



# RADIO TEST REPORT

Test Report No. : 11485102S-A

**Applicant** : Sony Corporation  
**Type of Equipment** : Wireless Noise Canceling Stereo Headset  
**Model No.** : MDR-XB950N1  
**FCC ID** : AK8XB950N1  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

**Date of test:** October 25 to 27, 2016

**Representative test engineer:**

Yosuke Ishikawa  
Engineer  
Consumer Technology Division

**Approved by:**

Toyokazu Imamura  
Leader  
Consumer Technology Division



- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
 There is no testing item of "Non-accreditation".

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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN  
Telephone : +81 463 50 6400  
Facsimile : +81 463 50 6401

13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : Sony Corporation  
Address : 1-7-1 Konan Minato-ku, Tokyo, 108-0075 Japan  
Telephone Number : +604-3835333  
Contact Person : Wan Nurfazwina binti Mat Soti

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

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

Type of Equipment : Wireless Noise Canceling Stereo Headset  
Model No. : MDR-XB950N1  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.65 V: Built-in lithium-ion rechargeable battery  
DC 5 V: When charged using USB  
Receipt Date of Sample : October 7, 2016  
Country of Mass-production : Malaysia  
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: MDR-XB950N1 (referred to as the EUT in this report) is a Wireless Noise Canceling Stereo Headset.

The clock frequencies used in the EUT: 26 MHz

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : FHSS, GFSK  
Power Supply (radio part input) : DC 1.35 V  
Antenna type : Chip  
Antenna Gain : 2.03 dBi

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC part 15 final revised on April 6, 2016  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report: 11485102S-E.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	-	-	N/A *1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10		9.2 dB 2483.500 MHz, AV, Horizontal, Tx 2480 MHz DH5	Complied

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

\*1) The EUT operates with a battery. AC Line can be connected to the EUT via PC; however, the EUT stops transmission during recharging. Therefore, the test is not applicable to the EUT.

\*2) Radiated test was selected over 30 MHz based on section 15.247(d).

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

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

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

#### **FCC Part 15.203**

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

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**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

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

### 3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k = 2$ .  
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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 dB	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

#### Radiated emission test

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

### 3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.  
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN  
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401  
JAB Accreditation No. RTL02610

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

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

Refer to APPENDIX.

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

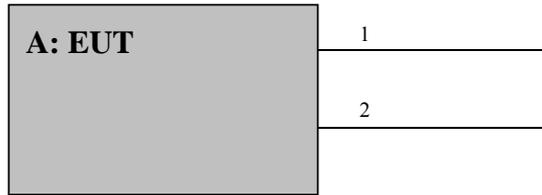
### **4.1 Operating Mode(s)**

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

Details of Operating Mode(s)

<b>Test Item</b>	<b>Mode</b>	<b>Tested frequency</b>
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows;  Power settings: BDR: Ext.=7, Int.=25  EDR: Ext.=72, Int.=38  Software: CSR BlueSuite BlueTest 3 Version 2.5.0.93  *This setting of software is the worst case.  Any conditions under the normal use do not exceed the condition of setting.  In addition, end users cannot change the settings of the output power of the product.</p>		

## 4.2 Configuration and peripherals



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

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Noise Canceling Stereo Headset	MDR-XB950N1	1200027	Sony	EUT

### List of cables used

No.	Name	Length (m)	Cable Shield	Connector Shield	Remarks
1	Audio	1.2	Unshielded	Unshielded	-
2	USB	0.5	Shielded	Shielded	-

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**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

[For below 1 GHz]

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

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength. The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer. The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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

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

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

Frequency	30 MHz to 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.86 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.86 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)

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

\*2) Distance Factor:  $20 \times \log(3.86 \text{ m}/3.0 \text{ m}) = 2.19 \text{ dB}$

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

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

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

**Measurement range : 30 MHz - 26.5 GHz**

**Test data : APPENDIX**

**Test result : Pass**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## **SECTION 6: Antenna Terminal Conducted Tests**

### **Test Procedure**

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

\*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.

\*2) 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.

(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

\*3) Reference data

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

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

## APPENDIX 1: Test data

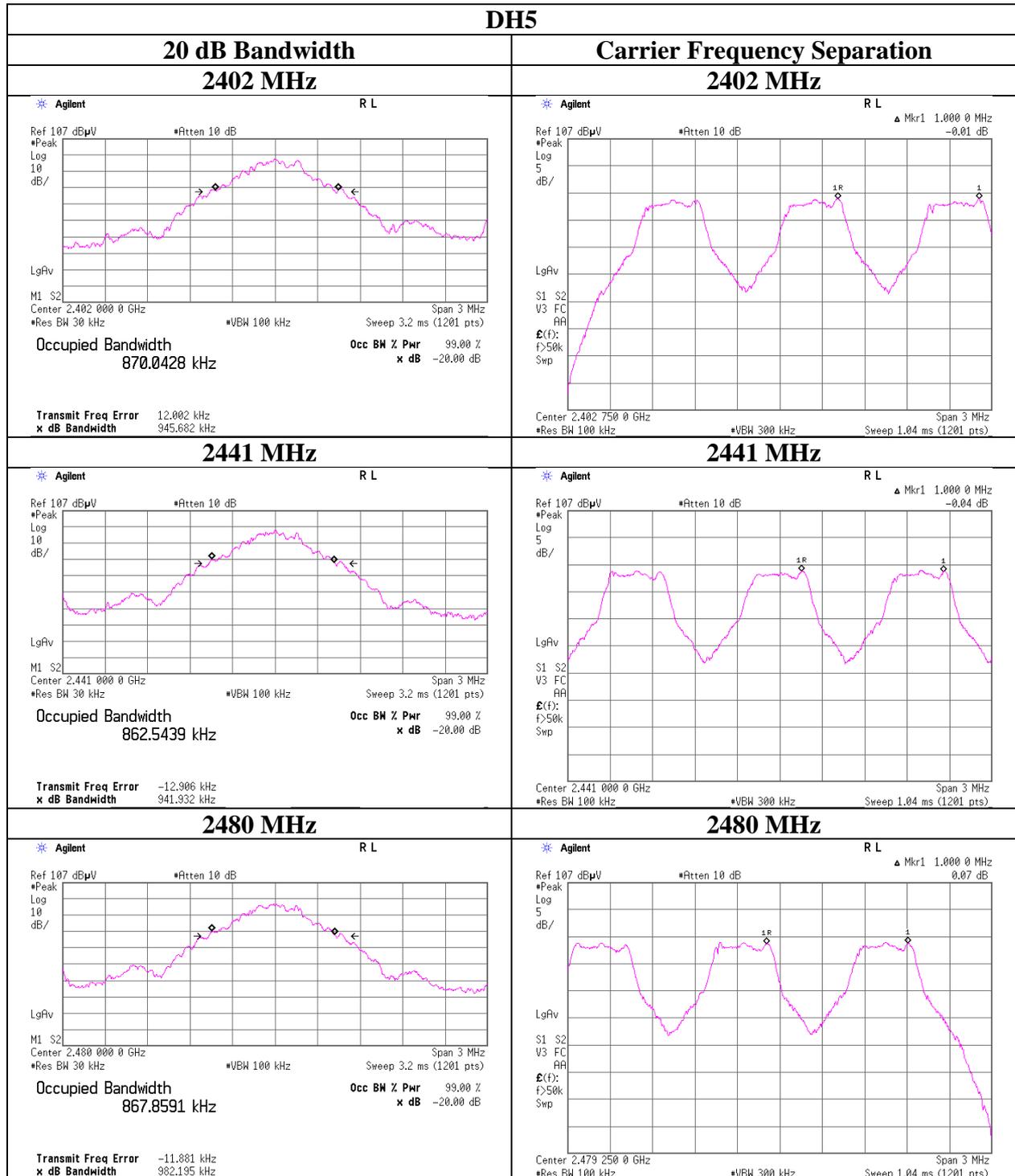
### 20dB Bandwidth and Carrier Frequency Separation

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11485102S-A  
Date October 25, 2016  
Temperature / Humidity 25 deg. C / 43 % RH  
Engineer Shinichi Takano  
Mode Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.946	1.000	$\geq 0.630$
DH5	2441.0	0.942	1.000	$\geq 0.628$
DH5	2480.0	0.982	1.000	$\geq 0.655$
3DH5	2402.0	1.257	1.000	$\geq 0.838$
3DH5	2441.0	1.259	1.000	$\geq 0.839$
3DH5	2480.0	1.257	1.000	$\geq 0.838$

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

## 20dB Bandwidth and Carrier Frequency Separation



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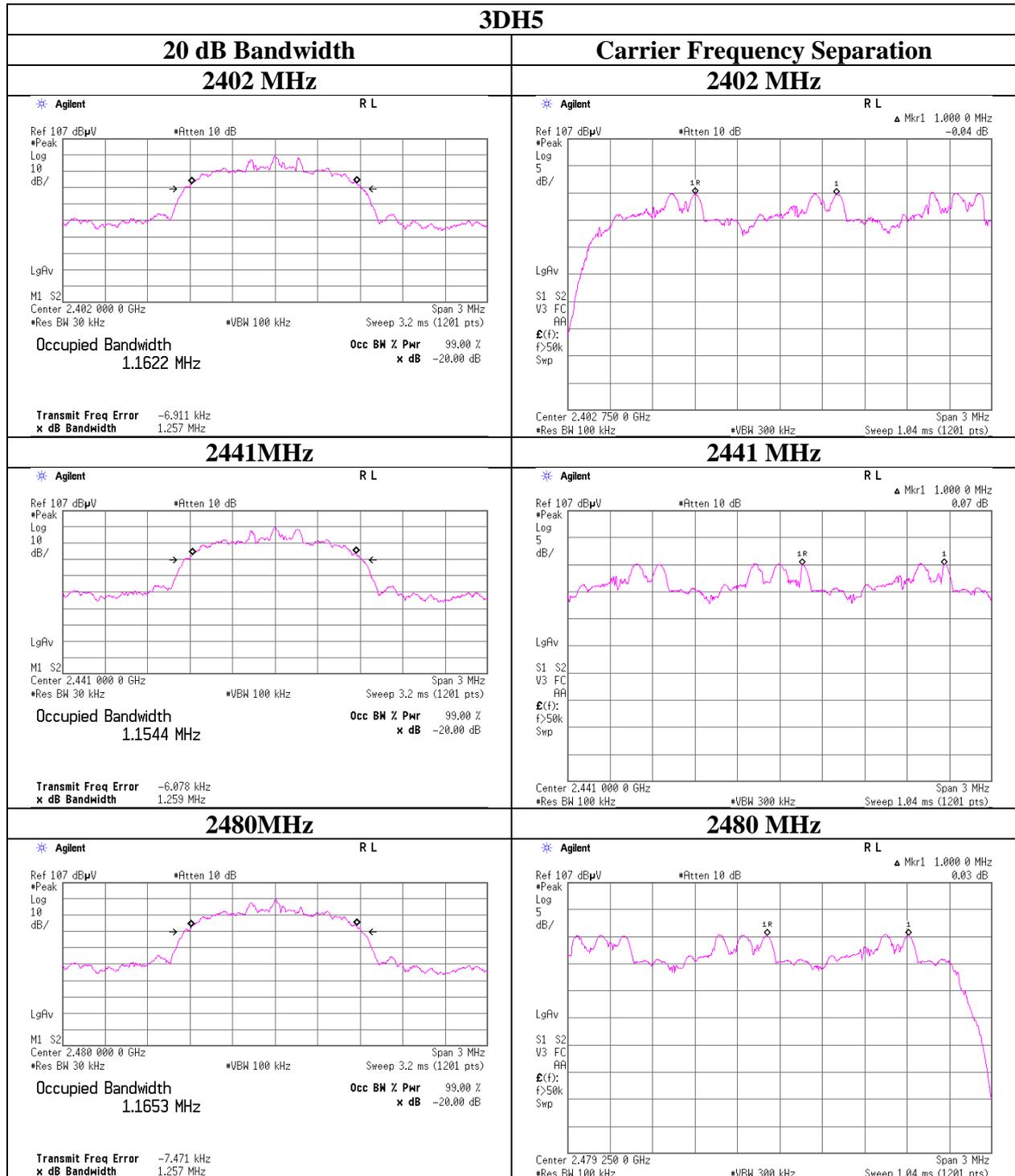
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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## 20dB Bandwidth and Carrier Frequency Separation



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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

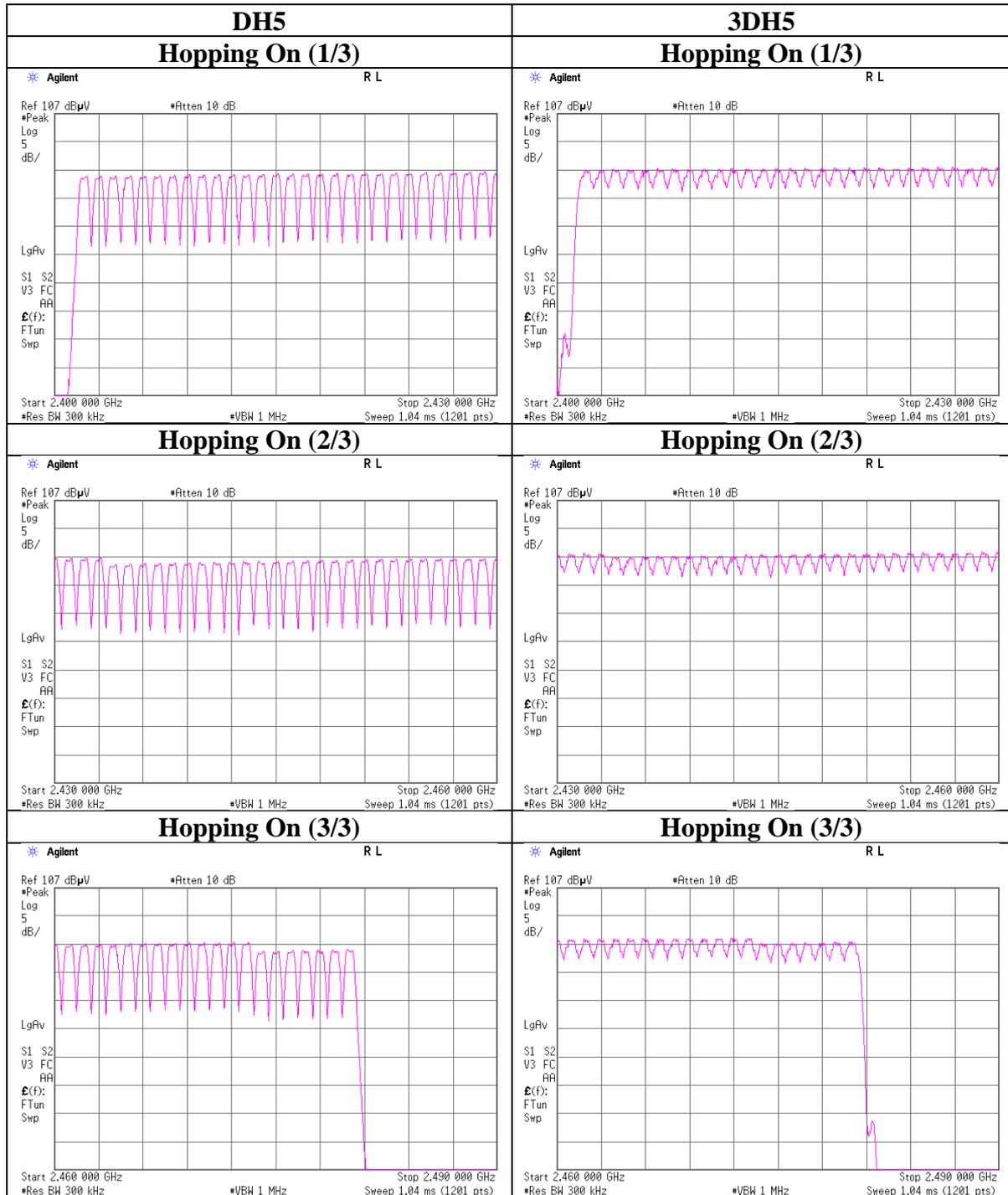
### Number of Hopping Frequency

Test place                   Shonan EMC Lab. No.5 Shielded Room  
Report No.                   11485102S-A  
Date                         October 25, 2016  
Temperature / Humidity     25 deg. C / 43 % RH  
Engineer                    Shinichi Takano  
Mode                         Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	$\geq 15$
3DH5	79	$\geq 15$

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

**Number of Hopping Frequency**



## Dwell time

Test place                      Shonan EMC Lab. No.5 Shielded Room  
Report No.                      11485102S-A  
Date                              October 25, 2016  
Temperature / Humidity      25 deg. C / 43 % RH  
Engineer                        Shinichi Takano  
Mode                              Tx, Hopping On

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 [msec]	Result [msec]	Limit [msec]
DH1	51.0 times /	5 sec. x	31.6 sec. =	323 times	0.415	134	400
DH3	26.0 times /	5 sec. x	31.6 sec. =	165 times	1.678	277	400
DH5	17.0 times /	5 sec. x	31.6 sec. =	108 times	2.926	316	400
3DH1	51.0 times /	5 sec. x	31.6 sec. =	323 times	0.440	142	400
3DH3	26.0 times /	5 sec. x	31.6 sec. =	165 times	1.691	279	400
3DH5	17.0 times /	5 sec. x	31.6 sec. =	108 times	2.933	317	400

Sample Calculation

Result = Number of transmission x Length of transmission

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

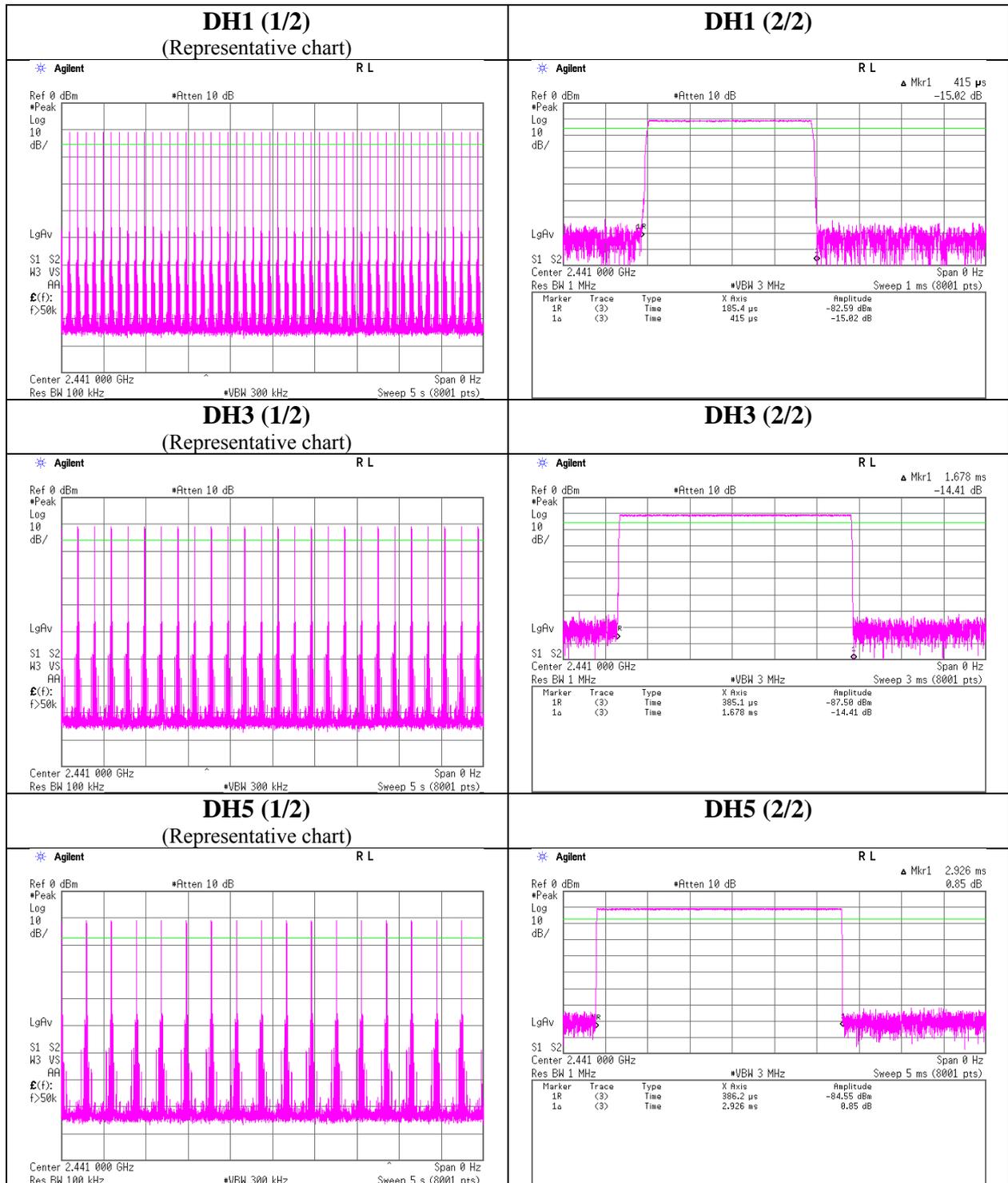
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	51	51	51
DH3	26	26	26	26	26	26
DH5	17	17	17	17	17	17
3DH1	51	51	51	51	51	51
3DH3	26	26	26	26	26	26
3DH5	17	17	17	17	17	17

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

**Dwell time**



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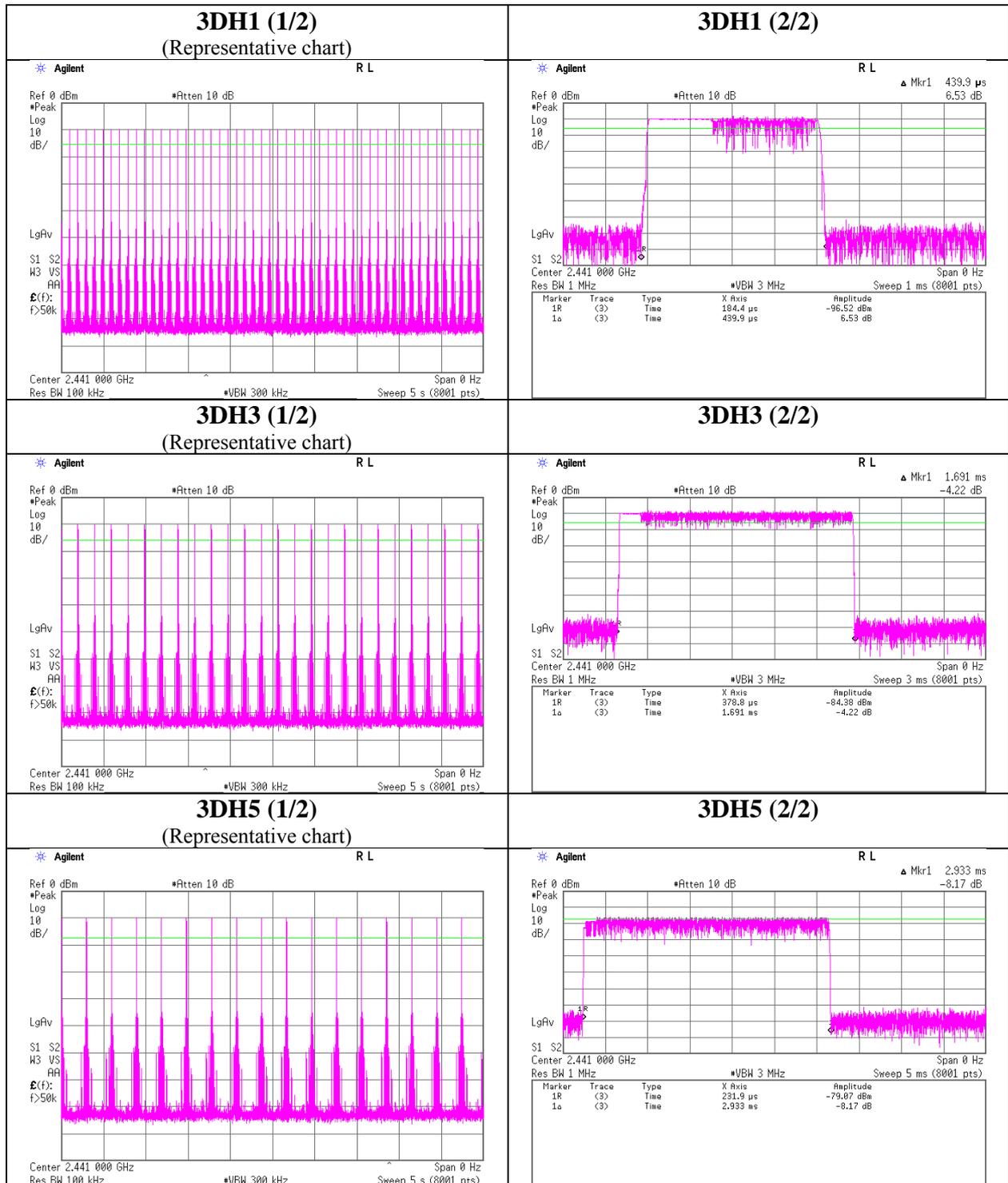
**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

### Dwell time



**UL Japan, Inc.**

**Shonan EMC Lab.**

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

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## Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11485102S-A  
Date : October 25, 2016  
Temperature / Humidity : 25 deg. C / 43 % RH  
Engineer : Shinichi Takano  
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-10.92	1.48	9.92	0.48	1.12	20.96	125	20.48
DH5	2441.0	-10.79	1.49	9.92	0.62	1.15	20.96	125	20.34
DH5	2480.0	-10.88	1.50	9.92	0.54	1.13	20.96	125	20.42
2DH5	2402.0	-8.16	1.48	9.92	3.24	2.11	20.96	125	17.72
2DH5	2441.0	-7.94	1.49	9.92	3.47	2.22	20.96	125	17.49
2DH5	2480.0	-7.87	1.50	9.92	3.55	2.26	20.96	125	17.41
3DH5	2402.0	-7.50	1.48	9.92	3.90	2.45	20.96	125	17.06
3DH5	2441.0	-7.28	1.49	9.92	4.13	2.59	20.96	125	16.83
3DH5	2480.0	-7.19	1.50	9.92	4.23	2.65	20.96	125	16.73

Sample Calculation:

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

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

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

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

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

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11485102S-A  
Date : October 25, 2016  
Temperature / Humidity : 25 deg. C / 43 % RH  
Engineer : Shinichi Takano  
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-12.66	1.48	9.92	-1.26	0.75	1.07	-0.19	0.96
DH5	2441.0	-12.48	1.49	9.92	-1.07	0.78	1.07	0.00	1.00
DH5	2480.0	-12.55	1.50	9.92	-1.13	0.77	1.07	-0.06	0.99
2DH5	2402.0	-12.63	1.48	9.92	-1.23	0.75	1.04	-0.19	0.96
2DH5	2441.0	-12.34	1.49	9.92	-0.93	0.81	1.04	0.11	1.03
2DH5	2480.0	-12.22	1.50	9.92	-0.80	0.83	1.04	0.24	1.06
3DH5	2402.0	-12.64	1.48	9.92	-1.24	0.75	1.04	-0.20	0.95
3DH5	2441.0	-12.33	1.49	9.92	-0.92	0.81	1.04	0.12	1.03
3DH5	2480.0	-12.21	1.50	9.92	-0.79	0.83	1.04	0.25	1.06

Sample Calculation:

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

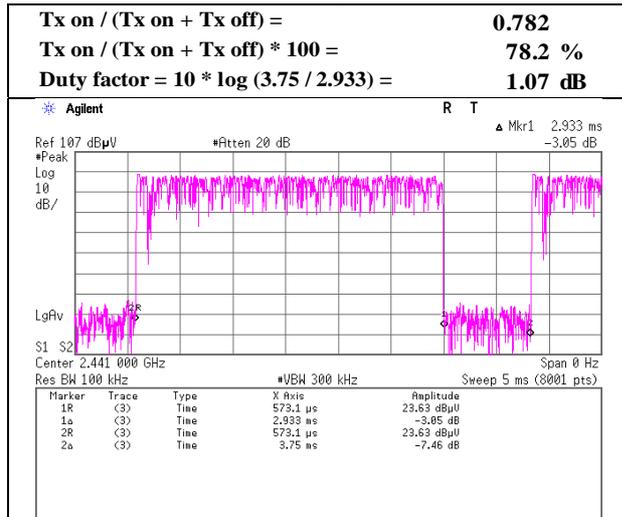
Result (Burst power average) = Time average + Duty factor

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

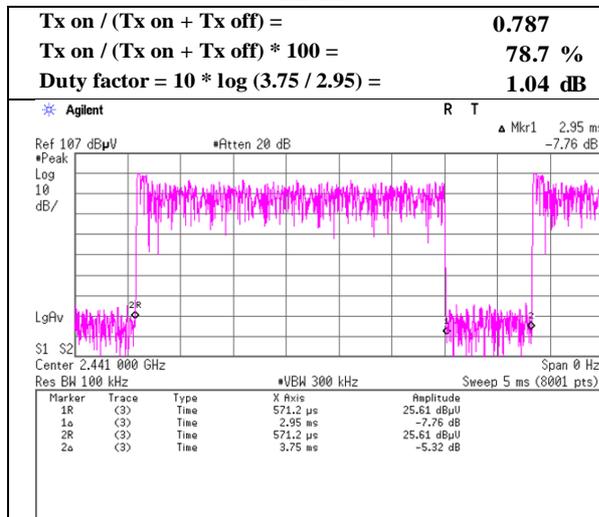
### Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off

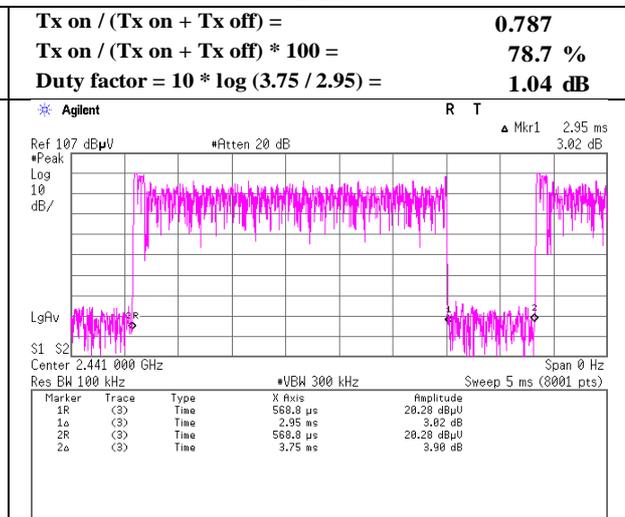
#### DH5



#### 2DH5



#### 3DH5



## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016      October 26, 2016      October 27, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH      24 deg. C / 56 % RH      25 deg. C / 49 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (30 MHz -1000 MHz)  
Mode : Tx, Hopping Off, DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	176.009	QP	25.10	15.74	8.73	31.78	0.00	17.79	43.50	25.7	176	21	
Hori.	316.004	QP	34.60	13.98	6.67	31.66	0.00	23.59	46.00	22.4	100	326	
Hori.	588.005	QP	31.20	18.77	8.30	31.61	0.00	26.66	46.00	19.3	155	288	
Hori.	596.004	QP	32.20	18.88	8.34	31.60	0.00	27.82	46.00	18.1	157	291	
Hori.	2390.000	PK	41.76	27.17	13.70	37.06	2.19	47.76	73.90	26.1	166	218	
Hori.	4804.000	PK	46.13	31.13	5.98	37.12	2.19	48.31	73.90	25.5	137	207	
Hori.	7206.000	PK	45.31	36.43	7.40	37.84	2.19	53.49	73.90	20.4	150	0	
Hori.	9608.000	PK	45.45	38.28	7.93	39.13	2.19	54.72	73.90	19.1	150	0	
Hori.	2390.000	AV	28.46	27.17	13.70	37.06	2.19	34.46	53.90	19.4	166	218	
Hori.	4804.000	AV	37.25	31.13	5.98	37.12	2.19	39.43	53.90	14.4	137	207	
Hori.	7206.000	AV	32.16	36.43	7.40	37.84	2.19	40.34	53.90	13.5	150	0	
Hori.	9608.000	AV	32.70	38.28	7.93	39.13	2.19	41.97	53.90	11.9	150	0	
Vert.	112.007	QP	35.40	11.91	8.06	31.84	0.00	23.53	43.50	19.9	100	325	
Vert.	120.001	QP	30.40	13.12	8.15	31.83	0.00	19.84	43.50	23.6	100	97	
Vert.	316.004	QP	34.70	13.98	6.67	31.66	0.00	23.69	46.00	22.3	111	9	
Vert.	588.011	QP	32.20	18.77	8.30	31.61	0.00	27.66	46.00	18.3	100	167	
Vert.	604.005	QP	32.30	18.99	8.38	31.60	0.00	28.07	46.00	17.9	100	158	
Vert.	616.002	QP	31.20	19.16	8.44	31.60	0.00	27.20	46.00	18.8	100	138	
Vert.	2390.000	PK	42.74	27.17	13.70	37.06	2.19	48.74	73.90	25.1	213	231	
Vert.	4804.000	PK	47.87	31.13	5.98	37.12	2.19	50.05	73.90	23.8	145	148	
Vert.	7206.000	PK	45.43	36.43	7.40	37.84	2.19	53.61	73.90	20.2	150	0	
Vert.	9608.000	PK	45.91	38.28	7.93	39.13	2.19	55.18	73.90	18.7	150	0	
Vert.	2390.000	AV	30.32	27.17	13.70	37.06	2.19	36.32	53.90	17.5	213	231	
Vert.	4804.000	AV	39.64	31.13	5.98	37.12	2.19	41.82	53.90	12.0	145	148	
Vert.	7206.000	AV	32.15	36.43	7.40	37.84	2.19	40.33	53.90	13.5	150	0	
Vert.	9608.000	AV	32.78	38.28	7.93	39.13	2.19	42.05	53.90	11.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.86 m / 3.0 m) = 2.19 dB

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

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	88.50	27.21	13.71	37.05	2.19	94.56	-	-	Carrier
Hori.	2399.153	PK	41.52	27.20	13.71	37.05	2.19	47.57	74.56	27.0	
Hori.	2400.000	PK	45.36	27.20	13.71	37.05	2.19	51.41	74.56	23.2	
Vert.	2402.000	PK	86.68	27.21	13.71	37.05	2.19	92.74	-	-	Carrier
Vert.	2399.182	PK	41.04	27.20	13.71	37.05	2.19	47.09	72.74	25.7	
Vert.	2400.000	PK	42.75	27.20	13.71	37.05	2.19	48.80	72.74	23.9	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.86 m / 3.0 m) = 2.19 dB

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

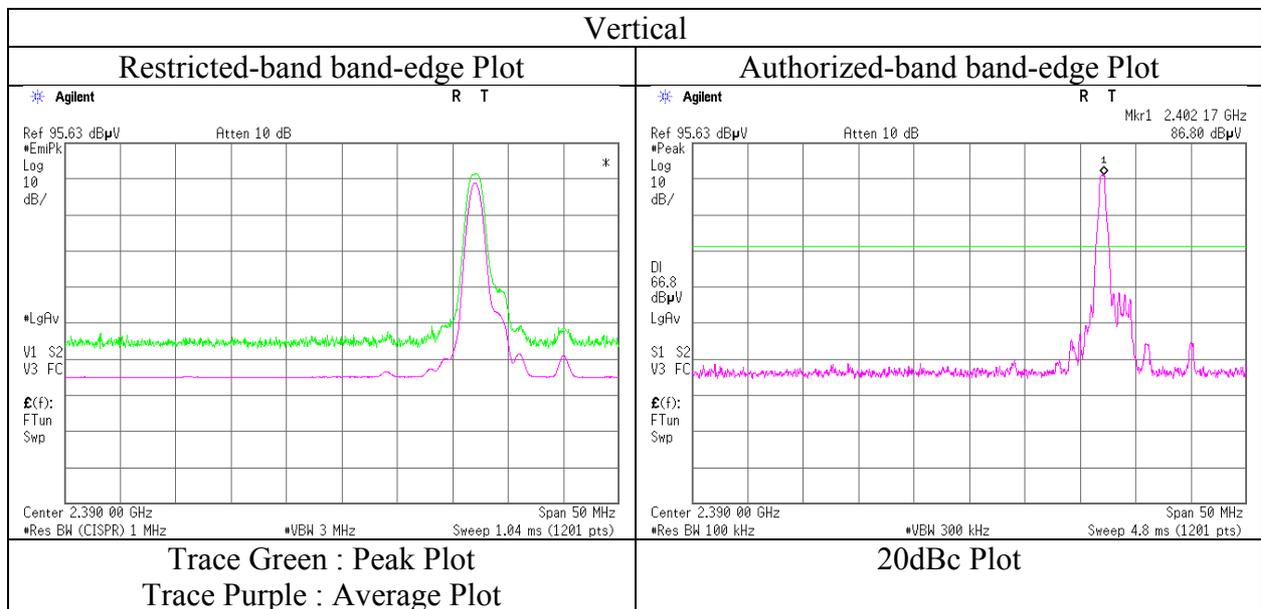
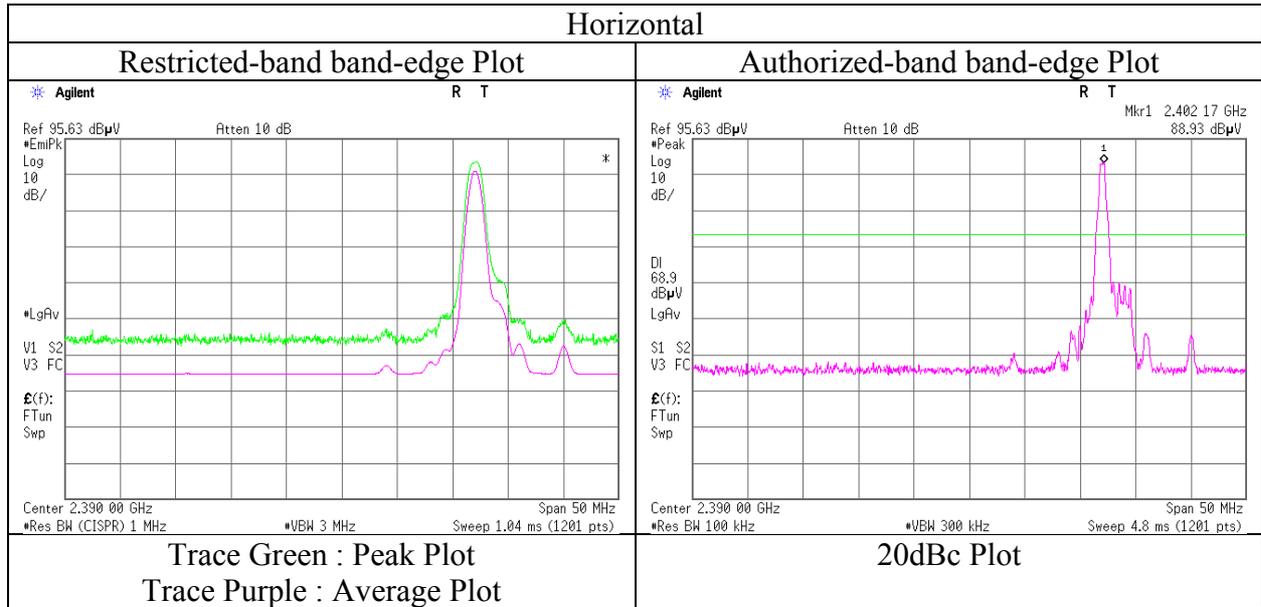
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Yosuke Ishikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016      October 26, 2016      October 27, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH      24 deg. C / 56 % RH      25 deg. C / 49 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (30 MHz -1000 MHz)  
Mode : Tx, Hopping Off, DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	175.012	QP	21.70	15.70	8.72	31.78	0.00	14.34	43.50	29.1	199	15	
Hori.	316.007	QP	33.00	13.98	6.67	31.66	0.00	21.99	46.00	24.0	100	307	
Hori.	596.009	QP	31.40	18.88	8.34	31.60	0.00	27.02	46.00	18.9	150	312	
Hori.	728.013	QP	26.50	20.47	9.01	31.48	0.00	24.50	46.00	21.5	128	353	
Hori.	857.299	QP	22.50	21.58	9.62	31.04	0.00	22.66	46.00	23.3	100	312	
Hori.	4882.000	PK	46.18	31.29	6.04	37.16	2.19	48.54	73.90	25.3	153	208	
Hori.	7323.000	PK	45.32	36.64	7.55	37.92	2.19	53.78	73.90	20.1	150	0	
Hori.	9764.000	PK	45.46	38.52	8.12	39.20	2.19	55.09	73.90	18.8	150	0	
Hori.	4882.000	AV	35.28	31.29	6.04	37.16	2.19	37.64	53.90	16.2	153	208	
Hori.	7323.000	AV	31.76	36.64	7.55	37.92	2.19	40.22	53.90	13.6	150	0	
Hori.	9764.000	AV	32.73	38.52	8.12	39.20	2.19	42.36	53.90	11.5	150	0	
Vert.	112.003	QP	35.60	11.91	8.06	31.84	0.00	23.73	43.50	19.7	100	328	
Vert.	120.005	QP	30.90	13.12	8.15	31.83	0.00	20.34	43.50	23.1	100	117	
Vert.	316.005	QP	34.10	13.98	6.67	31.66	0.00	23.09	46.00	22.9	100	8	
Vert.	576.007	QP	30.70	18.60	8.24	31.63	0.00	25.91	46.00	20.0	100	165	
Vert.	588.003	QP	32.20	18.77	8.30	31.61	0.00	27.66	46.00	18.3	100	169	
Vert.	604.013	QP	32.00	18.99	8.38	31.60	0.00	27.77	46.00	18.2	100	148	
Vert.	4882.000	PK	47.26	31.29	6.04	37.16	2.19	49.62	73.90	24.2	147	137	
Vert.	7323.000	PK	44.77	36.64	7.55	37.92	2.19	53.23	73.90	20.6	150	0	
Vert.	9764.000	PK	45.43	38.52	8.12	39.20	2.19	55.06	73.90	18.8	150	0	
Vert.	4882.000	AV	37.88	31.29	6.04	37.16	2.19	40.24	53.90	13.6	147	137	
Vert.	7323.000	AV	31.89	36.64	7.55	37.92	2.19	40.35	53.90	13.5	150	0	
Vert.	9764.000	AV	32.76	38.52	8.12	39.20	2.19	42.39	53.90	11.5	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.86 m / 3.0 m) = 2.19 dB

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

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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016      October 26, 2016      October 27, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH      24 deg. C / 56 % RH      25 deg. C / 49 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (30 MHz -1000 MHz)  
Mode : Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	187.645	QP	21.90	16.10	8.73	31.77	0.00	14.96	43.50	28.5	153	16	
Hori.	316.003	QP	33.10	13.98	6.67	31.66	0.00	22.09	46.00	23.9	100	140	
Hori.	324.006	QP	32.00	14.20	6.73	31.66	0.00	21.27	46.00	24.7	100	322	
Hori.	596.004	QP	31.80	18.88	8.34	31.60	0.00	27.42	46.00	18.5	152	294	
Hori.	616.003	QP	30.40	19.16	8.44	31.60	0.00	26.40	46.00	19.6	136	303	
Hori.	2483.500	PK	46.44	27.49	13.79	37.01	2.19	52.90	73.90	21.0	156	244	
Hori.	2488.071	PK	47.02	27.51	13.79	37.01	2.19	53.50	73.90	20.4	156	244	
Hori.	4960.000	PK	45.86	31.46	6.10	37.19	2.19	48.42	73.90	25.4	148	209	
Hori.	7440.000	PK	45.35	36.84	7.69	37.99	2.19	54.08	73.90	19.8	150	0	
Hori.	9920.000	PK	45.53	38.76	8.32	39.26	2.19	55.54	73.90	18.3	150	0	
Hori.	2483.500	AV	38.23	27.49	13.79	37.01	2.19	44.69	53.90	9.2	156	244	
Hori.	2488.071	AV	37.05	27.51	13.79	37.01	2.19	43.53	53.90	10.3	156	244	
Hori.	4960.000	AV	35.64	31.46	6.10	37.19	2.19	38.20	53.90	15.7	148	209	
Hori.	7440.000	AV	31.65	36.84	7.69	37.99	2.19	40.38	53.90	13.5	150	0	
Hori.	9920.000	AV	32.78	38.76	8.32	39.26	2.19	42.79	53.90	11.1	150	0	
Vert.	108.004	QP	38.40	11.31	7.92	31.84	0.00	25.79	43.50	17.7	100	92	
Vert.	112.004	QP	41.50	11.91	7.91	31.84	0.00	29.48	43.50	14.0	100	319	
Vert.	120.002	QP	42.30	13.12	7.95	31.83	0.00	31.54	43.50	11.9	100	107	
Vert.	428.006	QP	28.40	16.64	7.41	31.64	0.00	20.81	46.00	25.1	133	123	
Vert.	596.003	QP	32.90	18.88	8.34	31.60	0.00	28.52	46.00	17.4	100	158	
Vert.	2483.500	PK	46.08	27.49	13.79	37.01	2.19	52.54	73.90	21.3	147	213	
Vert.	2488.014	PK	46.18	27.51	13.79	37.01	2.19	52.66	73.90	21.2	147	213	
Vert.	4960.000	PK	46.38	31.46	6.10	37.19	2.19	48.94	73.90	24.9	112	80	
Vert.	7440.000	PK	43.86	36.84	7.69	37.99	2.19	52.59	73.90	21.3	150	0	
Vert.	9920.000	PK	44.65	38.76	8.32	39.26	2.19	54.66	73.90	19.2	150	0	
Vert.	2483.500	AV	37.30	27.49	13.79	37.01	2.19	43.76	53.90	10.1	147	213	
Vert.	2488.014	AV	36.97	27.51	13.79	37.01	2.19	43.45	53.90	10.4	147	213	
Vert.	4960.000	AV	39.57	31.46	6.10	37.19	2.19	42.13	53.90	11.7	112	80	
Vert.	7440.000	AV	31.75	36.84	7.69	37.99	2.19	40.48	53.90	13.4	150	0	
Vert.	9920.000	AV	32.67	38.76	8.32	39.26	2.19	42.68	53.90	11.2	150	0	

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

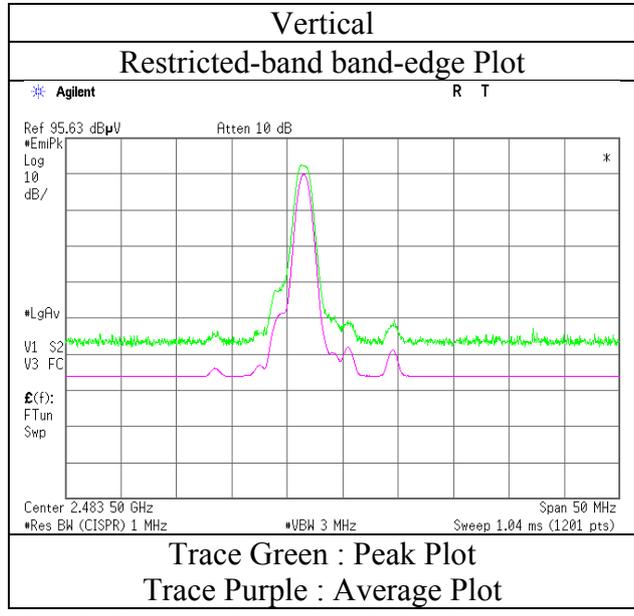
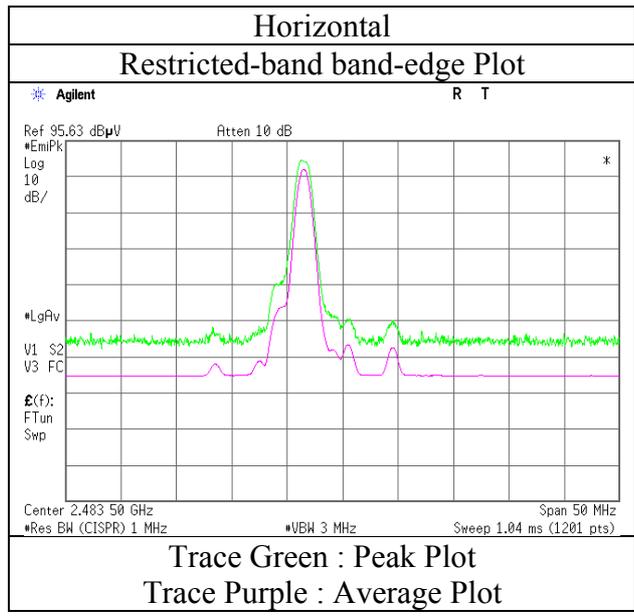
Distance factor : 1 GHz - 13 GHz :  $20\log(3.86\text{ m} / 3.0\text{ m}) = 2.19\text{ dB}$

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

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

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

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Yosuke Ishikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016      October 26, 2016      October 27, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH      24 deg. C / 56 % RH      25 deg. C / 49 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (30 MHz -1000 MHz)  
Mode : Tx, Hopping Off, 3DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	184.003	QP	24.70	16.01	8.72	31.78	0.00	17.65	43.50	25.8	183	42	
Hori.	316.007	QP	31.90	13.98	6.67	31.66	0.00	20.89	46.00	25.1	100	299	
Hori.	596.004	QP	31.70	18.88	8.34	31.60	0.00	27.32	46.00	18.6	150	300	
Hori.	608.010	QP	31.00	19.05	8.40	31.60	0.00	26.85	46.00	19.1	148	116	
Hori.	2390.000	PK	43.57	27.17	13.70	37.06	2.19	49.57	73.90	24.3	154	201	
Hori.	4804.000	PK	45.09	31.13	5.98	37.12	2.19	47.27	73.90	26.6	134	198	
Hori.	7206.000	PK	44.57	36.43	7.40	37.84	2.19	52.75	73.90	21.1	150	0	
Hori.	9608.000	PK	44.67	38.28	7.93	39.13	2.19	53.94	73.90	19.9	150	0	
Hori.	2390.000	AV	31.00	27.17	13.70	37.06	2.19	37.00	53.90	16.9	154	201	
Hori.	4804.000	AV	35.49	31.13	5.98	37.12	2.19	37.67	53.90	16.2	134	198	
Hori.	7206.000	AV	31.89	36.43	7.40	37.84	2.19	40.07	53.90	13.8	150	0	
Hori.	9608.000	AV	32.52	38.28	7.93	39.13	2.19	41.79	53.90	12.1	150	0	
Vert.	108.003	QP	35.70	11.31	7.92	31.84	0.00	23.09	43.50	20.4	100	328	
Vert.	112.005	QP	39.20	11.91	7.91	31.84	0.00	27.18	43.50	16.3	100	33	
Vert.	116.003	QP	35.40	12.52	7.92	31.84	0.00	24.00	43.50	19.5	100	106	
Vert.	120.003	QP	40.10	13.12	7.95	31.83	0.00	29.34	43.50	14.1	100	101	
Vert.	476.006	QP	28.00	17.23	7.70	31.61	0.00	21.32	46.00	24.6	122	113	
Vert.	588.005	QP	32.80	18.77	8.30	31.61	0.00	28.26	46.00	17.7	100	155	
Vert.	2390.000	PK	42.71	27.17	13.70	37.06	2.19	48.71	73.90	25.1	112	225	
Vert.	4804.000	PK	46.97	31.13	5.98	37.12	2.19	49.15	73.90	24.7	138	149	
Vert.	7206.000	PK	45.58	36.43	7.40	37.84	2.19	53.76	73.90	20.1	150	0	
Vert.	9608.000	PK	46.43	38.28	7.93	39.13	2.19	55.70	73.90	18.2	150	0	
Vert.	2390.000	AV	30.72	27.17	13.70	37.06	2.19	36.72	53.90	17.1	112	225	
Vert.	4804.000	AV	36.68	31.13	5.98	37.12	2.19	38.86	53.90	15.0	138	149	
Vert.	7206.000	AV	32.02	36.43	7.40	37.84	2.19	40.20	53.90	13.7	150	0	
Vert.	9608.000	AV	32.59	38.28	7.93	39.13	2.19	41.86	53.90	12.0	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.86 m / 3.0 m) = 2.19 dB  
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.70	27.21	13.71	37.05	2.19	96.76	-	-	Carrier
Hori.	2399.504	PK	54.73	27.20	13.71	37.05	2.19	60.78	76.76	16.0	
Hori.	2400.000	PK	55.71	27.20	13.71	37.05	2.19	61.76	76.76	15.0	
Vert.	2402.000	PK	89.21	27.21	13.71	37.05	2.19	95.27	-	-	Carrier
Vert.	2399.488	PK	53.67	27.20	13.71	37.05	2.19	59.72	75.27	15.6	
Vert.	2400.000	PK	54.32	27.20	13.71	37.05	2.19	60.37	75.27	14.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.86 m / 3.0 m) = 2.19 dB  
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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**Shonan EMC Lab.**

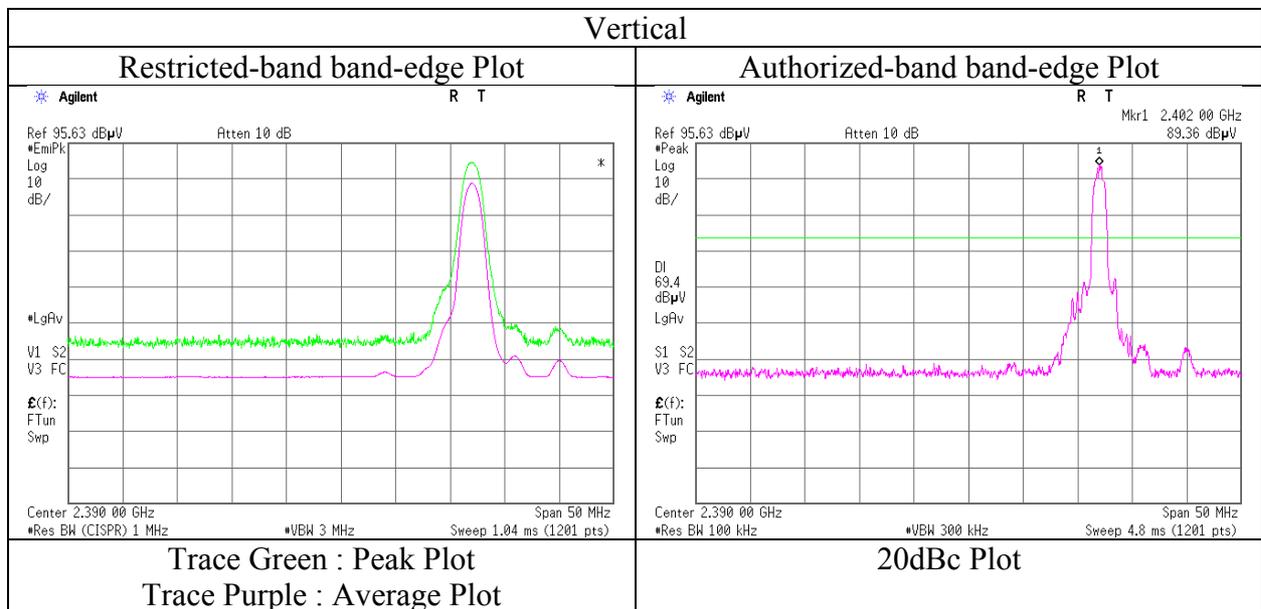
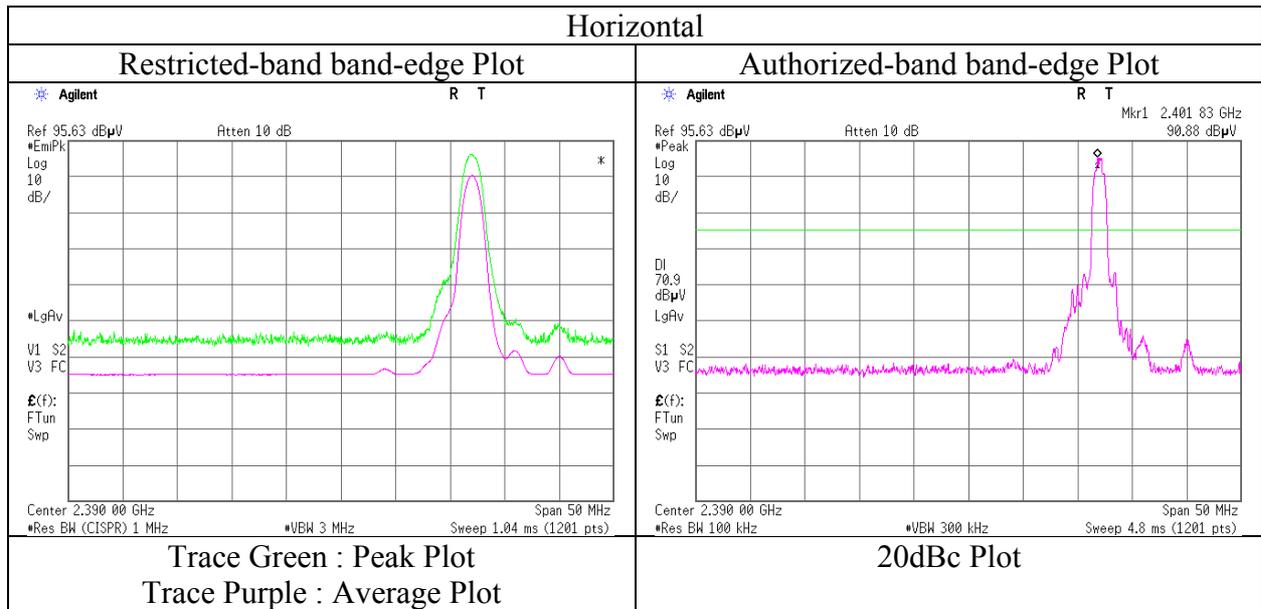
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
 Report No. : 11485102S-A  
 Date : October 25, 2016  
 Temperature / Humidity : 22 deg. C / 40 % RH  
 Engineer : Yosuke Ishikawa  
 (1 GHz -13 GHz)  
 Mode : Tx, Hopping Off, 3DH5 2402 MHz



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016      October 26, 2016      October 27, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH      24 deg. C / 56 % RH      25 deg. C / 49 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (30 MHz -1000 MHz)  
Mode : Tx, Hopping Off, 3DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	128.005	QP	28.40	13.61	8.09	31.83	0.00	18.27	43.50	25.2	262	50	
Hori.	308.005	QP	33.00	13.76	6.62	31.67	0.00	21.71	46.00	24.2	100	305	
Hori.	412.005	QP	27.60	16.44	7.30	31.63	0.00	19.71	46.00	26.2	100	289	
Hori.	608.001	QP	31.40	19.05	8.40	31.60	0.00	27.25	46.00	18.7	148	294	
Hori.	4882.000	PK	44.75	31.29	6.04	37.16	2.19	47.11	73.90	26.7	147	175	
Hori.	7323.000	PK	43.75	36.64	7.55	37.92	2.19	52.21	73.90	21.6	150	0	
Hori.	9764.000	PK	44.58	38.52	8.12	39.20	2.19	54.21	73.90	19.6	150	0	
Hori.	4882.000	AV	34.06	31.29	6.04	37.16	2.19	36.42	53.90	17.4	147	175	
Hori.	7323.000	AV	31.64	36.64	7.55	37.92	2.19	40.10	53.90	13.8	150	0	
Hori.	9764.000	AV	32.65	38.52	8.12	39.20	2.19	42.28	53.90	<b>11.6</b>	150	0	
Vert.	108.004	QP	39.80	11.31	7.92	31.84	0.00	27.19	43.50	16.3	100	100	
Vert.	112.006	QP	42.20	11.91	7.91	31.84	0.00	30.18	43.50	13.3	100	353	
Vert.	116.004	QP	38.50	12.52	7.92	31.84	0.00	27.10	43.50	16.4	100	16	
Vert.	120.005	QP	37.50	13.12	7.95	31.83	0.00	26.74	43.50	16.7	100	311	
Vert.	588.007	QP	32.50	18.77	8.30	31.61	0.00	27.96	46.00	18.0	100	158	
Vert.	596.006	QP	32.90	18.88	8.34	31.60	0.00	28.52	46.00	17.4	100	164	
Vert.	4882.000	PK	45.35	31.29	6.04	37.16	2.19	47.71	73.90	26.1	140	228	
Vert.	7323.000	PK	44.03	36.64	7.55	37.92	2.19	52.49	73.90	21.4	150	0	
Vert.	9764.000	PK	43.85	38.52	8.12	39.20	2.19	53.48	73.90	20.4	150	0	
Vert.	4882.000	AV	35.61	31.29	6.04	37.16	2.19	37.97	53.90	15.9	140	228	
Vert.	7323.000	AV	32.01	36.64	7.55	37.92	2.19	40.47	53.90	13.4	150	0	
Vert.	9764.000	AV	32.56	38.52	8.12	39.20	2.19	42.19	53.90	11.7	150	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.86\text{ m} / 3.0\text{ m}) = 2.19\text{ dB}$

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

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016      October 26, 2016      October 27, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH      24 deg. C / 56 % RH      25 deg. C / 49 % RH  
Engineer : Yosuke Ishikawa      Yosuke Ishikawa      Yosuke Ishikawa  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (30 MHz -1000 MHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	112.014	QP	29.50	11.91	7.91	31.84	0.00	17.48	43.50	26.0	168	221	
Hori.	324.006	QP	32.10	14.20	6.73	31.66	0.00	21.37	46.00	24.6	100	126	
Hori.	596.011	QP	31.70	18.88	8.34	31.60	0.00	27.32	46.00	18.6	147	293	
Hori.	616.002	QP	30.70	19.16	8.44	31.60	0.00	26.70	46.00	19.3	147	310	
Hori.	2483.500	PK	48.38	27.49	13.79	37.01	2.19	54.84	73.90	19.0	164	214	
Hori.	2488.057	PK	47.57	27.51	13.79	37.01	2.19	54.05	73.90	19.8	164	214	
Hori.	4960.000	PK	44.30	31.46	6.10	37.19	2.19	46.86	73.90	27.0	139	212	
Hori.	7440.000	PK	44.92	36.84	7.69	37.99	2.19	53.65	73.90	20.2	150	0	
Hori.	9920.000	PK	44.50	38.76	8.32	39.26	2.19	54.51	73.90	19.3	150	0	
Hori.	2483.500	AV	36.56	27.49	13.79	37.01	2.19	43.02	53.90	10.8	164	214	
Hori.	2488.057	AV	35.79	27.51	13.79	37.01	2.19	42.27	53.90	11.6	164	214	
Hori.	4960.000	AV	34.28	31.46	6.10	37.19	2.19	36.84	53.90	17.0	139	212	
Hori.	7440.000	AV	31.48	36.84	7.69	37.99	2.19	40.21	53.90	13.6	150	0	
Hori.	9920.000	AV	32.62	38.76	8.32	39.26	2.19	42.63	53.90	11.2	150	0	
Vert.	108.002	QP	38.00	11.31	7.92	31.84	0.00	25.39	43.50	18.1	100	112	
Vert.	112.003	QP	40.50	11.91	7.91	31.84	0.00	28.48	43.50	15.0	100	122	
Vert.	116.005	QP	37.60	12.52	7.92	31.84	0.00	26.20	43.50	17.3	100	105	
Vert.	120.003	QP	42.10	13.12	7.95	31.83	0.00	31.34	43.50	12.1	100	108	
Vert.	316.006	QP	32.90	13.98	6.67	31.66	0.00	21.89	46.00	24.1	136	4	
Vert.	588.005	QP	32.20	18.77	8.30	31.61	0.00	27.66	46.00	18.3	100	154	
Vert.	596.006	QP	32.20	18.88	8.34	31.60	0.00	27.82	46.00	18.1	100	156	
Vert.	2483.500	PK	46.91	27.49	13.79	37.01	2.19	53.37	73.90	20.5	113	217	
Vert.	2488.086	PK	45.64	27.51	13.79	37.01	2.19	52.12	73.90	21.7	113	217	
Vert.	4960.000	PK	45.09	31.46	6.10	37.19	2.19	47.65	73.90	26.2	129	141	
Vert.	7440.000	PK	42.90	36.84	7.69	37.99	2.19	51.63	73.90	22.2	150	0	
Vert.	9920.000	PK	44.70	38.76	8.32	39.26	2.19	54.71	73.90	19.1	150	0	
Vert.	2483.500	AV	37.42	27.49	13.79	37.01	2.19	43.88	53.90	<b>10.0</b>	113	217	
Vert.	2488.086	AV	36.54	27.51	13.79	37.01	2.19	43.02	53.90	10.8	113	217	
Vert.	4960.000	AV	35.47	31.46	6.10	37.19	2.19	38.03	53.90	15.8	129	141	
Vert.	7440.000	AV	31.45	36.84	7.69	37.99	2.19	40.18	53.90	13.7	150	0	
Vert.	9920.000	AV	32.66	38.76	8.32	39.26	2.19	42.67	53.90	11.2	150	0	

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

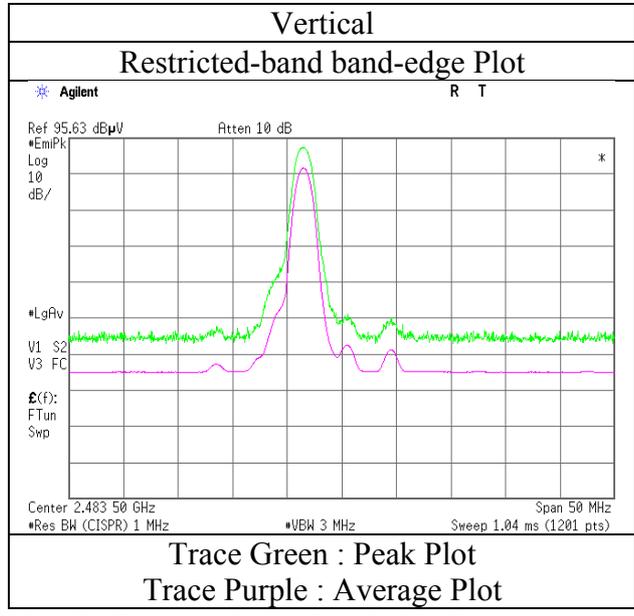
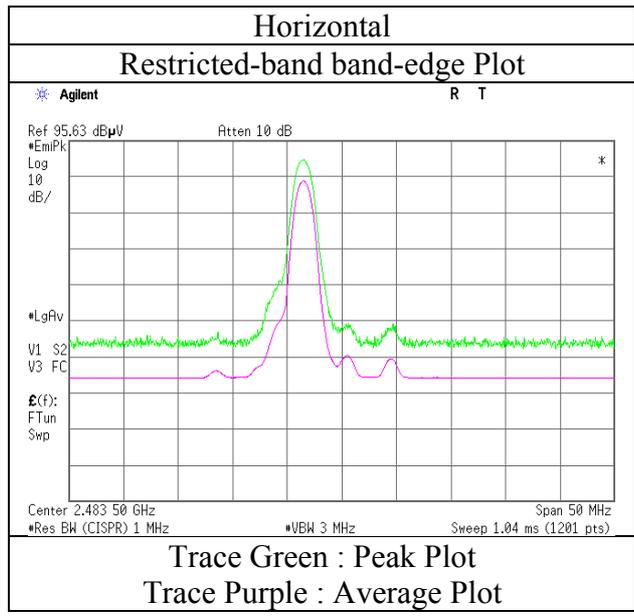
Distance factor : 1 GHz - 13 GHz :  $20\log(3.86\text{ m} / 3.0\text{ m}) = 2.19\text{ dB}$

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

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

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

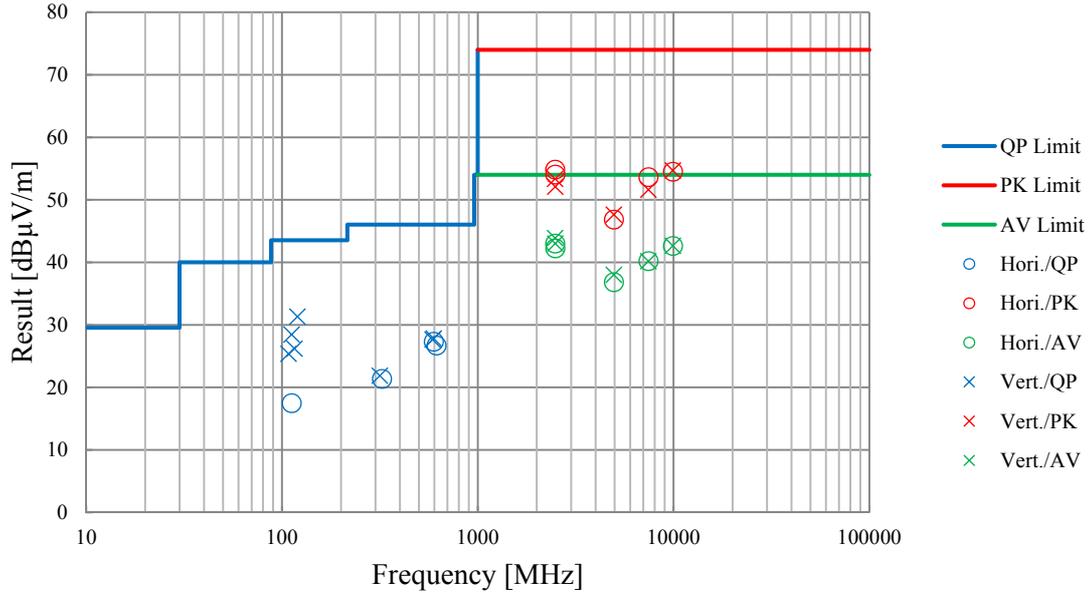
Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 11485102S-A  
Date : October 25, 2016  
Temperature / Humidity : 22 deg. C / 40 % RH  
Engineer : Yosuke Ishikawa  
(1 GHz -13 GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz



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

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

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11485102S-A		
Date	October 25, 2016	October 26, 2016	October 27, 2016
Temperature / Humidity	22 deg. C / 40 % RH	24 deg. C / 56 % RH	25 deg. C / 49 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)	(30 MHz -1000 MHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

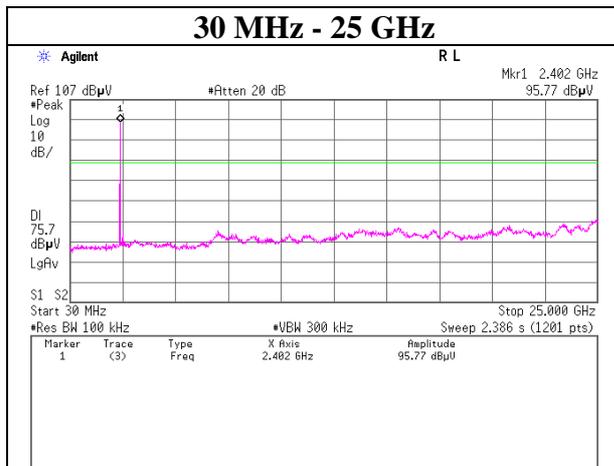
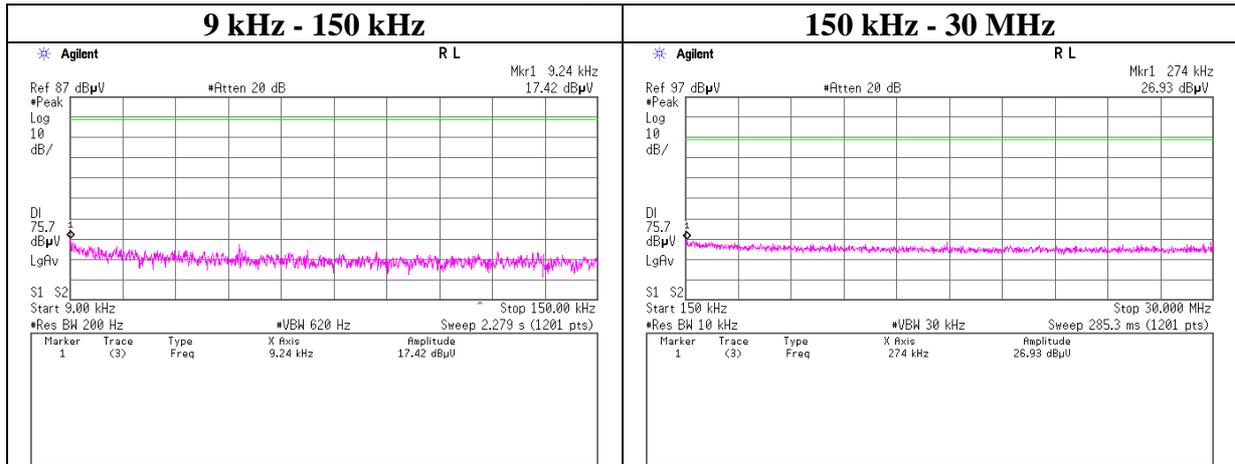


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

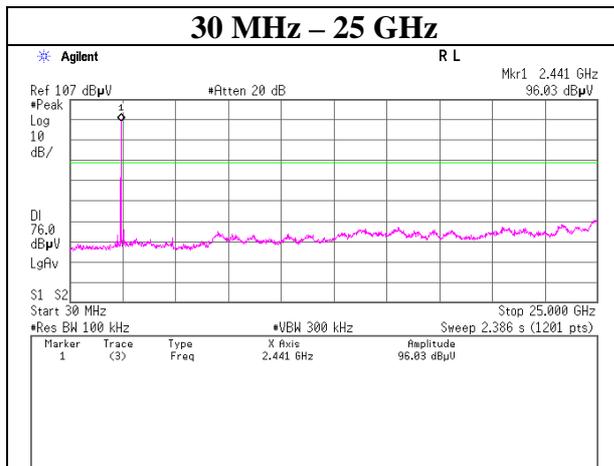
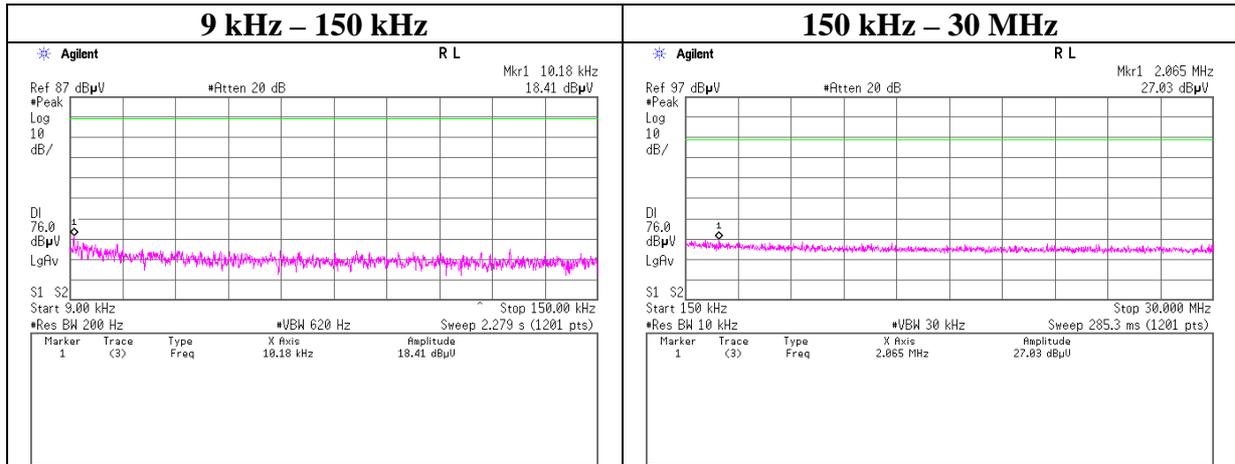
### 2402 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

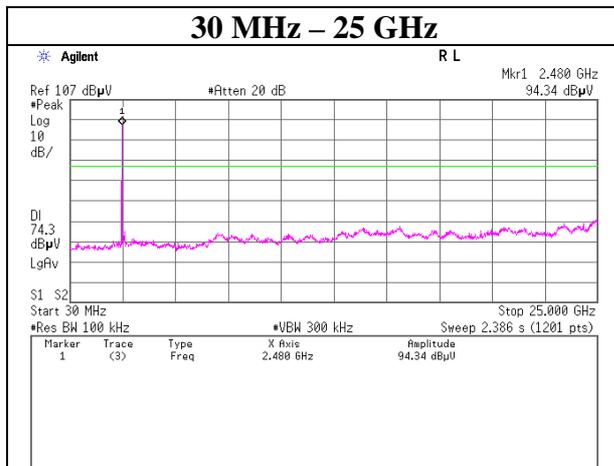
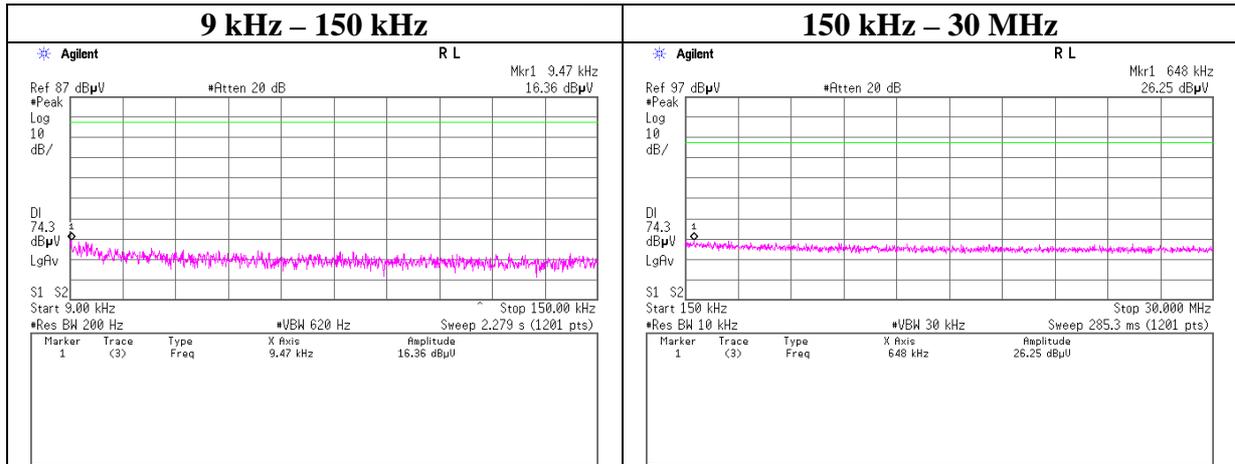
### 2441 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, DH5

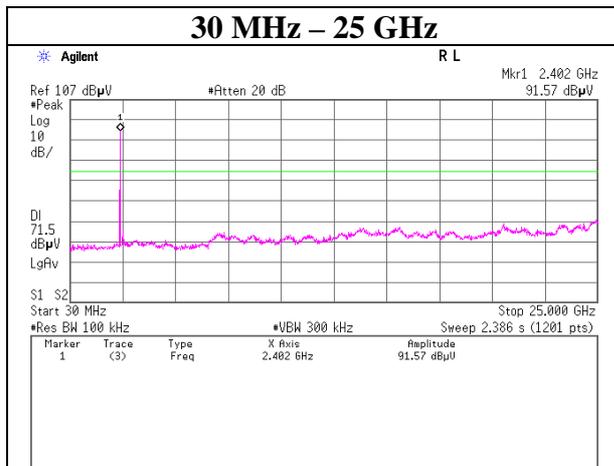
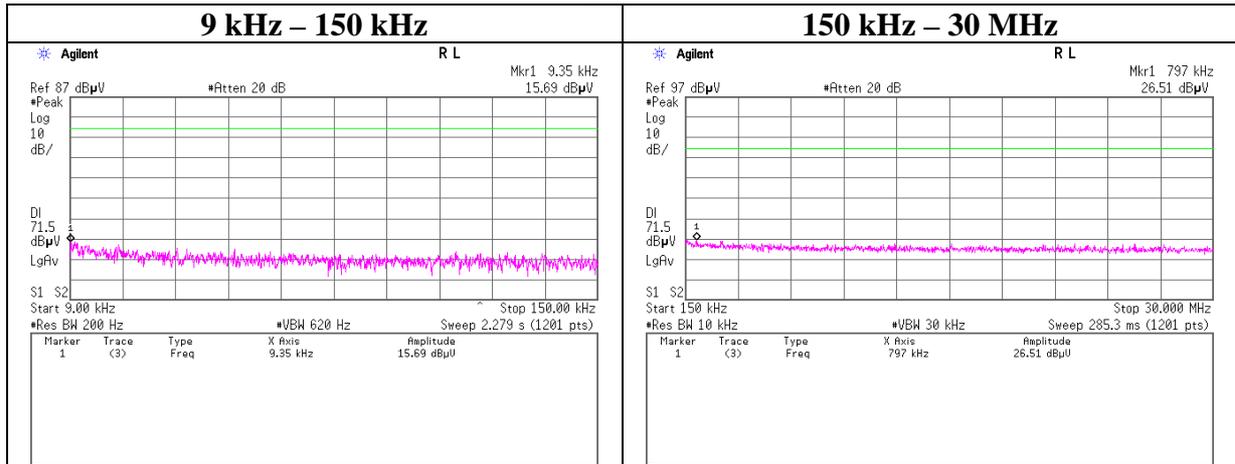
### 2480 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, 3DH5

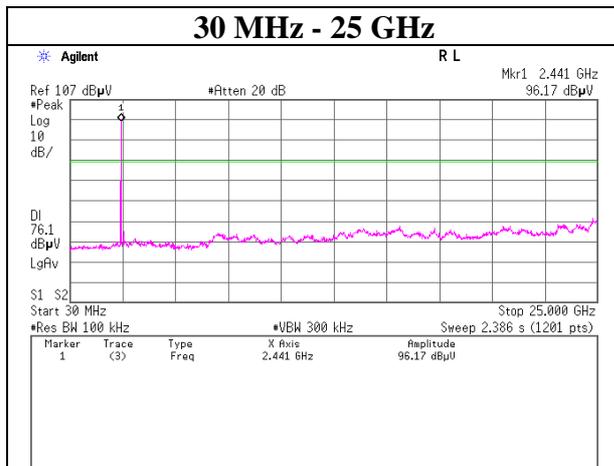
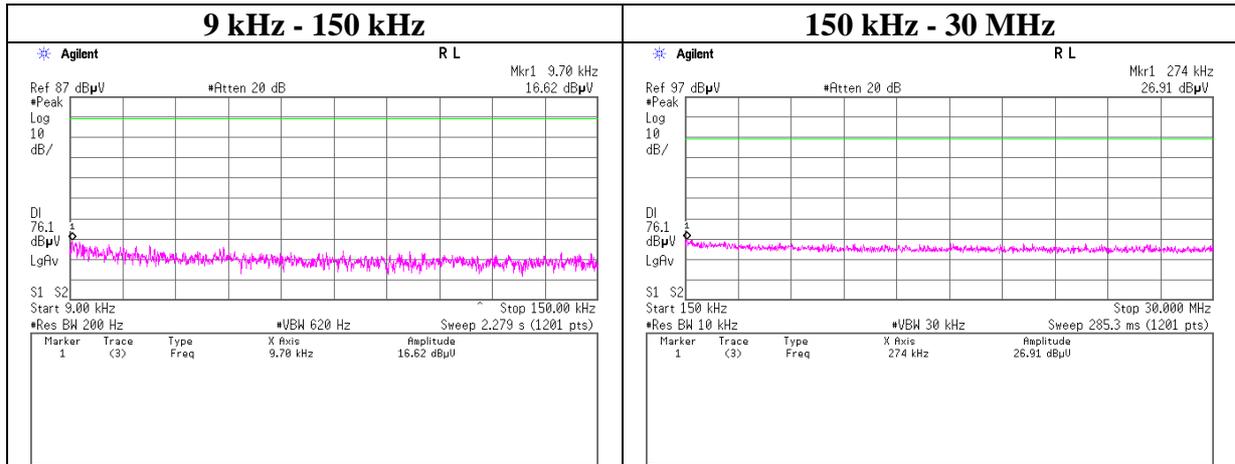
### 2402 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, 3DH5

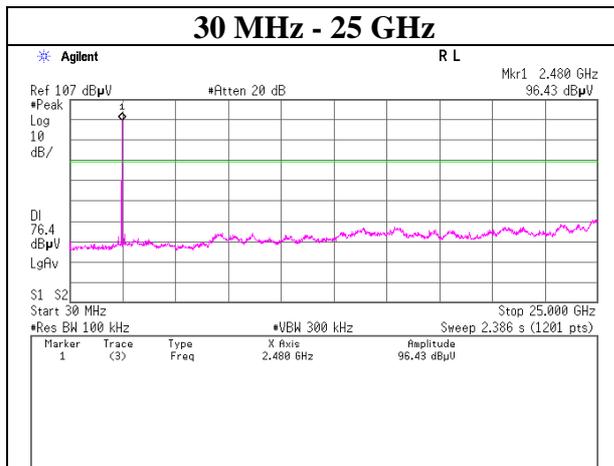
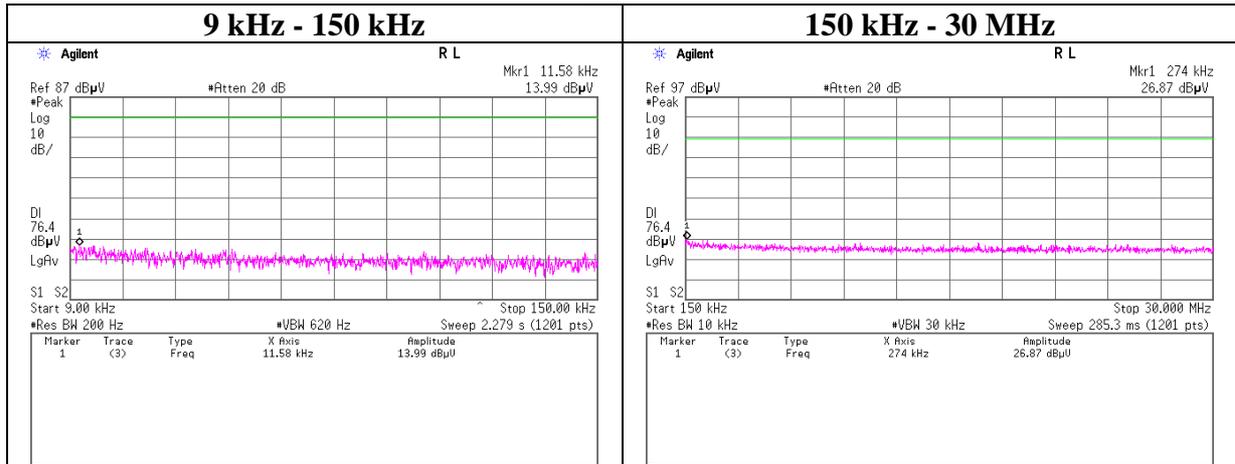
### 2441 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off, 3DH5

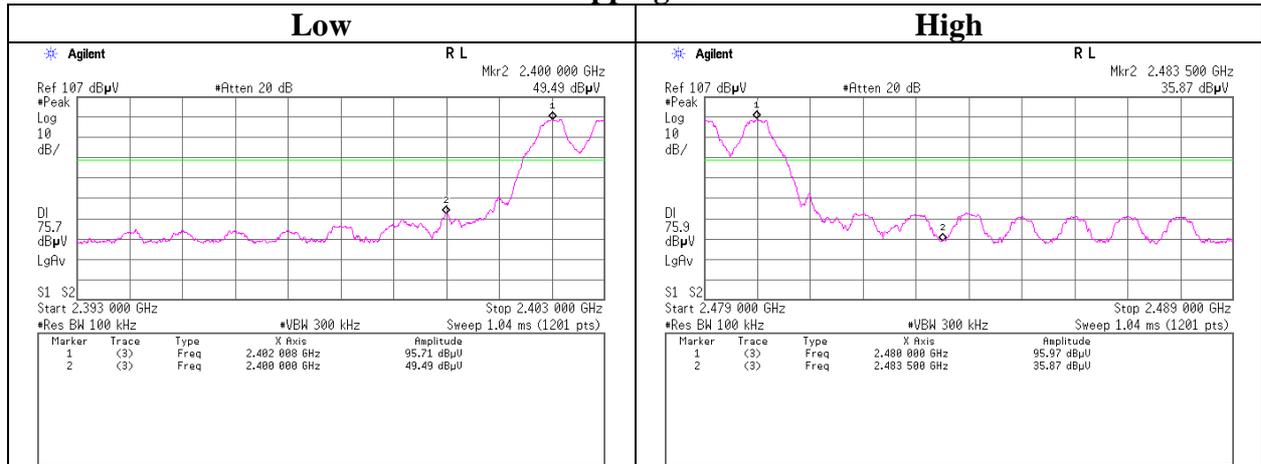
### 2480 MHz



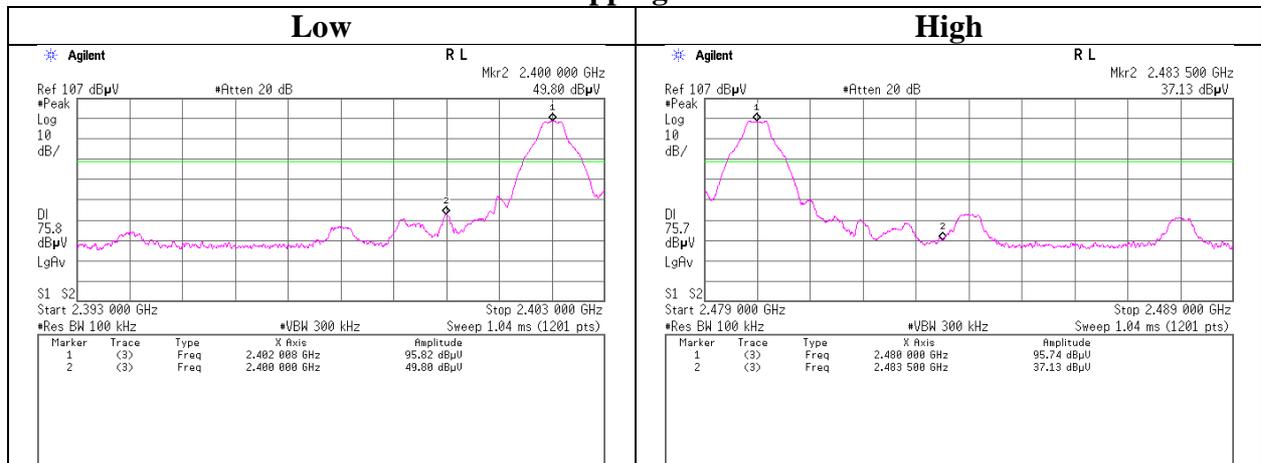
## Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx DH5

### Hopping On



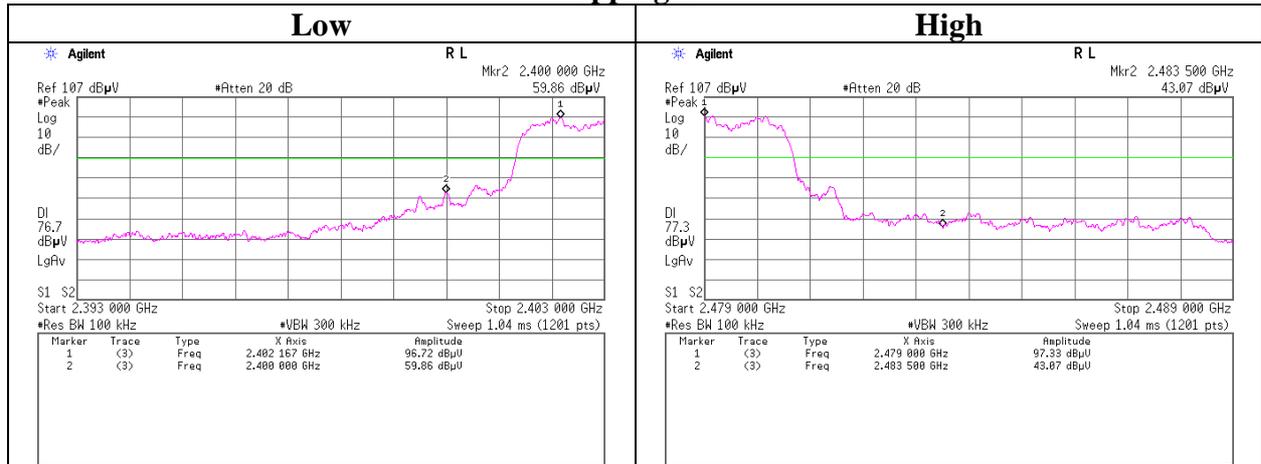
### Hopping Off



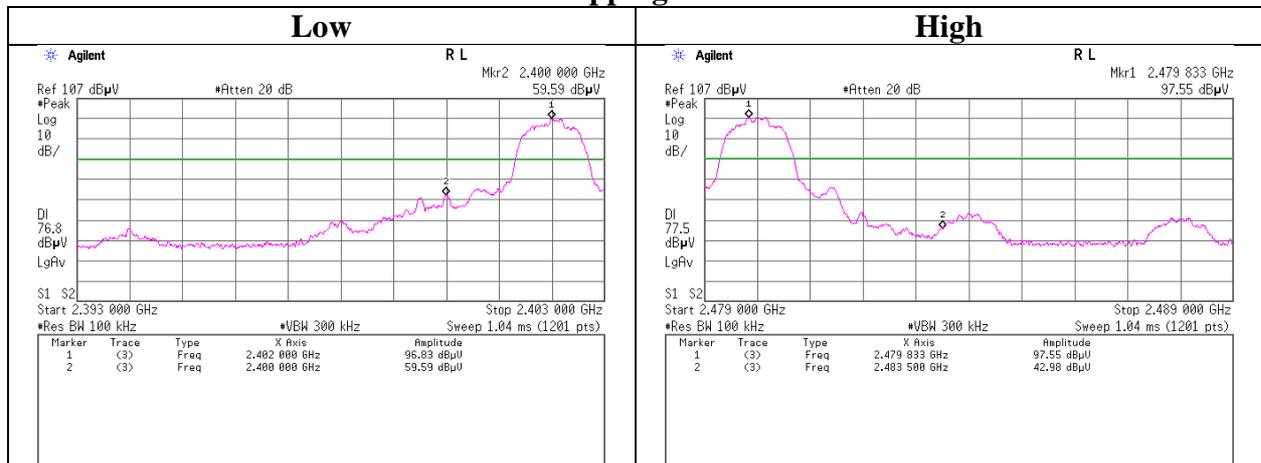
## Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx 3DH5

### Hopping On



### Hopping Off



**UL Japan, Inc.**

**Shonan EMC Lab.**

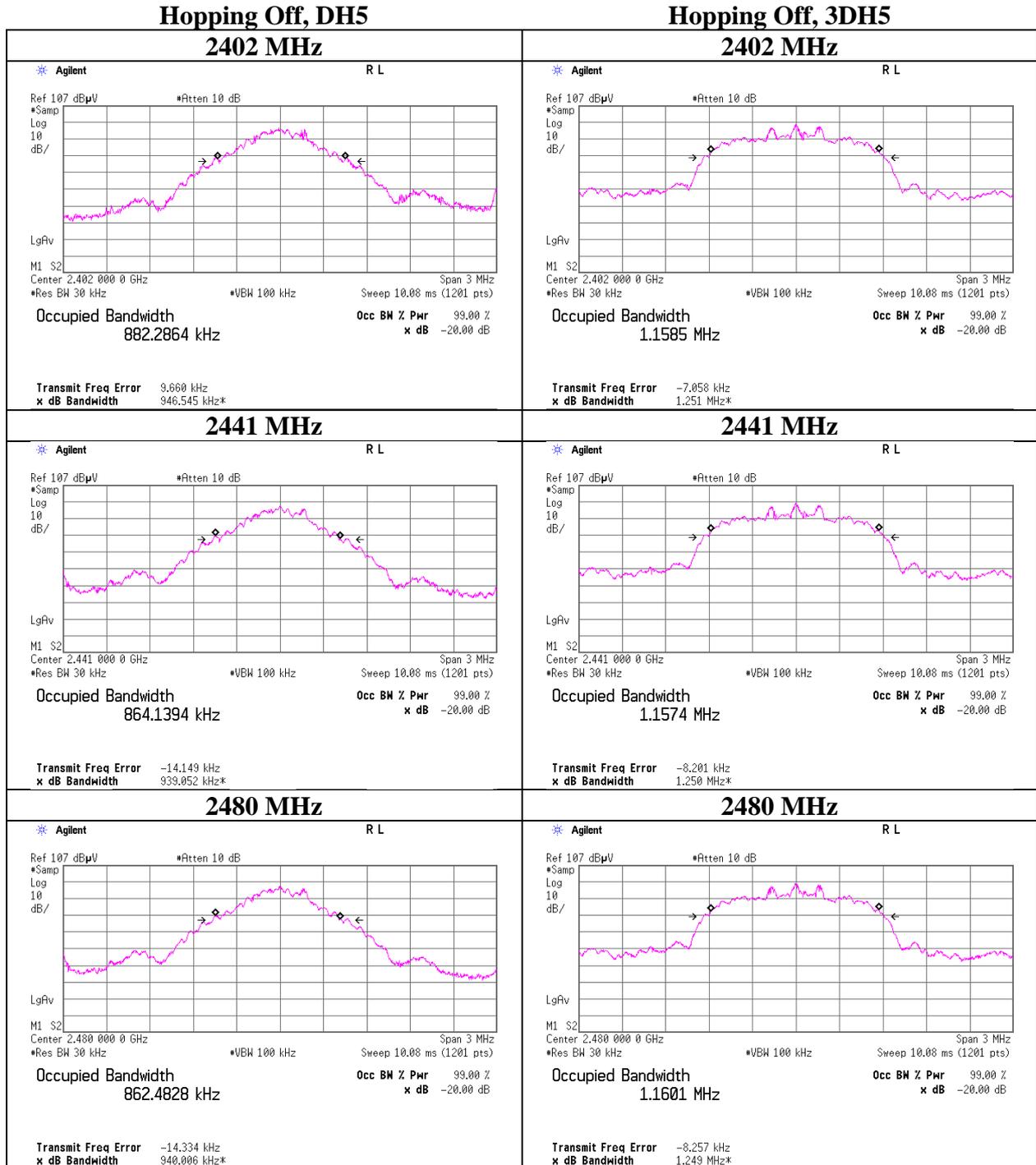
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

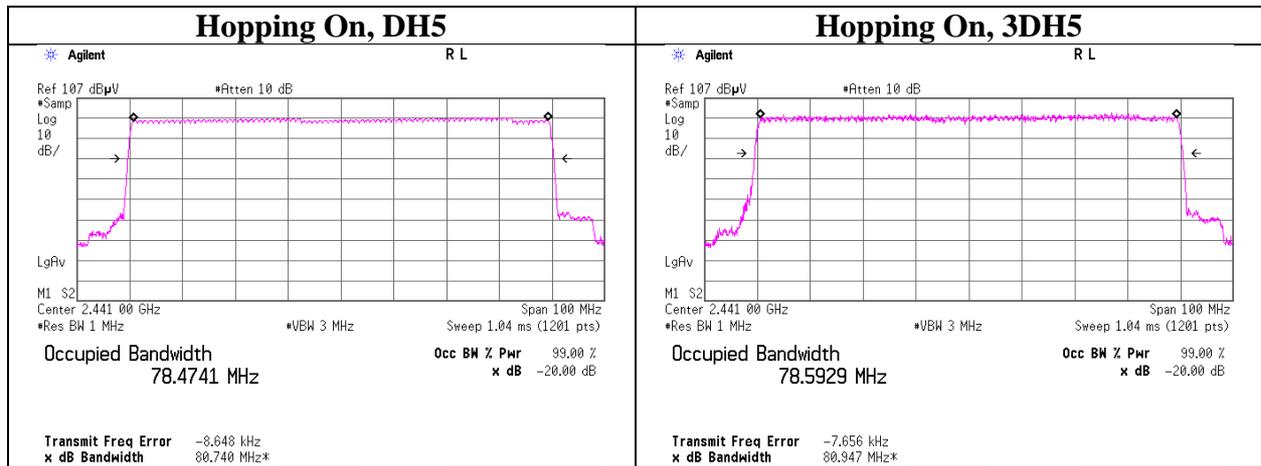
## 99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping Off



## 99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11485102S-A
Date	October 25, 2016
Temperature / Humidity	25 deg. C / 43 % RH
Engineer	Shinichi Takano
Mode	Tx, Hopping On



\*Refer to 20dB Bandwidth for 99% Bandwidth inquiry mode.

## **APPENDIX 2: Test instruments**

### **Test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2016/02/10 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2016/05/24 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2016/05/11 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2016/08/09 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2016/10/11 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2016/07/22 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SSA-01	Spectrum Analyzer	Agilent	N9010A-526	MY48031482	RE	2016/04/28 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMSKMS	-	RE	2016/04/18 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2016/02/19 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2016/02/25 * 12
KAT3-10	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2016/07/26 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2015/11/02 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS4906	-/0901-270(R F Selector)	RE	2016/04/22 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS4906	-/0901-270(R F Selector)	RE	2016/04/22 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2015/11/03 * 12
TR-09	Test Receiver	Rohde & Schwarz	ESC1	100769	RE	2016/10/07 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2016/07/13 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2016/10/11 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2016/03/23 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2016/04/18 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12

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

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

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

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401