



# **RADIO TEST REPORT**

**Test Report No. : 11834855S-B-R1**

**Applicant** : OLYMPUS CORPORATION  
**Type of Equipment** : Wireless LAN/Bluetooth Module  
**Model No.** : S080WIFI-PCA  
**FCC ID** : YSKW80  
**Test regulation** : FCC Part 15 Subpart C: 2018  
\* Bluetooth BDR/EDR part  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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. This report is a revised version of 11834855S-B. 11834855S-B is replaced with this report.

**Date of test:**

November 2 to 22, 2017

**Representative test engineer:**

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Engineer

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**Approved by:**

Toyokazu Imamura

Leader

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- ☐ 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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13-EM-F0429



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## **SECTION 1: Customer information**

|                  |   |                                                       |
|------------------|---|-------------------------------------------------------|
| Company Name     | : | OLYMPUS CORPORATION                                   |
| Address          | : | 2951 Ishikawa-machi Hachioji-shi Tokyo 192-8507 Japan |
| Telephone Number | : | +81-42-642-2283                                       |
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## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

|                            |   |                                                                                           |
|----------------------------|---|-------------------------------------------------------------------------------------------|
| Type of Equipment          | : | Wireless LAN/Bluetooth Module                                                             |
| Model No.                  | : | S080WIFI-PCA                                                                              |
| Serial No.                 | : | Refer to Section 4, Clause 4.2                                                            |
| Rating                     | : | DC 3.35 V - 4.2 V                                                                         |
| Receipt Date of Sample     | : | June 24, 2017                                                                             |
| Country of Mass-production | : | Vietnam                                                                                   |
| Condition of EUT           | : | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification of EUT        | : | No Modification by the test lab                                                           |

### **2.2 Product Description**

Model: S080WIFI-PCA (referred to as the EUT in this report) is a Wireless LAN/Bluetooth Module.

### **Radio Specification**

|                           |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radio Type                | : | Transceiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Frequency of Operation    | : | 2.4 GHz: 2402 MHz - 2480 MHz (Bluetooth BDR/EDR, Bluetooth Low Energy)<br>2412 MHz - 2462 MHz (Wireless LAN)<br>U-NII-1 / 5180 MHz - 5320 MHz (IEEE 802.11a/n-20/ac-20)<br>U-NII-2A: 5190 MHz - 5310 MHz (IEEE 802.11n-40/ac-40)<br>5210 MHz - 5290 MHz (IEEE 802.11ac-80)<br>U-NII-2C: 5500 MHz - 5700 MHz (IEEE 802.11a/n-20/ac-20)<br>5510 MHz - 5670 MHz (IEEE 802.11n-40/ac-40)<br>5530 MHz (IEEE 802.11ac-80)<br>U-NII-3: 5745 MHz - 5825 MHz (IEEE 802.11a/n-20/ac-20)<br>5755 MHz - 5795 MHz (IEEE 802.11n-40/ac-40)<br>5775 MHz (IEEE 802.11ac-80) |
| Modulation                | : | DSSS (IEEE 802.11b), OFDM (IEEE 802.11g/n/a/ac)<br>FHSS (Bluetooth BDR/EDR), GFSK (Bluetooth Low Energy)                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Power Supply (inner)      | : | VBAT: DC 3.8 V (3.35 V - 4.2 V),<br>VIO: DC 1.8 V, DC 3.3 V (1.62 V - 3.63 V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Antenna type              | : | Pattern Antenna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Antenna Gain              | : | 2.4 GHz: -2.9 dBi<br>5 GHz: +1.3 dBi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Operating Temperature     | : | -10 deg. C to +40 deg. C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Clock frequency (Maximum) | : | 37.4 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on February 2, 2018 and effective March 5, 2018

Title : FCC 47CFR Part15 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 revisions made after testing date do not affect the test specification applied to the EUT.

### **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>IC: RSS-Gen 8.8 | FCC: Section 15.207<br>IC: RSS-Gen 8.8                                  | 33.1 dB<br>0.17900 MHz, N and L1, AV<br>BT 3DH5 2402 MHz                                                                                   | Complied | -                                               |
| Carrier Frequency Separation             | FCC: FCC Public Notice<br>DA 00-705<br>IC: -                         | FCC: Section15.247(a)(1)<br>IC: RSS-247 5.1 (b)                         | See data.                                                                                                                                  | Complied | Conducted                                       |
| 20dB Bandwidth                           | FCC: FCC Public Notice<br>DA 00-705<br>IC: -                         | FCC: Section15.247(a)(1)<br>IC: RSS-247 5.1 (a)                         |                                                                                                                                            | Complied | Conducted                                       |
| Number of Hopping Frequency              | FCC: FCC Public Notice<br>DA 00-705<br>IC: -                         | FCC: Section15.247(a)(1)(iii)<br>IC: RSS-247 5.1 (d)                    |                                                                                                                                            | Complied | Conducted                                       |
| Dwell time                               | FCC: FCC Public Notice<br>DA 00-705<br>IC: -                         | FCC: Section15.247(a)(1)(iii)<br>IC: RSS-247 5.1 (d)                    |                                                                                                                                            | Complied | Conducted                                       |
| Maximum Peak Output Power                | FCC: FCC Public Notice<br>DA 00-705<br>IC: RSS-Gen 6.12              | FCC: Section15.247(a)(b)(1)<br>IC: RSS-247 5.4 (b)                      |                                                                                                                                            | Complied | Conducted                                       |
| Spurious Emission & Band Edge Compliance | FCC: FCC Public Notice<br>DA 00-705<br>IC: RSS-Gen 6.13              | FCC: Section15.247(d)<br>IC: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 10.7 dB<br>9920.00 MHz, AV, Vert.,<br>Tx, Hopping Off, DH5 2480<br>MHz<br><br>9920.00 MHz, AV, Hori.,<br>Tx, Hopping Off, 3DH5 2480<br>MHz | Complied | Conducted/<br>Radiated<br>(above 30 MHz)<br>*1) |

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

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

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

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

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC 3.8 V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

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

The antenna is not removable from the EUT. 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 | IC: RSS-Gen 6.6 | IC: -         | N/A          | -       | Conducted |

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

### 3.4 Uncertainty

#### EMI

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

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| Item                                             | Frequency range | Uncertainty (+/-) |                |                |                |              |
|--------------------------------------------------|-----------------|-------------------|----------------|----------------|----------------|--------------|
|                                                  |                 | No. 1 SAC / SR    | No. 2 SAC / SR | No. 3 SAC / SR | No. 4 SAC / SR | No. 5,6,8 SR |
| Conducted emission (AC Mains) LISN               | 150 kHz-30 MHz  | 2.5 dB            | 2.5 dB         | 2.6 dB         | 2.6 dB         | 2.6 dB       |
| Radiated emission<br>(Measurement distance: 3 m) | 30 MHz-200 MHz  | 4.3 dB            | 4.3 dB         | 4.3 dB         | -              | -            |
|                                                  | 200 MHz-1 GHz   | 5.9 dB            | 5.9 dB         | 5.9 dB         | -              | -            |
|                                                  | 1 GHz-6 GHz     | 4.7 dB            | 4.7 dB         | 4.7 dB         | -              | -            |
|                                                  | 6 GHz-18 GHz    | 5.3 dB            | 5.3 dB         | 5.3 dB         | -              | -            |
|                                                  | 18 GHz-40 GHz   | 5.6 dB            | 5.6 dB         | 5.6 dB         | -              | -            |
| Radiated emission<br>(Measurement distance: 1 m) | 13 GHz-18 GHz   | 5.6 dB            | 5.6 dB         | 5.6 dB         | -              | -            |
|                                                  | 18 GHz-40 GHz   | 5.9 dB            | 5.9 dB         | 5.9 dB         | -              | -            |

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

| Antenna terminal test                                   | Uncertainty (+/-) |
|---------------------------------------------------------|-------------------|
| Power Measurement above 1 GHz (Average Detector)_SPM-06 | 0.72 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-06    | 0.85 dB           |
| Power Measurement above 1 GHz (Average Detector)_SPM-07 | 0.74 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-07    | 0.91 dB           |
| Spurious emission (Conducted) below 1GHz                | 1.6 dB            |
| Spurious emission (Conducted) 1 GHz-3 GHz               | 1.3 dB            |
| Spurious emission (Conducted) 3 GHz-18 GHz              | 2.2 dB            |
| Spurious emission (Conducted) 18 GHz-26.5 GHz           | 2.3 dB            |
| Spurious emission (Conducted) 26.5 GHz-40 GHz           | 2.4 dB            |
| Bandwidth Measurement                                   | 1.01 %            |
| Duty cycle and Time Measurement                         | 0.012 %           |

#### Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

#### Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

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### 3.5 Test Location

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JAB Accreditation No. RTL02610  
FCC Test Firm Registration Number: 839876

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

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

Refer to APPENDIX.

## **SECTION 4: Operation of E.U.T. during testing**

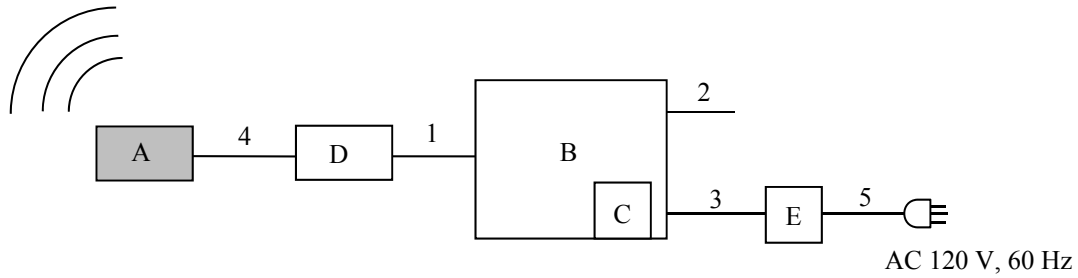
### **4.1 Operating Mode(s)**

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

Details of Operating Mode(s)

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Mode                                                    | Tested frequency                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------|
| Conducted Emission,<br>Spurious Emission<br>(Conducted/Radiated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Tx (Hopping Off) DH5, 3DH5                              | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Carrier Frequency Separation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tx (Hopping On) DH5, 3DH5                               | 2402 MHz<br>2441 MHz<br>2480 MHz |
| 20dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Tx (Hopping Off) DH5, 3DH5                              | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Number of Hopping Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tx (Hopping On) DH5, 3DH5                               | -                                |
| Dwell time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Tx (Hopping On),<br>-DH1, DH3, DH5<br>-3DH1, 3DH3, 3DH5 | -                                |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Tx (Hopping Off) DH5, 2DH5, 3DH5                        | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Band Edge Compliance<br>(Conducted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Tx DH5, 3DH5<br>-Hopping On<br>-Hopping Off             | 2402 MHz<br>2480 MHz             |
| 99% Occupied Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Tx DH5, 3DH5<br>-Hopping On<br>-Hopping Off             | 2402 MHz<br>2441 MHz<br>2480 MHz |
| <p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows;<br/>Power settings: Fixed<br/>Software: Bluetooth version: 1.9.6.5<br/>*This setting of software is the worst case.<br/>Any conditions under the normal use do not exceed the condition of setting.<br/>In addition, end users cannot change the settings of the output power of the product.</p> |                                                         |                                  |

## 4.2 Configuration and peripherals



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

### Description of EUT and Support equipment

| No. | Item                          | Model number     | Serial number | Manufacturer        | Remark |
|-----|-------------------------------|------------------|---------------|---------------------|--------|
| A   | Wireless LAN/Bluetooth Module | S080WIFI-PCA     | 5             | OLYMPUS CORPORATION | EUT    |
| B   | Jig Board                     | T3050TB          | -             | OLYMPUS CORPORATION | -      |
| C   | SD Card                       | SD-K08G          | 1572 CS00156  | TOSHIBA             | -      |
| D   | UART – USB Conversion Board   | T3050 UART - USB | -             | OLYMPUS CORPORATION | -      |
| E   | Power Supply(DC)              | PAN35-10A        | NA000955      | Kikusui             | -      |

### List of cables used

| No. | Name   | Length (m) | Shield     |            | Remark |
|-----|--------|------------|------------|------------|--------|
|     |        |            | Cable      | Connector  |        |
| 1   | Signal | 0.2        | Unshielded | Unshielded | -      |
| 2   | DC     | 0.3        | Unshielded | Unshielded | -      |
| 3   | DC     | 1.5        | Unshielded | Unshielded | -      |
| 4   | Signal | 0.2        | Unshielded | Unshielded | -      |
| 5   | AC     | 1.8        | Unshielded | Unshielded | -      |

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

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) and excess AC cable was bundled in center.

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

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Shielded room. 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>              |

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

### **Test Procedure**

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]

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

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### **Test Antennas are used as below;**

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

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

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

|                 |               |                                                         |                              |                                                         |
|-----------------|---------------|---------------------------------------------------------|------------------------------|---------------------------------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz                                             |                              | 20 dBc                                                  |
| Instrument used | Test Receiver | Spectrum Analyzer                                       |                              | Spectrum Analyzer                                       |
| Detector        | QP            | PK                                                      | AV                           | PK                                                      |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz                                | RBW: 1 MHz<br>VBW: 10 Hz *1) | RBW: 100 kHz<br>VBW: 300 kHz                            |
| Test Distance   | 3 m           | 3.99 m*2) (1 GHz – 13 GHz),<br>1 m*3) (13 GHz – 40 GHz) |                              | 3.99 m*2) (1 GHz – 13 GHz),<br>1 m*3) (13 GHz – 40 GHz) |

\*1) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.

\*2) Distance Factor:  $20 \times \log(3.99 \text{ m}/3.0 \text{ m}) = 2.47 \text{ dB}$

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m}/3.0 \text{ m}) = -9.54 \text{ dB}$

- 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.

| Antenna polarization | Carrier | Spurious (Below 1 GHz) | Spurious (1 GHz -2.8 GHz) | Spurious (2.8 GHz -13 GHz) | Spurious (13 GHz -26.5 GHz) |
|----------------------|---------|------------------------|---------------------------|----------------------------|-----------------------------|
| Horizontal           | Z       | Z                      | Z                         | Z                          | X                           |
| Vertical             | Y       | Z                      | Y                         | Y                          | X                           |

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

Measurement range : 30 MHz – 26.5 GHz  
 Test data : APPENDIX  
 Test result : Pass

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

### **Test Procedure**

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

| Test                                             | Span                                    | RBW             | VBW                | Sweep time                                                     | Detector         | Trace       | Instrument used                |
|--------------------------------------------------|-----------------------------------------|-----------------|--------------------|----------------------------------------------------------------|------------------|-------------|--------------------------------|
| 20dB Bandwidth                                   | 3 MHz                                   | 30 kHz          | 100 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer              |
| 99% Occupied Bandwidth *1)                       | Enough width to display emission skirts | 1 to 5 % of OBW | Three times of RBW | Auto                                                           | Sample           | Max Hold    | Spectrum Analyzer              |
| Maximum Peak Output Power                        | -                                       | -               | -                  | Auto                                                           | Peak Average *2) | -           | Power Meter (Sensor: 50MHz BW) |
| Carrier Frequency Separation                     | 3 MHz                                   | 100 kHz         | 300 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer              |
| Number of Hopping Frequency                      | 30 MHz                                  | 300 kHz         | 1 MHz              | 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)                  | 9 kHz to 150 kHz                        | 200 Hz          | 620 Hz             | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer              |
|                                                  | 150 kHz to 30 MHz                       | 10 kHz          | 30 kHz             |                                                                |                  |             |                                |
|                                                  | 30 MHz to 25 GHz                        | 100 kHz         | 300 kHz            |                                                                |                  |             |                                |
| Conducted Spurious Emission Band Edge compliance | 10 MHz                                  | 100 kHz         | 300 kHz            | Auto                                                           | Peak             | Max Hold    | Spectrum Analyzer              |

\*1) Max 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.

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

**Test data** : APPENDIX  
**Test result** : Pass

## APPENDIX 1: Test data

### Conducted Emission

#### DATA OF CONDUCTED EMISSION TEST

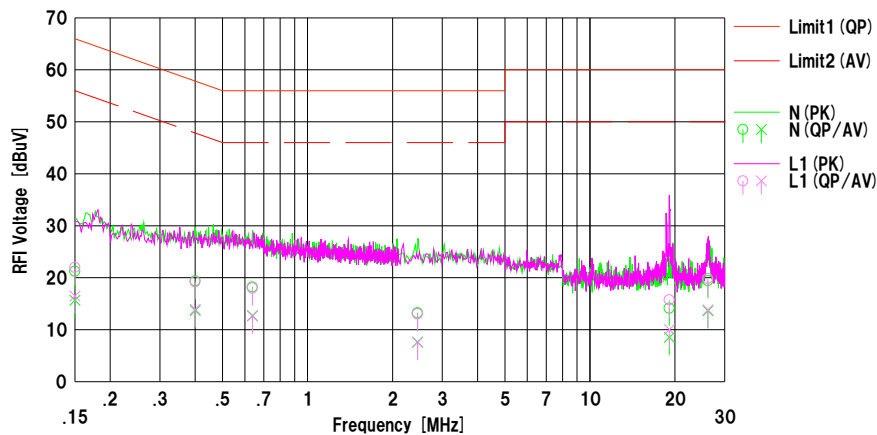
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2017/11/22

Mode : BT.DH5.2402MHz  
Power : AC 120 V / 60 Hz  
Temp./Humi. : 20 deg.C / 42 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

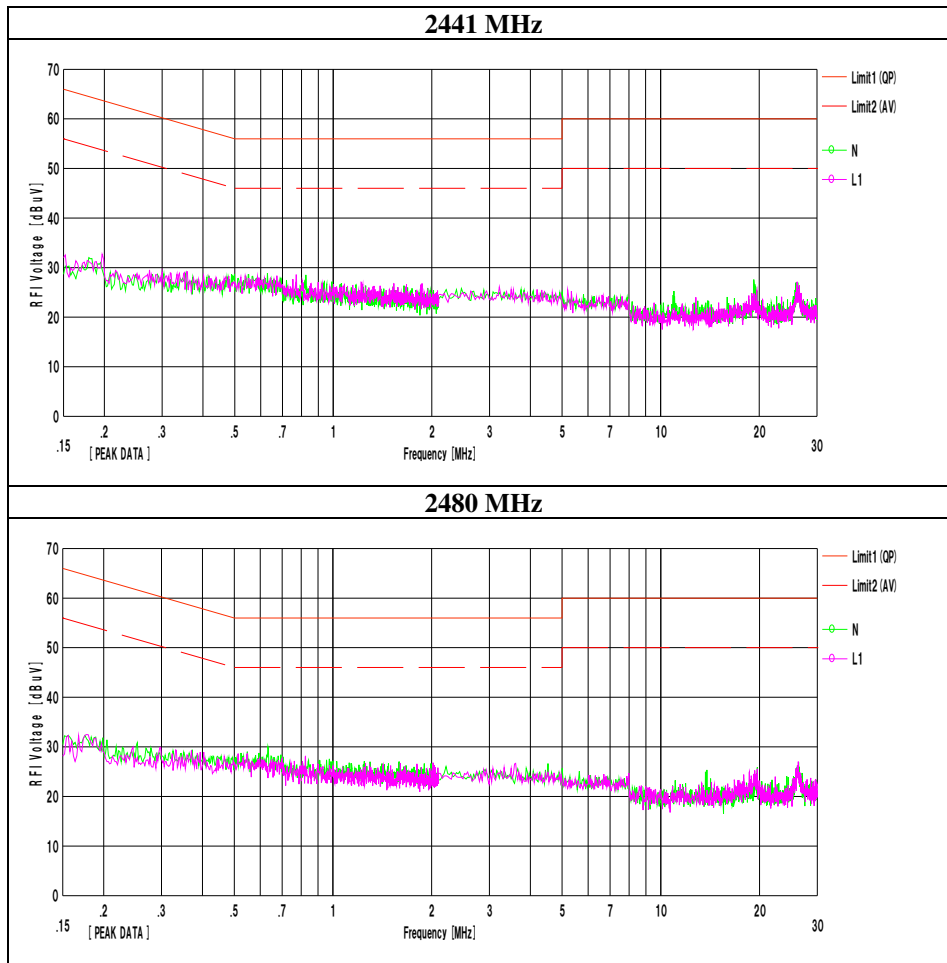
Engineer : Kazutaka Takeyama



| No. | Freq.<br>[MHz] | Reading        |                | C.Fac | 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        | 8.80           | 3.20           | 12.46 | 21.26          | 15.66          | 66.00          | 56.00          | 44.7         | 40.3         | N     |         |
| 2   | 0.40000        | 6.90           | 1.20           | 12.50 | 19.40          | 13.70          | 57.85          | 47.85          | 38.4         | 34.1         | N     |         |
| 3   | 0.63800        | 5.70           | 0.20           | 12.52 | 18.22          | 12.72          | 56.00          | 46.00          | 37.7         | 33.2         | N     |         |
| 4   | 2.45200        | 0.60           | -5.00          | 12.64 | 13.24          | 7.64           | 56.00          | 46.00          | 42.7         | 38.3         | N     |         |
| 5   | 19.12100       | 0.60           | -5.00          | 13.53 | 14.13          | 8.53           | 60.00          | 50.00          | 45.8         | 41.4         | N     |         |
| 6   | 26.19000       | 5.60           | -0.20          | 13.84 | 19.44          | 13.64          | 60.00          | 50.00          | 40.5         | 36.3         | N     |         |
| 7   | 0.15000        | 9.50           | 4.00           | 12.46 | 21.96          | 16.46          | 66.00          | 56.00          | 44.0         | 39.5         | L1    |         |
| 8   | 0.40000        | 6.70           | 1.40           | 12.50 | 19.20          | 13.90          | 57.85          | 47.85          | 38.6         | 33.9         | L1    |         |
| 9   | 0.63800        | 5.50           | 0.10           | 12.52 | 18.02          | 12.62          | 56.00          | 46.00          | 37.9         | 33.3         | L1    |         |
| 10  | 2.45200        | 0.40           | -5.10          | 12.64 | 13.04          | 7.54           | 56.00          | 46.00          | 42.9         | 38.4         | L1    |         |
| 11  | 19.12100       | 2.20           | -3.50          | 13.53 | 15.73          | 10.03          | 60.00          | 50.00          | 44.2         | 39.9         | L1    |         |
| 12  | 26.19000       | 6.00           | 0.00           | 13.84 | 19.84          | 13.84          | 60.00          | 50.00          | 40.1         | 36.1         | L1    |         |

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]  
LISN (AMN) = SLS-03

## Conducted Emission



## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

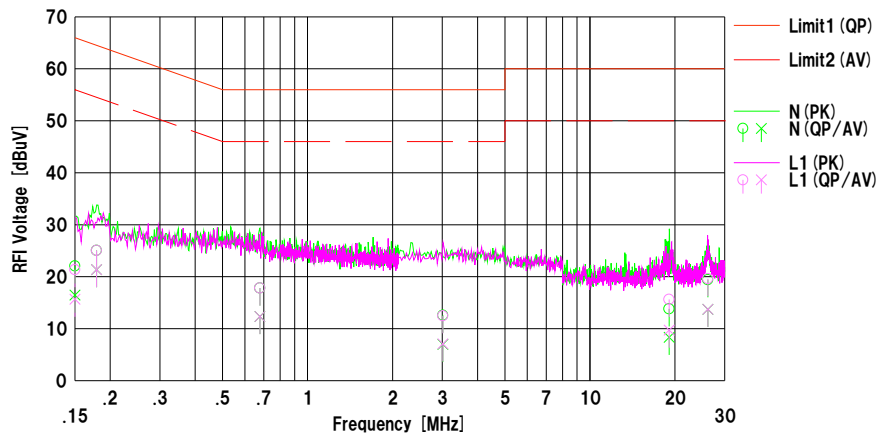
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2017/11/22

Mode : BT\_3DH5\_2402MHz  
Power : AC 120 V / 60 Hz  
Temp./Humi. : 20 deg.C / 42 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

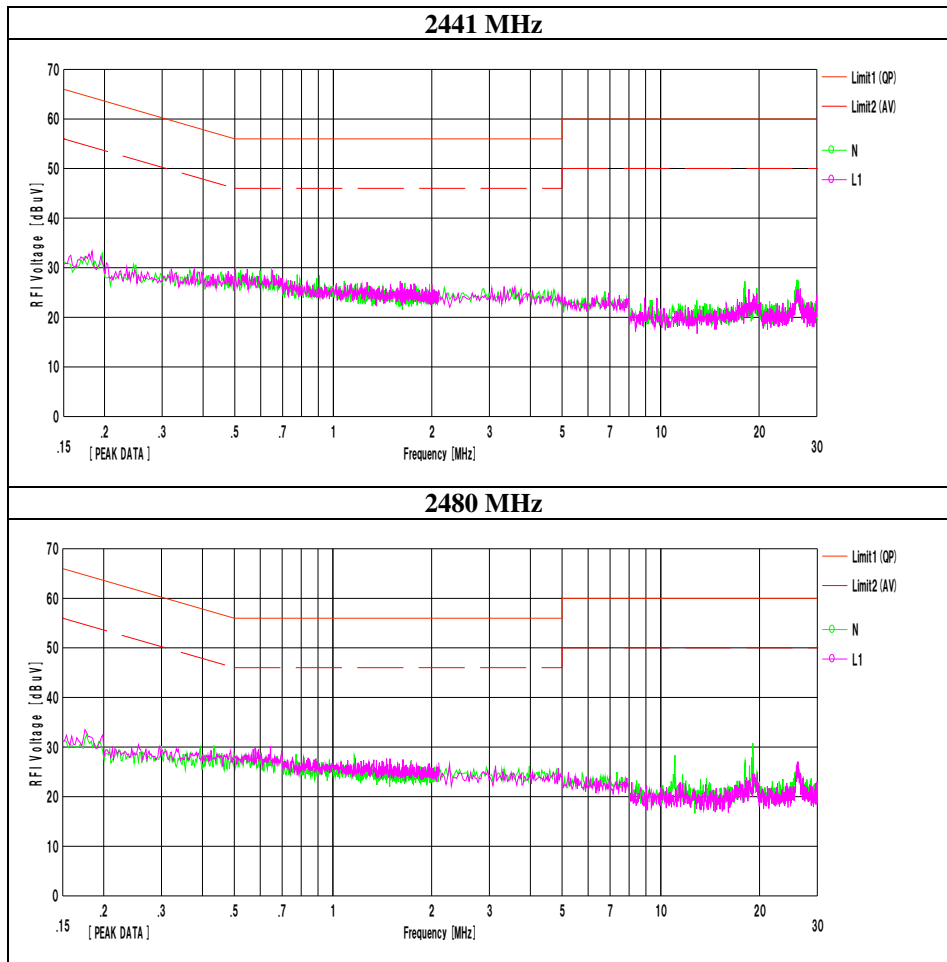
Engineer : Kazutaka Takeyama



| No. | Freq.<br>[MHz] | Reading        |                | C.Fac | 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        | 9.60           | 4.00           | 12.46 | 22.06          | 16.46          | 66.00          | 56.00          | 43.9         | 39.5         | N     |         |
| 2   | 0.17900        | 12.60          | 8.90           | 12.46 | 25.06          | 21.36          | 64.53          | 54.53          | 39.4         | 33.1         | N     |         |
| 3   | 0.67800        | 5.30           | -0.20          | 12.53 | 17.83          | 12.33          | 56.00          | 46.00          | 38.1         | 33.6         | N     |         |
| 4   | 3.01700        | -0.10          | -5.70          | 12.69 | 12.59          | 6.99           | 56.00          | 46.00          | 43.4         | 39.0         | N     |         |
| 5   | 19.08500       | 0.30           | -5.20          | 13.53 | 13.83          | 8.33           | 60.00          | 50.00          | 46.1         | 41.6         | N     |         |
| 6   | 26.16200       | 5.60           | -0.10          | 13.83 | 19.43          | 13.73          | 60.00          | 50.00          | 40.5         | 36.2         | N     |         |
| 7   | 0.15000        | 8.90           | 3.20           | 12.46 | 21.36          | 15.66          | 66.00          | 56.00          | 44.6         | 40.3         | L1    |         |
| 8   | 0.17900        | 12.60          | 8.90           | 12.46 | 25.06          | 21.36          | 64.53          | 54.53          | 39.4         | 33.1         | L1    |         |
| 9   | 0.67800        | 5.30           | -0.20          | 12.53 | 17.83          | 12.33          | 56.00          | 46.00          | 38.1         | 33.6         | L1    |         |
| 10  | 3.01700        | -0.20          | -5.60          | 12.69 | 12.49          | 7.09           | 56.00          | 46.00          | 43.5         | 38.9         | L1    |         |
| 11  | 19.08500       | 2.10           | -3.80          | 13.53 | 15.63          | 9.73           | 60.00          | 50.00          | 44.3         | 40.2         | L1    |         |
| 12  | 26.16200       | 5.80           | -0.10          | 13.83 | 19.63          | 13.73          | 60.00          | 50.00          | 40.3         | 36.2         | L1    |         |

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]  
LISN (AMN) = SLS-03

## Conducted Emission



**UL Japan, Inc.**

**Shonan EMC Lab.**

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

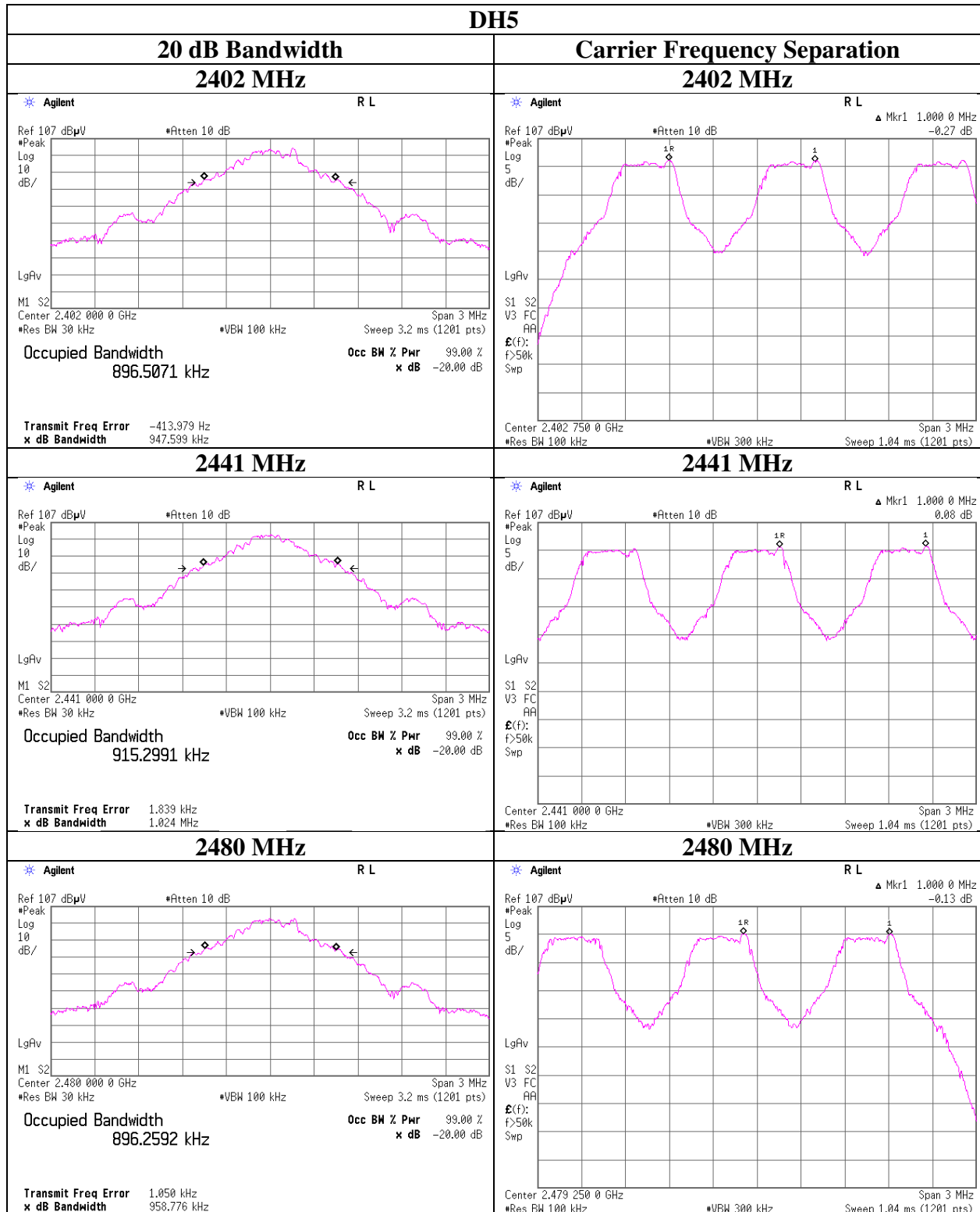
|                        |                                    |                    |
|------------------------|------------------------------------|--------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                    |
| Report No.             | 11834855S-B-R1                     |                    |
| Date                   | November 16, 2017                  | November 20, 2017  |
| Temperature / Humidity | 26deg. C / 37 % RH                 | 24deg. C / 31 % RH |
| Engineer               | Makoto Hosaka                      | Shiro Kobayashi    |
| Mode                   | Tx, Hopping Off                    |                    |

| Mode | Freq.<br>[MHz] | 20dB Bandwidth<br>[MHz] | 99% Occupied<br>Bandwidth<br>[kHz] | Carrier Frequency<br>Separation<br>[MHz] | Limit for Carrier<br>Frequency separation<br>[MHz] |
|------|----------------|-------------------------|------------------------------------|------------------------------------------|----------------------------------------------------|
| DH5  | 2402.0         | 0.948                   | 900.600                            | 1.000                                    | $\geq 0.632$                                       |
| DH5  | 2441.0         | 1.024                   | 901.300                            | 1.000                                    | $\geq 0.683$                                       |
| DH5  | 2480.0         | 0.959                   | 905.000                            | 1.000                                    | $\geq 0.639$                                       |
| DH5  | Hopping On     | -                       | 78623.100                          | -                                        | -                                                  |
| 3DH5 | 2402.0         | 1.312                   | 1210.700                           | 1.000                                    | $\geq 0.875$                                       |
| 3DH5 | 2441.0         | 1.313                   | 1213.900                           | 1.000                                    | $\geq 0.875$                                       |
| 3DH5 | 2480.0         | 1.314                   | 1213.000                           | 1.000                                    | $\geq 0.876$                                       |
| 3DH5 | Hopping On     | -                       | 78750.800                          | -                                        | -                                                  |

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

No limit applies to 20dB Bandwidth.

## 20dB Bandwidth and Carrier Frequency Separation



**UL Japan, Inc.**

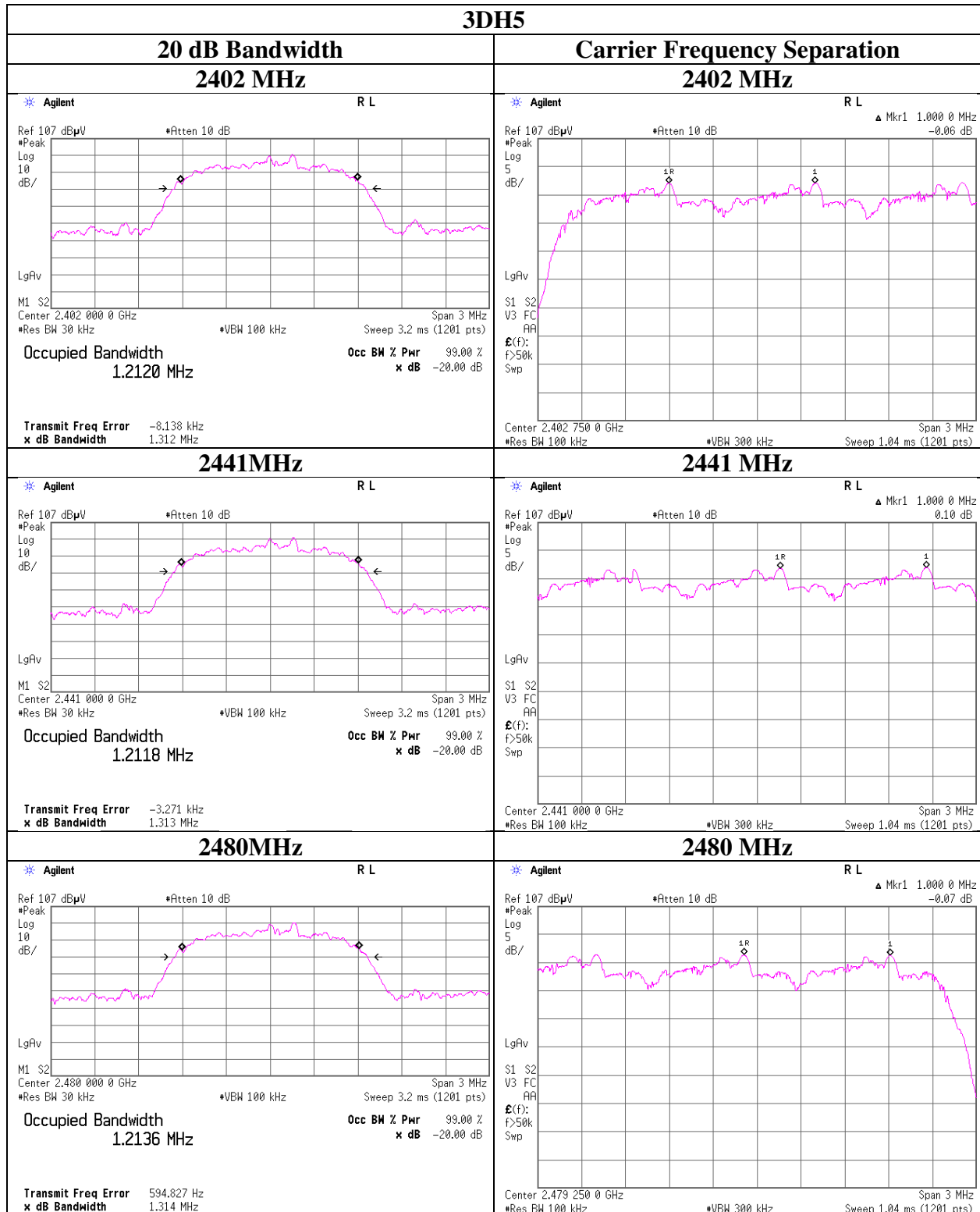
**Shonan EMC Lab.**

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## 20dB Bandwidth and Carrier Frequency Separation



**UL Japan, Inc.**

**Shonan EMC Lab.**

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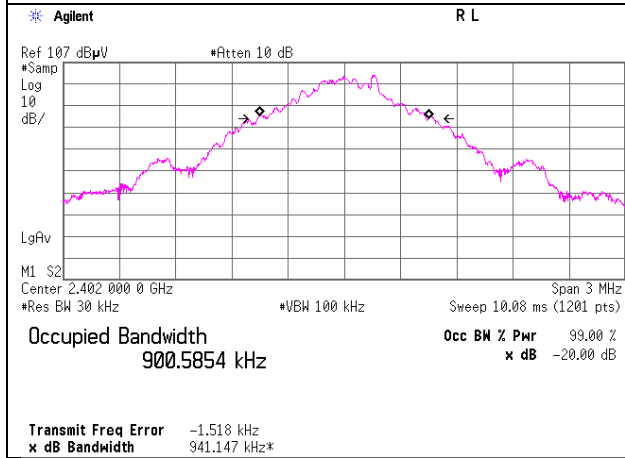
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## 99% Occupied Bandwidth

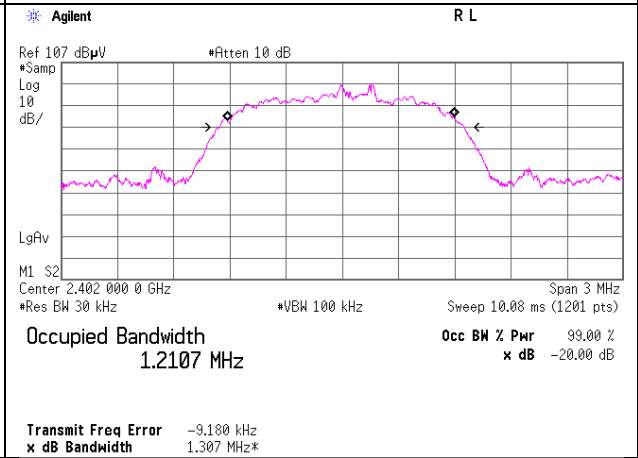
### Hopping Off, DH5

**2402 MHz**

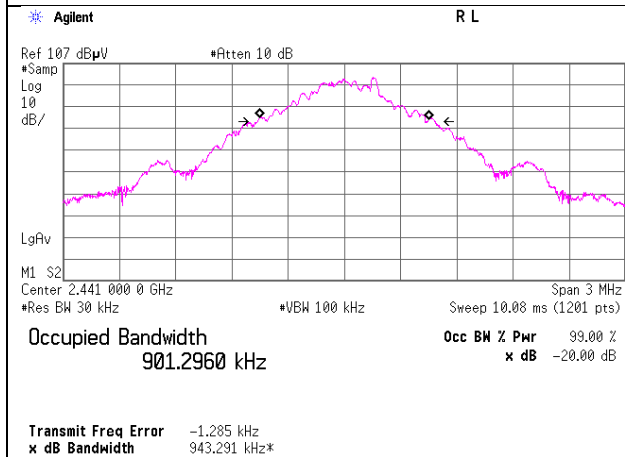


### Hopping Off, 3DH5

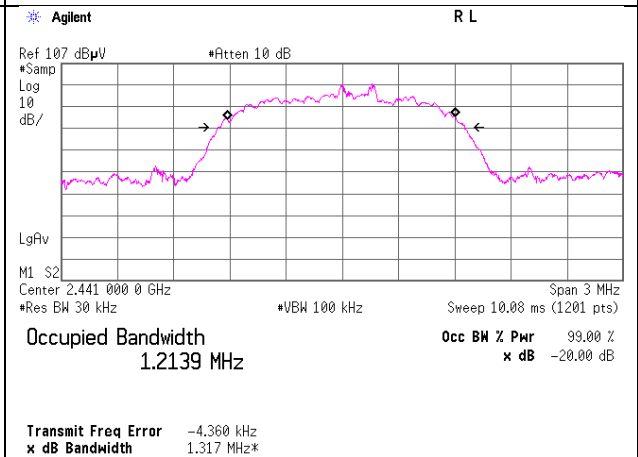
**2402 MHz**



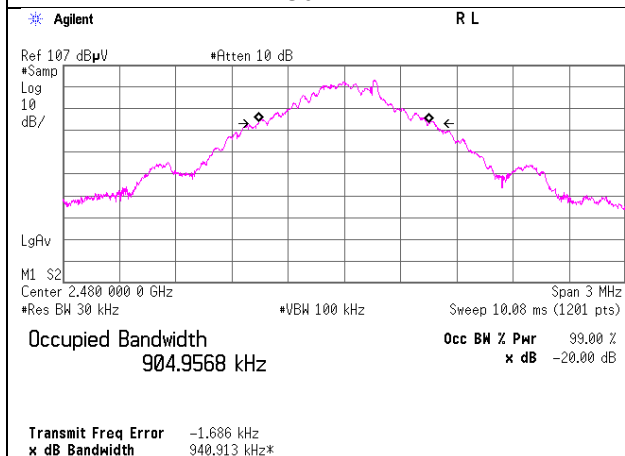
**2441 MHz**



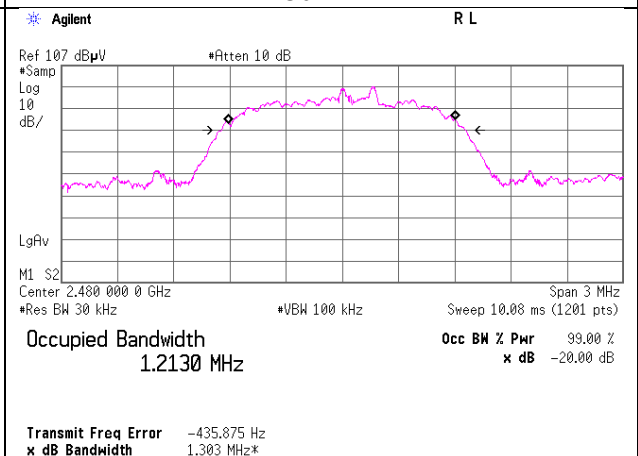
**2441 MHz**



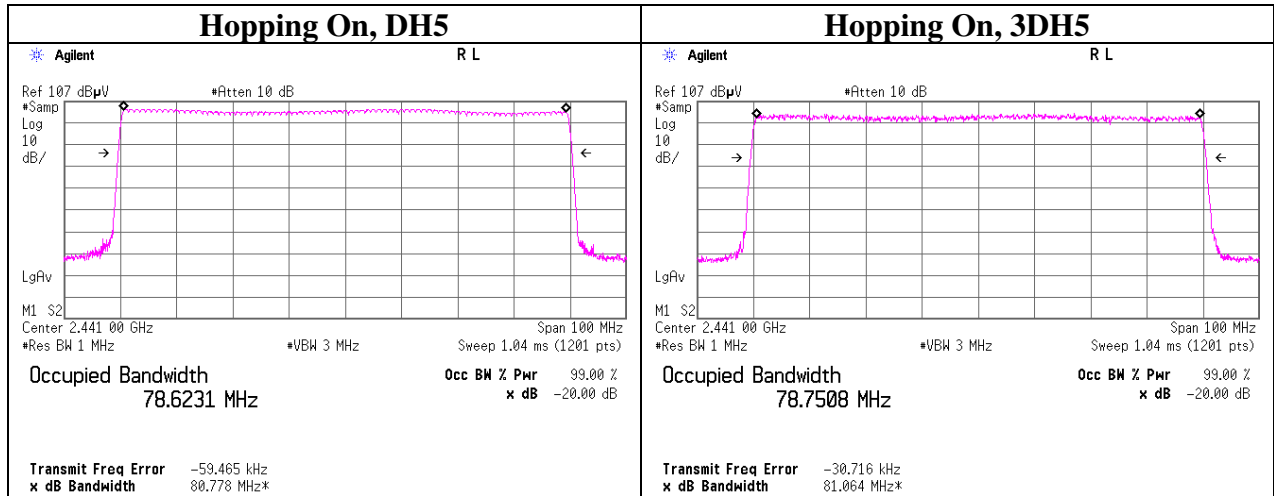
**2480 MHz**



**2480 MHz**



## 99% Occupied Bandwidth



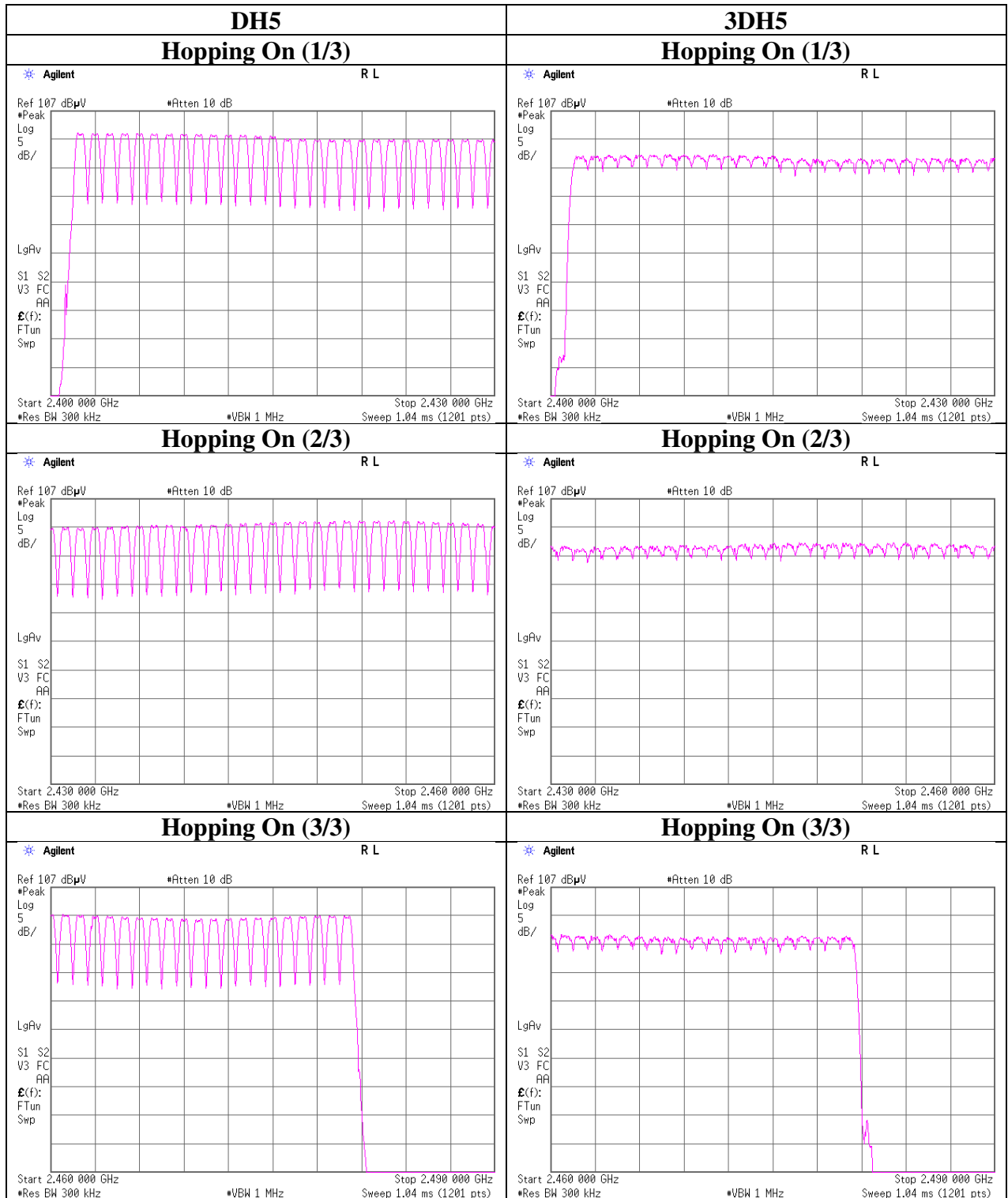
### **Number of Hopping Frequency**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11834855S-B-R1  
Date November 20, 2017  
Temperature / Humidity 24deg. C / 31 % RH  
Engineer Shiro Kobayashi  
Mode Tx, Hopping On

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

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

## Number of Hopping Frequency



## Dwell time

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11834855S-B-R1                     |
| Date                   | November 20, 2017                  |
| Temperature / Humidity | 24deg. C / 31 % RH                 |
| Engineer               | Shiro Kobayashi                    |
| Mode                   | Tx, Hopping On                     |

| Mode | Number of transmission<br>in a 31.6(79 Hopping x 0.4)<br>/ 12.8 (32 Hopping x 0.4) second period |   |        |   |                       | Length of<br>transmission<br>[msec] | Result<br>[msec] | Limit<br>[msec] |
|------|--------------------------------------------------------------------------------------------------|---|--------|---|-----------------------|-------------------------------------|------------------|-----------------|
| DH1  | 49.2 times                                                                                       | / | 5 sec. | x | 31.6 sec. = 311 times | 0.423                               | 132              | 400             |
| DH3  | 22.8 times                                                                                       | / | 5 sec. | x | 31.6 sec. = 145 times | 1.680                               | 244              | 400             |
| DH5  | 21.2 times                                                                                       | / | 5 sec. | x | 31.6 sec. = 134 times | 2.931                               | 393              | 400             |
| 3DH1 | 50.8 times                                                                                       | / | 5 sec. | x | 31.6 sec. = 322 times | 0.429                               | 138              | 400             |
| 3DH3 | 23.4 times                                                                                       | / | 5 sec. | x | 31.6 sec. = 148 times | 1.685                               | 249              | 400             |
| 3DH5 | 16.0 times                                                                                       | / | 5 sec. | x | 31.6 sec. = 102 times | 2.937                               | 300              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission

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

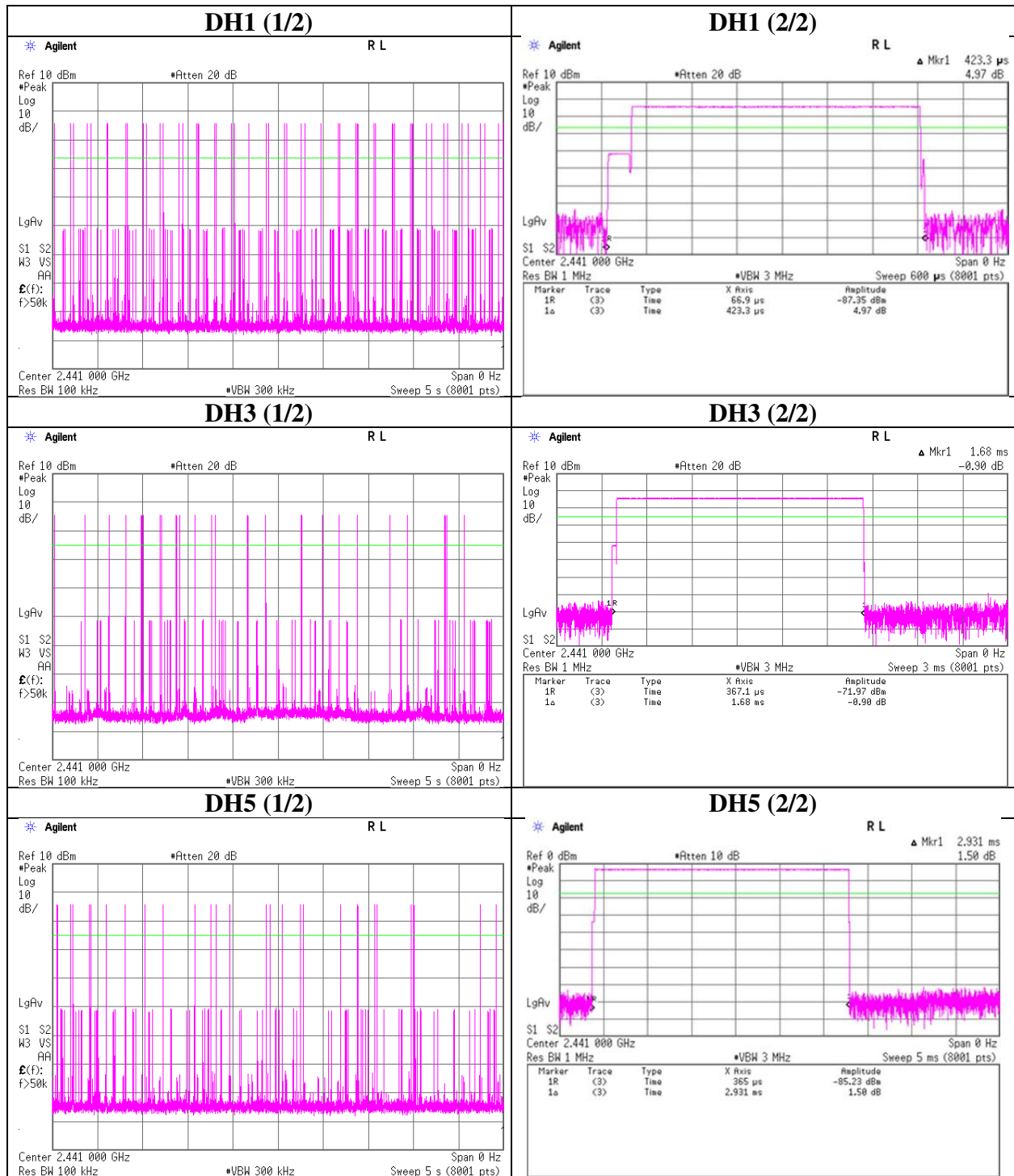
| Mode | Sampling [times] |    |    |    |    | Average<br>[times] |
|------|------------------|----|----|----|----|--------------------|
|      | 1                | 2  | 3  | 4  | 5  |                    |
| DH1  | 48               | 50 | 49 | 50 | 49 | 49.2               |
| DH3  | 23               | 26 | 20 | 21 | 24 | 22.8               |
| DH5  | 26               | 21 | 19 | 20 | 20 | 21.2               |
| 3DH1 | 51               | 51 | 51 | 50 | 51 | 50.8               |
| 3DH3 | 19               | 21 | 24 | 25 | 28 | 23.4               |
| 3DH5 | 16               | 14 | 13 | 19 | 18 | 16.0               |

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

## Dwell time



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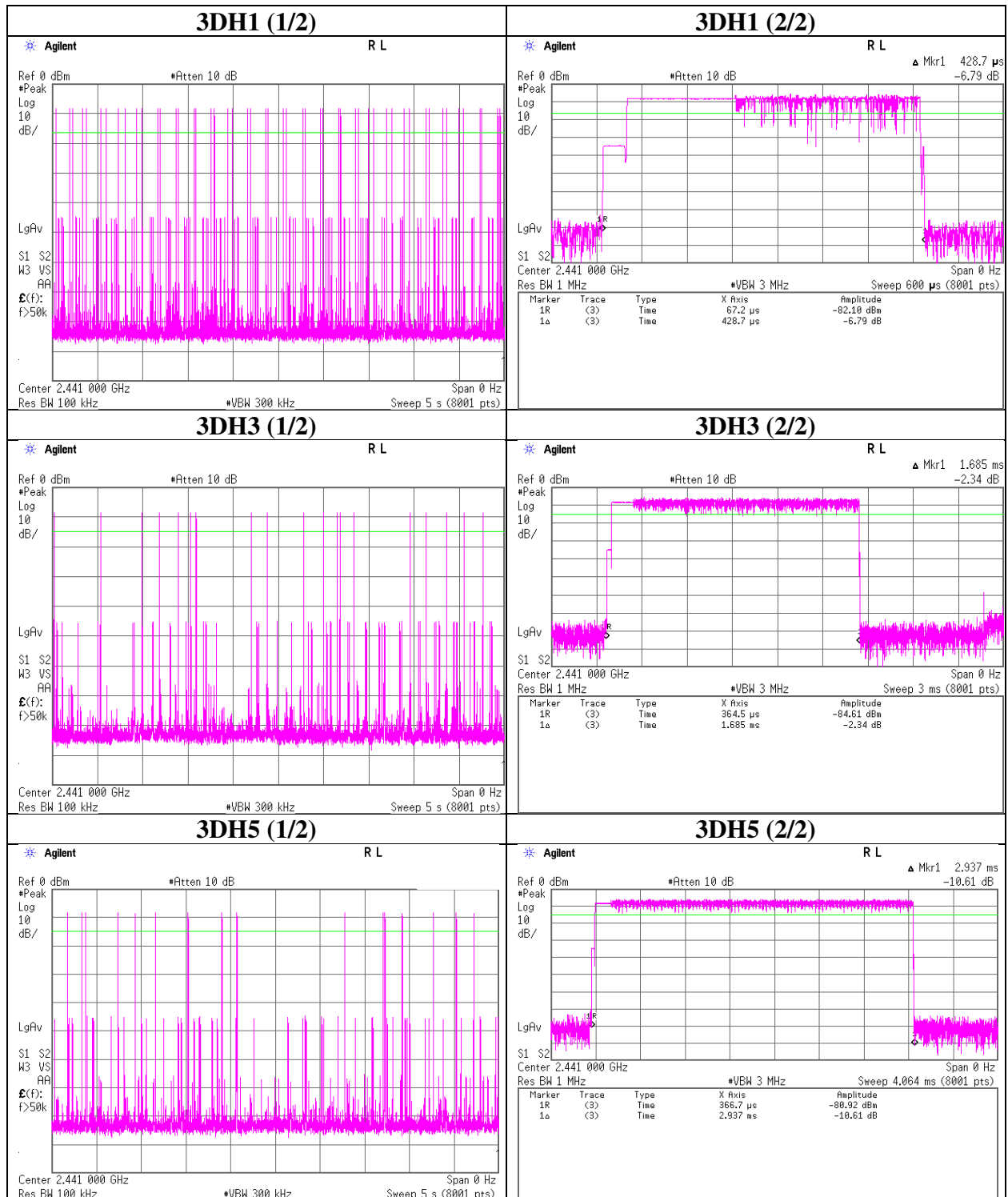
**Shonan EMC Lab.**

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Facsimile : +81 463 50 6401

## Dwell time



### **Maximum Peak Output Power**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11834855S-B-R1  
Date November 2, 2017  
Temperature / Humidity 22 deg. C / 41 % RH  
Engineer Makoto Hosaka  
Mode Tx, Hopping Off

| Mode | Freq.  | Reading | Cable Loss | Atten. Loss | Result |      | Limit |      | Margin |
|------|--------|---------|------------|-------------|--------|------|-------|------|--------|
|      | [MHz]  | [dBm]   | [dB]       | [dB]        | [dBm]  | [mW] | [dBm] | [mW] | [dB]   |
| DH5  | 2402.0 | -4.53   | 1.60       | 9.96        | 7.03   | 5.05 | 20.96 | 125  | 13.93  |
| DH5  | 2441.0 | -4.90   | 1.61       | 9.97        | 6.68   | 4.66 | 20.96 | 125  | 14.28  |
| DH5  | 2480.0 | -5.36   | 1.62       | 9.97        | 6.23   | 4.20 | 20.96 | 125  | 14.73  |
| 2DH5 | 2402.0 | -6.36   | 1.60       | 9.96        | 5.20   | 3.31 | 20.96 | 125  | 15.76  |
| 2DH5 | 2441.0 | -6.31   | 1.61       | 9.97        | 5.27   | 3.37 | 20.96 | 125  | 15.69  |
| 2DH5 | 2480.0 | -6.90   | 1.62       | 9.97        | 4.69   | 2.94 | 20.96 | 125  | 16.27  |
| 3DH5 | 2402.0 | -6.26   | 1.60       | 9.96        | 5.30   | 3.39 | 20.96 | 125  | 15.66  |
| 3DH5 | 2441.0 | -6.30   | 1.61       | 9.97        | 5.28   | 3.37 | 20.96 | 125  | 15.68  |
| 3DH5 | 2480.0 | -6.83   | 1.62       | 9.97        | 4.76   | 2.99 | 20.96 | 125  | 16.20  |

Sample Calculation:

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

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

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

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

**Average Output Power**  
**(Reference data for RF Exposure / SAR testing)**

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11834855S-B-R1                     |
| Date                   | November 2, 2017                   |
| Temperature / Humidity | 22 deg. C / 41 % RH                |
| Engineer               | Makoto Hosaka                      |
| Mode                   | Tx, Hopping Off                    |

| Mode | Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|------|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|      |                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| DH5  | 2402.0         | -5.86            | 1.60                  | 9.96                   | 5.70                     | 3.72 | 1.07                   | 6.77                            | 4.75 |
| DH5  | 2441.0         | -6.24            | 1.61                  | 9.97                   | 5.34                     | 3.42 | 1.07                   | 6.41                            | 4.38 |
| DH5  | 2480.0         | -6.73            | 1.62                  | 9.97                   | 4.86                     | 3.06 | 1.07                   | 5.93                            | 3.92 |
| 2DH5 | 2402.0         | -10.10           | 1.60                  | 9.96                   | 1.46                     | 1.40 | 1.07                   | 2.53                            | 1.79 |
| 2DH5 | 2441.0         | -10.02           | 1.61                  | 9.97                   | 1.56                     | 1.43 | 1.07                   | 2.63                            | 1.83 |
| 2DH5 | 2480.0         | -10.61           | 1.62                  | 9.97                   | 0.98                     | 1.25 | 1.07                   | 2.05                            | 1.60 |
| 3DH5 | 2402.0         | -10.14           | 1.60                  | 9.96                   | 1.42                     | 1.39 | 1.07                   | 2.49                            | 1.77 |
| 3DH5 | 2441.0         | -10.14           | 1.61                  | 9.97                   | 1.44                     | 1.39 | 1.07                   | 2.51                            | 1.78 |
| 3DH5 | 2480.0         | -10.64           | 1.62                  | 9.97                   | 0.95                     | 1.24 | 1.07                   | 2.02                            | 1.59 |

Sample Calculation:

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

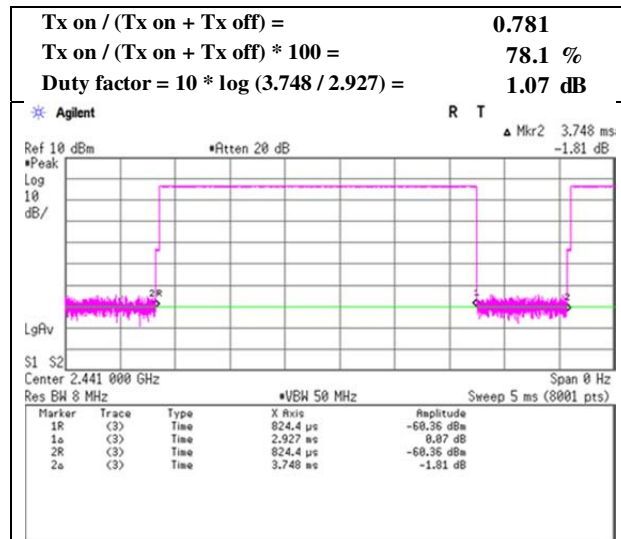
Result (Burst power average) = Time average + Duty factor

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

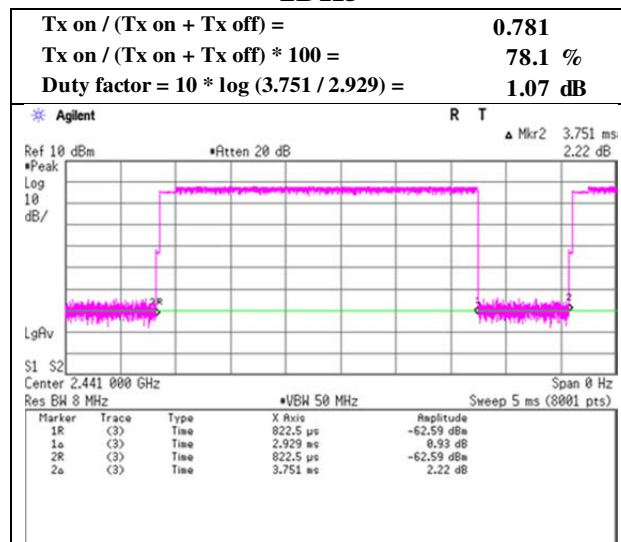
## Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11834855S-B-R1  
Date : November 20, 2017  
Temperature / Humidity : 24deg. C / 31 % RH  
Engineer : Shiro Kobayashi  
Mode : Tx, Hopping Off

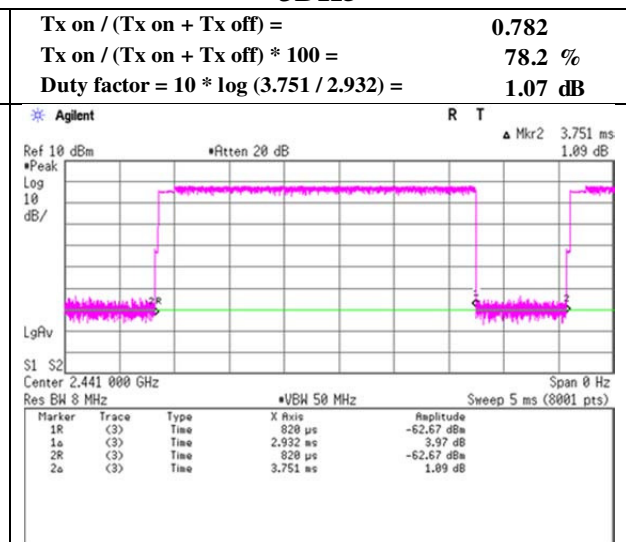
### DH5



### 2DH5



### 3DH5



## Radiated Spurious Emission

|                        |                               |                     |                     |
|------------------------|-------------------------------|---------------------|---------------------|
| Report No.             | 11834855S-B-R1                |                     |                     |
| Test place             | Shonan EMC Lab.               |                     |                     |
| Semi Anechoic Chamber  | No.1                          | No.1                | No.1                |
| Date                   | November 19, 2017             | November 17, 2017   | November 18, 2017   |
| Temperature / Humidity | 20 deg. C / 42 % RH           | 23 deg. C / 39 % RH | 21 deg. C / 30 % RH |
| Engineer               | Hiroyuki Morikawa             | Yosuke Ishikawa     | Shiro Kobayashi     |
|                        | (30 MHz -1 GHz)               | (1 GHz -13 GHz)     | (13 GHz -26.5 GHz)  |
| Mode                   | Tx, Hopping Off, DH5 2402 MHz |                     |                     |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 307.592         | QP       | 25.70          | 13.68           | 6.85      | 31.76     | 0.00                 | 14.47           | 46.00          | 31.5        | 100         | 107         |        |
| Hori.    | 337.517         | QP       | 30.60          | 14.36           | 7.10      | 31.75     | 0.00                 | 20.31           | 46.00          | 25.6        | 100         | 28          |        |
| Hori.    | 376.784         | QP       | 23.40          | 15.25           | 7.43      | 31.77     | 0.00                 | 14.31           | 46.00          | 31.6        | 100         | 166         |        |
| Hori.    | 533.027         | QP       | 28.80          | 18.18           | 8.33      | 31.93     | 0.00                 | 23.38           | 46.00          | 22.6        | 240         | 220         |        |
| Hori.    | 2390.000        | PK       | 45.67          | 27.14           | 14.23     | 40.85     | 2.47                 | 48.66           | 73.90          | 25.2        | 145         | 93          |        |
| Hori.    | 4804.000        | PK       | 45.49          | 31.13           | 6.79      | 41.86     | 2.47                 | 44.02           | 73.90          | 29.9        | 151         | 341         |        |
| Hori.    | 7206.000        | PK       | 45.28          | 36.35           | 8.41      | 41.18     | 2.47                 | 51.33           | 73.90          | 22.6        | 150         | 0           |        |
| Hori.    | 9608.000        | PK       | 44.69          | 38.11           | 9.48      | 40.59     | 2.47                 | 54.16           | 73.90          | 19.7        | 150         | 0           |        |
| Hori.    | 2390.000        | AV       | 33.27          | 27.14           | 14.23     | 40.85     | 2.47                 | 36.26           | 53.90          | 17.6        | 145         | 93          |        |
| Hori.    | 4804.000        | AV       | 34.05          | 31.13           | 6.79      | 41.86     | 2.47                 | 32.58           | 53.90          | 21.3        | 151         | 341         |        |
| Hori.    | 7206.000        | AV       | 33.20          | 36.35           | 8.41      | 41.18     | 2.47                 | 39.25           | 53.90          | 14.7        | 150         | 0           |        |
| Hori.    | 9608.000        | AV       | 32.27          | 38.11           | 9.48      | 40.59     | 2.47                 | 41.74           | 53.90          | 12.2        | 150         | 0           |        |
| Vert.    | 352.186         | QP       | 21.60          | 14.69           | 7.23      | 31.74     | 0.00                 | 11.78           | 46.00          | 34.2        | 100         | 0           |        |
| Vert.    | 464.404         | QP       | 22.70          | 17.01           | 7.98      | 31.85     | 0.00                 | 15.84           | 46.00          | 30.1        | 100         | 116         |        |
| Vert.    | 533.022         | QP       | 29.10          | 18.18           | 8.33      | 31.93     | 0.00                 | 23.68           | 46.00          | 22.3        | 102         | 105         |        |
| Vert.    | 2390.000        | PK       | 46.06          | 27.14           | 14.23     | 40.85     | 2.47                 | 49.05           | 73.90          | 24.9        | 248         | 135         |        |
| Vert.    | 4804.000        | PK       | 45.86          | 31.13           | 6.79      | 41.86     | 2.47                 | 44.39           | 73.90          | 29.5        | 149         | 7           |        |
| Vert.    | 7206.000        | PK       | 45.75          | 36.35           | 8.41      | 41.18     | 2.47                 | 51.80           | 73.90          | 22.1        | 150         | 0           |        |
| Vert.    | 9608.000        | PK       | 45.03          | 38.11           | 9.48      | 40.59     | 2.47                 | 54.50           | 73.90          | 19.4        | 150         | 0           |        |
| Vert.    | 2390.000        | AV       | 33.60          | 27.14           | 14.23     | 40.85     | 2.47                 | 36.59           | 53.90          | 17.3        | 248         | 135         |        |
| Vert.    | 4804.000        | AV       | 34.43          | 31.13           | 6.79      | 41.86     | 2.47                 | 32.96           | 53.90          | 20.9        | 149         | 7           |        |
| Vert.    | 7206.000        | AV       | 33.68          | 36.35           | 8.41      | 41.18     | 2.47                 | 39.73           | 53.90          | 14.2        | 150         | 0           |        |
| Vert.    | 9608.000        | AV       | 32.55          | 38.11           | 9.48      | 40.59     | 2.47                 | 42.02           | 53.90          | 11.9        | 150         | 0           |        |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.99 m / 3.0 m) = 2.47 dB

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

\* These results have sufficient margin without taking account Dwell time factor.

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2402.000        | PK       | 97.91          | 27.18           | 14.24     | 40.84     | 2.47                 | 100.96          | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 41.35          | 27.17           | 14.23     | 40.84     | 2.47                 | 44.38           | 80.96          | 36.6        |         |
| Vert.    | 2402.000        | PK       | 94.08          | 27.18           | 14.24     | 40.84     | 2.47                 | 97.13           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 38.64          | 27.17           | 14.23     | 40.84     | 2.47                 | 41.67           | 77.13          | 35.5        |         |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.99 m / 3.0 m) = 2.47 dB

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

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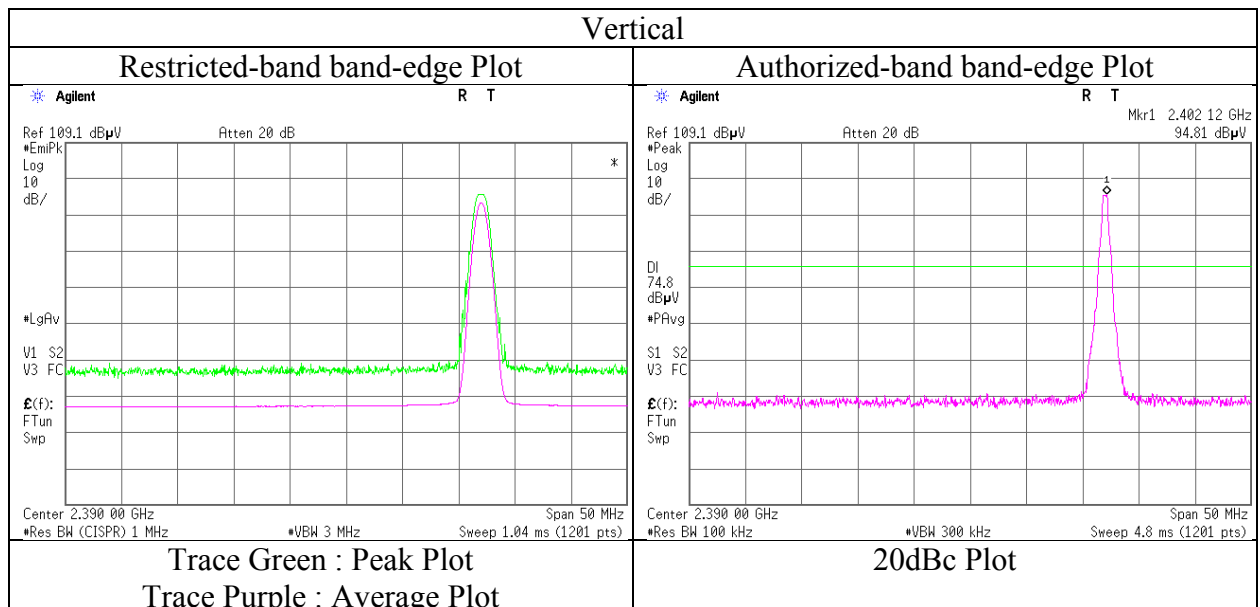
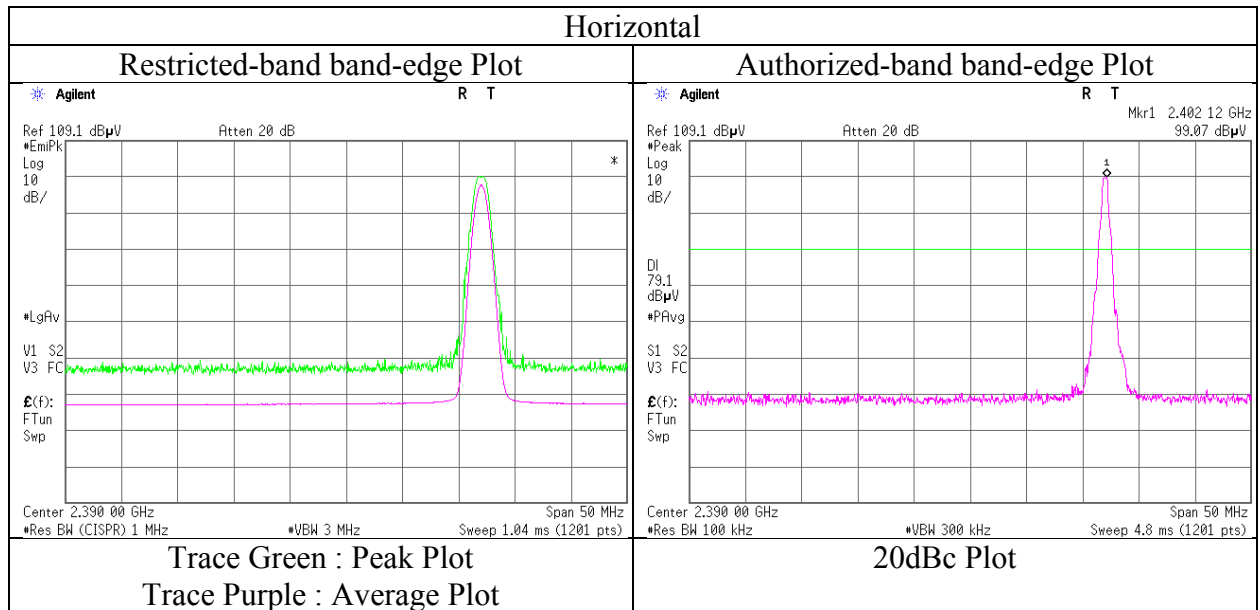
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 11834855S-B-R1                     |
| Test place             | Shonan EMC Lab.                    |
| Semi Anechoic Chamber  | No.1                               |
| Date                   | November 17, 2017                  |
| Temperature / Humidity | 23 deg. C / 39 % RH                |
| Engineer               | Yosuke Ishikawa<br>(1 GHz -13 GHz) |
| Mode                   | Tx, Hopping Off, DH5 2402 MHz      |



\* Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

|                        |                                      |                                    |                                       |
|------------------------|--------------------------------------|------------------------------------|---------------------------------------|
| Report No.             | 11834855S-B-R1                       |                                    |                                       |
| Test place             | Shonan EMC Lab.                      |                                    |                                       |
| Semi Anechoic Chamber  | No.1                                 | No.1                               | No.1                                  |
| Date                   | November 19, 2017                    | November 17, 2017                  | November 18, 2017                     |
| Temperature / Humidity | 20 deg. C / 42 % RH                  | 23 deg. C / 39 % RH                | 21 deg. C / 30 % RH                   |
| Engineer               | Hiroyuki Morikawa<br>(30 MHz -1 GHz) | Yosuke Ishikawa<br>(1 GHz -13 GHz) | Shiro Kobayashi<br>(13 GHz -26.5 GHz) |
| Mode                   | Tx, Hopping Off, DH5 2441 MHz        |                                    |                                       |

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 307.534            | QP       | 25.40             | 13.68              | 6.84         | 31.76        | 0.00                    | 14.16              | 46.00             | 31.8           | 100            | 113            |        |
| Hori.    | 337.520            | QP       | 31.70             | 14.36              | 7.10         | 31.75        | 0.00                    | 21.41              | 46.00             | 24.5           | 100            | 189            |        |
| Hori.    | 376.660            | QP       | 23.70             | 15.24              | 7.43         | 31.77        | 0.00                    | 14.60              | 46.00             | 31.4           | 100            | 167            |        |
| Hori.    | 533.021            | QP       | 29.50             | 18.18              | 8.33         | 31.93        | 0.00                    | 24.08              | 46.00             | 21.9           | 202            | 219            |        |
| Hori.    | 4882.000           | PK       | 46.17             | 31.31              | 6.87         | 41.76        | 2.47                    | 45.06              | 73.90             | 28.8           | 151            | 335            |        |
| Hori.    | 7323.000           | PK       | 46.57             | 36.51              | 8.57         | 41.27        | 2.47                    | 52.85              | 73.90             | 21.1           | 150            | 0              |        |
| Hori.    | 9764.000           | PK       | 45.11             | 38.37              | 9.60         | 40.62        | 2.47                    | 54.93              | 73.90             | 19.0           | 150            | 0              |        |
| Hori.    | 4882.000           | AV       | 33.88             | 31.31              | 6.87         | 41.76        | 2.47                    | 32.77              | 53.90             | 21.1           | 151            | 335            |        |
| Hori.    | 7323.000           | AV       | 34.10             | 36.51              | 8.57         | 41.27        | 2.47                    | 40.38              | 53.90             | 13.5           | 150            | 0              |        |
| Hori.    | 9764.000           | AV       | 32.67             | 38.37              | 9.60         | 40.62        | 2.47                    | 42.49              | 53.90             | 11.4           | 150            | 0              |        |
| Vert.    | 337.519            | QP       | 27.10             | 14.36              | 7.10         | 31.75        | 0.00                    | 16.81              | 46.00             | 29.1           | 157            | 225            |        |
| Vert.    | 463.580            | QP       | 22.70             | 17.00              | 7.98         | 31.85        | 0.00                    | 15.83              | 46.00             | 30.1           | 100            | 101            |        |
| Vert.    | 533.017            | QP       | 27.80             | 18.18              | 8.33         | 31.93        | 0.00                    | 22.38              | 46.00             | 23.6           | 100            | 106            |        |
| Vert.    | 4882.000           | PK       | 45.32             | 31.31              | 6.87         | 41.76        | 2.47                    | 44.21              | 73.90             | 29.7           | 152            | 2              |        |
| Vert.    | 7323.000           | PK       | 46.34             | 36.51              | 8.57         | 41.27        | 2.47                    | 52.62              | 73.90             | 21.3           | 150            | 0              |        |
| Vert.    | 9764.000           | PK       | 44.88             | 38.37              | 9.60         | 40.62        | 2.47                    | 54.70              | 73.90             | 19.2           | 150            | 0              |        |
| Vert.    | 4882.000           | AV       | 34.08             | 31.31              | 6.87         | 41.76        | 2.47                    | 32.97              | 53.90             | 20.9           | 152            | 2              |        |
| Vert.    | 7323.000           | AV       | 34.36             | 36.51              | 8.57         | 41.27        | 2.47                    | 40.64              | 53.90             | 13.3           | 150            | 0              |        |
| Vert.    | 9764.000           | AV       | 33.06             | 38.37              | 9.60         | 40.62        | 2.47                    | 42.88              | 53.90             | 11.0           | 150            | 0              |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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

\* These results have sufficient margin without taking account Dwell time factor.

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## Radiated Spurious Emission

|                        |                               |                     |                     |
|------------------------|-------------------------------|---------------------|---------------------|
| Report No.             | 11834855S-B-R1                |                     |                     |
| Test place             | Shonan EMC Lab.               |                     |                     |
| Semi Anechoic Chamber  | No.1                          | No.1                | No.1                |
| Date                   | November 19, 2017             | November 17, 2017   | November 18, 2017   |
| Temperature / Humidity | 20 deg. C / 42 % RH           | 23 deg. C / 39 % RH | 21 deg. C / 30 % RH |
| Engineer               | Hiroyuki Morikawa             | Yosuke Ishikawa     | Shiro Kobayashi     |
|                        | (30 MHz -1 GHz)               | (1 GHz -13 GHz)     | (13 GHz -26.5 GHz)  |
| Mode                   | Tx, Hopping Off, DH5 2480 MHz |                     |                     |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 308.420         | QP       | 25.60          | 13.70           | 6.85      | 31.76     | 0.00                 | 14.39           | 46.00          | 31.6        | 100         | 122         |        |
| Hori.    | 337.515         | QP       | 31.40          | 14.36           | 7.10      | 31.75     | 0.00                 | 21.11           | 46.00          | 24.8        | 100         | 181         |        |
| Hori.    | 387.401         | QP       | 23.40          | 15.49           | 7.52      | 31.78     | 0.00                 | 14.63           | 46.00          | 31.3        | 100         | 161         |        |
| Hori.    | 533.031         | QP       | 29.70          | 18.18           | 8.33      | 31.93     | 0.00                 | 24.28           | 46.00          | 21.7        | 209         | 220         |        |
| Hori.    | 2483.500        | PK       | 50.17          | 27.45           | 14.32     | 40.81     | 2.47                 | 53.60           | 73.90          | 20.3        | 147         | 89          |        |
| Hori.    | 4960.000        | PK       | 45.73          | 31.48           | 6.94      | 41.65     | 2.47                 | 44.97           | 73.90          | 28.9        | 149         | 340         |        |
| Hori.    | 7440.000        | PK       | 45.56          | 36.68           | 8.75      | 41.36     | 2.47                 | 52.10           | 73.90          | 21.8        | 150         | 0           |        |
| Hori.    | 9920.000        | PK       | 45.07          | 38.63           | 9.72      | 40.66     | 2.47                 | 55.23           | 73.90          | 18.7        | 150         | 0           |        |
| Hori.    | 2483.500        | AV       | 34.87          | 27.45           | 14.32     | 40.81     | 2.47                 | 38.30           | 53.90          | 15.6        | 147         | 89          |        |
| Hori.    | 4960.000        | AV       | 33.76          | 31.48           | 6.94      | 41.65     | 2.47                 | 33.00           | 53.90          | 20.9        | 149         | 340         |        |
| Hori.    | 7440.000        | AV       | 33.99          | 36.68           | 8.75      | 41.36     | 2.47                 | 40.53           | 53.90          | 13.4        | 150         | 0           |        |
| Hori.    | 9920.000        | AV       | 32.75          | 38.63           | 9.72      | 40.66     | 2.47                 | 42.91           | 53.90          | 11.0        | 150         | 0           |        |
| Vert.    | 337.516         | QP       | 26.90          | 14.36           | 7.10      | 31.75     | 0.00                 | 16.61           | 46.00          | 29.3        | 154         | 230         |        |
| Vert.    | 462.624         | QP       | 22.90          | 16.98           | 7.97      | 31.85     | 0.00                 | 16.00           | 46.00          | 30.0        | 100         | 99          |        |
| Vert.    | 533.022         | QP       | 28.00          | 18.18           | 8.33      | 31.93     | 0.00                 | 22.58           | 46.00          | 23.4        | 100         | 119         |        |
| Vert.    | 2483.500        | PK       | 48.42          | 27.45           | 14.32     | 40.81     | 2.47                 | 51.85           | 73.90          | 22.1        | 220         | 211         |        |
| Vert.    | 4960.000        | PK       | 45.95          | 31.48           | 6.94      | 41.65     | 2.47                 | 45.19           | 73.90          | 28.7        | 152         | 5           |        |
| Vert.    | 7440.000        | PK       | 46.75          | 36.68           | 8.75      | 41.36     | 2.47                 | 53.29           | 73.90          | 20.6        | 150         | 0           |        |
| Vert.    | 9920.000        | PK       | 45.82          | 38.63           | 9.72      | 40.66     | 2.47                 | 55.98           | 73.90          | 17.9        | 150         | 0           |        |
| Vert.    | 2483.500        | AV       | 33.61          | 27.45           | 14.32     | 40.81     | 2.47                 | 37.04           | 53.90          | 16.9        | 220         | 211         |        |
| Vert.    | 4960.000        | AV       | 34.13          | 31.48           | 6.94      | 41.65     | 2.47                 | 33.37           | 53.90          | 20.5        | 152         | 5           |        |
| Vert.    | 7440.000        | AV       | 34.48          | 36.68           | 8.75      | 41.36     | 2.47                 | 41.02           | 53.90          | 12.9        | 150         | 0           |        |
| Vert.    | 9920.000        | AV       | 33.03          | 38.63           | 9.72      | 40.66     | 2.47                 | 43.19           | 53.90          | <b>10.7</b> | 150         | 0           |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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

\* These results have sufficient margin without taking account Dwell time factor.

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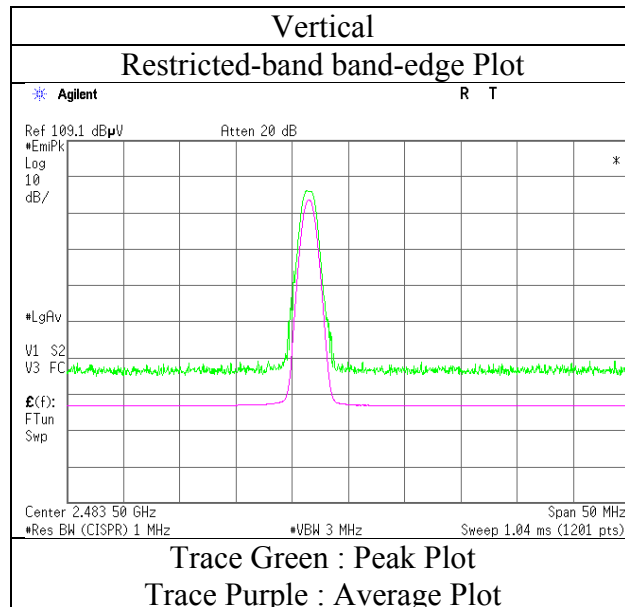
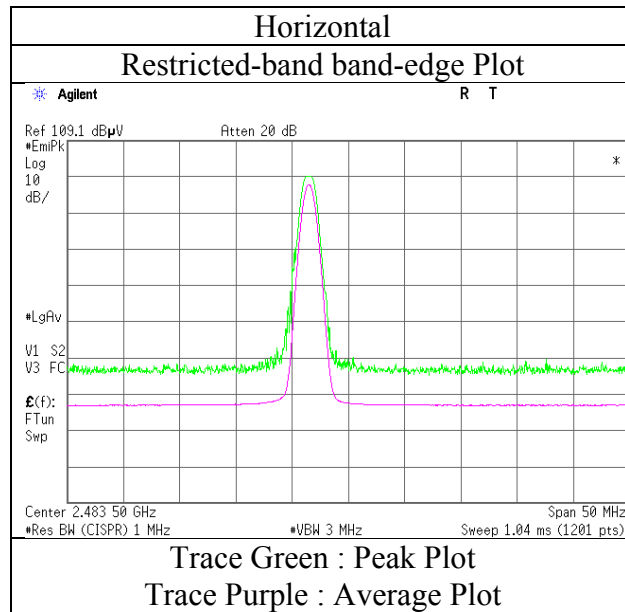
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 11834855S-B-R1                     |
| Test place             | Shonan EMC Lab.                    |
| Semi Anechoic Chamber  | No.1                               |
| Date                   | November 17, 2017                  |
| Temperature / Humidity | 23 deg. C / 39 % RH                |
| Engineer               | Yosuke Ishikawa<br>(1 GHz -13 GHz) |
| Mode                   | Tx, Hopping Off, DH5 2480 MHz      |



\* Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

|                        |                                |                     |                     |
|------------------------|--------------------------------|---------------------|---------------------|
| Report No.             | 11834855S-B-R1                 |                     |                     |
| Test place             | Shonan EMC Lab.                |                     |                     |
| Semi Anechoic Chamber  | No.1                           | No.1                | No.1                |
| Date                   | November 19, 2017              | November 17, 2017   | November 18, 2017   |
| Temperature / Humidity | 20 deg. C / 42 % RH            | 23 deg. C / 39 % RH | 21 deg. C / 30 % RH |
| Engineer               | Hiroyuki Morikawa              | Yosuke Ishikawa     | Shiro Kobayashi     |
|                        | (30 MHz -1 GHz)                | (1 GHz -13 GHz)     | (13 GHz -26.5 GHz)  |
| Mode                   | Tx, Hopping Off, 3DH5 2402 MHz |                     |                     |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 307.555         | QP       | 25.50          | 13.68           | 6.84      | 31.76     | 0.00                 | 14.26           | 46.00          | 31.7        | 100         | 121         |        |
| Hori.    | 337.515         | QP       | 32.40          | 14.36           | 7.10      | 31.75     | 0.00                 | 22.11           | 46.00          | 23.8        | 100         | 180         |        |
| Hori.    | 374.850         | QP       | 23.40          | 15.20           | 7.42      | 31.77     | 0.00                 | 14.25           | 46.00          | 31.7        | 100         | 164         |        |
| Hori.    | 533.021         | QP       | 29.00          | 18.18           | 8.33      | 31.93     | 0.00                 | 23.58           | 46.00          | 22.4        | 208         | 229         |        |
| Hori.    | 2390.000        | PK       | 45.32          | 27.14           | 14.23     | 40.85     | 2.47                 | 48.31           | 73.90          | 25.6        | 157         | 92          |        |
| Hori.    | 4804.000        | PK       | 46.56          | 31.13           | 6.79      | 41.86     | 2.47                 | 45.09           | 73.90          | 28.8        | 148         | 340         |        |
| Hori.    | 7206.000        | PK       | 45.56          | 36.35           | 8.41      | 41.18     | 2.47                 | 51.61           | 73.90          | 22.3        | 150         | 0           |        |
| Hori.    | 9608.000        | PK       | 44.47          | 38.11           | 9.48      | 40.59     | 2.47                 | 53.94           | 73.90          | 20.0        | 150         | 0           |        |
| Hori.    | 2390.000        | AV       | 32.97          | 27.14           | 14.23     | 40.85     | 2.47                 | 35.96           | 53.90          | 17.9        | 157         | 92          |        |
| Hori.    | 4804.000        | AV       | 34.49          | 31.13           | 6.79      | 41.86     | 2.47                 | 33.02           | 53.90          | 20.9        | 148         | 340         |        |
| Hori.    | 7206.000        | AV       | 33.61          | 36.35           | 8.41      | 41.18     | 2.47                 | 39.66           | 53.90          | 14.2        | 150         | 0           |        |
| Hori.    | 9608.000        | AV       | 32.71          | 38.11           | 9.48      | 40.59     | 2.47                 | 42.18           | 53.90          | 11.7        | 150         | 0           |        |
| Vert.    | 337.515         | QP       | 27.50          | 14.36           | 7.10      | 31.75     | 0.00                 | 17.21           | 46.00          | 28.7        | 146         | 230         |        |
| Vert.    | 462.422         | QP       | 22.90          | 16.97           | 7.97      | 31.85     | 0.00                 | 15.99           | 46.00          | 30.0        | 100         | 99          |        |
| Vert.    | 533.025         | QP       | 27.70          | 18.18           | 8.33      | 31.93     | 0.00                 | 22.28           | 46.00          | 23.7        | 100         | 119         |        |
| Vert.    | 2390.000        | PK       | 45.82          | 27.14           | 14.23     | 40.85     | 2.47                 | 48.81           | 73.90          | 25.1        | 226         | 215         |        |
| Vert.    | 4804.000        | PK       | 46.42          | 31.13           | 6.79      | 41.86     | 2.47                 | 44.95           | 73.90          | 29.0        | 152         | 4           |        |
| Vert.    | 7206.000        | PK       | 45.42          | 36.35           | 8.41      | 41.18     | 2.47                 | 51.47           | 73.90          | 22.4        | 150         | 0           |        |
| Vert.    | 9608.000        | PK       | 44.40          | 38.11           | 9.48      | 40.59     | 2.47                 | 53.87           | 73.90          | 20.0        | 150         | 0           |        |
| Vert.    | 2390.000        | AV       | 33.17          | 27.14           | 14.23     | 40.85     | 2.47                 | 36.16           | 53.90          | 17.7        | 226         | 215         |        |
| Vert.    | 4804.000        | AV       | 34.52          | 31.13           | 6.79      | 41.86     | 2.47                 | 33.05           | 53.90          | 20.9        | 152         | 4           |        |
| Vert.    | 7206.000        | AV       | 33.63          | 36.35           | 8.41      | 41.18     | 2.47                 | 39.68           | 53.90          | 14.2        | 150         | 0           |        |
| Vert.    | 9608.000        | AV       | 32.68          | 38.11           | 9.48      | 40.59     | 2.47                 | 42.15           | 53.90          | 11.8        | 150         | 0           |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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

\* These results have sufficient margin without taking account Dwell time factor.

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2402.000        | PK       | 94.43          | 27.18           | 14.24     | 40.84     | 2.47                 | 97.48           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 38.28          | 27.17           | 14.23     | 40.84     | 2.47                 | 41.31           | 77.48          | 36.2        |         |
| Vert.    | 2402.000        | PK       | 88.33          | 27.18           | 14.24     | 40.84     | 2.47                 | 91.38           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 36.37          | 27.17           | 14.23     | 40.84     | 2.47                 | 39.40           | 71.38          | 32.0        |         |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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

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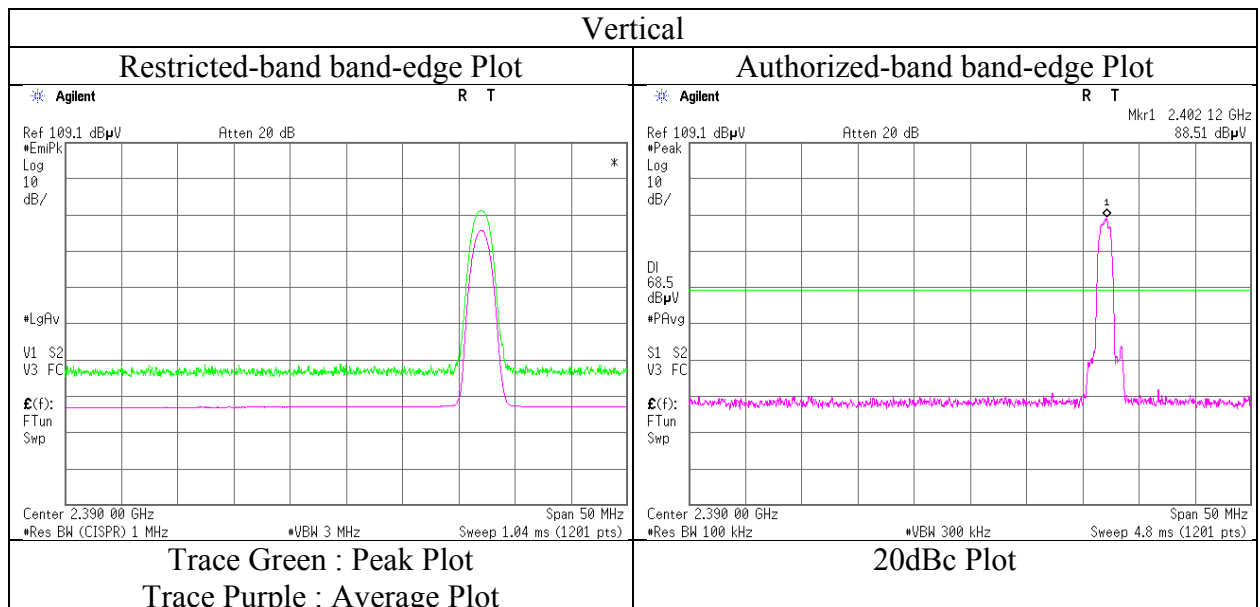
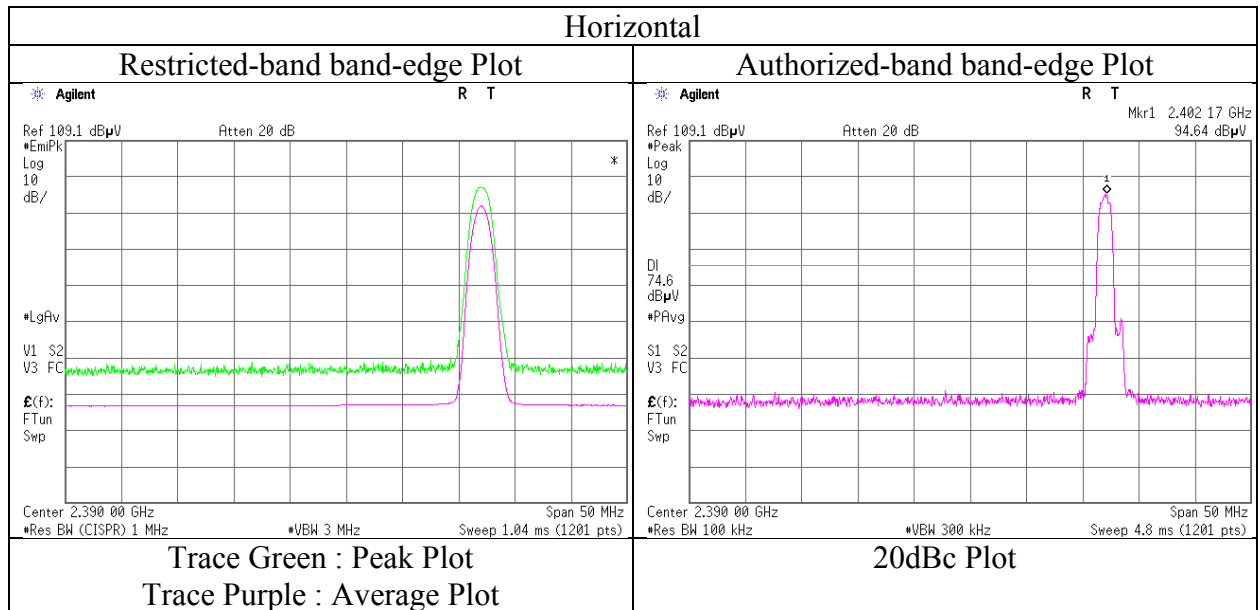
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

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

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 11834855S-B-R1                     |
| Test place             | Shonan EMC Lab.                    |
| Semi Anechoic Chamber  | No.1                               |
| Date                   | November 17, 2017                  |
| Temperature / Humidity | 23 deg. C / 39 % RH                |
| Engineer               | Yosuke Ishikawa<br>(1 GHz -13 GHz) |
| Mode                   | Tx, Hopping Off, 3DH5 2402 MHz     |



\* Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

|                        |                                      |                                    |                                       |
|------------------------|--------------------------------------|------------------------------------|---------------------------------------|
| Report No.             | 11834855S-B-R1                       |                                    |                                       |
| Test place             | Shonan EMC Lab.                      |                                    |                                       |
| Semi Anechoic Chamber  | No.1                                 | No.1                               | No.1                                  |
| Date                   | November 19, 2017                    | November 17, 2017                  | November 18, 2017                     |
| Temperature / Humidity | 20 deg. C / 42 % RH                  | 23 deg. C / 39 % RH                | 21 deg. C / 30 % RH                   |
| Engineer               | Hiroyuki Morikawa<br>(30 MHz -1 GHz) | Yosuke Ishikawa<br>(1 GHz -13 GHz) | Shiro Kobayashi<br>(13 GHz -26.5 GHz) |
| Mode                   | Tx, Hopping Off, 3DH5 2441 MHz       |                                    |                                       |

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 307.994            | QP       | 25.50             | 13.69              | 6.85         | 31.76        | 0.00                    | 14.28              | 46.00             | 31.7           | 100            | 126            |        |
| Hori.    | 337.518            | QP       | 31.90             | 14.36              | 7.10         | 31.75        | 0.00                    | 21.61              | 46.00             | 24.3           | 100            | 182            |        |
| Hori.    | 376.325            | QP       | 24.70             | 15.23              | 7.43         | 31.77        | 0.00                    | 15.59              | 46.00             | 30.4           | 100            | 178            |        |
| Hori.    | 533.023            | QP       | 29.20             | 18.18              | 8.33         | 31.93        | 0.00                    | 23.78              | 46.00             | 22.2           | 207            | 227            |        |
| Hori.    | 4882.000           | PK       | 45.46             | 31.31              | 6.87         | 41.76        | 2.47                    | 44.35              | 73.90             | 29.6           | 151            | 351            |        |
| Hori.    | 7323.000           | PK       | 45.55             | 36.51              | 8.57         | 41.27        | 2.47                    | 51.83              | 73.90             | 22.1           | 150            | 0              |        |
| Hori.    | 9764.000           | PK       | 44.48             | 38.37              | 9.60         | 40.62        | 2.47                    | 54.30              | 73.90             | 19.6           | 150            | 0              |        |
| Hori.    | 4882.000           | AV       | 34.15             | 31.31              | 6.87         | 41.76        | 2.47                    | 33.04              | 53.90             | 20.9           | 151            | 351            |        |
| Hori.    | 7323.000           | AV       | 34.18             | 36.51              | 8.57         | 41.27        | 2.47                    | 40.46              | 53.90             | 13.4           | 150            | 0              |        |
| Hori.    | 9764.000           | AV       | 33.14             | 38.37              | 9.60         | 40.62        | 2.47                    | 42.96              | 53.90             | 10.9           | 150            | 0              |        |
| Vert.    | 337.512            | QP       | 27.20             | 14.36              | 7.10         | 31.75        | 0.00                    | 16.91              | 46.00             | 29.0           | 154            | 221            |        |
| Vert.    | 462.606            | QP       | 22.90             | 16.98              | 7.97         | 31.85        | 0.00                    | 16.00              | 46.00             | 30.0           | 100            | 99             |        |
| Vert.    | 533.025            | QP       | 27.90             | 18.18              | 8.33         | 31.93        | 0.00                    | 22.48              | 46.00             | 23.5           | 100            | 144            |        |
| Vert.    | 4882.000           | PK       | 45.14             | 31.31              | 6.87         | 41.76        | 2.47                    | 44.03              | 73.90             | 29.9           | 148            | 8              |        |
| Vert.    | 7323.000           | PK       | 45.66             | 36.51              | 8.57         | 41.27        | 2.47                    | 51.94              | 73.90             | 22.0           | 150            | 0              |        |
| Vert.    | 9764.000           | PK       | 45.11             | 38.37              | 9.60         | 40.62        | 2.47                    | 54.93              | 73.90             | 19.0           | 150            | 0              |        |
| Vert.    | 4882.000           | AV       | 34.16             | 31.31              | 6.87         | 41.76        | 2.47                    | 33.05              | 53.90             | 20.9           | 148            | 8              |        |
| Vert.    | 7323.000           | AV       | 34.38             | 36.51              | 8.57         | 41.27        | 2.47                    | 40.66              | 53.90             | 13.2           | 150            | 0              |        |
| Vert.    | 9764.000           | AV       | 33.15             | 38.37              | 9.60         | 40.62        | 2.47                    | 42.97              | 53.90             | <b>10.9</b>    | 150            | 0              |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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

\* These results have sufficient margin without taking account Dwell time factor.

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## Radiated Spurious Emission

|                        |                                      |                                    |                                       |
|------------------------|--------------------------------------|------------------------------------|---------------------------------------|
| Report No.             | 11834855S-B-R1                       |                                    |                                       |
| Test place             | Shonan EMC Lab.                      |                                    |                                       |
| Semi Anechoic Chamber  | No.1                                 | No.1                               | No.1                                  |
| Date                   | November 19, 2017                    | November 17, 2017                  | November 18, 2017                     |
| Temperature / Humidity | 20 deg. C / 42 % RH                  | 23 deg. C / 39 % RH                | 21 deg. C / 30 % RH                   |
| Engineer               | Hiroyuki Morikawa<br>(30 MHz -1 GHz) | Yosuke Ishikawa<br>(1 GHz -13 GHz) | Shiro Kobayashi<br>(13 GHz -26.5 GHz) |
| Mode                   | Tx, Hopping Off, 3DH5 2480 MHz       |                                    |                                       |

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 307.897            | QP       | 25.50             | 13.69              | 6.85         | 31.76        | 0.00                    | 14.28              | 46.00             | 31.7           | 100            | 123            |        |
| Hori.    | 337.519            | QP       | 32.30             | 14.36              | 7.10         | 31.75        | 0.00                    | 22.01              | 46.00             | 23.9           | 100            | 185            |        |
| Hori.    | 376.309            | QP       | 23.90             | 15.23              | 7.43         | 31.77        | 0.00                    | 14.79              | 46.00             | 31.2           | 100            | 165            |        |
| Hori.    | 533.036            | QP       | 29.80             | 18.18              | 8.33         | 31.93        | 0.00                    | 24.38              | 46.00             | 21.6           | 209            | 219            |        |
| Hori.    | 2483.500           | PK       | 48.36             | 27.45              | 14.32        | 40.81        | 2.47                    | 51.79              | 73.90             | 22.1           | 149            | 91             |        |
| Hori.    | 4960.000           | PK       | 46.02             | 31.48              | 6.94         | 41.65        | 2.47                    | 45.26              | 73.90             | 28.6           | 151            | 334            |        |
| Hori.    | 7440.000           | PK       | 46.21             | 36.68              | 8.75         | 41.36        | 2.47                    | 52.75              | 73.90             | 21.2           | 150            | 0              |        |
| Hori.    | 9920.000           | PK       | 45.04             | 38.63              | 9.72         | 40.66        | 2.47                    | 55.20              | 73.90             | 18.7           | 150            | 0              |        |
| Hori.    | 2483.500           | AV       | 33.81             | 27.45              | 14.32        | 40.81        | 2.47                    | 37.24              | 53.90             | 16.7           | 149            | 91             |        |
| Hori.    | 4960.000           | AV       | 34.31             | 31.48              | 6.94         | 41.65        | 2.47                    | 33.55              | 53.90             | 20.4           | 151            | 334            |        |
| Hori.    | 7440.000           | AV       | 34.40             | 36.68              | 8.75         | 41.36        | 2.47                    | 40.94              | 53.90             | 13.0           | 150            | 0              |        |
| Hori.    | 9920.000           | AV       | 33.01             | 38.63              | 9.72         | 40.66        | 2.47                    | 43.17              | 53.90             | 10.7           | 150            | 0              |        |
| Vert.    | 337.515            | QP       | 27.40             | 14.36              | 7.10         | 31.75        | 0.00                    | 17.11              | 46.00             | 28.8           | 153            | 229            |        |
| Vert.    | 462.615            | QP       | 22.90             | 16.98              | 7.97         | 31.85        | 0.00                    | 16.00              | 46.00             | 30.0           | 100            | 99             |        |
| Vert.    | 533.027            | QP       | 27.80             | 18.18              | 8.33         | 31.93        | 0.00                    | 22.38              | 46.00             | 23.6           | 100            | 145            |        |
| Vert.    | 2483.500           | PK       | 45.95             | 27.45              | 14.32        | 40.81        | 2.47                    | 49.38              | 73.90             | 24.5           | 228            | 210            |        |
| Vert.    | 4960.000           | PK       | 45.68             | 31.48              | 6.94         | 41.65        | 2.47                    | 44.92              | 73.90             | 29.0           | 150            | 10             |        |
| Vert.    | 7440.000           | PK       | 46.23             | 36.68              | 8.75         | 41.36        | 2.47                    | 52.77              | 73.90             | 21.1           | 150            | 0              |        |
| Vert.    | 9920.000           | PK       | 44.78             | 38.63              | 9.72         | 40.66        | 2.47                    | 54.94              | 73.90             | 19.0           | 150            | 0              |        |
| Vert.    | 2483.500           | AV       | 33.40             | 27.45              | 14.32        | 40.81        | 2.47                    | 36.83              | 53.90             | 17.1           | 228            | 210            |        |
| Vert.    | 4960.000           | AV       | 34.09             | 31.48              | 6.94         | 41.65        | 2.47                    | 33.33              | 53.90             | 20.6           | 150            | 10             |        |
| Vert.    | 7440.000           | AV       | 34.32             | 36.68              | 8.75         | 41.36        | 2.47                    | 40.86              | 53.90             | 13.0           | 150            | 0              |        |
| Vert.    | 9920.000           | AV       | 32.93             | 38.63              | 9.72         | 40.66        | 2.47                    | 43.09              | 53.90             | 10.8           | 150            | 0              |        |

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

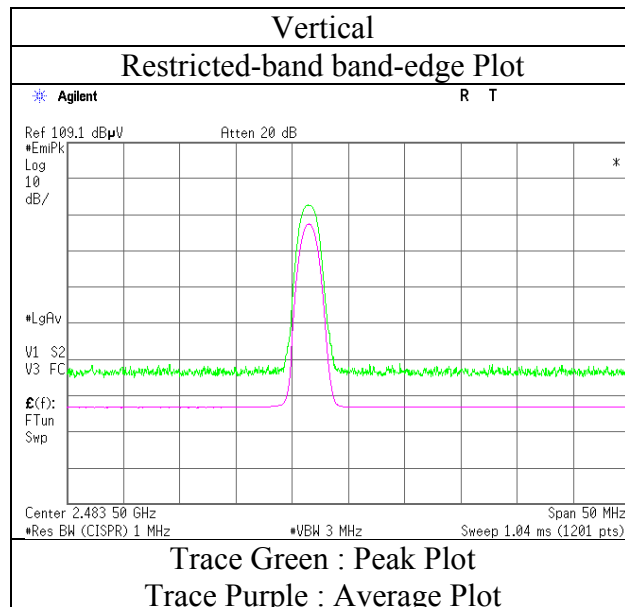
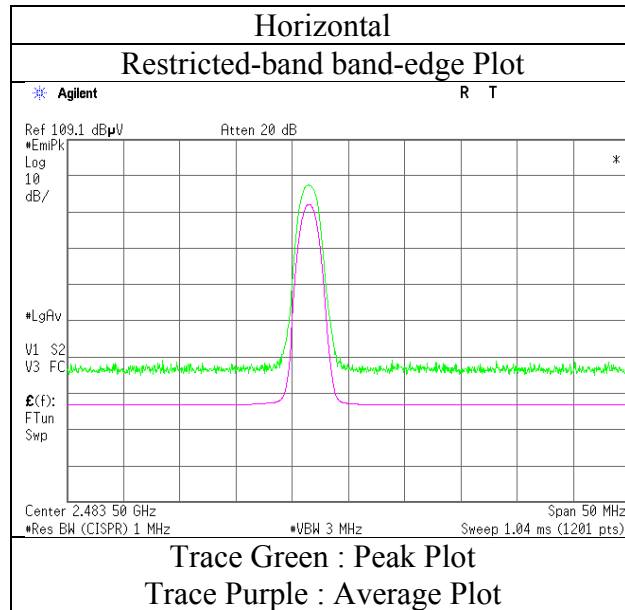
Distance factor : 1 GHz - 13 GHz :  $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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

\* These results have sufficient margin without taking account Dwell time factor.

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

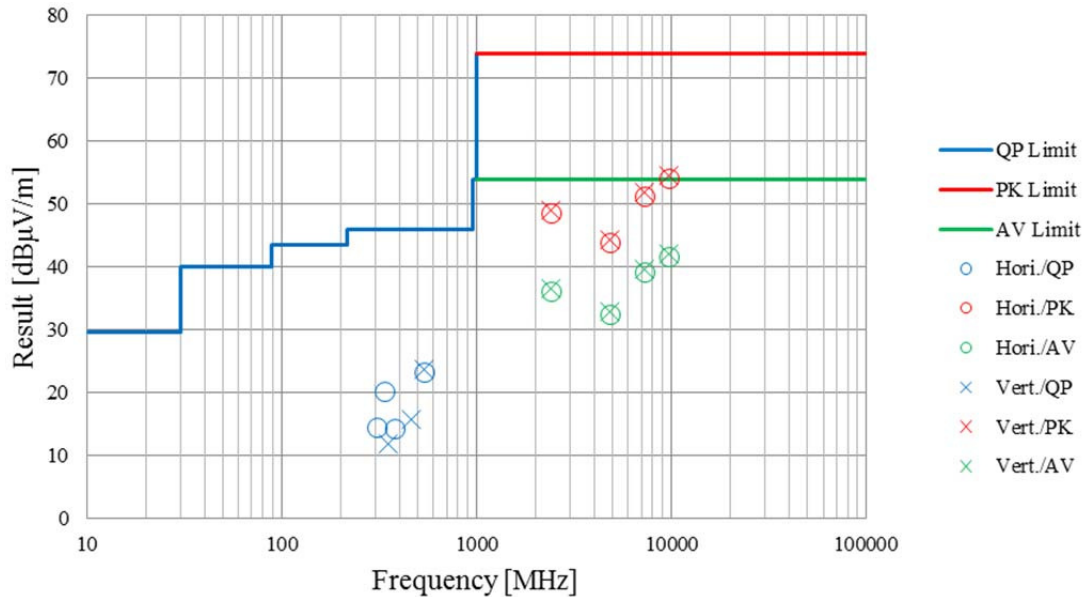
|                        |                                |
|------------------------|--------------------------------|
| Report No.             | 11834855S-B-R1                 |
| Test place             | Shonan EMC Lab.                |
| Semi Anechoic Chamber  | No.1                           |
| Date                   | November 17, 2017              |
| Temperature / Humidity | 23 deg. C / 39 % RH            |
| Engineer               | Yosuke Ishikawa                |
|                        | (1 GHz -13 GHz)                |
| Mode                   | Tx, Hopping Off, 3DH5 2480 MHz |



\* Final result of restricted band edge was shown in tabular data.

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

|                        |                                      |                                    |                                       |
|------------------------|--------------------------------------|------------------------------------|---------------------------------------|
| Report No.             | 11834855S-B-R1                       |                                    |                                       |
| Test place             | Shonan EMC Lab.                      |                                    |                                       |
| Semi Anechoic Chamber  | No.1                                 | No.1                               | No.1                                  |
| Date                   | November 19, 2017                    | November 17, 2017                  | November 18, 2017                     |
| Temperature / Humidity | 20 deg. C / 42 % RH                  | 23 deg. C / 39 % RH                | 21 deg. C / 30 % RH                   |
| Engineer               | Hiroyuki Morikawa<br>(30 MHz -1 GHz) | Yosuke Ishikawa<br>(1 GHz -13 GHz) | Shiro Kobayashi<br>(13 GHz -26.5 GHz) |
| Mode                   | Tx, Hopping Off, DH5 2402 MHz        |                                    |                                       |

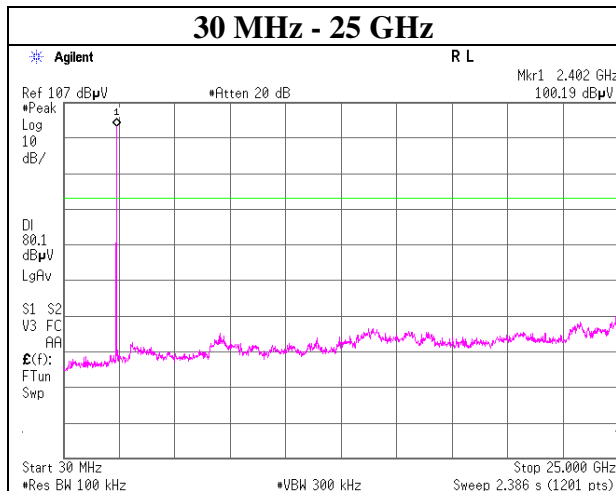
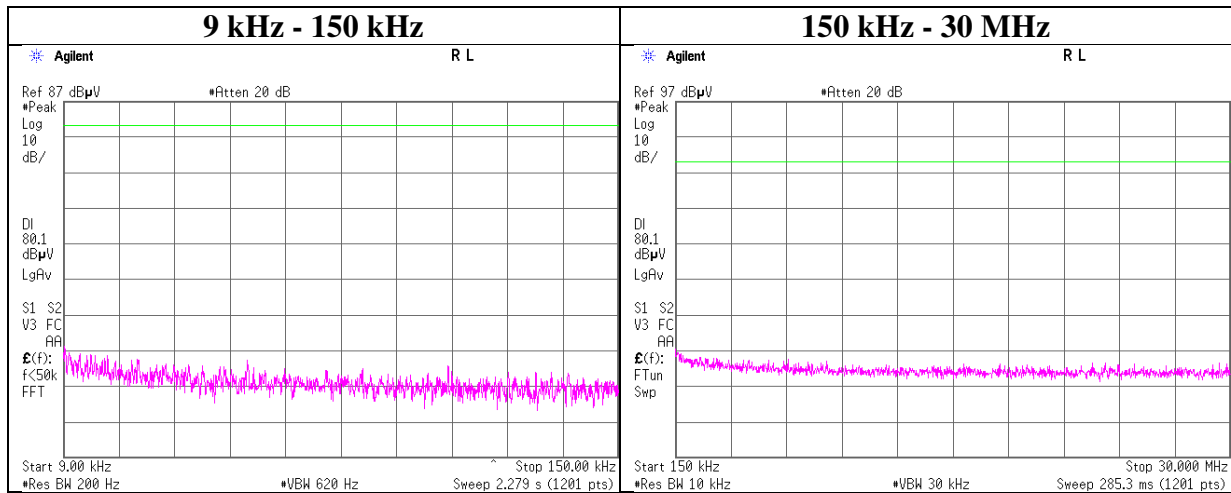


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11834855S-B-R1  
Date : November 16, 2017  
Temperature / Humidity : 26deg. C / 37 % RH  
Engineer : Makoto Hosaka  
Mode : Tx, Hopping Off, DH5

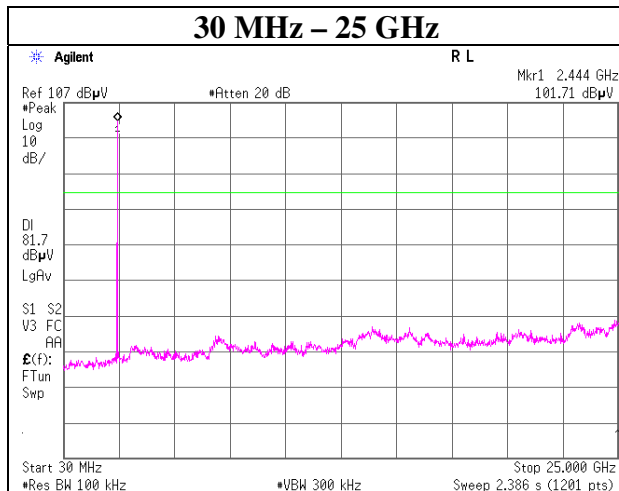
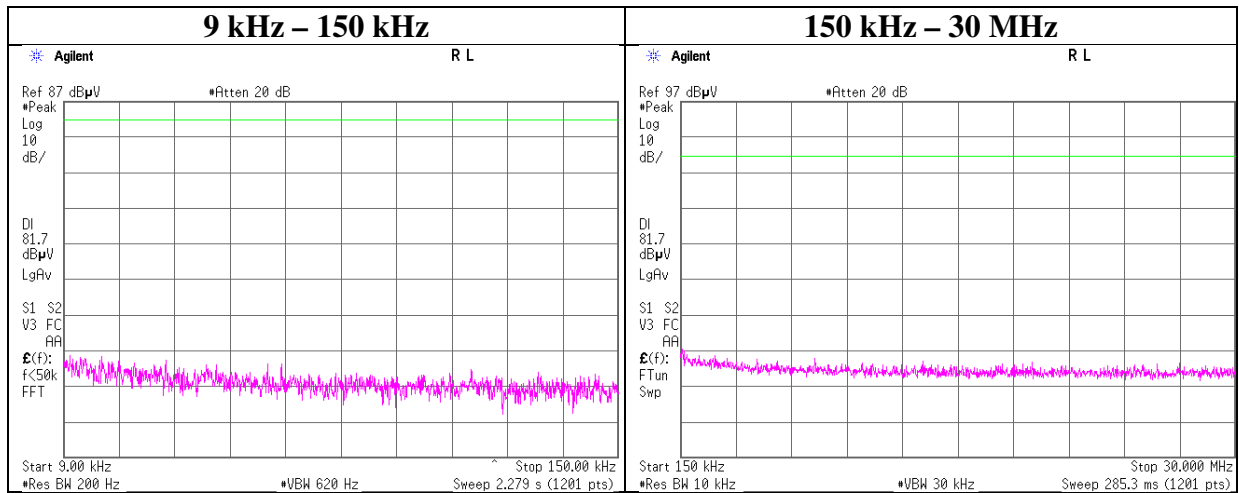
### 2402 MHz



## Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11834855S-B-R1  
Date : November 16, 2017  
Temperature / Humidity : 26deg. C / 37 % RH  
Engineer : Makoto Hosaka  
Mode : Tx, Hopping Off, DH5

### 2441 MHz



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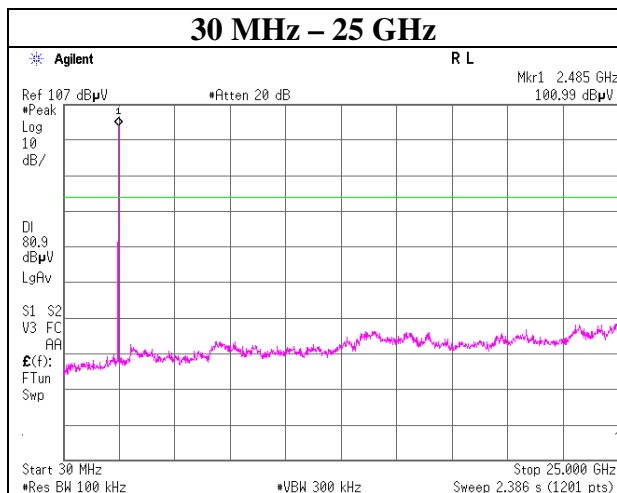
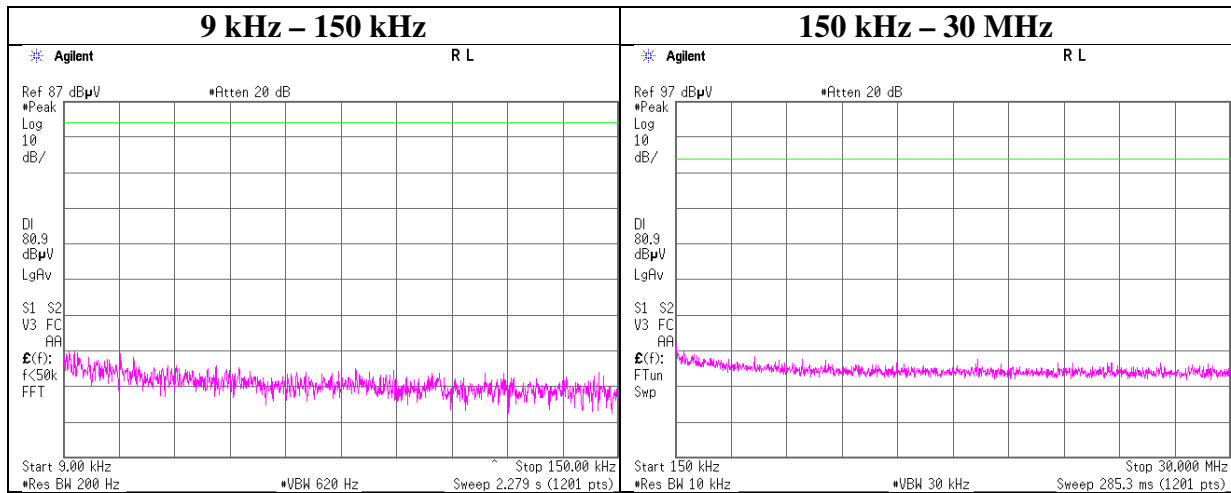
Telephone : +81 463 50 6400

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## Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11834855S-B-R1  
Date : November 16, 2017  
Temperature / Humidity : 26deg. C / 37 % RH  
Engineer : Makoto Hosaka  
Mode : Tx, Hopping Off, DH5

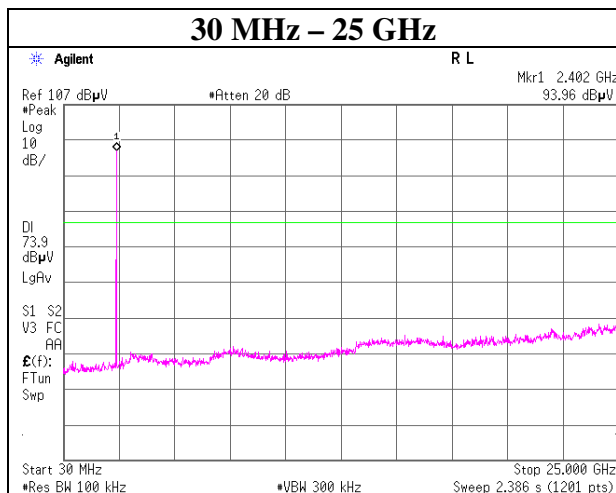
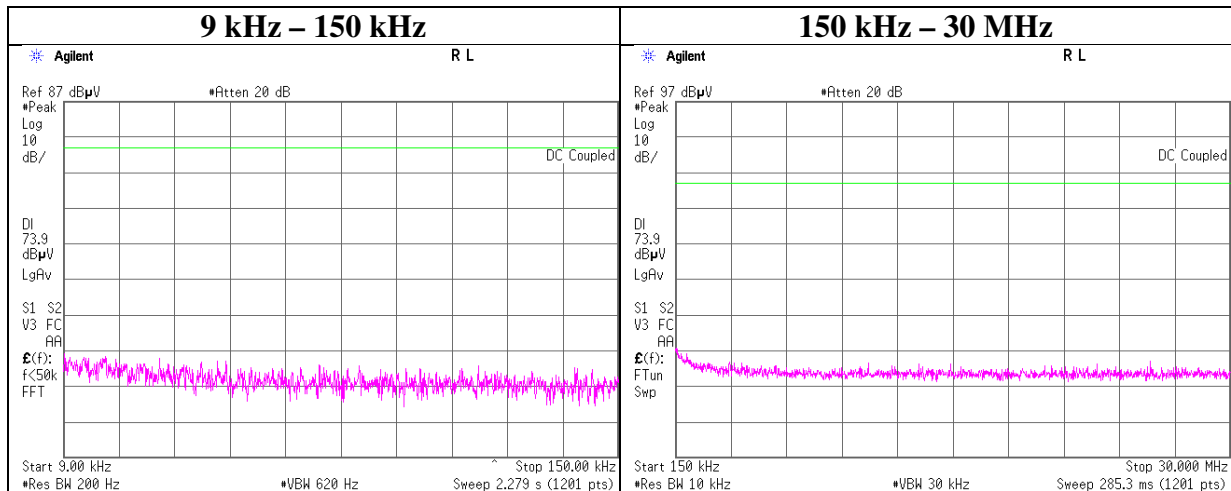
### 2480 MHz



## Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11834855S-B-R1  
Date : November 20, 2017  
Temperature / Humidity : 24 deg. C / 31 % RH  
Engineer : Shiro Kobayashi  
Mode : Tx, Hopping Off, 3DH5

### 2402 MHz

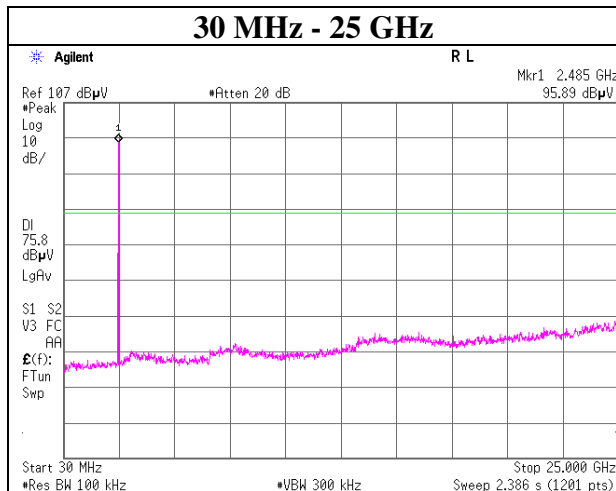
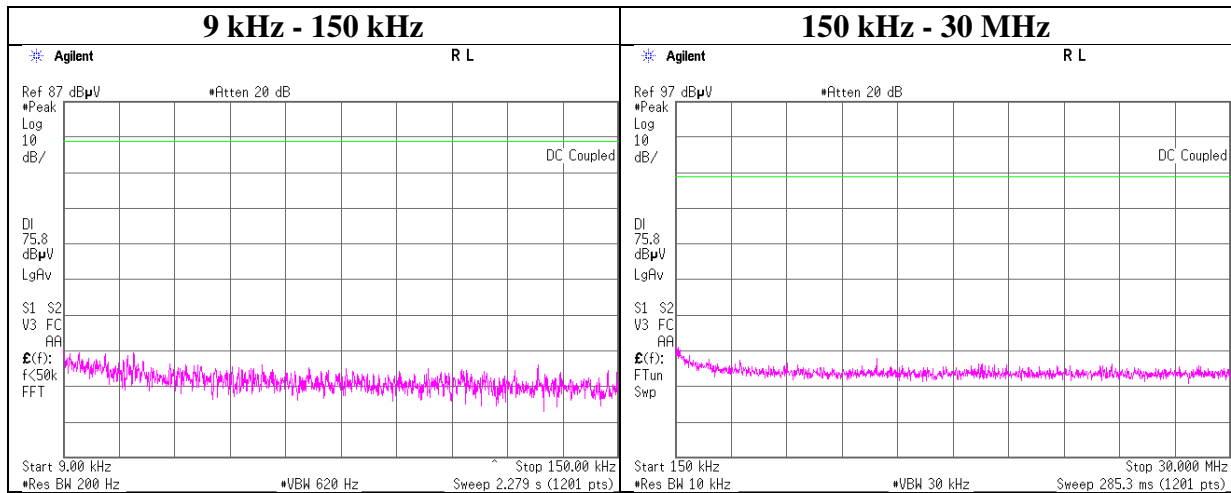




## Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11834855S-B-R1  
Date : November 20, 2017  
Temperature / Humidity : 24 deg. C / 31 % RH  
Engineer : Shiro Kobayashi  
Mode : Tx, Hopping Off, 3DH5

### 2480 MHz



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**Shonan EMC Lab.**

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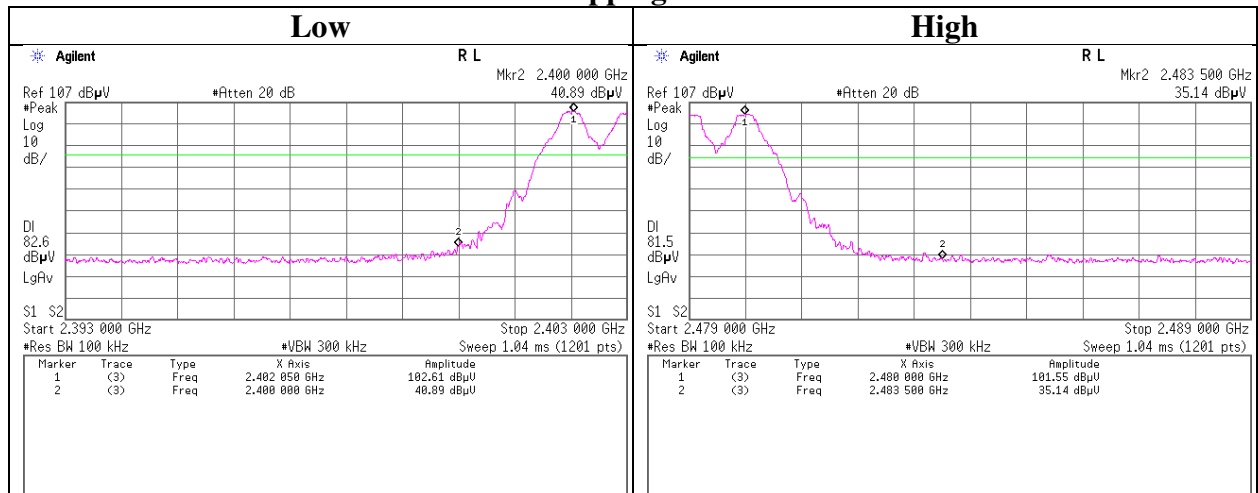
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

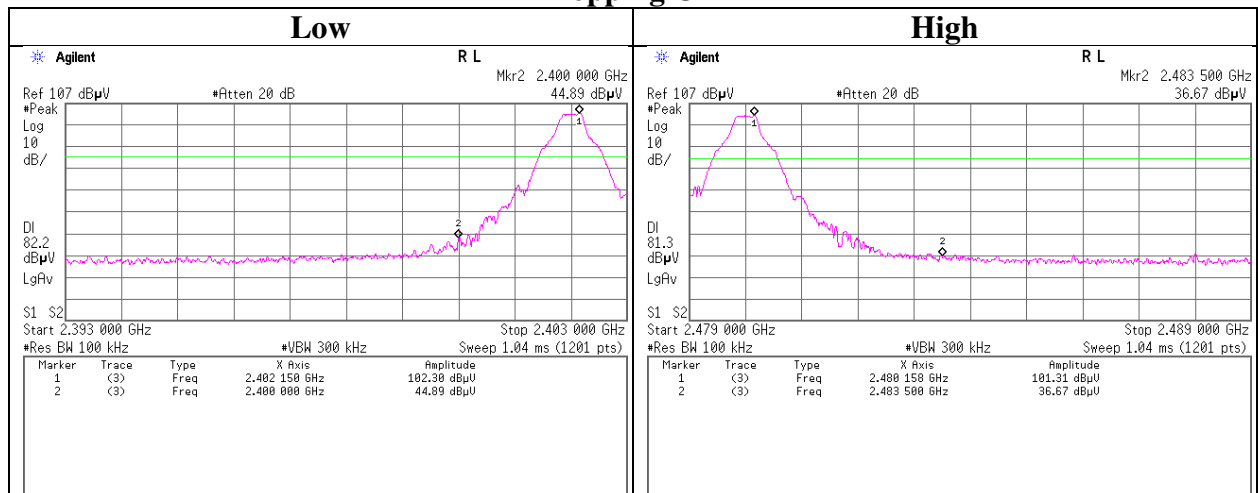
## Conducted Emission Band Edge compliance

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11834855S-B-R1                     |
| Date                   | November 16, 2017                  |
| Temperature / Humidity | 26deg. C / 37 % RH                 |
| Engineer               | Makoto Hosaka                      |
| Mode                   | Tx DH5                             |

### Hopping On



### Hopping Off



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**Shonan EMC Lab.**

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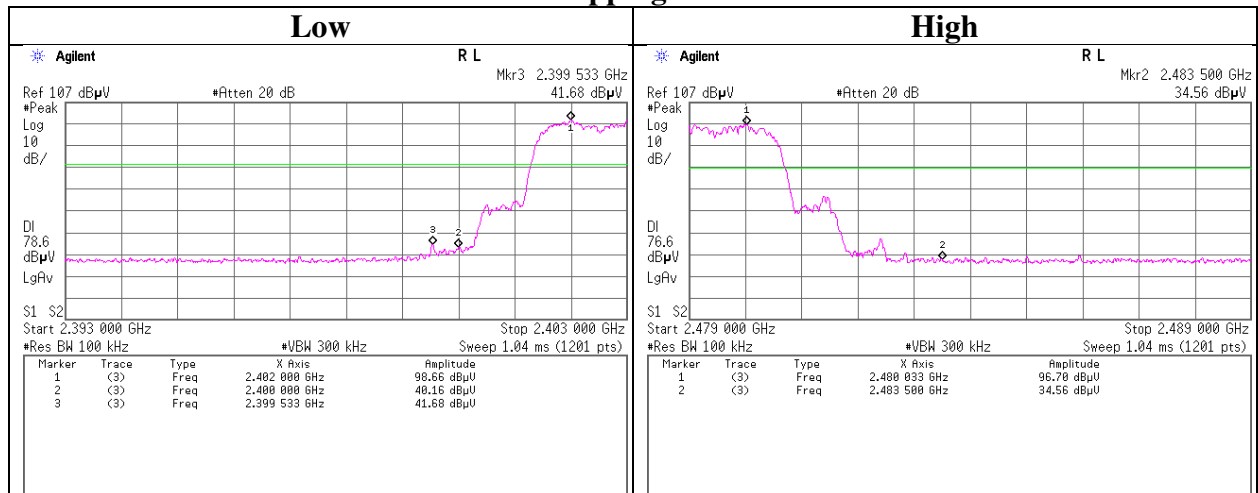
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

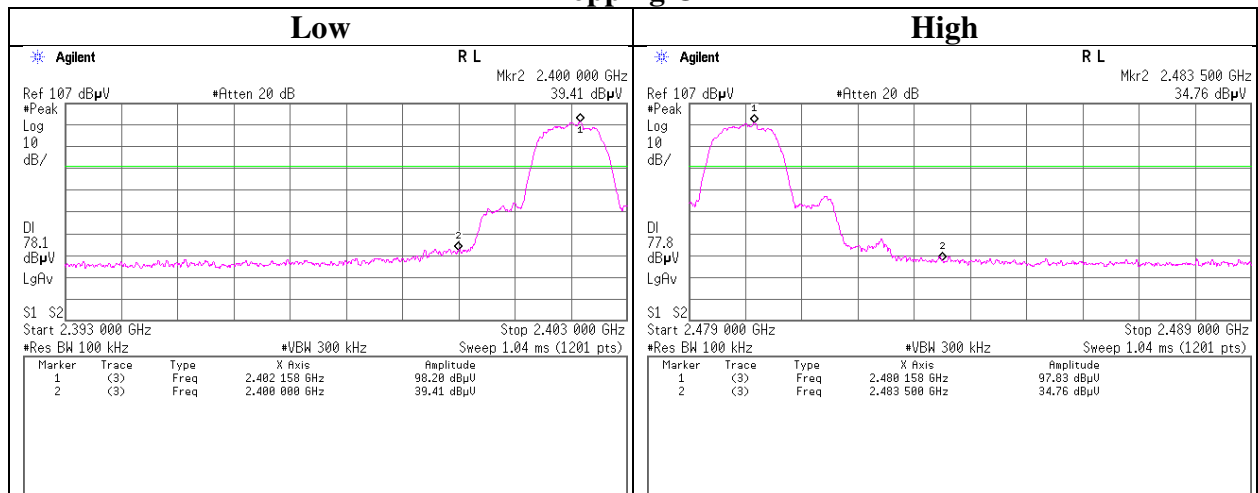
## Conducted Emission Band Edge compliance

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11834855S-B-R1                     |
| Date                   | November 20, 2017                  |
| Temperature / Humidity | 24 deg. C / 31 % RH                |
| Engineer               | Shiro Kobayashi                    |
| Mode                   | Tx 3DH5                            |

### Hopping On



### Hopping Off



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## APPENDIX 2: Test instruments

### Test equipment

| Control No.                      | Instrument                | Manufacturer                                | Model No                                       | Serial No                | Test Item | Calibration Date *<br>Interval(month) |
|----------------------------------|---------------------------|---------------------------------------------|------------------------------------------------|--------------------------|-----------|---------------------------------------|
| SAF-04                           | Pre Amplifier             | TOYO Corporation                            | TPA0118-36                                     | 1440489                  | RE        | 2017/03/17 * 12                       |
| SCC-G05                          | Coaxial Cable             | Junkosha                                    | J12J102207-00                                  | APR-30-15-037            | RE        | 2017/01/08 * 12                       |
| SCC-G22                          | Coaxial Cable             | Suhner                                      | SUCOFLEX 104                                   | 296199/4                 | RE        | 2017/05/08 * 12                       |
| SHA-01                           | Horn Antenna              | Schwarzbeck                                 | BBHA9120 D                                     | 9120D-725                | RE        | 2017/08/14 * 12                       |
| SOS-01                           | Humidity Indicator        | A&D                                         | AD-5681                                        | 4062555                  | RE        | 2017/10/30 * 12                       |
| SRENT-08                         | Spectrum Analyzer         | Agilent                                     | E4448A                                         | MY50180019               | RE        | 2017/10/12 * 12                       |
| KJM-09                           | Measure                   | KOMELON                                     | KMC-36                                         | -                        | RE        | -                                     |
| SAEC-01(SVS WR)                  | Semi-Anechoic Chamber     | TDK                                         | SAEC-01(S VSWR)                                | 1                        | RE        | 2017/07/20 * 12                       |
| COTS-SEMI-1                      | EMI Software              | TSJ                                         | TEPTO-DV( RE,CE,RFI, MF)                       | -                        | RE        | -                                     |
| STS-01                           | Digital Hitester          | Hioki                                       | 3805-50                                        | 080997812                | RE        | 2017/10/16 * 12                       |
| SCC-G40                          | Coaxial Cable             | Junkosha                                    | MWX221-01 000NFSNM S/B                         | 1612S005                 | RE        | 2017/01/08 * 12                       |
| SAT10-06                         | Attenuator                | Agilent                                     | 8493C-010                                      | 74865                    | RE        | 2016/11/07 * 12                       |
| SFL-02                           | Highpass Filter           | MICRO-TRONICS                               | HPM50111                                       | 051                      | RE        | 2016/11/29 * 12                       |
| SAEC-01(NSA )                    | Semi-Anechoic Chamber     | TDK                                         | SAEC-01(N SA)                                  | 1                        | RE        | 2017/06/09 * 12                       |
| SHA-05                           | Horn Antenna              | ETS LINDGREN                                | 3160-09                                        | LM4210                   | RE        | 2017/03/15 * 12                       |
| SAF-09                           | Pre Amplifier             | TOYO Corporation                            | HAP18-26W                                      | 00000018                 | RE        | 2017/09/22 * 12                       |
| SCC-G33                          | Coaxial Cable             | Junkosha                                    | MWX241-01 000KMSKM S                           | -                        | RE        | 2017/04/20 * 12                       |
| SCC-G19                          | Coaxial Cable             | Suhner                                      | SUCOFLEX 102A                                  | 1188/2A                  | RE        | 2017/03/23 * 12                       |
| SAF-01                           | Pre Amplifier             | SONOMA                                      | 310N                                           | 290211                   | RE        | 2017/02/09 * 12                       |
| KAT6-04                          | Attenuator                | INMET                                       | 18N-6dB                                        | -                        | RE        | 2016/12/15 * 12                       |
| SAT3-09                          | Attenuator                | JFW                                         | 50HF-003N                                      | -                        | RE        | 2017/08/24 * 12                       |
| SBA-01                           | Biconical Antenna         | Schwarzbeck                                 | BBA9106                                        | 91032664                 | RE        | 2017/10/21 * 12                       |
| SCC-A1/A3/A 5/A7/A8/A13/ SRSE-01 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DS FA/141PE/1 41PE/141PE /141PE/NS4 906 | -/0901-269 (RF Selector) | RE        | 2017/04/07 * 12                       |
| SCC-A2/A4/A 6/A7/A8/A13/ SRSE-01 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DS FA/141PE/1 41PE/141PE /141PE/NS4 906 | -/0901-269 (RF Selector) | RE        | 2017/04/07 * 12                       |
| SLA-05                           | Logperiodic Antenna       | Schwarzbeck                                 | VUSLP9111 B                                    | 193                      | RE        | 2017/01/05 * 12                       |
| STR-01                           | Test Receiver             | Rohde & Schwarz                             | ESU40                                          | 100093                   | RE        | 2017/04/12 * 12                       |

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| Control No.             | Instrument                   | Manufacturer       | Model No                       | Serial No                   | Test Item | Calibration Date *<br>Interval(month) |
|-------------------------|------------------------------|--------------------|--------------------------------|-----------------------------|-----------|---------------------------------------|
| SOS-09                  | Humidity Indicator           | A&D                | AD-5681                        | 4061484                     | AT        | 2016/12/13 * 12                       |
| KTS-07                  | Digital Tester               | SANWA              | PC500                          | 7019232                     | AT        | 2017/10/11 * 12                       |
| SPM-07                  | Power Meter                  | Agilent            | 8990B                          | MY510027<br>2               | AT        | 2017/05/01 * 12                       |
| SPSS-04                 | Power sensor                 | Agilent            | N1923A                         | MY532600<br>9               | AT        | 2017/05/01 * 12                       |
| SCC-G14                 | Coaxial Cable                | Suhner             | SUCOFLEX<br>102                | 31600/2                     | AT        | 2017/03/23 * 12                       |
| SAT10-13                | Attenuator                   | Weinschel Corp.    | 54A-10                         | 81626                       | AT        | 2017/03/23 * 12                       |
| SSA-03                  | Spectrum Analyzer            | Agilent            | E4448A                         | MY482501<br>52              | AT        | 2017/08/20 * 12                       |
| SRENT-10                | Spectrum Analyzer            | Agilent            | E4440A                         | US4142151<br>1              | AT        | 2016/12/05 * 12                       |
| SCC-B12/B13/<br>SRSE-02 | Coaxial Cable&RF<br>Selector | Suhner/Suhner/TOYO | RG223U/141<br>PE/NS4906        | -/0901-270(<br>RF Selector) | CE        | 2017/04/07 * 12                       |
| SLS-03                  | LISN                         | Rohde & Schwarz    | ENV216                         | 100513                      | CE        | 2017/02/27 * 12                       |
| KAT3-12                 | Attenuator                   | JFW IND. INC.      | 50HF-003N                      | -                           | CE        | 2017/07/24 * 12                       |
| SOS-04                  | Humidity Indicator           | A&D                | AD-5681                        | 4061512                     | CE        | 2016/12/13 * 12                       |
| STR-07                  | Test Receiver                | Rohde & Schwarz    | ESU26                          | 100484                      | CE        | 2017/09/26 * 12                       |
| SJM-09                  | Measure                      | PROMART            | SEN1935                        | -                           | CE        | -                                     |
| COTS-SEMI-1             | EMI Software                 | TSJ                | TEPTO-DV(<br>RE,CE,RFI,M<br>F) | -                           | CE        | -                                     |
| STS-02                  | Digital Hitester             | Hioki              | 3805-50                        | 080997819                   | CE        | 2017/03/08 * 12                       |

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

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

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

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