



# **RADIO TEST REPORT**

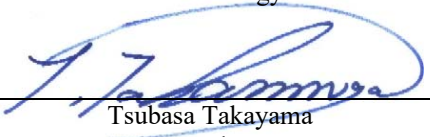
**Test Report No. : 13407533H-A-R1**

**Applicant** : DENSO WAVE INCORPORATED  
**Type of EUT** : Fixed Type RFID Scanner  
**Model Number of EUT** : UR40-H-ERU  
**FCC ID** : PZWUR40HERU  
**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 must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13407533H-A. 13407533H-A is replaced with this report.

**Date of test:** July 1 to September 4, 2020

**Representative test engineer:**   
Junya Okuno  
Engineer  
Consumer Technology Division

**Approved by:**   
Tsubasa Takayama  
Leader  
Consumer Technology Division



CERTIFICATE 5107.02

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

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## **REVISION HISTORY**

### **Original Test Report No.: 13407533H-A**

| Revision     | Test report No. | Date               | Page revised | Contents                                                                                                                                                  |
|--------------|-----------------|--------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| - (Original) | 13407533H-A     | July 28, 2020      | -            | -                                                                                                                                                         |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.1          | Correction of Date of test                                                                                                                                |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.7          | Correction of Worst Margin of Spurious Emission & Band Edge Compliance                                                                                    |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.7          | Correction of FCC Part 15.203 Antenna requirement for External Antenna.                                                                                   |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.10         | Addition of Power setting value                                                                                                                           |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.12         | Correction of cable Name No.9: from LAN Cable to ETHERNET MEDIA M12 PACH CORD                                                                             |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.12         | Addition of Remarks of cable No.9, Cable information and note *1)                                                                                         |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.15         | Recalculation of Test distance for 1 GHz - 10 GHz :<br>(Internal Antenna) part<br>from 4.0 m to 3.85 m<br>(External Antenna) part<br>from 4.0 m to 3.65 m |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.15         | Deletion of Test Setup for 10 GHz - 26.5 GHz                                                                                                              |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.15         | Correction of measurement range: from 30 MHz - 26.5 GHz to 30 MHz - 10 GHz                                                                                |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.29, 32     | Addition of setting value “(30 dBm Setting)”                                                                                                              |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.30, 33     | Addition of Test data on setting value 10 dBm                                                                                                             |
| 1            | 13407533H-A-R1  | September 10, 2020 | P.54         | Addition of Test Instrument:<br>Bottom three lines of the table                                                                                           |

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

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

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## **SECTION 1: Customer information**

|                  |   |                                                               |
|------------------|---|---------------------------------------------------------------|
| Company Name     | : | DENSO WAVE INCORPORATED                                       |
| Address          | : | 1 Yshiike, Kusagi, Agui-cho, Chita-gun, Aichi 470-2297, Japan |
| Telephone Number | : | +81-569-49-5276                                               |
| Facsimile Number | : | +81-569-49-5488                                               |
| Contact Person   | : | Akira Ito                                                     |

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                       | : | Fixed Type RFID Scanner                                                                    |
| Model Number               | : | UR40-H-ERU                                                                                 |
| Serial Number              | : | Refer to SECTION 4.2                                                                       |
| Rating                     | : | DC 20.4 V - 26.4 V                                                                         |
| Receipt Date               | : | June 27, 2020                                                                              |
| Country of Mass-production | : | Japan                                                                                      |
| Condition                  | : | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification               | : | No Modification by the test lab.                                                           |

### **2.2 Product Description**

Model: UR40-H-ERU (referred to as the EUT in this report) is a Fixed Type RFID Scanner.

### **Radio Specification**

|                           |   |                                                                                                                             |
|---------------------------|---|-----------------------------------------------------------------------------------------------------------------------------|
| Radio Type                | : | Transceiver                                                                                                                 |
| Frequency of Operation    | : | 915.25 MHz to 927.5 MHz                                                                                                     |
| Modulation                | : | PR-ASK                                                                                                                      |
| Antenna type              | : | Polarization switching antenna (Circularly / Linearly) (Internal (Int.)),<br>Circularly polarized antenna (External (Ext.)) |
| Antenna Gain              | : | 6.0 dBi                                                                                                                     |
| Clock frequency (Maximum) | : | RF board: 24 MHz                                                                                                            |

\*Simultaneously transmission does not do among combination of three external antennas and internal antenna.

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on June 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.

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

### 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                                   | 11.11 dB<br>12.07713 MHz, QP, N,<br>Internal Antenna /<br>12.07755 MHz, AV, N,<br>External Antenna | Complied<br>a)      | -                                               |
| Carrier Frequency Separation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)<br>ISED: RSS-247 5.1 (b)                         | See data.                                                                                          | Complied<br>b)      | Conducted                                       |
| 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<br>b)      | Conducted                                       |
| Number of Hopping Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)(iii)<br>ISED: RSS-247 5.1 (d)                    |                                                                                                    | Complied<br>c)      | Conducted                                       |
| Dwell time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(1)(iii)<br>ISED: RSS-247 5.1 (d)                    |                                                                                                    | Complied<br>d)      | Conducted                                       |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: RSS-Gen 6.12 | FCC: Section 15.247(a)(b)(1)<br>ISED: RSS-247 5.4 (b)                      |                                                                                                    | Complied<br>e)      | Conducted                                       |
| Spurious Emission & Band Edge Compliance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | FCC: KDB 558074 D01<br>15.247 Meas Guidance v05r02<br>ISED: RSS-Gen 6.13 | FCC: Section 15.247(d)<br>ISED: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 0.3 dB<br>2782.500 MHz, AV, Hori.,<br>Internal Antenna                                             | Complied<br>f) / g) | Conducted/<br>Radiated<br>(above 30 MHz)<br>*1) |
| Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.<br>*1) Radiated test was selected over 30 MHz based on section 15.247(d).<br>a) Refer to APPENDIX 1 (data of Conducted Emission)<br>b) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)<br>c) Refer to APPENDIX 1 (data of Number of Hopping Frequency)<br>d) Refer to APPENDIX 1 (data of Dwell time)<br>e) Refer to APPENDIX 1 (data of Maximum Peak Output Power)<br>f) Refer to APPENDIX 1 (data of Conducted Spurious Emission)<br>g) Refer to APPENDIX 1 (data of Radiated Spurious Emission)<br>Symbols:<br>Complied The data of this test item has enough margin, more than the measurement uncertainty.<br>Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration. |                                                                          |                                                                            |                                                                                                    |                     |                                                 |

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

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

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

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

##### For Internal Antenna

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.

##### For External Antenna

The EUT has an external antenna connector, but it is installed by the professionals. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

| Item                                                                                                    | Test Procedure    | Specification | Worst margin | Results | Remarks   |
|---------------------------------------------------------------------------------------------------------|-------------------|---------------|--------------|---------|-----------|
| 99% Occupied Bandwidth                                                                                  | ISED: RSS-Gen 6.7 | ISED: -       | N/A          | -<br>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.

### 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.

\*A2LA Certificate Number: 5107.02 / 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 3.0 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.

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

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

RFID: Transmitting (Tx)

\* Test was performed using each antenna (Internal / External).

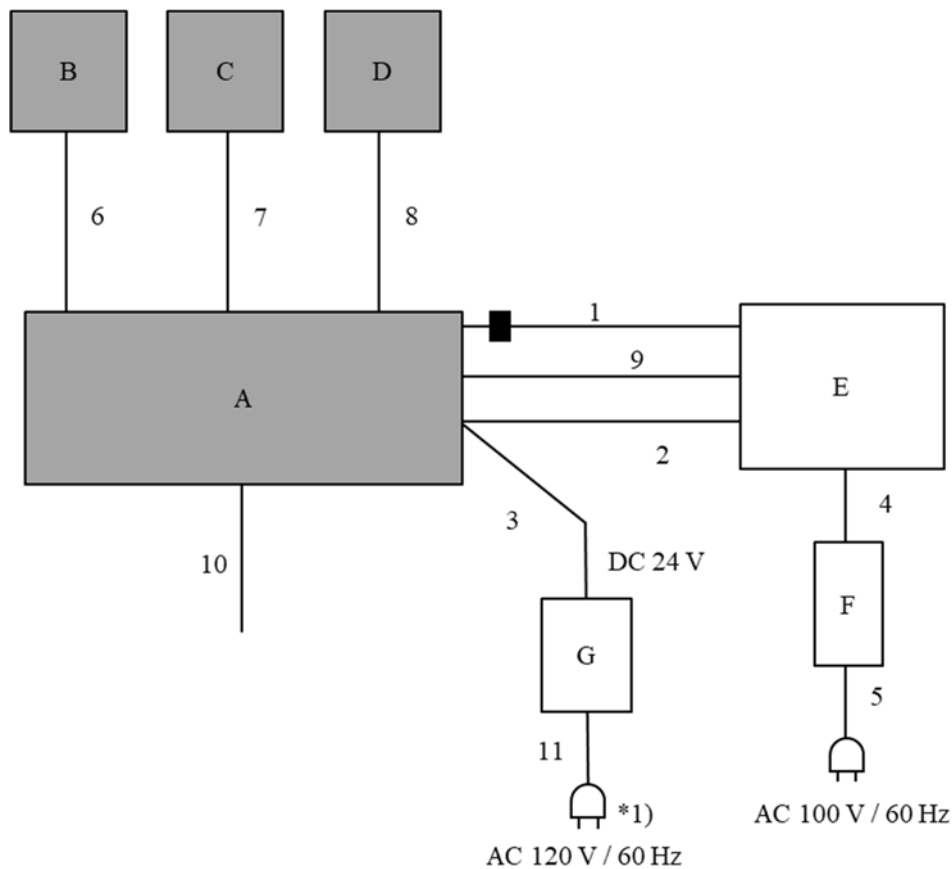
Worst rate:

|                  |                     |            |
|------------------|---------------------|------------|
| Internal Antenna | Polarization: Hori. | Profile: 4 |
| External Antenna | Antenna: 2          | Profile: 4 |

Details of Operating Mode(s)

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mode                              | Tested frequency                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------|
| Conducted Emission,<br>Spurious Emission<br>(Conducted/Radiated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Tx (Hopping Off)                  | 915.25 MHz<br>921.25 MHz<br>927.50 MHz |
| Carrier Frequency Separation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Tx (Hopping On)                   | 915.25 MHz<br>921.25 MHz<br>927.50 MHz |
| 20dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tx (Hopping Off)                  | 915.25 MHz<br>921.25 MHz<br>927.50 MHz |
| Number of Hopping Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tx (Hopping On)                   | -                                      |
| Dwell time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tx (Hopping On),                  | 915.25 MHz<br>921.25 MHz<br>927.50 MHz |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Tx (Hopping Off)                  | 915.25 MHz<br>921.25 MHz<br>927.50 MHz |
| Band Edge Compliance<br>(Conducted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Tx<br>-Hopping On<br>-Hopping Off | 915.25 MHz<br>927.50 MHz               |
| 99% Occupied Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Tx (Hopping On / Off)             | 915.25 MHz<br>921.25 MHz<br>927.50 MHz |
| <p>*EUT has the power settings by the software as follows;<br/>           Power settings: 10 dBm (Maximum Peak Output Power and Average Output Power tests),<br/>           30 dBm (all tests)<br/>           Software: ScannerSettingF (Ver.2.1.1.0)<br/>           UR40_TestTool (Ver.0.7.0)<br/>           IndyTool (Ver.2.6.0)<br/>           (Date: June 29, 2020 Storage location: Driven by connected PC)</p> <p>*This setting of software is the worst case.<br/>           Any conditions under the normal use do not exceed the condition of setting.<br/>           In addition, end users cannot change the settings of the output power of the product.</p> |                                   |                                        |

## 4.2 Configuration and peripherals



■ : Standard Ferrite Core

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

\*1) Conducted Emission test was performed on this port.

#### Description of EUT and Support equipment

| No. | Item                      | Model number    | Serial number | Manufacturer            | Remarks |
|-----|---------------------------|-----------------|---------------|-------------------------|---------|
| A   | Fixed Type RFID Scanner   | UR40-H-ERU      | 000007        | DENSO WAVE INCORPORATED | EUT     |
| B   | Antenna                   | URAN-40H1       | 900009        | DENSO WAVE INCORPORATED | EUT     |
| C   | Antenna                   | URAN-40H1       | 900025        | DENSO WAVE INCORPORATED | EUT     |
| D   | Antenna                   | URAN-40H1       | 900029        | DENSO WAVE INCORPORATED | EUT     |
| E   | Laptop PC                 | PR63PBAA337AD7X | 6F053983H     | TOSHIBA                 | -       |
| F   | AC Adapter                | PA51770-1ACA    | FX1200E91PCC  | TOSHIBA                 | -       |
| G   | Regulated DC Power Supply | PW16-2ATP       | GJR810407     | TEXIO                   | for CE* |

#### List of cables used

| No. | Name                         | Length (m)                  | Shield     |            | Remarks                                                     |
|-----|------------------------------|-----------------------------|------------|------------|-------------------------------------------------------------|
|     |                              |                             | Cable      | Connector  |                                                             |
| 1   | USB Cable                    | 1.8                         | Shielded   | Shielded   | -                                                           |
| 2   | RS-232C + USB cable          | 4.7 for CE<br>2.7 for other | Shielded   | Shielded   | -                                                           |
| 3   | DC Cable                     | 3.0                         | Unshielded | Unshielded | -                                                           |
| 4   | DC Cable                     | 1.7                         | Unshielded | Unshielded | -                                                           |
| 5   | AC Cable                     | 0.8                         | Unshielded | Unshielded | -                                                           |
| 6   | Signal Cable                 | 5.0                         | Shielded   | Shielded   | -                                                           |
| 7   | Signal Cable                 | 5.0                         | Shielded   | Shielded   | -                                                           |
| 8   | Signal Cable                 | 5.0                         | Shielded   | Shielded   | -                                                           |
| 9   | ETHERNET MEDIA M12 PACH CORD | 2.0                         | Shielded   | Shielded   | Model: 1585D-M4UBJM-2<br>Manufacturer: Allen-Bradley<br>*1) |
| 10  | Signal Cable                 | 2.0                         | Shielded   | Shielded   | -                                                           |
| 11  | AC Cable                     | 1.0                         | Unshielded | Unshielded | for CE*                                                     |

\*1) As for the port which is connected to this cable, this cable only could be connected. Other cables should not be connected to this port.

\*CE: Conducted Emission

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN). The test was performed on using representative DC power supply.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

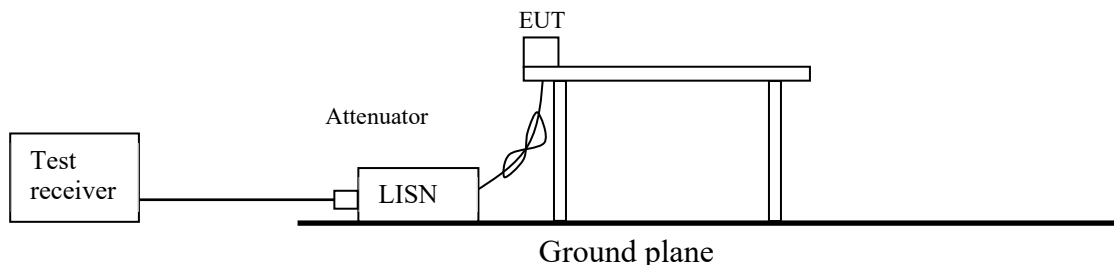
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

**Figure 1: Test Setup**



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

### **Test Procedure**

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 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.

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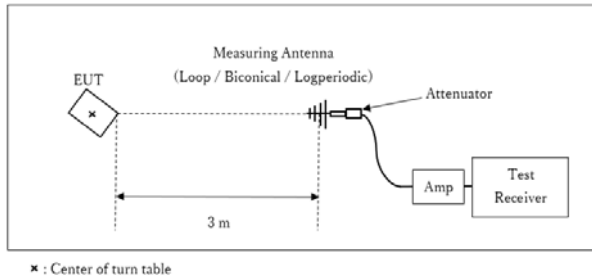
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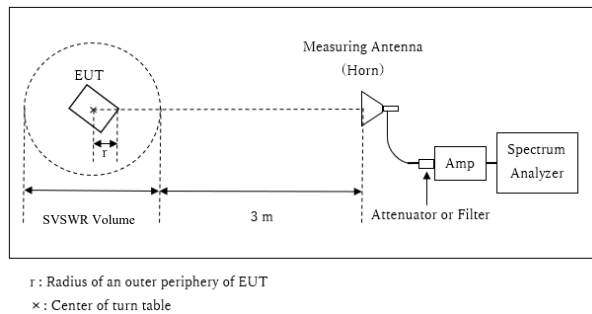
**Figure 2: Test Setup**

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz (Internal Antenna)



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

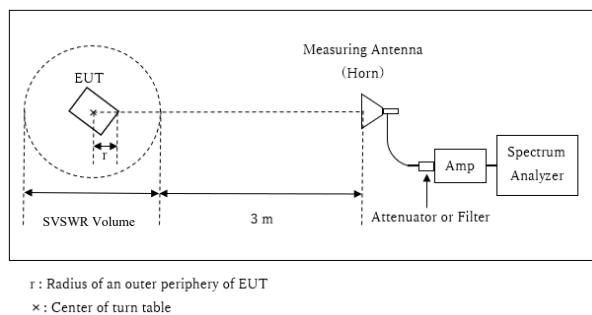
\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.85 \text{ m}$

SVSWR Volume : 2.0 m

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

$r = 0.15 \text{ m}$

1 GHz - 10 GHz (External Antenna)



Distance Factor:  $20 \times \log (3.65 \text{ m} / 3.0 \text{ m}) = 1.71 \text{ dB}$

\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.65 \text{ m}$

SVSWR Volume : 2.0 m

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

$r = 0.35 \text{ m}$

The carrier level and noise levels were confirmed at each position of X, Y and Z axes 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 - 10 GHz |
| Test data         | : APPENDIX        |
| Test result       | : Pass            |

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

### **Test Procedure**

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

| Test                                             | Span                                    | RBW             | VBW                | Sweep time                                                     | Detector         | Trace       | Instrument used                |
|--------------------------------------------------|-----------------------------------------|-----------------|--------------------|----------------------------------------------------------------|------------------|-------------|--------------------------------|
| 20dB Bandwidth                                   | 500 kHz                                 | 5.1 kHz         | 16 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                     | 750 kHz                                 | 10 kHz          | 30 kHz             | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer              |
| Number of Hopping Frequency                      | 30 MHz                                  | 68 kHz          | 200 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 10 GHz                        | 100 kHz         | 300 kHz            |                                                                |                  |             |                                |
| Conducted Spurious Emission Band Edge compliance | 16.5 MHz, 2.5 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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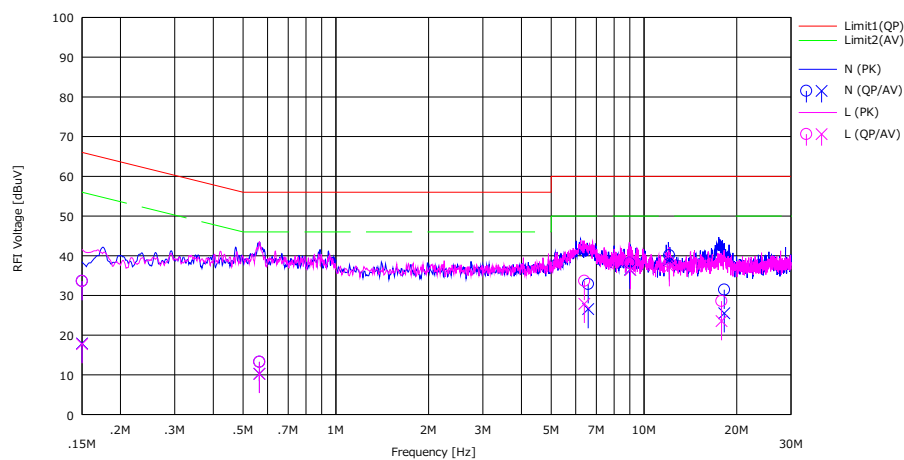
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## APPENDIX 1: Test data

### Conducted Emission (Internal Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 60 % RH  
Engineer Junya Okuno  
Mode Tx, Hopping Off, 915.25 MHz

Limit : FCC\_Part 15 Subpart C(15.207)



| No. | Freq.<br>[MHz] | Reading        |                | LISN | LOSS  | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|------|-------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | [QP]<br>[dBuV] | [AV]<br>[dBuV] |      |       | [QP]<br>[dBuV] | [AV]<br>[dBuV] | [QP]<br>[dBuV] | [AV]<br>[dBuV] | [QP]<br>[dB] | [AV]<br>[dB] |       |         |
| 1   | 0.15000        | 20.40          | 4.70           | 0.07 | 13.14 | 33.61          | 17.91          | 66.00          | 56.00          | 32.39        | 38.09        | N     |         |
| 2   | 0.56500        | 0.00           | -3.00          | 0.08 | 13.19 | 13.27          | 10.27          | 56.00          | 46.00          | 42.73        | 35.73        | N     |         |
| 3   | 6.59100        | 19.20          | 12.90          | 0.17 | 13.48 | 32.85          | 26.55          | 60.00          | 50.00          | 27.15        | 23.45        | N     |         |
| 4   | 9.00042        | 24.40          | 22.70          | 0.20 | 13.56 | 38.16          | 36.46          | 60.00          | 50.00          | 21.84        | 13.54        | N     |         |
| 5   | 12.07713       | 26.20          | 25.00          | 0.25 | 13.64 | 40.09          | 38.89          | 60.00          | 50.00          | 19.91        | 11.11        | N     |         |
| 6   | 18.22000       | 17.30          | 11.40          | 0.34 | 13.79 | 31.43          | 25.53          | 60.00          | 50.00          | 28.57        | 24.47        | N     |         |
| 7   | 0.15000        | 20.40          | 4.50           | 0.07 | 13.14 | 33.61          | 17.71          | 66.00          | 56.00          | 32.39        | 38.29        | L     |         |
| 8   | 0.56500        | 0.00           | -3.00          | 0.05 | 13.19 | 13.24          | 10.24          | 56.00          | 46.00          | 42.76        | 35.76        | L     |         |
| 9   | 6.40600        | 20.00          | 14.20          | 0.18 | 13.48 | 33.66          | 27.86          | 60.00          | 50.00          | 26.34        | 22.14        | L     |         |
| 10  | 9.03850        | 24.40          | 22.60          | 0.22 | 13.56 | 38.18          | 36.38          | 60.00          | 50.00          | 21.82        | 13.62        | L     |         |
| 11  | 12.07735       | 24.40          | 23.20          | 0.28 | 13.64 | 38.32          | 37.12          | 60.00          | 50.00          | 21.68        | 12.88        | L     |         |
| 12  | 17.84800       | 14.40          | 9.34           | 0.40 | 13.78 | 28.58          | 23.52          | 60.00          | 50.00          | 31.42        | 26.48        | L     |         |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)  
Except for the above table: adequate margin data below the limits.

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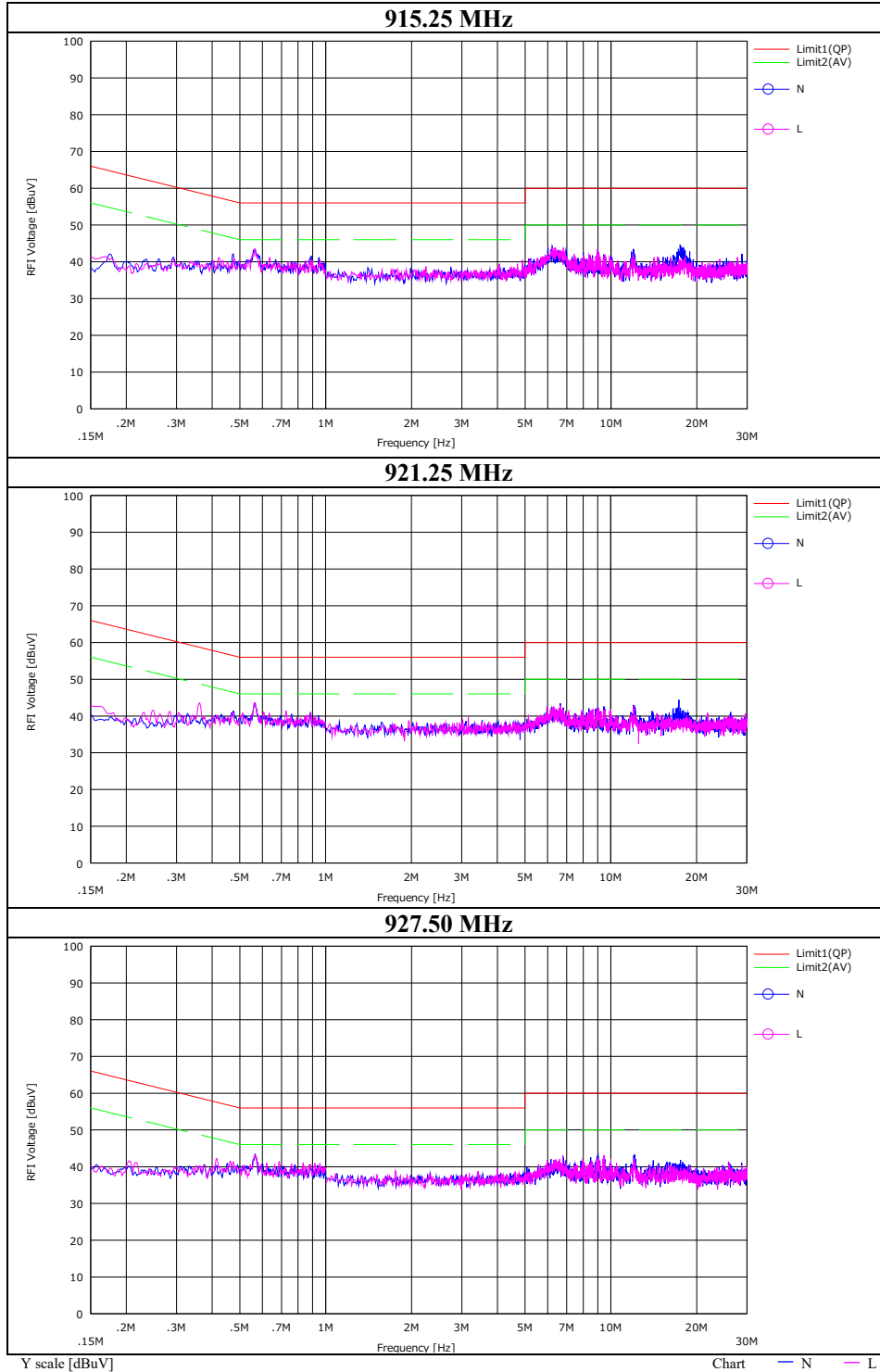
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## Conducted Emission (Internal Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 60 % RH  
Engineer Junya Okuno  
Mode Tx, Hopping Off



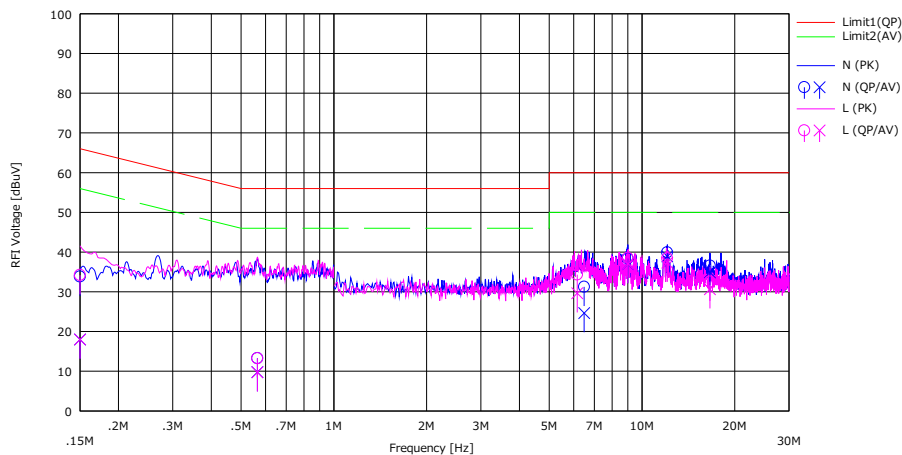
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## Conducted Emission (External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 60 % RH  
Engineer Junya Okuno  
Mode Tx, Hopping Off, 921.25 MHz

Limit : FCC\_Part 15 Subpart C(15.207)

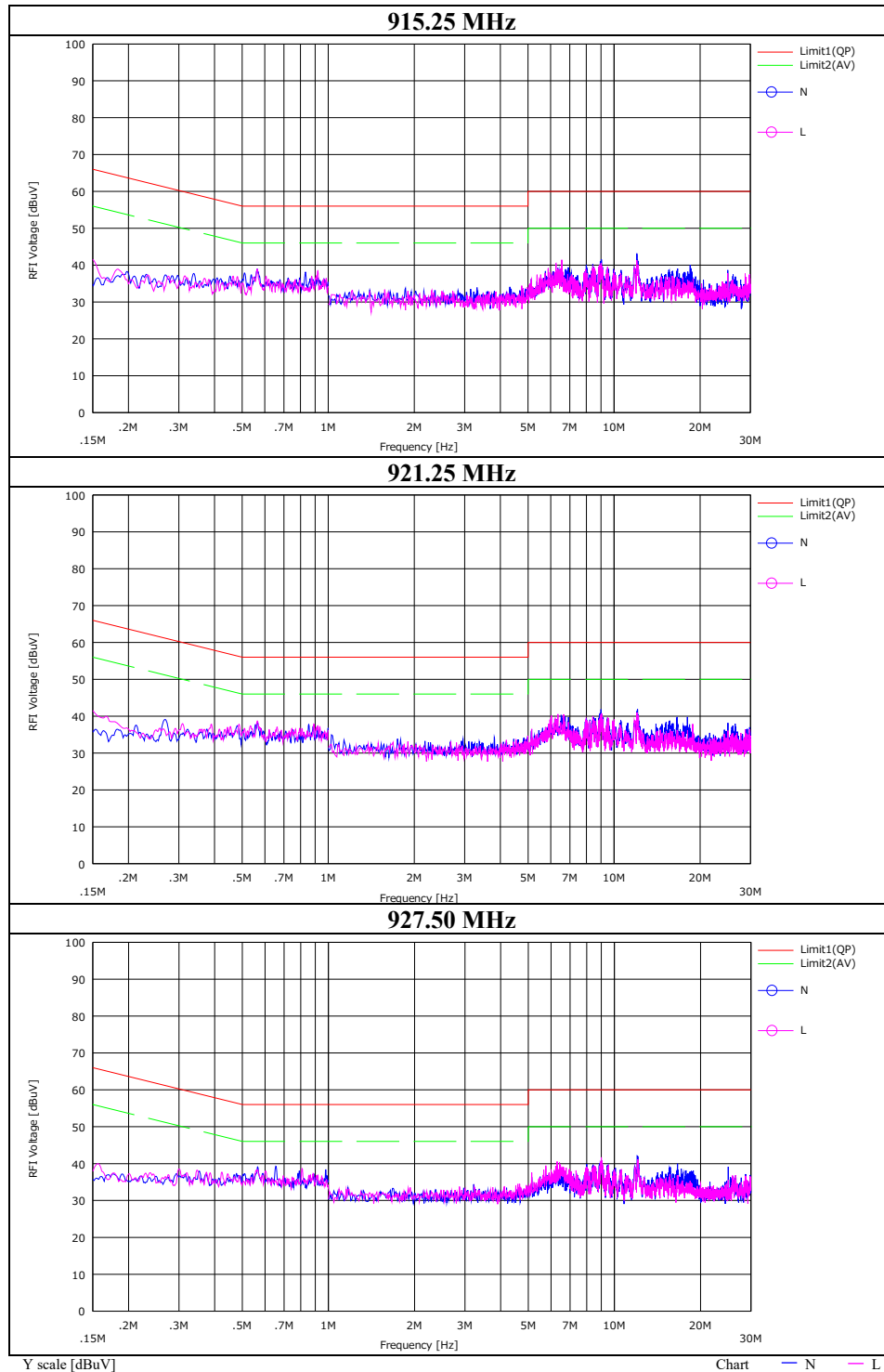


| No. | Freq.<br>[MHz] | Reading        |                | USN<br>[dB] | LOSS<br>[dB] | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|-------------|--------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | (QP)<br>[dBuV] | (AV)<br>[dBuV] |             |              | (QP)<br>[dBuV] | (AV)<br>[dBuV] | (QP)<br>[dBuV] | (AV)<br>[dBuV] | (QP)<br>[dB] | (AV)<br>[dB] |       |         |
| 1   | 0.15000        | 20.60          | 4.80           | 0.07        | 13.14        | 33.81          | 18.01          | 66.00          | 56.00          | 32.19        | 37.99        | N     |         |
| 2   | 0.56500        | 0.00           | -3.50          | 0.08        | 13.19        | 13.27          | 9.77           | 56.00          | 46.00          | 42.73        | 36.23        | N     |         |
| 3   | 6.49200        | 17.60          | 11.00          | 0.16        | 13.48        | 31.24          | 24.64          | 60.00          | 50.00          | 28.76        | 25.36        | N     |         |
| 4   | 8.99906        | 24.60          | 23.20          | 0.20        | 13.56        | 38.36          | 36.96          | 60.00          | 50.00          | 21.64        | 13.04        | N     |         |
| 5   | 12.07755       | 26.00          | 25.00          | 0.25        | 13.64        | 39.89          | 38.89          | 60.00          | 50.00          | 20.11        | 11.11        | N     |         |
| 6   | 16.61414       | 22.50          | 20.80          | 0.32        | 13.76        | 36.58          | 34.88          | 60.00          | 50.00          | 23.42        | 15.12        | N     |         |
| 7   | 0.15000        | 21.00          | 4.80           | 0.07        | 13.14        | 34.21          | 18.01          | 66.00          | 56.00          | 31.79        | 37.99        | L     |         |
| 8   | 0.56500        | 0.00           | -3.50          | 0.05        | 13.19        | 13.24          | 9.74           | 56.00          | 46.00          | 42.76        | 36.26        | L     |         |
| 9   | 6.16150        | 20.70          | 16.00          | 0.17        | 13.47        | 34.34          | 29.64          | 60.00          | 50.00          | 25.66        | 20.36        | L     |         |
| 10  | 8.99978        | 24.70          | 23.20          | 0.22        | 13.56        | 38.48          | 36.98          | 60.00          | 50.00          | 21.52        | 13.02        | L     |         |
| 11  | 12.07730       | 24.50          | 23.40          | 0.28        | 13.64        | 38.42          | 37.32          | 60.00          | 50.00          | 21.58        | 12.68        | L     |         |
| 12  | 16.61478       | 18.40          | 16.50          | 0.38        | 13.76        | 32.54          | 30.64          | 60.00          | 50.00          | 27.46        | 19.36        | L     |         |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)  
Except for the above table: adequate margin data below the limits.

## Conducted Emission (External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 60 % RH  
Engineer Junya Okuno  
Mode Tx, Hopping Off



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**20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation**  
(Internal / External Antenna)

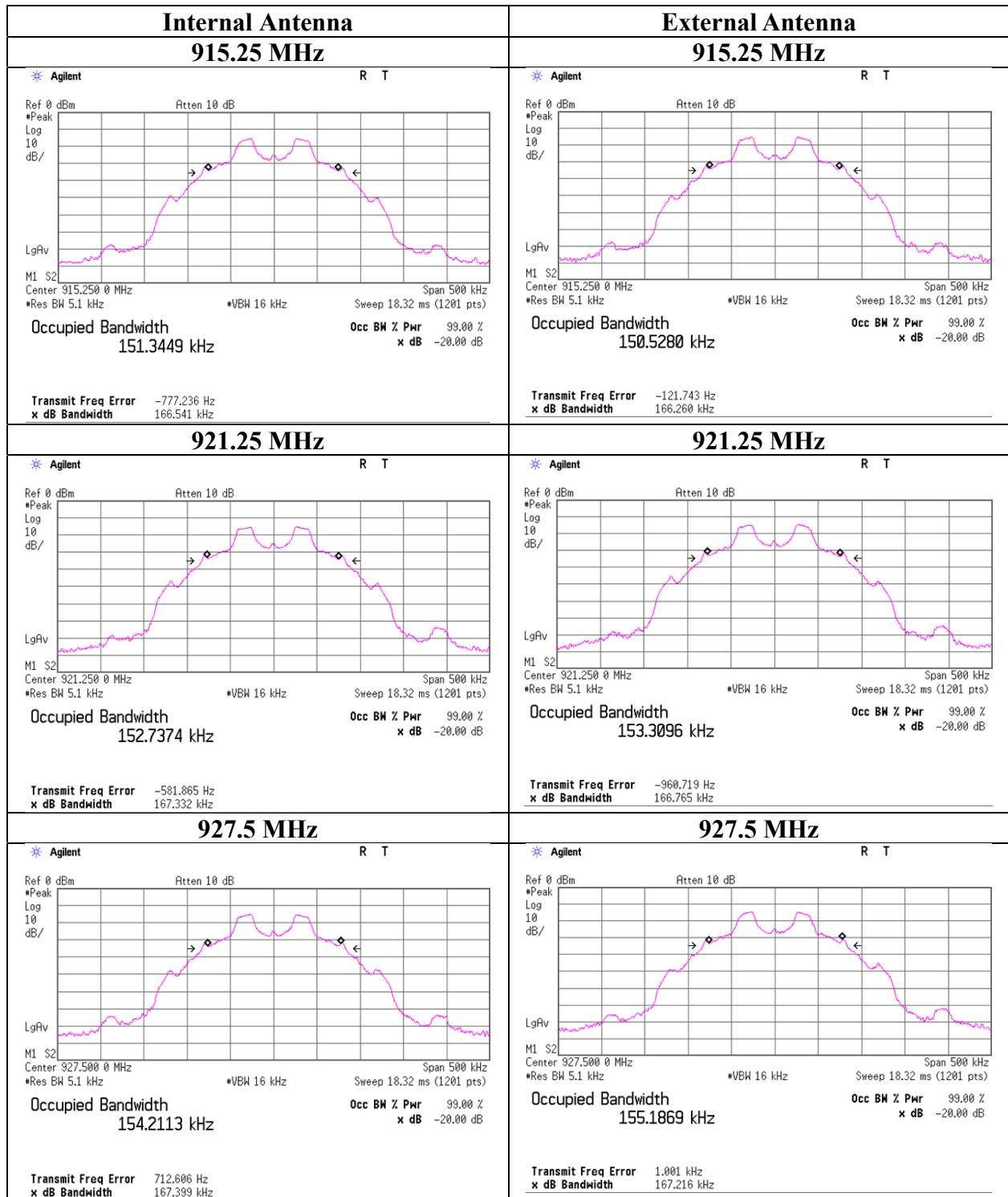
Report No. 13407533H  
Test place Ise EMC Lab. No.4 Measurement Room  
Date July 1, 2020 July 9, 2020  
Temperature / Humidity 23 deg. C / 54 % RH 22 deg. C / 74 % RH  
Engineer Junki Nagatomi Akihiko Maeda  
Mode Tx, Hopping On / Off

| Mode     | Freq.<br>[MHz] | 20dB Bandwidth<br>[MHz] | Limit for<br>20dB Bandwidth<br>[MHz] | 99% Occupied<br>Bandwidth<br>[kHz] | Carrier Frequency<br>Separation<br>[MHz] |
|----------|----------------|-------------------------|--------------------------------------|------------------------------------|------------------------------------------|
| Internal | 915.25         | 0.167                   | 0.500                                | 151.345                            | 0.250                                    |
| Internal | 921.25         | 0.167                   | 0.500                                | 152.737                            | 0.250                                    |
| Internal | 927.50         | 0.167                   | 0.500                                | 154.211                            | 0.250                                    |
| Internal | Hopping On     | -                       | -                                    | 12392.700                          | -                                        |
| External | 915.25         | 0.166                   | 0.500                                | 150.528                            | 0.250                                    |
| External | 921.25         | 0.167                   | 0.500                                | 153.310                            | 0.250                                    |
| External | 927.50         | 0.167                   | 0.500                                | 155.187                            | 0.250                                    |
| External | Hopping On     | -                       | -                                    | 12392.600                          | -                                        |

Limit for Carrier Frequency separation: 20dB Bandwidth or 25kHz (whichever is greater).

## 20dB Bandwidth and 99% Occupied Bandwidth

(Internal / External Antenna)



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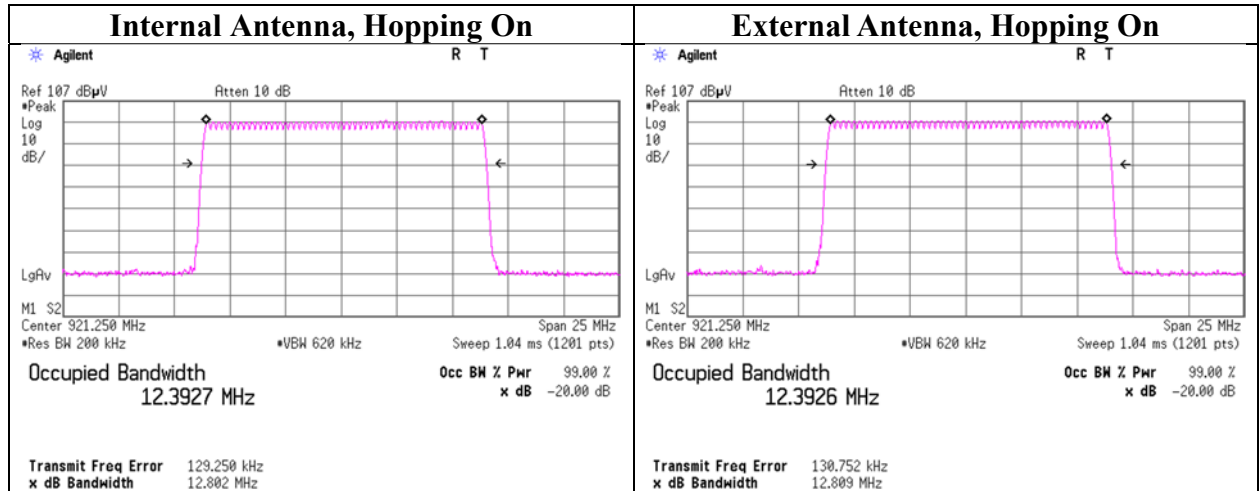
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## 20dB Bandwidth and 99% Occupied Bandwidth

(Internal / External Antenna)



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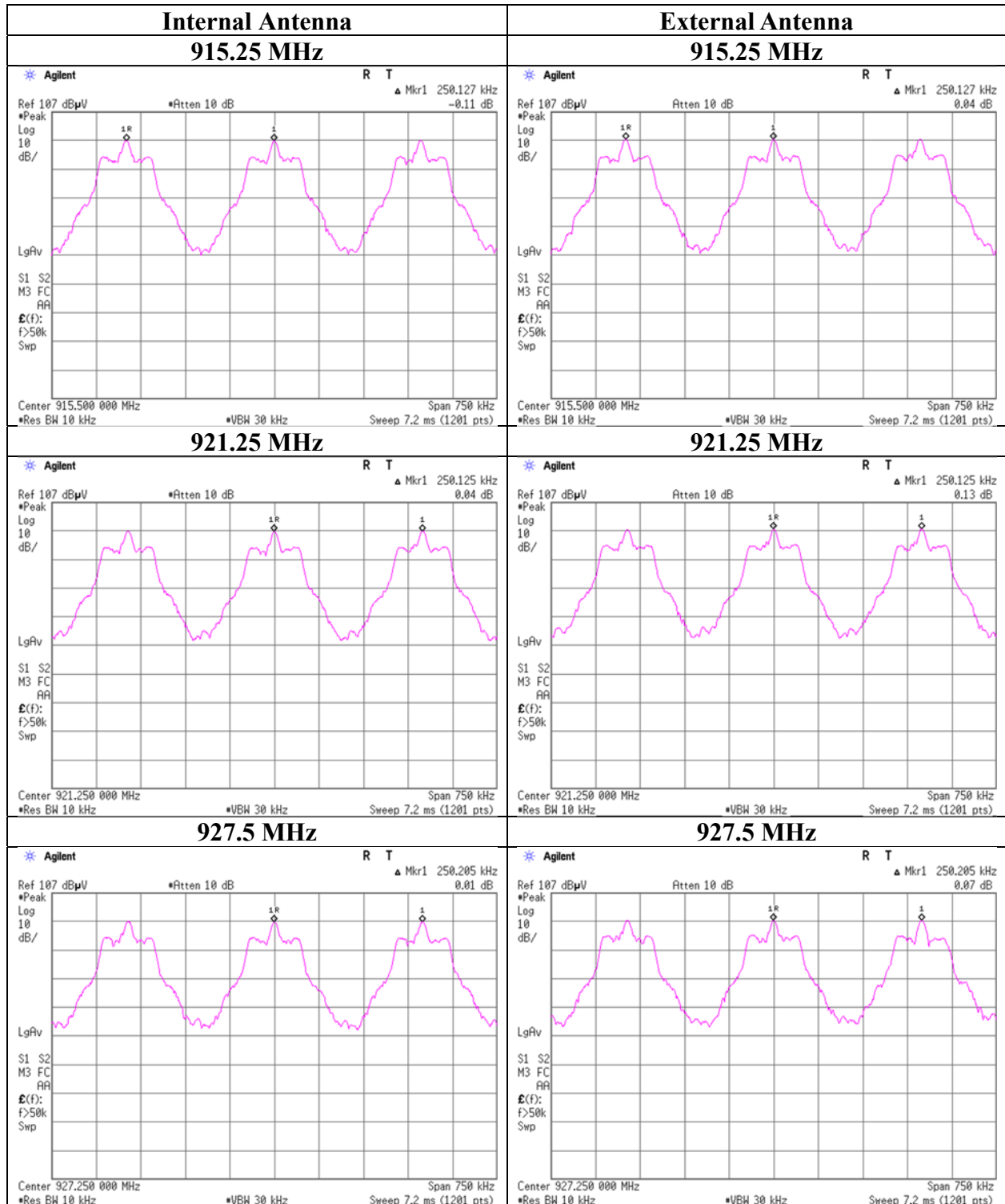
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## Carrier Frequency Separation

(Internal / External Antenna)



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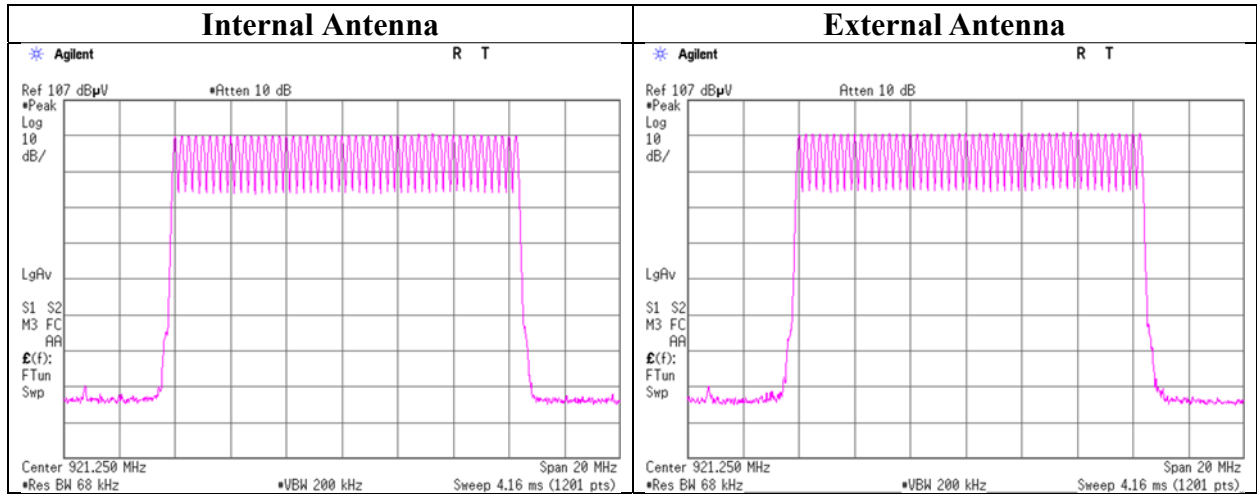
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Number of Hopping Frequency (Internal / External Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 9, 2020                       |
| Temperature / Humidity | 22 deg. C / 74 % RH                |
| Engineer               | Akihiko Maeda                      |
| Mode                   | Tx, Hopping On                     |

| Mode     | Number of channel<br>[channels] | Limit<br>[channels] |
|----------|---------------------------------|---------------------|
| Internal | 50                              | $\geq 50$           |
| External | 50                              | $\geq 50$           |



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**Dwell time**  
(Internal / External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.4 Measurement Room  
Date July 1, 2020 July 9, 2020  
Temperature / Humidity 23 deg. C / 54 % RH 22 deg. C / 74 % RH  
Engineer Junki Nagatomi Akihiko Maeda  
Mode Tx, Hopping On

**Internal Antenna**

| Mode   | Number of<br>transmission in<br>20 sec period | Length of<br>transmission<br>[msec] | Result<br>[msec] | Limit<br>[msec] |
|--------|-----------------------------------------------|-------------------------------------|------------------|-----------------|
| 915.25 | 1                                             | 399.200                             | 399.2            | 400             |
| 921.25 | 1                                             | 399.200                             | 399.2            | 400             |
| 927.50 | 1                                             | 399.200                             | 399.2            | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission

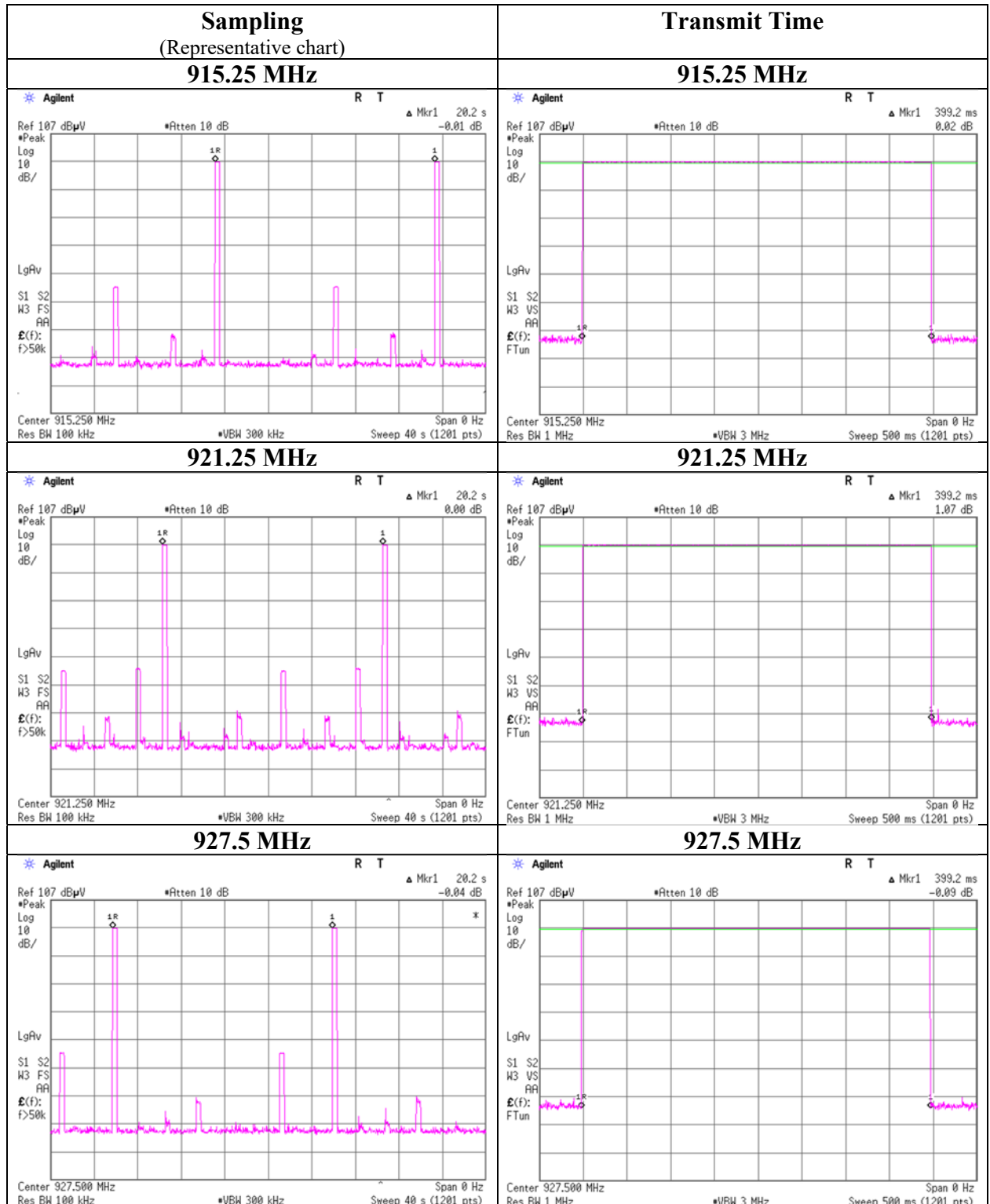
**External Antenna**

| Mode   | Number of<br>transmission in<br>20 sec period | Length of<br>transmission<br>[msec] | Result<br>[msec] | Limit<br>[msec] |
|--------|-----------------------------------------------|-------------------------------------|------------------|-----------------|
| 915.25 | 1                                             | 399.200                             | 399.2            | 400             |
| 921.25 | 1                                             | 399.600                             | 399.6            | 400             |
| 927.50 | 1                                             | 399.600                             | 399.6            | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission

**Dwell time**  
(Internal Antenna)



**UL Japan, Inc.**

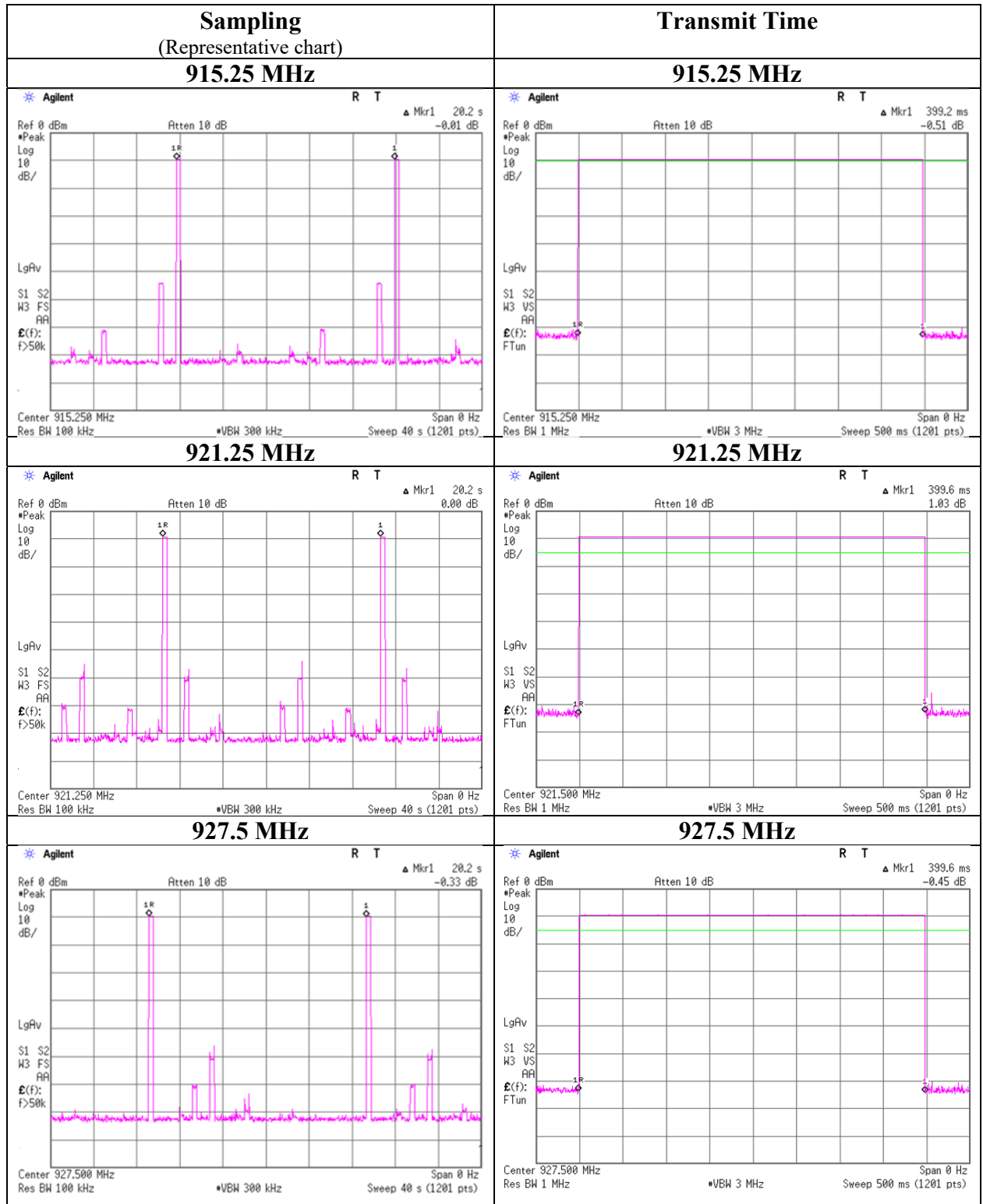
**Ise EMC Lab.**

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**Dwell time**  
(External Antenna)



**UL Japan, Inc.**

**Ise EMC Lab.**

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## Maximum Peak Output Power (Internal / External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.4 Measurement Room  
Date July 1, 2020  
Temperature / Humidity 23 deg. C / 54 % RH  
Engineer Junki Nagatomi  
Mode Tx, Hopping Off (30 dBm setting)

### Internal Antenna

|        |         |            |             | Conducted Power |        |       |      |        | e.i.r.p. for RSS-247 |        |         |       |      |        |
|--------|---------|------------|-------------|-----------------|--------|-------|------|--------|----------------------|--------|---------|-------|------|--------|
| Freq.  | Reading | Cable Loss | Atten. Loss | Result          |        | Limit |      | Margin | Antenna Gain         | Result |         | Limit |      | Margin |
| [MHz]  | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW]   | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW]    | [dBm] | [mW] | [dB]   |
| 915.25 | -10.63  | 0.54       | 39.65       | 29.56           | 903.65 | 30.00 | 1000 | 0.44   | 6.00                 | 35.56  | 3597.49 | 36.02 | 4000 | 0.46   |
| 921.25 | -10.84  | 0.54       | 39.65       | 29.35           | 860.99 | 30.00 | 1000 | 0.65   | 6.00                 | 35.35  | 3427.68 | 36.02 | 4000 | 0.67   |
| 927.50 | -10.79  | 0.55       | 39.65       | 29.41           | 872.97 | 30.00 | 1000 | 0.59   | 6.00                 | 35.41  | 3475.36 | 36.02 | 4000 | 0.61   |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

### External Antenna

|        |         |            |             | Conducted Power |        |       |      |        | e.i.r.p. for RSS-247 |        |         |       |      |        |
|--------|---------|------------|-------------|-----------------|--------|-------|------|--------|----------------------|--------|---------|-------|------|--------|
| Freq.  | Reading | Cable Loss | Atten. Loss | Result          |        | Limit |      | Margin | Antenna Gain         | Result |         | Limit |      | Margin |
| [MHz]  | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW]   | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW]    | [dBm] | [mW] | [dB]   |
| 915.25 | -10.19  | 0.36       | 39.65       | 29.82           | 959.40 | 30.00 | 1000 | 0.18   | 6.00                 | 35.82  | 3819.44 | 36.02 | 4000 | 0.20   |
| 921.25 | -10.12  | 0.36       | 39.65       | 29.89           | 974.99 | 30.00 | 1000 | 0.11   | 6.00                 | 35.89  | 3881.50 | 36.02 | 4000 | 0.13   |
| 927.50 | -10.29  | 0.37       | 39.65       | 29.73           | 939.72 | 30.00 | 1000 | 0.27   | 6.00                 | 35.73  | 3741.11 | 36.02 | 4000 | 0.29   |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

## Maximum Peak Output Power (Internal / External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.2 Measurement Room  
Date September 4, 2020  
Temperature / Humidity 25 deg. C / 63 % RH  
Engineer Ken Fujita  
Mode Tx, Hopping Off (10dBm setting)

### Internal Antenna

|        |         |            |             | Conducted Power |      |       |      |        | e.i.r.p. for RSS-247 |        |       |       |      |        |  |
|--------|---------|------------|-------------|-----------------|------|-------|------|--------|----------------------|--------|-------|-------|------|--------|--|
| Freq.  | Reading | Cable Loss | Atten. Loss | Result          |      | Limit |      | Margin | Antenna Gain         | Result |       | Limit |      | Margin |  |
| [MHz]  | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW] | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW]  | [dBm] | [mW] | [dB]   |  |
| 915.25 | -10.65  | 0.36       | 19.92       | 9.63            | 9.18 | 30.00 | 1000 | 20.37  | 6.00                 | 15.63  | 36.56 | 36.02 | 4000 | 20.39  |  |
| 921.25 | -10.42  | 0.36       | 19.92       | 9.86            | 9.68 | 30.00 | 1000 | 20.14  | 6.00                 | 15.86  | 38.55 | 36.02 | 4000 | 20.16  |  |
| 927.50 | -10.35  | 0.37       | 19.92       | 9.94            | 9.86 | 30.00 | 1000 | 20.06  | 6.00                 | 15.94  | 39.26 | 36.02 | 4000 | 20.08  |  |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

### External Antenna

|        |         |            |             | Conducted Power |      |       |      |        | e.i.r.p. for RSS-247 |        |       |       |      |        |
|--------|---------|------------|-------------|-----------------|------|-------|------|--------|----------------------|--------|-------|-------|------|--------|
| Freq.  | Reading | Cable Loss | Atten. Loss | Result          |      | Limit |      | Margin | Antenna Gain         | Result |       | Limit |      | Margin |
| [MHz]  | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW] | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW]  | [dBm] | [mW] | [dB]   |
| 915.25 | -10.87  | 0.36       | 19.92       | 9.41            | 8.73 | 30.00 | 1000 | 20.59  | 6.00                 | 15.41  | 34.75 | 36.02 | 4000 | 20.61  |
| 921.25 | -10.57  | 0.36       | 19.92       | 9.71            | 9.35 | 30.00 | 1000 | 20.29  | 6.00                 | 15.71  | 37.24 | 36.02 | 4000 | 20.31  |
| 927.50 | -10.52  | 0.37       | 19.92       | 9.77            | 9.48 | 30.00 | 1000 | 20.23  | 6.00                 | 15.77  | 37.76 | 36.02 | 4000 | 20.25  |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

**Maximum Peak Output Power**  
**(Worst Case Check)**  
**(Internal / External Antenna)**

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

**Worst Internal Antenna Polarization and Profile Check**

| Internal Antenna Polarization | Profile | Freq.<br>[MHz] | Reading<br>[dBm] | Remarks |
|-------------------------------|---------|----------------|------------------|---------|
| Circle                        | 1       | 915.25         | -10.81           |         |
|                               | 2       | 915.25         | -10.73           |         |
|                               | 4       | 915.25         | -10.69           |         |
|                               | 5       | 915.25         | -10.77           |         |
| Hori.                         | 1       | 915.25         | -10.83           |         |
|                               | 2       | 915.25         | -10.83           |         |
|                               | 4       | 915.25         | -10.67           | *worst  |
|                               | 5       | 915.25         | -10.79           |         |
| Vert.                         | 1       | 915.25         | -10.82           |         |
|                               | 2       | 915.25         | -10.77           |         |
|                               | 4       | 915.25         | -10.79           |         |
|                               | 5       | 915.25         | -10.77           |         |

**Worst External Antenna and Profile Check**

| External Antenna | Profile | Freq.<br>[MHz] | Reading<br>[dBm] | Remarks |
|------------------|---------|----------------|------------------|---------|
| 1                | 1       | 915.25         | -10.55           |         |
|                  | 2       | 915.25         | -10.30           |         |
|                  | 4       | 915.25         | -10.31           |         |
|                  | 5       | 915.25         | -10.28           |         |
| 2                | 1       | 915.25         | -10.29           |         |
|                  | 2       | 915.25         | -10.30           |         |
|                  | 4       | 915.25         | -10.19           | *worst  |
|                  | 5       | 915.25         | -10.22           |         |
| 3                | 1       | 915.25         | -10.37           |         |
|                  | 2       | 915.25         | -10.35           |         |
|                  | 4       | 915.25         | -10.33           |         |
|                  | 5       | 915.25         | -10.31           |         |

**Average Output Power**  
**(Reference data for RF Exposure)**  
(Internal / External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.4 Measurement Room  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 74 % RH  
Engineer Akihiko Maeda  
Mode Tx, Hopping Off (30 dBm setting)

| Mode     | Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |        | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |        |
|----------|----------------|------------------|-----------------------|------------------------|--------------------------|--------|------------------------|---------------------------------|--------|
|          |                |                  |                       |                        | [dBm]                    | [mW]   |                        | [dBm]                           | [mW]   |
| Internal | 915.25         | -12.78           | 0.54                  | 39.65                  | 27.41                    | 550.81 | 0.00                   | 27.41                           | 550.81 |
| Internal | 921.25         | -12.67           | 0.54                  | 39.65                  | 27.52                    | 564.94 | 0.00                   | 27.52                           | 564.94 |
| Internal | 927.50         | -12.68           | 0.55                  | 39.65                  | 27.52                    | 564.94 | 0.00                   | 27.52                           | 564.94 |
| External | 915.25         | -12.64           | 0.54                  | 39.65                  | 27.55                    | 568.85 | 0.00                   | 27.55                           | 568.85 |
| External | 921.25         | -12.28           | 0.54                  | 39.65                  | 27.91                    | 618.02 | 0.00                   | 27.91                           | 618.02 |
| External | 927.50         | -12.30           | 0.55                  | 39.65                  | 27.90                    | 616.60 | 0.00                   | 27.90                           | 616.60 |

Sample Calculation:

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

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

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

**Average Output Power**  
**(Reference data for RF Exposure)**  
(Internal / External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.2 Measurement Room  
Date September 4, 2020  
Temperature / Humidity 25 deg. C / 63 % RH  
Engineer Ken Fujita  
Mode Tx, Hopping Off (10 dBm setting)

| Mode     | Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|          |                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| Internal | 915.25         | -13.33           | 0.36                  | 19.92                  | 6.95                     | 4.95 | 0.00                   | 6.95                            | 4.95 |
| Internal | 921.25         | -13.06           | 0.36                  | 19.92                  | 7.22                     | 5.27 | 0.00                   | 7.22                            | 5.27 |
| Internal | 927.50         | -13.02           | 0.37                  | 19.92                  | 7.27                     | 5.33 | 0.00                   | 7.27                            | 5.33 |
| External | 915.25         | -13.54           | 0.36                  | 19.92                  | 6.74                     | 4.72 | 0.00                   | 6.74                            | 4.72 |
| External | 921.25         | -13.22           | 0.36                  | 19.92                  | 7.06                     | 5.08 | 0.00                   | 7.06                            | 5.08 |
| External | 927.50         | -13.21           | 0.37                  | 19.92                  | 7.08                     | 5.11 | 0.00                   | 7.08                            | 5.11 |

Sample Calculation:

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

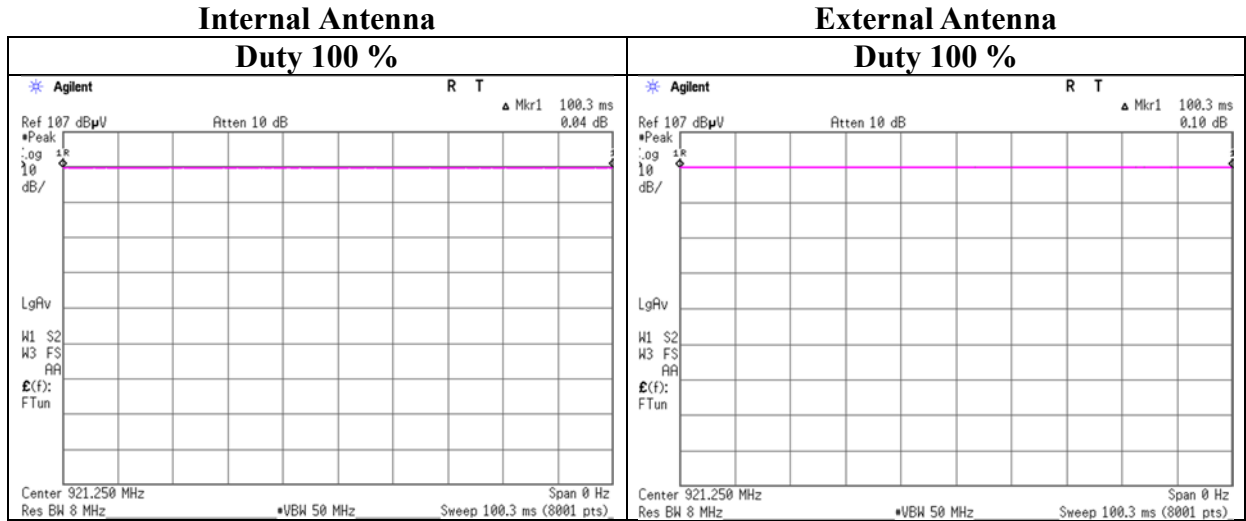
Result (Burst power average) = Time average + Duty factor

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

## Burst Rate Confirmation

(Internal / External Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 9, 2020                       |
| Temperature / Humidity | 22 deg. C / 74 % RH                |
| Engineer               | Akihiko Maeda                      |
| Mode                   | Tx, Hopping Off                    |



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

## Radiated Spurious Emission (Internal Antenna)

|                        |                              |                     |
|------------------------|------------------------------|---------------------|
| Report No.             | 13407533H                    |                     |
| Test place             | Ise EMC Lab.                 |                     |
| Semi Anechoic Chamber  | No.4                         | No.3                |
| Date                   | July 2, 2020                 | July 4, 2020        |
| Temperature / Humidity | 23 deg. C / 53 % RH          | 22 deg. C / 51 % RH |
| Engineer               | Junki Nagatomi               | Ken Fujita          |
|                        | (Below 1 GHz)                | (Above 1 GHz)       |
| Mode                   | Tx, Hopping Off , 915.25 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.    | 57.052             | QP       | 30.3              | 8.7                | 7.8          | 32.0         | -                   | 14.8               | 40.0              | 25.2           |             |
| Hori.    | 79.950             | QP       | 31.9              | 6.9                | 8.1          | 32.0         | -                   | 14.9               | 40.0              | 25.1           |             |
| Hori.    | 117.000            | QP       | 26.5              | 12.5               | 8.5          | 31.9         | -                   | 15.7               | 43.5              | 27.8           |             |
| Hori.    | 161.000            | QP       | 25.8              | 15.5               | 9.0          | 31.9         | -                   | 18.4               | 43.5              | 25.1           |             |
| Hori.    | 412.256            | QP       | 24.9              | 16.0               | 11.0         | 31.8         | -                   | 20.1               | 46.0              | 25.9           |             |
| Hori.    | 649.012            | QP       | 22.4              | 19.2               | 12.5         | 32.0         | -                   | 22.1               | 46.0              | 24.0           |             |
| Hori.    | 1830.500           | PK       | 54.2              | 25.3               | 3.0          | 32.5         | -                   | 50.0               | 73.9              | 23.9           |             |
| Hori.    | 2745.750           | PK       | 50.2              | 28.5               | 3.2          | 31.7         | -                   | 50.3               | 73.9              | 23.6           |             |
| Hori.    | 3661.000           | PK       | 47.4              | 29.1               | 3.6          | 31.5         | -                   | 48.7               | 73.9              | 25.2           |             |
| Hori.    | 4576.250           | PK       | 40.2              | 30.9               | 4.0          | 31.3         | -                   | 43.9               | 73.9              | 30.0           | Floor noise |
| Hori.    | 5491.500           | PK       | 40.2              | 32.2               | 4.5          | 31.3         | -                   | 45.6               | 73.9              | 28.3           | Floor noise |
| Hori.    | 6406.750           | PK       | 41.0              | 34.2               | 4.8          | 31.8         | -                   | 48.2               | 73.9              | 25.7           | Floor noise |
| Hori.    | 7322.000           | PK       | 40.3              | 36.6               | 4.9          | 32.5         | -                   | 49.4               | 73.9              | 24.5           | Floor noise |
| Hori.    | 8237.250           | PK       | 40.1              | 36.6               | 5.3          | 32.8         | -                   | 49.2               | 73.9              | 24.7           | Floor noise |
| Hori.    | 9152.500           | PK       | 41.1              | 37.5               | 5.7          | 32.6         | -                   | 51.8               | 73.9              | 22.1           | Floor noise |
| Hori.    | 1830.500           | AV       | 50.0              | 25.3               | 3.0          | 32.5         | -                   | 45.8               | 53.9              | 8.1            |             |
| Hori.    | 2745.750           | AV       | 44.0              | 28.5               | 3.2          | 31.7         | -                   | 44.0               | 53.9              | 9.9            |             |
| Hori.    | 3661.000           | AV       | 41.2              | 29.1               | 3.6          | 31.5         | -                   | 42.5               | 53.9              | 11.4           |             |
| Hori.    | 4576.250           | AV       | 32.3              | 30.9               | 4.0          | 31.3         | -                   | 35.9               | 53.9              | 18.0           | Floor noise |
| Hori.    | 5491.500           | AV       | 32.2              | 32.2               | 4.5          | 31.3         | -                   | 37.5               | 53.9              | 16.4           | Floor noise |
| Hori.    | 6406.750           | AV       | 32.2              | 34.2               | 4.8          | 31.8         | -                   | 39.4               | 53.9              | 14.5           | Floor noise |
| Hori.    | 7322.000           | AV       | 32.2              | 36.6               | 4.9          | 32.5         | -                   | 41.3               | 53.9              | 12.6           | Floor noise |
| Hori.    | 8237.250           | AV       | 32.0              | 36.6               | 5.3          | 32.8         | -                   | 41.1               | 53.9              | 12.8           | Floor noise |
| Hori.    | 9152.500           | AV       | 32.1              | 37.5               | 5.7          | 32.6         | -                   | 42.8               | 53.9              | 11.1           | Floor noise |
| Vert.    | 55.730             | QP       | 38.4              | 9.1                | 7.7          | 32.0         | -                   | 23.3               | 40.0              | 16.7           |             |
| Vert.    | 79.340             | QP       | 35.8              | 6.8                | 8.1          | 32.0         | -                   | 18.7               | 40.0              | 21.3           |             |
| Vert.    | 116.000            | QP       | 36.7              | 12.5               | 8.5          | 31.9         | -                   | 25.8               | 43.5              | 17.7           |             |
| Vert.    | 159.646            | QP       | 33.1              | 15.4               | 9.0          | 31.9         | -                   | 25.6               | 43.5              | 17.9           |             |
| Vert.    | 412.256            | QP       | 23.8              | 16.0               | 11.0         | 31.8         | -                   | 19.0               | 46.0              | 27.0           |             |
| Vert.    | 649.835            | QP       | 22.2              | 19.2               | 12.5         | 32.0         | -                   | 21.8               | 46.0              | 24.2           |             |
| Vert.    | 1830.500           | PK       | 55.9              | 25.3               | 3.0          | 32.5         | -                   | 51.8               | 73.9              | 22.1           |             |
| Vert.    | 2745.750           | PK       | 50.2              | 28.5               | 3.2          | 31.7         | -                   | 50.2               | 73.9              | 23.7           |             |
| Vert.    | 3661.000           | PK       | 44.1              | 29.1               | 3.6          | 31.5         | -                   | 45.4               | 73.9              | 28.5           |             |
| Vert.    | 4576.250           | PK       | 40.5              | 30.9               | 4.0          | 31.3         | -                   | 44.2               | 73.9              | 29.7           | Floor noise |
| Vert.    | 5491.500           | PK       | 41.6              | 32.2               | 4.5          | 31.3         | -                   | 47.0               | 73.9              | 26.9           |             |
| Vert.    | 6406.750           | PK       | 40.1              | 34.2               | 4.8          | 31.8         | -                   | 47.3               | 73.9              | 26.6           | Floor noise |
| Vert.    | 7322.000           | PK       | 40.2              | 36.6               | 4.9          | 32.5         | -                   | 49.3               | 73.9              | 24.6           | Floor noise |
| Vert.    | 8237.250           | PK       | 40.2              | 36.6               | 5.3          | 32.8         | -                   | 49.3               | 73.9              | 24.6           | Floor noise |
| Vert.    | 9152.500           | PK       | 41.1              | 37.5               | 5.7          | 32.6         | -                   | 51.8               | 73.9              | 22.1           | Floor noise |
| Vert.    | 1830.500           | AV       | 51.8              | 25.3               | 3.0          | 32.5         | -                   | 47.7               | 53.9              | 6.2            |             |
| Vert.    | 2745.750           | AV       | 43.8              | 28.5               | 3.2          | 31.7         | -                   | 43.9               | 53.9              | 10.1           |             |
| Vert.    | 3661.000           | AV       | 36.1              | 29.1               | 3.6          | 31.5         | -                   | 37.4               | 53.9              | 16.5           |             |
| Vert.    | 4576.250           | AV       | 33.3              | 30.9               | 4.0          | 31.3         | -                   | 36.9               | 53.9              | 17.0           | Floor noise |
| Vert.    | 5491.500           | AV       | 35.2              | 32.2               | 4.5          | 31.3         | -                   | 40.6               | 53.9              | 13.3           |             |
| Vert.    | 6406.750           | AV       | 33.3              | 34.2               | 4.8          | 31.8         | -                   | 40.5               | 53.9              | 13.4           | Floor noise |
| Vert.    | 7322.000           | AV       | 34.1              | 36.6               | 4.9          | 32.5         | -                   | 43.2               | 53.9              | 10.7           | Floor noise |
| Vert.    | 8237.250           | AV       | 32.3              | 36.6               | 5.3          | 32.8         | -                   | 41.4               | 53.9              | 12.5           | Floor noise |
| Vert.    | 9152.500           | AV       | 33.0              | 37.5               | 5.7          | 32.6         | -                   | 43.7               | 53.9              | 10.2           | 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

**\*These results have sufficient margin without taking account Duty cycle correction factor.**

### 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.    | 915.250            | PK       | 94.7              | 22.0                    | 12.9         | 0.0          | 129.7              | -                 | -              | Carrier |
| Hori.    | 902.000            | PK       | 36.4              | 22.0                    | 12.9         | 0.0          | 71.3               | 109.7             | 38.4           |         |
| Vert.    | 915.250            | PK       | 96.5              | 22.0                    | 12.9         | 0.0          | 131.4              | -                 | -              | Carrier |
| Vert.    | 902.000            | PK       | 33.7              | 22.0                    | 12.9         | 0.0          | 68.7               | 111.4             | 42.8           |         |

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

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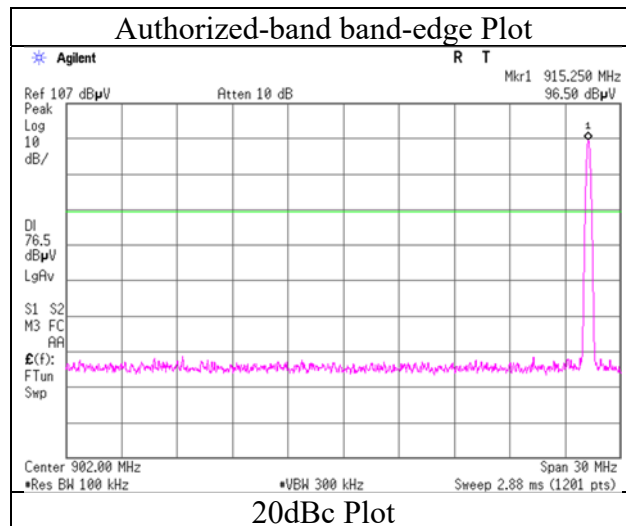
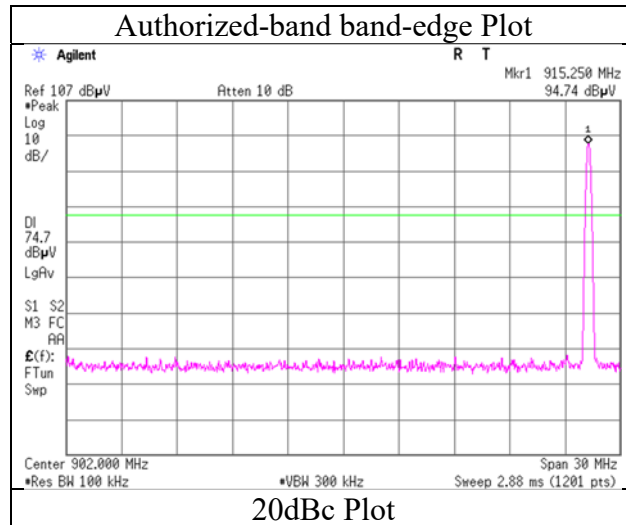
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## Radiated Spurious Emission (Reference Plot for band-edge) (Internal Antenna)

|                        |                                 |                             |
|------------------------|---------------------------------|-----------------------------|
| Report No.             | 13407533H                       |                             |
| Test place             | Ise EMC Lab.                    |                             |
| Semi Anechoic Chamber  | No.4                            | No.3                        |
| Date                   | July 2, 2020                    | July 4, 2020                |
| Temperature / Humidity | 23 deg. C / 53 % RH             | 22 deg. C / 51 % RH         |
| Engineer               | Junki Nagatomi<br>(Below 1 GHz) | Ken Fujita<br>(Above 1 GHz) |
| Mode                   | Tx, Hopping Off, 915.25 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 (Internal Antenna)

Report No. 13407533H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.3  
Date July 2, 2020 July 4, 2020  
Temperature / Humidity 23 deg. C / 53 % RH 22 deg. C / 51 % RH  
Engineer Junki Nagatomi Ken Fujita  
(Below 1 GHz) (Above 1 GHz)  
Mode Tx, Hopping Off , 921.25 MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|-----------------|----------------|-------------|-------------|
| Hori.    | 55.369          | QP       | 28.5           | 9.2             | 7.7       | 32.0      | -                | 13.5            | 40.0           | 26.5        |             |
| Hori.    | 79.206          | QP       | 30.2           | 6.8             | 8.1       | 32.0      | -                | 13.1            | 40.0           | 26.9        |             |
| Hori.    | 152.781         | QP       | 28.1           | 15.2            | 8.9       | 31.9      | -                | 20.3            | 43.5           | 23.2        |             |
| Hori.    | 353.542         | QP       | 27.3           | 15.1            | 10.6      | 31.8      | -                | 21.2            | 46.0           | 24.8        |             |
| Hori.    | 414.456         | QP       | 25.3           | 16.0            | 11.1      | 31.8      | -                | 20.6            | 46.0           | 25.4        |             |
| Hori.    | 649.460         | QP       | 22.4           | 19.2            | 12.5      | 32.0      | -                | 22.1            | 46.0           | 24.0        |             |
| Hori.    | 1842.500        | PK       | 58.9           | 25.3            | 3.0       | 32.5      | -                | 54.8            | 73.9           | 19.1        |             |
| Hori.    | 2763.750        | PK       | 52.7           | 28.6            | 3.3       | 31.7      | -                | 52.8            | 73.9           | 21.1        |             |
| Hori.    | 3685.000        | PK       | 50.9           | 29.2            | 3.6       | 31.5      | -                | 52.2            | 73.9           | 21.7        |             |
| Hori.    | 4606.250        | PK       | 40.2           | 31.0            | 4.0       | 31.3      | -                | 44.0            | 73.9           | 29.9        | Floor noise |
| Hori.    | 5527.500        | PK       | 47.4           | 32.2            | 4.5       | 31.4      | -                | 52.8            | 73.9           | 21.1        |             |
| Hori.    | 6448.750        | PK       | 40.2           | 34.3            | 4.8       | 31.8      | -                | 47.6            | 73.9           | 26.3        | Floor noise |
| Hori.    | 7370.000        | PK       | 40.3           | 36.7            | 5.0       | 32.5      | -                | 49.5            | 73.9           | 24.5        | Floor noise |
| Hori.    | 8291.250        | PK       | 40.1           | 36.5            | 5.3       | 32.8      | -                | 49.1            | 73.9           | 24.8        | Floor noise |
| Hori.    | 9212.500        | PK       | 41.2           | 37.8            | 5.7       | 32.6      | -                | 52.2            | 73.9           | 21.7        | Floor noise |
| Hori.    | 1842.500        | AV       | 55.6           | 25.3            | 3.0       | 32.5      | -                | 51.5            | 53.9           | 2.4         |             |
| Hori.    | 2763.750        | AV       | 47.1           | 28.6            | 3.3       | 31.7      | -                | 47.2            | 53.9           | 6.7         |             |
| Hori.    | 3685.000        | AV       | 44.7           | 29.2            | 3.6       | 31.5      | -                | 46.0            | 53.9           | 7.9         |             |
| Hori.    | 4606.250        | AV       | 33.1           | 31.0            | 4.0       | 31.3      | -                | 36.9            | 53.9           | 17.0        | Floor noise |
| Hori.    | 5527.500        | AV       | 40.5           | 32.2            | 4.5       | 31.4      | -                | 45.9            | 53.9           | 8.0         |             |
| Hori.    | 6448.750        | AV       | 32.4           | 34.3            | 4.8       | 31.8      | -                | 39.7            | 53.9           | 14.2        | Floor noise |
| Hori.    | 7370.000        | AV       | 33.2           | 36.7            | 5.0       | 32.5      | -                | 42.4            | 53.9           | 11.5        | Floor noise |
| Hori.    | 8291.250        | AV       | 33.3           | 36.5            | 5.3       | 32.8      | -                | 42.2            | 53.9           | 11.7        | Floor noise |
| Hori.    | 9212.500        | AV       | 32.3           | 37.8            | 5.7       | 32.6      | -                | 43.2            | 53.9           | 10.7        | Floor noise |
| Vert.    | 53.480          | QP       | 35.4           | 9.9             | 7.7       | 32.0      | -                | 21.0            | 40.0           | 19.0        |             |
| Vert.    | 79.750          | QP       | 36.3           | 6.8             | 8.1       | 32.0      | -                | 19.3            | 40.0           | 20.7        |             |
| Vert.    | 153.657         | QP       | 29.5           | 15.2            | 8.9       | 31.9      | -                | 21.7            | 43.5           | 21.8        |             |
| Vert.    | 353.224         | QP       | 24.9           | 15.1            | 10.6      | 31.8      | -                | 18.8            | 46.0           | 27.2        |             |
| Vert.    | 412.246         | QP       | 24.0           | 16.0            | 11.0      | 31.8      | -                | 19.2            | 46.0           | 26.8        |             |
| Vert.    | 649.030         | QP       | 22.3           | 19.2            | 12.5      | 32.0      | -                | 22.0            | 46.0           | 24.1        |             |
| Vert.    | 1842.500        | PK       | 56.4           | 25.3            | 3.0       | 32.5      | -                | 52.2            | 73.9           | 21.7        |             |
| Vert.    | 2763.750        | PK       | 58.0           | 28.6            | 3.3       | 31.7      | -                | 58.1            | 73.9           | 15.8        |             |
| Vert.    | 3685.000        | PK       | 49.3           | 29.2            | 3.6       | 31.5      | -                | 50.7            | 73.9           | 23.3        |             |
| Vert.    | 4606.250        | PK       | 42.2           | 31.0            | 4.0       | 31.3      | -                | 46.0            | 73.9           | 27.9        | Floor noise |
| Vert.    | 5527.500        | PK       | 46.5           | 32.2            | 4.5       | 31.4      | -                | 51.9            | 73.9           | 22.0        |             |
| Vert.    | 6448.750        | PK       | 41.1           | 34.3            | 4.8       | 31.8      | -                | 48.5            | 73.9           | 25.5        | Floor noise |
| Vert.    | 7417.778        | PK       | 42.1           | 36.7            | 5.0       | 32.5      | -                | 51.3            | 73.9           | 22.6        | Floor noise |
| Vert.    | 8291.250        | PK       | 41.3           | 36.5            | 5.3       | 32.8      | -                | 50.2            | 73.9           | 23.7        | Floor noise |
| Vert.    | 9212.500        | PK       | 41.3           | 37.8            | 5.7       | 32.6      | -                | 52.3            | 73.9           | 21.6        | Floor noise |
| Vert.    | 1842.500        | AV       | 52.4           | 25.3            | 3.0       | 32.5      | -                | 48.3            | 53.9           | 5.6         |             |
| Vert.    | 2763.750        | AV       | 52.7           | 28.6            | 3.3       | 31.7      | -                | 52.7            | 53.9           | 1.2         |             |
| Vert.    | 3685.000        | AV       | 42.6           | 29.2            | 3.6       | 31.5      | -                | 43.9            | 53.9           | 10.0        |             |
| Vert.    | 4606.250        | AV       | 32.3           | 31.0            | 4.0       | 31.3      | -                | 36.1            | 53.9           | 17.8        | Floor noise |
| Vert.    | 5527.500        | AV       | 41.1           | 32.2            | 4.5       | 31.4      | -                | 46.5            | 53.9           | 7.4         |             |
| Vert.    | 6448.750        | AV       | 32.1           | 34.3            | 4.8       | 31.8      | -                | 39.4            | 53.9           | 14.5        | Floor noise |
| Vert.    | 7417.778        | AV       | 31.9           | 36.7            | 5.0       | 32.5      | -                | 41.1            | 53.9           | 12.9        | Floor noise |
| Vert.    | 8291.250        | AV       | 32.2           | 36.5            | 5.3       | 32.8      | -                | 41.2            | 53.9           | 12.7        | Floor noise |
| Vert.    | 9212.500        | AV       | 32.0           | 37.8            | 5.7       | 32.6      | -                | 42.9            | 53.9           | 11.0        | 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  $20 \log (3.85 \text{ m} / 3.0 \text{ m}) = 2.17 \text{ dB}$

**\*These results have sufficient margin without taking account Duty cycle correction factor.**

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## Radiated Spurious Emission (Internal Antenna)

Report No. 13407533H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.3  
Date July 2, 2020 July 4, 2020  
Temperature / Humidity 23 deg. C / 53 % RH 22 deg. C / 51 % RH  
Engineer Junki Nagatomi Ken Fujita  
(Below 1 GHz) (Above 1 GHz)  
Mode Tx, Hopping Off, 927.5 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.    | 53.654             | QP       | 28.1              | 9.9                | 7.7          | 32.0         | -                   | 13.7               | 40.0              | 26.3           |             |
| Hori.    | 108.243            | QP       | 29.5              | 11.4               | 8.4          | 31.9         | -                   | 17.4               | 43.5              | 26.1           |             |
| Hori.    | 169.313            | QP       | 26.8              | 15.7               | 9.1          | 31.9         | -                   | 19.7               | 43.5              | 23.8           |             |
| Hori.    | 353.350            | QP       | 25.0              | 15.1               | 10.6         | 31.8         | -                   | 18.9               | 46.0              | 27.1           |             |
| Hori.    | 412.766            | QP       | 24.3              | 16.0               | 11.1         | 31.8         | -                   | 19.6               | 46.0              | 26.5           |             |
| Hori.    | 649.465            | QP       | 22.6              | 19.2               | 12.5         | 32.0         | -                   | 22.3               | 46.0              | 23.8           |             |
| Hori.    | 1855.000           | PK       | 54.7              | 25.4               | 3.0          | 32.4         | -                   | 50.7               | 73.9              | 23.2           |             |
| Hori.    | 2782.500           | PK       | 58.6              | 28.5               | 3.3          | 31.7         | -                   | 58.6               | 73.9              | 15.3           |             |
| Hori.    | 3710.000           | PK       | 54.6              | 29.3               | 3.6          | 31.5         | -                   | 56.0               | 73.9              | 17.9           |             |
| Hori.    | 4637.500           | PK       | 46.5              | 31.1               | 4.1          | 31.3         | -                   | 50.4               | 73.9              | 23.5           |             |
| Hori.    | 5565.000           | PK       | 50.5              | 32.2               | 4.5          | 31.4         | -                   | 55.8               | 73.9              | 18.1           |             |
| Hori.    | 6463.130           | PK       | 45.1              | 34.4               | 4.8          | 31.8         | -                   | 52.5               | 73.9              | 21.4           |             |
| Hori.    | 7420.000           | PK       | 40.2              | 36.7               | 5.0          | 32.5         | -                   | 49.4               | 73.9              | 24.5           | Floor noise |
| Hori.    | 8347.500           | PK       | 40.1              | 36.4               | 5.3          | 32.7         | -                   | 49.1               | 73.9              | 24.8           | Floor noise |
| Hori.    | 9275.000           | PK       | 41.1              | 38.0               | 5.7          | 32.6         | -                   | 52.2               | 73.9              | 21.7           | Floor noise |
| Hori.    | 1855.000           | AV       | 52.2              | 25.4               | 3.0          | 32.4         | -                   | 48.1               | 53.9              | 5.8            |             |
| Hori.    | 2782.500           | AV       | 53.6              | 28.5               | 3.3          | 31.7         | -                   | 53.6               | 53.9              | 0.3            |             |
| Hori.    | 3710.000           | AV       | 48.9              | 29.3               | 3.6          | 31.5         | -                   | 50.3               | 53.9              | 3.6            |             |
| Hori.    | 4637.500           | AV       | 39.3              | 31.1               | 4.1          | 31.3         | -                   | 43.2               | 53.9              | 10.7           |             |
| Hori.    | 5565.000           | AV       | 44.2              | 32.2               | 4.5          | 31.4         | -                   | 49.6               | 53.9              | 4.3            |             |
| Hori.    | 6463.130           | AV       | 37.2              | 34.4               | 4.8          | 31.8         | -                   | 44.6               | 53.9              | 9.3            |             |
| Hori.    | 7420.000           | AV       | 34.1              | 36.7               | 5.0          | 32.5         | -                   | 43.3               | 53.9              | 10.6           | Floor noise |
| Hori.    | 8347.500           | AV       | 33.3              | 36.4               | 5.3          | 32.7         | -                   | 42.3               | 53.9              | 11.6           | Floor noise |
| Hori.    | 9275.000           | AV       | 32.3              | 38.0               | 5.7          | 32.6         | -                   | 43.5               | 53.9              | 10.5           | Floor noise |
| Vert.    | 79.297             | QP       | 37.0              | 6.8                | 8.1          | 32.0         | -                   | 19.9               | 40.0              | 20.1           |             |
| Vert.    | 116.748            | QP       | 34.8              | 12.5               | 8.5          | 31.9         | -                   | 23.9               | 43.5              | 19.6           |             |
| Vert.    | 154.357            | QP       | 29.5              | 15.2               | 8.9          | 31.9         | -                   | 21.8               | 43.5              | 21.7           |             |
| Vert.    | 350.353            | QP       | 26.2              | 15.0               | 10.6         | 31.8         | -                   | 20.1               | 46.0              | 26.0           |             |
| Vert.    | 412.542            | QP       | 25.5              | 16.0               | 11.1         | 31.8         | -                   | 20.8               | 46.0              | 25.3           |             |
| Vert.    | 649.433            | QP       | 23.4              | 19.2               | 12.5         | 32.0         | -                   | 23.1               | 46.0              | 23.0           |             |
| Vert.    | 1855.000           | PK       | 55.5              | 25.4               | 3.0          | 32.4         | -                   | 51.4               | 73.9              | 22.5           |             |
| Vert.    | 2782.500           | PK       | 57.8              | 28.5               | 3.3          | 31.7         | -                   | 57.8               | 73.9              | 16.1           |             |
| Vert.    | 3710.000           | PK       | 53.0              | 29.3               | 3.6          | 31.5         | -                   | 54.5               | 73.9              | 19.4           |             |
| Vert.    | 4637.500           | PK       | 45.1              | 31.1               | 4.1          | 31.3         | -                   | 49.0               | 73.9              | 24.9           |             |
| Vert.    | 5565.000           | PK       | 49.7              | 32.2               | 4.5          | 31.4         | -                   | 55.0               | 73.9              | 18.9           |             |
| Vert.    | 6463.130           | PK       | 43.0              | 34.4               | 4.8          | 31.8         | -                   | 50.4               | 73.9              | 23.5           |             |
| Vert.    | 7420.000           | PK       | 40.2              | 36.7               | 5.0          | 32.5         | -                   | 49.4               | 73.9              | 24.5           | Floor noise |
| Vert.    | 8347.500           | PK       | 41.1              | 36.4               | 5.3          | 32.7         | -                   | 50.1               | 73.9              | 23.8           | Floor noise |
| Vert.    | 9275.000           | PK       | 41.3              | 38.0               | 5.7          | 32.6         | -                   | 52.5               | 73.9              | 21.4           | Floor noise |
| Vert.    | 1855.000           | AV       | 52.3              | 25.4               | 3.0          | 32.4         | -                   | 48.2               | 53.9              | 5.7            |             |
| Vert.    | 2782.500           | AV       | 52.7              | 28.5               | 3.3          | 31.7         | -                   | 52.8               | 53.9              | 1.1            |             |
| Vert.    | 3710.000           | AV       | 45.5              | 29.3               | 3.6          | 31.5         | -                   | 47.0               | 53.9              | 6.9            |             |
| Vert.    | 4637.500           | AV       | 35.4              | 31.1               | 4.1          | 31.3         | -                   | 39.3               | 53.9              | 14.6           |             |
| Vert.    | 5565.000           | AV       | 43.7              | 32.2               | 4.5          | 31.4         | -                   | 49.1               | 53.9              | 4.9            |             |
| Vert.    | 6463.130           | AV       | 36.3              | 34.4               | 4.8          | 31.8         | -                   | 43.7               | 53.9              | 10.2           |             |
| Vert.    | 7420.000           | AV       | 32.3              | 36.7               | 5.0          | 32.5         | -                   | 41.5               | 53.9              | 12.4           | Floor noise |
| Vert.    | 8347.500           | AV       | 33.3              | 36.4               | 5.3          | 32.7         | -                   | 42.3               | 53.9              | 11.6           | Floor noise |
| Vert.    | 9275.000           | AV       | 32.3              | 38.0               | 5.7          | 32.6         | -                   | 43.4               | 53.9              | 10.5           | 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

**\*These results have sufficient margin without taking account Duty cycle correction factor.**

### 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.    | 927.500            | PK       | 99.3              | 21.8                    | 13.0         | 0.0          | 134.1              | -                 | -              | Carrier |
| Hori.    | 928.000            | PK       | 32.4              | 21.8                    | 13.0         | 0.0          | 67.2               | 114.1             | 46.9           |         |
| Vert.    | 927.500            | PK       | 97.4              | 21.8                    | 13.0         | 0.0          | 132.2              | -                 | -              | Carrier |
| Vert.    | 928.000            | PK       | 33.9              | 21.8                    | 13.0         | 0.0          | 68.7               | 112.2             | 43.5           |         |

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

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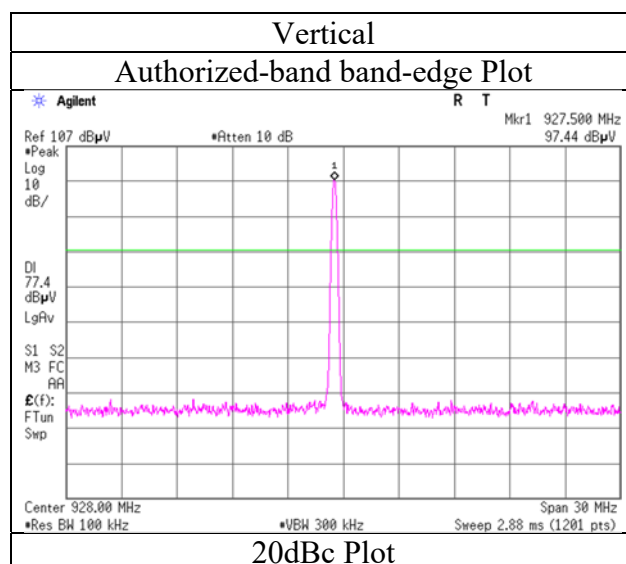
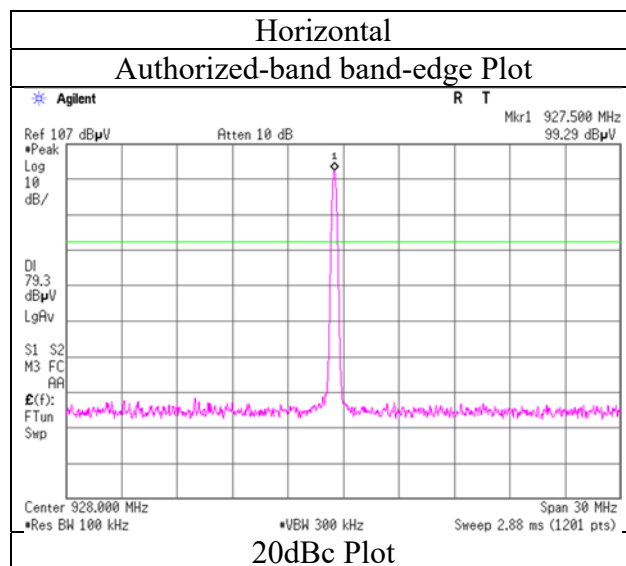
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## Radiated Spurious Emission (Reference Plot for band-edge) (Internal Antenna)

|                        |                                 |
|------------------------|---------------------------------|
| Report No.             | 13407533H                       |
| Test place             | Ise EMC Lab.                    |
| Semi Anechoic Chamber  | No.4                            |
| Date                   | July 2, 2020                    |
| Temperature / Humidity | 23 deg. C / 53 % RH             |
| Engineer               | Junki Nagatomi<br>(Below 1 GHz) |
| Mode                   | Tx, Hopping Off , 927.5 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 (External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.3  
Date July 3, 2020 July 4, 2020  
Temperature / Humidity 23 deg. C / 53 % RH 22 deg. C / 51 % RH  
Engineer Ken Fujita Ken Fujita  
(Below 1 GHz) (Above 1 GHz)  
Mode Tx, Hopping Off, 915.25 MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|-----------------|----------------|-------------|-------------|
| Hori.    | 55.417          | QP       | 26.6           | 9.2             | 7.7       | 32.0      | -                | 11.6            | 40.0           | 28.4        |             |
| Hori.    | 79.369          | QP       | 32.4           | 6.8             | 8.1       | 32.0      | -                | 15.3            | 40.0           | 24.7        |             |
| Hori.    | 116.100         | QP       | 26.8           | 12.5            | 8.5       | 31.9      | -                | 15.9            | 43.5           | 27.6        |             |
| Hori.    | 154.066         | QP       | 25.7           | 15.2            | 8.9       | 31.9      | -                | 18.0            | 43.5           | 25.5        |             |
| Hori.    | 412.348         | QP       | 25.8           | 16.0            | 11.0      | 31.8      | -                | 21.0            | 46.0           | 25.0        |             |
| Hori.    | 649.932         | QP       | 22.2           | 19.2            | 12.5      | 32.0      | -                | 21.8            | 46.0           | 24.2        |             |
| Hori.    | 1830.500        | PK       | 54.6           | 25.3            | 3.0       | 32.5      | -                | 50.4            | 73.9           | 23.5        |             |
| Hori.    | 2745.750        | PK       | 46.1           | 28.5            | 3.2       | 31.7      | -                | 46.1            | 73.9           | 27.8        |             |
| Hori.    | 3661.000        | PK       | 45.8           | 29.1            | 3.6       | 31.5      | -                | 47.0            | 73.9           | 26.9        |             |
| Hori.    | 4576.250        | PK       | 41.0           | 30.9            | 4.0       | 31.3      | -                | 44.7            | 73.9           | 29.2        | Floor noise |
| Hori.    | 5491.500        | PK       | 41.0           | 32.2            | 4.5       | 31.3      | -                | 46.4            | 73.9           | 27.5        | Floor noise |
| Hori.    | 6406.750        | PK       | 41.0           | 34.2            | 4.8       | 31.8      | -                | 48.2            | 73.9           | 25.7        | Floor noise |
| Hori.    | 7322.000        | PK       | 41.0           | 36.6            | 4.9       | 32.5      | -                | 50.1            | 73.9           | 23.8        | Floor noise |
| Hori.    | 8237.250        | PK       | 40.8           | 36.6            | 5.3       | 32.8      | -                | 49.9            | 73.9           | 24.0        | Floor noise |
| Hori.    | 9152.500        | PK       | 41.3           | 37.5            | 5.7       | 32.6      | -                | 52.0            | 73.9           | 21.9        | Floor noise |
| Hori.    | 1830.500        | AV       | 50.5           | 25.3            | 3.0       | 32.5      | -                | 46.3            | 53.9           | 7.6         |             |
| Hori.    | 2745.750        | AV       | 39.0           | 28.5            | 3.2       | 31.7      | -                | 39.1            | 53.9           | 14.8        |             |
| Hori.    | 3661.000        | AV       | 39.3           | 29.1            | 3.6       | 31.5      | -                | 40.6            | 53.9           | 13.3        |             |
| Hori.    | 4576.250        | AV       | 33.1           | 30.9            | 4.0       | 31.3      | -                | 36.8            | 53.9           | 17.1        | Floor noise |
| Hori.    | 5491.500        | AV       | 33.0           | 32.2            | 4.5       | 31.3      | -                | 38.4            | 53.9           | 15.5        | Floor noise |
| Hori.    | 6406.750        | AV       | 33.0           | 34.2            | 4.8       | 31.8      | -                | 40.2            | 53.9           | 13.7        | Floor noise |
| Hori.    | 7322.000        | AV       | 32.0           | 36.6            | 4.9       | 32.5      | -                | 41.1            | 53.9           | 12.8        | Floor noise |
| Hori.    | 8237.250        | AV       | 32.2           | 36.6            | 5.3       | 32.8      | -                | 41.3            | 53.9           | 12.6        | Floor noise |
| Hori.    | 9152.500        | AV       | 32.8           | 37.5            | 5.7       | 32.6      | -                | 43.4            | 53.9           | 10.5        | Floor noise |
| Vert.    | 53.785          | QP       | 38.0           | 9.8             | 7.7       | 32.0      | -                | 23.5            | 40.0           | 16.5        |             |
| Vert.    | 78.734          | QP       | 40.4           | 6.7             | 8.1       | 32.0      | -                | 23.2            | 40.0           | 16.8        |             |
| Vert.    | 115.499         | QP       | 37.5           | 12.4            | 8.5       | 31.9      | -                | 26.5            | 43.5           | 17.0        |             |
| Vert.    | 158.983         | QP       | 33.9           | 15.3            | 9.0       | 31.9      | -                | 26.3            | 43.5           | 17.2        |             |
| Vert.    | 413.344         | QP       | 25.4           | 16.0            | 11.1      | 31.8      | -                | 20.7            | 46.0           | 25.3        |             |
| Vert.    | 649.543         | QP       | 25.3           | 19.2            | 12.5      | 32.0      | -                | 25.0            | 46.0           | 21.1        |             |
| Vert.    | 1830.500        | PK       | 58.9           | 25.3            | 3.0       | 32.5      | -                | 54.7            | 73.9           | 19.2        |             |
| Vert.    | 2745.750        | PK       | 47.9           | 28.5            | 3.2       | 31.7      | -                | 48.0            | 73.9           | 26.0        |             |
| Vert.    | 3661.000        | PK       | 49.0           | 29.1            | 3.6       | 31.5      | -                | 50.3            | 73.9           | 23.6        |             |
| Vert.    | 4576.250        | PK       | 41.0           | 30.9            | 4.0       | 31.3      | -                | 44.7            | 73.9           | 29.2        | Floor noise |
| Vert.    | 5491.500        | PK       | 43.2           | 32.2            | 4.5       | 31.3      | -                | 48.6            | 73.9           | 25.3        |             |
| Vert.    | 6406.750        | PK       | 40.2           | 34.2            | 4.8       | 31.8      | -                | 47.4            | 73.9           | 26.5        | Floor noise |
| Vert.    | 7322.000        | PK       | 40.2           | 36.6            | 4.9       | 32.5      | -                | 49.3            | 73.9           | 24.6        | Floor noise |
| Vert.    | 8237.250        | PK       | 40.4           | 36.6            | 5.3       | 32.8      | -                | 49.5            | 73.9           | 24.4        | Floor noise |
| Vert.    | 9152.500        | PK       | 41.0           | 37.5            | 5.7       | 32.6      | -                | 51.7            | 73.9           | 22.2        | Floor noise |
| Vert.    | 1830.500        | AV       | 55.7           | 25.3            | 3.0       | 32.5      | -                | 51.6            | 53.9           | 2.3         |             |
| Vert.    | 2745.750        | AV       | 41.5           | 28.5            | 3.2       | 31.7      | -                | 41.5            | 53.9           | 12.4        |             |
| Vert.    | 3661.000        | AV       | 42.5           | 29.1            | 3.6       | 31.5      | -                | 43.8            | 53.9           | 10.1        |             |
| Vert.    | 4576.250        | AV       | 34.2           | 30.9            | 4.0       | 31.3      | -                | 37.9            | 53.9           | 16.0        | Floor noise |
| Vert.    | 5491.500        | AV       | 35.3           | 32.2            | 4.5       | 31.3      | -                | 40.7            | 53.9           | 13.2        |             |
| Vert.    | 6406.750        | AV       | 32.2           | 34.2            | 4.8       | 31.8      | -                | 39.4            | 53.9           | 14.5        | Floor noise |
| Vert.    | 7322.000        | AV       | 32.1           | 36.6            | 4.9       | 32.5      | -                | 41.2            | 53.9           | 12.7        | Floor noise |
| Vert.    | 8237.250        | AV       | 32.0           | 36.6            | 5.3       | 32.8      | -                | 41.1            | 53.9           | 12.8        | Floor noise |
| Vert.    | 9152.500        | AV       | 32.3           | 37.5            | 5.7       | 32.6      | -                | 43.0            | 53.9           | 10.9        | 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 (3.65 m / 3.0 m) = 1.71 dB

**\*These results have sufficient margin without taking account Duty cycle correction factor.**

### 20dBc Data Sheet

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-------------------|-----------|-----------|-----------------|----------------|-------------|---------|
| Hori     | 915.250         | PK       | 92.2           | 22.0              | 12.9      | 0.0       | 127.1           | -              | -           | Carrier |
| Hori     | 902.000         | PK       | 31.1           | 22.0              | 12.9      | 0.0       | 66.0            | 107.1          | 41.1        |         |
| Vert     | 915.250         | PK       | 90.7           | 22.0              | 12.9      | 0.0       | 125.6           | -              | -           | Carrier |
| Vert     | 902.000         | PK       | 31.4           | 22.0              | 12.9      | 0.0       | 66.4            | 105.6          | 39.3        |         |

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

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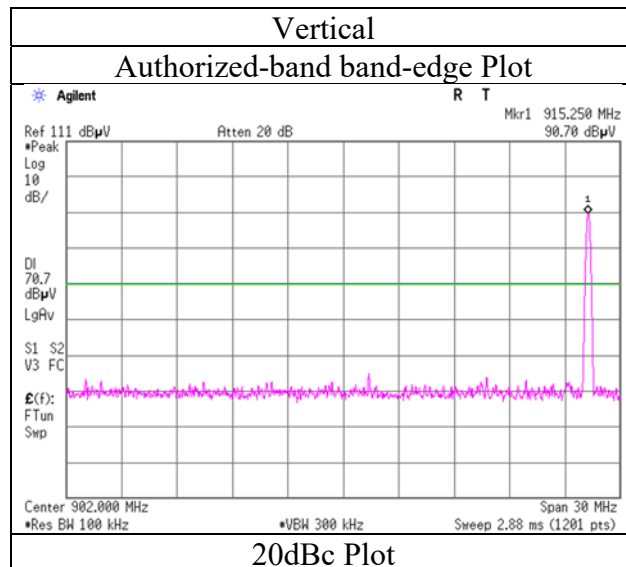
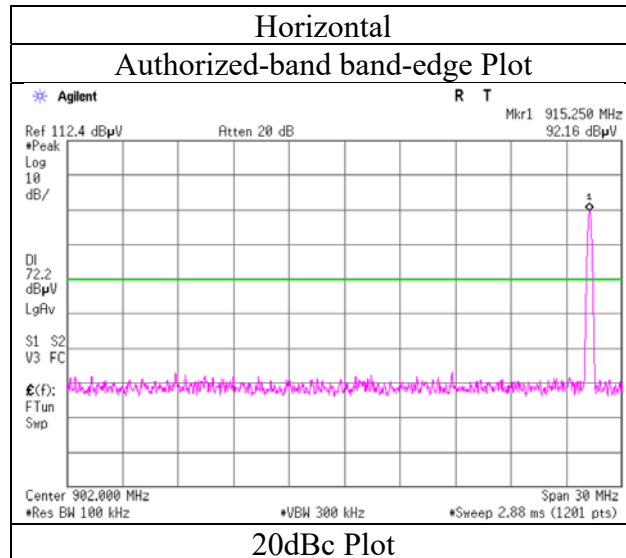
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## Radiated Spurious Emission (Reference Plot for band-edge) (External Antenna)

|                        |                              |
|------------------------|------------------------------|
| Report No.             | 13407533H                    |
| Test place             | Ise EMC Lab.                 |
| Semi Anechoic Chamber  | No.4                         |
| Date                   | July 3, 2020                 |
| Temperature / Humidity | 23 deg. C / 53 % RH          |
| Engineer               | Ken Fujita<br>(Below 1 GHz)  |
| Mode                   | Tx, Hopping Off , 915.25 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 (External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.3  
Date July 3, 2020 July 4, 2020  
Temperature / Humidity 23 deg. C / 53 % RH 22 deg. C / 51 % RH  
Engineer Ken Fujita Ken Fujita  
(Below 1 GHz) (Above 1 GHz)  
Mode Tx, Hopping Off , 921.25 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.    | 54.281             | QP       | 27.1              | 9.6                | 7.7          | 32.0         | -                   | 12.5               | 40.0              | 27.6           |             |
| Hori.    | 78.873             | QP       | 31.4              | 6.7                | 8.1          | 32.0         | -                   | 14.2               | 40.0              | 25.8           |             |
| Hori.    | 116.299            | QP       | 25.0              | 12.5               | 8.5          | 31.9         | -                   | 14.1               | 43.5              | 29.4           |             |
| Hori.    | 154.238            | QP       | 26.6              | 15.2               | 8.9          | 31.9         | -                   | 18.9               | 43.5              | 24.6           |             |
| Hori.    | 412.118            | QP       | 25.5              | 16.0               | 11.0         | 31.8         | -                   | 20.7               | 46.0              | 25.3           |             |
| Hori.    | 659.077            | QP       | 25.6              | 19.3               | 12.6         | 32.0         | -                   | 25.4               | 46.0              | 20.6           |             |
| Hori.    | 1842.500           | PK       | 60.3              | 25.3               | 3.0          | 32.5         | -                   | 56.2               | 73.9              | 17.7           |             |
| Hori.    | 2763.750           | PK       | 50.7              | 28.6               | 3.3          | 31.7         | -                   | 50.7               | 73.9              | 23.2           |             |
| Hori.    | 3685.000           | PK       | 47.2              | 29.2               | 3.6          | 31.5         | -                   | 48.6               | 73.9              | 25.3           |             |
| Hori.    | 4606.250           | PK       | 44.6              | 31.0               | 4.0          | 31.3         | -                   | 48.4               | 73.9              | 25.5           |             |
| Hori.    | 5527.500           | PK       | 40.0              | 32.2               | 4.5          | 31.4         | -                   | 45.4               | 73.9              | 28.5           | Floor noise |
| Hori.    | 6448.750           | PK       | 40.8              | 34.3               | 4.8          | 31.8         | -                   | 48.1               | 73.9              | 25.8           | Floor noise |
| Hori.    | 7370.000           | PK       | 40.2              | 36.7               | 5.0          | 32.5         | -                   | 49.4               | 73.9              | 24.5           | Floor noise |
| Hori.    | 8291.250           | PK       | 40.1              | 36.5               | 5.3          | 32.8         | -                   | 49.1               | 73.9              | 24.8           | Floor noise |
| Hori.    | 9212.500           | PK       | 40.2              | 37.8               | 5.7          | 32.6         | -                   | 51.1               | 73.9              | 22.8           | Floor noise |
| Hori.    | 1842.500           | AV       | 56.4              | 25.3               | 3.0          | 32.5         | -                   | 52.3               | 53.9              | 1.6            |             |
| Hori.    | 2763.750           | AV       | 44.0              | 28.6               | 3.3          | 31.7         | -                   | 44.1               | 53.9              | 9.8            |             |
| Hori.    | 3685.000           | AV       | 40.2              | 29.2               | 3.6          | 31.5         | -                   | 41.6               | 53.9              | 12.3           |             |
| Hori.    | 4606.250           | AV       | 36.6              | 31.0               | 4.0          | 31.3         | -                   | 40.4               | 53.9              | 13.5           |             |
| Hori.    | 5527.500           | AV       | 33.0              | 32.2               | 4.5          | 31.4         | -                   | 38.4               | 53.9              | 15.5           | Floor noise |
| Hori.    | 6448.750           | AV       | 33.0              | 34.3               | 4.8          | 31.8         | -                   | 40.3               | 53.9              | 13.6           | Floor noise |
| Hori.    | 7370.000           | AV       | 32.9              | 36.7               | 5.0          | 32.5         | -                   | 42.1               | 53.9              | 11.9           | Floor noise |
| Hori.    | 8291.250           | AV       | 32.0              | 36.5               | 5.3          | 32.8         | -                   | 40.9               | 53.9              | 13.0           | Floor noise |
| Hori.    | 9212.500           | AV       | 32.9              | 37.8               | 5.7          | 32.6         | -                   | 43.8               | 53.9              | 10.1           | Floor noise |
| Vert.    | 54.406             | QP       | 36.5              | 9.6                | 7.7          | 32.0         | -                   | 21.8               | 40.0              | 18.2           |             |
| Vert.    | 78.667             | QP       | 41.2              | 6.7                | 8.1          | 32.0         | -                   | 24.0               | 40.0              | 16.0           |             |
| Vert.    | 116.690            | QP       | 35.8              | 12.5               | 8.5          | 31.9         | -                   | 24.9               | 43.5              | 18.6           |             |
| Vert.    | 154.614            | QP       | 29.9              | 15.2               | 8.9          | 31.9         | -                   | 22.2               | 43.5              | 21.4           |             |
| Vert.    | 412.546            | QP       | 24.5              | 16.0               | 11.1         | 31.8         | -                   | 19.8               | 46.0              | 26.3           |             |
| Vert.    | 649.283            | QP       | 23.3              | 19.2               | 12.5         | 32.0         | -                   | 23.0               | 46.0              | 23.1           |             |
| Vert.    | 1842.500           | PK       | 61.1              | 25.3               | 3.0          | 32.5         | -                   | 57.0               | 73.9              | 16.9           |             |
| Vert.    | 2763.750           | PK       | 47.7              | 28.6               | 3.3          | 31.7         | -                   | 47.8               | 73.9              | 26.1           |             |
| Vert.    | 3685.000           | PK       | 52.4              | 29.2               | 3.6          | 31.5         | -                   | 53.8               | 73.9              | 20.2           |             |
| Vert.    | 4606.250           | PK       | 46.2              | 31.0               | 4.0          | 31.3         | -                   | 50.0               | 73.9              | 23.9           |             |
| Vert.    | 5527.500           | PK       | 40.1              | 32.2               | 4.5          | 31.4         | -                   | 45.5               | 73.9              | 28.4           | Floor noise |
| Vert.    | 6448.750           | PK       | 40.8              | 34.3               | 4.8          | 31.8         | -                   | 48.1               | 73.9              | 25.8           | Floor noise |
| Vert.    | 7370.000           | PK       | 40.9              | 36.7               | 5.0          | 32.5         | -                   | 50.1               | 73.9              | 23.8           | Floor noise |
| Vert.    | 8291.250           | PK       | 40.9              | 36.5               | 5.3          | 32.8         | -                   | 49.9               | 73.9              | 24.1           | Floor noise |
| Vert.    | 9212.500           | PK       | 41.1              | 37.8               | 5.7          | 32.6         | -                   | 52.0               | 73.9              | 21.9           | Floor noise |
| Vert.    | 1842.500           | AV       | 57.6              | 25.3               | 3.0          | 32.5         | -                   | 53.5               | 53.9              | 0.4            |             |
| Vert.    | 2763.750           | AV       | 40.5              | 28.6               | 3.3          | 31.7         | -                   | 40.5               | 53.9              | 13.4           |             |
| Vert.    | 3685.000           | AV       | 45.2              | 29.2               | 3.6          | 31.5         | -                   | 46.6               | 53.9              | 7.3            |             |
| Vert.    | 4606.250           | AV       | 38.8              | 31.0               | 4.0          | 31.3         | -                   | 42.6               | 53.9              | 11.3           |             |
| Vert.    | 5527.500           | AV       | 32.0              | 32.2               | 4.5          | 31.4         | -                   | 37.4               | 53.9              | 16.5           | Floor noise |
| Vert.    | 6448.750           | AV       | 31.9              | 34.3               | 4.8          | 31.8         | -                   | 39.2               | 53.9              | 14.7           | Floor noise |
| Vert.    | 7370.000           | AV       | 31.7              | 36.7               | 5.0          | 32.5         | -                   | 40.8               | 53.9              | 13.1           | Floor noise |
| Vert.    | 8291.250           | AV       | 32.1              | 36.5               | 5.3          | 32.8         | -                   | 41.1               | 53.9              | 12.8           | Floor noise |
| Vert.    | 9212.500           | AV       | 32.2              | 37.8               | 5.7          | 32.6         | -                   | 43.2               | 53.9              | 10.8           | 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  $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$

**\*These results have sufficient margin without taking account Duty cycle correction factor.**

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## Radiated Spurious Emission (External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.3  
Date July 3, 2020 July 4, 2020  
Temperature / Humidity 23 deg. C / 53 % RH 22 deg. C / 51 % RH  
Engineer Ken Fujita Ken Fujita  
(Below 1 GHz) (Above 1 GHz)  
Mode Tx, Hopping Off , 927.5 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.    | 54.458             | QP       | 27.5              | 9.6                | 7.7          | 32.0         | -                   | 12.8               | 40.0              | 27.2           |        |
| Hori.    | 78.209             | QP       | 33.7              | 6.7                | 8.1          | 32.0         | -                   | 16.5               | 40.0              | 23.5           |        |
| Hori.    | 113.974            | QP       | 25.9              | 12.2               | 8.5          | 31.9         | -                   | 14.6               | 43.5              | 28.9           |        |
| Hori.    | 155.411            | QP       | 28.6              | 15.2               | 8.9          | 31.9         | -                   | 20.8               | 43.5              | 22.7           |        |
| Hori.    | 412.258            | QP       | 25.8              | 16.0               | 11.0         | 31.8         | -                   | 21.0               | 46.0              | 25.0           |        |
| Hori.    | 649.761            | QP       | 25.8              | 19.2               | 12.5         | 32.0         | -                   | 25.4               | 46.0              | 20.6           |        |
| Hori.    | 1855.000           | PK       | 52.5              | 25.4               | 3.0          | 32.4         | -                   | 48.4               | 73.9              | 25.5           |        |
| Hori.    | 2782.500           | PK       | 49.5              | 28.5               | 3.3          | 31.7         | -                   | 49.6               | 73.9              | 24.3           |        |
| Hori.    | 3710.000           | PK       | 43.5              | 29.3               | 3.6          | 31.5         | -                   | 45.0               | 73.9              | 28.9           |        |
| Hori.    | 4637.500           | PK       | 42.3              | 31.1               | 4.1          | 31.3         | -                   | 46.2               | 73.9              | 27.7           |        |
| Hori.    | 5565.000           | PK       | 40.7              | 32.2               | 4.5          | 31.4         | -                   | 46.1               | 73.9              | 27.8           |        |
| Hori.    | 6492.500           | PK       | 40.3              | 34.6               | 4.8          | 31.9         | -                   | 47.8               | 73.9              | 26.1           |        |
| Hori.    | 7420.000           | PK       | 40.6              | 36.7               | 5.0          | 32.5         | -                   | 49.8               | 73.9              | 24.1           |        |
| Hori.    | 8347.500           | PK       | 40.3              | 36.4               | 5.3          | 32.7         | -                   | 49.2               | 73.9              | 24.7           |        |
| Hori.    | 9275.000           | PK       | 41.2              | 38.0               | 5.7          | 32.6         | -                   | 52.3               | 73.9              | 21.6           |        |
| Hori.    | 1855.000           | AV       | 48.0              | 25.4               | 3.0          | 32.4         | -                   | 43.9               | 53.9              | 10.0           |        |
| Hori.    | 2782.500           | AV       | 43.0              | 28.5               | 3.3          | 31.7         | -                   | 43.1               | 53.9              | 10.8           |        |
| Hori.    | 3710.000           | AV       | 35.8              | 29.3               | 3.6          | 31.5         | -                   | 37.2               | 53.9              | 16.7           |        |
| Hori.    | 4637.500           | AV       | 33.4              | 31.1               | 4.1          | 31.3         | -                   | 37.3               | 53.9              | 16.6           |        |
| Hori.    | 5565.000           | AV       | 33.1              | 32.2               | 4.5          | 31.4         | -                   | 38.5               | 53.9              | 15.4           |        |
| Hori.    | 6492.500           | AV       | 33.2              | 34.6               | 4.8          | 31.9         | -                   | 40.7               | 53.9              | 13.2           |        |
| Hori.    | 7420.000           | AV       | 32.3              | 36.7               | 5.0          | 32.5         | -                   | 41.5               | 53.9              | 12.5           |        |
| Hori.    | 8347.500           | AV       | 32.2              | 36.4               | 5.3          | 32.7         | -                   | 41.2               | 53.9              | 12.7           |        |
| Hori.    | 9275.000           | AV       | 32.9              | 38.0               | 5.7          | 32.6         | -                   | 44.0               | 53.9              | 9.9            |        |
| Vert.    | 54.539             | QP       | 39.9              | 9.5                | 7.7          | 32.0         | -                   | 25.2               | 40.0              | 14.9           |        |
| Vert.    | 79.338             | QP       | 36.2              | 6.8                | 8.1          | 32.0         | -                   | 19.1               | 40.0              | 20.9           |        |
| Vert.    | 116.759            | QP       | 35.9              | 12.5               | 8.5          | 31.9         | -                   | 25.1               | 43.5              | 18.5           |        |
| Vert.    | 153.805            | QP       | 27.3              | 15.2               | 8.9          | 31.9         | -                   | 19.6               | 43.5              | 24.0           |        |
| Vert.    | 412.431            | QP       | 24.5              | 16.0               | 11.0         | 31.8         | -                   | 19.7               | 46.0              | 26.3           |        |
| Vert.    | 649.865            | QP       | 23.1              | 19.2               | 12.5         | 32.0         | -                   | 22.7               | 46.0              | 23.3           |        |
| Vert.    | 1855.000           | PK       | 55.4              | 25.4               | 3.0          | 32.4         | -                   | 51.3               | 73.9              | 22.6           |        |
| Vert.    | 2782.500           | PK       | 50.5              | 28.5               | 3.3          | 31.7         | -                   | 50.6               | 73.9              | 23.3           |        |
| Vert.    | 3710.000           | PK       | 45.8              | 29.3               | 3.6          | 31.5         | -                   | 47.2               | 73.9              | 26.7           |        |
| Vert.    | 4637.500           | PK       | 45.3              | 31.1               | 4.1          | 31.3         | -                   | 49.2               | 73.9              | 24.7           |        |
| Vert.    | 5565.000           | PK       | 44.3              | 32.2               | 4.5          | 31.4         | -                   | 49.7               | 73.9              | 24.2           |        |
| Vert.    | 6492.500           | PK       | 40.1              | 34.6               | 4.8          | 31.9         | -                   | 47.6               | 73.9              | 26.3           |        |
| Vert.    | 7420.000           | PK       | 40.3              | 36.7               | 5.0          | 32.5         | -                   | 49.5               | 73.9              | 24.4           |        |
| Vert.    | 8347.500           | PK       | 40.2              | 36.4               | 5.3          | 32.7         | -                   | 49.2               | 73.9              | 24.7           |        |
| Vert.    | 9275.000           | PK       | 40.2              | 38.0               | 5.7          | 32.6         | -                   | 51.4               | 73.9              | 22.6           |        |
| Vert.    | 1855.000           | AV       | 50.5              | 25.4               | 3.0          | 32.4         | -                   | 46.4               | 53.9              | 7.5            |        |
| Vert.    | 2782.500           | AV       | 44.4              | 28.5               | 3.3          | 31.7         | -                   | 44.5               | 53.9              | 9.5            |        |
| Vert.    | 3710.000           | AV       | 39.9              | 29.3               | 3.6          | 31.5         | -                   | 41.3               | 53.9              | 12.6           |        |
| Vert.    | 4637.500           | AV       | 37.4              | 31.1               | 4.1          | 31.3         | -                   | 41.3               | 53.9              | 12.6           |        |
| Vert.    | 5565.000           | AV       | 36.1              | 32.2               | 4.5          | 31.4         | -                   | 41.5               | 53.9              | 12.4           |        |
| Vert.    | 6492.500           | AV       | 32.2              | 34.6               | 4.8          | 31.9         | -                   | 39.7               | 53.9              | 14.2           |        |
| Vert.    | 7420.000           | AV       | 32.0              | 36.7               | 5.0          | 32.5         | -                   | 41.1               | 53.9              | 12.8           |        |
| Vert.    | 8347.500           | AV       | 32.1              | 36.4               | 5.3          | 32.7         | -                   | 41.1               | 53.9              | 12.8           |        |
| Vert.    | 9275.000           | AV       | 32.2              | 38.0               | 5.7          | 32.6         | -                   | 43.3               | 53.9              | 10.6           |        |

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 (3.65 m / 3.0 m) = 1.71 dB

**\*These results have sufficient margin without taking account Duty cycle correction factor.**

### 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     | 927.500            | PK       | 91.9              | 21.8                    | 13.0         | 0.0          | 126.7              | -                 | -              | Carrier |
| Hori     | 928.000            | PK       | 31.6              | 21.8                    | 13.0         | 0.0          | 66.4               | 106.7             | 40.2           |         |
| Vert     | 927.500            | PK       | 91.3              | 21.8                    | 13.0         | 0.0          | 126.1              | -                 | -              | Carrier |
| Vert     | 928.000            | PK       | 28.2              | 21.8                    | 13.0         | 0.0          | 63.1               | 106.1             | 43.1           |         |

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

**UL Japan, Inc.**

**Ise EMC Lab.**

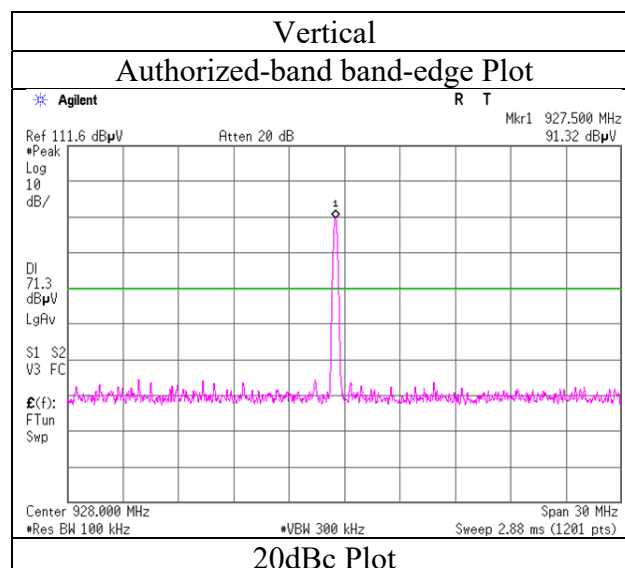
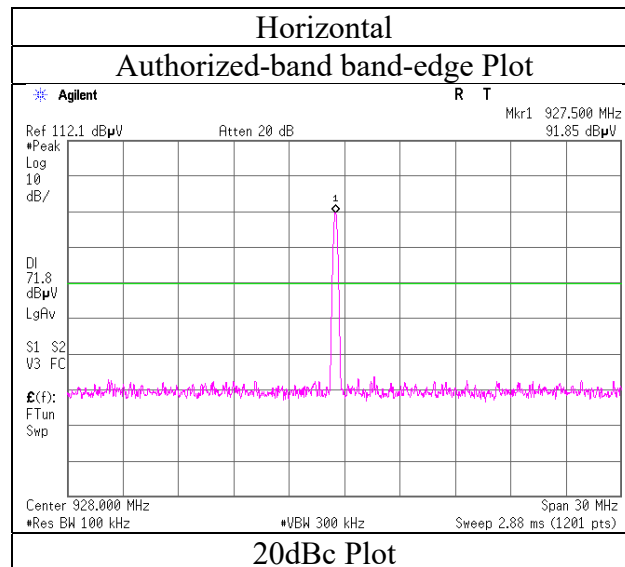
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Facsimile : +81 596 24 8124

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

|                        |                             |
|------------------------|-----------------------------|
| Report No.             | 13407533H                   |
| Test place             | Ise EMC Lab.                |
| Semi Anechoic Chamber  | No.4                        |
| Date                   | July 3, 2020                |
| Temperature / Humidity | 23 deg. C / 53 % RH         |
| Engineer               | Ken Fujita<br>(Below 1 GHz) |
| Mode                   | Tx, Hopping Off , 927.5 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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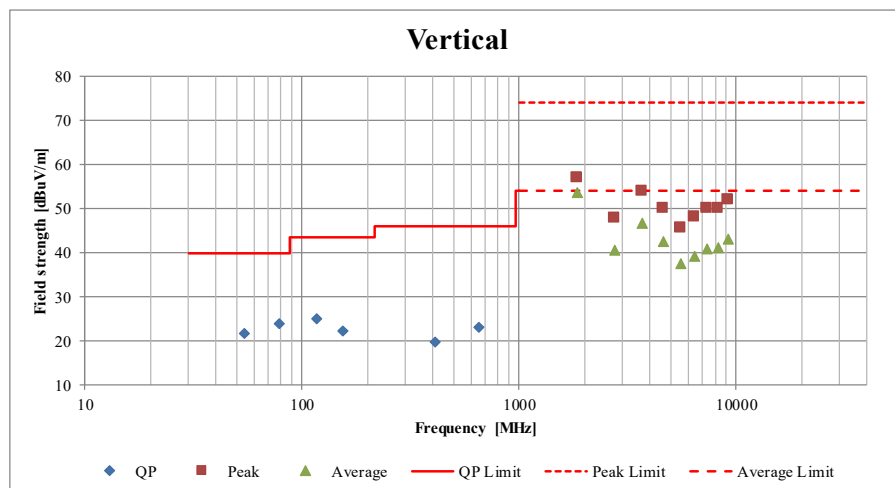
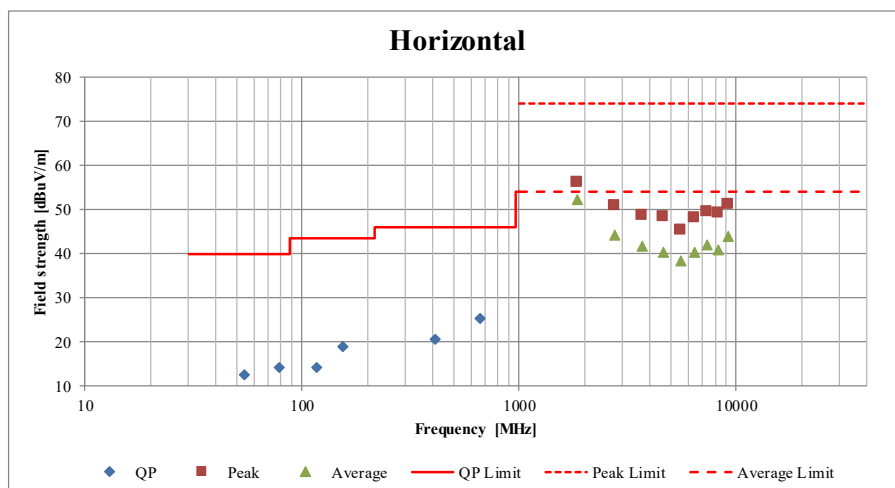
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**Radiated Spurious Emission**  
**(Plot data, Worst case)**  
(External Antenna)

|                        |                             |                             |
|------------------------|-----------------------------|-----------------------------|
| Report No.             | 13407533H                   |                             |
| Test place             | Ise EMC Lab.                |                             |
| Semi Anechoic Chamber  | No.4                        | No.3                        |
| Date                   | July 3, 2020                | July 4, 2020                |
| Temperature / Humidity | 23 deg. C / 53 % RH         | 22 deg. C / 51 % RH         |
| Engineer               | Ken Fujita<br>(Below 1 GHz) | Ken Fujita<br>(Above 1 GHz) |
| Mode                   | Tx, Hopping Off, 915.25 MHz |                             |

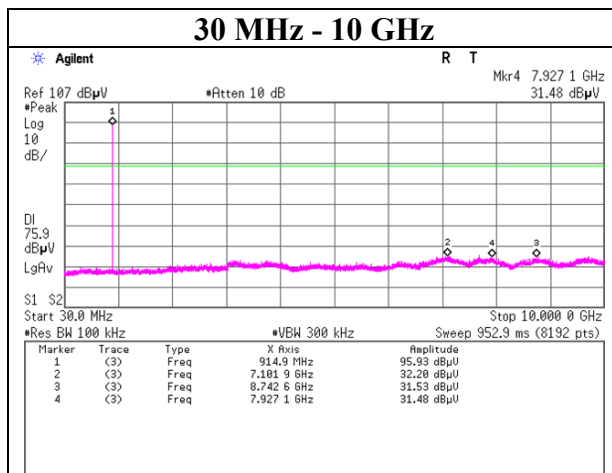
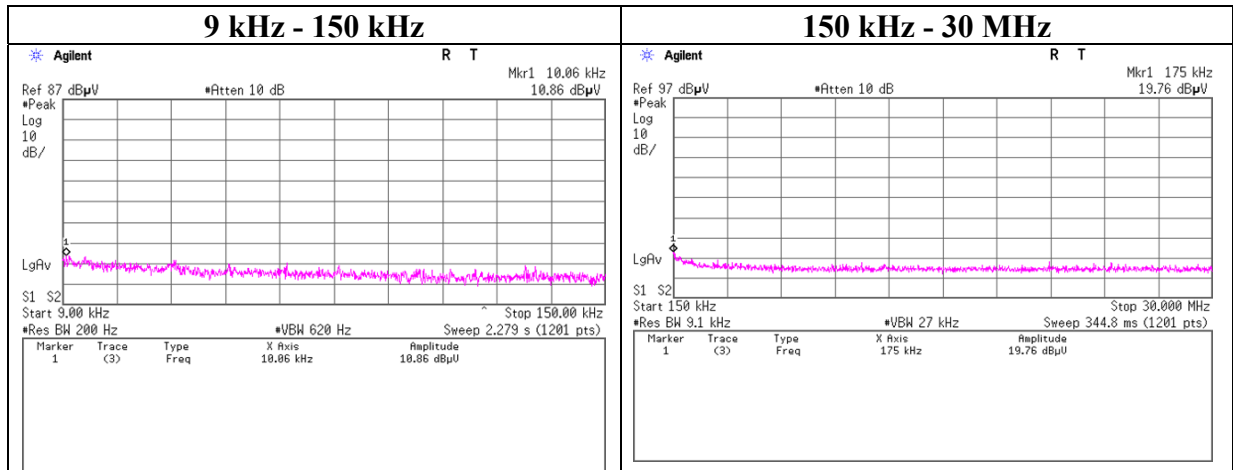


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Conducted Spurious Emission (Internal Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

### 915.25 MHz



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**Ise EMC Lab.**

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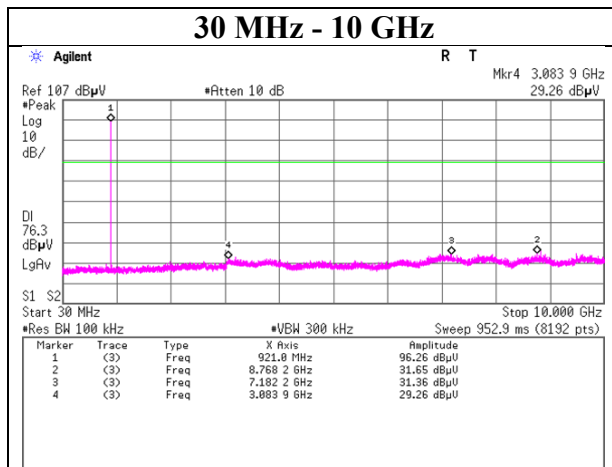
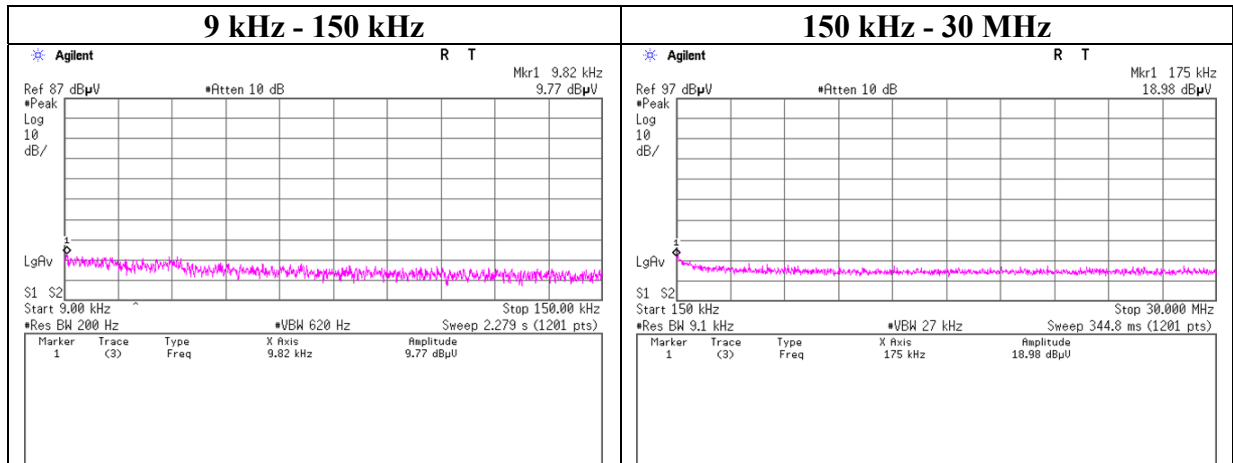
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Facsimile : +81 596 24 8124

## Conducted Spurious Emission (Internal Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

### 921.25 MHz



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**Ise EMC Lab.**

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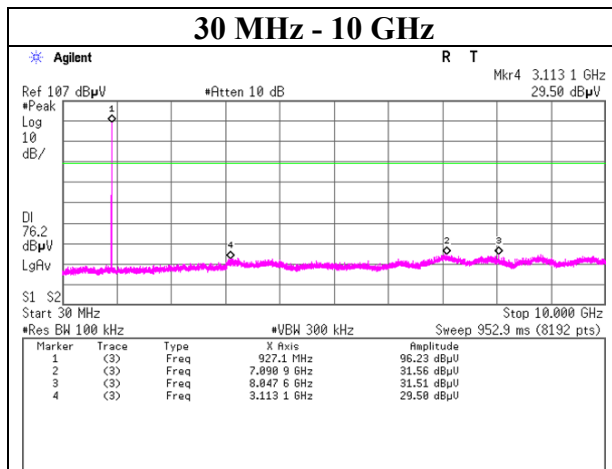
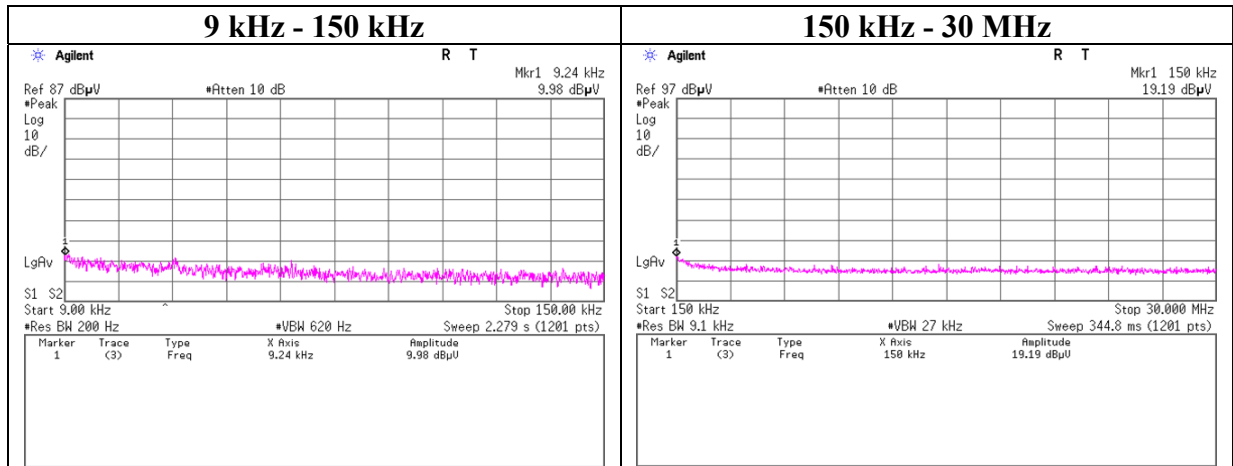
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Facsimile : +81 596 24 8124

## Conducted Spurious Emission (Internal Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

### 927.5 MHz



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**Ise EMC Lab.**

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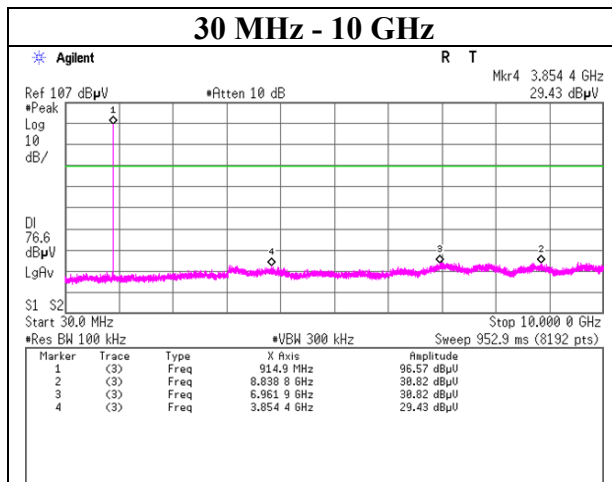
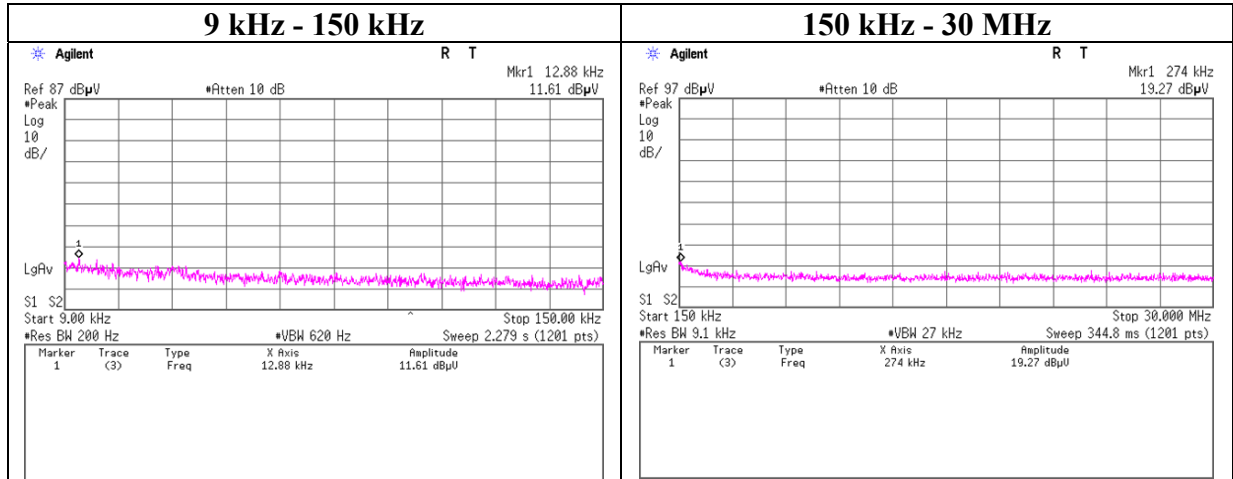
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission (External Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

### 915.25 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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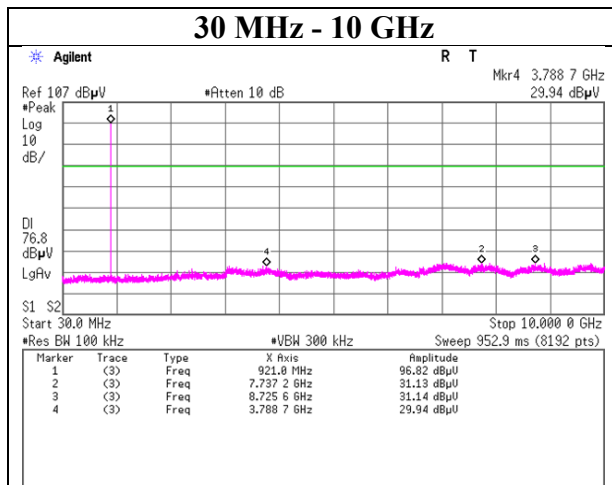
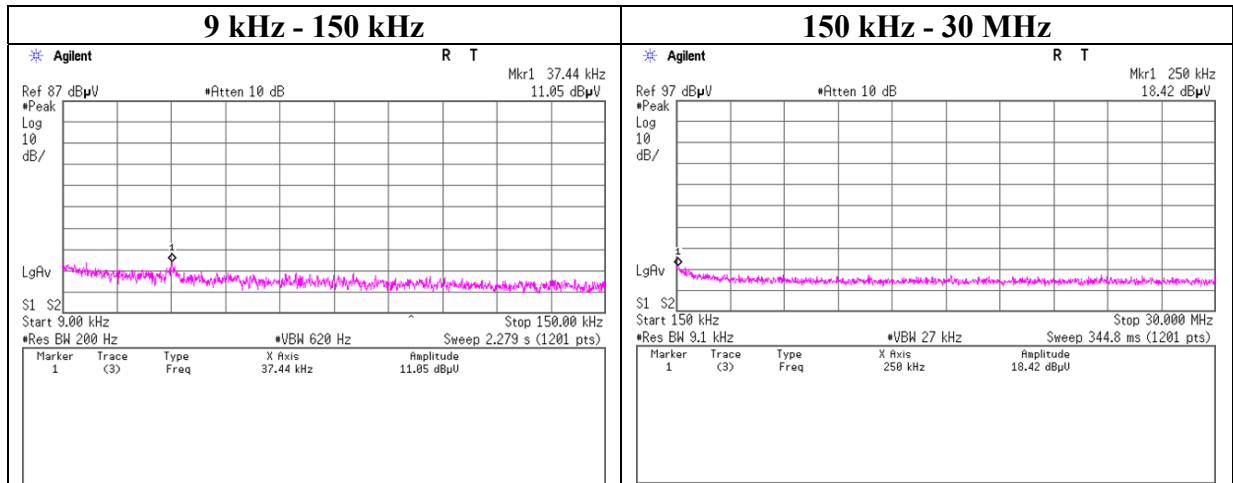
Facsimile : +81 596 24 8124

## Conducted Spurious Emission

(External Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

### 921.25 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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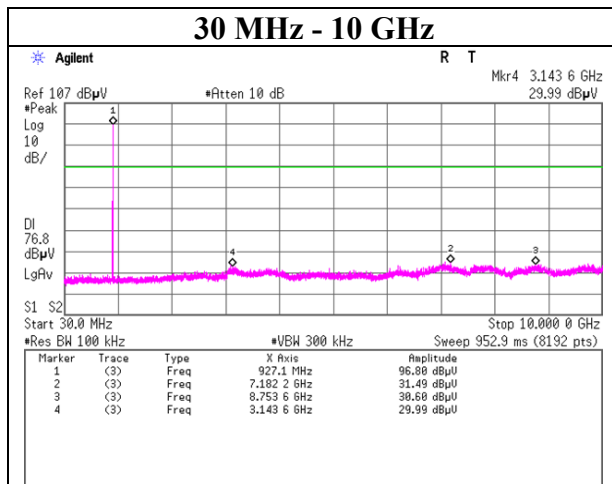
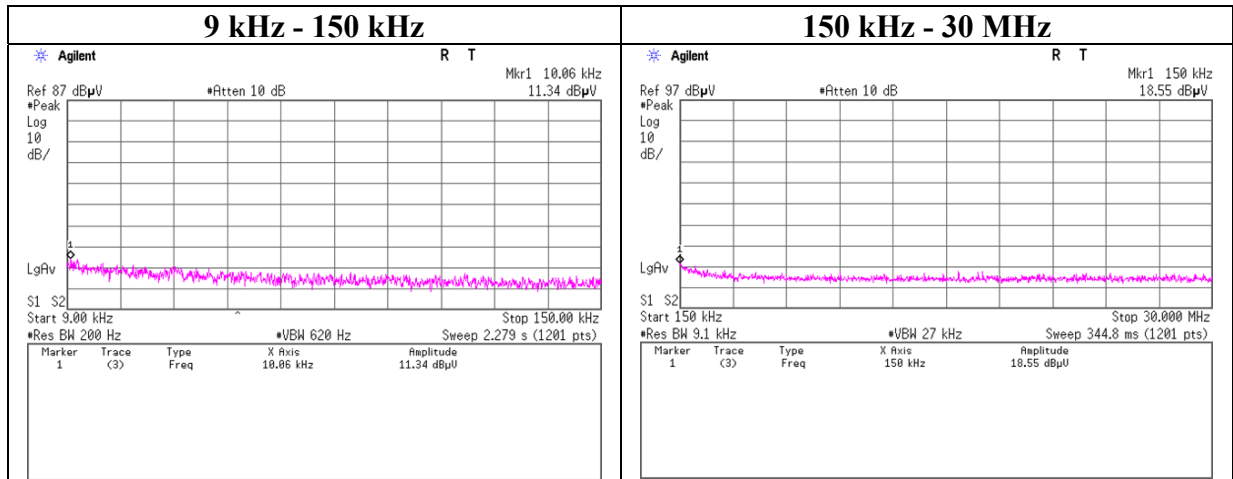
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Facsimile : +81 596 24 8124

## Conducted Spurious Emission (External Antenna)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 13407533H                          |
| Test place             | Ise EMC Lab. No.4 Measurement Room |
| Date                   | July 1, 2020                       |
| Temperature / Humidity | 23 deg. C / 54 % RH                |
| Engineer               | Junki Nagatomi                     |
| Mode                   | Tx, Hopping Off                    |

### 927.5 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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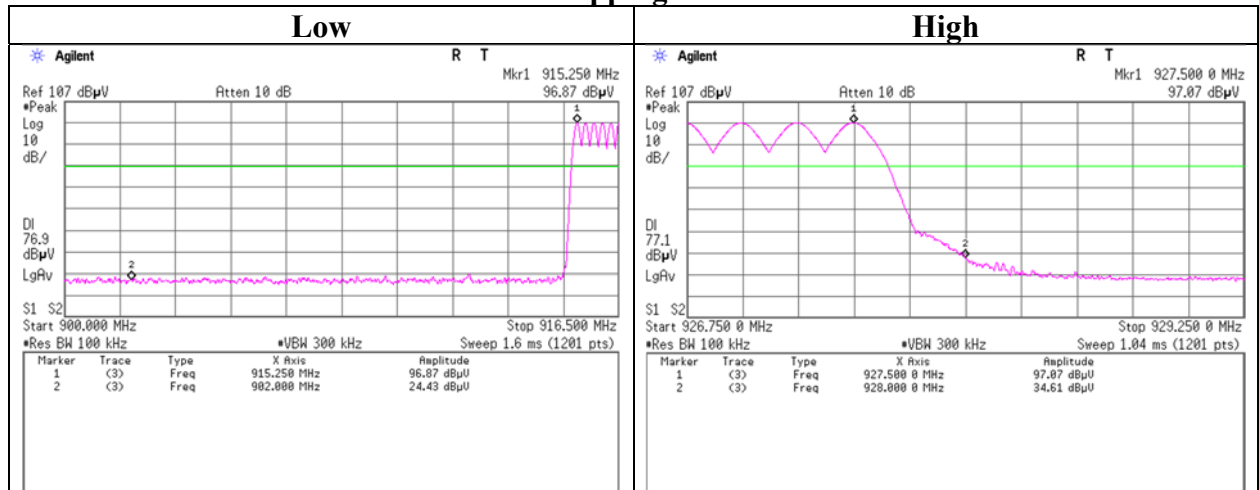
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

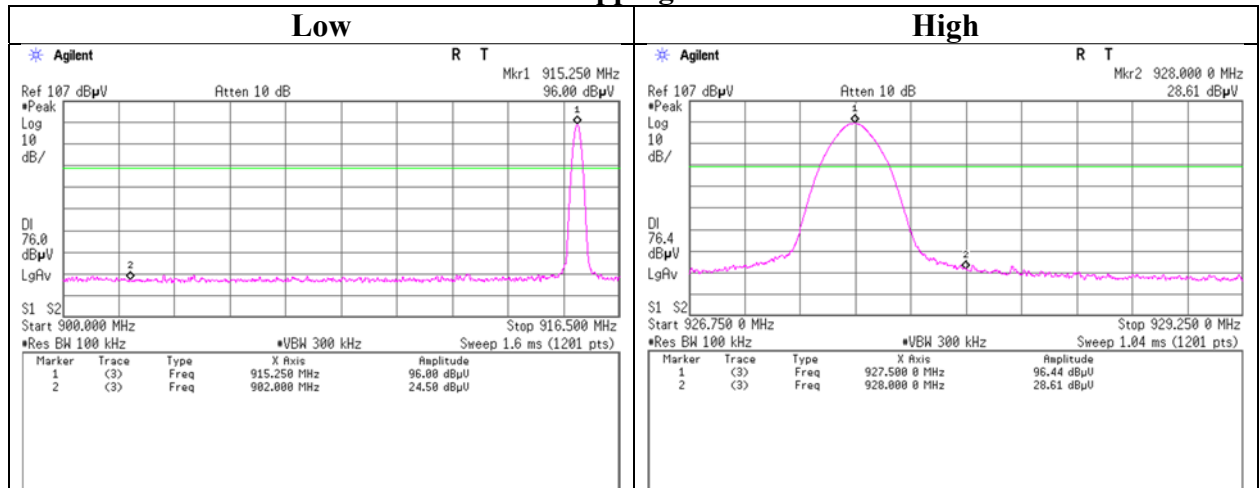
## Conducted Emission Band Edge compliance (Internal Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.4 Measurement Room  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 74 % RH  
Engineer Akihiko Maeda  
Mode Tx Hopping On / Off

### Hopping On



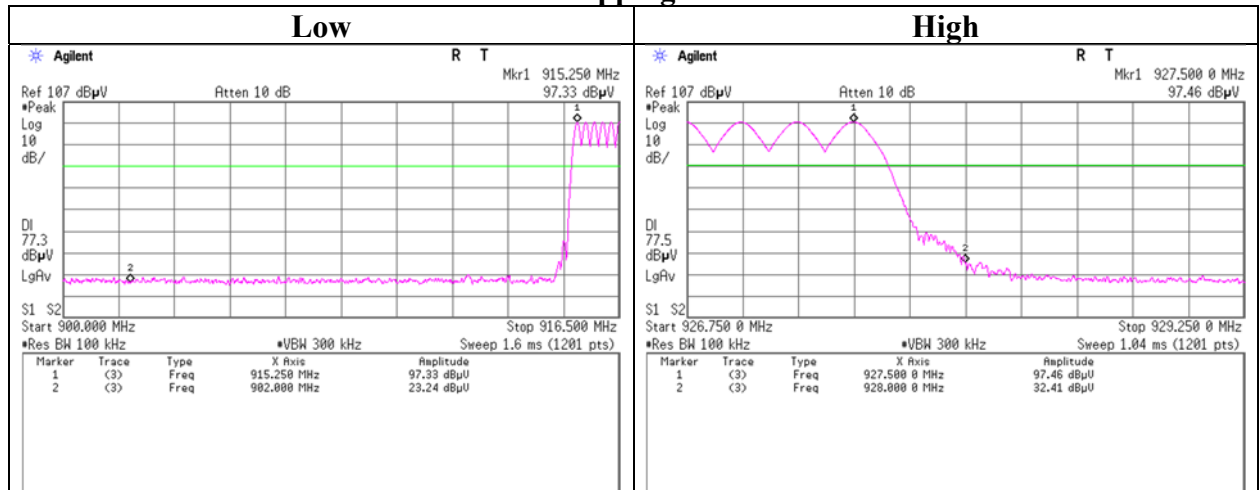
### Hopping Off



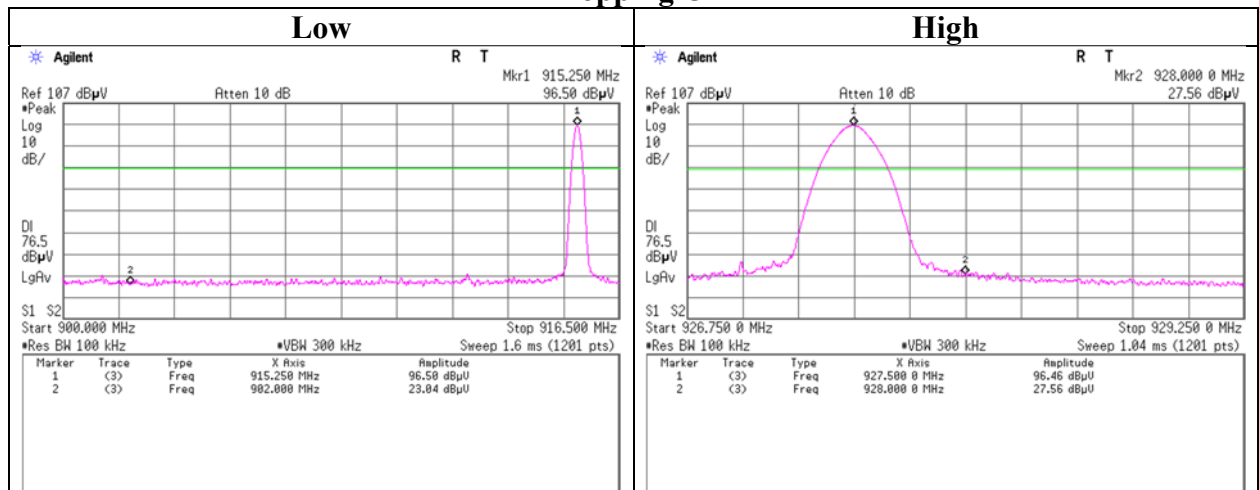
## Conducted Emission Band Edge compliance (External Antenna)

Report No. 13407533H  
Test place Ise EMC Lab. No.4 Measurement Room  
Date July 9, 2020  
Temperature / Humidity 22 deg. C / 74 % RH  
Engineer Akihiko Maeda  
Mode Tx Hopping On / Off

### Hopping On



### Hopping Off



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**Ise EMC Lab.**

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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 |
|-----------|--------------|---------|------------------------------------|------------------------------------------|-------------------------------------------------|------------|-----------------------|---------|
| CE        | MAEC-03      | 142008  | AC3_Semi Anechoic Chamber(NSA)     | TDK                                      | Semi Anechoic Chamber 3m                        | DA-10005   | 05/22/2020            | 24      |
| CE        | MOS-13       | 141554  | Thermo-Hygrometer                  | CUSTOM                                   | CTH-201                                         | 1301       | 01/07/2020            | 12      |
| CE        | MMM-08       | 141532  | DIGITAL HiTESTER                   | Hioki                                    | 3805                                            | 51201197   | 01/06/2020            | 12      |
| CE        | MJM-16       | 142183  | Measure                            | KOMELON                                  | KMC-36                                          | -          | -                     | -       |
| CE        | COTS-MEMI-02 | 178648  | EMI measurement program            | TSJ (Techno Science Japan)               | TEPTO-DV                                        | -          | -                     | -       |
| CE        | MLS-23       | 141357  | LISN(AMN)                          | Schwarzbeck Mess - Elektronik            | NSLK8127                                        | 8127-729   | 07/05/2019            | 12      |
| CE        | MLS-24       | 141358  | LISN(AMN)                          | Schwarzbeck Mess - Elektronik            | NSLK8127                                        | 8127-730   | 07/05/2019            | 12      |
| CE        | MTA-52       | 141934  | Terminator                         | TME                                      | CT-01BP                                         | -          | 12/02/2019            | 12      |
| CE        | MAT-67       | 141248  | Attenuator                         | JFW Industries, Inc.                     | 50FP-013H2 N                                    | -          | 12/02/2019            | 12      |
| CE        | MCC-112      | 141216  | Coaxial cable                      | Fujikura/Suhner/TSJ                      | 5D-2W/SFM14/sucoform141-PE/421-010/RFM-E321(SW) | -/00640    | 07/06/2020            | 12      |
| CE        | MTR-08       | 141949  | Test Receiver                      | Rohde & Schwarz                          | ESCI                                            | 100767     | 08/02/2019            | 12      |
| RE        | MAEC-04      | 142011  | AC4_Semi Anechoic Chamber(NSA)     | TDK                                      | Semi Anechoic Chamber 3m                        | DA-10005   | 05/25/2020            | 24      |
| 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        | MRF-12       | 192072  | Band Rejection Filter (902-928MHz) | Wakoh Communication Industrial Co., Ltd. | WFR-481                                         | 19122541   | 03/16/2020            | 12      |
| 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        | MHF-27       | 141297  | High Pass Filter (1.1-10GHz)       | TOKYO KEIKI                              | TF219CD1                                        | 1001       | 01/09/2020            | 12      |
| RE        | MSA-16       | 141903  | Spectrum Analyzer                  | Keysight Technologies Inc                | E4440A                                          | MY46186390 | 02/06/2020            | 12      |
| AT        | MSA-04       | 141885  | Spectrum Analyzer                  | Keysight Technologies Inc                | E4448A                                          | US44300523 | 11/21/2019            | 12      |
| AT        | MPM-16       | 141812  | Power Meter                        | Keysight Technologies Inc                | 8990B                                           | MY51000271 | 08/02/2019            | 12      |
| AT        | MPSE-23      | 141835  | Power sensor                       | Keysight Technologies Inc                | N1923A                                          | MY54070004 | 08/02/2019            | 12      |
| AT        | MAT-16       | 141170  | Attenuator(40dB)_DC-1GHz N         | Weinschel Corp                           | MODEL 1                                         | BF1940     | 12/09/2019            | 12      |
| AT        | MCC-64       | 141327  | Coaxial Cable                      | UL Japan                                 | -                                               | -          | 02/04/2020            | 12      |
| AT        | MCC-212      | 141391  | Microwave Cable                    | RS Pro                                   | R-132G7210200CD                                 | -          | 04/13/2020            | 12      |
| AT        | MOS-15       | 141562  | Thermo-Hygrometer                  | CUSTOM                                   | CTH-201                                         | 0010       | 01/07/2020            | 12      |
| AT        | MMM-10       | 141545  | DIGITAL HiTESTER                   | Hioki                                    | 3805                                            | 51201148   | 01/06/2020            | 12      |
| AT        | MCC-210      | 141289  | Microwave Cable                    | RS Pro                                   | R-132G7210200CD                                 | -          | 04/13/2020            | 12      |
| AT        | MCC-178      | 141227  | Microwave Cable                    | Junkosha                                 | MMX221-00500DMSDMS                              | 1502S305   | 03/18/2020            | 12      |
| AT        | MTA-51       | 141933  | Terminator                         | TME                                      | CT-01BP                                         | -          | 12/02/2019            | 12      |
| AT        | MTA-54       | 141936  | Terminator                         | TME                                      | CT-01BP                                         | -          | 12/02/2019            | 12      |
| AT        | MAT-17       | 141171  | Attenuator(20dB)_DC-1GHz N         | Weinschel Corp                           | MODEL 1                                         | BG0143     | 12/09/2019            | 12      |
| AT        | MOS-41       | 192300  | Thermo-Hygrometer                  | CUSTOM. Inc                              | CTH-201                                         | 0013       | 12/19/2019            | 12      |
| AT        | MCC-206      | 141286  | Microwave Cable                    | RS Pro                                   | R-132G7210200CD                                 | -          | 02/04/2020            | 12      |

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

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

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

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

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