.56     | 43.87     | 3.31                 | 99.05           | -              | -           | Carrier |
| Vert.    | 2399.375        | PK       | 52.20          | 27.60           | 13.55     | 43.88     | 3.31                 | 52.78           | 79.05          | 26.2        |         |
| Vert.    | 2400.000        | PK       | 51.70          | 27.60           | 13.55     | 43.88     | 3.31                 | 52.28           | 79.05          | 26.7        |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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**Kashima EMC Lab.**

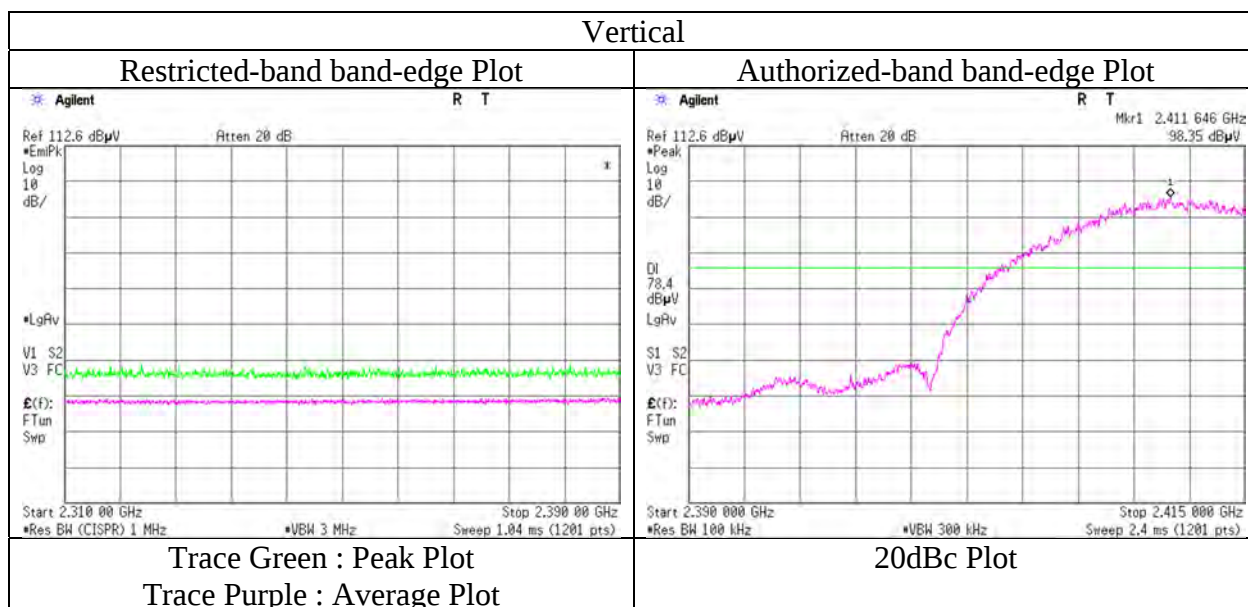
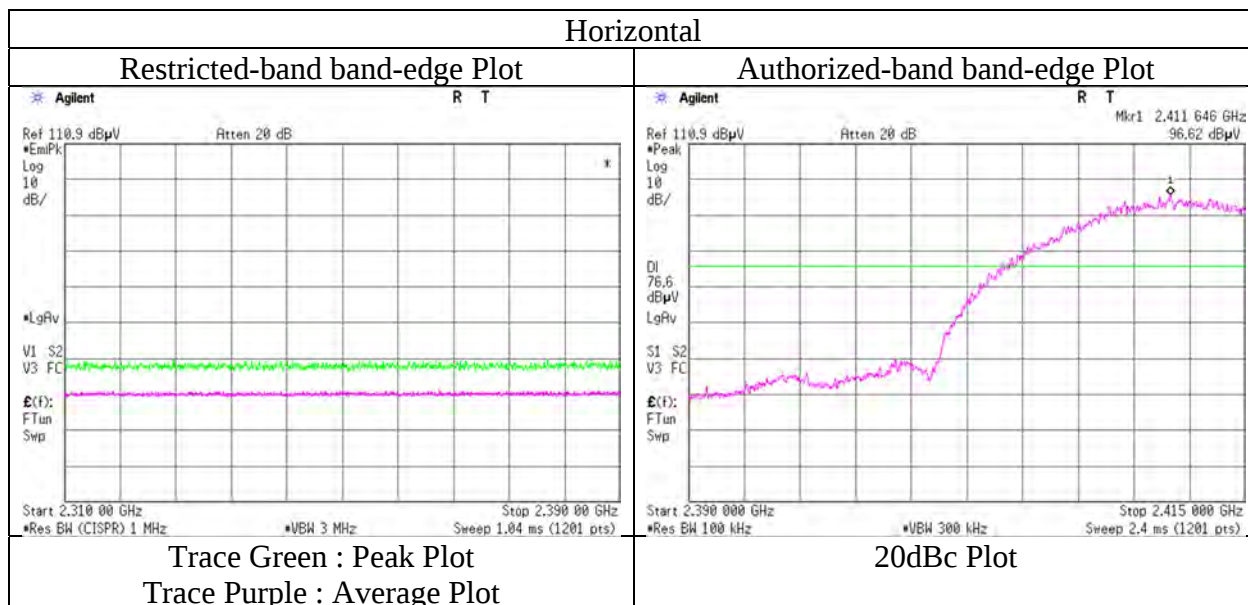
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                      |
|------------------------|--------------------------------------|
| Report No.             | 13977035M-A                          |
| Test place             | Kashima EMC Lab.                     |
| Semi Anechoic Chamber  | No.10                                |
| Date                   | December 3, 2021                     |
| Temperature / Humidity | 20 deg. C / 42 % RH                  |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 10 GHz) |
| Mode                   | Tx 11b 2412 MHz                      |



\* 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.

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## Radiated Spurious Emission

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11b 2437 MHz     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 4874.000           | PK       | 50.00             | 32.61              | 5.59         | 45.22        | 3.31                    | 46.29              | 73.9              | 27.6           | 150            | 0              | Floor noise |
| Hori.    | 7311.000           | PK       | 47.20             | 37.53              | 6.91         | 43.85        | 3.31                    | 51.10              | 73.9              | 22.8           | 150            | 0              | Floor noise |
| Hori.    | 9748.000           | PK       | 44.80             | 38.09              | 7.82         | 41.85        | 3.31                    | 52.17              | 73.9              | 21.7           | 150            | 0              | Floor noise |
| Hori.    | 4874.000           | AV       | 41.40             | 32.61              | 5.59         | 45.22        | 3.31                    | 37.69              | 53.9              | 16.2           | 150            | 0              | Floor noise |
| Hori.    | 7311.000           | AV       | 38.10             | 37.53              | 6.91         | 43.85        | 3.31                    | 42.00              | 53.9              | 11.9           | 150            | 0              | Floor noise |
| Hori.    | 9748.000           | AV       | 35.70             | 38.09              | 7.82         | 41.85        | 3.31                    | 43.07              | 53.9              | 10.8           | 150            | 0              | Floor noise |
| Vert.    | 4874.000           | PK       | 50.50             | 32.61              | 5.59         | 45.22        | 3.31                    | 46.79              | 73.9              | 27.1           | 150            | 0              | Floor noise |
| Vert.    | 7311.000           | PK       | 47.60             | 37.53              | 6.91         | 43.85        | 3.31                    | 51.50              | 73.9              | 22.4           | 150            | 0              | Floor noise |
| Vert.    | 9748.000           | PK       | 44.50             | 38.09              | 7.82         | 41.85        | 3.31                    | 51.87              | 73.9              | 22.0           | 150            | 0              | Floor noise |
| Vert.    | 4874.000           | AV       | 41.50             | 32.61              | 5.59         | 45.22        | 3.31                    | 37.79              | 53.9              | 16.1           | 150            | 0              | Floor noise |
| Vert.    | 7311.000           | AV       | 38.20             | 37.53              | 6.91         | 43.85        | 3.31                    | 42.10              | 53.9              | 11.8           | 150            | 0              | Floor noise |
| Vert.    | 9748.000           | AV       | 35.80             | 38.09              | 7.82         | 41.85        | 3.31                    | 43.17              | 53.9              | 10.7           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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## Radiated Spurious Emission

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11b 2462 MHz     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 2483.500           | PK       | 50.80             | 28.01              | 13.61        | 43.82        | 3.31                    | 51.91              | 73.9              | 21.9           | 335            | 46             |             |
| Hori.    | 4924.000           | PK       | 50.00             | 32.67              | 5.65         | 45.24        | 3.31                    | 46.39              | 73.9              | 27.5           | 150            | 0              | Floor noise |
| Hori.    | 7386.000           | PK       | 47.90             | 37.49              | 6.97         | 43.65        | 3.31                    | 52.02              | 73.9              | 21.8           | 150            | 0              | Floor noise |
| Hori.    | 9848.000           | PK       | 45.70             | 38.11              | 7.84         | 41.77        | 3.31                    | 53.19              | 73.9              | 20.7           | 150            | 0              | Floor noise |
| Hori.    | 2483.500           | AV       | 41.50             | 28.01              | 13.61        | 43.82        | 3.31                    | 42.61              | 53.9              | 11.2           | 335            | 46             |             |
| Hori.    | 4924.000           | AV       | 40.80             | 32.67              | 5.65         | 45.24        | 3.31                    | 37.19              | 53.9              | 16.7           | 150            | 0              | Floor noise |
| Hori.    | 7386.000           | AV       | 38.80             | 37.49              | 6.97         | 43.65        | 3.31                    | 42.92              | 53.9              | 10.9           | 150            | 0              | Floor noise |
| Hori.    | 9848.000           | AV       | 36.10             | 38.11              | 7.84         | 41.77        | 3.31                    | 43.59              | 53.9              | 10.3           | 150            | 0              | Floor noise |
| Vert.    | 2483.500           | PK       | 51.40             | 28.01              | 13.61        | 43.82        | 3.31                    | 52.51              | 73.9              | 21.3           | 145            | 340            |             |
| Vert.    | 4924.000           | PK       | 49.20             | 32.67              | 5.65         | 45.24        | 3.31                    | 45.59              | 73.9              | 28.3           | 150            | 0              | Floor noise |
| Vert.    | 7386.000           | PK       | 48.20             | 37.49              | 6.97         | 43.65        | 3.31                    | 52.32              | 73.9              | 21.5           | 150            | 0              | Floor noise |
| Vert.    | 9848.000           | PK       | 45.00             | 38.11              | 7.84         | 41.77        | 3.31                    | 52.49              | 73.9              | 21.4           | 150            | 0              | Floor noise |
| Vert.    | 2483.500           | AV       | 42.00             | 28.01              | 13.61        | 43.82        | 3.31                    | 43.11              | 53.9              | 10.7           | 145            | 340            |             |
| Vert.    | 4924.000           | AV       | 40.80             | 32.67              | 5.65         | 45.24        | 3.31                    | 37.19              | 53.9              | 16.7           | 150            | 0              | Floor noise |
| Vert.    | 7386.000           | AV       | 38.80             | 37.49              | 6.97         | 43.65        | 3.31                    | 42.92              | 53.9              | 10.9           | 150            | 0              | Floor noise |
| Vert.    | 9848.000           | AV       | 36.20             | 38.11              | 7.84         | 41.77        | 3.31                    | 43.69              | 53.9              | 10.2           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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**Kashima EMC Lab.**

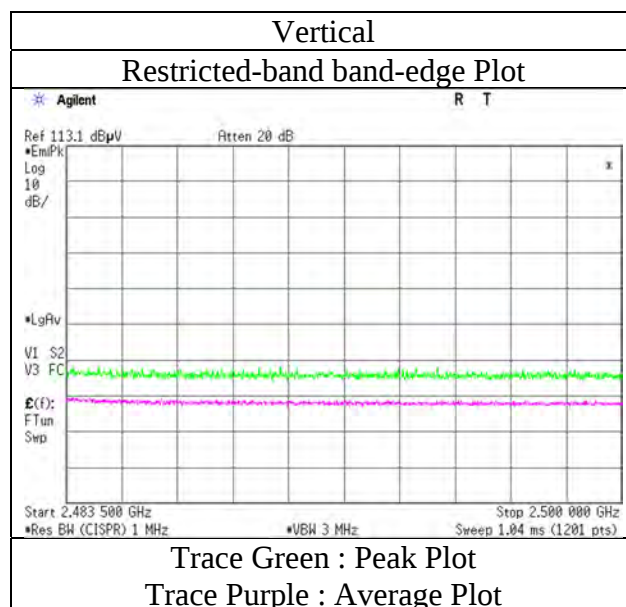
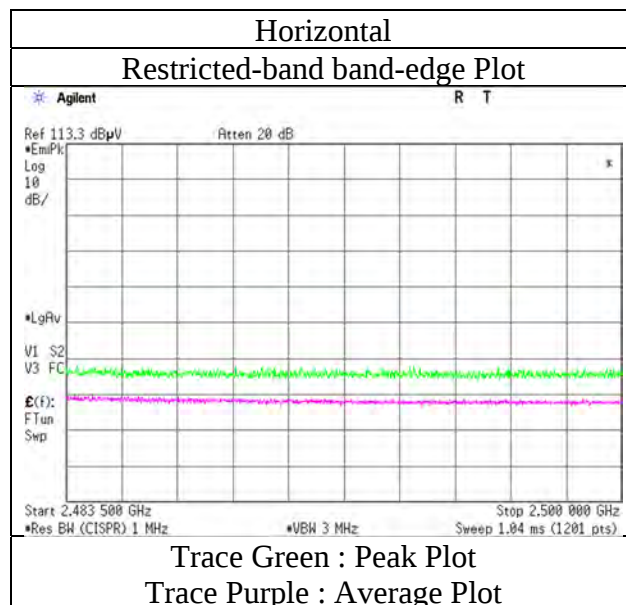
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Facsimile : +81 478 82 3373

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

Report No. 13977035M-A  
Test place Kashima EMC Lab.  
Semi Anechoic Chamber No.10  
Date December 3, 2021  
Temperature / Humidity 20 deg. C / 42 % RH  
Engineer Hiromitsu Tanabe  
(1 GHz - 10 GHz)  
Mode Tx 11b 2462 MHz



\* 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

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11g 2412 MHz     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 2390.000           | PK       | 56.80             | 27.61              | 13.54        | 43.88        | 3.31                    | 57.38              | 73.9              | 16.5           | 148            | 52             |             |
| Hori.    | 4824.000           | PK       | 50.90             | 32.63              | 5.58         | 45.19        | 3.31                    | 47.23              | 73.9              | 26.6           | 150            | 0              | Floor noise |
| Hori.    | 7236.000           | PK       | 47.30             | 37.38              | 6.89         | 44.01        | 3.31                    | 50.87              | 73.9              | 23.0           | 150            | 0              | Floor noise |
| Hori.    | 9648.000           | PK       | 44.50             | 37.95              | 7.76         | 41.94        | 3.31                    | 51.58              | 73.9              | 22.3           | 150            | 0              | Floor noise |
| Vert.    | 2390.000           | PK       | 57.30             | 27.61              | 13.54        | 43.88        | 3.31                    | 57.88              | 73.9              | 16.0           | 122            | 343            |             |
| Vert.    | 4824.000           | PK       | 50.50             | 32.63              | 5.58         | 45.19        | 3.31                    | 46.83              | 73.9              | 27.0           | 150            | 0              | Floor noise |
| Vert.    | 7236.000           | PK       | 48.60             | 37.38              | 6.89         | 44.01        | 3.31                    | 52.17              | 73.9              | 21.7           | 150            | 0              | Floor noise |
| Vert.    | 9648.000           | PK       | 44.80             | 37.95              | 7.76         | 41.94        | 3.31                    | 51.88              | 73.9              | 22.0           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 2390.000           | AV       | 44.70             | 27.61              | 13.54        | 43.88        | 0.58                   | 3.31                       | 45.86              | 53.9              | <b>8.0</b> *1) |             |
| Hori.    | 4824.000           | AV       | 42.10             | 32.63              | 5.58         | 45.19        | 0.58                   | 3.31                       | 39.01              | 53.9              | 14.8           | Floor noise |
| Hori.    | 7236.000           | AV       | 39.00             | 37.38              | 6.89         | 44.01        | 0.58                   | 3.31                       | 43.15              | 53.9              | 10.7           | Floor noise |
| Hori.    | 9648.000           | AV       | 36.10             | 37.95              | 7.76         | 41.94        | 0.58                   | 3.31                       | 43.76              | 53.9              | 10.1           | Floor noise |
| Vert.    | 2390.000           | AV       | 44.70             | 27.61              | 13.54        | 43.88        | 0.58                   | 3.31                       | 45.86              | 53.9              | <b>8.0</b> *1) |             |
| Vert.    | 4824.000           | AV       | 42.10             | 32.63              | 5.58         | 45.19        | 0.58                   | 3.31                       | 39.01              | 53.9              | 14.8           | Floor noise |
| Vert.    | 7236.000           | AV       | 38.90             | 37.38              | 6.89         | 44.01        | 0.58                   | 3.31                       | 43.05              | 53.9              | 10.8           | Floor noise |
| Vert.    | 9648.000           | AV       | 36.10             | 37.95              | 7.76         | 41.94        | 0.58                   | 3.31                       | 43.76              | 53.9              | 10.1           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2412.000           | PK       | 90.10             | 27.65              | 13.56        | 43.87        | 3.31                    | 90.75              | -                 | -              | Carrier |
| Hori.    | 2399.792           | PK       | 57.50             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.08              | 70.75             | 12.6           |         |
| Hori.    | 2400.000           | PK       | 56.50             | 27.60              | 13.55        | 43.88        | 3.31                    | 57.08              | 70.75             | 13.6           |         |
| Vert.    | 2412.000           | PK       | 91.50             | 27.65              | 13.56        | 43.87        | 3.31                    | 92.15              | -                 | -              | Carrier |
| Vert.    | 2399.833           | PK       | 57.60             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.18              | 72.15             | 13.9           |         |
| Vert.    | 2400.000           | PK       | 56.60             | 27.60              | 13.55        | 43.88        | 3.31                    | 57.18              | 72.15             | 14.9           |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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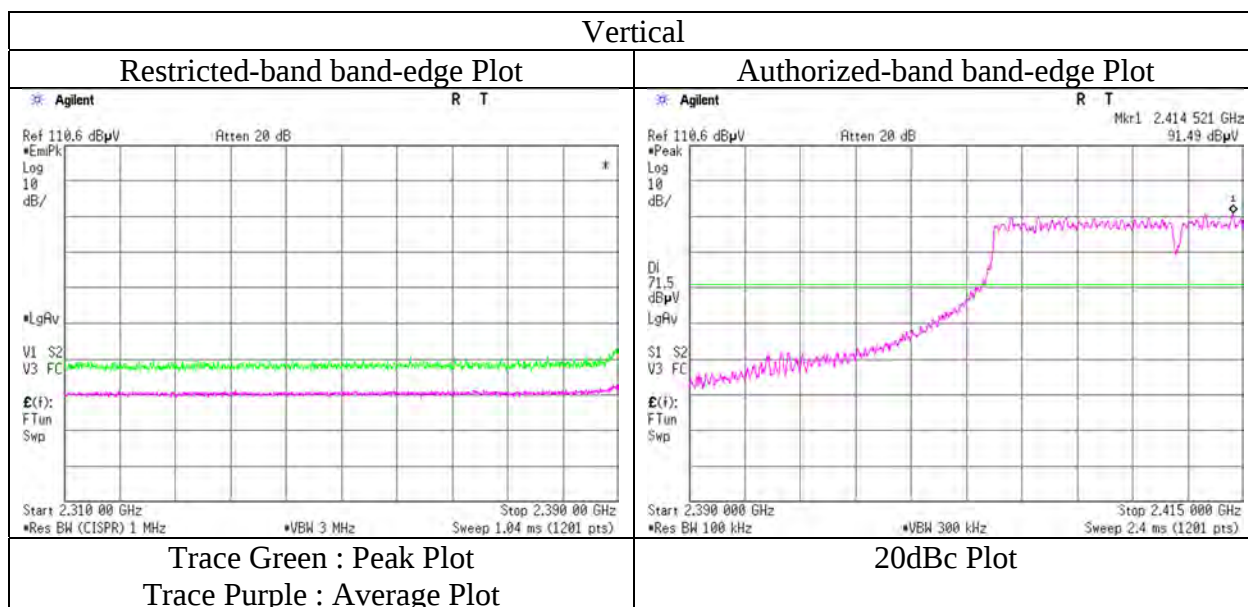
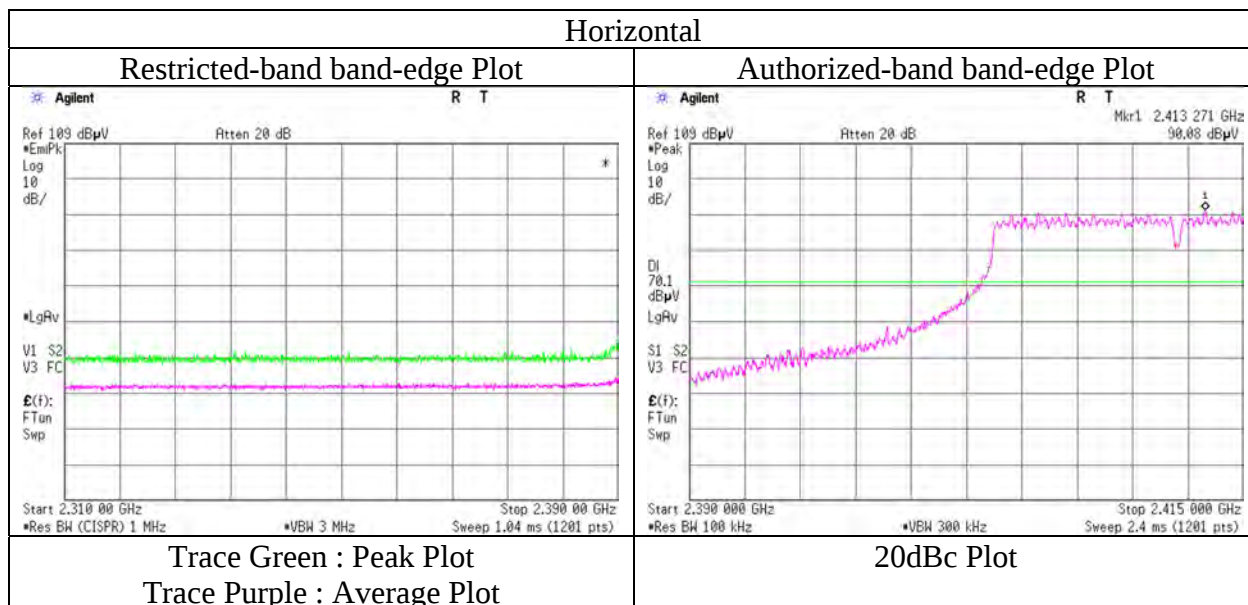
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13977035M-A         |
| Test place             | Kashima EMC Lab.    |
| Semi Anechoic Chamber  | No.10               |
| Date                   | December 3, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH |
| Engineer               | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    |
| Mode                   | Tx 11g 2412 MHz     |



\* 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

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11g 2437 MHz     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 4874.000           | PK       | 50.10             | 32.61              | 5.59         | 45.22        | 3.31                    | 46.39              | 73.9              | 27.5           | 150            | 0              | Floor noise |
| Hori.    | 7311.000           | PK       | 47.00             | 37.53              | 6.91         | 43.85        | 3.31                    | 50.90              | 73.9              | 23.0           | 150            | 0              | Floor noise |
| Hori.    | 9748.000           | PK       | 45.60             | 38.09              | 7.82         | 41.85        | 3.31                    | 52.97              | 73.9              | 20.9           | 150            | 0              | Floor noise |
| Vert.    | 4874.000           | PK       | 50.40             | 32.61              | 5.59         | 45.22        | 3.31                    | 46.69              | 73.9              | 27.2           | 150            | 0              | Floor noise |
| Vert.    | 7311.000           | PK       | 46.40             | 37.53              | 6.91         | 43.85        | 3.31                    | 50.30              | 73.9              | 23.6           | 150            | 0              | Floor noise |
| Vert.    | 9748.000           | PK       | 44.30             | 38.09              | 7.82         | 41.85        | 3.31                    | 51.67              | 73.9              | 22.2           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 4874.000           | AV       | 41.50             | 32.61              | 5.59         | 45.22        | 0.58                   | 3.31                    | 38.37              | 53.9              | 15.5           | Floor noise |
| Hori.    | 7311.000           | AV       | 38.10             | 37.53              | 6.91         | 43.85        | 0.58                   | 3.31                    | 42.58              | 53.9              | 11.3           | Floor noise |
| Hori.    | 9748.000           | AV       | 35.80             | 38.09              | 7.82         | 41.85        | 0.58                   | 3.31                    | 43.75              | 53.9              | 10.1           | Floor noise |
| Vert.    | 4874.000           | AV       | 41.60             | 32.61              | 5.59         | 45.22        | 0.58                   | 3.31                    | 38.47              | 53.9              | 15.4           | Floor noise |
| Vert.    | 7311.000           | AV       | 38.20             | 37.53              | 6.91         | 43.85        | 0.58                   | 3.31                    | 42.68              | 53.9              | 11.2           | Floor noise |
| Vert.    | 9748.000           | AV       | 35.80             | 38.09              | 7.82         | 41.85        | 0.58                   | 3.31                    | 43.75              | 53.9              | 10.1           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

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## Radiated Spurious Emission

|                        |                     |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               | No.10               |
| Date                   | December 18, 2021   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 48 % RH | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz) | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11g 2462 MHz     |                     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 304.482            | QP       | 40.46             | 13.59              | 8.76         | 31.35        | 0.00                    | 31.46              | 46.0              | 14.5           | 109            | 224            |             |
| Hori.    | 412.777            | QP       | 33.46             | 15.87              | 9.65         | 31.26        | 0.00                    | 27.72              | 46.0              | 18.2           | 100            | 147            |             |
| Hori.    | 942.851            | QP       | 26.86             | 23.95              | 12.23        | 30.90        | 0.00                    | 32.14              | 46.0              | 13.8           | 100            | 311            |             |
| Hori.    | 2483.500           | PK       | 57.70             | 28.01              | 13.61        | 43.82        | 3.31                    | 58.81              | 73.9              | 15.0           | 259            | 57             |             |
| Hori.    | 4924.000           | PK       | 49.60             | 32.67              | 5.65         | 45.24        | 3.31                    | 45.99              | 73.9              | 27.9           | 150            | 0              | Floor noise |
| Hori.    | 7386.000           | PK       | 48.40             | 37.49              | 6.97         | 43.65        | 3.31                    | 52.52              | 73.9              | 21.3           | 150            | 0              | Floor noise |
| Hori.    | 9848.000           | PK       | 45.50             | 38.11              | 7.84         | 41.77        | 3.31                    | 52.99              | 73.9              | 20.9           | 150            | 0              | Floor noise |
| Vert.    | 35.661             | QP       | 42.49             | 12.74              | 5.97         | 31.64        | 0.00                    | 29.56              | 40.0              | 10.4           | 100            | 238            |             |
| Vert.    | 71.307             | QP       | 33.01             | 11.31              | 6.51         | 31.58        | 0.00                    | 19.25              | 40.0              | 20.7           | 100            | 326            |             |
| Vert.    | 304.804            | QP       | 35.21             | 13.60              | 8.77         | 31.35        | 0.00                    | 26.23              | 46.0              | 19.7           | 100            | 151            |             |
| Vert.    | 346.011            | QP       | 32.65             | 14.30              | 9.24         | 31.32        | 0.00                    | 24.87              | 46.0              | 21.1           | 100            | 171            |             |
| Vert.    | 407.531            | QP       | 33.25             | 15.73              | 9.61         | 31.27        | 0.00                    | 27.32              | 46.0              | 18.6           | 100            | 243            |             |
| Vert.    | 742.157            | QP       | 28.08             | 21.76              | 11.31        | 31.01        | 0.00                    | 30.14              | 46.0              | 15.8           | 100            | 339            |             |
| Vert.    | 944.581            | QP       | 27.55             | 23.94              | 12.23        | 30.89        | 0.00                    | 32.83              | 46.0              | 13.1           | 169            | 0              |             |
| Vert.    | 2483.500           | PK       | 59.10             | 28.01              | 13.61        | 43.82        | 3.31                    | 60.21              | 73.9              | 13.6           | 147            | 345            |             |
| Vert.    | 4924.000           | PK       | 49.80             | 32.67              | 5.65         | 45.24        | 3.31                    | 46.19              | 73.9              | 27.7           | 150            | 0              | Floor noise |
| Vert.    | 7386.000           | PK       | 47.90             | 37.49              | 6.97         | 43.65        | 3.31                    | 52.02              | 73.9              | 21.8           | 150            | 0              | Floor noise |
| Vert.    | 9848.000           | PK       | 44.80             | 38.11              | 7.84         | 41.77        | 3.31                    | 52.29              | 73.9              | 21.6           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 2483.500           | AV       | 46.00             | 28.01              | 13.61        | 43.82        | 0.58                   | 3.31                    | 47.69              | 53.9              | 6.2            | *1)         |
| Hori.    | 4924.000           | AV       | 40.80             | 32.67              | 5.65         | 45.24        | 0.58                   | 3.31                    | 37.77              | 53.9              | 16.1           | Floor noise |
| Hori.    | 7386.000           | AV       | 38.80             | 37.49              | 6.97         | 43.65        | 0.58                   | 3.31                    | 43.50              | 53.9              | 10.4           | Floor noise |
| Hori.    | 9848.000           | AV       | 36.40             | 38.11              | 7.84         | 41.77        | 0.58                   | 3.31                    | 44.47              | 53.9              | 9.4            | Floor noise |
| Vert.    | 2483.500           | AV       | 46.00             | 28.01              | 13.61        | 43.82        | 0.58                   | 3.31                    | 47.69              | 53.9              | 6.2            | *1)         |
| Vert.    | 4924.000           | AV       | 41.00             | 32.67              | 5.65         | 45.24        | 0.58                   | 3.31                    | 37.97              | 53.9              | 15.9           | Floor noise |
| Vert.    | 7386.000           | AV       | 38.80             | 37.49              | 6.97         | 43.65        | 0.58                   | 3.31                    | 43.50              | 53.9              | 10.4           | Floor noise |
| Vert.    | 9848.000           | AV       | 36.40             | 38.11              | 7.84         | 41.77        | 0.58                   | 3.31                    | 44.47              | 53.9              | 9.4            | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

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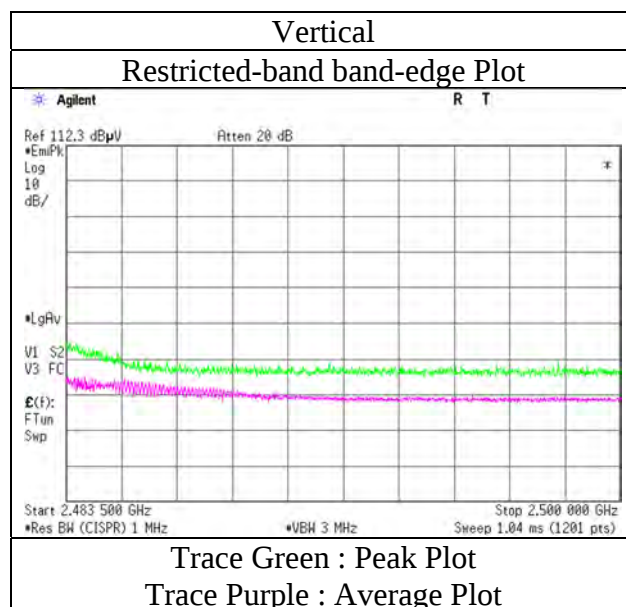
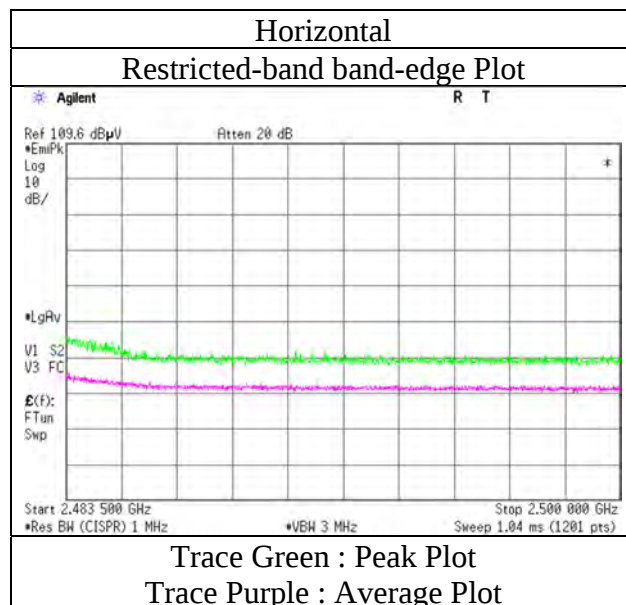
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## Radiated Spurious Emission (Reference Plot for band-edge)

Report No. 13977035M-A  
Test place Kashima EMC Lab.  
Semi Anechoic Chamber No.10  
Date December 3, 2021  
Temperature / Humidity 20 deg. C / 42 % RH  
Engineer Hiromitsu Tanabe  
(1 GHz - 10 GHz)  
Mode Tx 11g 2462 MHz



\* 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

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11n-20 2412 MHz  |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 2390.000           | PK       | 57.90             | 27.61              | 13.54        | 43.88        | 3.31                    | 58.48              | 73.9              | 15.4           | 145            | 50             |             |
| Hori.    | 4824.000           | PK       | 50.40             | 32.63              | 5.58         | 45.19        | 3.31                    | 46.73              | 73.9              | 27.1           | 150            | 0              | Floor noise |
| Hori.    | 7236.000           | PK       | 47.50             | 37.38              | 6.89         | 44.01        | 3.31                    | 51.07              | 73.9              | 22.8           | 150            | 0              | Floor noise |
| Hori.    | 9648.000           | PK       | 44.70             | 37.95              | 7.76         | 41.94        | 3.31                    | 51.78              | 73.9              | 22.1           | 150            | 0              | Floor noise |
| Vert.    | 2390.000           | PK       | 58.70             | 27.61              | 13.54        | 43.88        | 3.31                    | 59.28              | 73.9              | 14.6           | 121            | 346            |             |
| Vert.    | 4824.000           | PK       | 50.20             | 32.63              | 5.58         | 45.19        | 3.31                    | 46.53              | 73.9              | 27.3           | 150            | 0              | Floor noise |
| Vert.    | 7236.000           | PK       | 47.80             | 37.38              | 6.89         | 44.01        | 3.31                    | 51.37              | 73.9              | 22.5           | 150            | 0              | Floor noise |
| Vert.    | 9648.000           | PK       | 44.90             | 37.95              | 7.76         | 41.94        | 3.31                    | 51.98              | 73.9              | 21.9           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 2390.000           | AV       | 45.80             | 27.61              | 13.54        | 43.88        | 0.72                   | 3.31                       | 47.10              | 53.9              | 6.8            | *1)         |
| Hori.    | 4824.000           | AV       | 42.20             | 32.63              | 5.58         | 45.19        | 0.72                   | 3.31                       | 39.25              | 53.9              | 14.6           | Floor noise |
| Hori.    | 7236.000           | AV       | 38.90             | 37.38              | 6.89         | 44.01        | 0.72                   | 3.31                       | 43.19              | 53.9              | 10.7           | Floor noise |
| Hori.    | 9648.000           | AV       | 36.10             | 37.95              | 7.76         | 41.94        | 0.72                   | 3.31                       | 43.90              | 53.9              | 10.0           | Floor noise |
| Vert.    | 2390.000           | AV       | 45.90             | 27.61              | 13.54        | 43.88        | 0.72                   | 3.31                       | 47.20              | 53.9              | 6.7            | *1)         |
| Vert.    | 4824.000           | AV       | 41.90             | 32.63              | 5.58         | 45.19        | 0.72                   | 3.31                       | 38.95              | 53.9              | 14.9           | Floor noise |
| Vert.    | 7236.000           | AV       | 38.80             | 37.38              | 6.89         | 44.01        | 0.72                   | 3.31                       | 43.09              | 53.9              | 10.8           | Floor noise |
| Vert.    | 9648.000           | AV       | 36.00             | 37.95              | 7.76         | 41.94        | 0.72                   | 3.31                       | 43.80              | 53.9              | 10.1           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2412.000           | PK       | 89.90             | 27.65              | 13.56        | 43.87        | 3.31                    | 90.55              | -                 | -              | Carrier |
| Hori.    | 2399.867           | PK       | 57.50             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.08              | 70.55             | 12.4           |         |
| Hori.    | 2400.000           | PK       | 56.80             | 27.60              | 13.55        | 43.88        | 3.31                    | 57.38              | 70.55             | 13.1           |         |
| Vert.    | 2412.000           | PK       | 91.60             | 27.65              | 13.56        | 43.87        | 3.31                    | 92.25              | -                 | -              | Carrier |
| Vert.    | 2399.625           | PK       | 58.40             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.98              | 72.25             | 13.2           |         |
| Vert.    | 2400.000           | PK       | 57.30             | 27.60              | 13.55        | 43.88        | 3.31                    | 57.88              | 72.25             | 14.3           |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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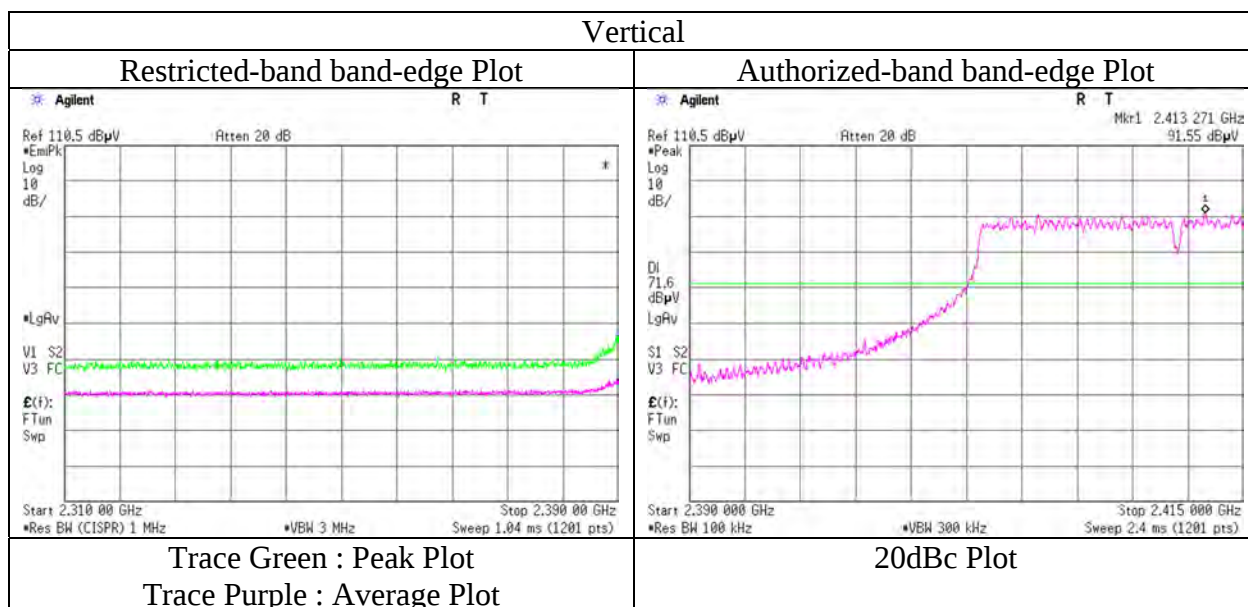
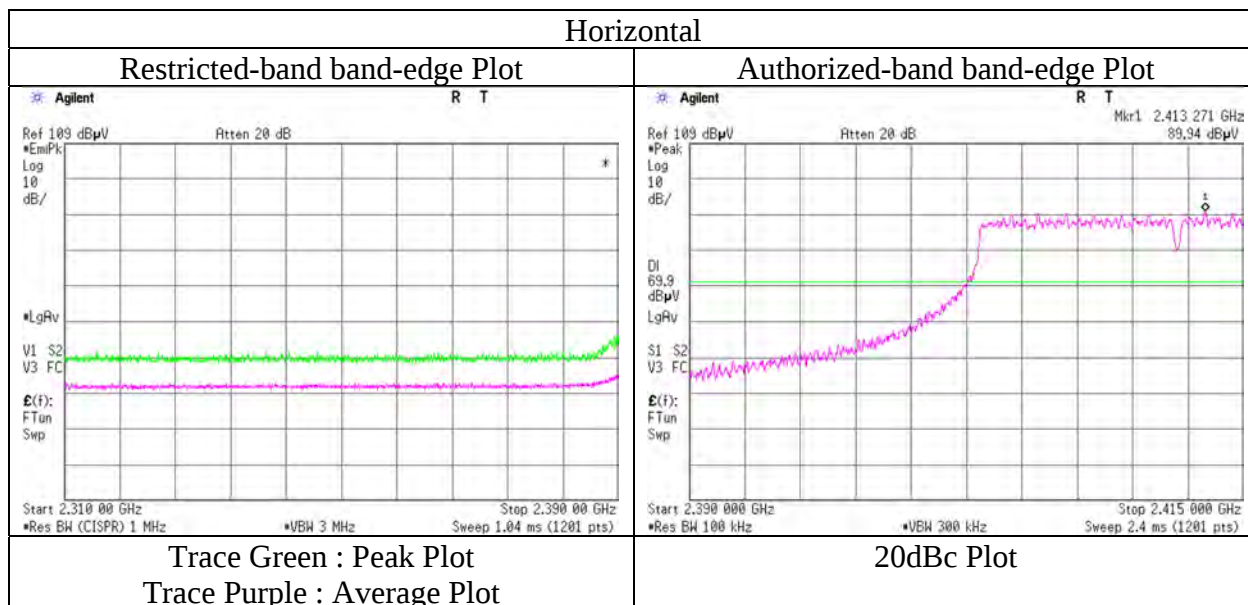
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13977035M-A         |
| Test place             | Kashima EMC Lab.    |
| Semi Anechoic Chamber  | No.10               |
| Date                   | December 3, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH |
| Engineer               | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    |
| Mode                   | Tx 11n-20 2412 MHz  |



\* 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

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11n-20 2437 MHz  |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 4874.000           | PK       | 50.10             | 32.61              | 5.59         | 45.22        | 3.31                    | 46.39              | 73.9              | 27.5           | 150            | 0              | Floor noise |
| Hori.    | 7311.000           | PK       | 46.10             | 37.53              | 6.91         | 43.85        | 3.31                    | 50.00              | 73.9              | 23.9           | 150            | 0              | Floor noise |
| Hori.    | 9748.000           | PK       | 44.20             | 38.09              | 7.82         | 41.85        | 3.31                    | 51.57              | 73.9              | 22.3           | 150            | 0              | Floor noise |
| Vert.    | 4874.000           | PK       | 51.30             | 32.61              | 5.59         | 45.22        | 3.31                    | 47.59              | 73.9              | 26.3           | 150            | 0              | Floor noise |
| Vert.    | 7311.000           | PK       | 46.10             | 37.53              | 6.91         | 43.85        | 3.31                    | 50.00              | 73.9              | 23.9           | 150            | 0              | Floor noise |
| Vert.    | 9748.000           | PK       | 44.60             | 38.09              | 7.82         | 41.85        | 3.31                    | 51.97              | 73.9              | 21.9           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 4874.000           | AV       | 41.50             | 32.61              | 5.59         | 45.22        | 0.72                   | 3.31                       | 38.51              | 53.9              | 15.3           | Floor noise |
| Hori.    | 7311.000           | AV       | 38.10             | 37.53              | 6.91         | 43.85        | 0.72                   | 3.31                       | 42.72              | 53.9              | 11.1           | Floor noise |
| Hori.    | 9748.000           | AV       | 35.90             | 38.09              | 7.82         | 41.85        | 0.72                   | 3.31                       | 43.99              | 53.9              | <b>9.9</b>     | Floor noise |
| Vert.    | 4874.000           | AV       | 41.40             | 32.61              | 5.59         | 45.22        | 0.72                   | 3.31                       | 38.41              | 53.9              | 15.4           | Floor noise |
| Vert.    | 7311.000           | AV       | 38.20             | 37.53              | 6.91         | 43.85        | 0.72                   | 3.31                       | 42.82              | 53.9              | 11.0           | Floor noise |
| Vert.    | 9748.000           | AV       | 35.90             | 38.09              | 7.82         | 41.85        | 0.72                   | 3.31                       | 43.99              | 53.9              | <b>9.9</b>     | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

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## Radiated Spurious Emission

|                        |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               |
| Date                   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11n-20 2462 MHz  |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 2483.500           | PK       | 61.30             | 28.01              | 13.61        | 43.82        | 3.31                    | 62.41              | 73.9              | 11.4           | 265            | 56             |             |
| Hori.    | 4924.000           | PK       | 50.10             | 32.67              | 5.65         | 45.24        | 3.31                    | 46.49              | 73.9              | 27.4           | 150            | 0              | Floor noise |
| Hori.    | 7386.000           | PK       | 47.70             | 37.49              | 6.97         | 43.65        | 3.31                    | 51.82              | 73.9              | 22.0           | 150            | 0              | Floor noise |
| Hori.    | 9848.000           | PK       | 45.20             | 38.11              | 7.84         | 41.77        | 3.31                    | 52.69              | 73.9              | 21.2           | 150            | 0              | Floor noise |
| Vert.    | 2483.500           | PK       | 62.80             | 28.01              | 13.61        | 43.82        | 3.31                    | 63.91              | 73.9              | 9.9            | 145            | 345            |             |
| Vert.    | 4924.000           | PK       | 48.50             | 32.67              | 5.65         | 45.24        | 3.31                    | 44.89              | 73.9              | 29.0           | 150            | 0              | Floor noise |
| Vert.    | 7386.000           | PK       | 47.50             | 37.49              | 6.97         | 43.65        | 3.31                    | 51.62              | 73.9              | 22.2           | 150            | 0              | Floor noise |
| Vert.    | 9848.000           | PK       | 44.90             | 38.11              | 7.84         | 41.77        | 3.31                    | 52.39              | 73.9              | 21.5           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 2483.500           | AV       | 48.00             | 28.01              | 13.61        | 43.82        | 0.72                   | 3.31                       | 49.83              | 53.9              | 4.0            | *1)         |
| Hori.    | 4924.000           | AV       | 40.70             | 32.67              | 5.65         | 45.24        | 0.72                   | 3.31                       | 37.81              | 53.9              | 16.0           | Floor noise |
| Hori.    | 7386.000           | AV       | 38.60             | 37.49              | 6.97         | 43.65        | 0.72                   | 3.31                       | 43.44              | 53.9              | 10.4           | Floor noise |
| Hori.    | 9848.000           | AV       | 36.20             | 38.11              | 7.84         | 41.77        | 0.72                   | 3.31                       | 44.41              | 53.9              | 9.4            | Floor noise |
| Vert.    | 2483.500           | AV       | 47.30             | 28.01              | 13.61        | 43.82        | 0.72                   | 3.31                       | 49.13              | 53.9              | 4.7            | *1)         |
| Vert.    | 4924.000           | AV       | 41.00             | 32.67              | 5.65         | 45.24        | 0.72                   | 3.31                       | 38.11              | 53.9              | 15.7           | Floor noise |
| Vert.    | 7386.000           | AV       | 39.00             | 37.49              | 6.97         | 43.65        | 0.72                   | 3.31                       | 43.84              | 53.9              | 10.0           | Floor noise |
| Vert.    | 9848.000           | AV       | 36.30             | 38.11              | 7.84         | 41.77        | 0.72                   | 3.31                       | 44.51              | 53.9              | 9.3            | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

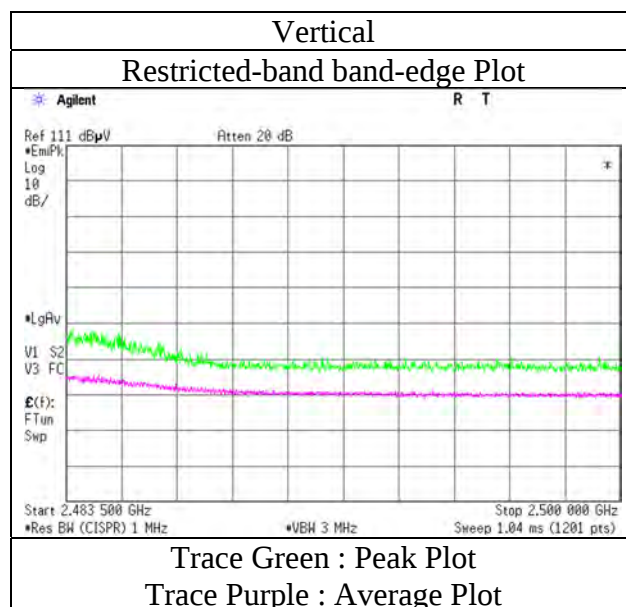
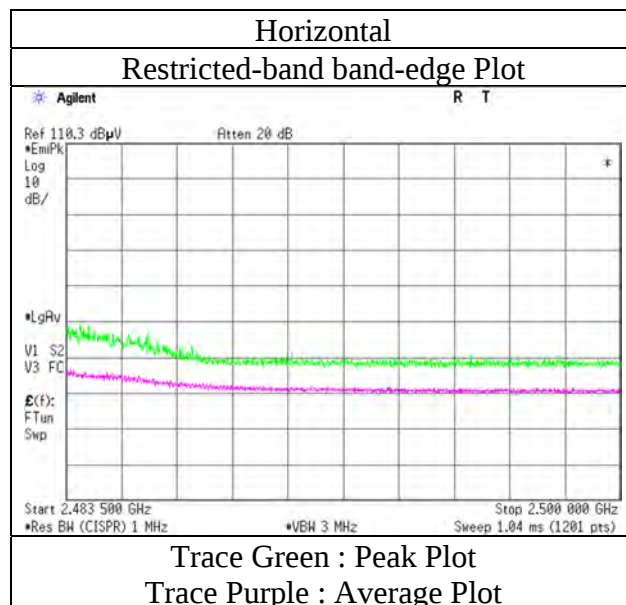
10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

## **Radiated Spurious Emission** **(Reference Plot for band-edge)**

Report No. 13977035M-A  
Test place Kashima EMC Lab.  
Semi Anechoic Chamber No.10  
Date December 3, 2021  
Temperature / Humidity 20 deg. C / 42 % RH  
Engineer Hiromitsu Tanabe  
(1 GHz - 10 GHz)  
Mode Tx 11n-20 2462 MHz

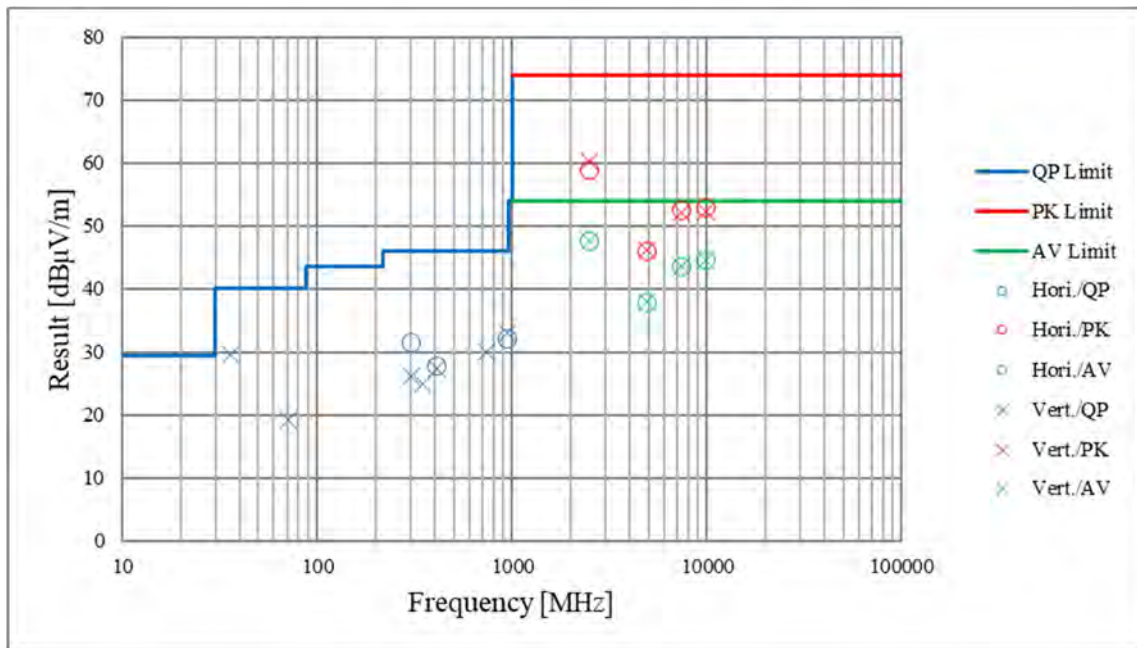


\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

(Plot data, Worst case mode for Maximum Peak Output Power)

|                        |                     |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |                     |
| Semi Anechoic Chamber  | No.10               | No.10               | No.10               | No.10               |
| Date                   | December 18, 2021   | December 3, 2021    | December 1, 2021    | December 1, 2021    |
| Temperature / Humidity | 20 deg. C / 48 % RH | 20 deg. C / 42 % RH | 22 deg. C / 52 % RH | 22 deg. C / 52 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz) | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11g 2462 MHz     |                     |                     |                     |



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

## Radiated Spurious Emission

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13977035M-A                       |
| Test place             | Kashima EMC Lab.                  |
| Semi Anechoic Chamber  | No.10                             |
| Date                   | December 8, 2021                  |
| Temperature / Humidity | 22 deg. C / 45 % RH               |
| Engineer               | Hiromitsu Tanabe                  |
|                        | (1 GHz - 2.8 GHz)                 |
| Mode                   | Tx 11b 2412 MHz with 11a 5700 MHz |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 2390.000        | PK       | 51.00          | 27.61           | 13.54     | 43.88     | 3.31                 | 51.58           | 73.9           | 22.3        | 158         | 300         |        |
| Hori.    | 2390.000        | AV       | 41.50          | 27.61           | 13.54     | 43.88     | 3.31                 | 42.08           | 53.9           | 11.8        | 158         | 300         |        |
| Vert.    | 2390.000        | PK       | 51.30          | 27.61           | 13.54     | 43.88     | 3.31                 | 51.88           | 73.9           | 22.0        | 122         | 350         |        |
| Vert.    | 2390.000        | AV       | 41.70          | 27.61           | 13.54     | 43.88     | 3.31                 | 42.28           | 53.9           | 11.6        | 122         | 350         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (4.39 m / 3.0 m) = 3.31 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2412.000        | PK       | 97.20          | 27.65           | 13.56     | 43.87     | 3.31                 | 97.85           | -              | -           | Carrier |
| Hori.    | 2397.492        | PK       | 49.90          | 27.60           | 13.55     | 43.88     | 3.31                 | 50.48           | 77.85          | 27.3        |         |
| Hori.    | 2400.000        | PK       | 47.60          | 27.60           | 13.55     | 43.88     | 3.31                 | 48.18           | 77.85          | 29.6        |         |
| Vert.    | 2412.000        | PK       | 98.90          | 27.65           | 13.56     | 43.87     | 3.31                 | 99.55           | -              | -           | Carrier |
| Vert.    | 2397.525        | PK       | 51.10          | 27.60           | 13.55     | 43.88     | 3.31                 | 51.68           | 79.55          | 27.8        |         |
| Vert.    | 2400.000        | PK       | 48.10          | 27.60           | 13.55     | 43.88     | 3.31                 | 48.68           | 79.55          | 30.8        |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (4.39 m / 3.0 m) = 3.31 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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**Kashima EMC Lab.**

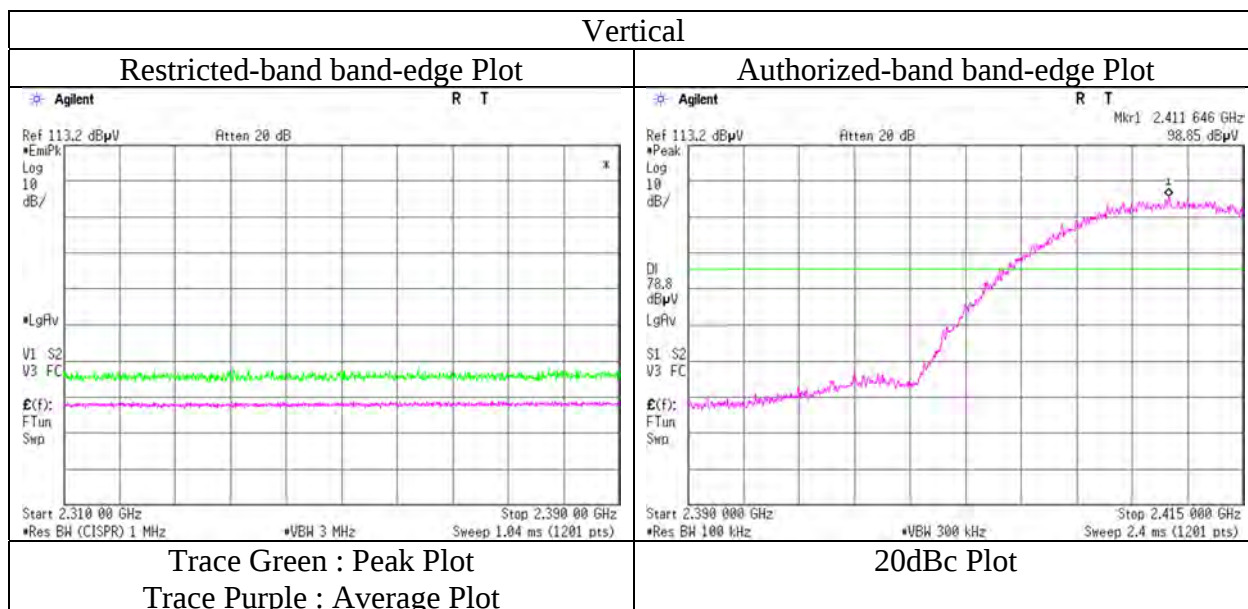
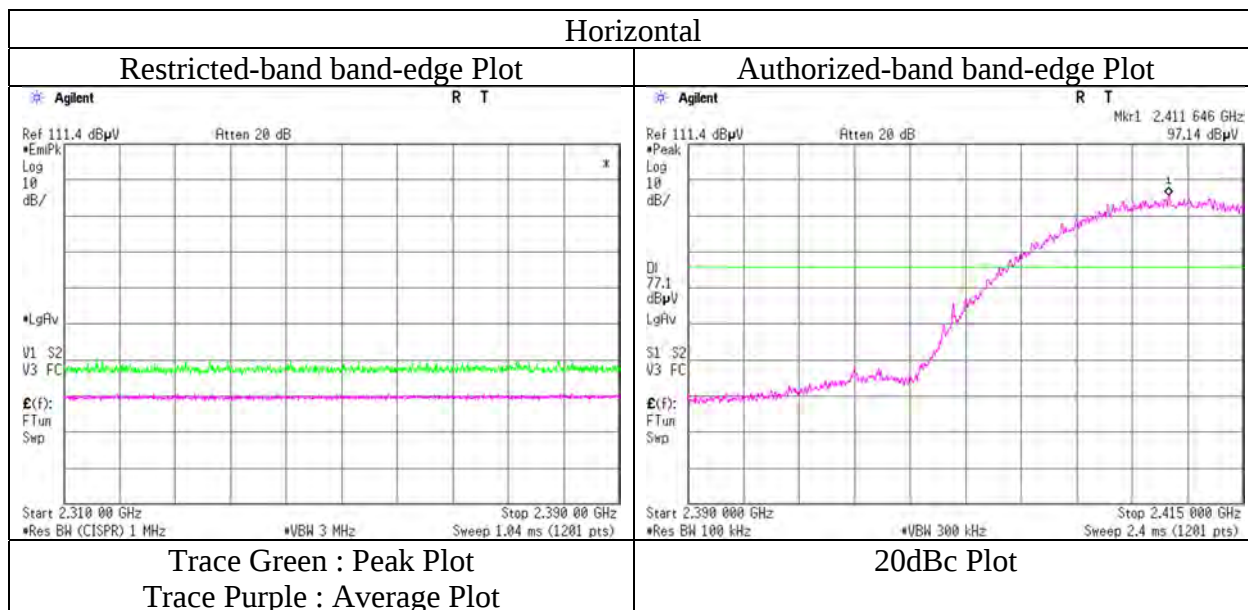
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13977035M-A                       |
| Test place             | Kashima EMC Lab.                  |
| Semi Anechoic Chamber  | No.10                             |
| Date                   | December 8, 2021                  |
| Temperature / Humidity | 22 deg. C / 45 % RH               |
| Engineer               | Hiromitsu Tanabe                  |
|                        | (1 GHz - 2.8 GHz)                 |
| Mode                   | Tx 11b 2412 MHz with 11a 5700 MHz |



\* 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

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13977035M-A                       |
| Test place             | Kashima EMC Lab.                  |
| Semi Anechoic Chamber  | No.10                             |
| Date                   | December 8, 2021                  |
| Temperature / Humidity | 22 deg. C / 45 % RH               |
| Engineer               | Hiromitsu Tanabe                  |
|                        | (1 GHz - 2.8 GHz)                 |
| Mode                   | Tx 11b 2462 MHz with 11a 5700 MHz |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2483.500           | PK       | 51.00             | 28.01              | 13.61        | 43.82        | 3.31                    | 52.11              | 73.9              | 21.7           | 273            | 303            |        |
| Hori.    | 2483.500           | AV       | 41.60             | 28.01              | 13.61        | 43.82        | 3.31                    | 42.71              | 53.9              | 11.1           | 273            | 303            |        |
| Vert.    | 2483.500           | PK       | 51.30             | 28.01              | 13.61        | 43.82        | 3.31                    | 52.41              | 73.9              | 21.4           | 146            | 345            |        |
| Vert.    | 2483.500           | AV       | 41.80             | 28.01              | 13.61        | 43.82        | 3.31                    | 42.91              | 53.9              | <b>10.9</b>    | 146            | 345            |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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**Kashima EMC Lab.**

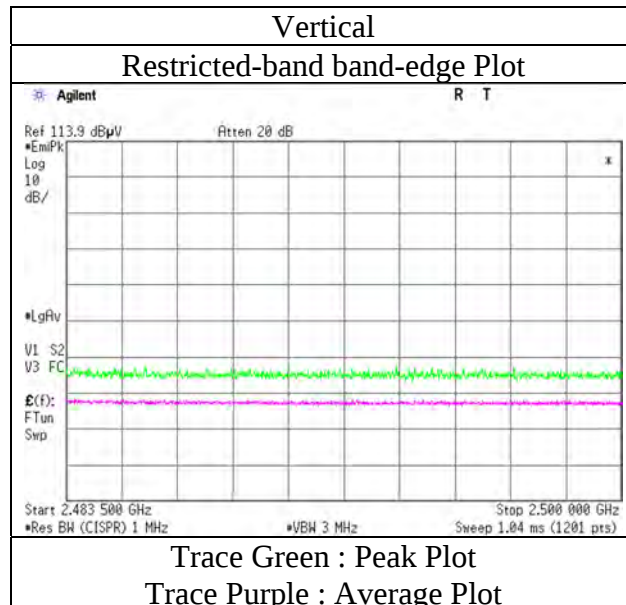
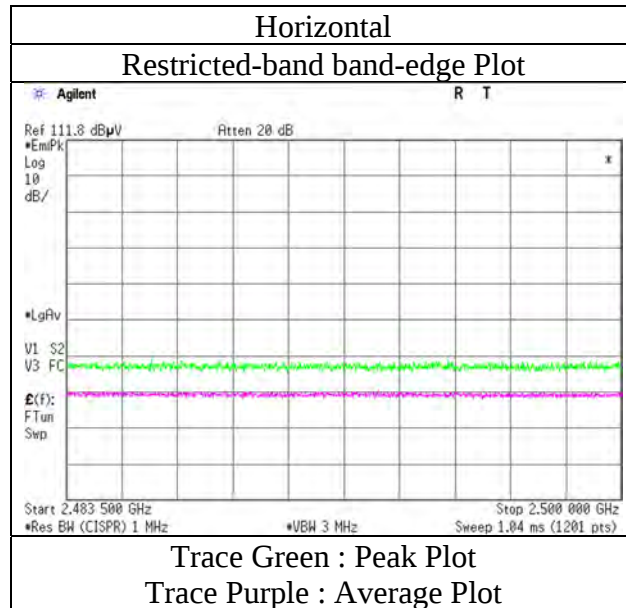
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

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## **Radiated Spurious Emission** **(Reference Plot for band-edge)**

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Kashima EMC Lab.                      |
| Semi Anechoic Chamber  | No.10                                 |
| Date                   | December 8, 2021                      |
| Temperature / Humidity | 22 deg. C / 45 % RH                   |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 2.8 GHz) |
| Mode                   | Tx 11b 2462 MHz with 11a 5700 MHz     |



\* 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

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13977035M-A                       |
| Test place             | Kashima EMC Lab.                  |
| Semi Anechoic Chamber  | No.10                             |
| Date                   | December 8, 2021                  |
| Temperature / Humidity | 22 deg. C / 45 % RH               |
| Engineer               | Hiromitsu Tanabe                  |
|                        | (1 GHz - 2.8 GHz)                 |
| Mode                   | Tx 11g 2412 MHz with 11a 5700 MHz |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2390.000           | PK       | 56.20             | 27.61              | 13.54        | 43.88        | 3.31                    | 56.78              | 73.9              | 17.1           | 309            | 51             |        |
| Vert.    | 2390.000           | PK       | 56.90             | 27.61              | 13.54        | 43.88        | 3.31                    | 57.48              | 73.9              | 16.4           | 150            | 345            |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2390.000           | AV       | 43.50             | 27.61              | 13.54        | 43.88        | 0.58                   | 3.31                    | 44.66              | 53.9              | 9.2            | *1)    |
| Vert.    | 2390.000           | AV       | 44.30             | 27.61              | 13.54        | 43.88        | 0.58                   | 3.31                    | 45.46              | 53.9              | 8.4            | *1)    |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2412.000           | PK       | 90.60             | 27.65              | 13.56        | 43.87        | 3.31                    | 91.25              | -                 | -              | Carrier |
| Hori.    | 2394.458           | PK       | 57.90             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.48              | 71.25             | 12.7           |         |
| Hori.    | 2400.000           | PK       | 57.50             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.08              | 71.25             | 13.1           |         |
| Vert.    | 2412.000           | PK       | 91.00             | 27.65              | 13.56        | 43.87        | 3.31                    | 91.65              | -                 | -              | Carrier |
| Vert.    | 2394.500           | PK       | 58.10             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.68              | 71.65             | 12.9           |         |
| Vert.    | 2400.000           | PK       | 57.80             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.38              | 71.65             | 13.2           |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

**UL Japan, Inc.**

**Kashima EMC Lab.**

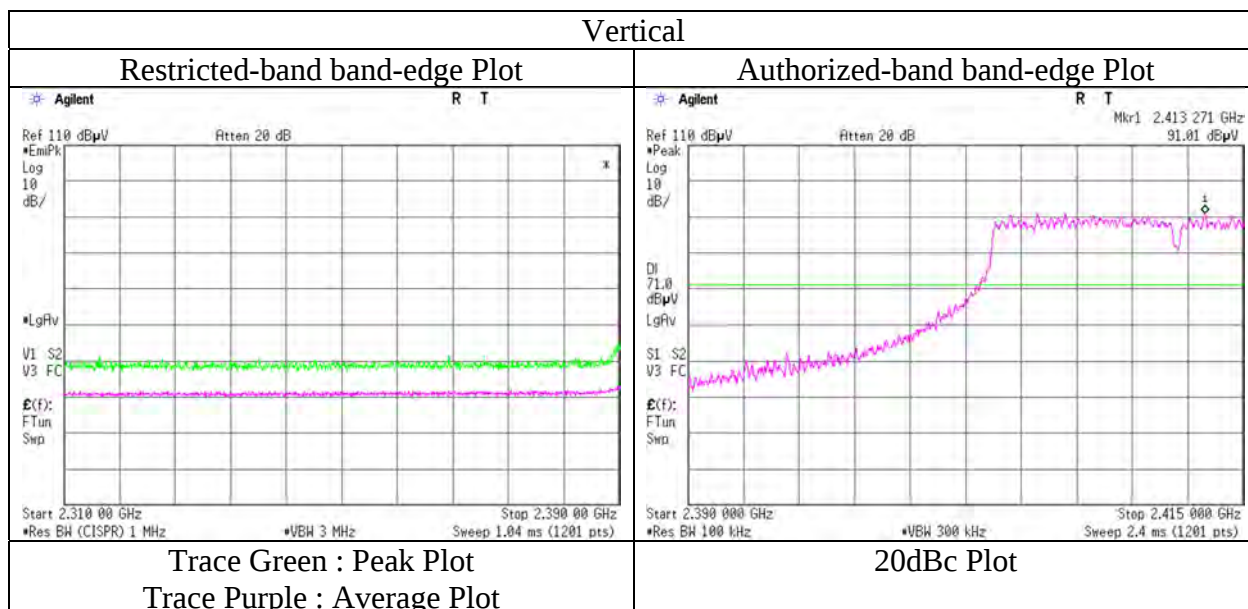
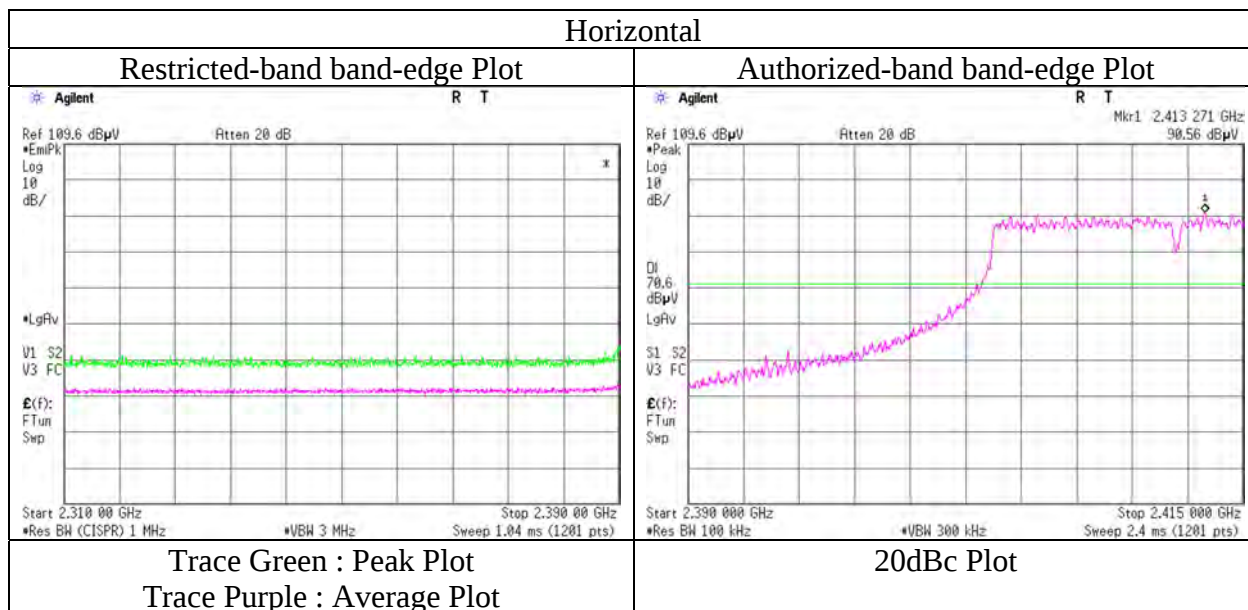
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

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

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13977035M-A                       |
| Test place             | Kashima EMC Lab.                  |
| Semi Anechoic Chamber  | No.10                             |
| Date                   | December 8, 2021                  |
| Temperature / Humidity | 22 deg. C / 45 % RH               |
| Engineer               | Hiromitsu Tanabe                  |
|                        | (1 GHz - 2.8 GHz)                 |
| Mode                   | Tx 11g 2412 MHz with 11a 5700 MHz |



\* 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

|                        |                                   |                     |                     |                     |
|------------------------|-----------------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A                       |                     |                     |                     |
| Test place             | Kashima EMC Lab.                  |                     |                     |                     |
| Semi Anechoic Chamber  | No.11                             | No.10               | No.10               | No.11               |
| Date                   | December 8, 2021                  | December 8, 2021    | December 17, 2021   | December 7, 2021    |
| Temperature / Humidity | 23 deg. C / 41 % RH               | 22 deg. C / 45 % RH | 21 deg. C / 45 % RH | 20 deg. C / 45 % RH |
| Engineer               | Hiromitsu Tanabe                  | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz)               | (1 GHz - 2.8 GHz)   | (2.8 GHz - 10 GHz)  | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11g 2462 MHz with 11a 5700 MHz |                     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 336.064            | QP       | 37.50             | 14.31              | 7.75         | 31.99        | 0.00                    | 27.57              | 46.0              | 18.4           | 100            | 293            |             |
| Hori.    | 940.015            | QP       | 27.50             | 24.13              | 9.93         | 31.09        | 0.00                    | 30.47              | 46.0              | 15.5           | 100            | 179            |             |
| Hori.    | 2483.500           | PK       | 59.40             | 28.01              | 13.61        | 43.82        | 3.31                    | 60.51              | 73.9              | 13.3           | 331            | 54             |             |
| Hori.    | 4924.000           | PK       | 53.20             | 32.67              | 5.65         | 45.24        | 3.31                    | 49.59              | 73.9              | 24.3           | 100            | 285            |             |
| Hori.    | 7386.000           | PK       | 48.60             | 37.49              | 6.97         | 43.65        | 3.31                    | 52.72              | 73.9              | 21.1           | 150            | 0              | Floor noise |
| Hori.    | 9848.000           | PK       | 45.80             | 38.11              | 7.84         | 41.77        | 3.31                    | 53.29              | 73.9              | 20.6           | 150            | 0              | Floor noise |
| Vert.    | 35.637             | QP       | 39.30             | 12.86              | 5.73         | 32.21        | 0.00                    | 25.68              | 40.0              | 14.3           | 100            | 262            |             |
| Vert.    | 54.036             | QP       | 28.60             | 13.76              | 5.94         | 32.20        | 0.00                    | 16.10              | 40.0              | 23.9           | 279            | 104            |             |
| Vert.    | 306.740            | QP       | 36.00             | 13.71              | 7.61         | 32.01        | 0.00                    | 25.31              | 46.0              | 20.6           | 100            | 252            |             |
| Vert.    | 439.256            | QP       | 30.00             | 16.87              | 8.22         | 31.98        | 0.00                    | 23.11              | 46.0              | 22.8           | 100            | 297            |             |
| Vert.    | 743.052            | QP       | 29.70             | 21.98              | 9.32         | 31.99        | 0.00                    | 29.01              | 46.0              | 16.9           | 100            | 24             |             |
| Vert.    | 937.201            | QP       | 27.10             | 24.11              | 9.92         | 31.11        | 0.00                    | 30.02              | 46.0              | 15.9           | 108            | 188            |             |
| Vert.    | 2483.500           | PK       | 60.30             | 28.01              | 13.61        | 43.82        | 3.31                    | 61.41              | 73.9              | 12.4           | 150            | 346            |             |
| Vert.    | 4924.000           | PK       | 57.00             | 32.67              | 5.65         | 45.24        | 3.31                    | 53.39              | 73.9              | 20.5           | 390            | 355            |             |
| Vert.    | 7386.000           | PK       | 48.40             | 37.49              | 6.97         | 43.65        | 3.31                    | 52.52              | 73.9              | 21.3           | 150            | 0              | Floor noise |
| Vert.    | 9848.000           | PK       | 45.40             | 38.11              | 7.84         | 41.77        | 3.31                    | 52.89              | 73.9              | 21.0           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 2483.500           | AV       | 45.30             | 28.01              | 13.61        | 43.82        | 0.58                   | 3.31                       | 46.99              | 53.9              | 6.9            | *1)         |
| Hori.    | 4924.000           | AV       | 46.10             | 32.67              | 5.65         | 45.24        | 0.58                   | 3.31                       | 43.07              | 53.9              | 10.8           |             |
| Hori.    | 7386.000           | AV       | 38.90             | 37.49              | 6.97         | 43.65        | 0.58                   | 3.31                       | 43.60              | 53.9              | 10.3           | Floor noise |
| Hori.    | 9848.000           | AV       | 36.60             | 38.11              | 7.84         | 41.77        | 0.58                   | 3.31                       | 44.67              | 53.9              | 9.2            | Floor noise |
| Vert.    | 2483.500           | AV       | 45.80             | 28.01              | 13.61        | 43.82        | 0.58                   | 3.31                       | 47.49              | 53.9              | 6.4            | *1)         |
| Vert.    | 4924.000           | AV       | 50.20             | 32.67              | 5.65         | 45.24        | 0.58                   | 3.31                       | 47.17              | 53.9              | 6.7            |             |
| Vert.    | 7386.000           | AV       | 39.40             | 37.49              | 6.97         | 43.65        | 0.58                   | 3.31                       | 44.10              | 53.9              | 9.8            | Floor noise |
| Vert.    | 9848.000           | AV       | 36.70             | 38.11              | 7.84         | 41.77        | 0.58                   | 3.31                       | 44.77              | 53.9              | 9.1            | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

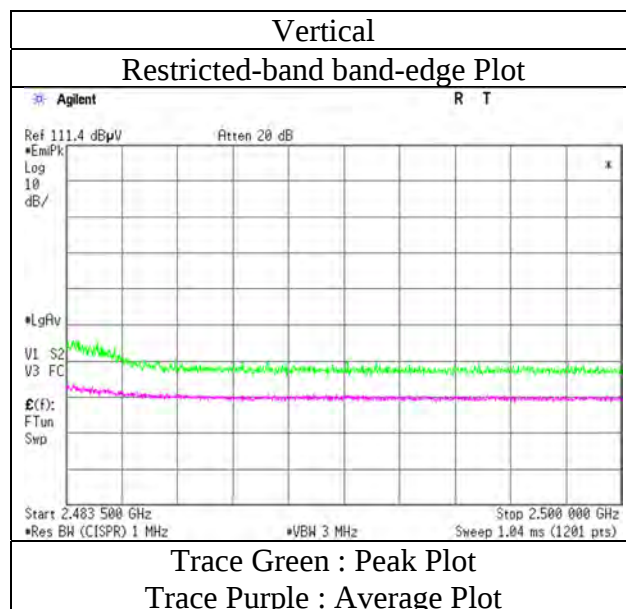
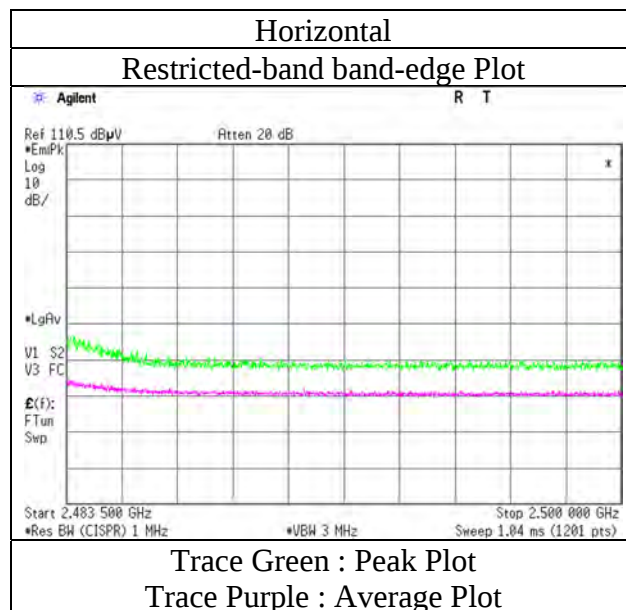
10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

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

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Kashima EMC Lab.                      |
| Semi Anechoic Chamber  | No.10                                 |
| Date                   | December 8, 2021                      |
| Temperature / Humidity | 22 deg. C / 45 % RH                   |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 2.8 GHz) |
| Mode                   | Tx 11g 2462 MHz with 11a 5700 MHz     |



\* 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

|                        |                                      |
|------------------------|--------------------------------------|
| Report No.             | 13977035M-A                          |
| Test place             | Kashima EMC Lab.                     |
| Semi Anechoic Chamber  | No.10                                |
| Date                   | December 8, 2021                     |
| Temperature / Humidity | 22 deg. C / 45 % RH                  |
| Engineer               | Hiromitsu Tanabe                     |
|                        | (1 GHz - 2.8 GHz)                    |
| Mode                   | Tx 11n-20 2412 MHz with 11a 5700 MHz |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2390.000           | PK       | 58.40             | 27.61              | 13.54        | 43.88        | 3.31                    | 58.98              | 73.9              | 14.9           | 317            | 301            |        |
| Vert.    | 2390.000           | PK       | 61.20             | 27.61              | 13.54        | 43.88        | 3.31                    | 61.78              | 73.9              | 12.1           | 150            | 349            |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2390.000           | AV       | 44.40             | 27.61              | 13.54        | 43.88        | 0.72                   | 3.31                    | 45.70              | 53.9              | 8.2            | *1)    |
| Vert.    | 2390.000           | AV       | 45.10             | 27.61              | 13.54        | 43.88        | 0.72                   | 3.31                    | 46.40              | 53.9              | 7.5            | *1)    |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2412.000           | PK       | 90.00             | 27.65              | 13.56        | 43.87        | 3.31                    | 90.65              | -                 | -              | Carrier |
| Hori.    | 2394.133           | PK       | 58.40             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.98              | 70.65             | 11.6           |         |
| Hori.    | 2400.000           | PK       | 58.10             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.68              | 70.65             | 11.9           |         |
| Vert.    | 2412.000           | PK       | 90.70             | 27.65              | 13.56        | 43.87        | 3.31                    | 91.35              | -                 | -              | Carrier |
| Vert.    | 2394.458           | PK       | 58.80             | 27.60              | 13.55        | 43.88        | 3.31                    | 59.38              | 71.35             | 11.9           |         |
| Vert.    | 2400.000           | PK       | 58.30             | 27.60              | 13.55        | 43.88        | 3.31                    | 58.88              | 71.35             | 12.4           |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39\text{ m} / 3.0\text{ m}) = 3.31\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

**UL Japan, Inc.**

**Kashima EMC Lab.**

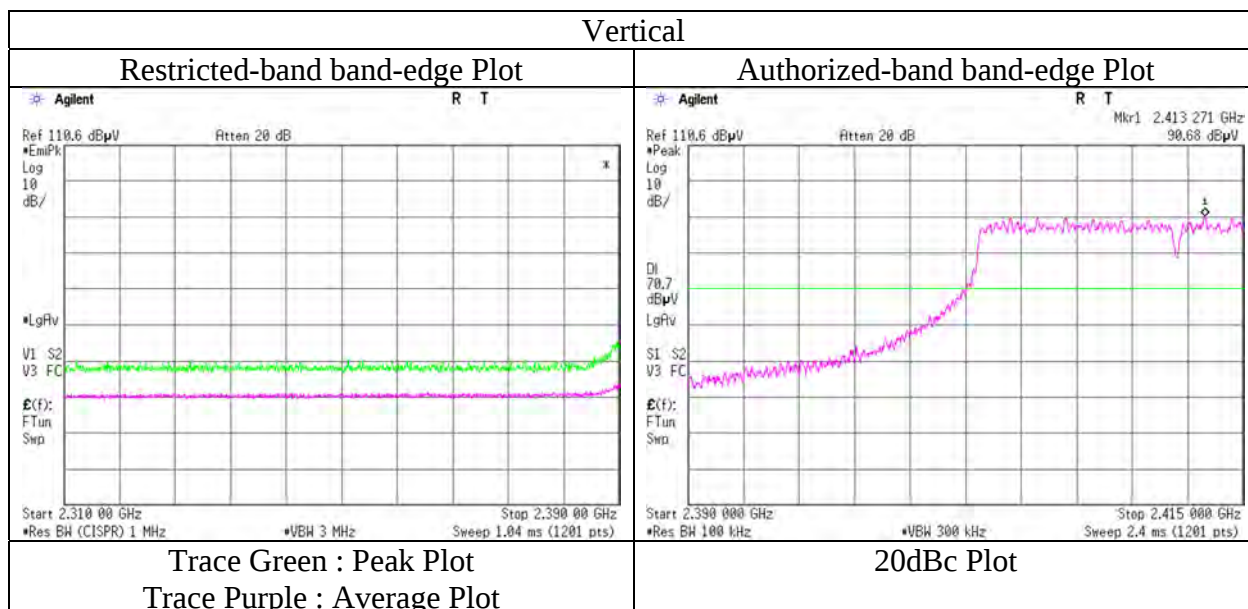
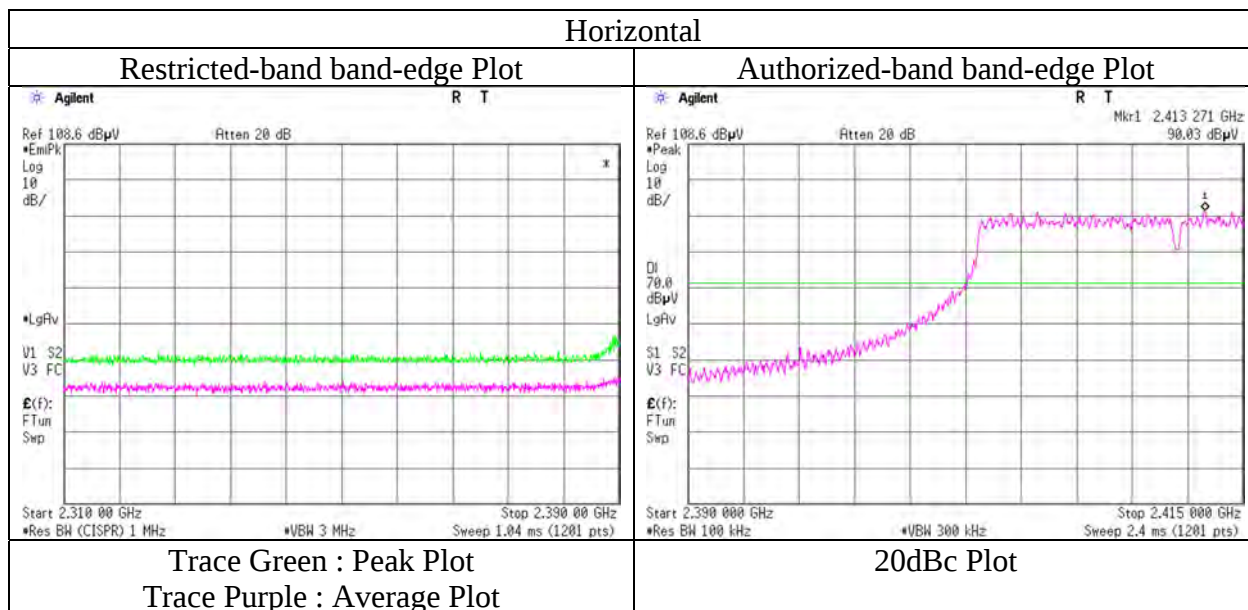
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                      |
|------------------------|--------------------------------------|
| Report No.             | 13977035M-A                          |
| Test place             | Kashima EMC Lab.                     |
| Semi Anechoic Chamber  | No.10                                |
| Date                   | December 8, 2021                     |
| Temperature / Humidity | 22 deg. C / 45 % RH                  |
| Engineer               | Hiromitsu Tanabe                     |
|                        | (1 GHz - 2.8 GHz)                    |
| Mode                   | Tx 11n-20 2412 MHz with 11a 5700 MHz |



\* 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

|                        |                                      |
|------------------------|--------------------------------------|
| Report No.             | 13977035M-A                          |
| Test place             | Kashima EMC Lab.                     |
| Semi Anechoic Chamber  | No.10                                |
| Date                   | December 8, 2021                     |
| Temperature / Humidity | 22 deg. C / 45 % RH                  |
| Engineer               | Hiromitsu Tanabe                     |
|                        | (1 GHz - 2.8 GHz)                    |
| Mode                   | Tx 11n-20 2462 MHz with 11a 5700 MHz |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2483.500           | PK       | 59.80             | 28.01              | 13.61        | 43.82        | 3.31                    | 60.91              | 73.9              | 12.9           | 243            | 297            |        |
| Vert.    | 2483.500           | PK       | 62.50             | 28.01              | 13.61        | 43.82        | 3.31                    | 63.61              | 73.9              | 10.2           | 148            | 349            |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2483.500           | AV       | 45.60             | 28.01              | 13.61        | 43.82        | 0.72                   | 3.31                    | 47.43              | 53.9              | 6.4            | *1)    |
| Vert.    | 2483.500           | AV       | 47.30             | 28.01              | 13.61        | 43.82        | 0.72                   | 3.31                    | 49.13              | 53.9              | 4.7            | *1)    |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.39 \text{ m} / 3.0 \text{ m}) = 3.31 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

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**Kashima EMC Lab.**

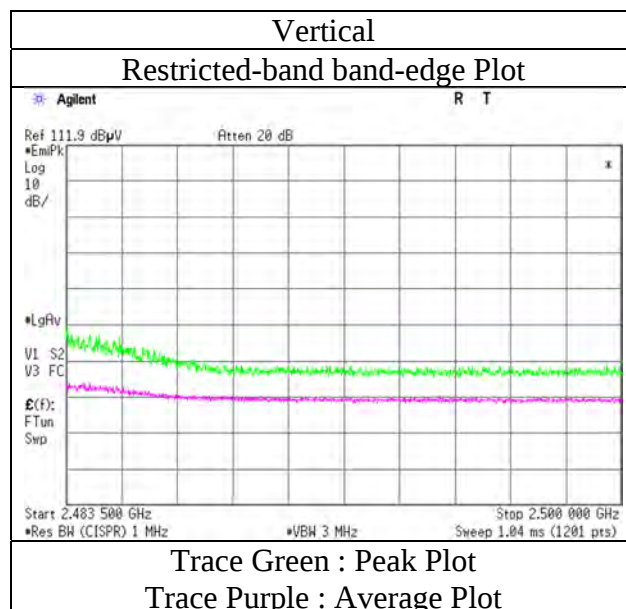
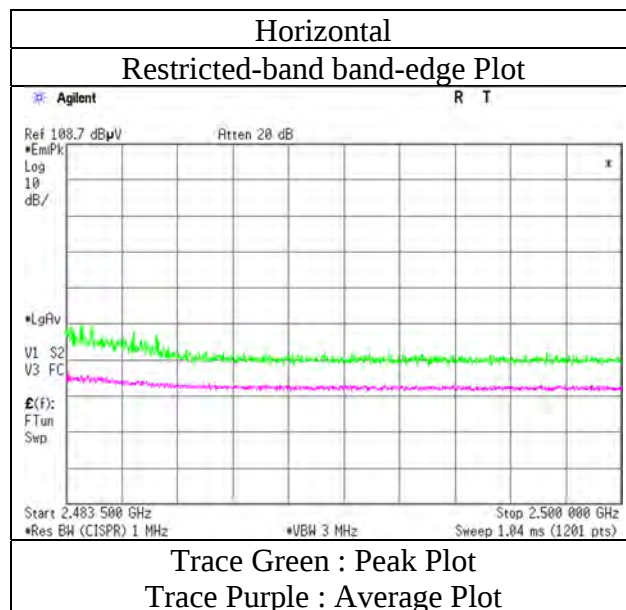
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## Radiated Spurious Emission (Reference Plot for band-edge)

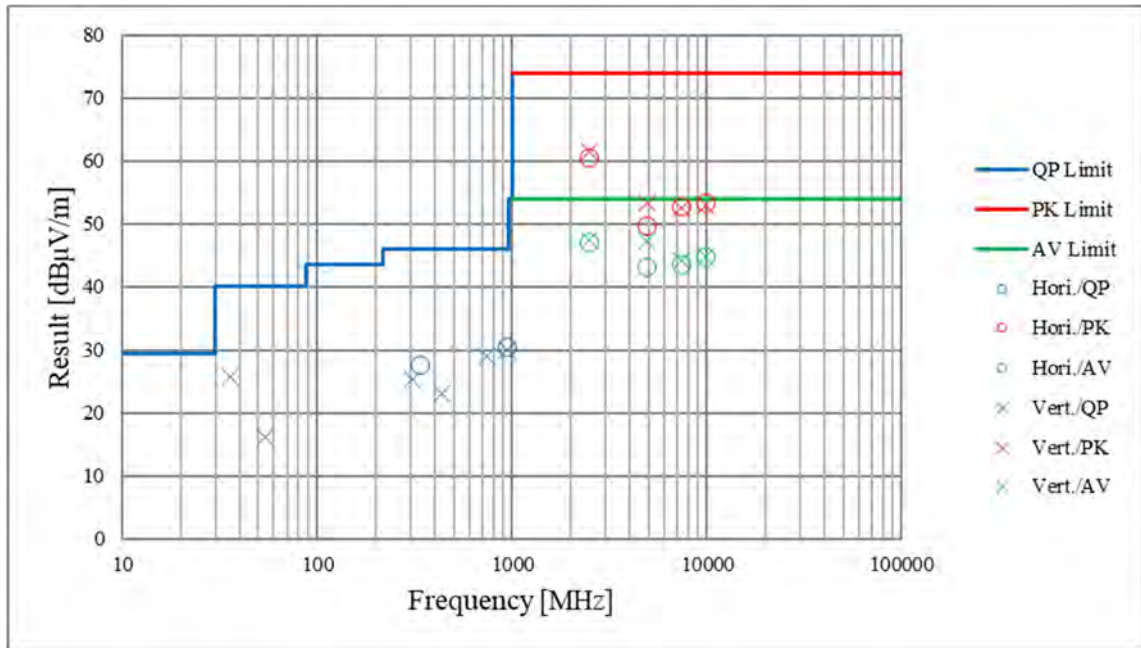
|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Kashima EMC Lab.                      |
| Semi Anechoic Chamber  | No.10                                 |
| Date                   | December 8, 2021                      |
| Temperature / Humidity | 22 deg. C / 45 % RH                   |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 2.8 GHz) |
| Mode                   | Tx 11n-20 2462 MHz with 11a 5700 MHz  |



\* 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**  
**(Plot data, Worst case mode for Maximum Peak Output Power)**

|                        |                                   |                     |                     |                     |
|------------------------|-----------------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A                       |                     |                     |                     |
| Test place             | Kashima EMC Lab.                  |                     |                     |                     |
| Semi Anechoic Chamber  | No.11                             | No.10               | No.10               | No.11               |
| Date                   | December 8, 2021                  | December 8, 2021    | December 17, 2021   | December 7, 2021    |
| Temperature / Humidity | 23 deg. C / 41 % RH               | 22 deg. C / 45 % RH | 21 deg. C / 45 % RH | 20 deg. C / 45 % RH |
| Engineer               | Hiromitsu Tanabe                  | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz)               | (1 GHz - 2.8 GHz)   | (2.8 GHz - 10 GHz)  | (18 GHz - 26.5 GHz) |
| Mode                   | Tx 11g 2462 MHz with 11a 5700 MHz |                     |                     |                     |



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

## Radiated Spurious Emission

|                        |                     |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |                     |
| Semi Anechoic Chamber  | No.11               | No.11               | No.11               | No.11               |
| Date                   | November 11, 2021   | November 10, 2021   | November 10, 2021   | November 11, 2021   |
| Temperature / Humidity | 20 deg. C / 44 % RH | 23 deg. C / 56 % RH | 23 deg. C / 56 % RH | 20 deg. C / 44 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz) | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx BT LE 2402 MHz   |                     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 290.589         | QP       | 41.30          | 13.23           | 7.50      | 32.02     | 0.00                 | 30.01           | 46.0           | 15.9        | 130         | 145         |             |
| Hori.    | 416.644         | QP       | 36.40          | 16.04           | 8.08      | 31.97     | 0.00                 | 28.55           | 46.0           | 17.4        | 100         | 307         |             |
| Hori.    | 2390.000        | PK       | 46.70          | 27.61           | 13.54     | 41.42     | 2.26                 | 48.69           | 73.9           | 25.2        | 100         | 226         |             |
| Hori.    | 4804.000        | PK       | 47.70          | 32.69           | 5.57      | 41.17     | 2.26                 | 47.05           | 73.9           | 26.8        | 150         | 0           | Floor noise |
| Hori.    | 7206.000        | PK       | 45.70          | 37.26           | 6.90      | 39.72     | 2.26                 | 52.40           | 73.9           | 21.5        | 150         | 0           | Floor noise |
| Hori.    | 9608.000        | PK       | 43.10          | 38.09           | 7.76      | 38.54     | 2.26                 | 52.67           | 73.9           | 21.2        | 150         | 0           | Floor noise |
| Vert.    | 35.656          | QP       | 39.30          | 12.86           | 5.72      | 32.21     | 0.00                 | 25.67           | 40.0           | 14.3        | 100         | 277         |             |
| Vert.    | 43.818          | QP       | 31.60          | 13.64           | 5.81      | 32.21     | 0.00                 | 18.84           | 40.0           | 21.1        | 100         | 252         |             |
| Vert.    | 289.755         | QP       | 33.80          | 13.22           | 7.50      | 32.02     | 0.00                 | 22.50           | 46.0           | 23.5        | 100         | 88          |             |
| Vert.    | 332.452         | QP       | 33.10          | 14.30           | 7.71      | 31.99     | 0.00                 | 23.12           | 46.0           | 22.8        | 100         | 83          |             |
| Vert.    | 740.111         | QP       | 29.00          | 21.85           | 9.26      | 31.99     | 0.00                 | 28.12           | 46.0           | 17.8        | 100         | 340         |             |
| Vert.    | 944.497         | QP       | 26.30          | 24.12           | 9.89      | 31.06     | 0.00                 | 29.25           | 46.0           | 16.7        | 100         | 0           |             |
| Vert.    | 2390.000        | PK       | 46.30          | 27.61           | 13.54     | 41.42     | 2.26                 | 48.29           | 73.9           | 25.6        | 165         | 11          |             |
| Vert.    | 4804.000        | PK       | 47.60          | 32.69           | 5.57      | 41.17     | 2.26                 | 46.95           | 73.9           | 26.9        | 150         | 0           | Floor noise |
| Vert.    | 7206.000        | PK       | 46.60          | 37.26           | 6.90      | 39.72     | 2.26                 | 53.30           | 73.9           | 20.6        | 150         | 0           | Floor noise |
| Vert.    | 9608.000        | PK       | 43.50          | 38.09           | 7.76      | 38.54     | 2.26                 | 53.07           | 73.9           | 20.8        | 150         | 0           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|-------------|
| Hori.    | 2390.000        | AV       | 37.70          | 27.61           | 13.54     | 41.42     | 0.64             | 2.26                 | 40.33           | 53.9           | 13.5        | *1)         |
| Hori.    | 4804.000        | AV       | 38.60          | 32.69           | 5.57      | 41.17     | 0.64             | 2.26                 | 38.59           | 53.9           | 15.3        | Floor noise |
| Hori.    | 7206.000        | AV       | 36.40          | 37.26           | 6.90      | 39.72     | 0.64             | 2.26                 | 43.74           | 53.9           | 10.1        | Floor noise |
| Hori.    | 9608.000        | AV       | 34.80          | 38.09           | 7.76      | 38.54     | 0.64             | 2.26                 | 45.01           | 53.9           | 8.8         | Floor noise |
| Vert.    | 2390.000        | AV       | 37.80          | 27.61           | 13.54     | 41.42     | 0.64             | 2.26                 | 40.43           | 53.9           | 13.4        | *1)         |
| Vert.    | 4804.000        | AV       | 38.60          | 32.69           | 5.57      | 41.17     | 0.64             | 2.26                 | 38.59           | 53.9           | 15.3        | Floor noise |
| Vert.    | 7206.000        | AV       | 36.50          | 37.26           | 6.90      | 39.72     | 0.64             | 2.26                 | 43.84           | 53.9           | 10.0        | Floor noise |
| Vert.    | 9608.000        | AV       | 34.70          | 38.09           | 7.76      | 38.54     | 0.64             | 2.26                 | 44.91           | 53.9           | 8.9         | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2402.000        | PK       | 91.70          | 27.61           | 13.55     | 41.42     | 2.26                 | 93.70           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 38.20          | 27.60           | 13.55     | 41.42     | 2.26                 | 40.19           | 73.70          | 33.5        |         |
| Vert.    | 2402.000        | PK       | 93.70          | 27.61           | 13.55     | 41.42     | 2.26                 | 95.70           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 38.40          | 27.60           | 13.55     | 41.42     | 2.26                 | 40.39           | 75.70          | 35.3        |         |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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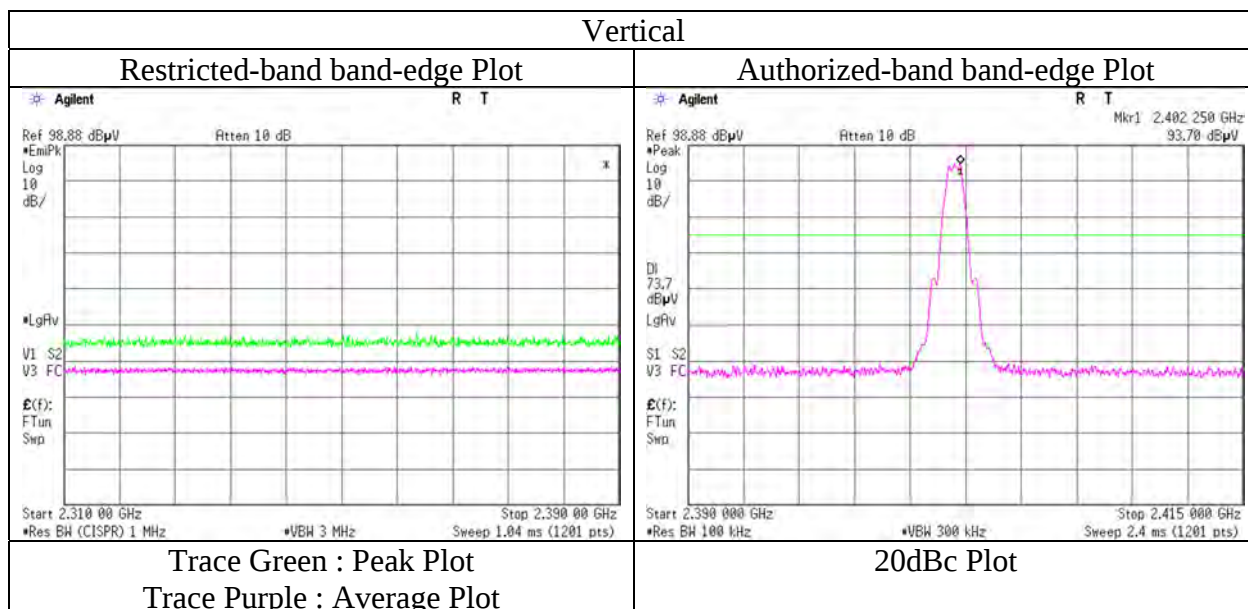
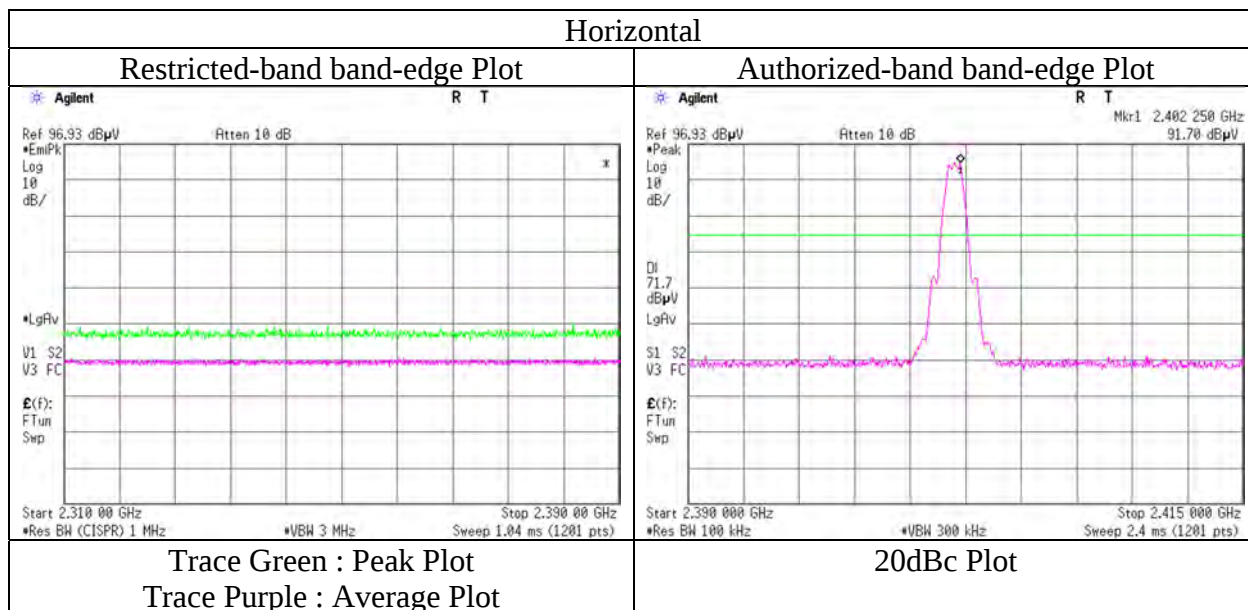
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                      |
|------------------------|--------------------------------------|
| Report No.             | 13977035M-A                          |
| Test place             | Kashima EMC Lab.                     |
| Semi Anechoic Chamber  | No.11                                |
| Date                   | November 10, 2021                    |
| Temperature / Humidity | 23 deg. C / 56 % RH                  |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 10 GHz) |
| Mode                   | Tx BT LE 2402 MHz                    |



\* 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

|                        |                     |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |                     |
| Semi Anechoic Chamber  | No.11               | No.11               | No.11               | No.11               |
| Date                   | November 11, 2021   | November 10, 2021   | November 10, 2021   | November 11, 2021   |
| Temperature / Humidity | 20 deg. C / 44 % RH | 23 deg. C / 56 % RH | 23 deg. C / 56 % RH | 20 deg. C / 44 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz) | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx BT LE 2440 MHz   |                     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 290.735            | QP       | 41.00             | 13.23              | 7.51         | 32.02        | 0.00                    | 29.72              | 46.0              | 16.2           | 160            | 142            |             |
| Hori.    | 415.043            | QP       | 36.50             | 15.97              | 8.08         | 31.97        | 0.00                    | 28.58              | 46.0              | 17.4           | 100            | 303            |             |
| Hori.    | 4880.000           | PK       | 47.00             | 32.62              | 5.62         | 41.18        | 2.26                    | 46.32              | 73.9              | 27.5           | 150            | 0              | Floor noise |
| Hori.    | 7320.000           | PK       | 44.10             | 37.54              | 6.93         | 39.66        | 2.26                    | 51.17              | 73.9              | 22.7           | 150            | 0              | Floor noise |
| Hori.    | 9760.000           | PK       | 43.20             | 38.09              | 7.81         | 38.41        | 2.26                    | 52.95              | 73.9              | 20.9           | 150            | 0              | Floor noise |
| Vert.    | 35.654             | QP       | 38.70             | 12.86              | 5.72         | 32.21        | 0.00                    | 25.07              | 40.0              | 14.9           | 100            | 249            |             |
| Vert.    | 43.595             | QP       | 31.80             | 13.59              | 5.81         | 32.21        | 0.00                    | 18.99              | 40.0              | 21.0           | 100            | 242            |             |
| Vert.    | 290.659            | QP       | 34.00             | 13.23              | 7.51         | 32.02        | 0.00                    | 22.72              | 46.0              | 23.2           | 100            | 98             |             |
| Vert.    | 329.446            | QP       | 33.50             | 14.28              | 7.69         | 31.99        | 0.00                    | 23.48              | 46.0              | 22.5           | 100            | 93             |             |
| Vert.    | 740.700            | QP       | 28.50             | 21.88              | 9.26         | 31.99        | 0.00                    | 27.65              | 46.0              | 18.3           | 100            | 337            |             |
| Vert.    | 944.436            | QP       | 26.00             | 24.12              | 9.89         | 31.06        | 0.00                    | 28.95              | 46.0              | 17.0           | 100            | 0              |             |
| Vert.    | 4880.000           | PK       | 46.30             | 32.62              | 5.62         | 41.18        | 2.26                    | 45.62              | 73.9              | 28.2           | 150            | 0              | Floor noise |
| Vert.    | 7320.000           | PK       | 45.10             | 37.54              | 6.93         | 39.66        | 2.26                    | 52.17              | 73.9              | 21.7           | 150            | 0              | Floor noise |
| Vert.    | 9760.000           | PK       | 43.30             | 38.09              | 7.81         | 38.41        | 2.26                    | 53.05              | 73.9              | 20.8           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 4880.000           | AV       | 37.40             | 32.62              | 5.62         | 41.18        | 0.64                   | 2.26                    | 37.36              | 53.9              | 16.5           | Floor noise |
| Hori.    | 7320.000           | AV       | 35.90             | 37.54              | 6.93         | 39.66        | 0.64                   | 2.26                    | 43.61              | 53.9              | 10.2           | Floor noise |
| Hori.    | 9760.000           | AV       | 34.50             | 38.09              | 7.81         | 38.41        | 0.64                   | 2.26                    | 44.89              | 53.9              | <b>9.0</b>     | Floor noise |
| Vert.    | 4880.000           | AV       | 36.00             | 32.62              | 5.62         | 41.18        | 0.64                   | 2.26                    | 35.96              | 53.9              | 17.9           | Floor noise |
| Vert.    | 7320.000           | AV       | 35.10             | 37.54              | 6.93         | 39.66        | 0.64                   | 2.26                    | 42.81              | 53.9              | 11.0           | Floor noise |
| Vert.    | 9760.000           | AV       | 34.40             | 38.09              | 7.81         | 38.41        | 0.64                   | 2.26                    | 44.79              | 53.9              | 9.1            | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

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## Radiated Spurious Emission

|                        |                     |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |                     |
| Semi Anechoic Chamber  | No.11               | No.11               | No.11               | No.11               |
| Date                   | November 11, 2021   | November 10, 2021   | November 10, 2021   | November 11, 2021   |
| Temperature / Humidity | 20 deg. C / 44 % RH | 23 deg. C / 56 % RH | 23 deg. C / 56 % RH | 20 deg. C / 44 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz) | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx BT LE 2480 MHz   |                     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 290.836            | QP       | 41.50             | 13.24              | 7.51         | 32.02        | 0.00                    | 30.23              | 46.0              | 15.7           | 137            | 142            |             |
| Hori.    | 414.880            | QP       | 38.10             | 15.97              | 8.08         | 31.97        | 0.00                    | 30.18              | 46.0              | 15.8           | 100            | 303            |             |
| Hori.    | 2483.500           | PK       | 46.70             | 28.01              | 13.61        | 41.40        | 2.26                    | 49.18              | 73.9              | 24.7           | 312            | 299            |             |
| Hori.    | 4960.000           | PK       | 46.80             | 32.69              | 5.67         | 41.18        | 2.26                    | 46.24              | 73.9              | 27.6           | 150            | 0              | Floor noise |
| Hori.    | 7440.000           | PK       | 44.60             | 37.51              | 6.98         | 39.58        | 2.26                    | 51.77              | 73.9              | 22.1           | 150            | 0              | Floor noise |
| Hori.    | 9920.000           | PK       | 43.40             | 38.26              | 7.87         | 38.27        | 2.26                    | 53.52              | 73.9              | 20.3           | 150            | 0              | Floor noise |
| Vert.    | 35.652             | QP       | 38.50             | 12.86              | 5.72         | 32.21        | 0.00                    | 24.87              | 40.0              | 15.1           | 100            | 281            |             |
| Vert.    | 43.765             | QP       | 31.80             | 13.63              | 5.81         | 32.21        | 0.00                    | 19.03              | 40.0              | 20.9           | 100            | 232            |             |
| Vert.    | 290.779            | QP       | 34.70             | 13.24              | 7.51         | 32.02        | 0.00                    | 23.43              | 46.0              | 22.5           | 100            | 100            |             |
| Vert.    | 329.845            | QP       | 33.80             | 14.29              | 7.69         | 31.99        | 0.00                    | 23.79              | 46.0              | 22.2           | 100            | 87             |             |
| Vert.    | 740.085            | QP       | 28.50             | 21.85              | 9.26         | 31.99        | 0.00                    | 27.62              | 46.0              | 18.3           | 100            | 341            |             |
| Vert.    | 945.077            | QP       | 27.10             | 24.12              | 9.89         | 31.06        | 0.00                    | 30.05              | 46.0              | 15.9           | 100            | 0              |             |
| Vert.    | 2483.500           | PK       | 46.90             | 28.01              | 13.61        | 41.40        | 2.26                    | 49.38              | 73.9              | 24.5           | 160            | 312            |             |
| Vert.    | 4960.000           | PK       | 47.40             | 32.69              | 5.67         | 41.18        | 2.26                    | 46.84              | 73.9              | 27.0           | 150            | 0              | Floor noise |
| Vert.    | 7440.000           | PK       | 44.90             | 37.51              | 6.98         | 39.58        | 2.26                    | 52.07              | 73.9              | 21.8           | 150            | 0              | Floor noise |
| Vert.    | 9920.000           | PK       | 43.40             | 38.26              | 7.87         | 38.27        | 2.26                    | 53.52              | 73.9              | 20.3           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 2483.500           | AV       | 37.60             | 28.01              | 13.61        | 41.40        | 0.64                   | 2.26                       | 40.72              | 53.9              | 13.1           | *1)         |
| Hori.    | 4960.000           | AV       | 38.10             | 32.69              | 5.67         | 41.18        | 0.64                   | 2.26                       | 38.18              | 53.9              | 15.7           | Floor noise |
| Hori.    | 7440.000           | AV       | 36.10             | 37.51              | 6.98         | 39.58        | 0.64                   | 2.26                       | 43.91              | 53.9              | 9.9            | Floor noise |
| Hori.    | 9920.000           | AV       | 34.30             | 38.26              | 7.87         | 38.27        | 0.64                   | 2.26                       | 45.06              | 53.9              | 8.8            | Floor noise |
| Vert.    | 2483.500           | AV       | 37.90             | 28.01              | 13.61        | 41.40        | 0.64                   | 2.26                       | 41.02              | 53.9              | 12.8           | *1)         |
| Vert.    | 4960.000           | AV       | 38.30             | 32.69              | 5.67         | 41.18        | 0.64                   | 2.26                       | 38.38              | 53.9              | 15.5           | Floor noise |
| Vert.    | 7440.000           | AV       | 36.30             | 37.51              | 6.98         | 39.58        | 0.64                   | 2.26                       | 44.11              | 53.9              | 9.7            | Floor noise |
| Vert.    | 9920.000           | AV       | 34.10             | 38.26              | 7.87         | 38.27        | 0.64                   | 2.26                       | 44.86              | 53.9              | 9.0            | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

**UL Japan, Inc.**

**Kashima EMC Lab.**

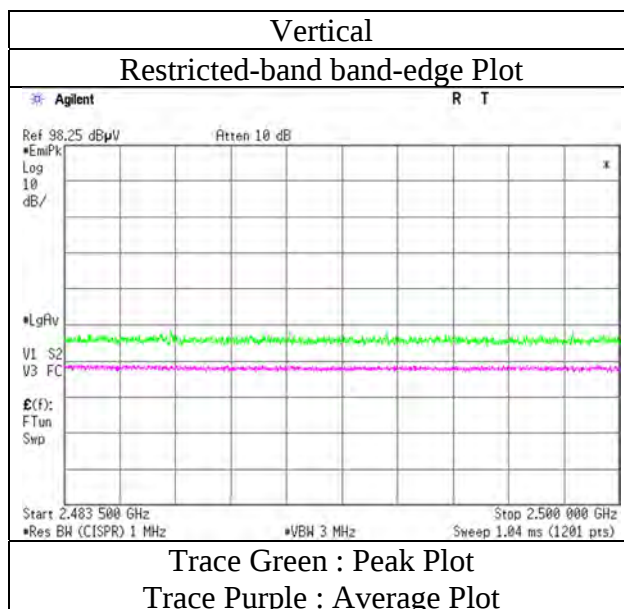
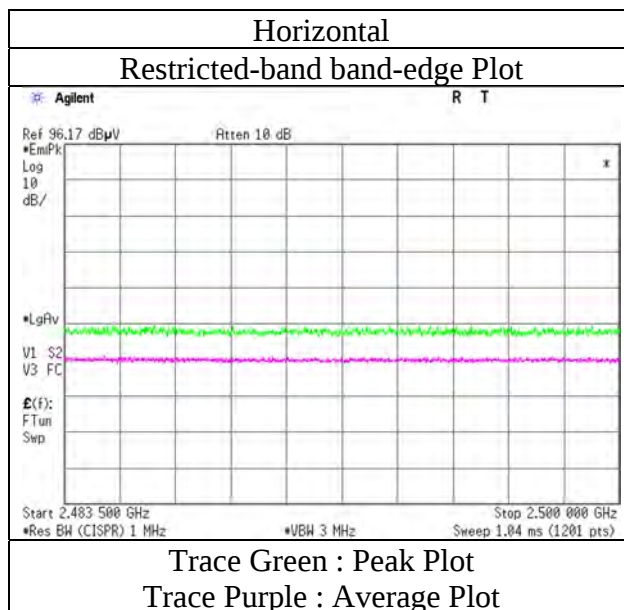
1614, Mushiata, Katori-shi, Chiba-ken, 289-0341 Japan

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## **Radiated Spurious Emission** **(Reference Plot for band-edge)**

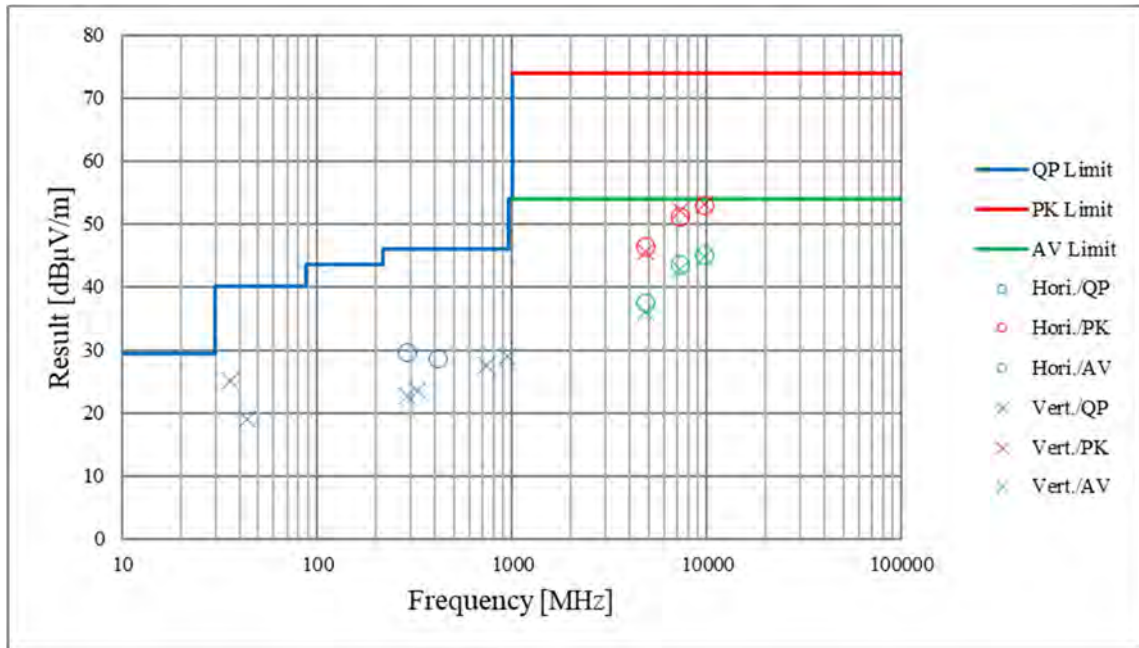
Report No. 13977035M-A  
Test place Kashima EMC Lab.  
Semi Anechoic Chamber No.11  
Date November 10, 2021  
Temperature / Humidity 23 deg. C / 56 % RH  
Engineer Hiromitsu Tanabe  
(1 GHz - 10 GHz)  
Mode Tx BT LE 2480 MHz



\* 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**  
**(Plot data, Worst case mode for Maximum Peak Output Power)**

|                        |                     |                     |                     |                     |
|------------------------|---------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A         |                     |                     |                     |
| Test place             | Kashima EMC Lab.    |                     |                     |                     |
| Semi Anechoic Chamber  | No.11               | No.11               | No.11               | No.11               |
| Date                   | November 11, 2021   | November 10, 2021   | November 10, 2021   | November 11, 2021   |
| Temperature / Humidity | 20 deg. C / 44 % RH | 23 deg. C / 56 % RH | 23 deg. C / 56 % RH | 20 deg. C / 44 % RH |
| Engineer               | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz) | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx BT LE 2440 MHz   |                     |                     |                     |



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

## Radiated Spurious Emission

|                        |                                     |
|------------------------|-------------------------------------|
| Report No.             | 13977035M-A                         |
| Test place             | Kashima EMC Lab.                    |
| Semi Anechoic Chamber  | No.10                               |
| Date                   | December 6, 2021                    |
| Temperature / Humidity | 20 deg. C / 37 % RH                 |
| Engineer               | Hiromitsu Tanabe                    |
|                        | (1 GHz - 2.8 GHz)                   |
| Mode                   | Tx BT LE 2402 MHz with 11a 5785 MHz |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2390.000           | PK       | 50.00             | 27.61              | 13.54        | 43.88        | 2.26                    | 49.53              | 73.9              | 24.3           | 159            | 300            |        |
| Vert.    | 2390.000           | PK       | 49.80             | 27.61              | 13.54        | 43.88        | 2.26                    | 49.33              | 73.9              | 24.5           | 147            | 313            |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89 \text{ m} / 3.0 \text{ m}) = 2.26 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2390.000           | AV       | 40.80             | 27.61              | 13.54        | 43.88        | 0.64                   | 2.26                    | 40.97              | 53.9              | 12.9           | *1)    |
| Vert.    | 2390.000           | AV       | 41.00             | 27.61              | 13.54        | 43.88        | 0.64                   | 2.26                    | 41.17              | 53.9              | 12.7           | *1)    |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89 \text{ m} / 3.0 \text{ m}) = 2.26 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2402.000           | PK       | 94.00             | 27.61              | 13.55        | 43.88        | 2.26                    | 93.54              | -                 | -              | Carrier |
| Hori.    | 2400.000           | PK       | 41.10             | 27.60              | 13.55        | 43.88        | 2.26                    | 40.63              | 73.54             | 32.9           |         |
| Vert.    | 2402.000           | PK       | 95.70             | 27.61              | 13.55        | 43.88        | 2.26                    | 95.24              | -                 | -              | Carrier |
| Vert.    | 2400.000           | PK       | 41.30             | 27.60              | 13.55        | 43.88        | 2.26                    | 40.83              | 75.24             | 34.4           |         |

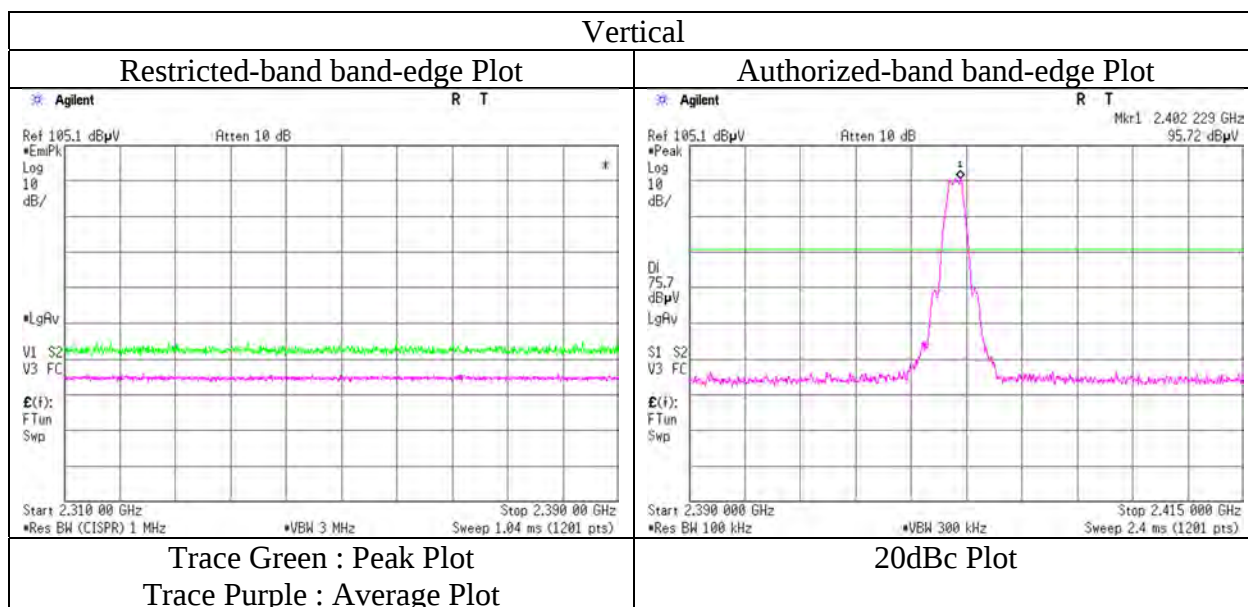
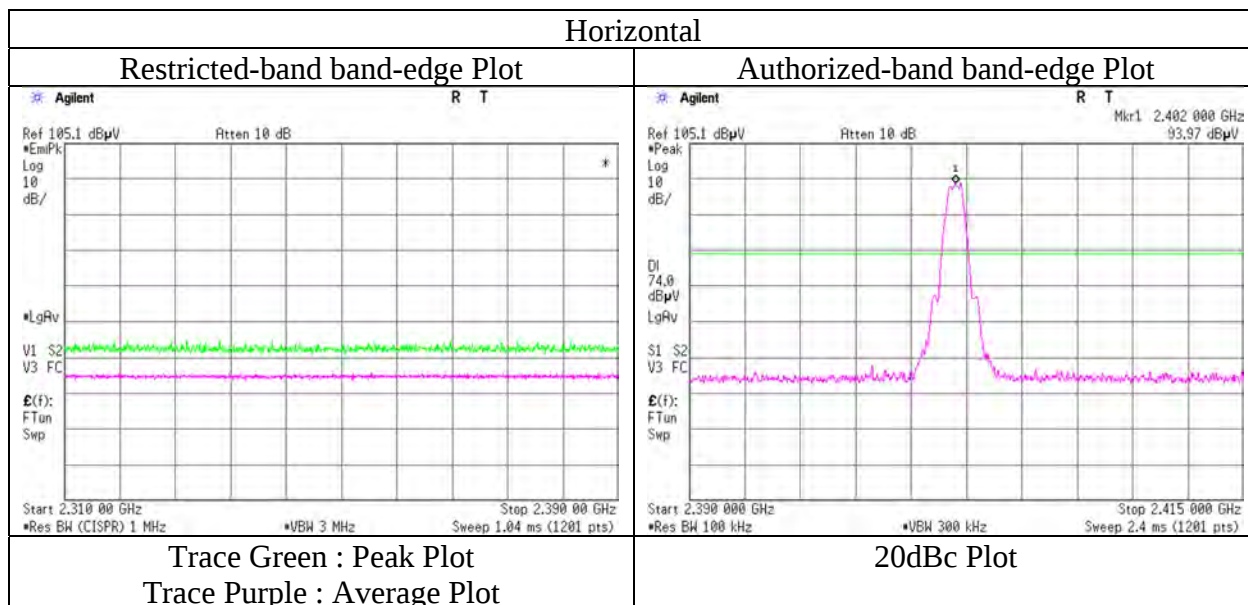
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89 \text{ m} / 3.0 \text{ m}) = 2.26 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Kashima EMC Lab.                      |
| Semi Anechoic Chamber  | No.11                                 |
| Date                   | December 6, 2021                      |
| Temperature / Humidity | 20 deg. C / 37 % RH                   |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 2.8 GHz) |
| Mode                   | Tx BT LE 2402 MHz with 11a 5785 MHz   |



\* 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

|                        |                                     |                     |                     |                     |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A                         |                     |                     |                     |
| Test place             | Kashima EMC Lab.                    |                     |                     |                     |
| Semi Anechoic Chamber  | No.11                               | No.11               | No.11               | No.11               |
| Date                   | December 8, 2021                    | December 20, 2021   | December 7, 2021    | December 7, 2021    |
| Temperature / Humidity | 23 deg. C / 41 % RH                 | 21 deg. C / 43 % RH | 20 deg. C / 45 % RH | 20 deg. C / 45 % RH |
| Engineer               | Hiromitsu Tanabe                    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz)                 | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx BT LE 2440 MHz with 11a 5785 MHz |                     |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 320.603            | QP       | 37.50             | 14.08              | 7.68         | 32.00        | 0.00                    | 27.26              | 46.0              | 18.7           | 100            | 122            |             |
| Hori.    | 951.736            | QP       | 26.40             | 24.15              | 9.97         | 31.00        | 0.00                    | 29.52              | 46.0              | 16.4           | 100            | 153            |             |
| Hori.    | 4880.000           | PK       | 52.20             | 32.62              | 5.62         | 45.22        | 2.26                    | 47.48              | 73.9              | 26.4           | 150            | 0              | Floor noise |
| Hori.    | 7320.000           | PK       | 48.60             | 37.54              | 6.93         | 43.82        | 2.26                    | 51.51              | 73.9              | 22.3           | 150            | 0              | Floor noise |
| Hori.    | 9760.000           | PK       | 47.50             | 38.09              | 7.81         | 41.84        | 2.26                    | 53.82              | 73.9              | 20.0           | 150            | 0              | Floor noise |
| Vert.    | 35.646             | QP       | 38.70             | 12.86              | 5.73         | 32.21        | 0.00                    | 25.08              | 40.0              | 14.9           | 100            | 275            |             |
| Vert.    | 54.058             | QP       | 27.80             | 13.75              | 5.94         | 32.20        | 0.00                    | 15.29              | 40.0              | 24.7           | 270            | 100            |             |
| Vert.    | 306.712            | QP       | 36.40             | 13.70              | 7.61         | 32.01        | 0.00                    | 25.70              | 46.0              | 20.3           | 100            | 264            |             |
| Vert.    | 437.005            | QP       | 29.60             | 16.82              | 8.21         | 31.98        | 0.00                    | 22.65              | 46.0              | 23.3           | 100            | 299            |             |
| Vert.    | 743.615            | QP       | 29.80             | 22.00              | 9.33         | 31.99        | 0.00                    | 29.14              | 46.0              | 16.8           | 100            | 18             |             |
| Vert.    | 945.115            | QP       | 25.10             | 24.12              | 9.95         | 31.06        | 0.00                    | 28.11              | 46.0              | 17.8           | 101            | 8              |             |
| Vert.    | 4880.000           | PK       | 51.30             | 32.62              | 5.62         | 45.22        | 2.26                    | 46.58              | 73.9              | 27.3           | 150            | 0              | Floor noise |
| Vert.    | 7320.000           | PK       | 48.20             | 37.54              | 6.93         | 43.82        | 2.26                    | 51.11              | 73.9              | 22.7           | 150            | 0              | Floor noise |
| Vert.    | 9760.000           | PK       | 47.40             | 38.09              | 7.81         | 41.84        | 2.26                    | 53.72              | 73.9              | 20.1           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 4880.000           | AV       | 42.70             | 32.62              | 5.62         | 45.22        | 0.64                   | 2.26                       | 38.62              | 53.9              | 15.2           | Floor noise |
| Hori.    | 7320.000           | AV       | 39.40             | 37.54              | 6.93         | 43.82        | 0.64                   | 2.26                       | 42.95              | 53.9              | 10.9           | Floor noise |
| Hori.    | 9760.000           | AV       | 37.80             | 38.09              | 7.81         | 41.84        | 0.64                   | 2.26                       | 44.76              | 53.9              | 9.1            | Floor noise |
| Vert.    | 4880.000           | AV       | 42.80             | 32.62              | 5.62         | 45.22        | 0.64                   | 2.26                       | 38.72              | 53.9              | 15.1           | Floor noise |
| Vert.    | 7320.000           | AV       | 39.30             | 37.54              | 6.93         | 43.82        | 0.64                   | 2.26                       | 42.85              | 53.9              | 11.0           | Floor noise |
| Vert.    | 9760.000           | AV       | 38.00             | 38.09              | 7.81         | 41.84        | 0.64                   | 2.26                       | 44.96              | 53.9              | 8.9            | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

**UL Japan, Inc.**

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## Radiated Spurious Emission

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Kashima EMC Lab.                      |
| Semi Anechoic Chamber  | No.11                                 |
| Date                   | December 6, 2021                      |
| Temperature / Humidity | 20 deg. C / 37 % RH                   |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 2.8 GHz) |
| Mode                   | Tx BT LE 2480 MHz with 11a 5785 MHz   |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2483.500           | PK       | 50.00             | 28.01              | 13.61        | 43.82        | 2.26                    | 50.06              | 73.9              | 23.8           | 187            | 54             |        |
| Vert.    | 2483.500           | PK       | 52.10             | 28.01              | 13.61        | 43.82        | 2.26                    | 52.16              | 73.9              | 21.7           | 133            | 325            |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89 \text{ m} / 3.0 \text{ m}) = 2.26 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|----------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2483.500           | AV       | 41.10             | 28.01              | 13.61        | 43.82        | 0.64                   | 2.26                       | 41.80              | 53.9              | 12.1           | *1)    |
| Vert.    | 2483.500           | AV       | 41.70             | 28.01              | 13.61        | 43.82        | 0.64                   | 2.26                       | 42.40              | 53.9              | 11.5           | *1)    |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.89 \text{ m} / 3.0 \text{ m}) = 2.26 \text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

**UL Japan, Inc.**

**Kashima EMC Lab.**

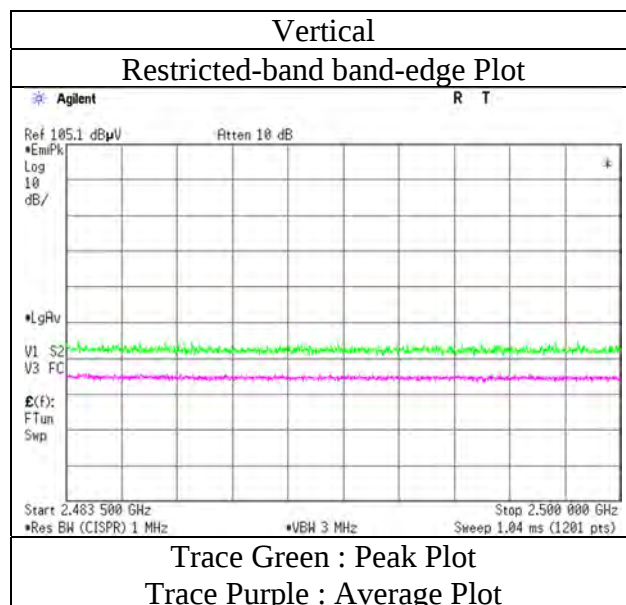
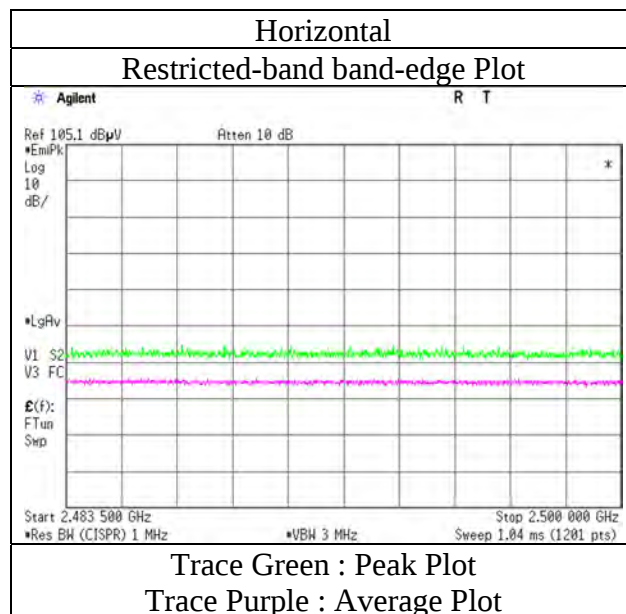
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

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## **Radiated Spurious Emission** **(Reference Plot for band-edge)**

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13977035M-A                           |
| Test place             | Kashima EMC Lab.                      |
| Semi Anechoic Chamber  | No.11                                 |
| Date                   | December 6, 2021                      |
| Temperature / Humidity | 20 deg. C / 37 % RH                   |
| Engineer               | Hiromitsu Tanabe<br>(1 GHz - 2.8 GHz) |
| Mode                   | Tx BT LE 2480 MHz with 11a 5785 MHz   |

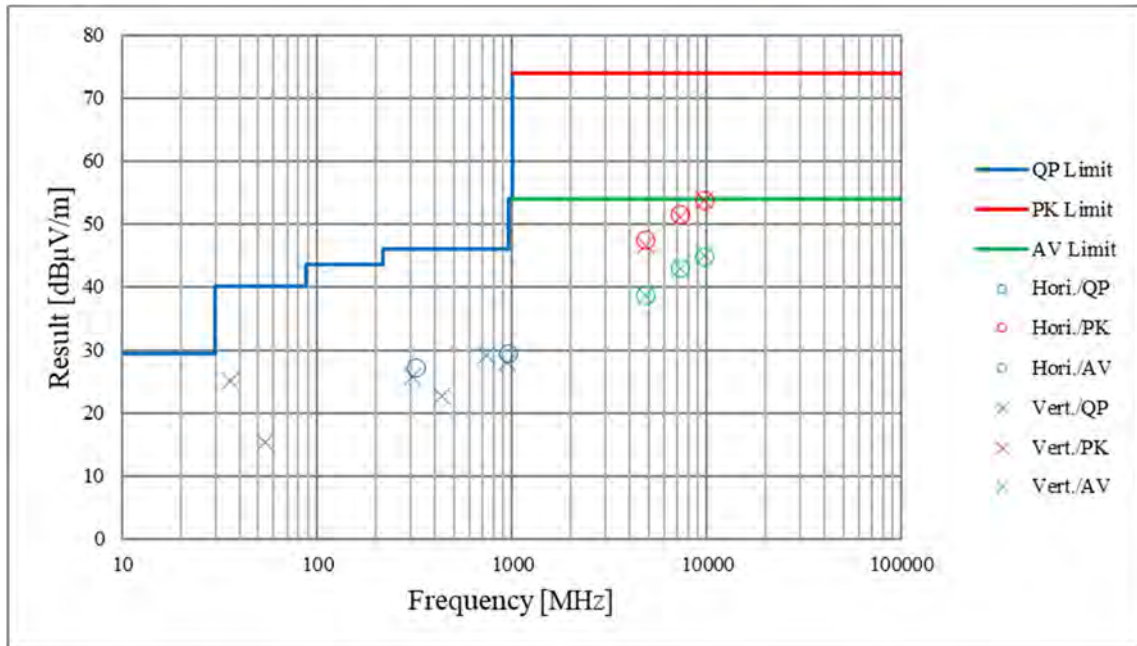


\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

(Plot data, Worst case mode for Maximum Peak Output Power)

|                        |                                     |                     |                     |                     |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|
| Report No.             | 13977035M-A                         |                     |                     |                     |
| Test place             | Kashima EMC Lab.                    |                     |                     |                     |
| Semi Anechoic Chamber  | No.11                               | No.11               | No.11               | No.11               |
| Date                   | December 8, 2021                    | December 20, 2021   | December 7, 2021    | December 7, 2021    |
| Temperature / Humidity | 23 deg. C / 41 % RH                 | 21 deg. C / 43 % RH | 20 deg. C / 45 % RH | 20 deg. C / 45 % RH |
| Engineer               | Hiromitsu Tanabe                    | Hiromitsu Tanabe    | Hiromitsu Tanabe    | Hiromitsu Tanabe    |
|                        | (30 MHz - 1000 MHz)                 | (1 GHz - 10 GHz)    | (10 GHz - 18 GHz)   | (18 GHz - 26.5 GHz) |
| Mode                   | Tx BT LE 2440 MHz with 11a 5785 MHz |                     |                     |                     |



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

## APPENDIX 2: Test instruments

### Test equipment

| Test Item | Local ID     | LIMS ID | Description                      | Manufacturer                      | Model                    | Serial                     | Last Calibration Date | Cal Int |
|-----------|--------------|---------|----------------------------------|-----------------------------------|--------------------------|----------------------------|-----------------------|---------|
| RE        | CBL-08       | 143121  | LOGBICON                         | Schwarzbeck Mess-Elektronik OHG   | VULB 9168                | 343                        | 2021/04/26            | 12      |
| RE        | CAT5-03      | 178806  | 5dB Fixed Atten.                 | Pasternack Enterprises            | PE7047-5                 | none                       | 2021/04/21            | 12      |
| RE        | CCC-S10-R3   | 143165  | 10 Site RE 3m System             | UL Japan Inc.                     | none                     | none                       | 2021/08/10            | 12      |
| RE        | CAF-28       | 183880  | Pre-Amplifier                    | UL Japan Inc.                     | ZKL-2                    | 001                        | 2021/04/26            | 12      |
| RE        | CTR-09       | 144199  | Test Receiver                    | Keysight Technologies Inc         | N9038A                   | MY53290016                 | 2021/07/16            | 12      |
| RE(GHz)   | CHA-24       | 143455  | Double Ridged Wave Guide         | ETS-Lindgren (Cedar Park, Texas)  | 3115                     | 00204569                   | 2021/02/06            | 12      |
| RE(GHz)   | CAF-22       | 142940  | Pre-Amplifier                    | Micro Wave Factory                | MPR-1G26.5-35            | 161399                     | 2021/06/11            | 12      |
| RE(GHz)   | CAF-18       | 142908  | Pre-Amplifier                    | TOYO                              | TPA0118-36               | A-1001                     | 2021/02/08            | 12      |
| RE(GHz)   | CCC-G16      | 192243  | Microwave Cable                  | Huber+Suhner                      | SF104/11N /11PC35/8000MM | 808995/4                   | 2021/01/19            | 12      |
| RE(GHz)   | CCC-G13      | 171928  | Microwave Cable                  | Huber+Suhner                      | SF102/SKm/SKm /1000mm    | 801389/2                   | 2021/08/03            | 12      |
| RE(GHz)   | CAT10-17     | 143023  | 10dB Fixed Atten.                | Weinschel - API Technologies Corp | 54A-10                   | 56251                      | 2021/05/14            | 12      |
| RE(GHz)   | CHF-04       | 143442  | HPF                              | MICRO-TRONICS                     | HPM50111-02              | 009                        | 2021/05/14            | 12      |
| RE(GHz)   | TSA-01       | 143642  | Spectrum Analyzer                | Keysight Technologies Inc         | N9030A                   | MY53310670 Version A.13.12 | 2021/05/24            | 12      |
| RE(GHz)   | CCC-G16      | 192243  | Microwave Cable                  | Huber+Suhner                      | SF104/11N /11PC35/8000MM | 808995/4                   | 2021/01/19            | 12      |
| RE(GHz)   | CHA-07       | 143438  | Double Ridged Horn               | ETS-Lindgren (Cedar Park, Texas)  | 3160-09                  | 00166043                   | 2021/06/05            | 12      |
| RE(GHz)   | CAF-19       | 142937  | Pre-Amplifier                    | TOYO                              | HAP18-26W                | 00000035                   | 2021/06/23            | 12      |
| RE(GHz)   | CCC-W09      | 143113  | Micro Wave Cable                 | Suhner                            | SUCOFLEX104              | MY588/4                    | 2021/08/03            | 12      |
| RE        | CSCL-12      | 143653  | Ruler                            | TAJIMA                            | L19-55                   | none                       | -                     | -       |
| RE        | COS-10       | 143542  | Temperature & Humidity Indicator | HIOKI E.E. CORPORATION            | 3641/9680-50             | 090999895 /090905406       | 2021/06/24            | 12      |
| RE        | CBM-10       | 143133  | Barometer                        | Sunoh                             | SBR-151                  | 001439                     | 2021/11/24            | 36      |
| RE        | CTS-14       | 144216  | Digital Multimeter               | Fluke Corporation                 | 115                      | 994460954                  | 2021/10/20            | 12      |
| RE        | COTS-CEMI-03 | 178804  | EMI Software                     | TSJ (Techno Science Japan)        | TEPTO-DV3 (RE,CE,ME,PE)  | Ver 3.1.0484               | -                     | -       |

\*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

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