



# RADIO TEST REPORT

Test Report No. : 11339636H-A-R1

**Applicant** : KONICA MINOLTA, INC.  
**Type of Equipment** : Bluetooth Dongle  
**Model No.** : CM-A219  
**FCC ID** : VTLCMA219  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. 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 11339636H-A. 11339636H-A is replaced with this report.

**Date of test:** September 21 and 22, 2016

**Representative test engineer:**

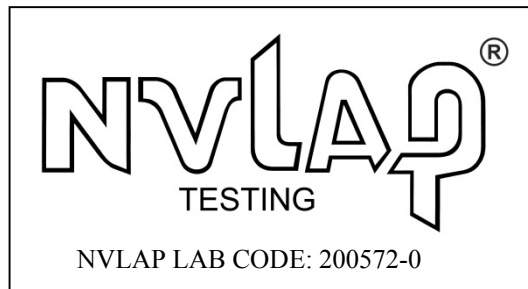
  
Satofumi Matsuyama

Engineer  
Consumer Technology Division

**Approved by:**



Takahiro Hatakeda  
Leader  
Consumer Technology Division



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,  
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## **SECTION 1: Customer information**

### [Applicant information]

Company Name : KONICA MINOLTA, INC.  
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Telephone Number : +81-72-241-7651  
Facsimile Number : +81-72-241-7681  
Contact Person : Yasuaki Serita

### [Manufacturer information]

Company Name : Telepower Inc.  
Address : 2-11-9 #3F Minami-ikebukuro, Toshima-ku, Tokyo, Japan 171-0022  
Telephone Number : +81-3-6907-8511  
Facsimile Number : +81-3-6907-8512  
Contact Person : Takashi Miki

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

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

Type of Equipment : Bluetooth Dongle  
Model No. : CM-A219  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 5.0V  
Receipt Date of Sample : September 20, 2016  
Country of Mass-production : Japan  
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**

Model: CM-A219 (referred to as the EUT in this report) is a Bluetooth Dongle.

### **Radio Specification**

#### **[Bluetooth (Ver. 4.1 with EDR function)]**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : GFSK,  $\pi/4$ DQPSK, 8DPSK  
Power Supply (radio part input) : DC 1.8 V  
Antenna type : Chip Antenna  
Antenna Gain : 1.69 dBi  
Clock frequency (Maximum) : 38.4MHz

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC part 15 final revised on April 6, 2016.

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

### **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 12.8 dB, 0.54820 MHz, N AV 6.1 dB, 0.54820 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(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		2.3 dB 19216.000 MHz, AV, Vertical	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)**

This EUT provides stable voltage(DC 1.8 V) constantly to RF Module regardless of input voltage. Therefore, this 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 EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

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

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

### 3.4 Uncertainty

#### 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) (+/-)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	3.0 dB

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

Polarity	Radiated emission (Below 1GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 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 report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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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	-	-

### 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)**

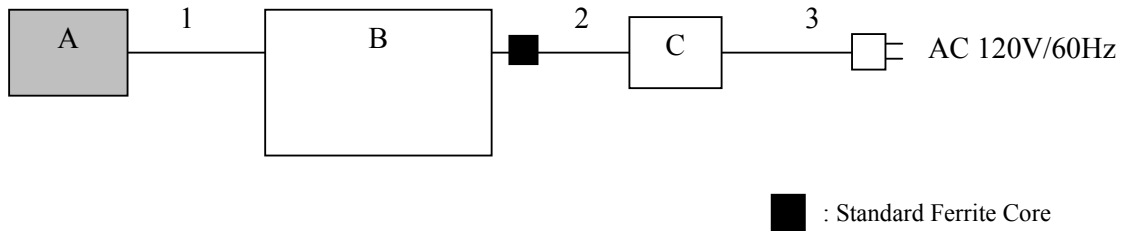
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

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)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows;  Power settings: BDR: Same as Production model  EDR: Same as Production model  Software: HCI Tester Version 2.3.5.0  *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.

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Dongle	CM-A219	1606# 1 for CE, RE 1607# 10 for AT	Telepower Inc.	EUT
B	Laptop PC	25220C49	R8-9LMPO	lenovo	for CE, AT*
		CF-N8	OBKSA07625	Panasonic	for RE*
C	AC Adapter	DCWP CM-2	11S92P1156Z1ZDXN016ERE	lenovo	for CE, AT*
		CF-AA6372B	6372BM409X17174B	Panasonic	for RE*

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	0.25 for CE, AT* 3.25 for RE*	Shielded	Shielded	*1)
2	DC Cable	1.10 for CE, AT* 1.80 for RE	Unshielded	Unshielded	-
3	AC Cable	1.80 for CE, AT* 0.95 for RE*	Unshielded	Unshielded	-

\*1) 0.25 m Length Cable is dedicated I/F Cable.

The Radiated Emission was tested with 0.25 m dedicated I/F Cable connected to 3 m extra cable after confirming that there was no effect on its result by using extra cable.

\*CE: Conducted Emission test  
RE: Radiated Emission test  
AT: Antenna Terminal conducted test

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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, 0.5 m by 1.0 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 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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

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

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

Frequency	30 MHz to 200 MHz	200 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	3.75 m*2) (1 GHz – 10 GHz), 1.0 m*3) (10 GHz – 26.5 GHz)		3.75 m*2) (1 GHz – 10 GHz), 1.0 m*3) (10 GHz – 26.5 GHz)

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

\*2) Distance Factor:  $20 \times \log(3.75 \text{ m}/3.0 \text{ m}) = 1.94 \text{ dB}$

\*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 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

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## **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 not detected as shown in the chart.

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

\*3) Reference data

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

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

**APPENDIX 1: Test data**

**Conducted Emission**

**DATA OF CONDUCTED EMISSION TEST**

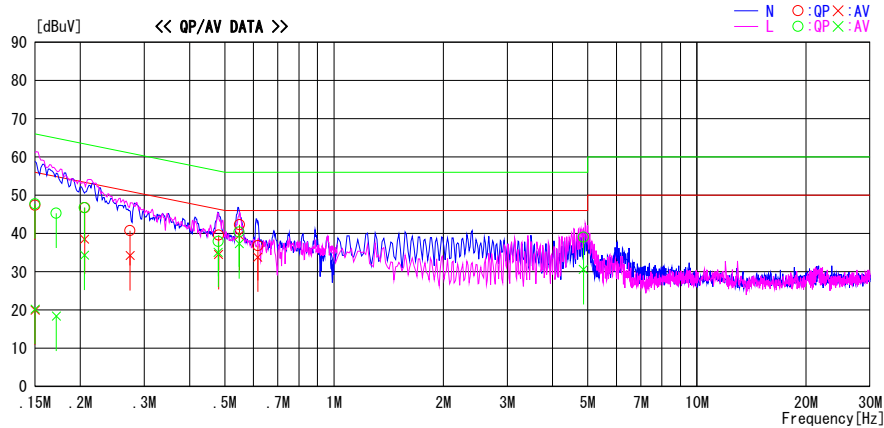
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2016/09/22

Report No. : 11339636H

Temp./Humi. : 25deg. C / 69% RH  
Engineer : Tomoki Matsui

Mode / Remarks : Tx BT DH5 2480MHz

LIMIT : FCC15.207 QP  
FCC15.207 AV

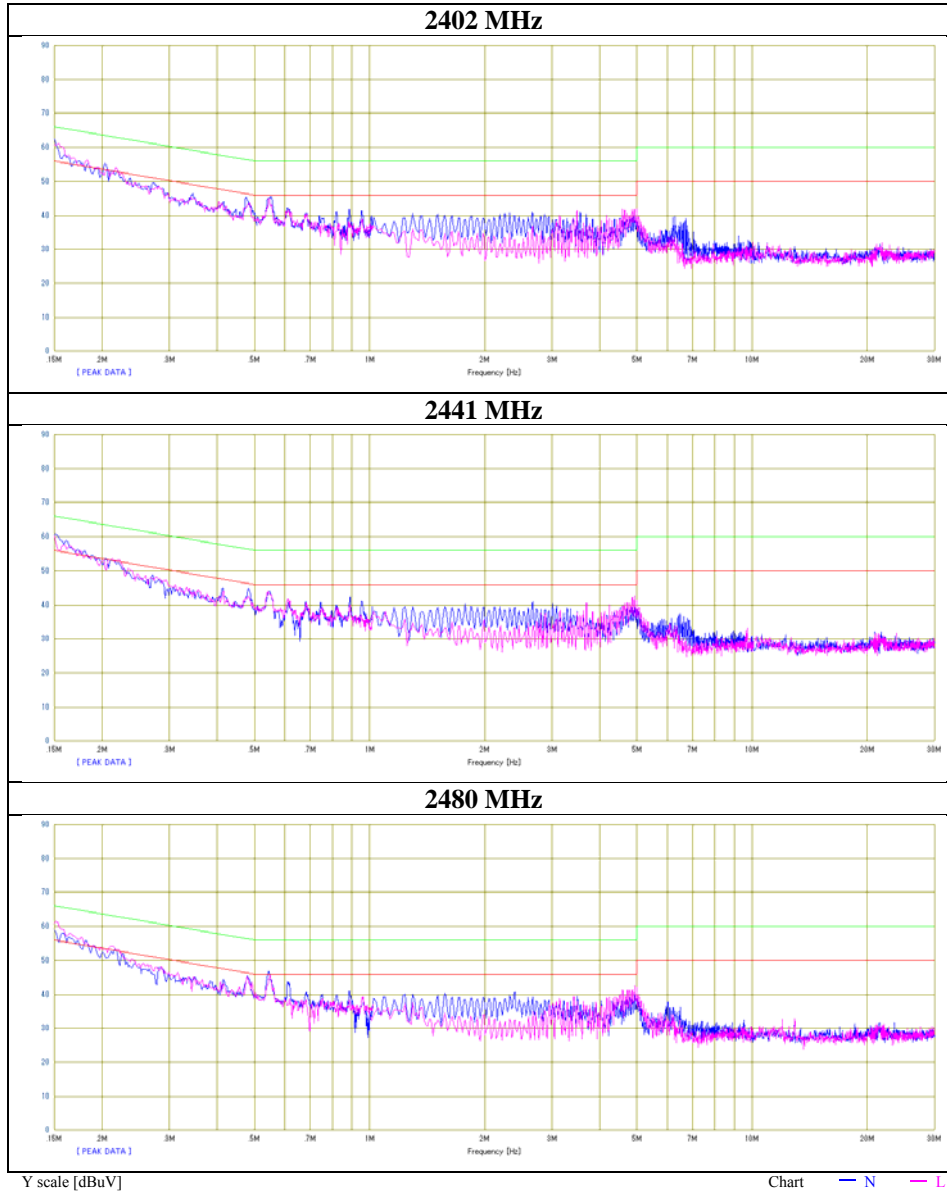


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	34.5	7.0	13.2	47.7	20.2	66.0	56.0	18.3	35.8	L	
0.15000	34.2	6.8	13.2	47.4	20.0	66.0	56.0	18.6	36.0	N	
0.17170	32.1	5.2	13.2	45.3	18.4	64.9	54.9	19.6	36.5	L	
0.20550	33.5	25.3	13.2	46.7	38.5	63.4	53.4	16.7	14.9	N	
0.20520	33.5	21.1	13.2	46.7	34.3	63.4	53.4	16.7	19.1	L	
0.27408	27.5	21.0	13.2	40.7	34.2	61.0	51.0	20.3	16.8	N	
0.48036	26.4	21.3	13.2	39.6	34.5	56.3	46.3	16.7	11.8	N	
0.47960	24.7	21.9	13.2	37.9	35.1	56.3	46.3	18.4	11.2	L	
0.54860	29.1	26.3	13.2	42.3	39.5	56.0	46.0	13.7	6.5	N	
0.54772	27.2	24.1	13.2	40.4	37.3	56.0	46.0	15.6	8.7	L	
0.61680	23.5	20.5	13.3	36.8	33.8	56.0	46.0	19.2	12.2	N	
4.86300	25.1	16.7	13.9	39.0	30.6	56.0	46.0	17.0	15.4	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.2 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 22, 2016  
Temperature / Humidity : 25 deg. C / 69 % RH  
Engineer : Tomoki Matsui  
Mode : Tx, Hopping Off, DH5



## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

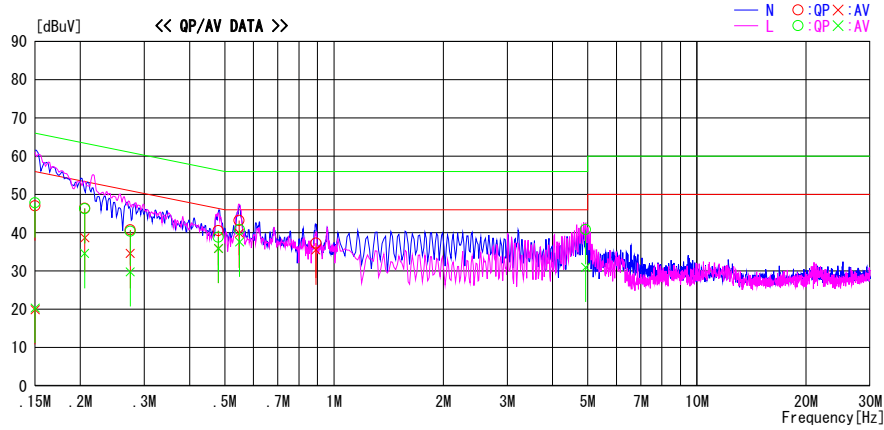
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
 Date : 2016/09/22

Report No. : 11339636H

Temp./Humi. : 25deg. C / 69% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx BT 3DH5 2441MHz

LIMIT : FCC15.207 QP  
 FCC15.207 AV

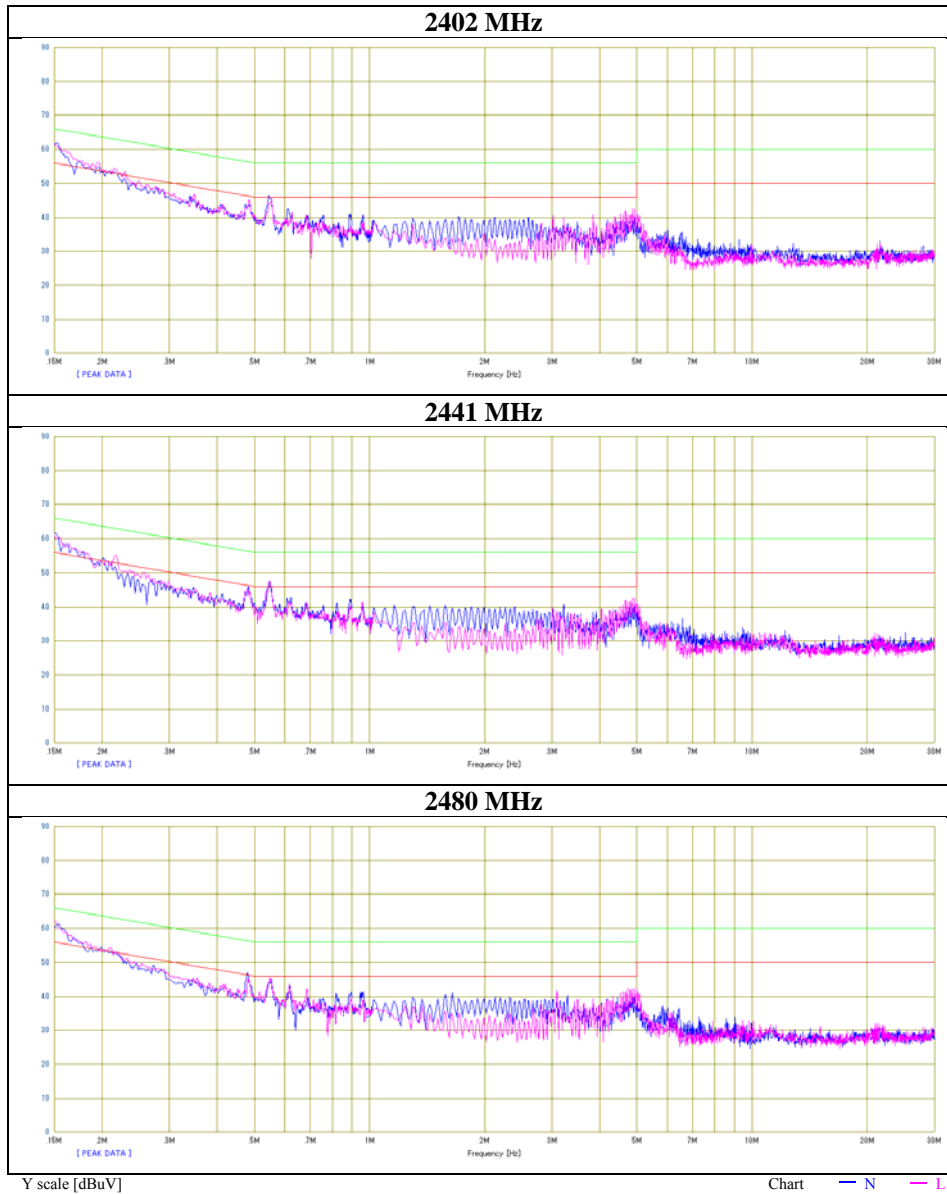


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	33.8	6.7	13.2	47.0	19.9	66.0	56.0	19.0	36.1	N	
0.15000	34.6	7.1	13.2	47.8	20.3	66.0	56.0	18.2	35.7	L	
0.20544	33.1	21.4	13.2	46.3	34.6	63.4	53.4	17.1	18.8	L	
0.20580	33.2	25.5	13.2	46.4	38.7	63.4	53.4	17.0	14.7	N	
0.27430	27.2	16.6	13.2	40.4	29.8	61.0	51.0	20.6	21.2	L	
0.27440	27.5	21.4	13.2	40.7	34.6	61.0	51.0	20.3	16.4	N	
0.47980	27.4	22.7	13.2	40.6	35.9	56.3	46.3	15.7	10.4	N	
0.48000	25.6	22.7	13.2	38.8	35.9	56.3	46.3	17.5	10.4	L	
0.54820	30.0	26.7	13.2	43.2	39.9	56.0	46.0	12.8	6.1	N	
0.54920	27.6	24.4	13.2	40.8	37.6	56.0	46.0	15.2	8.4	L	
0.89156	24.0	22.2	13.3	37.3	35.5	56.0	46.0	18.7	10.5	N	
4.93500	26.9	17.1	13.9	40.8	31.0	56.0	46.0	15.2	15.0	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.2 Semi Anechoic Chamber
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 69 % RH
Engineer	Tomoki Matsui
Mode	Tx, Hopping Off, 3DH5



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**Ise EMC Lab.**

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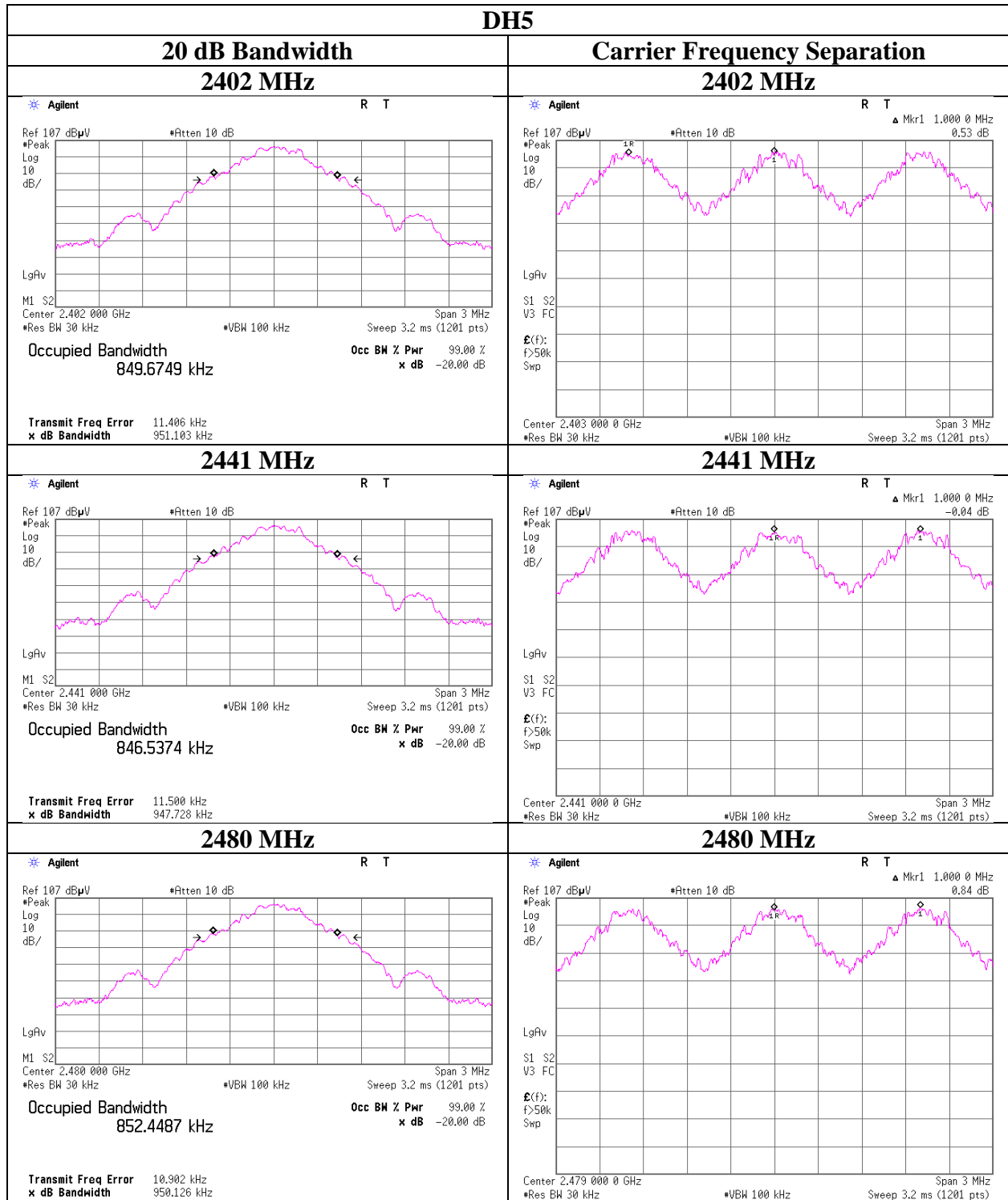
## 20dB Bandwidth and Carrier Frequency Separation

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 24 deg. C / 61 % RH  
Engineer : Satofumi Matsuyama  
Mode : Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.951	1.000	$\geq 0.634$
DH5	2441.0	0.948	1.000	$\geq 0.632$
DH5	2480.0	0.950	1.000	$\geq 0.633$
3DH5	2402.0	1.317	1.000	$\geq 0.878$
3DH5	2441.0	1.320	1.000	$\geq 0.880$
3DH5	2480.0	1.316	1.000	$\geq 0.877$

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

## 20dB Bandwidth and Carrier Frequency Separation



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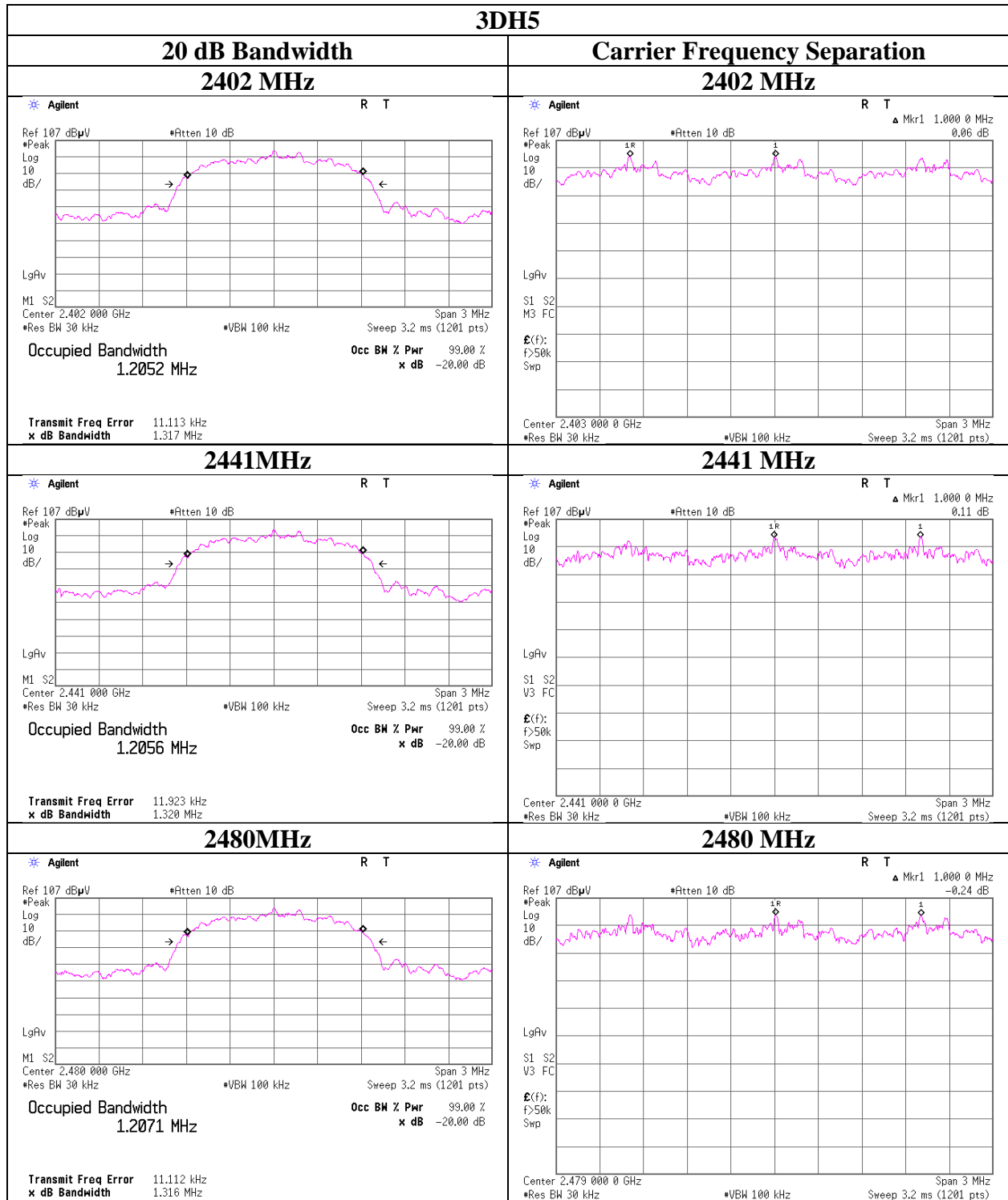
**Ise EMC Lab.**

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## 20dB Bandwidth and Carrier Frequency Separation



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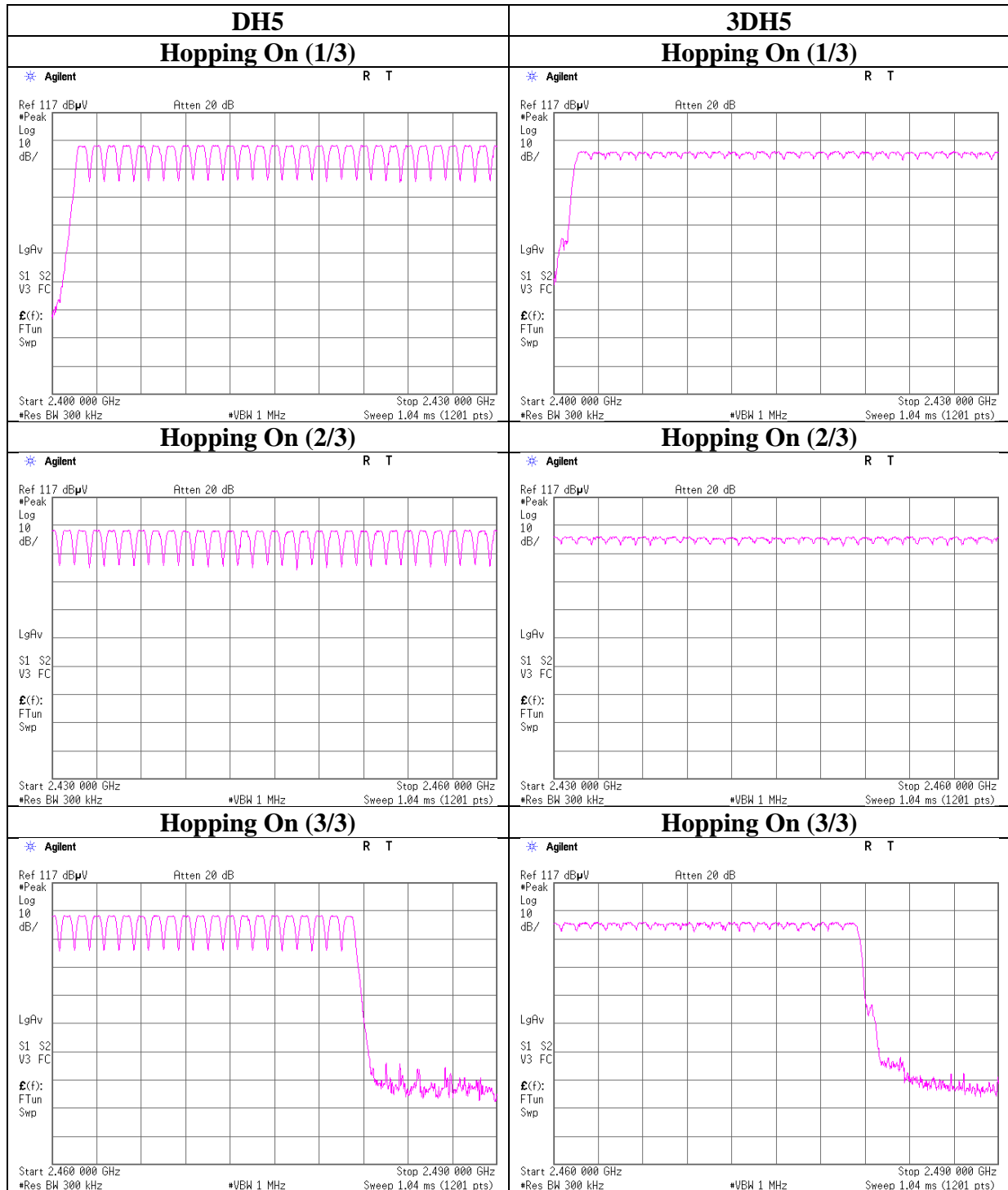
### Number of Hopping Frequency

Test place Ise EMC Lab. No.3 Measurement Room  
Report No. 11339636H  
Date September 21, 2016  
Temperature / Humidity 24 deg. C / 61 % RH  
Engineer Satofumi Matsuyama  
Mode Tx, Hopping On

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

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

### Number of Hopping Frequency



### Dwell time

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
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	19.0 times / 5 sec. x 31.6 sec. = 121 times	0.423	51	400
DH3	17.8 times / 5 sec. x 31.6 sec. = 113 times	1.669	189	400
DH5	20.8 times / 5 sec. x 31.6 sec. = 132 times	2.919	385	400
3DH1	19.4 times / 5 sec. x 31.6 sec. = 123 times	0.421	52	400
3DH3	18.4 times / 5 sec. x 31.6 sec. = 117 times	1.680	197	400
3DH5	20.0 times / 5 sec. x 31.6 sec. = 127 times	2.923	371	400

Sample Calculation

Result = Number of transmission x Length of transmission

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

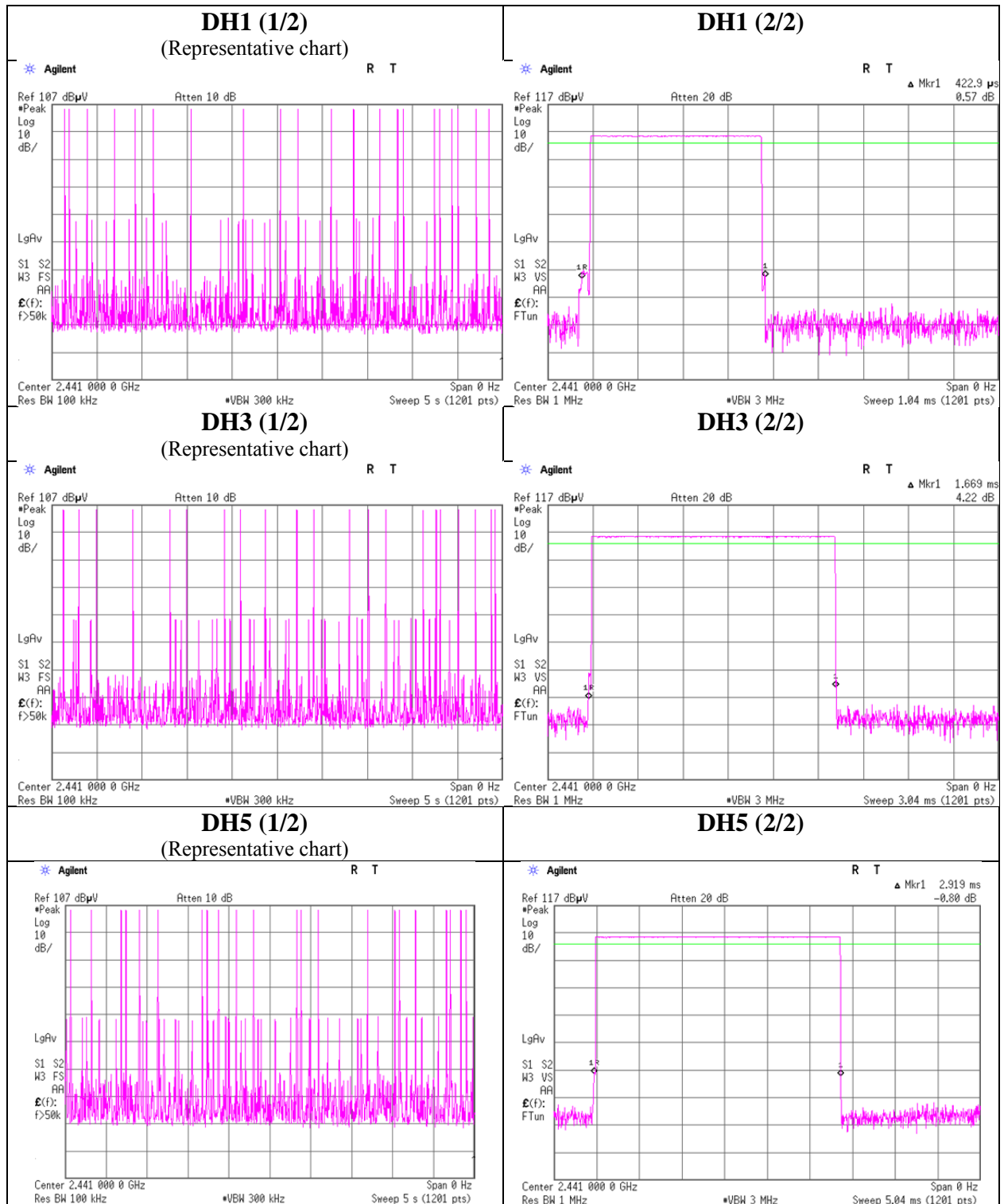
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	20	20	21	15	19	19
DH3	16	20	18	21	14	17.8
DH5	19	19	22	22	22	20.8
3DH1	27	17	19	16	18	19.4
3DH3	21	17	19	16	19	18.4
3DH5	19	19	20	22	20	20

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

### Dwell time



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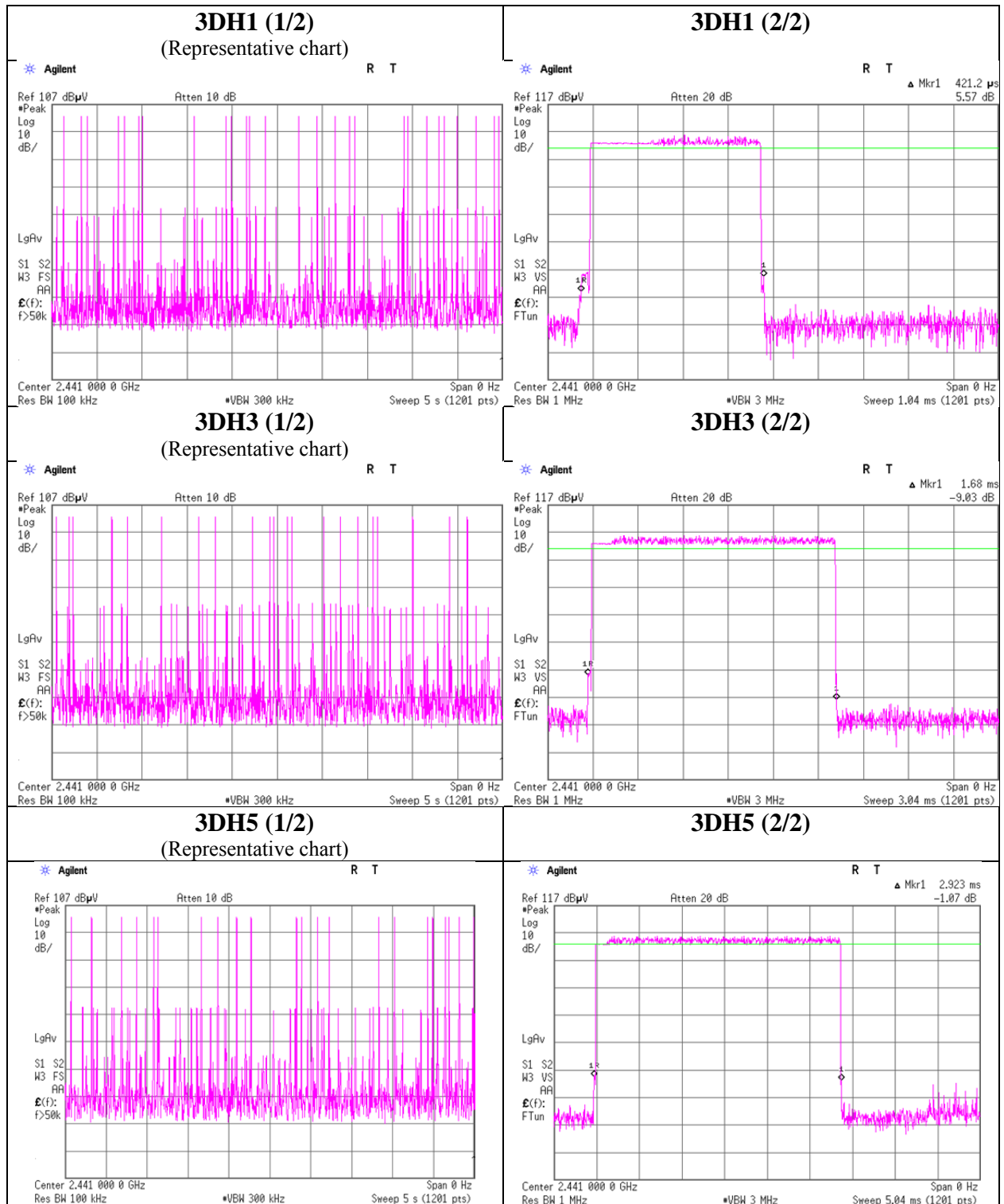
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**Dwell time**



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## Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 24 deg. C / 61 % RH  
Engineer : Satofumi Matsuyama  
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	-1.47	1.16	10.03	9.72	9.36	20.96	125	11.25
DH5	2441.0	-1.61	1.17	10.03	9.59	9.09	20.96	125	11.38
DH5	2480.0	-1.41	1.18	10.03	9.80	9.54	20.96	125	11.17
2DH5	2402.0	-1.23	1.16	10.03	9.96	9.90	20.96	125	11.01
2DH5	2441.0	-1.35	1.17	10.03	9.85	9.65	20.96	125	11.12
2DH5	2480.0	-1.22	1.18	10.03	9.99	9.97	20.96	125	10.98
3DH5	2402.0	-0.63	1.16	10.03	10.56	11.36	20.96	125	10.41
3DH5	2441.0	-0.66	1.17	10.03	10.54	11.31	20.96	125	10.43
3DH5	2480.0	-0.59	1.18	10.03	10.62	11.52	20.96	125	10.35

Sample Calculation:

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

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

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

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

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

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 24 deg. C / 61 % RH  
Engineer : Satofumi Matsuyama  
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-2.65	1.16	10.03	8.54	7.14	1.13	9.67	9.26
DH5	2441.0	-2.80	1.17	10.03	8.40	6.91	1.13	9.53	8.96
DH5	2480.0	-2.61	1.18	10.03	8.60	7.24	1.13	9.73	9.39
2DH5	2402.0	-5.32	1.16	10.03	5.87	3.86	1.12	6.99	4.99
2DH5	2441.0	-5.49	1.17	10.03	5.71	3.72	1.12	6.83	4.81
2DH5	2480.0	-5.31	1.18	10.03	5.90	3.89	1.12	7.02	5.03
3DH5	2402.0	-5.31	1.16	10.03	5.88	3.87	1.12	7.00	5.01
3DH5	2441.0	-5.38	1.17	10.03	5.82	3.82	1.12	6.94	4.94
3DH5	2480.0	-5.28	1.18	10.03	5.93	3.91	1.12	7.05	5.06

Sample Calculation:

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

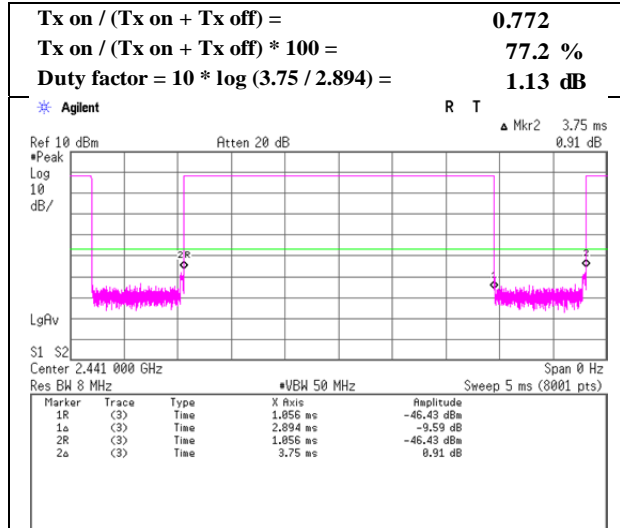
Result (Burst power average) = Time average + Duty factor

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

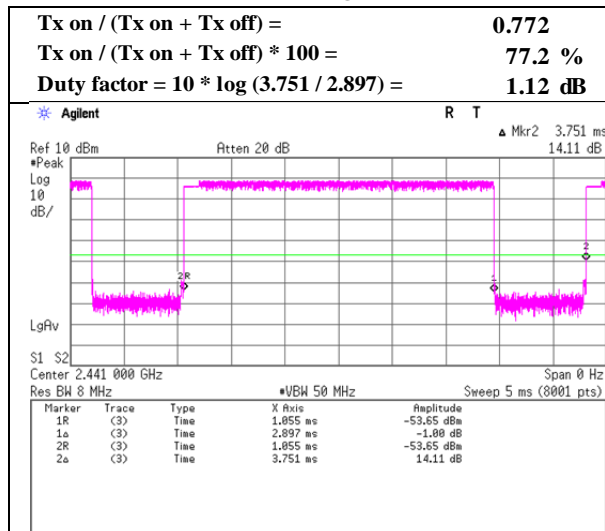
### Burst Rate Confirmation

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11339636H
Date	September 21, 2016
Temperature / Humidity	24 deg. C / 61 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off

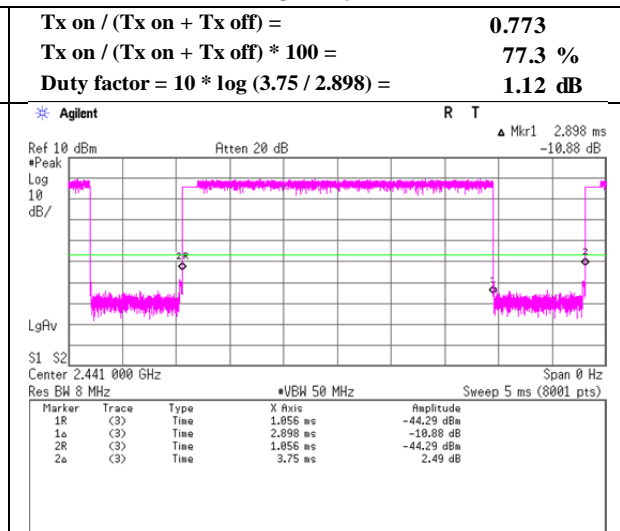
#### DH5



#### 2DH5



#### 3DH5





## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 23 deg. C / 68 % RH  
Engineer : Tomoki Matsui  
(1-10GHz)  
Mode : Tx, Hopping Off, DH5 2402 MHz

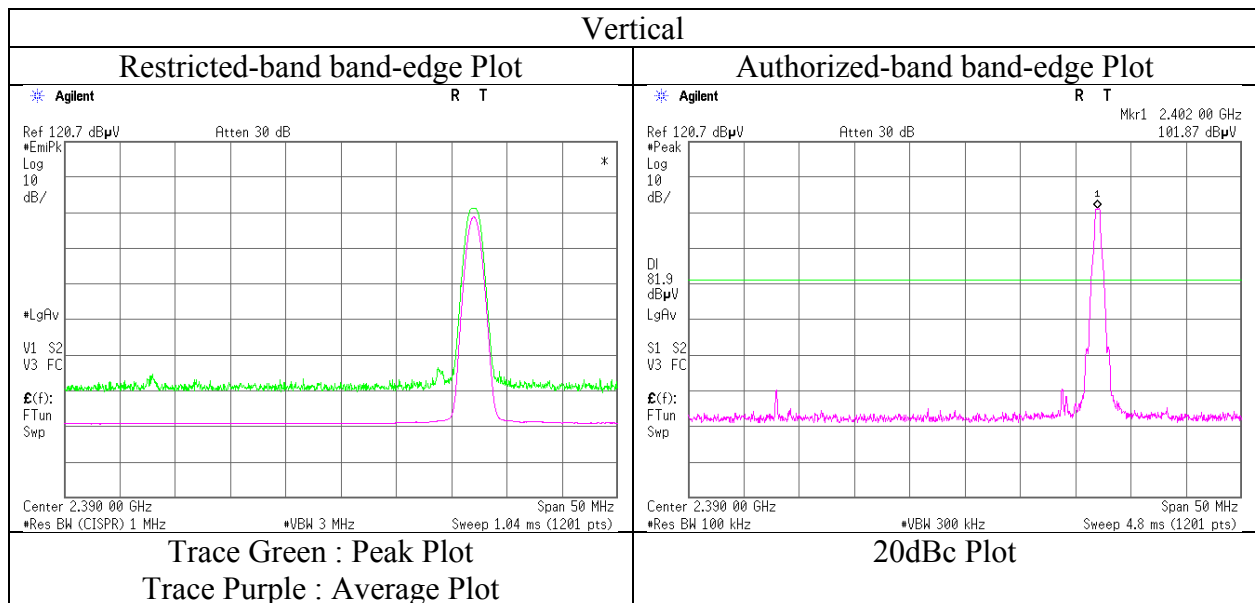
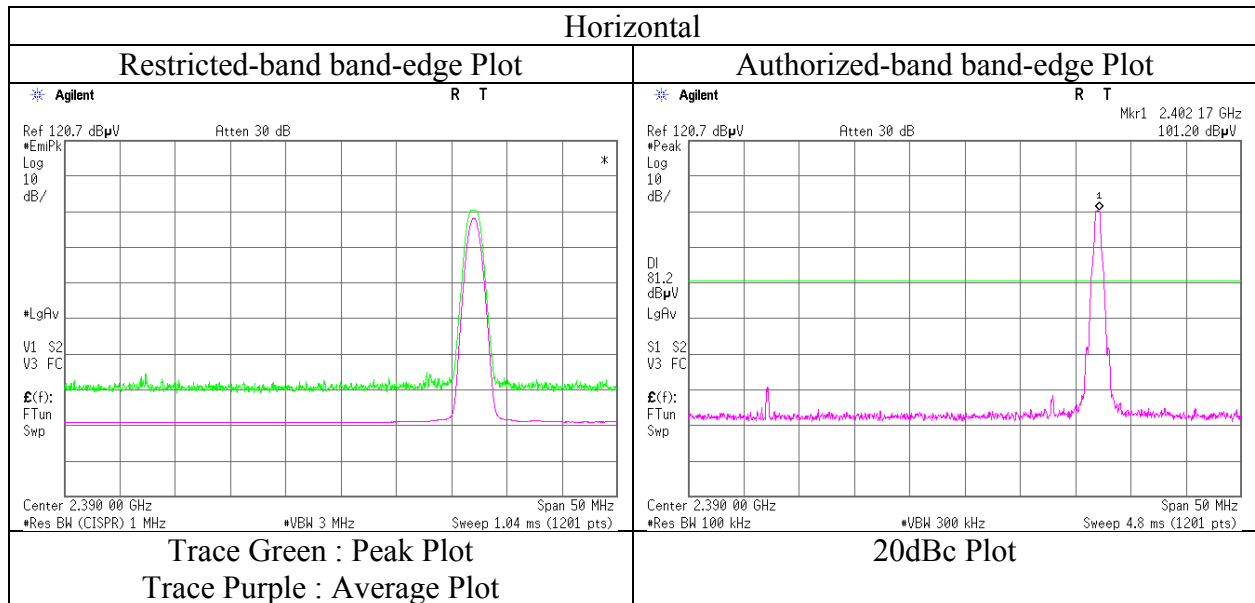
**20dBc Data Sheet**

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	101.2	27.6	5.0	34.8	99.0	-	-	Carrier
Hori	2398.420	PK	49.3	27.6	5.0	34.8	47.1	79.0	31.9	
Hori	2400.000	PK	47.8	27.6	5.0	34.8	45.6	79.0	33.4	
Vert	2402.000	PK	101.9	27.6	5.0	34.8	99.7	-	-	Carrier
Vert	2398.600	PK	49.5	27.6	5.0	34.8	47.3	79.7	32.4	
Vert	2400.000	PK	46.1	27.6	5.0	34.8	43.9	79.7	35.8	

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

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

Test place	Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No.	11339636H
Date	September 21, 2016
Temperature / Humidity	23 deg. C / 68 % RH
Engineer	Tomoki Matsui (1-10GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	51.900	QP	28.0	9.6	7.4	32.2	-	12.8	40.0	27.2	
Hori	56.598	QP	35.5	8.1	7.5	32.2	-	18.9	40.0	21.1	
Hori	60.293	QP	37.6	7.0	7.5	32.2	-	19.9	40.0	20.1	
Hori	84.295	QP	38.5	7.1	7.9	32.2	-	21.3	40.0	18.7	
Hori	86.499	QP	36.4	7.5	7.9	32.2	-	19.6	40.0	20.4	
Hori	90.697	QP	30.5	8.3	7.9	32.2	-	14.5	43.5	29.0	
Hori	4882.000	PK	46.4	31.7	7.5	34.1	-	51.5	73.9	22.4	
Hori	7323.000	PK	43.0	36.3	8.5	34.1	-	53.7	73.9	20.2	Floor noise
Hori	9764.000	PK	43.4	38.5	9.2	34.8	-	56.3	73.9	17.6	Floor noise
Hori	12205.000	PK	47.3	39.6	-1.4	33.7	-	51.8	73.9	22.1	
Hori	14646.000	PK	51.7	40.6	-0.1	33.0	-	59.2	73.9	14.7	
Hori	19528.000	PK	50.1	40.2	-2.0	33.0	-	55.3	73.9	18.6	
Hori	4882.000	AV	37.5	31.7	7.5	34.1	-	42.6	53.9	11.3	
Hori	7323.000	AV	31.0	36.3	8.5	34.1	-	41.7	53.9	12.2	Floor noise
Hori	9764.000	AV	31.4	38.5	9.2	34.8	-	44.3	53.9	9.6	Floor noise
Hori	12205.000	AV	36.0	39.6	-1.4	33.7	-	40.5	53.9	13.4	
Hori	14646.000	AV	42.3	40.6	-0.1	33.0	-	49.8	53.9	4.1	
Hori	19528.000	AV	40.1	40.2	-2.0	33.0	-	45.3	53.9	8.6	
Vert	51.900	QP	42.3	9.6	7.4	32.2	-	27.1	40.0	12.9	
Vert	56.598	QP	50.4	8.1	7.5	32.2	-	33.8	40.0	6.2	
Vert	60.293	QP	51.8	7.0	7.5	32.2	-	34.1	40.0	5.9	
Vert	84.295	QP	50.0	7.1	7.9	32.2	-	32.8	40.0	7.2	
Vert	86.499	QP	48.0	7.5	7.9	32.2	-	31.2	40.0	8.8	
Vert	90.697	QP	43.0	8.3	7.9	32.2	-	27.0	43.5	16.5	
Vert	4882.000	PK	46.9	31.7	7.5	34.1	-	52.0	73.9	21.9	
Vert	7323.000	PK	43.0	36.3	8.5	34.1	-	53.7	73.9	20.2	Floor noise
Vert	9764.000	PK	43.4	38.5	9.2	34.8	-	56.3	73.9	17.6	Floor noise
Vert	12205.000	PK	45.1	39.6	-1.4	33.7	-	49.6	73.9	24.3	
Vert	14646.000	PK	49.9	40.6	-0.1	33.0	-	57.4	73.9	16.5	
Vert	19528.000	PK	51.6	40.2	-2.0	33.0	-	56.8	73.9	17.1	
Vert	4882.000	AV	38.2	31.7	7.5	34.1	-	43.3	53.9	10.6	
Vert	7323.000	AV	31.0	36.3	8.5	34.1	-	41.7	53.9	12.2	Floor noise
Vert	9764.000	AV	31.4	38.5	9.2	34.8	-	44.3	53.9	9.6	Floor noise
Vert	12205.000	AV	35.1	39.6	-1.4	33.7	-	39.6	53.9	14.3	
Vert	14646.000	AV	39.6	40.6	-0.1	33.0	-	47.1	53.9	6.8	
Vert	19528.000	AV	41.7	40.2	-2.0	33.0	-	46.9	53.9	7.0	

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).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 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.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	51.900	QP	28.0	9.6	7.4	32.2	-	12.8	40.0	27.2	
Hori	56.598	QP	35.4	8.1	7.5	32.2	-	18.8	40.0	21.2	
Hori	60.293	QP	37.6	7.0	7.5	32.2	-	19.9	40.0	20.1	
Hori	84.295	QP	38.6	7.1	7.9	32.2	-	21.4	40.0	18.6	
Hori	86.499	QP	36.6	7.5	7.9	32.2	-	19.8	40.0	20.2	
Hori	90.697	QP	30.6	8.3	7.9	32.2	-	14.6	43.5	28.9	
Hori	2483.500	PK	47.9	27.7	5.1	34.7	-	46.0	73.9	27.9	
Hori	4960.000	PK	49.1	32.0	7.6	34.2	-	54.5	73.9	19.4	
Hori	7440.000	PK	43.4	36.4	8.5	34.1	-	54.2	73.9	19.7	Floor noise
Hori	9920.000	PK	46.4	38.6	9.3	34.9	-	59.4	73.9	14.5	
Hori	12400.000	PK	47.3	39.8	-1.2	33.6	-	52.3	73.9	21.6	
Hori	14880.000	PK	48.3	40.4	0.1	33.2	-	55.6	73.9	18.3	
Hori	19840.000	PK	51.1	40.1	-1.9	33.4	-	55.9	73.9	18.0	
Hori	2483.500	AV	34.0	27.7	5.1	34.7	-	32.1	53.9	21.8	
Hori	4960.000	AV	42.3	32.0	7.6	34.2	-	47.7	53.9	6.2	
Hori	7440.000	AV	31.2	36.4	8.5	34.1	-	42.0	53.9	11.9	Floor noise
Hori	9920.000	AV	35.1	38.6	9.3	34.9	-	48.1	53.9	5.8	
Hori	12400.000	AV	37.7	39.8	-1.2	33.6	-	42.7	53.9	11.2	
Hori	14880.000	AV	37.0	40.4	0.1	33.2	-	44.3	53.9	9.6	
Hori	19840.000	AV	41.0	40.1	-1.9	33.4	-	45.8	53.9	8.1	
Vert	51.900	QP	42.2	9.6	7.4	32.2	-	27.0	40.0	13.0	
Vert	56.598	QP	50.4	8.1	7.5	32.2	-	33.8	40.0	6.2	
Vert	60.293	QP	51.7	7.0	7.5	32.2	-	34.0	40.0	6.0	
Vert	84.295	QP	50.0	7.1	7.9	32.2	-	32.8	40.0	7.2	
Vert	86.499	QP	48.0	7.5	7.9	32.2	-	31.2	40.0	8.8	
Vert	90.697	QP	42.9	8.3	7.9	32.2	-	26.9	43.5	16.6	
Vert	2483.500	PK	48.2	27.7	5.1	34.7	-	46.3	73.9	27.6	
Vert	4960.000	PK	50.7	32.0	7.6	34.2	-	56.1	73.9	17.8	
Vert	7440.000	PK	43.4	36.4	8.5	34.1	-	54.2	73.9	19.7	Floor noise
Vert	9920.000	PK	44.8	38.6	9.3	34.9	-	57.8	73.9	16.1	
Vert	12400.000	PK	46.9	39.8	-1.2	33.6	-	51.9	73.9	22.0	
Vert	14880.000	PK	47.8	40.4	0.1	33.2	-	55.1	73.9	18.8	
Vert	19840.000	PK	53.1	40.1	-1.9	33.4	-	57.9	73.9	16.0	
Vert	2483.500	AV	34.3	27.7	5.1	34.7	-	32.4	53.9	21.5	
Vert	4960.000	AV	44.4	32.0	7.6	34.2	-	49.8	53.9	4.1	
Vert	7440.000	AV	31.2	36.4	8.5	34.1	-	42.0	53.9	11.9	Floor noise
Vert	9920.000	AV	33.3	38.6	9.3	34.9	-	46.3	53.9	7.6	
Vert	12400.000	AV	36.4	39.8	-1.2	33.6	-	41.4	53.9	12.5	
Vert	14880.000	AV	37.9	40.4	0.1	33.2	-	45.2	53.9	8.7	
Vert	19840.000	AV	43.2	40.1	-1.9	33.4	-	48.0	53.9	5.9	

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).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 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.

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**Ise EMC Lab.**

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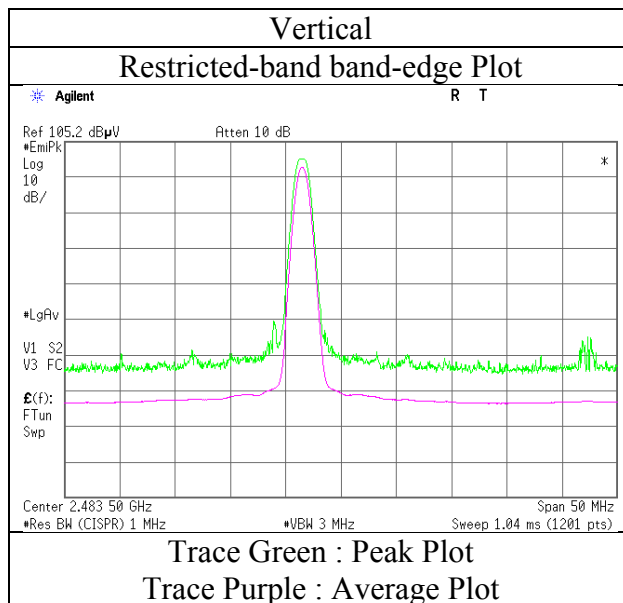
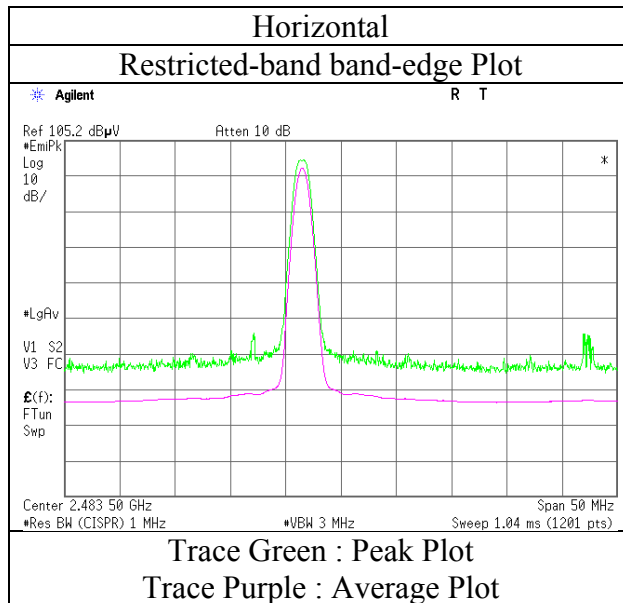
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



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

Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
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.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, 3DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	51.900	QP	27.9	9.6	7.4	32.2	-	12.7	40.0	27.3	
Hori	56.598	QP	35.3	8.1	7.5	32.2	-	18.7	40.0	21.3	
Hori	60.293	QP	37.5	7.0	7.5	32.2	-	19.8	40.0	20.2	
Hori	84.295	QP	38.5	7.1	7.9	32.2	-	21.3	40.0	18.7	
Hori	86.499	QP	36.4	7.5	7.9	32.2	-	19.6	40.0	20.4	
Hori	90.697	QP	30.7	8.3	7.9	32.2	-	14.7	43.5	28.8	
Hori	2381.291	PK	55.4	27.6	4.9	34.8	-	53.1	73.9	20.8	
Hori	2390.000	PK	51.6	27.6	4.9	34.8	-	49.3	73.9	24.6	
Hori	4003.346	PK	46.8	29.8	7.9	33.7	-	50.8	73.9	23.1	
Hori	4804.000	PK	46.1	31.5	7.6	34.1	-	51.1	73.9	22.8	
Hori	7206.000	PK	42.5	36.1	8.4	34.1	-	52.9	73.9	21.0	Floor noise
Hori	9608.000	PK	42.5	38.5	9.3	34.8	-	55.5	73.9	18.4	Floor noise
Hori	12010.000	PK	44.1	39.4	-1.4	33.9	-	48.2	73.9	25.7	
Hori	14412.000	PK	48.7	40.9	-0.3	32.8	-	56.5	73.9	17.4	
Hori	19216.000	PK	52.4	40.3	-2.0	32.6	-	58.1	73.9	15.8	
Hori	2381.291	AV	32.6	27.6	4.9	34.8	-	30.3	53.9	23.6	
Hori	2390.000	AV	33.4	27.6	4.9	34.8	-	31.1	53.9	22.8	
Hori	4003.346	AV	36.5	29.8	7.9	33.7	-	40.5	53.9	13.4	
Hori	4804.000	AV	36.0	31.5	7.6	34.1	-	41.0	53.9	12.9	
Hori	7206.000	AV	31.1	36.1	8.4	34.1	-	41.5	53.9	12.4	Floor noise
Hori	9608.000	AV	31.2	38.5	9.3	34.8	-	44.2	53.9	9.7	Floor noise
Hori	12010.000	AV	32.3	39.4	-1.4	33.9	-	36.4	53.9	17.5	
Hori	14412.000	AV	37.7	40.9	-0.3	32.8	-	45.5	53.9	8.4	
Hori	19216.000	AV	40.9	40.3	-2.0	32.6	-	46.6	53.9	7.3	
Vert	51.900	QP	42.1	9.6	7.4	32.2	-	26.9	40.0	13.1	
Vert	56.598	QP	50.3	8.1	7.5	32.2	-	33.7	40.0	6.3	
Vert	60.293	QP	51.5	7.0	7.5	32.2	-	33.8	40.0	6.2	
Vert	84.295	QP	49.8	7.1	7.9	32.2	-	32.6	40.0	7.4	
Vert	86.499	QP	48.0	7.5	7.9	32.2	-	31.2	40.0	8.8	
Vert	90.697	QP	42.9	8.3	7.9	32.2	-	26.9	43.5	16.6	
Vert	2382.943	PK	53.9	27.6	4.9	34.8	-	51.6	73.9	22.3	
Vert	2390.000	PK	50.6	27.6	4.9	34.8	-	48.3	73.9	25.6	
Vert	4003.346	PK	47.1	29.8	7.9	33.7	-	51.1	73.9	22.8	
Vert	4804.000	PK	46.7	31.5	7.6	34.1	-	51.7	73.9	22.2	
Vert	7206.000	PK	42.5	36.1	8.4	34.1	-	52.9	73.9	21.0	Floor noise
Vert	9608.000	PK	42.5	38.5	9.3	34.8	-	55.5	73.9	18.4	Floor noise
Vert	12010.000	PK	43.7	39.4	-1.4	33.9	-	47.8	73.9	26.1	
Vert	14412.000	PK	47.4	40.9	-0.3	32.8	-	55.2	73.9	18.7	
Vert	19216.000	PK	52.7	40.3	-2.0	32.6	-	58.4	73.9	15.5	
Vert	2382.943	AV	32.5	27.6	4.9	34.8	-	30.2	53.9	23.7	
Vert	2390.000	AV	33.0	27.6	4.9	34.8	-	30.7	53.9	23.2	
Vert	4003.346	AV	37.2	29.8	7.9	33.7	-	41.2	53.9	12.7	
Vert	4804.000	AV	36.0	31.5	7.6	34.1	-	41.0	53.9	12.9	
Vert	7206.000	AV	31.1	36.1	8.4	34.1	-	41.5	53.9	12.4	Floor noise
Vert	9608.000	AV	31.2	38.5	9.3	34.8	-	44.2	53.9	9.7	Floor noise
Vert	12010.000	AV	32.6	39.4	-1.4	33.9	-	36.7	53.9	17.2	
Vert	14412.000	AV	36.2	40.9	-0.3	32.8	-	44.0	53.9	9.9	
Vert	19216.000	AV	41.3	40.3	-2.0	32.6	-	47.0	53.9	6.9	

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).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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**Ise EMC Lab.**

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Telephone : +81 596 24 8999

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(1 – 10 GHz)  
Mode : Tx, Hopping Off, 3DH5 2402 MHz

**20dBc Data Sheet**

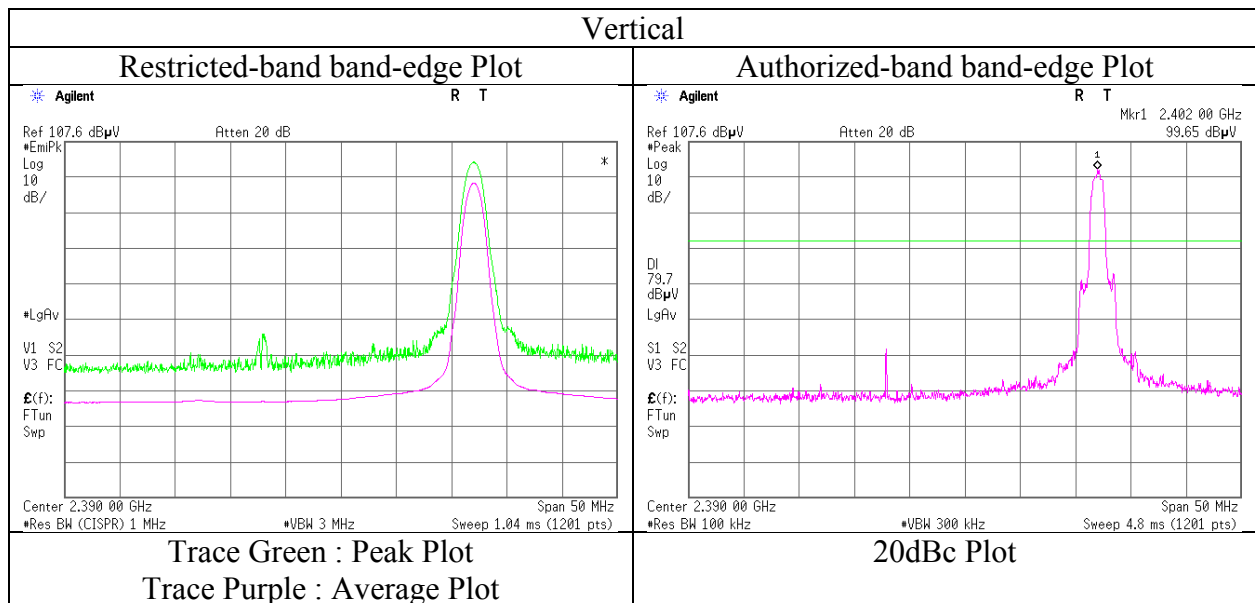
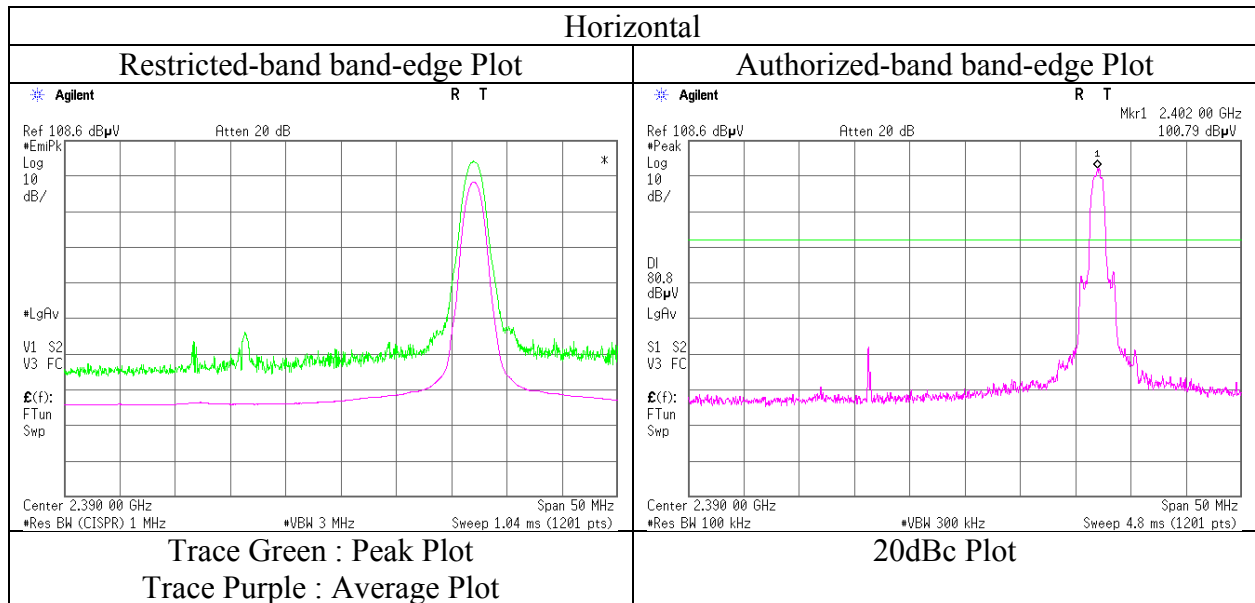
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	100.8	27.6	5.0	34.8	98.6	-	-	Carrier
Hori	2400.000	PK	51.1	27.6	5.0	34.8	48.9	78.6	29.7	
Vert	2402.000	PK	99.7	27.6	5.0	34.8	97.5	-	-	Carrier
Vert	2400.000	PK	49.5	27.6	5.0	34.8	47.3	77.5	30.2	

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**  
**(Reference Plot for band-edge)**

Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, 3DH5 2402 MHz



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

## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, 3DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	51.900	QP	27.8	9.6	7.4	32.2	-	12.6	40.0	27.4	
Hori	56.598	QP	35.2	8.1	7.5	32.2	-	18.6	40.0	21.4	
Hori	60.293	QP	37.5	7.0	7.5	32.2	-	19.8	40.0	20.2	
Hori	84.295	QP	38.5	7.1	7.9	32.2	-	21.3	40.0	18.7	
Hori	86.499	QP	36.4	7.5	7.9	32.2	-	19.6	40.0	20.4	
Hori	90.697	QP	30.8	8.3	7.9	32.2	-	14.8	43.5	28.7	
Hori	4882.000	PK	45.4	31.7	7.5	34.1	-	50.5	73.9	23.4	
Hori	7323.000	PK	43.0	36.3	8.5	34.1	-	53.7	73.9	20.2	Floor noise
Hori	9764.000	PK	43.4	38.5	9.2	34.8	-	56.3	73.9	17.6	Floor noise
Hori	12205.000	PK	44.2	39.6	-1.4	33.7	-	48.7	73.9	25.2	
Hori	14646.000	PK	50.3	40.6	-0.1	33.0	-	57.8	73.9	16.1	
Hori	19528.000	PK	50.3	40.2	-2.0	33.0	-	55.5	73.9	18.4	
Hori	4882.000	AV	32.9	31.7	7.5	34.1	-	38.0	53.9	15.9	
Hori	7323.000	AV	31.0	36.3	8.5	34.1	-	41.7	53.9	12.2	Floor noise
Hori	9764.000	AV	31.4	38.5	9.2	34.8	-	44.3	53.9	9.6	Floor noise
Hori	12205.000	AV	32.6	39.6	-1.4	33.7	-	37.1	53.9	16.8	
Hori	14646.000	AV	38.3	40.6	-0.1	33.0	-	45.8	53.9	8.1	
Hori	19528.000	AV	38.3	40.2	-2.0	33.0	-	43.5	53.9	10.4	
Vert	51.900	QP	41.8	9.6	7.4	32.2	-	26.6	40.0	13.4	
Vert	56.598	QP	50.0	8.1	7.5	32.2	-	33.4	40.0	6.6	
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Vert	84.295	QP	49.7	7.1	7.9	32.2	-	32.5	40.0	7.5	
Vert	86.499	QP	47.9	7.5	7.9	32.2	-	31.1	40.0	8.9	
Vert	90.697	QP	42.9	8.3	7.9	32.2	-	26.9	43.5	16.6	
Vert	4882.000	PK	45.8	31.7	7.5	34.1	-	50.9	73.9	23.0	
Vert	7323.000	PK	43.0	36.3	8.5	34.1	-	53.7	73.9	20.2	Floor noise
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Vert	14646.000	PK	47.9	40.6	-0.1	33.0	-	55.4	73.9	18.5	
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Vert	14646.000	AV	36.1	40.6	-0.1	33.0	-	43.6	53.9	10.3	
Vert	19528.000	AV	40.6	40.2	-2.0	33.0	-	45.8	53.9	8.1	

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).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB  
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**\*These results have sufficient margin without taking account Dwell time factor.**

## Radiated Spurious Emission

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Report No. : 11339636H  
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Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	51.900	QP	27.7	9.6	7.4	32.2	-	12.5	40.0	27.5	
Hori	56.598	QP	35.1	8.1	7.5	32.2	-	18.5	40.0	21.5	
Hori	60.293	QP	37.5	7.0	7.5	32.2	-	19.8	40.0	20.2	
Hori	84.295	QP	38.5	7.1	7.9	32.2	-	21.3	40.0	18.7	
Hori	86.499	QP	36.4	7.5	7.9	32.2	-	19.6	40.0	20.4	
Hori	90.697	QP	30.6	8.3	7.9	32.2	-	14.6	43.5	28.9	
Hori	2483.500	PK	53.9	27.7	5.1	34.7	-	52.0	73.9	21.9	
Hori	4960.000	PK	47.8	32.0	7.6	34.2	-	53.2	73.9	20.7	
Hori	7440.000	PK	43.4	36.4	8.5	34.1	-	54.2	73.9	19.7	Floor noise
Hori	9920.000	PK	45.6	38.6	9.3	34.9	-	58.6	73.9	15.3	
Hori	12400.000	PK	46.2	39.8	-1.2	33.6	-	51.2	73.9	22.7	
Hori	14880.000	PK	45.8	40.4	0.1	33.2	-	53.1	73.9	20.8	
Hori	19840.000	PK	48.9	40.1	-1.9	33.4	-	53.7	73.9	20.2	
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Hori	7440.000	AV	31.2	36.4	8.5	34.1	-	42.0	53.9	11.9	Floor noise
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Hori	19840.000	AV	37.6	40.1	-1.9	33.4	-	42.4	53.9	11.5	
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Vert	14880.000	AV	34.9	40.4	0.1	33.2	-	42.2	53.9	11.7	
Vert	19840.000	AV	41.0	40.1	-1.9	33.4	-	45.8	53.9	8.1	

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).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB  
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**UL Japan, Inc.**

**Ise EMC Lab.**

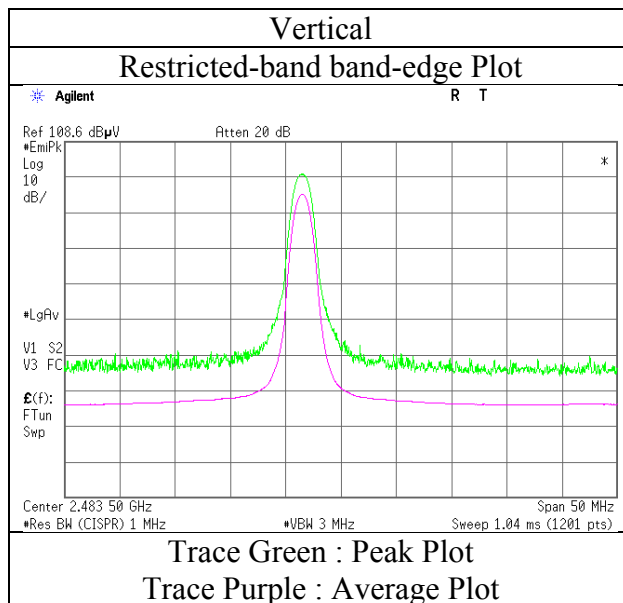
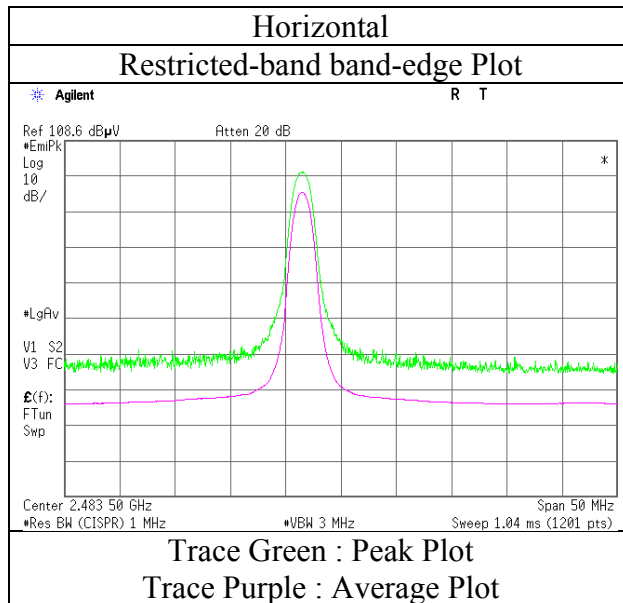
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

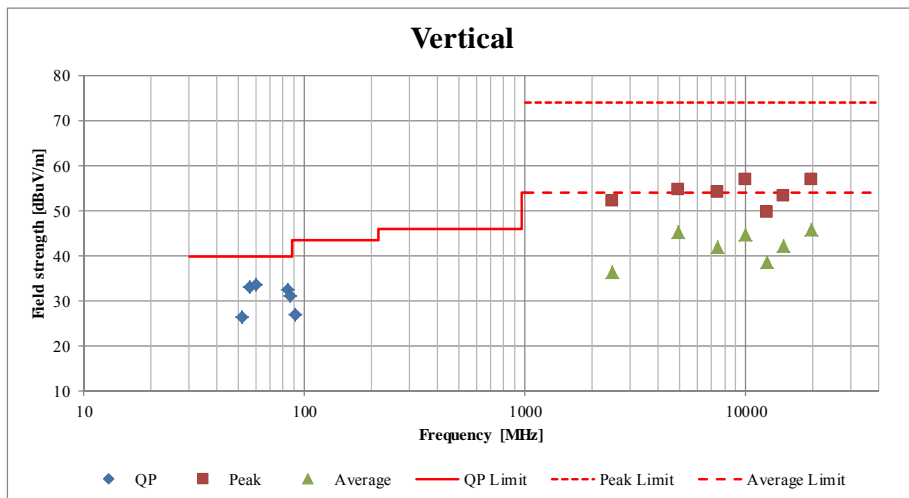
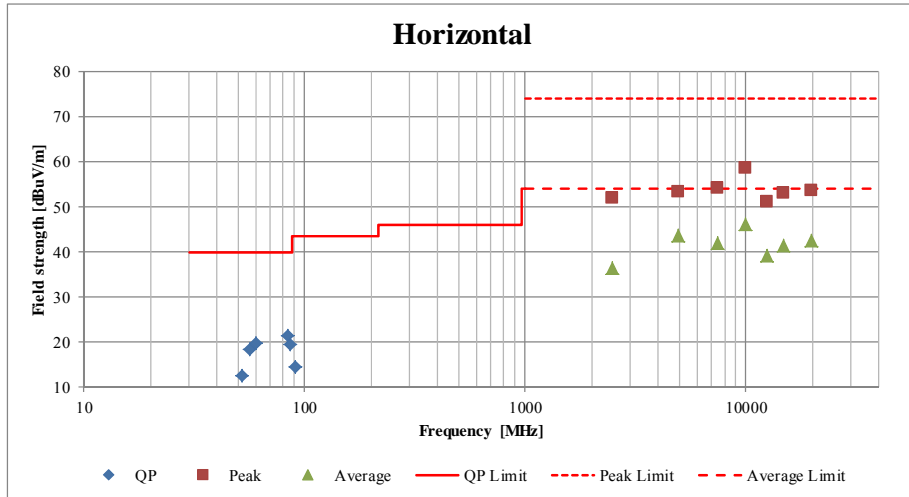
Test place : Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber  
Report No. : 11339636H  
Date : September 21, 2016  
Temperature / Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
(30 MHz-26.5 GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz



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

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

Test place	Ise EMC Lab. No.2 and No.3 Semi Anechoic Chamber
Report No.	11339636H
Date	September 21, 2016
Temperature / Humidity	22 deg. C / 69 % RH
Engineer	Takafumi Noguchi (30 MHz-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



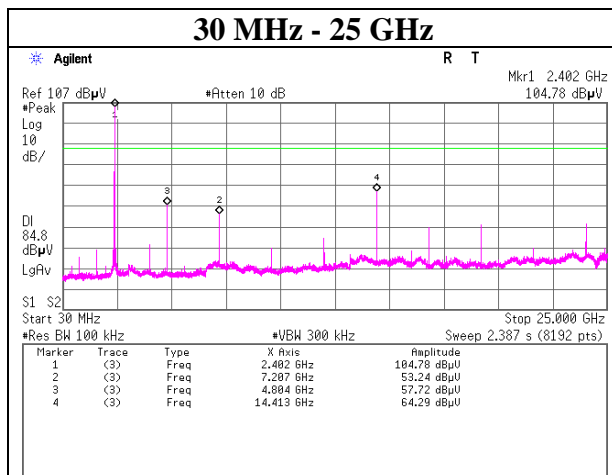
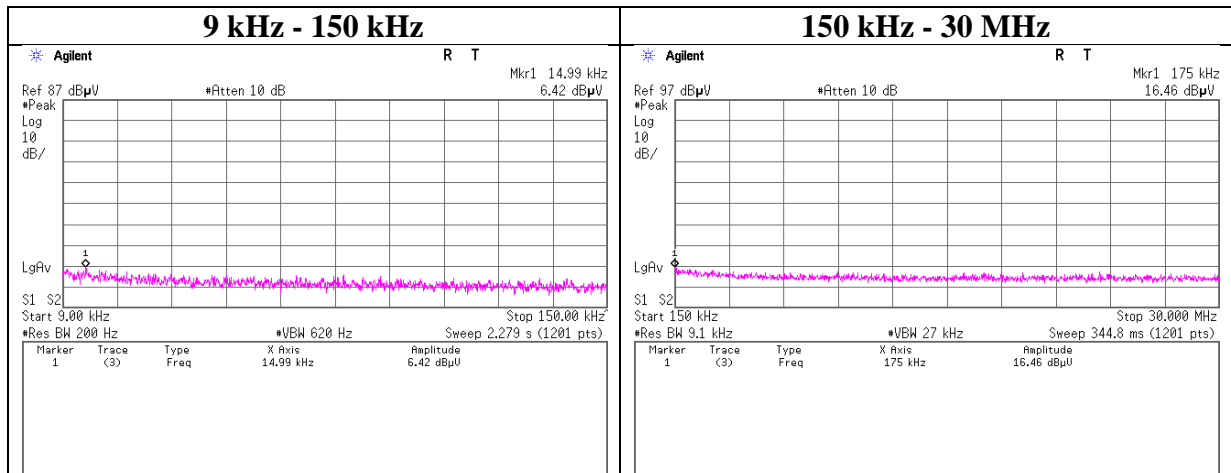
\*These plots data contains sufficient number to show the trend of characteristic features for EUT.



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off, DH5

### 2402 MHz



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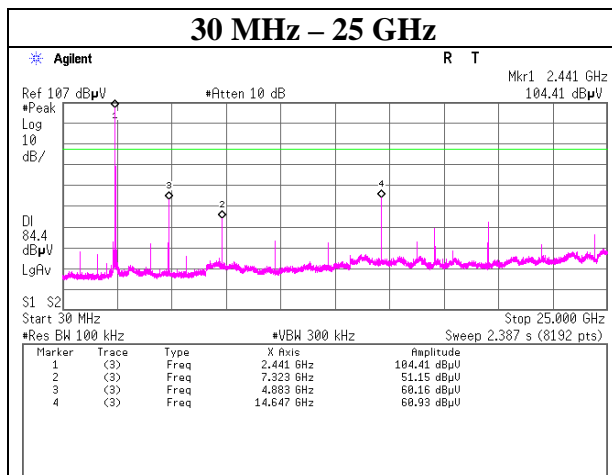
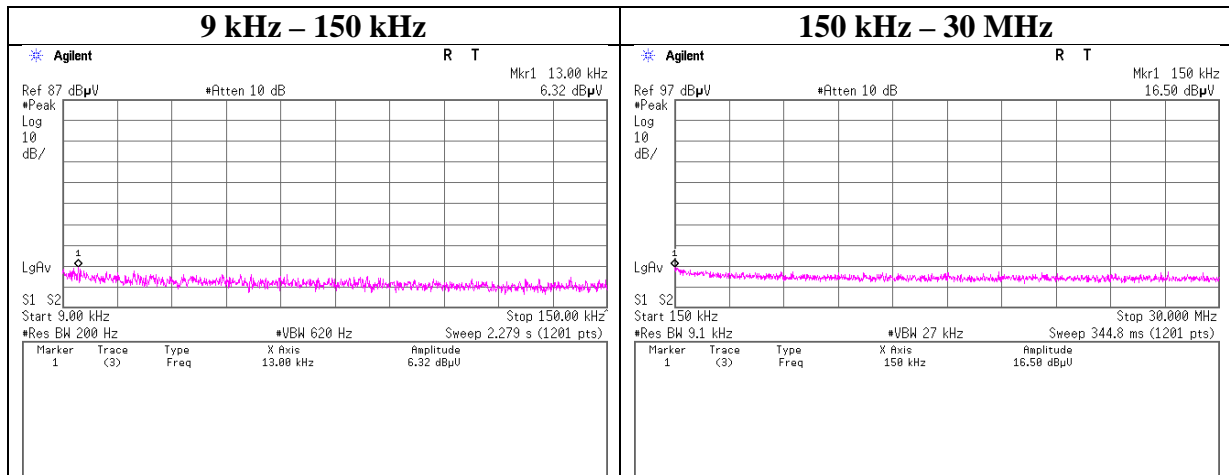
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off, DH5

### 2441 MHz



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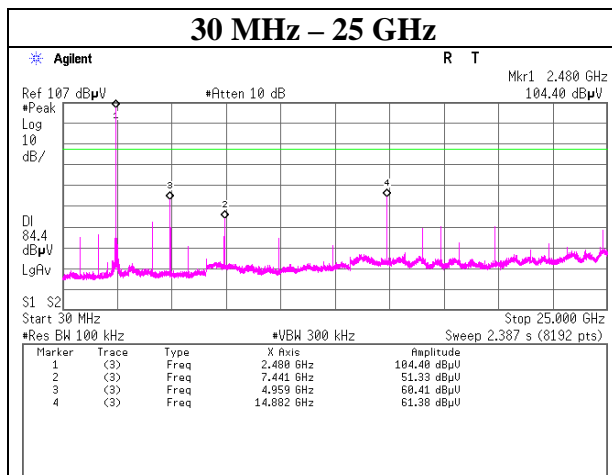
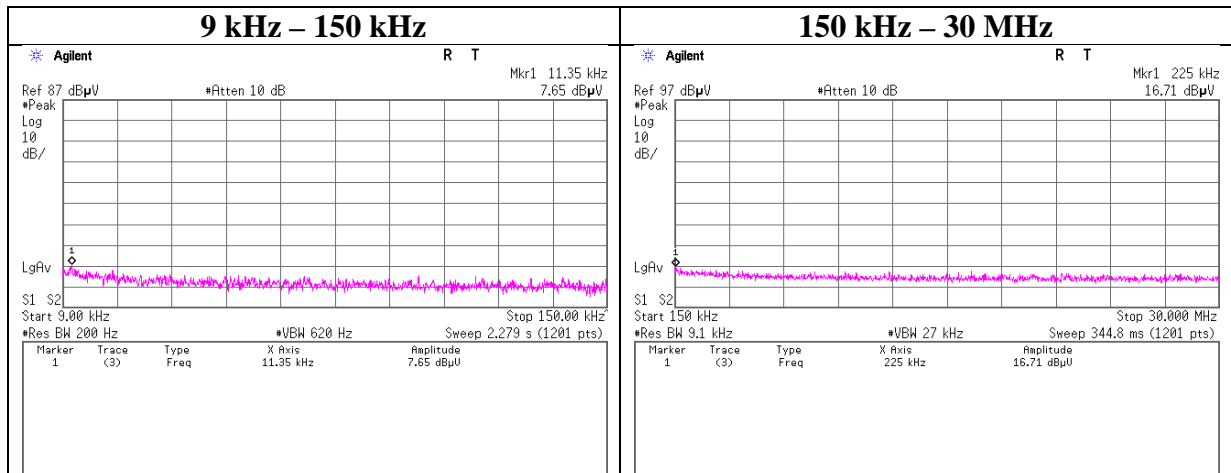
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off, DH5

### 2480 MHz



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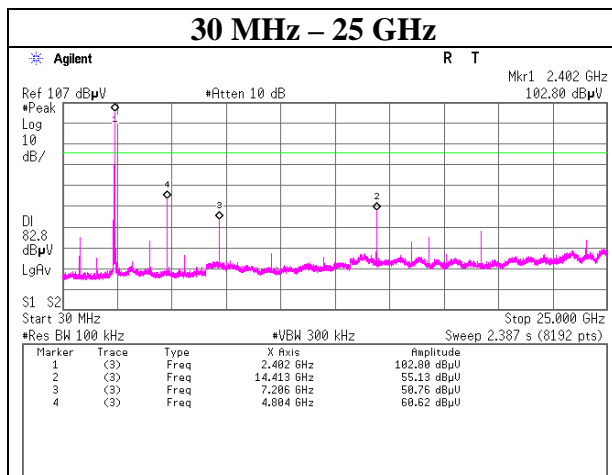
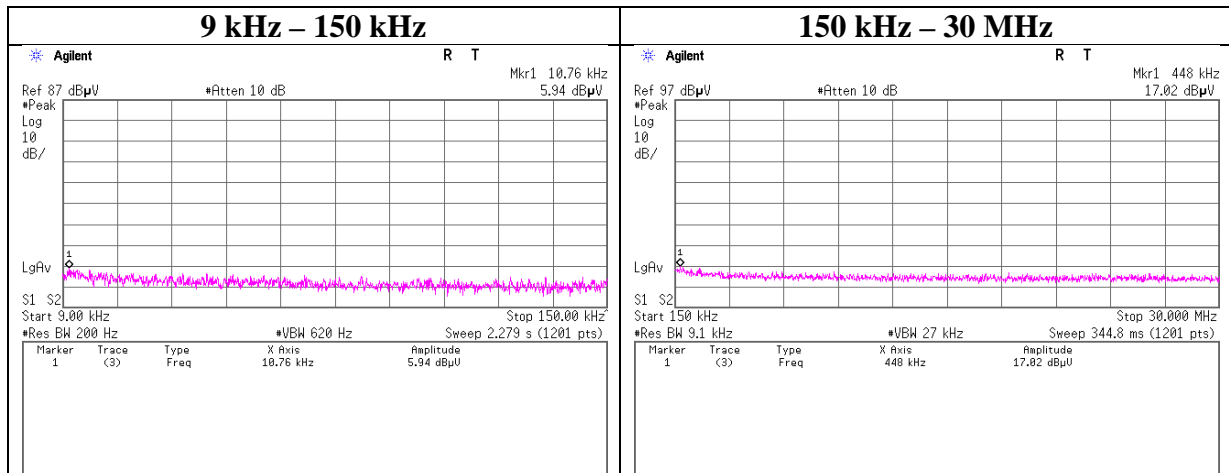
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off, 3DH5

### 2402 MHz



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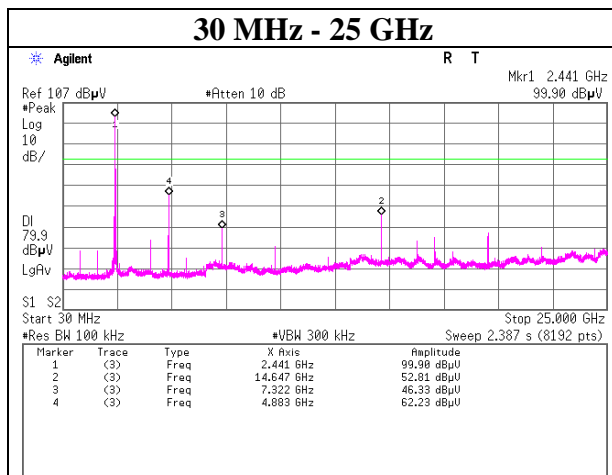
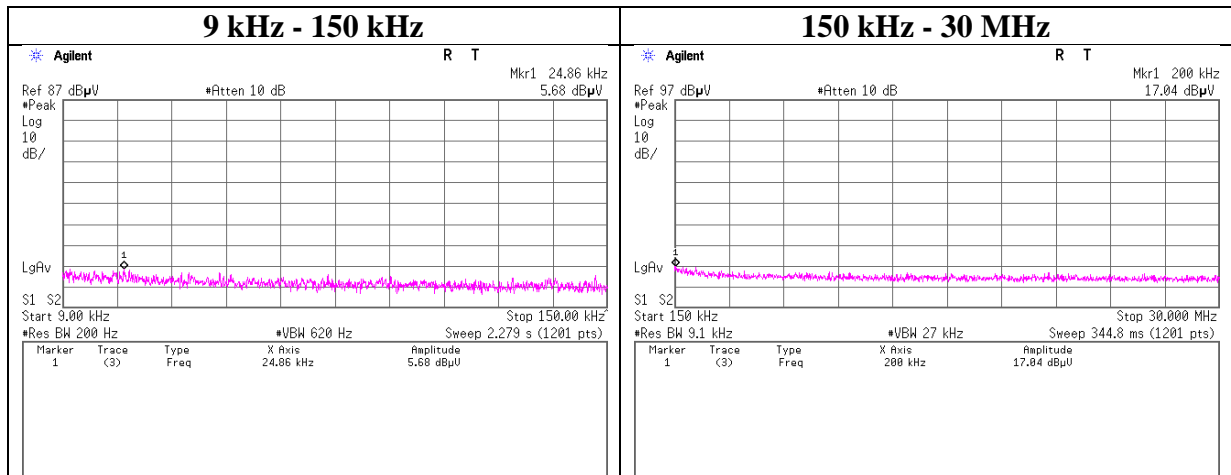
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off, 3DH5

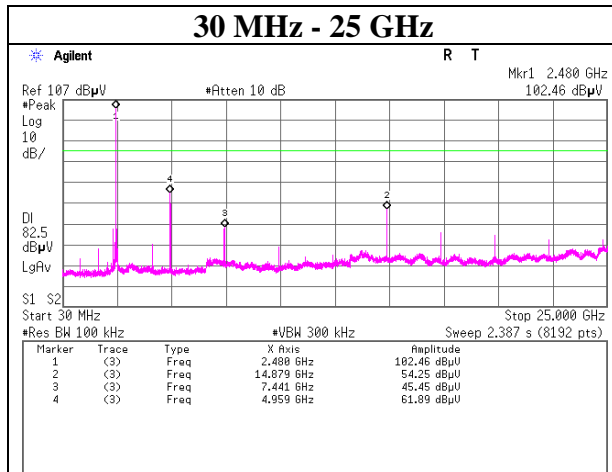
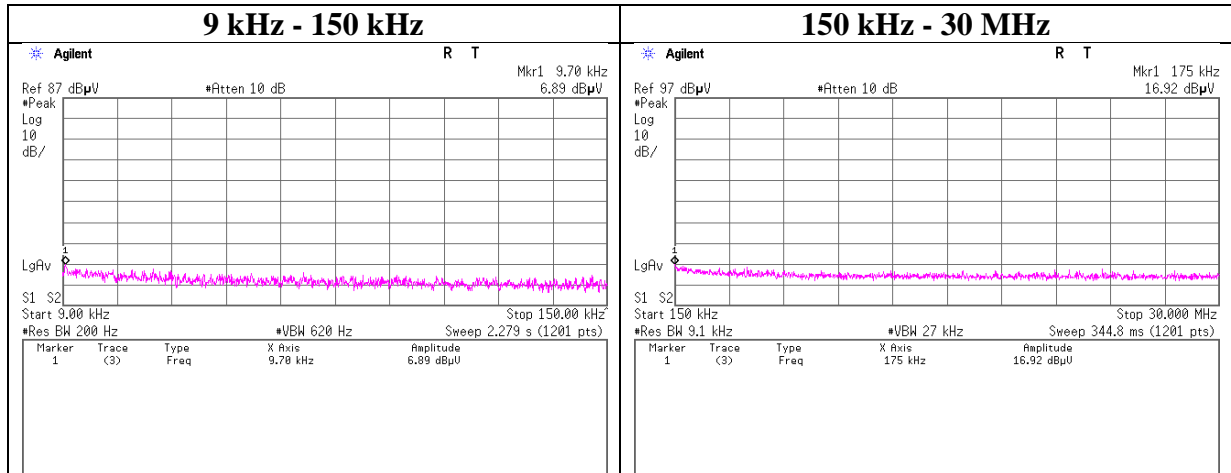
### 2441 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off, 3DH5

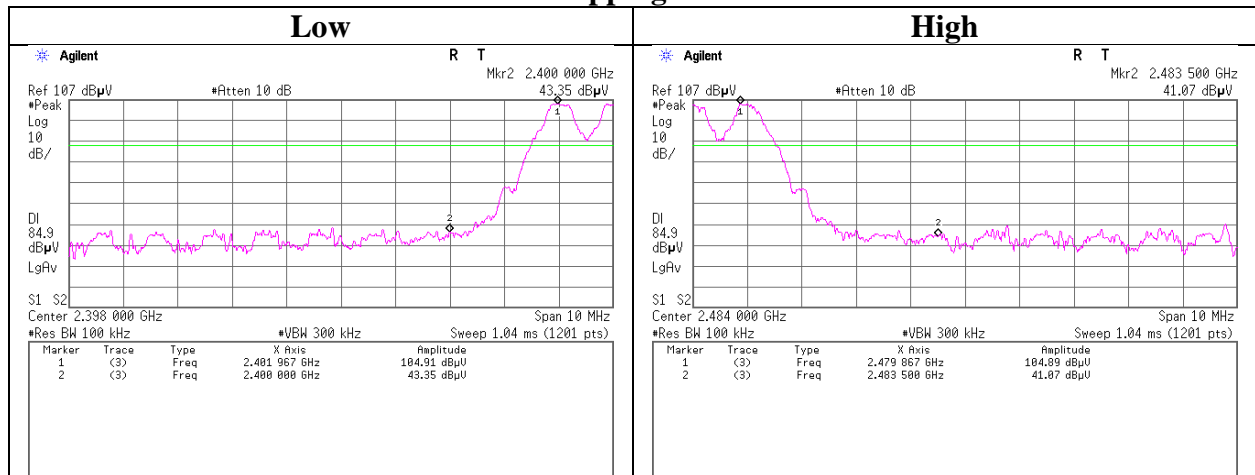
### 2480 MHz



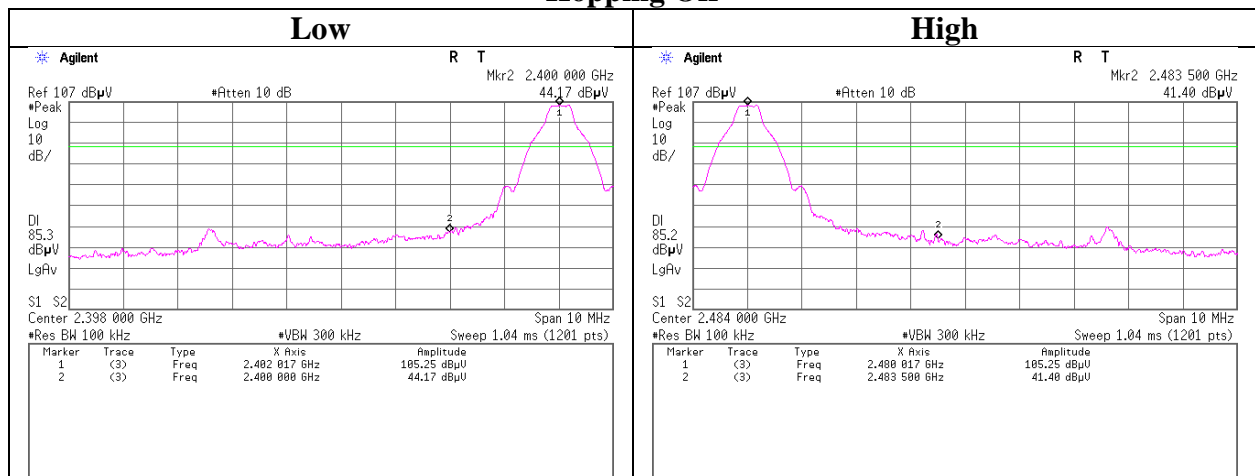
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11339636H
Date	September 21, 2016
Temperature / Humidity	24 deg. C / 61 % RH
Engineer	Satofumi Matsuyama
Mode	Tx DH5

### Hopping On



### Hopping Off



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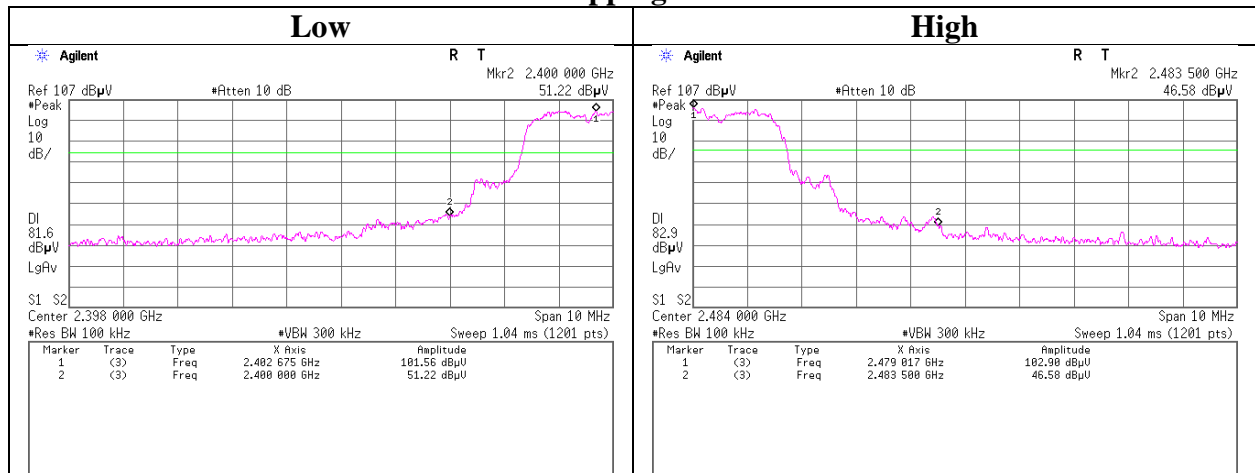
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

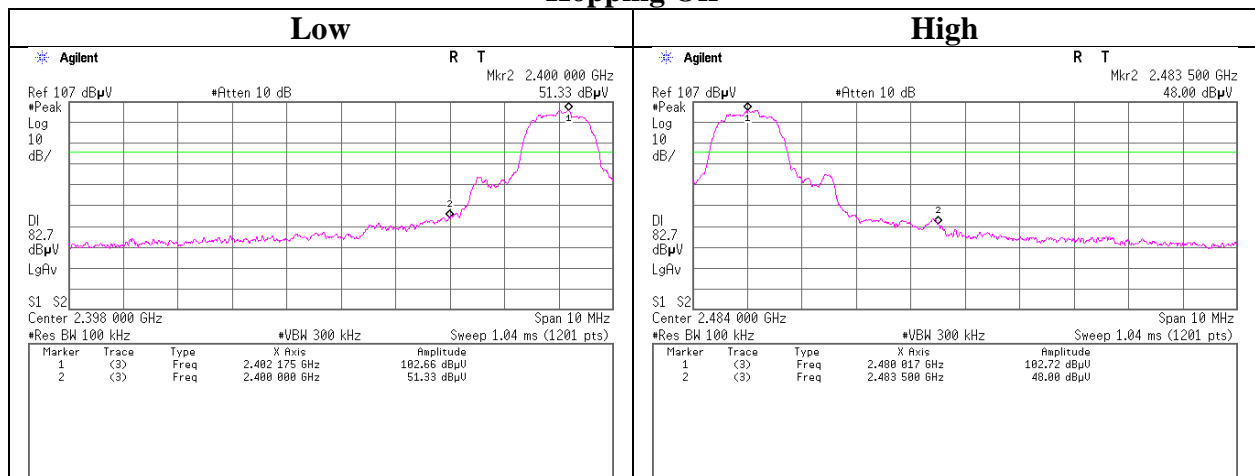
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11339636H
Date	September 21, 2016
Temperature / Humidity	24 deg. C / 61 % RH
Engineer	Satofumi Matsuyama
Mode	Tx 3DH5

### Hopping On



### Hopping Off

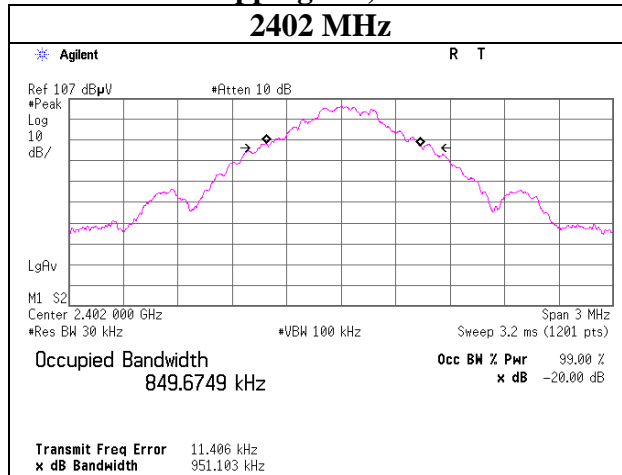




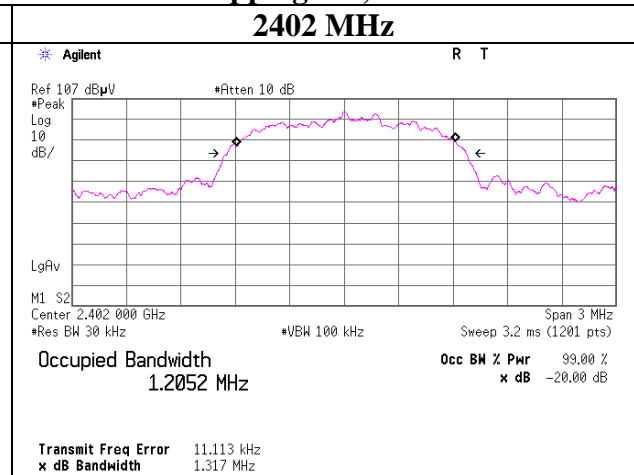
### 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping Off

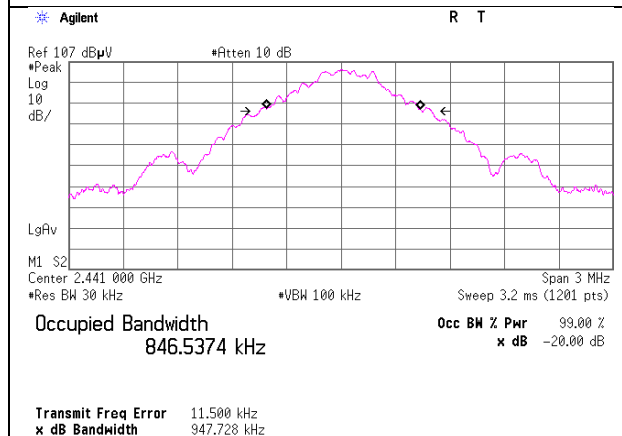
#### Hopping Off, DH5



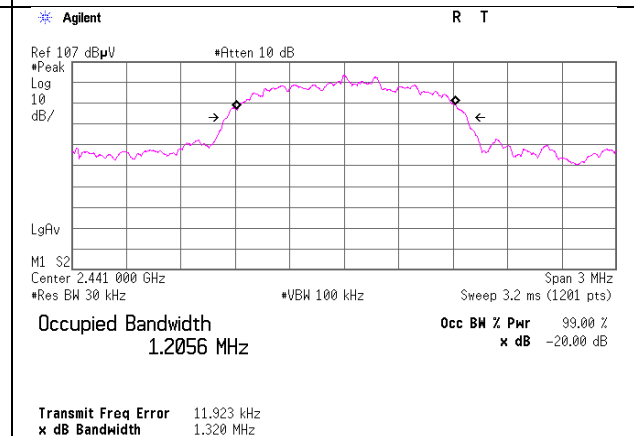
#### Hopping Off, 3DH5



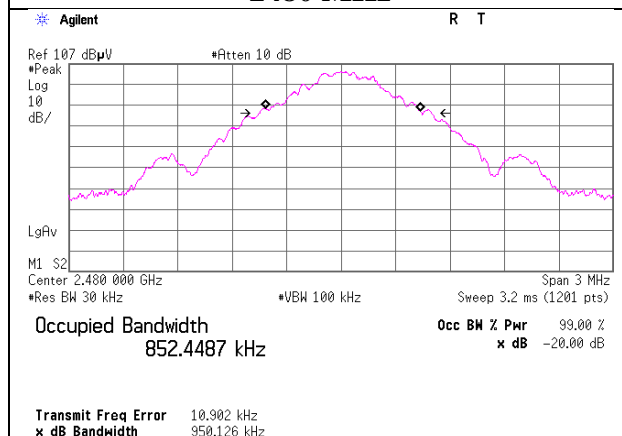
#### 2441 MHz



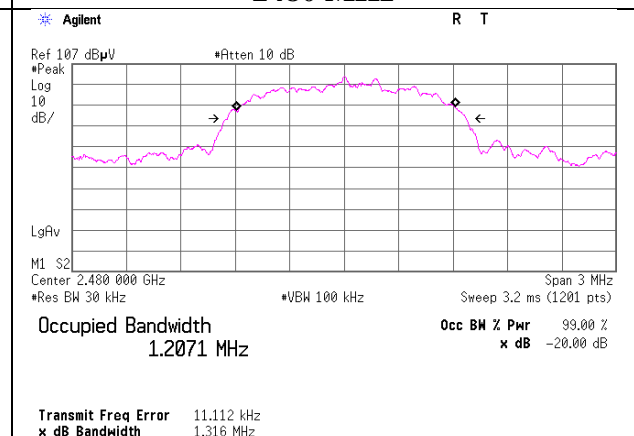
#### 2441 MHz



#### 2480 MHz



#### 2480 MHz



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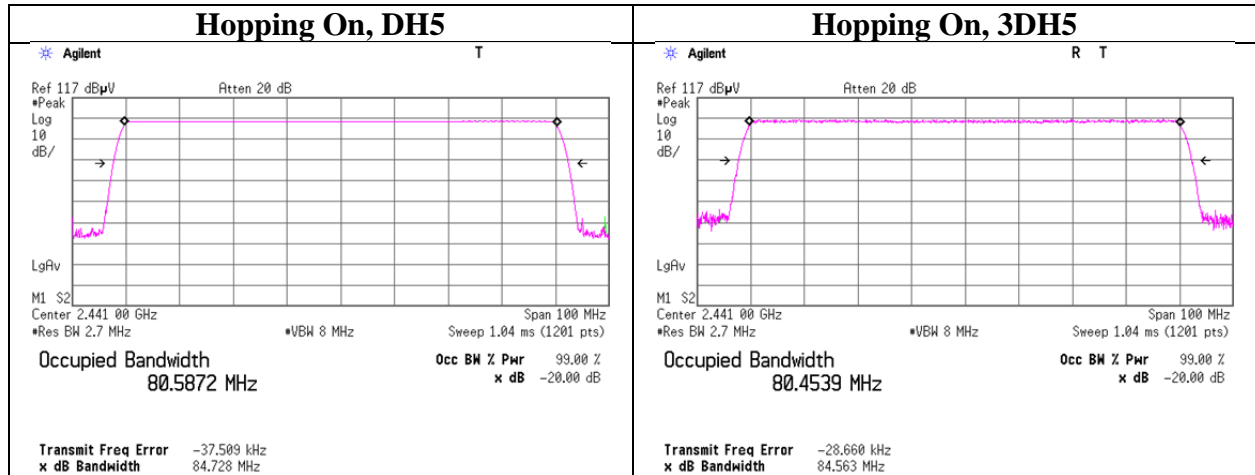
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## 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11339636H
Date	September 22, 2016
Temperature / Humidity	25 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx, Hopping On



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## **APPENDIX 2: Test instruments**

### **Test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2015/10/11 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2016/07/07 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	CE	2016/02/08 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2016/01/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE/CE	2015/10/07 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2016/02/29 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2016/08/29 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2016/01/19 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE/CE	2016/08/23 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 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
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2016/02/29 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2016/09/19 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2016/08/17 * 12
MPM-13	Power Meter	Anritsu	ML2495A	0824014	AT	2015/11/11 * 12
MPSE-18	Power sensor	Anritsu	MA2411B	0738174	AT	2015/11/11 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2016/03/18 * 12
MCC-174	Microwave Cable	Junkosha	MWX221	1409S497	AT	2016/03/11 * 12
MOS-29	Thermo-Hygrometer	Custom	CTH-201	2901	AT	2016/01/21 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2015/12/08 * 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**

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