



Test report No. : 10407942S-A  
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Issued date : September 12, 2014  
FCC ID : ACJ932AT1501

# RADIO TEST REPORT

**Test Report No.: 10407942S-A**

**Applicant** : Panasonic Corporation  
**Type of Equipment** : Car Audio  
**Model No.** : AT1501  
**FCC ID** : ACJ932AT1501  
**Test regulation** : FCC Part15 Subpart C: 2014  
**Test result** : Complied

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3. This sample tested is in compliance with the limits of the above regulation.
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**Date of test:** March 1, 2013 to August 25, 2014

**Tested by:** *S. Takano*  
Shinichi Takano  
Engineer  
Consumer Technology Division

**Approved by :** *T. Imamura*  
Toyokazu Imamura  
Leader  
Consumer Technology Division



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 There is no testing item of "Non-accreditation".

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13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : Panasonic Corporation  
Brand Name : Panasonic  
Address : 4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa 224-8520 Japan  
Telephone Number : +81-50-3689-6973  
Facsimile Number : +81-45-931-0806  
Contact Person : Ichiro Furuya

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

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

Type of Equipment : Car Audio  
Model No. : AT1501  
Serial No. : No.0001 (CV-VS05F2AJ)  
Rating : System : DC12.0V (Car battery), Bluetooth Block : DC5V  
Receipt Date of Sample : February 26, 2013 and August 8, 2014  
Country of Mass-production : Japan  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No modification by the test lab.

### **2.2 Product description**

Model: AT1501 (referred to as the EUT in this report) is a Car Audio.

Clock frequency(ies) in the system : 26MHz, 32.768kHz

### **Radio specification**

Equipment type : Transceiver  
Frequency of operation : 2402-2480MHz  
Bandwidth / Channel spacing : 79MHz & 1MHz  
Type of modulation : FHSS (GFSK,  $\pi/4$ -DQPSK, 8DPSK)  
Antenna type : Dipole  
Antenna connector type : U.FL  
Antenna gain with cable loss : -2.85dBi  
ITU code : F1D, G1D  
Operation temperature range : -30 to +85 deg. C.

#### FCC 15.31 (e)

The stable voltage (DC3.3V and DC1.8V) is provided constantly to RF part via regulator. Therefore, the EUT complies with the requirement.

#### FCC 15.203

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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### **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

#### **3.2 Procedures & Results**

| Item                                     | Test Procedure  | Specification            | Remarks                | Deviation  | Worst Margin | Results   |          |
|--|---|--------------------------|------------------------|------------|--------------|---|----------|
| Conducted emission                       | ANSI C63.4:2009<br>7. AC powerline conducted emission 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)<br>15.209 | Conducted/<br>Radiated | N/A        |              | 14.8 dB<br>Freq.: 7440.000MHz<br>Detection: Peak<br>Polarization: Vertical<br>Mode: Tx 2480MHz, 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.

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### 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</b><br>(Measurement distance: 3m) | 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</b><br>(Measurement distance: 1m) | 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%

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### 3.5 Test location

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JAB Accreditation No. : RTL02610

|  | IC Registration No. | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|--|---------------------|----------------------------|--|------------------------------|
| <input checked="" type="checkbox"/> No.1 semi-anechoic chamber | 2973D-1             | 20.6 x 11.3 x 7.65         | 20.6 x 11.3  | 10m                          |
| <input checked="" type="checkbox"/> No.2 semi-anechoic chamber | 2973D-2             | 20.6 x 11.3 x 7.65         | 20.6 x 11.3  | 10m                          |
| <input 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 checked="" 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.

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

### **4.1 Operating mode**

| <b>Test item</b>                                    | <b>Operating mode</b>   | <b>Tested frequency</b>   |
|---|---|---|
| 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<br>-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 ON<br>-Hopping OFF                                 | Band edge compliance:<br>2402MHz, 2480MHz<br>Spurious emission: |
| Band edge compliance & Spurious emission (Radiated) | Transmitting (DH5 / 3-DH5), Payload: PRBS9<br>-Hopping OFF  | 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.  
The carrier separation may be less than 20 dB bandwidth, therefore 125mW power limit was applied to it.

We removed 2-DH mode (2 Mb/s EDR: pi/4DQPSK) except power measurement by using 3-DH mode (3 Mb/s EDR: 8DPSK) as a representative.

EUT has the power settings by the software as follows;

|                |                         |
|----------------|-------------------------|
| Power settings | Fixed                   |
| Software       | HCI Tester Ver 3.0.0.12 |

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

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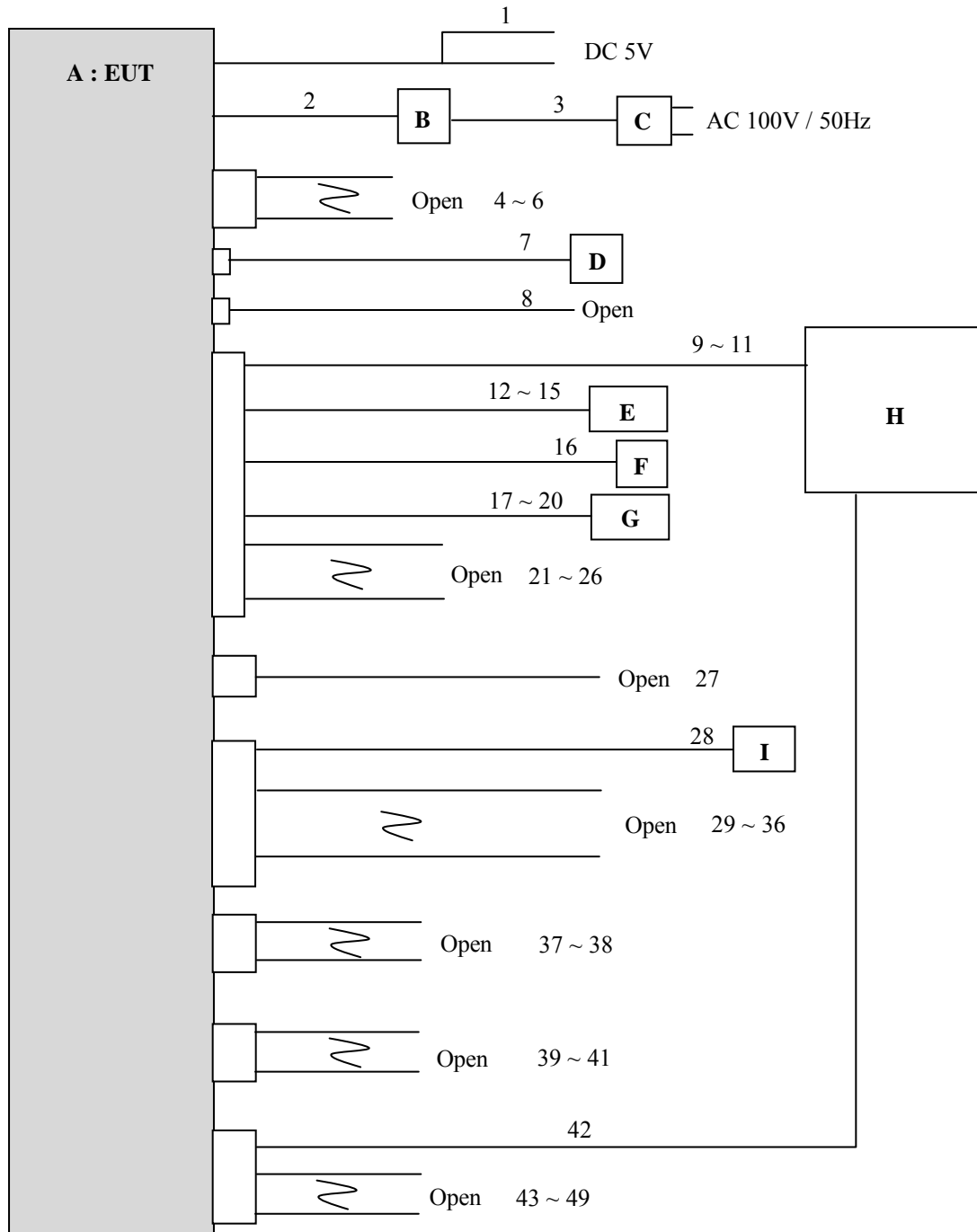
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#### 4.2 Configuration and peripherals



\* Test data was taken under worse case conditions.

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**Description of EUT and Auxiliary equipment**

| No. | Item              | Model number | Serial number        | Manufacturer               | Remarks |
|-----|-------------------|--------------|----------------------|----------------------------|---------|
| A   | Car Audio         | AT1501       | No.0001(CV-VS05F2AJ) | Panasonic                  | EUT     |
| B   | Test Jig          | PCA-A-036702 | 48554                | Panasonic                  | -       |
| C   | AC Adapter        | GF18-US0530T | -                    | GO FORWARD ENTERPRISE CORP | -       |
| D   | GPS Antenna       | -            | 07330028             | Panasonic                  | -       |
| E   | AUX               | 86190-12020  | -                    | Panasonic                  | -       |
| F   | Mic               | -            | No.100               | Panasonic                  | -       |
| G   | Remote Controller | 1-36-I-i     | No.56                | Panasonic                  | -       |
| H   | JIG Terminal Box  | -            | -                    | Panasonic                  | -       |
| I   | Rear Camera       | GP-KD3302RS  | 7XS00016             | Panasonic                  | -       |

**List of cables used**

| No. | Item                     | Length(m) | Shield (Cable) | Shield (Connector) | Remarks |
|-----|--------------------------|-----------|----------------|--------------------|---------|
| 1   | DC                       | 2.3       | Unshielded     | Unshielded         | -       |
| 2   | Signal                   | 0.5       | Shielded       | Shielded           | -       |
| 3   | DC                       | 1.6       | Unshielded     | Unshielded         | -       |
| 4   | Signal (3pin Connector)  | 0.25      | Shielded       | Shielded           | -       |
| 5   | Signal (3pin Connector)  | 0.25      | Shielded       | Shielded           | -       |
| 6   | Signal (3pin Connector)  | 0.25      | Unshielded     | Unshielded         | -       |
| 7   | GPS                      | 3.5       | Shielded       | Shielded           | -       |
| 8   | USB                      | 2.0       | Shielded       | Shielded           | -       |
| 9   | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 10  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 11  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 12  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 13  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 14  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 15  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 16  | Signal (28pin Connector) | 4.4       | Unshielded     | Unshielded         | -       |
| 17  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 18  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 19  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 20  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 21  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 22  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 23  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 24  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 25  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 26  | Signal (28pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 27  | Signal (12pin Connector) | 6.2       | Unshielded     | Unshielded         | -       |
| 28  | Signal (24pin Connector) | 2.2       | Unshielded     | Unshielded         | -       |
| 29  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 30  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |

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**List of cables used**

| No. | Item                     | Length(m) | Shield (Cable) | Shield (Connector) | Remarks |
|-----|--------------------------|-----------|----------------|--------------------|---------|
| 31  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 32  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 33  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 34  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 35  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 36  | Signal (24pin Connector) | 2.0       | Unshielded     | Unshielded         | -       |
| 37  | Signal (8pin Connector)  | 1.0       | Unshielded     | Unshielded         | -       |
| 38  | Signal (8pin Connector)  | 1.0       | Unshielded     | Unshielded         | -       |
| 39  | Signal (6pin Connector)  | 1.7       | Unshielded     | Unshielded         | -       |
| 40  | Signal (6pin Connector)  | 1.7       | Unshielded     | Unshielded         | -       |
| 41  | Signal (6pin Connector)  | 1.7       | Unshielded     | Unshielded         | -       |
| 42  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 43  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 44  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 45  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 46  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 47  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 48  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |
| 49  | Signal (10pin Connector) | 1.7       | Unshielded     | Unshielded         | -       |

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## **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.

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## **SECTION 10: Radiated emission**

### **10.1 Operating environment**

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

### **10.2 Test configuration**

EUT was placed on a platform of nominal size, 1.0m by 2.0m (30MHz-1GHz) or 1.0m by 1.5m (1-25GHz), raised 0.8m (30MHz-15GHz) or 1.0m (15-25GHz) 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.

### **10.3 Test conditions**

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

### **10.4 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 |           | 20dBc       |
|----------------|--------------|-----------|-----------|-------------|
| Detection Type | : Quasi-Peak | Peak      | * Average | Peak        |
| IF Bandwidth   | : 120kHz     | RBW:1MHz  | RBW:1MHz  | RBW: 100kHz |
|                |              | VBW:3MHz  | VBW:10Hz  | VBW: 300kHz |

\* 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 angle of 0 to 29 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

| Antenna polarization | Test item | Carrier *1) | Spurious emission (Below 1GHz) | Spurious emission (Above 1GHz) |
|----------------------|-----------|-------------|--------------------------------|--------------------------------|
| Horizontal           |           | 0 deg.      | 0 deg.                         | 0 deg.                         |
| Vertical             |           | 0 deg.      | 0 deg.                         | 0 deg.                         |

\*1) with spurious emissions near carrier frequency

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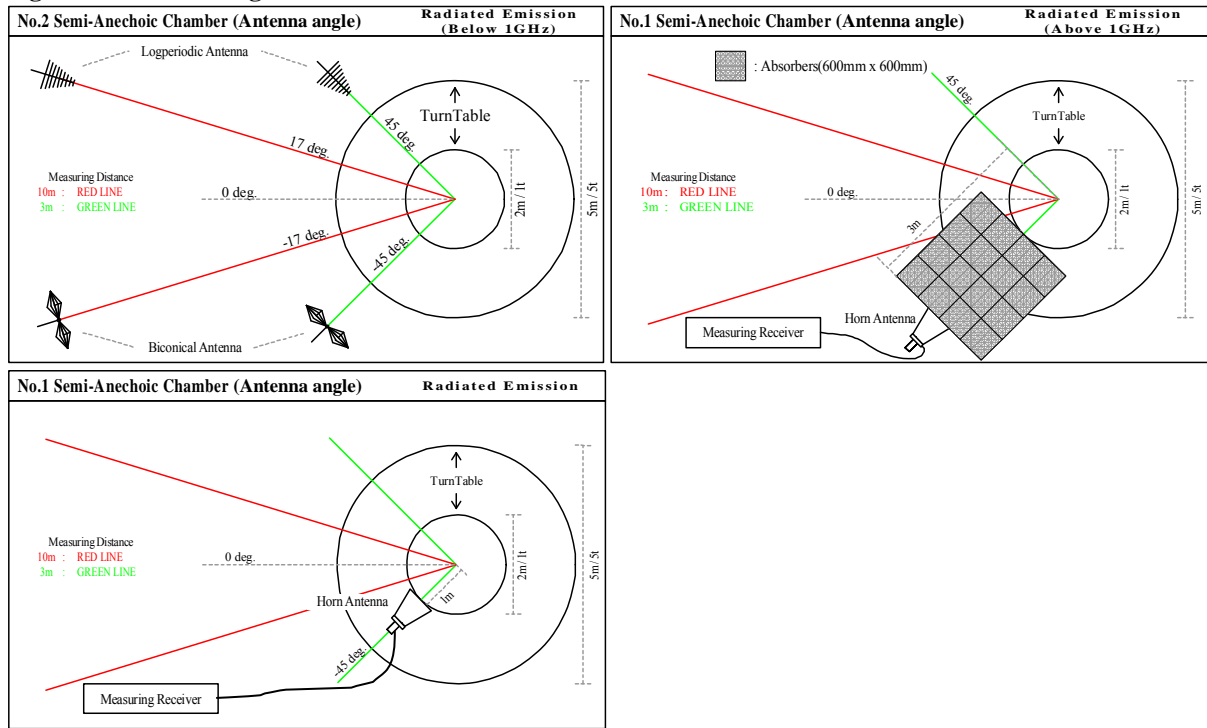
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**Figure 1. Antenna angle**



**10.5 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.

**10.6 Results**

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

Refer to APPENDIX 1.

**SECTION 11: Spurious emissions (Antenna port conducted)**

**Test procedure**

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

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## **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

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## APPENDIX 1: Data of Radio tests

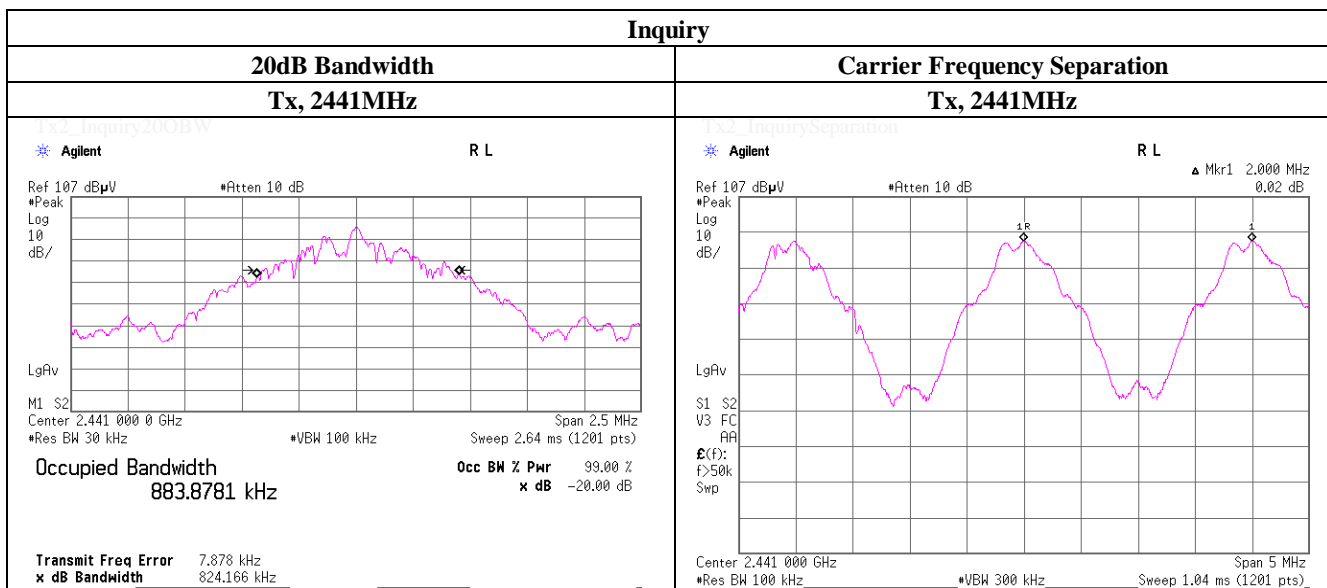
### 20dB Bandwidth and Carrier Frequency Separation

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.3 Shielded Room |
| Date                   | March 1, 2013                  |                    |
| Temperature / Humidity | 22 deg.C , 31 %RH              |                    |
| Engineer               | Tatsuya Arai                   |                    |
| 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         | 0.956                      | 1.000                                       | >= 0.637   |
| DH5     | 2441.0         | 0.947                      | 1.000                                       | >= 0.631   |
| DH5     | 2480.0         | 0.951                      | 1.000                                       | >= 0.634   |
| Inquiry | 2441.0         | 0.824                      | 2.000                                       | >= 0.549   |

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

No limit applies to 20dB Bandwidth.



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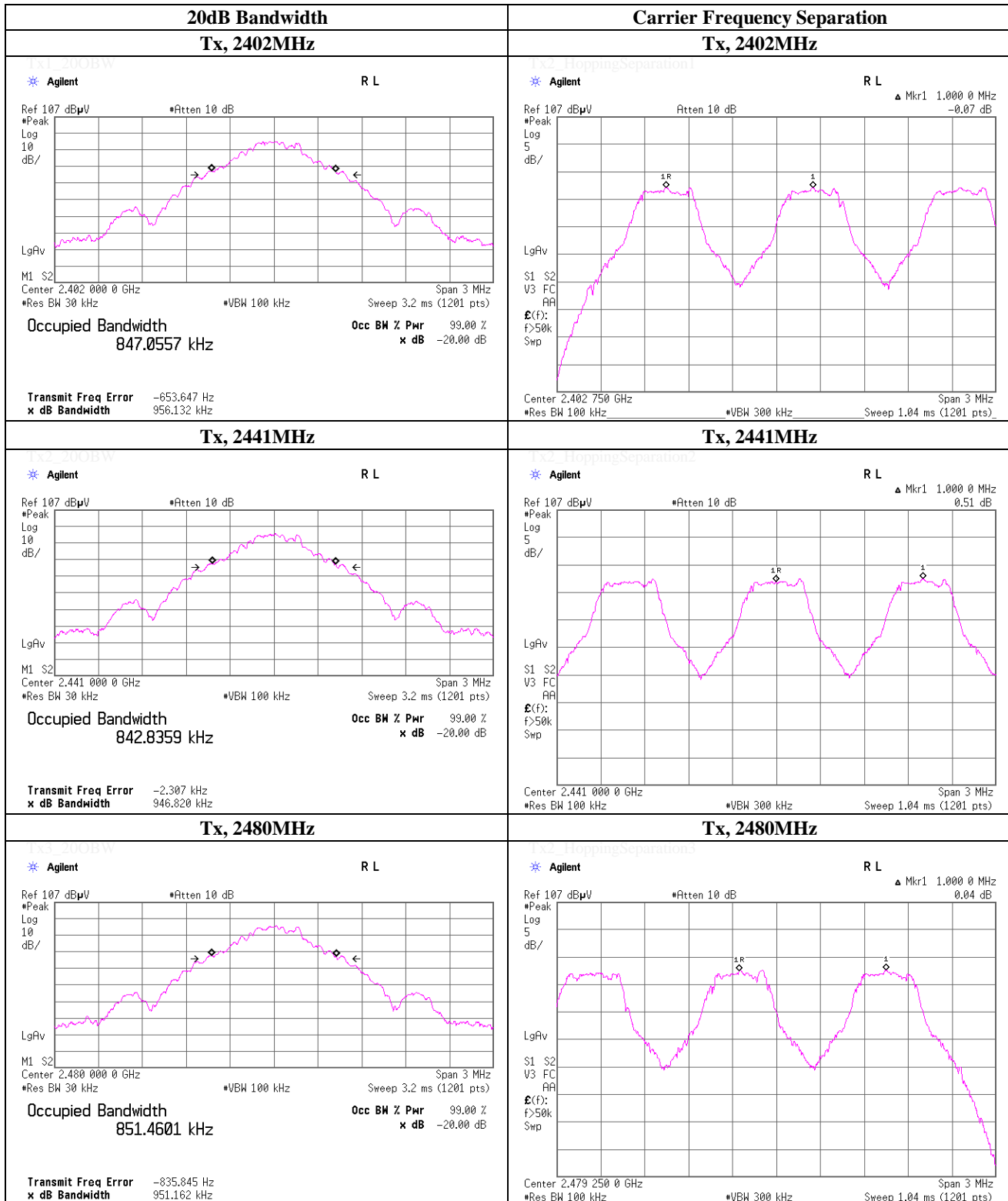
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## 20dB Bandwidth and Carrier Frequency Separation

### Tx, Bluetooth, BDR, PRBS9



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## 20dB Bandwidth and Carrier Frequency Separation

Test place                   UL Japan, Inc. Shonan EMC Lab.           No.5 Shielded Room  
 Date                         March 1, 2013  
 Temperature / Humidity   22 deg.C     , 31 %RH  
 Engineer                  Tatsuya Arai  
 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         | 1.318                      | 1.000                                       | >= 0.879   |
| 3-DH5 | 2441.0         | 1.331                      | 1.000                                       | >= 0.888   |
| 3-DH5 | 2480.0         | 1.317                      | 1.000                                       | >= 0.878   |
|       |                |                            |   |  |

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

No limit applies to 20dB Bandwidth.

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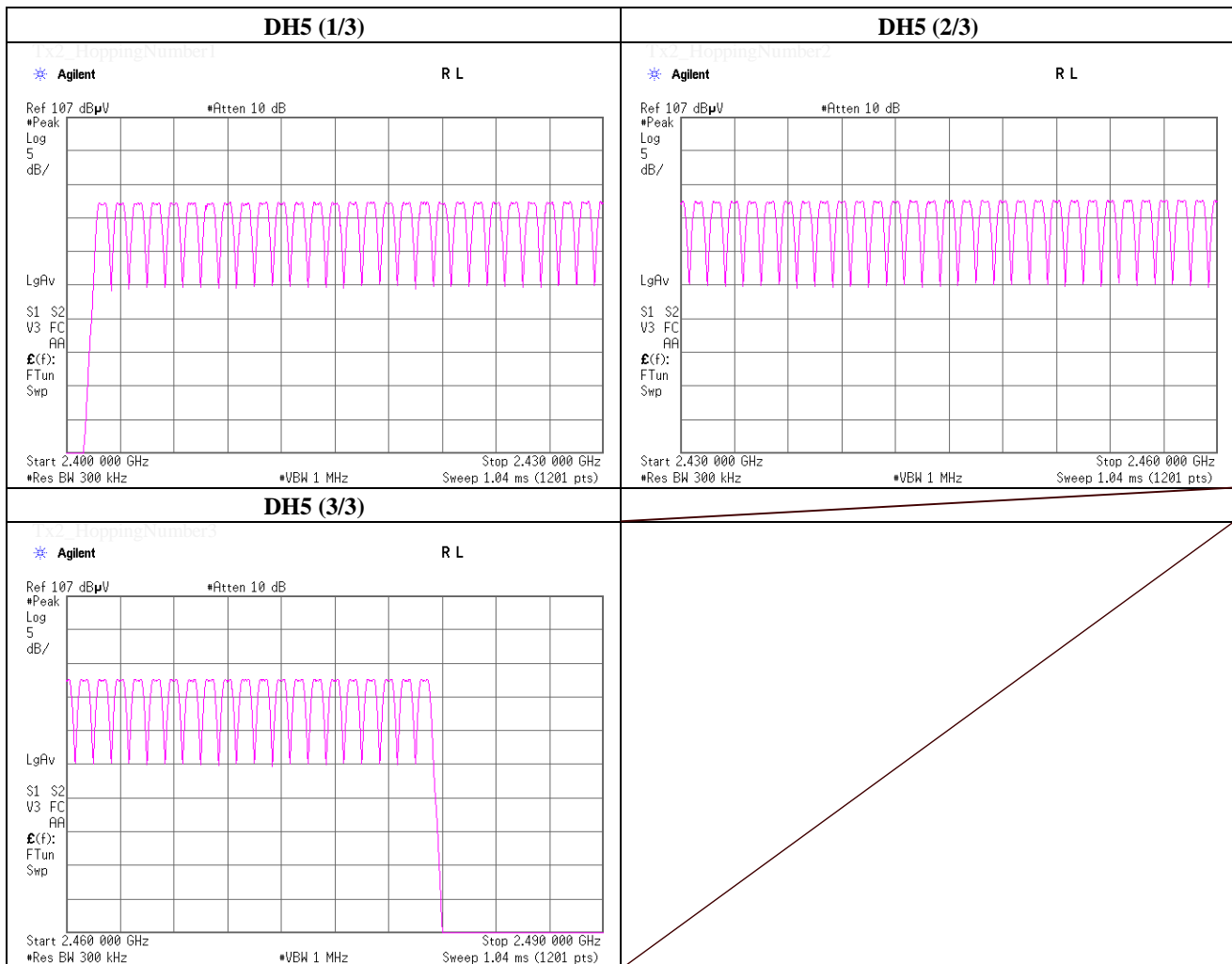


### Number of Hopping Frequency

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.3 Shielded Room |
| Date                   | March 1, 2013                  |                    |
| Temperature / Humidity | 22 deg.C , 31 %RH              |                    |
| Engineer               | Tatsuya Arai                   |                    |
| Mode                   | Tx, Bluetooth, BDR, PRBS9      |                    |

| 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.



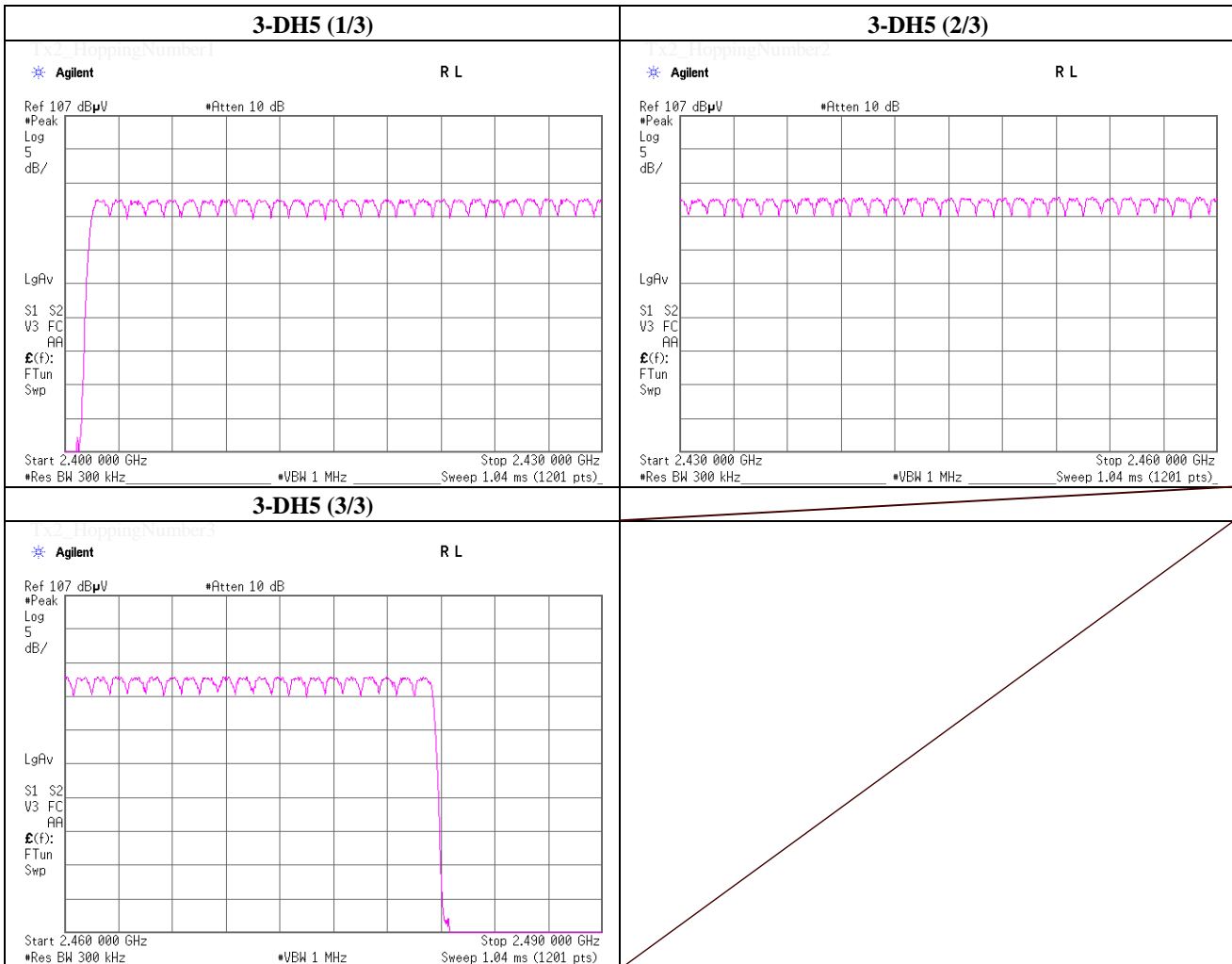
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### Number of Hopping Frequency

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.5 Shielded Room |
| Date                   | March 1, 2013                  |                    |
| Temperature / Humidity | 22 deg.C , 31 %RH              |                    |
| Engineer               | Tatsuya Arai                   |                    |
| 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.

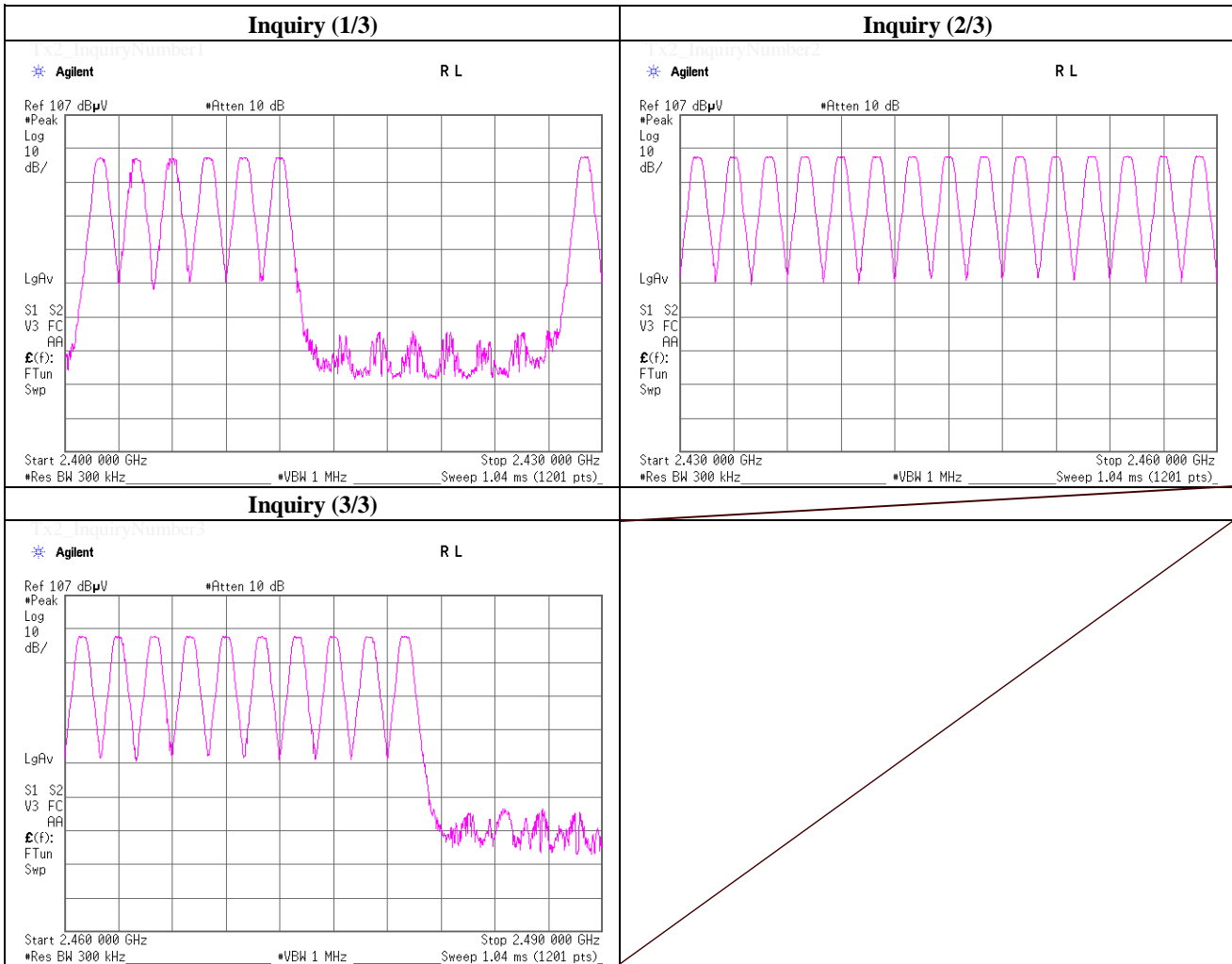


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### Number of Hopping Frequency

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.3 Shielded Room |
| Date                   | March 1, 2013                  |                    |
| Temperature / Humidity | 22 deg.C , 31 %RH              |                    |
| Engineer               | Tatsuya Arai                   |                    |
| Mode                   | Tx, Bluetooth, Inquiry         |                    |

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



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## Dwell Time

|                        |                                |                    |
|------------------------|--------------------------------|--------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.3 Shielded Room |
| Date                   | March 1, 2013                  |                    |
| Temperature / Humidity | 22 deg.C , 31 %RH              |                    |
| Engineer               | Tatsuya Arai                   |                    |
| 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     | 49.8 / 5.0 sec. x 31.6 sec. = 315 times   | 0.387                                    | 122              | 400             |
| DH3     | 25.4 / 5.0 sec. x 31.6 sec. = 161 times   | 1.643                                    | 265              | 400             |
| DH5     | 19.0 / 5.0 sec. x 31.6 sec. = 121 times   | 2.891                                    | 350              | 400             |
| Inquiry | 100.0 / 1.0 sec. x 12.8 sec. = 1280 times   | 0.093                                    | 119              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission time

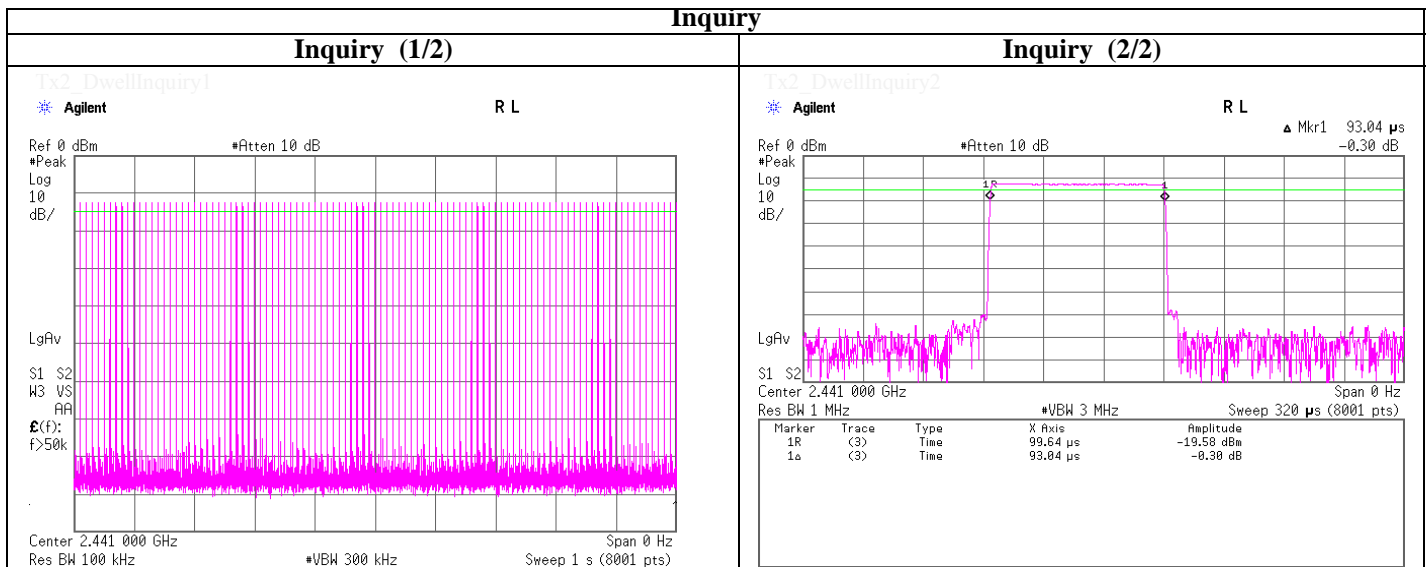
\*Average data of 5 tests.(except Inquiry)

| Mode    | Sampling [times] |    |    |    |    | Average<br>[times] |
|---------|------------------|----|----|----|----|--------------------|
|         | 1                | 2  | 3  | 4  | 5  |                    |
| DH1     | 49               | 49 | 50 | 51 | 50 | 49.8               |
| DH3     | 27               | 27 | 25 | 26 | 22 | 25.4               |
| DH5     | 18               | 15 | 18 | 21 | 23 | 19.0               |
| Inquiry | 100              | -  | -  | -  | -  | 100.0              |

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

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



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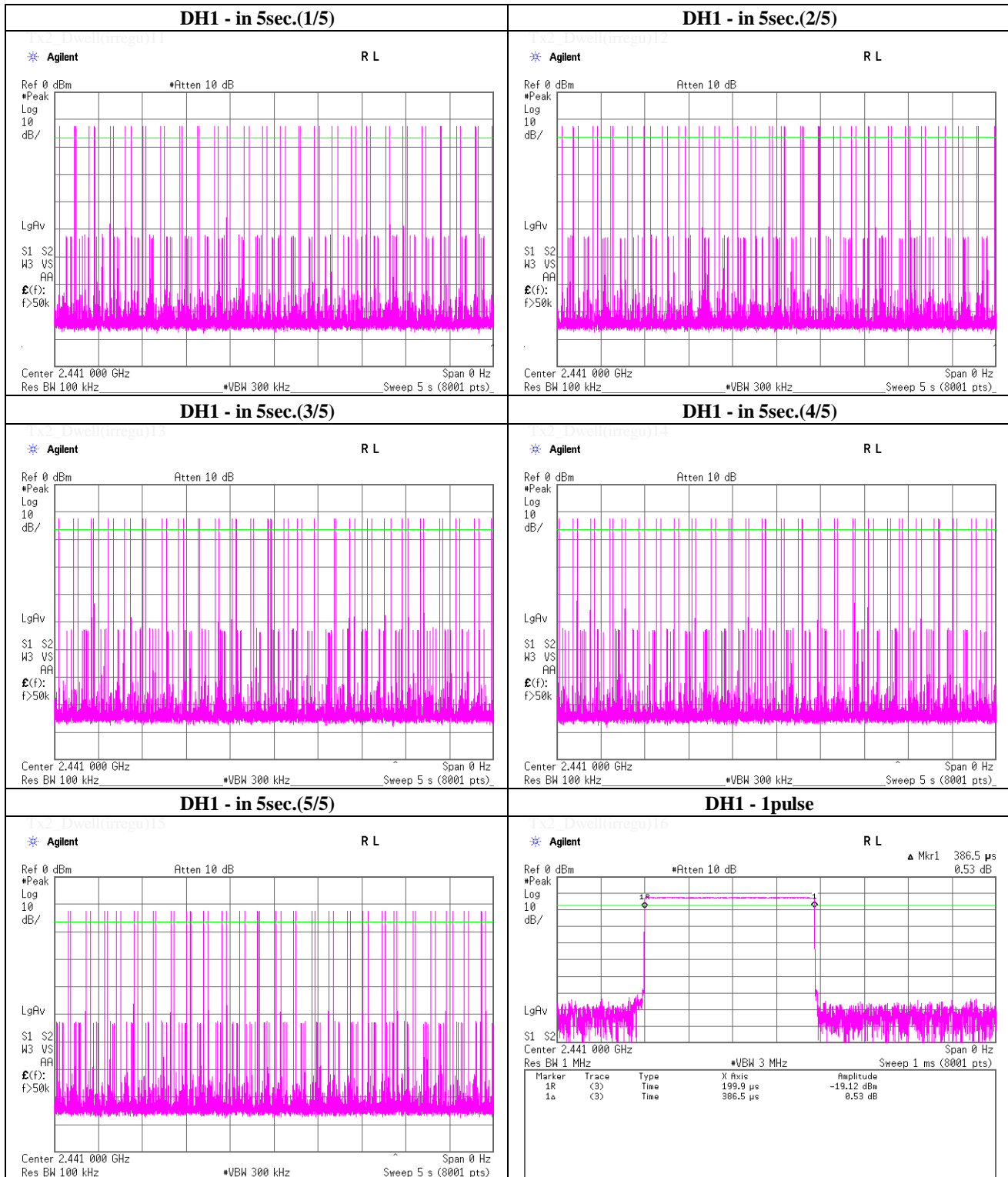
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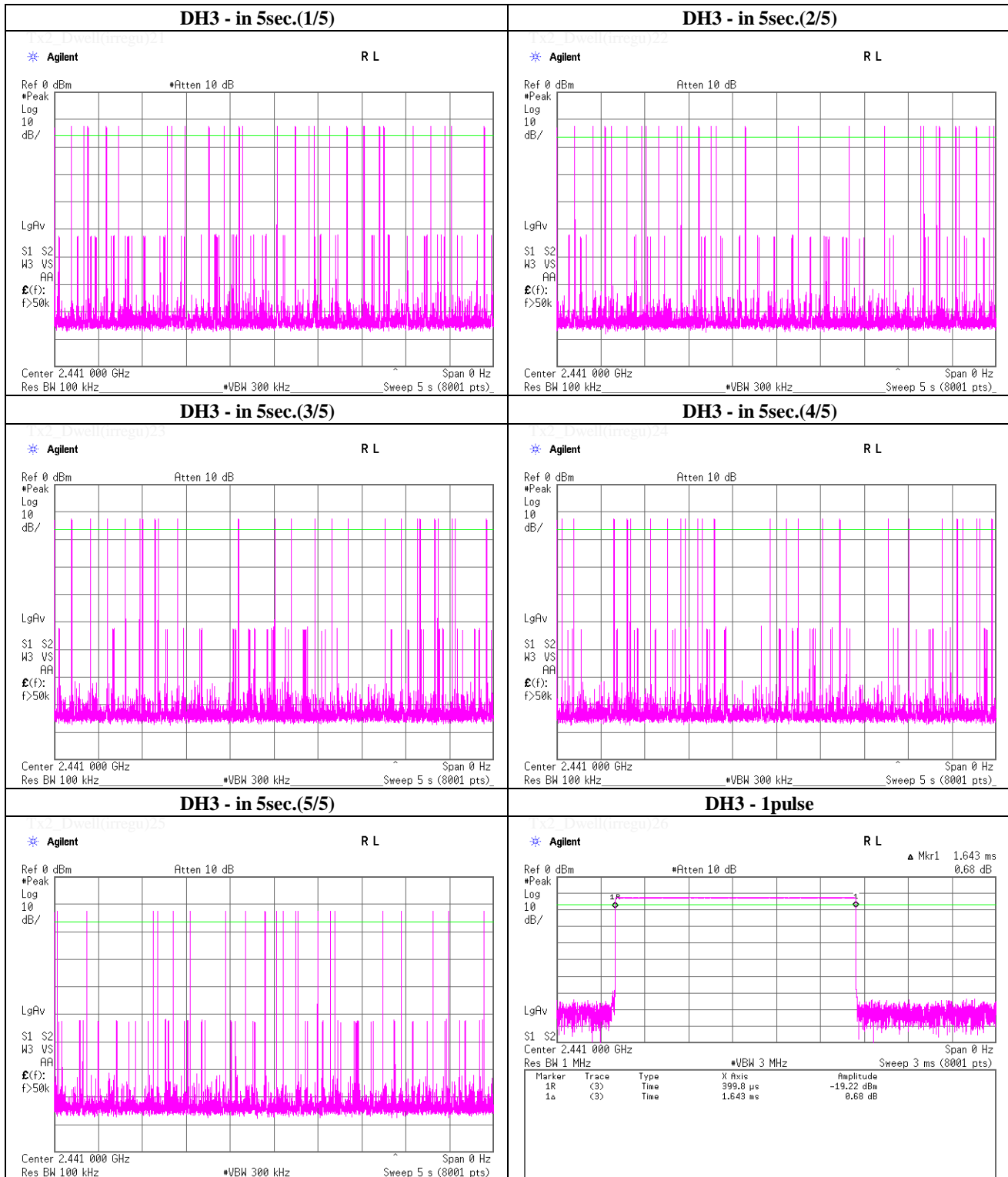
## Dwell time

### Tx, Bluetooth, BDR, PRBS9



## Dwell time

### Tx, Bluetooth, BDR, PRBS9



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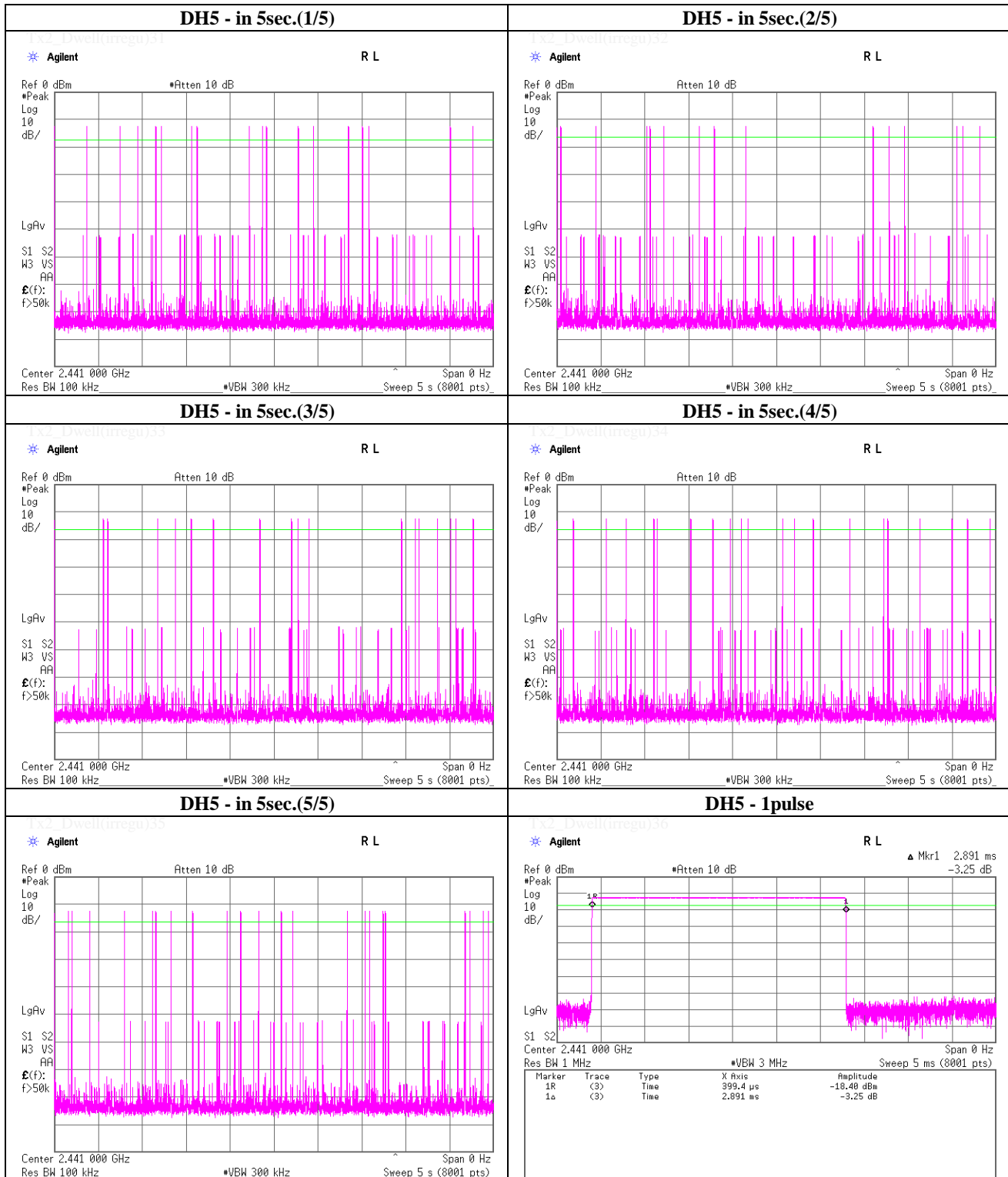
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## Dwell time

### Tx, Bluetooth, BDR, PRBS9



## Dwell Time

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.5 Shielded Room  
 Date                         March 1, 2013  
 Temperature / Humidity   22 deg.C     , 31 %RH  
 Engineer                    Tatsuya Arai  
 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 | 50.0 / 5.0 sec. x 31.6 sec. = 316 times                       | 0.388                                    | 122              | 400             |
| 3-DH3 | 25.2 / 5.0 sec. x 31.6 sec. = 160 times                       | 1.636                                    | 262              | 400             |
| 3-DH5 | 19.2 / 5.0 sec. x 31.6 sec. = 122 times                       | 2.884                                    | 352              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission time

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

| Mode  | Sampling [times] |    |    |    |    | Average<br>[times] |
|-------|------------------|----|----|----|----|--------------------|
|       | 1                | 2  | 3  | 4  | 5  |                    |
| 3-DH1 | 50               | 50 | 50 | 50 | 50 | 50.0               |
| 3-DH3 | 27               | 26 | 26 | 23 | 24 | 25.2               |
| 3-DH5 | 17               | 22 | 18 | 20 | 19 | 19.2               |

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

\* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in  $N \times 0.4s$ , where  $N$  is the number of channels being used in the hopping sequence ( $20 \leq N \leq 79$ ), is always less than 0.4s regardless of packet size (3-DH1, 3-DH3 or 3-DH5). This is confirmed in the test report for  $N=79$ .

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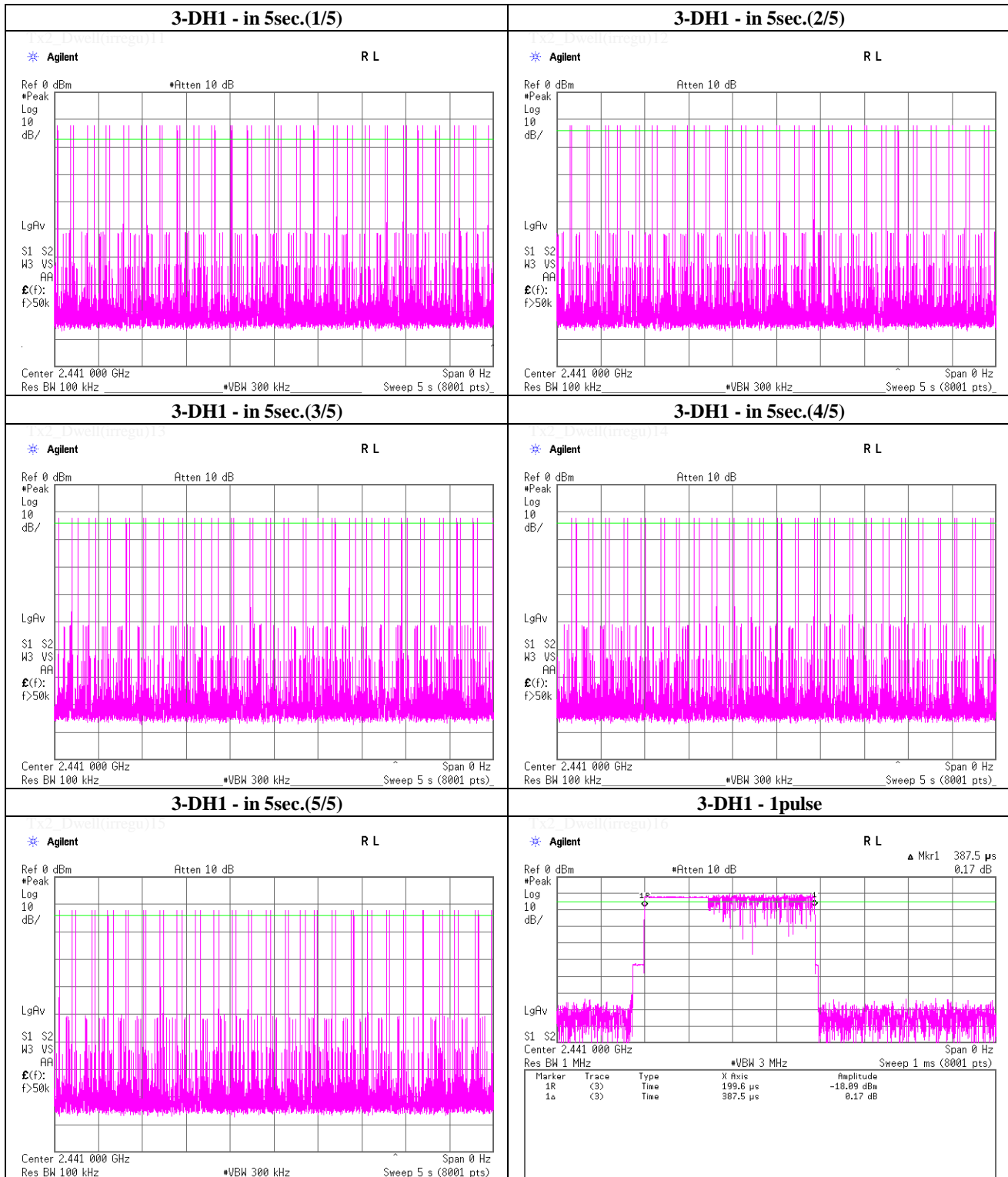
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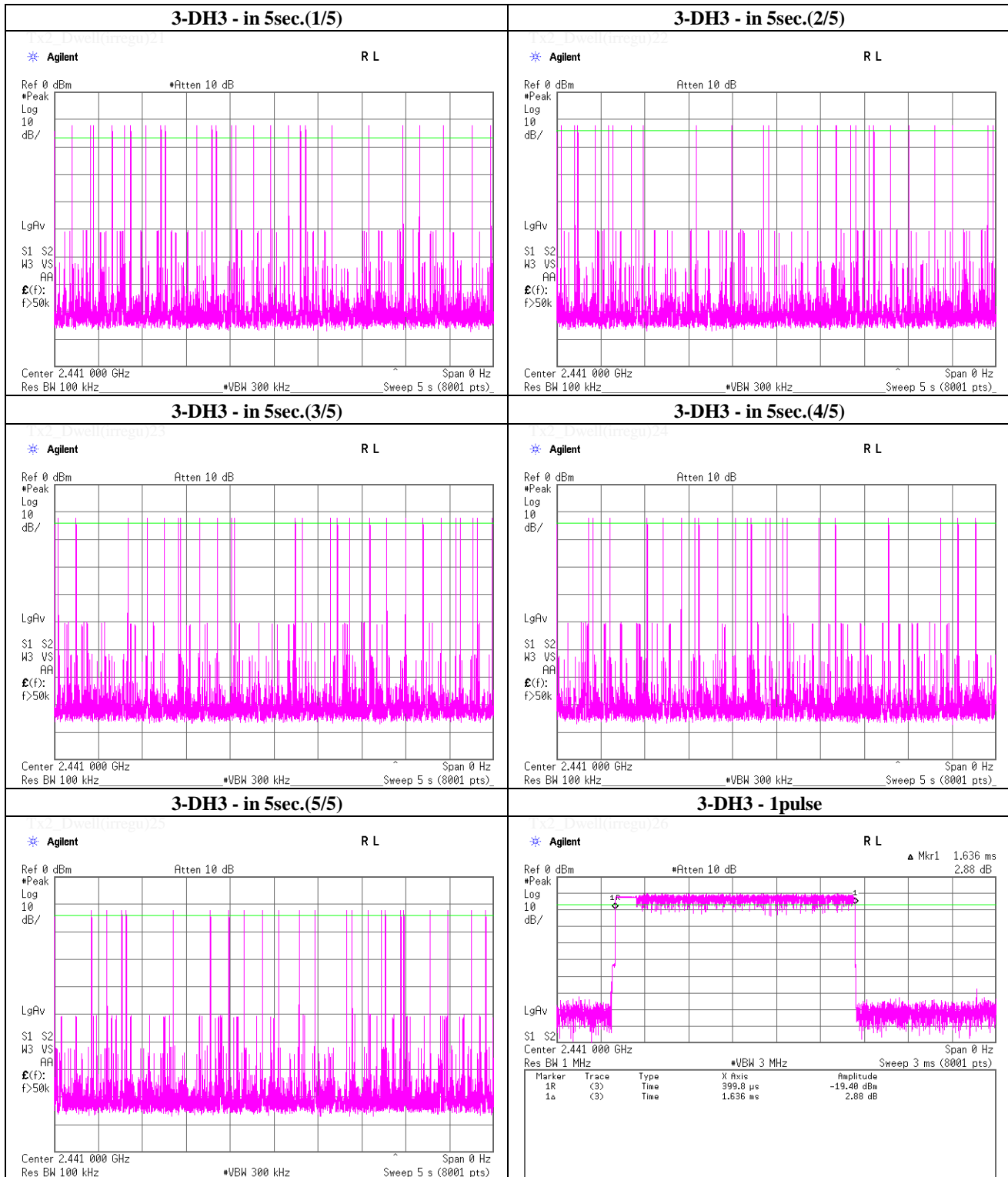
## Dwell time

### Tx, Bluetooth, EDR, PRBS9



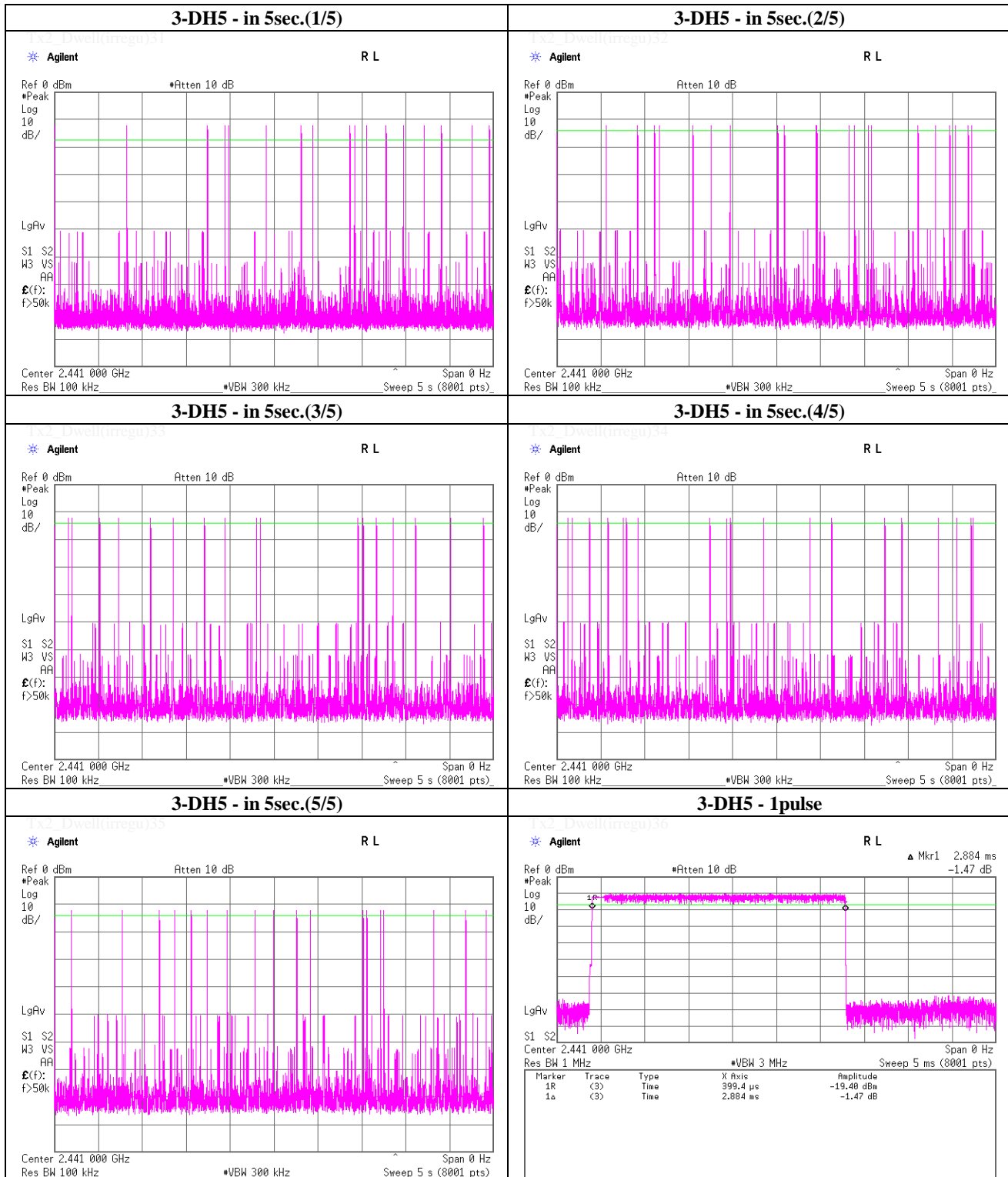
## Dwell time

### Tx, Bluetooth, EDR, PRBS9



## Dwell time

### Tx, Bluetooth, EDR, PRBS9



## Maximum Peak Conducted Output Power (Conducted)

Test place                   UL Japan, Inc. Shonan EMC Lab.      No.3 Shielded Room  
 Date                         March 1, 2013  
 Temperature / Humidity   22 deg.C   , 31 %RH  
 Engineer                  Tatsuya Arai  
 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         | -12.27                         | 1.48                  | 10.00                  | -0.79  | 0.83 | 20.97 | 125  | 21.76          |
| DH5   | 2441.0         | -12.05                         | 1.49                  | 10.00                  | -0.56  | 0.88 | 20.97 | 125  | 21.53          |
| DH5   | 2480.0         | -11.94                         | 1.50                  | 10.00                  | -0.44  | 0.90 | 20.97 | 125  | 21.41          |
| 2-DH5 | 2402.0         | -10.15                         | 1.48                  | 10.00                  | 1.33   | 1.36 | 20.97 | 125  | 19.64          |
| 2-DH5 | 2441.0         | -9.98                          | 1.49                  | 10.00                  | 1.51   | 1.42 | 20.97 | 125  | 19.46          |
| 2-DH5 | 2480.0         | -9.89                          | 1.50                  | 10.00                  | 1.61   | 1.45 | 20.97 | 125  | 19.36          |
| 3-DH5 | 2402.0         | -9.78                          | 1.48                  | 10.00                  | 1.70   | 1.48 | 20.97 | 125  | 19.27          |
| 3-DH5 | 2441.0         | -9.61                          | 1.49                  | 10.00                  | 1.88   | 1.54 | 20.97 | 125  | 19.09          |
| 3-DH5 | 2480.0         | -9.52                          | 1.50                  | 10.00                  | 1.98   | 1.58 | 20.97 | 125  | 18.99          |

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

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## Radiated Emission

|                        |   |                            |
|------------------------|---|----------------------------|
| Test place             | No.1 Semi Anechoic Chamber                | No.2 Semi Anechoic Chamber |
| Date                   | August 21, 2014                           | August 25, 2014            |
| Temperature / Humidity | 23 deg.C, 68 %RH                          | 24 deg.C, 55 %RH           |
| Engineer               | Shinichi Takano                           | Makoto Hosaka              |
| Mode                   | Tx, 2402 MHz<br>Tx, Bluetooth, BDR, PRBS9 |                            |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 182.005         | QP       | 32.7           | 16.1            | 8.6       | 31.8      | 25.6            | 43.5           | 17.9        | 181         | 227         |        |
| Hori.    | 442.007         | QP       | 25.5           | 16.7            | 7.4       | 31.7      | 17.9            | 46.0           | 28.1        | 169         | 172         |        |
| Hori.    | 2390.000        | PK       | 45.6           | 28.1            | 14.6      | 40.9      | 47.4            | 73.9           | 26.5        | 100         | 321         |        |
| Hori.    | 4804.000        | PK       | 46.0           | 32.2            | 7.0       | 41.7      | 43.5            | 73.9           | 30.4        | 100         | 240         |        |
| Hori.    | 7206.000        | PK       | 50.6           | 37.1            | 8.4       | 41.5      | 54.6            | 73.9           | 19.3        | 100         | 15          |        |
| Hori.    | 9608.000        | PK       | 46.4           | 39.1            | 9.3       | 40.4      | 54.4            | 73.9           | 19.5        | 100         | 15          |        |
| Hori.    | 12010.000       | PK       | 45.0           | 40.3            | 10.3      | 39.7      | 55.9            | 73.9           | 18.0        | 100         | 0           |        |
| Hori.    | 2390.000        | AV       | 34.4           | 28.1            | 14.6      | 40.9      | 36.2            | 53.9           | <b>17.7</b> | 100         | 321         |        |
| Vert.    | 78.008          | QP       | 39.1           | 6.4             | 7.9       | 31.9      | 21.5            | 40.0           | 18.5        | 100         | 145         |        |
| Vert.    | 130.001         | QP       | 28.8           | 13.7            | 8.1       | 31.8      | 18.8            | 43.5           | 24.7        | 100         | 110         |        |
| Vert.    | 2390.000        | PK       | 46.0           | 28.1            | 14.6      | 40.9      | 47.8            | 73.9           | 26.1        | 100         | 277         |        |
| Vert.    | 4804.000        | PK       | 47.0           | 32.2            | 7.0       | 41.7      | 44.5            | 73.9           | 29.4        | 100         | 154         |        |
| Vert.    | 7206.000        | PK       | 51.1           | 37.1            | 8.4       | 41.5      | 55.1            | 73.9           | 18.8        | 100         | 96          |        |
| Vert.    | 9608.000        | PK       | 46.4           | 39.1            | 9.3       | 40.4      | 54.4            | 73.9           | 19.5        | 119         | 95          |        |
| Vert.    | 12010.000       | PK       | 44.4           | 40.3            | 10.3      | 39.7      | 55.3            | 73.9           | 18.6        | 100         | 0           |        |
| Vert.    | 2390.000        | AV       | 33.7           | 28.1            | 14.6      | 40.9      | 35.5            | 53.9           | 18.4        | 100         | 277         |        |

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

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

**Dwell time factor relaxation**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4804.000        | AV       | 35.1           | 32.2            | 7.0       | 41.7      | -24.8             | 7.9             | 53.9           | 46.1        |        |
| Hori.    | 7206.000        | AV       | 40.7           | 37.1            | 8.4       | 41.5      | -24.8             | 20.0            | 53.9           | 33.9        |        |
| Hori.    | 9608.000        | AV       | 35.6           | 39.1            | 9.3       | 40.4      | -24.8             | 18.9            | 53.9           | 35.0        |        |
| Hori.    | 12010.000       | AV       | 33.3           | 40.3            | 10.3      | 39.7      | -24.8             | 19.5            | 53.9           | 34.4        |        |
| Vert.    | 4804.000        | AV       | 35.8           | 32.2            | 7.0       | 41.7      | -24.8             | 8.6             | 53.9           | 45.3        |        |
| Vert.    | 7206.000        | AV       | 42.8           | 37.1            | 8.4       | 41.5      | -24.8             | 22.1            | 53.9           | <b>31.9</b> |        |
| Vert.    | 9608.000        | AV       | 35.2           | 39.1            | 9.3       | 40.4      | -24.8             | 18.5            | 53.9           | 35.4        |        |
| Vert.    | 12010.000       | AV       | 33.4           | 40.3            | 10.3      | 39.7      | -24.8             | 19.6            | 53.9           | 34.4        |        |

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori.    | 2402.000        | PK       | 89.0           | 28.1            | 14.6      | 40.9      | 90.8            | -              | -           |        |
| Hori.    | 2400.000        | PK       | 37.7           | 28.1            | 14.6      | 40.9      | 39.5            | 70.8           | 31.3        |        |
| Vert.    | 2402.000        | PK       | 87.3           | 28.1            | 14.6      | 40.9      | 89.1            | -              | -           |        |
| Vert.    | 2400.000        | PK       | 37.8           | 28.1            | 14.6      | 40.9      | 39.6            | 69.1           | 29.5        |        |

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

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## Radiated Emission

|                        |   |                            |
|------------------------|---|----------------------------|
| Test place             | No.1 Semi Anechoic Chamber                | No.2 Semi Anechoic Chamber |
| Date                   | August 21, 2014                           | August 25, 2014            |
| Temperature / Humidity | 23 deg.C, 68 %RH                          | 24 deg.C, 55 %RH           |
| Engineer               | Shinichi Takano                           | Makoto Hosaka              |
| Mode                   | Tx, 2441 MHz<br>Tx, Bluetooth, BDR, PRBS9 |                            |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 181.997         | QP       | 32.8           | 16.1            | 8.6       | 31.8      | 25.7            | 43.5           | 17.8        | 183         | 229         |        |
| Hori.    | 441.957         | QP       | 25.2           | 16.7            | 7.4       | 31.7      | 17.6            | 46.0           | 28.4        | 166         | 173         |        |
| Hori.    | 4882.000        | PK       | 46.7           | 32.6            | 7.0       | 41.6      | 44.7            | 73.9           | 29.2        | 100         | 246         |        |
| Hori.    | 7323.000        | PK       | 49.9           | 37.3            | 8.3       | 41.5      | 54.0            | 73.9           | 19.9        | 104         | 15          |        |
| Hori.    | 9764.000        | PK       | 45.2           | 39.0            | 9.5       | 40.4      | 53.3            | 73.9           | 20.6        | 100         | 104         |        |
| Hori.    | 12205.000       | PK       | 45.4           | 40.4            | 10.4      | 39.7      | 56.5            | 73.9           | <b>17.4</b> | 100         | 0           |        |
| Vert.    | 77.816          | QP       | 39.1           | 6.4             | 7.9       | 31.9      | 21.5            | 40.0           | 18.5        | 100         | 153         |        |
| Vert.    | 129.908         | QP       | 29.0           | 13.7            | 8.1       | 31.8      | 19.0            | 43.5           | 24.5        | 100         | 112         |        |
| Vert.    | 4882.000        | PK       | 47.3           | 32.6            | 7.0       | 41.6      | 45.3            | 73.9           | 28.6        | 115         | 165         |        |
| Vert.    | 7323.000        | PK       | 52.0           | 37.3            | 8.3       | 41.5      | 56.1            | 73.9           | 17.8        | 100         | 165         |        |
| Vert.    | 9764.000        | PK       | 46.4           | 39.0            | 9.5       | 40.4      | 54.5            | 73.9           | 19.4        | 125         | 96          |        |
| Vert.    | 12205.000       | PK       | 44.4           | 40.4            | 10.4      | 39.7      | 55.5            | 73.9           | 18.4        | 100         | 0           |        |

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

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

**Dwell time factor relaxation**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4882.000        | AV       | 36.7           | 32.6            | 7.0       | 41.6      | -24.8             | 10.0            | 53.9           | 44.0        |        |
| Hori.    | 7323.000        | AV       | 40.3           | 37.3            | 8.3       | 41.5      | -24.8             | 19.7            | 53.9           | 34.3        |        |
| Hori.    | 9764.000        | AV       | 34.2           | 39.0            | 9.5       | 40.4      | -24.8             | 17.6            | 53.9           | 36.4        |        |
| Hori.    | 12205.000       | AV       | 32.6           | 40.4            | 10.4      | 39.7      | -24.8             | 19.0            | 53.9           | 34.9        |        |
| Vert.    | 4882.000        | AV       | 37.5           | 32.6            | 7.0       | 41.6      | -24.8             | 10.8            | 53.9           | 43.2        |        |
| Vert.    | 7323.000        | AV       | 43.7           | 37.3            | 8.3       | 41.5      | -24.8             | 23.1            | 53.9           | <b>30.9</b> |        |
| Vert.    | 9764.000        | AV       | 35.0           | 39.0            | 9.5       | 40.4      | -24.8             | 18.4            | 53.9           | 35.5        |        |
| Vert.    | 12205.000       | AV       | 32.6           | 40.4            | 10.4      | 39.7      | -24.8             | 19.0            | 53.9           | 34.9        |        |

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

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

## Radiated Emission

|                        |   |                            |
|------------------------|---|----------------------------|
| Test place             | No.1 Semi Anechoic Chamber                | No.2 Semi Anechoic Chamber |
| Date                   | August 21, 2014                           | August 25, 2014            |
| Temperature / Humidity | 23 deg.C, 68 %RH                          | 24 deg.C, 55 %RH           |
| Engineer               | Shinichi Takano                           | Makoto Hosaka              |
| Mode                   | Tx, 2480 MHz<br>Tx, Bluetooth, BDR, PRBS9 |                            |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 182.011         | QP       | 32.5           | 16.1            | 8.6       | 31.8      | 25.4            | 43.5           | 18.1        | 188         | 233         |        |
| Hori.    | 441.985         | QP       | 25.3           | 16.7            | 7.4       | 31.7      | 17.7            | 46.0           | 28.3        | 166         | 177         |        |
| Hori.    | 2483.500        | PK       | 44.9           | 28.4            | 14.7      | 40.9      | 47.1            | 73.9           | 26.8        | 100         | 32          |        |
| Hori.    | 4960.000        | PK       | 49.9           | 33.0            | 7.1       | 41.5      | 48.5            | 73.9           | 25.4        | 100         | 252         |        |
| Hori.    | 7440.000        | PK       | 50.2           | 37.4            | 8.4       | 41.4      | 54.6            | 73.9           | 19.3        | 100         | 358         |        |
| Hori.    | 9920.000        | PK       | 46.2           | 38.9            | 9.6       | 40.4      | 54.3            | 73.9           | 19.6        | 100         | 246         |        |
| Hori.    | 12400.000       | PK       | 45.6           | 40.4            | 10.5      | 39.7      | 56.8            | 73.9           | 17.1        | 100         | 0           |        |
| Hori.    | 2483.500        | AV       | 34.0           | 28.4            | 14.7      | 40.9      | 36.2            | 53.9           | 17.7        | 100         | 32          |        |
| Vert.    | 77.760          | QP       | 39.0           | 6.4             | 7.9       | 31.9      | 21.4            | 40.0           | 18.6        | 100         | 140         |        |
| Vert.    | 129.900         | QP       | 29.0           | 13.7            | 8.1       | 31.8      | 19.0            | 43.5           | 24.5        | 100         | 109         |        |
| Vert.    | 2483.500        | PK       | 45.7           | 28.4            | 14.7      | 40.9      | 47.9            | 73.9           | 26.0        | 240         | 288         |        |
| Vert.    | 4960.000        | PK       | 50.2           | 33.0            | 7.1       | 41.5      | 48.8            | 73.9           | 25.1        | 131         | 162         |        |
| Vert.    | 7440.000        | PK       | 54.7           | 37.4            | 8.4       | 41.4      | 59.1            | 73.9           | <b>14.8</b> | 100         | 0           |        |
| Vert.    | 9920.000        | PK       | 46.9           | 38.9            | 9.6       | 40.4      | 55.0            | 73.9           | 18.9        | 112         | 275         |        |
| Vert.    | 12400.000       | PK       | 45.5           | 40.4            | 10.5      | 39.7      | 56.7            | 73.9           | 17.2        | 100         | 0           |        |
| Vert.    | 2483.500        | AV       | 33.9           | 28.4            | 14.7      | 40.9      | 36.1            | 53.9           | 17.8        | 240         | 288         |        |

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

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

**Dwell time factor relaxation**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4960.000        | AV       | 40.2           | 33.0            | 7.1       | 41.5      | -24.8             | 14.1            | 53.9           | 39.8        |        |
| Hori.    | 7440.000        | AV       | 40.3           | 37.4            | 8.4       | 41.4      | -24.8             | 20.0            | 53.9           | 33.9        |        |
| Hori.    | 9920.000        | AV       | 34.5           | 38.9            | 9.6       | 40.4      | -24.8             | 17.9            | 53.9           | 36.0        |        |
| Hori.    | 12400.000       | AV       | 33.1           | 40.4            | 10.5      | 39.7      | -24.8             | 19.6            | 53.9           | 34.4        |        |
| Vert.    | 4960.000        | AV       | 42.1           | 33.0            | 7.1       | 41.5      | -24.8             | 16.0            | 53.9           | 38.0        |        |
| Vert.    | 7440.000        | AV       | 47.1           | 37.4            | 8.4       | 41.4      | -24.8             | 26.8            | 53.9           | <b>27.2</b> |        |
| Vert.    | 9920.000        | AV       | 35.7           | 38.9            | 9.6       | 40.4      | -24.8             | 19.1            | 53.9           | 34.9        |        |
| Vert.    | 12400.000       | AV       | 33.2           | 40.4            | 10.5      | 39.7      | -24.8             | 19.7            | 53.9           | 34.3        |        |

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

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

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## Radiated Emission

|                        |   |                            |
|------------------------|---|----------------------------|
| Test place             | No.1 Semi Anechoic Chamber                | No.2 Semi Anechoic Chamber |
| Date                   | August 21, 2014                           | August 25, 2014            |
| Temperature / Humidity | 23 deg.C, 68 %RH                          | 24 deg.C, 55 %RH           |
| Engineer               | Shinichi Takano                           | Makoto Hosaka              |
| Mode                   | Tx, 2402 MHz<br>Tx, Bluetooth, EDR, PRBS9 |                            |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 182.011         | QP       | 32.8           | 16.1            | 8.6       | 31.8      | 25.7            | 43.5           | 17.8        | 180         | 220         |        |
| Hori.    | 442.062         | QP       | 25.3           | 16.7            | 7.4       | 31.7      | 17.7            | 46.0           | 28.3        | 165         | 162         |        |
| Hori.    | 2362.214        | PK       | 48.1           | 28.0            | 14.5      | 40.9      | 49.7            | 73.9           | 24.2        | 100         | 0           |        |
| Hori.    | 2385.287        | PK       | 48.3           | 28.1            | 14.6      | 40.9      | 50.1            | 73.9           | 23.8        | 100         | 0           |        |
| Hori.    | 2390.000        | PK       | 45.6           | 28.1            | 14.6      | 40.9      | 47.4            | 73.9           | 26.5        | 100         | 323         |        |
| Hori.    | 4804.000        | PK       | 47.3           | 32.2            | 7.0       | 41.7      | 44.8            | 73.9           | 29.1        | 100         | 111         |        |
| Hori.    | 7206.000        | PK       | 48.8           | 37.1            | 8.4       | 41.5      | 52.8            | 73.9           | 21.1        | 100         | 16          |        |
| Hori.    | 9608.000        | PK       | 49.5           | 39.1            | 9.3       | 40.4      | 57.5            | 73.9           | <b>16.4</b> | 104         | 14          |        |
| Hori.    | 12010.000       | PK       | 45.7           | 40.3            | 10.3      | 39.7      | 56.6            | 73.9           | 17.3        | 100         | 0           |        |
| Hori.    | 2362.214        | AV       | 35.2           | 28.0            | 14.5      | 40.9      | 36.8            | 53.9           | 17.1        | 100         | 0           |        |
| Hori.    | 2385.287        | AV       | 35.5           | 28.1            | 14.6      | 40.9      | 37.3            | 53.9           | 16.6        | 100         | 0           |        |
| Hori.    | 2390.000        | AV       | 34.1           | 28.1            | 14.6      | 40.9      | 35.9            | 53.9           | 18.0        | 100         | 323         |        |
| Vert.    | 77.650          | QP       | 39.0           | 6.4             | 7.9       | 31.9      | 21.4            | 40.0           | 18.6        | 100         | 144         |        |
| Vert.    | 129.910         | QP       | 28.9           | 13.7            | 8.1       | 31.8      | 18.9            | 43.5           | 24.6        | 100         | 121         |        |
| Vert.    | 2362.235        | PK       | 47.6           | 28.0            | 14.5      | 40.9      | 49.2            | 73.9           | 24.7        | 100         | 0           |        |
| Vert.    | 2385.268        | PK       | 48.3           | 28.1            | 14.6      | 40.9      | 50.1            | 73.9           | 23.8        | 100         | 0           |        |
| Vert.    | 2390.000        | PK       | 45.7           | 28.1            | 14.6      | 40.9      | 47.5            | 73.9           | 26.4        | 100         | 284         |        |
| Vert.    | 4804.000        | PK       | 47.6           | 32.2            | 7.0       | 41.7      | 45.1            | 73.9           | 28.8        | 100         | 150         |        |
| Vert.    | 7206.000        | PK       | 50.3           | 37.1            | 8.4       | 41.5      | 54.3            | 73.9           | 19.6        | 100         | 97          |        |
| Vert.    | 9608.000        | PK       | 49.3           | 39.1            | 9.3       | 40.4      | 57.3            | 73.9           | 16.6        | 173         | 275         |        |
| Vert.    | 12010.000       | PK       | 45.0           | 40.3            | 10.3      | 39.7      | 55.9            | 73.9           | 18.0        | 100         | 0           |        |
| Vert.    | 2362.235        | AV       | 35.0           | 28.0            | 14.5      | 40.9      | 36.6            | 53.9           | 17.3        | 100         | 0           |        |
| Vert.    | 2385.268        | AV       | 35.3           | 28.1            | 14.6      | 40.9      | 37.1            | 53.9           | 16.8        | 100         | 0           |        |
| Vert.    | 2390.000        | AV       | 34.0           | 28.1            | 14.6      | 40.9      | 35.8            | 53.9           | 18.1        | 100         | 284         |        |

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

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

**Dwell time factor relaxation**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4804.000        | AV       | 36.9           | 32.2            | 7.0       | 41.7      | -24.8             | 9.6             | 53.9           | 44.3        |        |
| Hori.    | 7206.000        | AV       | 38.8           | 37.1            | 8.4       | 41.5      | -24.8             | 18.0            | 53.9           | 35.9        |        |
| Hori.    | 9608.000        | AV       | 38.2           | 39.1            | 9.3       | 40.4      | -24.8             | 21.4            | 53.9           | <b>32.5</b> |        |
| Hori.    | 12010.000       | AV       | 33.3           | 40.3            | 10.3      | 39.7      | -24.8             | 19.4            | 53.9           | 34.5        |        |
| Vert.    | 4804.000        | AV       | 36.8           | 32.2            | 7.0       | 41.7      | -24.8             | 9.5             | 53.9           | 44.4        |        |
| Vert.    | 7206.000        | AV       | 40.0           | 37.1            | 8.4       | 41.5      | -24.8             | 19.2            | 53.9           | 34.7        |        |
| Vert.    | 9608.000        | AV       | 37.2           | 39.1            | 9.3       | 40.4      | -24.8             | 20.4            | 53.9           | 33.5        |        |
| Vert.    | 12010.000       | AV       | 33.2           | 40.3            | 10.3      | 39.7      | -24.8             | 19.3            | 53.9           | 34.6        |        |

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori.    | 2402.000        | PK       | 87.2           | 28.1            | 14.6      | 40.9      | 89.0            | -              | -           |        |
| Hori.    | 2400.000        | PK       | 38.4           | 28.1            | 14.6      | 40.9      | 40.2            | 69.0           | 28.8        |        |
| Vert.    | 2402.000        | PK       | 85.1           | 28.1            | 14.6      | 40.9      | 86.9            | -              | -           |        |
| Vert.    | 2400.000        | PK       | 37.6           | 28.1            | 14.6      | 40.9      | 39.4            | 66.9           | 27.5        |        |

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

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

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## Radiated Emission

|                        |   |                            |
|------------------------|---|----------------------------|
| Test place             | No.1 Semi Anechoic Chamber                | No.2 Semi Anechoic Chamber |
| Date                   | August 21, 2014                           | August 25, 2014            |
| Temperature / Humidity | 23 deg.C, 68 %RH                          | 24 deg.C, 55 %RH           |
| Engineer               | Shinichi Takano                           | Makoto Hosaka              |
| Mode                   | Tx, 2441 MHz<br>Tx, Bluetooth, EDR, PRBS9 |                            |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 182.015         | QP       | 33.0           | 16.1            | 8.6       | 31.8      | 25.9            | 43.5           | <b>17.6</b> | 183         | 229         |        |
| Hori.    | 441.946         | QP       | 25.6           | 16.7            | 7.4       | 31.7      | 18.0            | 46.0           | 28.0        | 166         | 173         |        |
| Hori.    | 4882.000        | PK       | 50.1           | 32.6            | 7.0       | 41.6      | 48.1            | 73.9           | 25.8        | 100         | 245         |        |
| Hori.    | 7323.000        | PK       | 49.6           | 37.3            | 8.3       | 41.5      | 53.7            | 73.9           | 20.2        | 105         | 15          |        |
| Hori.    | 9764.000        | PK       | 48.0           | 39.0            | 9.5       | 40.4      | 56.1            | 73.9           | 17.8        | 100         | 317         |        |
| Hori.    | 12205.000       | PK       | 45.1           | 40.4            | 10.4      | 39.7      | 56.2            | 73.9           | 17.7        | 100         | 0           |        |
| Vert.    | 78.058          | QP       | 39.0           | 6.4             | 7.9       | 31.9      | 21.4            | 40.0           | 18.6        | 100         | 147         |        |
| Vert.    | 129.889         | QP       | 28.9           | 13.7            | 8.1       | 31.8      | 18.9            | 43.5           | 24.6        | 100         | 112         |        |
| Vert.    | 4882.000        | PK       | 50.1           | 32.6            | 7.0       | 41.6      | 48.1            | 73.9           | 25.8        | 100         | 171         |        |
| Vert.    | 7323.000        | PK       | 51.5           | 37.3            | 8.3       | 41.5      | 55.6            | 73.9           | 18.3        | 100         | 165         |        |
| Vert.    | 9764.000        | PK       | 48.1           | 39.0            | 9.5       | 40.4      | 56.2            | 73.9           | 17.7        | 100         | 100         |        |
| Vert.    | 12205.000       | PK       | 44.1           | 40.4            | 10.4      | 39.7      | 55.2            | 73.9           | 18.7        | 100         | 0           |        |

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

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

**Dwell time factor relaxation**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4882.000        | AV       | 39.7           | 32.6            | 7.0       | 41.6      | -24.8             | 12.9            | 53.9           | 41.0        |        |
| Hori.    | 7323.000        | AV       | 38.8           | 37.3            | 8.3       | 41.5      | -24.8             | 18.1            | 53.9           | 35.8        |        |
| Hori.    | 9764.000        | AV       | 36.1           | 39.0            | 9.5       | 40.4      | -24.8             | 19.4            | 53.9           | 34.5        |        |
| Hori.    | 12205.000       | AV       | 32.7           | 40.4            | 10.4      | 39.7      | -24.8             | 19.0            | 53.9           | 34.9        |        |
| Vert.    | 4882.000        | AV       | 40.8           | 32.6            | 7.0       | 41.6      | -24.8             | 14.0            | 53.9           | 39.9        |        |
| Vert.    | 7323.000        | AV       | 41.8           | 37.3            | 8.3       | 41.5      | -24.8             | 21.1            | 53.9           | <b>32.8</b> |        |
| Vert.    | 9764.000        | AV       | 36.3           | 39.0            | 9.5       | 40.4      | -24.8             | 19.6            | 53.9           | 34.3        |        |
| Vert.    | 12205.000       | AV       | 32.7           | 40.4            | 10.4      | 39.7      | -24.8             | 19.0            | 53.9           | 34.9        |        |

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

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

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## Radiated Emission

|                        |   |                            |
|------------------------|---|----------------------------|
| Test place             | No.1 Semi Anechoic Chamber                | No.2 Semi Anechoic Chamber |
| Date                   | August 21, 2014                           | August 25, 2014            |
| Temperature / Humidity | 23 deg.C, 68 %RH                          | 24 deg.C, 55 %RH           |
| Engineer               | Shinichi Takano                           | Makoto Hosaka              |
| Mode                   | Tx, 2480 MHz<br>Tx, Bluetooth, EDR, PRBS9 |                            |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 182.023         | QP       | 32.8           | 16.1            | 8.6       | 31.8      | 25.7            | 43.5           | 17.8        | 187         | 230         |        |
| Hori.    | 441.640         | QP       | 25.4           | 16.7            | 7.3       | 31.7      | 17.7            | 46.0           | 28.3        | 169         | 169         |        |
| Hori.    | 2483.500        | PK       | 46.9           | 28.4            | 14.7      | 40.9      | 49.1            | 73.9           | 24.8        | 100         | 278         |        |
| Hori.    | 2493.367        | PK       | 47.8           | 28.5            | 14.7      | 40.9      | 50.1            | 73.9           | 23.8        | 100         | 0           |        |
| Hori.    | 2520.010        | PK       | 47.1           | 28.5            | 14.7      | 40.9      | 49.4            | 73.9           | 24.5        | 100         | 339         |        |
| Hori.    | 4960.000        | PK       | 52.7           | 33.0            | 7.1       | 41.5      | 51.3            | 73.9           | 22.6        | 100         | 251         |        |
| Hori.    | 7440.000        | PK       | 49.1           | 37.4            | 8.4       | 41.4      | 53.5            | 73.9           | 20.4        | 100         | 15          |        |
| Hori.    | 9920.000        | PK       | 47.6           | 38.9            | 9.6       | 40.4      | 55.7            | 73.9           | 18.2        | 100         | 15          |        |
| Hori.    | 12400.000       | PK       | 45.3           | 40.4            | 10.5      | 39.7      | 56.5            | 73.9           | 17.4        | 100         | 0           |        |
| Hori.    | 2483.500        | AV       | 33.8           | 28.4            | 14.7      | 40.9      | 36.0            | 53.9           | 17.9        | 100         | 278         |        |
| Hori.    | 2493.367        | AV       | 34.1           | 28.5            | 14.7      | 40.9      | 36.4            | 53.9           | 17.5        | 100         | 0           |        |
| Hori.    | 2520.010        | AV       | 35.4           | 28.5            | 14.7      | 40.9      | 37.7            | 53.9           | 16.2        | 100         | 339         |        |
| Vert.    | 77.515          | QP       | 39.0           | 6.4             | 7.9       | 31.9      | 21.4            | 40.0           | 18.6        | 100         | 148         |        |
| Vert.    | 129.936         | QP       | 29.0           | 13.7            | 8.1       | 31.8      | 19.0            | 43.5           | 24.5        | 100         | 111         |        |
| Vert.    | 2483.500        | PK       | 46.7           | 28.4            | 14.7      | 40.9      | 48.9            | 73.9           | 25.0        | 243         | 288         |        |
| Vert.    | 2493.367        | PK       | 48.3           | 28.5            | 14.7      | 40.9      | 50.6            | 73.9           | 23.3        | 100         | 0           |        |
| Vert.    | 2519.978        | PK       | 46.6           | 28.5            | 14.7      | 40.9      | 48.9            | 73.9           | 25.0        | 195         | 281         |        |
| Vert.    | 4960.000        | PK       | 52.7           | 33.0            | 7.1       | 41.5      | 51.3            | 73.9           | 22.6        | 100         | 167         |        |
| Vert.    | 7440.000        | PK       | 54.2           | 37.4            | 8.4       | 41.4      | 58.6            | 73.9           | <b>15.3</b> | 100         | 99          |        |
| Vert.    | 9920.000        | PK       | 48.7           | 38.9            | 9.6       | 40.4      | 56.8            | 73.9           | 17.1        | 100         | 275         |        |
| Vert.    | 12400.000       | PK       | 45.5           | 40.4            | 10.5      | 39.7      | 56.7            | 73.9           | 17.2        | 100         | 0           |        |
| Vert.    | 2483.500        | AV       | 33.8           | 28.4            | 14.7      | 40.9      | 36.0            | 53.9           | 17.9        | 243         | 288         |        |
| Vert.    | 2493.367        | AV       | 34.4           | 28.5            | 14.7      | 40.9      | 36.7            | 53.9           | 17.2        | 100         | 0           |        |
| Vert.    | 2519.978        | AV       | 35.0           | 28.5            | 14.7      | 40.9      | 37.3            | 53.9           | 16.6        | 195         | 281         |        |

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

**Dwell time factor relaxation**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4960.000        | AV       | 43.9           | 33.0            | 7.1       | 41.5      | -24.8             | 17.7            | 53.9           | 36.2        |        |
| Hori.    | 7440.000        | AV       | 39.6           | 37.4            | 8.4       | 41.4      | -24.8             | 19.2            | 53.9           | 34.7        |        |
| Hori.    | 9920.000        | AV       | 36.1           | 38.9            | 9.6       | 40.4      | -24.8             | 19.4            | 53.9           | 34.5        |        |
| Hori.    | 12400.000       | AV       | 33.2           | 40.4            | 10.5      | 39.7      | -24.8             | 19.6            | 53.9           | 34.3        |        |
| Vert.    | 4960.000        | AV       | 44.2           | 33.0            | 7.1       | 41.5      | -24.8             | 18.0            | 53.9           | 35.9        |        |
| Vert.    | 7440.000        | AV       | 44.7           | 37.4            | 8.4       | 41.4      | -24.8             | 24.3            | 53.9           | <b>29.6</b> |        |
| Vert.    | 9920.000        | AV       | 37.7           | 38.9            | 9.6       | 40.4      | -24.8             | 21.0            | 53.9           | 32.9        |        |
| Vert.    | 12400.000       | AV       | 33.2           | 40.4            | 10.5      | 39.7      | -24.8             | 19.6            | 53.9           | 34.3        |        |

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

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

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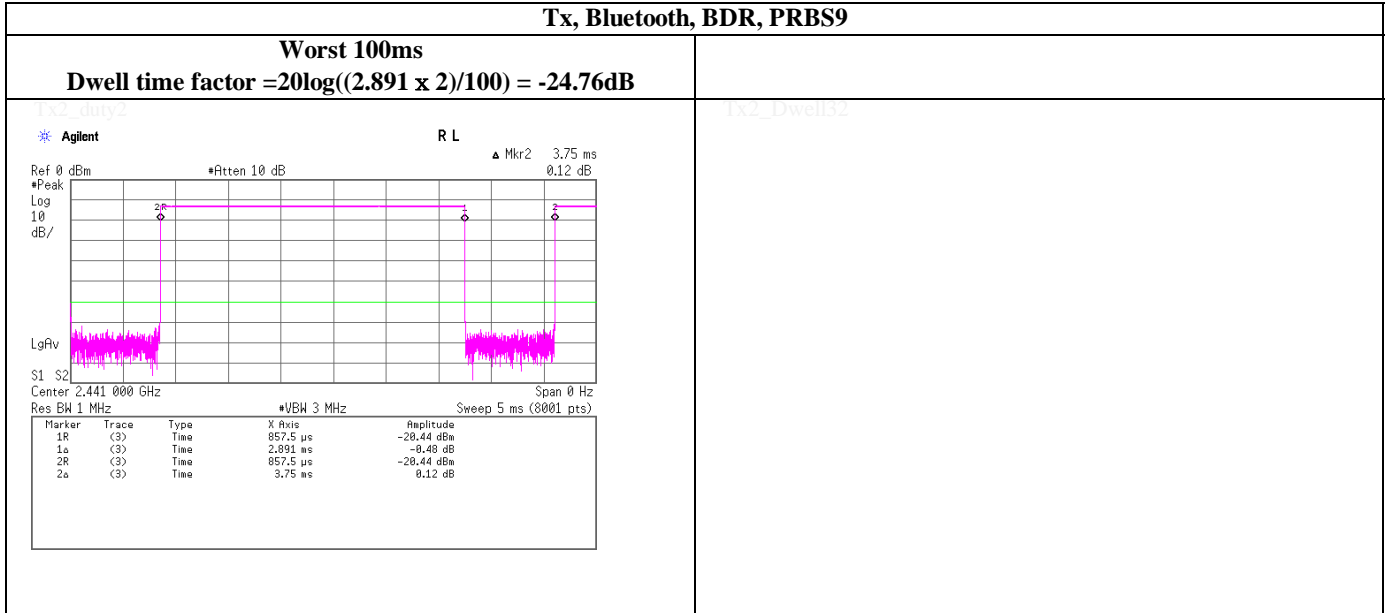
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## Dwell time factor Calculation chart

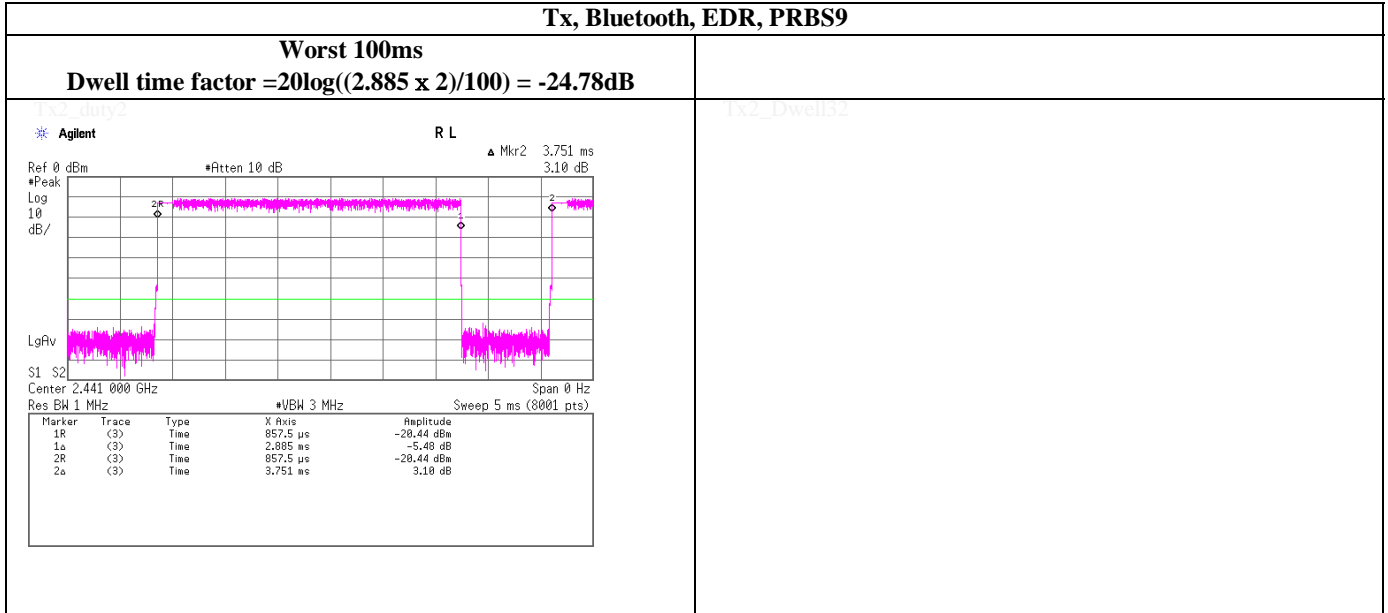
### Dwell time factor Calculation Tx, Bluetooth, BDR, PRBS9



ON time of some channel during 100ms: Twice  
 This is the worst case in hopping sequence of Bluetooth.

## Dwell time factor Calculation chart

### Dwell time factor Calculation Tx, Bluetooth, EDR, PRBS9

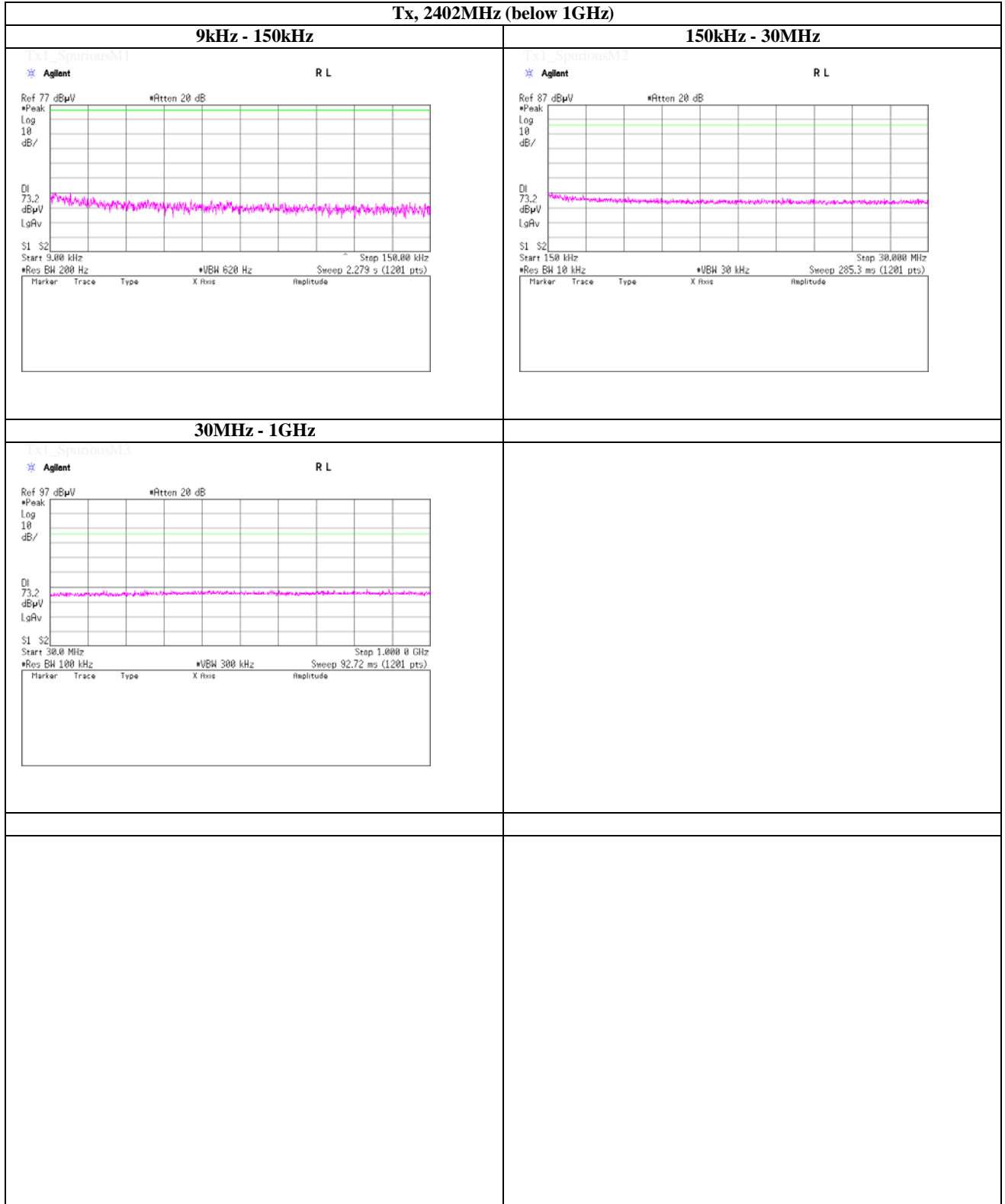


ON time of some channel during 100ms: Twice  
 This is the worst case in hopping sequence of Bluetooth.

### Spurious emission (Conducted)

**Tx, Bluetooth, BDR, PRBS9**

**Tx, 2402MHz (below 1GHz)**



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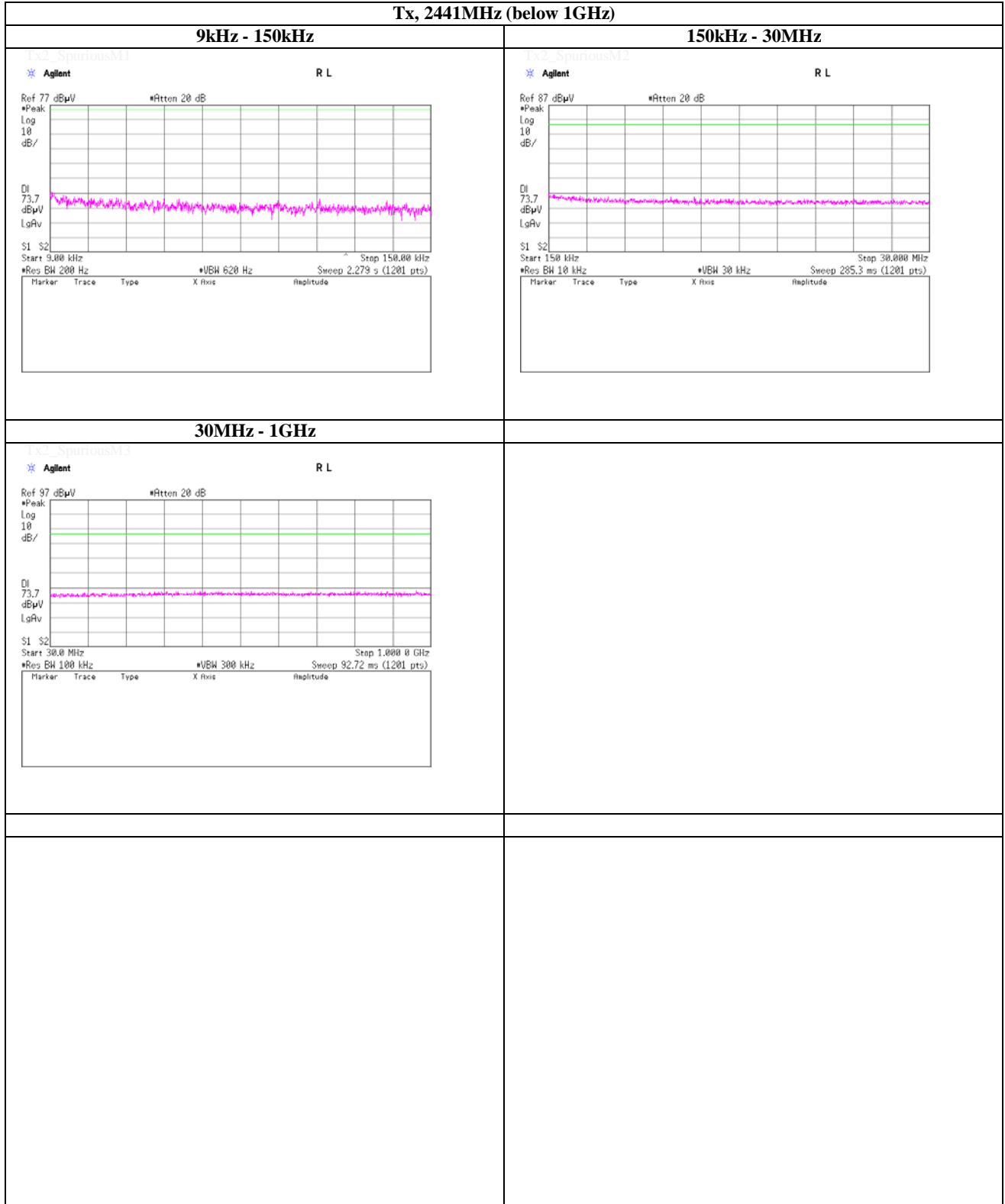
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**Spurious emission (Conducted)**

**Tx, Bluetooth, BDR, PRBS9**

**Tx, 2441MHz (below 1GHz)**

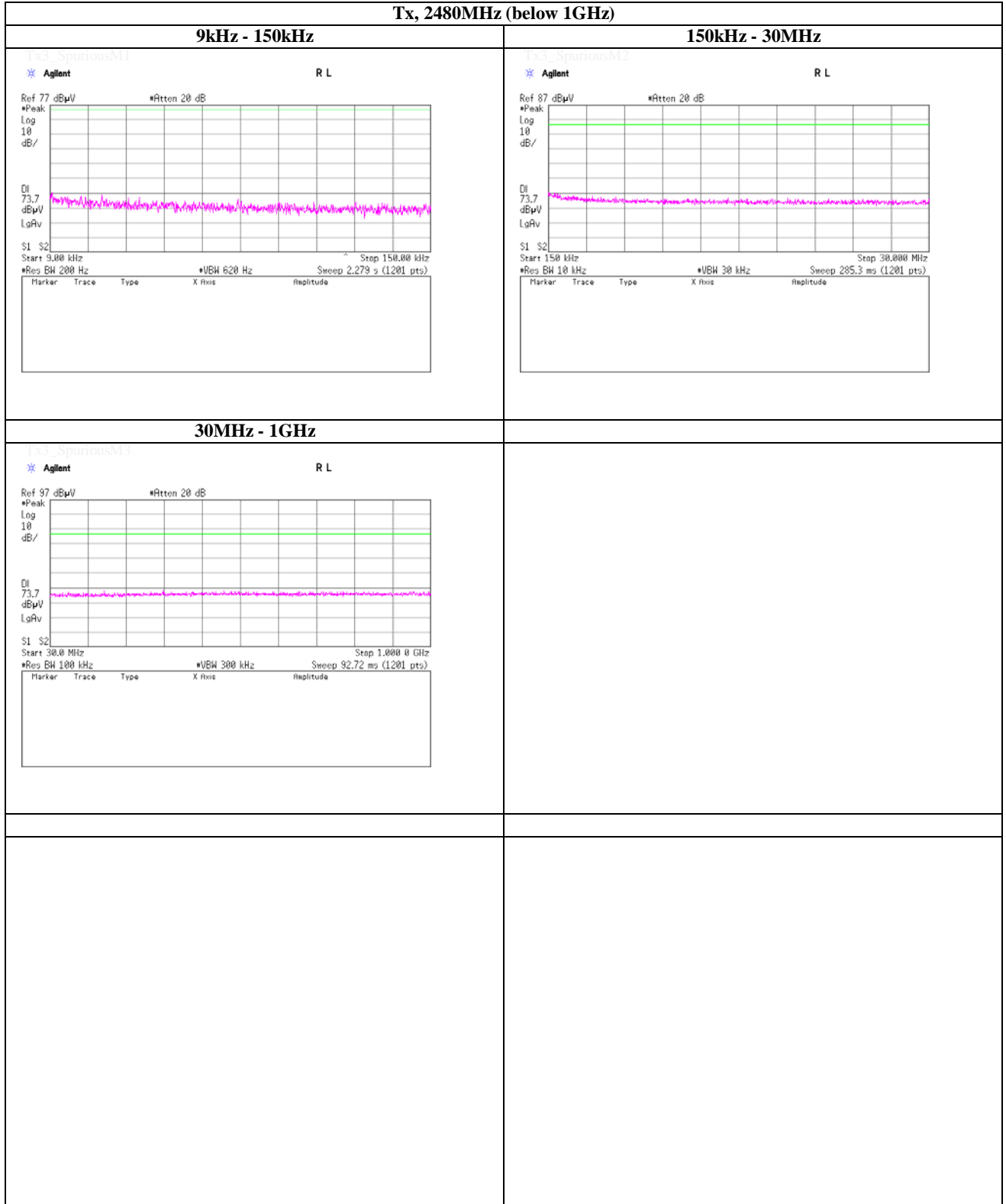




### Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

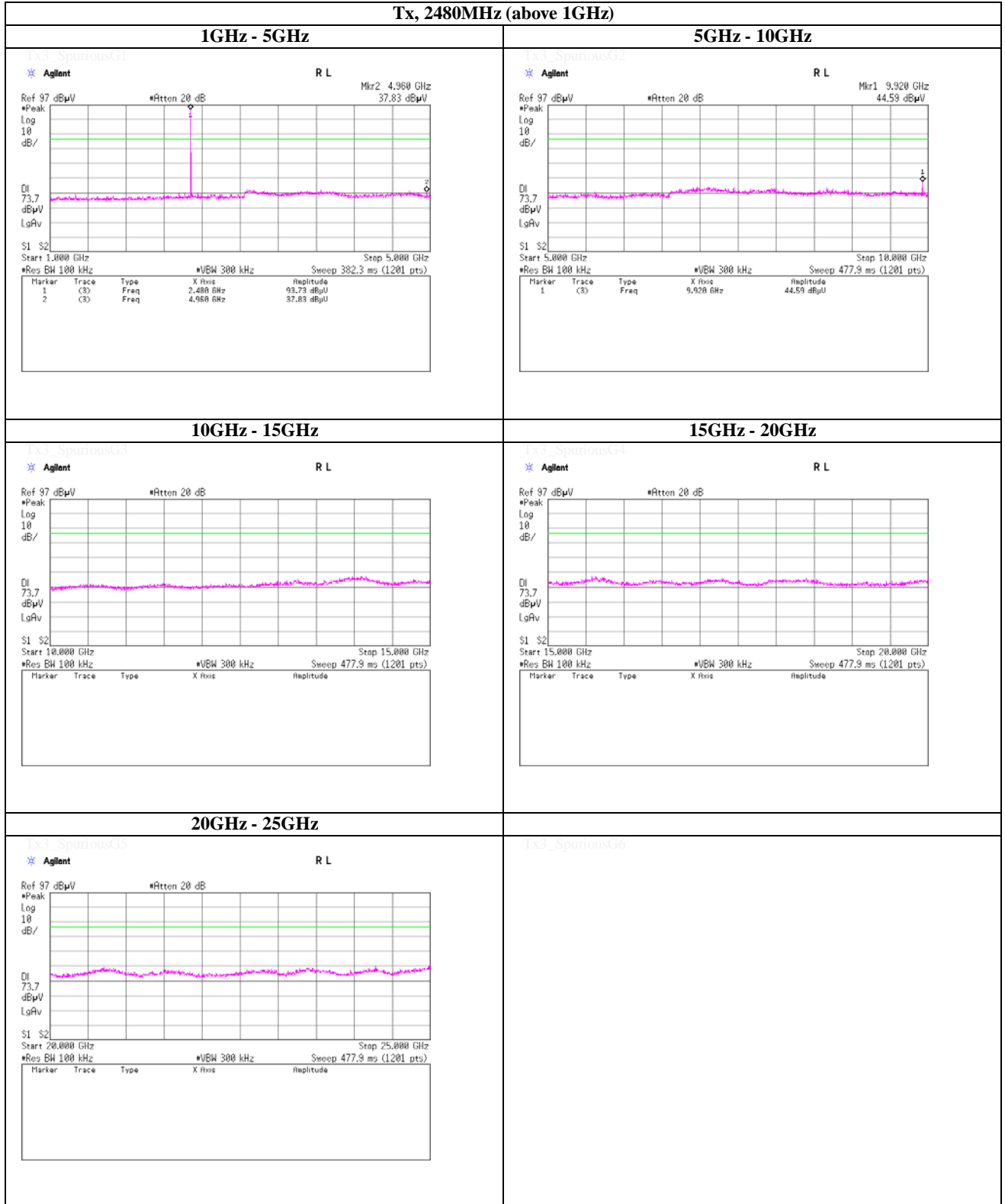
Tx, 2480MHz (below 1GHz)



## Spurious emission (Conducted)

**Tx, Bluetooth, BDR, PRBS9**

**Tx, 2480MHz (above 1GHz)**



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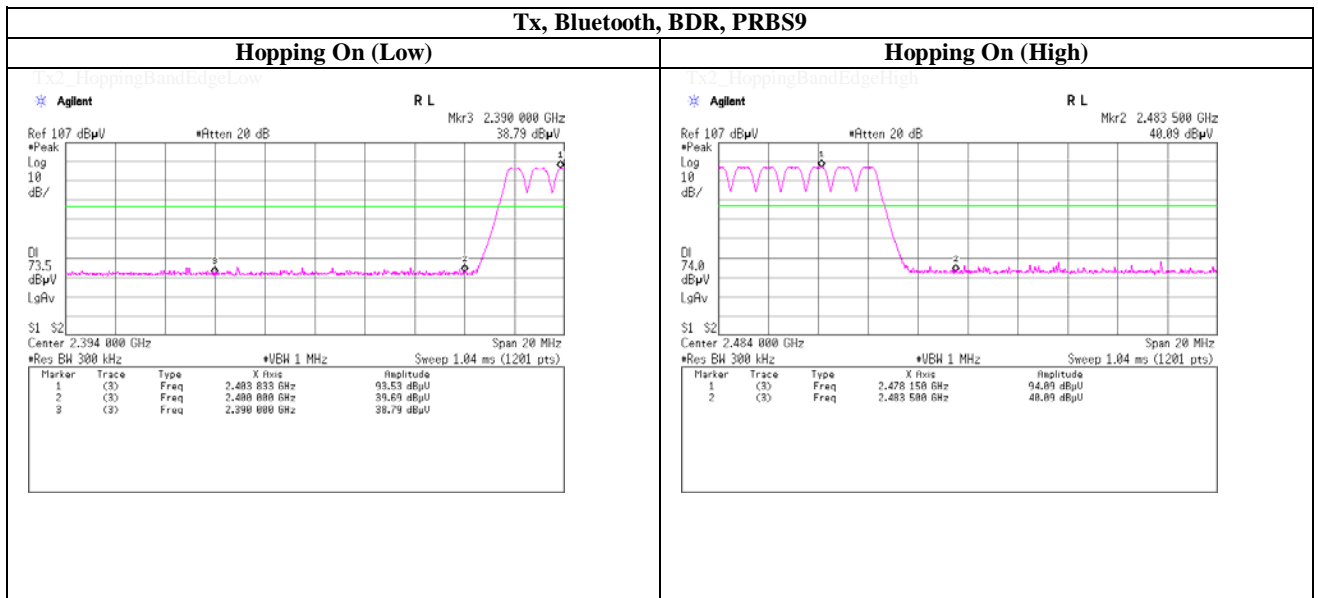
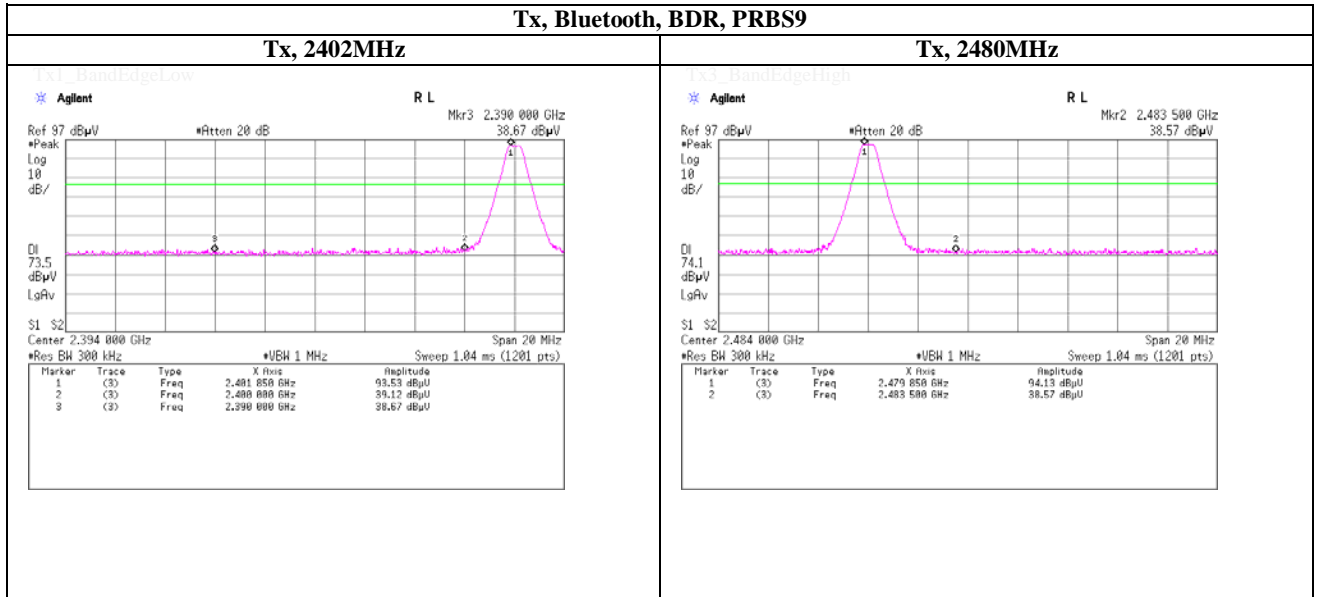
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## Spurious emission (Conducted)

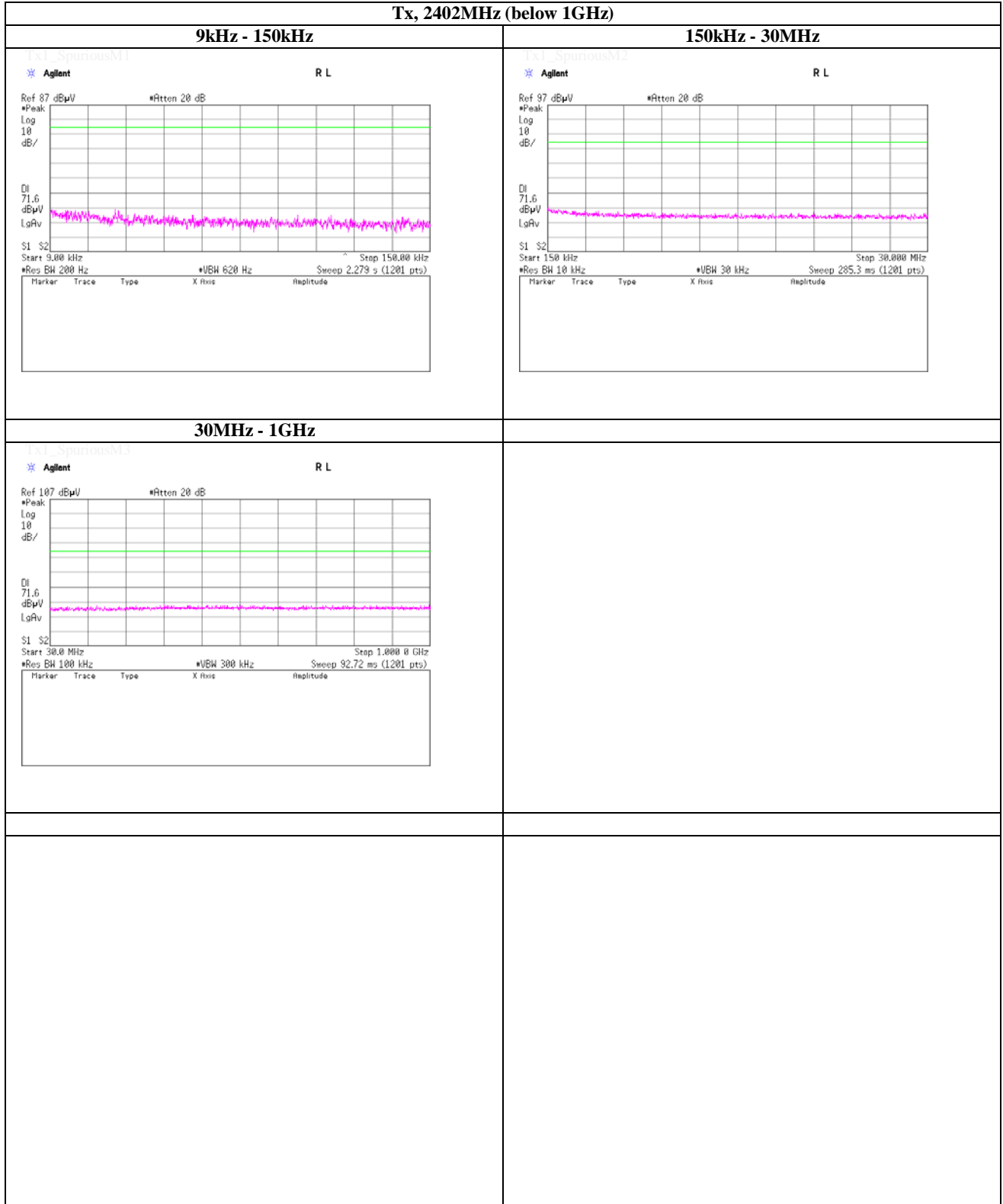
### Band Edge compliance



### Spurious emission (Conducted)

**Tx, Bluetooth, EDR, PRBS9**

**Tx, 2402MHz (below 1GHz)**



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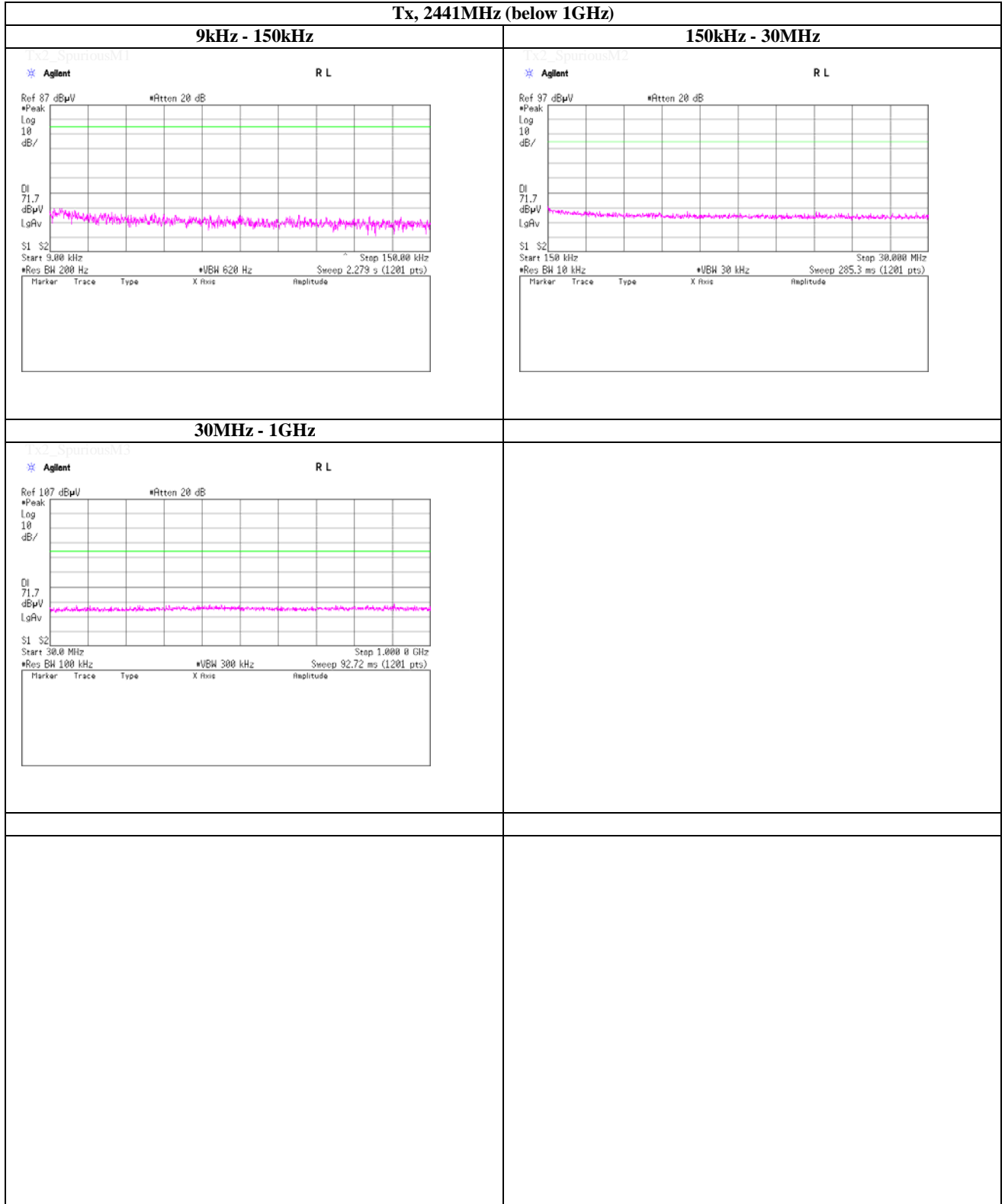
Facsimile : +81 463 50 6401



### Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

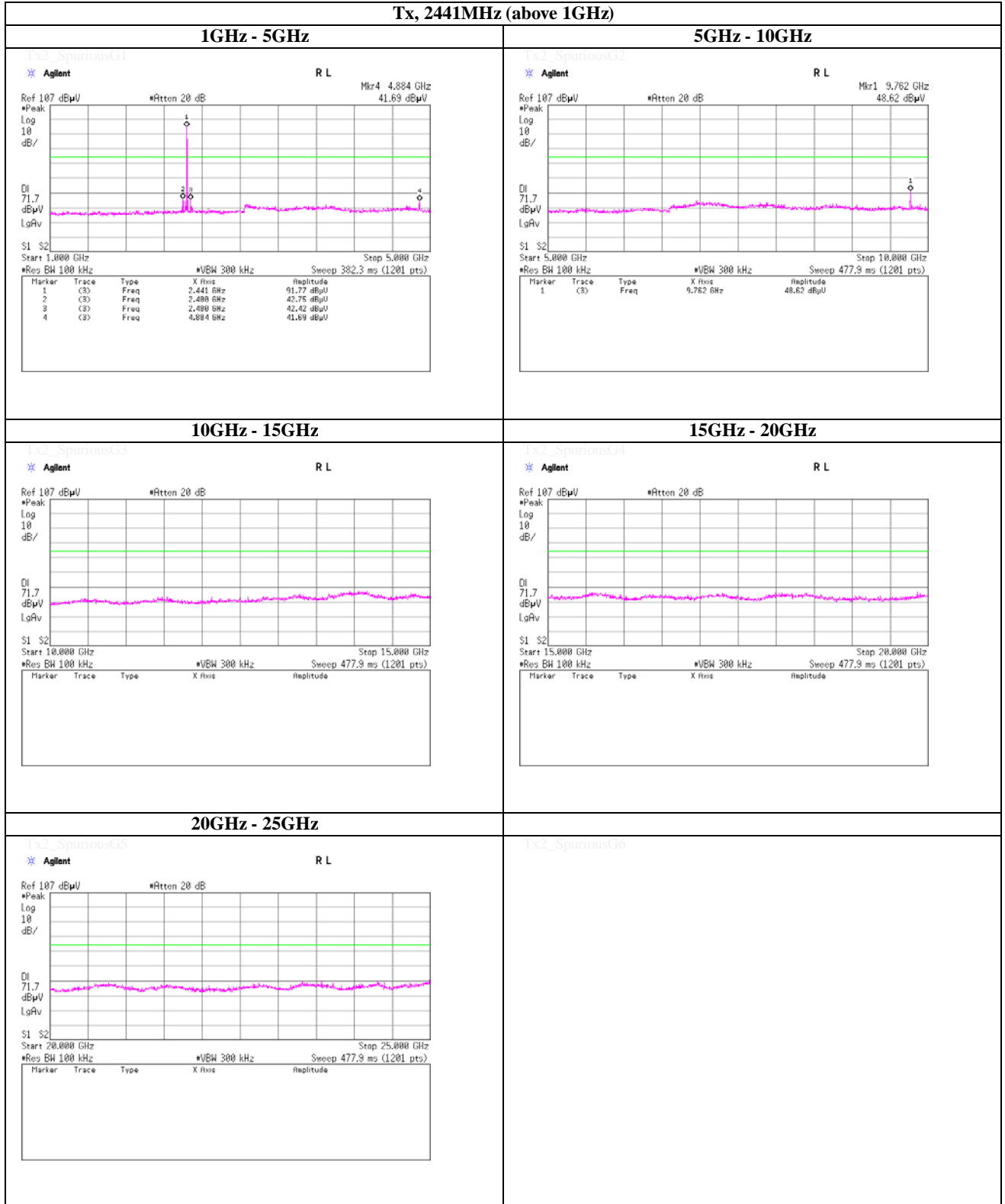
Tx, 2441MHz (below 1GHz)



## Spurious emission (Conducted)

**Tx, Bluetooth, EDR, PRBS9**

**Tx, 2441MHz (above 1GHz)**



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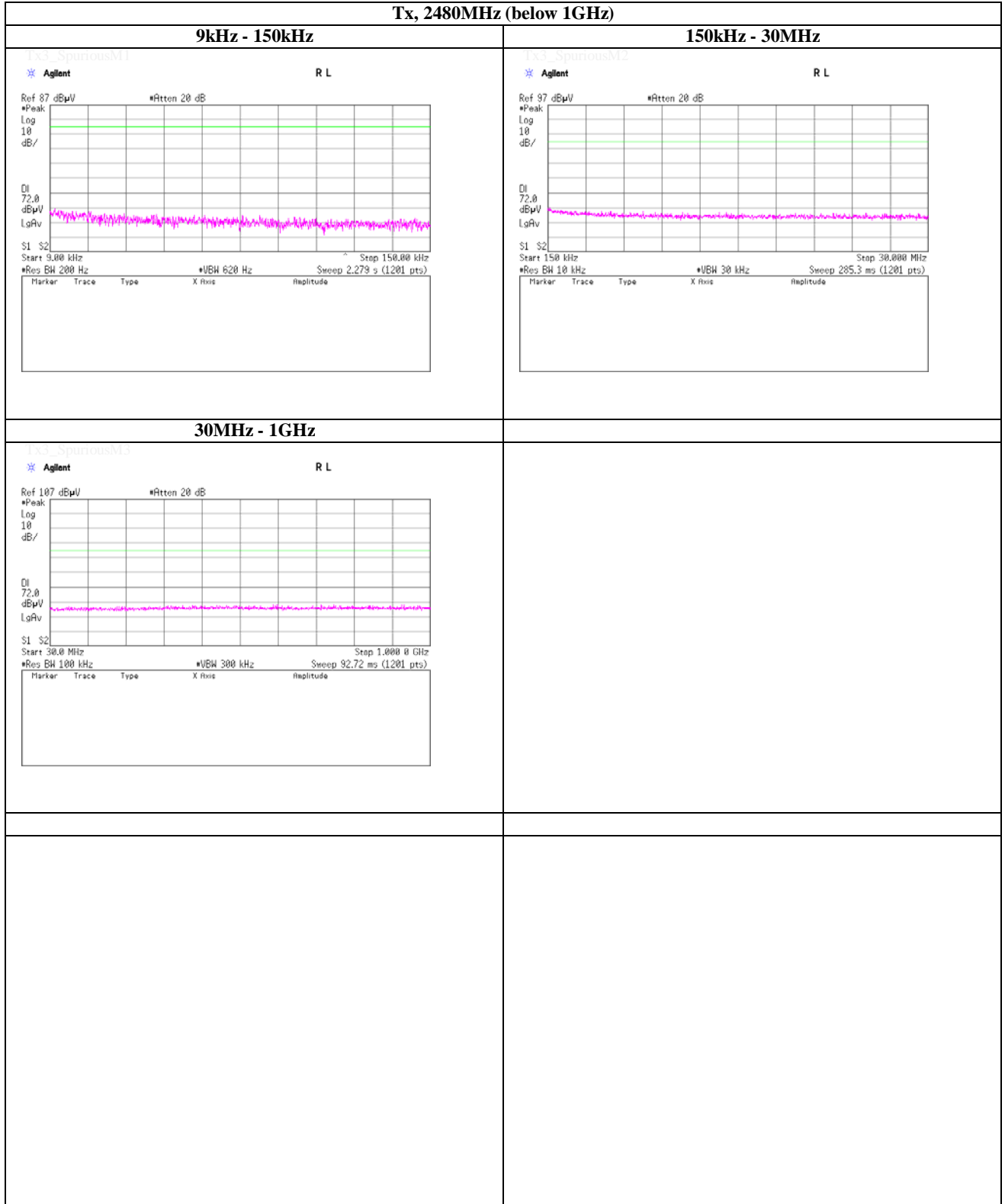
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### Spurious emission (Conducted)

**Tx, Bluetooth, EDR, PRBS9**

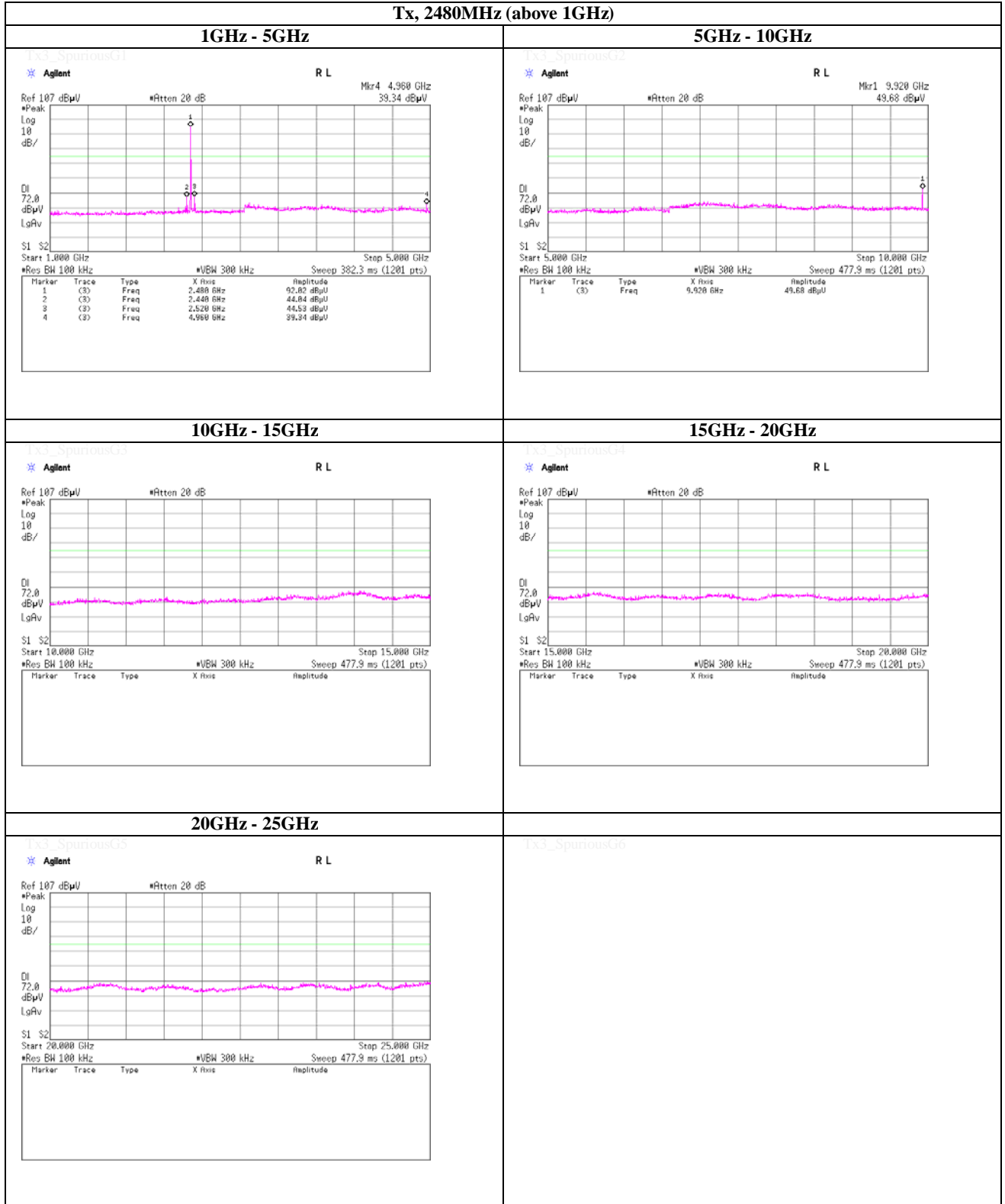
**Tx, 2480MHz (below 1GHz)**



## Spurious emission (Conducted)

**Tx, Bluetooth, EDR, PRBS9**

**Tx, 2480MHz (above 1GHz)**



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**Shonan EMC Lab.**

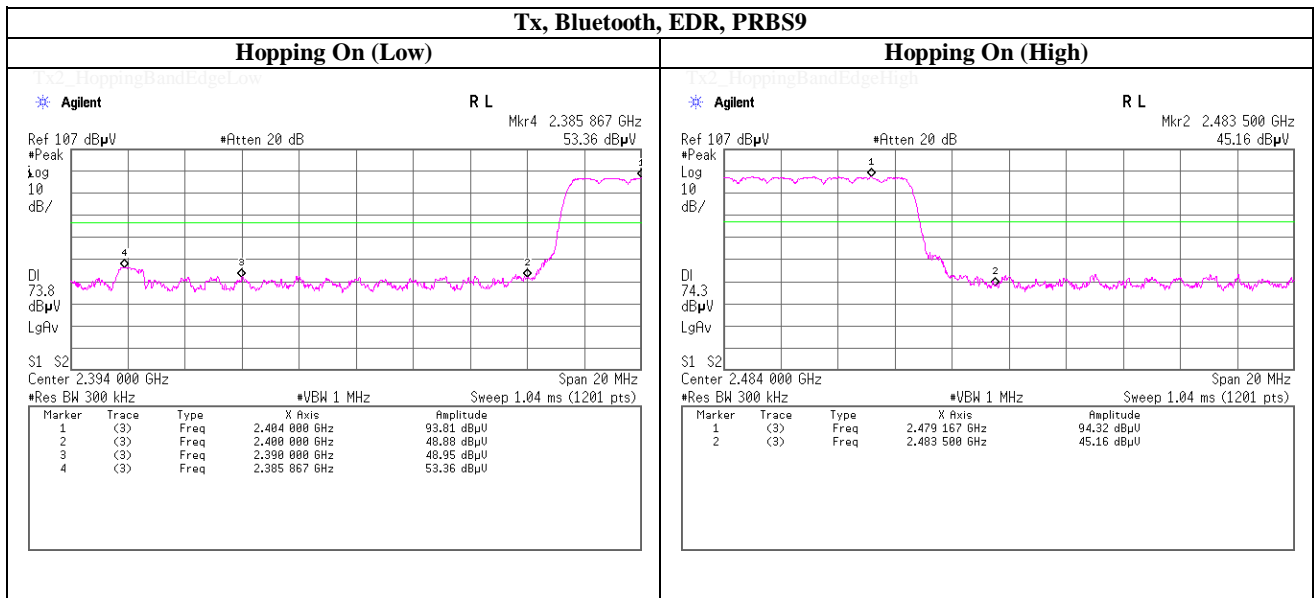
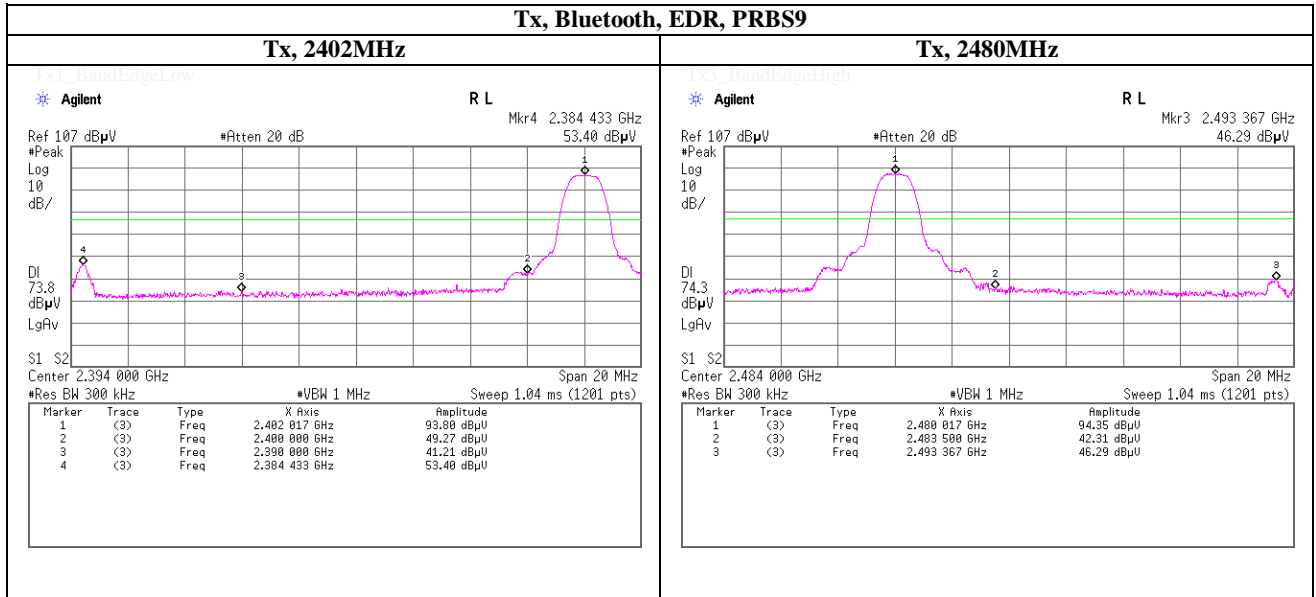
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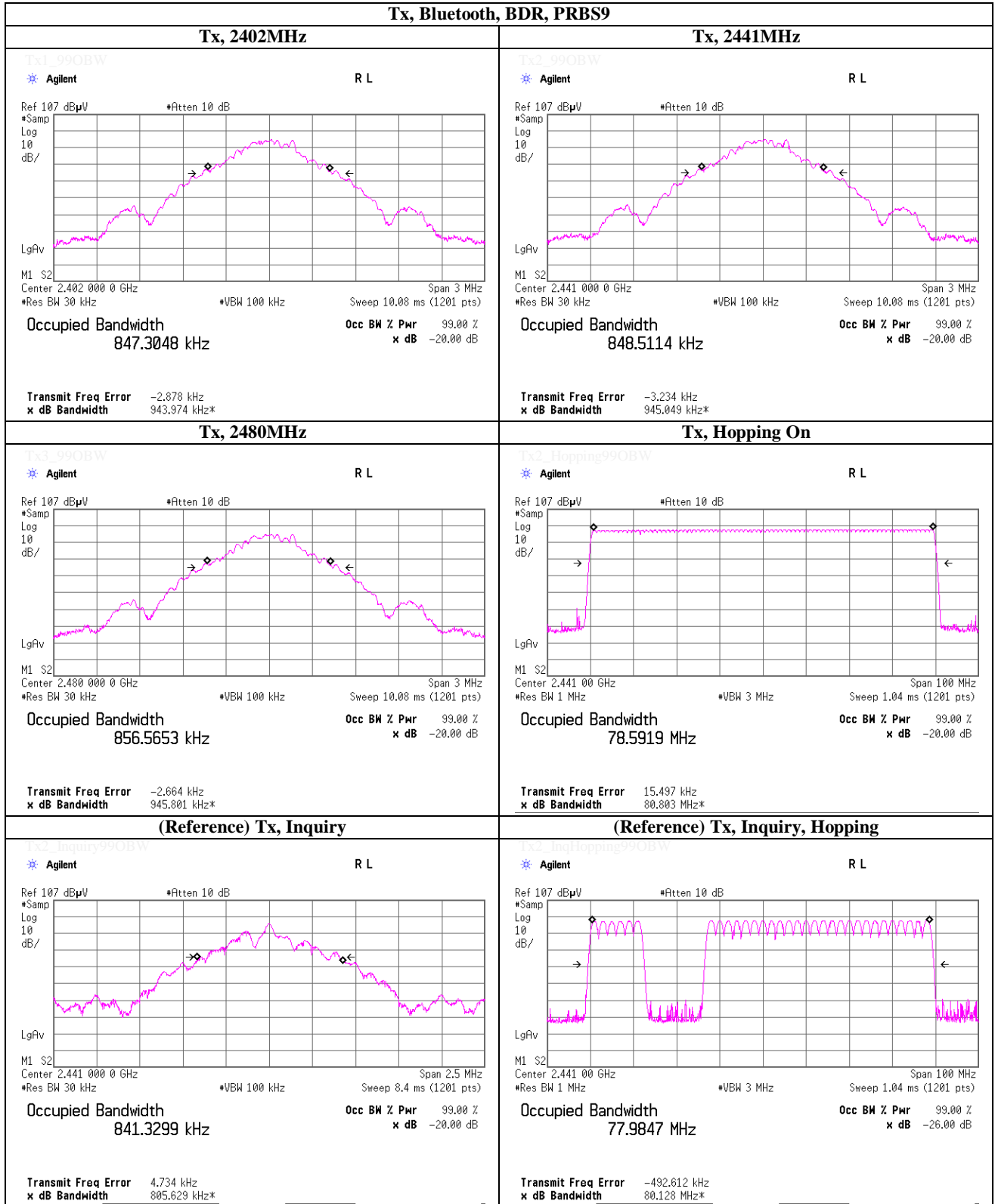
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## Spurious emission (Conducted)

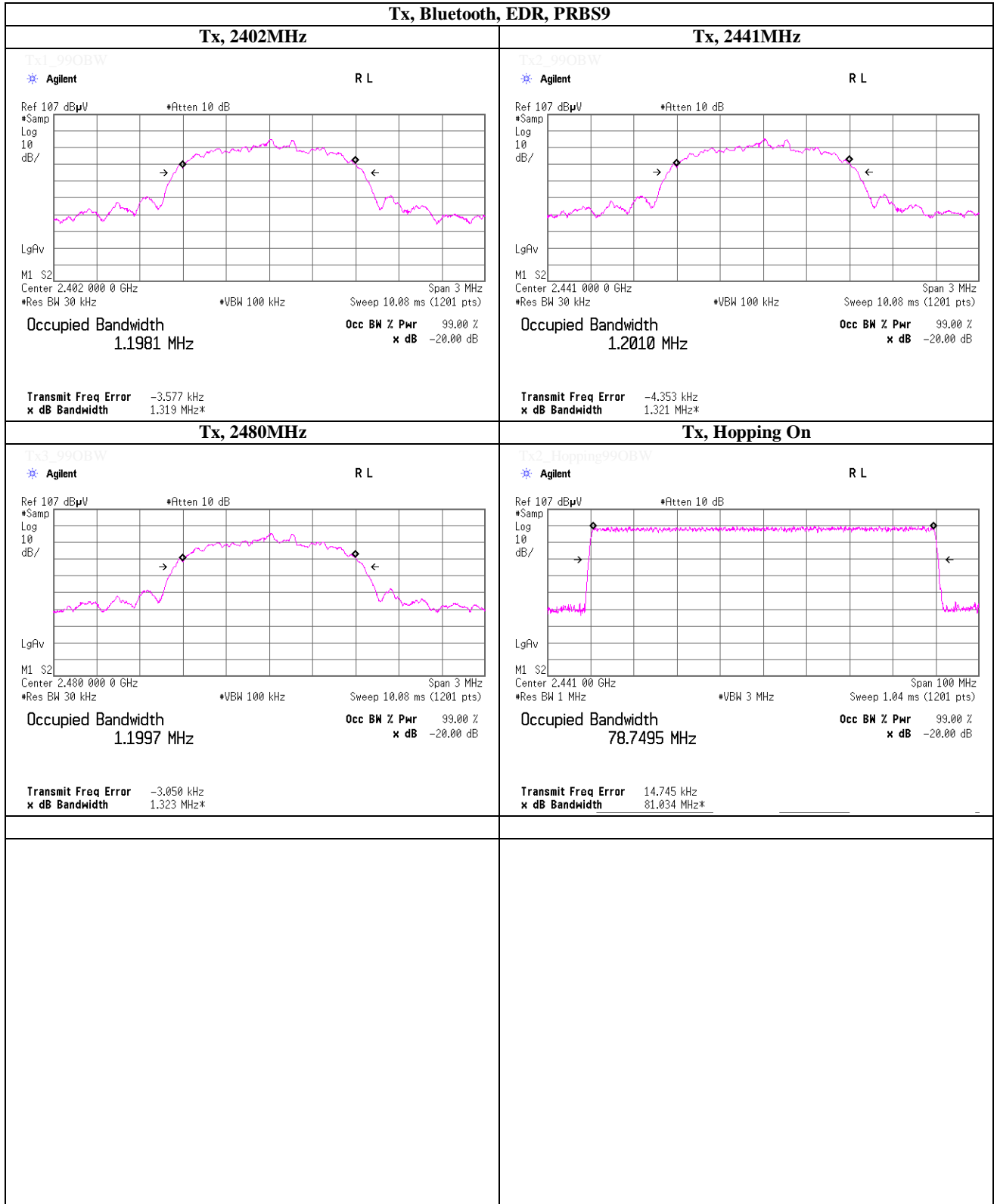
### Band Edge compliance



## 99% Occupied Bandwidth



## 99% Occupied Bandwidth



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## APPENDIX 2 Test Instruments

### EMI test equipment

| Control No.                    | Instrument                | Manufacturer                                       | Model No                                   | Serial No               | Test Item | Calibration Date * Interval(month) |
|--------------------------------|---------------------------|--|--|-------------------------|-----------|------------------------------------|
| SAEC-01(NSA)                   | Semi-Anechoic Chamber     | TDK  | SAEC-01(NSA)                               | 1                       | RE        | 2014/07/09 * 12                    |
| SAF-04                         | Pre Amplifier             | TOYO Corporation                                   | TPA0118-36                                 | 1440489                 | RE        | 2014/03/14 * 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-01                         | Horn Antenna              | Schwarzbeck  | BBHA9120D                                  | 9120D-725               | RE        | 2014/08/12 * 12                    |
| SOS-01                         | Humidity Indicator        | A&D  | AD-5681                                    | 4062555                 | RE        | 2014/02/21 * 12                    |
| SSA-03                         | Spectrum Analyzer         | Agilent  | E4448A                                     | MY48250152              | RE        | 2014/02/03 * 12                    |
| SJM-13                         | Measure                   | ASKUL  | -  | -                       | RE        | -                                  |
| COTS-SEMI-1                    | EMI Software              | TSJ  | TEPTO-DV(RE,CE, RFLMF)                     | -                       | RE        | -                                  |
| SAT10-06                       | Attenuator                | Agilent  | 8493C-010                                  | 74865                   | RE        | 2013/11/22 * 12                    |
| SFL-18                         | Highpass Filter           | MICRO-TRONICS                                      | HPM50111                                   | 119                     | RE        | 2014/04/22 * 12                    |
| SAEC-02(NSA)                   | Semi-Anechoic Chamber     | TDK  | SAEC-02(NSA)                               | 2                       | RE        | 2014/07/08 * 12                    |
| SCC-G18                        | Coaxial Cable             | Suhner   | SUCOFLEX 104A                              | 46292/4A                | RE        | 2014/03/14 * 12                    |
| SAF-09                         | Pre Amplifier             | TOYO Corporation                                   | HAP18-26W                                  | 00000018                | RE        | 2014/05/15 * 12                    |
| SHA-05                         | Horn Antenna              | ETS LINDGREN                                       | 3160-09                                    | LM4210                  | RE        | 2014/03/15 * 12                    |
| SOS-03                         | Humidity Indicator        | A&D  | AD-5681                                    | 4063325                 | RE        | 2014/02/21 * 12                    |
| SSA-01                         | Spectrum Analyzer         | Agilent  | N9010A-526                                 | MY48031482              | RE        | 2014/04/07 * 12                    |
| SJM-14                         | Measure                   | ASKUL  | -  | -                       | RE        | -                                  |
| SAF-02                         | Pre Amplifier             | SONOMA   | 310N                                       | 290212                  | RE        | 2014/02/17 * 12                    |
| SAT6-02                        | Attenuator                | JFW  | 50HF-006N                                  | -                       | RE        | 2014/02/17 * 12                    |
| KAT3-11                        | Attenuator                | JFW IND. INC.                                      | 50HF-003N                                  | -                       | RE        | 2014/08/27 * 12                    |
| SBA-02                         | Biconical Antenna         | Schwarzbeck  | BBA9106                                    | 91032665                | RE        | 2013/11/24 * 12                    |
| SCC-B1/B3/B5/B7/B8/B13/SRSE-02 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906 | -/0901-270(RF Selector) | RE        | 2014/04/25 * 12                    |
| SCC-B2/B4/B6/B7/B8/B13/SRSE-02 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906 | -/0901-270(RF Selector) | RE        | 2014/04/25 * 12                    |
| SLA-02                         | Logperiodic Antenna       | Schwarzbeck  | UHALP9108A                                 | UHALP 9108-A 0893       | RE        | 2013/11/24 * 12                    |
| STR-02                         | Test Receiver             | Rohde & Schwarz                                    | ESCI                                       | 100575                  | RE        | 2013/09/24 * 12                    |
| SSA-03                         | Spectrum Analyzer         | Agilent  | E4448A                                     | MY48250152              | AT        | 2014/02/03 * 12                    |
| SCC-G12                        | Coaxial Cable             | Suhner   | SUCOFLEX 102                               | 30790/2                 | AT        | 2014/03/13 * 12                    |
| SAT10-11                       | Attenuator                | Weinschel Corp.                                    | 54A-10                                     | 37588                   | AT        | 2014/04/22 * 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                    |
| SOS-06                         | Humidity Indicator        | A&D  | AD-5681                                    | 4062118                 | 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 conducted test