



# **RADIO TEST REPORT**

**Test Report No. : 13554183S-B**

**Applicant** : Sony Corporation, Japan and Sony Group Companies  
**Type of EUT** : CONTROL BOX  
**Model Number of EUT** : TMR-A9WT (Module: WM-BAC-AT-49)  
**FCC ID** : AK8TMRA9WT  
**Test regulation** : FCC Part 15 Subpart C: 2021  
\*Bluetooth (BR / EDR) part  
**Test Result** : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
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. Shonan 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.

**Date of test:** October 14 to November 28, 2020

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CERTIFICATE 1266.03

- ☐ 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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## **REVISION HISTORY**

**Original Test Report No.: 13554183S-B**

| Revision     | Test report No. | Date                 | Page revised | Contents |
|--------------|-----------------|----------------------|--------------|----------|
| - (Original) | 13554183S-B     | February 26,<br>2021 | -            | -        |

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

|                |                                                                 |         |                                                     |
|----------------|-----------------------------------------------------------------|---------|-----------------------------------------------------|
| A2LA           | The American Association for Laboratory Accreditation           | MCS     | Modulation and Coding Scheme                        |
| AC             | Alternating Current                                             | MRA     | Mutual Recognition Arrangement                      |
| AFH            | Adaptive Frequency Hopping                                      | N/A     | Not Applicable                                      |
| AM             | Amplitude Modulation                                            | NIST    | National Institute of Standards and Technology      |
| Amp, AMP       | Amplifier                                                       | NS      | No signal detect.                                   |
| ANSI           | American National Standards Institute                           | NSA     | Normalized Site Attenuation                         |
| Ant, ANT       | Antenna                                                         | NVLAP   | National Voluntary Laboratory Accreditation Program |
| AP             | Access Point                                                    | OBW     | Occupied Band Width                                 |
| 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    | Quadri-Phase Shift Keying                           |
| CW             | Continuous Wave                                                 | RBW     | Resolution Band Width                               |
| 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                                               | RSS     | Radio Standards Specifications                      |
| DSSS           | Direct Sequence Spread Spectrum                                 | 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      | Test Receiver                                       |
| EN             | European Norm                                                   | Tx      | Transmitting                                        |
| ERP, e.r.p.    | Effective Radiated Power                                        | VBW     | Video BandWidth                                     |
| EU             | European Union                                                  | Vert.   | Vertical                                            |
| EUT            | Equipment Under Test                                            | WLAN    | Wireless LAN                                        |
| 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                                              |         |                                                     |
| LIMS           | Laboratory Information Management System                        |         |                                                     |

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## **SECTION 1: Customer information**

|                |   |                                                  |
|----------------|---|--------------------------------------------------|
| Company Name   | : | Sony Corporation, Japan and Sony Group Companies |
| Address        | : | 1-7-1 Konan Minato-ku, Tokyo, 108-0075 Japan     |
| Contact Person | : | Kazuhiko Nagano                                  |

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                       | : | CONTROL BOX                                                                                |
| Model Number               | : | TMR-A9WT                                                                                   |
| Serial Number              | : | Refer to SECTION 4.2                                                                       |
| Rating                     | : | AC adapter Input: AC 100 V – 240 V, 50/60 Hz<br>DC 12 V                                    |
| Receipt Date               | : | October 1, 2020                                                                            |
| Country of Mass-production | : | Malaysia                                                                                   |
| Condition                  | : | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification               | : | No Modification by the test lab.                                                           |

### **2.2 Product Description**

Model: TMR-A9WT (referred to as the EUT in this report) is a CONTROL BOX.

|                            |   |                                                                       |
|----------------------------|---|-----------------------------------------------------------------------|
| Clock frequency of the EUT | : | 48 MHz (MAX) (Module A: WM-BAC-AT-49)<br>48 MHz (MAX) (Module B: 1PJ) |
|----------------------------|---|-----------------------------------------------------------------------|

## Radio Specification

<Module A: model No. WM-BAC-AT-49> (\* The module covered by this report.)

|                        | Bluetooth (BR/EDR) *1)                           | Bluetooth (Low Energy) *1) |
|------------------------|--------------------------------------------------|----------------------------|
| Frequency of operation | 2402 MHz - 2480 MHz                              | 2402 MHz - 2480 MHz        |
| Channel spacing        | 1 MHz                                            | 2 MHz                      |
| Modulation             | FHSS: GFSK (*, EDR: GFSK+ /4-DQPSK, GFSK+ 8DPSK) |                            |
| Antenna type           | Dipole antenna                                   |                            |
| Antenna Gain           | 3.54 dBi                                         |                            |
| Antenna                | U.FL connector                                   |                            |
| Connector type         |                                                  |                            |

\*1) The Bluetooth part antenna and the Module B antenna are common antenna.

|                        | IEEE802.11b                                                                                                                                                                                                                | IEEE802.11g                                                                              | IEEE802.11n<br>(20 MHz band)                                                                                    | IEEE802.11n<br>(40 MHz band)                                                             |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Frequency of operation | 2412 MHz - 2462 MHz                                                                                                                                                                                                        | 2412 MHz - 2462 MHz                                                                      | 2412 MHz - 2462 MHz<br>5180 MHz - 5240 MHz<br>5260 MHz - 5320 MHz<br>5500 MHz - 5720 MHz<br>5745 MHz - 5825 MHz | 5190 MHz - 5230 MHz<br>5270 MHz - 5310 MHz<br>5510 MHz - 5710 MHz<br>5755 MHz - 5795 MHz |
| Channel spacing        | 5 MHz                                                                                                                                                                                                                      |                                                                                          | 2.4 GHz band<br>5 MHz<br>5 GHz band<br>20 MHz                                                                   | 5 GHz band<br>40 MHz                                                                     |
| Modulation             | DSSS:<br>DBPSK, DQPSK, CCK                                                                                                                                                                                                 | OFDM:<br>BPSK, QPSK, 16QAM, 64QAM                                                        |                                                                                                                 |                                                                                          |
|                        | IEEE802.11a                                                                                                                                                                                                                | IEEE802.11ac<br>(20 MHz band)                                                            | IEEE802.11ac<br>(40 MHz band)                                                                                   | IEEE802.11ac<br>(80 MHz band)                                                            |
| Frequency of operation | 5180 MHz - 5240 MHz<br>5260 MHz - 5320 MHz<br>5500 MHz - 5720 MHz<br>5745 MHz - 5825 MHz                                                                                                                                   | 5180 MHz - 5240 MHz<br>5260 MHz - 5320 MHz<br>5500 MHz - 5720 MHz<br>5745 MHz - 5825 MHz | 5190 MHz - 5230 MHz<br>5270 MHz - 5310 MHz<br>5510 MHz - 5710 MHz<br>5755 MHz - 5795 MHz                        | 5210 MHz<br>5290 MHz<br>5530 MHz - 5610 MHz<br>5690 MHz<br>5775 MHz                      |
| Channel spacing        | 20 MHz                                                                                                                                                                                                                     |                                                                                          | 40 MHz                                                                                                          | 80 MHz                                                                                   |
| Modulation             | OFDM<br>BPSK, QPSK, 16QAM, 64QAM, 256QAM (*256QAM is only for IEEE802.11ac 80 MHz band)                                                                                                                                    |                                                                                          |                                                                                                                 |                                                                                          |
| Antenna type           | Dipole antenna                                                                                                                                                                                                             |                                                                                          |                                                                                                                 |                                                                                          |
| Antenna Gain           | ANT0 : 1.36 dBi (2.4 GHz), 3.71 dBi (U-NII-1), 2.60 dBi (U-NII-2A), 2.48 dBi (U-NII-2C), 3.09 dBi (U-NII-3)<br>ANT1 : 1.90 dBi (2.4 GHz), 5.79 dBi (U-NII-1), 5.79 dBi (U-NII-2A), 5.12 dBi (U-NII-2C), 4.13 dBi (U-NII-3) |                                                                                          |                                                                                                                 |                                                                                          |
| Antenna                | U.FL connector                                                                                                                                                                                                             |                                                                                          |                                                                                                                 |                                                                                          |
| Connector type         |                                                                                                                                                                                                                            |                                                                                          |                                                                                                                 |                                                                                          |

<Module B: Model No. 1PJ>

|                        | IEEE802.11a                                                                              | IEEE802.11n<br>(20 MHz band)                                                             | IEEE802.11n<br>(40 MHz band)                                                             |  |
|------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--|
| Frequency of operation | 5180 MHz - 5240 MHz<br>5260 MHz - 5320 MHz<br>5500 MHz - 5700 MHz<br>5745 MHz - 5825 MHz | 5180 MHz - 5240 MHz<br>5260 MHz - 5320 MHz<br>5500 MHz - 5700 MHz<br>5745 MHz - 5825 MHz | 5190 MHz - 5230 MHz<br>5270 MHz - 5310 MHz<br>5510 MHz - 5670 MHz<br>5755 MHz - 5795 MHz |  |
| Channel spacing        | 20 MHz                                                                                   | 20 MHz                                                                                   | 40 MHz                                                                                   |  |
| Modulation             | DSSS:<br>DBPSK, DQPSK, CCK                                                               | OFDM:<br>BPSK, QPSK, 16QAM, 64QAM                                                        |                                                                                          |  |
| Antenna type           | Dipole antenna                                                                           |                                                                                          |                                                                                          |  |
| Antenna Gain           | ANT : 4.64 dBi (U-NII-1), 4.48 dBi (U-NII-2A), 4.76 dBi (U-NII-2C), 4.76 dBi (U-NII-3)   |                                                                                          |                                                                                          |  |
| Antenna                | U.FL connector                                                                           |                                                                                          |                                                                                          |  |
| Connector type         |                                                                                          |                                                                                          |                                                                                          |  |

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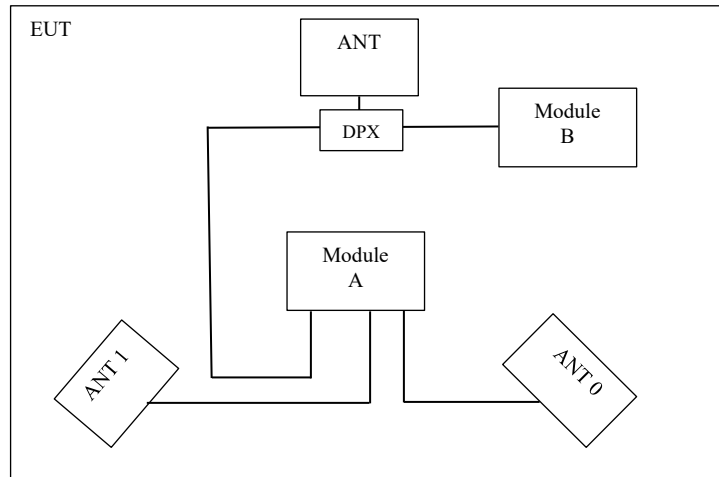
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Additional information for specification:



The EUT has Module A and Module B.

\* DPX: Diplexer.

Combination of antennas used

|       | BT       | BT LE    | WLAN<br>2.4 GHz | WLAN<br>5 GHz |
|-------|----------|----------|-----------------|---------------|
| ANT   | Module A | Module A | -               | Module B      |
| ANT 0 | -        | -        | Module A        | Module A      |
| ANT 1 | -        | -        | Module A        | Module A      |

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021  
\* The revision does not affect the test result conducted before its effective date.

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

### 3.2 Procedures and results

| Item                                     | Test Procedure                                                           | Specification                                                              | Worst Margin                                                                                                           | Results             | Remarks                                         |
|------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------|
| Conducted Emission                       | FCC: ANSI C63.10-2013<br>6. Standard test methods<br>ISED: RSS-Gen 8.8   | FCC: Section 15.207<br>ISED: RSS-Gen 8.8                                   | 14.3 dB<br>11.66100 MHz, AV, N<br>Tx 3DH5 2402 MHz<br>with Module A 11n-20<br>5320 MHz and Module B<br>11n-20 5580 MHz | Complied<br>a)      | -                                               |
| Carrier Frequency Separation             | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)<br>ISED: RSS-247 5.1 (b)                         | See data.                                                                                                              | Complied<br>b)      | Conducted                                       |
| 20 dB Bandwidth                          | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)<br>ISED: RSS-247 5.1 (a)                         |                                                                                                                        | Complied<br>b)      | Conducted                                       |
| Number of Hopping Frequency              | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)(iii)<br>ISED: RSS-247 5.1 (d)                    |                                                                                                                        | Complied<br>c)      | Conducted                                       |
| Dwell time                               | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)(iii)<br>ISED: RSS-247 5.1 (d)                    |                                                                                                                        | Complied<br>d)      | Conducted                                       |
| Maximum Peak Output Power                | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: RSS-Gen 6.12 | FCC: Section 15.247(a)(b)(1)<br>ISED: RSS-247 5.4 (b)                      |                                                                                                                        | Complied<br>e)      | Conducted                                       |
| Spurious Emission & Band Edge Compliance | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: RSS-Gen 6.13 | FCC: Section 15.247(d)<br>ISED: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 7.5 dB<br>45.048 MHz, QP, Vert.<br>Tx, 3DH5 2480 MHz                                                                   | Complied<br>f) / g) | Conducted/<br>Radiated<br>(above 30 MHz)<br>*1) |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

\*1) Radiated test was selected over 30 MHz based on section 15.247(d).

a) Refer to APPENDIX 1 (data of Conducted Emission)

b) Refer to APPENDIX 1 (data of 20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation)

c) Refer to APPENDIX 1 (data of Number of Hopping Frequency)

d) Refer to APPENDIX 1 (data of Dwell time)

e) Refer to APPENDIX 1 (data of Maximum Peak Output Power)

f) Refer to APPENDIX 1 (data of Conducted Spurious Emission)

g) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

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)**

This EUT provides the stable voltage constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

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

### 3.3 Addition to standard

| Item                                                                                                      | Test Procedure    | Specification | Worst margin | Results | Remarks   |
|-----------------------------------------------------------------------------------------------------------|-------------------|---------------|--------------|---------|-----------|
| 99% Occupied Bandwidth                                                                                    | ISED: RSS-Gen 6.7 | ISED: -       | N/A          | -<br>b) | Conducted |
| b) Refer to APPENDIX 1 (data of 20 dB Bandwidth, 99 %Occupied Bandwidth and Carrier Frequency Separation) |                   |               |              |         |           |

Other than above, 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 or not laboratory uncertainty is applied.

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

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| Item                                             | Frequency range | Uncertainty (+/-) |                |                |                |
|--------------------------------------------------|-----------------|-------------------|----------------|----------------|----------------|
|                                                  |                 | No. 1 SAC / SR    | No. 2 SAC / SR | No. 3 SAC / SR | No. 4,5,6,8 SR |
| Conducted emission (AC Mains) LISN               | 150 kHz-30 MHz  | 2.6 dB            | 2.6 dB         | 2.5 dB         | 2.6 dB         |
| Radiated emission<br>(Measurement distance: 3 m) | 9 kHz-30 MHz    | 3.0 dB            | 3.0 dB         | 3.0 dB         | -              |
|                                                  | 30 MHz-200 MHz  | 4.6 dB            | 4.6 dB         | 4.6 dB         | -              |
|                                                  | 200 MHz-1 GHz   | 6.0 dB            | 6.0 dB         | 6.0 dB         | -              |
|                                                  | 1 GHz-6 GHz     | 4.9 dB            | 4.9 dB         | 4.9 dB         | -              |
|                                                  | 6 GHz-18 GHz    | 5.5 dB            | 5.5 dB         | 5.5 dB         | -              |
|                                                  | 18 GHz-40 GHz   | 5.4 dB            | 5.4 dB         | 5.4 dB         | -              |
| Radiated emission<br>(Measurement distance: 1 m) | 1 GHz-18 GHz    | 5.8 dB            | 5.8 dB         | 5.8 dB         | -              |
|                                                  | 18 GHz-40 GHz   | 5.7 dB            | 5.7 dB         | 5.7 dB         | -              |

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

| Antenna terminal test                                    | Uncertainty (+/-) |
|----------------------------------------------------------|-------------------|
| Power Measurement above 1 GHz (Average Detector)_ SPM-06 | 0.98 dB           |
| Power Measurement above 1 GHz (Peak Detector)_ SPM-06    | 1.75 dB           |
| Power Measurement above 1 GHz (Average Detector)_ SPM-07 | 0.89 dB           |
| Power Measurement above 1 GHz (Peak Detector)_ SPM-07    | 1.12 dB           |
| Power Measurement above 1 GHz (Average Detector)_ SPM-13 | 1.06 dB           |
| Power Measurement above 1 GHz (Peak Detector)_ SPM-13    | 1.24 dB           |
| Spurious emission (Conducted) below 1GHz                 | 0.9 dB            |
| Spurious emission (Conducted) 1 GHz-3 GHz                | 0.9 dB            |
| Spurious emission (Conducted) 3 GHz-18 GHz               | 2.9 dB            |
| Spurious emission (Conducted) 18 GHz-26.5 GHz            | 2.6 dB            |
| Spurious emission (Conducted) 26.5 GHz-40 GHz            | 2.0 dB            |
| Bandwidth Measurement                                    | 0.07 %            |
| Duty cycle and Time Measurement                          | 0.262 %           |
| Temperature                                              | 0.95 deg.C.       |
| Voltage                                                  | 0.83 %            |

### 3.5 Test Location

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A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

| Test site                  | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|----------------------------|------------------------|----------------------------|------------------------------------------------------------------|------------------------------|
| No.1 Semi-anechoic chamber | 2973D-1                | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.2 Semi-anechoic chamber | 2973D-2                | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.3 Semi-anechoic chamber | 2973D-3                | 12.7 x 7.7 x 5.35          | 12.7 x 7.7                                                       | 5 m                          |
| No.4 Semi-anechoic chamber | -                      | 8.1 x 5.1 x 3.55           | 8.1 x 5.1                                                        | -                            |
| No.1 Shielded room         | -                      | 6.8 x 4.1 x 2.7            | 6.8 x 4.1                                                        | -                            |
| No.2 Shielded room         | -                      | 6.8 x 4.1 x 2.7            | 6.8 x 4.1                                                        | -                            |
| No.3 Shielded room         | -                      | 6.3 x 4.7 x 2.7            | 6.3 x 4.7                                                        | -                            |
| No.4 Shielded room         | -                      | 4.4 x 4.7 x 2.7            | 4.4 x 4.7                                                        | -                            |
| No.5 Shielded room         | -                      | 7.8 x 6.4 x 2.7            | 7.8 x 6.4                                                        | -                            |
| No.6 Shielded room         | -                      | 7.8 x 6.4 x 2.7            | 7.8 x 6.4                                                        | -                            |
| No.8 Shielded room         | -                      | 3.45 x 5.5 x 2.4           | 3.45 x 5.5                                                       | -                            |
| No.1 Measurement room      | -                      | 2.55 x 4.1 x 2.5           | -                                                                | -                            |

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

Refer to APPENDIX.

## SECTION 4: Operation of EUT during testing

### 4.1 Operating Mode(s)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Mode                                                                                        | Tested frequency                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------|
| Spurious Emission<br>(Conducted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Tx (Hopping Off) DH5, 3DH5                                                                  | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Conducted Emission,<br>Spurious Emission<br>(Radiated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tx (Hopping Off) DH5, 3DH5                                                                  | 2402 MHz<br>2441 MHz<br>2480 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Tx (Hopping Off) DH5, 3DH5<br>with Module A 11n-20 5320 MHz<br>and Module B 11n-20 5580 MHz | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Carrier Frequency Separation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Tx (Hopping On) DH5, 3DH5                                                                   | 2402 MHz<br>2441 MHz<br>2480 MHz |
| 20 dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Tx (Hopping Off) DH5, 3DH5                                                                  | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Number of Hopping Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Tx (Hopping On) DH5, 3DH5                                                                   | -                                |
| Dwell time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tx (Hopping On),<br>-DH1, DH3, DH5<br>-3DH1, 3DH3, 3DH5                                     | -                                |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Tx (Hopping Off) DH5, 2DH5, 3DH5                                                            | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Band Edge Compliance<br>(Conducted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Tx DH5, 3DH5<br>-Hopping On<br>-Hopping Off                                                 | 2402 MHz<br>2480 MHz             |
| 99 % Occupied Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tx DH5, 3DH5<br>-Hopping On<br>-Hopping Off                                                 | 2402 MHz<br>2441 MHz<br>2480 MHz |
| <p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows;<br/> Power settings: Fixed<br/> Software: (single transmission)<br/> AT-49 BT Test Ver 1.1<br/> (Date: 2020.10.14, Storage location: Driven by connected PC)<br/> (simultaneous transmission)<br/> AT-49 BT Test Ver 1.2, LBEE5ZZ1PJ_331_RF_Test_v1.1<br/> (Date: 2020.11.06, Storage location: Driven by connected PC)<br/> AT-49 RF Test Ver 1.4<br/> (Date: 2020.11.20, Storage location: Driven by connected PC)</p> <p>*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.</p> |                                                                                             |                                  |

**UL Japan, Inc.**

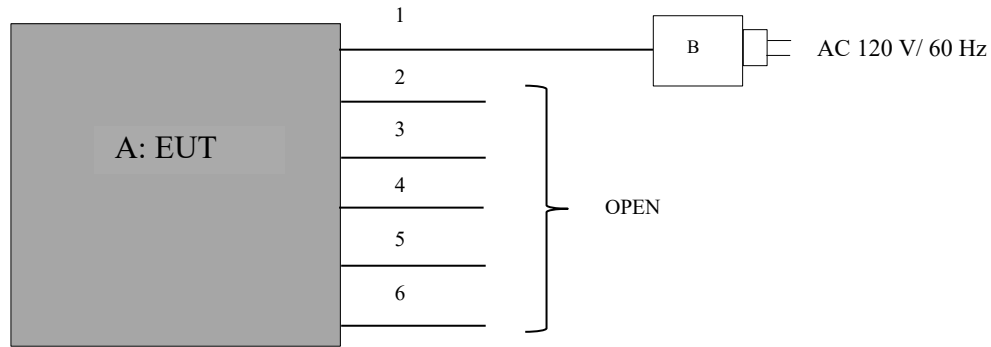
**Shonan EMC Lab.**

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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.

### Description of EUT and Support equipment

| No. | Item        | Model number | Serial number                       | Manufacturer | Remarks |
|-----|-------------|--------------|-------------------------------------|--------------|---------|
| A   | CONTROL BOX | TMR-A9WT     | 1 *1)<br>1000002 *2)<br>1000015 *3) | SONY         | EUT *4) |
| B   | AC Adaptor  | AC-M1215UC   | M2090660255                         | SONY         | -       |

\*1) Used for Antenna Terminal conducted test

\*2) Used for Radiated Emission test (single transmission)

\*3) Used for Conducted Emission test and Radiated Emission test (simultaneous transmission)

\*4) The EUT is mounted Module A(WM-BAC-AT-49) and Module B(1PJ) on its inside.

### List of cables used

| No. | Name  | Length (m) | Shield     |            | Remarks  |
|-----|-------|------------|------------|------------|----------|
|     |       |            | Cable      | Connector  |          |
| 1   | DC    | 1.5        | Unshielded | Unshielded | -        |
| 2   | USB   | 1.7        | Shielded   | Shielded   | -        |
| 3   | Audio | 2.0        | Shielded   | Shielded   | -        |
| 4   | LAN   | 1.0        | Unshielded | Unshielded | Cat.5e   |
| 5   | HDMI  | 1.5        | Shielded   | Shielded   | HDMI OUT |
| 6   | HDMI  | 1.8        | Shielded   | Shielded   | HDMI IN  |

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

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 rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

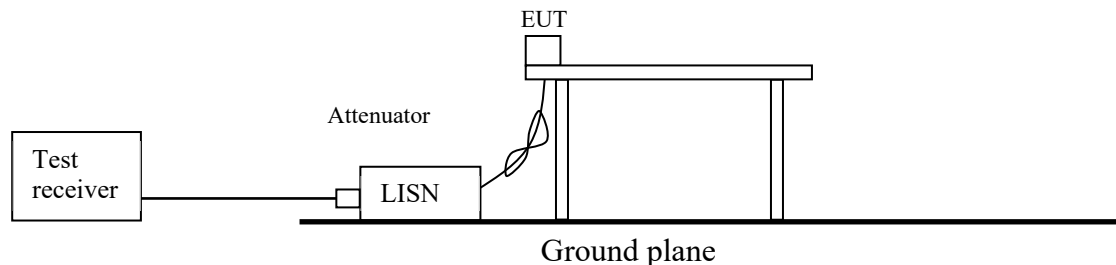
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

|                          |                            |
|--------------------------|----------------------------|
| <b>Detector</b>          | <b>: QP and CISPR AV</b>   |
| <b>Measurement range</b> | <b>: 0.15 MHz - 30 MHz</b> |
| <b>Test data</b>         | <b>: APPENDIX</b>          |
| <b>Test result</b>       | <b>: Pass</b>              |

**Figure 1: Test Setup**



## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

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

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

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

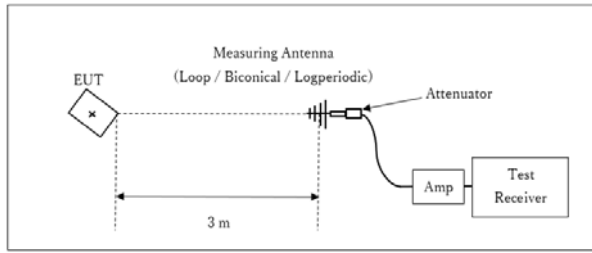
|                 |               |                          |                                                                                                       |                              |
|-----------------|---------------|--------------------------|-------------------------------------------------------------------------------------------------------|------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz              |                                                                                                       | 20 dBc                       |
| Instrument used | Test Receiver | Spectrum Analyzer *a)    |                                                                                                       | Spectrum Analyzer            |
| Detector        | QP            | PK                       | AV *1)                                                                                                | PK                           |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz | RBW: 1 MHz<br>VBW: 1/T<br>(T: burst length, refer to Burst rate confirmation sheet)<br>Detector: Peak | RBW: 100 kHz<br>VBW: 300 kHz |

\*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r02.

\*a) The Spectrum Analyzer was used in 3 dB resolution bandwidth.

**Figure 2: Test Setup**

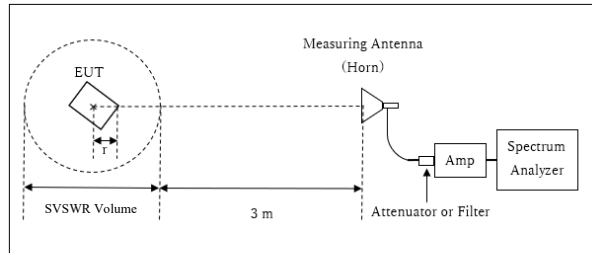
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



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

Distance Factor:  $20 \times \log (3.9 \text{ m} / 3.0 \text{ m}) = 2.28 \text{ dB}$

\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.9 \text{ m}$

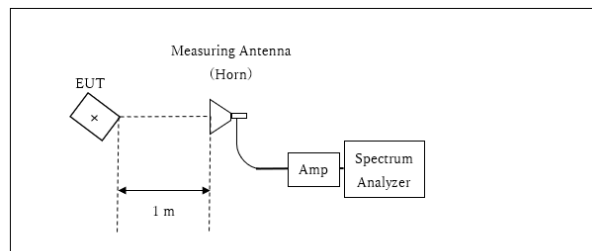
SVSWR Volume : 2.0 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4.)

r = 0.1 m

\* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

10 GHz - 26.5 GHz



x : Center of turn table

Distance Factor:  $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

\*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 - 26.5 GHz |
| Test data         | : APPENDIX          |
| Test result       | : Pass              |

## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

| Test                                             | Span                                    | RBW             | VBW                | Sweep time                                                     | Detector         | Trace       | Instrument used                  |
|--------------------------------------------------|-----------------------------------------|-----------------|--------------------|----------------------------------------------------------------|------------------|-------------|----------------------------------|
| 20 dB Bandwidth                                  | 3 MHz                                   | 30 kHz          | 100 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer                |
| 99 % Occupied Bandwidth *1)                      | Enough width to display emission skirts | 1 to 5 % of OBW | Three times of RBW | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer                |
| Maximum Peak Output Power                        | -                                       | -               | -                  | Auto                                                           | Peak Average *2) | -           | Power Meter (Sensor: 160 MHz BW) |
| Carrier Frequency Separation                     | 3 MHz                                   | 100 kHz         | 300 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer                |
| Number of Hopping Frequency                      | 30 MHz                                  | 100 kHz         | 300 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer                |
| Dwell Time                                       | Zero Span                               | 100 kHz, 1 MHz  | 300 kHz, 3 MHz     | As necessary capture the entire dwell time per hopping channel | Peak             | Clear Write | Spectrum Analyzer                |
| Conducted Spurious Emission *3) *4)              | 9 kHz to 150 kHz                        | 200 Hz          | 620 Hz             | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer                |
|                                                  | 150 kHz to 30 MHz                       | 10 kHz          | 30 kHz             |                                                                |                  |             |                                  |
|                                                  | 30 MHz to 25 GHz                        | 100 kHz         | 300 kHz            |                                                                |                  |             |                                  |
| Conducted Spurious Emission Band Edge compliance | 10 MHz                                  | 100 kHz         | 300 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer                |

\*1) Peak hold was applied as Worst-case measurement.

\*2) Reference data

\*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.

(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

\*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to  $45.5 - 51.5 = -6.0$  dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

The equipment and cables were not used for factor 0 dB of the data sheets.

**Test data** : APPENDIX

**Test result** : Pass

## APPENDIX 1: Test data

### Conducted Emission

#### DATA OF CONDUCTED EMISSION TEST

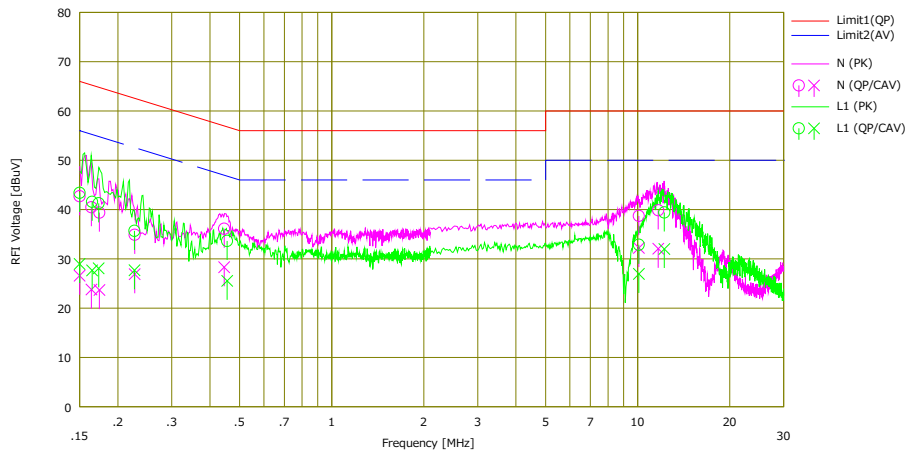
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room  
Date : 2020/11/28

Mode : Tx DH5 2402 MHz  
Power : AC 120 V / 60 Hz  
Temp./Humi. : 22 deg.C / 45 %RH

Remarks : -

Limit : FCC\_Part 15 Subpart C(15.207)

Engineer : Kazuya Noda



| No. | Freq.<br>[MHz] | Reading        |                 | C.Fac | Results        |                 | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|-----------------|-------|----------------|-----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | [QP]<br>[dBuV] | [CAV]<br>[dBuV] |       | [QP]<br>[dBuV] | [CAV]<br>[dBuV] | [QP]<br>[dBuV] | [AV]<br>[dBuV] | [QP]<br>[dB] | [AV]<br>[dB] |       |         |
| 1   | 0.15000        | 30.10          | 14.00           | 12.60 | 42.70          | 26.60           | 66.00          | 56.00          | 23.3         | 29.4         | N     |         |
| 2   | 0.16395        | 27.90          | 11.20           | 12.59 | 40.49          | 23.79           | 65.26          | 55.26          | 24.7         | 31.4         | N     |         |
| 3   | 0.17400        | 26.80          | 11.10           | 12.59 | 39.39          | 23.69           | 64.77          | 54.77          | 25.3         | 31.0         | N     |         |
| 4   | 0.22704        | 22.30          | 14.30           | 12.60 | 34.90          | 26.90           | 62.56          | 52.56          | 27.6         | 25.6         | N     |         |
| 5   | 0.44530        | 23.50          | 15.70           | 12.62 | 36.12          | 28.32           | 56.96          | 46.96          | 20.8         | 18.6         | N     |         |
| 6   | 10.08550       | 25.10          | 18.60           | 13.62 | 38.72          | 32.22           | 60.00          | 50.00          | 21.2         | 17.7         | N     |         |
| 7   | 11.67050       | 26.10          | 18.30           | 13.76 | 39.86          | 32.06           | 60.00          | 50.00          | 20.1         | 17.9         | N     |         |
| 8   | 0.15000        | 30.80          | 16.40           | 12.58 | 43.38          | 28.98           | 66.00          | 56.00          | 22.6         | 27.0         | L1    |         |
| 9   | 0.16472        | 29.00          | 15.10           | 12.58 | 41.58          | 27.68           | 65.22          | 55.22          | 23.6         | 27.5         | L1    |         |
| 10  | 0.17314        | 28.70          | 15.50           | 12.58 | 41.28          | 28.08           | 64.81          | 54.81          | 23.5         | 26.7         | L1    |         |
| 11  | 0.22666        | 23.10          | 15.10           | 12.59 | 35.69          | 27.69           | 62.57          | 52.57          | 26.8         | 24.8         | L1    |         |
| 12  | 0.45520        | 21.00          | 12.90           | 12.64 | 33.64          | 25.54           | 56.78          | 46.78          | 23.1         | 21.2         | L1    |         |
| 13  | 10.08630       | 19.40          | 13.50           | 13.46 | 32.86          | 26.96           | 60.00          | 50.00          | 27.1         | 23.0         | L1    |         |
| 14  | 12.21930       | 25.80          | 18.40           | 13.61 | 39.41          | 32.01           | 60.00          | 50.00          | 20.5         | 17.9         | L1    |         |

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]  
LISN(AMN): SLS-02

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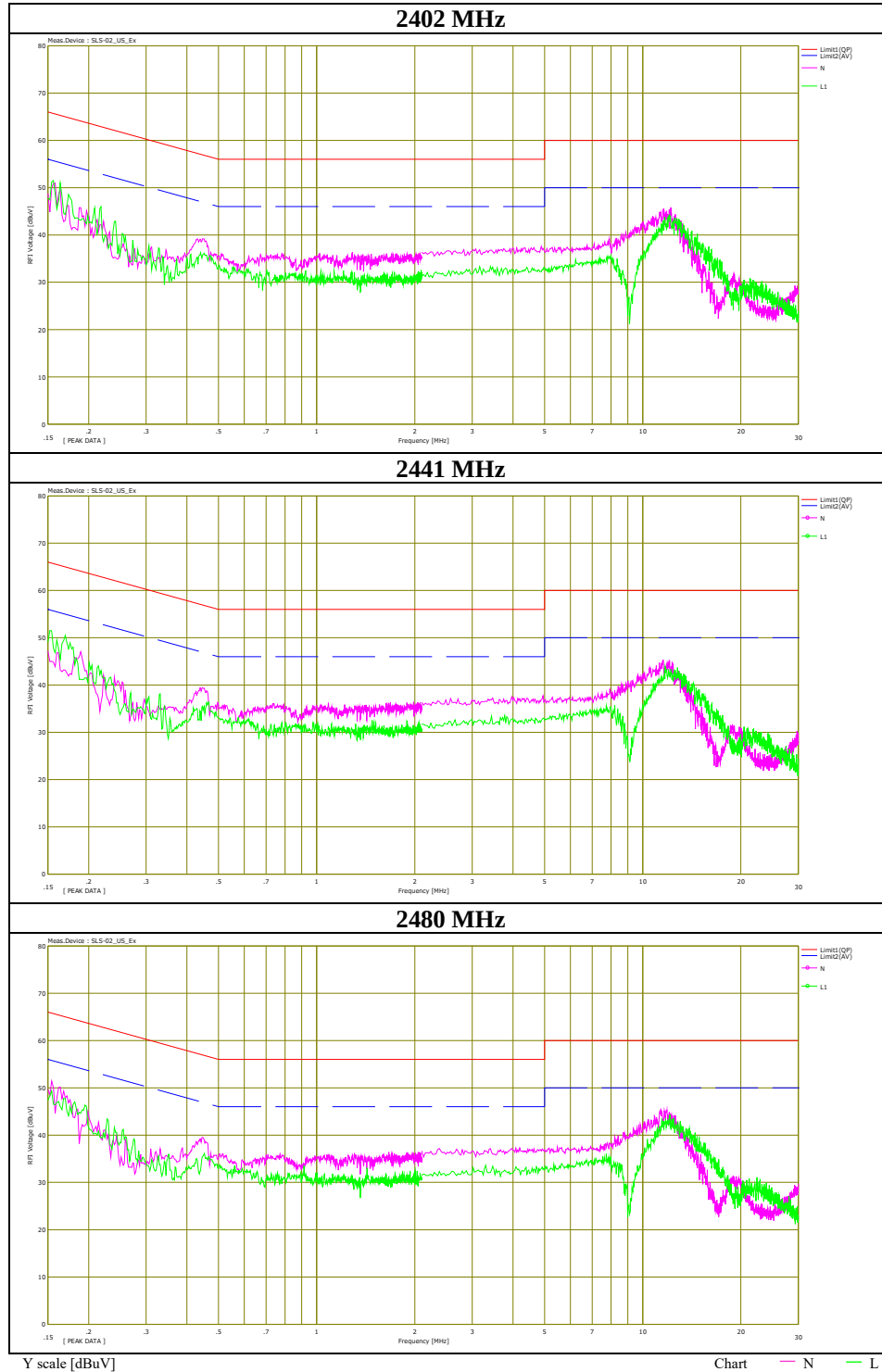
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

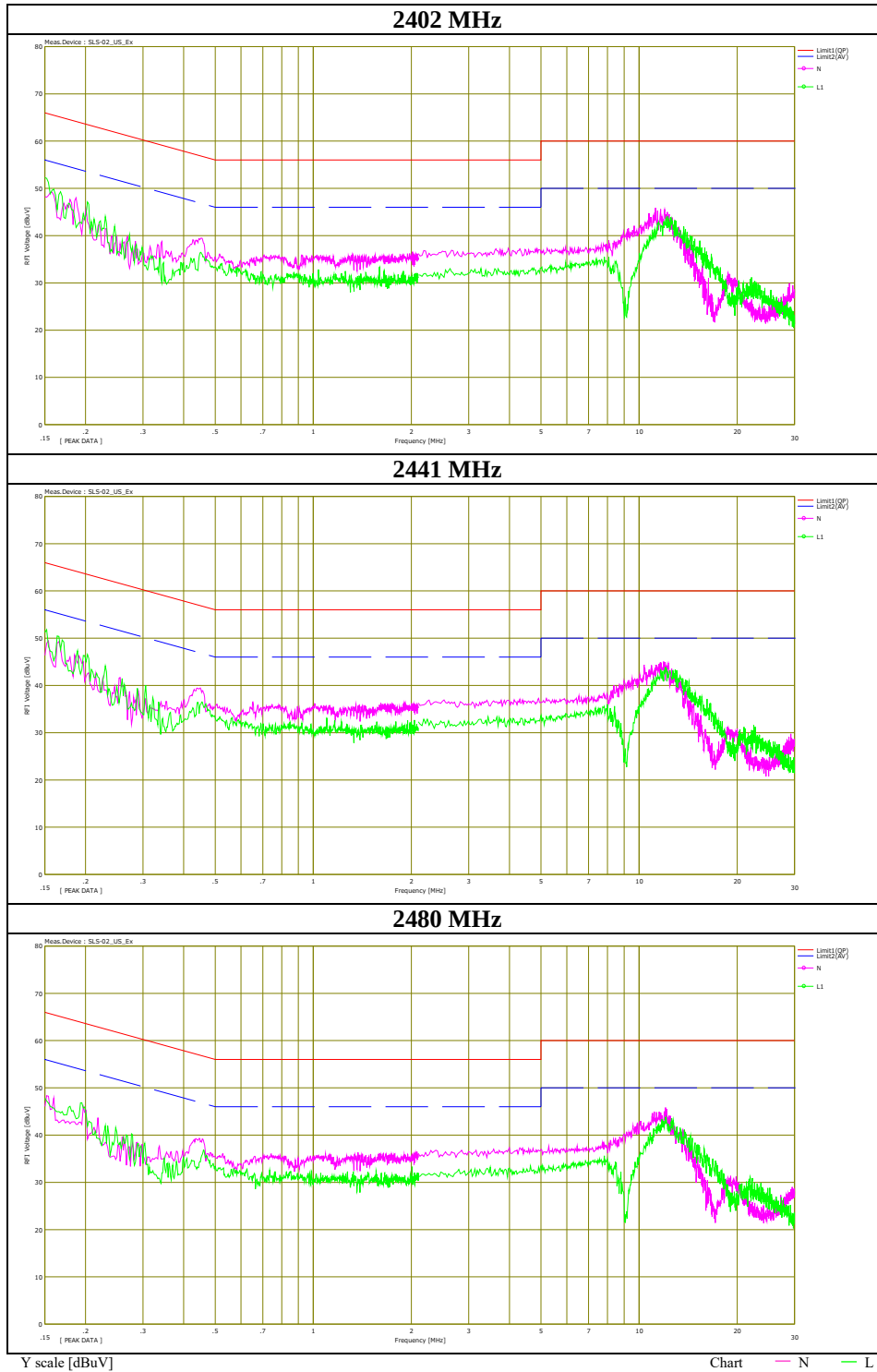
## Conducted Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.1 Shielded Room  
Date November 28, 2020  
Temperature / Humidity 22 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, DH5



## Conducted Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.1 Shielded Room  
Date November 28, 2020  
Temperature / Humidity 22 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, 3DH5



**UL Japan, Inc.**

**Shonan EMC Lab.**

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## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room  
Date : 2020/11/28

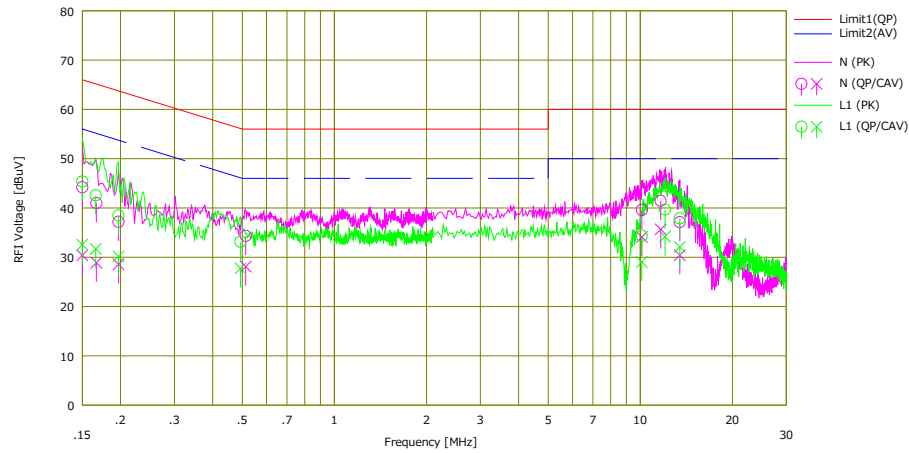
Mode : Tx 3DH5 2402 MHz

Power : AC 120 V / 60 Hz  
Temp./Humi. : 22 deg.C / 45 %RH

Remarks : with Module A 11n-20 5320 MHz and Module B 11n-20 5580 MHz

Limit : FCC\_Part 15 Subpart C(15.207)

Engineer : Kazuya Noda



| No. | Freq.<br>[MHz] | Reading        |                 | C.Fac | Results        |                 | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|-----------------|-------|----------------|-----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <CAV><br>[dBuV] |       | <QP><br>[dBuV] | <CAV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
|     |                | [dB]           | [dB]            |       | [dB]           | [dB]            | [dB]           | [dB]           | [dB]         | [dB]         |       |         |
| 1   | 0.15000        | 31.60          | 17.80           | 12.60 | 44.20          | 30.40           | 66.00          | 56.00          | 21.8         | 25.6         | N     |         |
| 2   | 0.16670        | 28.40          | 16.30           | 12.59 | 40.99          | 28.89           | 65.12          | 55.12          | 24.1         | 26.2         | N     |         |
| 3   | 0.19698        | 24.60          | 16.00           | 12.59 | 37.19          | 28.59           | 63.74          | 53.74          | 26.5         | 25.1         | N     |         |
| 4   | 0.51296        | 21.70          | 15.50           | 12.63 | 34.33          | 28.13           | 56.00          | 46.00          | 21.6         | 17.8         | N     |         |
| 5   | 10.12200       | 26.00          | 20.50           | 13.62 | 39.62          | 34.12           | 60.00          | 50.00          | 20.3         | 15.8         | N     |         |
| 6   | 11.66100       | 27.70          | 21.90           | 13.76 | 41.46          | 35.66           | 60.00          | 50.00          | 18.5         | 14.3         | N     |         |
| 7   | 13.45747       | 23.20          | 16.50           | 13.93 | 37.13          | 30.43           | 60.00          | 50.00          | 22.8         | 19.5         | N     |         |
| 8   | 0.15000        | 32.80          | 20.00           | 12.58 | 45.38          | 32.58           | 66.00          | 56.00          | 20.6         | 23.4         | L1    |         |
| 9   | 0.16594        | 30.00          | 19.10           | 12.58 | 42.58          | 31.68           | 65.16          | 55.16          | 22.5         | 23.4         | L1    |         |
| 10  | 0.19704        | 25.90          | 17.60           | 12.59 | 38.49          | 30.19           | 63.73          | 53.73          | 25.2         | 23.5         | L1    |         |
| 11  | 0.49340        | 20.50          | 15.10           | 12.65 | 33.15          | 27.75           | 56.11          | 46.11          | 22.9         | 18.3         | L1    |         |
| 12  | 10.11194       | 20.90          | 15.60           | 13.46 | 34.36          | 29.06           | 60.00          | 50.00          | 25.6         | 20.9         | L1    |         |
| 13  | 12.04380       | 26.10          | 20.60           | 13.60 | 39.70          | 34.20           | 60.00          | 50.00          | 20.3         | 15.8         | L1    |         |
| 14  | 13.45907       | 24.20          | 18.40           | 13.70 | 37.90          | 32.10           | 60.00          | 50.00          | 22.1         | 17.9         | L1    |         |

Calculation: Result[dBuV] = Reading[dBuV] + C.Fac(LISN(AMN) + Cable + ATT)[dB]  
LISN(AMN): SLS-02

UL Japan, Inc.

Shonan EMC Lab.

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Facsimile : +81 463 50 6401

## **20dB Bandwidth, 99% Occupied Bandwidth and Carrier Frequency Separation**

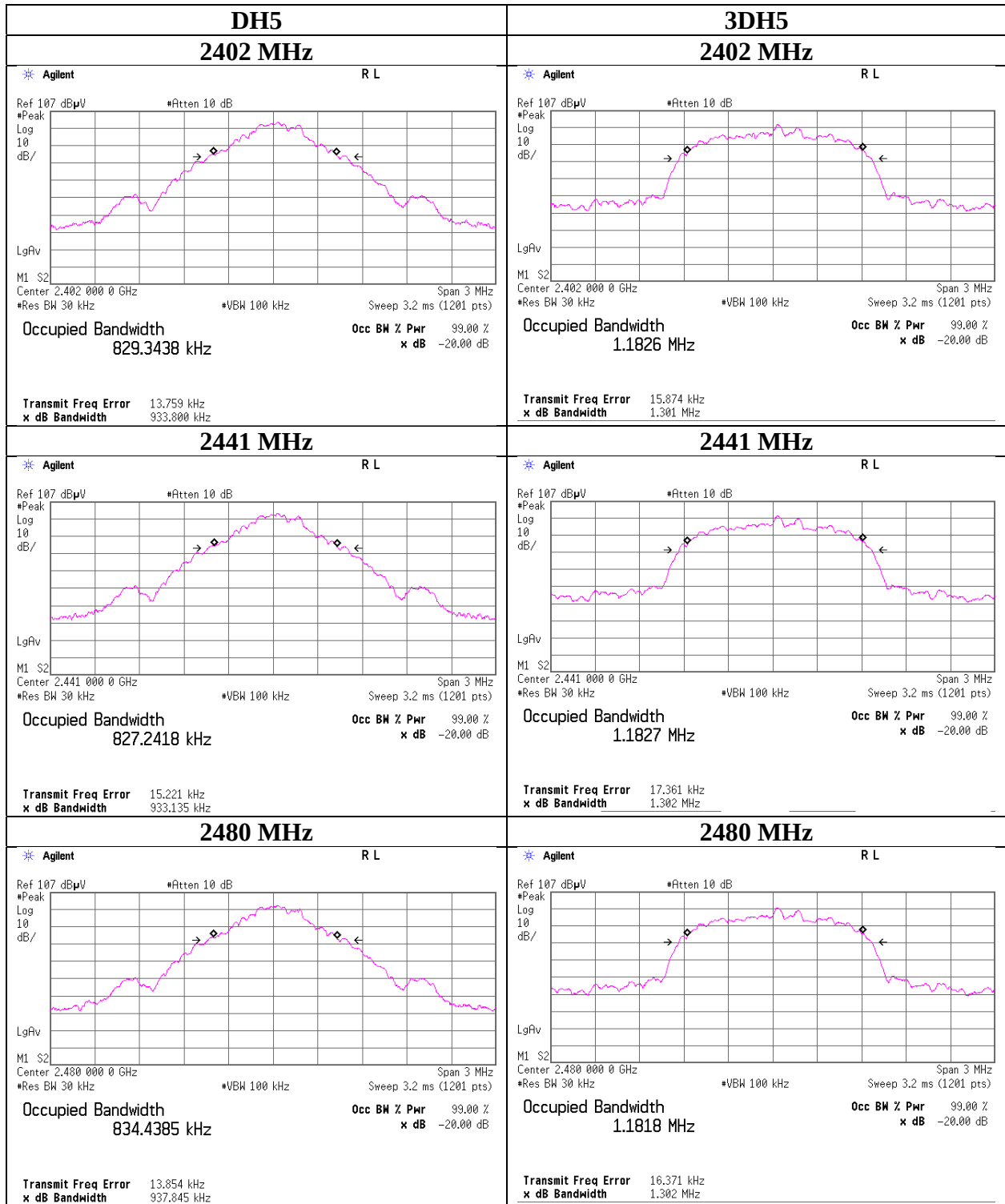
Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, Tx, Hopping On

| Mode | Freq.<br>[MHz] | 20dB Bandwidth<br>[MHz] | 99% Occupied<br>Bandwidth<br>[kHz] | Carrier Frequency<br>Separation<br>[MHz] | Limit for Carrier<br>Frequency separation<br>[MHz] |
|------|----------------|-------------------------|------------------------------------|------------------------------------------|----------------------------------------------------|
| DH5  | 2402.0         | 0.934                   | 829.344                            | 1.000                                    | $\geq 0.623$                                       |
| DH5  | 2441.0         | 0.933                   | 827.242                            | 1.000                                    | $\geq 0.622$                                       |
| DH5  | 2480.0         | 0.938                   | 834.439                            | 1.000                                    | $\geq 0.625$                                       |
| DH5  | Hopping On     | -                       | 78604.300                          | -                                        | -                                                  |
| 3DH5 | 2402.0         | 1.301                   | 1182.600                           | 1.000                                    | $\geq 0.867$                                       |
| 3DH5 | 2441.0         | 1.302                   | 1182.700                           | 1.000                                    | $\geq 0.868$                                       |
| 3DH5 | 2480.0         | 1.302                   | 1181.800                           | 1.000                                    | $\geq 0.868$                                       |
| 3DH5 | Hopping On     | -                       | 78709.600                          | -                                        | -                                                  |

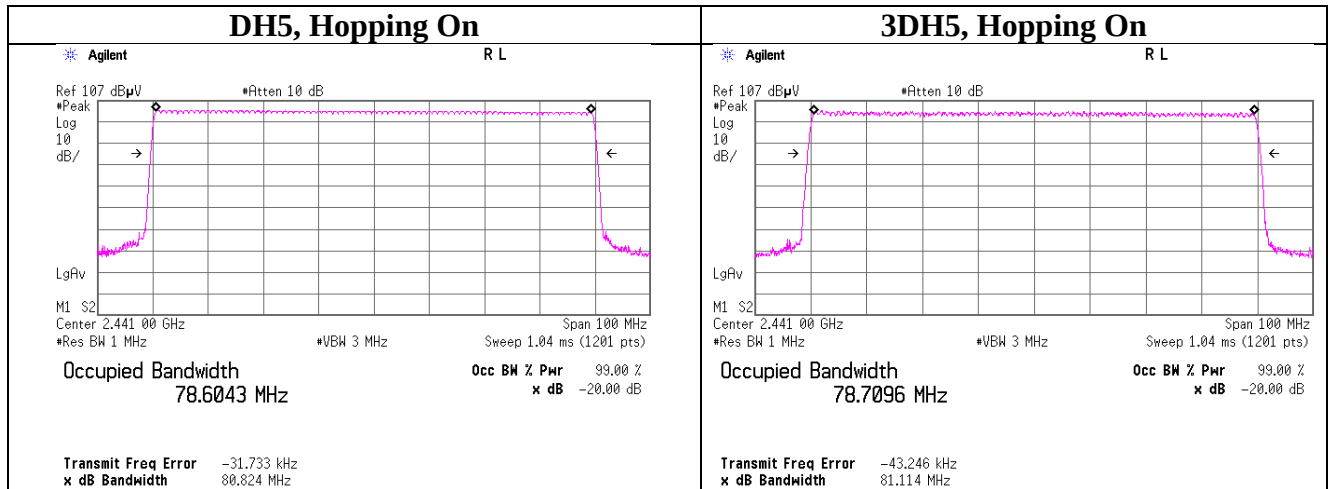
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

## 20 dB Bandwidth and 99 % Occupied Bandwidth



## 20 dB Bandwidth and 99 % Occupied Bandwidth



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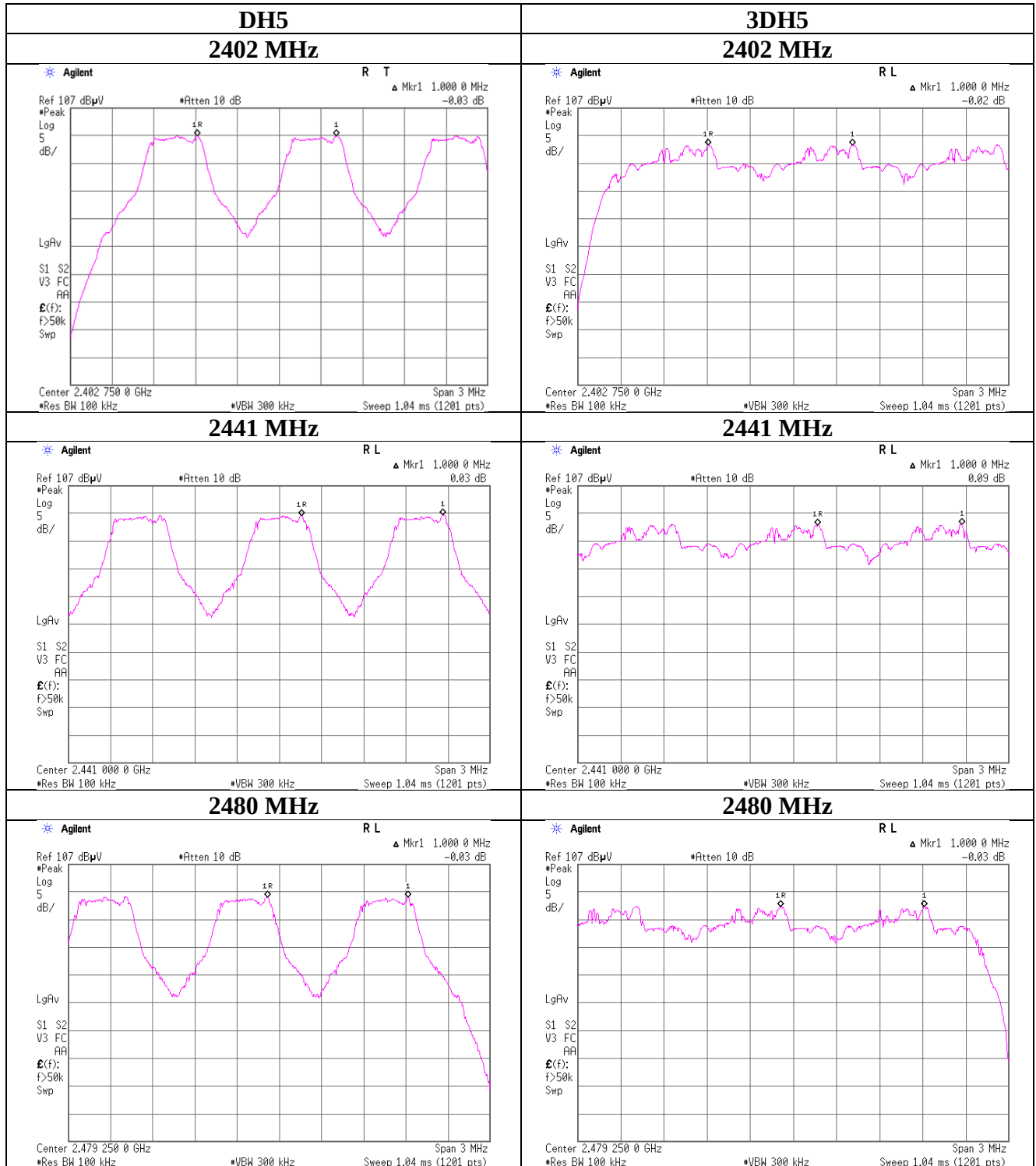
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## Carrier Frequency Separation



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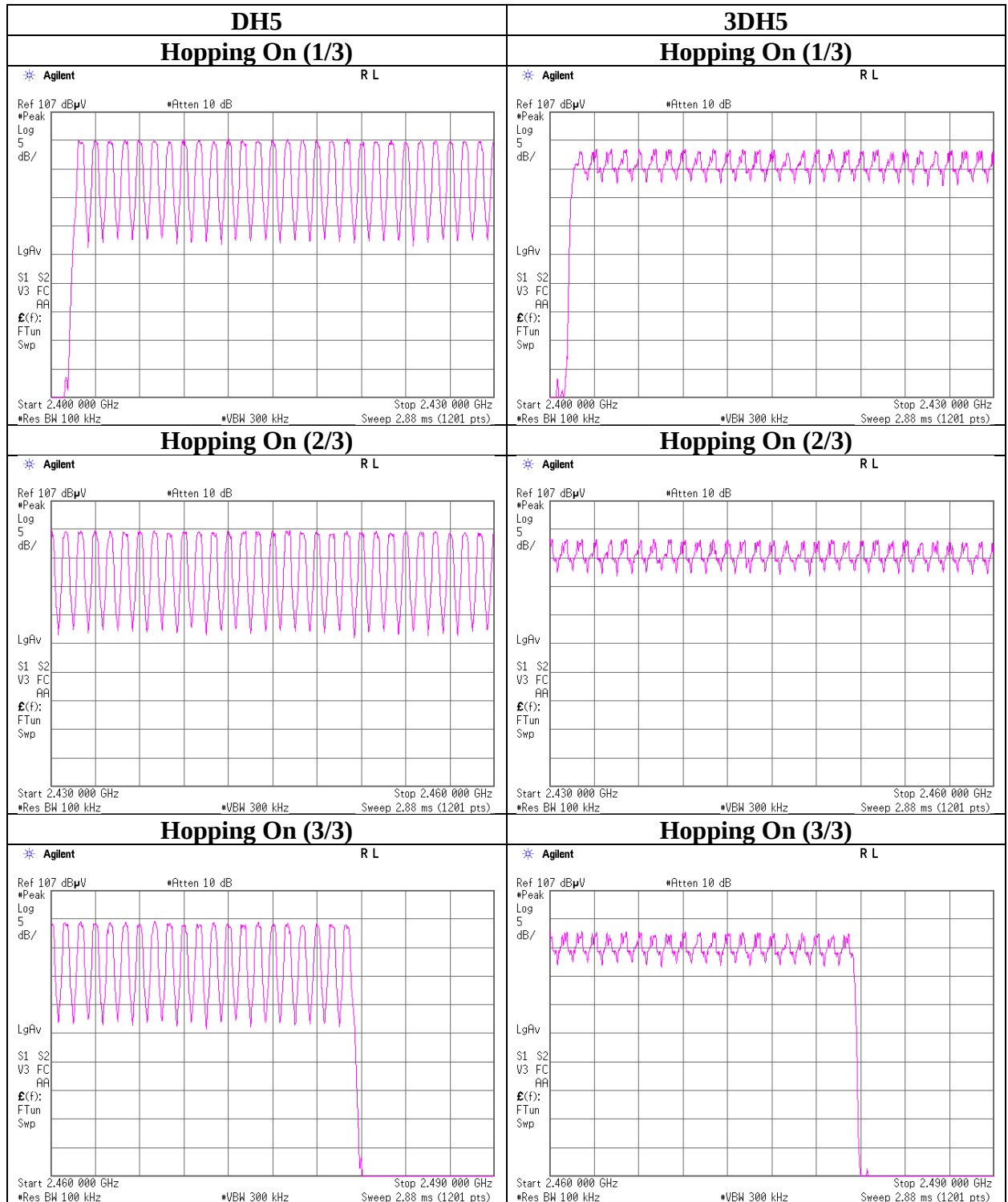
### **Number of Hopping Frequency**

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping On

| Mode | Number of channel<br>[channels] | Limit<br>[channels] |
|------|---------------------------------|---------------------|
| DH5  | 79                              | $\geq 15$           |
| 3DH5 | 79                              | $\geq 15$           |

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

## Number of Hopping Frequency



## Dwell time

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping On

| Mode | Number of transmission<br>in a 31.6(79 Hopping x 0.4)<br>/ 12.8 (32 Hopping x 0.4) second period |   |          | Length of<br>transmission<br>[msec] | Result<br>[msec] | Limit<br>[msec] |
|------|--------------------------------------------------------------------------------------------------|---|----------|-------------------------------------|------------------|-----------------|
| DH1  | 50.0 times                                                                                       | / | 5 sec. x | 31.6 sec. =                         | 128              | 400             |
| DH3  | 26.6 times                                                                                       | / | 5 sec. x | 31.6 sec. =                         | 281              | 400             |
| DH5  | 21.2 times                                                                                       | / | 5 sec. x | 31.6 sec. =                         | 390              | 400             |
| 3DH1 | 49.8 times                                                                                       | / | 5 sec. x | 31.6 sec. =                         | 130              | 400             |
| 3DH3 | 28.6 times                                                                                       | / | 5 sec. x | 31.6 sec. =                         | 301              | 400             |
| 3DH5 | 21.2 times                                                                                       | / | 5 sec. x | 31.6 sec. =                         | 392              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission

\*Average data of 5 tests.(except Inquiry)

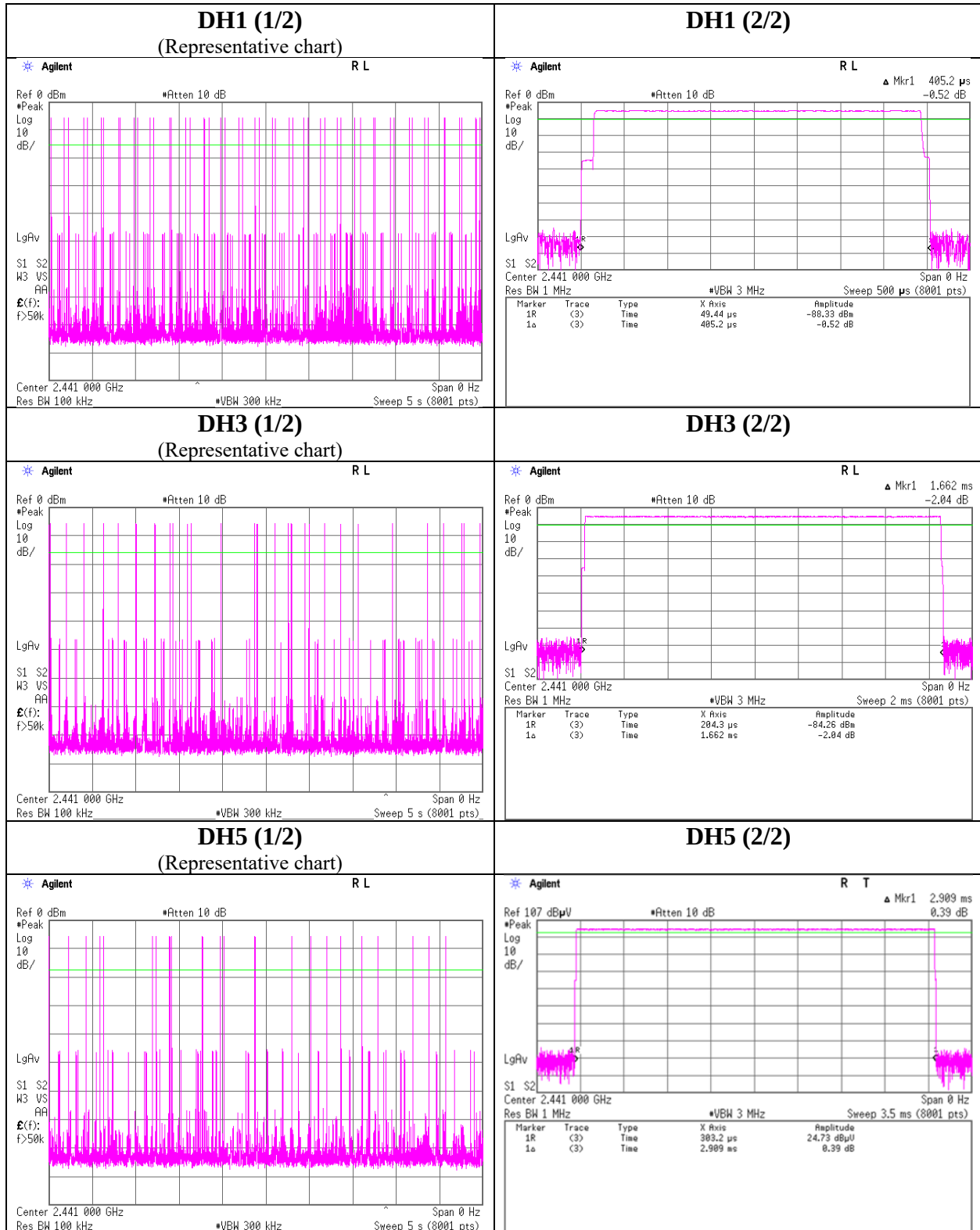
| Mode | Sampling [times] |    |    |    |    | Average<br>[times] |
|------|------------------|----|----|----|----|--------------------|
|      | 1                | 2  | 3  | 4  | 5  |                    |
| DH1  | 50               | 49 | 50 | 50 | 51 | 50                 |
| DH3  | 27               | 25 | 29 | 27 | 25 | 26.6               |
| DH5  | 22               | 24 | 21 | 18 | 21 | 21.2               |
| 3DH1 | 50               | 48 | 51 | 50 | 50 | 49.8               |
| 3DH3 | 28               | 29 | 30 | 27 | 29 | 28.6               |
| 3DH5 | 21               | 20 | 23 | 23 | 19 | 21.2               |

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in  $N \times 0.4s$ , where  $N$  is the number of channels being used in the hopping sequence ( $20 \leq N \leq 79$ ), is always less than  $0.4s$  regardless of packet size. This is confirmed in the test report for  $N = 79$ .

## Dwell time



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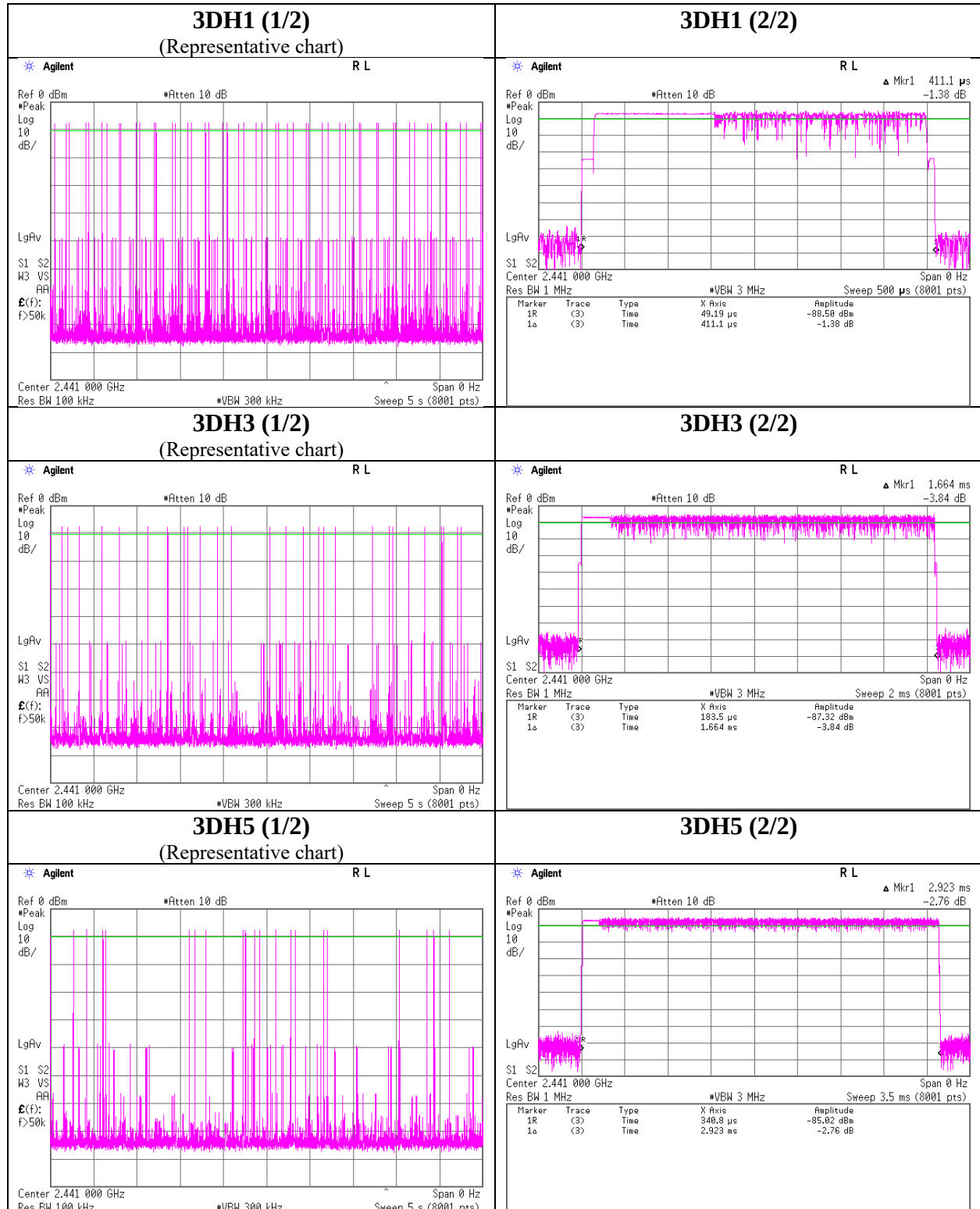
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## Dwell time



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## Maximum Peak Output Power

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off

| Mode | Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Conducted Power |      |       |      |                | e.i.r.p. for RSS-247     |        |      |       |      |
|------|----------------|------------------|-----------------------|------------------------|-----------------|------|-------|------|----------------|--------------------------|--------|------|-------|------|
|      |                |                  |                       |                        | Result          |      | Limit |      | Margin<br>[dB] | Antenna<br>Gain<br>[dBi] | Result |      | Limit |      |
|      |                |                  |                       |                        | [dBm]           | [mW] | [dBm] | [mW] |                |                          | [dBm]  | [mW] | [dBm] | [mW] |
| DH5  | 2402.0         | -5.04            | 0.99                  | 9.81                   | 5.76            | 3.77 | 20.96 | 125  | 15.20          | 3.54                     | 9.30   | 8.51 | 36.02 | 4000 |
| DH5  | 2441.0         | -5.26            | 0.97                  | 9.82                   | 5.53            | 3.57 | 20.96 | 125  | 15.43          | 3.54                     | 9.07   | 8.07 | 36.02 | 4000 |
| DH5  | 2480.0         | -5.91            | 0.97                  | 9.82                   | 4.88            | 3.08 | 20.96 | 125  | 16.08          | 3.54                     | 8.42   | 6.95 | 36.02 | 4000 |
| 2DH5 | 2402.0         | -5.08            | 0.99                  | 9.81                   | 5.72            | 3.73 | 20.96 | 125  | 15.24          | 3.54                     | 9.26   | 8.43 | 36.02 | 4000 |
| 2DH5 | 2441.0         | -5.33            | 0.97                  | 9.82                   | 5.46            | 3.52 | 20.96 | 125  | 15.50          | 3.54                     | 9.00   | 7.94 | 36.02 | 4000 |
| 2DH5 | 2480.0         | -5.95            | 0.97                  | 9.82                   | 4.84            | 3.05 | 20.96 | 125  | 16.12          | 3.54                     | 8.38   | 6.89 | 36.02 | 4000 |
| 3DH5 | 2402.0         | -4.47            | 0.99                  | 9.81                   | 6.33            | 4.30 | 20.96 | 125  | 14.63          | 3.54                     | 9.87   | 9.71 | 36.02 | 4000 |
| 3DH5 | 2441.0         | -4.75            | 0.97                  | 9.82                   | 6.04            | 4.02 | 20.96 | 125  | 14.92          | 3.54                     | 9.58   | 9.08 | 36.02 | 4000 |
| 3DH5 | 2480.0         | -5.36            | 0.97                  | 9.82                   | 5.43            | 3.49 | 20.96 | 125  | 15.53          | 3.54                     | 8.97   | 7.89 | 36.02 | 4000 |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.

As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

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## Average Output Power (Reference data for RF Exposure)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13554183S-B                        |
| Test place             | Shonan EMC Lab. No.6 Shielded Room |
| Date                   | October 14, 2020                   |
| Temperature / Humidity | 27 deg. C / 45 % RH                |
| Engineer               | Kazuya Noda                        |
| Mode                   | Tx, Hopping Off                    |

| Mode | Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|------|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|      |                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| DH5  | 2402.0         | -6.50            | 0.99                  | 9.81                   | 4.30                     | 2.69 | 1.10                   | 5.40                            | 3.47 |
| DH5  | 2441.0         | -6.77            | 0.97                  | 9.82                   | 4.02                     | 2.52 | 1.10                   | 5.12                            | 3.25 |
| DH5  | 2480.0         | -7.43            | 0.97                  | 9.82                   | 3.36                     | 2.17 | 1.10                   | 4.46                            | 2.79 |
| 2DH5 | 2402.0         | -8.68            | 0.99                  | 9.81                   | 2.12                     | 1.63 | 1.08                   | 3.20                            | 2.09 |
| 2DH5 | 2441.0         | -8.95            | 0.97                  | 9.82                   | 1.84                     | 1.53 | 1.08                   | 2.92                            | 1.96 |
| 2DH5 | 2480.0         | -9.61            | 0.97                  | 9.82                   | 1.18                     | 1.31 | 1.08                   | 2.26                            | 1.68 |
| 3DH5 | 2402.0         | -8.65            | 0.99                  | 9.81                   | 2.15                     | 1.64 | 1.08                   | 3.23                            | 2.10 |
| 3DH5 | 2441.0         | -8.93            | 0.97                  | 9.82                   | 1.86                     | 1.53 | 1.08                   | 2.94                            | 1.97 |
| 3DH5 | 2480.0         | -9.59            | 0.97                  | 9.82                   | 1.20                     | 1.32 | 1.08                   | 2.28                            | 1.69 |

Sample Calculation:

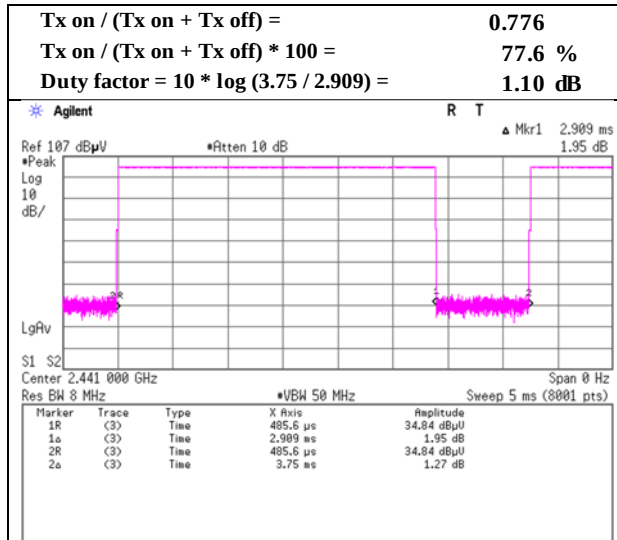
Result (Time average) = Reading + Cable Loss + Attenuator Loss

Result (Burst power average) = Time average + Duty factor

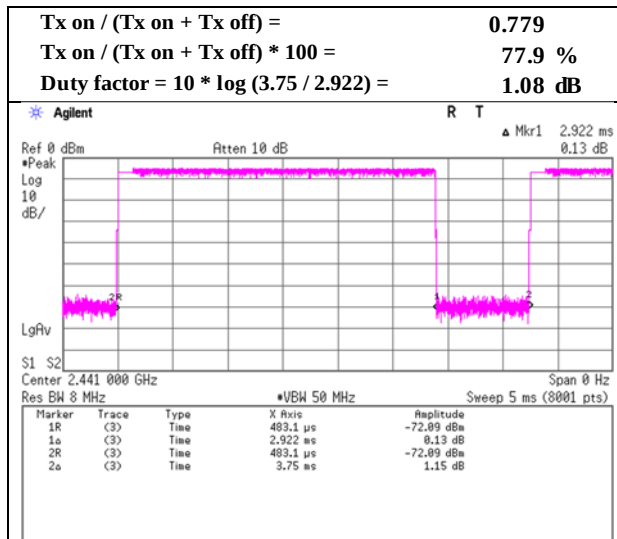
## Burst Rate Confirmation

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off

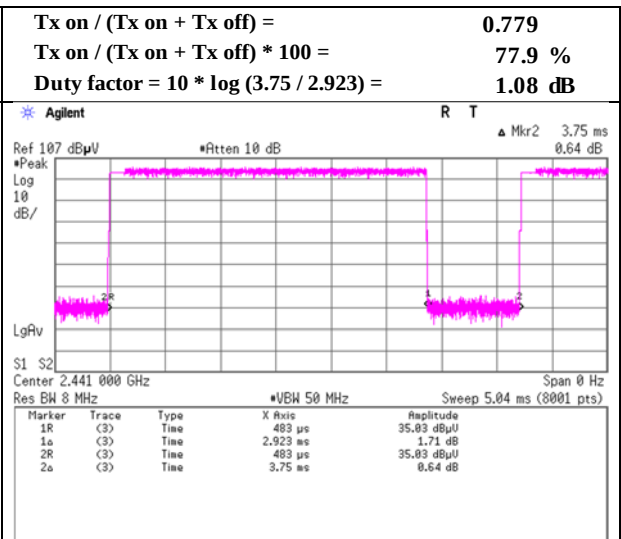
### DH5



### 2DH5



### 3DH5



## Radiated Spurious Emission

|                        |                               |                    |                     |                      |
|------------------------|-------------------------------|--------------------|---------------------|----------------------|
| Report No.             | 13554183S-B                   |                    |                     |                      |
| Test place             | Shonan EMC Lab.               |                    |                     |                      |
| Semi Anechoic Chamber  | 1                             | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                  | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH              | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki               | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )             | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, DH5 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.    | 115.217         | QP       | 29.86          | 12.61           | 8.16      | 31.81     | 0.00                 | 18.82           | 43.5           | 24.6        | 260         | 108         | -                        |
| Hori.    | 191.829         | QP       | 26.45          | 16.39           | 8.97      | 31.78     | 0.00                 | 20.03           | 43.5           | 23.4        | 183         | 283         | -                        |
| Hori.    | 2390.000        | PK       | 47.54          | 27.93           | 14.49     | 39.55     | 2.28                 | 52.69           | 73.9           | 21.2        | 143         | 6           | -                        |
| Hori.    | 4804.000        | PK       | 46.72          | 31.47           | 7.03      | 39.73     | 2.28                 | 47.77           | 73.9           | 26.1        | 145         | 56          | -                        |
| Hori.    | 7206.000        | PK       | 45.96          | 36.90           | 8.67      | 39.51     | 2.28                 | 54.30           | 73.9           | 19.6        | 150         | 0           | -                        |
| Hori.    | 9608.000        | PK       | 45.34          | 38.23           | 10.20     | 39.66     | 2.28                 | 56.39           | 73.9           | 17.5        | 150         | 0           | -                        |
| Hori.    | 2390.000        | AV       | 33.78          | 27.93           | 14.49     | 39.55     | 2.28                 | 38.93           | 53.9           | 14.9        | 143         | 6           | VBW: 360 Hz              |
| Hori.    | 4804.000        | AV       | 33.98          | 31.47           | 7.03      | 39.73     | 2.28                 | 35.03           | 53.9           | 18.8        | 145         | 56          | VBW: 360 Hz              |
| Hori.    | 7206.000        | AV       | 33.39          | 36.90           | 8.67      | 39.51     | 2.28                 | 41.73           | 53.9           | 12.1        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9608.000        | AV       | 32.94          | 38.23           | 10.20     | 39.66     | 2.28                 | 43.99           | 53.9           | 9.9         | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 36.247          | QP       | 35.14          | 16.26           | 7.19      | 31.83     | 0.00                 | 26.76           | 40.0           | 13.2        | 100         | 223         | -                        |
| Vert.    | 45.999          | QP       | 42.57          | 12.64           | 7.41      | 31.83     | 0.00                 | 30.79           | 40.0           | 9.2         | 100         | 293         | -                        |
| Vert.    | 64.227          | QP       | 43.19          | 7.37            | 7.22      | 31.83     | 0.00                 | 25.95           | 40.0           | 14.0        | 100         | 195         | -                        |
| Vert.    | 110.375         | QP       | 40.07          | 11.98           | 8.17      | 31.81     | 0.00                 | 28.41           | 43.5           | 15.0        | 100         | 1           | -                        |
| Vert.    | 116.815         | QP       | 39.05          | 12.80           | 8.17      | 31.81     | 0.00                 | 28.21           | 43.5           | 15.2        | 100         | 358         | -                        |
| Vert.    | 134.860         | QP       | 33.96          | 14.23           | 8.48      | 31.79     | 0.00                 | 24.88           | 43.5           | 18.6        | 100         | 3           | -                        |
| Vert.    | 189.376         | QP       | 31.31          | 16.41           | 8.96      | 31.78     | 0.00                 | 24.90           | 43.5           | 18.6        | 100         | 195         | -                        |
| Vert.    | 2390.000        | PK       | 48.31          | 27.93           | 14.49     | 39.55     | 2.28                 | 53.46           | 73.9           | 20.4        | 360         | 52          | -                        |
| Vert.    | 4804.000        | PK       | 45.98          | 31.47           | 7.03      | 39.73     | 2.28                 | 47.03           | 73.9           | 26.8        | 147         | 114         | -                        |
| Vert.    | 7206.000        | PK       | 45.39          | 36.90           | 8.67      | 39.51     | 2.28                 | 53.73           | 73.9           | 20.1        | 150         | 0           | -                        |
| Vert.    | 9608.000        | PK       | 45.37          | 38.23           | 10.20     | 39.66     | 2.28                 | 56.42           | 73.9           | 17.4        | 150         | 0           | -                        |
| Vert.    | 2390.000        | AV       | 33.77          | 27.93           | 14.49     | 39.55     | 2.28                 | 38.92           | 53.9           | 14.9        | 360         | 52          | VBW: 360 Hz              |
| Vert.    | 4804.000        | AV       | 33.91          | 31.47           | 7.03      | 39.73     | 2.28                 | 34.96           | 53.9           | 18.9        | 147         | 114         | VBW: 360 Hz              |
| Vert.    | 7206.000        | AV       | 33.60          | 36.90           | 8.67      | 39.51     | 2.28                 | 41.94           | 53.9           | 11.9        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9608.000        | AV       | 33.13          | 38.23           | 10.20     | 39.66     | 2.28                 | 44.18           | 53.9           | 9.7         | 150         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 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.    | 2402.000        | PK       | 98.09          | 27.92           | 14.50     | 39.56     | 2.28                 | 103.23          | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 40.77          | 27.92           | 14.50     | 39.56     | 2.28                 | 45.91           | 83.2           | 37.2        | -       |
| Vert.    | 2402.000        | PK       | 88.66          | 27.92           | 14.50     | 39.56     | 2.28                 | 93.80           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 37.36          | 27.92           | 14.50     | 39.56     | 2.28                 | 42.50           | 73.8           | 31.3        | -       |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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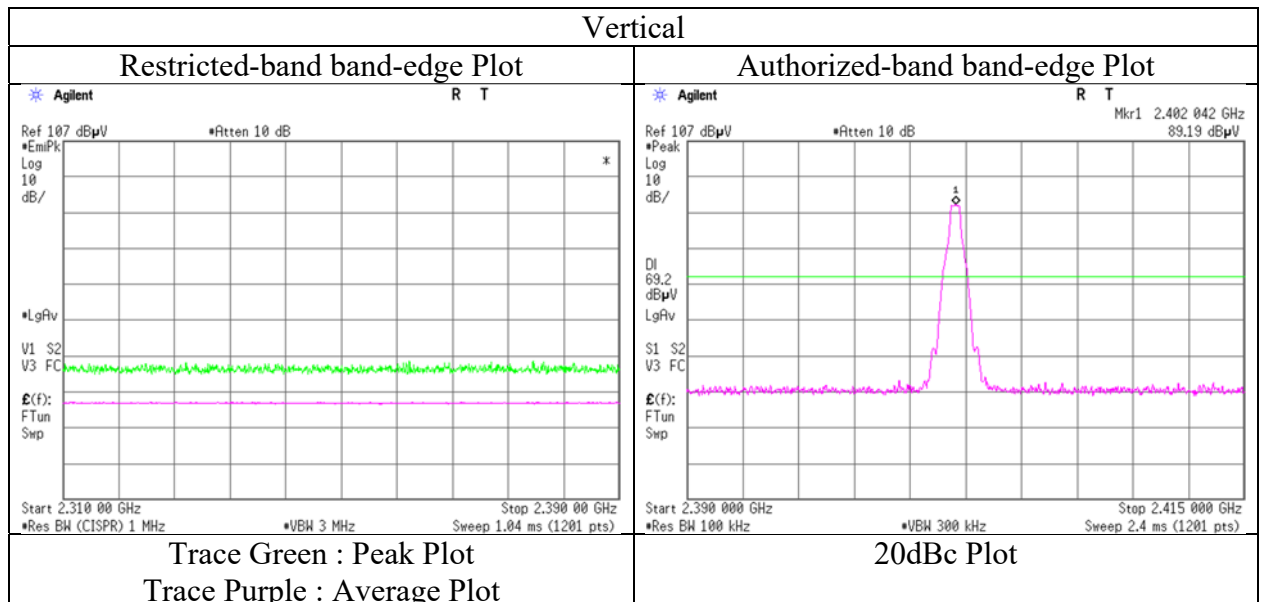
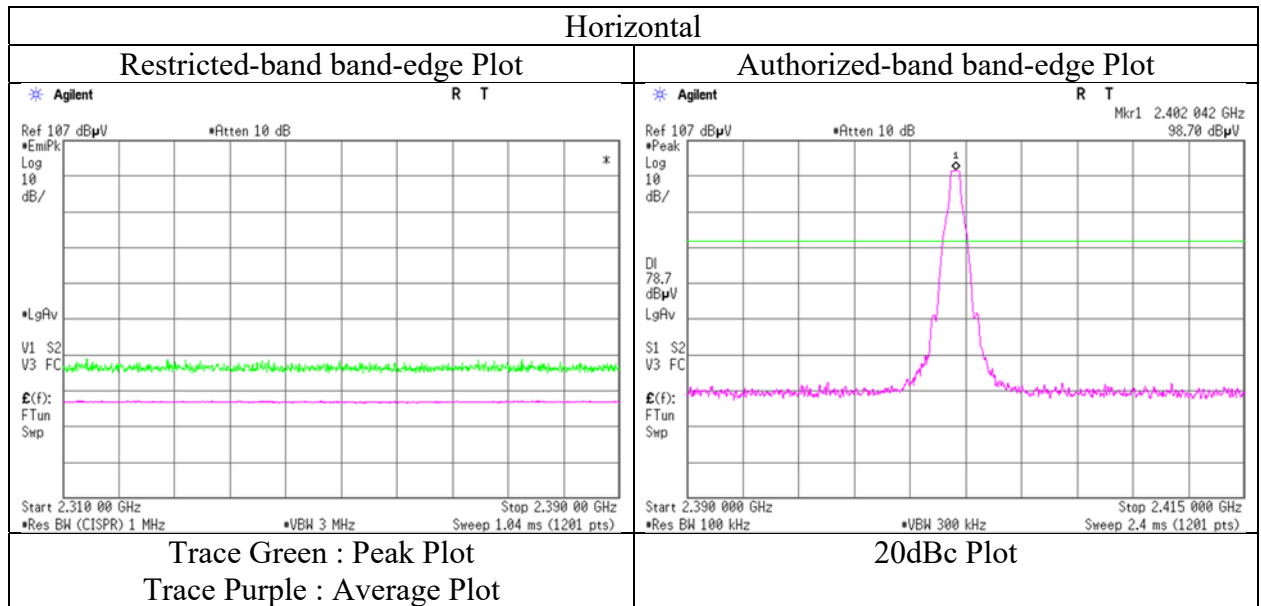
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                               |
|------------------------|-------------------------------|
| Report No.             | 13554183S-B                   |
| Test place             | Shonan EMC Lab.               |
| Semi Anechoic Chamber  | 1                             |
| Date                   | Oct 19, 2020                  |
| Temperature / Humidity | 22 deg.C, 54 %RH              |
| Engineer               | Takahiro Suzuki               |
|                        | ( 1 GHz -2.8 GHz )            |
| Mode                   | Tx, Hopping Off, DH5 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.

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## Radiated Spurious Emission

|                        |                               |                    |                     |                      |
|------------------------|-------------------------------|--------------------|---------------------|----------------------|
| Report No.             | 13554183S-B                   |                    |                     |                      |
| Test place             | Shonan EMC Lab.               |                    |                     |                      |
| Semi Anechoic Chamber  | 1                             | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                  | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH              | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki               | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )             | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, DH5 2441 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.    | 116.535         | QP       | 28.24          | 12.77           | 8.17      | 31.81     | 0.00                 | 17.37           | 43.5           | 26.1        | 272         | 98          | -                        |
| Hori.    | 189.000         | QP       | 27.48          | 16.39           | 8.97      | 31.78     | 0.00                 | 21.06           | 43.5           | 22.4        | 177         | 287         | -                        |
| Hori.    | 4882.000        | PK       | 46.37          | 31.51           | 7.07      | 39.72     | 2.28                 | 47.51           | 73.9           | 26.3        | 148         | 28          | -                        |
| Hori.    | 7323.000        | PK       | 45.59          | 36.94           | 8.74      | 39.57     | 2.28                 | 53.98           | 73.9           | 19.9        | 150         | 0           | -                        |
| Hori.    | 9764.000        | PK       | 46.05          | 38.63           | 10.22     | 39.47     | 2.28                 | 57.71           | 73.9           | 16.1        | 150         | 0           | -                        |
| Hori.    | 4882.000        | AV       | 33.94          | 31.51           | 7.07      | 39.72     | 2.28                 | 35.08           | 53.9           | 18.8        | 148         | 28          | VBW: 360 Hz              |
| Hori.    | 7323.000        | AV       | 33.21          | 36.94           | 8.74      | 39.57     | 2.28                 | 41.60           | 53.9           | 12.3        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9764.000        | AV       | 33.52          | 38.63           | 10.22     | 39.47     | 2.28                 | 45.18           | 53.9           | 8.7         | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 36.366          | QP       | 35.13          | 16.21           | 7.19      | 31.83     | 0.00                 | 26.70           | 40.0           | 13.3        | 100         | 19          | -                        |
| Vert.    | 45.149          | QP       | 41.85          | 12.96           | 7.40      | 31.83     | 0.00                 | 30.38           | 40.0           | 9.6         | 100         | 26          | -                        |
| Vert.    | 64.930          | QP       | 43.31          | 7.23            | 7.21      | 31.83     | 0.00                 | 25.92           | 40.0           | 14.0        | 100         | 286         | -                        |
| Vert.    | 110.806         | QP       | 39.56          | 12.04           | 8.16      | 31.81     | 0.00                 | 27.95           | 43.5           | 15.5        | 100         | 334         | -                        |
| Vert.    | 119.130         | QP       | 37.27          | 13.04           | 8.19      | 31.80     | 0.00                 | 26.70           | 43.5           | 16.8        | 100         | 3           | -                        |
| Vert.    | 134.960         | QP       | 32.99          | 14.24           | 8.48      | 31.79     | 0.00                 | 23.92           | 43.5           | 19.5        | 100         | 244         | -                        |
| Vert.    | 190.541         | QP       | 31.87          | 16.42           | 8.97      | 31.78     | 0.00                 | 25.48           | 43.5           | 18.0        | 100         | 195         | -                        |
| Vert.    | 4882.000        | PK       | 46.99          | 31.51           | 7.07      | 39.72     | 2.28                 | 48.13           | 73.9           | 25.7        | 278         | 168         | -                        |
| Vert.    | 7323.000        | PK       | 45.85          | 36.94           | 8.74      | 39.57     | 2.28                 | 54.24           | 73.9           | 19.6        | 150         | 0           | -                        |
| Vert.    | 9764.000        | PK       | 46.80          | 38.63           | 10.22     | 39.47     | 2.28                 | 58.46           | 73.9           | 15.4        | 150         | 0           | -                        |
| Vert.    | 4882.000        | AV       | 33.93          | 31.51           | 7.07      | 39.72     | 2.28                 | 35.07           | 53.9           | 18.8        | 278         | 168         | VBW: 360 Hz              |
| Vert.    | 7323.000        | AV       | 33.18          | 36.94           | 8.74      | 39.57     | 2.28                 | 41.57           | 53.9           | 12.3        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9764.000        | AV       | 33.55          | 38.63           | 10.22     | 39.47     | 2.28                 | 45.21           | 53.9           | 8.6         | 150         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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## Radiated Spurious Emission

|                        |                               |                    |                     |                      |
|------------------------|-------------------------------|--------------------|---------------------|----------------------|
| Report No.             | 13554183S-B                   |                    |                     |                      |
| Test place             | Shonan EMC Lab.               |                    |                     |                      |
| Semi Anechoic Chamber  | 1                             | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                  | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH              | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki               | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )             | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, DH5 2480 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.    | 193.298         | QP       | 27.63          | 16.47           | 8.99      | 31.78     | 0.00                 | 21.31           | 43.5           | 22.1        | 172         | 282         | -                        |
| Hori.    | 211.131         | QP       | 33.82          | 11.20           | 5.90      | 31.77     | 0.00                 | 19.15           | 43.5           | 24.3        | 148         | 229         | -                        |
| Hori.    | 2483.500        | PK       | 48.90          | 27.84           | 14.59     | 39.58     | 2.28                 | 54.03           | 73.9           | 19.8        | 140         | 0           | -                        |
| Hori.    | 4960.000        | PK       | 46.68          | 31.69           | 7.14      | 39.71     | 2.28                 | 48.08           | 73.9           | 25.8        | 139         | 290         | -                        |
| Hori.    | 7440.000        | PK       | 46.31          | 37.02           | 8.80      | 39.62     | 2.28                 | 54.79           | 73.9           | 19.1        | 150         | 0           | -                        |
| Hori.    | 9920.000        | PK       | 45.24          | 38.66           | 10.23     | 39.28     | 2.28                 | 57.13           | 73.9           | 16.7        | 150         | 0           | -                        |
| Hori.    | 2483.500        | AV       | 34.61          | 27.84           | 14.59     | 39.58     | 2.28                 | 39.74           | 53.9           | 14.1        | 140         | 0           | VBW: 360 Hz              |
| Hori.    | 4960.000        | AV       | 33.81          | 31.69           | 7.14      | 39.71     | 2.28                 | 35.21           | 53.9           | 18.6        | 139         | 290         | VBW: 360 Hz              |
| Hori.    | 7440.000        | AV       | 33.69          | 37.02           | 8.80      | 39.62     | 2.28                 | 42.17           | 53.9           | 11.7        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9920.000        | AV       | 33.17          | 38.66           | 10.23     | 39.28     | 2.28                 | 45.06           | 53.9           | 8.8         | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 35.862          | QP       | 35.36          | 16.41           | 7.18      | 31.83     | 0.00                 | 27.12           | 40.0           | 12.8        | 100         | 325         | -                        |
| Vert.    | 45.790          | QP       | 42.98          | 12.72           | 7.41      | 31.83     | 0.00                 | 31.28           | 40.0           | 8.7         | 100         | 284         | -                        |
| Vert.    | 63.966          | QP       | 43.35          | 7.43            | 7.22      | 31.83     | 0.00                 | 26.17           | 40.0           | 13.8        | 100         | 17          | -                        |
| Vert.    | 119.705         | QP       | 31.59          | 13.10           | 8.19      | 31.80     | 0.00                 | 21.08           | 43.5           | 22.4        | 100         | 356         | -                        |
| Vert.    | 133.720         | QP       | 33.71          | 14.17           | 8.45      | 31.79     | 0.00                 | 24.54           | 43.5           | 18.9        | 100         | 359         | -                        |
| Vert.    | 143.898         | QP       | 32.27          | 14.71           | 8.70      | 31.78     | 0.00                 | 23.90           | 43.5           | 19.6        | 100         | 256         | -                        |
| Vert.    | 187.972         | QP       | 31.56          | 16.32           | 8.96      | 31.78     | 0.00                 | 25.06           | 43.5           | 18.4        | 100         | 171         | -                        |
| Vert.    | 2483.500        | PK       | 46.48          | 27.84           | 14.59     | 39.58     | 2.28                 | 51.61           | 73.9           | 22.2        | 143         | 236         | -                        |
| Vert.    | 4960.000        | PK       | 46.07          | 31.69           | 7.14      | 39.71     | 2.28                 | 47.47           | 73.9           | 26.4        | 339         | 66          | -                        |
| Vert.    | 7440.000        | PK       | 46.04          | 37.02           | 8.80      | 39.62     | 2.28                 | 54.52           | 73.9           | 19.3        | 150         | 0           | -                        |
| Vert.    | 9920.000        | PK       | 45.67          | 38.66           | 10.23     | 39.28     | 2.28                 | 57.56           | 73.9           | 16.3        | 150         | 0           | -                        |
| Vert.    | 2483.500        | AV       | 33.75          | 27.84           | 14.59     | 39.58     | 2.28                 | 38.88           | 53.9           | 15.0        | 143         | 236         | VBW: 360 Hz              |
| Vert.    | 4960.000        | AV       | 33.90          | 31.69           | 7.14      | 39.71     | 2.28                 | 35.30           | 53.9           | 18.6        | 339         | 66          | VBW: 360 Hz              |
| Vert.    | 7440.000        | AV       | 33.60          | 37.02           | 8.80      | 39.62     | 2.28                 | 42.08           | 53.9           | 11.8        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9920.000        | AV       | 33.19          | 38.66           | 10.23     | 39.28     | 2.28                 | 45.08           | 53.9           | 8.8         | 150         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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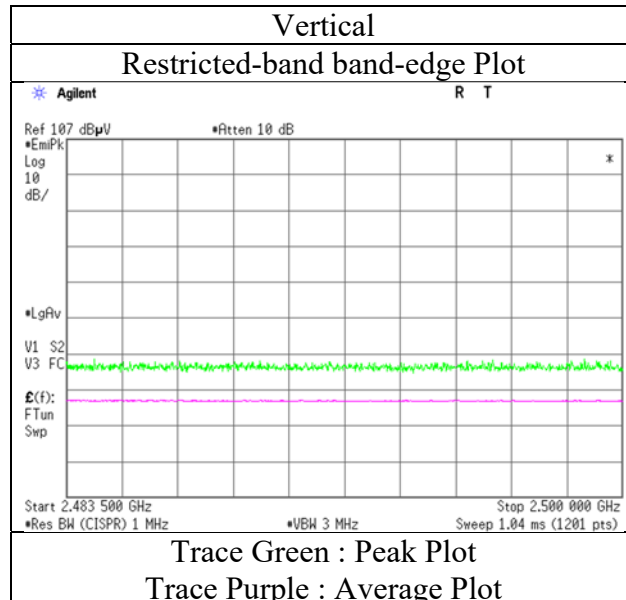
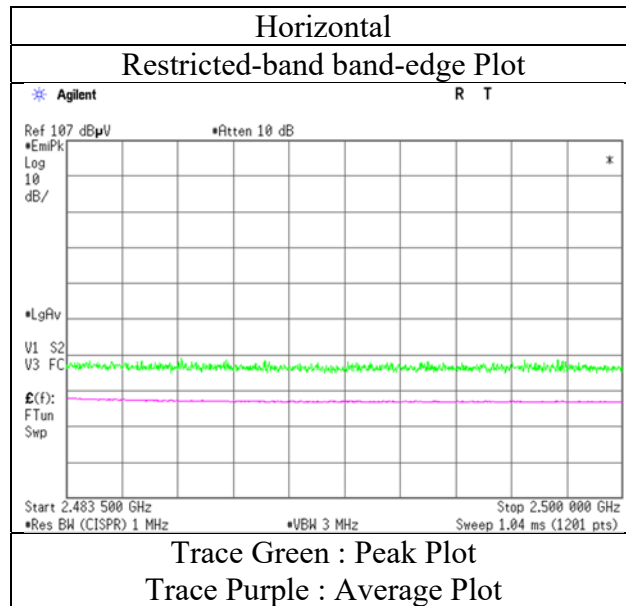
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13554183S-B                           |
| Test place             | Shonan EMC Lab.                       |
| Semi Anechoic Chamber  | 1                                     |
| Date                   | Oct 19, 2020                          |
| Temperature / Humidity | 22 deg.C, 54 %RH                      |
| Engineer               | Takahiro Suzuki<br>( 1 GHz ~2.8 GHz ) |
| Mode                   | Tx, Hopping Off, DH5 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

|                        |                                |                    |                     |                      |
|------------------------|--------------------------------|--------------------|---------------------|----------------------|
| Report No.             | 13554183S-B                    |                    |                     |                      |
| Test place             | Shonan EMC Lab.                |                    |                     |                      |
| Semi Anechoic Chamber  | 1                              | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                   | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH               | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki                | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )              | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, 3DH5 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.    | 192.792         | QP       | 28.25          | 16.44           | 8.98      | 31.78     | 0.00                 | 21.89           | 43.5           | 21.6        | 169         | 282         | -                        |
| Hori.    | 212.226         | QP       | 34.93          | 11.19           | 5.91      | 31.77     | 0.00                 | 20.26           | 43.5           | 23.2        | 168         | 214         | -                        |
| Hori.    | 2390.000        | PK       | 45.53          | 27.93           | 14.49     | 39.55     | 2.28                 | 50.68           | 73.9           | 23.2        | 144         | 9           | -                        |
| Hori.    | 4804.000        | PK       | 45.48          | 31.47           | 7.03      | 39.73     | 2.28                 | 46.53           | 73.9           | 27.3        | 142         | 47          | -                        |
| Hori.    | 7206.000        | PK       | 46.16          | 36.90           | 8.67      | 39.51     | 2.28                 | 54.50           | 73.9           | 19.4        | 150         | 0           | -                        |
| Hori.    | 9608.000        | PK       | 45.87          | 38.23           | 10.20     | 39.66     | 2.28                 | 56.92           | 73.9           | 16.9        | 150         | 0           | -                        |
| Hori.    | 2390.000        | AV       | 32.30          | 27.93           | 14.49     | 39.55     | 2.28                 | 37.45           | 53.9           | 16.4        | 144         | 9           | VBW: 360 Hz              |
| Hori.    | 4804.000        | AV       | 34.08          | 31.47           | 7.03      | 39.73     | 2.28                 | 35.13           | 53.9           | 18.7        | 142         | 47          | VBW: 360 Hz              |
| Hori.    | 7206.000        | AV       | 33.52          | 36.90           | 8.67      | 39.51     | 2.28                 | 41.86           | 53.9           | 12.0        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9608.000        | AV       | 33.19          | 38.23           | 10.20     | 39.66     | 2.28                 | 44.24           | 53.9           | 9.6         | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 36.698          | QP       | 35.08          | 16.07           | 7.19      | 31.83     | 0.00                 | 26.51           | 40.0           | 13.4        | 100         | 135         | -                        |
| Vert.    | 46.071          | QP       | 43.56          | 12.61           | 7.41      | 31.83     | 0.00                 | 31.75           | 40.0           | 8.2         | 100         | 101         | -                        |
| Vert.    | 62.510          | QP       | 43.79          | 7.69            | 7.24      | 31.83     | 0.00                 | 26.89           | 40.0           | 13.1        | 100         | 247         | -                        |
| Vert.    | 111.633         | QP       | 42.17          | 12.15           | 8.16      | 31.81     | 0.00                 | 30.67           | 43.5           | 12.8        | 100         | 339         | -                        |
| Vert.    | 132.162         | QP       | 35.25          | 14.05           | 8.42      | 31.79     | 0.00                 | 25.93           | 43.5           | 17.5        | 100         | 52          | -                        |
| Vert.    | 172.759         | QP       | 32.63          | 15.77           | 8.95      | 31.78     | 0.00                 | 25.57           | 43.5           | 17.9        | 100         | 232         | -                        |
| Vert.    | 187.208         | QP       | 31.84          | 16.29           | 8.96      | 31.78     | 0.00                 | 25.31           | 43.5           | 18.1        | 100         | 115         | -                        |
| Vert.    | 2390.000        | PK       | 46.29          | 27.93           | 14.49     | 39.55     | 2.28                 | 51.44           | 73.9           | 22.4        | 141         | 154         | -                        |
| Vert.    | 4804.000        | PK       | 46.24          | 31.47           | 7.03      | 39.73     | 2.28                 | 47.29           | 73.9           | 26.6        | 265         | 141         | -                        |
| Vert.    | 7206.000        | PK       | 45.62          | 36.90           | 8.67      | 39.51     | 2.28                 | 53.96           | 73.9           | 19.9        | 150         | 0           | -                        |
| Vert.    | 9608.000        | PK       | 45.70          | 38.23           | 10.20     | 39.66     | 2.28                 | 56.75           | 73.9           | 17.1        | 150         | 0           | -                        |
| Vert.    | 2390.000        | AV       | 33.71          | 27.93           | 14.49     | 39.55     | 2.28                 | 38.86           | 53.9           | 15.0        | 141         | 154         | VBW: 360 Hz              |
| Vert.    | 4804.000        | AV       | 34.01          | 31.47           | 7.03      | 39.73     | 2.28                 | 35.06           | 53.9           | 18.8        | 265         | 141         | VBW: 360 Hz              |
| Vert.    | 7206.000        | AV       | 33.52          | 36.90           | 8.67      | 39.51     | 2.28                 | 41.86           | 53.9           | 12.0        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9608.000        | AV       | 33.22          | 38.23           | 10.20     | 39.66     | 2.28                 | 44.27           | 53.9           | 9.6         | 150         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 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.    | 2402.000        | PK       | 97.83          | 27.92           | 14.50     | 39.56     | 2.28                 | 102.97          | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 39.58          | 27.92           | 14.50     | 39.56     | 2.28                 | 44.72           | 82.9           | 38.1        | -       |
| Vert.    | 2402.000        | PK       | 85.66          | 27.92           | 14.50     | 39.56     | 2.28                 | 90.80           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 35.48          | 27.92           | 14.50     | 39.56     | 2.28                 | 40.62           | 70.8           | 30.1        | -       |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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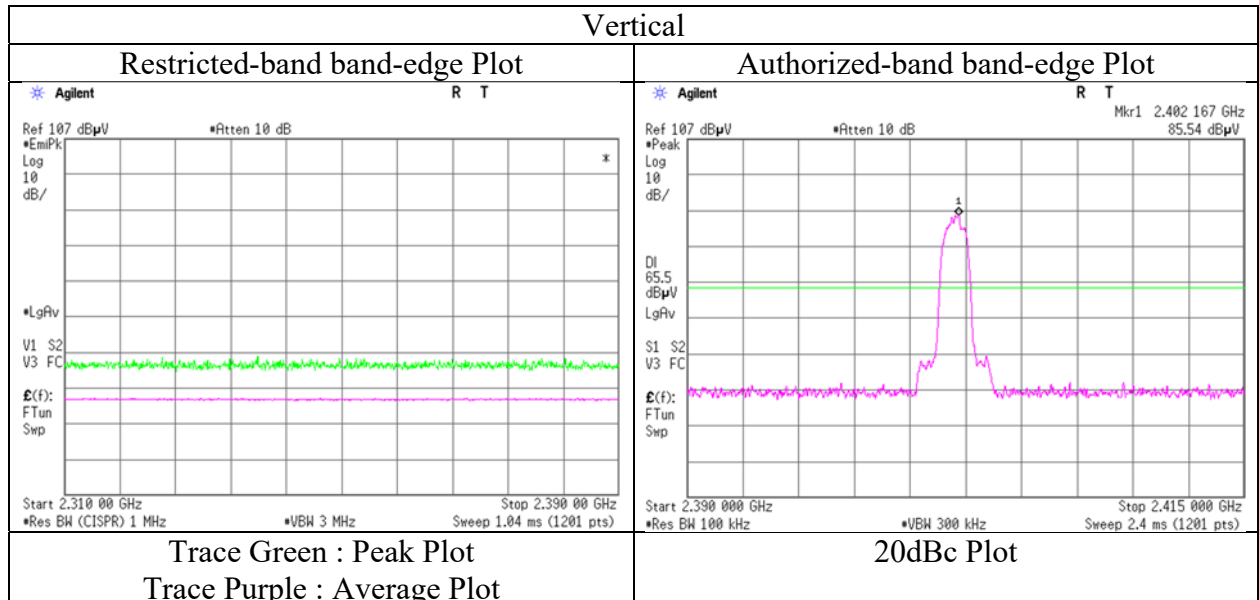
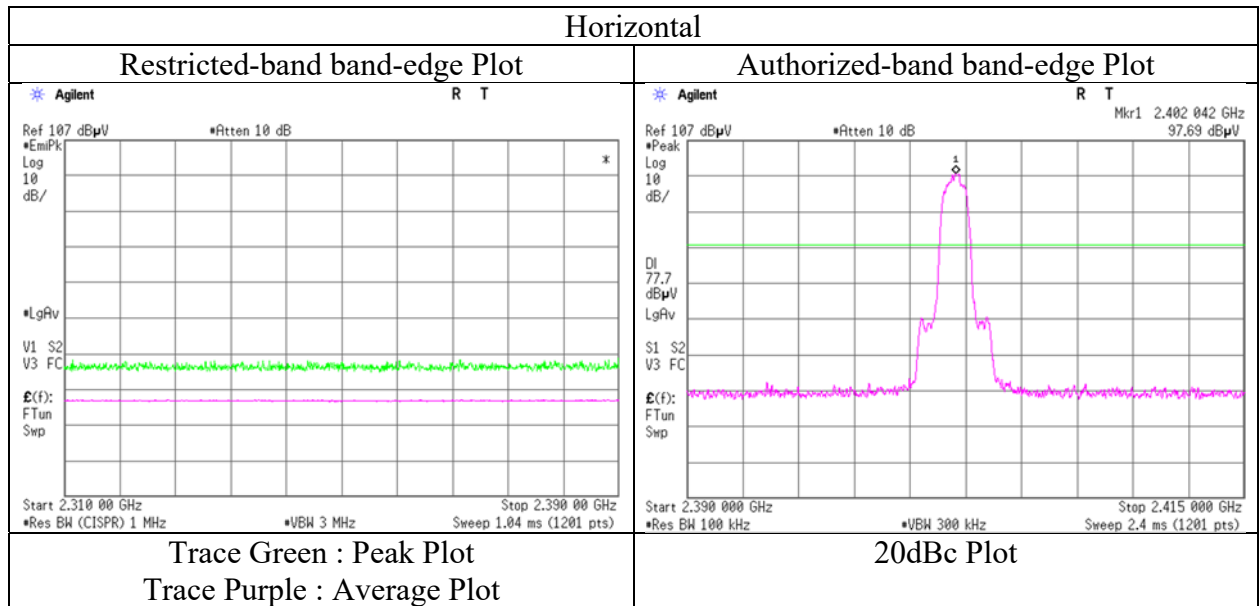
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                |
|------------------------|--------------------------------|
| Report No.             | 13554183S-B                    |
| Test place             | Shonan EMC Lab.                |
| Semi Anechoic Chamber  | 1                              |
| Date                   | Oct 19, 2020                   |
| Temperature / Humidity | 22 deg.C, 54 %RH               |
| Engineer               | Takahiro Suzuki                |
|                        | ( 1 GHz -2.8 GHz )             |
| Mode                   | Tx, Hopping Off, 3DH5 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.             | 13554183S-B                    |                    |                     |                      |
| Test place             | Shonan EMC Lab.                |                    |                     |                      |
| Semi Anechoic Chamber  | 1                              | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                   | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH               | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki                | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )              | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, 3DH5 2441 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.    | 189.984         | QP       | 28.02          | 16.43           | 8.97      | 31.78     | 0.00                 | 21.64           | 43.5           | 21.8        | 181         | 305         | -                        |
| Hori.    | 210.244         | QP       | 34.23          | 11.21           | 5.89      | 31.77     | 0.00                 | 19.56           | 43.5           | 23.9        | 150         | 212         | -                        |
| Hori.    | 4882.000        | PK       | 45.56          | 31.51           | 7.07      | 39.72     | 2.28                 | 46.70           | 73.9           | 27.2        | 151         | 78          | -                        |
| Hori.    | 7323.000        | PK       | 45.88          | 36.94           | 8.74      | 39.57     | 2.28                 | 54.27           | 73.9           | 19.6        | 150         | 0           | -                        |
| Hori.    | 9764.000        | PK       | 46.09          | 38.63           | 10.22     | 39.47     | 2.28                 | 57.75           | 73.9           | 16.1        | 150         | 0           | -                        |
| Hori.    | 4882.000        | AV       | 33.83          | 31.51           | 7.07      | 39.72     | 2.28                 | 34.97           | 53.9           | 18.9        | 151         | 78          | VBW: 360 Hz              |
| Hori.    | 7323.000        | AV       | 33.26          | 36.94           | 8.74      | 39.57     | 2.28                 | 41.65           | 53.9           | 12.2        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9764.000        | AV       | 33.51          | 38.63           | 10.22     | 39.47     | 2.28                 | 45.17           | 53.9           | 8.7         | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 36.543          | QP       | 35.86          | 16.14           | 7.19      | 31.83     | 0.00                 | 27.36           | 40.0           | 12.6        | 100         | 114         | -                        |
| Vert.    | 44.724          | QP       | 43.16          | 13.12           | 7.39      | 31.83     | 0.00                 | 31.84           | 40.0           | 8.1         | 100         | 52          | -                        |
| Vert.    | 63.136          | QP       | 42.95          | 7.58            | 7.23      | 31.83     | 0.00                 | 25.93           | 40.0           | 14.0        | 100         | 234         | -                        |
| Vert.    | 113.766         | QP       | 40.84          | 12.39           | 8.15      | 31.81     | 0.00                 | 29.57           | 43.5           | 13.9        | 100         | 227         | -                        |
| Vert.    | 131.859         | QP       | 34.83          | 14.03           | 8.41      | 31.79     | 0.00                 | 25.48           | 43.5           | 18.0        | 100         | 359         | -                        |
| Vert.    | 172.148         | QP       | 32.69          | 15.77           | 8.95      | 31.78     | 0.00                 | 25.63           | 43.5           | 17.8        | 100         | 192         | -                        |
| Vert.    | 183.139         | QP       | 31.78          | 16.17           | 8.94      | 31.78     | 0.00                 | 25.11           | 43.5           | 18.3        | 100         | 108         | -                        |
| Vert.    | 4882.000        | PK       | 45.67          | 31.51           | 7.07      | 39.72     | 2.28                 | 46.81           | 73.9           | 27.0        | 211         | 5           | -                        |
| Vert.    | 7323.000        | PK       | 45.71          | 36.94           | 8.74      | 39.57     | 2.28                 | 54.10           | 73.9           | 19.8        | 150         | 0           | -                        |
| Vert.    | 9764.000        | PK       | 45.94          | 38.63           | 10.22     | 39.47     | 2.28                 | 57.60           | 73.9           | 16.3        | 150         | 0           | -                        |
| Vert.    | 4882.000        | AV       | 33.84          | 31.51           | 7.07      | 39.72     | 2.28                 | 34.98           | 53.9           | 18.9        | 211         | 5           | VBW: 360 Hz              |
| Vert.    | 7323.000        | AV       | 33.20          | 36.94           | 8.74      | 39.57     | 2.28                 | 41.59           | 53.9           | 12.3        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9764.000        | AV       | 33.56          | 38.63           | 10.22     | 39.47     | 2.28                 | 45.22           | 53.9           | 8.6         | 150         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

**UL Japan, Inc.**

**Shonan EMC Lab.**

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## Radiated Spurious Emission

|                        |                                |                    |                     |                      |
|------------------------|--------------------------------|--------------------|---------------------|----------------------|
| Report No.             | 13554183S-B                    |                    |                     |                      |
| Test place             | Shonan EMC Lab.                |                    |                     |                      |
| Semi Anechoic Chamber  | 1                              | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                   | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH               | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki                | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )              | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, 3DH5 2480 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.    | 189.300         | QP       | 28.42          | 16.40           | 8.96      | 31.78     | 0.00                 | 22.00           | 43.5           | 21.5        | 175         | 286         | -                        |
| Hori.    | 211.897         | QP       | 33.94          | 11.19           | 5.90      | 31.77     | 0.00                 | 19.26           | 43.5           | 24.2        | 146         | 46          | -                        |
| Hori.    | 2483.500        | PK       | 48.02          | 27.84           | 14.59     | 39.58     | 2.28                 | 53.15           | 73.9           | 20.7        | 138         | 0           | -                        |
| Hori.    | 4960.000        | PK       | 45.47          | 31.69           | 7.14      | 39.71     | 2.28                 | 46.87           | 73.9           | 27.0        | 146         | 341         | -                        |
| Hori.    | 7440.000        | PK       | 46.19          | 37.02           | 8.80      | 39.62     | 2.28                 | 54.67           | 73.9           | 19.2        | 150         | 0           | -                        |
| Hori.    | 9920.000        | PK       | 45.44          | 38.66           | 10.23     | 39.28     | 2.28                 | 57.33           | 73.9           | 16.5        | 150         | 0           | -                        |
| Hori.    | 2483.500        | AV       | 34.29          | 27.84           | 14.59     | 39.58     | 2.28                 | 39.42           | 53.9           | 14.4        | 138         | 0           | VBW: 360 Hz              |
| Hori.    | 4960.000        | AV       | 33.62          | 31.69           | 7.14      | 39.71     | 2.28                 | 35.02           | 53.9           | 18.8        | 146         | 341         | VBW: 360 Hz              |
| Hori.    | 7440.000        | AV       | 33.68          | 37.02           | 8.80      | 39.62     | 2.28                 | 42.16           | 53.9           | 11.7        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9920.000        | AV       | 33.23          | 38.66           | 10.23     | 39.28     | 2.28                 | 45.12           | 53.9           | 8.7         | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 36.613          | QP       | 35.74          | 16.11           | 7.19      | 31.83     | 0.00                 | 27.21           | 40.0           | 12.7        | 100         | 223         | -                        |
| Vert.    | 45.048          | QP       | 43.91          | 13.00           | 7.40      | 31.83     | 0.00                 | 32.48           | 40.0           | 7.5         | 100         | 359         | -                        |
| Vert.    | 63.577          | QP       | 43.25          | 7.50            | 7.22      | 31.83     | 0.00                 | 26.14           | 40.0           | 13.8        | 100         | 159         | -                        |
| Vert.    | 108.247         | QP       | 38.16          | 11.62           | 8.18      | 31.81     | 0.00                 | 26.15           | 43.5           | 17.3        | 100         | 334         | -                        |
| Vert.    | 114.072         | QP       | 40.02          | 12.43           | 8.16      | 31.81     | 0.00                 | 28.80           | 43.5           | 14.7        | 100         | 118         | -                        |
| Vert.    | 131.710         | QP       | 34.98          | 14.03           | 8.41      | 31.79     | 0.00                 | 25.63           | 43.5           | 17.8        | 100         | 61          | -                        |
| Vert.    | 184.959         | QP       | 32.35          | 16.22           | 8.95      | 31.78     | 0.00                 | 25.74           | 43.5           | 17.7        | 100         | 131         | -                        |
| Vert.    | 2483.500        | PK       | 46.48          | 27.84           | 14.59     | 39.58     | 2.28                 | 51.61           | 73.9           | 22.2        | 379         | 88          | -                        |
| Vert.    | 4960.000        | PK       | 44.72          | 31.69           | 7.14      | 39.71     | 2.28                 | 46.12           | 73.9           | 27.7        | 361         | 1           | -                        |
| Vert.    | 7440.000        | PK       | 46.85          | 37.02           | 8.80      | 39.62     | 2.28                 | 55.33           | 73.9           | 18.5        | 150         | 0           | -                        |
| Vert.    | 9920.000        | PK       | 45.95          | 38.66           | 10.23     | 39.28     | 2.28                 | 57.84           | 73.9           | 16.0        | 150         | 0           | -                        |
| Vert.    | 2483.500        | AV       | 33.85          | 27.84           | 14.59     | 39.58     | 2.28                 | 38.98           | 53.9           | 14.9        | 379         | 88          | VBW: 360 Hz              |
| Vert.    | 4960.000        | AV       | 33.69          | 31.69           | 7.14      | 39.71     | 2.28                 | 35.09           | 53.9           | 18.8        | 361         | 1           | VBW: 360 Hz              |
| Vert.    | 7440.000        | AV       | 33.63          | 37.02           | 8.80      | 39.62     | 2.28                 | 42.11           | 53.9           | 11.7        | 150         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9920.000        | AV       | 33.30          | 38.66           | 10.23     | 39.28     | 2.28                 | 45.19           | 53.9           | 8.7         | 150         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

**UL Japan, Inc.**

**Shonan EMC Lab.**

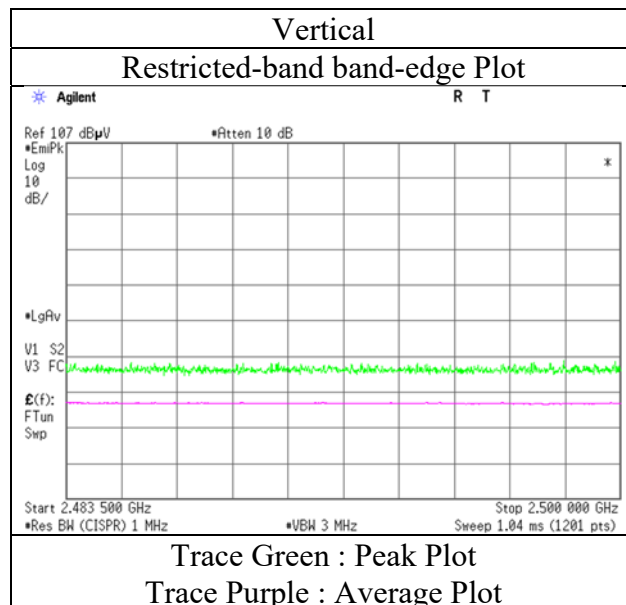
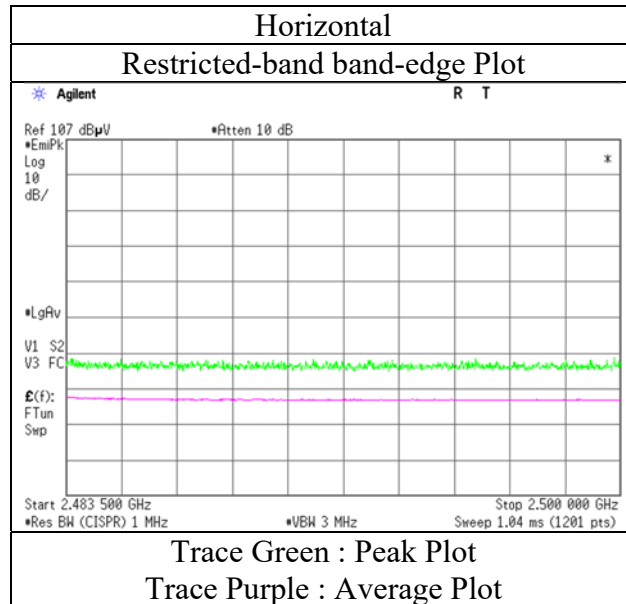
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## Radiated Spurious Emission (Reference Plot for band-edge)

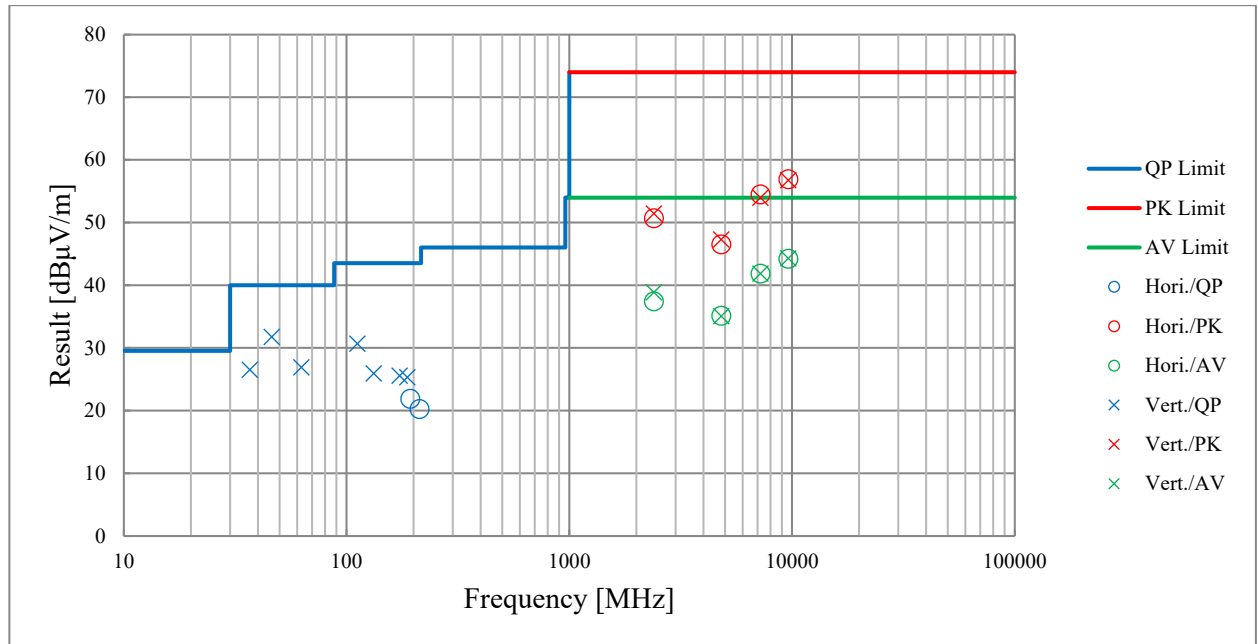
|                        |                                       |
|------------------------|---------------------------------------|
| Report No.             | 13554183S-B                           |
| Test place             | Shonan EMC Lab.                       |
| Semi Anechoic Chamber  | 1                                     |
| Date                   | Oct 19, 2020                          |
| Temperature / Humidity | 22 deg.C, 54 %RH                      |
| Engineer               | Takahiro Suzuki<br>( 1 GHz -2.8 GHz ) |
| Mode                   | Tx, Hopping Off, 3DH5 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)**

|                        |                                |                    |                     |                      |
|------------------------|--------------------------------|--------------------|---------------------|----------------------|
| Report No.             | 13554183S-B                    |                    |                     |                      |
| Test place             | Shonan EMC Lab.                |                    |                     |                      |
| Semi Anechoic Chamber  | 1                              | 1                  | 1                   | 1                    |
| Date                   | Oct 30, 2020                   | Oct 19, 2020       | Oct 21, 2020        | Oct 29, 2020         |
| Temperature / Humidity | 21 deg.C, 47 %RH               | 22 deg.C, 54 %RH   | 21 deg.C, 47 %RH    | 22 deg.C, 50 %RH     |
| Engineer               | Takahiro Suzuki                | Takahiro Suzuki    | Yosuke Murakami     | Toshinori Yamada     |
|                        | ( 30 MHz -1 GHz )              | ( 1 GHz -2.8 GHz ) | ( 2.8 GHz -18 GHz ) | ( 18 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, 3DH5 2402 MHz |                    |                     |                      |



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

## Radiated Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 1  
Date November 24, 2020  
Temperature / Humidity 21 deg.C, 41 %RH  
Engineer Yosuke Murakami  
( 1 GHz -2.8 GHz )  
Mode Tx, Hopping Off, DH5 2402 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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       | 44.88             | 27.93               | 14.50        | 39.55        | 2.28                    | 50.04              | 73.9              | 23.8           | 114            | 10             | -           |
| Hori.    | 2390.000           | AV       | 32.30             | 27.93               | 14.50        | 39.55        | 2.28                    | 37.46              | 53.9              | 16.4           | 114            | 10             | VBW: 360 Hz |
| Vert.    | 2390.000           | PK       | 45.21             | 27.93               | 14.50        | 39.55        | 2.28                    | 50.37              | 73.9              | 23.5           | 108            | 142            | -           |
| Vert.    | 2390.000           | AV       | 33.51             | 27.93               | 14.50        | 39.55        | 2.28                    | 38.67              | 53.9              | 15.2           | 108            | 142            | VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 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<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       | 99.09             | 27.92               | 14.51        | 39.56        | 2.28                    | 104.24             | -                 | -              | Carrier |
| Hori.    | 2400.000           | PK       | 40.85             | 27.92               | 14.51        | 39.56        | 2.28                    | 46.00              | 84.2              | 38.2           | -       |
| Vert.    | 2402.000           | PK       | 90.48             | 27.92               | 14.51        | 39.56        | 2.28                    | 95.63              | -                 | -              | Carrier |
| Vert.    | 2400.000           | PK       | 36.94             | 27.92               | 14.51        | 39.56        | 2.28                    | 42.09              | 75.6              | 33.5           | -       |

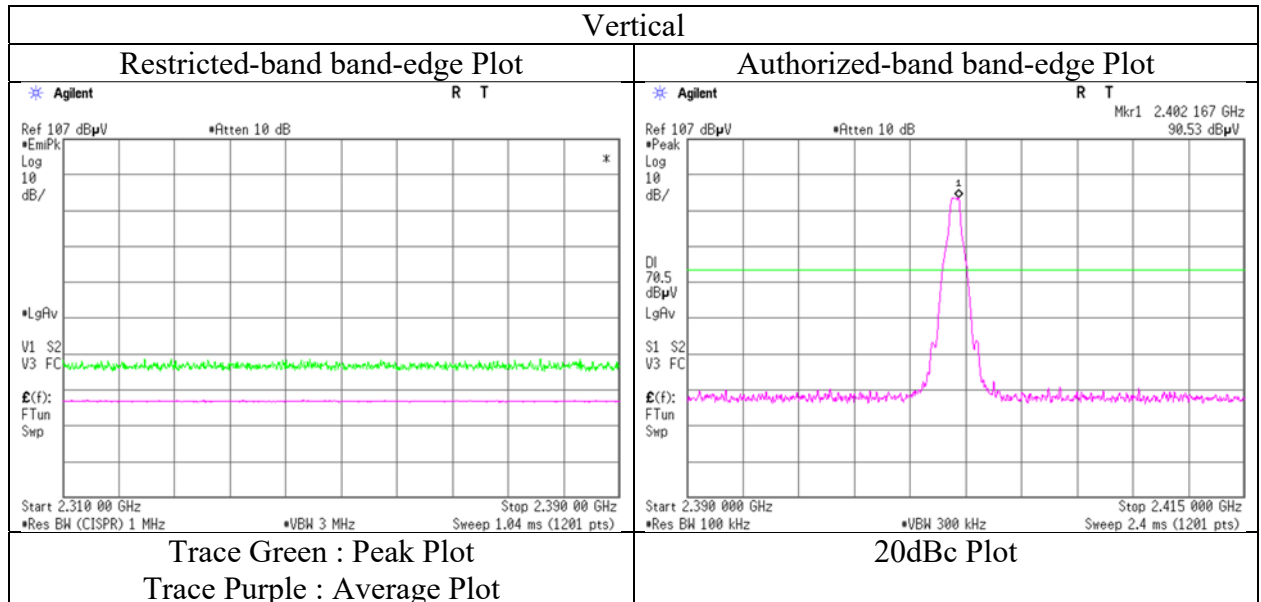
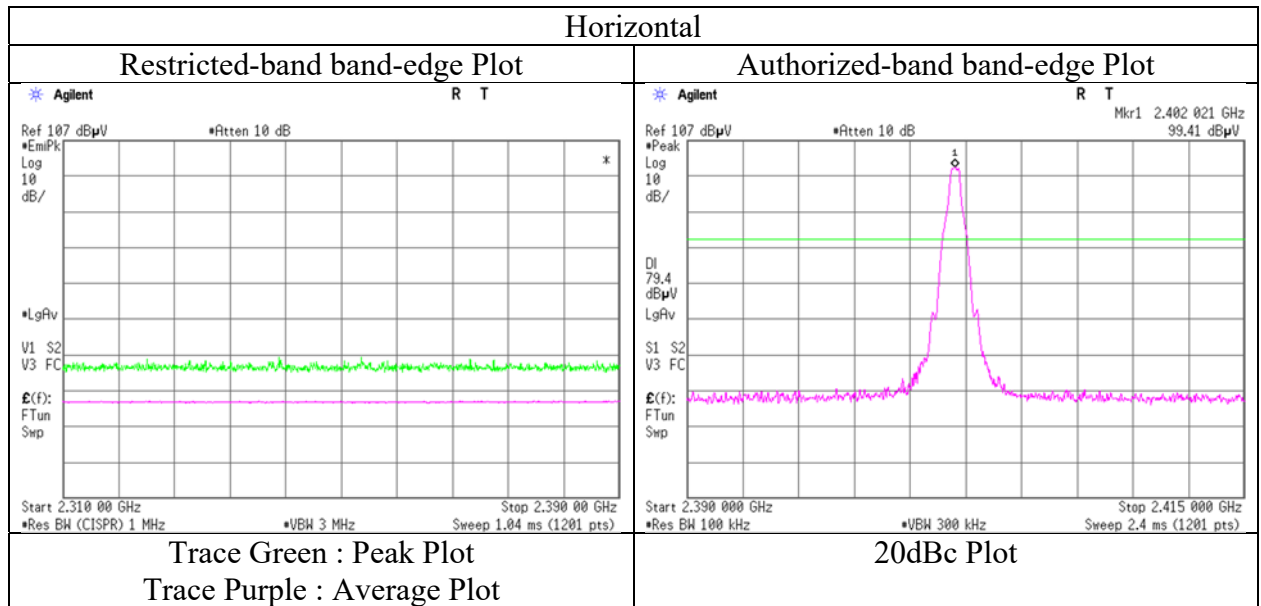
Result = Reading + Ant. Fac. + Loss (Cable + (Attenuator or Filter) (below 18 GHz)) - Gain (Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 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.             | 13554183S-B                                                                              |
| Test place             | Shonan EMC Lab.                                                                          |
| Semi Anechoic Chamber  | 1                                                                                        |
| Date                   | November 24, 2020                                                                        |
| Temperature / Humidity | 21 deg.C, 41 %RH                                                                         |
| Engineer               | Yosuke Murakami<br>( 1 GHz -2.8 GHz )                                                    |
| Mode                   | Tx, Hopping Off, DH5 2402 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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. 13554183S-B  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3  
Date November 23, 2020  
Temperature / Humidity 22 deg.C, 45 %RH  
Engineer Yasumasa Owaki  
( 1 GHz -2.8 GHz )  
Mode Tx, Hopping Off, DH5 2480 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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       | 49.20             | 28.28              | 14.31        | 41.69        | 2.28                    | 52.38              | 73.9              | 21.5           | 183            | 6              | -           |
| Hori.    | 2483.500           | AV       | 36.88             | 28.28              | 14.31        | 41.69        | 2.28                    | 40.06              | 53.9              | <b>13.8</b>    | 183            | 6              | VBW: 360 Hz |
| Vert.    | 2483.500           | PK       | 47.58             | 28.28              | 14.31        | 41.69        | 2.28                    | 50.76              | 73.9              | 23.1           | 149            | 147            | -           |
| Vert.    | 2483.500           | AV       | 35.69             | 28.28              | 14.31        | 41.69        | 2.28                    | 38.87              | 53.9              | 15.0           | 149            | 147            | VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

**UL Japan, Inc.**

**Shonan EMC Lab.**

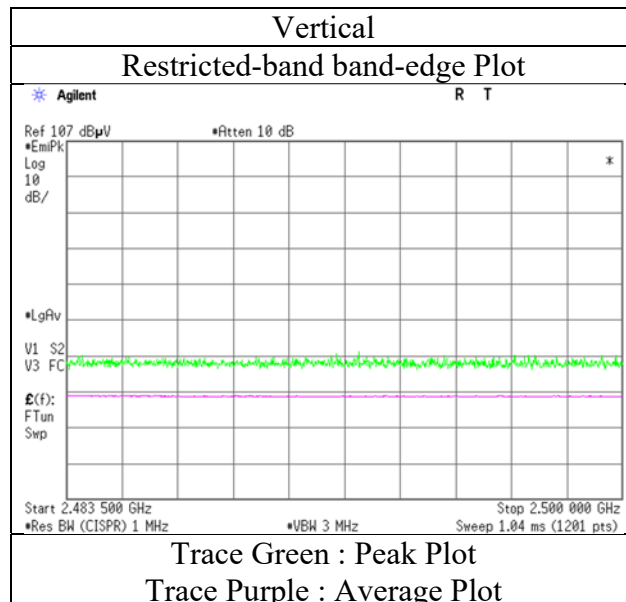
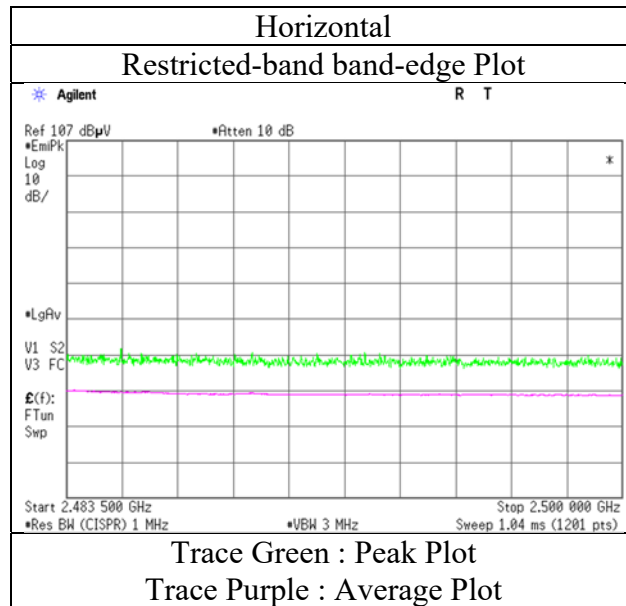
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Report No. 13554183S-B  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3  
Date November 23, 2020  
Temperature / Humidity 22 deg.C, 45 %RH  
Engineer Yasumasa Owaki  
( 1 GHz -2.8 GHz )  
Mode Tx, Hopping Off, DH5 2480 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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. 13554183S-B  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 1 3 1  
Date November 27, 2020 November 23, 2020 November 26, 2020  
Temperature / Humidity 20 deg.C, 46 %RH 22 deg.C, 45 %RH 21 deg.C, 48 %RH  
Engineer Yosuke Murakami Yasumasa Owaki Yosuke Murakami  
( 30 MHz -1 GHz ) ( 1 GHz -10 GHz ) ( 10 GHz -26.5 GHz )  
Mode Tx, Hopping Off, 3DH5 2402 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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.    | 688.128         | QP       | 36.84          | 19.66           | 8.70      | 32.16     | 0.00                 | 33.04           | 46.0           | 12.9        | 129         | 32          | -                        |
| Hori.    | 712.703         | QP       | 39.12          | 20.00           | 8.82      | 32.13     | 0.00                 | 35.81           | 46.0           | 10.1        | 120         | 187         | -                        |
| Hori.    | 811.007         | QP       | 35.24          | 20.82           | 9.24      | 31.96     | 0.00                 | 33.34           | 46.0           | 12.6        | 104         | 299         | -                        |
| Hori.    | 840.005         | QP       | 33.72          | 21.27           | 9.38      | 31.79     | 0.00                 | 32.58           | 46.0           | 13.4        | 100         | 297         | -                        |
| Hori.    | 860.160         | QP       | 33.89          | 21.71           | 9.47      | 31.68     | 0.00                 | 33.39           | 46.0           | 12.6        | 100         | 10          | -                        |
| Hori.    | 909.413         | QP       | 34.40          | 22.07           | 9.67      | 31.42     | 0.00                 | 34.72           | 46.0           | 11.2        | 100         | 13          | -                        |
| Hori.    | 933.887         | QP       | 34.45          | 21.98           | 9.76      | 31.24     | 0.00                 | 34.95           | 46.0           | 11.0        | 100         | 11          | -                        |
| Hori.    | 2390.000        | PK       | 45.79          | 27.93           | 14.50     | 39.55     | 2.28                 | 50.95           | 73.9           | 22.9        | 148         | 9           | -                        |
| Hori.    | 4804.000        | PK       | 49.96          | 31.60           | 6.68      | 42.92     | 2.28                 | 47.60           | 73.9           | 26.3        | 377         | 283         | -                        |
| Hori.    | 7206.000        | PK       | 49.10          | 37.60           | 8.16      | 43.39     | 2.28                 | 53.75           | 73.9           | 20.1        | 100         | 0           | -                        |
| Hori.    | 9608.000        | PK       | 48.20          | 38.92           | 9.33      | 43.14     | 2.28                 | 55.59           | 73.9           | 18.3        | 100         | 0           | -                        |
| Hori.    | 2390.000        | AV       | 33.67          | 27.93           | 14.50     | 39.55     | 2.28                 | 38.83           | 53.9           | 15.0        | 148         | 9           | VBW: 360 Hz              |
| Hori.    | 4804.000        | AV       | 39.14          | 31.60           | 6.68      | 42.92     | 2.28                 | 36.78           | 53.9           | 17.1        | 377         | 283         | VBW: 360 Hz              |
| Hori.    | 7206.000        | AV       | 37.63          | 37.60           | 8.16      | 43.39     | 2.28                 | 42.28           | 53.9           | 11.6        | 100         | 0           | Floor noise, VBW: 360 Hz |
| Hori.    | 9608.000        | AV       | 37.14          | 38.92           | 9.33      | 43.14     | 2.28                 | 44.53           | 53.9           | 9.3         | 100         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 50.366          | QP       | 45.21          | 11.05           | 7.46      | 31.83     | 0.00                 | 31.89           | 40.0           | 8.1         | 100         | 226         | -                        |
| Vert.    | 54.795          | QP       | 41.83          | 9.58            | 7.44      | 31.83     | 0.00                 | 27.02           | 40.0           | 12.9        | 100         | 268         | -                        |
| Vert.    | 135.336         | QP       | 36.13          | 14.25           | 8.50      | 31.79     | 0.00                 | 27.09           | 43.5           | 16.4        | 100         | 305         | -                        |
| Vert.    | 959.983         | QP       | 29.04          | 22.18           | 9.86      | 31.02     | 0.00                 | 30.06           | 46.0           | 15.9        | 100         | 158         | -                        |
| Vert.    | 2390.000        | PK       | 44.29          | 27.93           | 14.50     | 39.55     | 2.28                 | 49.45           | 73.9           | 24.4        | 108         | 140         | -                        |
| Vert.    | 4804.000        | PK       | 49.47          | 31.60           | 6.68      | 42.92     | 2.28                 | 47.11           | 73.9           | 26.7        | 264         | 296         | -                        |
| Vert.    | 7206.000        | PK       | 48.51          | 37.60           | 8.16      | 43.39     | 2.28                 | 53.16           | 73.9           | 20.7        | 100         | 0           | -                        |
| Vert.    | 9608.000        | PK       | 48.53          | 38.92           | 9.33      | 43.14     | 2.28                 | 55.92           | 73.9           | 17.9        | 100         | 0           | -                        |
| Vert.    | 2390.000        | AV       | 33.57          | 27.93           | 14.50     | 39.55     | 2.28                 | 38.73           | 53.9           | 15.1        | 108         | 140         | VBW: 360 Hz              |
| Vert.    | 4804.000        | AV       | 37.52          | 31.60           | 6.68      | 42.92     | 2.28                 | 35.16           | 53.9           | 18.7        | 264         | 296         | VBW: 360 Hz              |
| Vert.    | 7206.000        | AV       | 37.40          | 37.60           | 8.16      | 43.39     | 2.28                 | 42.05           | 53.9           | 11.8        | 100         | 0           | Floor noise, VBW: 360 Hz |
| Vert.    | 9608.000        | AV       | 37.03          | 38.92           | 9.33      | 43.14     | 2.28                 | 44.42           | 53.9           | 9.4         | 100         | 0           | Floor noise, VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 dB

10 GHz - 40 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.    | 2402.000        | PK       | 97.51          | 27.92           | 14.51     | 39.56     | 2.28                 | 102.66          | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 41.16          | 27.92           | 14.51     | 39.56     | 2.28                 | 46.31           | 82.6           | 36.2        | -       |
| Vert.    | 2402.000        | PK       | 88.80          | 27.92           | 14.51     | 39.56     | 2.28                 | 93.95           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 36.10          | 27.92           | 14.51     | 39.56     | 2.28                 | 41.25           | 73.9           | 32.6        | -       |

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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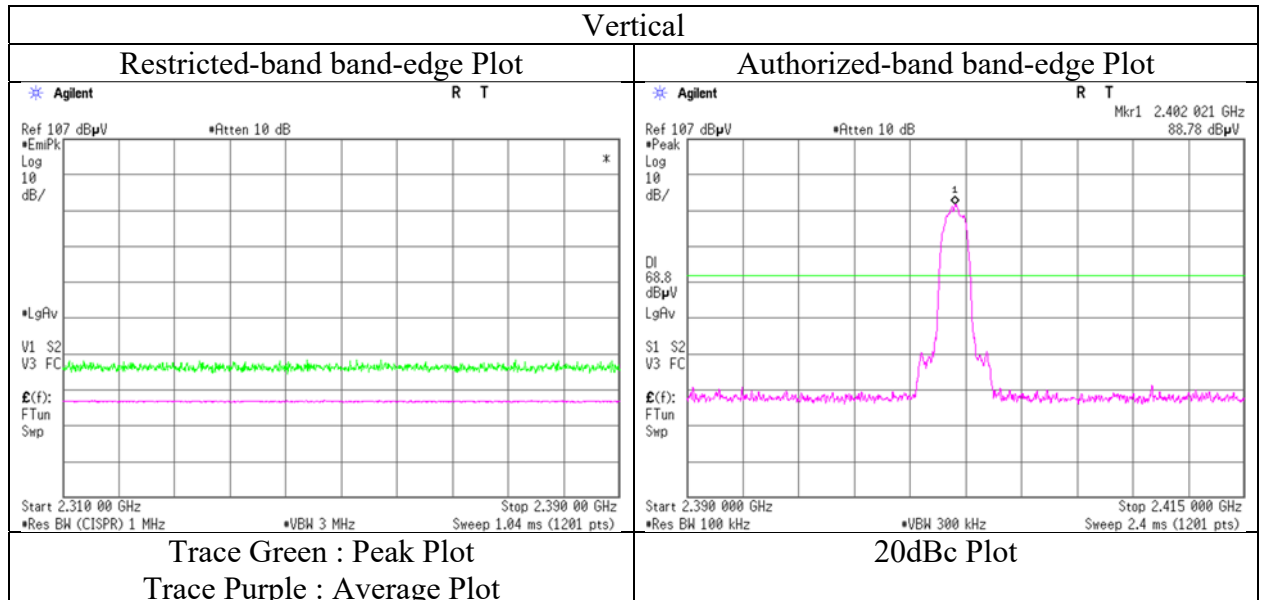
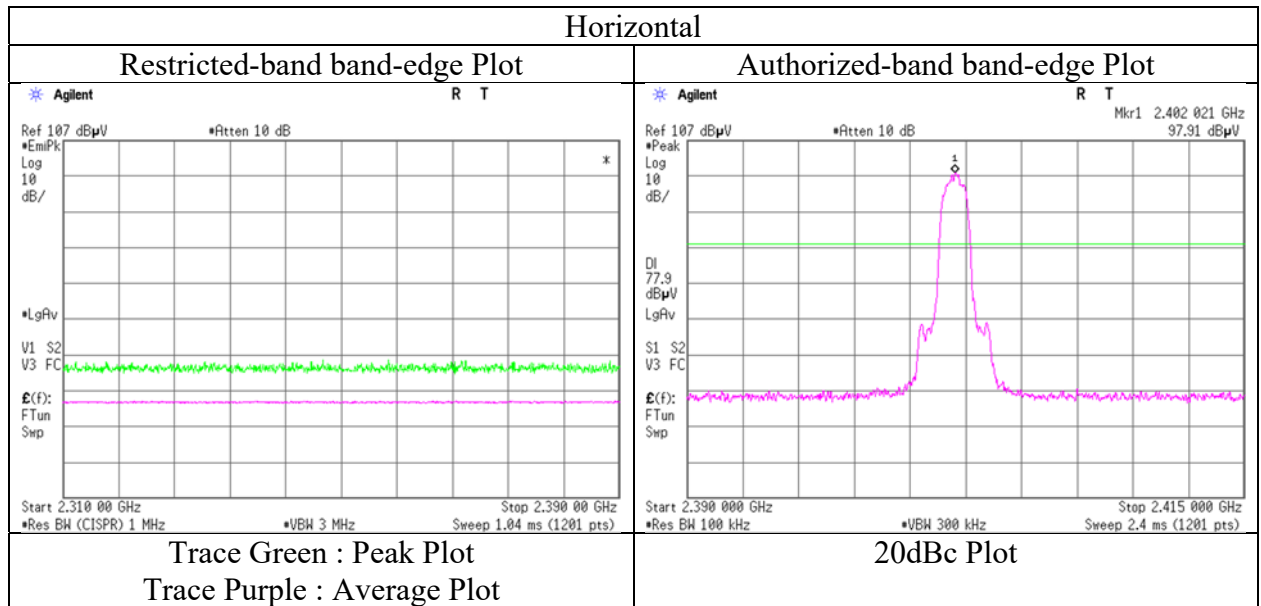
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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

|                        |                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------|
| Report No.             | 13554183S-B                                                                               |
| Test place             | Shonan EMC Lab.                                                                           |
| Semi Anechoic Chamber  | 3                                                                                         |
| Date                   | November 23, 2020                                                                         |
| Temperature / Humidity | 22 deg.C, 45 %RH                                                                          |
| Engineer               | Yasumasa Owaki<br>( 1 GHz -10 GHz )                                                       |
| Mode                   | Tx, Hopping Off, 3DH5 2402 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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. 13554183S-B  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3  
Date November 23, 2020  
Temperature / Humidity 22 deg.C, 45 %RH  
Engineer Yasumasa Owaki  
( 1 GHz -2.8 GHz )  
Mode Tx, Hopping Off, 3DH5 2480 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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       | 49.78             | 28.28              | 14.31        | 41.69        | 2.28                    | 52.96              | 73.9              | 20.9           | 130            | 6              | -           |
| Hori.    | 2483.500           | AV       | 35.20             | 28.28              | 14.31        | 41.69        | 2.28                    | 38.38              | 53.9              | 15.5           | 130            | 6              | VBW: 360 Hz |
| Vert.    | 2483.500           | PK       | 48.45             | 28.28              | 14.31        | 41.69        | 2.28                    | 51.63              | 73.9              | 22.2           | 373            | 57             | -           |
| Vert.    | 2483.500           | AV       | 35.56             | 28.28              | 14.31        | 41.69        | 2.28                    | 38.74              | 53.9              | 15.1           | 373            | 57             | VBW: 360 Hz |

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

Distance factor : 1 GHz - 10 GHz :  $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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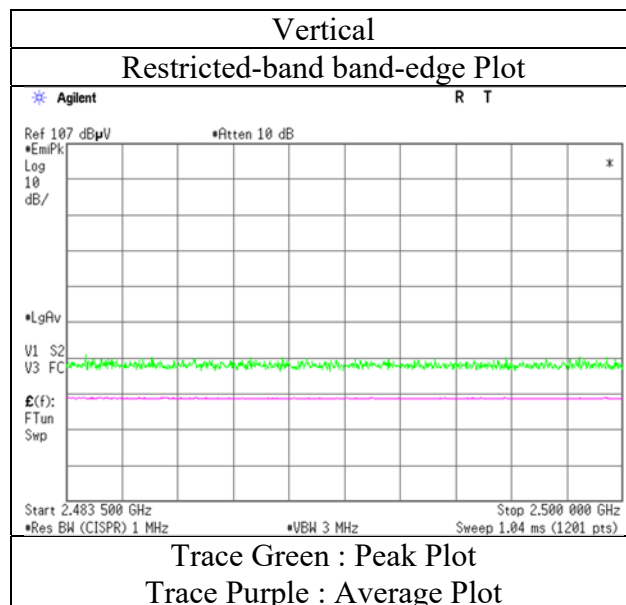
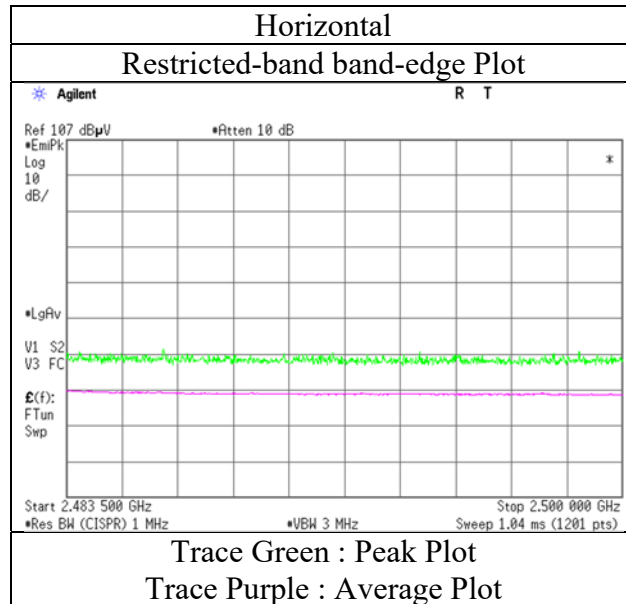
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## Radiated Spurious Emission (Reference Plot for band-edge)

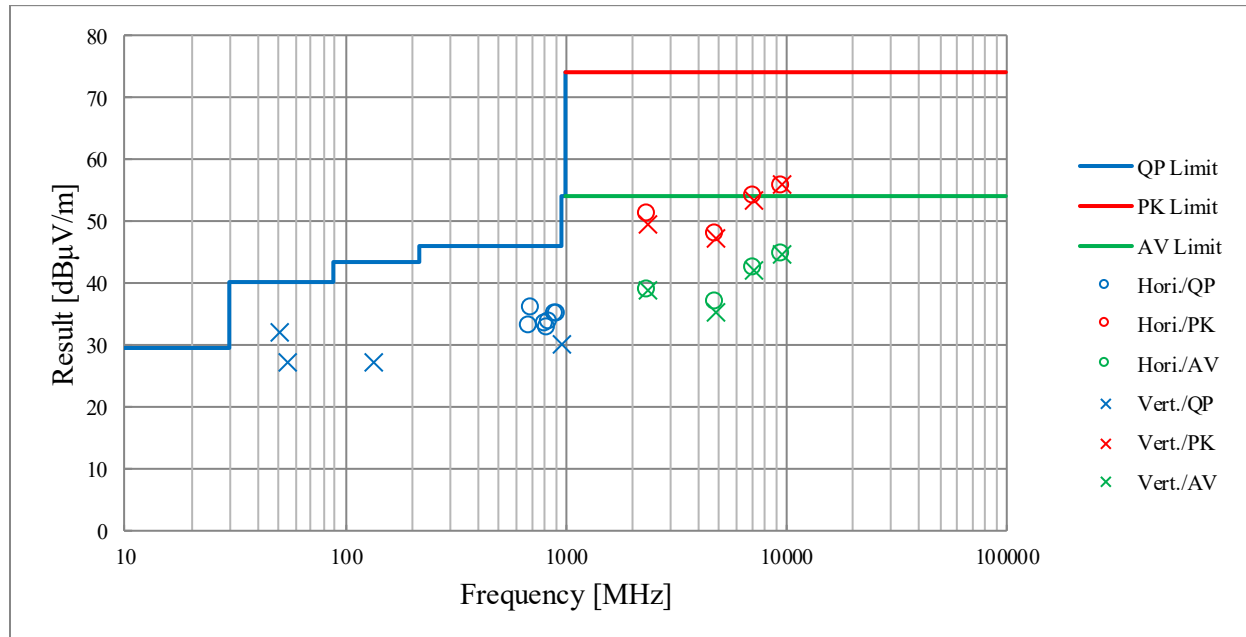
|                        |                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------|
| Report No.             | 13554183S-B                                                                               |
| Test place             | Shonan EMC Lab.                                                                           |
| Semi Anechoic Chamber  | 3                                                                                         |
| Date                   | November 23, 2020                                                                         |
| Temperature / Humidity | 22 deg.C, 45 %RH                                                                          |
| Engineer               | Yasumasa Owaki                                                                            |
|                        | ( 1 GHz -2.8 GHz )                                                                        |
| Mode                   | Tx, Hopping Off, 3DH5 2480 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 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)

|                        |                                                                                           |                   |                      |
|------------------------|-------------------------------------------------------------------------------------------|-------------------|----------------------|
| Report No.             | 13554183S-B                                                                               |                   |                      |
| Test place             | Shonan EMC Lab.                                                                           |                   |                      |
| Semi Anechoic Chamber  | 1                                                                                         | 3                 | 1                    |
| Date                   | November 27, 2020                                                                         | November 23, 2020 | November 26, 2020    |
| Temperature / Humidity | 20 deg.C, 46 %RH                                                                          | 22 deg.C, 45 %RH  | 21 deg.C, 48 %RH     |
| Engineer               | Yosuke Murakami                                                                           | Yasumasa Owaki    | Yosuke Murakami      |
|                        | ( 30 MHz -1 GHz )                                                                         | ( 1 GHz -10 GHz ) | ( 10 GHz -26.5 GHz ) |
| Mode                   | Tx, Hopping Off, 3DH5 2402 MHz with Module A 11n-20 5320 MHz and Module B 11n-20 5580 MHz |                   |                      |

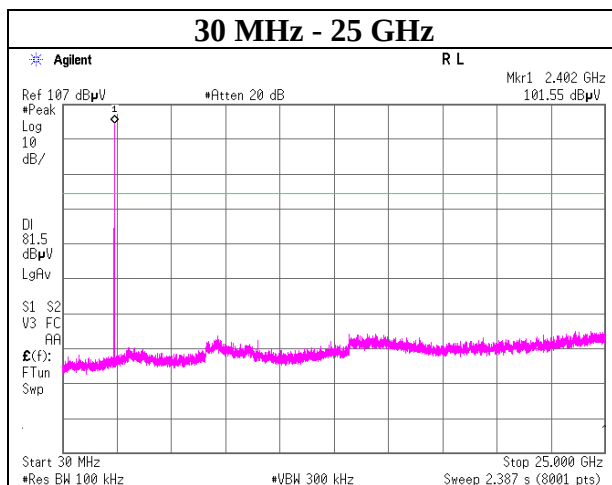
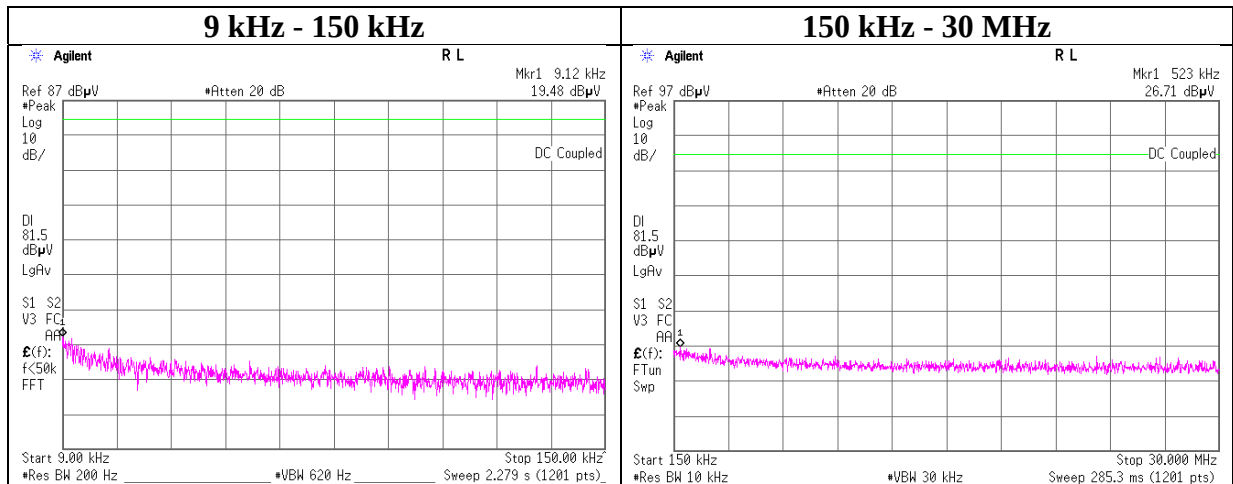


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Conducted Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, DH5

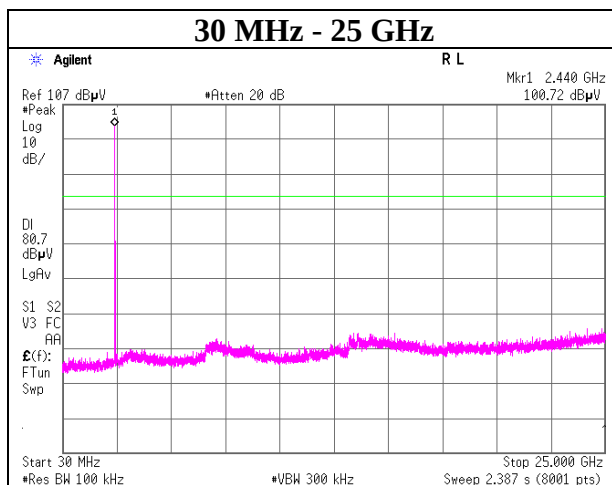
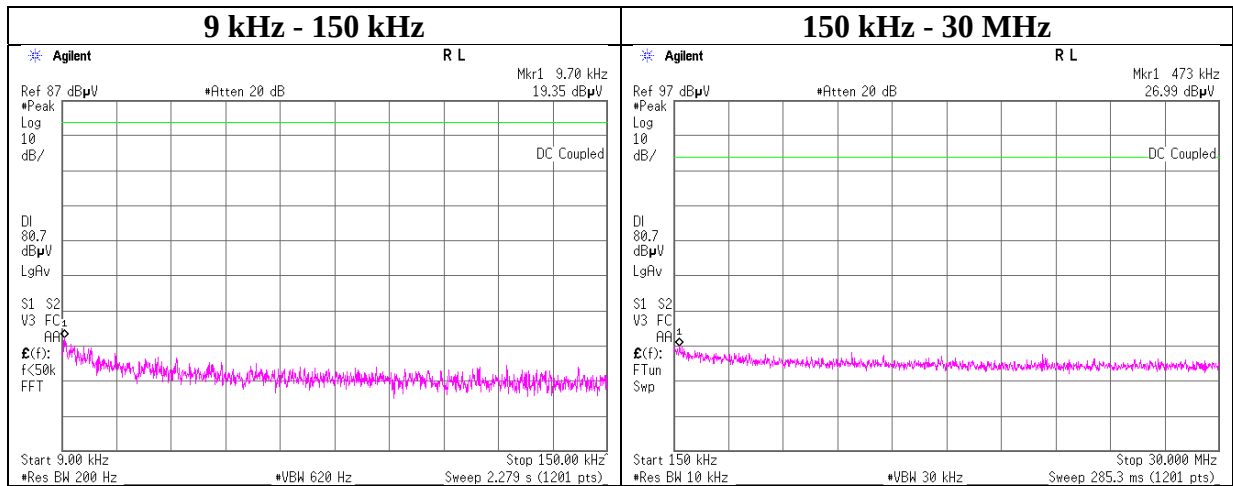
### 2402 MHz



## Conducted Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, DH5

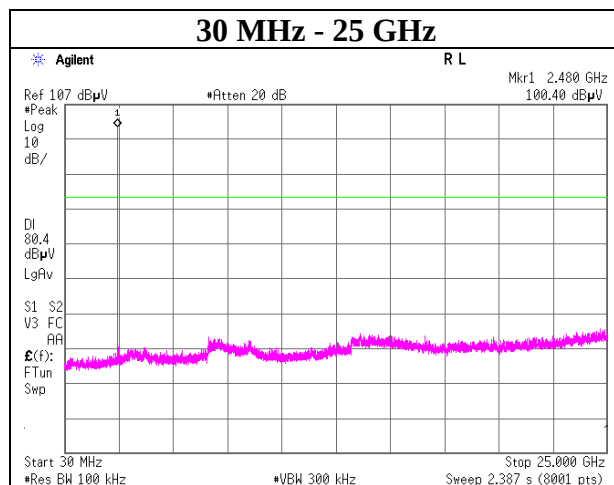
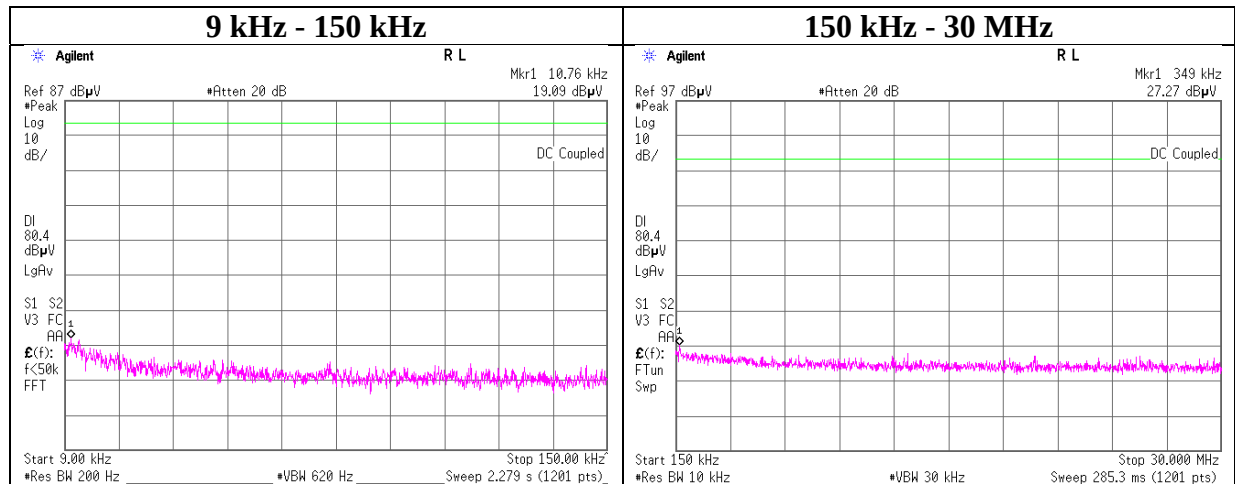
### 2441 MHz



## Conducted Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, DH5

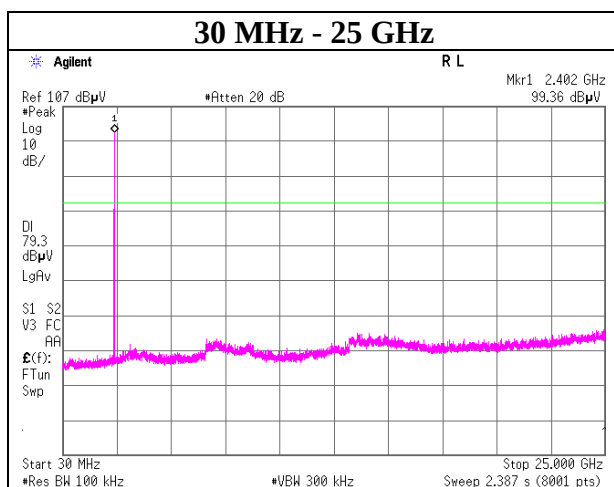
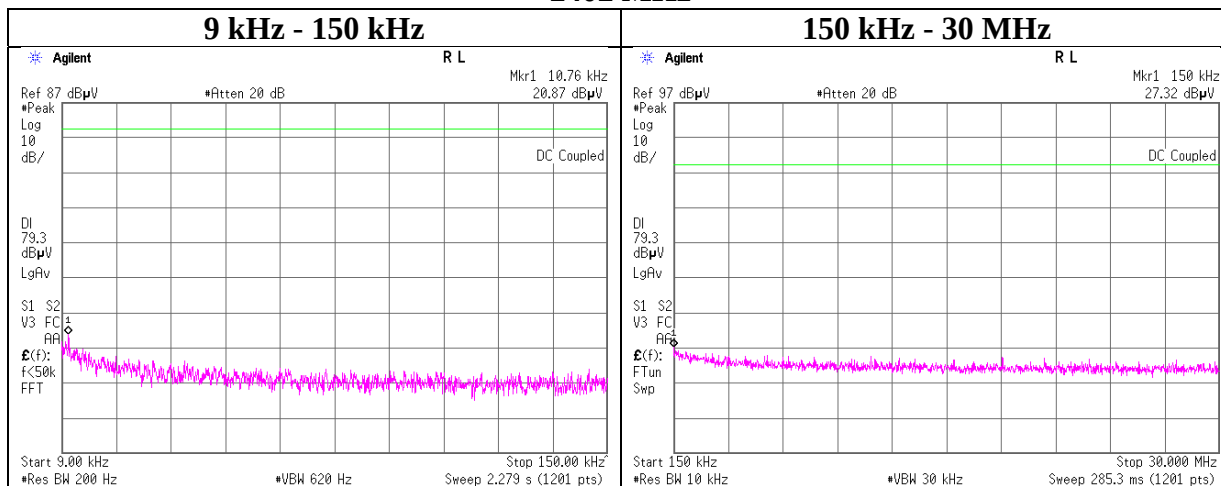
### 2480 MHz



## Conducted Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, 3DH5

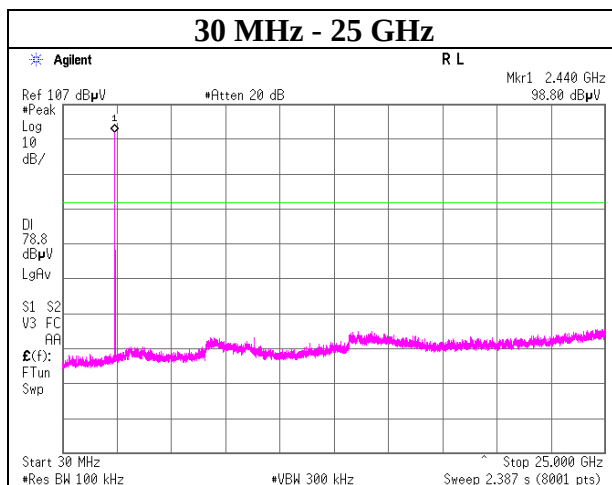
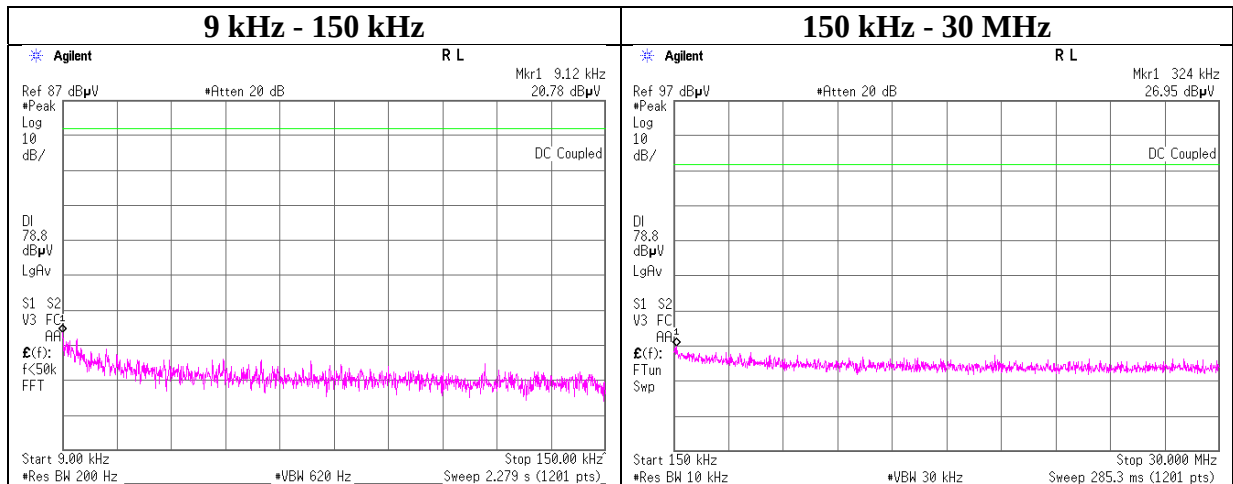
### 2402 MHz



## Conducted Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, 3DH5

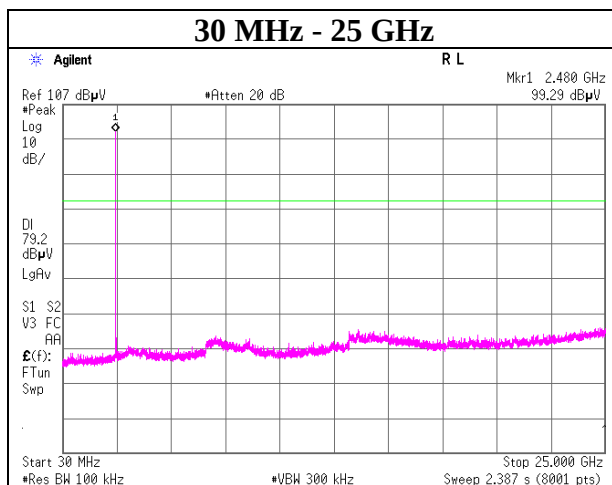
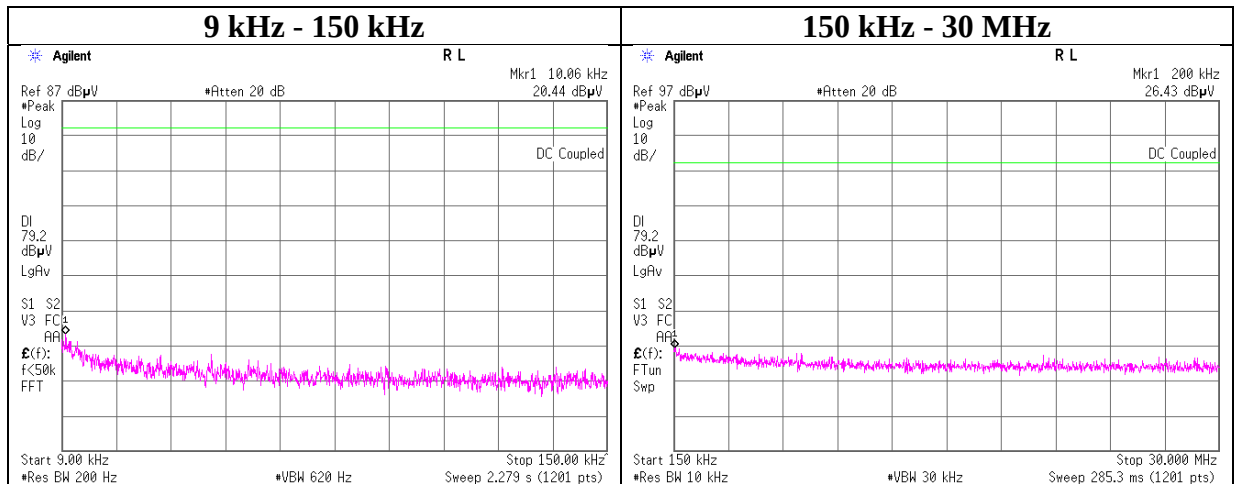
### 2441 MHz



## Conducted Spurious Emission

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx, Hopping Off, 3DH5

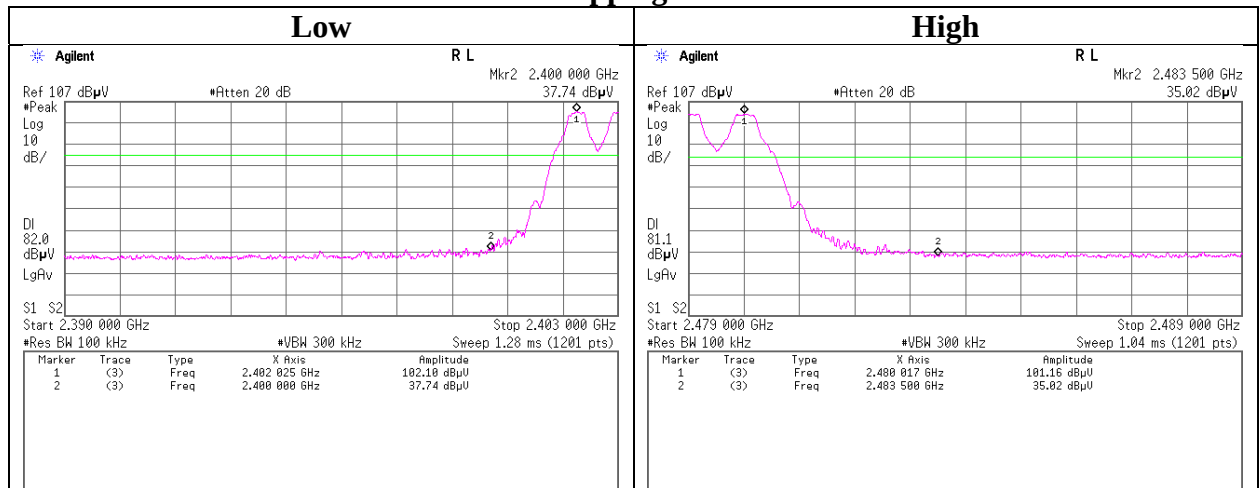
### 2480 MHz



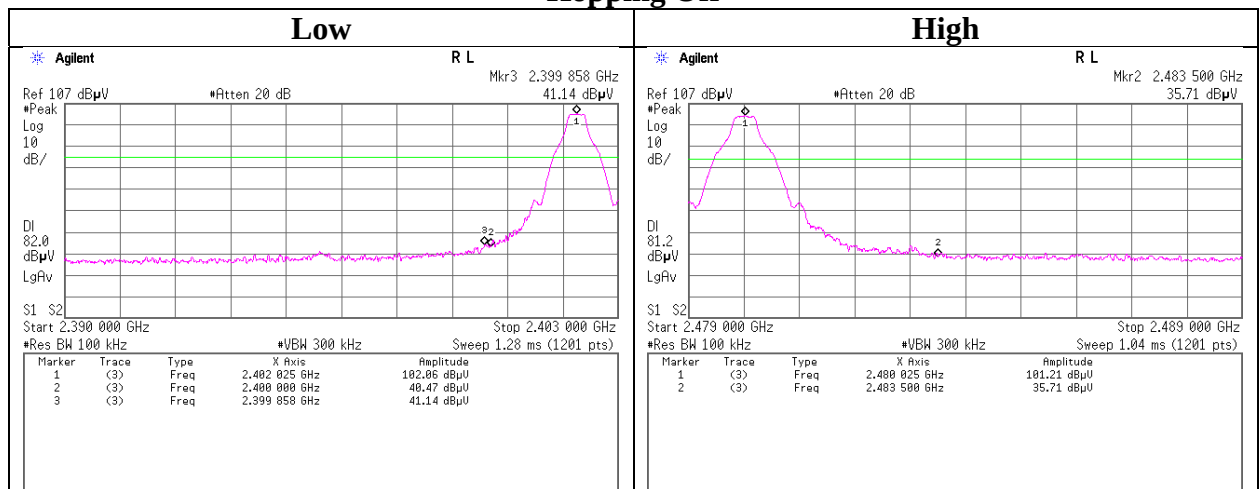
## Conducted Emission Band Edge compliance

Report No. 13554183S-B  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 14, 2020  
Temperature / Humidity 27 deg. C / 45 % RH  
Engineer Kazuya Noda  
Mode Tx DH5

### Hopping On



### Hopping Off



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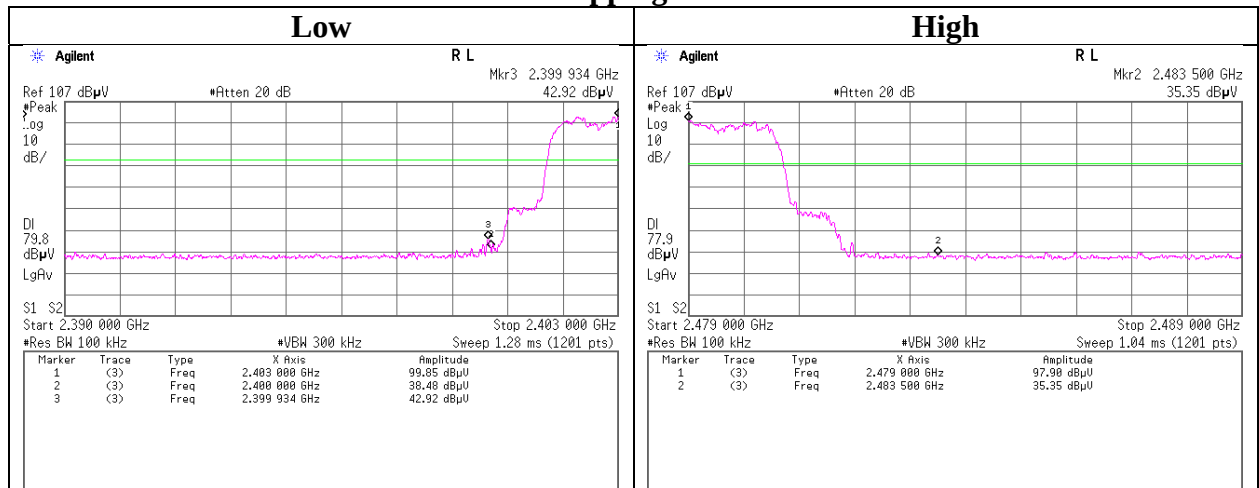
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Facsimile : +81 463 50 6401

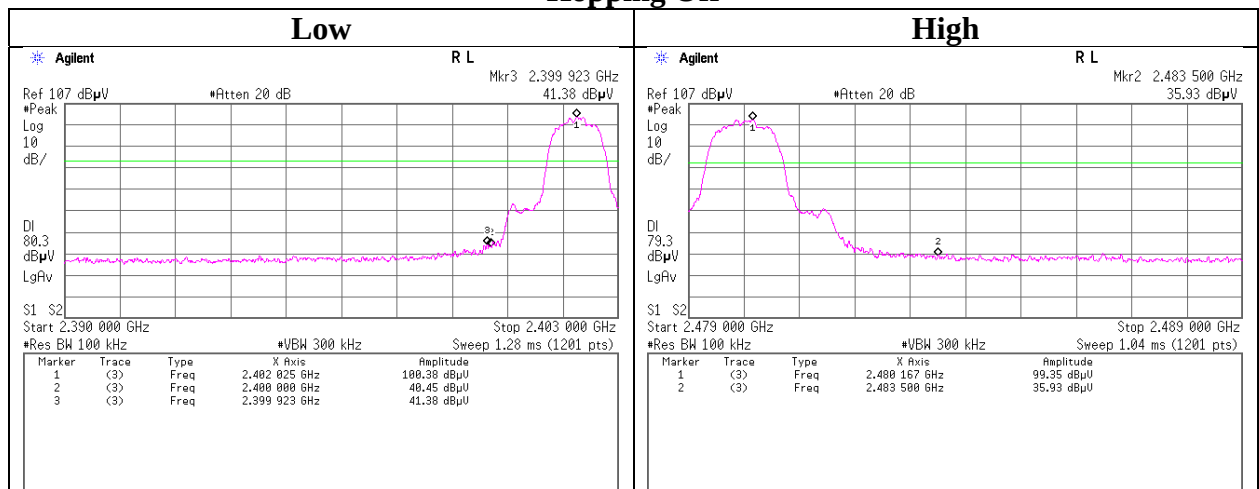
## Conducted Emission Band Edge compliance

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13554183S-B                        |
| Test place             | Shonan EMC Lab. No.6 Shielded Room |
| Date                   | October 14, 2020                   |
| Temperature / Humidity | 27 deg. C / 45 % RH                |
| Engineer               | Kazuya Noda                        |
| Mode                   | Tx 3DH5                            |

### Hopping On



### Hopping Off



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## APPENDIX 2: Test instruments

### Test equipment(1/3)

| Test Name | Local ID            | LIMS ID | Description               | Manufacturer                      | Model                   | Serial                  | Last Calibration Date | Calibration Interval (Month) |
|-----------|---------------------|---------|---------------------------|-----------------------------------|-------------------------|-------------------------|-----------------------|------------------------------|
| AT        | KTS-06              | 145110  | Digital Tester            | SANWA                             | PC500                   | 7019240                 | 2020/04/09            | 12                           |
| AT        | SAT10-14            | 154591  | Attenuator                | Weinschel Corp.                   | 54A-10                  | 81595                   | 2020/04/01            | 12                           |
| AT        | SCC-G53             | 179107  | Coaxial Cable             | Junkosha                          | MWX241-01000KMSKMS/B    | 1901Q062-R              | 2020/04/01            | 12                           |
| AT        | SCC-H21             | 197395  | Microwave cable           | RS Pro                            | R-132G7210 100CO        | -                       | 2020/04/07            | 12                           |
| AT        | SCC-H22             | 197396  | Microwave cable           | RS Pro                            | R-132G7210 100CO        | -                       | 2020/04/07            | 12                           |
| AT        | SCC-H23             | 199603  | Microwave cable           | RS Pro                            | R-132G7210 100CO        | -                       | 2020/06/12            | 12                           |
| AT        | SOS-05              | 146293  | Humidity Indicator        | A&D Company                       | AD-5681                 | 4062518                 | 2020/09/30            | 12                           |
| AT        | SPM-07              | 146247  | Power Meter               | Keysight Technologies Inc         | 8990B                   | MY5100272               | 2020/05/27            | 12                           |
| AT        | SPSS-04             | 146310  | Power sensor              | Keysight Technologies Inc         | N1923A                  | MY5326009               | 2020/05/27            | 12                           |
| AT        | SRENT-15            | 160899  | Spectrum Analyzer         | Keysight Technologies Inc         | E4440A                  | MY46185516              | 2020/01/15            | 12                           |
| AT        | STM-G7              | 171614  | Terminator                | Weinschel - API Technologies Corp | M1459A                  | 88995                   | 2020/06/03            | 12                           |
| AT        | STM-G8              | 171615  | Terminator                | Weinschel - API Technologies Corp | M1459A                  | 88997                   | 2020/06/03            | 12                           |
| CE        | SAT3-13             | 150923  | Attenuator                | JFW                               | 50HF-003N               | -                       | 2020/01/30            | 12                           |
| CE        | SCC-A12/A13/SRSE-01 | 144966  | Coaxial Cable&RF Selector | Suhner/Suhner/TOYO                | RG223U/141PE/N S4906    | -/0901-269(RF Selector) | 2020/04/12            | 12                           |
| CE        | SLS-02              | 145539  | LISN                      | Rohde & Schwarz                   | ENV216                  | 100512                  | 2020/02/18            | 12                           |
| CE        | SOS-16              | 167990  | Humidity Indicator        | CUSTOM. Inc                       | CTH-202                 | 708Q08R                 | 2020/10/01            | 12                           |
| CE        | STR-06              | 146208  | Test Receiver             | Rohde & Schwarz                   | ESCI                    | 101259                  | 2020/04/01            | 12                           |
| CE,RE     | COTS-SEMI-5         | 170932  | EMI Software              | TSJ (Techno Science Japan)        | TEPTO-DV3(RE,CE,ME,P E) | -                       | -                     | -                            |
| CE,RE     | KJM-09              | 145929  | Measure                   | KOMELON                           | KMC-36                  | -                       | -                     | -                            |
| CE,RE     | STS-01              | 145792  | Digital Hitester          | Hioki                             | 3805-50                 | 80997812                | 2020/10/19            | 12                           |

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### Test equipment(2/3)

| Test Name | Local ID        | LIMS ID | Description           | Manufacturer              | Model                | Serial         | Last Calibration Date | Calibration Interval (Month) |
|-----------|-----------------|---------|-----------------------|---------------------------|----------------------|----------------|-----------------------|------------------------------|
| RE        | KJM-02          | 146432  | Measure               | TAJIMA                    | GL19-55              | -              | -                     | -                            |
| RE        | KSA-08          | 145089  | Spectrum Analyzer     | Keysight Technologies Inc | E4446A               | MY46180525     | 2019/11/05            | 12                           |
| RE        | SAEC-01(NSA)    | 145597  | Semi-Anechoic Chamber | TDK                       | SAEC-01(NSA)         | 1              | 2020/04/08            | 12                           |
| RE        | SAEC-01(SVS WR) | 145561  | Semi-Anechoic Chamber | TDK                       | SAEC-01(SVSWR)       | 1              | 2020/05/04            | 12                           |
| RE        | SAEC-03(SVS WR) | 145566  | Semi-Anechoic Chamber | TDK                       | SAEC-03(SVSWR)       | 3              | 2020/05/11            | 12                           |
| RE        | SAF-04          | 145127  | Pre Amplifier         | Toyo Corporation          | TPA0118-36           | 2072554        | 2020/06/02            | 12                           |
| RE        | SAF-06          | 145005  | Pre Amplifier         | Toyo Corporation          | TPA0118-36           | 1440491        | 2020/02/20            | 12                           |
| RE        | SAF-08          | 145007  | Pre Amplifier         | Toyo Corporation          | HAP18-26W            | 19             | 2020/03/03            | 12                           |
| RE        | SAF-10          | 145129  | Pre Amplifier         | Toyo Corporation          | HAP26-40W            | 10             | 2020/03/03            | 12                           |
| RE        | SAT10-05        | 145136  | Attenuator            | Keysight Technologies Inc | 8493C-010            | 74864          | 2020/10/05            | 12                           |
| RE        | SAT10-06        | 145137  | Attenuator            | Keysight Technologies Inc | 8493C-010            | 74865          | 2020/10/05            | 12                           |
| RE        | SCC-G05         | 145039  | Coaxial Cable         | Junkosha                  | J12J102207-00        | APR-30-15-037  | 2020/01/31            | 12                           |
| RE        | SCC-G15         | 145176  | Coaxial Cable         | Suhner                    | SUCOFLEX 102         | 32703/2        | 2020/03/04            | 12                           |
| RE        | SCC-G40         | 166491  | Coaxial Cable         | Junkosha                  | MWX221-01000NFSNMS/B | 1612S005       | 2020/01/08            | 12                           |
| RE        | SCC-G41         | 151617  | Coaxial Cable         | Junkosha                  | MWX221-01000NFSNMS/B | 1612S006       | 2020/01/08            | 12                           |
| RE        | SCC-G43         | 156380  | Coaxial Cable         | HUBER+SUNER               | SUCOFLEX_104E        | SN MY 13406/4E | 2020/06/04            | 12                           |
| RE        | SCC-G57         | 179540  | Coaxial Cable         | HUBER+SUNER               | SUCOFLEX 102         | 802815/2       | 2020/05/12            | 12                           |
| RE        | SCC-G58         | 183047  | Coaxial Cable         | HUBER+SUNER               | SUCOFLEX 104         | 800287/4A      | 2020/06/04            | 12                           |
| RE        | SCC-G62         | 196985  | Coaxial Cable         | HUBER+SUNER               | SUCOFLEX 102         | 803650/2       | 2020/03/10            | 12                           |
| RE        | SCC-G68         | 200008  | Coaxial Cable         | HUBER+SUNER               | SUCOFLEX 104         | 575616/4       | 2020/07/07            | 12                           |

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### Test equipment(3/3)

| Test Name | Local ID | LIMS ID | Description        | Manufacturer                  | Model       | Serial     | Last Calibration Date | Calibration Interval (Month) |
|-----------|----------|---------|--------------------|-------------------------------|-------------|------------|-----------------------|------------------------------|
| RE        | SFL-02   | 145301  | Highpass Filter    | MICRO-TRONICS                 | HPM50111    | 51         | 2020/10/05            | 12                           |
| RE        | SFL-03   | 145377  | Highpass Filter    | MICRO-TRONICS                 | HPM50112    | 28         | 2020/10/05            | 12                           |
| RE        | SFL-18   | 145305  | Highpass Filter    | MICRO-TRONICS                 | HPM50111    | 119        | 2020/04/03            | 12                           |
| RE        | SHA-01   | 145383  | Horn Antenna       | Schwarzbeck Mess - Elektronik | BBHA9120D   | 9120D-725  | 2020/05/27            | 12                           |
| RE        | SHA-03   | 145501  | Horn Antenna       | Schwarzbeck Mess - Elektronik | BBHA9120D   | 9120D-739  | 2020/06/15            | 12                           |
| RE        | SHA-04   | 145512  | Horn Antenna       | ETS LINDGREN                  | 3160-09     | 00094868   | 2020/06/15            | 12                           |
| RE        | SHA-06   | 145514  | Horn Antenna       | ETS LINDGREN                  | 3160-10     | 00092383   | 2020/07/16            | 12                           |
| RE        | SHA-08   | 194683  | Horn Antenna       | Schwarzbeck Mess - Elektronik | BBHA 9120 C | 694        | 2020/02/17            | 12                           |
| RE        | SOS-20   | 191837  | Humidity Indicator | CUSTOM. Inc                   | CTH-201     | -          | 2020/09/28            | 12                           |
| RE        | SOS-23   | 191840  | Humidity Indicator | CUSTOM. Inc                   | CTH-201     | -          | 2020/09/28            | 12                           |
| RE        | SRENT-09 | 150461  | Spectrum Analyzer  | Keysight Technologies Inc     | E4440A      | MY46186392 | 2020/02/10            | 12                           |
| RE        | SSA-02   | 145800  | Spectrum Analyzer  | Keysight Technologies Inc     | E4448A      | MY48250106 | 2020/04/16            | 12                           |
| RE        | SSA-03   | 145801  | Spectrum Analyzer  | Keysight Technologies Inc     | E4448A      | MY48250152 | 2020/08/12            | 12                           |
| RE        | STS-03   | 146210  | Digital Hitester   | Hioki                         | 3805-50     | 80997823   | 2020/10/19            | 12                           |
| RE        | STS-04   | 146211  | Digital Hitester   | Hioki                         | 3805-50     | 80997827   | 2020/04/09            | 12                           |

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

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: CE: Conducted Emission test  
RE: Radiated Emission test  
AT: Antenna Terminal Conducted test

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