



# RADIO TEST REPORT

Test Report No. : 10706993H-C-R1

**Applicant** : MITSUBISHI ELECTRIC CORPORATION SANDA WORKS

**Type of Equipment** : Display Audio

**Model No.** : NR-000

**FCC ID** : UJHNR000

**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 10706993H-C. 10706993H-C is replaced with this report.

**Date of test:** March 11 to April 28, 2015

**Representative test engineer:**

  
Satofumi Matsuyama  
Engineer  
Consumer Technology Division

**Approved by:**

  
Motoya Imura  
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://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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

**UL Japan, Inc.**

**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: Radiated Spurious Emission .....</b>	<b>11</b>
<b>SECTION 6: Antenna Terminal Conducted Tests.....</b>	<b>12</b>
<b>APPENDIX 1: Data of EMI test.....</b>	<b>13</b>
20 dB Bandwidth and Carrier Frequency Separation.....	13
Number of Hopping Frequency .....	16
Dwell time.....	18
Maximum Peak Output Power .....	21
Radiated Spurious Emission .....	23
Conducted Spurious Emission .....	31
Conducted Emission Band Edge compliance .....	43
99 % Occupied Bandwidth.....	45
<b>APPENDIX 2: Test instruments .....</b>	<b>47</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>48</b>
Radiated Spurious Emission .....	48

## **SECTION 1: Customer information**

Company Name : MITSUBISHI ELECTRIC CORPORATION SANDA WORKS  
Address : 2-3-33, Miwa, Sanda-city, Hyogo, 669-1513, Japan  
Telephone Number : +81-79-559-3623  
Facsimile Number : +81-79-559-3875  
Contact Person : Kenji Otani

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

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

Type of Equipment : Display Audio  
Model No. : NR-000  
Serial No. : Refer to Clause 4.2  
Rating : DC 12.0 V  
Receipt Date of Sample : March 7, 2015  
Country of Mass-production : Thailand  
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

---

**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

## 2.2 Product Description

### General Specification

Clock frequency(ies) in the system : 900 MHz (Radio part: 26 MHz)

### Radio Specification

Radio Type : Transceiver  
Power Supply (inner) : DC 3.3 V / DC 1.8 V

### Radio Specification

	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz -2462 MHz	2412 MHz - 2462 MHz	[For FCC] 5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz [For IC] 5280 MHz - 5320 MHz 5745 MHz - 5825 MHz	[For FCC] 5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz [For IC] 5310 MHz 5755 MHz - 5795 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz		20 MHz	40 MHz
Antenna type	Inverted F Antenna			
Antenna Gain	0.29 dBi		W52, W53 band: 3.6 dBi W56, W58 band: 2.17 dBi	

	GPS/GLONASS	Bluetooth Ver.3.0 with EDR function *1)
Frequency of operation	GPS: 1575.42 MHz GLONASS: 1597.55 MHz - 1605.89 MHz	2402 MHz - 2480 MHz
Type of modulation	GPS: BPSK GLONASS: BPSK	FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK)
Channel spacing	GLONASS: 0.5625 MHz	1 MHz
Antenna type	Inverted F Antenna	
Antenna Gain	0 dBi	0.29 dBi

\*1) This test report applies for Bluetooth Ver.3.0 with EDR function.

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015

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

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2009 7. AC powerline conducted emission measurements IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	N/A *1)	N/A	-
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		4.4 dB 7323.000 MHz, Horizontal, AV	Complied

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

\*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

\* In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

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

The EUT provides stable voltage (DC 3.3 V / DC 1.8 V) constantly to the wireless transmitter regardless of input voltage.

Instead of a new battery, DC power supply was used for the test.

That does not affect the test result, therefore the EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the car. Therefore, the equipment complies with the antenna requirement of Section 15.203.

**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  $k = 2$ .

Test room (semi-anechoic chamber)	Radiated emission						
	(3 m*)(+dB)				(1 m*)(+dB)		(0.5 m*)(+dB)
	9 kHz - 30 MHz	30 MHz - 300 MHz	300 MHz - 1 GHz	1 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
No.1	4.3 dB	5.5 dB	6.3 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No.2	4.2 dB	5.4 dB	6.3 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No.3	4.4 dB	5.4 dB	6.4 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No.4	4.7 dB	5.6 dB	6.4 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

\*3 m / 1 m / 0.5 m = Measurement distance

Power meter (+dB)	
Below 1 GHz	Above 1 GHz
0.7 dB	1.5 dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
1.5 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

#### Radiated emission test (3 m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

**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

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7 m	7.0 x 6.0 m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2 m	4.0 x 4.0 m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9 m	6.8 x 5.75 m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7 m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9 m	6.8 x 5.75 m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7 m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9 m	6.0 x 6.0 m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7 m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0 m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7 m	4.7 x 7.5 m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7 m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8 m	2.4 x 2.4 m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0 m	4.8 x 4.6 m	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

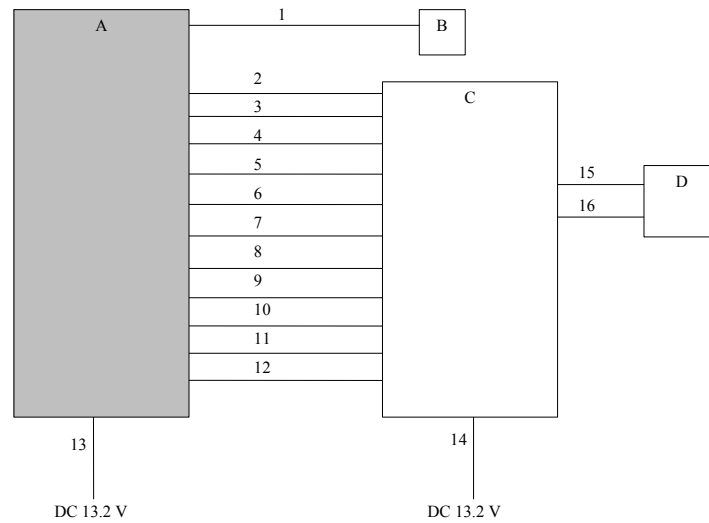
### **4.1 Operating Mode(s)**

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

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 Inquiry	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping off) DH5, 3DH5 Inquiry	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping on) DH5, 3DH5 Inquiry	-
Dwell time	Tx (Hopping on), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-
Maximum Peak Output Power	Tx (Hopping off) DH5, 2DH5, 3DH5 Inquiry	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.  *Power of the EUT was set by the software as follows;  Power settings: 0dBm  Software: Internal Software Ver1.0  *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(s) were taken into consideration and test data was taken under worse case conditions.

\* The testing was performed with DC 13.2 V only.

As the stable voltage (DC 3.3 V / DC 1.8 V) is provided to RF module via the internal regulator, it does not influence on the test result.

### Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Display Audio	NR-000	94ZN6004 *1) 94ZN6003 *2)	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	EUT
B	GPS Antenna	-	-	MITSUMI	-
C	Dummy board	-	320496A002	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	-
D	Display	39710-TBAA-A110-M1	411VIFW000803	LG	-

\*1) Used for Spurious Emission test and Antenna terminal conducted test (2DH5 / 3DH1 / 3DH3 / 3DH5)

\*2) Used for Antenna terminal conducted test (DH1 / DH3 / DH5)

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	GPS Cable	3.0	Shielded	Shielded	-
2	Signal Cable	2.0	Shielded	Shielded	-
3	Signal Cable	2.0	Shielded	Shielded	-
4	Signal Cable	2.0	Shielded	Shielded	-
5	Signal Cable	2.0	Shielded	Shielded	-
6	Signal Cable	2.0	Unshielded	Unshielded	-
7	Signal Cable	2.0	Unshielded	Unshielded	-
8	Signal Cable	2.0	Unshielded	Unshielded	-
9	Signal Cable	2.0	Shielded	Shielded	-
10	Signal Cable	2.0	Shielded	Shielded	-
11	Signal Cable	2.0	Shielded	Shielded	-
12	Signal Cable	2.0	Unshielded	Unshielded	-
13	DC Cable	2.0	Unshielded	Unshielded	-
14	DC Cable	2.0	Unshielded	Unshielded	-
15	Display Cable	0.3	Shielded	Shielded	-
16	Display Cable	0.3	Unshielded	Unshielded	-

**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 5: Radiated Spurious Emission**

### **Test Procedure**

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.

The height of the measuring antenna varied between 1 and 4m 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 m (below 10 GHz), 1 m*2) (above 10 GHz)		3 m (below 10 GHz), 1 m*2) (above 10 GHz)

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

\*2) Distance Factor:  $20 \times \log(3.0 \text{ m} / 1.0 \text{ m}) = 9.5 \text{ dB}$

The test was performed with the worst angle of carrier and noise levels.

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

**Measurement range** : 30 MHz - 25 GHz  
**Test data** : APPENDIX  
**Test result** : Pass

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

### **Test Procedure**

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

<b>Test</b>	<b>Span</b>	<b>RBW</b>	<b>VBW</b>	<b>Sweep time</b>	<b>Detector</b>	<b>Trace</b>	<b>Instrument used</b>
20 dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Carrier Frequency Separation	5 MHz or 3 MHz	100 kHz or 30 kHz	300 kHz or 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 *3)	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 (Less or equal to 5 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 %.

\*2) Reference data

\*3) In the frequency range below 30 MHz, 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)

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

**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

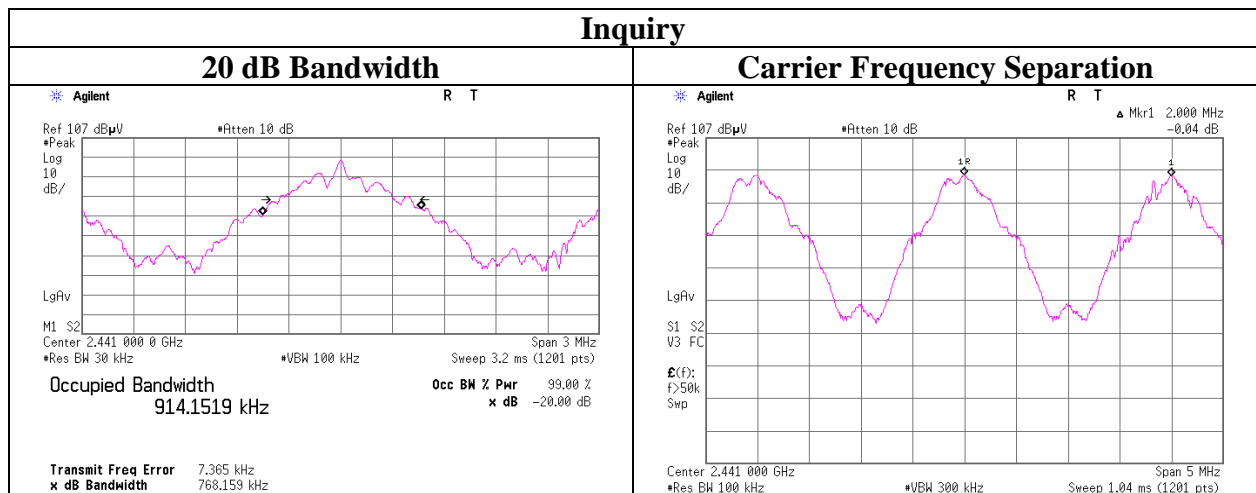
**APPENDIX 1: Data of EMI test**

**20 dB Bandwidth and Carrier Frequency Separation**

Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 10706993H  
 Date : 04/24/2015  
 Temperature/ Humidity : 20 deg. C / 45 % RH  
 Engineer : Yuta Moriya  
 Mode : Tx (Hopping on) DH5 / 3DH5 / Inquiry

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.955	1.000	≧ 0.637
DH5	2441.0	0.937	1.000	≧ 0.625
DH5	2480.0	0.940	1.000	≧ 0.627
3DH5	2402.0	1.289	1.000	≧ 0.859
3DH5	2441.0	1.281	1.000	≧ 0.854
3DH5	2480.0	1.289	1.000	≧ 0.859
Inquiry	2441.0	0.768	2.000	≧ 0.512

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



**UL Japan, Inc.**

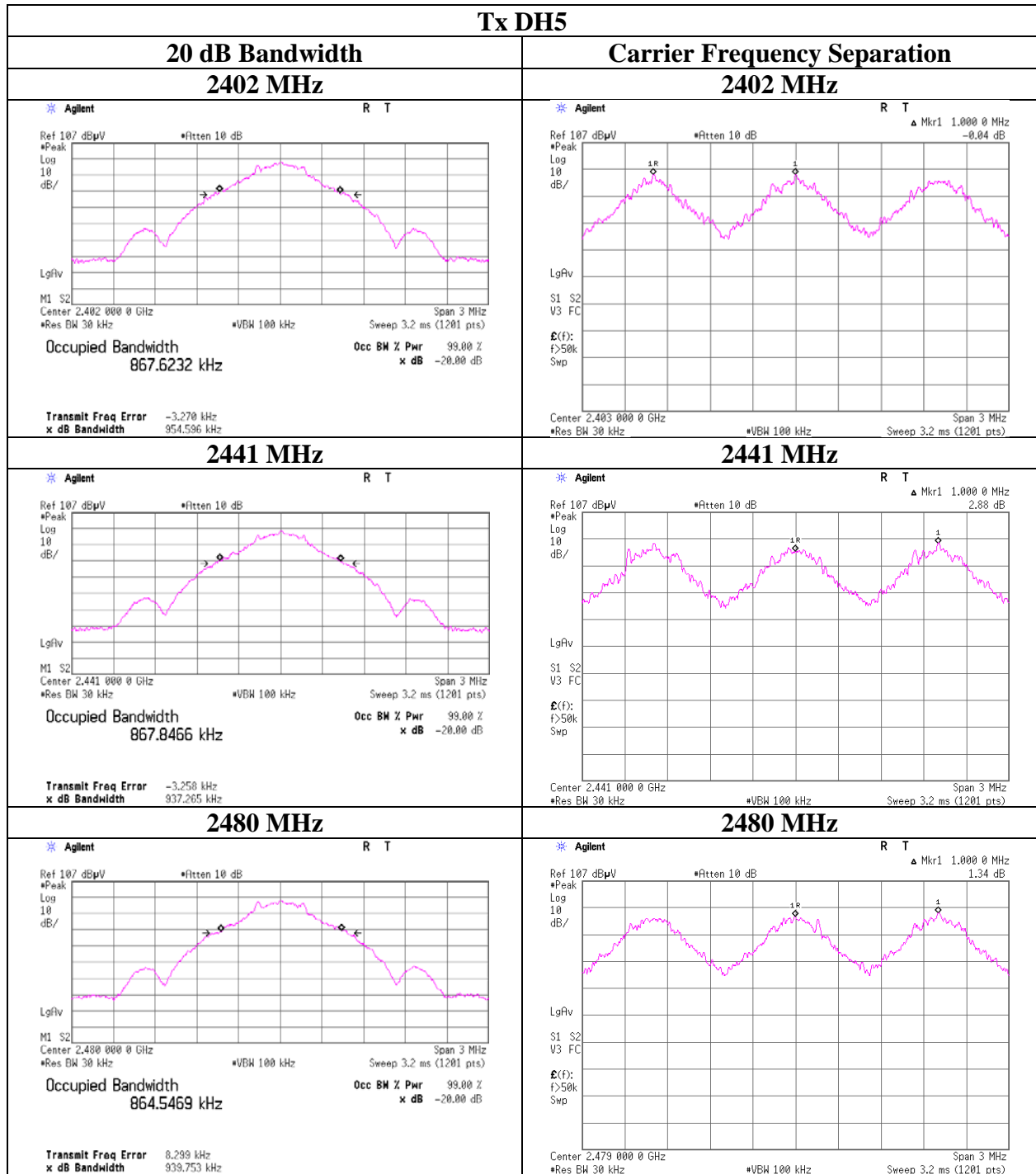
**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

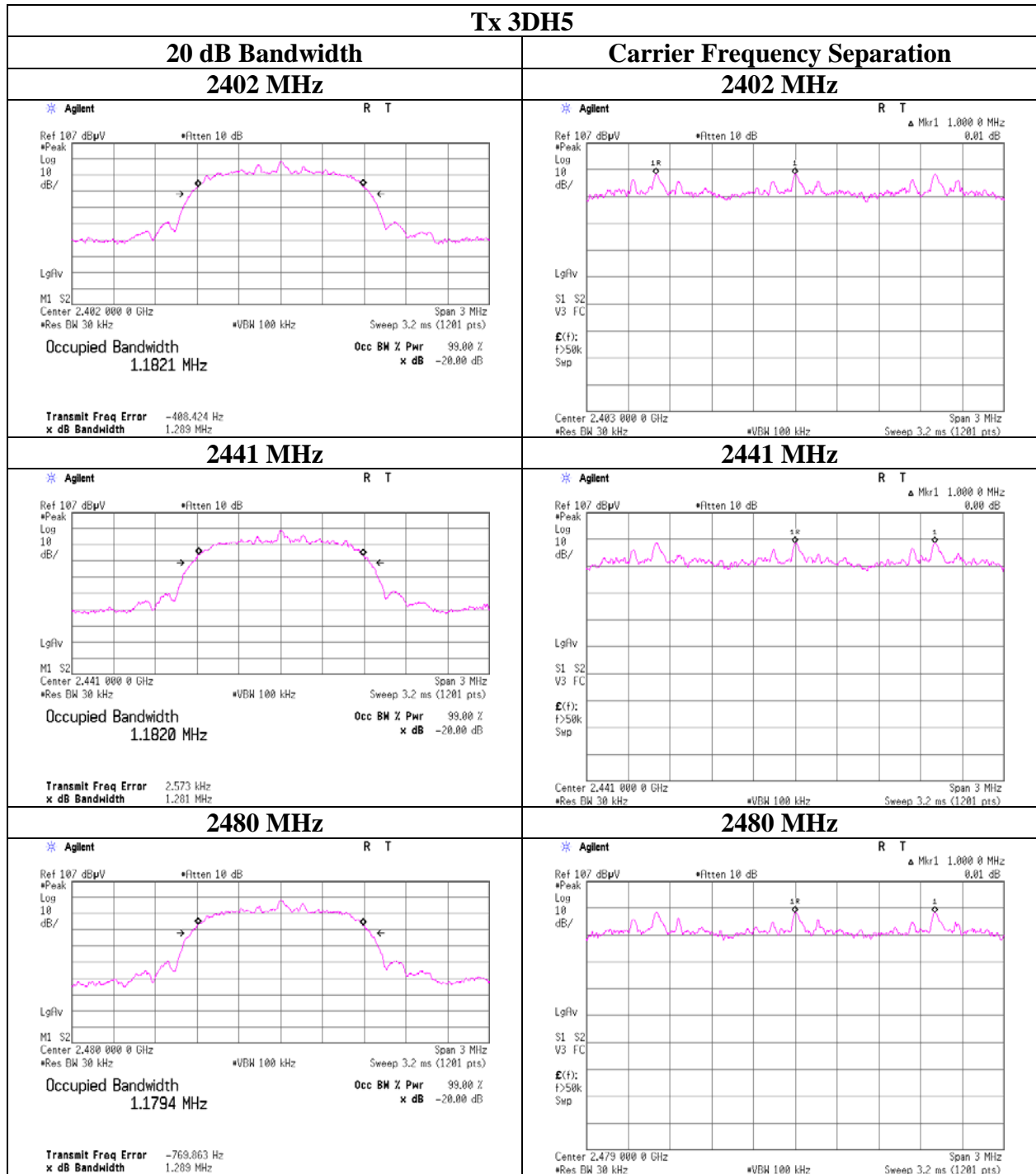
## 20 dB Bandwidth and Carrier Frequency Separation



**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

**20 dB Bandwidth and Carrier Frequency Separation**



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

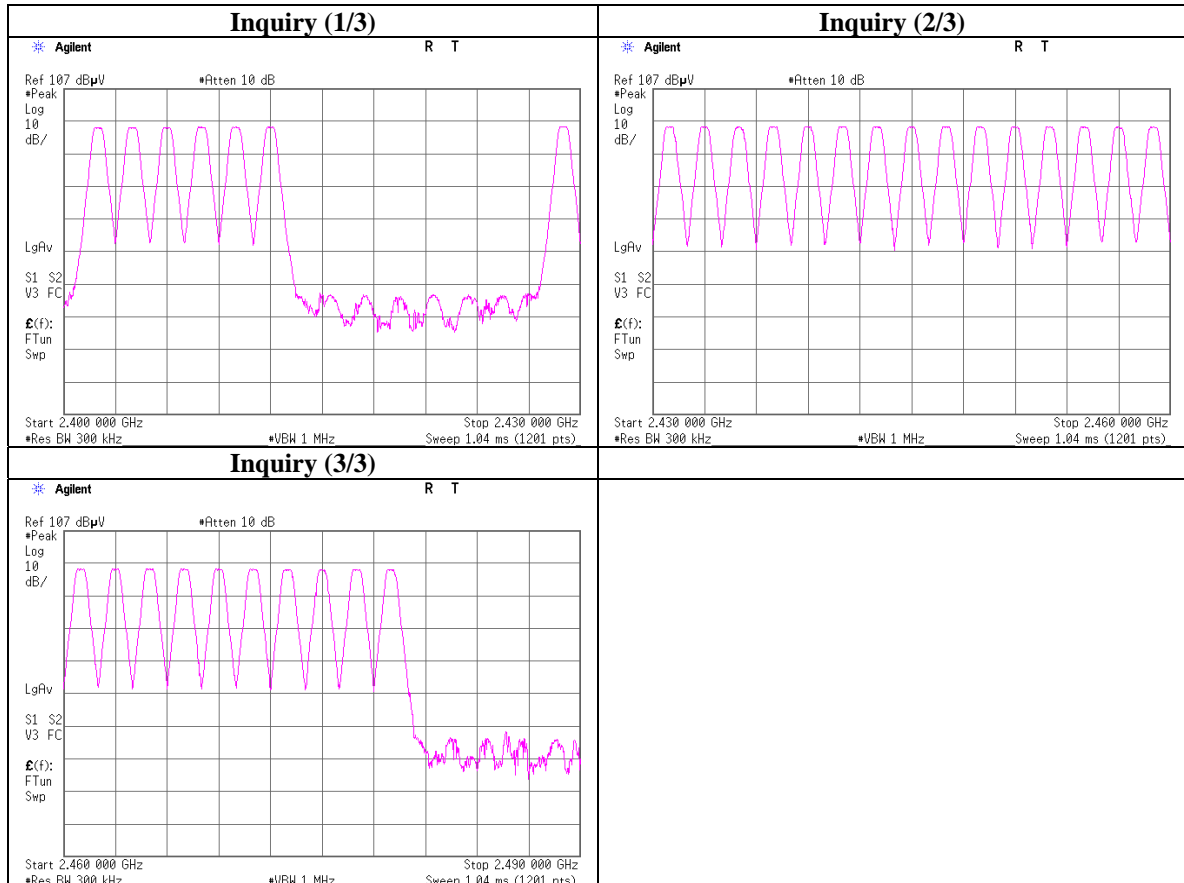
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
 Telephone : +81 596 24 8999  
 Facsimile : +81 596 24 8124

## Number of Hopping Frequency

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping on) DH5 / 3DH5 / Inquiry

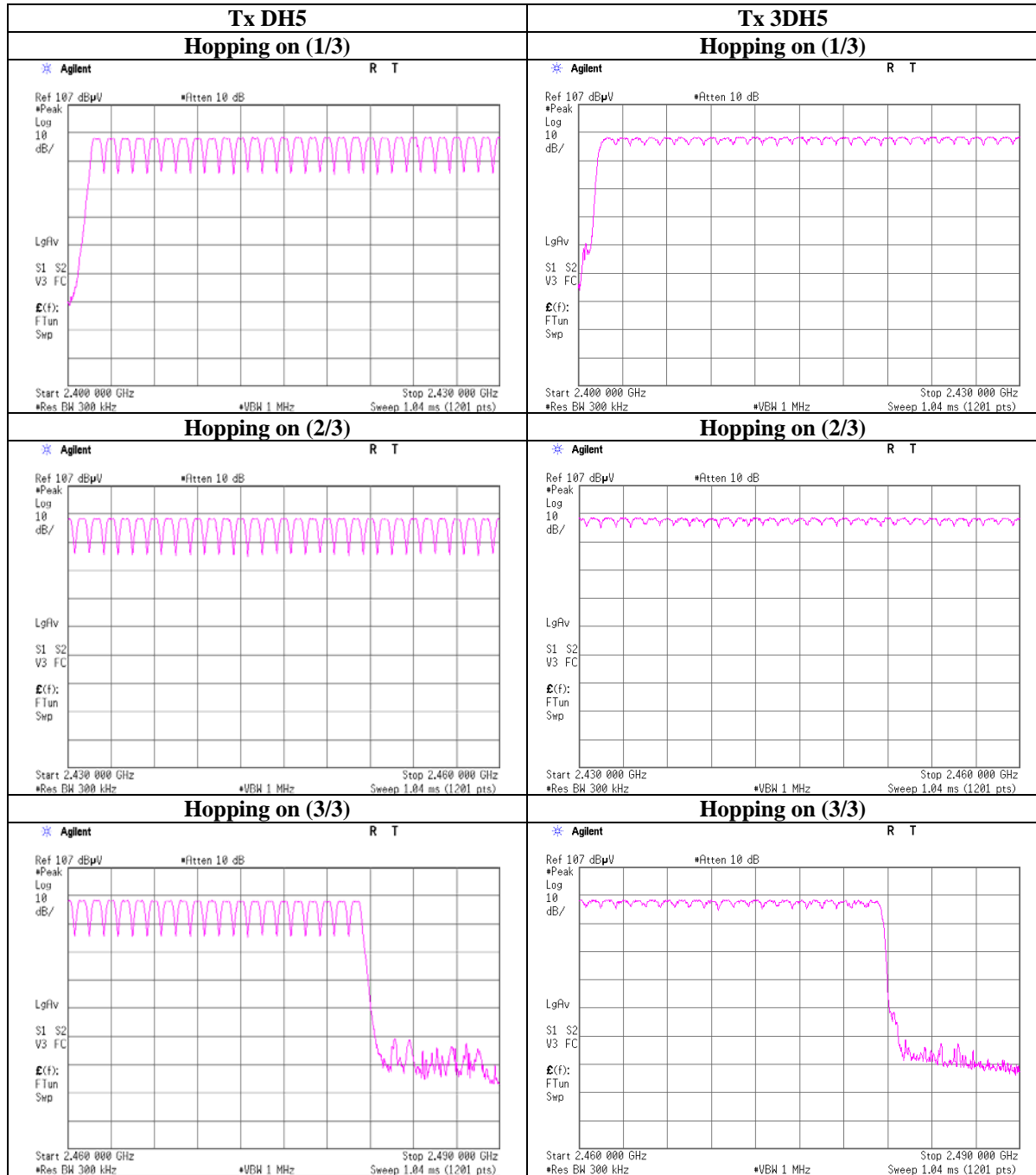
Mode	Number of channel [times]	Limit [times]
DH5	79	>= 15
3DH5	79	>= 15
Inquiry	32	>= 15

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



**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

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	10706993H	
Date	04/24/2015	04/28/2015
Temperature/ Humidity	20 deg. C / 45 % RH	25 deg. C / 36 % RH
Engineer	Yuta Moriya	Satofumi Matsuyama
Mode	Tx (Hopping on) DH5 / 3DH5 / Inquiry	

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8(32 Hopping x 0.4)second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	48.6 times / 5 sec. x 31.6 sec. = 308 times	0.418	129	400
DH3	25.2 times / 5 sec. x 31.6 sec. = 160 times	1.680	269	400
DH5	19.4 times / 5 sec. x 31.6 sec. = 123 times	2.927	360	400
3DH1	49.4 times / 5 sec. x 31.6 sec. = 313 times	0.421	132	400
3DH3	25.6 times / 5 sec. x 31.6 sec. = 162 times	1.672	271	400
3DH5	21.0 times / 5 sec. x 31.6 sec. = 133 times	2.924	389	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.118	150	400

Sample Calculation

Result = Number of transmission x Length of transmission time

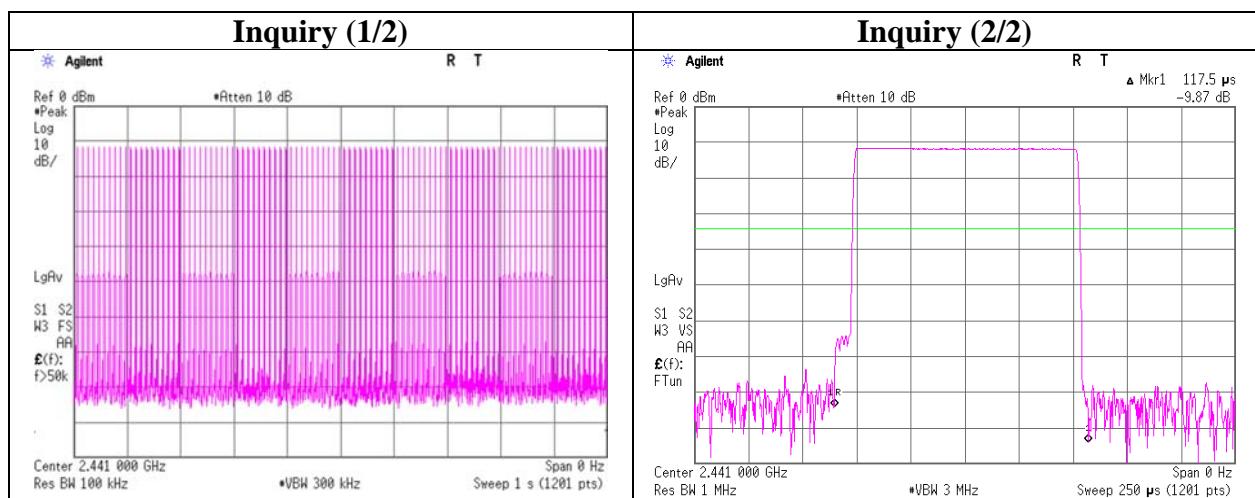
\*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	47	51	45	49	48.6
DH3	24	27	29	22	24	25.2
DH5	23	19	15	22	18	19.4
3DH1	49	49	50	49	50	49.4
3DH3	25	25	26	27	25	25.6
3DH5	23	19	22	16	25	21

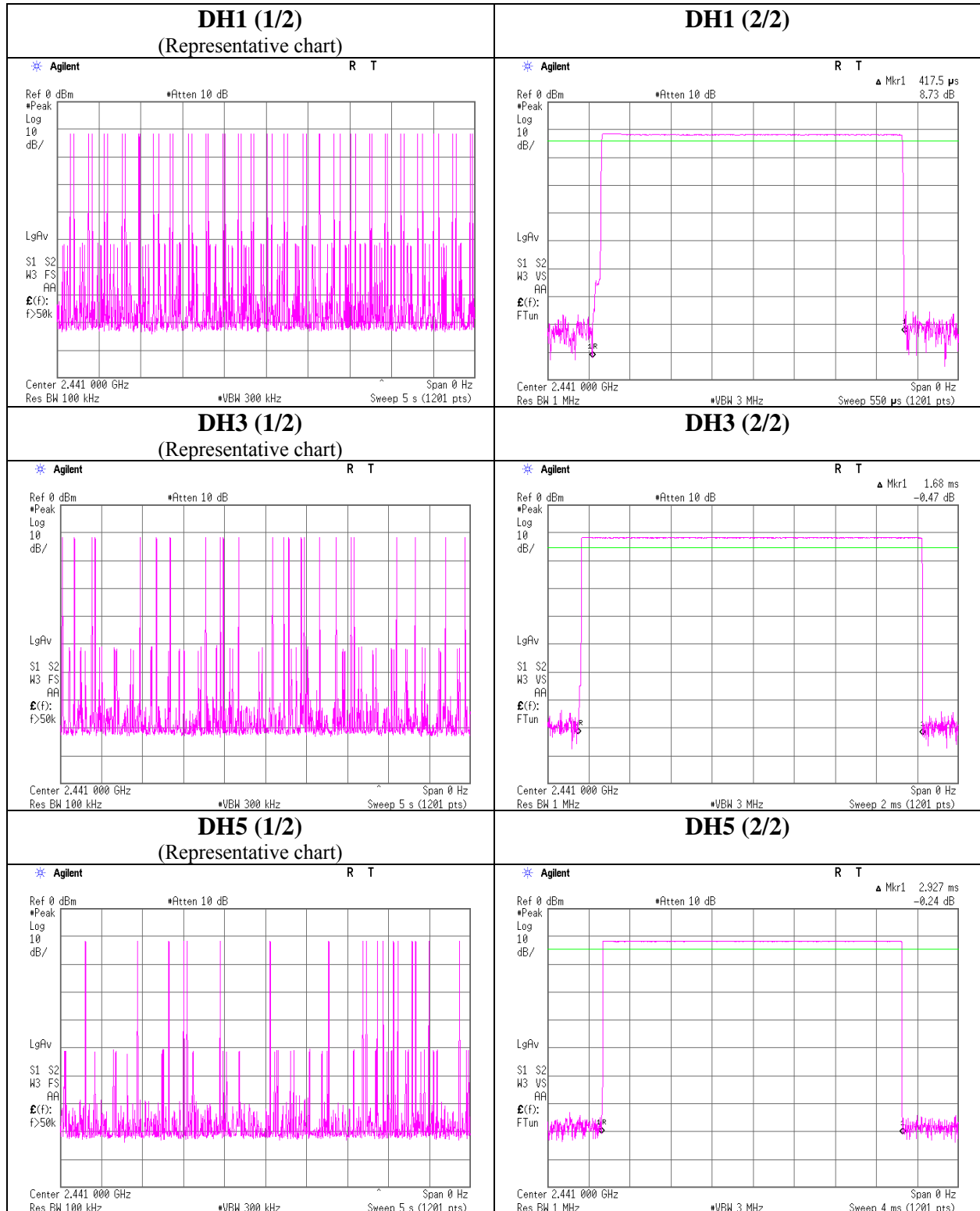
Sample Calculation

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.**

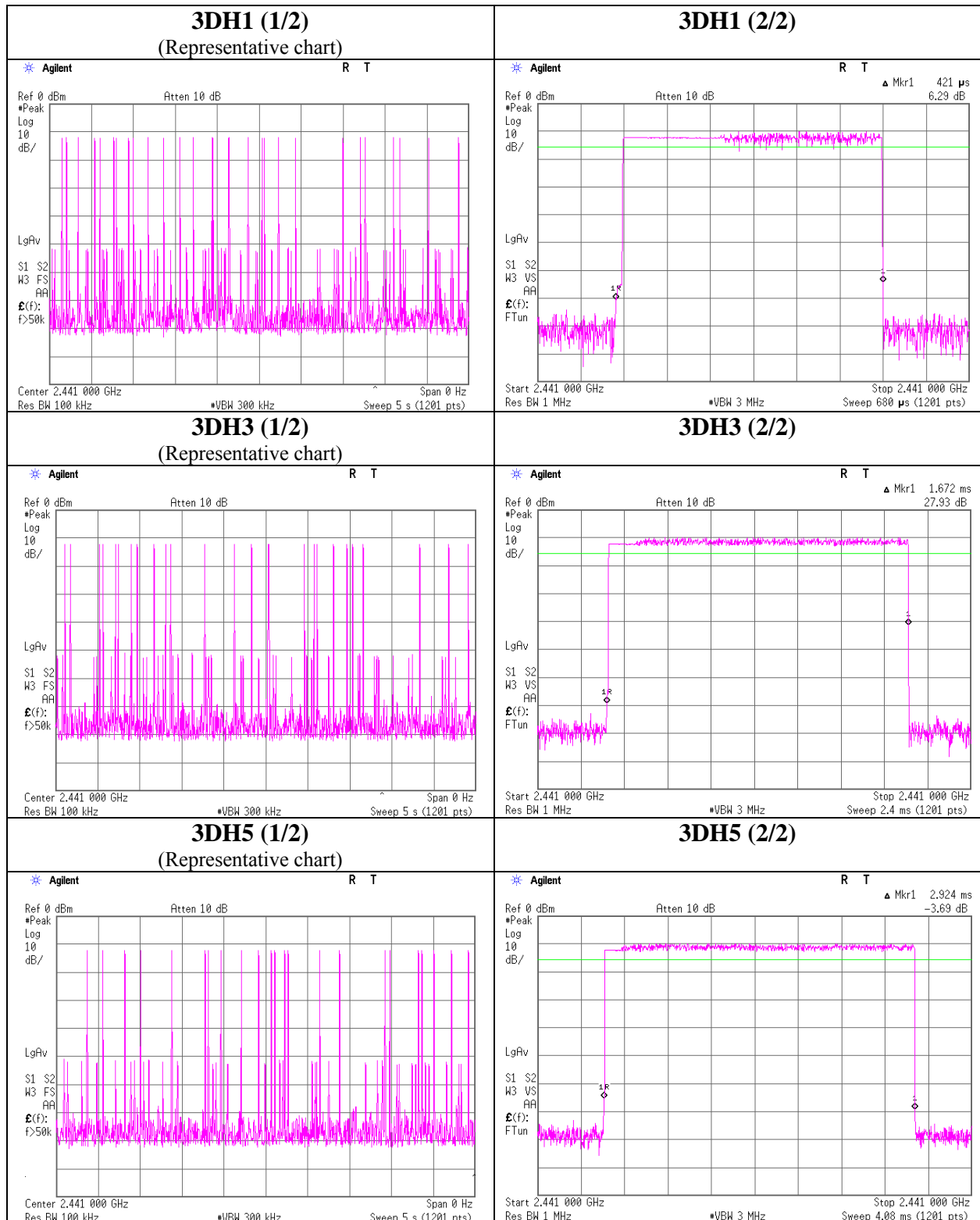
**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Dwell time**



## Maximum Peak Output Power

Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 10706993H  
 Date : 04/24/2015  
 Temperature/ Humidity : 20 deg. C / 45 % RH  
 Engineer : Yuta Moriya  
 Mode : Tx (Hopping off) DH5 / 2DH5 / 3DH5 / Inquiry

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-12.03	1.39	10.06	-0.58	0.87	20.96	125	21.54
DH5	2441.0	-11.73	1.39	10.06	-0.28	0.94	20.96	125	21.24
DH5	2480.0	-12.01	1.39	10.06	-0.56	0.88	20.96	125	21.52
2DH5	2402.0	-9.64	1.39	10.06	1.81	1.52	20.96	125	19.15
2DH5	2441.0	-9.46	1.39	10.06	1.99	1.58	20.96	125	18.97
2DH5	2480.0	-9.58	1.39	10.06	1.87	1.54	20.96	125	19.09
3DH5	2402.0	-9.27	1.39	10.06	2.18	1.65	20.96	125	18.78
3DH5	2441.0	-8.94	1.39	10.06	2.51	1.78	20.96	125	18.45
3DH5	2480.0	-9.21	1.39	10.06	2.24	1.67	20.96	125	18.72
Inquiry	2441.0	-11.83	1.39	10.06	-0.38	0.92	20.96	125	21.34

Sample Calculation:

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

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.

**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

**Average Output Power**  
**(Reference data for SAR testing)**

Test place : Ise EMC Lab. No.11 Measurement Room  
Report No. : 10706993H  
Date : 04/24/2015 04/28/2015  
Temperature/ Humidity : 20 deg. C / 45 % RH 25 deg. C / 36 % RH  
Engineer : Yuta Moriya Satofumi Matsuyama  
Mode : Tx (Hopping off) DH5 / 2DH5 / 3DH5

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
					[dBm]	[mW]
DH5	2402.0	-13.45	1.39	10.06	-2.00	0.63
DH5	2441.0	-13.19	1.39	10.06	-1.74	0.67
DH5	2480.0	-13.40	1.39	10.06	-1.95	0.64
2DH5	2402.0	-13.96	0.77	10.00	-3.19	0.48
2DH5	2441.0	-14.01	0.77	10.00	-3.24	0.47
2DH5	2480.0	-14.27	0.78	10.00	-3.49	0.45
3DH5	2402.0	-13.95	0.77	10.00	-3.18	0.48
3DH5	2441.0	-13.98	0.77	10.00	-3.21	0.48
3DH5	2480.0	-14.25	0.78	10.00	-3.47	0.45

Sample Calculation:

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



## Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10706993H  
Date 03/11/2015 03/15/2015 03/15/2015  
Temperature/ Humidity 20 deg. C / 29 % RH 22 deg. C / 33 % RH 22 deg. C / 33 % RH  
Engineer Takafumi Noguchi Takafumi Noguchi Takafumi Noguchi  
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (Below 1 GHz)  
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	76.803	QP	41.8	6.6	7.8	32.0	24.2	40.0	15.8	
Hori	80.894	QP	42.7	6.9	7.8	32.0	25.4	40.0	14.6	
Hori	101.607	QP	39.0	10.3	8.1	32.3	25.1	43.5	18.4	
Hori	135.201	QP	36.7	14.0	8.5	32.2	27.0	43.5	16.5	
Hori	444.003	QP	35.7	17.9	10.8	32.1	32.3	46.0	13.7	
Hori	540.793	QP	36.0	18.7	11.4	32.1	34.0	46.0	12.0	
Hori	4882.000	PK	40.5	30.8	5.3	31.7	44.9	73.9	29.0	
Hori	7323.000	PK	48.3	35.9	6.5	32.7	58.0	73.9	15.9	
Hori	9764.000	PK	42.4	38.7	7.1	33.4	54.8	73.9	19.1	
Hori	4882.000	AV	29.2	30.8	5.3	31.7	33.6	53.9	20.3	
Hori	7323.000	AV	39.8	35.9	6.5	32.7	49.5	53.9	4.4	
Hori	9764.000	AV	30.4	38.7	7.1	33.4	42.8	53.9	11.1	
Vert	76.801	QP	39.8	6.6	7.8	32.0	22.2	40.0	17.8	
Vert	80.899	QP	40.4	6.9	7.8	32.0	23.1	40.0	16.9	
Vert	101.609	QP	40.1	10.3	8.1	32.3	26.2	43.5	17.3	
Vert	135.198	QP	37.9	14.0	8.5	32.2	28.2	43.5	15.3	
Vert	444.001	QP	32.5	17.9	10.8	32.1	29.1	46.0	16.9	
Vert	540.797	QP	32.3	18.7	11.4	32.1	30.3	46.0	15.7	
Vert	4882.000	PK	40.8	30.8	5.3	31.7	45.2	73.9	28.7	
Vert	7323.000	PK	44.6	35.9	6.5	32.7	54.3	73.9	19.6	
Vert	9764.000	PK	42.0	38.7	7.1	33.4	54.4	73.9	19.5	
Vert	4882.000	AV	29.6	30.8	5.3	31.7	34.0	53.9	19.9	
Vert	7323.000	AV	34.0	35.9	6.5	32.7	43.7	53.9	10.2	
Vert	9764.000	AV	30.5	38.7	7.1	33.4	42.9	53.9	11.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

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



## Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10706993H  
Date 03/11/2015 03/15/2015 03/15/2015  
Temperature/ Humidity 20 deg. C / 29 % RH 22 deg. C / 33 % RH 22 deg. C / 33% RH  
Engineer Takafumi Noguchi Takafumi Noguchi Takafumi Noguchi  
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (Below 1 GHz)  
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	76.801	QP	41.8	6.6	7.8	32.0	24.2	40.0	15.8	
Hori	80.894	QP	42.8	6.9	7.8	32.0	25.5	40.0	14.5	
Hori	101.607	QP	39.4	10.3	8.1	32.3	25.5	43.5	18.0	
Hori	135.201	QP	36.7	14.0	8.5	32.2	27.0	43.5	16.5	
Hori	443.998	QP	35.7	17.9	10.8	32.1	32.3	46.0	13.7	
Hori	540.801	QP	35.9	18.7	11.4	32.1	33.9	46.0	12.1	
Hori	2483.500	PK	47.5	26.9	3.2	32.7	44.9	73.9	29.0	
Hori	4960.000	PK	41.1	30.9	5.2	31.7	45.5	73.9	28.4	
Hori	7440.000	PK	45.6	35.9	6.6	32.7	55.4	73.9	18.5	
Hori	9920.000	PK	41.7	38.9	7.1	33.5	54.2	73.9	19.7	
Hori	2483.500	AV	33.3	26.9	3.2	32.7	30.7	53.9	23.2	
Hori	4960.000	AV	29.5	30.9	5.2	31.7	33.9	53.9	20.0	
Hori	7440.000	AV	35.1	35.9	6.6	32.7	44.9	53.9	9.0	
Hori	9920.000	AV	30.7	38.9	7.1	33.5	43.2	53.9	10.7	
Vert	76.798	QP	39.8	6.6	7.8	32.0	22.2	40.0	17.8	
Vert	80.899	QP	40.3	6.9	7.8	32.0	23.0	40.0	17.0	
Vert	101.615	QP	40.0	10.3	8.1	32.3	26.1	43.5	17.4	
Vert	135.198	QP	37.8	14.0	8.5	32.2	28.1	43.5	15.4	
Vert	443.998	QP	32.5	17.9	10.8	32.1	29.1	46.0	16.9	
Vert	540.796	QP	32.4	18.7	11.4	32.1	30.4	46.0	15.6	
Vert	2483.500	PK	47.3	26.9	3.2	32.7	44.7	73.9	29.2	
Vert	4960.000	PK	42.2	30.9	5.2	31.7	46.6	73.9	27.3	
Vert	7440.000	PK	45.2	35.9	6.6	32.7	55.0	73.9	18.9	
Vert	9920.000	PK	42.1	38.9	7.1	33.5	54.6	73.9	19.3	
Vert	2483.500	AV	34.2	26.9	3.2	32.7	31.6	53.9	22.3	
Vert	4960.000	AV	29.7	30.9	5.2	31.7	34.1	53.9	19.8	
Vert	7440.000	AV	34.1	35.9	6.6	32.7	43.9	53.9	10.0	
Vert	9920.000	AV	30.7	38.9	7.1	33.5	43.2	53.9	10.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

Distance factor: 10GHz-26.5GHz  $20\log(3.0m/1.0m) = 9.5dB$

**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. 10706993H  
Date 03/12/2015 03/15/2015 03/15/2015  
Temperature/ Humidity 20 deg. C / 29 % RH 22 deg. C / 33 % RH 22 deg. C / 33 % RH  
Engineer Takafumi Noguchi Takafumi Noguchi Takafumi Noguchi  
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (Below 1 GHz)  
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	76.800	QP	41.7	6.6	7.8	32.0	24.1	40.0	15.9	
Hori	80.889	QP	42.7	6.9	7.8	32.0	25.4	40.0	14.6	
Hori	101.606	QP	39.4	10.3	8.1	32.3	25.5	43.5	18.0	
Hori	135.211	QP	36.8	14.0	8.5	32.2	27.1	43.5	16.4	
Hori	443.999	QP	35.8	17.9	10.8	32.1	32.4	46.0	13.6	
Hori	540.803	QP	36.0	18.7	11.4	32.1	34.0	46.0	12.0	
Hori	2390.000	PK	50.3	26.8	3.2	32.7	47.6	73.9	26.3	
Hori	4804.000	PK	40.4	30.6	5.2	31.8	44.4	73.9	29.5	
Hori	9608.000	PK	41.2	38.4	7.0	33.3	53.3	73.9	20.6	
Hori	2390.000	AV	32.3	26.8	3.2	32.7	29.6	53.9	24.3	
Hori	4804.000	AV	29.5	30.6	5.2	31.8	33.5	53.9	20.4	
Hori	9608.000	AV	30.7	38.4	7.0	33.3	42.8	53.9	11.1	
Vert	76.799	QP	39.9	6.6	7.8	32.0	22.3	40.0	17.7	
Vert	80.890	QP	40.4	6.9	7.8	32.0	23.1	40.0	16.9	
Vert	101.615	QP	39.9	10.3	8.1	32.3	26.0	43.5	17.5	
Vert	135.201	QP	37.9	14.0	8.5	32.2	28.2	43.5	15.3	
Vert	443.998	QP	32.5	17.9	10.8	32.1	29.1	46.0	16.9	
Vert	540.798	QP	32.4	18.7	11.4	32.1	30.4	46.0	15.6	
Vert	2390.000	PK	49.1	26.8	3.2	32.7	46.4	73.9	27.5	
Vert	4804.000	PK	41.3	30.6	5.2	31.8	45.3	73.9	28.6	
Vert	9608.000	PK	42.8	38.4	7.0	33.3	54.9	73.9	19.0	
Vert	2390.000	AV	32.5	26.8	3.2	32.7	29.8	53.9	24.1	
Vert	4804.000	AV	29.6	30.6	5.2	31.8	33.6	53.9	20.3	
Vert	9608.000	AV	31.0	38.4	7.0	33.3	43.1	53.9	10.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

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

### 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	97.4	26.8	3.2	32.7	94.7	-	-	Carrier
Hori	2400.000	PK	42.2	26.8	3.2	32.7	39.5	74.7	35.2	
Hori	7206.000	PK	43.8	35.9	6.6	32.7	53.6	74.7	21.1	
Vert	2402.000	PK	97.3	26.8	3.2	32.7	94.6	-	-	Carrier
Vert	2400.000	PK	41.8	26.8	3.2	32.7	39.1	74.6	35.5	
Vert	7206.000	PK	40.5	35.9	6.6	32.7	50.3	74.6	24.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

**UL Japan, Inc.**

**Ise EMC Lab.**

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

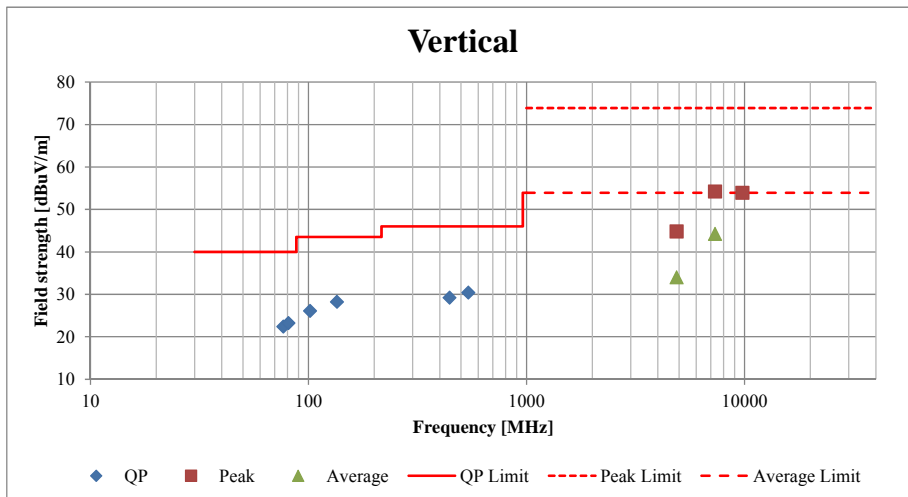
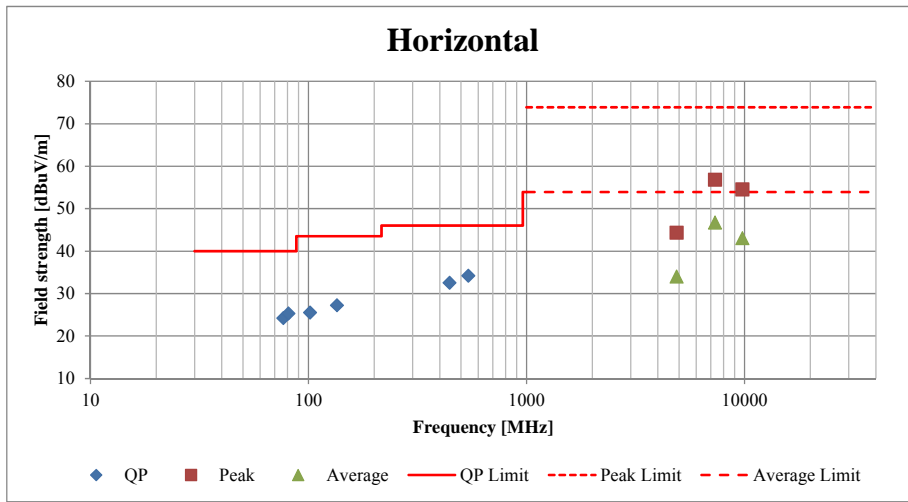
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10706993H		
Date	03/12/2015	03/15/2015	03/15/2015
Temperature/ Humidity	20 deg. C / 29 % RH	22 deg. C / 33 % RH	22 deg. C / 33 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi	Takafumi Noguchi
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx (Hopping off) 3DH5 2441 MHz		



### Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10706993H  
Date 03/12/2015 03/12/2015 03/12/2015  
Temperature/ Humidity 20 deg. C / 29 % RH 20 deg. C / 29 % RH 20 deg. C / 29 % RH  
Engineer Takafumi Noguchi Takafumi Noguchi Takafumi Noguchi  
(1 GHz - 10 GHz) (1 GHz - 10 GHz) (1 GHz - 10 GHz)  
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	76.800	QP	41.8	6.6	7.8	32.0	24.2	40.0	15.8	
Hori	80.894	QP	42.7	6.9	7.8	32.0	25.4	40.0	14.6	
Hori	101.619	QP	39.5	10.3	8.1	32.3	25.6	43.5	17.9	
Hori	135.214	QP	37.0	14.0	8.5	32.2	27.3	43.5	16.2	
Hori	444.000	QP	36.0	17.9	10.8	32.1	32.6	46.0	13.4	
Hori	540.809	QP	36.2	18.7	11.4	32.1	34.2	46.0	11.8	
Hori	2483.500	PK	48.7	26.9	3.2	32.7	46.1	73.9	27.8	
Hori	4960.000	PK	40.7	30.9	5.2	31.7	45.1	73.9	28.8	
Hori	7440.000	PK	45.6	35.9	6.6	32.7	55.4	73.9	18.5	
Hori	9920.000	PK	41.6	38.9	7.1	33.5	54.1	73.9	19.8	
Hori	2483.500	AV	36.1	26.9	3.2	32.7	33.5	53.9	20.4	
Hori	4960.000	AV	29.8	30.9	5.2	31.7	34.2	53.9	19.7	
Hori	7440.000	AV	34.4	35.9	6.6	32.7	44.2	53.9	9.7	
Hori	9920.000	AV	30.8	38.9	7.1	33.5	43.3	53.9	10.6	
Vert	76.800	QP	39.0	6.6	7.8	32.0	21.4	40.0	18.6	
Vert	80.888	QP	40.5	6.9	7.8	32.0	23.2	40.0	16.8	
Vert	101.616	QP	40.0	10.3	8.1	32.3	26.1	43.5	17.4	
Vert	135.211	QP	38.0	14.0	8.5	32.2	28.3	43.5	15.2	
Vert	444.002	QP	32.0	17.9	10.8	32.1	28.6	46.0	17.4	
Vert	540.802	QP	32.6	18.7	11.4	32.1	30.6	46.0	15.4	
Vert	2483.500	PK	48.8	26.9	3.2	32.7	46.2	73.9	27.7	
Vert	4960.000	PK	41.0	30.9	5.2	31.7	45.4	73.9	28.5	
Vert	7440.000	PK	44.6	35.9	6.6	32.7	54.4	73.9	19.5	
Vert	9920.000	PK	41.8	38.9	7.1	33.5	54.3	73.9	19.6	
Vert	2483.500	AV	35.5	26.9	3.2	32.7	32.9	53.9	21.0	
Vert	4960.000	AV	29.6	30.9	5.2	31.7	34.0	53.9	19.9	
Vert	7440.000	AV	33.5	35.9	6.6	32.7	43.3	53.9	10.6	
Vert	9920.000	AV	31.0	38.9	7.1	33.5	43.5	53.9	10.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

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

**UL Japan, Inc.**

**Ise EMC Lab.**

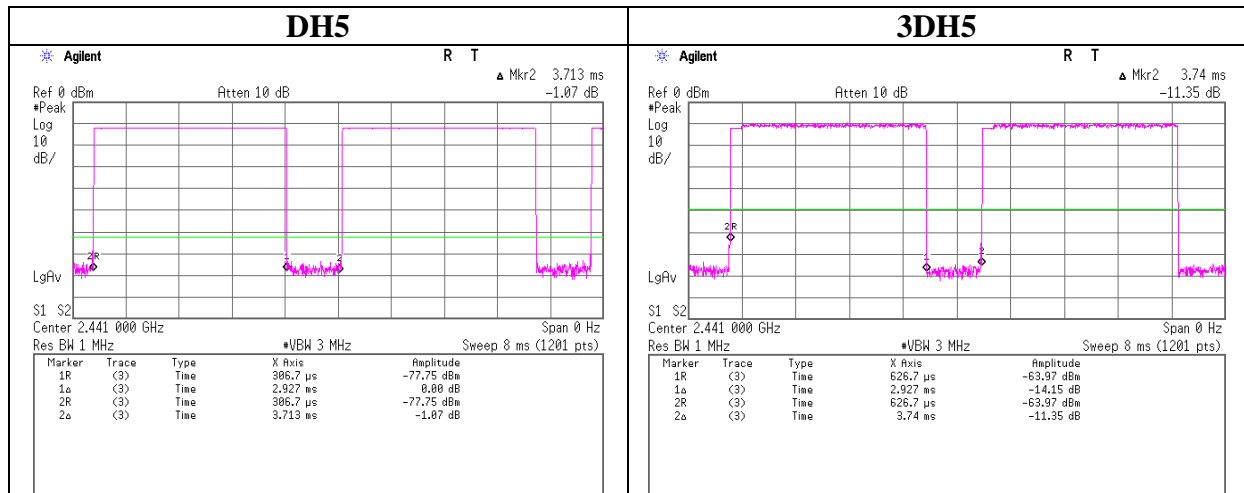
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### Burst Rate Confirmation

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	10706993H	
Date	04/24/2015	04/28/2015
Temperature/ Humidity	20 deg. C / 45 % RH	25 deg. C / 36 % RH
Engineer	Yuta Moriya	Satofumi Matsuyama
Mode	Tx (Hopping off) DH5 / 3DH5	



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) DH5

### Tx DH5 2402 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

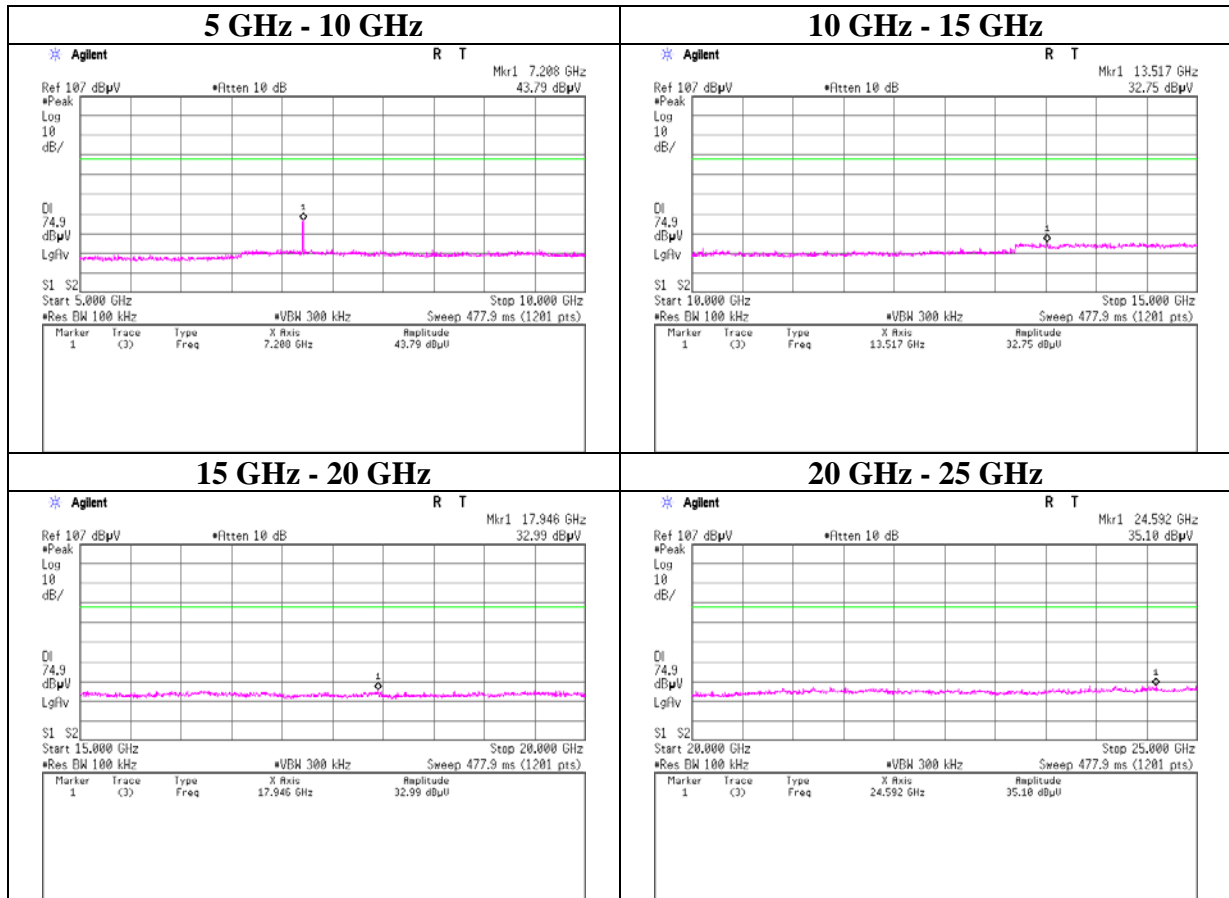
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) DH5

### Tx 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

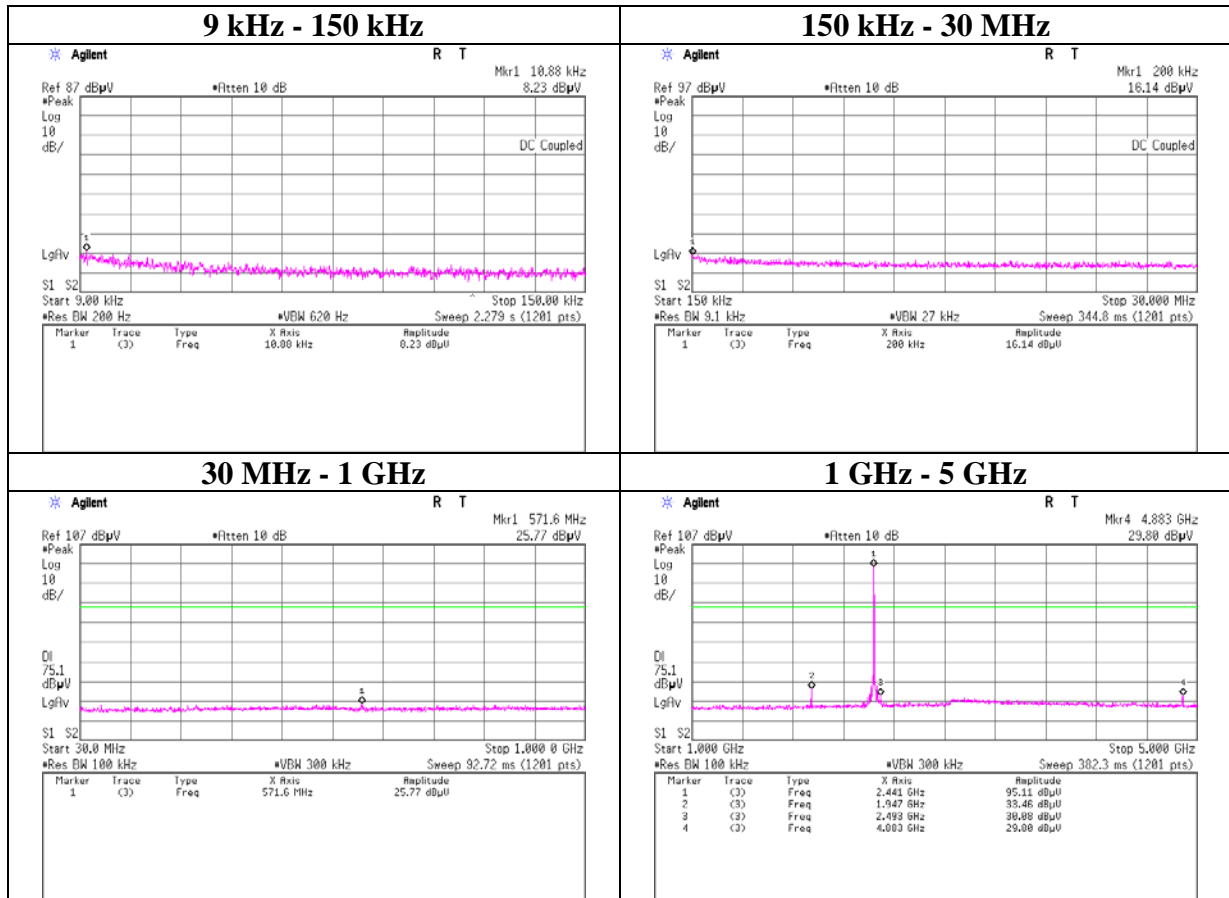
Facsimile : +81 596 24 8124



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) DH5

### Tx DH5 2441 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.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) DH5

### Tx DH5 2441 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

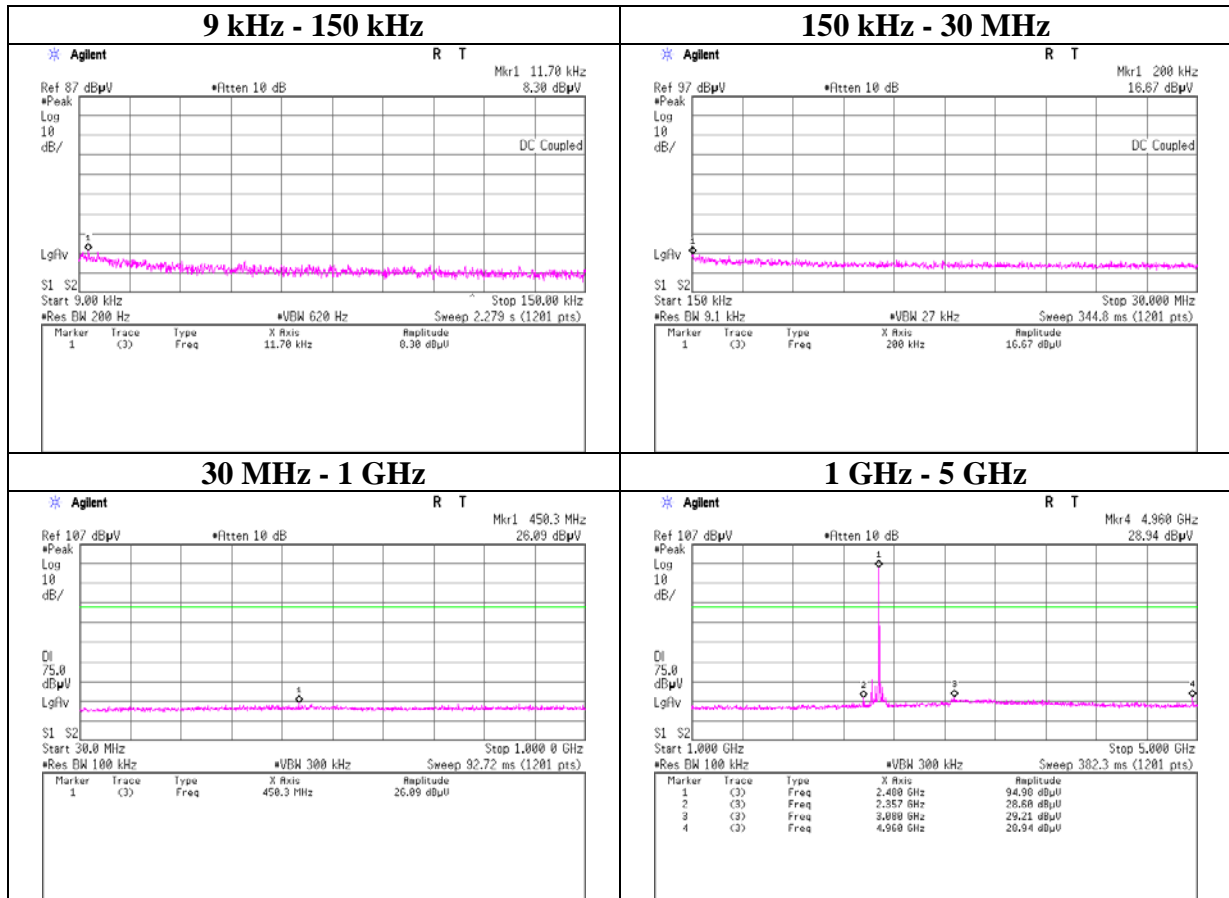
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) DH5

### Tx DH5 2480 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.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) DH5

### Tx DH5 2480 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

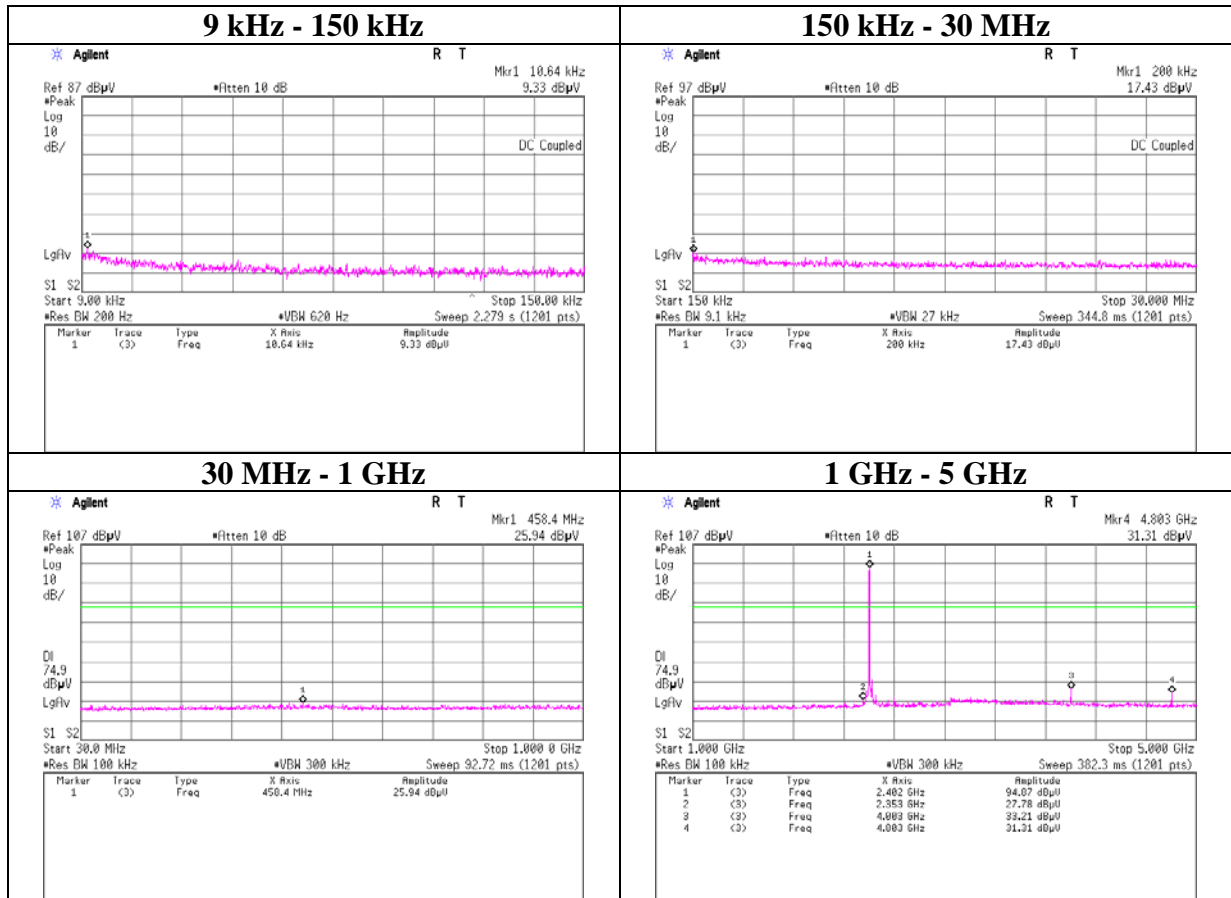
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### Conducted Spurious Emission

Test place : Ise EMC Lab. No.11 Measurement Room  
 Report No. : 10706993H  
 Date : 04/24/2015  
 Temperature/ Humidity : 20 deg. C / 45 % RH  
 Engineer : Yuta Moriya  
 Mode : Tx (Hopping off) 3DH5

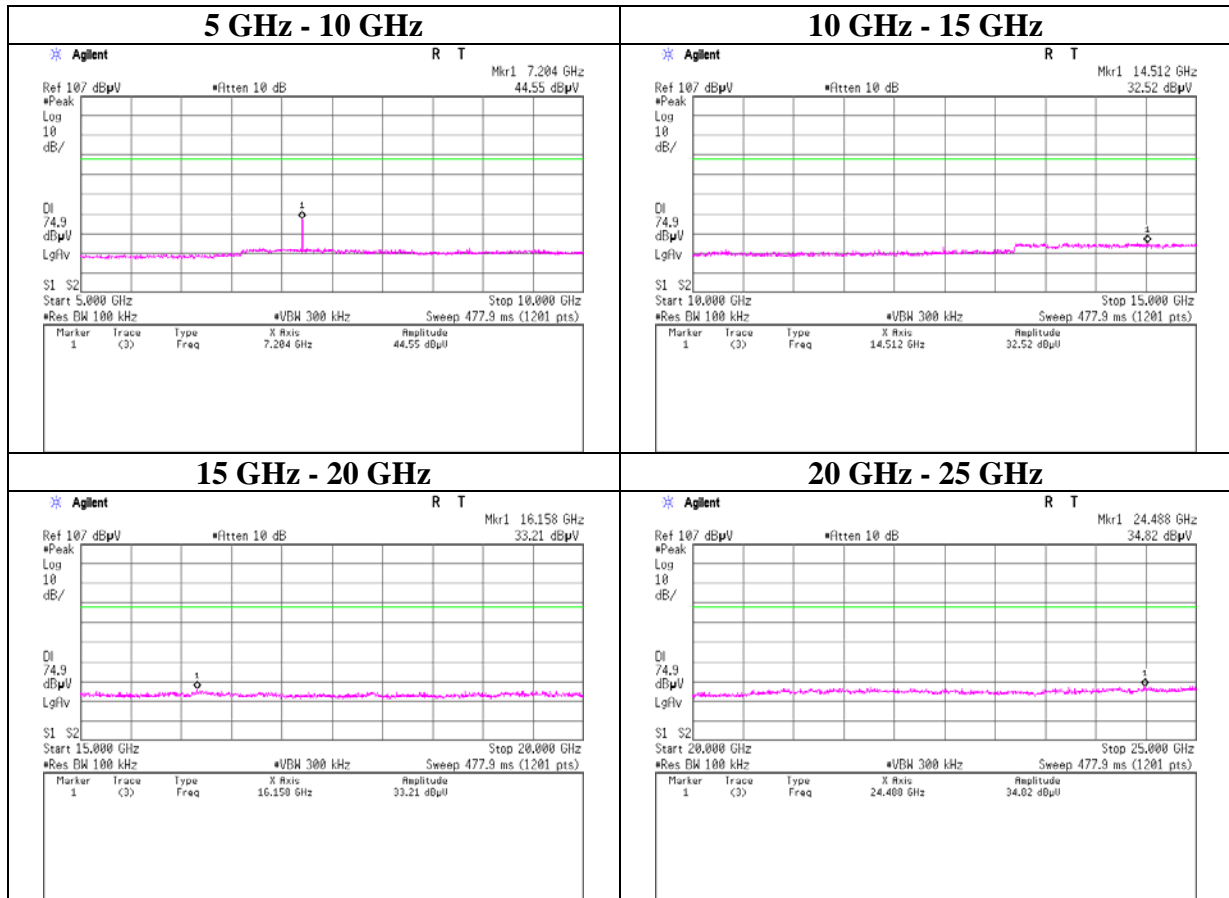
#### Tx 3DH5 2402 MHz



### Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) 3DH5

#### Tx 3DH5 2402 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

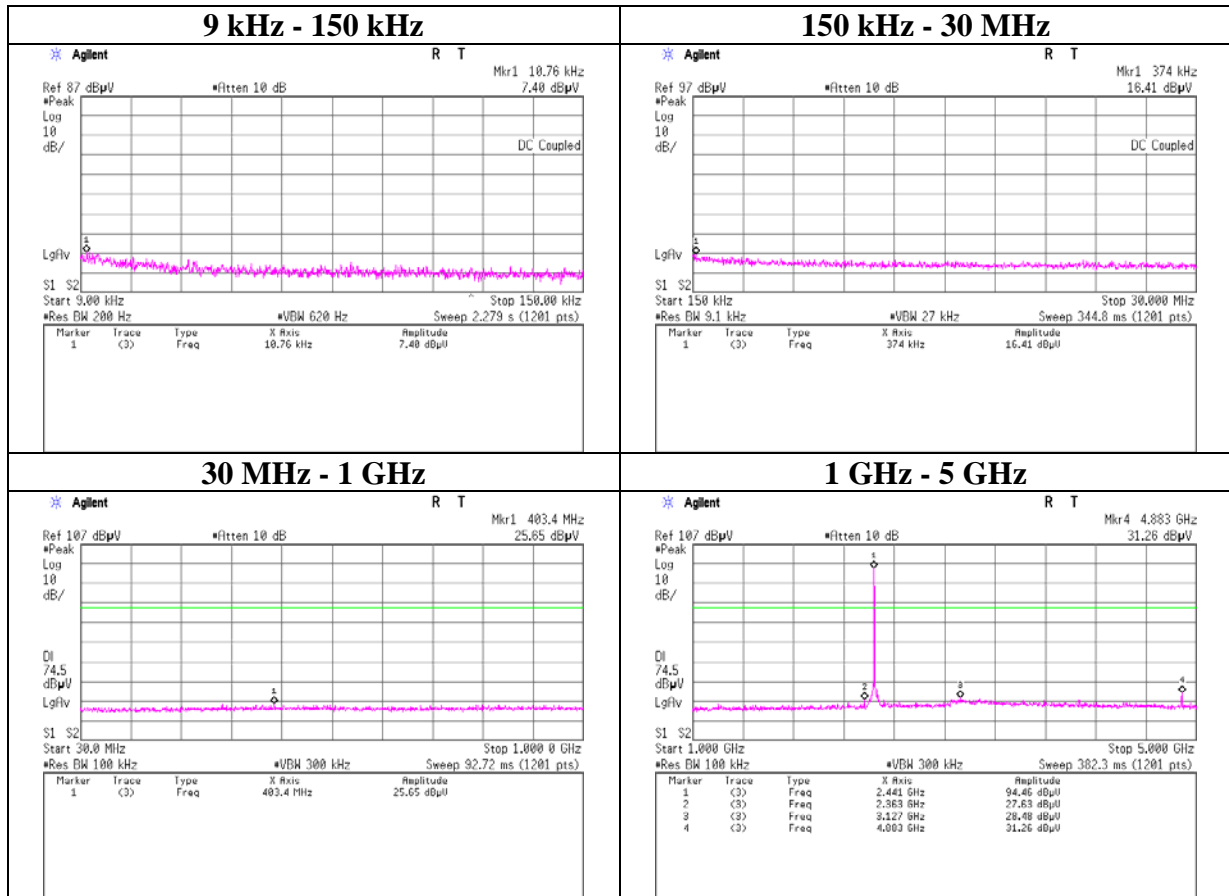
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) 3DH5

### Tx 3DH5 2441 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

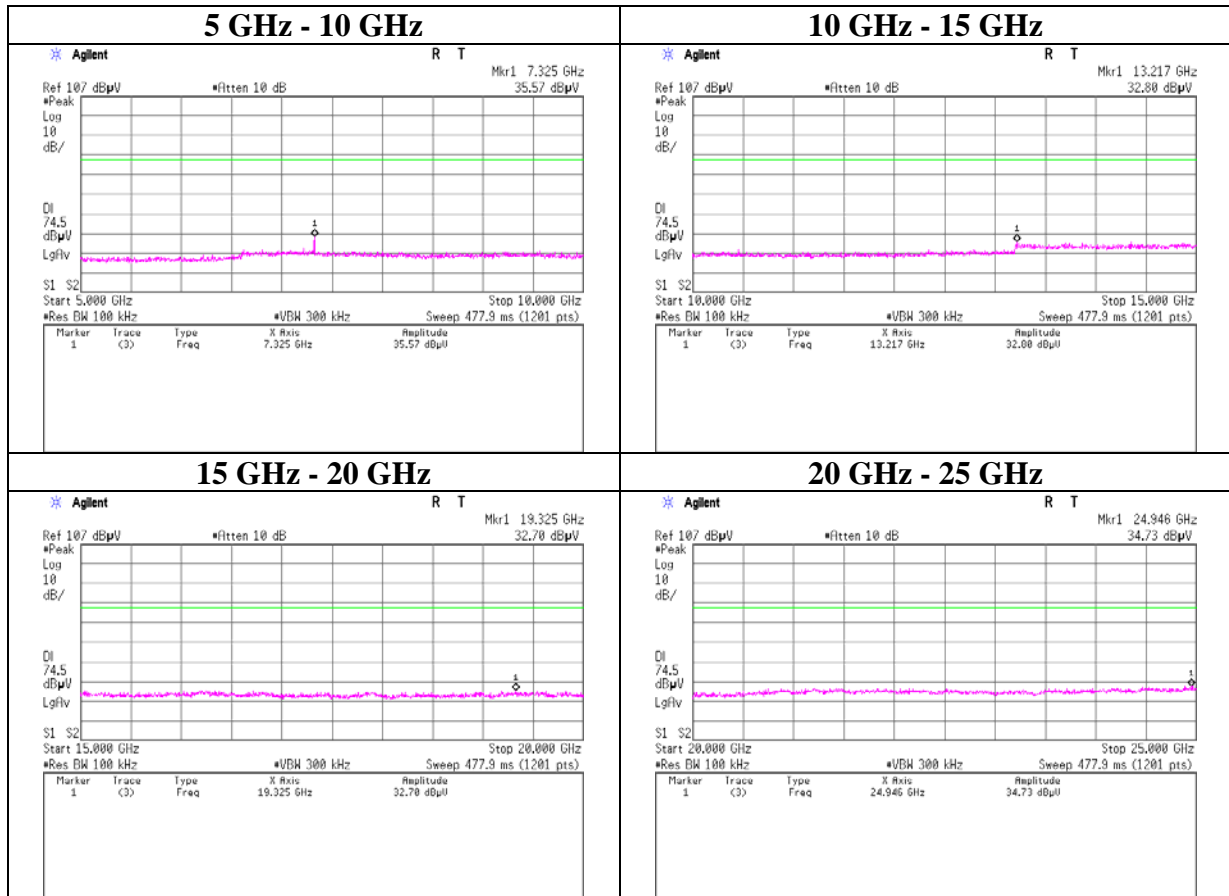
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) 3DH5

### Tx 3DH5 2441 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

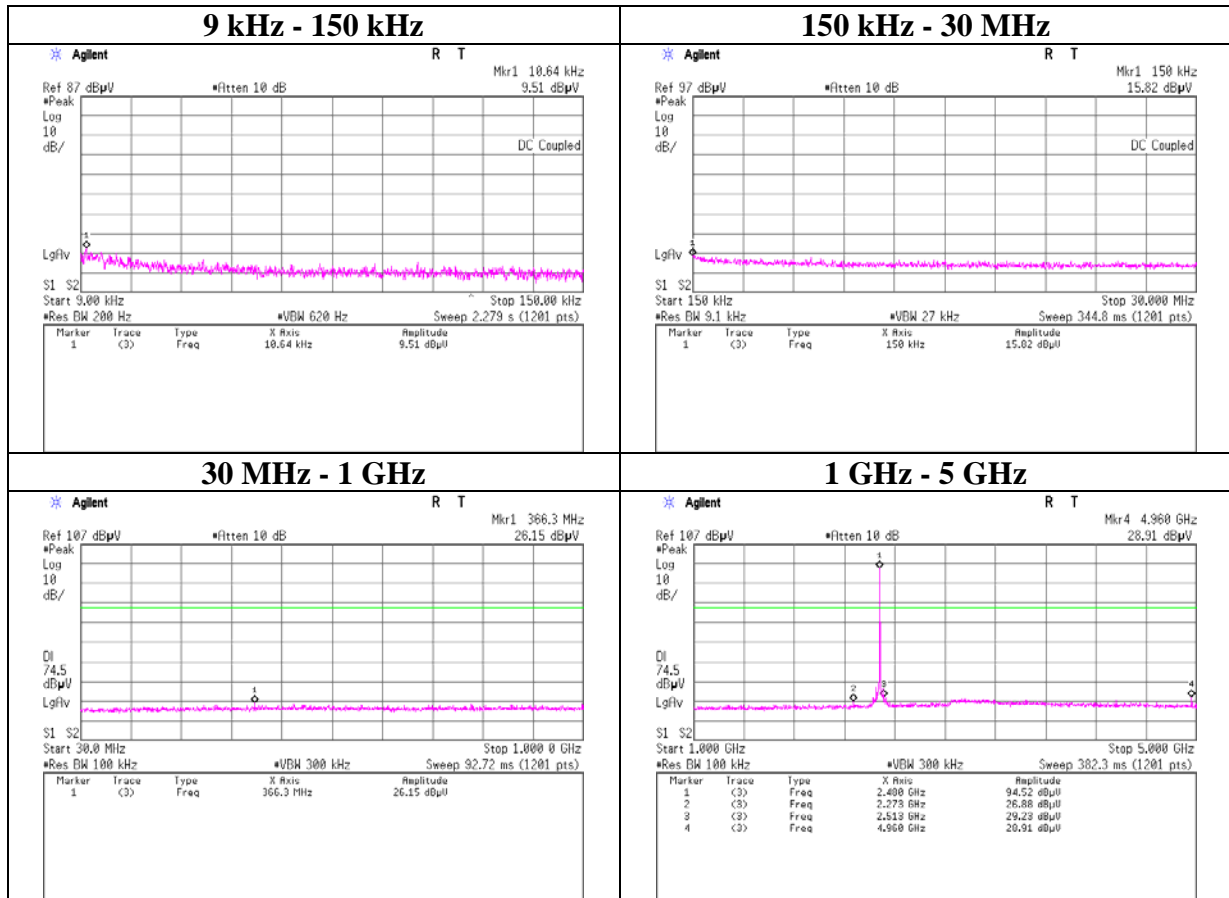
Facsimile : +81 596 24 8124



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) 3DH5

### Tx 3DH5 2480MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

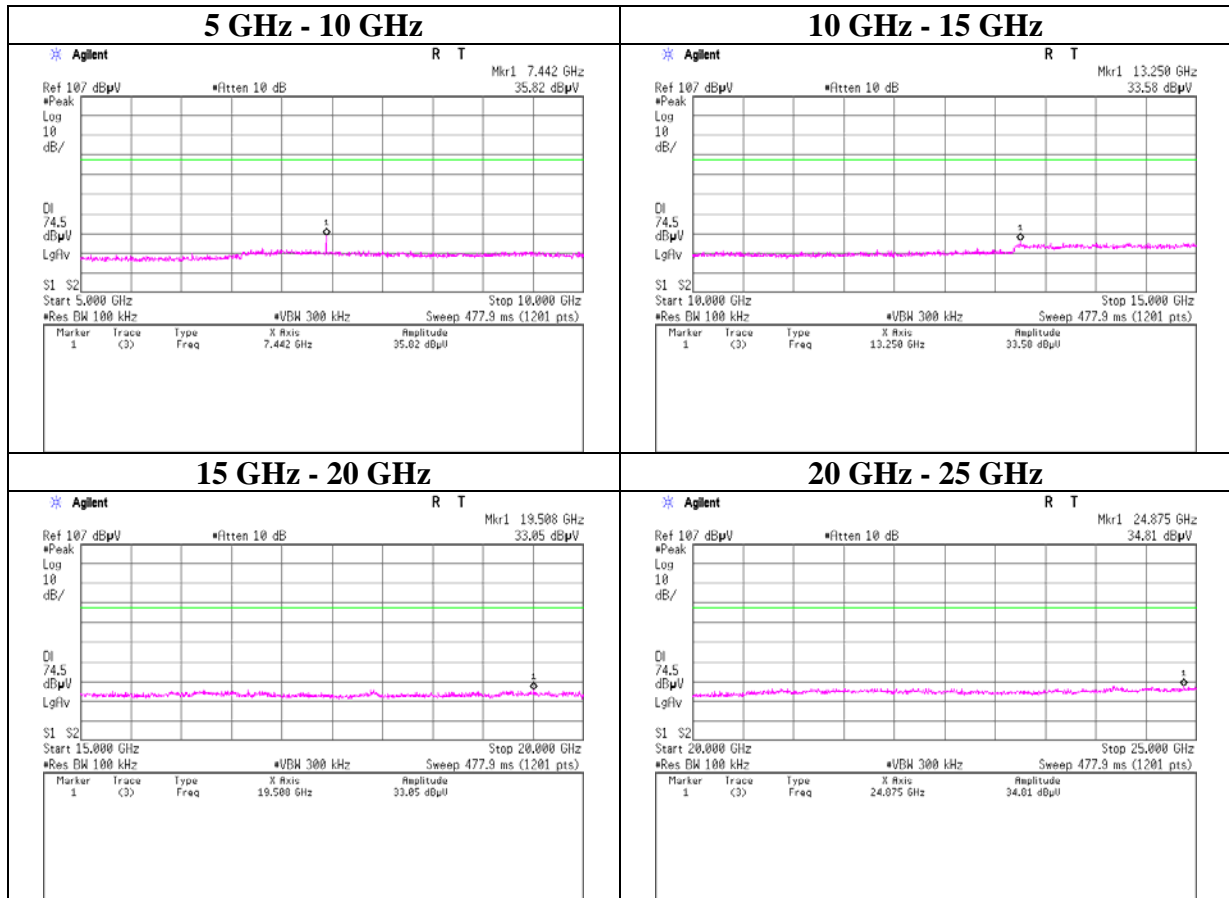
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping off) 3DH5

### Tx 3DH5 2480 MHz



**UL Japan, Inc.**

**Ise EMC Lab.**

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

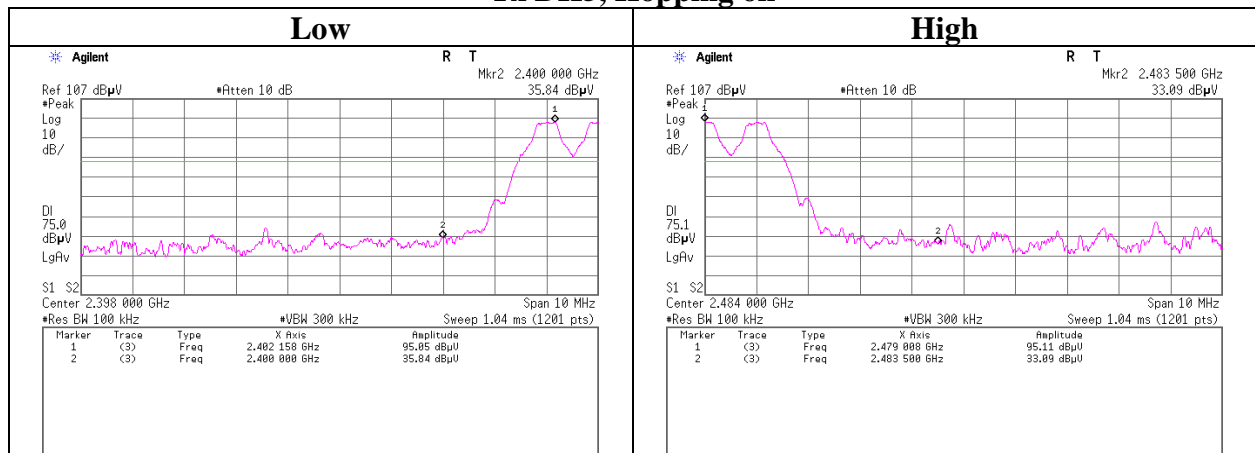
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

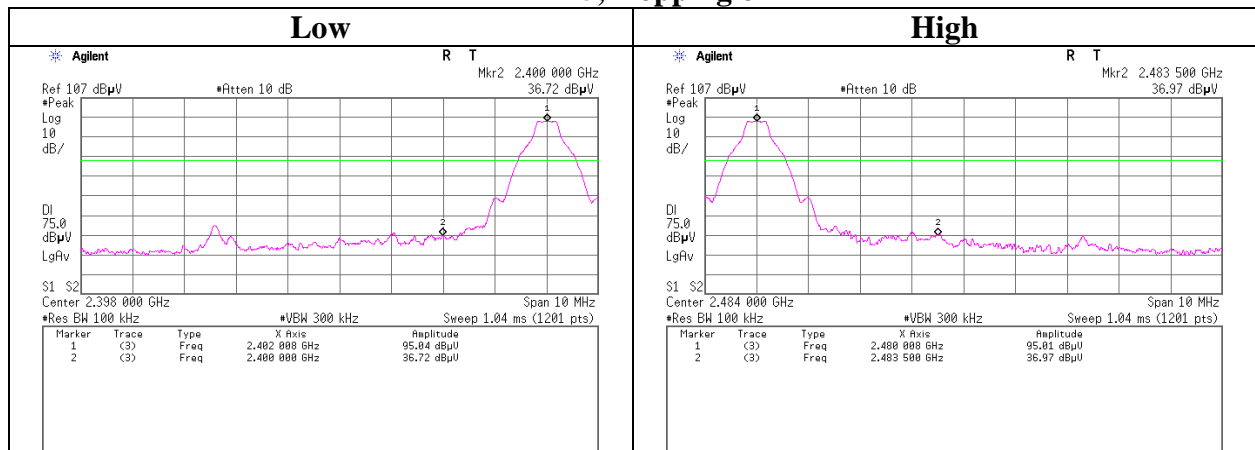
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping on / Hopping off) DH5

### Tx DH5, Hopping on



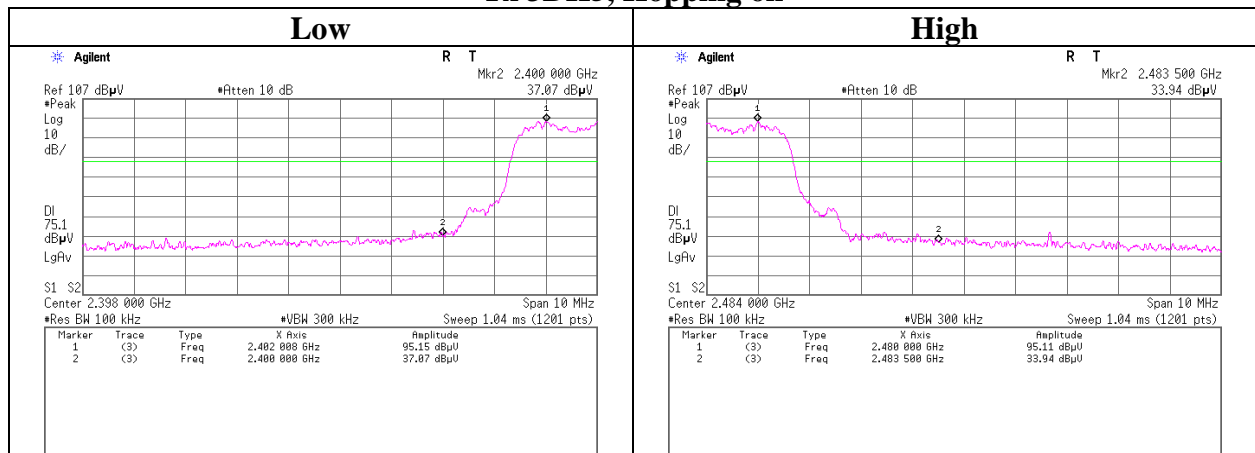
### Tx DH5, Hopping off



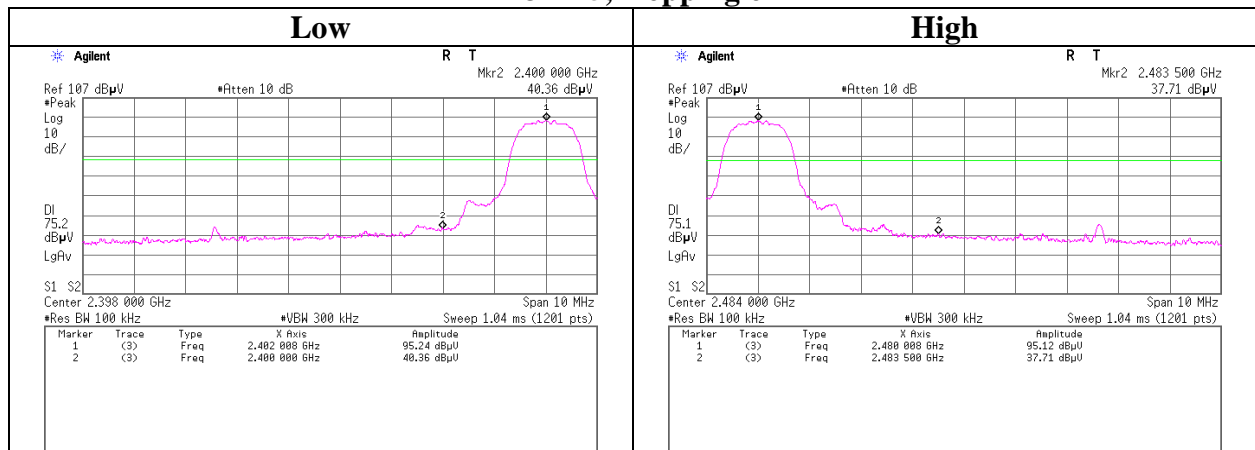
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping on / Hopping off) 3DH5

### Tx 3DH5, Hopping on

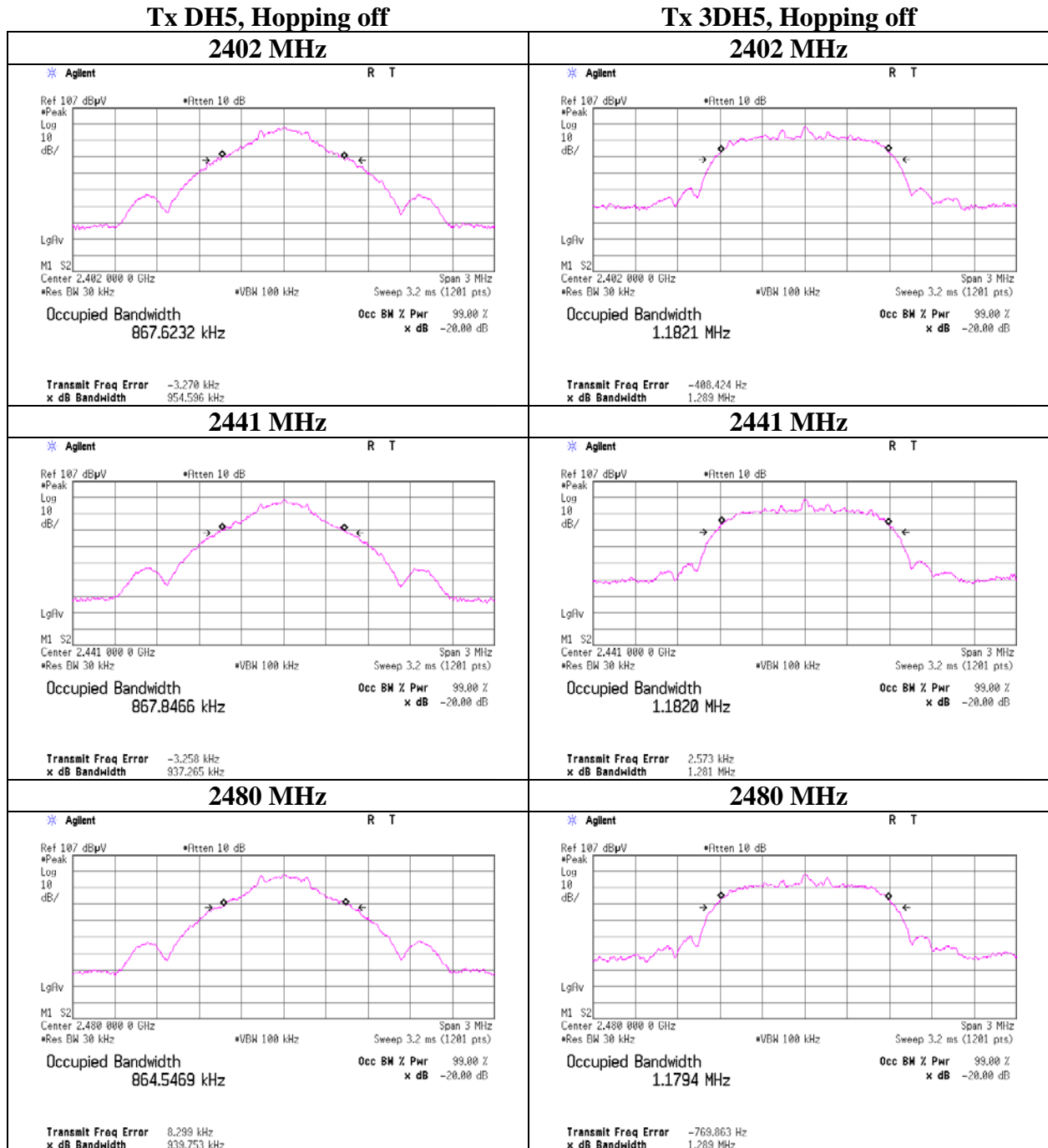


### Tx 3DH5, Hopping off



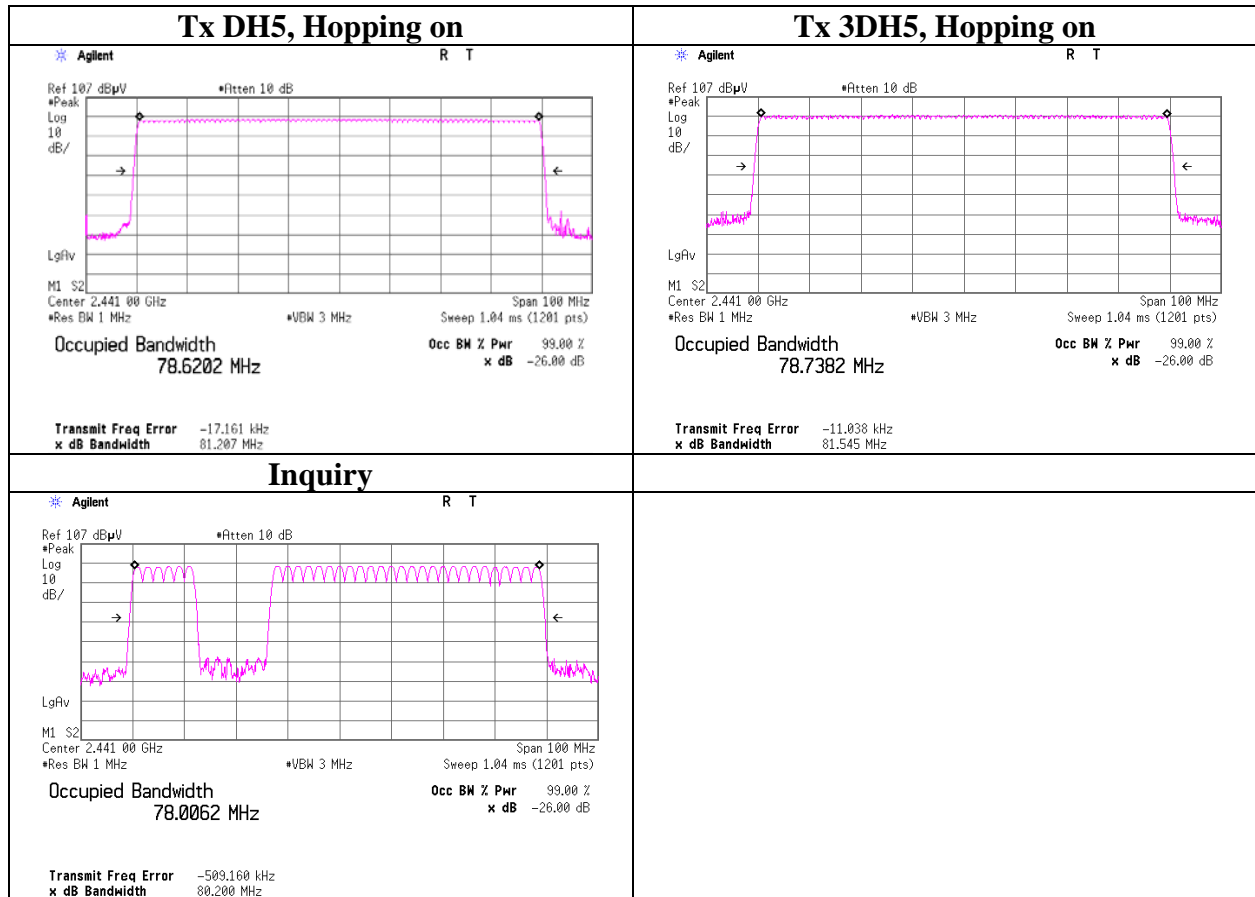
## 99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping on) DH5



## 99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10706993H
Date	04/24/2015
Temperature/ Humidity	20 deg. C / 45 % RH
Engineer	Yuta Moriya
Mode	Tx (Hopping on) DH5/3DH5 /Inquiry



## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2014/12/22 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2015/02/26 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2014/06/16 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2014/06/16 * 12
MCC-98	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	30819/2	AT	2014/05/16 * 12
MAT-20	Attenuator(10dB)(above1 GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2015/01/08 * 12
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	AT	2015/03/09 * 12
MCC-36	Microwave Cable	Hirose Electric	U.FL-2LP-066-A-(200)	-	AT	2014/09/12 * 12
MAT-57	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2015/01/08 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2014/05/26 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2014/05/26 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 12 *1)
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2014/09/22 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2014/04/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2014/05/26 * 12

**\*1) This test equipment was used for the tests before the expiration date of the calibration.**

**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.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124