



# RADIO TEST REPORT

**Test Report No. : 11155194H-A-R3**

**Applicant** : Sony Interactive Entertainment Inc.  
**Type of Equipment** : Wireless communication module  
**Model No.** : J20H091  
**FCC ID** : AK8M16DFL1  
**Test regulation** : FCC Part 15 Subpart C: 2015  
\*Bluetooth part  
**Test Result** : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11155194H-A-R2. 11155194H-A-R2 is replaced with this report.

**Date of test:** February 10 to April 28, 2016

**Representative test engineer:**

*T. Noguchi*

Takafumi Noguchi  
Engineer  
Consumer Technology Division

**Approved by:**

*Takayuki S.*

Takayuki Shimada  
Engineer  
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
[http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

13-EM-F0429



---

<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information.....</b>	<b>4</b>
<b>SECTION 2: Equipment under test (E.U.T.).....</b>	<b>4</b>
<b>SECTION 3: Test specification, procedures &amp; results.....</b>	<b>6</b>
<b>SECTION 4: Operation of E.U.T. during testing.....</b>	<b>9</b>
<b>SECTION 5: Conducted Emission.....</b>	<b>11</b>
<b>SECTION 6: Radiated Spurious Emission .....</b>	<b>12</b>
<b>SECTION 7: Antenna Terminal Conducted Tests.....</b>	<b>13</b>
<b>APPENDIX 1: Test data .....</b>	<b>14</b>
Conducted Emission .....	14
20dB Bandwidth and Carrier Frequency Separation.....	18
Number of Hopping Frequency .....	21
Dwell time.....	23
Maximum Peak Output Power .....	26
Average Output Power .....	27
Radiated Spurious Emission .....	29
Conducted Spurious Emission .....	43
Conducted Emission Band Edge compliance .....	49
99%Occupied Bandwidth .....	51
<b>APPENDIX 2: Test instruments .....</b>	<b>53</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>54</b>
Conducted Emission .....	54
Radiated Spurious Emission .....	55
Worst Case Position (Horizontal: X-axis/ Vertical:Y-axis).....	56
Test Configuration and peripherals .....	58

## **SECTION 1: Customer information**

Company Name	Sony Interactive Entertainment Inc.
Brand Name	SONY
Address	1-7-1 Konan, Minato-ku, Tokyo, 108-0075 Japan
Telephone Number	+81-3-6748-6333
Facsimile Number	+81-3-6748-6383
Contact Person	Kiyoto Sasaki

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

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

Type of Equipment	Wireless communication module
Model No	J20H091
Serial No	Refer to Clause 4.2
Country of Manufacture	China/Japan
Receipt Date of Sample	February 6, 2016
Condition of EUT	Production 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**

J20H091 is the Wireless communication module.

#### **Product Specification**

Clock frequency in the system (radio part)	40MHz
Operating Temperature	-10 - +85 deg. C
Power Supply	DC 3.3 V, DC 1.8 V
Size	20 x 18 x 3.6 mm, 55pin LGA

## Radio Specification

### WLAN (IEEE802.11b/g/n-20)

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	Less than 20MHz & 5MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WA for 2.4GHz / Antenna port WB)
Antenna Gain: G <sub>ANT</sub>	5.6dBi (Antenna port WA for 2.4GHz / Antenna port WB)
Directional Gain *1)	8.61dBi

### WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)

Equipment Type	Transceiver
Frequency of Operation	W52: 5180-5240MHz W53: 5260-5320MHz W56: 5500-5700MHz W58: 5745-5825MHz
Type of Modulation	OFDM
Bandwidth & Channel spacing	Less than 20MHz/40MHz/80MHz&20MHz/40MHz/80MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WA for 5GHz / Antenna port WC for 5GHz)
Antenna Gain: G <sub>ANT</sub>	5.0dBi (Antenna port WA for 5GHz) 3.5dBi (Antenna port WC for 5GHz)
Directional Gain *1)	7.29dBi

### Bluetooth (BDR/EDR)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	79MHz & 1MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4dBi (Antenna port WC for 2.4 GHz)

### Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	1MHz & 2MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4dBi (Antenna port WC for 2.4 GHz)

\*1) Directional antenna gain =  $10 \log \left( \frac{G_{ANT1}}{10^{20}} + \frac{G_{ANT2}}{10^{20}} \right)^2 / 2$

\*This test report applies to Bluetooth.

**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015  
\*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

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 complies with FCC Part 15 Subpart B: 2015, final revised on November 23, 2015

### **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	QP 29.0 dB, 0.15000 MHz, L AV 30.7 dB, 20.02100 MHz, N 20.28400 MHz, N	Complied	-
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		16.7 dB 2483.500 MHz, AV, Hori.	Complied

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

\*1) 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 has the power supply regulator. However one of the input voltages to RF part doesn't go through the regulator. The stable voltage will be supplied by the end product, which will be required to have a power supply regulator. Therefore, the EUT complies with the requirement.

#### **FCC Part 15.203/212 Antenna requirement**

The EUT has a unique coupling/antenna connector (U.FL). Therefore the equipment complies with the requirement of 15.203/212.

## **UL Japan, Inc.**

### **Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
Telephone : +81 596 24 8999  
Facsimile : +81 596 24 8124

### 3.3 Addition to standard

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

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

### 3.4 Uncertainty

#### EMI

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

Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

Frequency range	Conducted emission using AMN(LISN) (+dB)
0.009 - 0.15MHz	3.5 dB
0.15 - 30MHz	2.9 dB

Test distance	Radiated emission (+dB) 9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+dB)		(10 m*)(+dB)	
	30 - 300 MHz	300 - 1000MHz	30 - 300 MHz	300 - 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 - 6GHz	6 - 18GHz	10 - 26.5 GHz	26.5 - 40GHz	1 - 18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

\*Measurement distance

#### Conducted Emission test

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

#### Radiated emission test

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

**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab. \*NVLAP Lab. code: 200572-0  
 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
 Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 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>
Conducted Emission, 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)  *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.  * 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: Same as production model  Software: Opro_DOS_Labtool_Ver2.0.0.84  *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>		

### **Simultaneously transmission**

<b>Test Item</b>	<b>Mode *1)</b>
Spurious Emission (Radiated)	Tx (Hopping Off) 3DH5 2402 MHz + 11n-20 5180 MHz Tx (Hopping Off) 3DH5 2441 MHz + 11n-20 5180 MHz Tx (Hopping Off) 3DH5 2480 MHz + 11n-20 5180 MHz
*1) The test was performed on the mode as a representative, because it had the highest power of 5GHz band at antenna terminal test.	

## 4.2 Configuration and peripherals

**This page has been submitted for a separate exhibit.**

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

#### For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

**Detector** : QP and CISPR AV  
**Measurement range** : 0.15 MHz - 30 MHz  
**Test data** : APPENDIX  
**Test result** : Pass

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

### **Test Procedure**

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 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	4.5 m*2) (below 10 GHz), 1 m*3) (above 10 GHz)		4.5 m*2) (below 10 GHz), 1 m*3) (above 10 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:  $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.5 \text{ dB}$

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

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

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

**Measurement range** : 30 M - 26.5 GHz  
**Test data** : APPENDIX  
**Test result** : Pass

**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
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	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 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) 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 low enough as shown in the chart. (9 kHz - 150 kHz: RBW = 200Hz, 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**

**Conducted Emission**

**DATA OF CONDUCTED EMISSION TEST**

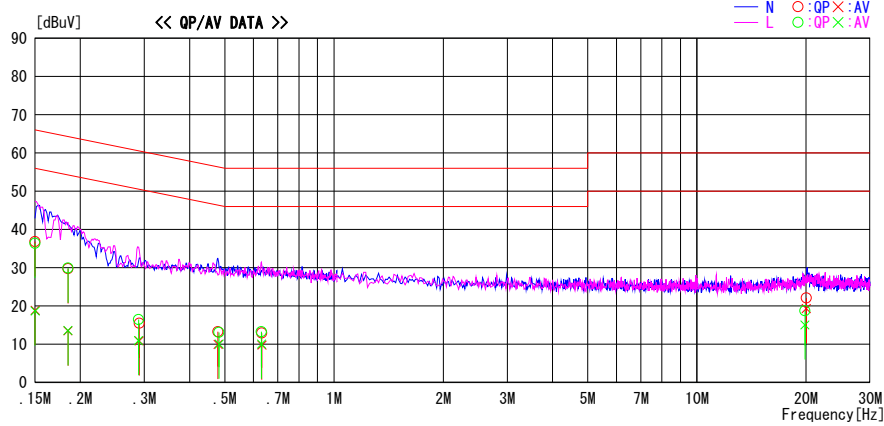
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2016/02/16

Report No. : 11155194H

Temp./Humi. : 20deg. C / 27% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx DH5 2480MHz

LIMIT : FCC15.207 QP  
 FCC15.207 AV

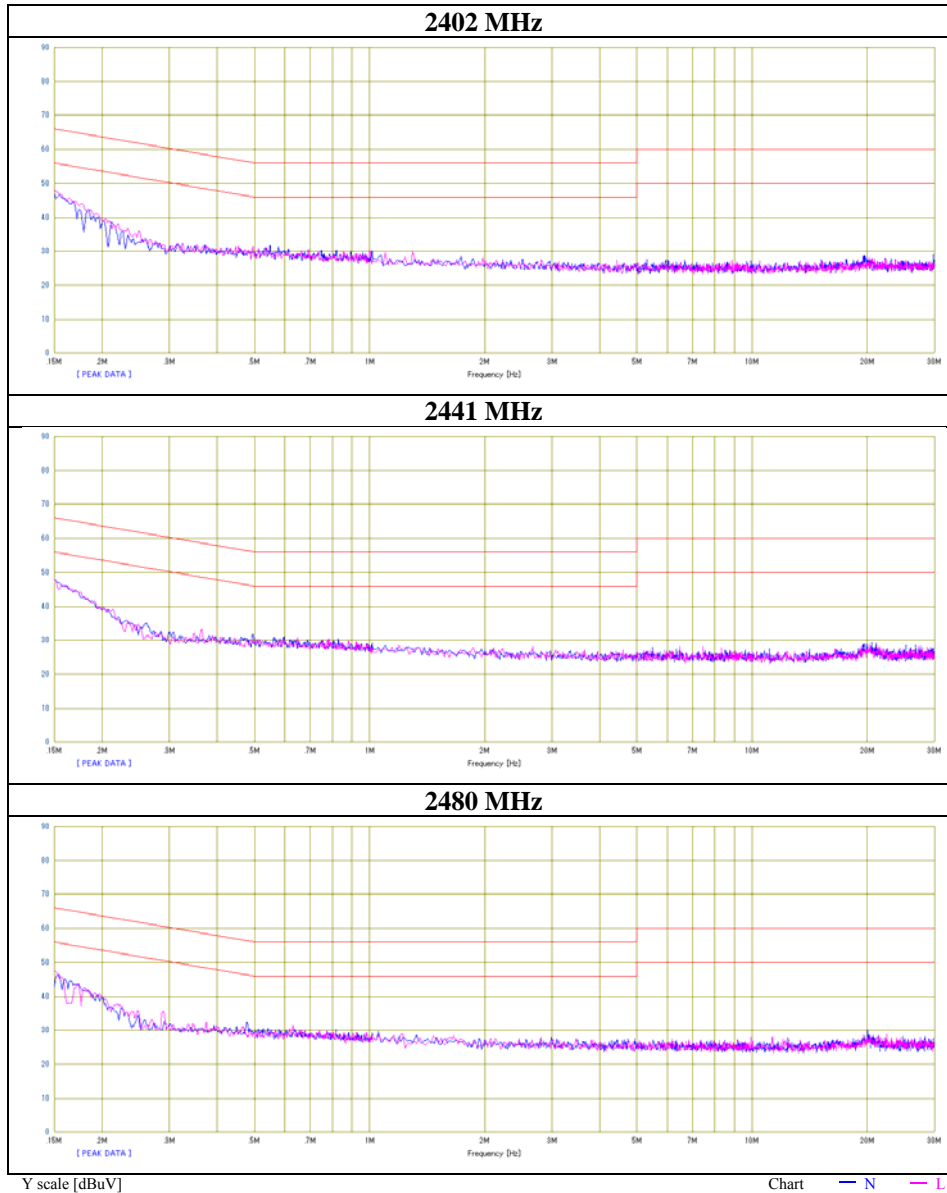


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	23.6	5.7	13.2	36.8	18.9	66.0	56.0	29.2	37.1	N	
0.18480	16.5	0.3	13.2	29.7	13.5	64.3	54.3	34.6	40.8	N	
0.29065	2.3	-2.3	13.2	15.5	10.9	60.5	50.5	45.0	39.6	N	
0.47915	0.0	-3.3	13.3	13.3	10.0	56.4	46.4	43.1	36.4	N	
0.63285	-0.4	-3.5	13.3	12.9	9.8	56.0	46.0	43.1	36.2	N	
20.02100	7.6	4.8	14.5	22.1	19.3	60.0	50.0	37.9	30.7	N	
0.15000	23.2	5.5	13.2	36.4	18.7	66.0	56.0	29.6	37.3	L	
0.18480	16.7	0.4	13.2	29.9	13.6	64.3	54.3	34.4	40.7	L	
0.28920	3.3	-2.2	13.2	16.5	11.0	60.5	50.5	44.0	39.5	L	
0.48205	-0.2	-3.2	13.3	13.1	10.1	56.3	46.3	43.2	36.2	L	
0.63140	0.0	-3.2	13.3	13.3	10.1	56.0	46.0	42.7	35.9	L	
19.83320	4.3	0.7	14.4	18.7	15.1	60.0	50.0	41.3	34.9	L	

CHART : WITH FACTOR. Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATTEN + CABLE)  
 Except for the above table : adequate margin data below the limits.

## Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11155194H
Date	February 16, 2016
Temperature / Humidity	20 deg. C / 27 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, DH5



## Conducted Emission

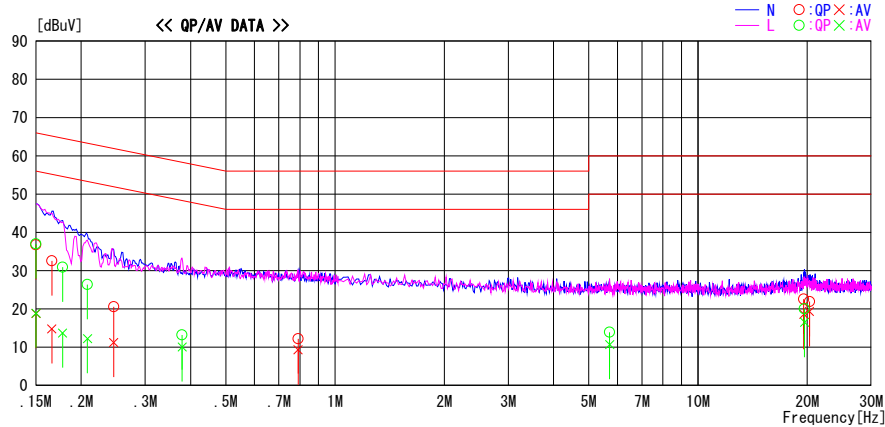
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2016/02/16

Report No. : 11155194H  
 Temp./Humi. : 20deg. C / 27% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx 3DH5 2480MHz

LIMIT : FCC15.207 QP  
 FCC15.207 AV



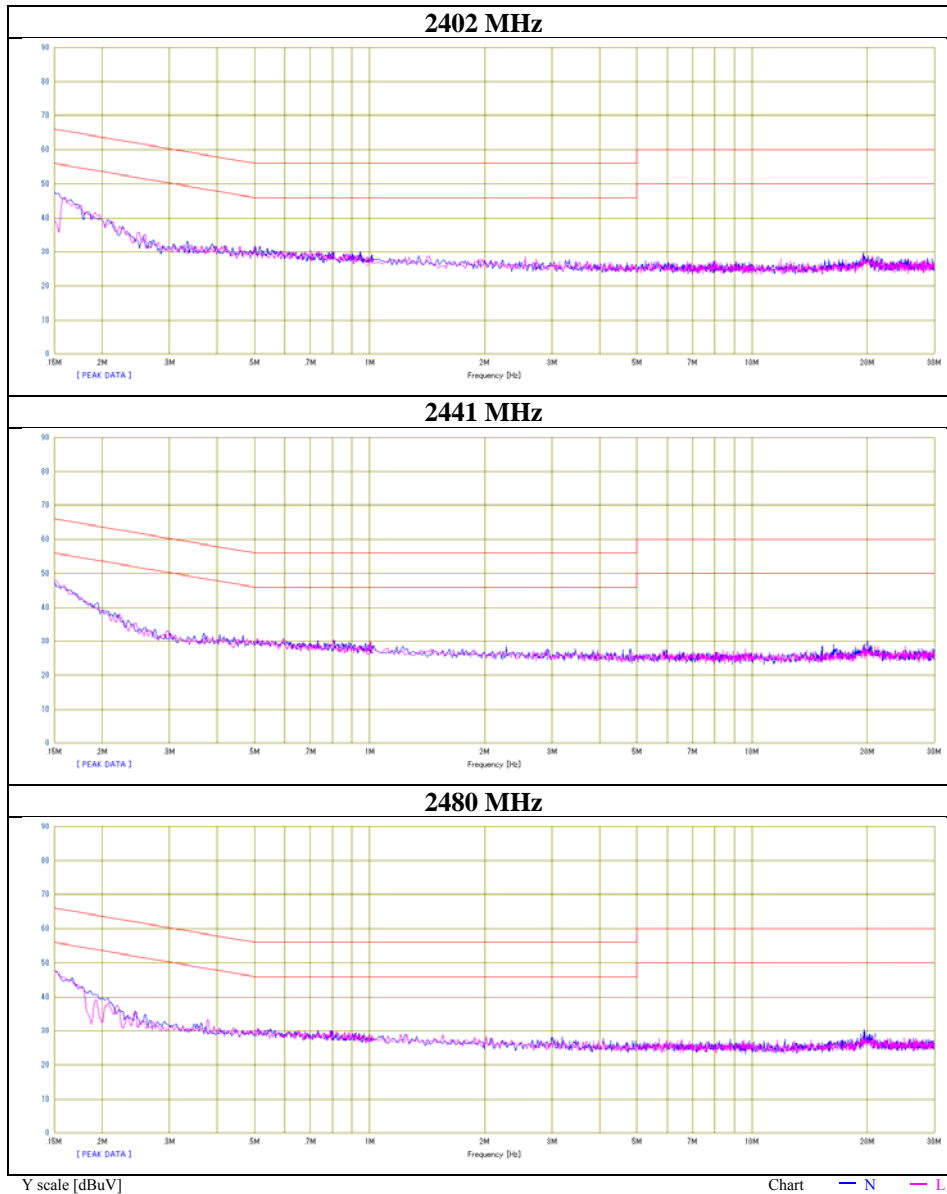
Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	23.5	5.6	13.2	36.7	18.8	66.0	56.0	29.3	37.2	N	
0.16595	19.4	1.6	13.2	32.6	14.8	65.2	55.2	32.6	40.4	N	
0.24570	7.4	-1.9	13.2	20.6	11.3	61.9	51.9	41.3	40.6	N	
0.79090	-1.1	-4.0	13.3	12.2	9.3	56.0	46.0	43.8	36.7	N	
19.56800	8.2	4.2	14.4	22.6	18.6	60.0	50.0	37.4	31.4	N	
20.28400	7.4	4.8	14.5	21.9	19.3	60.0	50.0	38.1	30.7	N	
0.15000	23.8	5.7	13.2	37.0	18.9	66.0	56.0	29.0	37.1	L	
0.17755	17.7	0.5	13.2	30.9	13.7	64.6	54.6	33.7	40.9	L	
0.20800	13.2	-0.9	13.2	26.4	12.3	63.3	53.3	36.9	41.0	L	
0.37910	-0.1	-3.2	13.3	13.2	10.1	58.3	48.3	45.1	38.2	L	
5.71152	0.1	-3.1	13.8	13.9	10.7	60.0	50.0	46.1	39.3	L	
19.63650	5.6	2.1	14.4	20.0	16.5	60.0	50.0	40.0	33.5	L	

CHART : WITH FACTOR. Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATTN + CABLE)  
 Except for the above table : adequate margin data below the limits.



## Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11155194H
Date	February 16, 2016
Temperature / Humidity	20 deg. C / 27 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, 3DH5



## 20dB Bandwidth and Carrier Frequency Separation

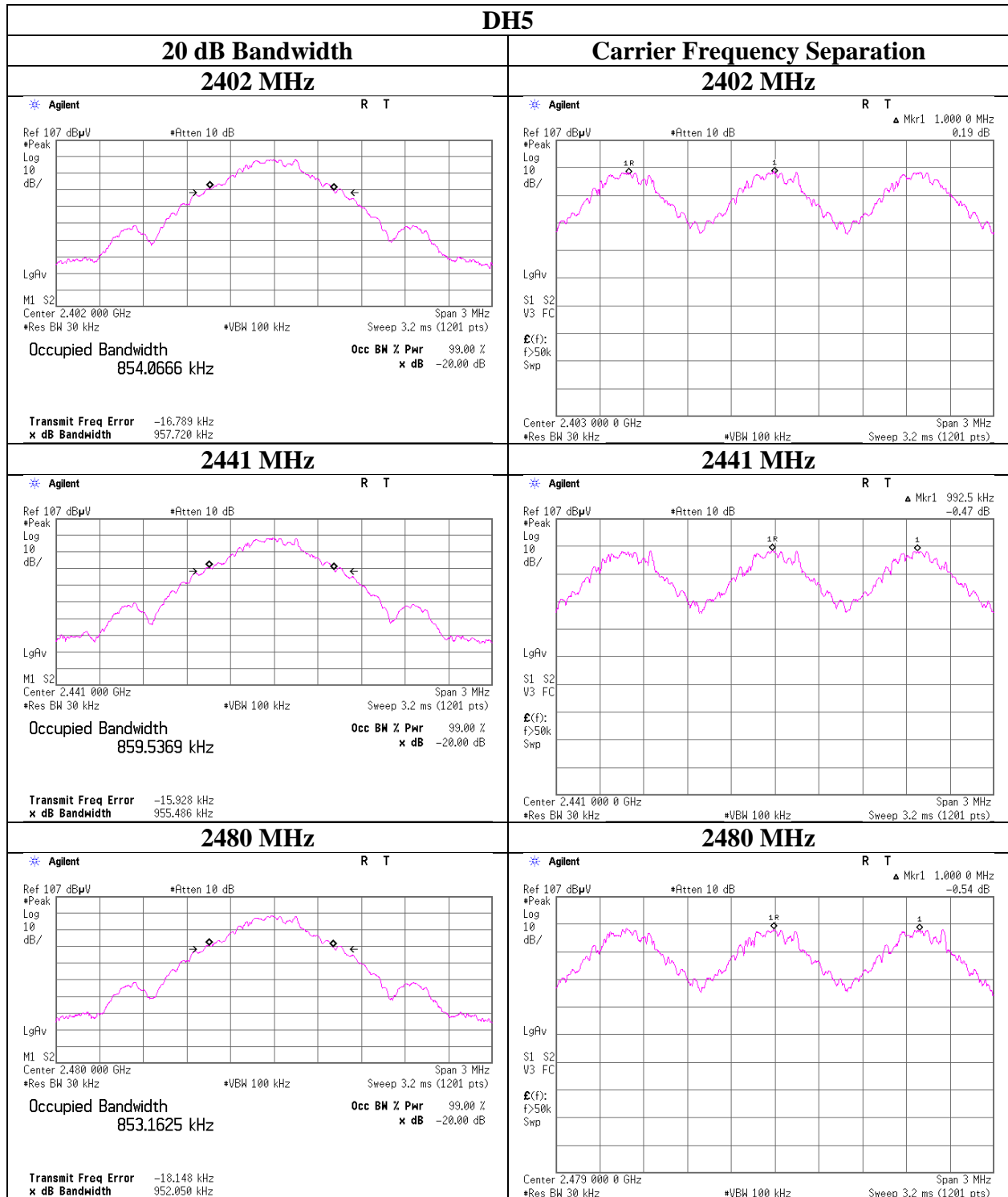
Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 11155194H  
Date February 10, 2016  
Temperature / Humidity 24 deg. C / 28 % RH  
Engineer Tomoki Matsui  
Mode Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.958	1.000	$\geq 0.638$
DH5	2441.0	0.955	0.993	$\geq 0.637$
DH5	2480.0	0.952	1.000	$\geq 0.635$
3DH5	2402.0	1.302	1.000	$\geq 0.868$
3DH5	2441.0	1.293	1.000	$\geq 0.862$
3DH5	2480.0	1.295	1.003	$\geq 0.863$

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

No limit applies to 20dB Bandwidth.

## 20dB Bandwidth and Carrier Frequency Separation



**UL Japan, Inc.**

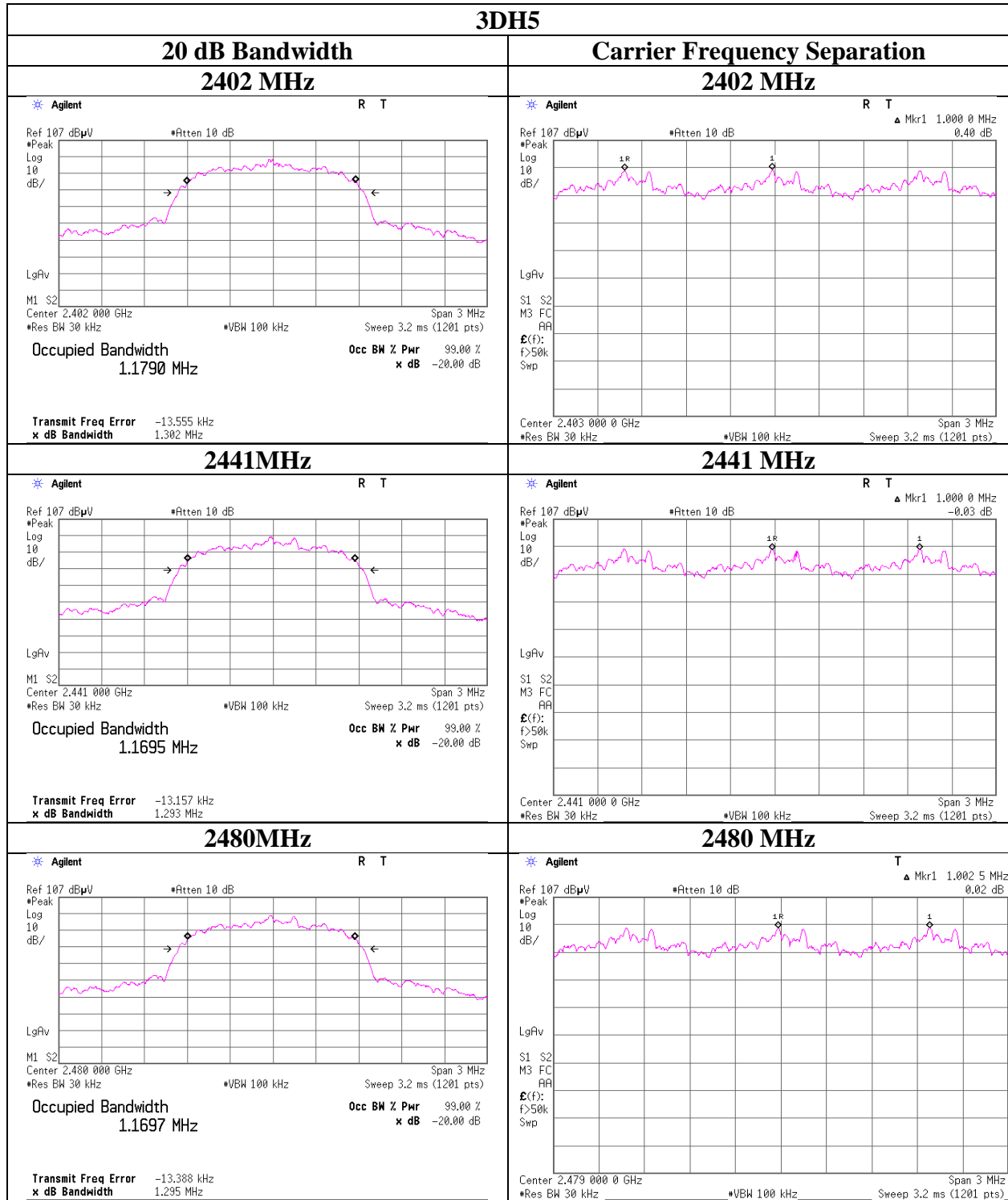
**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## 20dB Bandwidth and Carrier Frequency Separation



**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

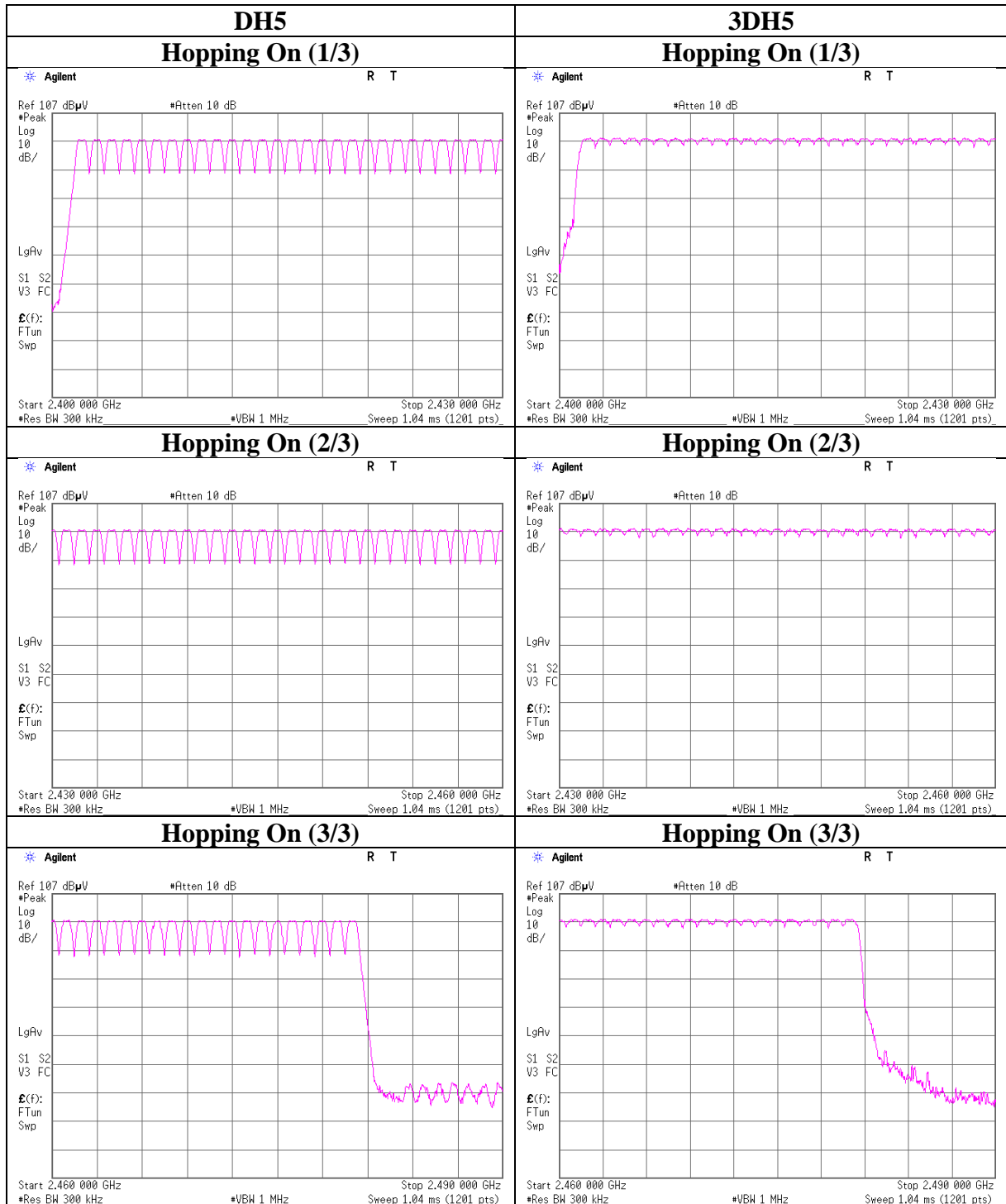
### Number of Hopping Frequency

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 11155194H  
Date February 10, 2016  
Temperature / Humidity 24 deg. C / 28 % RH  
Engineer Tomoki Matsui  
Mode Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15

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

### Number of Hopping Frequency



### Dwell time

Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 11155194H  
 Date : February 10, 2016  
 Temperature / Humidity : 24 deg. C / 28 % RH  
 Engineer : Tomoki Matsui  
 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	49.6 times / 5 sec. x 31.6 sec. = 314 times	0.407	128	400
DH3	22.4 times / 5 sec. x 31.6 sec. = 142 times	1.680	239	400
DH5	16.2 times / 5 sec. x 31.6 sec. = 103 times	2.932	302	400
3DH1	49.2 times / 5 sec. x 31.6 sec. = 311 times	0.406	126	400
3DH3	26.4 times / 5 sec. x 31.6 sec. = 167 times	1.672	279	400
3DH5	19.6 times / 5 sec. x 31.6 sec. = 124 times	2.940	365	400

Sample Calculation

Result = Number of transmission x Length of transmission

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

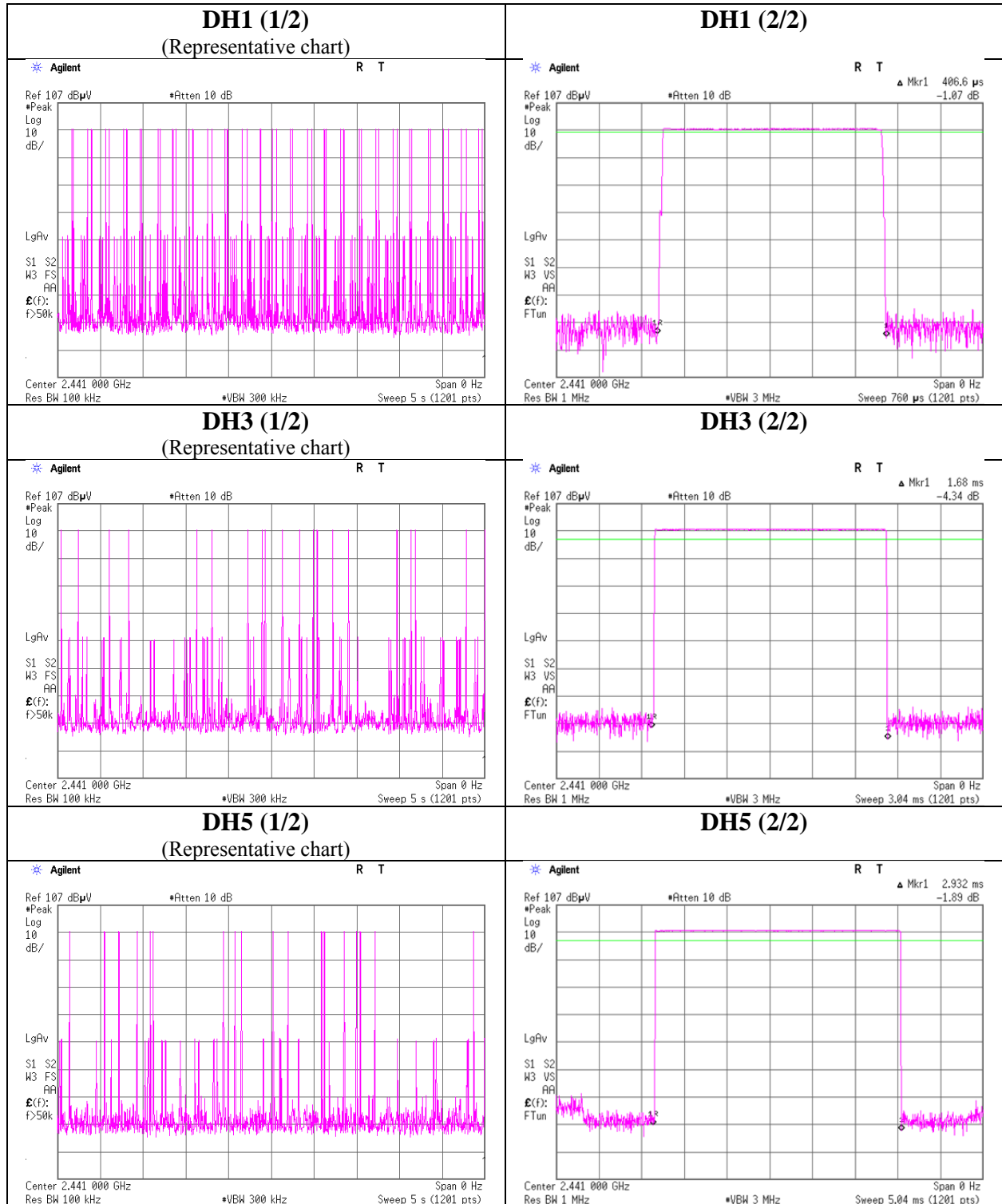
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	48	51	49	51	49.6
DH3	20	23	22	22	25	22.4
DH5	18	13	20	15	15	16.2
3DH1	47	50	50	50	49	49.2
3DH3	22	25	30	27	28	26.4
3DH5	19	19	18	22	20	19.6

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**



**UL Japan, Inc.**

**Ise EMC Lab.**

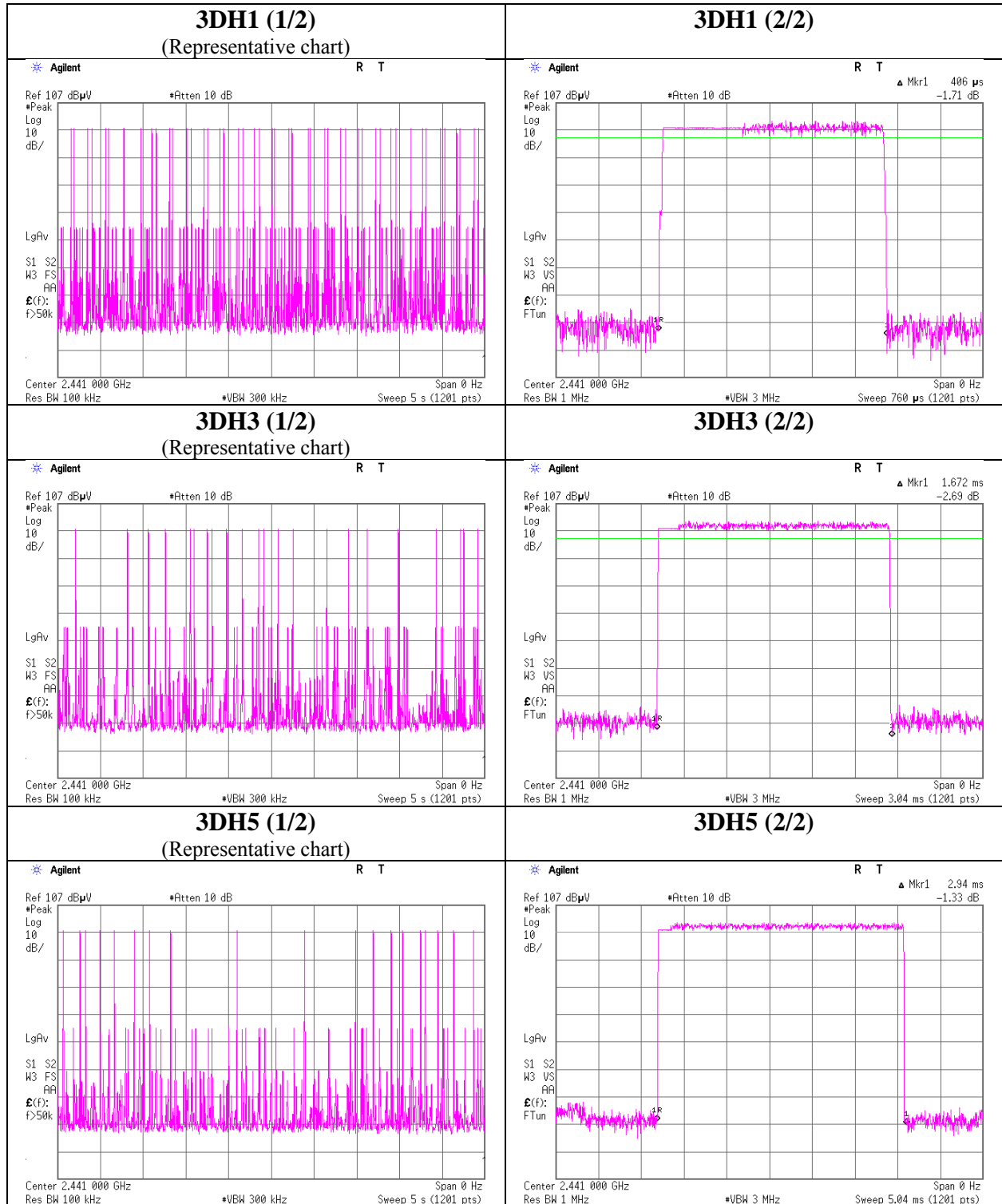
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



**Dwell time**



**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Maximum Peak Output Power

Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 11155194H  
 Date : February 10, 2016  
 Temperature / Humidity : 24 deg. C / 28 % RH  
 Engineer : Tomoki Matsui  
 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	-9.41	1.44	10.09	2.12	1.63	20.56	113.76	18.44
DH5	2441.0	-9.48	1.45	10.09	2.06	1.61	20.56	113.76	18.50
DH5	2480.0	-9.58	1.46	10.09	1.97	1.57	20.56	113.76	18.59
2DH5	2402.0	-6.44	1.44	10.09	5.09	3.23	20.56	113.76	15.47
2DH5	2441.0	-6.45	1.45	10.09	5.09	3.23	20.56	113.76	15.47
2DH5	2480.0	-6.65	1.46	10.09	4.90	3.09	20.56	113.76	15.66
3DH5	2402.0	-6.14	1.44	10.09	5.39	3.46	20.56	113.76	15.17
3DH5	2441.0	-6.19	1.45	10.09	5.35	3.43	20.56	113.76	15.21
3DH5	2480.0	-6.34	1.46	10.09	5.21	3.32	20.56	113.76	15.35

Sample Calculation:

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

\*This Limit was reduced by 0.4 dB for directional gain of the antenna/antenna array exceeding 6 dBi.

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.

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

Test place : Ise EMC Lab. No.11 Measurement Room  
Report No. : 11155194H  
Date : February 10, 2016  
Temperature / Humidity : 24 deg. C / 28 % RH  
Engineer : Tomoki Matsui  
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)	
					[dBm]	[mW]
DH5	2402.0	-10.67	1.44	10.09	0.86	1.22
DH5	2441.0	-10.74	1.45	10.09	0.80	1.20
DH5	2480.0	-10.85	1.46	10.09	0.70	1.17
2DH5	2402.0	-10.29	1.44	10.09	1.24	1.33
2DH5	2441.0	-10.29	1.45	10.09	1.25	1.33
2DH5	2480.0	-10.50	1.46	10.09	1.05	1.27
3DH5	2402.0	-10.30	1.44	10.09	1.23	1.33
3DH5	2441.0	-10.38	1.45	10.09	1.16	1.31
3DH5	2480.0	-10.50	1.46	10.09	1.05	1.27

Sample Calculation:

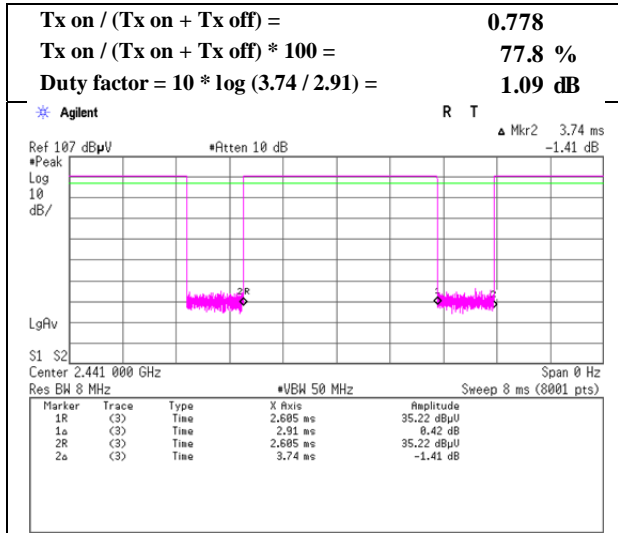
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

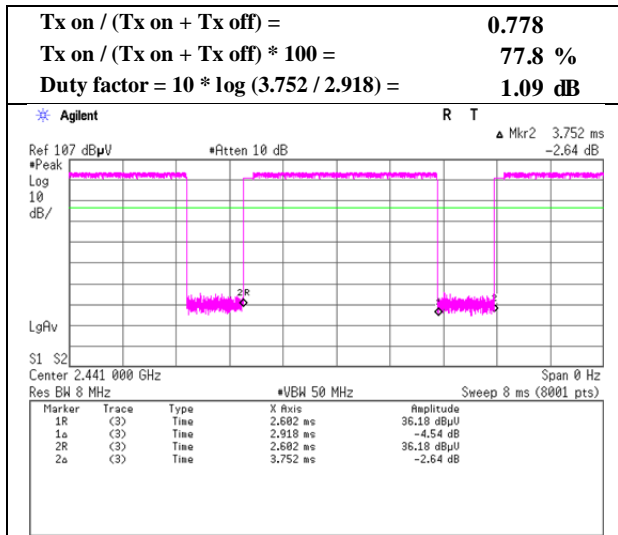
### Burst Rate Confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off

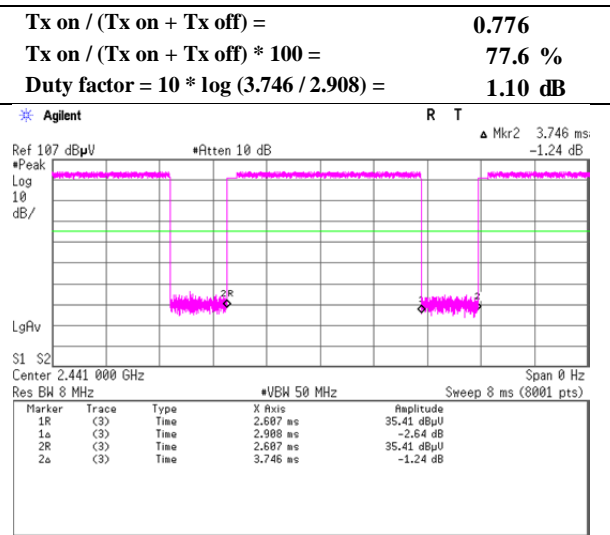
#### DH5



#### 2DH5



#### 3DH5



## Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11155194H  
Date February 10, 2016 February 12, 2016 February 15, 2016  
Temperature / Humidity 24 deg. C / 26 % RH 24 deg. C / 30 % RH 18 deg. C / 41 % RH  
Engineer Yuta Moriya Yuta Moriya Takafumi Noguchi  
(1-10GHz) (Above 10GHz) (Below 1GHz)  
Mode Tx, Hopping Off, DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.329	QP	22.9	13.8	7.2	32.2	11.7	40.0	28.3	
Hori	59.315	QP	23.1	7.2	7.5	32.1	5.7	40.0	34.3	
Hori	80.004	QP	34.6	6.3	7.8	32.0	16.7	40.0	23.3	
Hori	89.479	QP	25.5	8.1	7.9	32.1	9.4	43.5	34.1	
Hori	320.006	QP	27.7	15.2	10.1	32.0	21.0	46.0	25.1	
Hori	403.079	QP	22.3	17.4	10.6	32.0	18.3	46.0	27.7	
Hori	2390.000	PK	41.8	26.9	6.8	32.0	43.5	73.9	30.4	
Hori	4804.000	PK	39.5	31.8	9.0	31.3	49.0	73.9	24.9	Floor Noise
Hori	7206.000	PK	40.0	36.0	10.2	32.0	54.2	73.9	19.7	Floor Noise
Hori	9608.000	PK	40.0	38.2	11.0	32.4	56.8	73.9	17.1	Floor Noise
Hori	2390.000	AV	29.3	26.9	6.8	32.0	31.0	53.9	22.9	
Hori	4804.000	AV	27.2	31.8	9.0	31.3	36.7	53.9	17.2	Floor Noise
Hori	7206.000	AV	28.3	36.0	10.2	32.0	42.5	53.9	11.4	Floor Noise
Hori	9608.000	AV	28.6	38.2	11.0	32.4	45.4	53.9	8.5	Floor Noise
Vert	40.329	QP	23.4	13.8	7.2	32.2	12.2	40.0	27.8	
Vert	59.315	QP	23.7	7.2	7.5	32.1	6.3	40.0	33.7	
Vert	80.004	QP	32.6	6.3	7.8	32.0	14.7	40.0	25.3	
Vert	89.479	QP	29.0	8.1	7.9	32.1	12.9	43.5	30.6	
Vert	320.006	QP	22.9	15.2	10.1	32.0	16.2	46.0	29.8	
Vert	403.079	QP	22.9	17.4	10.6	32.0	18.9	46.0	27.1	
Vert	2390.000	PK	41.7	26.9	6.8	32.0	43.4	73.9	30.5	
Vert	4804.000	PK	40.0	31.8	9.0	31.3	49.5	73.9	24.4	Floor Noise
Vert	7206.000	PK	40.6	36.0	10.2	32.0	54.8	73.9	19.1	Floor Noise
Vert	9608.000	PK	40.5	38.2	11.0	32.4	57.3	73.9	16.6	Floor Noise
Vert	2390.000	AV	29.2	26.9	6.8	32.0	30.9	53.9	23.0	
Vert	4804.000	AV	27.2	31.8	9.0	31.3	36.7	53.9	17.2	Floor Noise
Vert	7206.000	AV	28.4	36.0	10.2	32.0	42.6	53.9	11.3	Floor Noise
Vert	9608.000	AV	28.7	38.2	11.0	32.4	45.5	53.9	8.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz  $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.52\text{ dB}$

10 GHz - 26.5 GHz  $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.52\text{ dB}$

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	93.2	26.9	6.8	32.0	94.9	-	-	Carrier
Hori	2400.000	PK	35.2	26.9	6.8	32.0	36.9	74.9	38.0	
Vert	2402.000	PK	92.4	26.9	6.8	32.0	94.1	-	-	Carrier
Vert	2400.000	PK	35.8	26.9	6.8	32.0	37.5	74.1	36.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

**UL Japan, Inc.**

**Ise EMC Lab.**

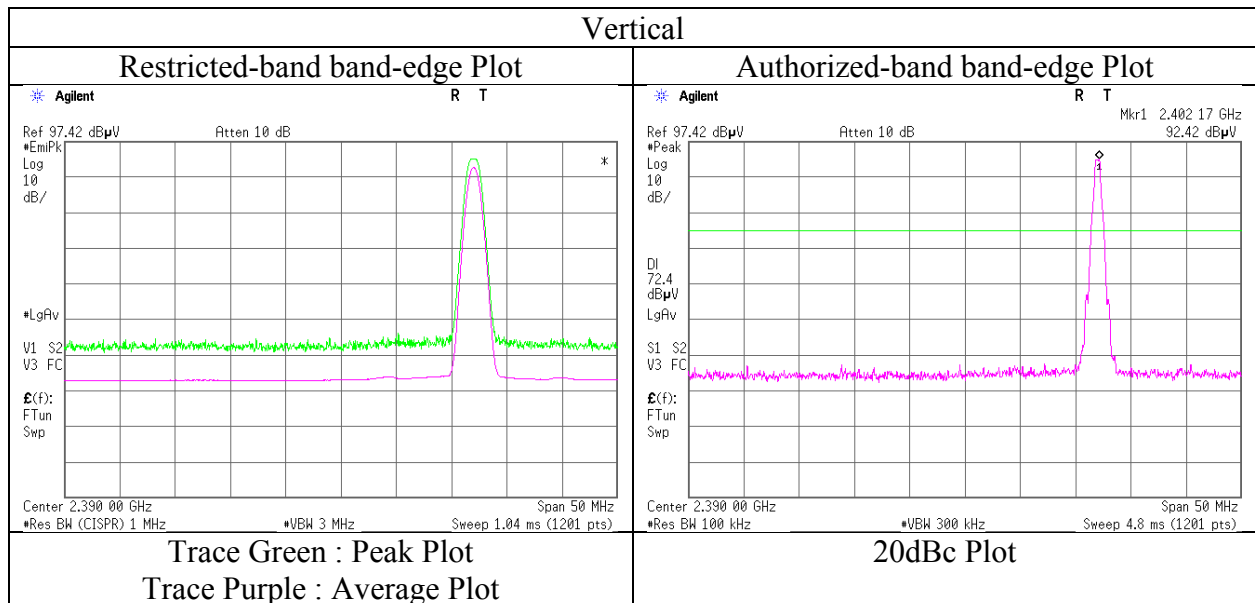
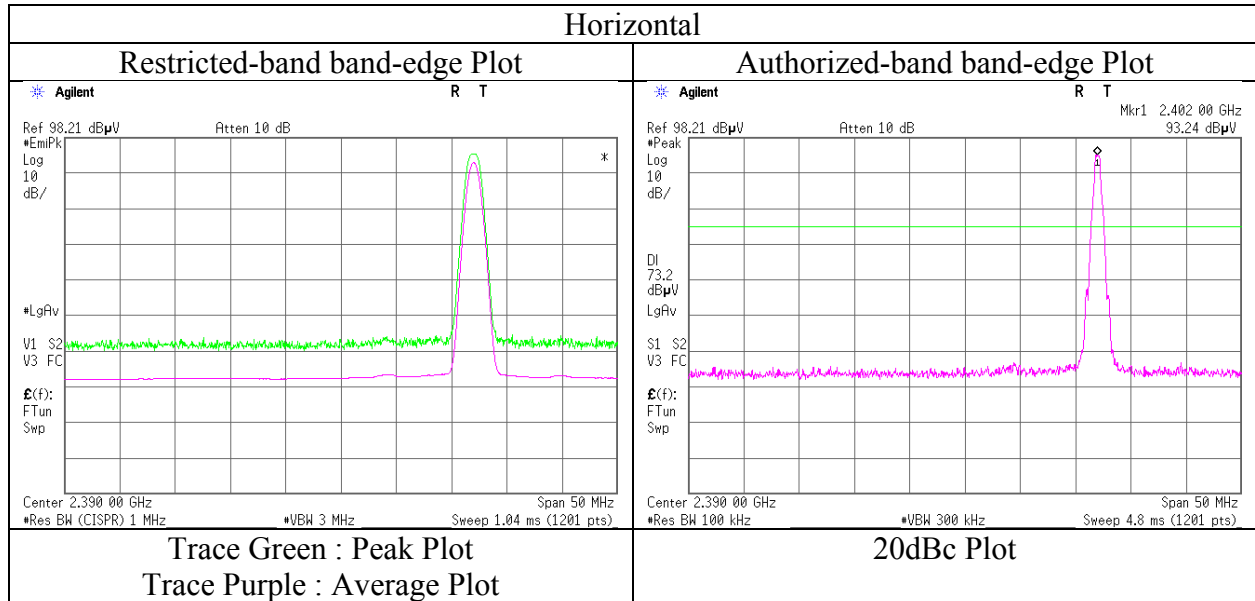
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 26 % RH
Engineer	Yuta Moriya (1-10GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Report No. : 11155194H  
 Date : February 10, 2016      February 12, 2016      February 15, 2016  
 Temperature / Humidity : 24 deg. C / 26 % RH      24 deg. C / 30 % RH      18 deg. C / 41 % RH  
 Engineer : Yuta Moriya      Yuta Moriya      Takafumi Noguchi  
 (1-10GHz)      (Above 10GHz)      (Below 1GHz)  
 Mode : Tx, Hopping Off, DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.329	QP	23.0	13.8	7.2	32.2	11.8	40.0	28.2	
Hori	59.315	QP	23.1	7.2	7.5	32.1	5.7	40.0	34.3	
Hori	80.004	QP	35.1	6.3	7.8	32.0	17.2	40.0	22.8	
Hori	89.479	QP	25.6	8.1	7.9	32.1	9.5	43.5	34.0	
Hori	320.006	QP	27.0	15.2	10.1	32.0	20.3	46.0	25.7	
Hori	403.079	QP	22.3	17.4	10.6	32.0	18.3	46.0	27.7	
Hori	4882.000	PK	39.9	31.9	9.0	31.3	49.5	73.9	24.4	Floor Noise
Hori	7323.000	PK	40.0	36.0	10.3	32.0	54.3	73.9	19.7	Floor Noise
Hori	9764.000	PK	40.3	38.2	11.0	32.5	57.0	73.9	16.9	Floor Noise
Hori	4882.000	AV	27.3	31.9	9.0	31.3	36.9	53.9	17.0	Floor Noise
Hori	7323.000	AV	28.2	36.0	10.3	32.0	42.5	53.9	11.4	Floor Noise
Hori	9764.000	AV	27.9	38.2	11.0	32.5	44.6	53.9	9.3	Floor Noise
Vert	40.329	QP	23.3	13.8	7.2	32.2	12.1	40.0	27.9	
Vert	59.315	QP	23.6	7.2	7.5	32.1	6.2	40.0	33.8	
Vert	80.004	QP	32.3	6.3	7.8	32.0	14.4	40.0	25.6	
Vert	89.479	QP	29.0	8.1	7.9	32.1	12.9	43.5	30.6	
Vert	320.006	QP	24.4	15.2	10.1	32.0	17.7	46.0	28.3	
Vert	403.079	QP	22.9	17.4	10.6	32.0	18.9	46.0	27.1	
Vert	4882.000	PK	40.1	31.9	9.0	31.3	49.7	73.9	24.2	Floor Noise
Vert	7323.000	PK	40.6	36.0	10.3	32.0	54.9	73.9	19.0	Floor Noise
Vert	9764.000	PK	40.3	38.2	11.0	32.5	57.0	73.9	16.9	Floor Noise
Vert	4882.000	AV	27.1	31.9	9.0	31.3	36.7	53.9	17.2	Floor Noise
Vert	7323.000	AV	28.4	36.0	10.3	32.0	42.7	53.9	11.2	Floor Noise
Vert	9764.000	AV	28.6	38.2	11.0	32.5	45.3	53.9	8.6	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor:      1 GHz - 10 GHz      20log(4.5 m / 3.0 m) = 3.52 dB  
                                 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

## Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11155194H  
Date : February 10, 2016      February 12, 2016      February 15, 2016  
Temperature / Humidity : 24 deg. C / 26 % RH      24 deg. C / 30 % RH      18 deg. C / 41 % RH  
Engineer : Yuta Moriya      Yuta Moriya      Takafumi Noguchi  
              (1-10GHz)      (Above 10GHz)      (Below 1GHz)  
Mode : Tx, Hopping Off, DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.329	QP	23.0	13.8	7.2	32.2	11.8	40.0	28.2	
Hori	59.315	QP	23.3	7.2	7.5	32.1	5.9	40.0	34.1	
Hori	80.004	QP	35.2	6.3	7.8	32.0	17.3	40.0	22.7	
Hori	89.479	QP	25.6	8.1	7.9	32.1	9.5	43.5	34.0	
Hori	320.006	QP	27.0	15.2	10.1	32.0	20.3	46.0	25.7	
Hori	403.079	QP	22.5	17.4	10.6	32.0	18.5	46.0	27.5	
Hori	2483.500	PK	44.3	26.9	6.8	32.0	46.0	73.9	27.9	
Hori	4960.000	PK	40.0	32.1	8.9	31.2	49.8	73.9	24.1	Floor Noise
Hori	7440.000	PK	41.0	36.0	10.2	32.1	55.1	73.9	18.8	Floor Noise
Hori	9920.000	PK	41.0	38.2	11.1	32.5	57.8	73.9	16.1	Floor Noise
Hori	2483.500	AV	31.7	26.9	6.8	32.0	33.4	53.9	20.5	
Hori	4960.000	AV	27.5	32.1	8.9	31.2	37.3	53.9	16.6	Floor Noise
Hori	7440.000	AV	28.4	36.0	10.2	32.1	42.5	53.9	11.4	Floor Noise
Hori	9920.000	AV	28.0	38.2	11.1	32.5	44.8	53.9	9.1	Floor Noise
Vert	40.329	QP	23.4	13.8	7.2	32.2	12.2	40.0	27.8	
Vert	59.315	QP	23.6	7.2	7.5	32.1	6.2	40.0	33.8	
Vert	80.004	QP	32.4	6.3	7.8	32.0	14.5	40.0	25.5	
Vert	89.479	QP	29.0	8.1	7.9	32.1	12.9	43.5	30.6	
Vert	320.006	QP	24.5	15.2	10.1	32.0	17.8	46.0	28.2	
Vert	403.079	QP	23.0	17.4	10.6	32.0	19.0	46.0	27.0	
Vert	2483.500	PK	45.4	26.9	6.8	32.0	47.1	73.9	26.8	
Vert	4960.000	PK	40.3	32.1	8.9	31.2	50.1	73.9	23.8	Floor Noise
Vert	7440.000	PK	40.5	36.0	10.2	32.1	54.6	73.9	19.3	Floor Noise
Vert	9920.000	PK	41.0	38.2	11.1	32.5	57.8	73.9	16.1	Floor Noise
Vert	2483.500	AV	31.6	26.9	6.8	32.0	33.3	53.9	20.6	
Vert	4960.000	AV	27.2	32.1	8.9	31.2	37.0	53.9	16.9	Floor Noise
Vert	7440.000	AV	28.3	36.0	10.2	32.1	42.4	53.9	11.5	Floor Noise
Vert	9920.000	AV	28.1	38.2	11.1	32.5	44.9	53.9	9.0	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

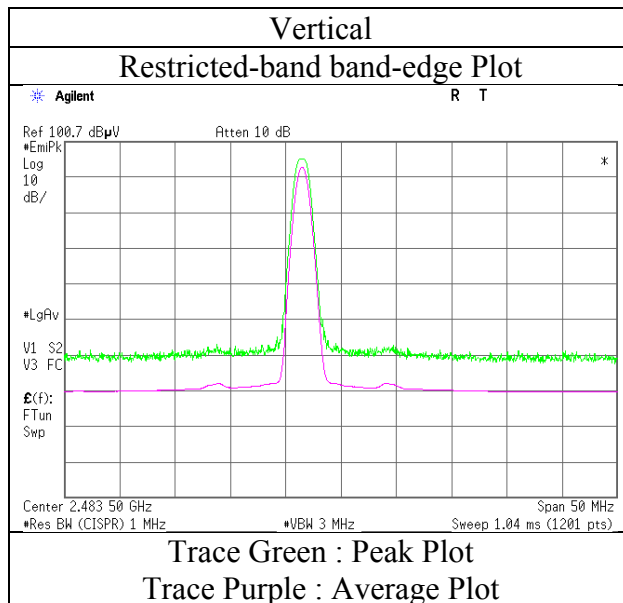
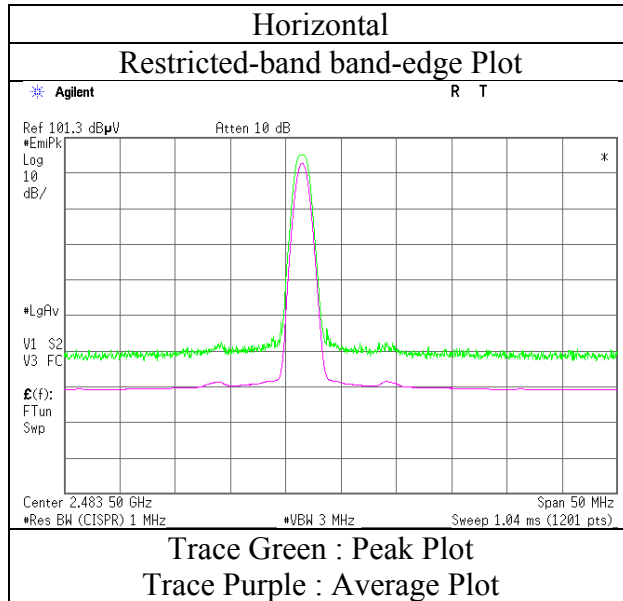
Distance factor:      1 GHz - 10 GHz      20log (4.5 m / 3.0 m) = 3.52 dB  
                              10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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



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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 26 % RH
Engineer	Yuta Moriya (1-10GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

## Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11155194H  
Date February 10, 2016 February 12, 2016 February 15, 2016  
Temperature / Humidity 24 deg. C / 26 % RH 24 deg. C / 30 % RH 18 deg. C / 41 % RH  
Engineer Yuta Moriya Yuta Moriya Takafumi Noguchi  
(1-10GHz) (Above 10GHz) (Below 1GHz)  
Mode Tx, Hopping Off, 3DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.329	QP	23.0	13.8	7.2	32.2	11.8	40.0	28.2	
Hori	59.315	QP	23.3	7.2	7.5	32.1	5.9	40.0	34.1	
Hori	80.004	QP	35.0	6.3	7.8	32.0	17.1	40.0	22.9	
Hori	89.479	QP	25.2	8.1	7.9	32.1	9.1	43.5	34.4	
Hori	320.006	QP	27.2	15.2	10.1	32.0	20.5	46.0	25.5	
Hori	403.079	QP	22.2	17.4	10.6	32.0	18.2	46.0	27.8	
Hori	2390.000	PK	41.5	26.9	6.8	32.0	43.2	73.9	30.7	
Hori	4804.000	PK	40.3	31.8	9.0	31.3	49.8	73.9	24.1	Floor Noise
Hori	7206.000	PK	40.1	36.0	10.2	32.0	54.3	73.9	19.6	Floor Noise
Hori	9608.000	PK	39.0	38.2	11.0	32.4	55.8	73.9	18.1	Floor Noise
Hori	2390.000	AV	29.1	26.9	6.8	32.0	30.8	53.9	23.1	
Hori	4804.000	AV	27.1	31.8	9.0	31.3	36.6	53.9	17.3	Floor Noise
Hori	7206.000	AV	28.2	36.0	10.2	32.0	42.4	53.9	11.5	Floor Noise
Hori	9608.000	AV	28.3	38.2	11.0	32.4	45.1	53.9	8.8	Floor Noise
Vert	40.329	QP	23.4	13.8	7.2	32.2	12.2	40.0	27.8	
Vert	59.315	QP	23.6	7.2	7.5	32.1	6.2	40.0	33.8	
Vert	80.004	QP	32.0	6.3	7.8	32.0	14.1	40.0	25.9	
Vert	89.479	QP	28.5	8.1	7.9	32.1	12.4	43.5	31.1	
Vert	320.006	QP	24.9	15.2	10.1	32.0	18.2	46.0	27.8	
Vert	403.079	QP	22.8	17.4	10.6	32.0	18.8	46.0	27.2	
Vert	2390.000	PK	40.7	26.9	6.8	32.0	42.4	73.9	31.5	
Vert	4804.000	PK	39.9	31.8	9.0	31.3	49.4	73.9	24.5	Floor Noise
Vert	7206.000	PK	40.1	36.0	10.2	32.0	54.3	73.9	19.6	Floor Noise
Vert	9608.000	PK	40.0	38.2	11.0	32.4	56.8	73.9	17.1	Floor Noise
Vert	2390.000	AV	29.0	26.9	6.8	32.0	30.7	53.9	23.2	
Vert	4804.000	AV	27.0	31.8	9.0	31.3	36.5	53.9	17.4	Floor Noise
Vert	7206.000	AV	28.2	36.0	10.2	32.0	42.4	53.9	11.5	Floor Noise
Vert	9608.000	AV	28.2	38.2	11.0	32.4	45.0	53.9	8.9	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

### 20dBc Data Sheet

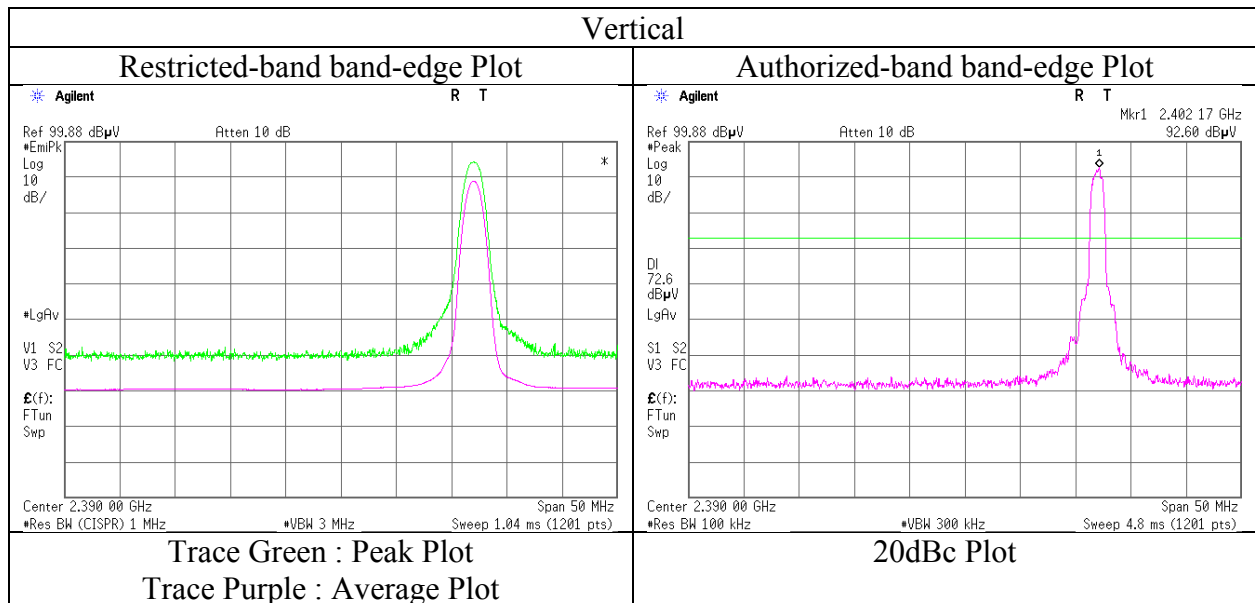
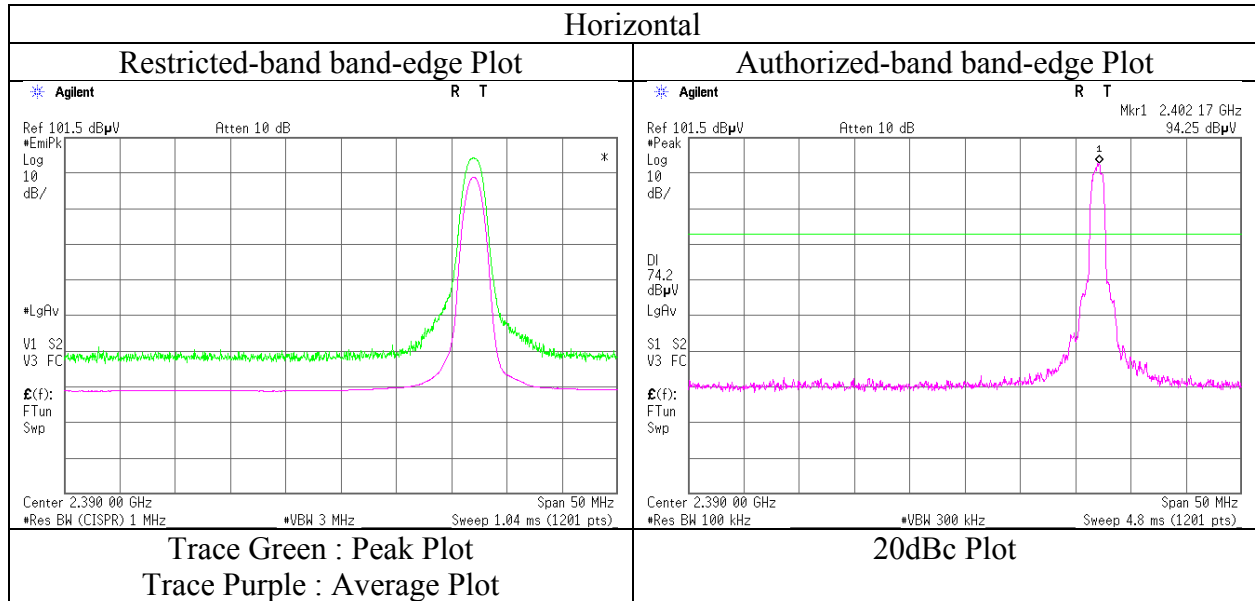
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	94.3	26.9	6.8	32.0	96.0	-	-	Carrier
Hori	2400.000	PK	44.6	26.9	6.8	32.0	46.3	76.0	29.7	
Vert	2402.000	PK	92.6	26.9	6.8	32.0	94.3	-	-	Carrier
Vert	2400.000	PK	43.2	26.9	6.8	32.0	44.9	74.3	29.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 26 % RH
Engineer	Yuta Moriya (1-10GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11155194H  
Date February 10, 2016 February 12, 2016 February 15, 2016  
Temperature / Humidity 24 deg. C / 26 % RH 24 deg. C / 30 % RH 18 deg. C / 41 % RH  
Engineer Yuta Moriya Yuta Moriya Takafumi Noguchi  
(1-10GHz) (Above 10GHz) (Below 1GHz)  
Mode Tx, Hopping Off, 3DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.329	QP	23.0	13.8	7.2	32.2	11.8	40.0	28.2	
Hori	59.315	QP	23.3	7.2	7.5	32.1	5.9	40.0	34.1	
Hori	80.004	QP	35.2	6.3	7.8	32.0	17.3	40.0	22.7	
Hori	89.479	QP	25.2	8.1	7.9	32.1	9.1	43.5	34.4	
Hori	320.006	QP	27.2	15.2	10.1	32.0	20.5	46.0	25.5	
Hori	403.079	QP	22.2	17.4	10.6	32.0	18.2	46.0	27.8	
Hori	4882.000	PK	39.2	31.9	9.0	31.3	48.8	73.9	25.1	Floor Noise
Hori	7323.000	PK	40.7	36.0	10.3	32.0	55.0	73.9	18.9	Floor Noise
Hori	9764.000	PK	39.8	38.2	11.0	32.5	56.5	73.9	17.4	Floor Noise
Hori	4882.000	AV	27.6	31.9	9.0	31.3	37.2	53.9	16.7	Floor Noise
Hori	7323.000	AV	28.2	36.0	10.3	32.0	42.5	53.9	11.4	Floor Noise
Hori	9764.000	AV	28.0	38.2	11.0	32.5	44.7	53.9	9.2	Floor Noise
Vert	40.329	QP	23.3	13.8	7.2	32.2	12.1	40.0	27.9	
Vert	59.315	QP	23.4	7.2	7.5	32.1	6.0	40.0	34.0	
Vert	80.004	QP	32.1	6.3	7.8	32.0	14.2	40.0	25.8	
Vert	89.479	QP	28.6	8.1	7.9	32.1	12.5	43.5	31.0	
Vert	320.006	QP	25.0	15.2	10.1	32.0	18.3	46.0	27.7	
Vert	403.079	QP	23.0	17.4	10.6	32.0	19.0	46.0	27.0	
Vert	4882.000	PK	39.3	31.9	9.0	31.3	48.9	73.9	25.0	Floor Noise
Vert	7323.000	PK	40.8	36.0	10.3	32.0	55.1	73.9	18.8	Floor Noise
Vert	9764.000	PK	39.8	38.2	11.0	32.5	56.5	73.9	17.4	Floor Noise
Vert	4882.000	AV	27.3	31.9	9.0	31.3	36.9	53.9	17.0	Floor Noise
Vert	7323.000	AV	28.1	36.0	10.3	32.0	42.4	53.9	11.5	Floor Noise
Vert	9764.000	AV	28.0	38.2	11.0	32.5	44.7	53.9	9.2	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

## Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11155194H  
Date : February 10, 2016      February 12, 2016      February 15, 2016  
Temperature / Humidity : 24 deg. C / 26 % RH      24 deg. C / 30 % RH      18 deg. C / 41 % RH  
Engineer : Yuta Moriya      Yuta Moriya      Takafumi Noguchi  
            (1-10GHz)      (Above 10GHz)      (Below 1GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	40.329	QP	23.1	13.8	7.2	32.2	11.9	40.0	28.1	
Hori	59.315	QP	23.5	7.2	7.5	32.1	6.1	40.0	33.9	
Hori	80.004	QP	35.1	6.3	7.8	32.0	17.2	40.0	22.8	
Hori	89.479	QP	27.0	8.1	7.9	32.1	10.9	43.5	32.6	
Hori	320.006	QP	27.4	15.2	10.1	32.0	20.7	46.0	25.3	
Hori	403.079	QP	22.3	17.4	10.6	32.0	18.3	46.0	27.7	
Hori	2483.500	PK	51.3	26.9	6.8	32.0	53.0	73.9	20.9	
Hori	4960.000	PK	39.9	32.1	8.9	31.2	49.7	73.9	24.2	Floor Noise
Hori	7440.000	PK	40.7	36.0	10.2	32.1	54.8	73.9	19.1	Floor Noise
Hori	9920.000	PK	40.8	38.2	11.1	32.5	57.6	73.9	16.3	Floor Noise
Hori	2483.500	AV	35.5	26.9	6.8	32.0	37.2	53.9	16.7	
Hori	4960.000	AV	28.0	32.1	8.9	31.2	37.8	53.9	16.1	Floor Noise
Hori	7440.000	AV	28.3	36.0	10.2	32.1	42.4	53.9	11.5	Floor Noise
Hori	9920.000	AV	28.1	38.2	11.1	32.5	44.9	53.9	9.0	Floor Noise
Vert	40.329	QP	23.4	13.8	7.2	32.2	12.2	40.0	27.8	
Vert	59.315	QP	23.6	7.2	7.5	32.1	6.2	40.0	33.8	
Vert	80.004	QP	32.0	6.3	7.8	32.0	14.1	40.0	25.9	
Vert	89.479	QP	31.8	8.1	7.9	32.1	15.7	43.5	27.8	
Vert	320.006	QP	25.2	15.2	10.1	32.0	18.5	46.0	27.5	
Vert	403.079	QP	23.1	17.4	10.6	32.0	19.1	46.0	26.9	
Vert	2483.500	PK	50.3	26.9	6.8	32.0	52.0	73.9	21.9	
Vert	4960.000	PK	40.6	32.1	8.2	31.2	49.7	73.9	24.2	Floor Noise
Vert	7440.000	PK	40.6	36.0	10.2	32.1	54.7	73.9	19.2	Floor Noise
Vert	9920.000	PK	41.0	38.2	11.1	32.5	57.8	73.9	16.1	Floor Noise
Vert	2483.500	AV	34.8	26.9	6.8	32.0	36.5	53.9	17.4	
Vert	4960.000	AV	27.3	32.1	8.9	31.2	37.1	53.9	16.8	Floor Noise
Vert	7440.000	AV	28.2	36.0	10.2	32.1	42.3	53.9	11.6	Floor Noise
Vert	9920.000	AV	27.9	38.2	11.1	32.5	44.7	53.9	9.2	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

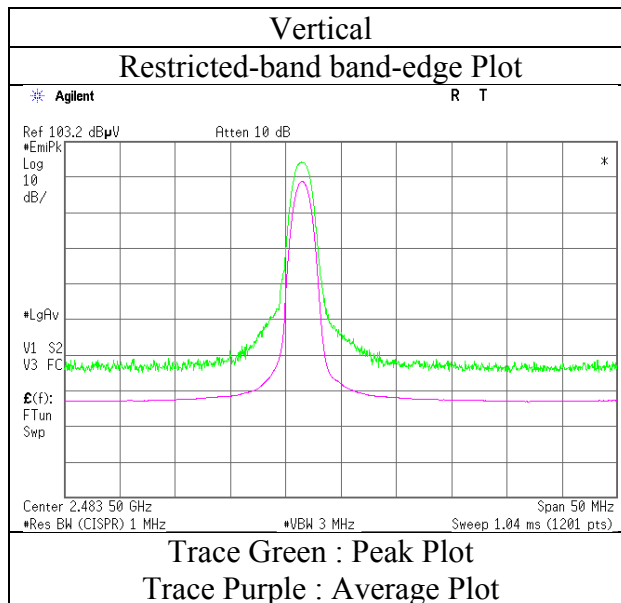
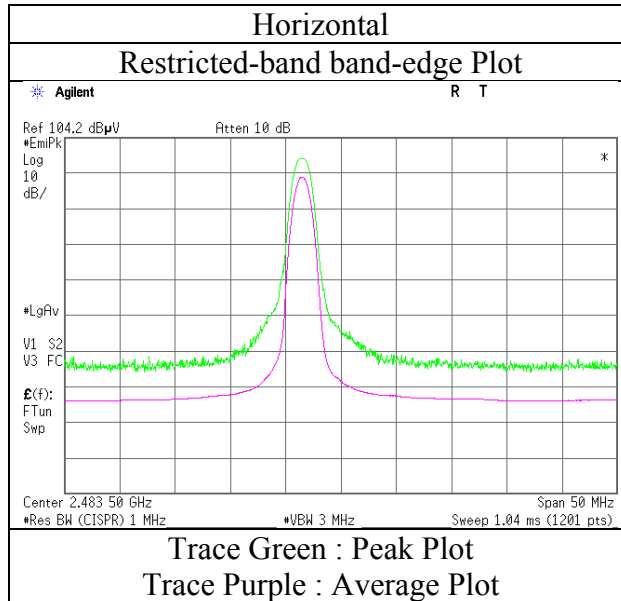
\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor:      1 GHz - 10 GHz      20log (4.5 m / 3.0 m) = 3.52 dB  
                                 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

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

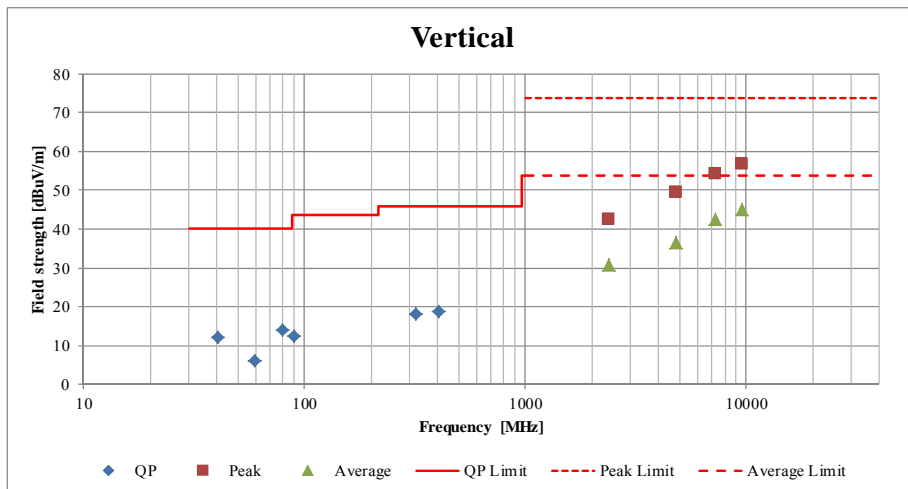
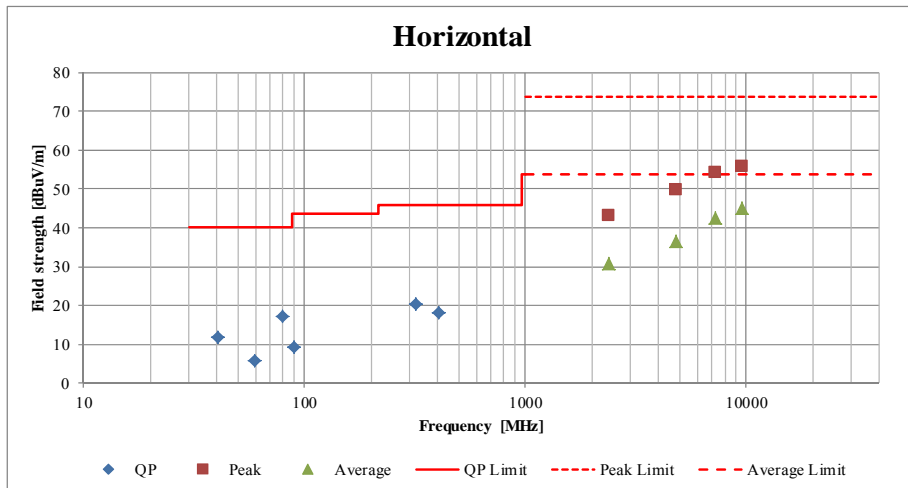
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 26 % RH
Engineer	Yuta Moriya (1-10GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11155194H		
Date	February 10, 2016	February 12, 2016	February 15, 2016
Temperature / Humidity	24 deg. C / 26 % RH	24 deg. C / 30 % RH	18 deg. C / 41 % RH
Engineer	Yuta Moriya	Yuta Moriya	Takafumi Noguchi
	(1-10GHz)	(Above 10GHz)	(Below 1GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		



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

## Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11155194H  
Date : April 27, 2016  
Temperature / Humidity : 23deg. C / 54 % RH  
Engineer : Takumi Shimada  
(Above 1GHz)  
Mode : Tx 3DH5 2402 MHz and 11n-20 5180MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	40.9	26.9	6.8	32.7	41.9	73.9	32.0	
Hori	2390.000	AV	28.9	26.9	6.8	32.7	29.9	53.9	24.0	
Vert	2390.000	PK	41.9	26.9	6.8	32.7	42.9	73.9	31.0	
Vert	2390.000	AV	29.3	26.9	6.8	32.7	30.3	53.9	23.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	91.1	26.9	6.8	32.7	92.1	-	-	Carrier
Hori	2400.000	PK	44.6	26.9	6.8	32.7	45.6	72.1	26.5	
Vert	2402.000	PK	91.3	26.9	6.8	32.7	92.3	-	-	Carrier
Vert	2400.000	PK	43.1	26.9	6.8	32.7	44.1	72.3	28.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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



## Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11155194H  
Date : April 27, 2016      April 28, 2016  
Temperature / Humidity : 23deg. C / 54 % RH      23 deg. C / 61 % RH  
Engineer : Takumi Shimada      Ken Fujita  
(Above 1GHz)      (Below 1GHz)  
Mode : Tx 3DH5 2441 MHz and 11n-20 5180MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	37.933	QP	23.1	14.6	7.2	32.2	12.7	40.0	27.3	
Hori	62.017	QP	33.1	6.7	7.5	32.2	15.1	40.0	24.9	
Hori	86.950	QP	25.3	7.6	7.9	32.2	8.6	40.0	31.4	
Hori	96.867	QP	24.2	9.3	8.0	32.2	9.3	43.5	34.2	
Hori	302.633	QP	29.9	13.6	9.9	31.9	21.5	46.0	24.5	
Hori	404.821	QP	24.3	15.7	10.6	31.9	18.7	46.0	27.3	
Hori	4882.000	PK	40.5	31.9	9.0	31.7	49.7	73.9	24.2	Floor Noise
Hori	7323.000	PK	41.4	36.0	10.3	32.6	55.1	73.9	18.8	Floor Noise
Hori	9764.000	PK	41.5	38.2	11.0	33.3	57.4	73.9	16.5	Floor Noise
Hori	4882.000	AV	27.7	31.9	9.0	31.7	36.9	53.9	17.0	Floor Noise
Hori	7323.000	AV	28.6	36.0	10.3	32.6	42.3	53.9	11.6	Floor Noise
Hori	9764.000	AV	29.0	38.2	11.0	33.3	44.9	53.9	9.0	Floor Noise
Vert	37.933	QP	27.9	14.6	7.2	32.2	17.5	40.0	22.5	
Vert	61.733	QP	33.1	6.8	7.5	32.2	15.2	40.0	24.8	
Vert	86.383	QP	25.5	7.5	7.9	32.2	8.7	40.0	31.3	
Vert	97.433	QP	23.1	9.3	8.0	32.2	8.2	43.5	35.3	
Vert	302.633	QP	27.1	13.6	9.9	31.9	18.7	46.0	27.3	
Vert	404.821	QP	24.3	15.7	10.6	31.9	18.7	46.0	27.3	
Vert	4882.000	PK	40.6	31.9	9.0	31.7	49.8	73.9	24.1	Floor Noise
Vert	7323.000	PK	41.5	36.0	10.3	32.6	55.2	73.9	18.7	Floor Noise
Vert	9764.000	PK	41.5	38.2	11.0	33.3	57.4	73.9	16.5	Floor Noise
Vert	4882.000	AV	27.6	31.9	9.0	31.7	36.8	53.9	17.1	Floor Noise
Vert	7323.000	AV	28.5	36.0	10.3	32.6	42.2	53.9	11.7	Floor Noise
Vert	9764.000	AV	28.8	38.2	11.0	33.3	44.7	53.9	9.2	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor:      1 GHz - 10 GHz      20log (4.5 m / 3.0 m) = 3.52 dB  
                                 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

## Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11155194H  
Date April 27, 2016  
Temperature / Humidity 23deg. C / 54 % RH  
Engineer Takumi Shimada  
(Above 1GHz)  
Mode Tx 3DH5 2480 MHz and 11n-20 5180MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	50.3	26.9	6.8	32.6	51.4	73.9	22.5	
Hori	2483.500	AV	34.8	26.9	6.8	32.6	35.9	53.9	18.0	
Vert	2483.500	PK	49.1	26.9	6.8	32.6	50.2	73.9	23.8	
Vert	2483.500	AV	33.2	26.9	6.8	32.6	34.3	53.9	19.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

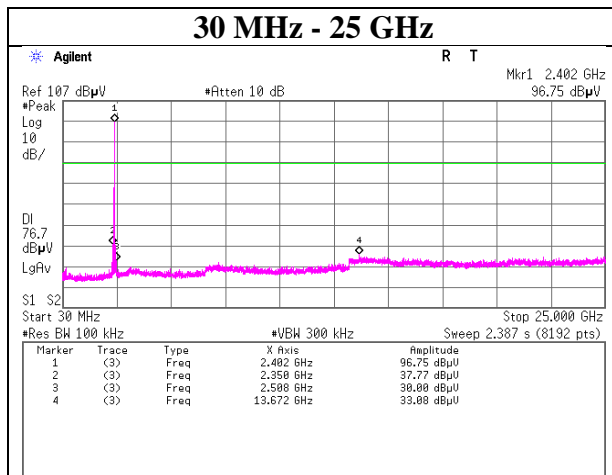
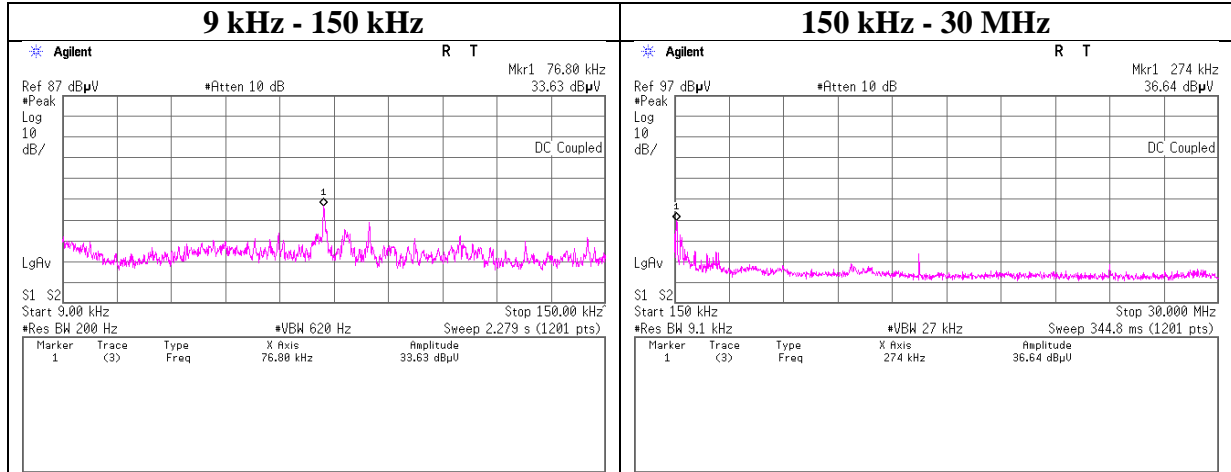
Distance factor: 1 GHz - 10 GHz  $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.52\text{ dB}$   
10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, DH5

### 2402 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

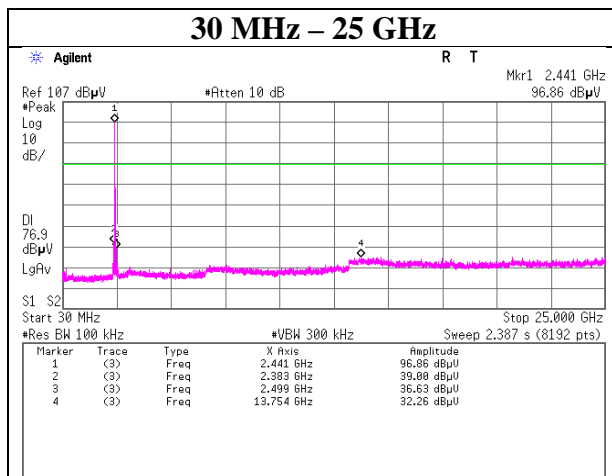
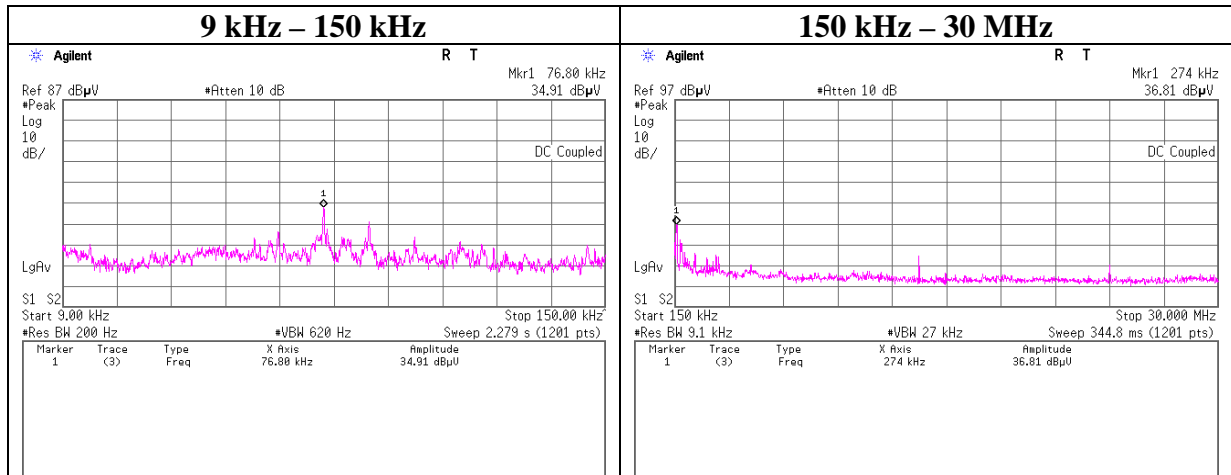
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, DH5

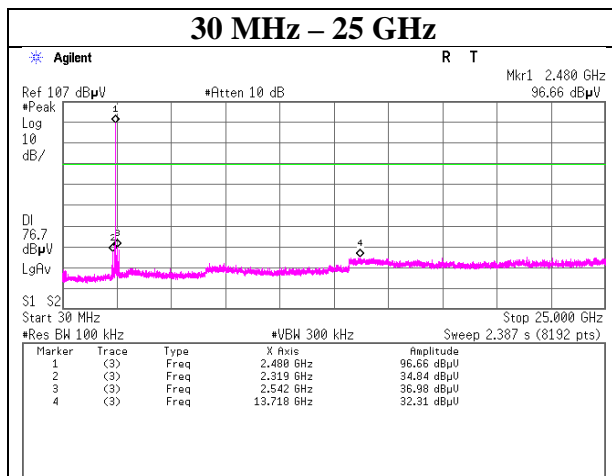
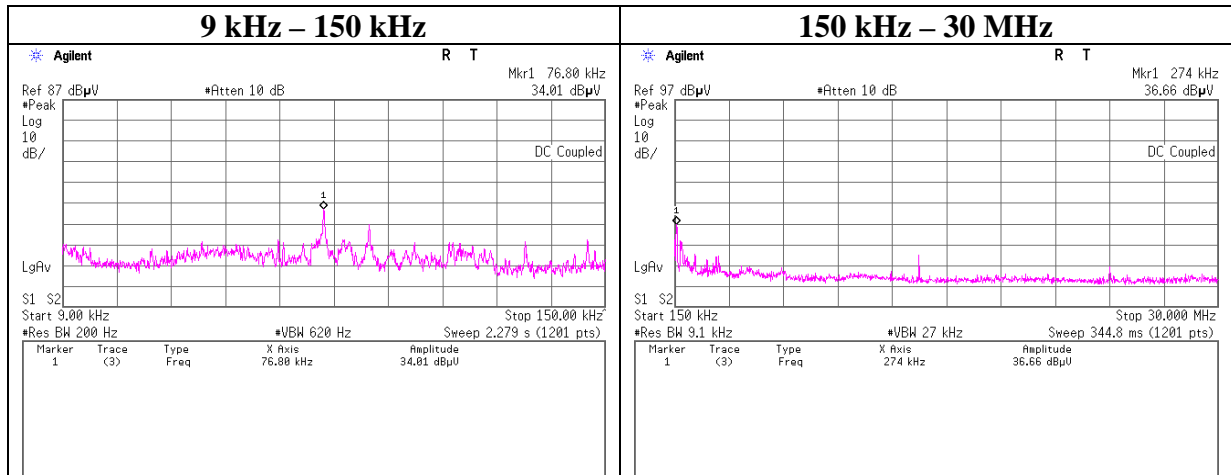
### 2441 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, DH5

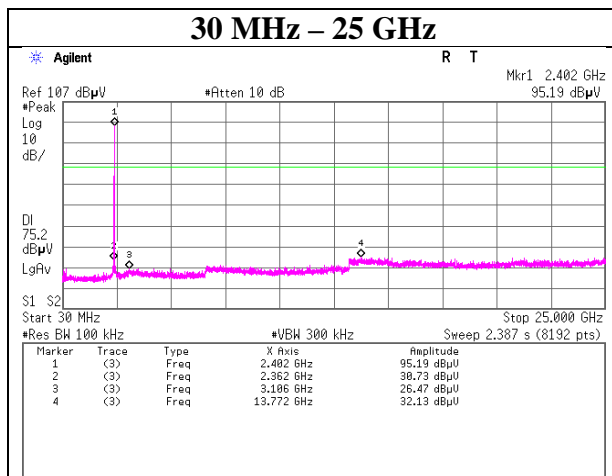
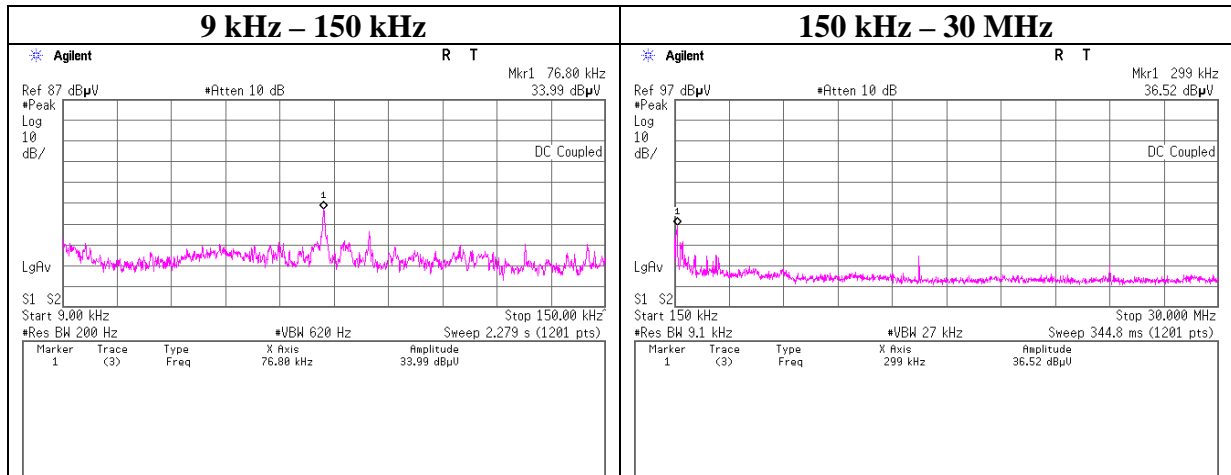
### 2480 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, 3DH5

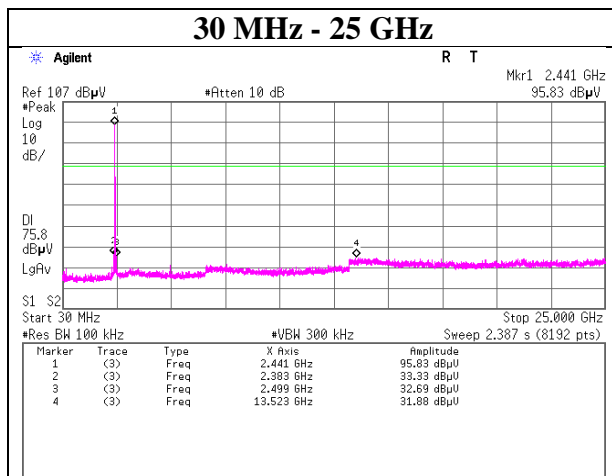
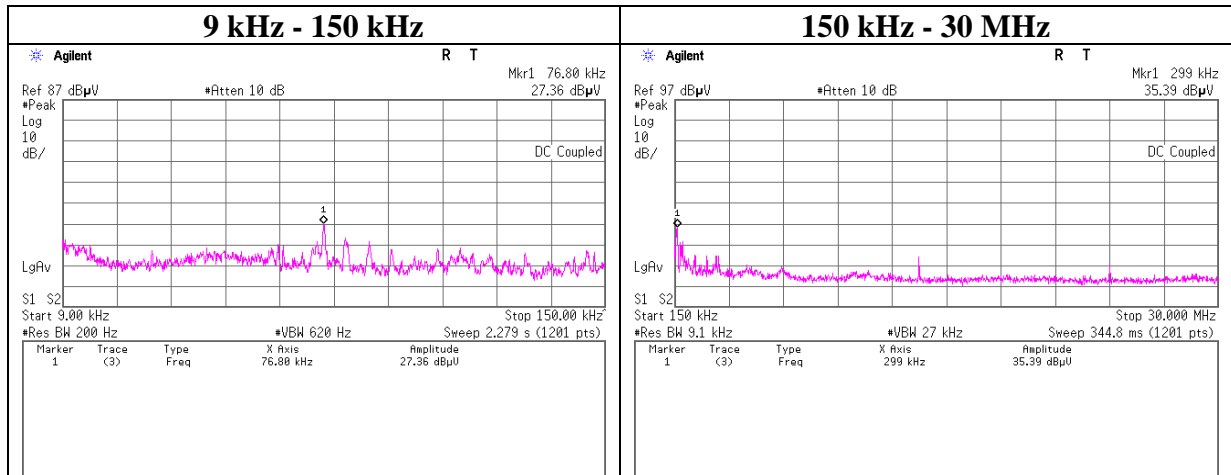
### 2402 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, 3DH5

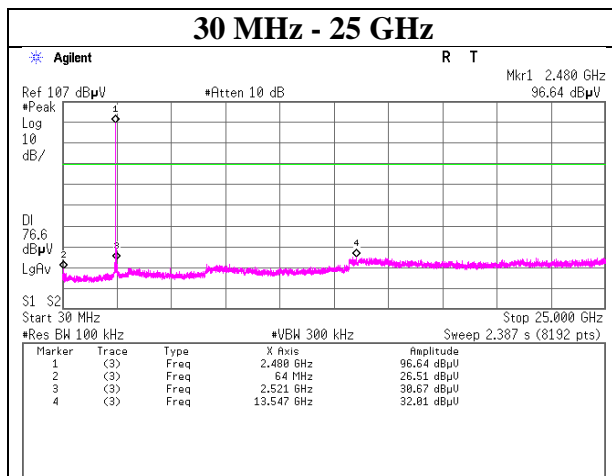
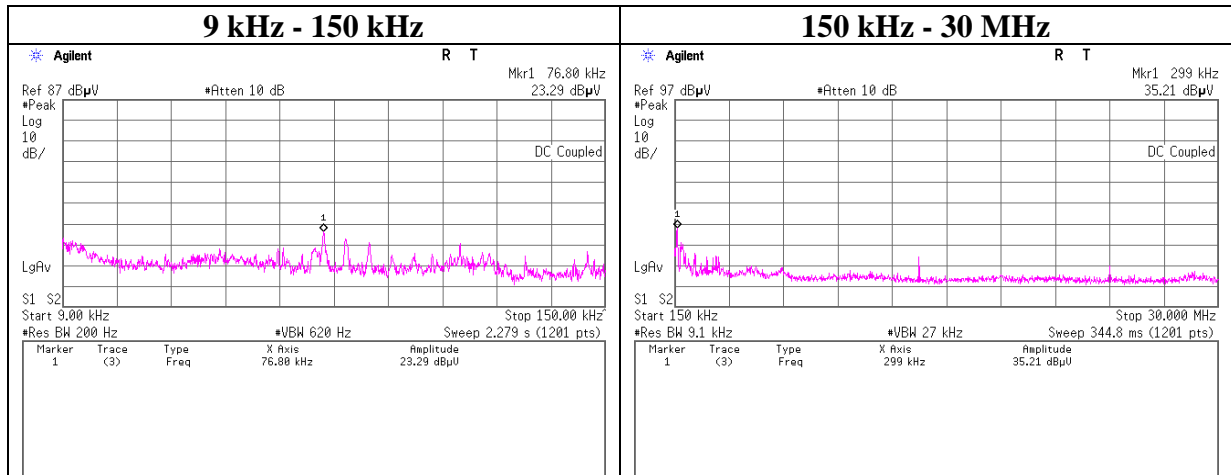
### 2441 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, 3DH5

### 2480 MHz

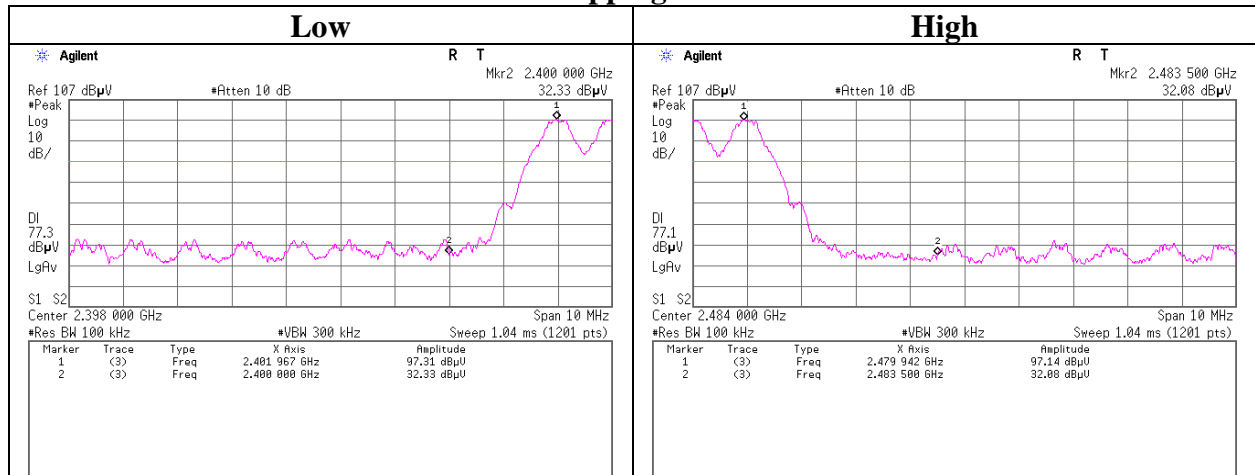




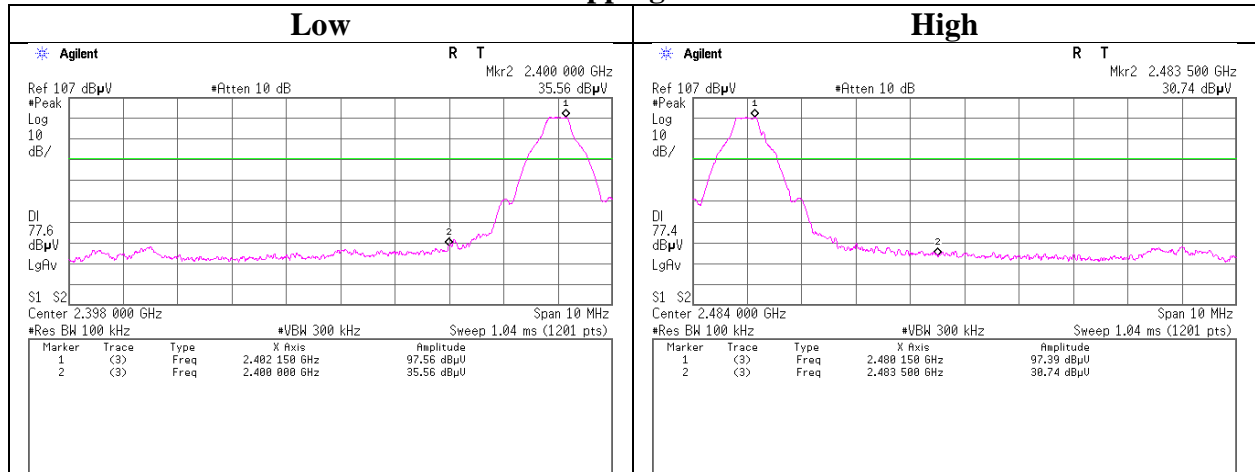
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx DHS

### Hopping On



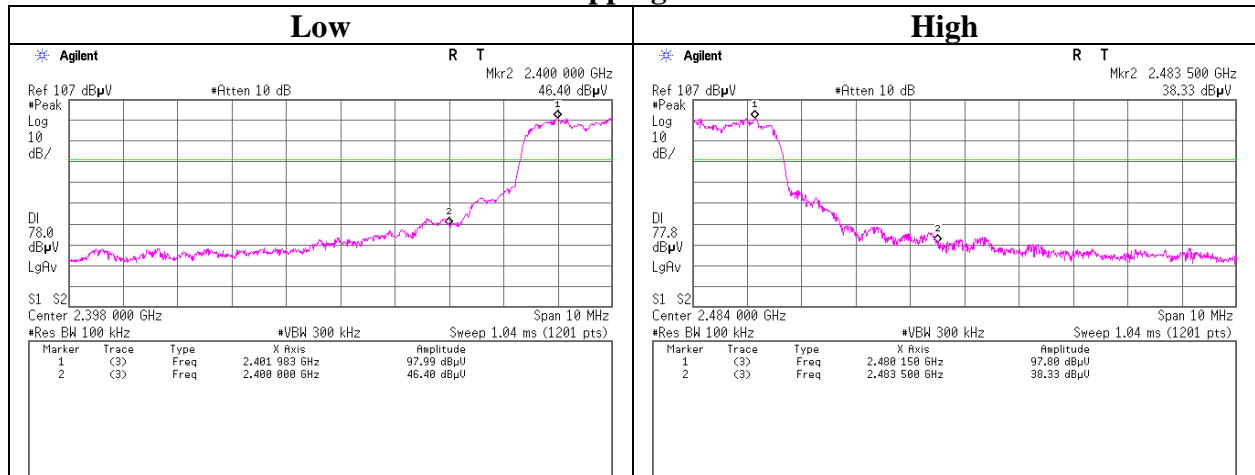
### Hopping Off



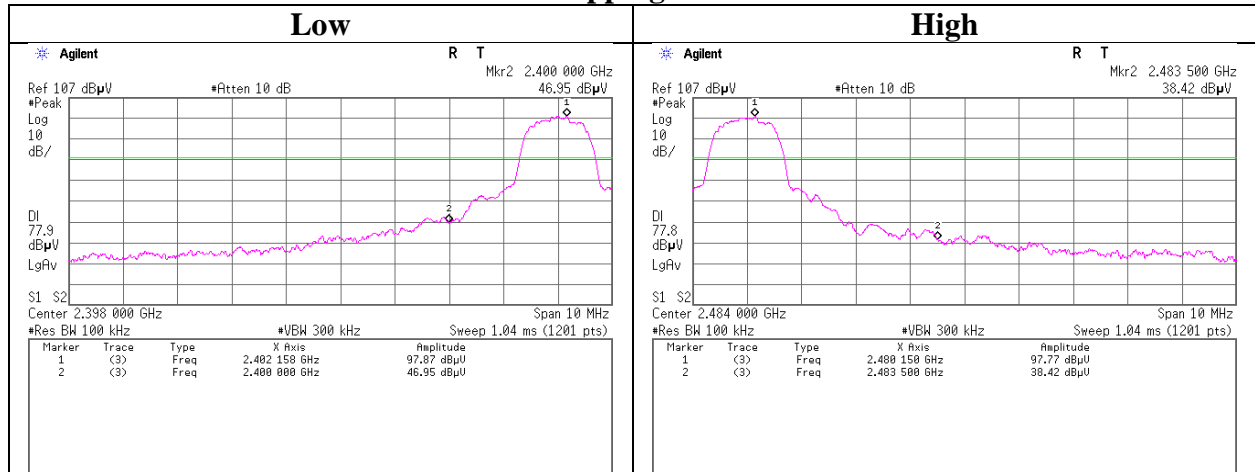
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx 3DH5

### Hopping On



### Hopping Off



**UL Japan, Inc.**

**Ise EMC Lab.**

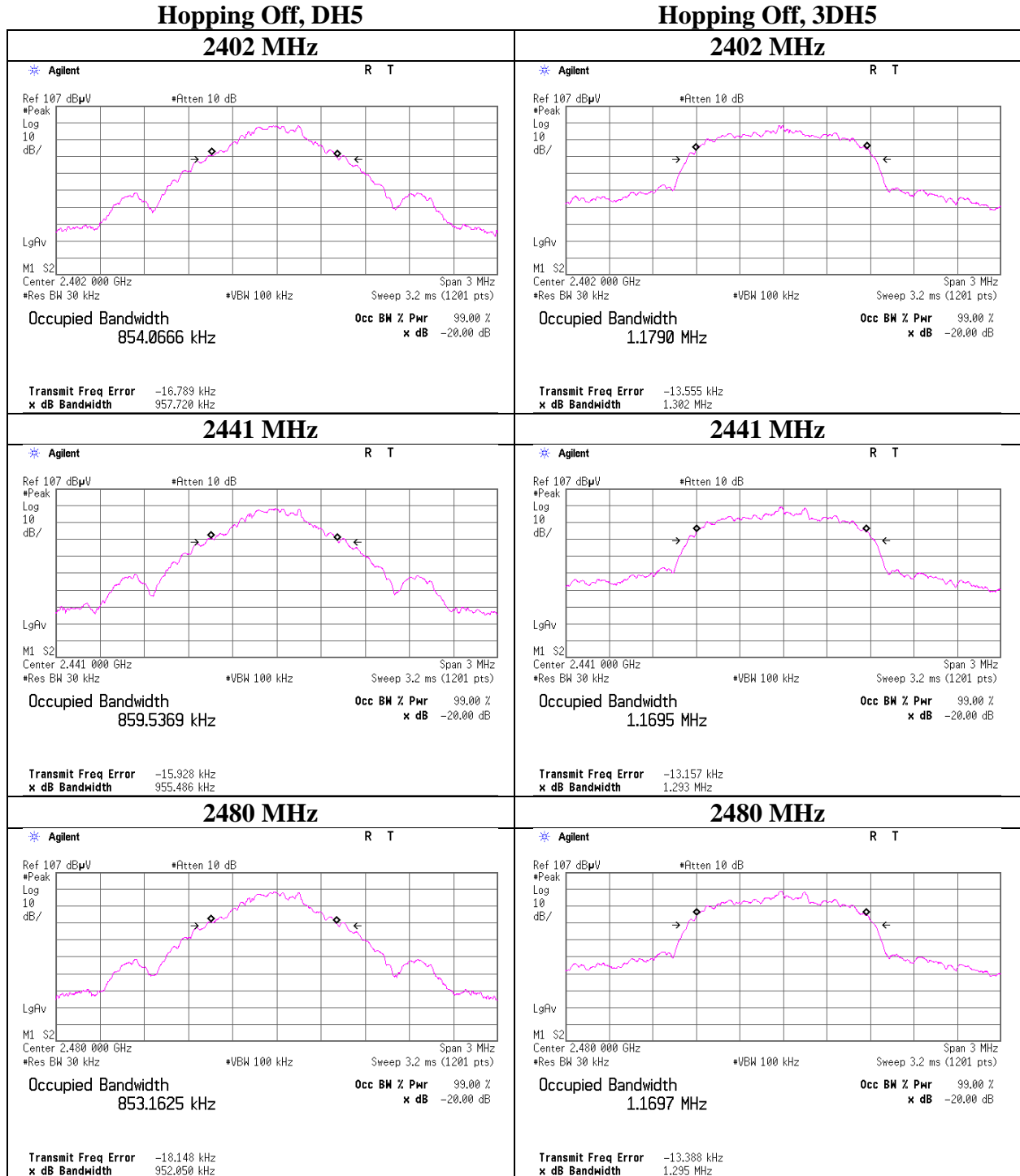
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

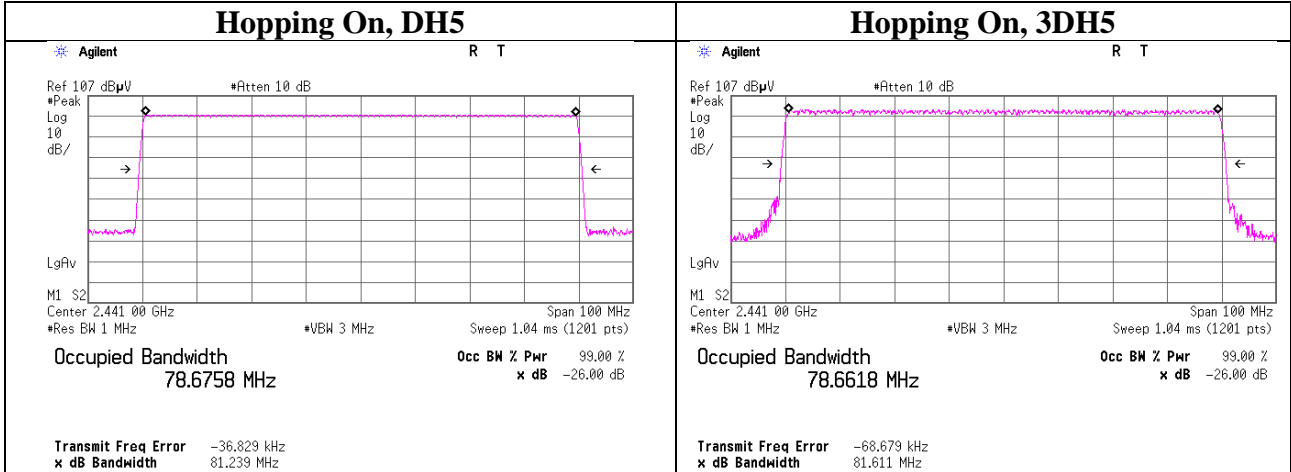
### 99% Occupied Bandwidth

Test place Report No. Date Temperature / Humidity Engineer Mode	Ise EMC Lab. No.11 Measurement Room 11155194H February 10, 2016 24 deg. C / 28 % RH Tomoki Matsui Tx Hopping Off
--	---



## 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11155194H
Date	February 10, 2016
Temperature / Humidity	24 deg. C / 28 % RH
Engineer	Tomoki Matsui
Mode	Tx Hopping On



## APPENDIX 2: Test instruments

### Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	AT	2015/10/07 * 12
MCC-144	Microwave Cable	Junkosha	MWX221	1207S407	AT	2015/08/06 * 12
MAT-56	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2016/01/18 * 12
MTA-43	Terminator	Mini-Circuits	ANNE-50X+	MUU3460140	AT	Pre Check
MTA-45	Terminator	Mini-Circuits	ANNE-50X+	MUU3460142	AT	Pre Check
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2015/10/08 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2015/10/08 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2015/12/08 * 12
MMM-17	DIGITAL HiTESTER	Hioki	3805	070900530	AT	2016/01/13 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE/CE	2015/05/18 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/CE	2016/01/13 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2015/09/16 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2015/05/19 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2015/09/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2015/10/11 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2015/07/10 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2015/07/02 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2016/02/24 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 12
MHF-22	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	RE	2016/01/19 * 12
MCC-177	Microwave Cable	Junkosha	MMX221-00500D MSDMS	1502S304	RE	2016/03/10 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 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: CE: Conducted Emission test  
RE: Radiated Emission test  
AT: Antenna Terminal Conducted test

## UL Japan, Inc.

### Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
Telephone : +81 596 24 8999  
Facsimile : +81 596 24 8124