



# **RADIO TEST REPORT**

**Test Report No. : 13328641H-A-R2**

**Applicant** : Pioneer Corporation  
**Type of EUT** : Car Audio with Bluetooth/ WLAN  
**Model Number of EUT** : SN211  
**FCC ID** : AJDK115  
**Test regulation** : FCC Part 15 Subpart C: 2020  
**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 covers Radio technical requirements.  
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 13328641H-A-R1. 13328641H-A-R1 is replaced with this report.

**Date of test:** April 22 to May 5, 2020

**Representative test engineer:**

  
Junki Nagatomi  
Engineer  
Consumer Technology Division

**Approved by:**

  
Tsubasa Takayama  
Leader  
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.

\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
[http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

- ☐ This report contains data that are not covered by the NVLAP accreditation.  
☒ There is no testing item of "Non-accreditation".

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## **REVISION HISTORY**

### **Original Test Report No.: 13328641H-A**

| Revision     | Test report No. | Date          | Page revised | Contents                                                               |
|--------------|-----------------|---------------|--------------|------------------------------------------------------------------------|
| - (Original) | 13328641H-A     | June 15, 2020 | -            | -                                                                      |
| 1            | 13328641H-A-R1  | July 1, 2020  | P.6          | Deletion of sentence about simultaneously transmission.                |
| 1            | 13328641H-A-R1  | July 1, 2020  | P.11         | Correction of Power setting value from 0 dBm to 5.2 dBm (both BDR/EDR) |
| 2            | 13328641H-A-R2  | July 8, 2020  | P.27         | Correction of calculation formula                                      |

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## 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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| <b>CONTENTS</b>                                                             | <b>PAGE</b> |
|-----------------------------------------------------------------------------|-------------|
| <b>SECTION 1: Customer information.....</b>                                 | <b>5</b>    |
| <b>SECTION 2: Equipment under test (EUT).....</b>                           | <b>5</b>    |
| <b>SECTION 3: Test specification, procedures &amp; results.....</b>         | <b>7</b>    |
| <b>SECTION 4: Operation of EUT during testing.....</b>                      | <b>11</b>   |
| <b>SECTION 5: Radiated Spurious Emission .....</b>                          | <b>14</b>   |
| <b>SECTION 6: Antenna Terminal Conducted Tests.....</b>                     | <b>16</b>   |
| <b>APPENDIX 1: Test data .....</b>                                          | <b>17</b>   |
| 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation..... | 17          |
| Number of Hopping Frequency .....                                           | 21          |
| Dwell time.....                                                             | 23          |
| Maximum Peak Output Power .....                                             | 26          |
| Average Output Power.....                                                   | 27          |
| Radiated Spurious Emission .....                                            | 29          |
| Conducted Spurious Emission .....                                           | 40          |
| Conducted Emission Band Edge compliance .....                               | 46          |
| <b>APPENDIX 2: Test instruments .....</b>                                   | <b>48</b>   |
| <b>APPENDIX 3: Photographs of test setup .....</b>                          | <b>49</b>   |
| Radiated Spurious Emission .....                                            | 49          |
| Worst Case Position .....                                                   | 50          |

## **SECTION 1: Customer information**

|                  |   |                                                             |
|------------------|---|-------------------------------------------------------------|
| Company Name     | : | Pioneer Corporation                                         |
| Address          | : | 28-8, Honkomagome 2-chome, Bunkyo-ku, Tokyo 113-0021, Japan |
| Telephone Number | : | +81-49-228-7681                                             |
| Facsimile Number | : | +81-49-228-6172                                             |
| Contact Person   | : | Yoshifumi Takahashi                                         |

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                       | : | Car Audio with Bluetooth/ WLAN                                                            |
| Model Number               | : | SN211                                                                                     |
| Serial Number              | : | Refer to SECTION 4.2                                                                      |
| Rating                     | : | DC 10 V -16 V, 10 A                                                                       |
| Receipt Date               | : | April 20, 2020                                                                            |
| Country of Mass-production | : | Thailand                                                                                  |
| Condition                  | : | Production 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: SN211 (referred to as the EUT in this report) is a Car Audio with Bluetooth/ WLAN.

Information of the Factory

|              |   |                                                                                                              |
|--------------|---|--------------------------------------------------------------------------------------------------------------|
| Factory Name | : | PIONEER MANUFACTURING(THAILAND) CO., LTD.                                                                    |
| Address      | : | Rojana Industrial Park, 1/31 Moo 5<br>Tambol Kanham,<br>Amphur U-Thai<br>Pranakornsriyutthaya 13210 Thailand |

## Radio Specification

### WLAN (IEEE 802.11a/n/ac)

| Type of radio             | IEEE802.11a/n/ac<br>(20 M band) | IEEE802.11n/ac<br>(40 M band) | IEEE802.11ac<br>(80 M band) |
|---------------------------|---------------------------------|-------------------------------|-----------------------------|
| Frequency of operation    | 5745 MHz - 5825 MHz             | 5755 MHz - 5795 MHz           | 5775 MHz                    |
| Type of modulation        | OFDM (64QAM, 16QAM, QPSK, BPSK) |                               |                             |
| Channel spacing           | 20 MHz                          | 40 MHz                        | 80 MHz                      |
| Antenna type              | Internal Antenna                |                               |                             |
| Antenna Gain              | -1.37 dBi                       |                               |                             |
| Clock frequency (Maximum) | 125 MHz                         |                               |                             |

### Bluetooth (BR / EDR function) \*1)

| Type of radio             | Bluetooth Version 4.2 |
|---------------------------|-----------------------|
| Frequency of operation    | 2402 MHz - 2480 MHz   |
| Type of modulation        | FHSS                  |
| Channel spacing           | 1 MHz                 |
| Antenna type              | Internal Antenna      |
| Antenna Gain              | -5.38 dBi             |
| Clock frequency (Maximum) | 125 MHz               |

### [GNSS]

|                        |   |                  |
|------------------------|---|------------------|
| Radio Type             | : | Receiver         |
| Frequency of Operation | : | See table below. |
| Antenna type           | : | External Antenna |
| Antenna Gain           | : | 20 dBi           |

### Supported GNSS and GNSS signals

| GNSS    | RNSS Frequency Band / Frequency [MHz]                      |                                                  |                                                                              |
|---------|------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------|
|         | 1559 to 1610                                               | 1215 to 1300                                     | 1164 to 1215                                                                 |
| BDS     | <input type="checkbox"/> B1I 1561.098                      | -                                                | -                                                                            |
| Galileo | <input type="checkbox"/> E1 1575.42                        | <input type="checkbox"/> E6 1278.75              | <input type="checkbox"/> E5a 1176.45<br><input type="checkbox"/> E5b 1207.14 |
| GLONASS | <input checked="" type="checkbox"/> G1 1598.063 - 1605.375 | <input type="checkbox"/> G2 1242.9375 - 1248.625 | -                                                                            |
| GPS     | <input checked="" type="checkbox"/> L1 1575.42             | <input type="checkbox"/> L2 1227.6               | <input type="checkbox"/> L5 1176.45                                          |
| SBAS    | <input type="checkbox"/> L1 1575.42                        | -                                                | <input type="checkbox"/> L5 1176.45                                          |

- ☒ Supported GNSS signal  
☐ Not supported GNSS signal

### AM / FM / DAB

| Type of radio          | FM                    | AM                  | DAB                                                                         |
|------------------------|-----------------------|---------------------|-----------------------------------------------------------------------------|
| Equipment Type         | Receiver              |                     |                                                                             |
| Frequency of Operation | 87.5 MHz to 108.0 MHz | 522 kHz to 1629 kHz | Band III: 174.928 MHz to 239.200 MHz<br>L-Band: 1452.96 MHz to 1490.624 MHz |
| Type of Modulation     | FM                    | AM                  | OFDM                                                                        |
| Antenna Connector Type | Custom                | Custom              | Custom                                                                      |
| Impedance              | 75 ohm                | 75 ohm              | 50 ohm                                                                      |
| Reception method       | Conducted             | Conducted           | Conducted                                                                   |

\* This test report applies to Bluetooth.

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

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on May 26, 2020 and effective July 27, 2020 except 15.258

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

\* The revision does not affect the test result conducted before its effective date.

\*The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

### 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                                   | N/A                              | N/A              | *1)                                             |
| 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 a)      | Conducted                                       |
| 20dB 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 a)      | 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 b)      | 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 c)      | 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 d)      | 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 | 9.8 dB<br>202.628 MHz, QP, Vert. | Complied e) / f) | Conducted/<br>Radiated<br>(above 30 MHz)<br>*2) |

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

\*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

\*2) Radiated test was selected over 30 MHz based on section 15.247(d).

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

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

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

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

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

f) 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          | - a)    | Conducted |
| a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation) |                   |               |              |         |           |

Other than above, no addition, exclusion nor deviation has been made from the standard.

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### 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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#### Antenna Terminal test

| Test Item                                        | Uncertainty (+/-) |
|--------------------------------------------------|-------------------|
| 20 dB Bandwidth / 99 % Occupied Bandwidth        | 0.96 %            |
| Maximum Peak Output Power / Average Output Power | 1.4 dB            |
| Carrier Frequency Separation                     | 0.42 %            |
| Dwell time / Burst rate                          | 0.10 %            |
| Conducted Spurious Emission                      | 2.6 dB            |

#### Conducted emission

| using Item | Frequency range       | Uncertainty (+/-) |
|------------|-----------------------|-------------------|
| AMN (LISN) | 0.009 MHz to 0.15 MHz | 3.4 dB            |
|            | 0.15 MHz to 30 MHz    | 2.9 dB            |

#### Radiated emission

| Measurement distance | Frequency range                                | Uncertainty (+/-) |
|----------------------|------------------------------------------------|-------------------|
| 3 m                  | 9 kHz to 30 MHz                                | 3.3 dB            |
| 10 m                 |                                                | 3.2 dB            |
| 3 m                  | 30 MHz to 200 MHz (Horizontal)<br>(Vertical)   | 4.8 dB            |
|                      |                                                | 5.0 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal)<br>(Vertical) | 5.2 dB            |
|                      |                                                | 6.3 dB            |
| 10 m                 | 30 MHz to 200 MHz (Horizontal)<br>(Vertical)   | 4.8 dB            |
|                      |                                                | 4.8 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal)<br>(Vertical) | 5.0 dB            |
|                      |                                                | 5.0 dB            |
| 3 m                  | 1 GHz to 6 GHz                                 | 4.9 dB            |
|                      | 6 GHz to 18 GHz                                | 5.2 dB            |
| 1 m                  | 10 GHz to 26.5 GHz                             | 5.5 dB            |
|                      | 26.5 GHz to 40 GHz                             | 5.5 dB            |
| 0.5 m                | 26.5 GHz to 40 GHz                             | 5.5 dB            |
| 10 m                 | 1 GHz to 18 GHz                                | 5.2 dB            |

### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

\*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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| Test site                  | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms            | Maximum measurement distance |
|----------------------------|----------------------------|------------------------------------------------------------------|------------------------|------------------------------|
| No.1 semi-anechoic chamber | 19.2 x 11.2 x 7.7          | 7.0 x 6.0                                                        | No.1 Power source room | 10 m                         |
| No.2 semi-anechoic chamber | 7.5 x 5.8 x 5.2            | 4.0 x 4.0                                                        | -                      | 3 m                          |
| No.3 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.3 Preparation room  | 3 m                          |
| No.3 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.4 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.4 Preparation room  | 3 m                          |
| No.4 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.5 semi-anechoic chamber | 6.0 x 6.0 x 3.9            | 6.0 x 6.0                                                        | -                      | -                            |
| No.5 measurement room      | 6.4 x 6.4 x 3.0            | 6.4 x 6.4                                                        | -                      | -                            |
| No.6 shielded room         | 4.0 x 4.5 x 2.7            | 4.0 x 4.5                                                        | -                      | -                            |
| No.6 measurement room      | 4.75 x 5.4 x 3.0           | 4.75 x 4.15                                                      | -                      | -                            |
| No.7 shielded room         | 4.7 x 7.5 x 2.7            | 4.7 x 7.5                                                        | -                      | -                            |
| No.8 measurement room      | 3.1 x 5.0 x 2.7            | 3.1 x 5.0                                                        | -                      | -                            |
| No.9 measurement room      | 8.8 x 4.6 x 2.8            | 2.4 x 2.4                                                        | -                      | -                            |
| No.11 measurement room     | 6.2 x 4.7 x 3.0            | 4.8 x 4.6                                                        | -                      | -                            |

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

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

Refer to APPENDIX.

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## **SECTION 4: Operation of EUT during testing**

### **4.1 Operating Mode(s)**

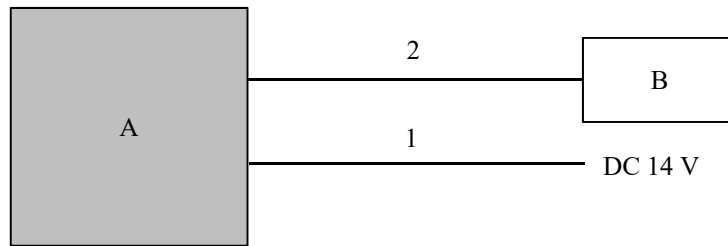
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Mode                                                    | Tested frequency                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------|
| Spurious Emission<br>(Conducted/Radiated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tx (Hopping Off) DH5, 3DH5                              | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Carrier Frequency Separation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tx (Hopping On) DH5, 3DH5                               | 2402 MHz<br>2441 MHz<br>2480 MHz |
| 20dB 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>*EUT has the power settings by the software as follows;<br/> Power settings:   BDR:   5.2 dBm<br/>                           EDR:   5.2 dBm<br/> Software:         R.A2.00.12.65.20.00.00<br/>                           (Date: April 20, 2020, Storage location: EUT memory)</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> |                                                         |                                  |

## 4.2 Configuration and peripherals

### Antenna Terminal Conducted Tests



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

### Description of EUT and Support equipment

| No. | Item                            | Model number | Serial number          | Manufacturer        | Remarks |
|-----|---------------------------------|--------------|------------------------|---------------------|---------|
| A   | Car Audio with Bluetooth / WLAN | SN211        | KATA035                | Pioneer Corporation | EUT     |
| B   | USB Memory                      | U202         | 1942QF0935MSQ<br>1RL1L | TOSHIBA             | -       |

### List of cables used

| No. | Name              | Length (m) | Shield     |            | Remarks |
|-----|-------------------|------------|------------|------------|---------|
|     |                   |            | Cable      | Connector  |         |
| 1   | DC & Signal Cable | 2.0        | Unshielded | Unshielded | -       |
| 2   | USB Cable         | 1.5        | Shielded   | Shielded   | -       |

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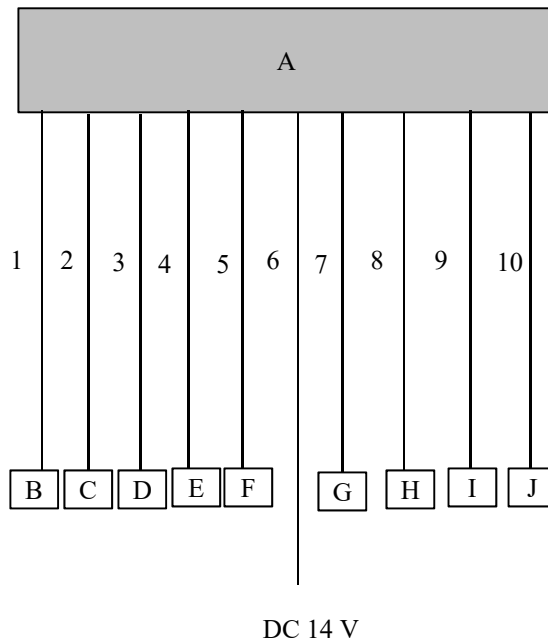
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## Radiated Spurious Emission



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

### Description of EUT and Support equipment

| No. | Item                            | Model number | Serial number          | Manufacturer        | Remarks |
|-----|---------------------------------|--------------|------------------------|---------------------|---------|
| A   | Car Audio with Bluetooth / WLAN | SN211        | KATA036                | Pioneer Corporation | EUT     |
| B   | USB Memory                      | U202         | 1942QF0935MSQ<br>1RL1L | TOSHIBA             | -       |
| C   | Terminator                      | -            | -                      | -                   | -       |
| D   | GNSS Antenna                    | DA15-D010    | A388619                | MITSUMI ELEC.       | -       |
| E   | Terminator                      | -            | -                      | -                   | -       |
| F   | Jig Board                       | -            | -                      | -                   | -       |
| G   | Mic                             | 39813-59S00  | -                      | -                   | -       |
| H   | Dummy Speaker                   | -            | -                      | -                   | -       |
| I   | Camera                          | -            | -                      | -                   | -       |
| J   | Terminator                      | -            | -                      | -                   | -       |

### List of cables used

| No. | Name               | Length (m) | Shield     |            | Remarks |
|-----|--------------------|------------|------------|------------|---------|
|     |                    |            | Cable      | Connector  |         |
| 1   | USB Cable          | 2.0        | Shielded   | Shielded   | -       |
| 2   | DAB Cable          | 2.0        | Shielded   | Shielded   | -       |
| 3   | GNSS Antenna Cable | 2.0        | Shielded   | Shielded   | -       |
| 4   | HDMI Cable         | 1.2        | Shielded   | Shielded   | -       |
| 5   | Signal Cable       | 2.0        | Unshielded | Unshielded | -       |
| 6   | DC Cable           | 2.8        | Unshielded | Unshielded | -       |
| 7   | MIC Cable          | 2.0        | Unshielded | Unshielded | -       |
| 8   | Speaker Cable      | 2.0        | Unshielded | Unshielded | -       |
| 9   | Signal Cable       | 2.2        | Unshielded | Unshielded | -       |
| 10  | AM/FM Cable        | 2.0        | Shielded   | Shielded   | -       |

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## **SECTION 5: 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.

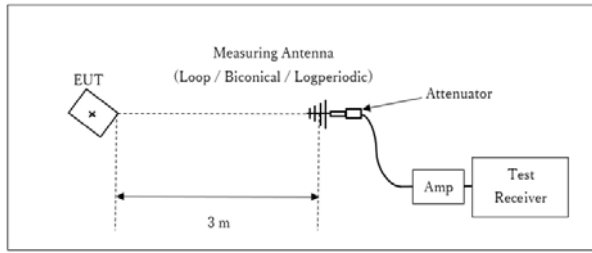
**20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).**

|                 |               |                          |                                                                                                                              |                              |
|-----------------|---------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz              |                                                                                                                              | 20 dBc                       |
| Instrument used | Test Receiver | Spectrum Analyzer        |                                                                                                                              | 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: 3 MHz<br>Detector:<br>Power Averaging (RMS)<br>Trace: 100 traces<br>Duty factor was added to the results. | RBW: 100 kHz<br>VBW: 300 kHz |

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

**Figure 2: Test Setup**

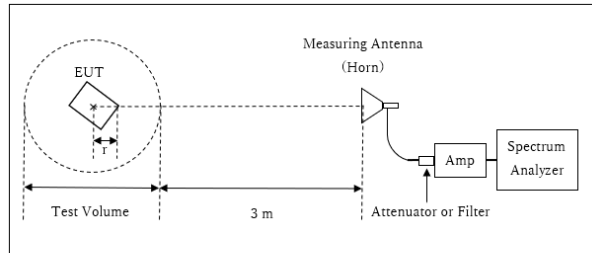
Below 1 GHz



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:  $20 \times \log (3.85 \text{ m} / 3.0 \text{ m}) = 2.17 \text{ dB}$

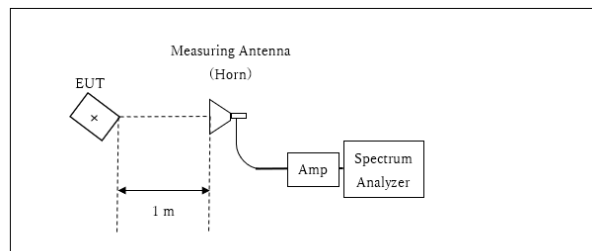
\* Test Distance:  $(3 + \text{Test Volume} / 2) - r = 3.85 \text{ m}$

Test Volume : 2.0 m

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

$r = 0.15 \text{ m}$

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 carrier level and noise levels were confirmed at each position of 0 degree and 40 degree as tilt angle of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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 6: 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                |
|--------------------------------------------------|-----------------------------------------|-----------------|--------------------|----------------------------------------------------------------|------------------|-------------|--------------------------------|
| 20dB 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: 50MHz BW) |
| Carrier Frequency Separation                     | 3 MHz                                   | 30 kHz          | 100 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer              |
| Number of Hopping Frequency                      | 30 MHz                                  | 200 kHz         | 620 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                       | 9.1 kHz         | 27 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 = 9.1 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**

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## **APPENDIX 1: Test data**

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

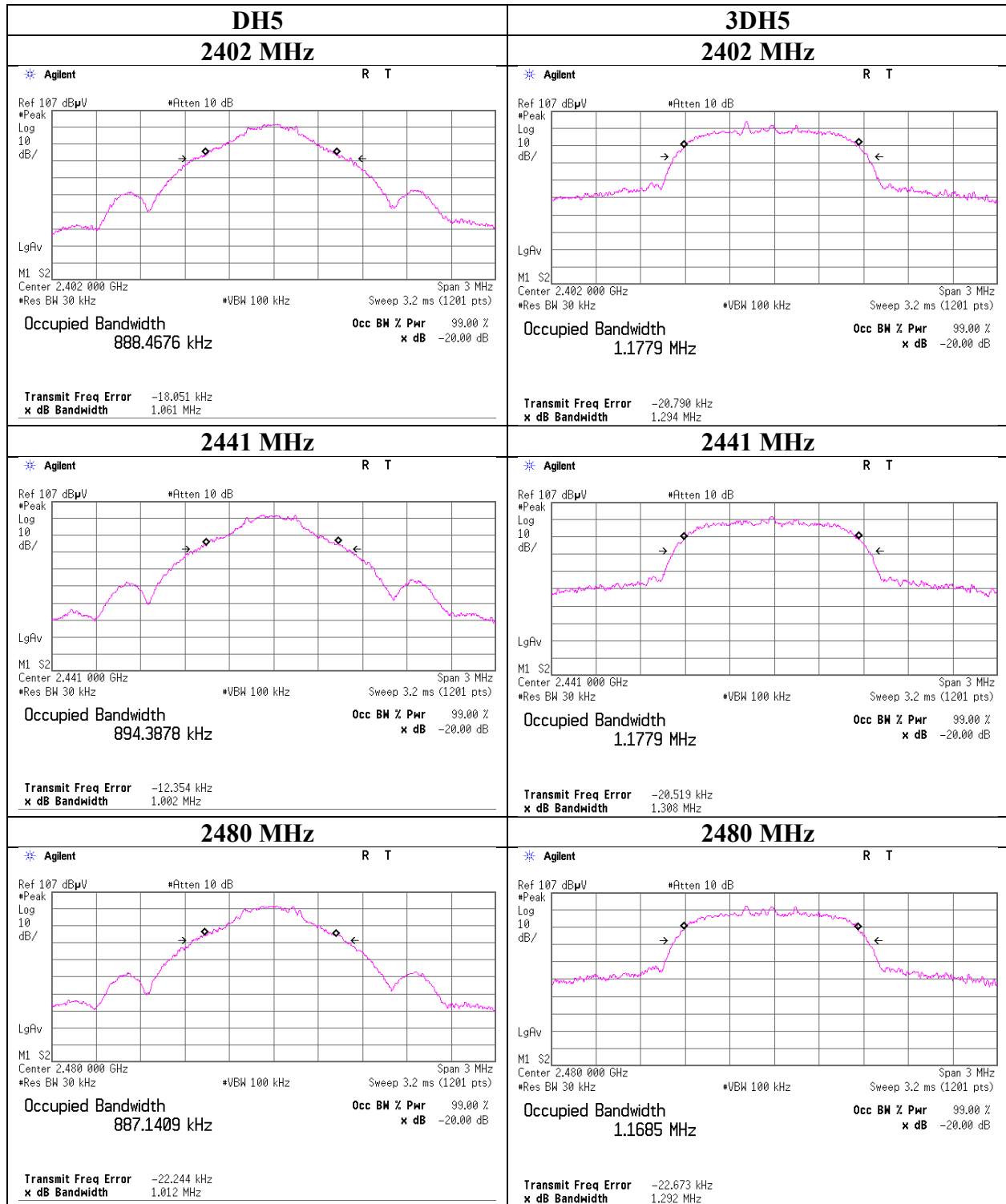
Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 23, 2020  
Temperature / Humidity 23 deg. C / 35 % RH  
Engineer Hiroyuki Furutaka  
Mode Tx, Hopping Off, Tx, Hopping On

| 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         | 1.061                   | 888.468                            | 1.000                                    | $\geq 0.707$                                       |
| DH5  | 2441.0         | 1.002                   | 894.388                            | 1.000                                    | $\geq 0.668$                                       |
| DH5  | 2480.0         | 1.012                   | 887.141                            | 1.000                                    | $\geq 0.675$                                       |
| DH5  | Hopping On     | -                       | 78656.200                          | -                                        | -                                                  |
| 3DH5 | 2402.0         | 1.294                   | 1177.900                           | 1.000                                    | $\geq 0.863$                                       |
| 3DH5 | 2441.0         | 1.308                   | 1177.900                           | 1.000                                    | $\geq 0.872$                                       |
| 3DH5 | 2480.0         | 1.292                   | 1168.500                           | 1.000                                    | $\geq 0.861$                                       |
| 3DH5 | Hopping On     | 81.522                  | 78725.200                          | -                                        | -                                                  |

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

No limit applies to 20dB Bandwidth.

## 20dB Bandwidth and 99% Occupied Bandwidth



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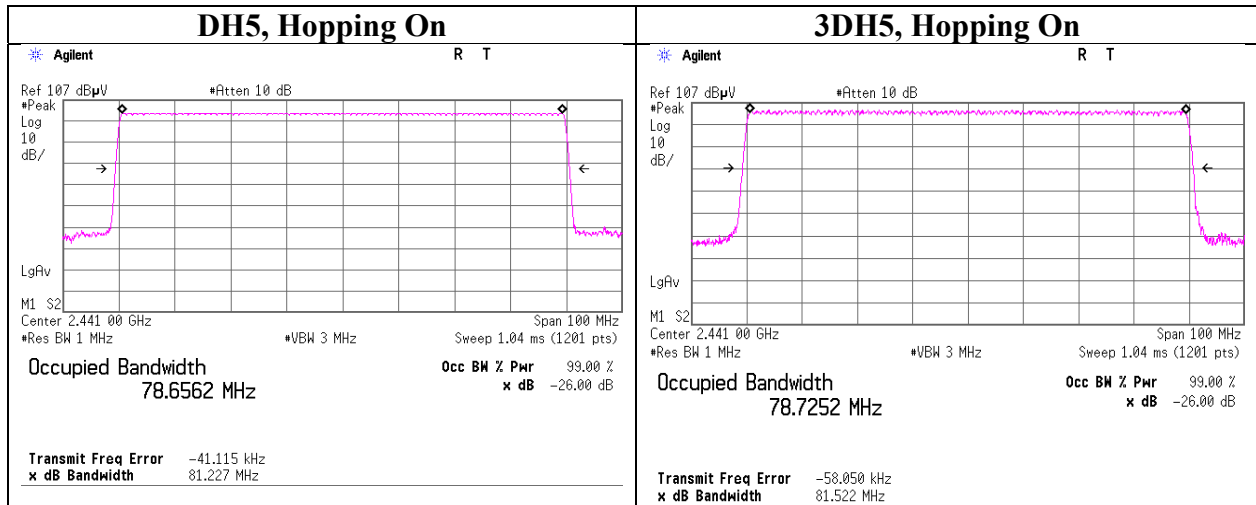
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## 20dB Bandwidth and 99% Occupied Bandwidth



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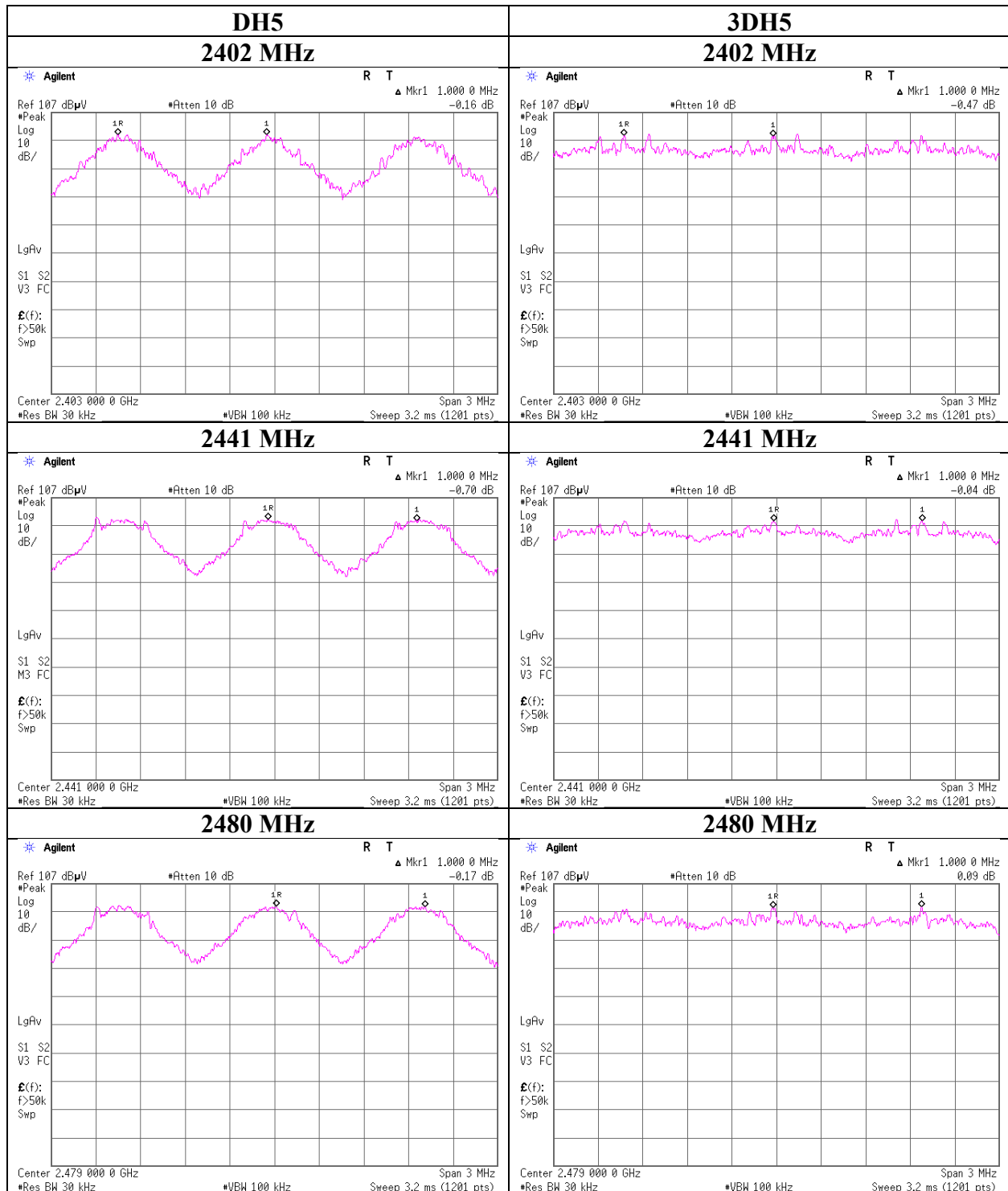
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## Carrier Frequency Separation



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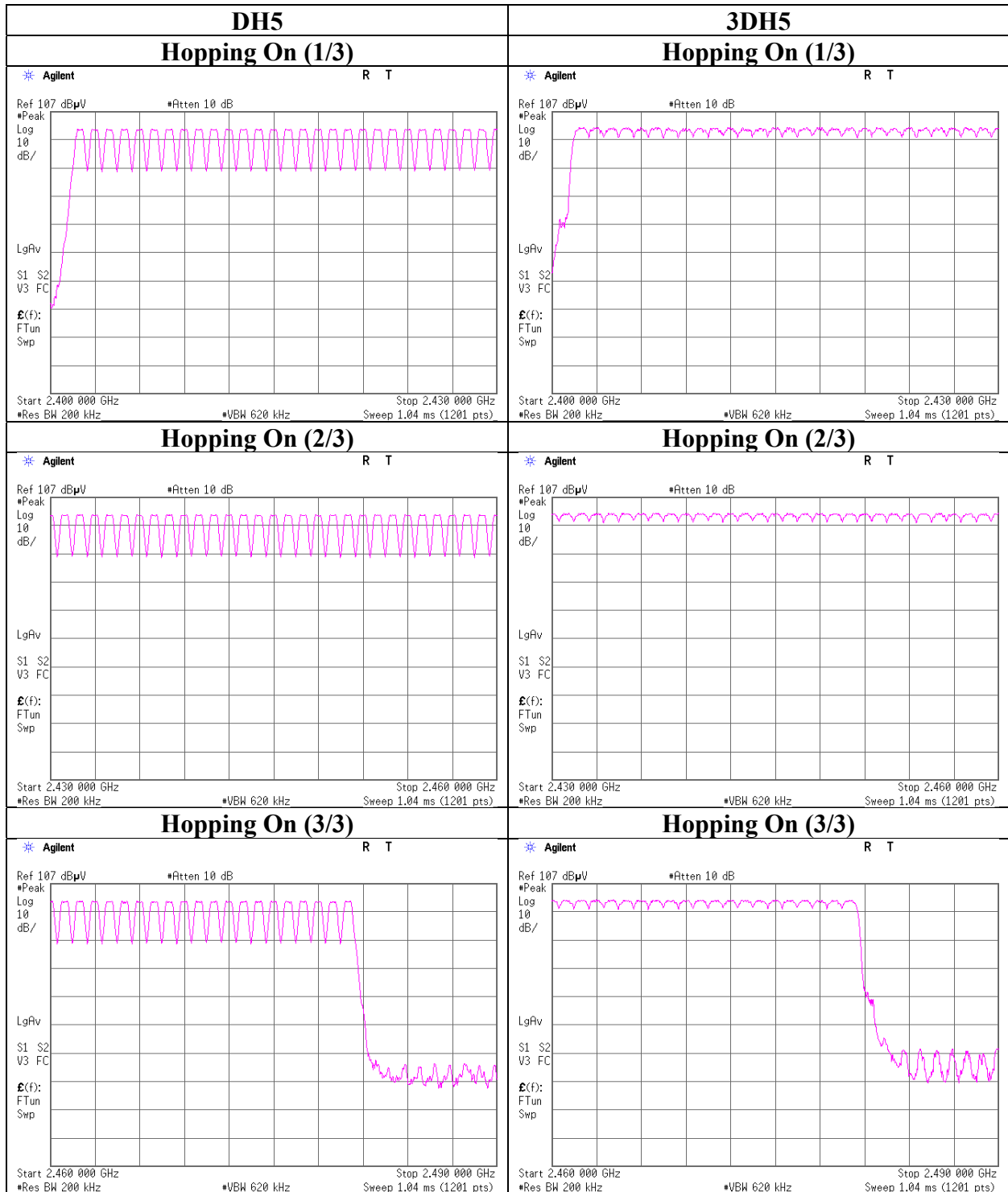
### **Number of Hopping Frequency**

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 23, 2020  
Temperature / Humidity 23 deg. C / 35 % RH  
Engineer Hiroyuki Furutaka  
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



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## Dwell time

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 23, 2020  
Temperature / Humidity 23 deg. C / 35 % RH  
Engineer Hiroyuki Furutaka  
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  | 49.6 times                                                                                       | / | 5 sec. x | 31.6 sec. = 314 times | 0.411                               | 129              | 400             |
| DH3  | 26.8 times                                                                                       | / | 5 sec. x | 31.6 sec. = 170 times | 1.675                               | 285              | 400             |
| DH5  | 21.2 times                                                                                       | / | 5 sec. x | 31.6 sec. = 134 times | 2.930                               | 393              | 400             |
| 3DH1 | 50.2 times                                                                                       | / | 5 sec. x | 31.6 sec. = 318 times | 0.410                               | 130              | 400             |
| 3DH3 | 24.8 times                                                                                       | / | 5 sec. x | 31.6 sec. = 157 times | 1.667                               | 262              | 400             |
| 3DH5 | 21.0 times                                                                                       | / | 5 sec. x | 31.6 sec. = 133 times | 2.923                               | 389              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission

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

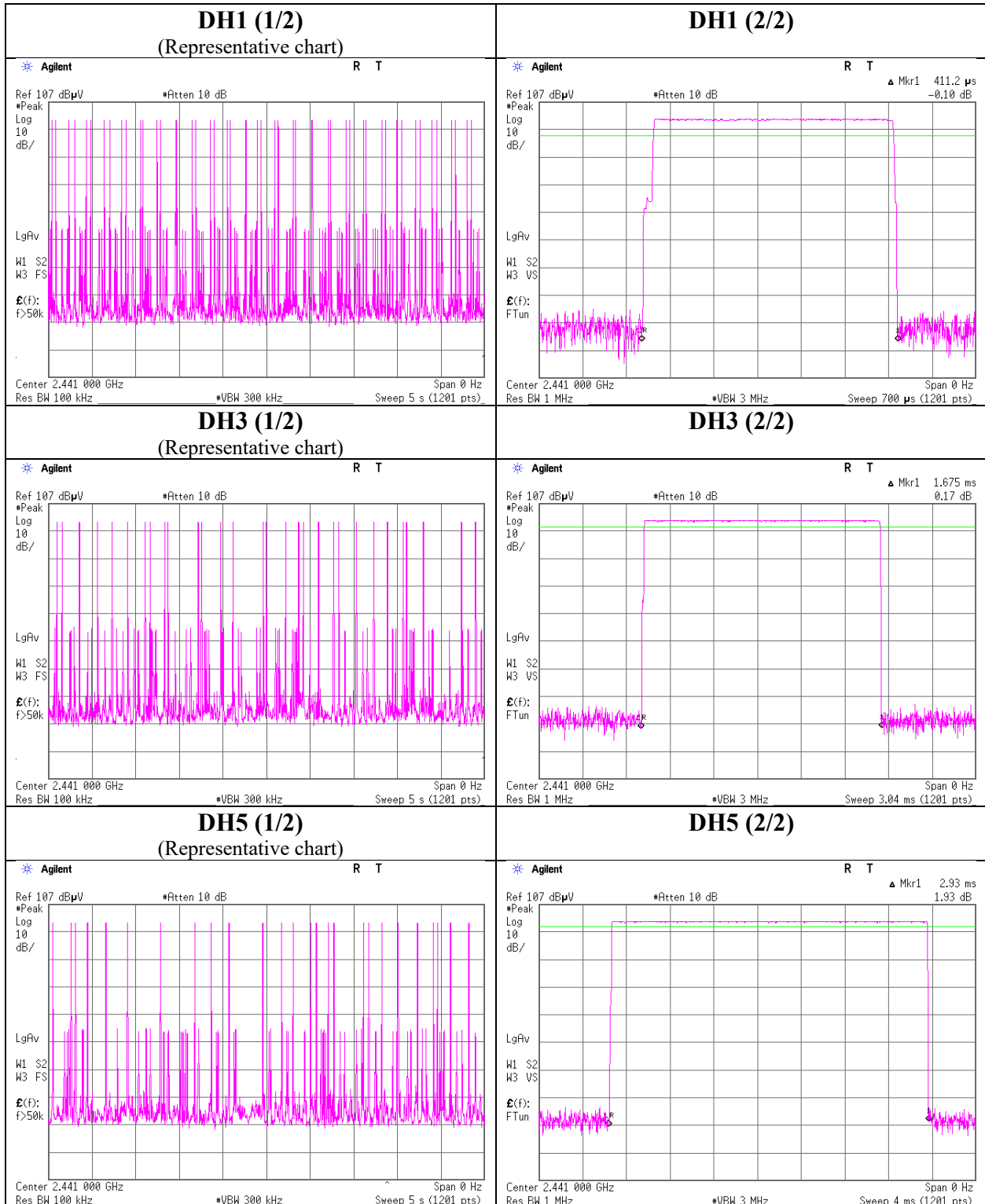
| Mode | Sampling [times] |    |    |    |    | Average<br>[times] |
|------|------------------|----|----|----|----|--------------------|
|      | 1                | 2  | 3  | 4  | 5  |                    |
| DH1  | 49               | 50 | 50 | 50 | 49 | 49.6               |
| DH3  | 30               | 25 | 26 | 27 | 26 | 26.8               |
| DH5  | 23               | 15 | 21 | 22 | 25 | 21.2               |
| 3DH1 | 50               | 51 | 49 | 50 | 51 | 50.2               |
| 3DH3 | 24               | 23 | 26 | 24 | 27 | 24.8               |
| 3DH5 | 19               | 20 | 21 | 25 | 20 | 21.0               |

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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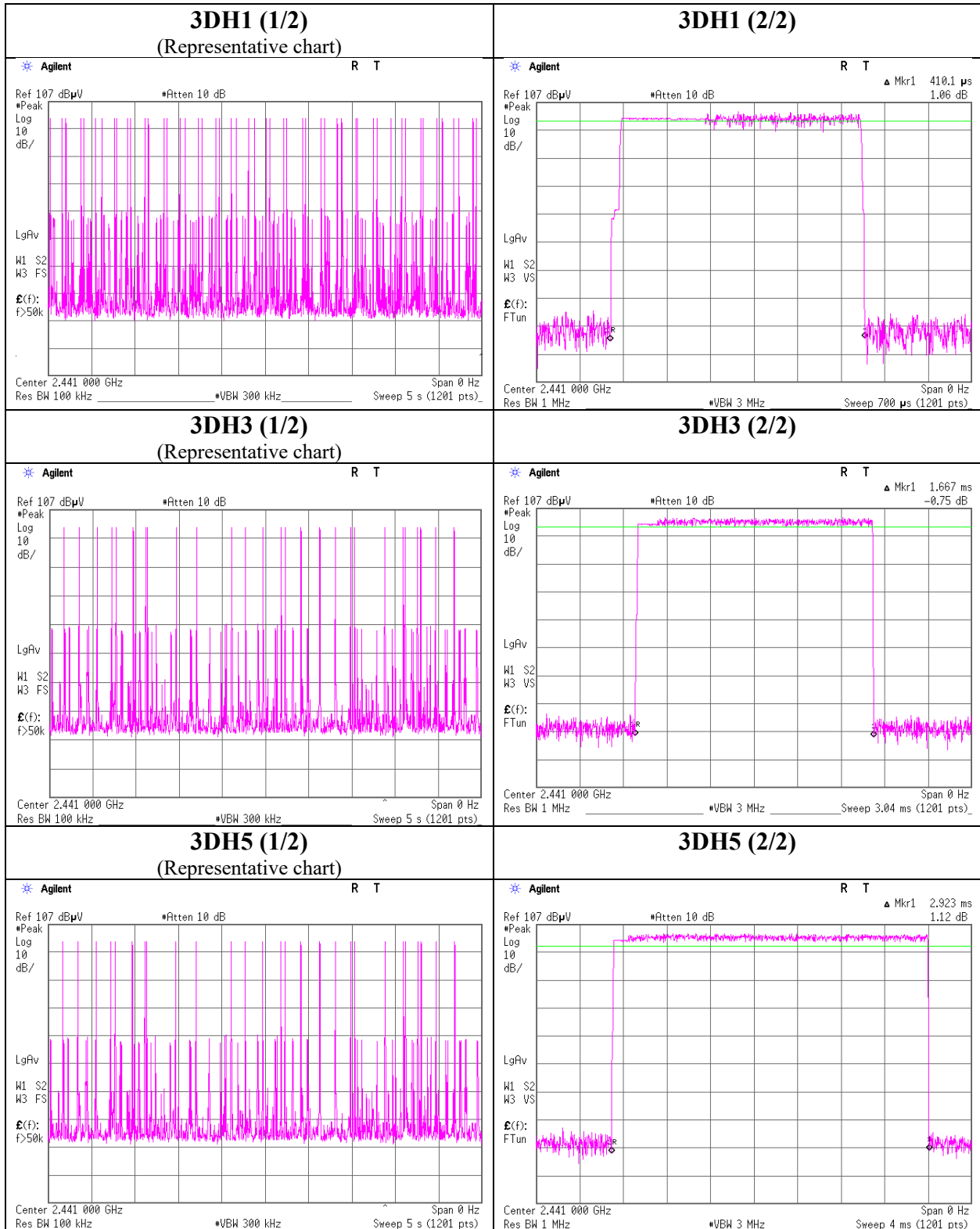
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## Dwell time



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## Maximum Peak Output Power

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 22, 2020  
Temperature / Humidity 23 deg. C / 45 % RH  
Engineer Hiroyuki Furutaka  
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 | Antenna<br>Gain<br>[dBi] | Result |      | Limit |      | Margin |
|      |                |                  |                       |                        | [dBm]           | [mW] | [dBm] | [mW] |        |                          | [dBm]  | [mW] | [dBm] | [mW] |        |
| DH5  | 2402.0         | -7.23            | 2.33                  | 10.10                  | 5.20            | 3.31 | 20.96 | 125  | 15.76  | -5.38                    | -0.18  | 0.96 | 36.02 | 4000 | 36.20  |
| DH5  | 2441.0         | -7.11            | 2.34                  | 10.10                  | 5.33            | 3.41 | 20.96 | 125  | 15.63  | -5.38                    | -0.05  | 0.99 | 36.02 | 4000 | 36.07  |
| DH5  | 2480.0         | -7.17            | 2.35                  | 10.10                  | 5.28            | 3.37 | 20.96 | 125  | 15.68  | -5.38                    | -0.10  | 0.98 | 36.02 | 4000 | 36.12  |
| 2DH5 | 2402.0         | -4.32            | 2.33                  | 10.10                  | 8.11            | 6.47 | 20.96 | 125  | 12.85  | -5.38                    | 2.73   | 1.87 | 36.02 | 4000 | 33.29  |
| 2DH5 | 2441.0         | -4.34            | 2.34                  | 10.10                  | 8.10            | 6.46 | 20.96 | 125  | 12.86  | -5.38                    | 2.72   | 1.87 | 36.02 | 4000 | 33.30  |
| 2DH5 | 2480.0         | -4.41            | 2.35                  | 10.10                  | 8.04            | 6.37 | 20.96 | 125  | 12.92  | -5.38                    | 2.66   | 1.85 | 36.02 | 4000 | 33.36  |
| 3DH5 | 2402.0         | -4.05            | 2.33                  | 10.10                  | 8.38            | 6.89 | 20.96 | 125  | 12.58  | -5.38                    | 3.00   | 2.00 | 36.02 | 4000 | 33.02  |
| 3DH5 | 2441.0         | -4.02            | 2.34                  | 10.10                  | 8.42            | 6.95 | 20.96 | 125  | 12.54  | -5.38                    | 3.04   | 2.01 | 36.02 | 4000 | 32.98  |
| 3DH5 | 2480.0         | -4.12            | 2.35                  | 10.10                  | 8.33            | 6.81 | 20.96 | 125  | 12.63  | -5.38                    | 2.95   | 1.97 | 36.02 | 4000 | 33.07  |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + 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.

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

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 22, 2020  
Temperature / Humidity 23 deg. C / 45 % RH  
Engineer Hiroyuki Furutaka  
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) |      |
|------|----------------|------------------|-----------------------|------------------------|--------------------------|------|
|      |                |                  |                       |                        | [dBm]                    | [mW] |
| DH5  | 2402.0         | -8.69            | 2.33                  | 10.10                  | 3.74                     | 2.37 |
| DH5  | 2441.0         | -8.60            | 2.34                  | 10.10                  | 3.84                     | 2.42 |
| DH5  | 2480.0         | -8.64            | 2.35                  | 10.10                  | 3.81                     | 2.40 |
| 2DH5 | 2402.0         | -8.22            | 2.33                  | 10.10                  | 4.21                     | 2.64 |
| 2DH5 | 2441.0         | -8.25            | 2.34                  | 10.10                  | 4.19                     | 2.62 |
| 2DH5 | 2480.0         | -8.39            | 2.35                  | 10.10                  | 4.06                     | 2.55 |
| 3DH5 | 2402.0         | -8.06            | 2.33                  | 10.10                  | 4.37                     | 2.74 |
| 3DH5 | 2441.0         | -8.03            | 2.34                  | 10.10                  | 4.41                     | 2.76 |
| 3DH5 | 2480.0         | -8.20            | 2.35                  | 10.10                  | 4.25                     | 2.66 |

Sample Calculation:

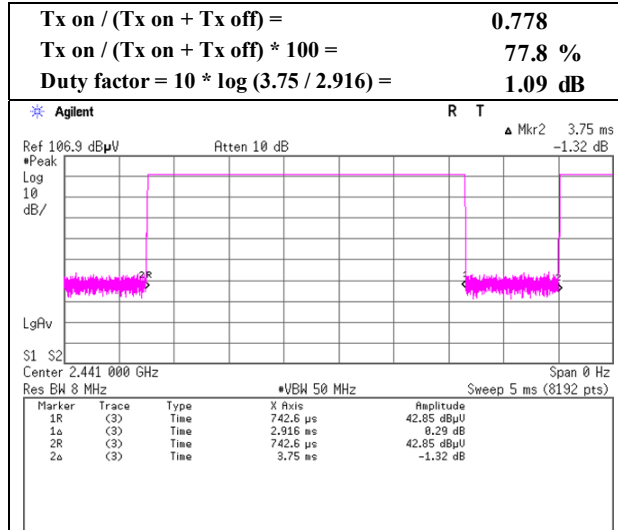
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

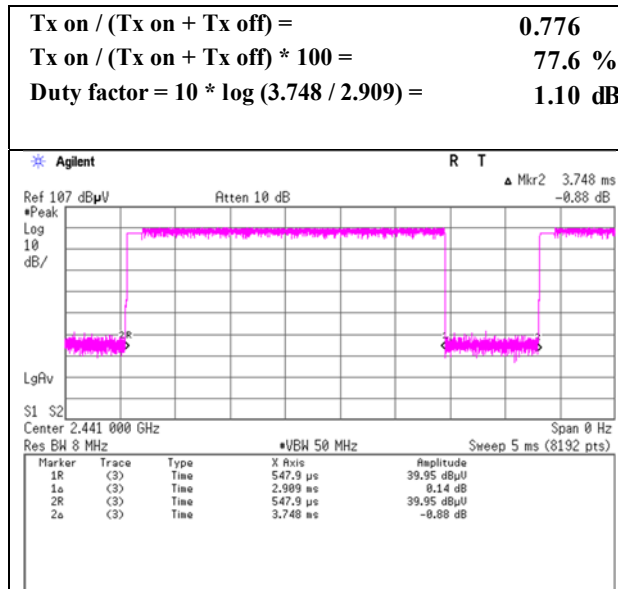
## Burst Rate Confirmation

Report No. 13328641H  
Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Date May 2, 2020  
Temperature / Humidity 22 deg. C / 50 % RH  
Engineer Junki Nagatomi  
Mode Tx, Hopping Off

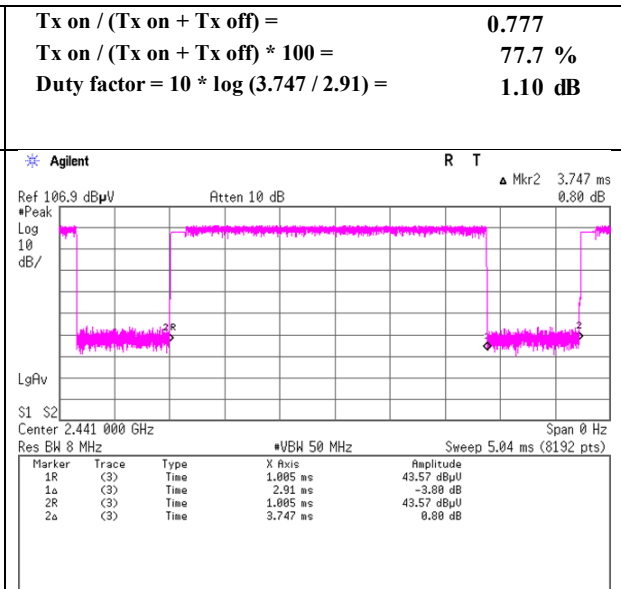
### DH5



### 2DH5



### 3DH5



## Radiated Spurious Emission

|                        |                               |                     |                     |
|------------------------|-------------------------------|---------------------|---------------------|
| Report No.             | 13328641H                     |                     |                     |
| Test place             | Ise EMC Lab.                  |                     |                     |
| Semi Anechoic Chamber  | No.4                          | No.4                | No.4                |
| Date                   | May 2, 2020                   | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH           | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)               | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, DH5 2402 MHz |                     |                     |

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 129.037            | QP       | 31.5              | 13.8               | 8.4          | 31.9         | -                   | 21.8               | 43.5              | 21.7           |             |
| Hori.    | 172.096            | QP       | 32.2              | 15.9               | 8.8          | 31.9         | -                   | 25.0               | 43.5              | 18.5           |             |
| Hori.    | 202.628            | QP       | 35.5              | 11.5               | 9.0          | 31.8         | -                   | 24.2               | 43.5              | 19.3           |             |
| Hori.    | 208.684            | QP       | 36.5              | 11.2               | 9.1          | 31.8         | -                   | 25.0               | 43.5              | 18.5           |             |
| Hori.    | 294.657            | QP       | 39.3              | 13.5               | 9.7          | 31.8         | -                   | 30.7               | 46.0              | 15.3           |             |
| Hori.    | 637.289            | QP       | 23.6              | 19.3               | 11.6         | 32.0         | -                   | 22.5               | 46.0              | 23.5           |             |
| Hori.    | 2390.000           | PK       | 43.9              | 27.9               | 5.6          | 31.9         | -                   | 45.5               | 73.9              | 28.4           |             |
| Hori.    | 4804.000           | PK       | 41.0              | 31.7               | 7.7          | 31.3         | -                   | 49.1               | 73.9              | 24.8           | Floor noise |
| Hori.    | 7206.000           | PK       | 42.7              | 36.2               | 9.2          | 32.4         | -                   | 55.7               | 73.9              | 18.2           | Floor noise |
| Hori.    | 9608.000           | PK       | 43.6              | 38.0               | 7.8          | 32.8         | -                   | 56.6               | 73.9              | 17.4           | Floor noise |
| Hori.    | 2390.000           | AV       | 34.4              | 27.9               | 5.6          | 31.9         | 1.1                 | 37.1               | 53.9              | 16.8           | *1)         |
| Hori.    | 4804.000           | AV       | 32.4              | 31.7               | 7.7          | 31.3         | -                   | 40.6               | 53.9              | 13.4           | Floor noise |
| Hori.    | 7206.000           | AV       | 34.8              | 36.2               | 9.2          | 32.4         | -                   | 47.8               | 53.9              | 6.1            | Floor noise |
| Hori.    | 9608.000           | AV       | 34.7              | 38.0               | 7.8          | 32.8         | -                   | 47.7               | 53.9              | 6.2            | Floor noise |
| Vert.    | 129.037            | QP       | 28.6              | 13.8               | 8.4          | 31.9         | -                   | 18.9               | 43.5              | 24.6           |             |
| Vert.    | 172.096            | QP       | 31.5              | 15.9               | 8.8          | 31.9         | -                   | 24.3               | 43.5              | 19.2           |             |
| Vert.    | 202.628            | QP       | 45.1              | 11.5               | 9.0          | 31.8         | -                   | 33.7               | 43.5              | 9.8            |             |
| Vert.    | 208.684            | QP       | 43.0              | 11.2               | 9.1          | 31.8         | -                   | 31.5               | 43.5              | 12.0           |             |
| Vert.    | 294.657            | QP       | 42.8              | 13.5               | 9.7          | 31.8         | -                   | 34.2               | 46.0              | 11.8           |             |
| Vert.    | 637.289            | QP       | 28.5              | 19.3               | 11.6         | 32.0         | -                   | 27.4               | 46.0              | 18.6           |             |
| Vert.    | 2390.000           | PK       | 42.3              | 27.9               | 5.6          | 31.9         | -                   | 43.9               | 73.9              | 30.0           |             |
| Vert.    | 4804.000           | PK       | 41.2              | 31.7               | 7.7          | 31.3         | -                   | 49.4               | 73.9              | 24.5           | Floor noise |
| Vert.    | 7206.000           | PK       | 43.4              | 36.2               | 9.2          | 32.4         | -                   | 56.4               | 73.9              | 17.5           | Floor noise |
| Vert.    | 9608.000           | PK       | 43.7              | 38.0               | 7.8          | 32.8         | -                   | 56.7               | 73.9              | 17.2           | Floor noise |
| Vert.    | 2390.000           | AV       | 33.8              | 27.9               | 5.6          | 31.9         | 1.1                 | 36.5               | 53.9              | 17.4           | *1)         |
| Vert.    | 4804.000           | AV       | 32.4              | 31.7               | 7.7          | 31.3         | -                   | 40.6               | 53.9              | 13.4           | Floor noise |
| Vert.    | 7206.000           | AV       | 34.8              | 36.2               | 9.2          | 32.4         | -                   | 47.8               | 53.9              | 6.1            | Floor noise |
| Vert.    | 9608.000           | AV       | 34.7              | 38.0               | 7.8          | 32.8         | -                   | 47.7               | 53.9              | 6.2            | Floor noise |

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

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.85 m / 3.0 m) = 2.17 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

\*1) Not Out of Band emission(Leakage Power)

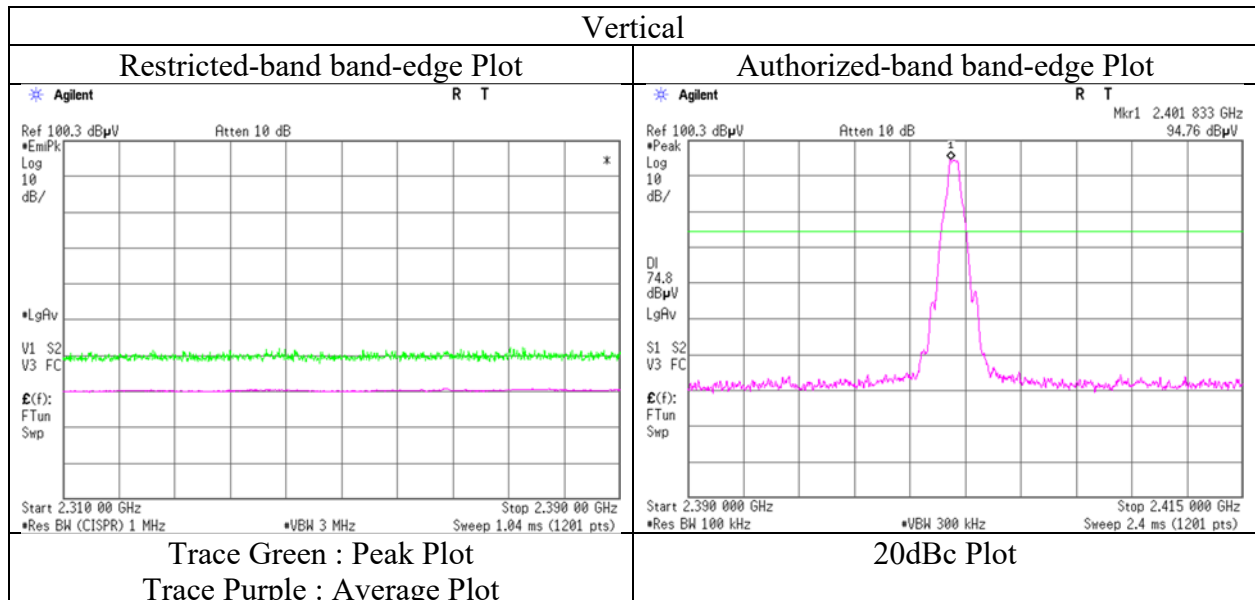
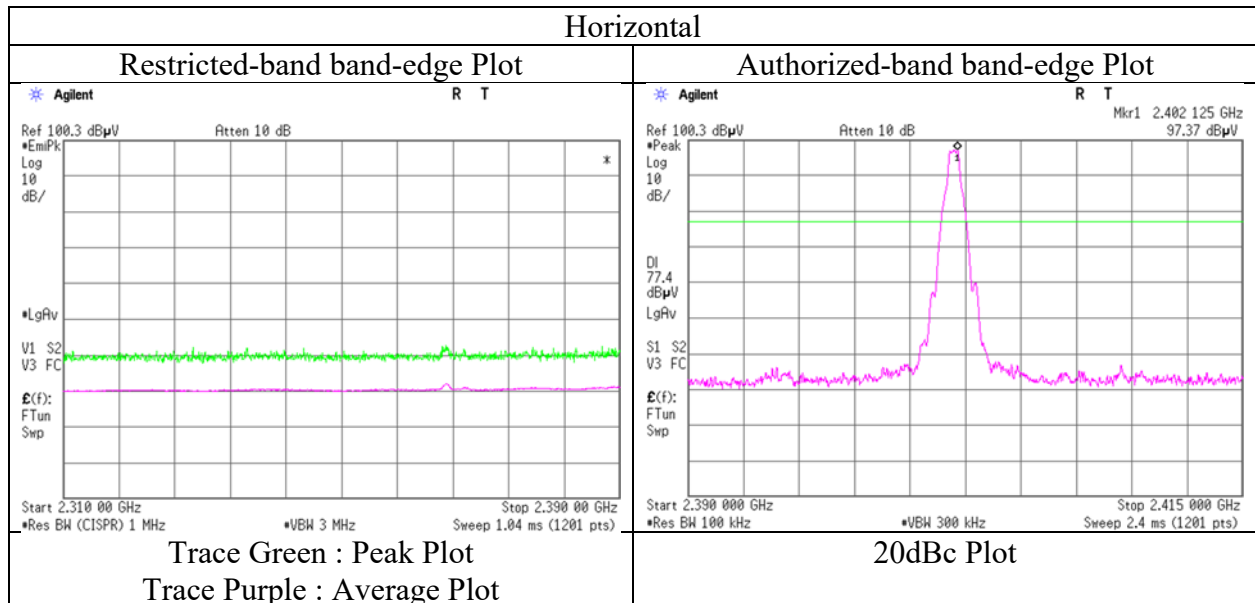
**20dBc Data Sheet**

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|-------------------------|--------------|--------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2402.000           | PK       | 97.4              | 27.9                    | 5.6          | 31.9         | 99.0               | -                 | -              | Carrier |
| Hori.    | 2400.000           | PK       | 97.3              | 27.9                    | 5.6          | 31.9         | 98.9               | 79.0              | 40.1           |         |
| Vert.    | 2402.000           | PK       | 94.8              | 27.9                    | 5.6          | 31.9         | 96.4               | -                 | -              | Carrier |
| Vert.    | 2400.000           | PK       | 95.3              | 27.9                    | 5.6          | 31.9         | 96.9               | 76.4              | 39.5           |         |

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

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

|                        |                               |
|------------------------|-------------------------------|
| Report No.             | 13328641H                     |
| Test place             | Ise EMC Lab.                  |
| Semi Anechoic Chamber  | No.4                          |
| Date                   | May 2, 2020                   |
| Temperature / Humidity | 22 deg. C / 50 % RH           |
| Engineer               | Junki Nagatomi                |
|                        | (1 GHz -10 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.             | 13328641H                     |                     |                     |
| Test place             | Ise EMC Lab.                  |                     |                     |
| Semi Anechoic Chamber  | No.4                          | No.4                | No.4                |
| Date                   | May 2, 2020                   | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH           | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)               | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, DH5 2441 MHz |                     |                     |

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 79.907             | QP       | 31.2              | 6.9                | 7.9          | 32.0         | -                   | 14.0               | 40.0              | 26.0           |             |
| Hori.    | 86.026             | QP       | 32.8              | 7.9                | 7.9          | 31.9         | -                   | 16.7               | 40.0              | 23.4           |             |
| Hori.    | 172.056            | QP       | 33.1              | 15.9               | 8.8          | 31.9         | -                   | 25.9               | 43.5              | 17.6           |             |
| Hori.    | 196.694            | QP       | 34.8              | 16.5               | 9.0          | 31.8         | -                   | 28.5               | 43.5              | 15.0           |             |
| Hori.    | 208.674            | QP       | 37.9              | 11.2               | 9.1          | 31.8         | -                   | 26.4               | 43.5              | 17.1           |             |
| Hori.    | 294.688            | QP       | 40.2              | 13.5               | 9.7          | 31.8         | -                   | 31.6               | 46.0              | 14.4           |             |
| Hori.    | 4882.000           | PK       | 40.4              | 31.6               | 7.8          | 31.2         | -                   | 48.5               | 73.9              | 25.4           | Floor noise |
| Hori.    | 7323.000           | PK       | 42.1              | 36.5               | 9.2          | 32.5         | -                   | 55.3               | 73.9              | 18.6           | Floor noise |
| Hori.    | 9764.000           | PK       | 42.9              | 38.3               | 7.8          | 32.9         | -                   | 56.1               | 73.9              | 17.8           | Floor noise |
| Hori.    | 4882.000           | AV       | 32.4              | 31.6               | 7.8          | 31.2         | -                   | 40.5               | 53.9              | 13.4           | Floor noise |
| Hori.    | 7323.000           | AV       | 33.8              | 36.5               | 9.2          | 32.5         | -                   | 47.1               | 53.9              | 6.9            | Floor noise |
| Hori.    | 9764.000           | AV       | 34.6              | 38.3               | 7.8          | 32.9         | -                   | 47.8               | 53.9              | 6.1            | Floor noise |
| Vert.    | 79.907             | QP       | 26.7              | 6.9                | 7.9          | 32.0         | -                   | 9.5                | 40.0              | 30.5           |             |
| Vert.    | 86.026             | QP       | 29.8              | 7.9                | 7.9          | 31.9         | -                   | 13.7               | 40.0              | 26.4           |             |
| Vert.    | 172.056            | QP       | 32.2              | 15.9               | 8.8          | 31.9         | -                   | 25.0               | 43.5              | 18.5           |             |
| Vert.    | 196.694            | QP       | 36.7              | 16.5               | 9.0          | 31.8         | -                   | 30.4               | 43.5              | 13.1           |             |
| Vert.    | 208.674            | QP       | 43.6              | 11.2               | 9.1          | 31.8         | -                   | 32.1               | 43.5              | 11.4           |             |
| Vert.    | 294.688            | QP       | 42.1              | 13.5               | 9.7          | 31.8         | -                   | 33.5               | 46.0              | 12.5           |             |
| Vert.    | 4882.000           | PK       | 40.9              | 31.6               | 7.8          | 31.2         | -                   | 49.0               | 73.9              | 24.9           | Floor noise |
| Vert.    | 7323.000           | PK       | 41.8              | 36.5               | 9.2          | 32.5         | -                   | 55.0               | 73.9              | 18.9           | Floor noise |
| Vert.    | 9764.000           | PK       | 43.0              | 38.3               | 7.8          | 32.9         | -                   | 56.2               | 73.9              | 17.7           | Floor noise |
| Vert.    | 4882.000           | AV       | 32.4              | 31.6               | 7.8          | 31.2         | -                   | 40.5               | 53.9              | 13.4           | Floor noise |
| Vert.    | 7323.000           | AV       | 33.8              | 36.5               | 9.2          | 32.5         | -                   | 47.1               | 53.9              | 6.9            | Floor noise |
| Vert.    | 9764.000           | AV       | 34.6              | 38.3               | 7.8          | 32.9         | -                   | 47.8               | 53.9              | 6.1            | Floor noise |

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

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.85 m / 3.0 m) = 2.17 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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## Radiated Spurious Emission

|                        |                               |                     |                     |
|------------------------|-------------------------------|---------------------|---------------------|
| Report No.             | 13328641H                     |                     |                     |
| Test place             | Ise EMC Lab.                  |                     |                     |
| Semi Anechoic Chamber  | No.4                          | No.4                | No.4                |
| Date                   | May 2, 2020                   | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH           | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)               | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, DH5 2480 MHz |                     |                     |

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 79.933             | QP       | 31.8              | 6.9                | 7.9          | 32.0         | -                   | 14.6               | 40.0              | 25.4           |             |
| Hori.    | 85.965             | QP       | 33.1              | 7.9                | 7.9          | 31.9         | -                   | 16.9               | 40.0              | 23.1           |             |
| Hori.    | 172.075            | QP       | 34.5              | 15.9               | 8.8          | 31.9         | -                   | 27.3               | 43.5              | 16.2           |             |
| Hori.    | 196.642            | QP       | 36.9              | 16.5               | 9.0          | 31.8         | -                   | 30.5               | 43.5              | 13.0           |             |
| Hori.    | 220.667            | QP       | 38.2              | 11.1               | 9.2          | 31.8         | -                   | 26.7               | 46.0              | 19.3           |             |
| Hori.    | 294.733            | QP       | 43.7              | 13.5               | 9.7          | 31.8         | -                   | 35.1               | 46.0              | 10.9           |             |
| Hori.    | 2483.500           | PK       | 46.1              | 27.7               | 5.7          | 31.8         | -                   | 47.6               | 73.9              | 26.3           |             |
| Hori.    | 2487.792           | PK       | 47.0              | 27.7               | 5.7          | 31.8         | -                   | 48.5               | 73.9              | 25.4           |             |
| Hori.    | 4960.000           | PK       | 42.0              | 31.6               | 7.8          | 31.2         | -                   | 50.2               | 73.9              | 23.7           | Floor noise |
| Hori.    | 7440.000           | PK       | 42.5              | 36.6               | 9.2          | 32.5         | -                   | 55.8               | 73.9              | 18.1           | Floor noise |
| Hori.    | 9920.000           | PK       | 43.9              | 38.5               | 7.9          | 33.0         | -                   | 57.2               | 73.9              | 16.7           | Floor noise |
| Hori.    | 2483.500           | AV       | 36.4              | 27.7               | 5.7          | 31.8         | 1.1                 | 39.0               | 53.9              | 14.9           | *1)         |
| Hori.    | 2487.792           | AV       | 38.1              | 27.7               | 5.7          | 31.8         | 1.1                 | 40.7               | 53.9              | 13.2           |             |
| Hori.    | 4960.000           | AV       | 32.5              | 31.6               | 7.8          | 31.2         | -                   | 40.7               | 53.9              | 13.2           | Floor noise |
| Hori.    | 7440.000           | AV       | 33.9              | 36.6               | 9.2          | 32.5         | -                   | 47.2               | 53.9              | 6.7            | Floor noise |
| Hori.    | 9920.000           | AV       | 33.5              | 38.5               | 7.9          | 33.0         | -                   | 46.8               | 53.9              | 7.1            | Floor noise |
| Vert.    | 79.933             | QP       | 27.6              | 6.9                | 7.9          | 32.0         | -                   | 10.4               | 40.0              | 29.6           |             |
| Vert.    | 85.965             | QP       | 28.8              | 7.9                | 7.9          | 31.9         | -                   | 12.6               | 40.0              | 27.4           |             |
| Vert.    | 172.075            | QP       | 32.3              | 15.9               | 8.8          | 31.9         | -                   | 25.1               | 43.5              | 18.4           |             |
| Vert.    | 196.642            | QP       | 36.7              | 16.5               | 9.0          | 31.8         | -                   | 30.4               | 43.5              | 13.1           |             |
| Vert.    | 220.667            | QP       | 38.7              | 11.1               | 9.2          | 31.8         | -                   | 27.2               | 46.0              | 18.8           |             |
| Vert.    | 294.733            | QP       | 42.3              | 13.5               | 9.7          | 31.8         | -                   | 33.7               | 46.0              | 12.3           |             |
| Vert.    | 2483.500           | PK       | 44.5              | 27.7               | 5.7          | 31.8         | -                   | 46.0               | 73.9              | 27.9           |             |
| Vert.    | 2487.792           | PK       | 45.6              | 27.7               | 5.7          | 31.8         | -                   | 47.1               | 73.9              | 26.8           |             |
| Vert.    | 4960.000           | PK       | 41.2              | 31.6               | 7.8          | 31.2         | -                   | 49.3               | 73.9              | 24.6           | Floor noise |
| Vert.    | 7440.000           | PK       | 42.7              | 36.6               | 9.2          | 32.5         | -                   | 56.0               | 73.9              | 18.0           | Floor noise |
| Vert.    | 9920.000           | PK       | 42.2              | 38.5               | 7.9          | 33.0         | -                   | 55.6               | 73.9              | 18.3           | Floor noise |
| Vert.    | 2483.500           | AV       | 35.7              | 27.7               | 5.7          | 31.8         | 1.1                 | 38.3               | 53.9              | 15.6           | *1)         |
| Vert.    | 2487.792           | AV       | 36.8              | 27.7               | 5.7          | 31.8         | 1.1                 | 39.4               | 53.9              | 14.5           |             |
| Vert.    | 4960.000           | AV       | 32.5              | 31.6               | 7.8          | 31.2         | -                   | 40.7               | 53.9              | 13.2           | Floor noise |
| Vert.    | 7440.000           | AV       | 33.9              | 36.6               | 9.2          | 32.5         | -                   | 47.2               | 53.9              | 6.7            | Floor noise |
| Vert.    | 9920.000           | AV       | 33.5              | 38.5               | 7.9          | 33.0         | -                   | 46.8               | 53.9              | 7.1            | Floor noise |

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

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

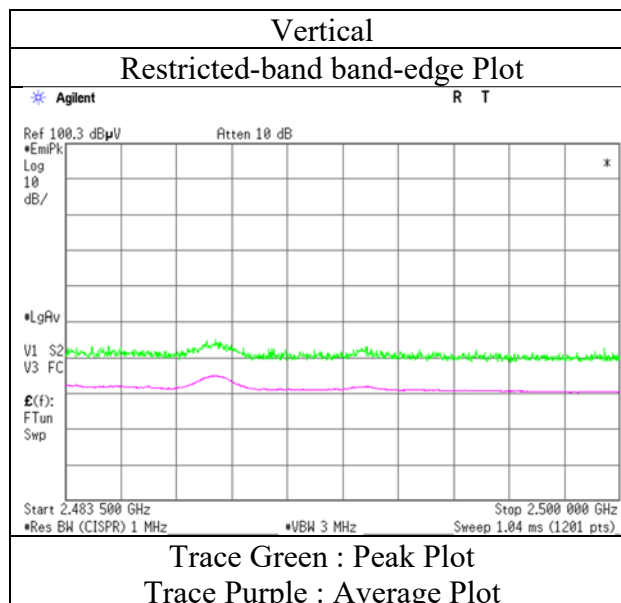
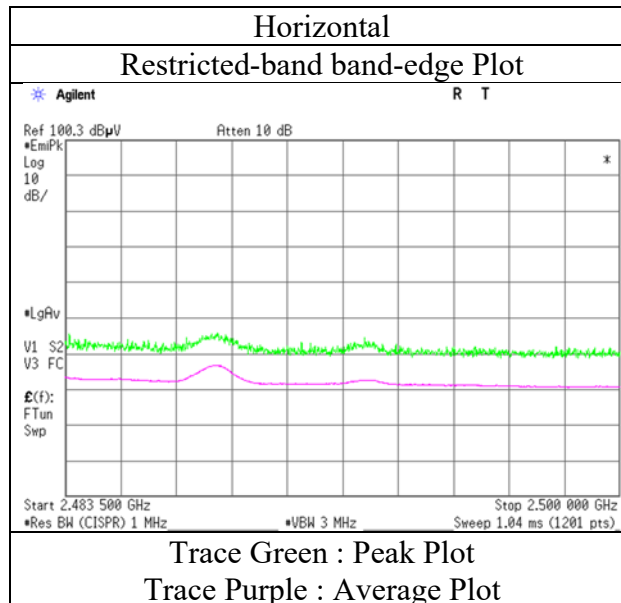
Distance factor: 1 GHz - 10 GHz 20log (3.85 m / 3.0 m) = 2.17 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

\*1) Not Out of Band emission(Leakage Power)



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

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13328641H                         |
| Test place             | Ise EMC Lab.                      |
| Semi Anechoic Chamber  | No.4                              |
| Date                   | May 2, 2020                       |
| Temperature / Humidity | 22 deg. C / 50 % RH               |
| Engineer               | Junki Nagatomi<br>(1 GHz -10 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.

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## Radiated Spurious Emission

|                        |                                |                     |                     |
|------------------------|--------------------------------|---------------------|---------------------|
| Report No.             | 13328641H                      |                     |                     |
| Test place             | Ise EMC Lab.                   |                     |                     |
| Semi Anechoic Chamber  | No.4                           | No.4                | No.4                |
| Date                   | May 2, 2020                    | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH            | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                 | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)                | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, 3DH5 2402 MHz |                     |                     |

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 79.942             | QP       | 33.1              | 6.9                | 7.9          | 32.0         | -                   | 15.9               | 40.0              | 24.1           |             |
| Hori.    | 85.949             | QP       | 32.1              | 7.9                | 7.9          | 31.9         | -                   | 15.9               | 40.0              | 24.1           |             |
| Hori.    | 172.050            | QP       | 34.4              | 15.9               | 8.8          | 31.9         | -                   | 27.2               | 43.5              | 16.3           |             |
| Hori.    | 196.681            | QP       | 36.1              | 16.5               | 9.0          | 31.8         | -                   | 29.8               | 43.5              | 13.7           |             |
| Hori.    | 208.669            | QP       | 37.5              | 11.2               | 9.1          | 31.8         | -                   | 26.0               | 43.5              | 17.5           |             |
| Hori.    | 294.641            | QP       | 43.3              | 13.5               | 9.7          | 31.8         | -                   | 34.7               | 46.0              | 11.3           |             |
| Hori.    | 2390.000           | PK       | 43.6              | 27.9               | 5.6          | 31.9         | -                   | 45.1               | 73.9              | 28.8           |             |
| Hori.    | 4804.000           | PK       | 41.7              | 31.7               | 7.7          | 31.3         | -                   | 49.8               | 73.9              | 24.1           | Floor noise |
| Hori.    | 7206.000           | PK       | 43.0              | 36.2               | 9.2          | 32.4         | -                   | 56.0               | 73.9              | 17.9           | Floor noise |
| Hori.    | 9608.000           | PK       | 44.0              | 38.0               | 7.8          | 32.8         | -                   | 57.0               | 73.9              | 16.9           | Floor noise |
| Hori.    | 2390.000           | AV       | 34.5              | 27.9               | 5.6          | 31.9         | 1.1                 | 37.2               | 53.9              | 16.7           | *1)         |
| Hori.    | 4804.000           | AV       | 32.3              | 31.7               | 7.7          | 31.3         | -                   | 40.4               | 53.9              | 13.5           | Floor noise |
| Hori.    | 7206.000           | AV       | 34.4              | 36.2               | 9.2          | 32.4         | -                   | 47.4               | 53.9              | 6.5            | Floor noise |
| Hori.    | 9608.000           | AV       | 34.8              | 38.0               | 7.8          | 32.8         | -                   | 47.8               | 53.9              | 6.1            | Floor noise |
| Vert.    | 79.942             | QP       | 25.1              | 6.9                | 7.9          | 32.0         | -                   | 7.9                | 40.0              | 32.1           |             |
| Vert.    | 85.949             | QP       | 30.0              | 7.9                | 7.9          | 31.9         | -                   | 13.8               | 40.0              | 26.2           |             |
| Vert.    | 172.050            | QP       | 33.9              | 15.9               | 8.8          | 31.9         | -                   | 26.7               | 43.5              | 16.8           |             |
| Vert.    | 196.681            | QP       | 35.2              | 16.5               | 9.0          | 31.8         | -                   | 28.9               | 43.5              | 14.6           |             |
| Vert.    | 208.669            | QP       | 44.1              | 11.2               | 9.1          | 31.8         | -                   | 32.6               | 43.5              | 10.9           |             |
| Vert.    | 294.641            | QP       | 42.1              | 13.5               | 9.7          | 31.8         | -                   | 33.5               | 46.0              | 12.5           |             |
| Vert.    | 2390.000           | PK       | 42.2              | 27.9               | 5.6          | 31.9         | -                   | 43.8               | 73.9              | 30.1           |             |
| Vert.    | 4804.000           | PK       | 40.7              | 31.7               | 7.7          | 31.3         | -                   | 48.9               | 73.9              | 25.0           | Floor noise |
| Vert.    | 7206.000           | PK       | 43.2              | 36.2               | 9.2          | 32.4         | -                   | 56.2               | 73.9              | 17.7           | Floor noise |
| Vert.    | 9608.000           | PK       | 43.3              | 38.0               | 7.8          | 32.8         | -                   | 56.3               | 73.9              | 17.6           | Floor noise |
| Vert.    | 2390.000           | AV       | 33.9              | 27.9               | 5.6          | 31.9         | 1.1                 | 36.6               | 53.9              | 17.3           | *1)         |
| Vert.    | 4804.000           | AV       | 32.3              | 31.7               | 7.7          | 31.3         | -                   | 40.4               | 53.9              | 13.5           | Floor noise |
| Vert.    | 7206.000           | AV       | 34.4              | 36.2               | 9.2          | 32.4         | -                   | 47.4               | 53.9              | 6.5            | Floor noise |
| Vert.    | 9608.000           | AV       | 34.8              | 38.0               | 7.8          | 32.8         | -                   | 47.8               | 53.9              | 6.1            | Floor noise |

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

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.85 m / 3.0 m) = 2.17 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

\*1) Not Out of Band emission(Leakage Power)

**20dBc Data Sheet**

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|-------------------------|--------------|--------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2402.000           | PK       | 96.9              | 27.9                    | 5.6          | 31.9         | 98.5               | -                 | -              | Carrier |
| Hori.    | 2400.000           | PK       | 45.2              | 27.9                    | 5.6          | 31.9         | 46.8               | 78.5              | 31.6           |         |
| Vert.    | 2402.000           | PK       | 95.0              | 27.9                    | 5.6          | 31.9         | 96.5               | -                 | -              | Carrier |
| Vert.    | 2400.000           | PK       | 43.0              | 27.9                    | 5.6          | 31.9         | 44.6               | 76.5              | 32.0           |         |

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

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**Ise EMC Lab.**

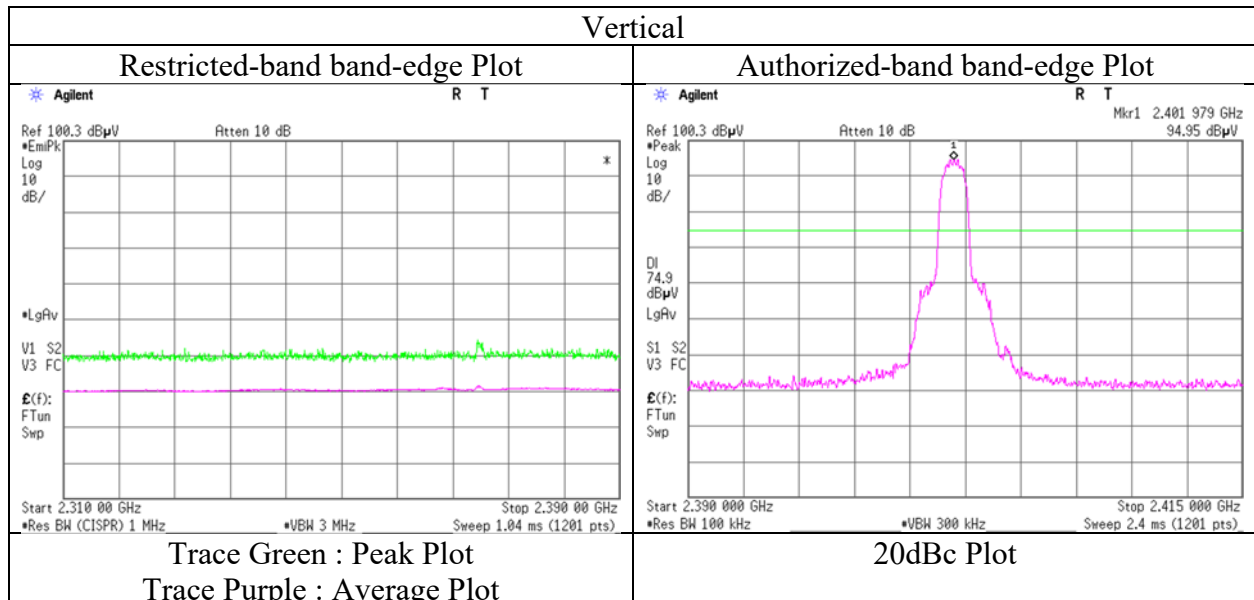
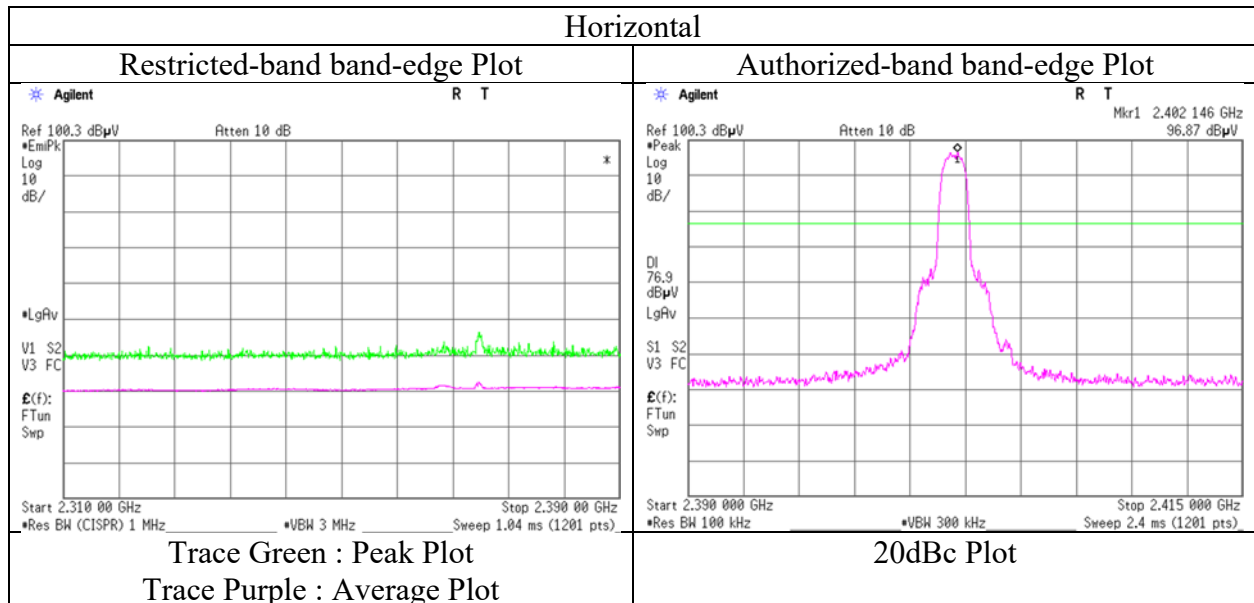
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                |
|------------------------|--------------------------------|
| Report No.             | 13328641H                      |
| Test place             | Ise EMC Lab.                   |
| Semi Anechoic Chamber  | No.4                           |
| Date                   | May 2, 2020                    |
| Temperature / Humidity | 22 deg. C / 50 % RH            |
| Engineer               | Junki Nagatomi                 |
|                        | (1 GHz -10 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.

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## Radiated Spurious Emission

|                        |                                |                     |                     |
|------------------------|--------------------------------|---------------------|---------------------|
| Report No.             | 13328641H                      |                     |                     |
| Test place             | Ise EMC Lab.                   |                     |                     |
| Semi Anechoic Chamber  | No.4                           | No.4                | No.4                |
| Date                   | May 2, 2020                    | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH            | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                 | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)                | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, 3DH5 2441 MHz |                     |                     |

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|-------------|
| Hori.    | 79.819             | QP       | 32.4              | 6.8                | 7.9          | 32.0         | -                   | 15.2               | 40.0              | 24.9           |             |
| Hori.    | 86.042             | QP       | 32.5              | 7.9                | 7.9          | 31.9         | -                   | 16.4               | 40.0              | 23.6           |             |
| Hori.    | 172.099            | QP       | 35.4              | 15.9               | 8.8          | 31.9         | -                   | 28.2               | 43.5              | 15.3           |             |
| Hori.    | 196.720            | QP       | 36.5              | 16.5               | 9.0          | 31.8         | -                   | 30.2               | 43.5              | 13.3           |             |
| Hori.    | 208.651            | QP       | 38.2              | 11.2               | 9.1          | 31.8         | -                   | 26.7               | 43.5              | 16.8           |             |
| Hori.    | 294.714            | QP       | 43.2              | 13.5               | 9.7          | 31.8         | -                   | 34.6               | 46.0              | 11.4           |             |
| Hori.    | 4882.000           | PK       | 41.4              | 31.6               | 7.8          | 31.2         | -                   | 49.5               | 73.9              | 24.4           | Floor noise |
| Hori.    | 7323.000           | PK       | 42.6              | 36.5               | 9.2          | 32.5         | -                   | 55.8               | 73.9              | 18.1           | Floor noise |
| Hori.    | 9764.000           | PK       | 43.1              | 38.3               | 7.8          | 32.9         | -                   | 56.3               | 73.9              | 17.6           | Floor noise |
| Hori.    | 4882.000           | AV       | 32.8              | 31.6               | 7.8          | 31.2         | -                   | 41.0               | 53.9              | 13.0           | Floor noise |
| Hori.    | 7323.000           | AV       | 33.9              | 36.5               | 9.2          | 32.5         | -                   | 47.1               | 53.9              | 6.8            | Floor noise |
| Hori.    | 9764.000           | AV       | 34.7              | 38.3               | 7.8          | 32.9         | -                   | 47.9               | 53.9              | 6.0            | Floor noise |
| Vert.    | 79.819             | QP       | 25.4              | 6.8                | 7.9          | 32.0         | -                   | 8.2                | 40.0              | 31.8           |             |
| Vert.    | 86.042             | QP       | 30.2              | 7.9                | 7.9          | 31.9         | -                   | 14.1               | 40.0              | 25.9           |             |
| Vert.    | 172.099            | QP       | 30.4              | 15.9               | 8.8          | 31.9         | -                   | 23.1               | 43.5              | 20.4           |             |
| Vert.    | 196.720            | QP       | 34.1              | 16.5               | 9.0          | 31.8         | -                   | 27.8               | 43.5              | 15.7           |             |
| Vert.    | 208.651            | QP       | 43.2              | 11.2               | 9.1          | 31.8         | -                   | 31.7               | 43.5              | 11.8           |             |
| Vert.    | 294.714            | QP       | 41.6              | 13.5               | 9.7          | 31.8         | -                   | 33.0               | 46.0              | 13.0           |             |
| Vert.    | 4882.000           | PK       | 41.1              | 31.6               | 7.8          | 31.2         | -                   | 49.2               | 73.9              | 24.7           | Floor noise |
| Vert.    | 7323.000           | PK       | 42.2              | 36.5               | 9.2          | 32.5         | -                   | 55.4               | 73.9              | 18.5           | Floor noise |
| Vert.    | 9764.000           | PK       | 43.4              | 38.3               | 7.8          | 32.9         | -                   | 56.6               | 73.9              | 17.3           | Floor noise |
| Vert.    | 4882.000           | AV       | 32.8              | 31.6               | 7.8          | 31.2         | -                   | 41.0               | 53.9              | 13.0           | Floor noise |
| Vert.    | 7323.000           | AV       | 33.9              | 36.5               | 9.2          | 32.5         | -                   | 47.1               | 53.9              | 6.8            | Floor noise |
| Vert.    | 9764.000           | AV       | 34.7              | 38.3               | 7.8          | 32.9         | -                   | 47.9               | 53.9              | 6.0            | Floor noise |

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

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor:     1 GHz - 10 GHz     20log (3.85 m / 3.0 m) = 2.17 dB  
                             10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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## Radiated Spurious Emission

|                        |                                |                     |                     |
|------------------------|--------------------------------|---------------------|---------------------|
| Report No.             | 13328641H                      |                     |                     |
| Test place             | Ise EMC Lab.                   |                     |                     |
| Semi Anechoic Chamber  | No.4                           | No.4                | No.4                |
| Date                   | May 2, 2020                    | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH            | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                 | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)                | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, 3DH5 2480 MHz |                     |                     |

| Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|-------------|
| 79.848             | QP       | 32.2              | 6.8                | 7.9          | 32.0         | -                   | 15.0               | 40.0              | 25.0           |             |
| 86.115             | QP       | 32.5              | 7.9                | 7.9          | 31.9         | -                   | 16.4               | 40.0              | 23.6           |             |
| 196.603            | QP       | 35.5              | 16.5               | 9.0          | 31.8         | -                   | 29.1               | 43.5              | 14.4           |             |
| 202.569            | QP       | 36.8              | 11.5               | 9.0          | 31.8         | -                   | 25.4               | 43.5              | 18.1           |             |
| 208.717            | QP       | 37.1              | 11.2               | 9.1          | 31.8         | -                   | 25.6               | 43.5              | 17.9           |             |
| 294.668            | QP       | 40.1              | 13.5               | 9.7          | 31.8         | -                   | 31.5               | 46.0              | 14.5           |             |
| 2483.500           | PK       | 50.0              | 27.7               | 5.7          | 31.8         | -                   | 51.5               | 73.9              | 22.4           |             |
| 4960.000           | PK       | 41.1              | 31.6               | 7.8          | 31.2         | -                   | 49.3               | 73.9              | 24.6           | Floor noise |
| 7440.000           | PK       | 42.3              | 36.6               | 9.2          | 32.5         | -                   | 55.6               | 73.9              | 18.3           | Floor noise |
| 9920.000           | PK       | 44.2              | 38.5               | 7.9          | 33.0         | -                   | 57.5               | 73.9              | 16.4           | Floor noise |
| 2483.500           | AV       | 40.3              | 27.7               | 5.7          | 31.8         | 1.1                 | 42.9               | 53.9              | 11.0           | *1)         |
| 4960.000           | AV       | 32.9              | 31.6               | 7.8          | 31.2         | -                   | 41.1               | 53.9              | 12.9           | Floor noise |
| 7440.000           | AV       | 33.9              | 36.6               | 9.2          | 32.5         | -                   | 47.2               | 53.9              | 6.7            | Floor noise |
| 9920.000           | AV       | 34.5              | 38.5               | 7.9          | 33.0         | -                   | 47.9               | 53.9              | 6.0            | Floor noise |
| 79.848             | QP       | 24.3              | 6.8                | 7.9          | 32.0         | -                   | 7.1                | 40.0              | 32.9           |             |
| 86.115             | QP       | 30.1              | 7.9                | 7.9          | 31.9         | -                   | 14.0               | 40.0              | 26.0           |             |
| 196.603            | QP       | 31.3              | 16.5               | 9.0          | 31.8         | -                   | 24.9               | 43.5              | 18.6           |             |
| 202.569            | QP       | 45.2              | 11.5               | 9.0          | 31.8         | -                   | 33.9               | 43.5              | 9.7            |             |
| 208.717            | QP       | 43.2              | 11.2               | 9.1          | 31.8         | -                   | 31.6               | 43.5              | 11.9           |             |
| 294.668            | QP       | 41.8              | 13.5               | 9.7          | 31.8         | -                   | 33.2               | 46.0              | 12.8           |             |
| 2483.500           | PK       | 47.3              | 27.7               | 5.7          | 31.8         | -                   | 48.9               | 73.9              | 25.0           |             |
| 4960.000           | PK       | 41.5              | 31.6               | 7.8          | 31.2         | -                   | 49.7               | 73.9              | 24.2           | Floor noise |
| 7440.000           | PK       | 42.7              | 36.6               | 9.2          | 32.5         | -                   | 55.9               | 73.9              | 18.0           | Floor noise |
| 9920.000           | PK       | 44.5              | 38.5               | 7.9          | 33.0         | -                   | 57.8               | 73.9              | 16.1           | Floor noise |
| 2483.500           | AV       | 37.3              | 27.7               | 5.7          | 31.8         | 1.1                 | 39.9               | 53.9              | 14.0           | *1)         |
| 4960.000           | AV       | 32.9              | 31.6               | 7.8          | 31.2         | -                   | 41.1               | 53.9              | 12.9           | Floor noise |
| 7440.000           | AV       | 33.9              | 36.6               | 9.2          | 32.5         | -                   | 47.2               | 53.9              | 6.7            | Floor noise |
| 9920.000           | AV       | 34.5              | 38.5               | 7.9          | 33.0         | -                   | 47.9               | 53.9              | 6.0            | Floor noise |

Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

Frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

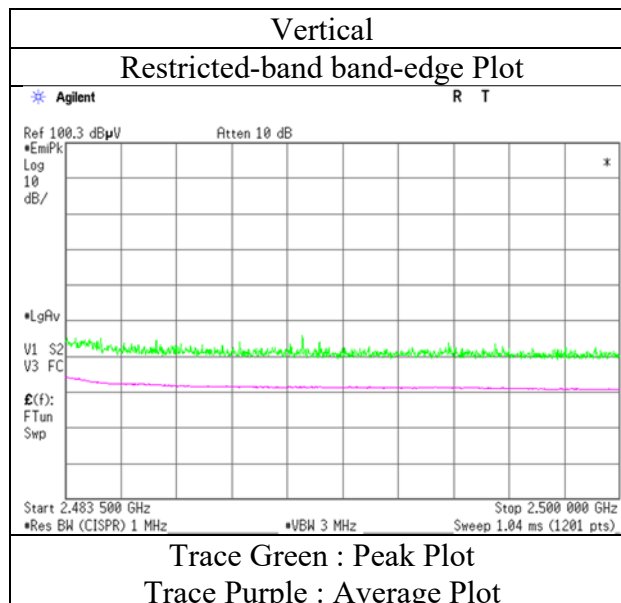
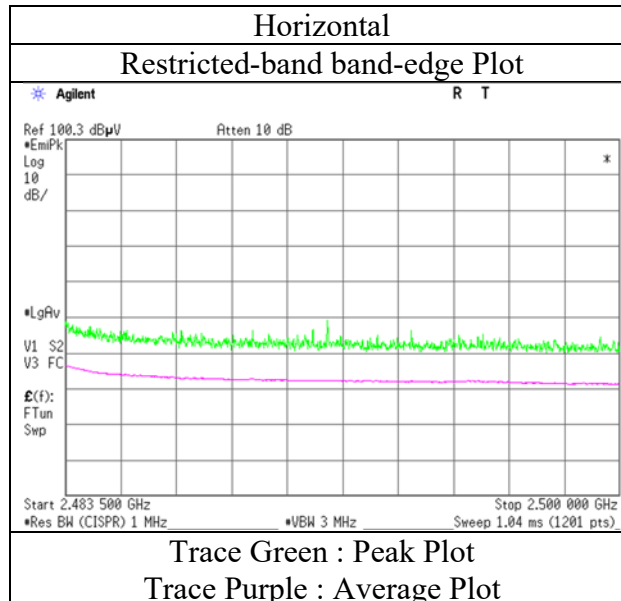
factor: 1 GHz - 10 GHz  $20\log(3.85\text{ m} / 3.0\text{ m}) = 2.17\text{ dB}$

10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

out of Band emission(Leakage Power)

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

|                        |                                   |
|------------------------|-----------------------------------|
| Report No.             | 13328641H                         |
| Test place             | Ise EMC Lab.                      |
| Semi Anechoic Chamber  | No.4                              |
| Date                   | May 2, 2020                       |
| Temperature / Humidity | 22 deg. C / 50 % RH               |
| Engineer               | Junki Nagatomi<br>(1 GHz -10 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.

**UL Japan, Inc.**

**Ise EMC Lab.**

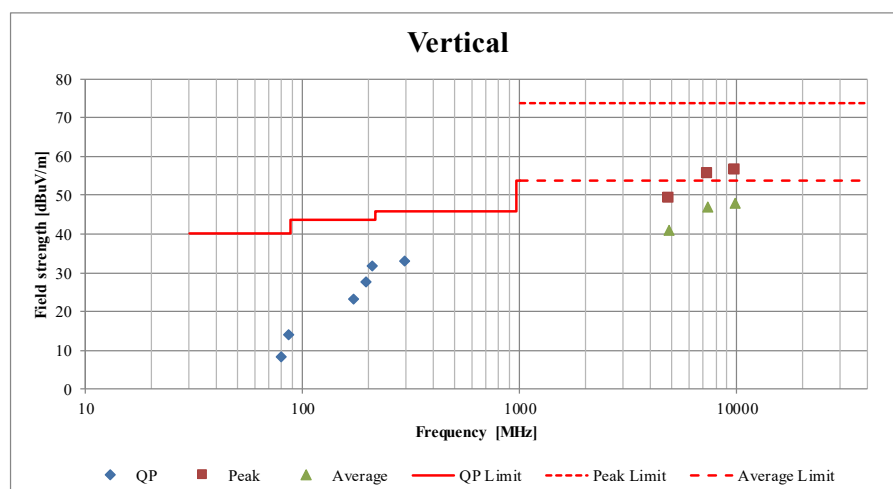
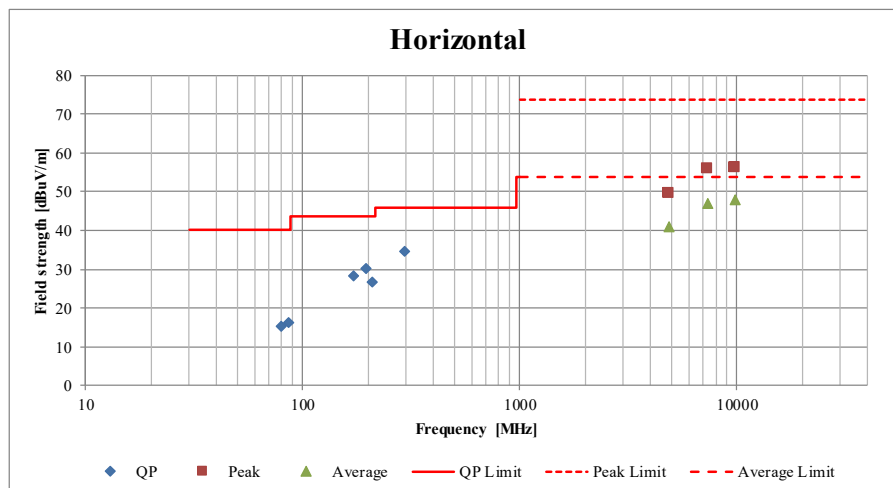
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## Radiated Spurious Emission (Plot data, Worst case)

|                        |                                |                     |                     |
|------------------------|--------------------------------|---------------------|---------------------|
| Report No.             | 13328641H                      |                     |                     |
| Test place             | Ise EMC Lab.                   |                     |                     |
| Semi Anechoic Chamber  | No.4                           | No.4                | No.4                |
| Date                   | May 2, 2020                    | May 2, 2020         | May 5, 2020         |
| Temperature / Humidity | 22 deg. C / 50 % RH            | 22 deg. C / 53 % RH | 23 deg. C / 43 % RH |
| Engineer               | Junki Nagatomi                 | Junki Nagatomi      | Ken Fujita          |
|                        | (1 GHz -10 GHz)                | (10 GHz -26.5 GHz)  | (Below 1 GHz)       |
| Mode                   | Tx, Hopping Off, 3DH5 2441 MHz |                     |                     |

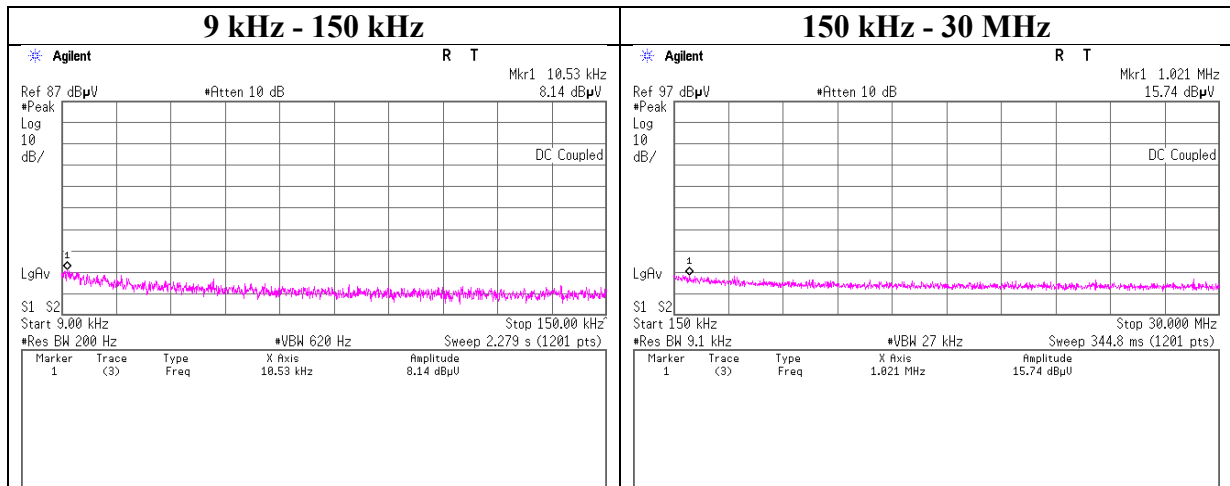


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

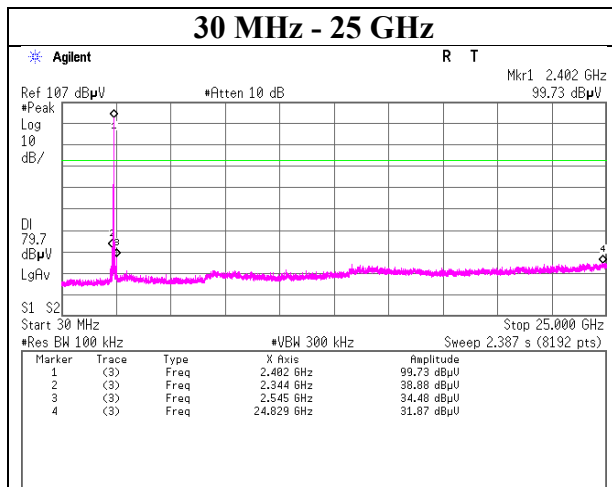
## Conducted Spurious Emission

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 22, 2020  
Temperature / Humidity 23 deg. C / 45 % RH  
Engineer Hiroyuki Furutaka  
Mode Tx, Hopping Off, DH5

### 2402 MHz



### 30 MHz - 25 GHz

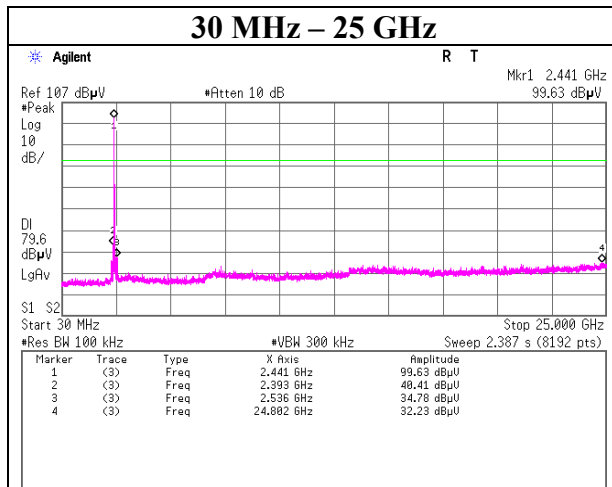
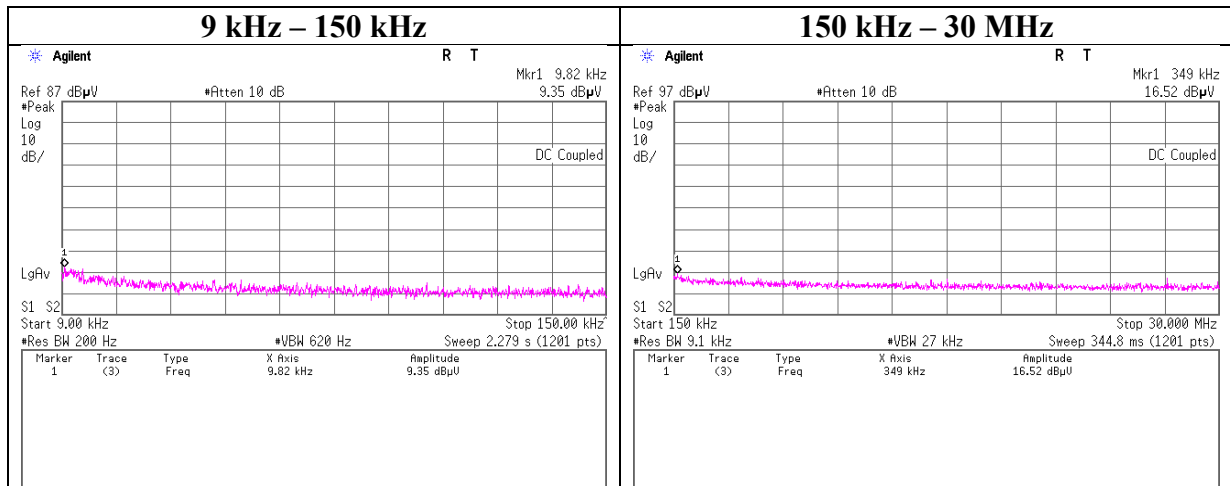




## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13328641H                          |
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | April 22, 2020                     |
| Temperature / Humidity | 23 deg. C / 45 % RH                |
| Engineer               | Hiroyuki Furutaka                  |
| Mode                   | Tx, Hopping Off, DH5               |

### 2441 MHz



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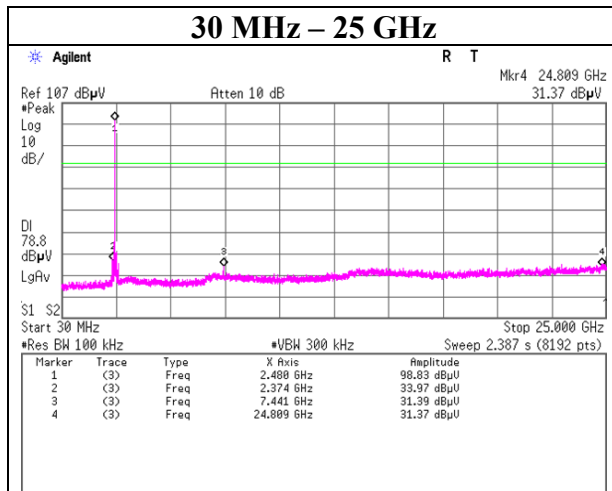
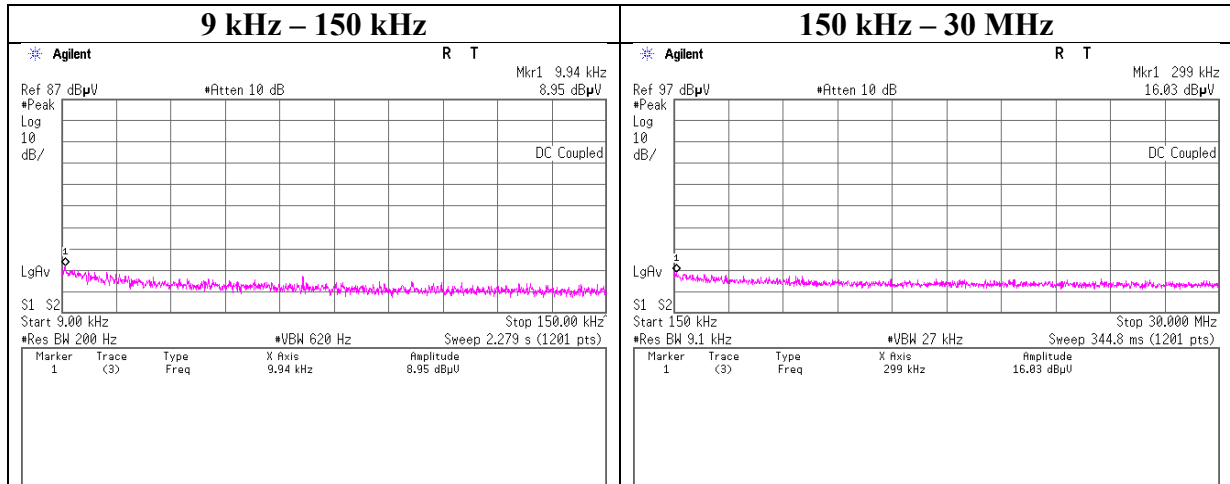
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13328641H                          |
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | April 22, 2020                     |
| Temperature / Humidity | 23 deg. C / 45 % RH                |
| Engineer               | Hiroyuki Furutaka                  |
| Mode                   | Tx, Hopping Off, DH5               |

### 2480 MHz



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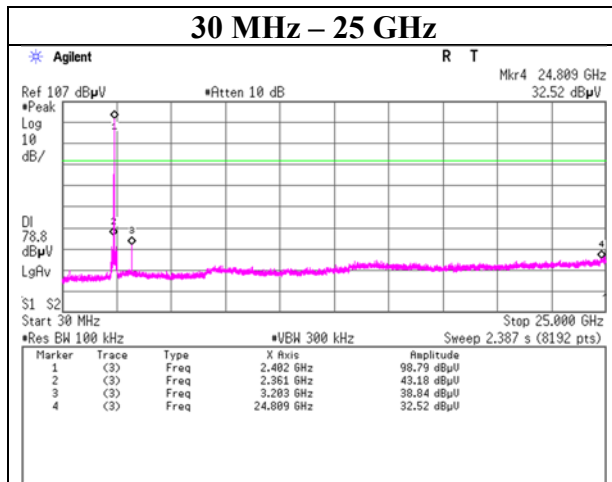
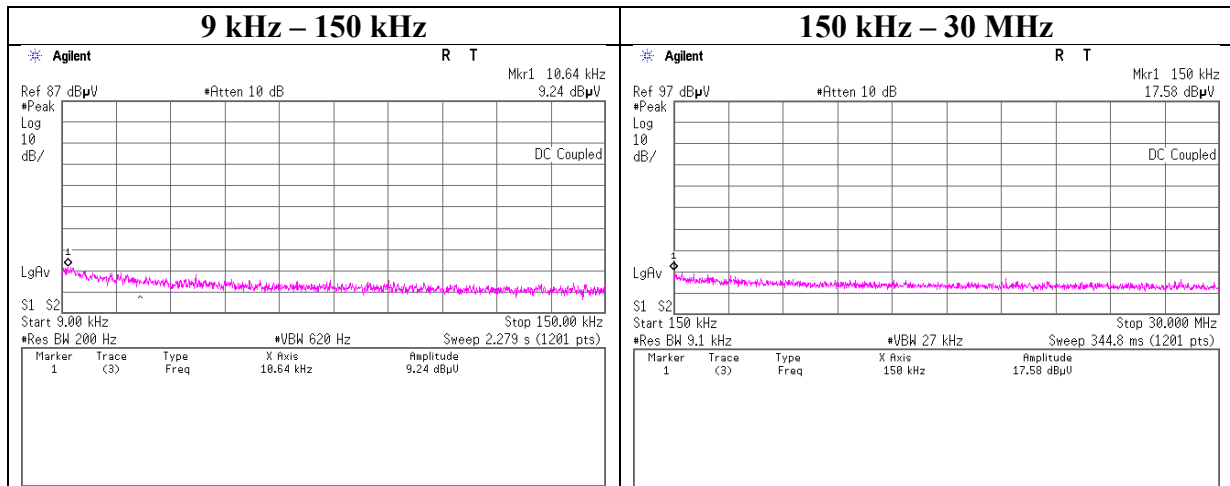
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13328641H                          |
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | April 22, 2020                     |
| Temperature / Humidity | 23 deg. C / 45 % RH                |
| Engineer               | Hiroyuki Furutaka                  |
| Mode                   | Tx, Hopping Off, 3DH5              |

### 2402 MHz



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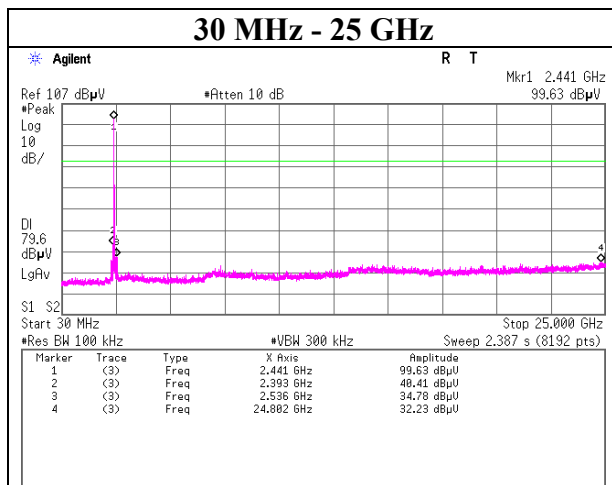
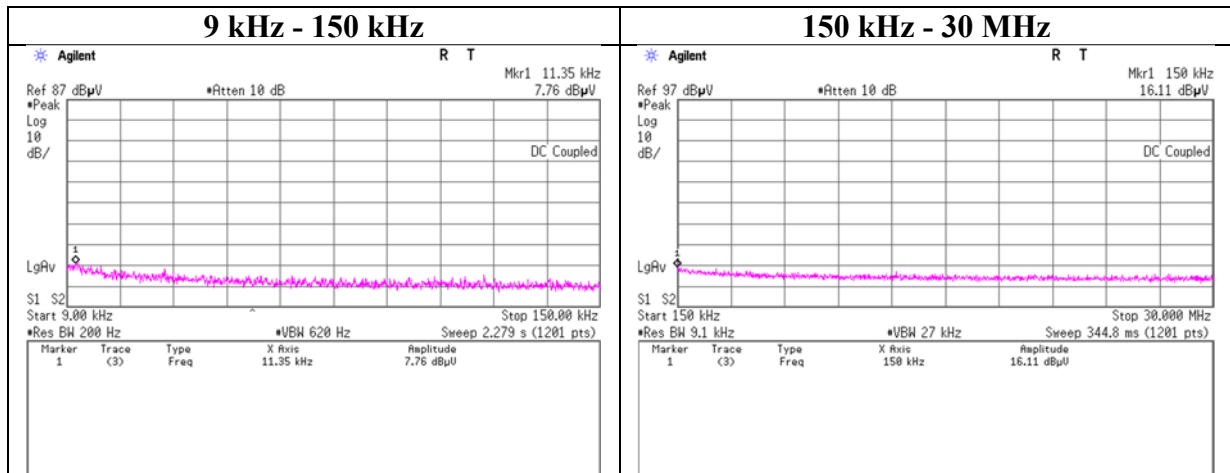
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 22, 2020  
Temperature / Humidity 23 deg. C / 45 % RH  
Engineer Hiroyuki Furutaka  
Mode Tx, Hopping Off, 3DH5

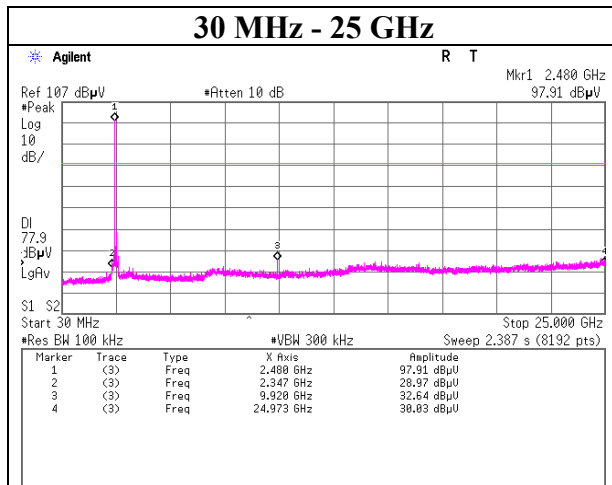
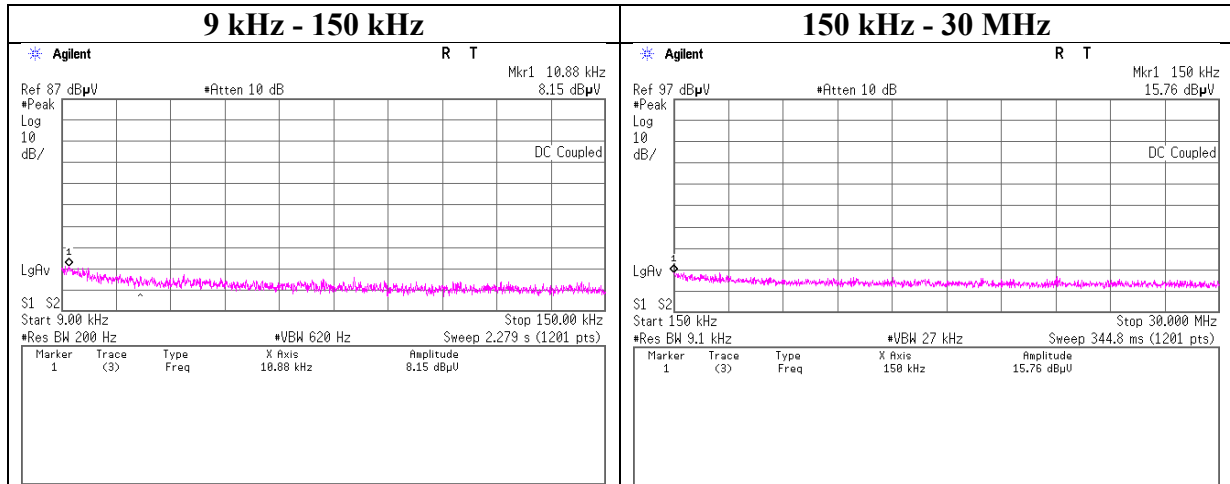
### 2441 MHz



## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13328641H                          |
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | April 22, 2020                     |
| Temperature / Humidity | 23 deg. C / 45 % RH                |
| Engineer               | Hiroyuki Furutaka                  |
| Mode                   | Tx, Hopping Off, 3DH5              |

### 2480 MHz



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**Ise EMC Lab.**

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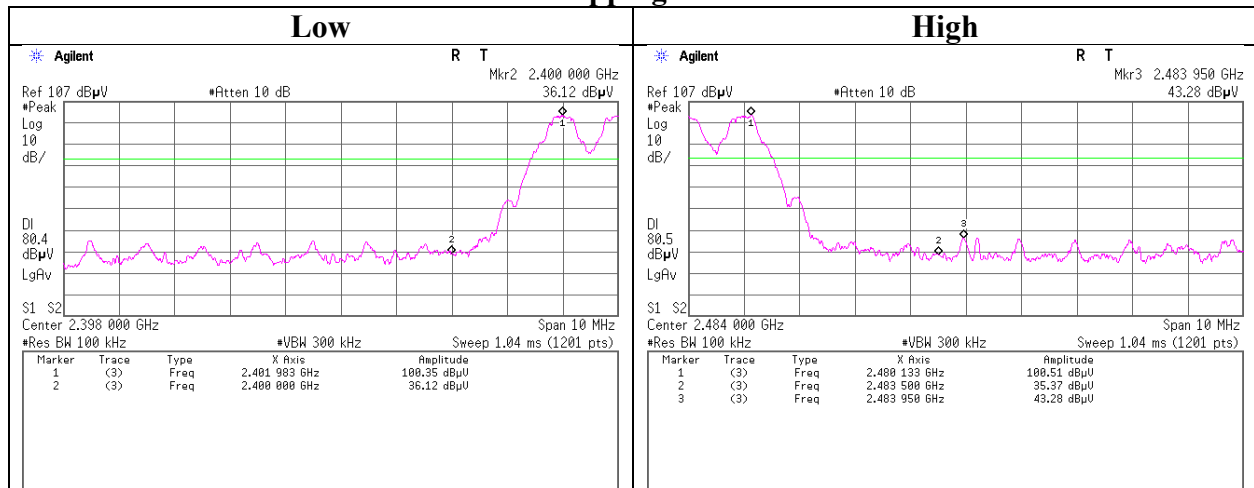
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

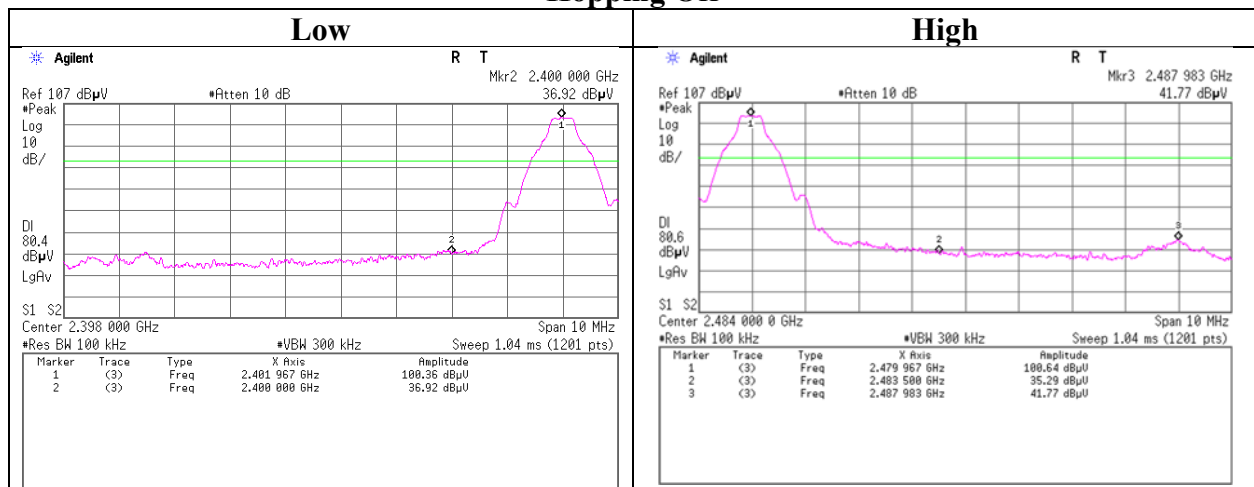
## Conducted Emission Band Edge compliance

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 22, 2020  
Temperature / Humidity 23 deg. C / 45 % RH  
Engineer Hiroyuki Furutaka  
Mode Tx, DH5

### Hopping On



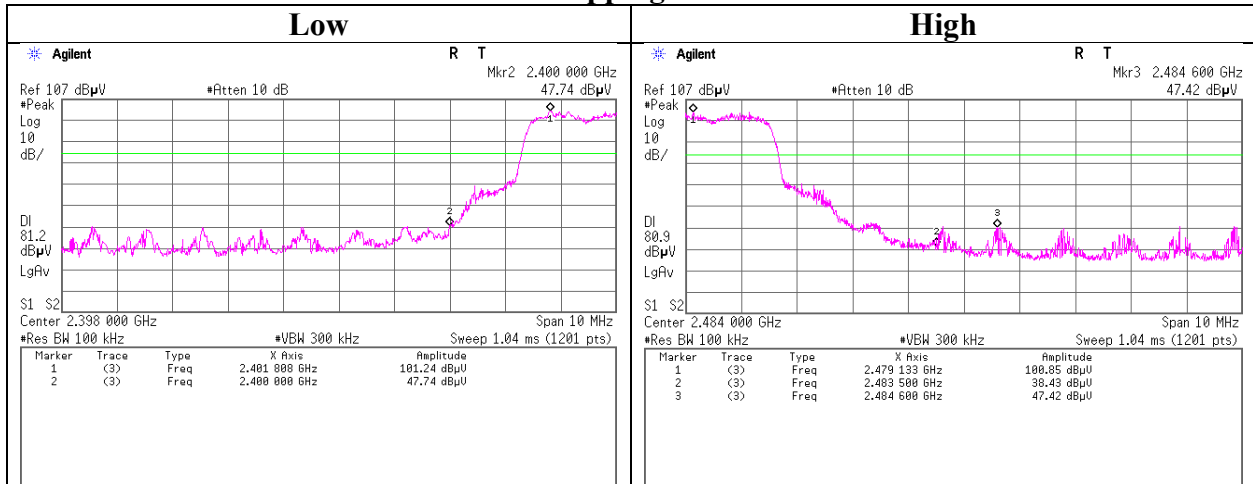
### Hopping Off



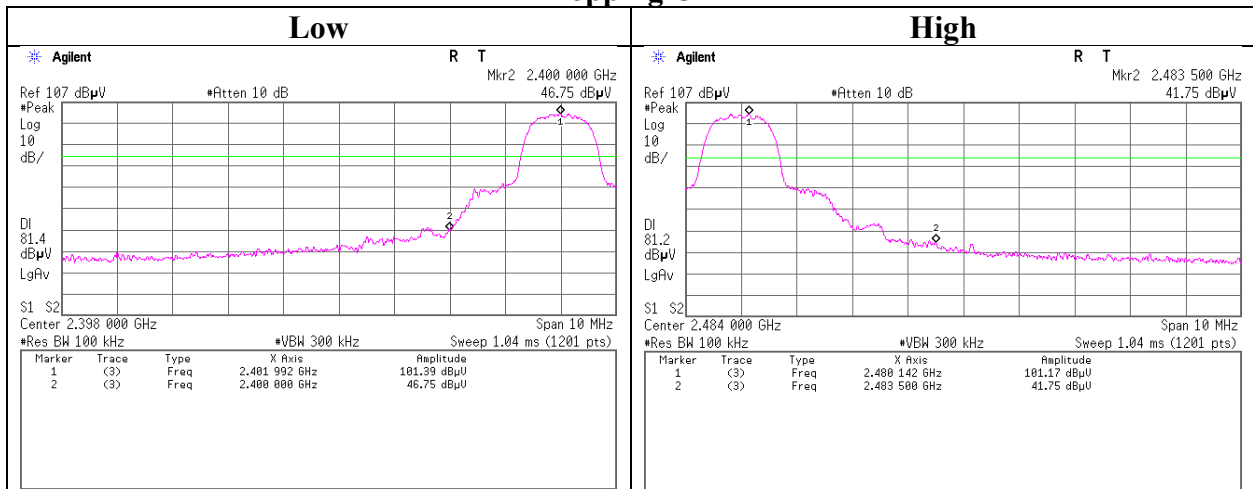
## Conducted Emission Band Edge compliance

Report No. 13328641H  
Test place Ise EMC Lab. No.8 Measurement Room  
Date April 22, 2020  
Temperature / Humidity 23 deg. C / 45 % RH  
Engineer Hiroyuki Furutaka  
Mode Tx, 3DH5

### Hopping On



### Hopping Off



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## APPENDIX 2: Test instruments

### Test equipment

| Test Item | Local ID       | LIMS ID | Description                       | Manufacturer                  | Model                    | Serial                       | Last Calibration Date | Cal Int |
|-----------|----------------|---------|-----------------------------------|-------------------------------|--------------------------|------------------------------|-----------------------|---------|
| AT        | MAT-23         | 141361  | Attenuator(10dB) 1-18GHz          | Orient Microwave              | BX10-0476-00             | -                            | 04/21/2020            | 12      |
| AT        | MCC-55         | 141326  | Microwave Cable                   | Suhner                        | SUCOFLEX101              | 2874(1m) / 2877(5m)          | 03/24/2020            | 12      |
| AT        | MSA-13         | 141900  | Spectrum Analyzer                 | Keysight Technologies Inc     | E4440A                   | MY46185823                   | -                     | -       |
| AT        | MPM-12         | 141809  | Power Meter                       | ANRITSU                       | ML2495A                  | 825002                       | 05/07/2020            | 12      |
| AT        | MPSE-17        | 141830  | Power sensor                      | ANRITSU                       | MA2411B                  | 738285                       | 05/07/2020            | 12      |
| AT        | MOS-28         | 141567  | Thermo-Hygrometer                 | CUSTOM                        | CTH-201                  | 0008                         | 01/07/2020            | 12      |
| AT        | MMM-16         | 141360  | DIGITAL HiTESTER                  | Hioki                         | 3805                     | 70900532                     | 01/06/2020            | 12      |
| AT        | MAT-10         | 141156  | Attenuator(10dB)                  | Weinschel Corp                | 2                        | BL1173                       | 11/07/2019            | 12      |
| AT        | MCC-64         | 141327  | Coaxial Cable                     | UL Japan                      | -                        | -                            | 02/04/2020            | 12      |
| RE        | MOS-15         | 141562  | Thermo-Hygrometer                 | CUSTOM                        | CTH-201                  | 0010                         | 01/07/2020            | 12      |
| RE        | MMM-10         | 141545  | DIGITAL HiTESTER                  | Hioki                         | 3805                     | 51201148                     | 01/06/2020            | 12      |
| RE        | MJM-26         | 142227  | Measure                           | KOMELON                       | KMC-36                   | -                            | -                     | -       |
| RE        | COTS-M EMI-02  | 178648  | EMI measurement program           | TSJ (Techno Science Japan)    | TEPTO-DV                 | -                            | -                     | -       |
| RE        | MAEC-04 -SVSWR | 142017  | AC4_Semi Anechoic Chamber(SVSWR)  | TDK                           | Semi Anechoic Chamber 3m | DA-10005                     | 04/04/2019            | 24      |
| RE        | MHA-21         | 141508  | Horn Antenna 1-18GHz              | Schwarzbeck Mess - Elektronik | BBHA9120D                | 557                          | 05/22/2020            | 12      |
| RE        | MPA-12         | 141581  | MicroWave System Amplifier        | Keysight Technologies Inc     | 83017A                   | 650                          | 10/16/2019            | 12      |
| RE        | MCC-141        | 141412  | Microwave Cable                   | Junkosha                      | MWX221                   | 1305S002R(1m) / 1405S146(5m) | 06/17/2019            | 12      |
| RE        | MHF-26         | 141296  | High Pass Filter 3.5-18.0GHz      | UL Japan                      | HPF SELECTOR             | 002                          | 09/11/2019            | 12      |
| RE        | MSA-04         | 141885  | Spectrum Analyzer                 | Keysight Technologies Inc     | E4448A                   | US44300523                   | 11/21/2019            | 12      |
| RE        | MHA-17         | 141506  | Horn Antenna 15-40GHz             | Schwarzbeck Mess - Elektronik | BBHA9170                 | BBHA9170307                  | 10/08/2019            | 12      |
| RE        | MAT-34         | 141331  | Attenuator(6dB)                   | TME                           | UFA-01                   | -                            | 02/05/2020            | 12      |
| RE        | MBA-05         | 141425  | Biconical Antenna                 | Schwarzbeck Mess - Elektronik | VHA9103+BBA9106          | 1302                         | 08/24/2019            | 12      |
| RE        | MCC-50         | 141397  | Coaxial Cable                     | UL Japan                      | -                        | -                            | 03/24/2020            | 12      |
| RE        | MLA-23         | 141267  | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess - Elektronik | VUSLP9111B               | 9111B-192                    | 08/24/2019            | 12      |
| RE        | MPA-14         | 141583  | Pre Amplifier                     | SONOMA INSTRUMENT             | 310                      | 260833                       | 02/18/2020            | 12      |
| RE        | MAEC-04        | 142011  | AC4_Semi Anechoic Chamber(NSA)    | TDK                           | Semi Anechoic Chamber 3m | DA-10005                     | 06/28/2018            | 24      |

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

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

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

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

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

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