



# RADIO TEST REPORT

**Test Report No.: 10241970S-A**

**Applicant** : Sony Corporation  
**Type of Equipment** : Bluetooth Audio System  
**Model No.** : MEX-GS810BH  
**FCC ID** : AK8MEXGS810BH  
**Test regulation** : FCC Part15 Subpart C: 2014  
**Test result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** March 2 to 28, 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 : Sony Corporation  
Brand Name : SONY  
Address : Sony City Osaki, 2-10-1 Osaki, Shinagawa-ku, Tokyo 141-8610 Japan  
Telephone Number : +81 50 3750 7634  
Facsimile Number : +81 50 3750 6574  
Contact Person : Toshihiro Maeda

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

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

Type of Equipment : Bluetooth Audio System  
Model Number : MEX-GS810BH  
Serial Number : Refer to 4.2  
Rating : DC12V (car battery)  
Country of Mass-production : Thailand  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Receipt Date of Sample : March 14, 2014  
Modification of EUT : No modification by the test lab.

### **2.2 Product description**

Model: MEX-GS810BH (referred to as the EUT in this report) is a Bluetooth Audio System.

Clock frequency(ies) in the system : 32.768kHz, 13.333MHz, 16.9344MHz, 26.000MHz, 28.224MHz, 30.000MHz, 36.480MHz, 48.000MHz

Bluetooth specification:

Equipment type : Transceiver  
Frequency of operation : 2402-2480MHz  
Bandwidth & channel spacing : 79MHz & 1MHz  
Type of modulation : FHSS  
Operation temperature range : -20 to +60 deg.C.  
Antenna type : Meander Monopole  
Antenna connector type : U-FL Type Interchangeability  
Antenna gain : 0.929dBi (Peak)  
ITU code : F1D, G1D

FCC 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC3.3V). Therefore, the equipment 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 March 6, 2014 and effective April 7, 2014  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,  
and 5725-5850MHz

\* The revision on March 6, 2014 does not affect the test specification applied to the EUT.

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 10241970S-B.

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### 3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	-	-
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2009 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 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A		Complied
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2009 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 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 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 13. Measurement of intentional radiators	FCC 15.247 (d) 15.209	Conducted/ Radiated	N/A		5.6dB Freq.: 166.391MHz Polarization: Horizontal Detection: Quasi-Peak Mode: Tx 2441MHz, DH5

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.

### 3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 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.

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### 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> (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (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
Radiated emission (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 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%

### 3.5 Test location

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JAB Accreditation No. : RTL02610

	FCC Registration No.	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	697847	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	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.3 semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 semi-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input checked="" type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.1 measurement room	-	-	2.55 x 4.1 x 2.5	-	-

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

Refer to APPENDIX 1 to 3.

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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 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5 -Inquiry	-
Maximum peak output power	Transmitting Hopping OFF, Payload: PRBS9 - DH5, - 2-DH5, - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping OFF	Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload: PRBS9 / Inquiry -Hopping ON -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.

Software: BlueTest3 ver.2.5.0.93  
BtCli ver.2.5.0.93 (Inquiry mode only)  
Power Settings: BDR: Ext PA: 23, Int PA: 39  
EDR: Ext PA: 73, Int PA: 48

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.

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

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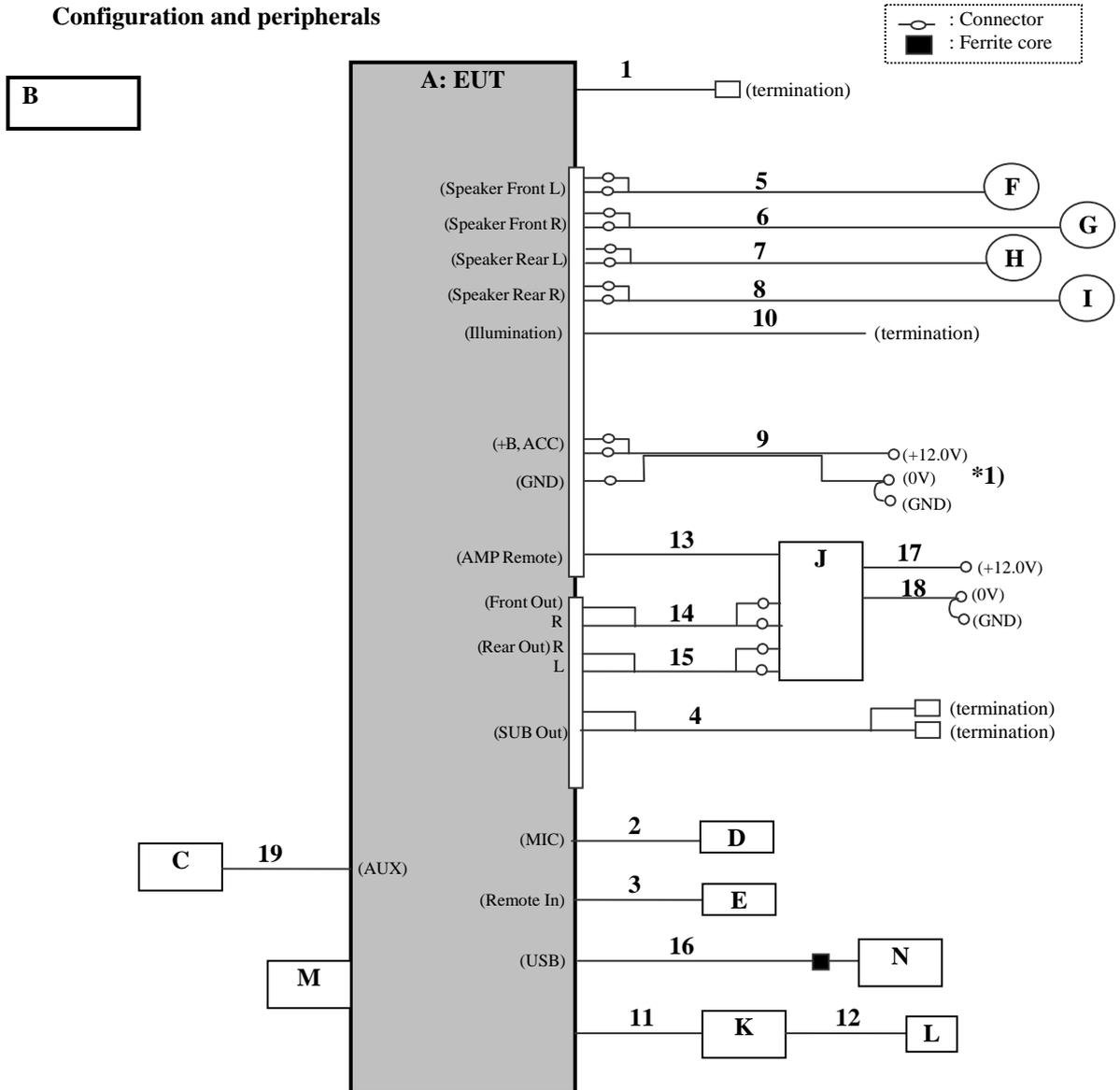
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4.2 Configuration and peripherals



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

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#### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Audio System	MEX-GS810BH	10	Sony	EUT
B	Remote Commander	RM-X231	-	Sony	-
C	Walkman	NWZ-A829	1000200	Sony	-
D	MIC	-	-	Sony	-
E	Wired Remote Controller	RM-X2S	-	Sony	-
F	Speaker 1	XS-GTF1338	-	Sony	-
G	Speaker 2	XS-GTF1338	-	Sony	-
H	Speaker 3	XS-GTF1338	-	Sony	-
I	Speaker 4	XS-GTF1338	-	Sony	-
J	Stereo Power Amplifier	XM-4S	-	Sony	-
K	Sirius XM tuner	SXV100	REG004RR	Sirius	-
L	Antenna for Sirius XM tuner	XVANT1	1046	Sirius	-
M	USB Memory	SDK-USM4GL	10413ME	Sony	-
N	USB Memory	SDK-USM4GL	10615ME	Sony	-

\*1) DC power supply (Model No.: PAN35-10A) was used for DC 12V input.

#### List of cables used

No.	Name	Length (m)	Shield- Cable	Shield- Connector	Remarks
1	FM antenna	1.2	Shielded	Shielded	-
2	MIC	4.0	Shielded	Shielded	-
3	REMOTE IN	2.0	Shielded	Shielded	-
4	Audio OUT(SUB)	2.0+0.45	Shielded	Shielded	-
5	Speaker (1)	0.15+2.25	Unshielded	Unshielded	-
6	Speaker (2)	0.15+2.25	Unshielded	Unshielded	-
7	Speaker (3)	0.15+2.25	Unshielded	Unshielded	-
8	Speaker (4)	0.15+2.25	Unshielded	Unshielded	-
9	DC Power	0.15+2.4	Unshielded	Unshielded	-
10	Illumination	0.15+1.0	Unshielded	Unshielded	-
11	XM tuner	0.6	Shielded	Shielded	-
12	Antenna	7.0	Shielded	Shielded	-
13	AMP Remote	0.15+1.5	Unshielded	Unshielded	-
14	RCA (Front Audio Out)	5.0	Shielded	Shielded	-
15	RCA (Rear Audio Out)	5.0	Shielded	Shielded	-
16	USB	1.5	Shielded	Shielded	-
17	DC Power (+)	1.3	Unshielded	Unshielded	-
18	DC Power (-)	1.3	Unshielded	Unshielded	-
19	Audio	2.0	Shielded	Shielded	-

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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.

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

### **Test procedure**

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

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

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

In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass

Refer to APPENDIX 1.

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## **SECTION 11: Radiated emission**

### **11.1 Operating environment**

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

### **11.2 Test configuration**

EUT was placed on a platform of nominal size, 1.0m by 2.0m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Photographs of the set up are shown in APPENDIX 3.

### **11.3 Test conditions**

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

### **11.4 Test procedure**

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

The radiated emission measurements were made with the following detection.

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

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

The carrier level and noise levels were confirmed at mounting angle of 0 to +45 deg (lengthwise direction) and -45 to +45 deg (crosswise direction) 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.

Test item		Carrier	Spurious emission (Below 1GHz)	Spurious emission (1-15GHz)	Spurious emission (Above 15GHz)
Antenna polarization	Horizontal				
	Lengthwise	0 deg.	0 deg.	0 deg.	0 deg.
	Crosswise	0 deg.	0 deg.	0 deg.	0 deg.
Vertical	Lengthwise	0 deg.	0 deg.	0 deg.	0 deg.
	Crosswise	0 deg.	0 deg.	0 deg.	0 deg.

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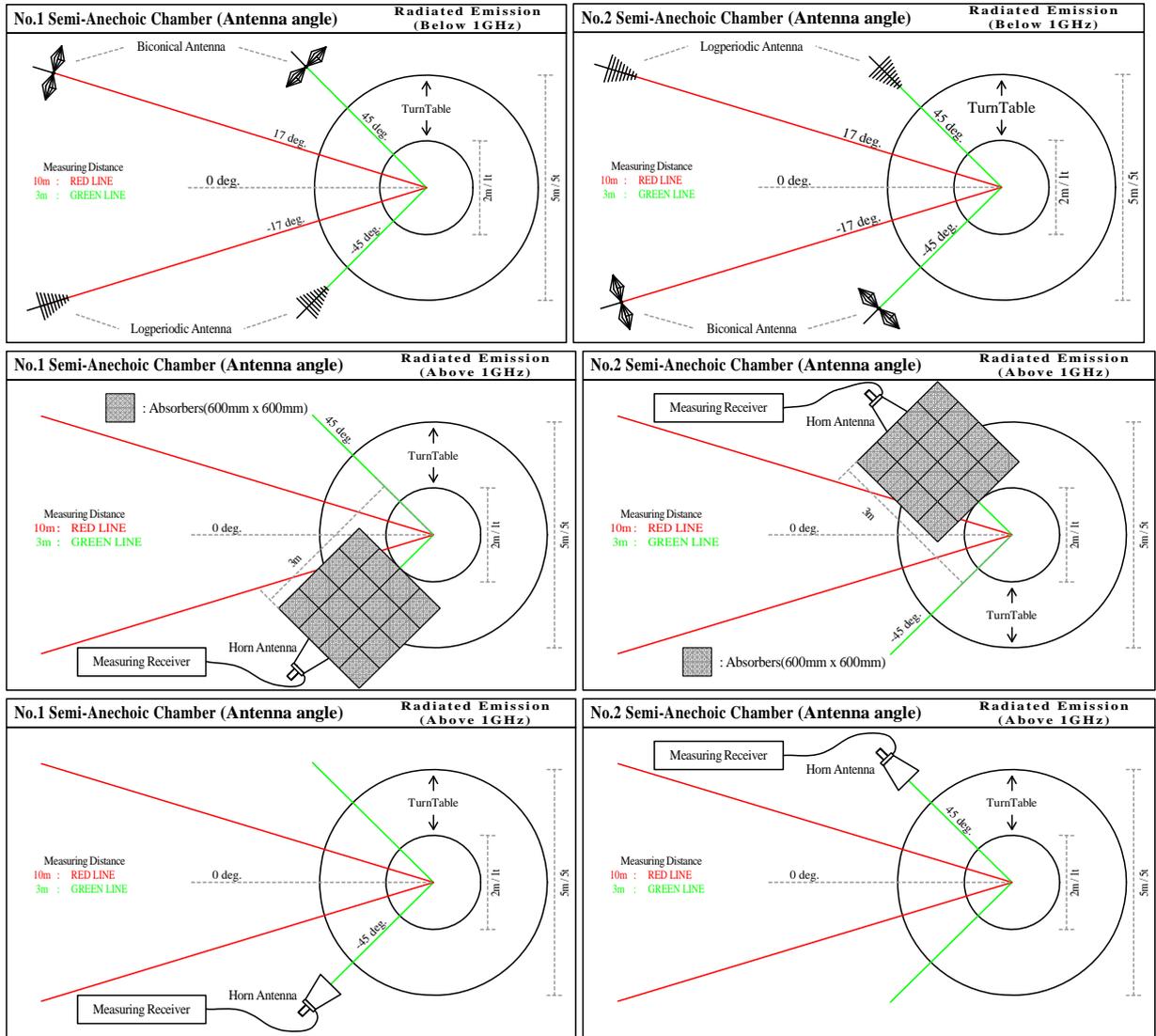
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Figure 1. Antenna angle



11.5 Band edge

Band edge level is below the limits of FCC 15.209. Refer to the data.

11.6 Results

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

Refer to APPENDIX 1.

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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  
Spurious emission (Antenna port conducted)  
Radiated emission  
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

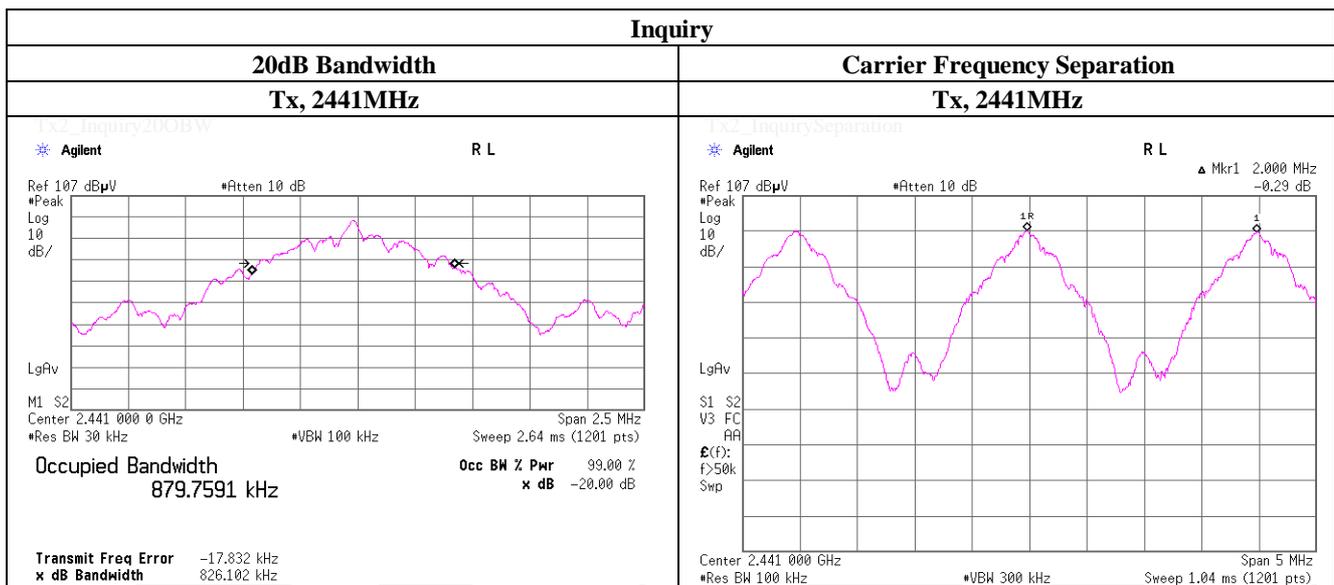
### 20dB Bandwidth and Carrier Frequency Separation

Test place                      UL Japan, Inc. Shonan EMC Lab.                      No.5 Shielded Room  
 Date                              March 2, 2014  
 Temperature / Humidity        26 deg.C        , 35 %RH  
 Engineer                        Shinichi Takano  
 Mode                              Tx, Bluetooth, BDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.956	1.000	>= 0.637
DH5	2441.0	0.961	1.000	>= 0.641
DH5	2480.0	0.956	1.000	>= 0.638
Inquiry	2441.0	0.826	2.000	>= 0.551

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

No limit applies to 20dB Bandwidth.



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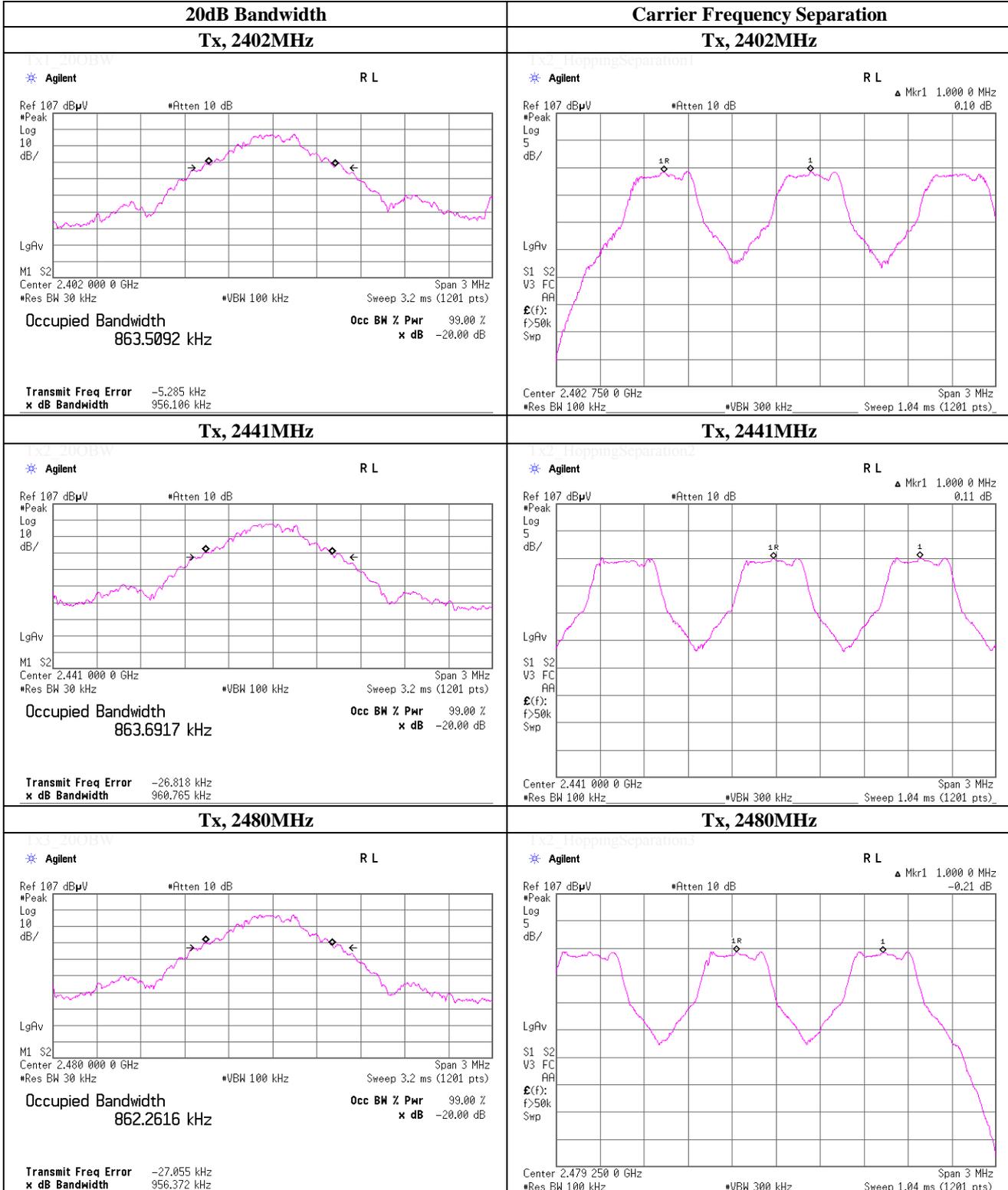
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## 20dB Bandwidth and Carrier Frequency Separation

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 2, 2014  
 Temperature / Humidity    26 deg.C       , 35 %RH  
 Engineer                     Shinichi Takano  
 Mode                         Tx, Bluetooth, EDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.297	1.000	>= 0.864
3-DH5	2441.0	1.286	1.003	>= 0.857
3-DH5	2480.0	1.290	1.000	>= 0.860

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

No limit applies to 20dB Bandwidth.

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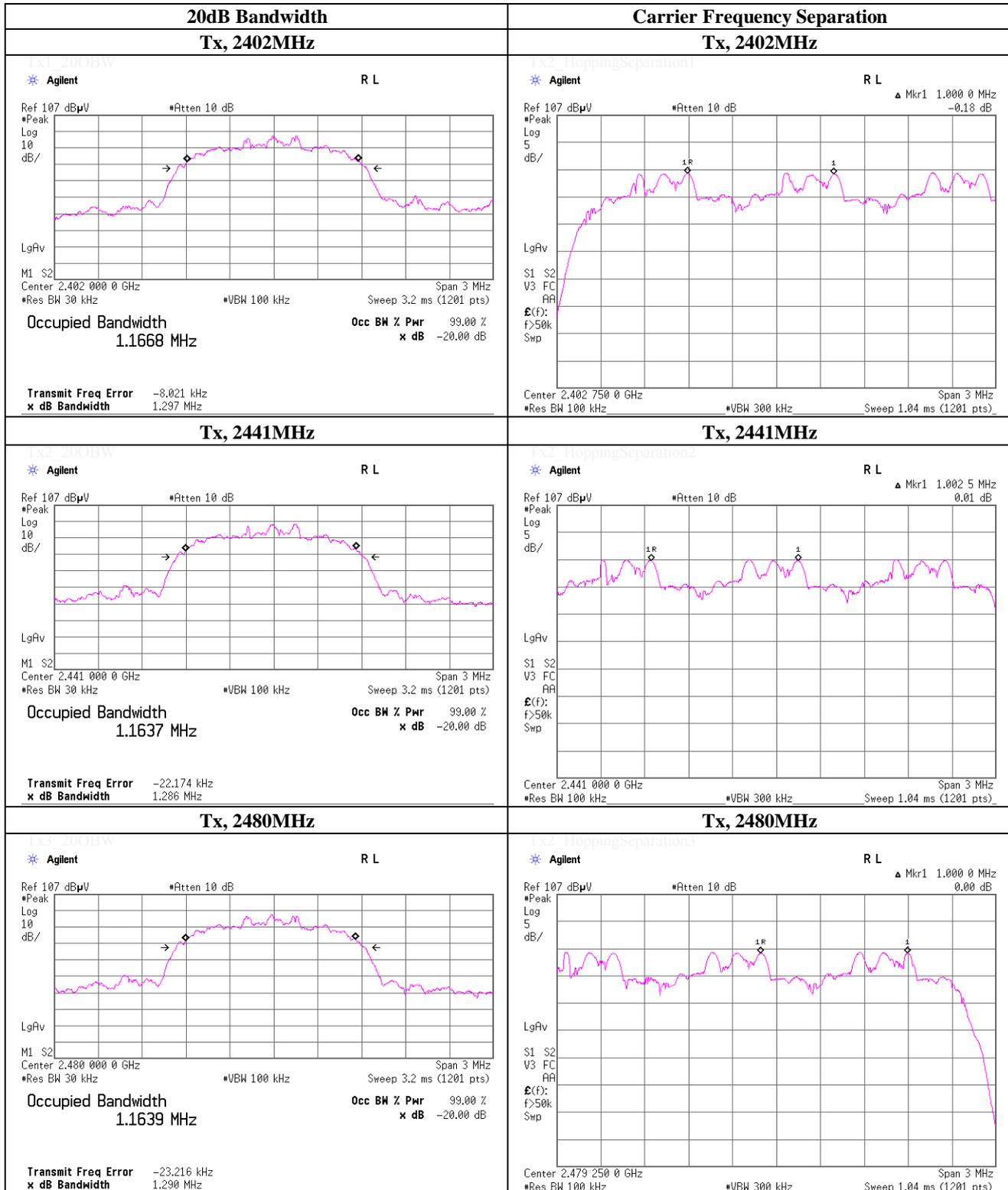
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## 20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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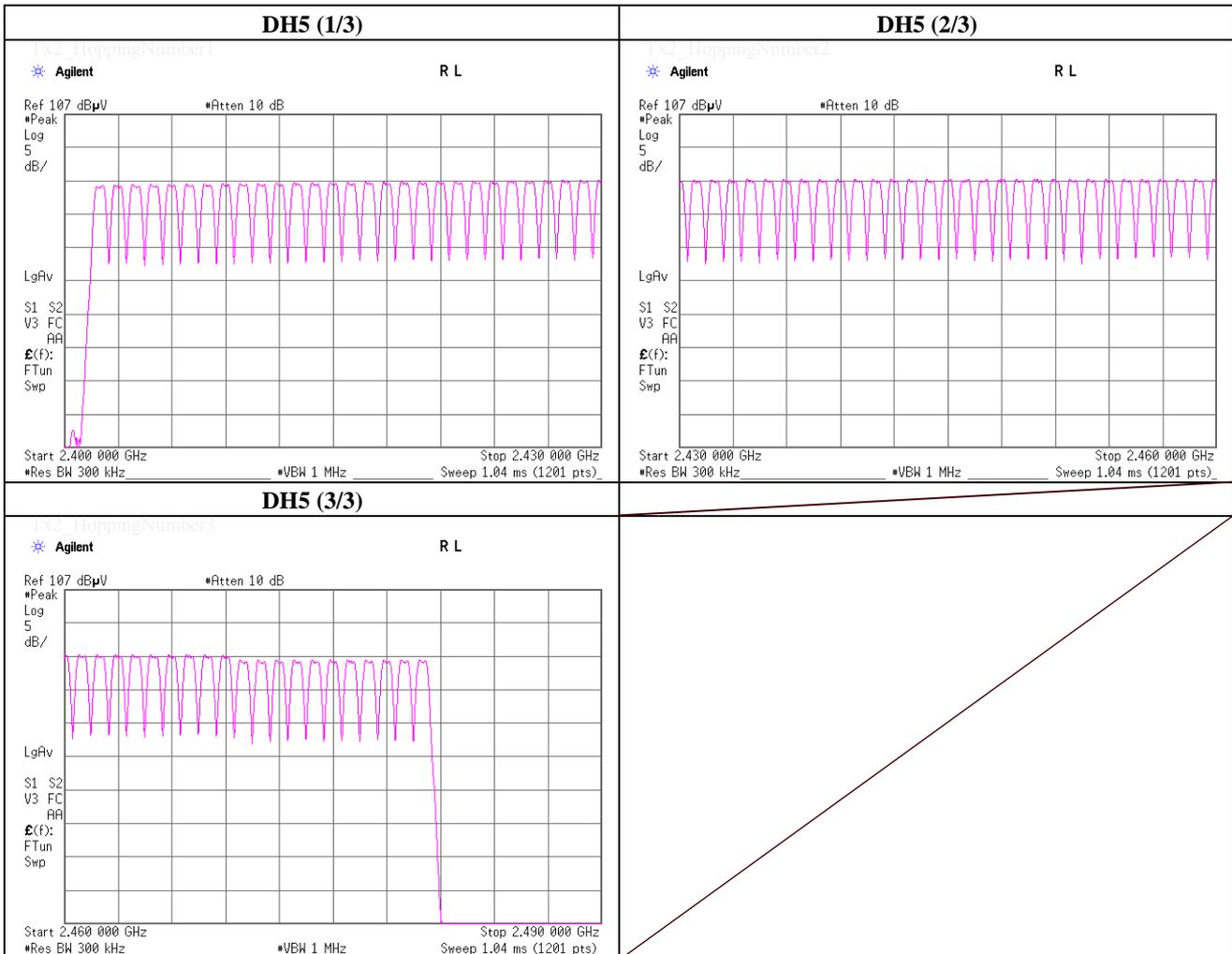
Facsimile : +81 463 50 6401

### Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2014	
Temperature / Humidity	26 deg.C , 35 %RH	
Engineer	Shinichi Takano	
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.



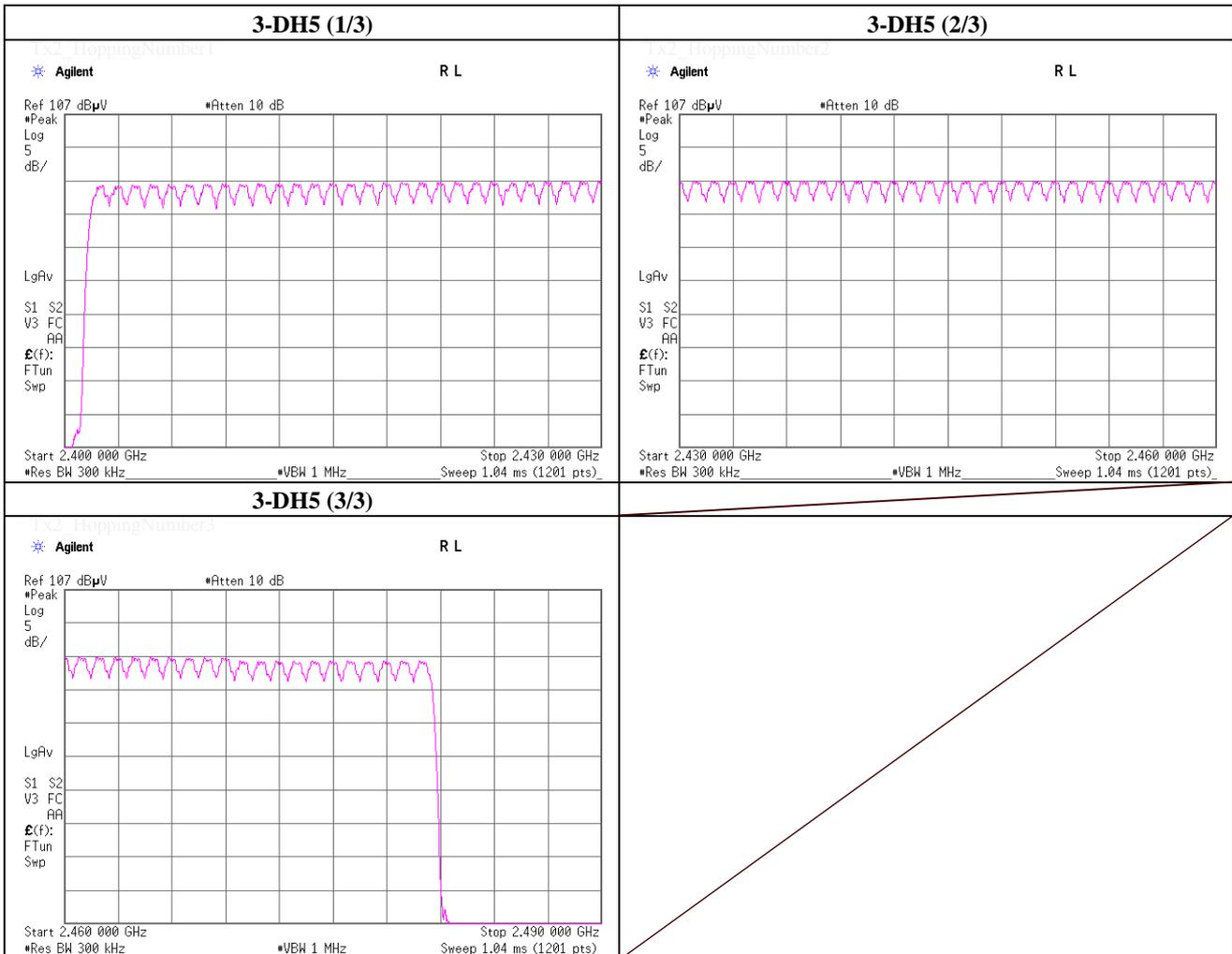
**UL Japan, Inc.**  
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 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
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 Facsimile : +81 463 50 6401

### Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2014	
Temperature / Humidity	26 deg.C , 35 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

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

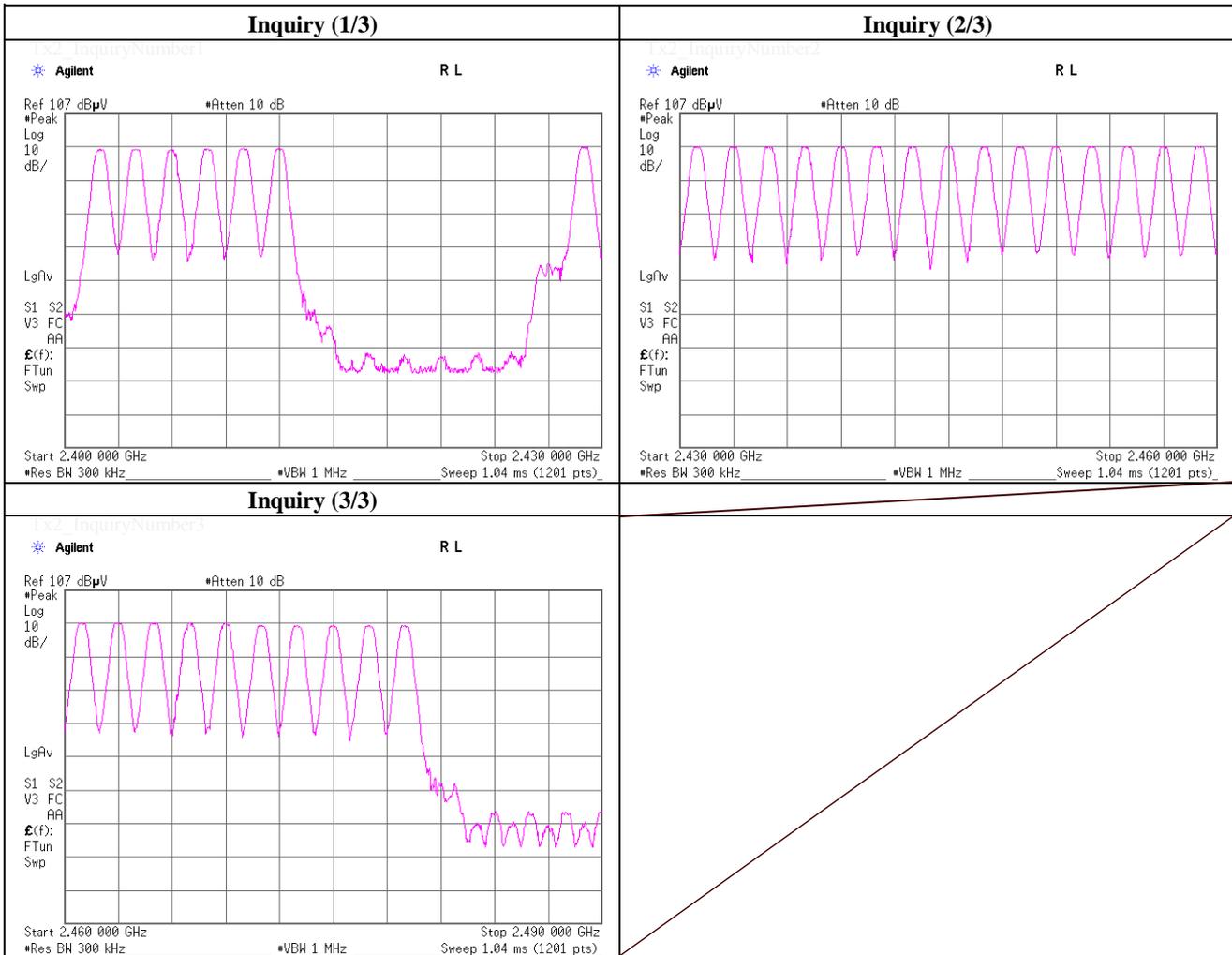


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### Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2014	
Temperature / Humidity	26 deg.C , 35 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, Inquiry	

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



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## Dwell Time

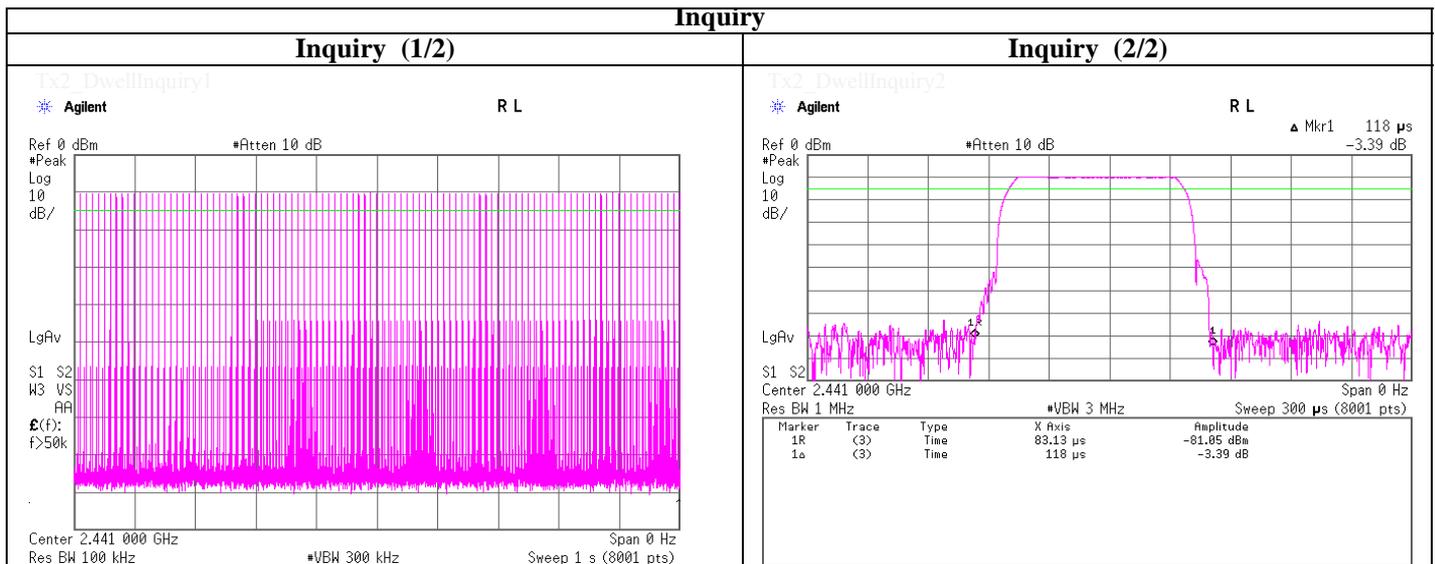
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2014	
Temperature / Humidity	26 deg.C , 35 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.415	134	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.672	276	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.920	315	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.118	151	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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



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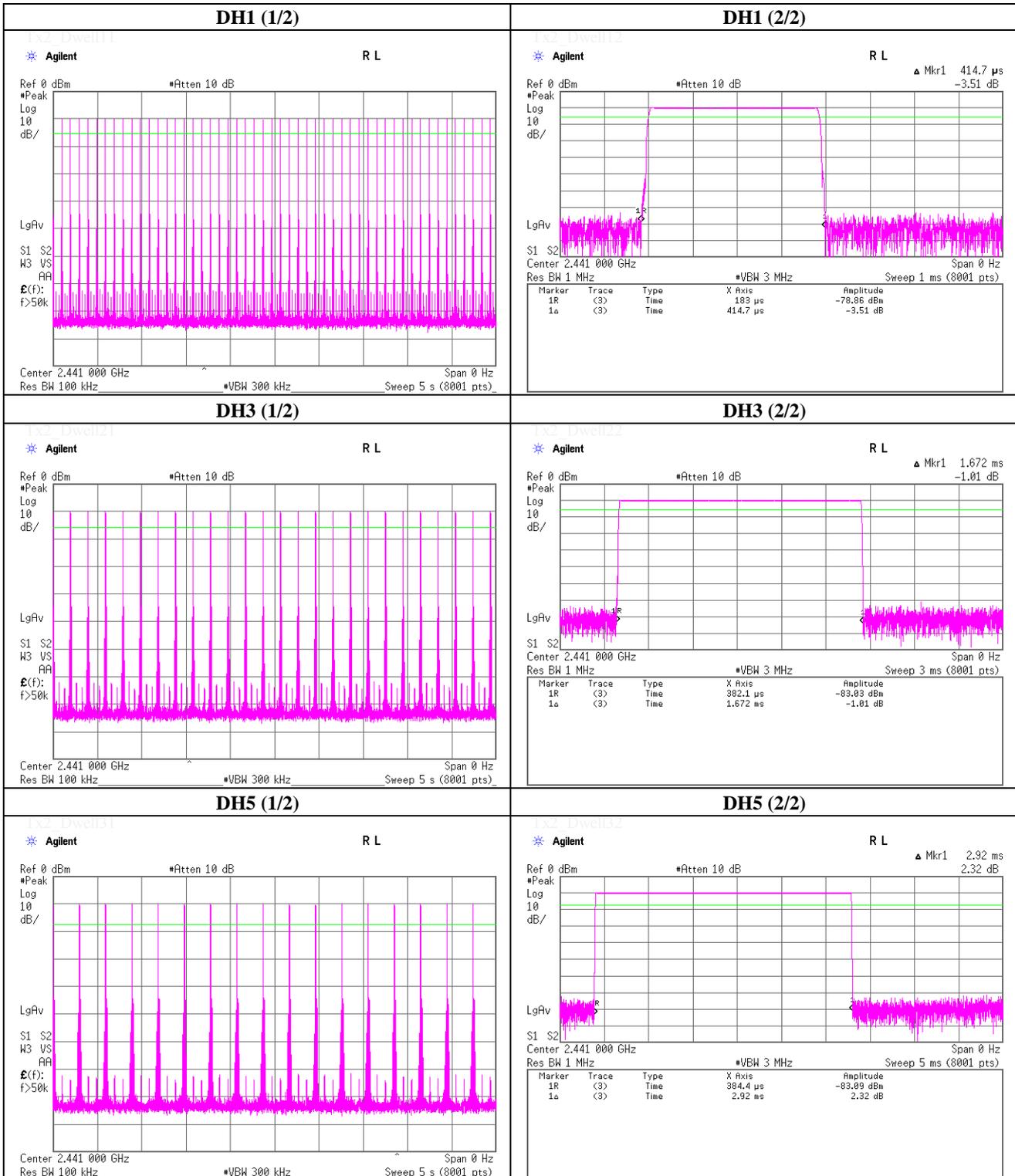
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## Dwell time

### Tx, Bluetooth, BDR, PRBS9



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## Dwell Time

Test place           UL Japan, Inc. Shonan EMC Lab.           No.5 Shielded Room  
 Date                March 2, 2014  
 Temperature / Humidity 26 deg.C , 35 %RH  
 Engineer           Shinichi Takano  
 Mode                Tx, Bluetooth, EDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second	Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.433	140	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.683	278	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.934	317	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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

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**UL Japan, Inc.**

**Shonan EMC Lab.**

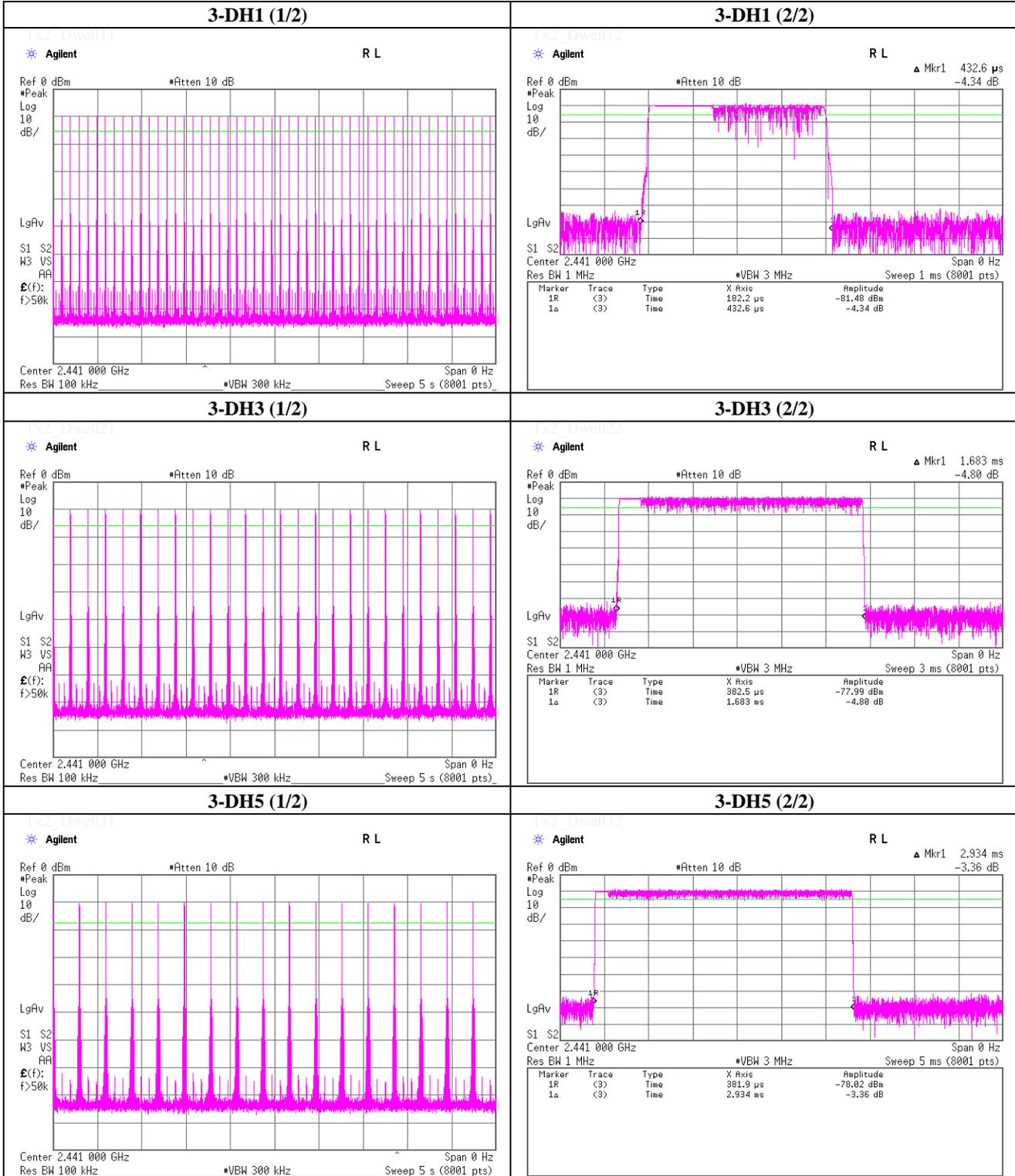
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## Dwell time

### Tx, Bluetooth, EDR, PRBS9



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## Maximum Peak Conducted Output Power (Conducted)

Test place                   UL Japan, Inc. Shonan EMC Lab.     No.5 Shielded Room  
 Date                         March 2, 2014  
 Temperature / Humidity    26 deg.C     , 35 %RH  
 Engineer                  Shinichi Takano  
 Mode                        Tx, Bluetooth

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

	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-10.57	0.76	10.04	0.23	1.05	20.97	125	20.74
DH5	2441.0	-9.59	0.77	10.04	1.22	1.32	20.97	125	19.75
DH5	2480.0	-10.35	0.78	10.04	0.47	1.11	20.97	125	20.50
2-DH5	2402.0	-9.18	0.76	10.04	1.62	1.45	20.97	125	19.35
2-DH5	2441.0	-8.57	0.77	10.04	2.24	1.67	20.97	125	18.73
2-DH5	2480.0	-9.21	0.78	10.04	1.61	1.45	20.97	125	19.36
3-DH5	2402.0	-8.97	0.76	10.04	1.83	1.52	20.97	125	19.14
3-DH5	2441.0	-8.11	0.77	10.04	2.70	1.86	20.97	125	18.27
3-DH5	2480.0	-8.81	0.78	10.04	2.01	1.59	20.97	125	18.96

Sample Calculation:

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

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## Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 27, 2014	March 28, 2014
Temperature / Humidity	20 deg.C, 40 %RH	22 deg.C, 35 %RH
Engineer	Tatsuya Arai	Akira Sato
Mode	Tx, 2402 MHz 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.	32.097	QP	29.3	17.5	7.0	31.8	22.0	40.0	18.0	300	153	
Hori.	163.259	QP	44.6	15.4	8.7	31.8	36.9	43.5	6.6	200	217	
Hori.	399.884	QP	39.6	16.2	7.6	31.9	31.5	46.0	14.5	100	102	
Hori.	480.010	QP	41.7	17.1	8.0	32.0	34.8	46.0	11.2	100	167	
Hori.	960.031	QP	40.6	21.6	10.0	30.9	41.3	53.9	12.6	117	214	
Hori.	1919.889	PK	50.5	25.8	13.8	41.0	49.1	73.9	24.8	100	0	
Hori.	2272.167	PK	46.7	27.0	14.2	40.9	47.0	73.9	26.9	100	357	
Hori.	2390.000	PK	47.1	27.5	14.3	40.9	48.0	73.9	25.9	127	223	
Hori.	2399.326	PK	47.5	27.5	14.3	40.9	48.4	73.9	25.5	127	223	
Hori.	2400.000	PK	49.0	27.5	14.3	40.9	49.9	73.9	24.0	127	223	
Hori.	2505.706	PK	47.8	27.9	14.4	40.9	49.2	73.9	24.7	100	195	
Hori.	2531.897	PK	48.2	28.0	14.4	40.9	49.7	73.9	24.2	100	30	
Hori.	2558.013	PK	47.4	28.0	14.4	40.9	48.9	73.9	25.0	100	351	
Hori.	4677.652	PK	47.7	30.2	7.2	41.9	43.2	73.9	30.7	100	4	
Hori.	4804.000	PK	50.3	30.9	7.3	41.7	46.8	73.9	27.1	131	200	
Hori.	7206.000	PK	47.3	36.6	8.6	41.5	51.0	73.9	22.9	100	0	
Hori.	9608.000	PK	45.7	39.1	9.6	40.4	54.0	73.9	19.9	100	0	
Hori.	12010.000	PK	47.2	39.9	10.8	39.7	58.2	73.9	15.7	100	0	
Hori.	1919.889	AV	41.0	25.8	13.8	41.0	39.6	53.9	14.3	100	0	
Hori.	2272.167	AV	34.1	27.0	14.2	40.9	34.4	53.9	19.5	100	357	
Hori.	2390.000	AV	32.3	27.5	14.3	40.9	33.2	53.9	20.7	127	223	
Hori.	2399.326	AV	35.9	27.5	14.3	40.9	36.8	53.9	17.1	127	223	
Hori.	2400.000	AV	36.3	27.5	14.3	40.9	37.2	53.9	16.7	127	223	
Hori.	2505.706	AV	35.1	27.9	14.4	40.9	36.5	53.9	17.4	100	195	
Hori.	2531.897	AV	36.8	28.0	14.4	40.9	38.3	53.9	15.6	100	30	
Hori.	2558.013	AV	35.1	28.0	14.4	40.9	36.6	53.9	17.3	100	351	
Hori.	4677.652	AV	36.8	30.2	7.2	41.9	32.3	53.9	21.6	100	4	
Hori.	4804.000	AV	42.7	30.9	7.3	41.7	39.2	53.9	14.7	131	200	
Hori.	7206.000	AV	35.6	36.6	8.6	41.5	39.3	53.9	14.6	100	0	
Hori.	9608.000	AV	32.9	39.1	9.6	40.4	41.2	53.9	12.7	100	0	
Hori.	12010.000	AV	32.5	39.9	10.8	39.7	43.5	53.9	10.4	100	0	
Vert.	33.884	QP	31.0	16.9	7.0	31.8	23.1	40.0	16.9	100	13	
Vert.	40.240	QP	30.0	14.7	7.1	31.8	20.0	40.0	20.0	100	352	
Vert.	960.031	QP	37.4	21.6	10.0	30.9	38.1	53.9	15.8	182	308	
Vert.	1920.176	PK	47.2	25.8	13.8	41.0	45.8	73.9	28.1	100	194	
Vert.	2272.248	PK	47.6	27.0	14.2	40.9	47.9	73.9	26.0	100	32	
Vert.	2390.000	PK	45.9	27.5	14.3	40.9	46.8	73.9	27.1	131	25	
Vert.	2399.340	PK	48.1	27.5	14.3	40.9	49.0	73.9	24.9	131	25	
Vert.	2400.000	PK	48.7	27.5	14.3	40.9	49.6	73.9	24.3	131	25	
Vert.	2506.000	PK	48.3	27.9	14.4	40.9	49.7	73.9	24.2	100	17	
Vert.	2532.124	PK	47.6	28.0	14.4	40.9	49.1	73.9	24.8	100	353	
Vert.	2557.862	PK	46.9	28.0	14.4	40.9	48.4	73.9	25.5	129	21	
Vert.	4677.623	PK	47.2	30.2	7.2	41.9	42.7	73.9	31.2	100	1	
Vert.	4804.000	PK	50.9	30.9	7.3	41.7	47.4	73.9	26.5	100	81	
Vert.	7206.000	PK	47.5	36.6	8.6	41.5	51.2	73.9	22.7	100	0	
Vert.	9608.000	PK	46.6	39.1	9.6	40.4	54.9	73.9	19.0	100	0	
Vert.	12010.000	PK	45.8	39.9	10.8	39.7	56.8	73.9	17.1	100	0	
Vert.	1920.176	AV	35.3	25.8	13.8	41.0	33.9	53.9	20.0	100	194	
Vert.	2272.248	AV	36.3	27.0	14.2	40.9	36.6	53.9	17.3	100	32	
Vert.	2390.000	AV	33.7	27.5	14.3	40.9	34.6	53.9	19.3	131	25	
Vert.	2399.340	AV	36.2	27.5	14.3	40.9	37.1	53.9	16.8	131	25	
Vert.	2400.000	AV	36.6	27.5	14.3	40.9	37.5	53.9	16.4	131	25	
Vert.	2506.000	AV	37.4	27.9	14.4	40.9	38.8	53.9	15.1	100	17	
Vert.	2532.124	AV	36.0	28.0	14.4	40.9	37.5	53.9	16.4	100	353	
Vert.	2557.862	AV	36.8	28.0	14.4	40.9	38.3	53.9	15.6	129	21	
Vert.	4677.623	AV	36.2	30.2	7.2	41.9	31.7	53.9	22.2	100	1	
Vert.	4804.000	AV	43.0	30.9	7.3	41.7	39.5	53.9	14.4	100	81	
Vert.	7206.000	AV	35.5	36.6	8.6	41.5	39.2	53.9	14.7	100	0	
Vert.	9608.000	AV	34.2	39.1	9.6	40.4	42.5	53.9	11.4	100	0	
Vert.	12010.000	AV	32.8	39.9	10.8	39.7	43.8	53.9	10.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amp/Prif)  
 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	March 27, 2014	March 28, 2014
Temperature / Humidity	20 deg.C, 40 %RH	22 deg.C, 35 %RH
Engineer	Tatsuya Arai	Akira Sato
Mode	Tx, 2441 MHz 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.	32.157	QP	28.9	17.5	7.0	31.8	21.6	40.0	18.4	300	135	
Hori.	159.144	QP	45.0	15.2	8.7	31.8	37.1	43.5	6.4	200	214	
Hori.	166.391	QP	45.4	15.5	8.8	31.8	37.9	43.5	5.6	200	213	
Hori.	399.846	QP	39.4	16.2	7.6	31.9	31.3	46.0	14.7	100	102	
Hori.	480.011	QP	41.9	17.1	8.0	32.0	35.0	46.0	11.0	100	164	
Hori.	960.035	QP	40.6	21.6	10.0	30.9	41.3	53.9	12.6	116	213	
Hori.	1920.209	PK	50.4	25.8	13.8	41.0	49.0	73.9	24.9	149	2	
Hori.	2310.807	PK	46.9	27.2	14.2	40.9	47.4	73.9	26.5	100	357	
Hori.	2545.029	PK	47.5	28.0	14.4	40.9	49.0	73.9	24.9	100	150	
Hori.	2570.891	PK	47.4	28.0	14.5	40.9	49.0	73.9	24.9	100	351	
Hori.	4677.363	PK	47.4	30.2	7.2	41.9	42.9	73.9	31.0	100	187	
Hori.	4882.000	PK	49.4	31.4	7.3	41.6	46.5	73.9	27.4	146	246	
Hori.	7323.000	PK	47.1	36.7	8.6	41.5	50.9	73.9	23.0	100	0	
Hori.	9764.000	PK	45.9	39.0	9.5	40.4	54.0	73.9	19.9	100	0	
Hori.	12205.000	PK	46.4	39.9	10.8	39.7	57.4	73.9	16.5	100	0	
Hori.	1920.209	AV	41.0	25.8	13.8	41.0	39.6	53.9	14.3	149	2	
Hori.	2310.807	AV	35.1	27.2	14.2	40.9	35.6	53.9	18.3	100	357	
Hori.	2545.029	AV	35.1	28.0	14.4	40.9	36.6	53.9	17.3	100	150	
Hori.	2570.891	AV	36.0	28.0	14.5	40.9	37.6	53.9	16.3	100	351	
Hori.	4677.363	AV	38.0	30.2	7.2	41.9	33.5	53.9	20.4	100	187	
Hori.	4882.000	AV	39.5	31.4	7.3	41.6	36.6	53.9	17.3	146	246	
Hori.	7323.000	AV	35.0	36.7	8.6	41.5	38.8	53.9	15.1	100	0	
Hori.	9764.000	AV	33.9	39.0	9.5	40.4	42.0	53.9	11.9	100	0	
Hori.	12205.000	AV	33.9	39.9	10.8	39.7	44.9	53.9	9.0	100	0	
Vert.	40.243	QP	30.0	14.7	7.1	31.8	20.0	40.0	20.0	100	355	
Vert.	44.247	QP	31.6	12.9	7.3	31.8	20.0	40.0	20.0	100	265	
Vert.	960.035	QP	37.4	21.6	10.0	30.9	38.1	53.9	15.8	189	308	
Vert.	1920.058	PK	48.0	25.8	13.8	41.0	46.6	73.9	27.3	149	23	
Vert.	2311.151	PK	47.2	27.2	14.2	40.9	47.7	73.9	26.2	100	73	
Vert.	2544.500	PK	47.5	28.0	14.4	40.9	49.0	73.9	24.9	157	17	
Vert.	2570.941	PK	47.0	28.0	14.5	40.9	48.6	73.9	25.3	100	356	
Vert.	4677.705	PK	47.7	30.2	7.2	41.9	43.2	73.9	30.7	100	347	
Vert.	4882.000	PK	50.9	31.4	7.3	41.6	48.0	73.9	25.9	171	86	
Vert.	7323.000	PK	47.0	36.7	8.6	41.5	50.8	73.9	23.1	100	0	
Vert.	9764.000	PK	46.1	39.0	9.5	40.4	54.2	73.9	19.7	100	0	
Vert.	12205.000	PK	45.9	39.9	10.8	39.7	56.9	73.9	17.0	100	0	
Vert.	1920.058	AV	37.3	25.8	13.8	41.0	35.9	53.9	18.0	149	23	
Vert.	2311.151	AV	35.7	27.2	14.2	40.9	36.2	53.9	17.7	100	73	
Vert.	2544.500	AV	36.5	28.0	14.4	40.9	38.0	53.9	15.9	157	17	
Vert.	2570.941	AV	34.9	28.0	14.5	40.9	36.5	53.9	17.4	100	356	
Vert.	4677.705	AV	37.5	30.2	7.2	41.9	33.0	53.9	20.9	100	347	
Vert.	4882.000	AV	42.7	31.4	7.3	41.6	39.8	53.9	14.1	171	86	
Vert.	7323.000	AV	35.1	36.7	8.6	41.5	38.9	53.9	15.0	100	0	
Vert.	9764.000	AV	33.9	39.0	9.5	40.4	42.0	53.9	11.9	100	0	
Vert.	12205.000	AV	33.8	39.9	10.8	39.7	44.8	53.9	9.1	100	0	

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

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

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## Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 27, 2014	March 28, 2014
Temperature / Humidity	20 deg.C, 40 %RH	22 deg.C, 35 %RH
Engineer	Tatsuya Arai	Akira Sato
Mode	Tx, 2480 MHz 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.	32.569	QP	28.7	17.3	7.0	31.8	21.2	40.0	18.8	300	148	
Hori.	158.652	QP	45.6	15.2	8.7	31.8	37.7	43.5	5.8	200	215	
Hori.	162.771	QP	45.0	15.4	8.7	31.8	37.3	43.5	6.2	200	217	
Hori.	399.855	QP	39.9	16.2	7.6	31.9	31.8	46.0	14.2	100	100	
Hori.	480.011	QP	41.9	17.1	8.0	32.0	35.0	46.0	11.0	100	165	
Hori.	960.033	QP	40.7	21.6	10.0	30.9	41.4	53.9	12.5	116	215	
Hori.	1920.045	PK	50.1	25.8	13.8	41.0	48.7	73.9	25.2	100	354	
Hori.	2350.207	PK	47.0	27.3	14.2	40.9	47.6	73.9	26.3	100	45	
Hori.	2483.500	PK	46.4	27.8	14.4	40.9	47.7	73.9	26.2	100	65	
Hori.	2583.750	PK	49.1	28.0	14.5	40.9	50.7	73.9	23.2	100	60	
Hori.	2609.919	PK	48.9	28.1	14.5	40.9	50.6	73.9	23.3	100	357	
Hori.	2635.988	PK	47.8	28.1	14.5	41.0	49.4	73.9	24.5	100	45	
Hori.	4960.000	PK	47.3	31.8	7.3	41.5	44.9	73.9	29.0	100	246	
Hori.	7440.000	PK	46.2	36.8	8.7	41.4	50.3	73.9	23.6	100	0	
Hori.	9920.000	PK	45.0	38.9	9.5	40.4	53.0	73.9	20.9	100	0	
Hori.	12400.000	PK	43.6	40.0	10.7	39.7	54.6	73.9	19.3	100	0	
Hori.	1920.045	AV	40.7	25.8	13.8	41.0	39.3	53.9	14.6	100	354	
Hori.	2350.207	AV	34.5	27.3	14.2	40.9	35.1	53.9	18.8	100	45	
Hori.	2483.500	AV	34.2	27.8	14.4	40.9	35.5	53.9	18.4	100	65	
Hori.	2583.750	AV	40.1	28.0	14.5	40.9	41.7	53.9	12.2	100	60	
Hori.	2609.919	AV	37.3	28.1	14.5	40.9	39.0	53.9	14.9	100	357	
Hori.	2635.988	AV	36.8	28.1	14.5	41.0	38.4	53.9	15.5	100	45	
Hori.	4960.000	AV	34.6	31.8	7.3	41.5	32.2	53.9	21.7	100	246	
Hori.	7440.000	AV	35.0	36.8	8.7	41.4	39.1	53.9	14.8	100	0	
Hori.	9920.000	AV	33.3	38.9	9.5	40.4	41.3	53.9	12.6	100	0	
Hori.	12400.000	AV	32.4	40.0	10.7	39.7	43.4	53.9	10.5	100	0	
Vert.	40.236	QP	30.0	14.7	7.1	31.8	20.0	40.0	20.0	100	354	
Vert.	44.758	QP	31.8	12.7	7.3	31.8	20.0	40.0	20.0	100	337	
Vert.	960.034	QP	37.3	21.6	10.0	30.9	38.0	53.9	15.9	187	310	
Vert.	1920.162	PK	46.8	25.8	13.8	41.0	45.4	73.9	28.5	100	3	
Vert.	2350.192	PK	47.9	27.3	14.2	40.9	48.5	73.9	25.4	100	354	
Vert.	2483.500	PK	48.0	27.8	14.4	40.9	49.3	73.9	24.6	100	23	
Vert.	2584.008	PK	48.1	28.0	14.5	40.9	49.7	73.9	24.2	141	235	
Vert.	2609.973	PK	47.7	28.1	14.5	40.9	49.4	73.9	24.5	119	15	
Vert.	2635.748	PK	47.8	28.1	14.5	41.0	49.4	73.9	24.5	100	267	
Vert.	4960.000	PK	50.4	31.8	7.3	41.5	48.0	73.9	25.9	100	85	
Vert.	7440.000	PK	47.0	36.8	8.7	41.4	51.1	73.9	22.8	100	0	
Vert.	9920.000	PK	44.4	38.9	9.5	40.4	52.4	73.9	21.5	100	0	
Vert.	12400.000	PK	44.2	40.0	10.7	39.7	55.2	73.9	18.7	100	0	
Vert.	1920.162	AV	35.8	25.8	13.8	41.0	34.4	53.9	19.5	100	3	
Vert.	2350.192	AV	37.5	27.3	14.2	40.9	38.1	53.9	15.8	100	354	
Vert.	2483.500	AV	32.5	27.8	14.4	40.9	33.8	53.9	20.1	100	23	
Vert.	2584.008	AV	37.9	28.0	14.5	40.9	39.5	53.9	14.4	141	235	
Vert.	2609.973	AV	38.8	28.1	14.5	40.9	40.5	53.9	13.4	119	15	
Vert.	2635.748	AV	35.7	28.1	14.5	41.0	37.3	53.9	16.6	100	267	
Vert.	4960.000	AV	42.4	31.8	7.3	41.5	40.0	53.9	13.9	100	85	
Vert.	7440.000	AV	35.0	36.8	8.7	41.4	39.1	53.9	14.8	100	0	
Vert.	9920.000	AV	33.2	38.9	9.5	40.4	41.2	53.9	12.7	100	0	
Vert.	12400.000	AV	32.5	40.0	10.7	39.7	43.5	53.9	10.4	100	0	

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

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

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## Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 27, 2014	March 28, 2014
Temperature / Humidity	20 deg.C, 40 %RH	22 deg.C, 35 %RH
Engineer	Tatsuya Arai	Akira Sato
Mode	Tx, 2402 MHz 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.	32.151	QP	28.8	17.5	7.0	31.8	21.5	40.0	18.5	310	147	
Hori.	158.669	QP	45.7	15.2	8.7	31.8	37.8	43.5	5.7	200	220	
Hori.	162.281	QP	45.3	15.4	8.7	31.8	37.6	43.5	5.9	199	208	
Hori.	399.844	QP	39.7	16.2	7.6	31.9	31.6	46.0	14.4	100	102	
Hori.	480.012	QP	42.0	17.1	8.0	32.0	35.1	46.0	10.9	100	170	
Hori.	960.042	QP	40.6	21.6	10.0	30.9	41.3	53.9	12.6	115	216	
Hori.	1919.871	PK	50.1	25.8	13.8	41.0	48.7	73.9	25.2	100	1	
Hori.	2390.000	PK	46.2	27.5	14.3	40.9	47.1	73.9	26.8	106	41	
Hori.	2400.000	PK	52.2	27.5	14.3	40.9	53.1	73.9	20.8	106	41	
Hori.	4677.641	PK	49.3	30.2	7.2	41.9	44.8	73.9	29.1	100	2	
Hori.	4804.000	PK	48.8	30.9	7.3	41.7	45.3	73.9	28.6	100	357	
Hori.	7206.000	PK	48.8	36.6	8.6	41.5	52.5	73.9	21.4	100	0	
Hori.	9608.000	PK	46.2	39.1	9.6	40.4	54.5	73.9	19.4	100	0	
Hori.	12010.000	PK	45.8	39.9	10.8	39.7	56.8	73.9	17.1	100	0	
Hori.	1919.871	AV	41.0	25.8	13.8	41.0	39.6	53.9	14.3	100	1	
Hori.	2390.000	AV	33.5	27.5	14.3	40.9	34.4	53.9	19.5	106	41	
Hori.	2400.000	AV	36.9	27.5	14.3	40.9	37.8	53.9	16.1	106	41	
Hori.	4677.641	AV	37.2	30.2	7.2	41.9	32.7	53.9	21.2	100	2	
Hori.	4804.000	AV	36.3	30.9	7.3	41.7	32.8	53.9	21.1	100	357	
Hori.	7206.000	AV	35.5	36.6	8.6	41.5	39.2	53.9	14.7	100	0	
Hori.	9608.000	AV	34.3	39.1	9.6	40.4	42.6	53.9	11.3	100	0	
Hori.	12010.000	AV	34.5	39.9	10.8	39.7	45.5	53.9	8.4	100	0	
Vert.	33.873	QP	30.7	16.9	7.0	31.8	22.8	40.0	17.2	100	11	
Vert.	44.762	QP	31.9	12.7	7.3	31.8	20.1	40.0	19.9	100	331	
Vert.	960.039	QP	37.3	21.6	10.0	30.9	38.0	53.9	15.9	182	308	
Vert.	1920.007	PK	47.2	25.8	13.8	41.0	45.8	73.9	28.1	149	357	
Vert.	2390.000	PK	45.6	27.5	14.3	40.9	46.5	73.9	27.4	100	17	
Vert.	2400.000	PK	52.5	27.5	14.3	40.9	53.4	73.9	20.5	100	17	
Vert.	4677.479	PK	48.1	30.2	7.2	41.9	43.6	73.9	30.3	100	358	
Vert.	4804.000	PK	49.0	30.9	7.3	41.7	45.5	73.9	28.4	100	59	
Vert.	7206.000	PK	46.6	36.6	8.6	41.5	50.3	73.9	23.6	100	0	
Vert.	9608.000	PK	45.5	39.1	9.6	40.4	53.8	73.9	20.1	100	0	
Vert.	12010.000	PK	45.5	39.9	10.8	39.7	56.5	73.9	17.4	100	0	
Vert.	1920.007	AV	36.7	25.8	13.8	41.0	35.3	53.9	18.6	149	357	
Vert.	2390.000	AV	33.4	27.5	14.3	40.9	34.3	53.9	19.6	100	17	
Vert.	2400.000	AV	37.8	27.5	14.3	40.9	38.7	53.9	15.2	100	17	
Vert.	4677.479	AV	36.8	30.2	7.2	41.9	32.3	53.9	21.6	100	358	
Vert.	4804.000	AV	39.2	30.9	7.3	41.7	35.7	53.9	18.2	100	59	
Vert.	7206.000	AV	35.4	36.6	8.6	41.5	39.1	53.9	14.8	100	0	
Vert.	9608.000	AV	34.0	39.1	9.6	40.4	42.3	53.9	11.6	100	0	
Vert.	12010.000	AV	34.2	39.9	10.8	39.7	45.2	53.9	8.7	100	0	

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

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

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## Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 27, 2014	March 28, 2014
Temperature / Humidity	20 deg.C, 40 %RH	22 deg.C, 35 %RH
Engineer	Tatsuya Arai	Akira Sato
Mode	Tx, 2441 MHz 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.	32.140	QP	28.6	17.5	7.0	31.8	21.3	40.0	18.7	300	144	
Hori.	158.666	QP	45.3	15.2	8.7	31.8	37.4	43.5	6.1	200	215	
Hori.	166.382	QP	45.0	15.5	8.8	31.8	37.5	43.5	6.0	199	210	
Hori.	399.840	QP	39.4	16.2	7.6	31.9	31.3	46.0	14.7	100	88	
Hori.	480.013	QP	41.9	17.1	8.0	32.0	35.0	46.0	11.0	100	174	
Hori.	960.039	QP	40.3	21.6	10.0	30.9	41.0	53.9	12.9	115	215	
Hori.	1920.418	PK	49.6	25.8	13.8	41.0	48.2	73.9	25.7	100	4	
Hori.	4677.404	PK	50.5	30.2	7.2	41.9	46.0	73.9	27.9	100	345	
Hori.	4882.000	PK	49.4	31.4	7.3	41.6	46.5	73.9	27.4	138	5	
Hori.	7323.000	PK	47.9	36.7	8.6	41.5	51.7	73.9	22.2	100	0	
Hori.	9764.000	PK	47.1	39.0	9.5	40.4	55.2	73.9	18.7	100	0	
Hori.	12205.000	PK	46.4	39.9	10.8	39.7	57.4	73.9	16.5	100	0	
Hori.	1920.418	AV	40.0	25.8	13.8	41.0	38.6	53.9	15.3	100	4	
Hori.	4677.404	AV	38.9	30.2	7.2	41.9	34.4	53.9	19.5	100	345	
Hori.	4882.000	AV	35.7	31.4	7.3	41.6	32.8	53.9	21.1	138	5	
Hori.	7323.000	AV	34.5	36.7	8.6	41.5	38.3	53.9	15.6	100	0	
Hori.	9764.000	AV	33.8	39.0	9.5	40.4	41.9	53.9	12.0	100	0	
Hori.	12205.000	AV	33.3	39.9	10.8	39.7	44.3	53.9	9.6	100	0	
Vert.	40.689	QP	29.2	14.5	7.1	31.8	19.0	40.0	21.0	100	2	
Vert.	44.745	QP	31.7	12.7	7.3	31.8	19.9	40.0	20.1	100	327	
Vert.	960.026	QP	37.0	21.6	10.0	30.9	37.7	53.9	16.2	183	307	
Vert.	1920.193	PK	46.8	25.8	13.8	41.0	45.4	73.9	28.5	100	359	
Vert.	4677.649	PK	47.9	30.2	7.2	41.9	43.4	73.9	30.5	100	357	
Vert.	4882.000	PK	48.6	31.4	7.3	41.6	45.7	73.9	28.2	100	219	
Vert.	7323.000	PK	48.0	36.7	8.6	41.5	51.8	73.9	22.1	100	0	
Vert.	9764.000	PK	46.7	39.0	9.5	40.4	54.8	73.9	19.1	100	0	
Vert.	12205.000	PK	46.8	39.9	10.8	39.7	57.8	73.9	16.1	100	0	
Vert.	1920.193	AV	35.8	25.8	13.8	41.0	34.4	53.9	19.5	100	359	
Vert.	4677.649	AV	37.2	30.2	7.2	41.9	32.7	53.9	21.2	100	357	
Vert.	4882.000	AV	37.2	31.4	7.3	41.6	34.3	53.9	19.6	100	219	
Vert.	7323.000	AV	35.0	36.7	8.6	41.5	38.8	53.9	15.1	100	0	
Vert.	9764.000	AV	33.7	39.0	9.5	40.4	41.8	53.9	12.1	100	0	
Vert.	12205.000	AV	33.7	39.9	10.8	39.7	44.7	53.9	9.2	100	0	

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

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

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## Radiated Emission

Test place	No.1 Semi Anechoic Chamber	No.2 Semi Anechoic Chamber
Date	March 27, 2014	March 28, 2014
Temperature / Humidity	20 deg.C, 40 %RH	22 deg.C, 35 %RH
Engineer	Tatsuya Arai	Akira Sato
Mode	Tx, 2480 MHz 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.	32.571	QP	28.8	17.3	7.0	31.8	21.3	40.0	18.7	300	150	
Hori.	158.661	QP	45.5	15.2	8.7	31.8	37.6	43.5	5.9	200	211	
Hori.	166.374	QP	44.9	15.5	8.8	31.8	37.4	43.5	6.1	200	221	
Hori.	399.850	QP	39.6	16.2	7.6	31.9	31.5	46.0	14.5	100	106	
Hori.	480.013	QP	41.9	17.1	8.0	32.0	35.0	46.0	11.0	100	170	
Hori.	960.037	QP	40.3	21.6	10.0	30.9	41.0	53.9	12.9	115	214	
Hori.	1920.182	PK	50.3	25.8	13.8	41.0	48.9	73.9	25.0	100	346	
Hori.	2483.500	PK	45.5	27.8	14.4	40.9	46.8	73.9	27.1	100	101	
Hori.	2610.084	PK	48.6	28.1	14.5	40.9	50.3	73.9	23.6	100	85	
Hori.	4677.426	PK	48.4	30.2	7.2	41.9	43.9	73.9	30.0	100	356	
Hori.	4960.000	PK	47.1	31.8	7.3	41.5	44.7	73.9	29.2	100	29	
Hori.	7440.000	PK	44.4	36.8	8.7	41.4	48.5	73.9	25.4	100	0	
Hori.	9920.000	PK	44.7	38.9	9.5	40.4	52.7	73.9	21.2	100	0	
Hori.	12400.000	PK	44.8	40.0	10.7	39.7	55.8	73.9	18.1	100	0	
Hori.	1920.182	AV	42.5	25.8	13.8	41.0	41.1	53.9	12.8	100	346	
Hori.	2483.500	AV	33.7	27.8	14.4	40.9	35.0	53.9	18.9	100	101	
Hori.	2610.084	AV	38.8	28.1	14.5	40.9	40.5	53.9	13.4	100	85	
Hori.	4677.426	AV	37.7	30.2	7.2	41.9	33.2	53.9	20.7	100	356	
Hori.	4960.000	AV	34.2	31.8	7.3	41.5	31.8	53.9	22.1	100	29	
Hori.	7440.000	AV	35.1	36.8	8.7	41.4	39.2	53.9	14.7	100	0	
Hori.	9920.000	AV	33.0	38.9	9.5	40.4	41.0	53.9	12.9	100	0	
Hori.	12400.000	AV	32.4	40.0	10.7	39.7	43.4	53.9	10.5	100	0	
Vert.	40.246	QP	29.4	14.7	7.1	31.8	19.4	40.0	20.6	100	349	
Vert.	44.789	QP	31.6	12.7	7.3	31.8	19.8	40.0	20.2	100	271	
Vert.	960.037	QP	37.1	21.6	10.0	30.9	37.8	53.9	16.1	183	304	
Vert.	1920.356	PK	47.3	25.8	13.8	41.0	45.9	73.9	28.0	137	41	
Vert.	2483.500	PK	44.9	27.8	14.4	40.9	46.2	73.9	27.7	117	20	
Vert.	2609.828	PK	47.0	28.1	14.5	40.9	48.7	73.9	25.2	100	350	
Vert.	4677.514	PK	49.2	30.2	7.2	41.9	44.7	73.9	29.2	100	265	
Vert.	4960.000	PK	49.0	31.8	7.3	41.5	46.6	73.9	27.3	100	200	
Vert.	7440.000	PK	46.5	36.8	8.7	41.4	50.6	73.9	23.3	100	0	
Vert.	9920.000	PK	43.7	38.9	9.5	40.4	51.7	73.9	22.2	100	0	
Vert.	12400.000	PK	43.7	40.0	10.7	39.7	54.7	73.9	19.2	100	0	
Vert.	1920.356	AV	38.1	25.8	13.8	41.0	36.7	53.9	17.2	137	41	
Vert.	2483.500	AV	33.6	27.8	14.4	40.9	34.9	53.9	19.0	117	20	
Vert.	2609.828	AV	35.4	28.1	14.5	40.9	37.1	53.9	16.8	100	350	
Vert.	4677.514	AV	38.2	30.2	7.2	41.9	33.7	53.9	20.2	100	265	
Vert.	4960.000	AV	38.1	31.8	7.3	41.5	35.7	53.9	18.2	100	200	
Vert.	7440.000	AV	35.0	36.8	8.7	41.4	39.1	53.9	14.8	100	0	
Vert.	9920.000	AV	33.2	38.9	9.5	40.4	41.2	53.9	12.7	100	0	
Vert.	12400.000	AV	32.4	40.0	10.7	39.7	43.4	53.9	10.5	100	0	

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

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

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

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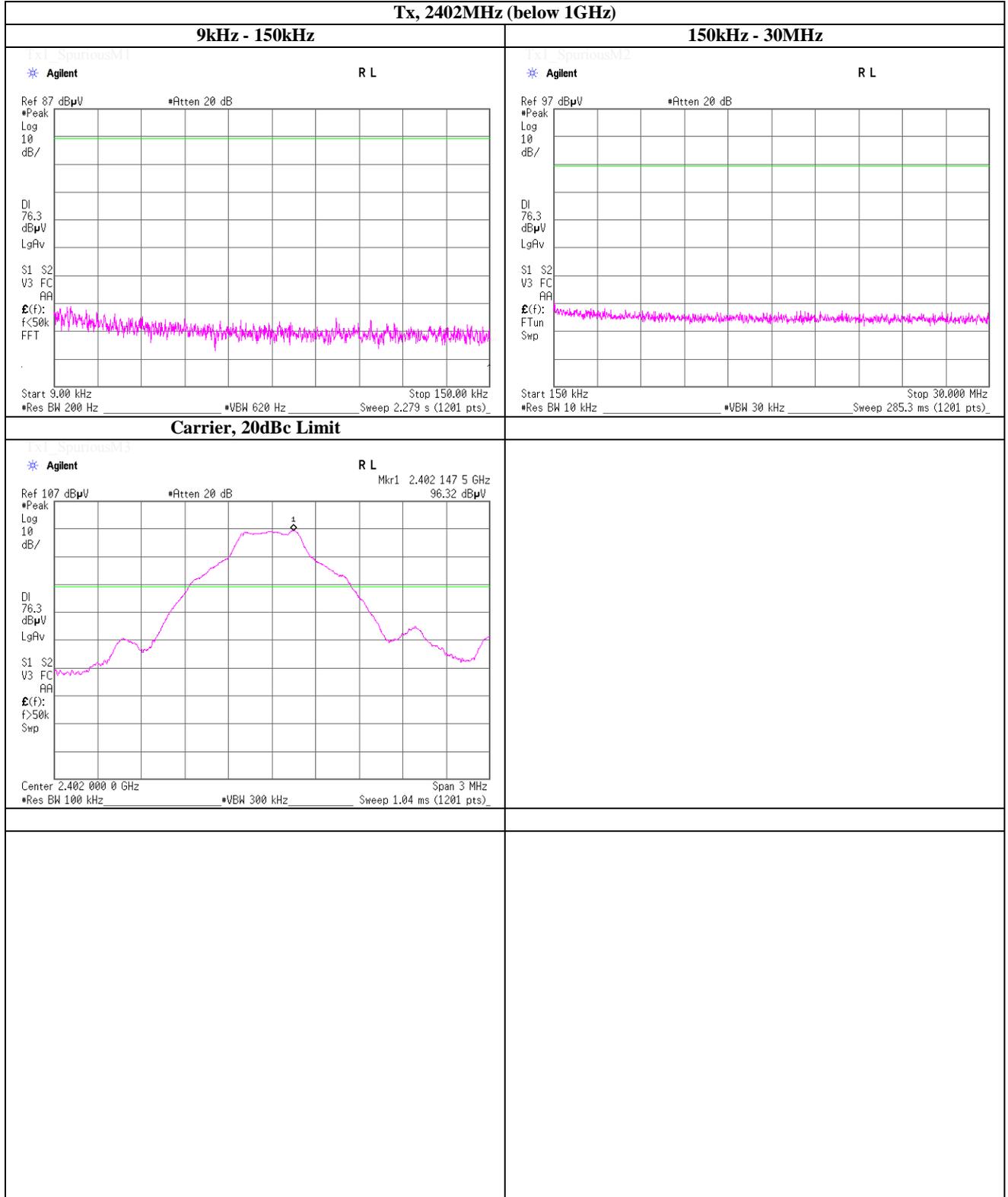
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
 Date March 2, 2014  
 Temperature / Humidity 26 deg.C , 35 %RH  
 Engineer Shinichi Takano

### Spurious emission (Conducted)

**Tx, Bluetooth, BDR, PRBS9**

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



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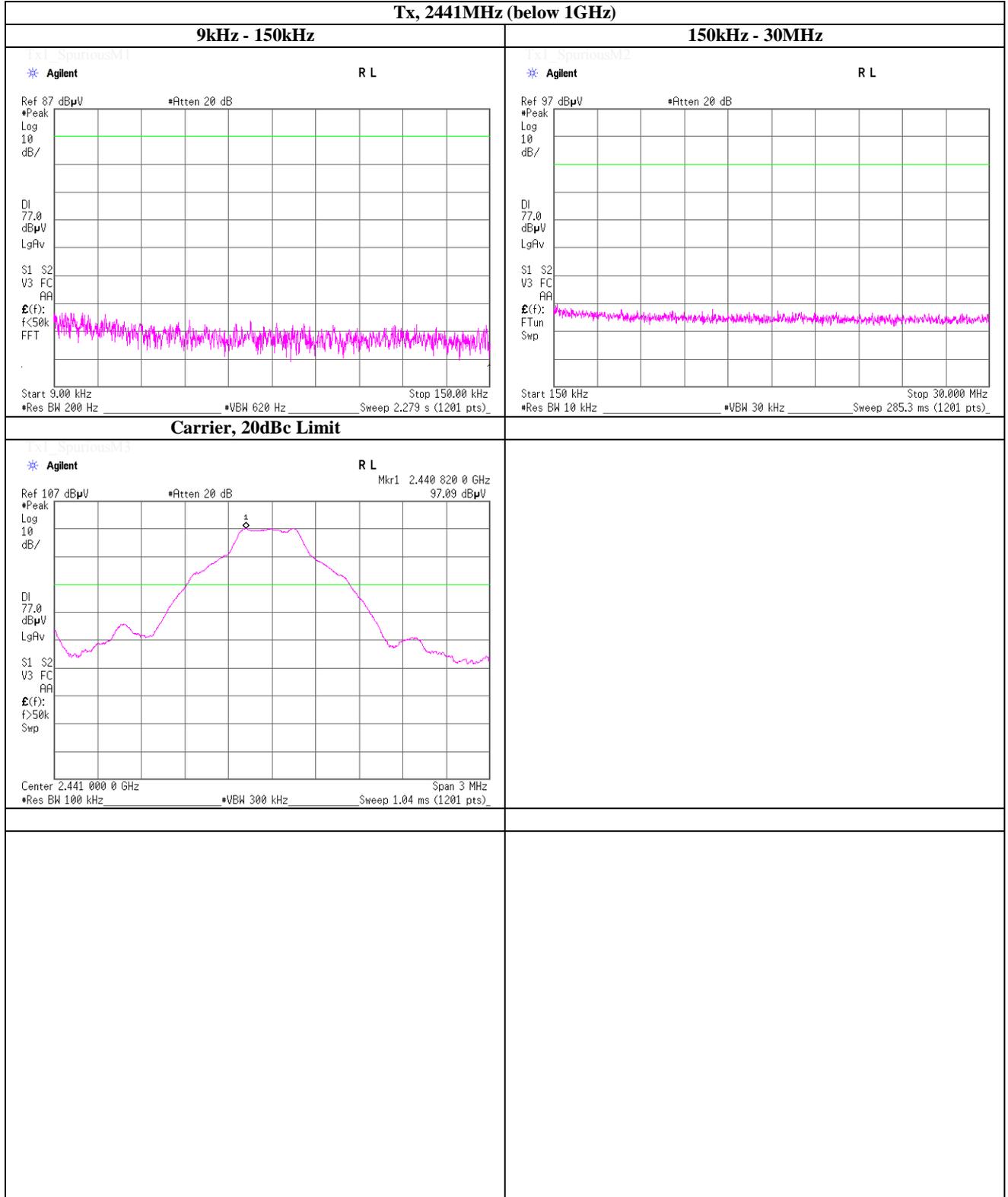
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
 Date March 2, 2014  
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 Engineer Shinichi Takano

### Spurious emission (Conducted)

**Tx, Bluetooth, BDR, PRBS9**

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



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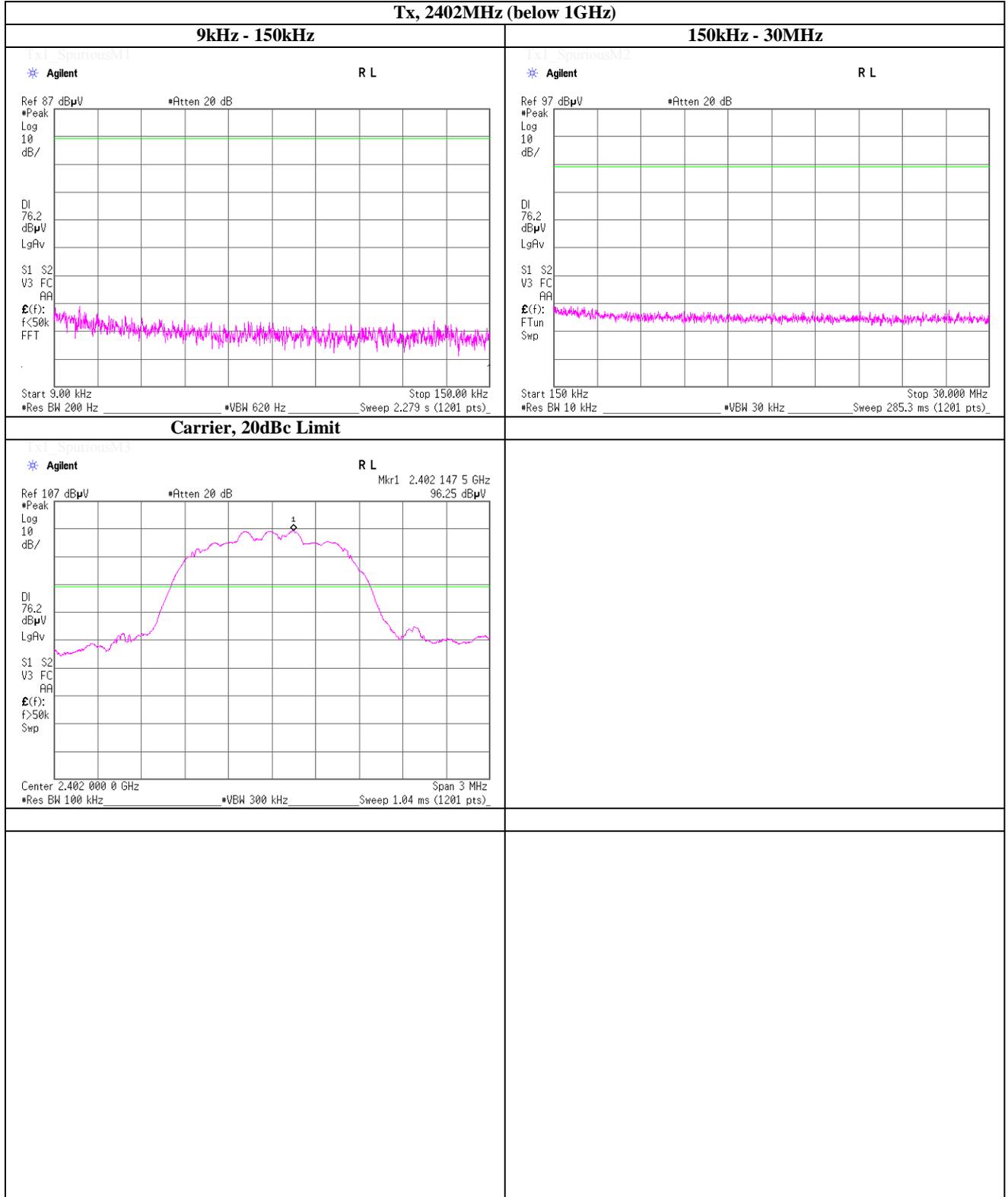


Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
 Date March 2, 2014  
 Temperature / Humidity 26 deg.C , 35 %RH  
 Engineer Shinichi Takano

### Spurious emission (Conducted)

**Tx, Bluetooth, EDR, PRBS9**

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



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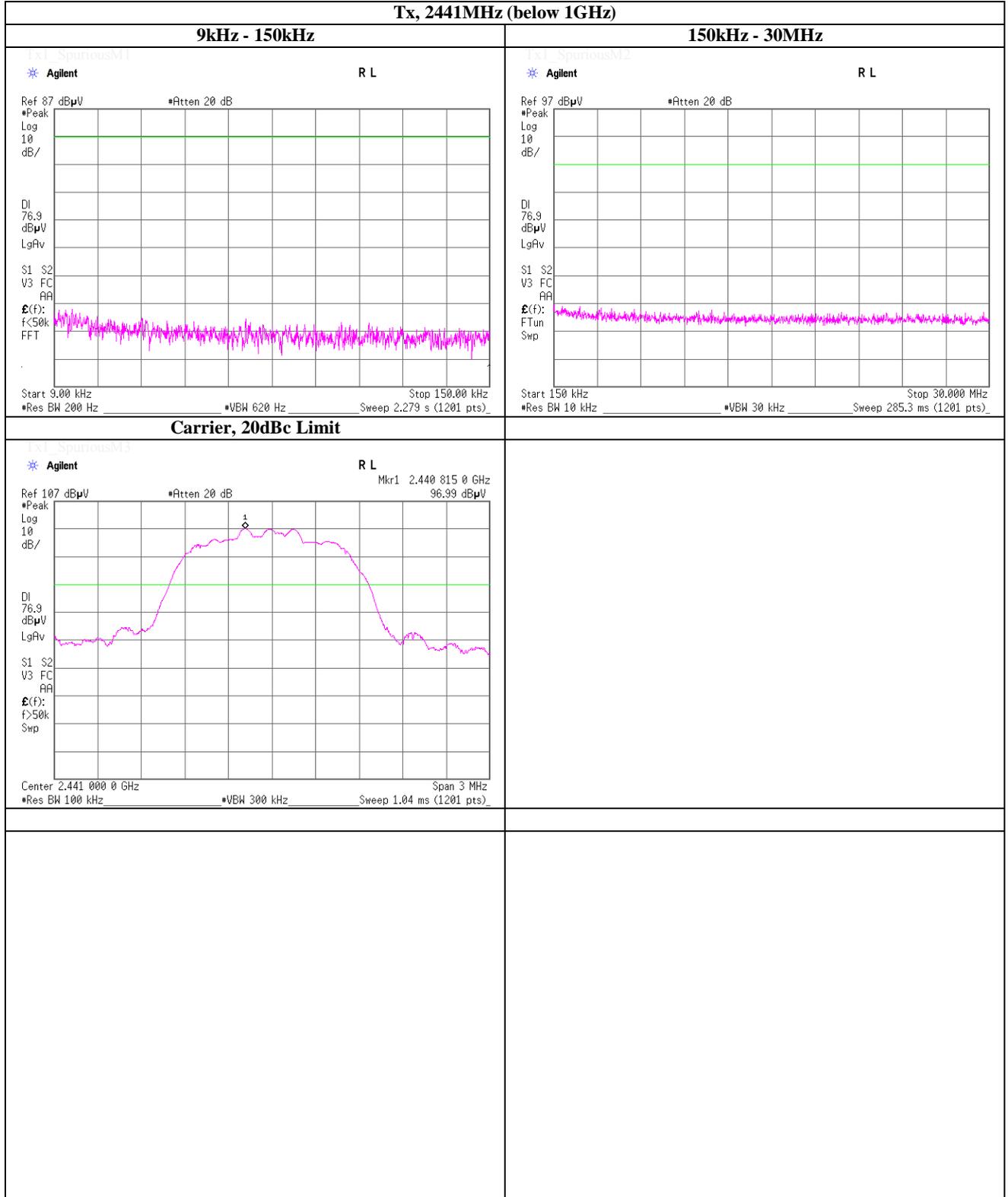
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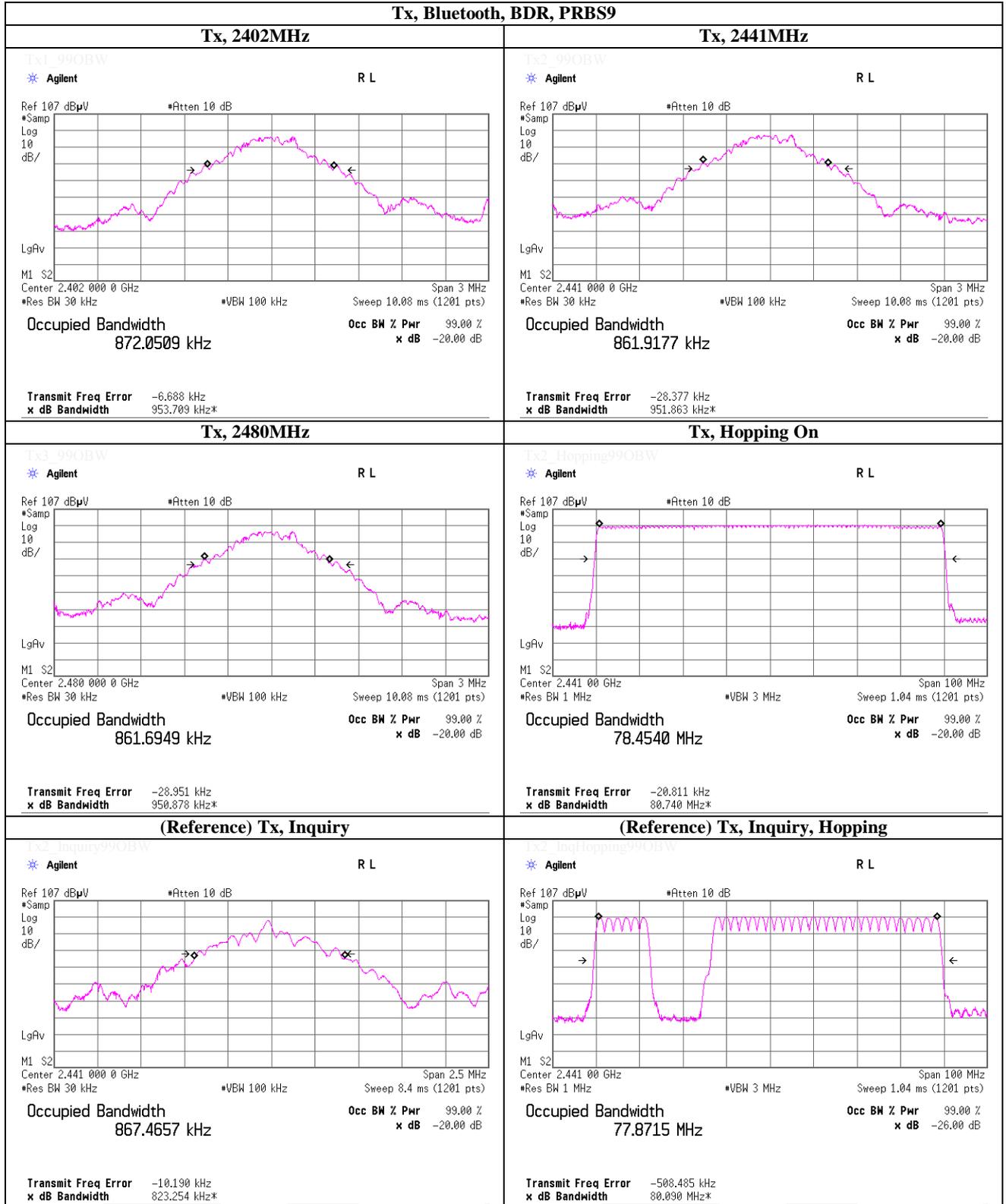
Telephone : +81 463 50 6400

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Test place           UL Japan, Inc. Shonan EMC Lab.    No.5 Shielded Room  
 Date                 March 2, 2014  
 Temperature / Humidity   26 deg.C     , 35 %RH  
 Engineer             Shinichi Takano

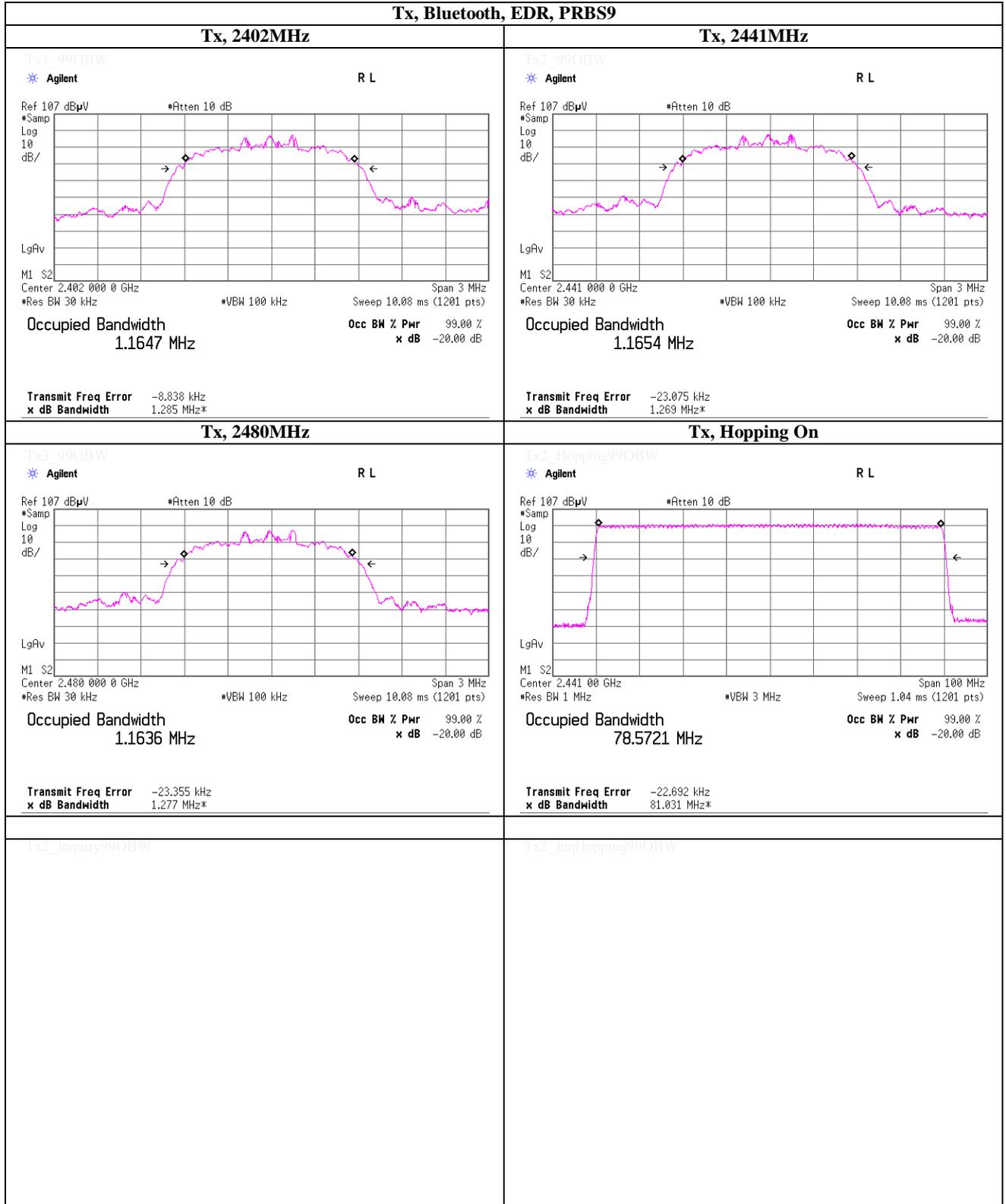
### 99% Occupied Bandwidth



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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
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### 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)
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2014/02/17 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2013/12/26 * 12
KAT3-09	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2013/08/23 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2013/10/13 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2013/04/04 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2013/10/26 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2014/02/21 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2013/11/20 * 12
SJM-08	Measure	PROMART	SEN1935	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2013/07/03 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,IMF)	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2013/07/06 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2014/03/14 * 12
SCC-G02	Coaxial Cable	Suhner	SUCOFLEX 104A	46498/4A	RE	2013/04/09 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2013/05/22 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2013/08/12 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2014/02/21 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2014/03/17 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2014/03/14 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2014/03/13 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2014/03/04 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2014/03/13 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2013/04/09 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/03/07 * 12

The expiration date of the calibration is the end of the expired month .  
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

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

Test Item :

- CE: Conducted emission ,
- RE: Radiated emission ,
- AT: Antenna terminal conducted tests