



# **RADIO TEST REPORT**

**Test Report No. : 11724218S-A-R1**

**Applicant** : SEIKO EPSON CORPORATION  
**Type of Equipment** : sensor solar GPS watch  
**Model No.** : TR-MB8  
**FCC ID** : BKMAP012  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**Test Result** : Complied

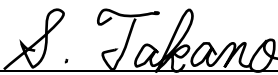
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations 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 11724218S-A. 11724218S-A is replaced with this report.

**Date of test:** May 9 to 12, 2017

**Representative test engineer:**

  
Hikaru Shirasawa  
Engineer  
Consumer Technology Division

**Approved by:**

  
Shinichi Takano  
Engineer  
Consumer Technology Division



- ☐ 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

## REVISION HISTORY

**Original Test Report No.: 11724218S-A**

[illegible]

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## **SECTION 1: Customer information**

|                  |   |                                                              |
|------------------|---|--------------------------------------------------------------|
| Company Name     | : | SEIKO EPSON CORPORATION                                      |
| Address          | : | 390, Shiojiri-machi, Shiojiri-shi, Nagano-ken 399-0796 Japan |
| Telephone Number | : | +81 263 54 5863                                              |
| Facsimile Number | : | +81 263 54 5761                                              |
| Contact Person   | : | Junya Kondo                                                  |

## **SECTION 2: Equipment under test (E.U.T.)**

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

|                            |   |                                                                                           |
|----------------------------|---|-------------------------------------------------------------------------------------------|
| Type of Equipment          | : | sensor solar GPS watch                                                                    |
| Model No.                  | : | TR-MB8                                                                                    |
| Serial No.                 | : | Refer to Section 4, Clause 4.2                                                            |
| Rating                     | : | DC 3.7 V                                                                                  |
| Receipt Date of Sample     | : | May 8, 2017                                                                               |
| Country of Mass-production | : | Japan                                                                                     |
| 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: TR-MB8 (referred to as the EUT in this report) is a sensor solar GPS watch.

## **Radio Specification**

### **Bluetooth Low Energy**

|                                 |   |                                |
|---------------------------------|---|--------------------------------|
| Radio Type                      | : | Transceiver                    |
| Frequency of Operation          | : | 2402 MHz - 2480 MHz            |
| Modulation                      | : | GFSK                           |
| Power Supply (radio part input) | : | DC 1.9 V                       |
| Antenna type                    | : | 1/4 $\lambda$ Monopole antenna |
| Antenna Gain                    | : | -4.3 dBi                       |
| Clock frequency (Maximum)       | : | 16 MHz                         |

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

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

### **3.2 Procedures and results**

| Item                                       | Test Procedure                                                       | Specification                                                            | Worst margin                                      | Results  | Remarks                                                           |
|--------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------|----------|-------------------------------------------------------------------|
| Conducted Emission                         | FCC: ANSI C63.10-2013<br>6. Standard test methods<br>IC: RSS-Gen 8.8 | FCC: Section 15.207<br>IC: RSS-Gen 8.8                                   | N/A                                               | N/A      | *1)                                                               |
| 6dB Bandwidth                              | FCC: KDB 558074 D01 DTS Meas<br>Guidance v04<br>IC: -                | FCC: Section<br>15.247(a)(2)<br>IC: RSS-247 5.2(a)                       | See data.                                         | Complied | Conducted                                                         |
| Maximum Peak<br>Output Power               | FCC: KDB 558074 D01 DTS Meas<br>Guidance v04<br>IC: RSS-Gen 6.12     | FCC: Section<br>15.247(b)(3)<br>IC: RSS-247 5.4(d)                       |                                                   | Complied | Conducted                                                         |
| Power Density                              | FCC: KDB 558074 D01 DTS Meas<br>Guidance v04<br>IC: -                | FCC: Section 15.247(e)<br>IC: RSS-247 5.2(b)                             |                                                   | Complied | Conducted                                                         |
| Spurious Emission<br>Restricted Band Edges | FCC: KDB 558074 D01 DTS Meas<br>Guidance v04<br>IC: RSS-Gen 6.13     | FCC: Section 15.247(d)<br>IC: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 1.0 dB<br>4804.000 MHz, AV, Vert.<br>BLE 2402 MHz | Complied | Conducted<br>(below 30 MHz)/<br>Radiated<br>(above 30 MHz)<br>*2) |

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

\*1) The test is not applicable since the EUT does not have AC power ports.

\*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.

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

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

The EUT provides stable voltage (DC 1.9 V) constantly to the wireless transmitter regardless of input voltage.

#### **Radiated Spurious Emission**

The test was performed with the New Battery and the stable voltage was supplied to the EUT during the tests.  
Therefore, the EUT complies with the requirement.

#### **Antenna Terminal Conducted Tests**

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

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

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

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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  | 2.6 dB            | 2.5 dB         | 2.6 dB         | 2.5 dB         | 2.5 dB       |
| Radiated emission<br>(Measurement distance: 3 m) | 9 kHz-30 MHz    | 3.1 dB            | 3.1 dB         | 3.1 dB         | -              | -            |
|                                                  | 30 MHz-200 MHz  | 4.6 dB            | 4.4 dB         | 4.6 dB         | -              | -            |
|                                                  | 200 MHz-1 GHz   | 5.8 dB            | 5.7 dB         | 5.8 dB         | -              | -            |
|                                                  | 1 GHz-13 GHz    | 4.9 dB            | 4.9 dB         | 4.9 dB         | -              | -            |
| Radiated emission<br>(Measurement distance: 1 m) | 13 GHz-18 GHz   | 4.6 dB            | 4.6 dB         | 4.6 dB         | -              | -            |
|                                                  | 18 GHz-40 GHz   | 4.9 dB            | 4.9 dB         | 4.9 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 %           |

#### Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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JAB Accreditation No. RTL02610

| 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.

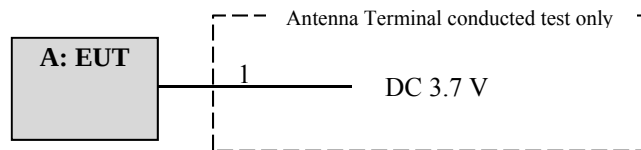
## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating Mode(s)

\*The details of Operating mode(s)

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Operating Mode       | Tested frequency                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------|
| Spurious Emission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Bluetooth Low Energy | 2402 MHz<br>2440 MHz<br>2480 MHz |
| 6dB Bandwidth<br>Maximum Peak Output Power<br>Power Density                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Bluetooth Low Energy | 2402 MHz<br>2440 MHz<br>2480 MHz |
| *Transmitting duty was 100 % on all tests.<br>*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)<br>*Power of the EUT was set by the software as follows;<br>Power settings: 0 dBm<br>Software: Ver: 10/A900.OPTL/0067.0A21.4153<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. |                      |                                  |

### 4.2 Configuration and peripherals



### Description of EUT

| No. | Item                   | Model number | Serial number                 | Manufacturer | Remarks |
|-----|------------------------|--------------|-------------------------------|--------------|---------|
| A   | sensor solar GPS watch | TR-MB8       | A02 *1)<br>192 *2)<br>193 *3) | Seiko Epson  | EUT     |

\*1) Used for Antenna Terminal conducted test

\*2) Used for Radiated Emission test

\*3) Used for Radiated Emission test (1 GHz – 2.8 GHz)

### List of cables used

| No. | Name | Length (m) | Shield     |            | Remarks |
|-----|------|------------|------------|------------|---------|
|     |      |            | Cable      | Connector  |         |
| 1   | DC   | 1.5        | Unshielded | Unshielded | -       |

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

### **Test Procedure**

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

[For below 1 GHz]

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 Styrofoam and covered with polyvinyl chloride. That has very low permittivity. 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 *1)                                                                                                                                                                              | PK                                                          |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz                                    | Average Power Method:<br><u>12.2.5.2</u><br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (Linear voltage)<br>Trace: 100 traces<br>Duty factor was added to the results. | RBW: 100 kHz<br>VBW: 300 kHz                                |
| Test Distance   | 3 m           | 3.97 m *2) (1 GHz – 13 GHz),<br>1 m *3) (13 GHz – 26.5 GHz) |                                                                                                                                                                                     | 3.97 m *2) (1 GHz – 13 GHz),<br>1 m *3) (13 GHz – 26.5 GHz) |

\*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

\*2) Distance Factor:  $20 \times \log(3.97 \text{ m} / 3.0 \text{ m}) = 2.43 \text{ dB}$

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

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- 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 -13 GHz) | Spurious (13 GHz -26.5 GHz) |
|----------------------|---------|------------------------|--------------------------|-----------------------------|
| Horizontal           | Z       | X                      | Y                        | X                           |
| Vertical             | Y       | X                      | X                        | 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                 |
|---------------------------------|-----------------------------------------|-----------------|--------------------|------------|------------------|----------|---------------------------------|
| 6dB Bandwidth                   | 10 MHz                                  | 100 kHz         | 300 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: 50 MHz BW) |
| Peak Power Density              | 1.5 times the 6dB Bandwidth             | 3 kHz           | 9.1 kHz            | Auto       | Peak             | Max Hold | Spectrum Analyzer *3) *4)       |
| Conducted Spurious Emission *5) | 9kHz to 150kHz                          | 200 Hz          | 620 Hz             | Auto       | Peak             | Max Hold | Spectrum Analyzer               |
|                                 | 150kHz to 30MHz                         | 9.1 kHz         | 27 kHz             |            |                  |          |                                 |

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

\*2) Reference data

\*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".

\*4) The test was not performed at RBW:3 kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3 kHz is less than the value of RBW:30 kHz and the test data met the limit with RBW:30 kHz.

\*5) 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**

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## **APPENDIX 1: Test data**

### **6dB Bandwidth**

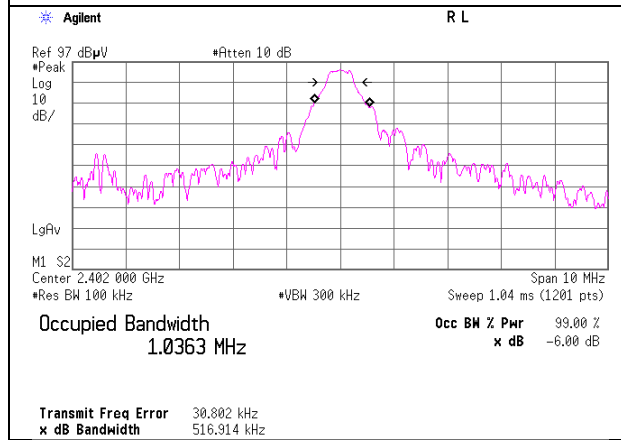
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11724218S-A-R1                     |
| Date                   | May 9, 2017                        |
| Temperature / Humidity | 26 deg. C / 34 % RH                |
| Engineer               | Hikaru Shirasawa                   |
| Mode                   | Tx BT LE                           |

| Mode  | Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|-------|--------------------|------------------------|----------------|
| BT LE | 2402               | 0.517                  | > 500          |
|       | 2440               | 0.531                  | > 500          |
|       | 2480               | 0.515                  | > 500          |

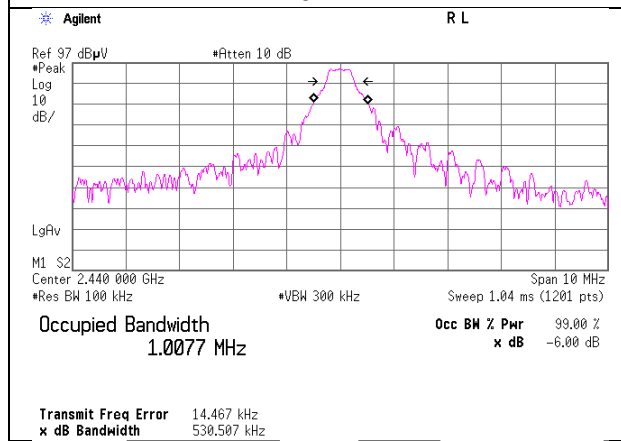
## 6dB Bandwidth

### BT LE

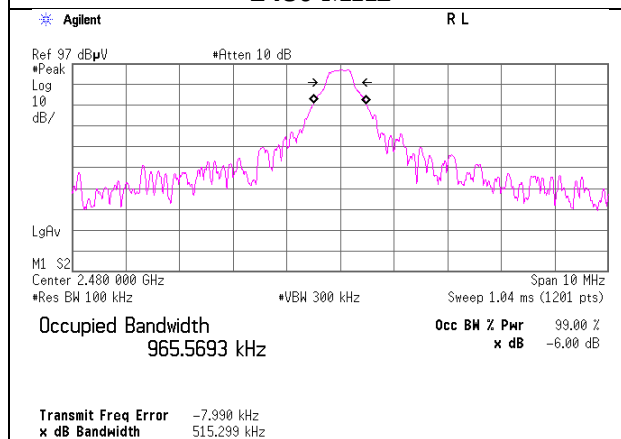
#### 2402 MHz



#### 2440 MHz



#### 2480 MHz



### **Maximum Peak Output Power**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11724218S-A-R1  
Date May 9, 2017  
Temperature / Humidity 26 deg. C / 34 % RH  
Engineer Hikaru Shirasawa  
Mode Tx BT LE

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |      | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2402           | -13.91           | 0.84                  | 9.64                   | -3.43  | 0.45 | 30.00 | 1000 | 33.43          |
| 2440           | -12.88           | 0.84                  | 9.64                   | -2.40  | 0.58 | 30.00 | 1000 | 32.40          |
| 2480           | -12.73           | 0.84                  | 9.65                   | -2.24  | 0.60 | 30.00 | 1000 | 32.24          |

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.

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

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11724218S-A-R1  
Date May 9, 2017  
Temperature / Humidity 26 deg. C / 34 % RH  
Engineer Hikaru Shirasawa  
Mode Tx BT LE

| 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] |
| 2402           | -14.33           | 0.84                  | 9.64                   | -3.85                    | 0.41 | 0.00                   | -3.85                           | 0.41 |
| 2440           | -13.25           | 0.84                  | 9.64                   | -2.77                    | 0.53 | 0.00                   | -2.77                           | 0.53 |
| 2480           | -13.10           | 0.84                  | 9.65                   | -2.61                    | 0.55 | 0.00                   | -2.61                           | 0.55 |

Sample Calculation:

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

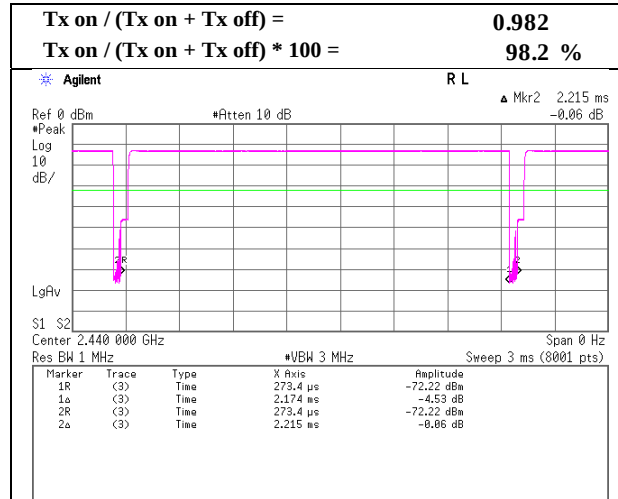
Result (Burst power average) = Time average + Duty factor

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

**The average output power was measured with the lowest order modulation and  
lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.**

## Burst rate confirmation

|                        |                                        |
|------------------------|----------------------------------------|
| Test place             | Shonan EMC Lab. No. No.5 Shielded Room |
| Report No.             | 11724218S-A-R1                         |
| Date                   | May 9, 2017                            |
| Temperature / Humidity | 26 deg. C / 34 % RH                    |
| Engineer               | Hikaru Shirasawa                       |
| Mode                   | Tx BT LE                               |



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

## Radiated Spurious Emission

|                        |                                            |                                 |                                  |
|------------------------|--------------------------------------------|---------------------------------|----------------------------------|
| Test place             | Shonan EMC Lab. No.1 Semi Anechoic Chamber |                                 |                                  |
| Report No.             | 11724218S-A-R1                             |                                 |                                  |
| Date                   | May 12, 2017                               | May 11, 2017                    | May 12, 2017                     |
| Temperature / Humidity | 24 deg. C / 40 % RH                        | 23 deg. C / 51 % RH             | 24 deg. C / 40 % RH              |
| Engineer               | Yosuke Ishikawa<br>(30 - 1000 MHz)         | Yosuke Ishikawa<br>(1 - 13 GHz) | Yosuke Ishikawa<br>(13-26.5 GHz) |
| Mode                   | BLE 2402 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.    | 146.949            | QP       | 22.00             | 14.76              | 8.77         | 31.77        | 0.00                    | 13.76              | 43.50             | 29.7           | 100            | 16             |        |
| Hori.    | 184.062            | QP       | 21.80             | 16.35              | 8.98         | 31.77        | 0.00                    | 15.36              | 43.50             | 28.1           | 100            | 50             |        |
| Hori.    | 606.945            | QP       | 21.90             | 19.19              | 8.62         | 31.96        | 0.00                    | 17.75              | 46.00             | 28.2           | 100            | 31             |        |
| Hori.    | 840.149            | QP       | 21.50             | 21.29              | 9.70         | 31.63        | 0.00                    | 20.86              | 46.00             | 25.1           | 100            | 9              |        |
| Hori.    | 2390.000           | PK       | 49.10             | 27.21              | 14.19        | 40.85        | 2.43                    | 52.08              | 73.90             | 21.8           | 164            | 12             |        |
| Hori.    | 4804.000           | PK       | 58.30             | 31.13              | 6.64         | 41.86        | 2.43                    | 56.64              | 73.90             | 17.2           | 220            | 78             |        |
| Hori.    | 7206.000           | PK       | 45.68             | 36.24              | 8.07         | 41.18        | 2.43                    | 51.24              | 73.90             | 22.6           | 150            | 0              |        |
| Hori.    | 9608.000           | PK       | 43.98             | 38.13              | 8.98         | 40.59        | 2.43                    | 52.93              | 73.90             | 20.9           | 150            | 0              |        |
| Hori.    | 2390.000           | AV       | 36.12             | 27.21              | 14.19        | 40.85        | 2.43                    | 39.10              | 53.90             | 14.8           | 164            | 12             |        |
| Hori.    | 4804.000           | AV       | 54.02             | 31.13              | 6.64         | 41.86        | 2.43                    | 52.36              | 53.90             | 1.5            | 220            | 78             |        |
| Hori.    | 7206.000           | AV       | 37.34             | 36.24              | 8.07         | 41.18        | 2.43                    | 42.90              | 53.90             | 11.0           | 150            | 0              |        |
| Hori.    | 9608.000           | AV       | 35.59             | 38.13              | 8.98         | 40.59        | 2.43                    | 44.54              | 53.90             | 9.3            | 150            | 0              |        |
| Vert.    | 31.047             | QP       | 22.00             | 17.43              | 7.05         | 31.83        | 0.00                    | 14.65              | 40.00             | 25.3           | 100            | 24             |        |
| Vert.    | 171.916            | QP       | 21.90             | 15.92              | 8.98         | 31.77        | 0.00                    | 15.03              | 43.50             | 28.4           | 100            | 11             |        |
| Vert.    | 722.238            | QP       | 21.70             | 19.97              | 9.18         | 31.96        | 0.00                    | 18.89              | 46.00             | 27.1           | 100            | 60             |        |
| Vert.    | 873.099            | QP       | 21.40             | 21.70              | 9.86         | 31.48        | 0.00                    | 21.48              | 46.00             | 24.5           | 100            | 27             |        |
| Vert.    | 2390.000           | PK       | 38.52             | 27.21              | 14.19        | 40.85        | 2.43                    | 41.50              | 73.90             | 32.4           | 139            | 5              |        |
| Vert.    | 4804.000           | PK       | 58.65             | 31.13              | 6.64         | 41.86        | 2.43                    | 56.99              | 73.90             | 16.9           | 141            | 31             |        |
| Vert.    | 7206.000           | PK       | 45.67             | 36.24              | 8.07         | 41.18        | 2.43                    | 51.23              | 73.90             | 22.6           | 150            | 0              |        |
| Vert.    | 9608.000           | PK       | 45.66             | 38.13              | 8.98         | 40.59        | 2.43                    | 54.61              | 73.90             | 19.2           | 176            | 24             |        |
| Vert.    | 2390.000           | AV       | 35.22             | 27.21              | 14.19        | 40.85        | 2.43                    | 38.20              | 53.90             | 15.7           | 139            | 5              |        |
| Vert.    | 4804.000           | AV       | 54.54             | 31.13              | 6.64         | 41.86        | 2.43                    | 52.88              | 53.90             | 1.0            | 141            | 31             |        |
| Vert.    | 7206.000           | AV       | 37.29             | 36.24              | 8.07         | 41.18        | 2.43                    | 42.85              | 53.90             | 11.0           | 150            | 0              |        |
| Vert.    | 9608.000           | AV       | 37.33             | 38.13              | 8.98         | 40.59        | 2.43                    | 46.28              | 53.90             | 7.6            | 176            | 24             |        |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2402.000           | PK       | 87.17             | 27.25              | 14.20        | 40.84        | 2.43                    | 90.21              | -                 | -              | Carrier |
| Hori.    | 2395.547           | PK       | 50.01             | 27.23              | 14.19        | 40.85        | 2.43                    | 53.01              | 70.21             | 17.2           |         |
| Hori.    | 2400.000           | PK       | 44.83             | 27.25              | 14.19        | 40.84        | 2.43                    | 47.86              | 70.21             | 22.4           |         |
| Vert.    | 2402.000           | PK       | 87.29             | 27.25              | 14.20        | 40.84        | 2.43                    | 90.33              | -                 | -              | Carrier |
| Vert.    | 2395.649           | PK       | 50.50             | 27.23              | 14.19        | 40.85        | 2.43                    | 53.50              | 70.33             | 16.8           |         |
| Vert.    | 2400.000           | PK       | 43.87             | 27.25              | 14.19        | 40.84        | 2.43                    | 46.90              | 70.33             | 23.4           |         |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

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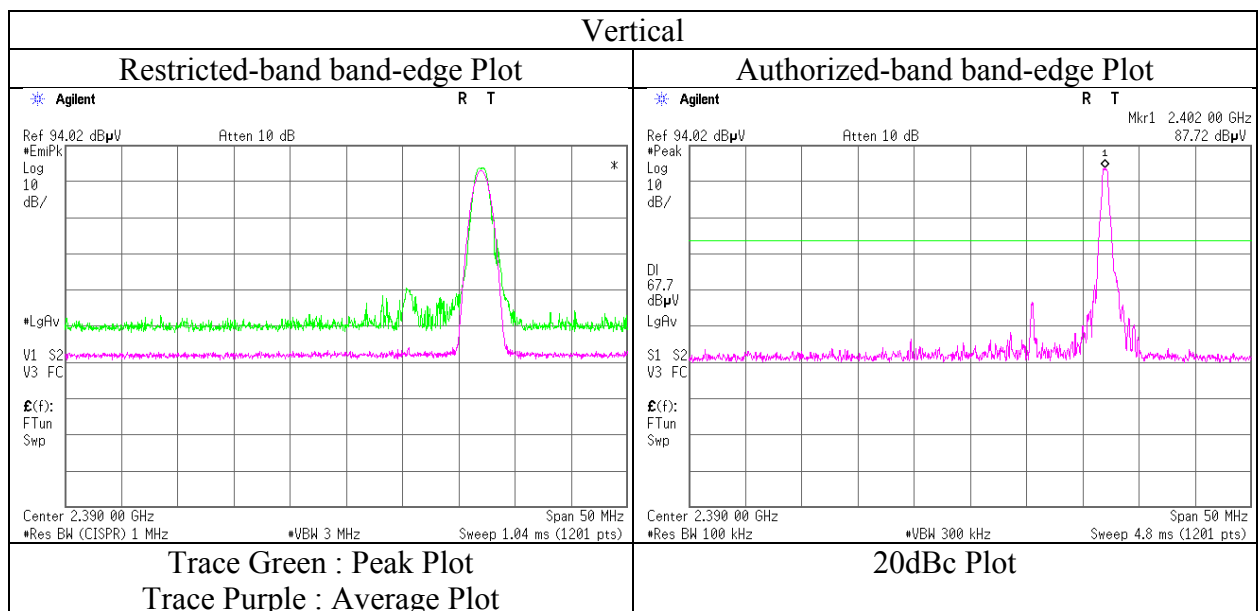
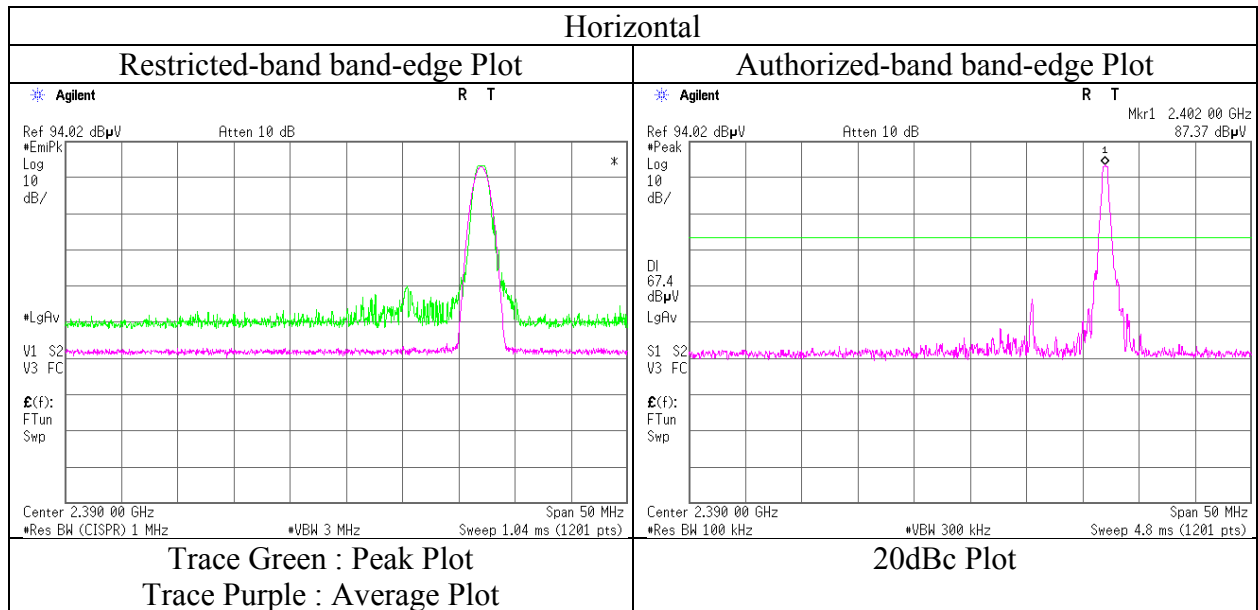
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.1 Semi Anechoic Chamber |
| Report No.             | 11724218S-A-R1                             |
| Date                   | May 11, 2017                               |
| Temperature / Humidity | 23 deg. C / 51 % RH                        |
| Engineer               | Yosuke Ishikawa<br>(1 - 13 GHz)            |
| Mode                   | BLE 2402 MHz                               |



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

## Radiated Spurious Emission

|                        |                                            |                                 |                                  |
|------------------------|--------------------------------------------|---------------------------------|----------------------------------|
| Test place             | Shonan EMC Lab. No.1 Semi Anechoic Chamber |                                 |                                  |
| Report No.             | 11724218S-A-R1                             |                                 |                                  |
| Date                   | May 12, 2017                               | May 11, 2017                    | May 12, 2017                     |
| Temperature / Humidity | 24 deg. C / 40 % RH                        | 23 deg. C / 51 % RH             | 24 deg. C / 40 % RH              |
| Engineer               | Yosuke Ishikawa<br>(30 - 1000 MHz)         | Yosuke Ishikawa<br>(1 - 13 GHz) | Yosuke Ishikawa<br>(13-26.5 GHz) |
| Mode                   | BLE 2440 MHz                               |                                 |                                  |

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 163.475            | QP       | 21.80             | 15.50              | 8.96         | 31.77        | 0.00                    | 14.49              | 43.50             | 29.0           | 100            | 43             |        |
| Hori.    | 188.242            | QP       | 22.00             | 16.37              | 8.99         | 31.77        | 0.00                    | 15.59              | 43.50             | 27.9           | 100            | 69             |        |
| Hori.    | 796.563            | QP       | 21.40             | 20.74              | 9.48         | 31.79        | 0.00                    | 19.83              | 46.00             | 26.1           | 100            | 4              |        |
| Hori.    | 908.227            | QP       | 21.20             | 22.09              | 10.02        | 31.27        | 0.00                    | 22.04              | 46.00             | 23.9           | 100            | 41             |        |
| Hori.    | 4880.000           | PK       | 55.56             | 31.29              | 6.72         | 41.76        | 2.43                    | 54.24              | 73.90             | 19.6           | 225            | 56             |        |
| Hori.    | 7320.000           | PK       | 45.28             | 36.40              | 8.20         | 41.27        | 2.43                    | 51.04              | 73.90             | 22.8           | 150            | 0              |        |
| Hori.    | 9760.000           | PK       | 44.42             | 38.35              | 9.09         | 40.62        | 2.43                    | 53.67              | 73.90             | 20.2           | 150            | 0              |        |
| Hori.    | 4880.000           | AV       | 52.34             | 31.29              | 6.72         | 41.76        | 2.43                    | 51.02              | 53.90             | 2.8            | 225            | 56             |        |
| Hori.    | 7320.000           | AV       | 37.11             | 36.40              | 8.20         | 41.27        | 2.43                    | 42.87              | 53.90             | 11.0           | 150            | 0              |        |
| Hori.    | 9760.000           | AV       | 35.69             | 38.35              | 9.09         | 40.62        | 2.43                    | 44.94              | 53.90             | 8.9            | 150            | 0              |        |
| Vert.    | 31.316             | QP       | 22.00             | 17.35              | 7.05         | 31.83        | 0.00                    | 14.57              | 40.00             | 25.4           | 100            | 32             |        |
| Vert.    | 178.127            | QP       | 22.10             | 16.24              | 8.97         | 31.77        | 0.00                    | 15.54              | 43.50             | 27.9           | 100            | 20             |        |
| Vert.    | 576.878            | QP       | 21.60             | 18.81              | 8.51         | 31.96        | 0.00                    | 16.96              | 46.00             | 29.0           | 100            | 8              |        |
| Vert.    | 923.037            | QP       | 21.10             | 22.17              | 10.06        | 31.14        | 0.00                    | 22.19              | 46.00             | 23.8           | 100            | 15             |        |
| Vert.    | 4880.000           | PK       | 55.34             | 31.29              | 6.72         | 41.76        | 2.43                    | 54.02              | 73.90             | 19.8           | 139            | 36             |        |
| Vert.    | 7320.000           | PK       | 45.66             | 36.40              | 8.20         | 41.27        | 2.43                    | 51.42              | 73.90             | 22.4           | 150            | 0              |        |
| Vert.    | 9760.000           | PK       | 45.01             | 38.35              | 9.09         | 40.62        | 2.43                    | 54.26              | 73.90             | 19.6           | 146            | 23             |        |
| Vert.    | 4880.000           | AV       | 52.24             | 31.29              | 6.72         | 41.76        | 2.43                    | 50.92              | 53.90             | 2.9            | 139            | 36             |        |
| Vert.    | 7320.000           | AV       | 37.12             | 36.40              | 8.20         | 41.27        | 2.43                    | 42.88              | 53.90             | 11.0           | 150            | 0              |        |
| Vert.    | 9760.000           | AV       | 36.42             | 38.35              | 9.09         | 40.62        | 2.43                    | 45.67              | 53.90             | 8.2            | 146            | 23             |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.43\text{ dB}$

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

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## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber  
Report No. : 11724218S-A-R1  
Date : May 12, 2017      May 11, 2017      May 12, 2017  
Temperature / Humidity : 24 deg. C / 40 % RH      23 deg. C / 51 % RH      24 deg. C / 40 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(30 - 1000 MHz)      (1 - 13 GHz)      (13-26.5 GHz)  
Mode : BLE 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.    | 152.535            | QP       | 21.70             | 15.00              | 8.87         | 31.77        | 0.00                    | 13.80              | 43.50             | 29.7           | 100            | 63             |        |
| Hori.    | 194.412            | QP       | 21.90             | 16.40              | 9.02         | 31.77        | 0.00                    | 15.55              | 43.50             | 27.9           | 100            | 19             |        |
| Hori.    | 733.881            | QP       | 22.00             | 20.09              | 9.23         | 31.95        | 0.00                    | 19.37              | 46.00             | 26.6           | 100            | 8              |        |
| Hori.    | 876.050            | QP       | 21.60             | 21.74              | 9.89         | 31.46        | 0.00                    | 21.77              | 46.00             | 24.2           | 100            | 31             |        |
| Hori.    | 2483.500           | PK       | 46.32             | 27.52              | 14.27        | 40.81        | 2.43                    | 49.73              | 73.90             | 24.1           | 158            | 14             |        |
| Hori.    | 2485.567           | PK       | 55.12             | 27.53              | 14.27        | 40.81        | 2.43                    | 58.54              | 73.90             | 15.3           | 149            | 8              |        |
| Hori.    | 4960.000           | PK       | 53.78             | 31.45              | 6.79         | 41.65        | 2.43                    | 52.80              | 73.90             | 21.1           | 218            | 67             |        |
| Hori.    | 7440.000           | PK       | 45.08             | 36.57              | 8.35         | 41.36        | 2.43                    | 51.07              | 73.90             | 22.8           | 150            | 0              |        |
| Hori.    | 9920.000           | PK       | 44.58             | 38.58              | 9.21         | 40.66        | 2.43                    | 54.14              | 73.90             | 19.7           | 150            | 0              |        |
| Hori.    | 2483.500           | AV       | 36.46             | 27.52              | 14.27        | 40.81        | 2.43                    | 39.87              | 53.90             | 14.0           | 158            | 14             |        |
| Hori.    | 2485.567           | AV       | 35.96             | 27.53              | 14.27        | 40.81        | 2.43                    | 39.38              | 53.90             | 14.5           | 149            | 8              |        |
| Hori.    | 4960.000           | AV       | 49.85             | 31.45              | 6.79         | 41.65        | 2.43                    | 48.87              | 53.90             | 5.0            | 218            | 67             |        |
| Hori.    | 7440.000           | AV       | 36.54             | 36.57              | 8.35         | 41.36        | 2.43                    | 42.53              | 53.90             | 11.3           | 150            | 0              |        |
| Hori.    | 9920.000           | AV       | 34.84             | 38.58              | 9.21         | 40.66        | 2.43                    | 44.40              | 53.90             | 9.5            | 150            | 0              |        |
| Vert.    | 32.933             | QP       | 22.50             | 16.85              | 7.09         | 31.83        | 0.00                    | 14.61              | 40.00             | 25.3           | 100            | 17             |        |
| Vert.    | 174.738            | QP       | 22.00             | 16.06              | 8.97         | 31.77        | 0.00                    | 15.26              | 43.50             | 28.2           | 100            | 42             |        |
| Vert.    | 632.025            | QP       | 22.10             | 19.34              | 8.75         | 32.00        | 0.00                    | 18.19              | 46.00             | 27.8           | 100            | 25             |        |
| Vert.    | 853.118            | QP       | 21.60             | 21.45              | 9.76         | 31.58        | 0.00                    | 21.23              | 46.00             | 24.7           | 100            | 16             |        |
| Vert.    | 2483.500           | PK       | 46.02             | 27.52              | 14.27        | 40.81        | 2.43                    | 49.43              | 73.90             | 24.4           | 109            | 9              |        |
| Vert.    | 2485.529           | PK       | 55.42             | 27.53              | 14.27        | 40.81        | 2.43                    | 58.84              | 73.90             | 15.0           | 132            | 11             |        |
| Vert.    | 4960.000           | PK       | 55.64             | 31.45              | 6.79         | 41.65        | 2.43                    | 54.66              | 73.90             | 19.2           | 138            | 202            |        |
| Vert.    | 7440.000           | PK       | 44.87             | 36.57              | 8.35         | 41.36        | 2.43                    | 50.86              | 73.90             | 23.0           | 150            | 0              |        |
| Vert.    | 9920.000           | PK       | 44.86             | 38.58              | 9.21         | 40.66        | 2.43                    | 54.42              | 73.90             | 19.4           | 157            | 25             |        |
| Vert.    | 2483.500           | AV       | 36.73             | 27.52              | 14.27        | 40.81        | 2.43                    | 40.14              | 53.90             | 13.7           | 109            | 9              |        |
| Vert.    | 2485.529           | AV       | 35.85             | 27.53              | 14.27        | 40.81        | 2.43                    | 39.27              | 53.90             | 14.6           | 132            | 11             |        |
| Vert.    | 4960.000           | AV       | 52.11             | 31.45              | 6.79         | 41.65        | 2.43                    | 51.13              | 53.90             | 2.7            | 138            | 202            |        |
| Vert.    | 7440.000           | AV       | 36.80             | 36.57              | 8.35         | 41.36        | 2.43                    | 42.79              | 53.90             | 11.1           | 150            | 0              |        |
| Vert.    | 9920.000           | AV       | 35.34             | 38.58              | 9.21         | 40.66        | 2.43                    | 44.90              | 53.90             | 9.0            | 157            | 25             |        |

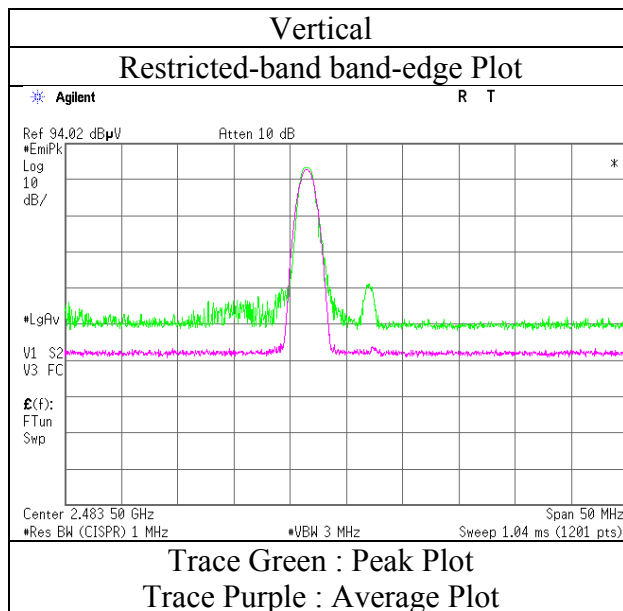
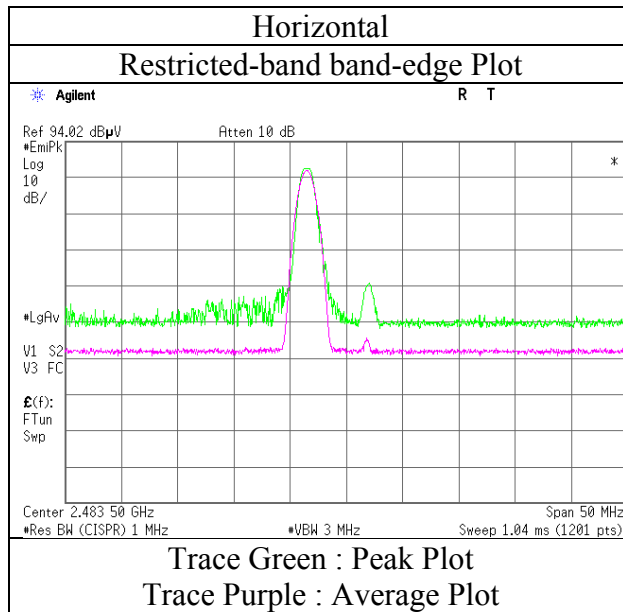
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz :  $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.43\text{ dB}$

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

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

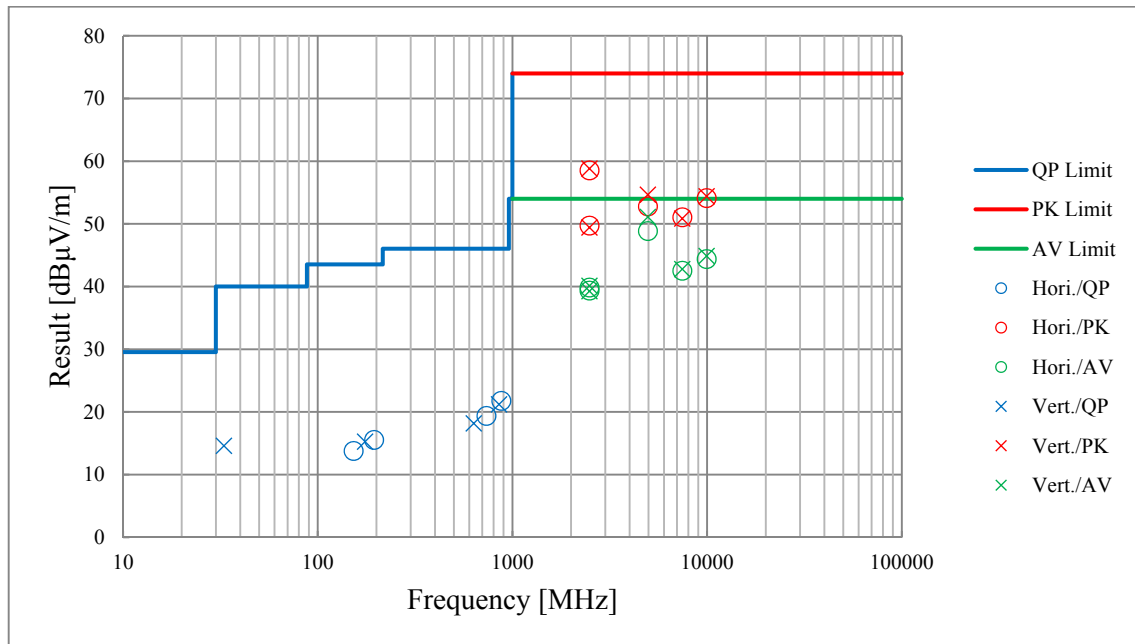
|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.1 Semi Anechoic Chamber |
| Report No.             | 11724218S-A-R1                             |
| Date                   | May 11, 2017                               |
| Temperature / Humidity | 23 deg. C / 51 % RH                        |
| Engineer               | Yosuke Ishikawa                            |
|                        | (1 - 13 GHz)                               |
| Mode                   | BLE 2480 MHz                               |



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

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

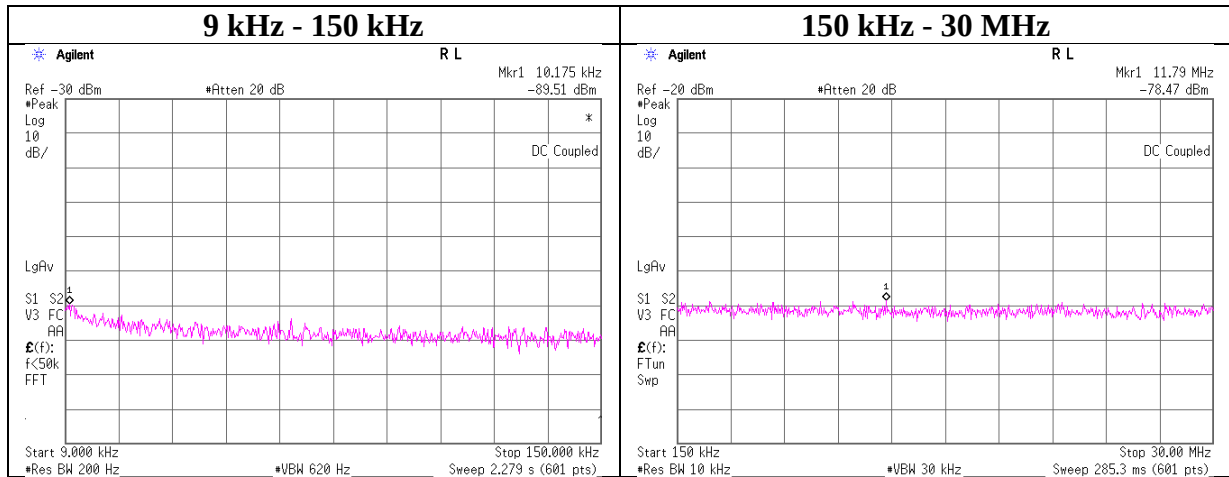
|                        |                                            |                                 |                                  |
|------------------------|--------------------------------------------|---------------------------------|----------------------------------|
| Test place             | Shonan EMC Lab. No.1 Semi Anechoic Chamber |                                 |                                  |
| Report No.             | 11724218S-A-R1                             |                                 |                                  |
| Date                   | May 12, 2017                               | May 11, 2017                    | May 12, 2017                     |
| Temperature / Humidity | 24 deg. C / 40 % RH                        | 23 deg. C / 51 % RH             | 24 deg. C / 40 % RH              |
| Engineer               | Yosuke Ishikawa<br>(30 - 1000 MHz)         | Yosuke Ishikawa<br>(1 - 13 GHz) | Yosuke Ishikawa<br>(13-26.5 GHz) |
| Mode                   | BLE 2480 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. : 11724218S-A-R1  
Date : May 9, 2017  
Temperature / Humidity : 26 deg. C / 34 % RH  
Engineer : Hikaru Shirasawa  
Mode : Tx BT LE 2402 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain*<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|---------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 10.18              | -89.5            | 0.00                  | 9.5                        | 2.0                       | 1                          | -78.0         | 300             | 6.0                      | -16.7                             | 47.4              | 64.1           |        |
| 1179.00            | -78.5            | 0.02                  | 9.5                        | 2.0                       | 1                          | -66.9         | 30              | 6.0                      | 14.4                              | 26.1              | 11.7           |        |

$E [dBuV/m] = EIRP [dBm] - 20 \log (Distance [m]) + Ground\ bounce [dB] + 104.8 [dBuV/m]$

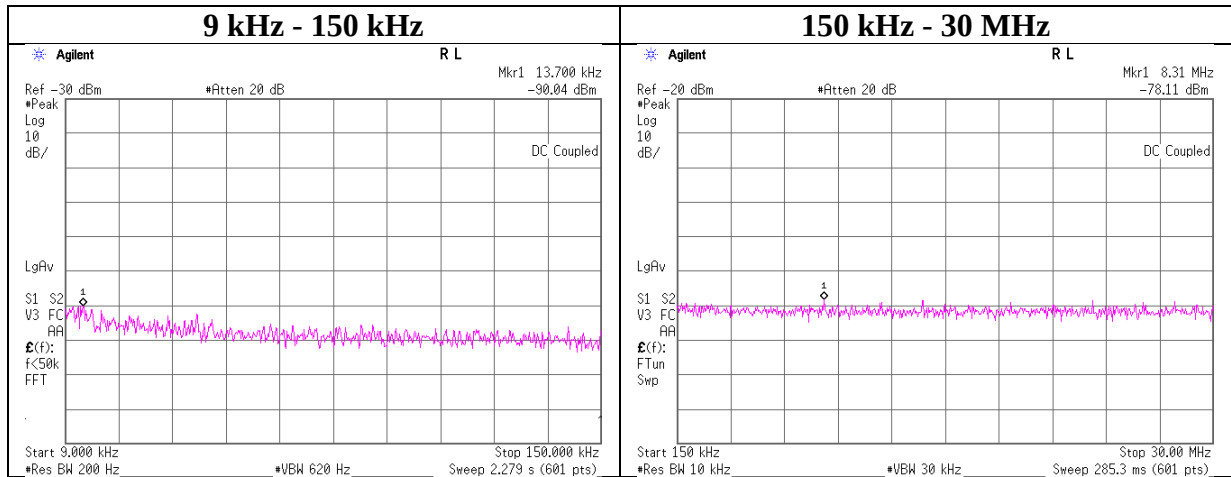
$EIRP[dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

|                        |                                     |
|------------------------|-------------------------------------|
| Test place             | Shonan EMC Lab. No.5 5Shielded Room |
| Report No.             | 11724218S-A-R1                      |
| Date                   | May 9, 2017                         |
| Temperature / Humidity | 26 deg. C / 34 % RH                 |
| Engineer               | Hikaru Shirasawa                    |
| Mode                   | Tx BT LE 2440 MHz                   |



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain*<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|---------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 13.70              | -90.0            | 0.00                  | 9.5                        | 2.0                       | 1                          | -78.5         | 300             | 6.0                      | -17.2                             | 44.8              | 62.0           |        |
| 8310.00            | -78.1            | 0.02                  | 9.5                        | 2.0                       | 1                          | -66.6         | 30              | 6.0                      | 14.7                              | 29.5              | 14.8           |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

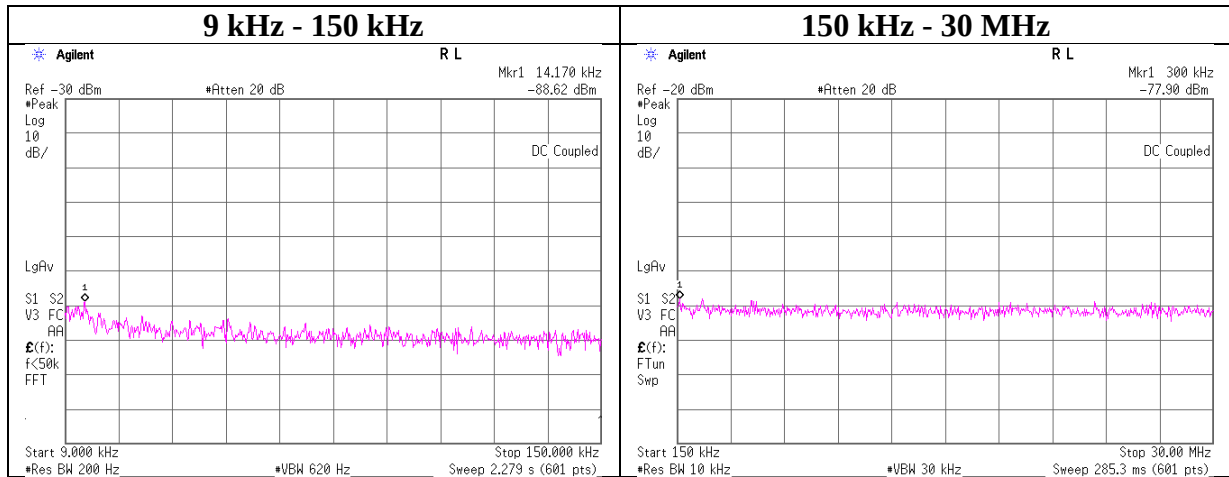
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11724218S-A-R1                     |
| Date                   | May 9, 2017                        |
| Temperature / Humidity | 26 deg. C / 34 % RH                |
| Engineer               | Hikaru Shirasawa                   |
| Mode                   | Tx BT LE 2480 MHz                  |



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain*<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|---------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 14.17              | -88.6            | 0.00                  | 9.5                        | 2.0                       | 1                          | -77.1         | 300             | 6.0                      | -15.8                             | 44.5              | 60.3           |        |
| 0.30               | -77.9            | 0.00                  | 9.5                        | 2.0                       | 1                          | -66.4         | 300             | 6.0                      | -5.1                              | 78.0              | 83.1           |        |

$E [dBuV/m] = EIRP [dBm] - 20 \log (Distance [m]) + Ground\ bounce [dB] + 104.8 [dBuV/m]$

$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

### **Power Density**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11724218S-A-R1  
Date May 9, 2017  
Temperature / Humidity 26 deg. C / 34 % RH  
Engineer Hikaru Shirasawa  
Mode Tx BT LE

| Freq.   | Reading | Cable<br>Loss | Atten.<br>Loss | Result | Limit | Margin |
|---------|---------|---------------|----------------|--------|-------|--------|
| [MHz]   | [dBm]   | [dB]          | [dB]           | [dBm]  | [dBm] | [dB]   |
| 2402.00 | -24.61  | 0.84          | 9.64           | -14.13 | 8.00  | 22.13  |
| 2440.00 | -23.70  | 0.84          | 9.64           | -13.22 | 8.00  | 21.22  |
| 2480.00 | -23.07  | 0.84          | 9.65           | -12.58 | 8.00  | 20.58  |

Sample Calculation:

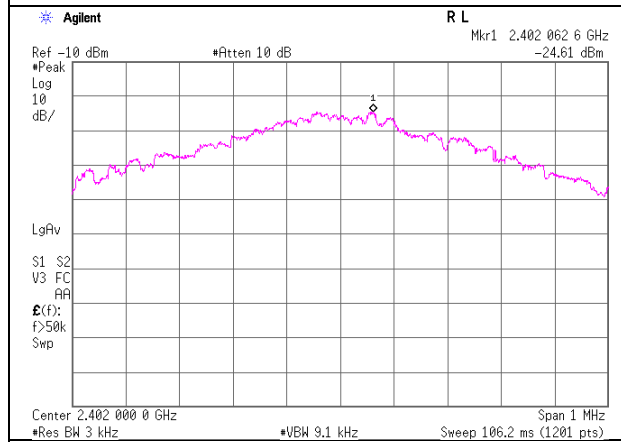
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

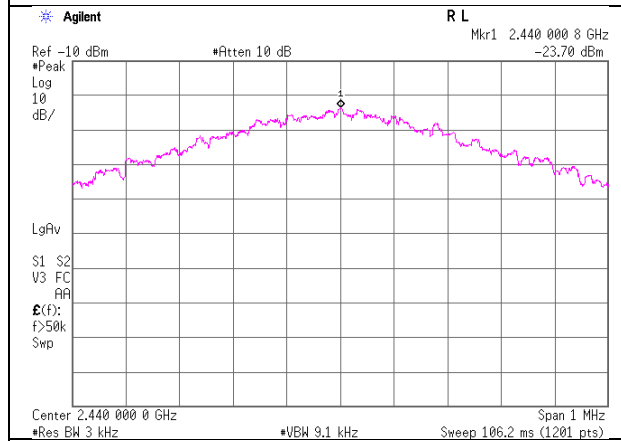
## Power Density

### BT LE

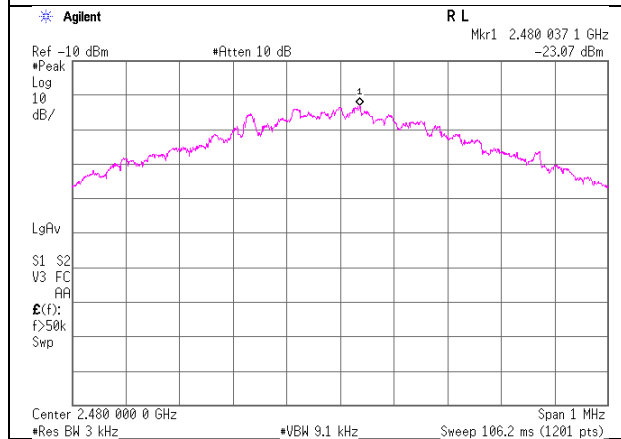
#### 2402 MHz



#### 2440 MHz

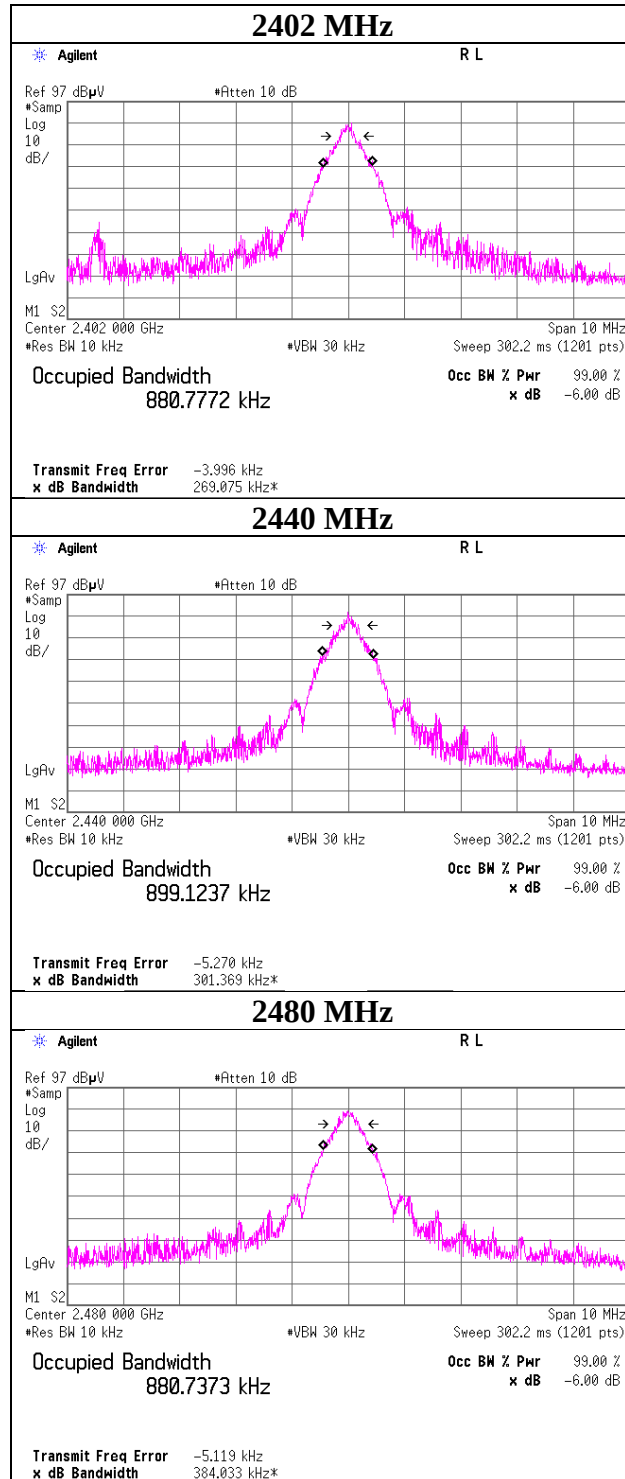


#### 2480 MHz



## 99% Occupied Bandwidth

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11724218S-A-R1                     |
| Date                   | May 9, 2017                        |
| Temperature / Humidity | 26 deg. C / 34 % RH                |
| Engineer               | Hikaru Shirasawa                   |
| Mode                   | Tx BT LE                           |



## APPENDIX 2: Test instruments

### Test equipment

| Control No.                            | Instrument                   | Manufacturer                                               | Model No                                               | Serial No                   | Test Item | Calibration Date *<br>Interval(month) |
|----------------------------------------|------------------------------|------------------------------------------------------------|--------------------------------------------------------|-----------------------------|-----------|---------------------------------------|
| SPM-06                                 | Power Meter                  | Anritsu                                                    | ML2495A                                                | 0850009                     | AT        | 2017/04/25 * 12                       |
| SPSS-01                                | Power Sensor                 | Anritsu                                                    | MA2444D                                                | 0738366                     | AT        | 2017/04/25 * 12                       |
| SRENT-09                               | Spectrum Analyzer            | Agilent                                                    | E4440A                                                 | MY46186392                  | AT        | 2016/11/01 * 12                       |
| SCC-G11                                | Coaxial Cable                | Suhner                                                     | SUCOFLEX<br>102                                        | 31595/2                     | AT        | 2017/03/23 * 12                       |
| SAT10-09                               | Attenuator                   | Weinschel Corp.                                            | 54A-10                                                 | W5692                       | AT        | 2016/11/07 * 12                       |
| SOS-09                                 | Humidity Indicator           | A&D                                                        | AD-5681                                                | 4061484                     | AT        | 2016/12/13 * 12                       |
| STS-05                                 | Digital Hitester             | Hioki                                                      | 3805-50                                                | 080997828                   | AT        | 2016/10/17 * 12                       |
| SAF-04                                 | Pre Amplifier                | TOYO Corporation                                           | TPA0118-36                                             | 1440489                     | RE        | 2017/03/17 * 12                       |
| SCC-G05                                | Coaxial Cable                | Junkosha                                                   | J121102207-00                                          | APR-30-15-0<br>37           | RE        | 2017/01/08 * 12                       |
| SCC-G22                                | Coaxial Cable                | Suhner                                                     | SUCOFLEX<br>104                                        | 296199/4                    | RE        | 2016/05/11 * 12                       |
| SHA-01                                 | Horn Antenna                 | Schwarzbeck                                                | BBHA9120D                                              | 9120D-725                   | RE        | 2016/08/09 * 12                       |
| SOS-01                                 | Humidity Indicator           | A&D                                                        | AD-5681                                                | 4062555                     | RE        | 2016/10/12 * 12                       |
| SSA-02                                 | Spectrum Analyzer            | Agilent                                                    | E4448A                                                 | MY48250106                  | RE        | 2017/03/07 * 12                       |
| KJM-09                                 | Measure                      | KOMELON                                                    | KMC-36                                                 | -                           | RE        | -                                     |
| SAEC-01(SVSW<br>R)                     | Semi-Anechoic Chamber        | TDK                                                        | SAEC-01(SVS<br>WR)                                     | 1                           | RE        | 2016/07/24 * 12                       |
| COTS-SEMI-1                            | EMI Software                 | TSJ                                                        | TEPTO-DV(RE<br>,CE,RFI,MF)                             | -                           | RE        | -                                     |
| SCC-G41                                | Coaxial Cable                | Junkosha                                                   | MWX221-0100<br>ONFSNMS/B                               | 1612S006                    | RE        | 2017/01/08 * 12                       |
| SAT10-05                               | Attenuator(above1GHz)        | Agilent                                                    | 8493C-010                                              | 74864                       | RE        | 2016/11/07 * 12                       |
| SFL-02                                 | Highpass Filter              | MICRO-TRONICS                                              | HPM50111                                               | 051                         | RE        | 2016/11/29 * 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        | 2016/08/04 * 12                       |
| SBA-01                                 | Biconical Antenna            | Schwarzbeck                                                | BBA9106                                                | 91032664                    | RE        | 2016/10/15 * 12                       |
| SCC-A1/A3/A5/<br>A7/A8/A13/SRS<br>E-01 | Coaxial Cable&RF<br>Selector | Fujikura/Fujikura/Suhner<br>/Suhner/Suhner/Suhner/T<br>OYO | 8D2W/12DSFA<br>/141PE/141PE/<br>141PE/141PE/<br>NS4906 | -/0901-269(R<br>F Selector) | RE        | 2017/04/07 * 12                       |
| SCC-A2/A4/A6/<br>A7/A8/A13/SRS<br>E-01 | Coaxial Cable&RF<br>Selector | Fujikura/Fujikura/Suhner<br>/Suhner/Suhner/Suhner/T<br>OYO | 8D2W/12DSFA<br>/141PE/141PE/<br>141PE/141PE/<br>NS4906 | -/0901-269(R<br>F Selector) | RE        | 2017/04/07 * 12                       |
| SLA-05                                 | Logperiodic Antenna          | Schwarzbeck                                                | VUSLP9111B                                             | 193                         | RE        | 2017/01/05 * 12                       |
| STR-07                                 | Test Receiver                | Rohde & Schwarz                                            | ESU26                                                  | 100484                      | RE        | 2016/09/28 * 12                       |
| SAEC-01(NSA)                           | Semi-Anechoic Chamber        | TDK                                                        | SAEC-01(NSA<br>)                                       | 1                           | RE        | 2016/07/14 * 12                       |
| SCC-G20                                | Coaxial Cable                | Junkosha                                                   | J12J102518-00                                          | APR-15-15-0<br>03           | RE        | 2017/04/20 * 12                       |
| SCC-G33                                | Coaxial Cable                | Junkosha                                                   | MWX241-0100<br>0KMSKMS                                 | -                           | RE        | 2017/04/20 * 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        | 2016/09/27 * 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: RE: Radiated Emission test  
AT: Antenna Terminal Conducted test

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