



Test report No. : 10373518S-A  
Page : 1 of 43  
Issued date : July 3, 2014  
Revised date : July 9, 2014  
FCC ID : AK8NWZA10

# **RADIO TEST REPORT**

**Test Report No.: 10373518S-A**

**Applicant** : Sony Corporation  
**Type of Equipment** : Digital Media Player  
**Model No.** : NWZ-A17  
**FCC ID** : AK8NWZA10  
**Test regulation** : FCC Part15 Subpart C: 2014  
**Test result** : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** June 18 to 20, 2014

**Tested by:**

*M. Hosaka*

Makoto Hosaka  
Engineer  
Consumer Technology Division

**Approved by :**

*T. Imamura*

Toyokazu Imamura  
Leader  
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".

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

13-EM-F0429

Facsimile: +81 463 50 6401

## **Contents**

|                                                                      | <b>Page</b> |
|----------------------------------------------------------------------|-------------|
| <b>SECTION 1: Customer information .....</b>                         | <b>4</b>    |
| <b>SECTION 2: Equipment under test (E.U.T.).....</b>                 | <b>4</b>    |
| <b>SECTION 3: Test specification, procedures &amp; results .....</b> | <b>6</b>    |
| <b>SECTION 4: Operation of E.U.T. during testing.....</b>            | <b>9</b>    |
| <b>SECTION 5: Carrier frequency separation.....</b>                  | <b>11</b>   |
| <b>SECTION 6: 20dB bandwidth &amp; Occupied bandwidth (99%).....</b> | <b>11</b>   |
| <b>SECTION 7: Number of hopping frequency .....</b>                  | <b>11</b>   |
| <b>SECTION 8: Dwell time .....</b>                                   | <b>11</b>   |
| <b>SECTION 9: Maximum peak output power.....</b>                     | <b>11</b>   |
| <b>SECTION 10: Spurious emissions (Antenna port conducted).....</b>  | <b>11</b>   |
| <b>SECTION 11: Radiated emission.....</b>                            | <b>12</b>   |
| <b>Contents of APPENDIXES .....</b>                                  | <b>14</b>   |
| <b>APPENDIX 1: Data of radio tests .....</b>                         | <b>15</b>   |
| <b>APPENDIX 2: Test instruments .....</b>                            | <b>41</b>   |
| <b>APPENDIX 3: Photographs of test setup .....</b>                   | <b>42</b>   |

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## **SECTION 1: Customer information**

Company Name : Sony Corporation  
Brand Name : SONY  
Address : 2-10-1 Osaki, Shinagawa-ku, Tokyo, 141-8610, Japan  
Telephone Number : +81 50 3750 7634  
Contact Person : Shinichi Maru

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

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

Type of Equipment : Digital Media Player  
Model Number : NWZ-A17  
Serial Number : Refer to Clause 4.2  
Rating : DC3.7V  
Country of Mass-production : Malaysia  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Receipt Date of Sample : May 28, 2014  
Modification of EUT : No modification by the test lab.

### **2.2 Product description**

Model: NWZ-A17 (referred to as the EUT in this report) is a Digital Media Player.

Variant model: NWZ-A15

Difference is the memory capacity: NWZ-A15 (16GB), NWZ-A17 (64GB)

Clock frequency(ies) in the system : 533MHz (CPU), 49.152MHz (Audio CODEC), 27.12MHz (NFC),  
24MHz (USB), 24.576MHz (Audio), 22.5792MHz (Audio),  
32.768kHz (PMIC), 26MHz (BT)

Bluetooth specification:

Equipment type : Transceiver  
Frequency of operation : 2402-2480MHz  
Bandwidth / Channel spacing : 1MHz / 1MHz  
Type of modulation : FHSS (GFSK,  $\pi/4$ -DQPSK, 8DPSK)  
Antenna type : Chip  
Antenna connector type : None  
Antenna gain : 1.6dBi  
ITU code : F1D, G1D  
Operation temperature range : +5 to +35 deg.C

NFC specification:

Equipment type : Transceiver  
Frequency of operation : 13.56MHz  
Type of modulation : ASK  
Antenna type : Pattern  
Antenna connector type : None  
ITU code : A1D  
Operation temperature range : +5 to +35 deg.C.

\* For NFC part, refer to the test report: 10373518S-C.

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

FCC 15.31 (e)

The EUT is a battery-operated device and test was performed with the full-charged battery. Therefore, the EUT complies with the requirement.

FCC 15.203

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

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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

#### 3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 2014  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,  
and 5725-5850MHz

\* The EUT has been tested for compliance with FCC Part 15 Subpart B.

#### 3.2 Procedures & Results

| Item                                     | Test Procedure                                                                            | Specification          | Remarks                | Deviation  | Worst Margin                                                                                                                                                                                                            | Results  |
|------------------------------------------|-------------------------------------------------------------------------------------------|------------------------|------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Conducted emission                       | ANSI C63.4:2009<br>7. AC powerline<br>conducted emission<br>measurements                  | FCC 15.207             | -                      | N/A<br>*1) | -                                                                                                                                                                                                                       | -        |
| Carrier frequency separation             | FCC Public Notice DA 00-705 & ANSI C63.4:2009<br>13. Measurement of intentional radiators | FCC 15.247 (a)(1)      | Conducted              | N/A        | *See data.                                                                                                                                                                                                              | Complied |
| 20dB bandwidth                           | FCC Public Notice DA 00-705 & ANSI C63.4:2009<br>13. Measurement of intentional radiators | FCC 15.247 (a)(1)      | Conducted              | N/A        |                                                                                                                                                                                                                         | -        |
| Number of hopping frequency              | FCC Public Notice DA 00-705 & ANSI C63.4:2009<br>13. Measurement of intentional radiators | FCC 15.247 (a)(1)(iii) | Conducted              | N/A        |                                                                                                                                                                                                                         | Complied |
| Dwell time                               | FCC Public Notice DA 00-705 & ANSI C63.4:2009<br>13. Measurement of intentional radiators | FCC 15.247 (a)(1)(iii) | Conducted              | N/A        |                                                                                                                                                                                                                         | Complied |
| Maximum peak output power                | FCC Public Notice DA 00-705 & ANSI C63.4:2009<br>13. Measurement of intentional radiators | FCC 15.247 (b)(1)      | Conducted              | N/A        |                                                                                                                                                                                                                         | Complied |
| Band edge compliance & Spurious emission | FCC Public Notice DA 00-705 & ANSI C63.4:2009<br>13. Measurement of intentional radiators | FCC 15.247 (d) 15.209  | Conducted/<br>Radiated | N/A        | 7.0 dB<br>Freq.: 12010.000MHz<br>Detection: AV<br>Polarization: Horizontal<br>Mode: Tx 2402MHz, DH5<br><br>Polarization: Horizontal<br>Mode: Tx 2402MHz, 3-DH5<br><br>Polarization: Vertical<br>Mode: Tx 2402MHz, 3-DH5 | Complied |

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

\*1) The test is not applicable since the EUT has no AC mains. Bluetooth does not operate during charging.

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

### 3.3 Addition to standard

| Item                                                             | Test Procedure                                                             | Specification | Remarks   | Worst Margin | Results |
|------------------------------------------------------------------|----------------------------------------------------------------------------|---------------|-----------|--------------|---------|
| Occupied Bandwidth (99%)                                         | ANSI C63.4:2009<br>13. Measurement of intentional radiators, RSS-Gen 4.6.1 | -             | Conducted | -            | -       |
| Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422 |                                                                            |               |           |              |         |

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

### 3.4 Uncertainty

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

| Item                                                    | Frequency range | No.1 SAC <sup>*1</sup> /SR <sup>*2</sup><br>(±) | No.2 SAC/SR<br>(±) | No.3 SAC/SR<br>(±) |
|---------------------------------------------------------|-----------------|-------------------------------------------------|--------------------|--------------------|
| <b>Radiated emission<br/>(Measurement distance: 3m)</b> | 9kHz-30MHz      | 3.7 dB                                          | 3.7 dB             | 3.6 dB             |
|                                                         | 30MHz-300MHz    | 4.8 dB                                          | 5.0 dB             | 4.8 dB             |
|                                                         | 300MHz-1GHz     | 5.0 dB                                          | 5.0 dB             | 4.8 dB             |
|                                                         | 1GHz-15GHz      | 4.9 dB                                          | 4.9 dB             | 4.9 dB             |
| <b>Radiated emission<br/>(Measurement distance: 1m)</b> | 15GHz-18GHz     | 5.7 dB                                          | 5.6 dB             | 5.6 dB             |
|                                                         | 18GHz-40GHz     | 5.2 dB                                          | 4.3 dB             | 4.3 dB             |

\*1: SAC=Semi-Anechoic Chamber

\*2: SR= Shielded Room is applied besides radiated emission

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

#### Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.6dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 1.4dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 2.8dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB

Bandwidth measurement uncertainty for this test was: (±) 5.4%

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

### 3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

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

Telephone number : +81 463 50 6400

Facsimile number: +81 463 50 6401

JAB Accreditation No. : RTL02610

|                                                                | IC<br>Registration<br>No. | Width x Depth x<br>Height (m) | Size of reference<br>ground plane<br>(m) / horizontal<br>conducting<br>plane | Maximum<br>measurement<br>distance |
|----------------------------------------------------------------|---------------------------|-------------------------------|------------------------------------------------------------------------------|------------------------------------|
| <input type="checkbox"/> No.1 semi-anechoic chamber            | 2973D-1                   | 20.6 x 11.3 x 7.65            | 20.6 x 11.3                                                                  | 10m                                |
| <input type="checkbox"/> No.2 semi-anechoic chamber            | 2973D-2                   | 20.6 x 11.3 x 7.65            | 20.6 x 11.3                                                                  | 10m                                |
| <input checked="" type="checkbox"/> No.3 semi-anechoic chamber | 2973D-3                   | 12.7 x 7.7 x 5.35             | 12.7 x 7.7                                                                   | 5m                                 |
| <input type="checkbox"/> No.4 semi-anechoic chamber            | -                         | 8.1 x 5.1 x 3.55              | 8.1 x 5.1                                                                    | -                                  |
| <input type="checkbox"/> No.1 shielded room                    | -                         | 6.8 x 4.1 x 2.7               | 6.8 x 4.1                                                                    | -                                  |
| <input type="checkbox"/> No.2 shielded room                    | -                         | 6.8 x 4.1 x 2.7               | 6.8 x 4.1                                                                    | -                                  |
| <input type="checkbox"/> No.3 shielded room                    | -                         | 6.3 x 4.7 x 2.7               | 6.3 x 4.7                                                                    | -                                  |
| <input type="checkbox"/> No.4 shielded room                    | -                         | 4.4 x 4.7 x 2.7               | 4.4 x 4.7                                                                    | -                                  |
| <input checked="" type="checkbox"/> No.5 shielded room         | -                         | 7.8 x 6.4 x 2.7               | 7.8 x 6.4                                                                    | -                                  |
| <input type="checkbox"/> No.6 shielded room                    | -                         | 7.8 x 6.4 x 2.7               | 7.8 x 6.4                                                                    | -                                  |
| <input type="checkbox"/> No.1 Measurement room                 | -                         | 2.55 x 4.1 x 2.5              | -                                                                            | -                                  |

### 3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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

### 4.1 Operating mode

| Test item                                           | Operating mode                                                                                | Tested frequency                                |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------|
| Carrier frequency separation                        | Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9                               | -                                               |
| 20dB bandwidth                                      | Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9                              | 2402MHz, 2441MHz, 2480MHz                       |
| Number of hopping frequency                         | Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9                               | -                                               |
| Dwell time                                          | Transmitting (Hopping ON), Payload: PRBS9<br>- DH1, - DH3, - DH5<br>- 3-DH1, - 3-DH3, - 3-DH5 | -                                               |
|                                                     | -Inquiry                                                                                      |                                                 |
| Maximum peak output power                           | Transmitting Hopping OFF, Payload: PRBS9<br>- DH5, - 2-DH5, - 3-DH5                           | 2402MHz, 2441MHz, 2480MHz                       |
| Spurious emission (Conducted)                       | Transmitting (DH5 / 3-DH5), Payload: PRBS9<br>-Hopping OFF                                    | Band edge compliance:<br>2402MHz, 2480MHz       |
| Band edge compliance & Spurious emission (Radiated) | Transmitting (DH5 / 3-DH5), Payload: PRBS9<br>-Hopping OFF                                    | Spurious emission:<br>2402MHz, 2441MHz, 2480MHz |
| 99% occupied bandwidth                              | Transmitting (DH5 / 3-DH5), Payload: PRBS9 / Inquiry<br>-Hopping ON<br>-Hopping OFF           | 2402MHz, 2441MHz, 2480MHz                       |

\*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload (except Dwell time test).

\*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not affect 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.

Power settings: Fixed

Test software: BT RADIO TEST ver. 1.10

**Justification:** The system was configured in typical fashion (as customer would normally use it) for testing.

**UL Japan, Inc.**

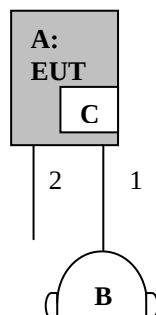
**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## 4.2 Configuration and peripherals



\* Test data was taken under worse case conditions.

### Description of EUT and Auxiliary equipment

| No. | Item                 | Model number | Serial number | Manufacturer | Remarks |
|-----|----------------------|--------------|---------------|--------------|---------|
| A   | Digital Media Player | NWZ-A17      | *1)           | Sony         | EUT     |
| B   | Headphones           | MDR-1RMK2    | -             | Sony         | -       |
| C   | Micro SD Memory      | SR-16A4      | TPSN002554976 | Sony         | -       |

\*1) Antenna port conducted tests: 2000232(except Inquiry mode) / 2000234(Inquiry mode) , Radiated emission tests: 2000231

### List of cables used

| No. | Item       | Length(m) | Shield (Cable) | Shield (Connector) | Remarks |
|-----|------------|-----------|----------------|--------------------|---------|
| 1   | Headphones | 3.0       | Unshielded     | Unshielded         | -       |
| 2   | USB        | 1.0       | Shielded       | Shielded           | -       |

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## **SECTION 5: Carrier frequency separation**

### **Test procedure**

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 6: 20dB bandwidth & Occupied bandwidth (99%)**

### **Test procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 7: Number of hopping frequency**

### **Test procedure**

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 8: Dwell time**

### **Test procedure**

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 9: Maximum peak output power**

### **Test procedure**

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 10: Spurious emissions (Antenna port conducted)**

### **Test procedure**

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating,

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

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

Summary of the test results: Pass  
Refer to APPENDIX 1.

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## **SECTION 11: Radiated emission**

### **11.1 Operating environment**

Test room : See test data (APPENDIX 1)  
Temperature : See test data (APPENDIX 1)  
Humidity : See test data (APPENDIX 1)

### **11.2 Test configuration**

EUT was placed on a platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Photographs of the set up are shown in APPENDIX 3.

### **11.3 Test conditions**

Frequency range : 30MHz - 25GHz  
EUT position : Table top

### **11.4 Test procedure**

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection.

| Frequency      | 30 - 1000MHz | 1 - 25GHz            |                      |
|----------------|--------------|----------------------|----------------------|
| Detection Type | Quasi-Peak   | Peak                 | * Average            |
| IF Bandwidth   | 120kHz       | RBW:1MHz<br>VBW:3MHz | RBW:1MHz<br>VBW:10Hz |

\* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold. Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

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.

Combinations of the worst case

|     | Frequency<br>Antenna<br>polarization | Carrier<br>*2) | Spurious   |         |          |          |
|-----|--------------------------------------|----------------|------------|---------|----------|----------|
|     |                                      |                | Below 1GHz | 1-15GHz | 15-18GHz | 15-25GHz |
| EUT | Horizontal                           | Z              | X          | X       | X        | X        |
|     | Vertical                             | Y              | X          | Y       | X        | X        |

\*2) with spurious emissions near carrier frequency.

**UL Japan, Inc.**

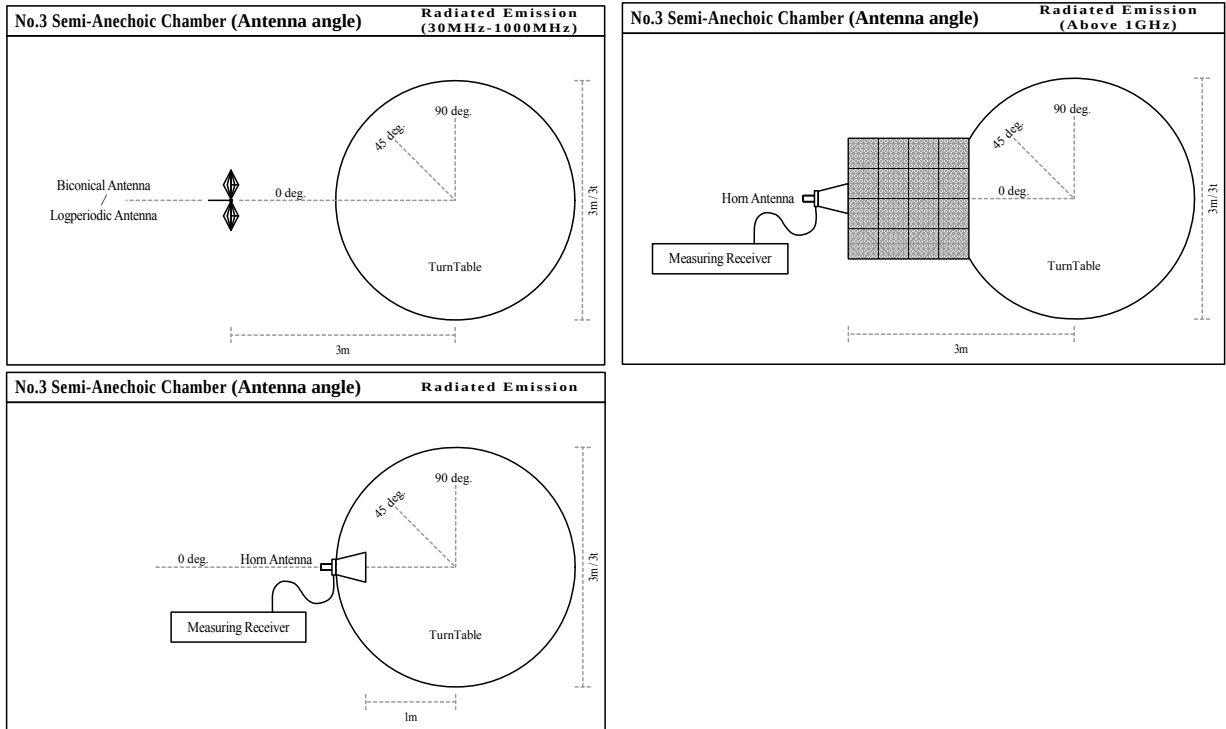
**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

**Figure 1. Antenna angle**



## 11.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

## 11.6 Results

Summary of the test results: Pass \*No noise was detected above the 5<sup>th</sup> order harmonics.

Refer to APPENDIX 1.

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## **Contents of APPENDIXES**

### **APPENDIX 1: Data of Radio tests**

20dB bandwidth and Carrier frequency separation  
Number of hopping frequency  
Dwell time  
Maximum peak output power  
Radiated emission  
Spurious emission (Antenna port conducted)  
Occupied bandwidth

### **APPENDIX 2: Test instruments**

Test instruments

### **APPENDIX 3: Photographs of test setup**

Radiated emission

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

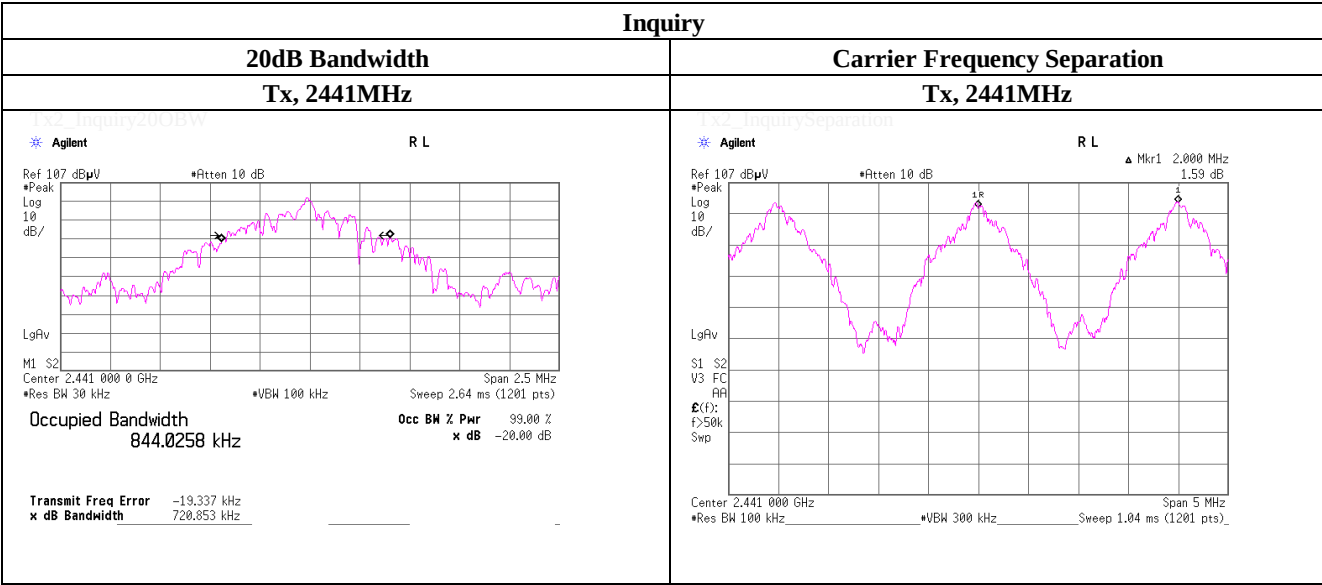
APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.5 Shielded Room |
| Date                   | June 20, 2014                  |                    |
| Temperature / Humidity | 24 deg.C , 52%                 |                    |
| Engineer               | Shinichi Takano                |                    |
| Mode                   | Tx, Bluetooth, BDR, PRBS9      |                    |

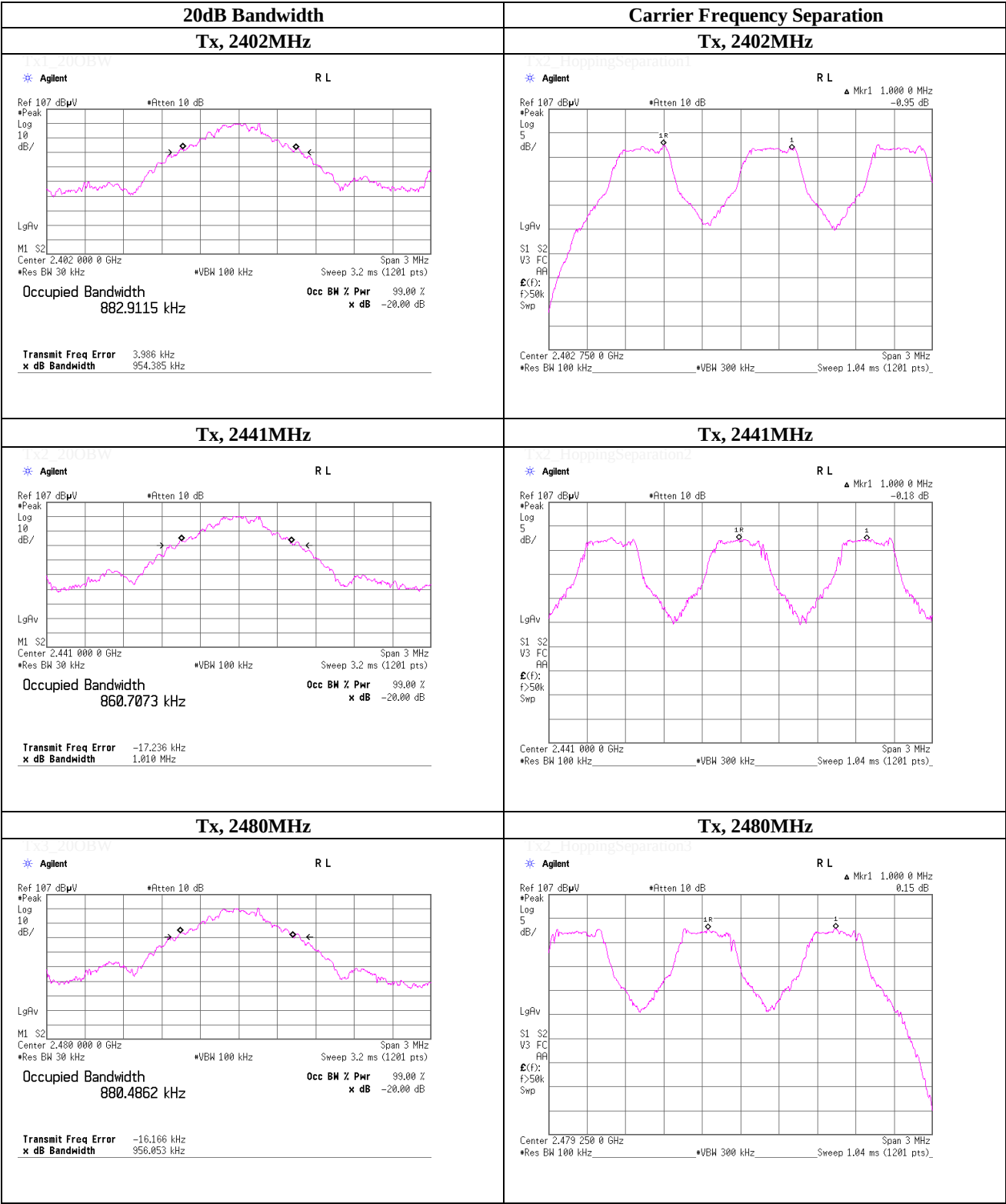
| Mode    | Freq.<br>[MHz] | 20dB<br>Bandwidth<br>[MHz] | Carrier<br>Frequency<br>Separation<br>[MHz] | Limit for<br>Carrier<br>Frequency<br>Separation<br>[MHz] |
|---------|----------------|----------------------------|---------------------------------------------|----------------------------------------------------------|
| DH5     | 2402.0         | 0.954                      | 1.000                                       | >= 0.636                                                 |
| DH5     | 2441.0         | 1.010                      | 1.000                                       | >= 0.673                                                 |
| DH5     | 2480.0         | 0.956                      | 1.000                                       | >= 0.637                                                 |
| Inquiry | 2441.0         | 0.721                      | 2.000                                       | >= 0.481                                                 |

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).  
No limit applies to 20dB Bandwidth.



20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



---

## **20dB Bandwidth and Carrier Frequency Separation**

Test place                      UL Japan, Inc. Shonan EMC Lab.                      No.5 Shielded Room  
Date                              June 20, 2014  
Temperature / Humidity        24 deg.C                      , 52%  
Engineer                        Shinichi Takano  
Mode                              Tx, Bluetooth, EDR, PRBS9

| Mode  | Freq.<br>[MHz] | 20dB<br>Bandwidth<br>[MHz] | Carrier<br>Frequency<br>Separation<br>[MHz] | Limit for<br>Carrier<br>Frequency<br>Separation<br>[MHz] |
|-------|----------------|----------------------------|---------------------------------------------|----------------------------------------------------------|
| 3-DH5 | 2402.0         | 1.250                      | 1.000                                       | >= 0.834                                                 |
| 3-DH5 | 2441.0         | 1.275                      | 1.000                                       | >= 0.850                                                 |
| 3-DH5 | 2480.0         | 1.297                      | 1.000                                       | >= 0.865                                                 |

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).  
No limit applies to 20dB Bandwidth.

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

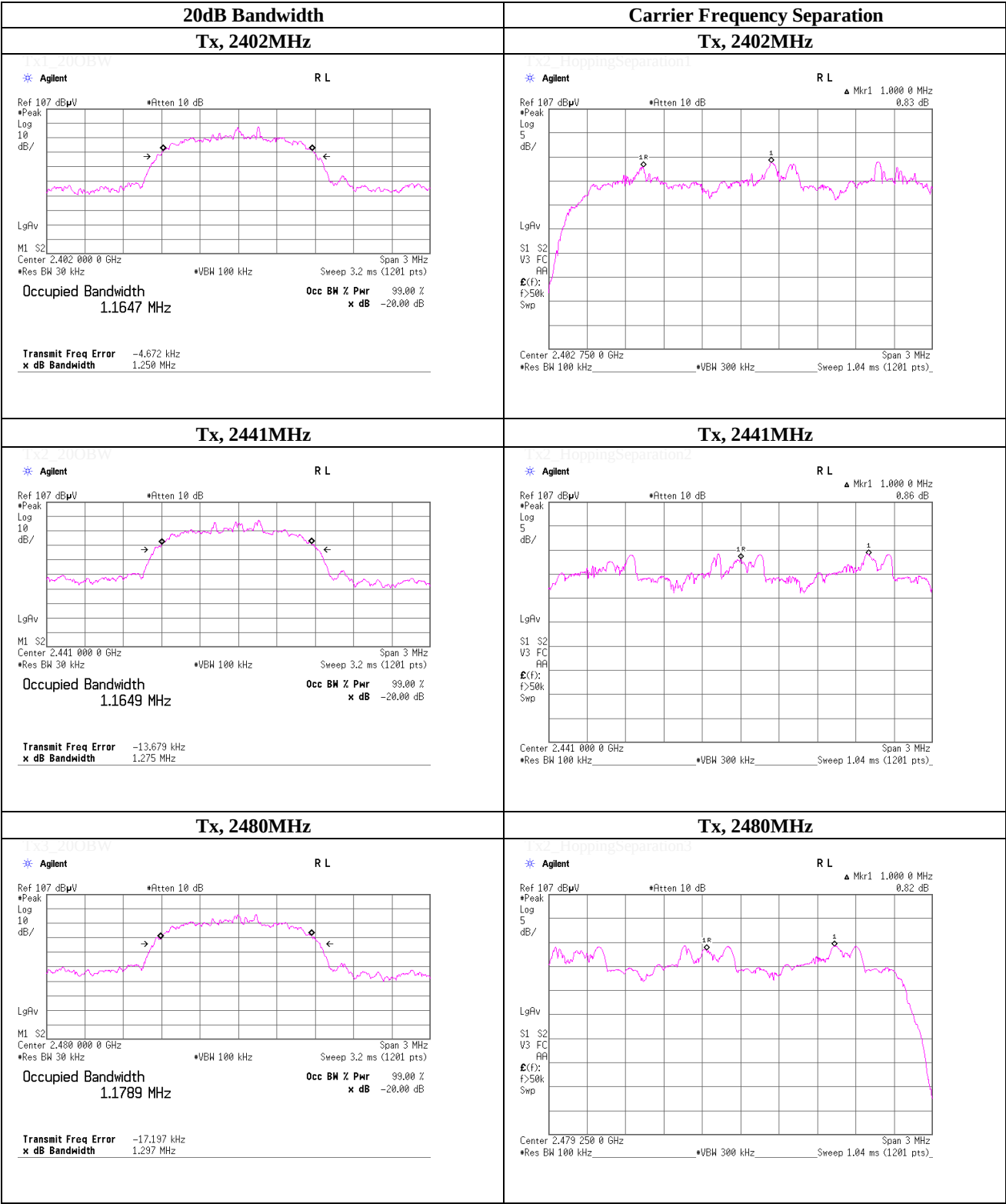
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



Number of Hopping Frequency

Test place

Date

Temperature / Humidity

Engineer

Mode

UL Japan, Inc. Shonan EMC Lab.

June 20, 2014

24 deg.C , 52%

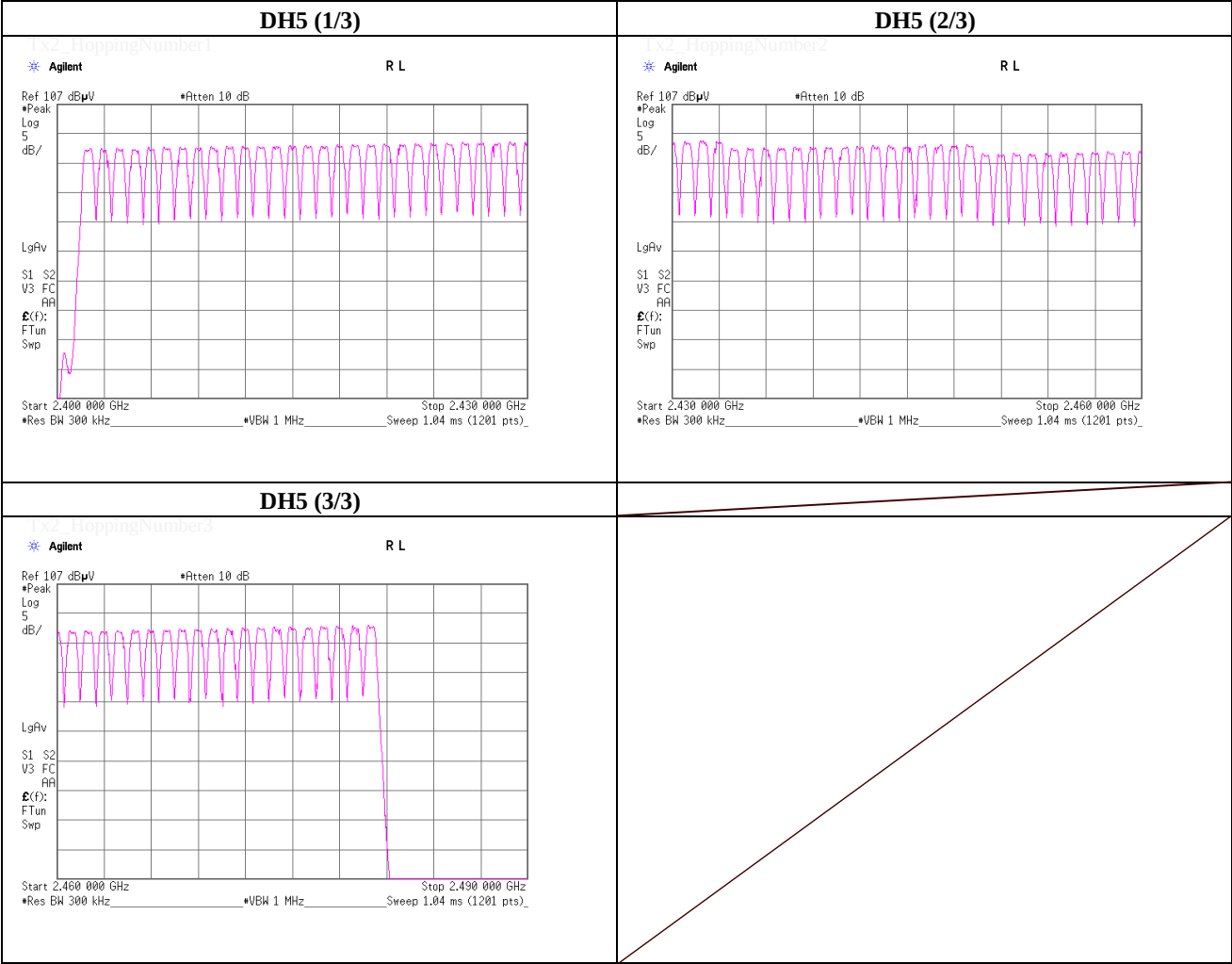
Shinichi Takano

Tx, Bluetooth, BDR, PRBS9

No.5 Shielded Room

|      |                           |               |
|------|---------------------------|---------------|
| Mode | Number of Channel [times] | Limit [times] |
| DH5  | 79                        | >= 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

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

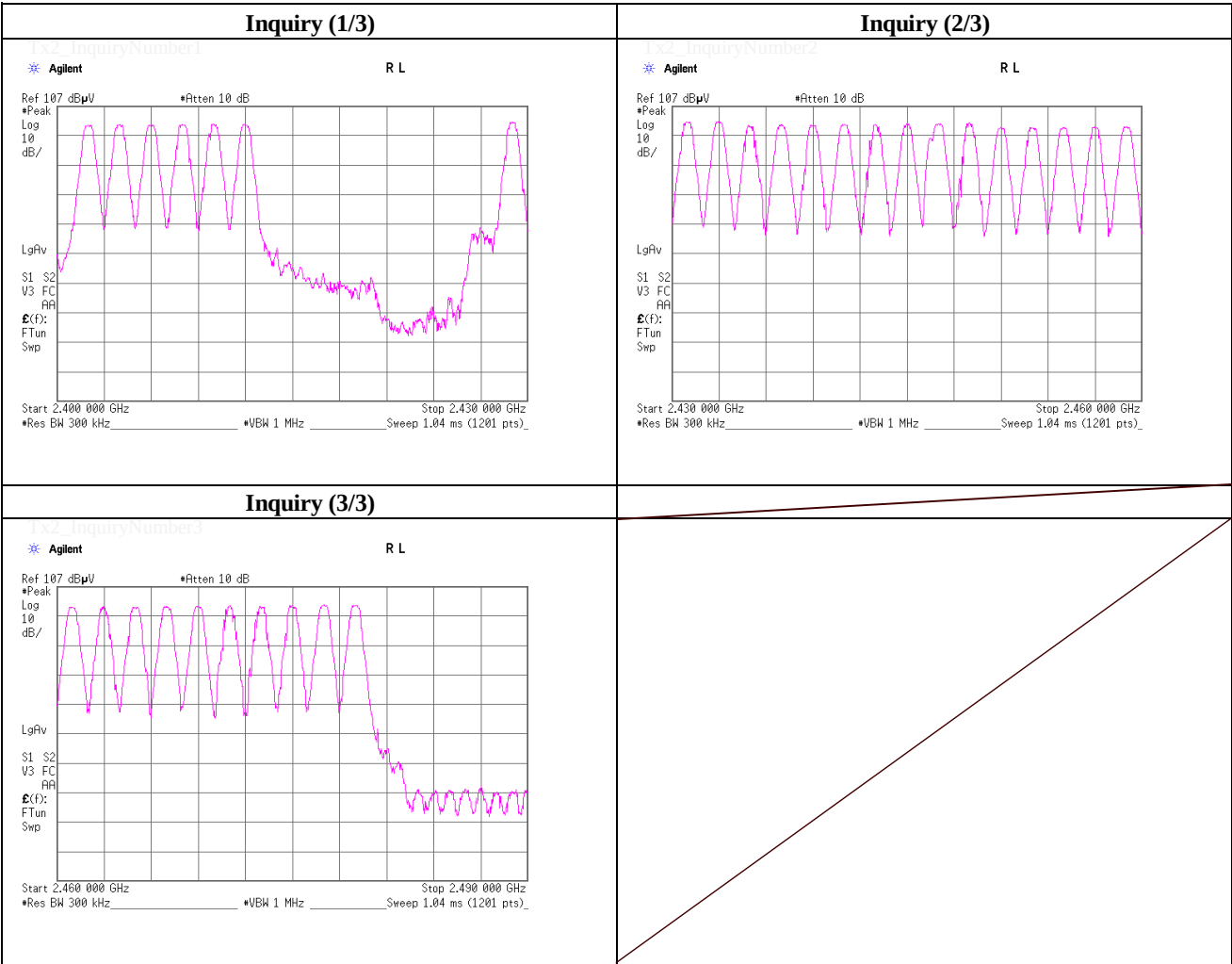
Engineer

Shinichi Takano

Mode

Tx, Bluetooth, Inquiry

|         |                           |               |
|---------|---------------------------|---------------|
| Mode    | Number of Channel [times] | Limit [times] |
| Inquiry | 32                        | >= 15         |



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

Engineer

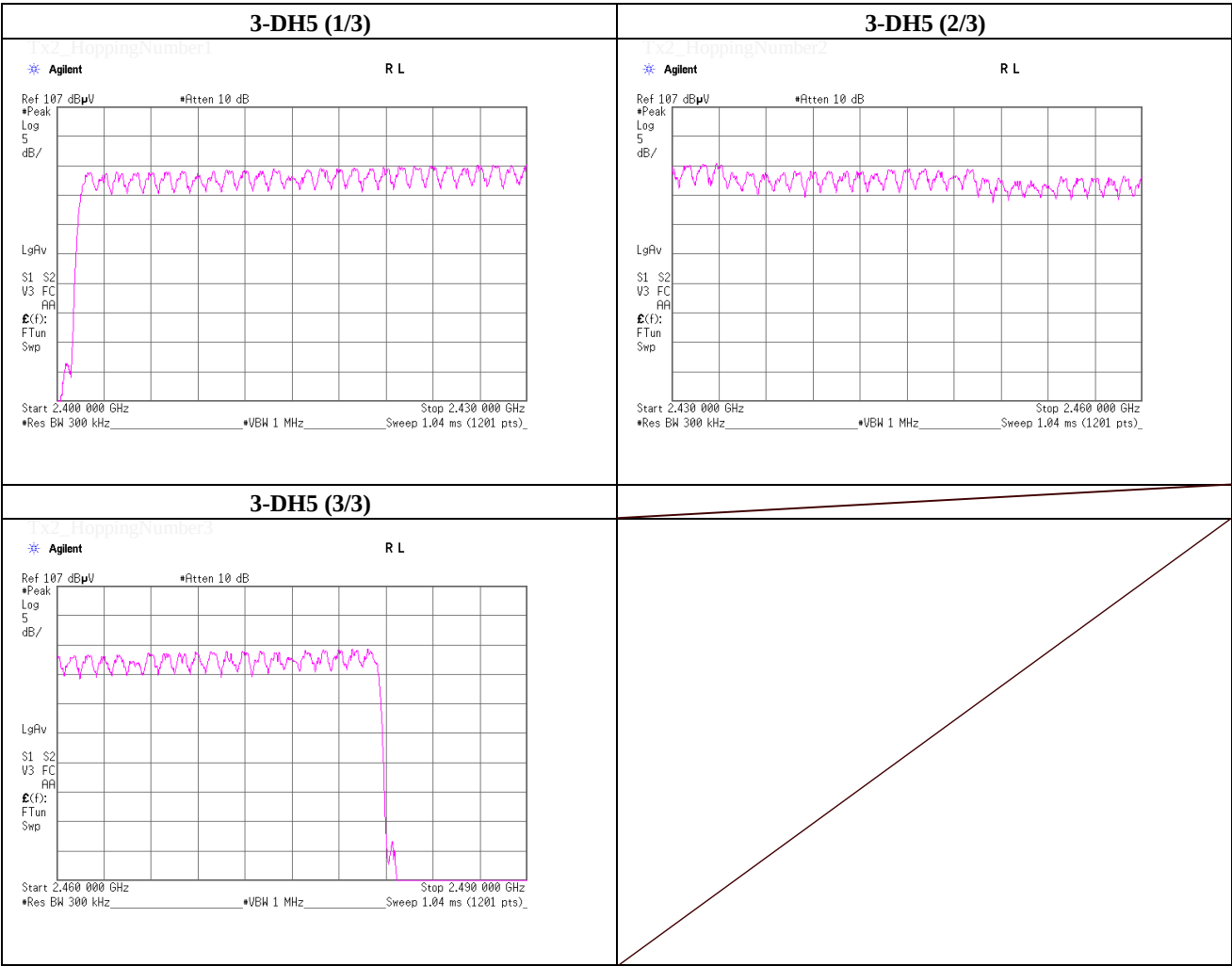
Shinichi Takano

Mode

Tx, Bluetooth, EDR, PRBS9

| Mode  | Number of Channel [times] | Limit [times] |
|-------|---------------------------|---------------|
| 3-DH5 | 79                        | >= 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.



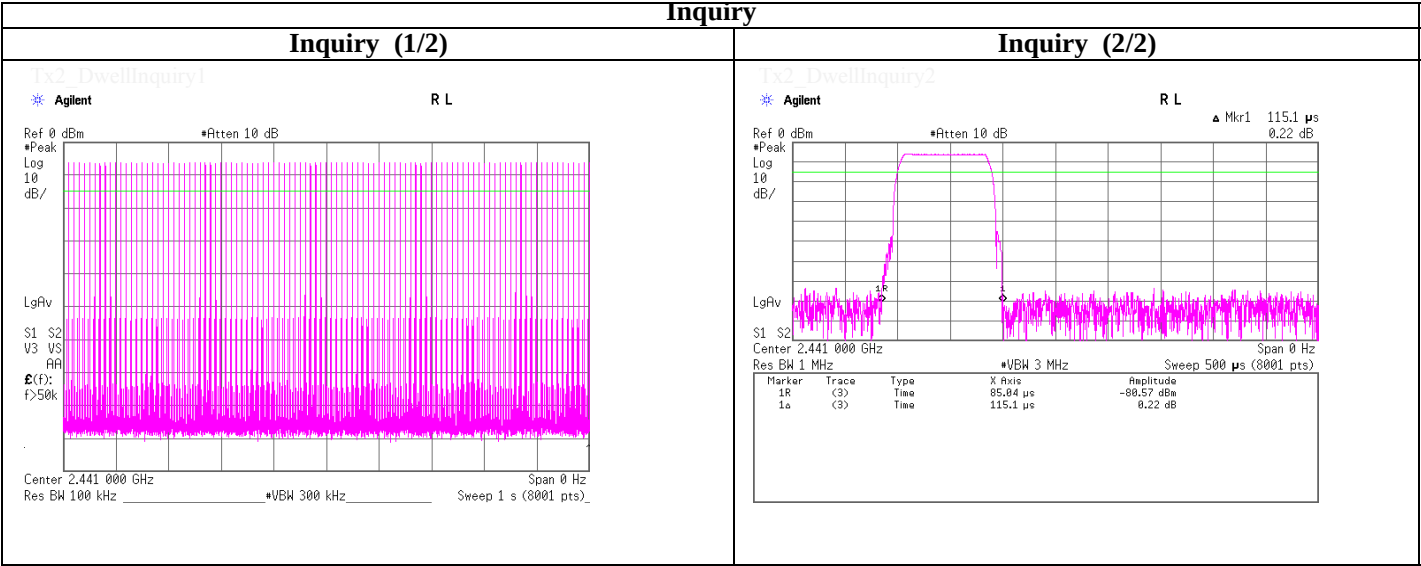
Dwell Time

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.5 Shielded Room  
Date                         June 20, 2014  
Temperature / Humidity   24 deg.C     , 52%  
Engineer                   Shinichi Takano  
Mode                        Tx, Bluetooth, BDR, PRBS9

| 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>time [msec] | Result<br>[msec] | Limit<br>[msec] |
|---------|---------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------|------------------|-----------------|
| DH1     | 51.0                                                                                              | / 5.0 sec. x 31.6 sec. = 323 times  | 0.413                                    | 133              | 400             |
| DH3     | 17.0                                                                                              | / 5.0 sec. x 31.6 sec. = 108 times  | 1.609                                    | 174              | 400             |
| DH5     | 6.0                                                                                               | / 5.0 sec. x 31.6 sec. = 38 times   | 2.920                                    | 111              | 400             |
| Inquiry | 100.0                                                                                             | / 1.0 sec. x 12.8 sec. = 1280 times | 0.115                                    | 147              | 400             |

Sample Calculation  
Result = Number of transmission x Length of transmission time

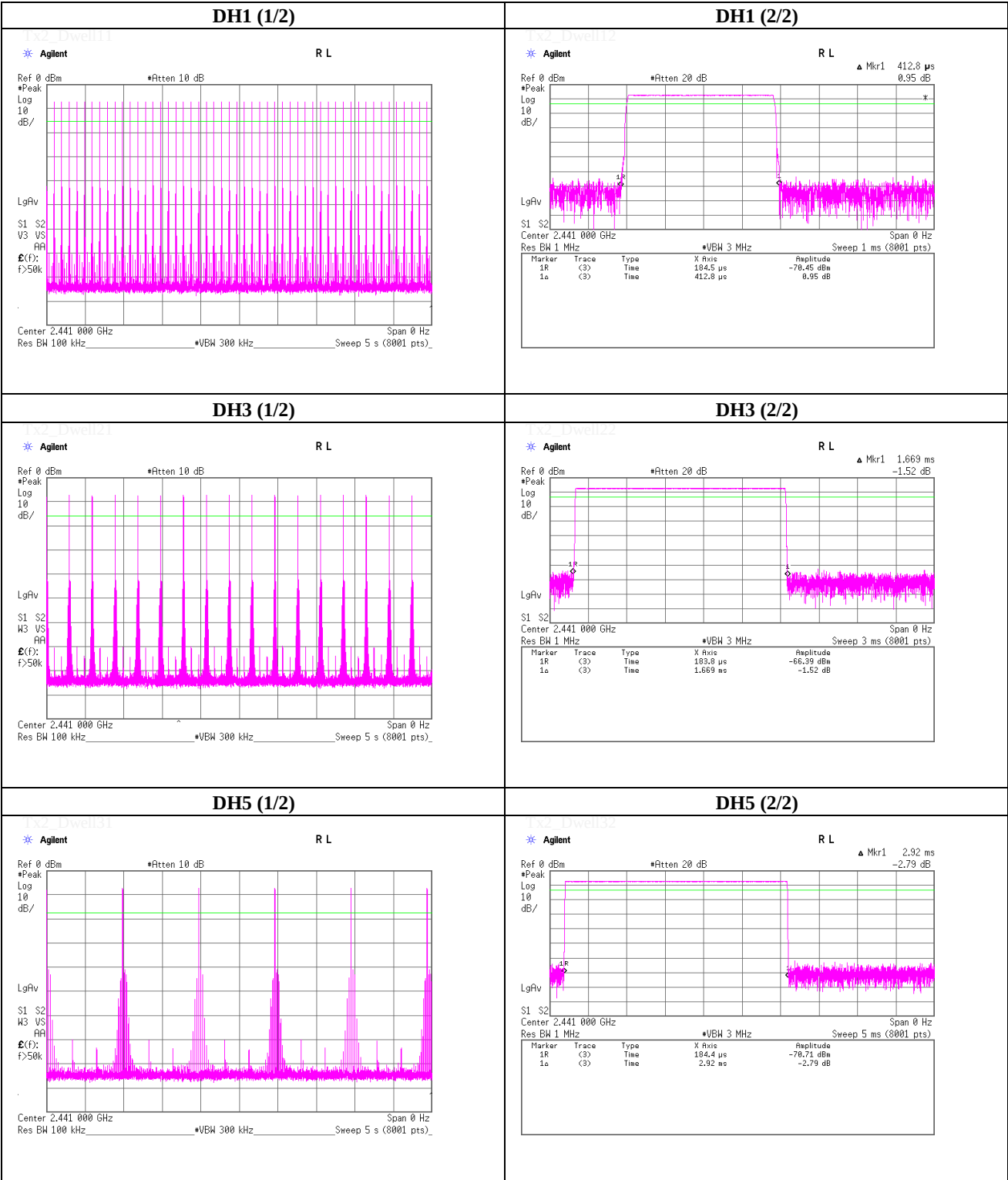
\* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 79), is always less than 0.4s regardless of packet size (DH1, DH3 or DH5). This is confirmed in the test report for N=79.



UL Japan, Inc.  
Shonan EMC Lab.  
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
Telephone : +81 463 50 6400  
Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9



## Dwell Time

Test place                    UL Japan, Inc. Shonan EMC Lab.                    No.5 Shielded Room  
 Date                            June 20, 2014  
 Temperature / Humidity    24 deg.C            , 52%  
 Engineer                      Shinichi Takano  
 Mode                           Tx, Bluetooth, EDR, PRBS9

| Mode  | Number of transmission<br>in a 31.6 (79 Hopping x 0.4) second |            |                         | Length of<br>transmission<br>time [msec] | Result<br>[msec] | Limit<br>[msec] |
|-------|---------------------------------------------------------------|------------|-------------------------|------------------------------------------|------------------|-----------------|
| 3-DH1 | 51.0                                                          | / 5.0 sec. | x 31.6 sec. = 323 times | 0.426                                    | 137              | 400             |
| 3-DH3 | 13.0                                                          | / 5.0 sec. | x 31.6 sec. = 83 times  | 1.677                                    | 139              | 400             |
| 3-DH5 | 6.0                                                           | / 5.0 sec. | x 31.6 sec. = 38 times  | 2.928                                    | 111              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission time

\* 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 (3-DH1, 3-DH3 or 3-DH5). This is confirmed in the test report for  $N=79$ .

**UL Japan, Inc.**

**Shonan EMC Lab.**

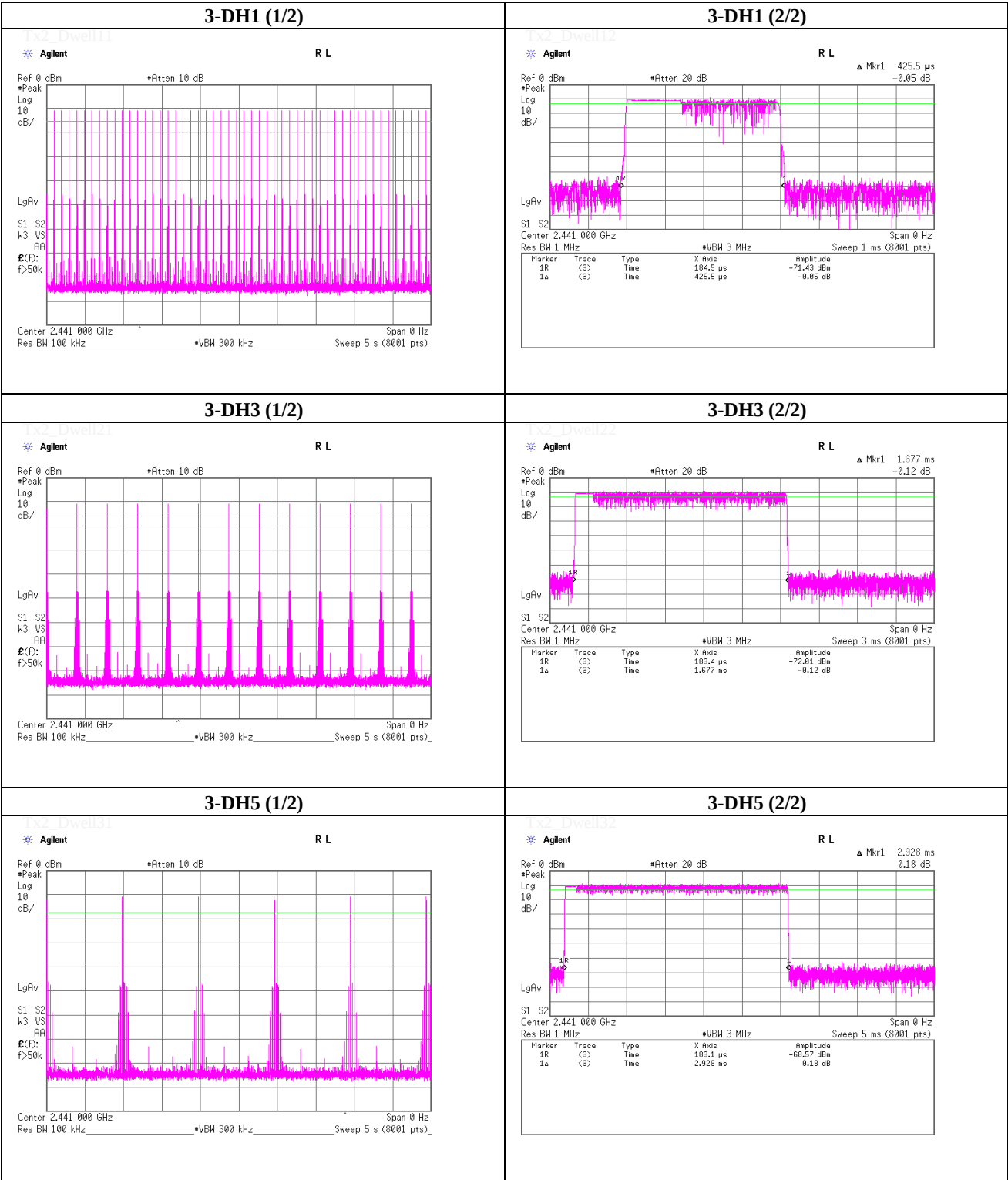
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9



## Maximum Peak Conducted Output Power (Conducted)

Test place                      UL Japan, Inc. Shonan EMC Lab.                      No.5 Shielded Room  
 Date                              June 20, 2014  
 Temperature / Humidity        24 deg.C        , 52%  
 Engineer                        Shinichi Takano  
 Mode                              Tx, Bluetooth

(\* P/M: Power Meter with power sensor)

|       | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |      | Limit |      | Margin<br>[dB] |
|-------|----------------|--------------------------------|-----------------------|------------------------|--------|------|-------|------|----------------|
|       |                |                                |                       |                        | [dBm]  | [mW] | [dBm] | [mW] |                |
| DH5   | 2402.0         | -7.12                          | 2.38                  | 9.65                   | 4.91   | 3.10 | 20.97 | 125  | 16.06          |
| DH5   | 2441.0         | -6.69                          | 2.39                  | 9.66                   | 5.36   | 3.44 | 20.97 | 125  | 15.61          |
| DH5   | 2480.0         | -6.63                          | 2.40                  | 9.66                   | 5.43   | 3.49 | 20.97 | 125  | 15.54          |
| 2-DH5 | 2402.0         | -9.15                          | 2.38                  | 9.65                   | 2.88   | 1.94 | 20.97 | 125  | 18.09          |
| 2-DH5 | 2441.0         | -8.87                          | 2.39                  | 9.66                   | 3.18   | 2.08 | 20.97 | 125  | 17.79          |
| 2-DH5 | 2480.0         | -8.75                          | 2.40                  | 9.66                   | 3.31   | 2.14 | 20.97 | 125  | 17.66          |
| 3-DH5 | 2402.0         | -8.76                          | 2.38                  | 9.65                   | 3.27   | 2.12 | 20.97 | 125  | 17.70          |
| 3-DH5 | 2441.0         | -8.55                          | 2.39                  | 9.66                   | 3.50   | 2.24 | 20.97 | 125  | 17.47          |
| 3-DH5 | 2480.0         | -8.47                          | 2.40                  | 9.66                   | 3.59   | 2.29 | 20.97 | 125  | 17.38          |

Sample Calculation:

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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                    No.3 Semi Anechoic Chamber  
 Date                         June 18, 2014                    June 19, 2014  
 Temperature / Humidity   24 deg.C, 55 %RH            26 deg.C, 50 %RH  
 Engineer                    Makoto Hosaka  
 Mode                        Tx,                    2402 MHz  
                                  Tx, Bluetooth, BDR, PRBS9

(\* 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] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 479.999            | QP       | 22.2              | 17.1               | 9.2          | 32.1         | 16.4               | 46.0              | 29.6           | 150            | 203            |        |
| Hori.    | 533.005            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 150            | 43             |        |
| Hori.    | 2390.000           | PK       | 46.9              | 26.8               | 14.6         | 41.1         | 47.2               | 73.9              | 26.7           | 100            | 177            |        |
| Hori.    | 4804.000           | PK       | 58.4              | 30.9               | 7.5          | 39.8         | 57.0               | 73.9              | 16.9           | 100            | 3              |        |
| Hori.    | 7206.000           | PK       | 47.6              | 37.1               | 8.6          | 40.2         | 53.1               | 73.9              | 20.8           | 100            | 0              |        |
| Hori.    | 9608.000           | PK       | 47.8              | 38.6               | 9.6          | 40.1         | 55.9               | 73.9              | 18.0           | 100            | 0              |        |
| Hori.    | 12010.000          | PK       | 47.8              | 39.6               | 10.7         | 39.6         | 58.5               | 73.9              | 15.4           | 100            | 0              |        |
| Hori.    | 2390.000           | AV       | 34.6              | 26.8               | 14.6         | 41.1         | 34.9               | 53.9              | 19.0           | 100            | 177            |        |
| Hori.    | 4804.000           | AV       | 47.2              | 30.9               | 7.5          | 39.8         | 45.8               | 53.9              | 8.1            | 100            | 3              |        |
| Hori.    | 7206.000           | AV       | 35.4              | 37.1               | 8.6          | 40.2         | 40.9               | 53.9              | 13.0           | 100            | 0              |        |
| Hori.    | 9608.000           | AV       | 35.6              | 38.6               | 9.6          | 40.1         | 43.7               | 53.9              | 10.2           | 100            | 0              |        |
| Hori.    | 12010.000          | AV       | 36.2              | 39.6               | 10.7         | 39.6         | 46.9               | 53.9              | 7.0            | 100            | 0              |        |
| Vert.    | 479.999            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 100            | 144            |        |
| Vert.    | 533.005            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 100            | 341            |        |
| Vert.    | 2390.000           | PK       | 47.1              | 26.8               | 14.6         | 41.1         | 47.4               | 73.9              | 26.5           | 100            | 281            |        |
| Vert.    | 4804.000           | PK       | 56.9              | 30.9               | 7.5          | 39.8         | 55.5               | 73.9              | 18.4           | 100            | 329            |        |
| Vert.    | 7206.000           | PK       | 47.6              | 37.1               | 8.6          | 40.2         | 53.1               | 73.9              | 20.8           | 100            | 0              |        |
| Vert.    | 9608.000           | PK       | 47.7              | 38.6               | 9.6          | 40.1         | 55.8               | 73.9              | 18.1           | 100            | 0              |        |
| Vert.    | 12010.000          | PK       | 48.2              | 39.6               | 10.7         | 39.6         | 58.9               | 73.9              | 15.0           | 100            | 0              |        |
| Vert.    | 2390.000           | AV       | 35.1              | 26.8               | 14.6         | 41.1         | 35.4               | 53.9              | 18.5           | 100            | 281            |        |
| Vert.    | 4804.000           | AV       | 45.0              | 30.9               | 7.5          | 39.8         | 43.6               | 53.9              | 10.3           | 100            | 329            |        |
| Vert.    | 7206.000           | AV       | 35.5              | 37.1               | 8.6          | 40.2         | 41.0               | 53.9              | 12.9           | 100            | 0              |        |
| Vert.    | 9608.000           | AV       | 35.7              | 38.6               | 9.6          | 40.1         | 43.8               | 53.9              | 10.1           | 100            | 0              |        |
| Vert.    | 12010.000          | AV       | 36.1              | 39.6               | 10.7         | 39.6         | 46.8               | 53.9              | 7.1            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2402.000           | PK       | 88.7              | 26.8               | 14.6         | 41.1         | 89.0               | -                 | -              |        |
| Hori.    | 2399.205           | PK       | 40.8              | 26.8               | 14.6         | 41.1         | 41.1               | 69.0              | 27.9           |        |
| Hori.    | 2400.000           | PK       | 43.6              | 26.8               | 14.6         | 41.1         | 43.9               | 69.0              | 25.1           |        |
| Vert.    | 2402.000           | PK       | 89.9              | 26.8               | 14.6         | 41.1         | 90.2               | -                 | -              |        |
| Vert.    | 2399.205           | PK       | 42.0              | 26.8               | 14.6         | 41.1         | 42.3               | 70.2              | 27.9           |        |
| Vert.    | 2400.000           | PK       | 44.9              | 26.8               | 14.6         | 41.1         | 45.2               | 70.2              | 25.0           |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                    No.3 Semi Anechoic Chamber  
 Date                         June 18, 2014                    June 19, 2014  
 Temperature / Humidity   24 deg.C, 55 %RH            26 deg.C, 50 %RH  
 Engineer                    Makoto Hosaka  
 Mode                        Tx,                    2441 MHz  
                                  Tx, Bluetooth, BDR, PRBS9

(\* 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] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 480.007            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 150            | 177            |        |
| Hori.    | 533.003            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 150            | 175            |        |
| Hori.    | 4882.000           | PK       | 55.6              | 31.4               | 7.5          | 39.7         | 54.8               | 73.9              | 19.1           | 100            | 7              |        |
| Hori.    | 7323.000           | PK       | 46.8              | 37.2               | 8.6          | 40.3         | 52.3               | 73.9              | 21.6           | 100            | 0              |        |
| Hori.    | 9764.000           | PK       | 47.4              | 38.8               | 9.6          | 40.0         | 55.8               | 73.9              | 18.1           | 100            | 0              |        |
| Hori.    | 12205.000          | PK       | 46.6              | 39.6               | 10.8         | 39.8         | 57.2               | 73.9              | 16.7           | 100            | 0              |        |
| Hori.    | 4882.000           | AV       | 44.3              | 31.4               | 7.5          | 39.7         | 43.5               | 53.9              | 10.4           | 100            | 7              |        |
| Hori.    | 7323.000           | AV       | 35.1              | 37.2               | 8.6          | 40.3         | 40.6               | 53.9              | 13.3           | 100            | 0              |        |
| Hori.    | 9764.000           | AV       | 34.9              | 38.8               | 9.6          | 40.0         | 43.3               | 53.9              | 10.6           | 100            | 0              |        |
| Hori.    | 12205.000          | AV       | 35.0              | 39.6               | 10.8         | 39.8         | 45.6               | 53.9              | <b>8.3</b>     | 100            | 0              |        |
| Vert.    | 480.007            | QP       | 22.4              | 17.1               | 9.2          | 32.1         | 16.6               | 46.0              | 29.4           | 100            | 3              |        |
| Vert.    | 533.003            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 100            | 279            |        |
| Vert.    | 4882.000           | PK       | 54.9              | 31.4               | 7.5          | 39.7         | 54.1               | 73.9              | 19.8           | 100            | 339            |        |
| Vert.    | 7323.000           | PK       | 47.1              | 37.2               | 8.6          | 40.3         | 52.6               | 73.9              | 21.3           | 100            | 0              |        |
| Vert.    | 9764.000           | PK       | 47.1              | 38.8               | 9.6          | 40.0         | 55.5               | 73.9              | 18.4           | 100            | 0              |        |
| Vert.    | 12205.000          | PK       | 47.1              | 39.6               | 10.8         | 39.8         | 57.7               | 73.9              | 16.2           | 100            | 0              |        |
| Vert.    | 4882.000           | AV       | 43.6              | 31.4               | 7.5          | 39.7         | 42.8               | 53.9              | 11.1           | 100            | 339            |        |
| Vert.    | 7323.000           | AV       | 35.1              | 37.2               | 8.6          | 40.3         | 40.6               | 53.9              | 13.3           | 100            | 0              |        |
| Vert.    | 9764.000           | AV       | 34.6              | 38.8               | 9.6          | 40.0         | 43.0               | 53.9              | 10.9           | 100            | 0              |        |
| Vert.    | 12205.000          | AV       | 34.9              | 39.6               | 10.8         | 39.8         | 45.5               | 53.9              | 8.4            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                    No.3 Semi Anechoic Chamber  
 Date                         June 18, 2014                    June 19, 2014  
 Temperature / Humidity   24 deg.C, 55 %RH            26 deg.C, 50 %RH  
 Engineer                    Makoto Hosaka  
 Mode                        Tx,                    2480 MHz  
                                  Tx, Bluetooth, BDR, PRBS9

(\* 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] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 480.001            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 150            | 97             |        |
| Hori.    | 533.000            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 150            | 267            |        |
| Hori.    | 2483.500           | PK       | 48.5              | 26.9               | 14.7         | 41.1         | 49.0               | 73.9              | 24.9           | 100            | 182            |        |
| Hori.    | 4960.000           | PK       | 55.0              | 31.8               | 7.5          | 39.6         | 54.7               | 73.9              | 19.2           | 100            | 7              |        |
| Hori.    | 7440.000           | PK       | 47.4              | 37.4               | 8.8          | 40.4         | 53.2               | 73.9              | 20.7           | 100            | 0              |        |
| Hori.    | 9920.000           | PK       | 46.7              | 38.9               | 9.6          | 39.9         | 55.3               | 73.9              | 18.6           | 100            | 0              |        |
| Hori.    | 12400.000          | PK       | 46.1              | 39.7               | 10.9         | 40.0         | 56.7               | 73.9              | 17.2           | 100            | 0              |        |
| Hori.    | 2483.500           | AV       | 36.6              | 26.9               | 14.7         | 41.1         | 37.1               | 53.9              | 16.8           | 100            | 182            |        |
| Hori.    | 4960.000           | AV       | 43.3              | 31.8               | 7.5          | 39.6         | 43.0               | 53.9              | 10.9           | 100            | 7              |        |
| Hori.    | 7440.000           | AV       | 34.4              | 37.4               | 8.8          | 40.4         | 40.2               | 53.9              | 13.7           | 100            | 0              |        |
| Hori.    | 9920.000           | AV       | 33.4              | 38.9               | 9.6          | 39.9         | 42.0               | 53.9              | 11.9           | 100            | 0              |        |
| Hori.    | 12400.000          | AV       | 33.4              | 39.7               | 10.9         | 40.0         | 44.0               | 53.9              | 9.9            | 100            | 0              |        |
| Vert.    | 480.001            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 100            | 341            |        |
| Vert.    | 533.000            | QP       | 22.4              | 17.7               | 9.4          | 32.1         | 17.4               | 46.0              | 28.6           | 100            | 322            |        |
| Vert.    | 2483.500           | PK       | 47.8              | 26.9               | 14.7         | 41.1         | 48.3               | 73.9              | 25.6           | 100            | 280            |        |
| Vert.    | 4960.000           | PK       | 54.5              | 31.8               | 7.5          | 39.6         | 54.2               | 73.9              | 19.7           | 100            | 325            |        |
| Vert.    | 7440.000           | PK       | 47.9              | 37.4               | 8.8          | 40.4         | 53.7               | 73.9              | 20.2           | 100            | 0              |        |
| Vert.    | 9920.000           | PK       | 46.7              | 38.9               | 9.6          | 39.9         | 55.3               | 73.9              | 18.6           | 100            | 0              |        |
| Vert.    | 12400.000          | PK       | 46.7              | 39.7               | 10.9         | 40.0         | 57.3               | 73.9              | 16.6           | 100            | 0              |        |
| Vert.    | 2483.500           | AV       | 35.3              | 26.9               | 14.7         | 41.1         | 35.8               | 53.9              | 18.1           | 100            | 280            |        |
| Vert.    | 4960.000           | AV       | 42.6              | 31.8               | 7.5          | 39.6         | 42.3               | 53.9              | 11.6           | 100            | 325            |        |
| Vert.    | 7440.000           | AV       | 34.6              | 37.4               | 8.8          | 40.4         | 40.4               | 53.9              | 13.5           | 100            | 0              |        |
| Vert.    | 9920.000           | AV       | 33.6              | 38.9               | 9.6          | 39.9         | 42.2               | 53.9              | 11.7           | 100            | 0              |        |
| Vert.    | 12400.000          | AV       | 33.6              | 39.7               | 10.9         | 40.0         | 44.2               | 53.9              | 9.7            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

Test place No.3 Semi Anechoic Chamber  
Date June 18, 2014 June 19, 2014  
Temperature / Humidity 24 deg.C, 55 %RH 26 deg.C, 50 %RH  
Engineer Makoto Hosaka  
Mode Tx, 2402 MHz  
Tx, Bluetooth, EDR, PRBS9

(\* 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] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 480.003            | QP       | 22.2              | 17.1               | 9.2          | 32.1         | 16.4               | 46.0              | 29.6           | 150            | 1              |        |
| Hori.    | 533.004            | QP       | 22.4              | 17.7               | 9.4          | 32.1         | 17.4               | 46.0              | 28.6           | 150            | 131            |        |
| Hori.    | 2390.000           | PK       | 47.9              | 26.8               | 14.6         | 41.1         | 48.2               | 73.9              | 25.7           | 100            | 187            |        |
| Hori.    | 4804.000           | PK       | 56.4              | 30.9               | 7.5          | 39.8         | 55.0               | 73.9              | 18.9           | 100            | 2              |        |
| Hori.    | 7206.000           | PK       | 46.9              | 37.1               | 8.6          | 40.2         | 52.4               | 73.9              | 21.5           | 100            | 0              |        |
| Hori.    | 9608.000           | PK       | 47.4              | 38.6               | 9.6          | 40.1         | 55.5               | 73.9              | 18.4           | 100            | 0              |        |
| Hori.    | 12010.000          | PK       | 48.1              | 39.6               | 10.7         | 39.6         | 58.8               | 73.9              | 15.1           | 100            | 0              |        |
| Hori.    | 2390.000           | AV       | 34.7              | 26.8               | 14.6         | 41.1         | 35.0               | 53.9              | 18.9           | 100            | 187            |        |
| Hori.    | 4804.000           | AV       | 41.7              | 30.9               | 7.5          | 39.8         | 40.3               | 53.9              | 13.6           | 100            | 2              |        |
| Hori.    | 7206.000           | AV       | 35.4              | 37.1               | 8.6          | 40.2         | 40.9               | 53.9              | 13.0           | 100            | 0              |        |
| Hori.    | 9608.000           | AV       | 35.6              | 38.6               | 9.6          | 40.1         | 43.7               | 53.9              | 10.2           | 100            | 0              |        |
| Hori.    | 12010.000          | AV       | 36.2              | 39.6               | 10.7         | 39.6         | 46.9               | 53.9              | 7.0            | 100            | 0              |        |
| Vert.    | 480.003            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 100            | 105            |        |
| Vert.    | 533.004            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 100            | 357            |        |
| Vert.    | 2390.000           | PK       | 47.8              | 26.8               | 14.6         | 41.1         | 48.1               | 73.9              | 25.8           | 100            | 267            |        |
| Vert.    | 4804.000           | PK       | 54.5              | 30.9               | 7.5          | 39.8         | 53.1               | 73.9              | 20.8           | 100            | 351            |        |
| Vert.    | 7206.000           | PK       | 49.0              | 37.1               | 8.6          | 40.2         | 54.5               | 73.9              | 19.4           | 100            | 0              |        |
| Vert.    | 9608.000           | PK       | 47.7              | 38.6               | 9.6          | 40.1         | 55.8               | 73.9              | 18.1           | 100            | 0              |        |
| Vert.    | 12010.000          | PK       | 48.1              | 39.6               | 10.7         | 39.6         | 58.8               | 73.9              | 15.1           | 100            | 0              |        |
| Vert.    | 2390.000           | AV       | 35.0              | 26.8               | 14.6         | 41.1         | 35.3               | 53.9              | 18.6           | 100            | 267            |        |
| Vert.    | 4804.000           | AV       | 41.2              | 30.9               | 7.5          | 39.8         | 39.8               | 53.9              | 14.1           | 100            | 351            |        |
| Vert.    | 7206.000           | AV       | 35.4              | 37.1               | 8.6          | 40.2         | 40.9               | 53.9              | 13.0           | 100            | 0              |        |
| Vert.    | 9608.000           | AV       | 35.7              | 38.6               | 9.6          | 40.1         | 43.8               | 53.9              | 10.1           | 100            | 0              |        |
| Vert.    | 12010.000          | AV       | 36.2              | 39.6               | 10.7         | 39.6         | 46.9               | 53.9              | 7.0            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2402.000           | PK       | 84.3              | 26.8               | 14.6         | 41.1         | 84.6               | -                 | -              |        |
| Hori.    | 2400.000           | PK       | 38.2              | 26.8               | 14.6         | 41.1         | 38.5               | 64.6              | 26.1           |        |
| Vert.    | 2402.000           | PK       | 85.9              | 26.8               | 14.6         | 41.1         | 86.2               | -                 | -              |        |
| Vert.    | 2400.000           | PK       | 38.7              | 26.8               | 14.6         | 41.1         | 39.0               | 66.2              | 27.2           |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

## Radiated Emission

Test place                    No.3 Semi Anechoic Chamber  
 Date                            June 18, 2014                    June 19, 2014  
 Temperature / Humidity    24 deg.C, 55 %RH              26 deg.C, 50 %RH  
 Engineer                      Makoto Hosaka  
 Mode                            Tx,                    2441 MHz  
                                       Tx, Bluetooth, EDR, PRBS9

(\* 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] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 480.001            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 150            | 14             |        |
| Hori.    | 533.003            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 150            | 357            |        |
| Hori.    | 4882.000           | PK       | 53.4              | 31.4               | 7.5          | 39.7         | 52.6               | 73.9              | 21.3           | 100            | 8              |        |
| Hori.    | 7323.000           | PK       | 46.9              | 37.2               | 8.6          | 40.3         | 52.4               | 73.9              | 21.5           | 100            | 0              |        |
| Hori.    | 9764.000           | PK       | 46.8              | 38.8               | 9.6          | 40.0         | 55.2               | 73.9              | 18.7           | 100            | 0              |        |
| Hori.    | 12205.000          | PK       | 47.4              | 39.6               | 10.8         | 39.8         | 58.0               | 73.9              | 15.9           | 100            | 0              |        |
| Hori.    | 4882.000           | AV       | 39.5              | 31.4               | 7.5          | 39.7         | 38.7               | 53.9              | 15.2           | 100            | 8              |        |
| Hori.    | 7323.000           | AV       | 35.1              | 37.2               | 8.6          | 40.3         | 40.6               | 53.9              | 13.3           | 100            | 0              |        |
| Hori.    | 9764.000           | AV       | 34.8              | 38.8               | 9.6          | 40.0         | 43.2               | 53.9              | 10.7           | 100            | 0              |        |
| Hori.    | 12205.000          | AV       | 34.9              | 39.6               | 10.8         | 39.8         | 45.5               | 53.9              | 8.4            | 100            | 0              |        |
| Vert.    | 480.001            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 100            | 167            |        |
| Vert.    | 533.003            | QP       | 22.2              | 17.7               | 9.4          | 32.1         | 17.2               | 46.0              | 28.8           | 100            | 91             |        |
| Vert.    | 4882.000           | PK       | 53.8              | 31.4               | 7.5          | 39.7         | 53.0               | 73.9              | 20.9           | 100            | 321            |        |
| Vert.    | 7323.000           | PK       | 47.3              | 37.2               | 8.6          | 40.3         | 52.8               | 73.9              | 21.1           | 100            | 0              |        |
| Vert.    | 9764.000           | PK       | 47.4              | 38.8               | 9.6          | 40.0         | 55.8               | 73.9              | 18.1           | 100            | 0              |        |
| Vert.    | 12205.000          | PK       | 47.9              | 39.6               | 10.8         | 39.8         | 58.5               | 73.9              | 15.4           | 100            | 0              |        |
| Vert.    | 4882.000           | AV       | 39.2              | 31.4               | 7.5          | 39.7         | 38.4               | 53.9              | 15.5           | 100            | 321            |        |
| Vert.    | 7323.000           | AV       | 35.0              | 37.2               | 8.6          | 40.3         | 40.5               | 53.9              | 13.4           | 100            | 0              |        |
| Vert.    | 9764.000           | AV       | 34.6              | 38.8               | 9.6          | 40.0         | 43.0               | 53.9              | 10.9           | 100            | 0              |        |
| Vert.    | 12205.000          | AV       | 35.0              | 39.6               | 10.8         | 39.8         | 45.6               | 53.9              | 8.3            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                      No.3 Semi Anechoic Chamber  
 Date                              June 18, 2014                      June 19, 2014  
 Temperature / Humidity      24 deg.C, 55 %RH              26 deg.C, 50 %RH  
 Engineer                        Makoto Hosaka  
 Mode                              Tx,                      2480 MHz  
                                          Tx, Bluetooth, EDR, PRBS9

(\* 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] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 480.002            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 150            | 76             |        |
| Hori.    | 533.002            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 150            | 356            |        |
| Hori.    | 2483.500           | PK       | 46.9              | 26.9               | 14.7         | 41.1         | 47.4               | 73.9              | 26.5           | 100            | 183            |        |
| Hori.    | 4960.000           | PK       | 52.5              | 31.8               | 7.5          | 39.6         | 52.2               | 73.9              | 21.7           | 100            | 5              |        |
| Hori.    | 7440.000           | PK       | 47.0              | 37.4               | 8.8          | 40.4         | 52.8               | 73.9              | 21.1           | 100            | 0              |        |
| Hori.    | 9920.000           | PK       | 46.6              | 38.9               | 9.6          | 39.9         | 55.2               | 73.9              | 18.7           | 100            | 0              |        |
| Hori.    | 12400.000          | PK       | 46.4              | 39.7               | 10.9         | 40.0         | 57.0               | 73.9              | 16.9           | 100            | 0              |        |
| Hori.    | 2483.500           | AV       | 34.9              | 26.9               | 14.7         | 41.1         | 35.4               | 53.9              | 18.5           | 100            | 183            |        |
| Hori.    | 4960.000           | AV       | 38.5              | 31.8               | 7.5          | 39.6         | 38.2               | 53.9              | 15.7           | 100            | 5              |        |
| Hori.    | 7440.000           | AV       | 34.4              | 37.4               | 8.8          | 40.4         | 40.2               | 53.9              | 13.7           | 100            | 0              |        |
| Hori.    | 9920.000           | AV       | 33.4              | 38.9               | 9.6          | 39.9         | 42.0               | 53.9              | 11.9           | 100            | 0              |        |
| Hori.    | 12400.000          | AV       | 33.4              | 39.7               | 10.9         | 40.0         | 44.0               | 53.9              | 9.9            | 100            | 0              |        |
| Vert.    | 480.002            | QP       | 22.3              | 17.1               | 9.2          | 32.1         | 16.5               | 46.0              | 29.5           | 100            | 233            |        |
| Vert.    | 533.002            | QP       | 22.3              | 17.7               | 9.4          | 32.1         | 17.3               | 46.0              | 28.7           | 100            | 358            |        |
| Vert.    | 2483.500           | PK       | 47.3              | 26.9               | 14.7         | 41.1         | 47.8               | 73.9              | 26.1           | 100            | 131            |        |
| Vert.    | 4960.000           | PK       | 52.2              | 31.8               | 7.5          | 39.6         | 51.9               | 73.9              | 22.0           | 100            | 323            |        |
| Vert.    | 7440.000           | PK       | 47.9              | 37.4               | 8.8          | 40.4         | 53.7               | 73.9              | 20.2           | 100            | 0              |        |
| Vert.    | 9920.000           | PK       | 46.7              | 38.9               | 9.6          | 39.9         | 55.3               | 73.9              | 18.6           | 100            | 0              |        |
| Vert.    | 12400.000          | PK       | 47.1              | 39.7               | 10.9         | 40.0         | 57.7               | 73.9              | 16.2           | 100            | 0              |        |
| Vert.    | 2483.500           | AV       | 34.9              | 26.9               | 14.7         | 41.1         | 35.4               | 53.9              | 18.5           | 100            | 131            |        |
| Vert.    | 4960.000           | AV       | 38.1              | 31.8               | 7.5          | 39.6         | 37.8               | 53.9              | 16.1           | 100            | 323            |        |
| Vert.    | 7440.000           | AV       | 34.6              | 37.4               | 8.8          | 40.4         | 40.4               | 53.9              | 13.5           | 100            | 0              |        |
| Vert.    | 9920.000           | AV       | 33.6              | 38.9               | 9.6          | 39.9         | 42.2               | 53.9              | 11.7           | 100            | 0              |        |
| Vert.    | 12400.000          | AV       | 33.6              | 39.7               | 10.9         | 40.0         | 44.2               | 53.9              | 9.7            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

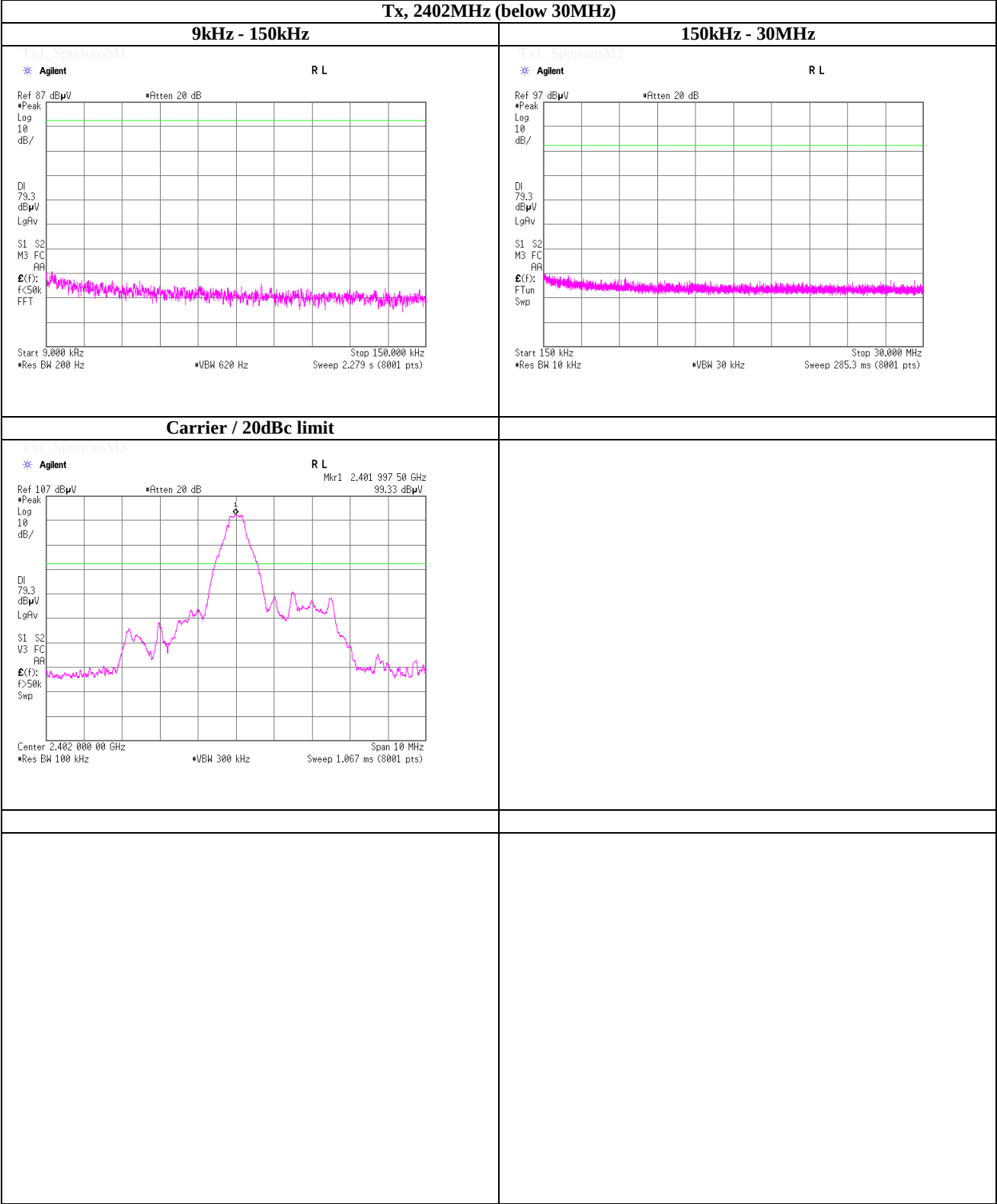
Engineer

Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

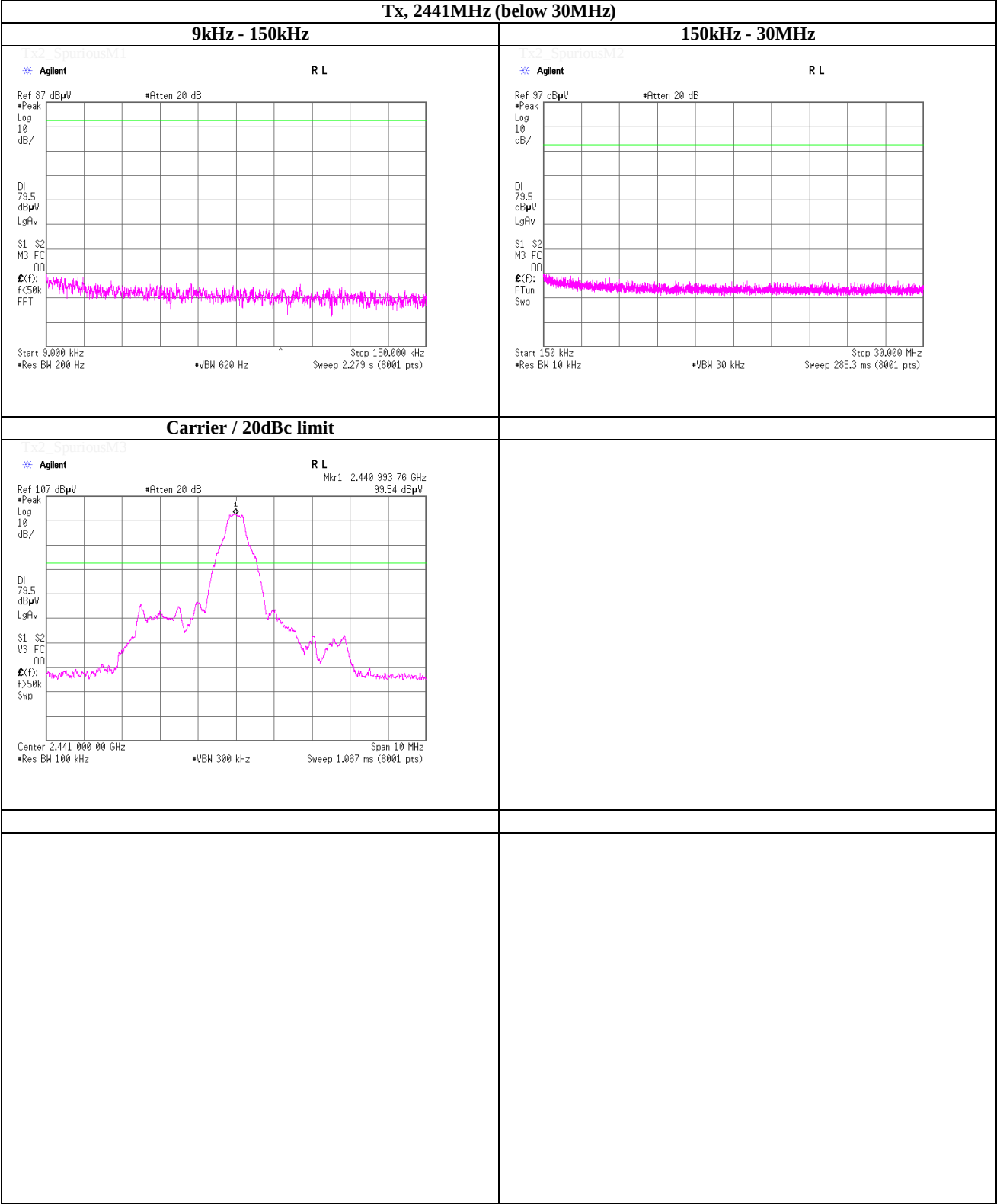
Engineer

Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

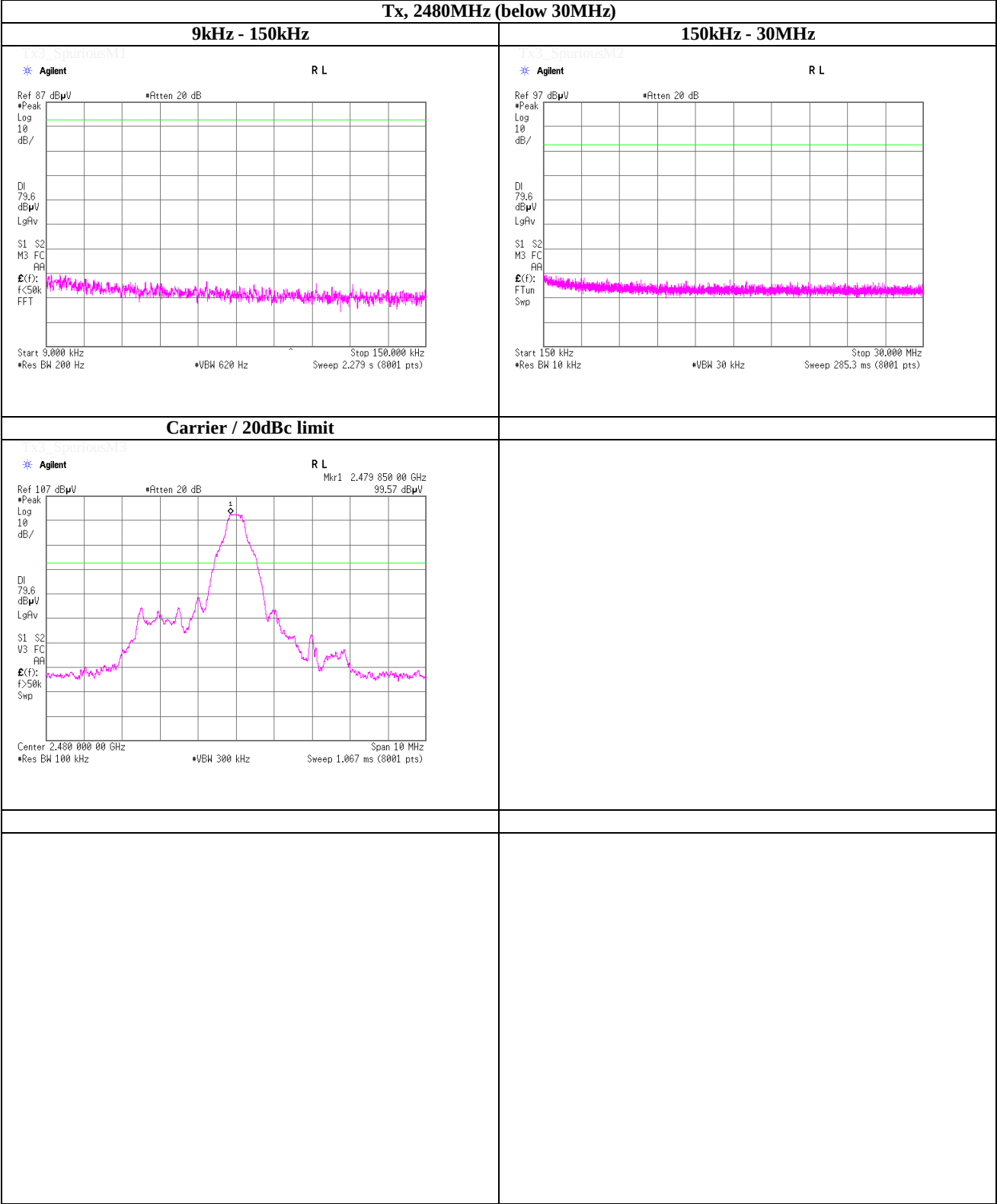
Engineer

Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

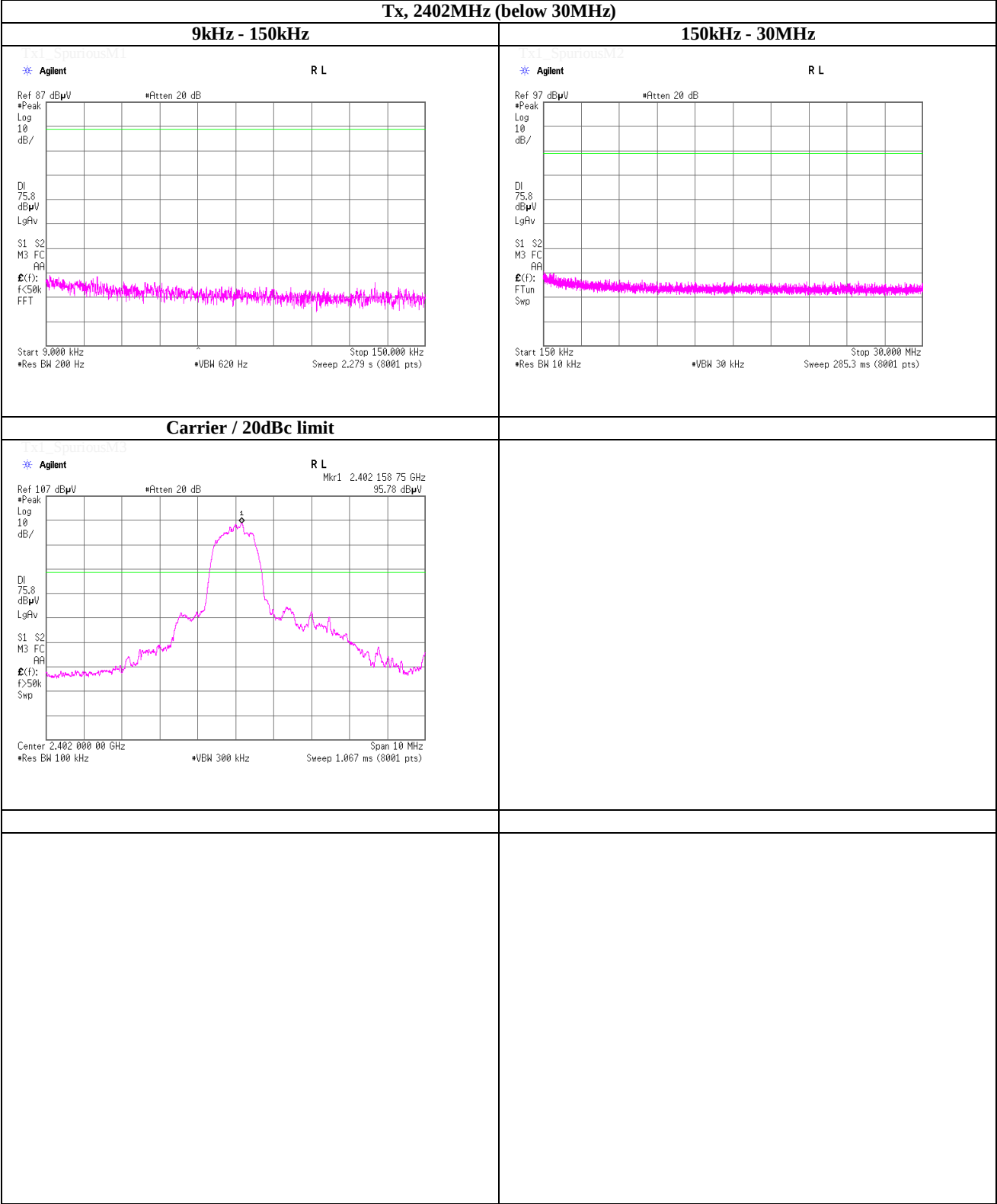
Engineer

Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

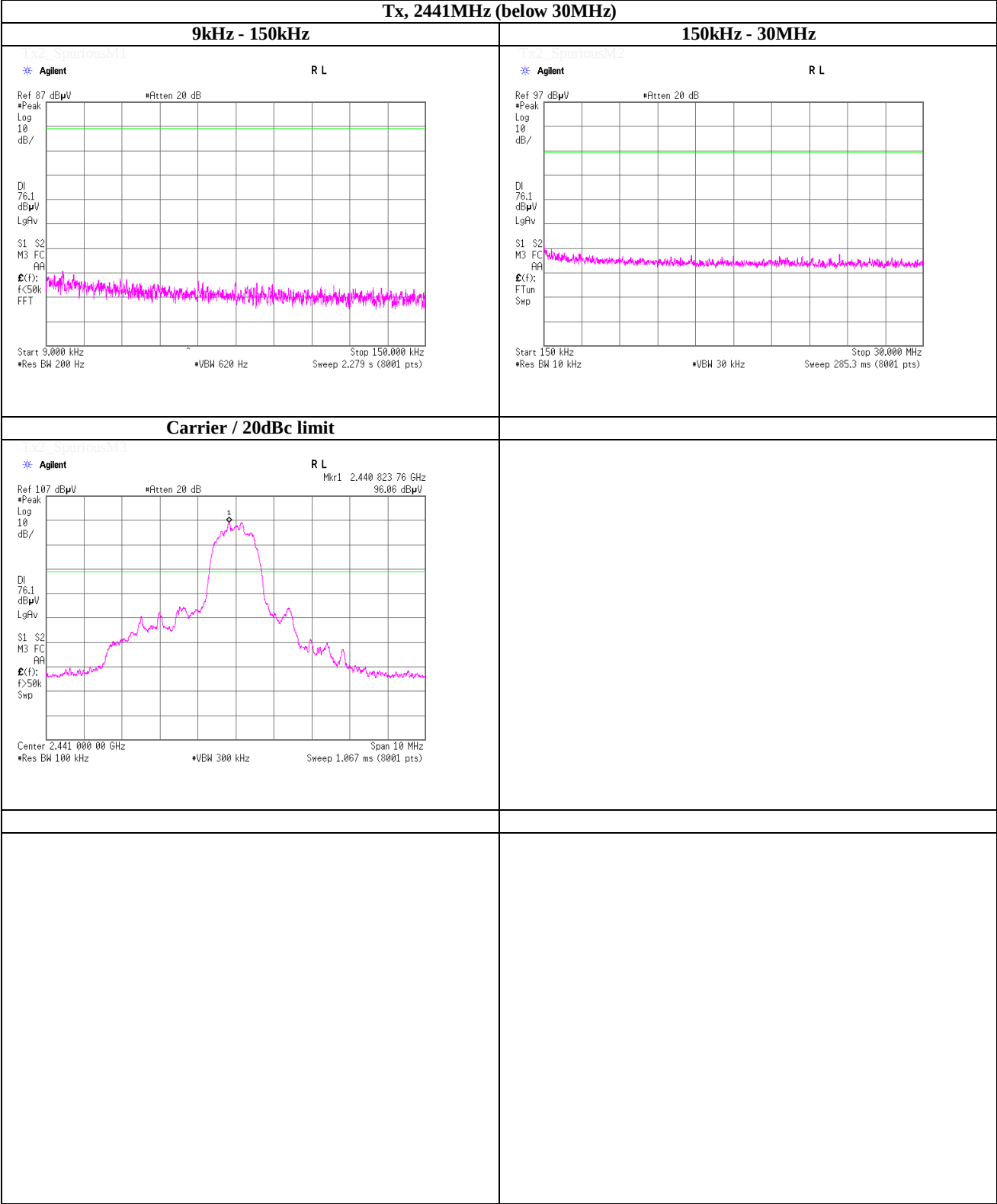
Engineer

Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

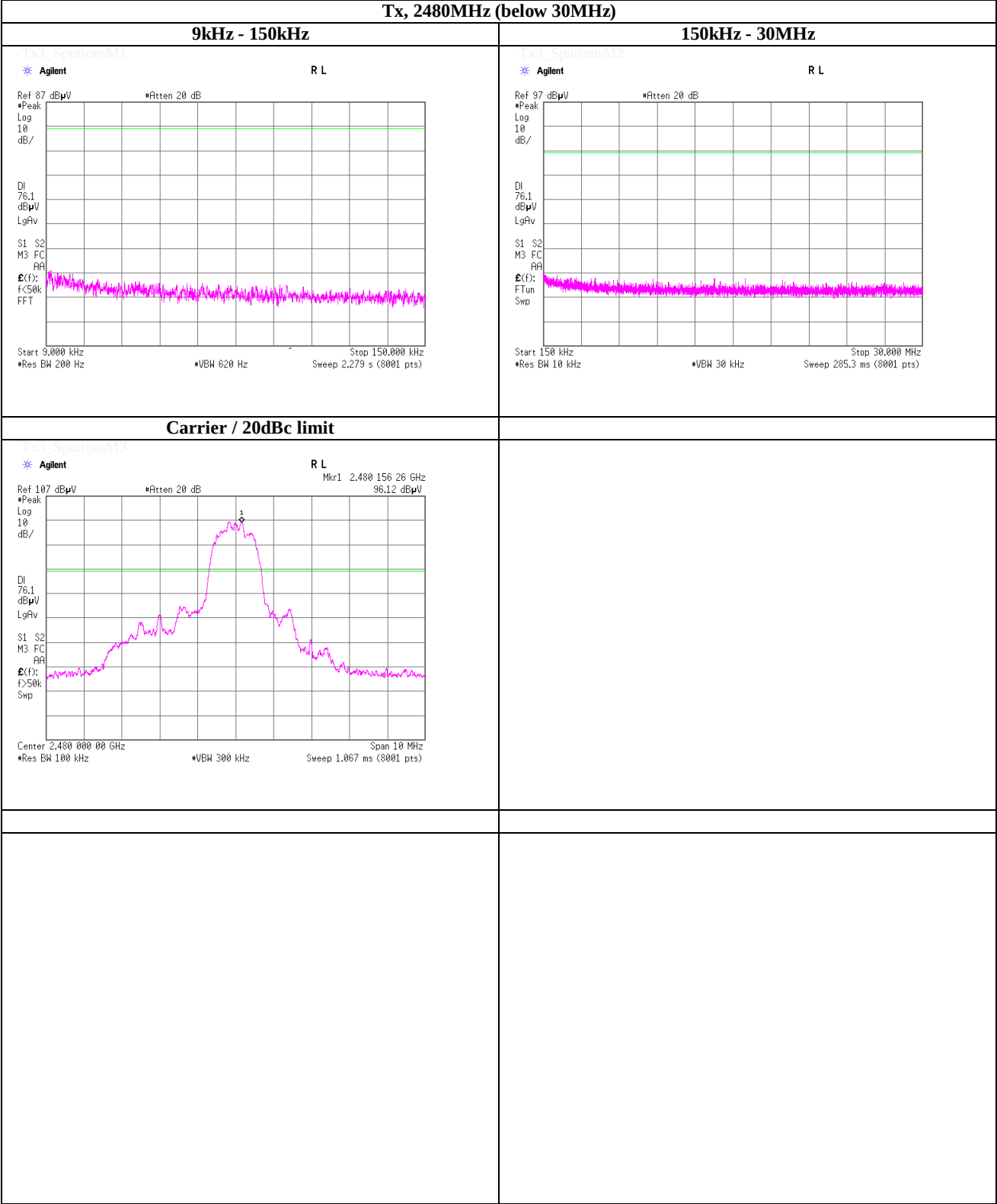
Engineer

Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

June 20, 2014

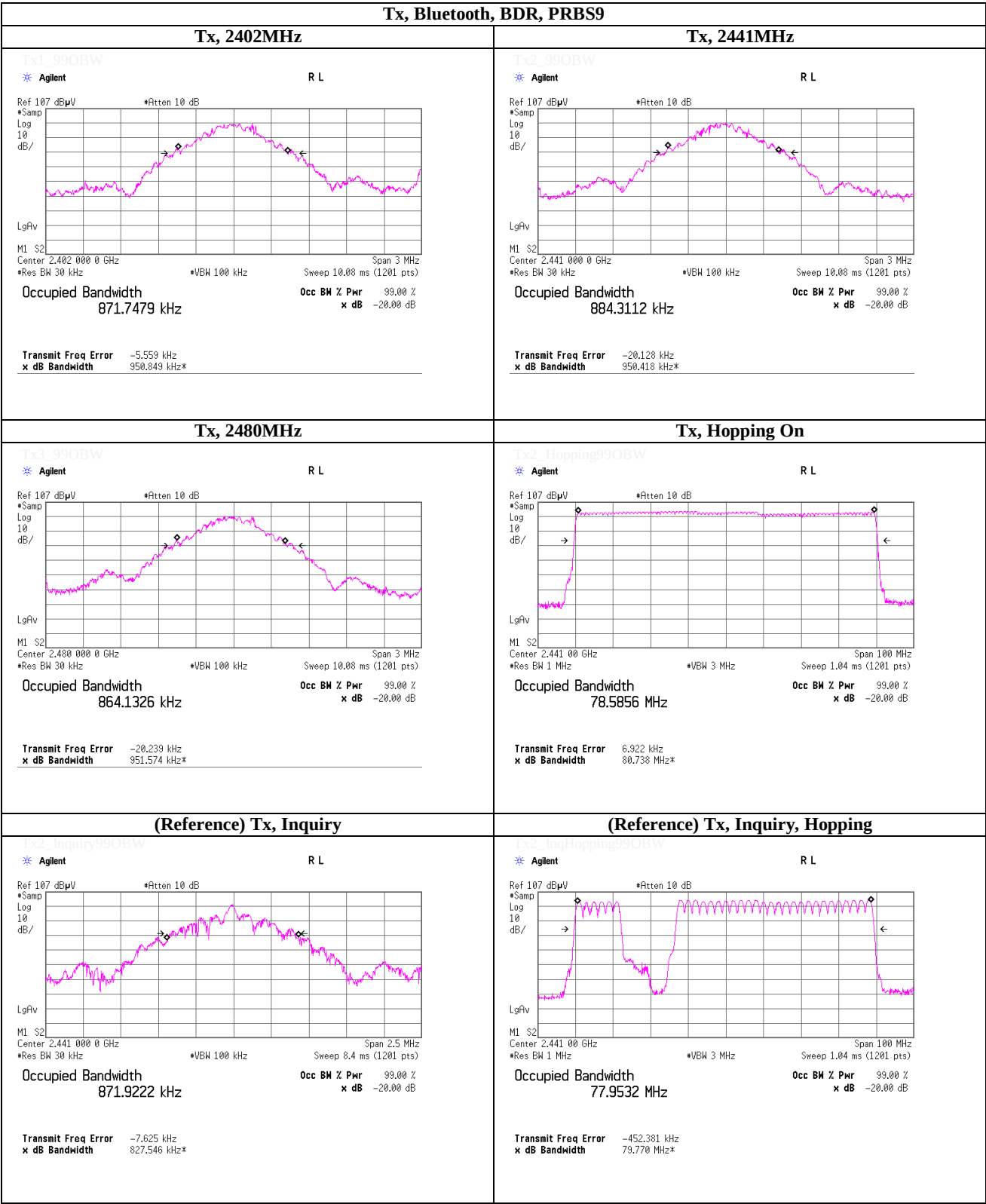
Temperature / Humidity

24 deg.C , 52%

Engineer

Shinichi Takano

99% Occupied Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

June 20, 2014

Temperature / Humidity

24 deg.C , 52%

Engineer

Shinichi Takano

99% Occupied Bandwidth

| Tx, Bluetooth, EDR, PRBS9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tx, 2402MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tx, 2441MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <div><div>Tx1_99OBW</div><div><div>Agilent</div><div>R L</div></div><div><div>Ref 107 dBμV</div><div>*Atten 10 dB</div></div><div><div><div>#Samp</div><div>Log</div><div>10</div><div>dB/</div></div><div><div>LgAv</div><div>M1 S2</div><div>Center 2.402 000 0 GHz</div><div>*Res BW 30 kHz</div><div>*VBW 100 kHz</div><div>Sweep 10.00 ms (1201 pts)</div><div>Span 3 MHz</div></div></div><div><div>Occupied Bandwidth</div><div>1.1746 MHz</div><div>Occ BW % Pwr 99.00 %</div><div>x dB -20.00 dB</div></div><div><div>Transmit Freq Error</div><div>-2.454 kHz</div><div>x dB Bandwidth 1.278 MHz*</div></div></div>         | <div><div>Tx2_99OBW</div><div><div>Agilent</div><div>R L</div></div><div><div>Ref 107 dBμV</div><div>*Atten 10 dB</div></div><div><div><div>#Samp</div><div>Log</div><div>10</div><div>dB/</div></div><div><div>LgAv</div><div>M1 S2</div><div>Center 2.441 000 0 GHz</div><div>*Res BW 30 kHz</div><div>*VBW 100 kHz</div><div>Sweep 10.00 ms (1201 pts)</div><div>Span 3 MHz</div></div></div><div><div>Occupied Bandwidth</div><div>1.1716 MHz</div><div>Occ BW % Pwr 99.00 %</div><div>x dB -20.00 dB</div></div><div><div>Transmit Freq Error</div><div>-19.043 kHz</div><div>x dB Bandwidth 1.273 MHz*</div></div></div>      |
| Tx, 2480MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Tx, Hopping On                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <div><div>Tx3_99OBW</div><div><div>Agilent</div><div>R L</div></div><div><div>Ref 107 dBμV</div><div>*Atten 10 dB</div></div><div><div><div>#Samp</div><div>Log</div><div>10</div><div>dB/</div></div><div><div>LgAv</div><div>M1 S2</div><div>Center 2.480 000 0 GHz</div><div>*Res BW 30 kHz</div><div>*VBW 100 kHz</div><div>Sweep 10.00 ms (1201 pts)</div><div>Span 3 MHz</div></div></div><div><div>Occupied Bandwidth</div><div>1.1682 MHz</div><div>Occ BW % Pwr 99.00 %</div><div>x dB -20.00 dB</div></div><div><div>Transmit Freq Error</div><div>-17.223 kHz</div><div>x dB Bandwidth 1.264 MHz*</div></div></div>        | <div><div>Tx2_Hopping99OBW</div><div><div>Agilent</div><div>R L</div></div><div><div>Ref 107 dBμV</div><div>*Atten 10 dB</div></div><div><div><div>#Samp</div><div>Log</div><div>10</div><div>dB/</div></div><div><div>LgAv</div><div>M1 S2</div><div>Center 2.441 00 GHz</div><div>*Res BW 1 MHz</div><div>*VBW 3 MHz</div><div>Sweep 1.04 ms (1201 pts)</div><div>Span 100 MHz</div></div></div><div><div>Occupied Bandwidth</div><div>78.6424 MHz</div><div>Occ BW % Pwr 99.00 %</div><div>x dB -20.00 dB</div></div><div><div>Transmit Freq Error</div><div>4.628 kHz</div><div>x dB Bandwidth 80.989 MHz*</div></div></div>    |
| <div><div>Tx2_inquiry99OBW</div><div><div>Agilent</div><div>R L</div></div><div><div>Ref 107 dBμV</div><div>*Atten 10 dB</div></div><div><div><div>#Samp</div><div>Log</div><div>10</div><div>dB/</div></div><div><div>LgAv</div><div>M1 S2</div><div>Center 2.480 000 0 GHz</div><div>*Res BW 30 kHz</div><div>*VBW 100 kHz</div><div>Sweep 10.00 ms (1201 pts)</div><div>Span 3 MHz</div></div></div><div><div>Occupied Bandwidth</div><div>1.1682 MHz</div><div>Occ BW % Pwr 99.00 %</div><div>x dB -20.00 dB</div></div><div><div>Transmit Freq Error</div><div>-17.223 kHz</div><div>x dB Bandwidth 1.264 MHz*</div></div></div> | <div><div>Tx2_inqHopping99OBW</div><div><div>Agilent</div><div>R L</div></div><div><div>Ref 107 dBμV</div><div>*Atten 10 dB</div></div><div><div><div>#Samp</div><div>Log</div><div>10</div><div>dB/</div></div><div><div>LgAv</div><div>M1 S2</div><div>Center 2.441 00 GHz</div><div>*Res BW 1 MHz</div><div>*VBW 3 MHz</div><div>Sweep 1.04 ms (1201 pts)</div><div>Span 100 MHz</div></div></div><div><div>Occupied Bandwidth</div><div>78.6424 MHz</div><div>Occ BW % Pwr 99.00 %</div><div>x dB -20.00 dB</div></div><div><div>Transmit Freq Error</div><div>4.628 kHz</div><div>x dB Bandwidth 80.989 MHz*</div></div></div> |

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## APPENDIX 2

### Test Instruments

#### EMI test equipment

| Control No.                    | Instrument                | Manufacturer                                | Model No                                   | Serial No               | Test Item | Calibration Date<br>* Interval(month) |
|--------------------------------|---------------------------|---------------------------------------------|--------------------------------------------|-------------------------|-----------|---------------------------------------|
| SAEC-03(NSA)                   | Semi-Anechoic Chamber     | TDK                                         | SAEC-03(NSA)                               | 3                       | RE        | 2013/07/09 * 12                       |
| SAF-06                         | Pre Amplifier             | TOYO Corporation                            | TPA0118-36                                 | 1440491                 | RE        | 2014/05/23 * 12                       |
| SAT10-06                       | Attenuator                | Agilent                                     | 8493C-010                                  | 74865                   | RE        | 2013/11/22 * 12                       |
| SFL-02                         | Highpass Filter           | MICRO-TRONICS                               | HPM50111                                   | 051                     | RE        | 2013/11/22 * 12                       |
| SCC-G01                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 104A                              | 46497/4A                | RE        | 2014/04/22 * 12                       |
| SCC-G21                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 104                               | 296169/4                | RE        | 2014/05/15 * 12                       |
| SHA-03                         | Horn Antenna              | Schwarzbeck                                 | BBHA9120D                                  | 9120D-739               | RE        | 2013/08/19 * 12                       |
| SOS-05                         | Humidity Indicator        | A&D                                         | AD-5681                                    | 4062518                 | RE        | 2014/02/21 * 12                       |
| SSA-02                         | Spectrum Analyzer         | Agilent                                     | E4448A                                     | MY48250106              | RE        | 2014/03/17 * 12                       |
| SJM-15                         | Measure                   | ASKUL                                       | -                                          | -                       | RE        | -                                     |
| COTS-SEMI-1                    | EMI Software              | TSJ                                         | TEPTO-DV(RE,CE,<br>RFLMF)                  | -                       | RE        | -                                     |
| SAF-08                         | Pre Amplifier             | TOYO Corporation                            | HAP18-26W                                  | 00000019                | RE        | 2014/03/14 * 12                       |
| SHA-04                         | Horn Antenna              | ETS LINDGREN                                | 3160-09                                    | LM3640                  | RE        | 2014/03/15 * 12                       |
| SCC-G15                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 102                               | 32703/2                 | RE        | 2014/03/13 * 12                       |
| SAF-03                         | Pre Amplifier             | SONOMA                                      | 310N                                       | 290213                  | RE        | 2014/02/14 * 12                       |
| SAT6-06                        | Attenuator                | JFW                                         | 50HF-006N                                  | -                       | RE        | 2014/02/17 * 12                       |
| SBA-03                         | Biconical Antenna         | Schwarzbeck                                 | BBA9106                                    | 91032666                | RE        | 2013/10/26 * 12                       |
| SCC-C1/C2/C3/C4/C5/C10/SRSE-03 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906 | -/0901-271(RF Selector) | RE        | 2014/04/25 * 12                       |
| SLA-03                         | Logperiodic Antenna       | Schwarzbeck                                 | UHALP9108A                                 | UHALP 9108-A<br>0901    | RE        | 2013/10/26 * 12                       |
| STR-06                         | Test Receiver             | Rohde & Schwarz                             | ESCI                                       | 101259                  | RE        | 2014/03/04 * 12                       |
| SSA-03                         | Spectrum Analyzer         | Agilent                                     | E4448A                                     | MY48250152              | AT        | 2014/02/03 * 12                       |
| SPM-06                         | Power Meter               | Anritsu                                     | ML2495A                                    | 0850009                 | AT        | 2014/04/08 * 12                       |
| SPSS-03                        | Power sensor              | Anritsu                                     | MA2411B                                    | 0917063                 | AT        | 2014/04/08 * 12                       |
| SAT10-09                       | Attenuator                | Weinschel Corp.                             | 54A-10                                     | W5692                   | AT        | 2013/11/27 * 12                       |
| SCC-G13                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 102                               | 31599/2                 | AT        | 2014/03/14 * 12                       |
| SOS-09                         | Humidity Indicator        | A&D                                         | AD-5681                                    | 4061484                 | AT        | 2014/03/07 * 12                       |
|                                |                           |                                             |                                            |                         |           |                                       |
|                                |                           |                                             |                                            |                         |           |                                       |

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

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

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

Test Item :

RE: Radiated emission,

AT: Antenna terminal disturbance voltage