



Test report No. : 10171657H-A-R1  
Page : 1 of 55  
Issued date : March 4, 2014  
Revised date : March 6, 2014  
FCC ID : AFJ356100

# RADIO TEST REPORT

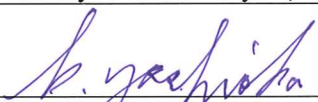
Test Report No. : 10171657H-A-R1

**Applicant** : ICOM Incorporated  
**Type of Equipment** : UT-133  
**Model No.** : UT-133  
**FCC ID** : AFJ356100  
**Test regulation** : FCC Part 15 Subpart C: 2013  
**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 report is a revised version of 10171657H-A. 10171657H-A is replaced with this report.

**Date of test:** January 15 to February 10, 2014

**Representative test engineer:**

  
Kazuya Yoshioka  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

  
Masanori Nishiyama  
Manager of WiSE Japan,  
UL Verification Service



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>

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13-EM-F0429

**REVISION HISTORY**

**Original Test Report No.: 10171657H-A**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10171657H-A	March 4, 2014	-	-
1	10171657H-A-R1	March 6, 2014	4	Correction of receipt date of sample
1	10171657H-A-R1	March 6, 2014	9	Addition of Jig and Jig cable to test configuration and peripherals in section 4.2

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## **SECTION 1: Customer information**

Company Name : ICOM Incorporated  
Address : 1-1-32 Kamiminami, Hirano-ku, Osaka, 547-0003 Japan  
Telephone Number : +81-6-6794-7783  
Facsimile Number : +81-6-6794-7785  
Contact Person : Hideji Fujishima

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

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

Type of Equipment : UT-133  
Model No. : UT-133  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC3.3V  
Receipt Date of Sample : January 10, 2014  
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**

#### **General Specification**

Clock frequency(ies) in the system : 26MHz

#### **Radio Specification**

##### **[Bluetooth Ver 3.0]**

Radio Type : Transceiver  
Frequency of Operation : 2402-2480MHz  
Modulation : FHSS GFSK,  $\pi/4$  DQPSK, 8DPSK  
Power Supply (radio part input) : DC1.5V  
Antenna type : Multilayer Monopole Antenna  
Antenna Gain : 2.7dBi

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013

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

\*The EUT complies with FCC Part 15 Subpart B: 2013, final revised on September 30, 2013 and effective October 30, 2013.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst Margin	Results	Remarks	
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 IC: RSS-Gen 7.2.4	QP 18.2dB, 24.94641MHz, N AV 7.9dB, 24.94641MHz, N	Complied	-	
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-210 A8.1 (b)	See data.	Complied	Conducted	
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-210 A8.1 (a)		-	Conducted	
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted	
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-210 A8.1 (d)		Complied	Conducted	
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.8	FCC: Section15.247(a)(b)(1) IC: RSS-210 A8.4 (2)		Complied	Conducted	
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.9	FCC: Section15.247(d) IC: RSS-210 A8.5 RSS-Gen 6 and 7.2.3		11.3dB 4882.000MHz, PK, Vert.	Complied	Conducted/ Radiated

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

\* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

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**FCC 15.31 (e)**

The stable voltage (DC1.5V) is constantly supplied to the EUT regardless of input voltage. Therefore, this EUT complies with the requirement.

**FCC Part 15.203/212 Antenna requirement**

It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore, the equipment complies with the antenna requirement of Section 15.203/212.

**3.3 Addition to standard**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	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)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

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

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

Conducted Emission test

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

Radiated emission test(3m)

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

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### 3.5 Test Location

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	FCC Registration Number	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	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 x 3.0m	2.4 x 3.4m	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m 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.

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## **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	2402MHz 2441MHz 2480MHz
Carrier Frequency Separation	Tx (Hopping on) DH5, 3DH5 Inquiry	2402MHz 2441MHz 2480MHz
20dB Bandwidth	Tx (Hopping off) DH5, 3DH5 Inquiry	2402MHz 2441MHz 2480MHz
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	2402MHz 2441MHz 2480MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping on -Hopping off	2402MHz 2480MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping on -Hopping off Inquiry	2402MHz 2441MHz 2480MHz
Spurious Emissions (Receiver) (Conducted/Radiated)	Rx	2402MHz 2480MHz
<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)  *We removed 2DH mode (2 Mb/s EDR: pi/4DQPSK) except power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.  *EUT has the power settings by the software as follows;  - Power settings: BDR: Ext.=255, Int.=53  EDR: Ext.=255, Int.=55  - Software: CSR BlueSuite BlueTest Version 2.2.0.0  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>		

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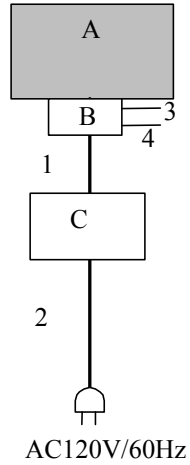
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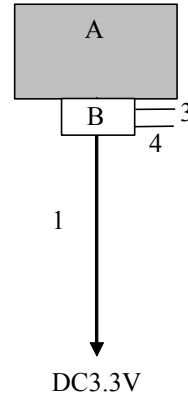


## 4.2 Configuration and peripherals

[Conducted Emission/Antenna Terminal Conducted test]



[Radiated Emission test]



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

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	UT-133	UT-133	0000214 for AT*1) 0000202 for CE/RE*2)	ICOM Incorporated	EUT
B	Jig	-	-	ICOM Incorporated	-
C	DC Power Supply	PW8-3ATP	09067054	KENWOOD	-

\*1) Used for Antenna Terminal conducted test

\*2) Used for Conducted Emission test and Radiated Emission test

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	AC Cable	0.6	Unshielded	Unshielded	-
3	Jig Cable	0.02	Unshielded	Unshielded	-
4	Jig Cable	0.02	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

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

The rear of tabletop was located 40cm 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 80cm from any other grounded conducting surface. EUT was located 80cm 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 the representative host

The current-carrying power lead (except the ground (safety) lead) of the representative host was connected through a LISN/(AMN) to the input power source.

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.

<b>Detector</b>	<b>: QP and CISPR AV</b>
<b>Measurement range</b>	<b>: 0.15-30MHz</b>
<b>Test data</b>	<b>: APPENDIX</b>
<b>Test result</b>	<b>: Pass</b>

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

### **Test Procedure**

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m 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	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

### **20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5 (IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).**

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *1)	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz)		3m (below 10GHz), 1m*2) (above 10GHz),

\*1) Although 00-705 accepts VBW=10Hz 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 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** : 30M-25GHz  
**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	3MHz	30kHz	100kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	5MHz, 3MHz	100kHz 30kHz	300kHz 100kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30MHz	300kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100kHz, 1MHz	300kHz, 3MHz	As necessary capture the entire dwell time per hopping channel	Peak	Max Hold	Spectrum Analyzer
Conducted Spurious Emission *2)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 25GHz (Less or equal to 5GHz)	100kHz	300kHz				
Conducted Spurious Emission Band Edge compliance	10MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer

\*1) The measurement was performed with Max Hold since the duty cycle was not 100%.  
\*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.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)  
\*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**

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**APPENDIX 1: Data of EMI test**

**Conducted Emission**

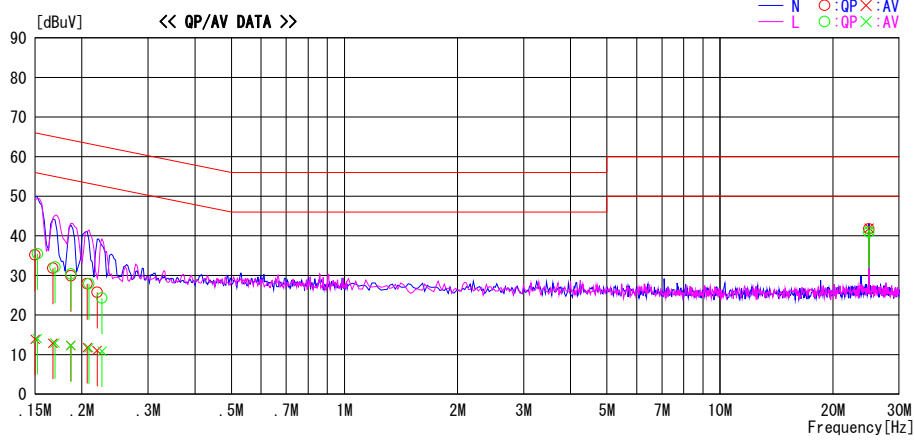
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2014/02/10

Report No. : 10171657H  
Temp./Humi. : 24deg. C / 30% RH  
Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx DHS 2402MHz

LIMIT : FCC15.207 QP  
FCC15.207 AV

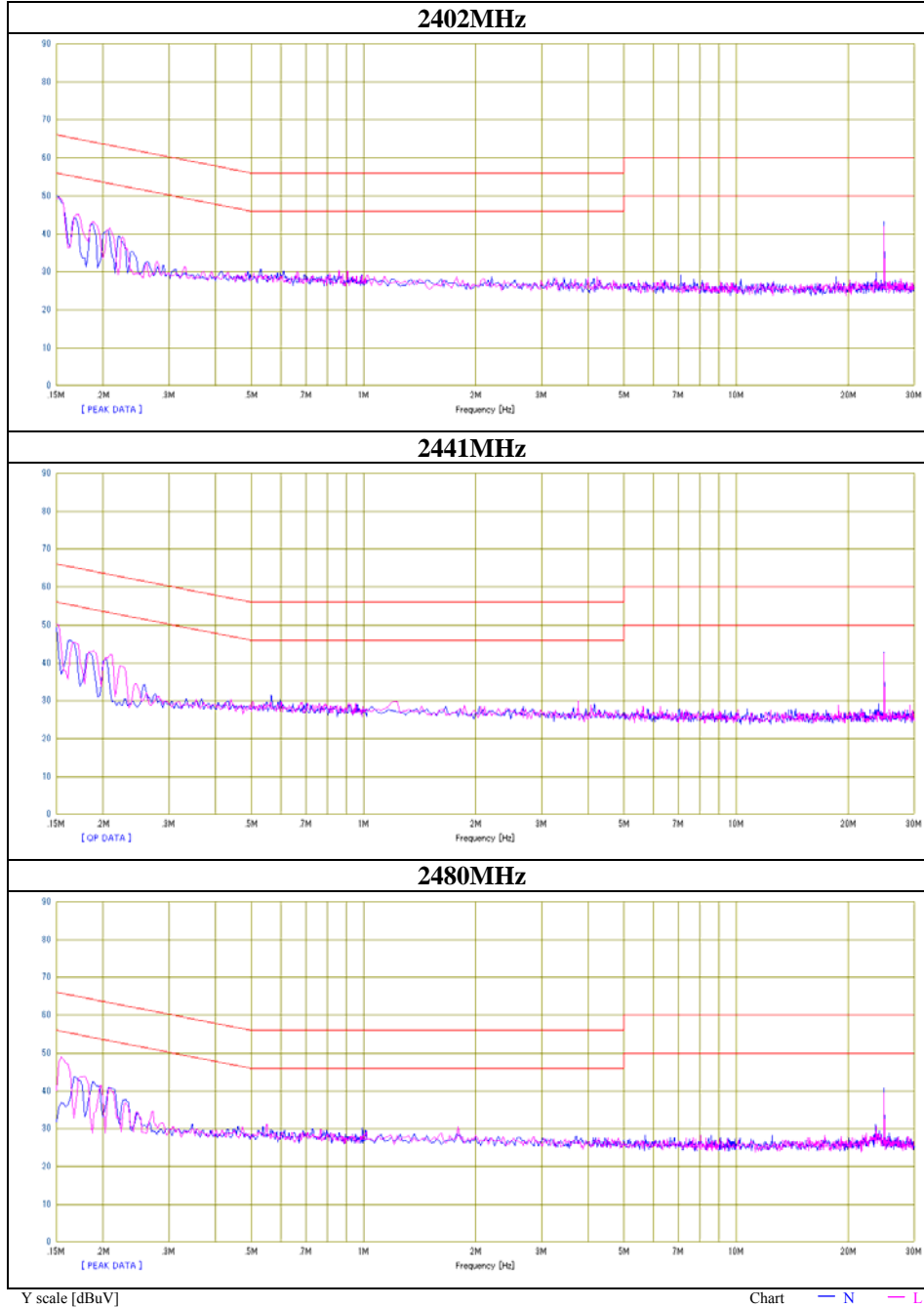


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	22.0	0.7	13.2	35.2	13.9	66.0	56.0	30.8	42.1	N	
0.15218	22.3	0.9	13.2	35.5	14.1	65.9	55.9	30.4	41.8	L	
0.16740	18.6	-0.3	13.2	31.8	12.9	65.1	55.1	33.3	42.2	N	
0.16958	18.9	-0.2	13.2	32.1	13.0	65.0	55.0	32.9	42.0	L	
0.18698	16.7	-0.9	13.2	29.9	12.3	64.2	54.2	34.3	41.9	N	
0.18698	17.2	-0.9	13.2	30.4	12.3	64.2	54.2	33.8	41.9	L	
0.20655	14.6	-1.5	13.3	27.9	11.8	63.3	53.3	35.4	41.5	N	
0.20873	14.6	-1.6	13.3	27.9	11.7	63.3	53.3	35.4	41.6	L	
0.21960	12.4	-2.2	13.3	25.7	11.1	62.8	52.8	37.1	41.7	N	
0.22613	11.0	-2.4	13.3	24.3	10.9	62.6	52.6	38.3	41.7	L	
24.93741	26.9	27.2	14.8	41.7	42.0	60.0	50.0	18.3	8.0	N	
24.93741	26.1	26.4	14.8	40.9	41.2	60.0	50.0	19.1	8.8	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING[dBuV]+C.F[dB] (L1SN+CABLE+ATTEN.)  
Except for the above table : adequate margin data below the limits.

## Conducted Emission

Test place	Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10171657H
Date	02/10/2014
Temperature/ Humidity	24 deg. C/ 30% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx DH5



## Conducted Emission

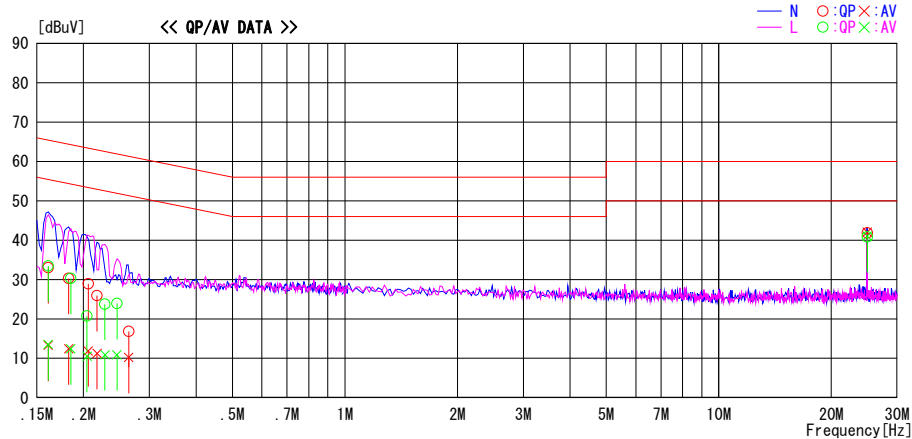
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber  
Date : 2014/02/10

Report No. : 10171657H  
 Temp./Humi. : 24deg. C / 30% RH  
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx 3DH5 2402MHz

LIMIT : FCC15.207 QP  
 FCC15.207 AV

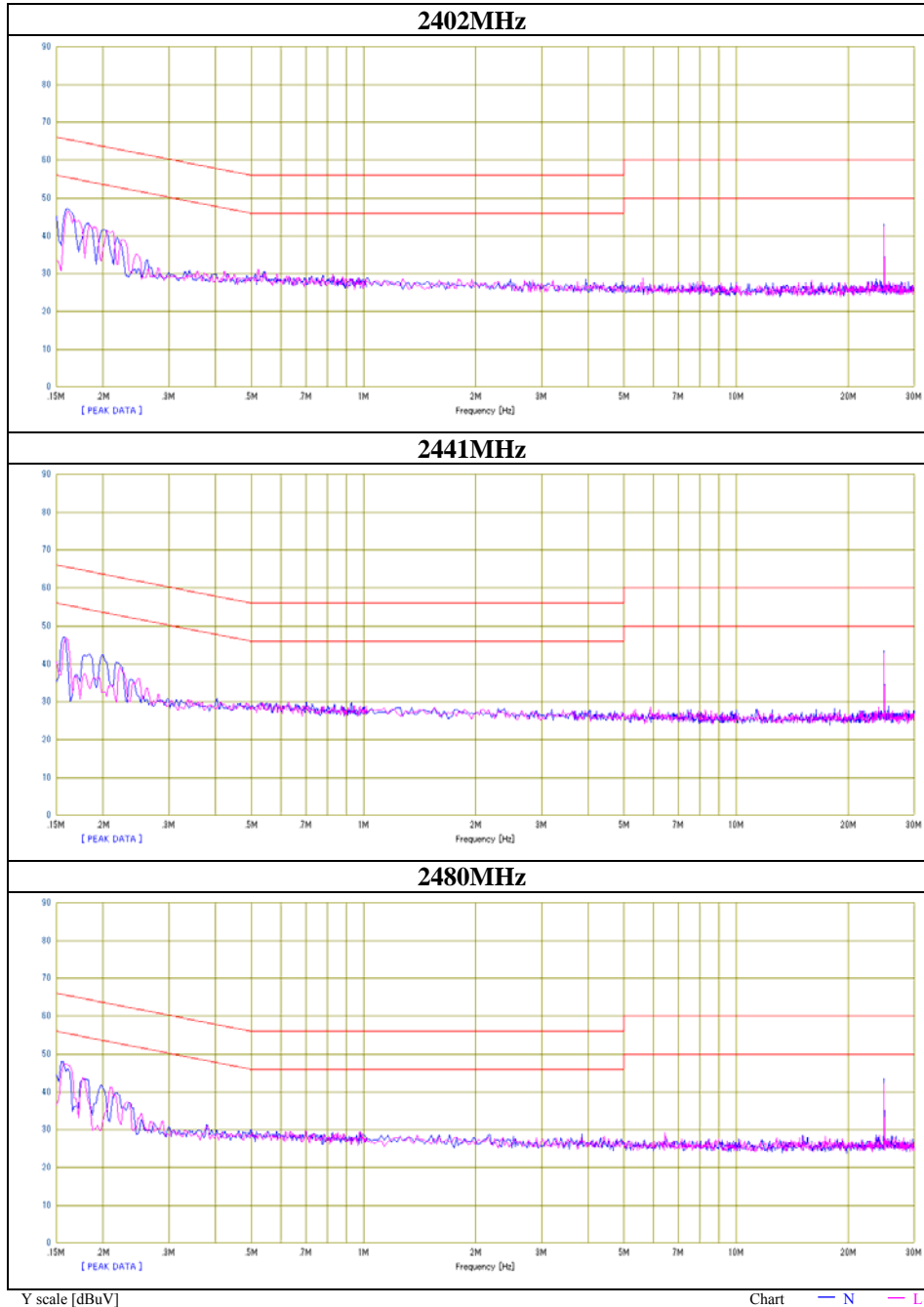


Frequency [MHz]	Reading_Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.16088	19.8	0.1	13.2	33.0	13.3	65.4	55.4	32.4	42.1	N	
0.18263	17.1	-0.8	13.2	30.3	12.4	64.4	54.4	34.1	42.0	N	
0.20603	15.6	-1.4	13.3	28.9	11.9	63.4	53.4	34.5	41.5	N	
0.21743	12.6	-2.1	13.3	25.9	11.2	62.9	52.9	37.0	41.7	N	
0.26423	3.5	-3.1	13.3	16.8	10.2	61.3	51.3	44.5	41.1	N	
24.94641	27.0	27.3	14.8	41.8	42.1	60.0	50.0	18.2	7.9	N	
0.16088	20.3	0.3	13.2	33.5	13.5	65.4	55.4	31.9	41.9	L	
0.18480	17.1	-0.8	13.2	30.3	12.4	64.3	54.3	34.0	41.9	L	
0.20438	7.4	-2.8	13.3	20.7	10.5	63.4	53.4	42.7	42.9	L	
0.22830	10.4	-2.4	13.3	23.7	10.9	62.5	52.5	38.8	41.6	L	
0.24570	10.6	-2.4	13.3	23.9	10.9	61.9	51.9	38.0	41.0	L	
24.94741	26.0	26.3	14.8	40.8	41.1	60.0	50.0	19.2	8.9	L	

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

## Conducted Emission

Test place	Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10171657H
Date	02/10/2014
Temperature/ Humidity	24 deg.C/ 30% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 3DH5





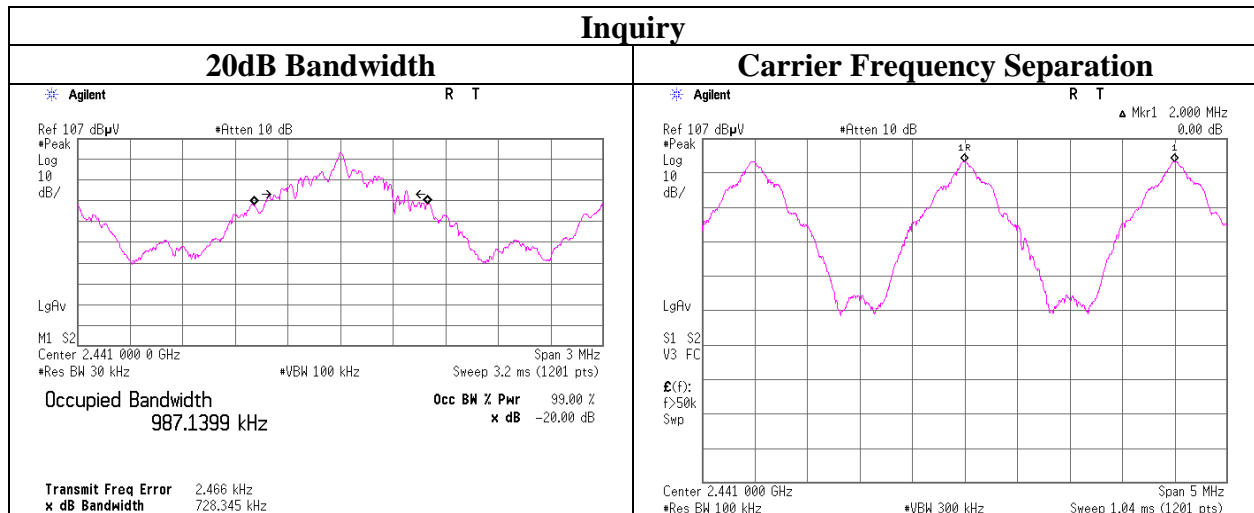
## 20dB Bandwidth and Carrier Frequency Separation

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg. C/ 32% RH
Engineer	Tsubasa Takayama
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	0.927	1.000	≧ 0.618
DH5	2441.0	0.927	1.000	≧ 0.618
DH5	2480.0	0.926	1.000	≧ 0.618
3DH5	2402.0	1.268	1.000	≧ 0.845
3DH5	2441.0	1.268	1.000	≧ 0.845
3DH5	2480.0	1.264	1.000	≧ 0.842
Inquiry	2441.0	0.728	2.000	≧ 0.486

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

No limit applies to 20dB Bandwidth.



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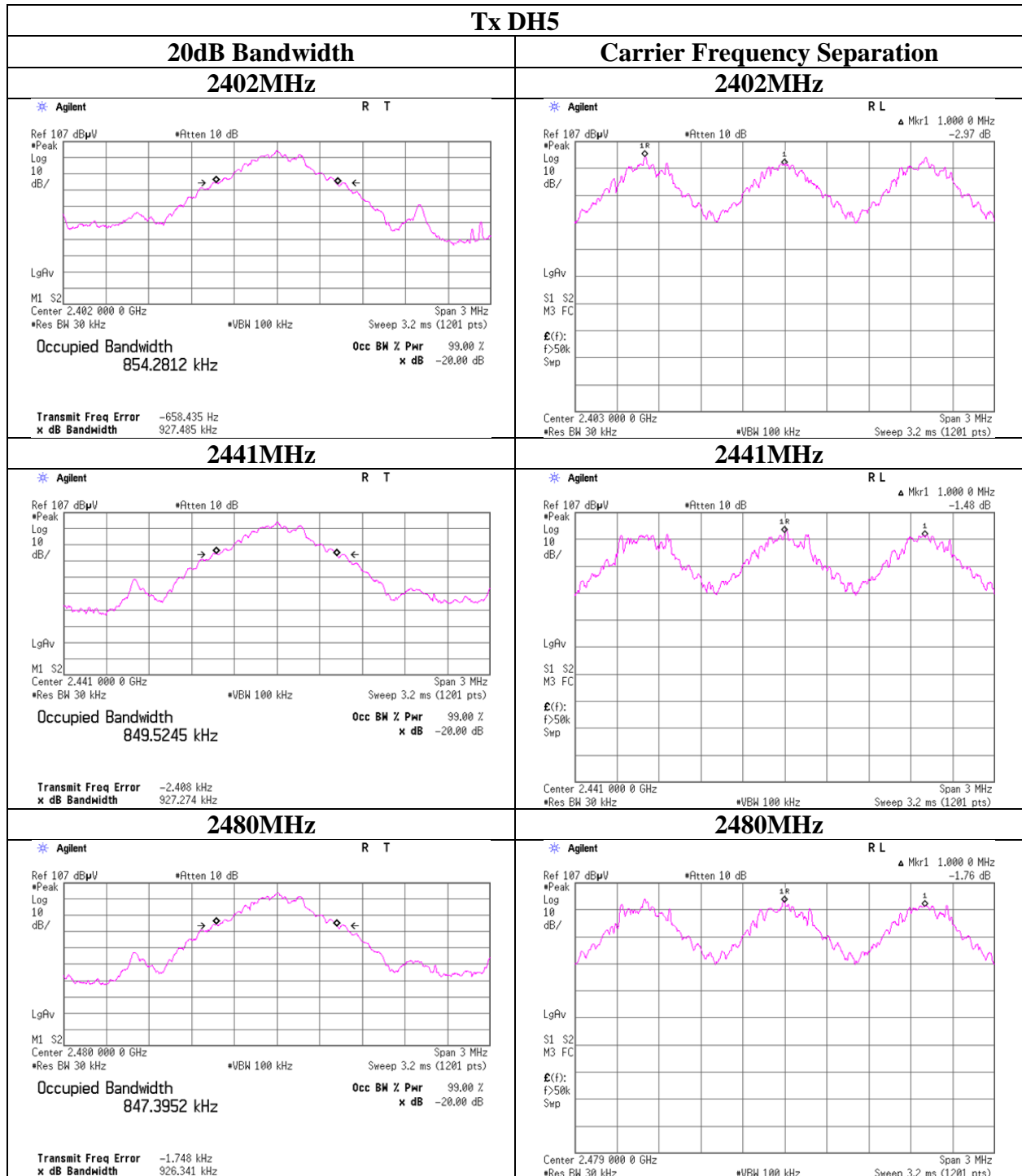
**Head Office EMC Lab.**

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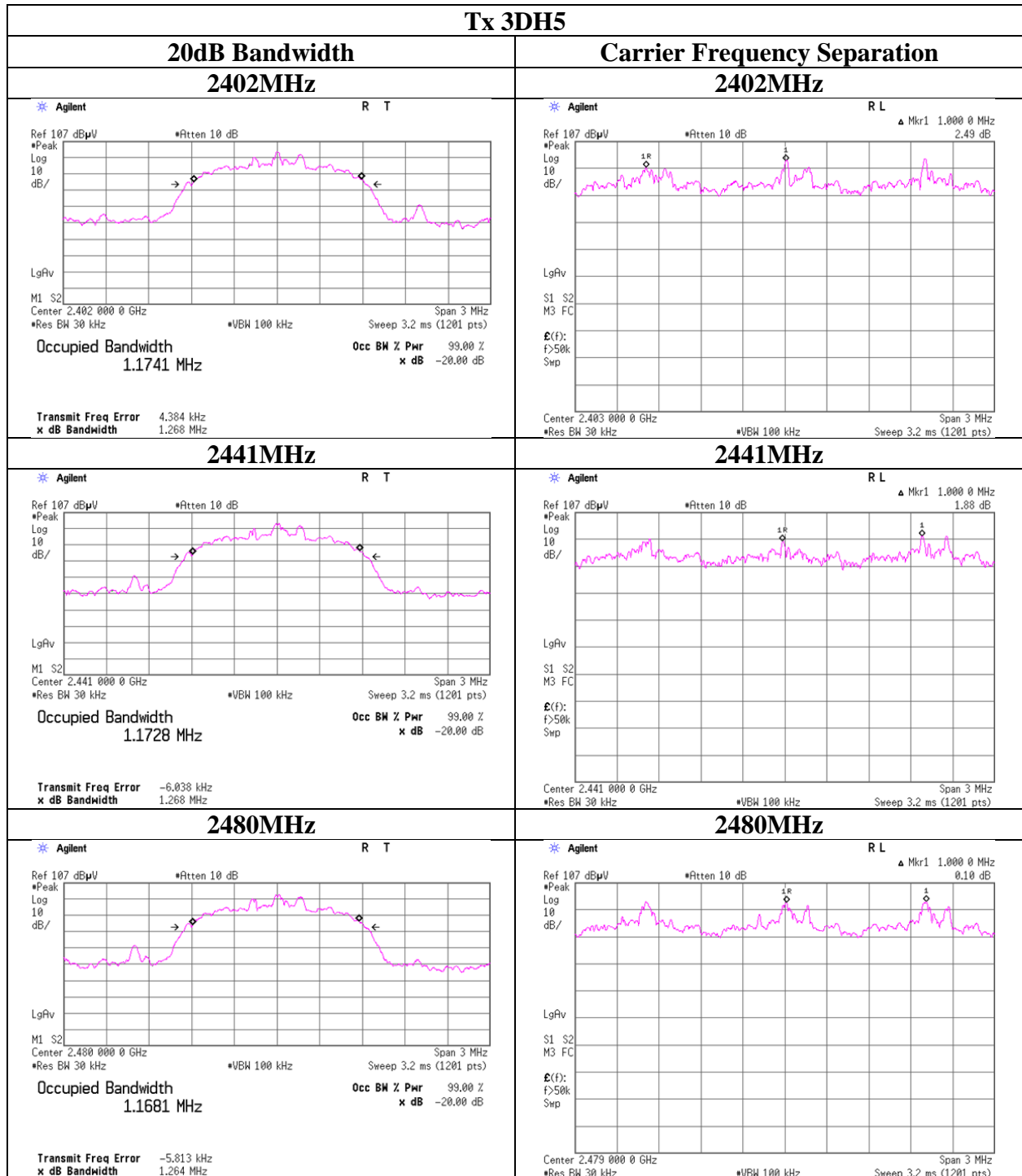
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## 20dB Bandwidth and Carrier Frequency Separation



## 20dB Bandwidth and Carrier Frequency Separation

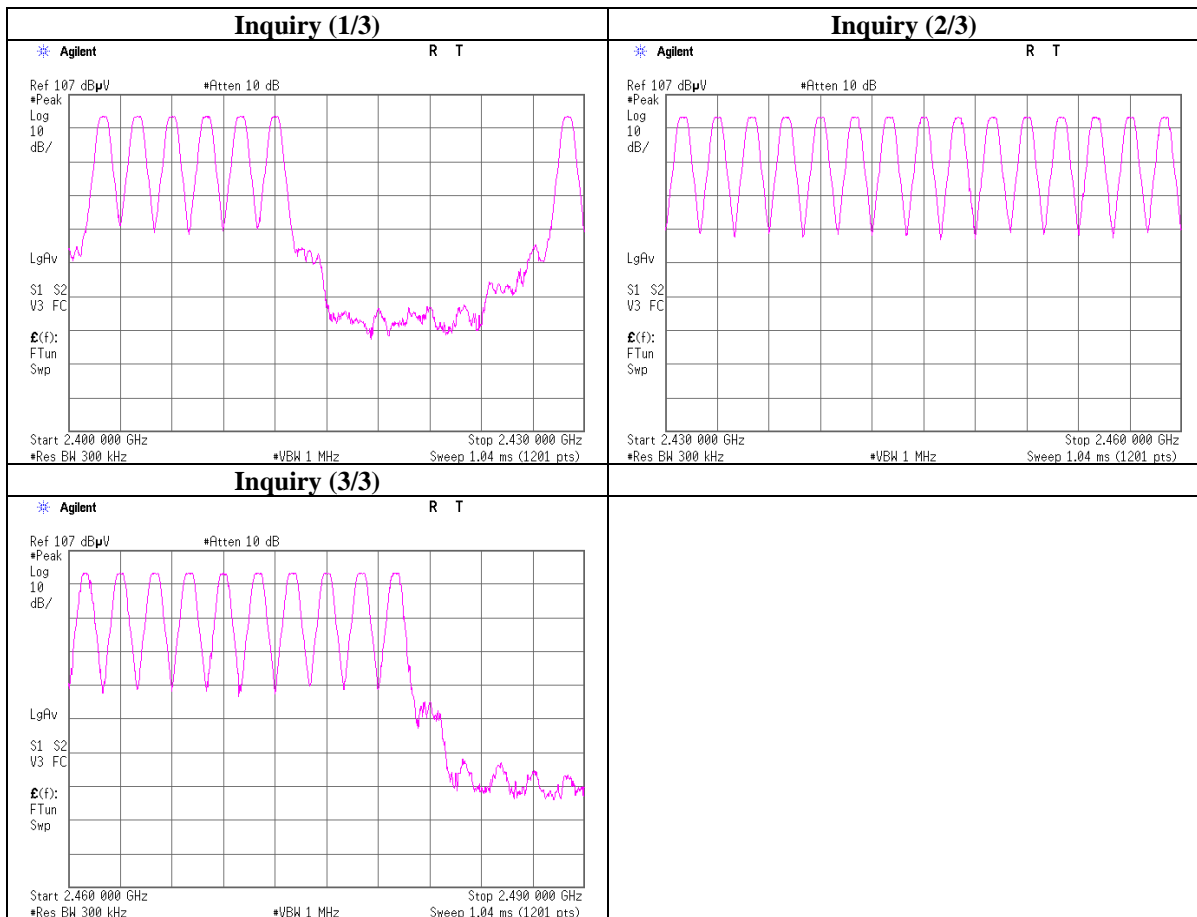


## Number of Hopping Frequency

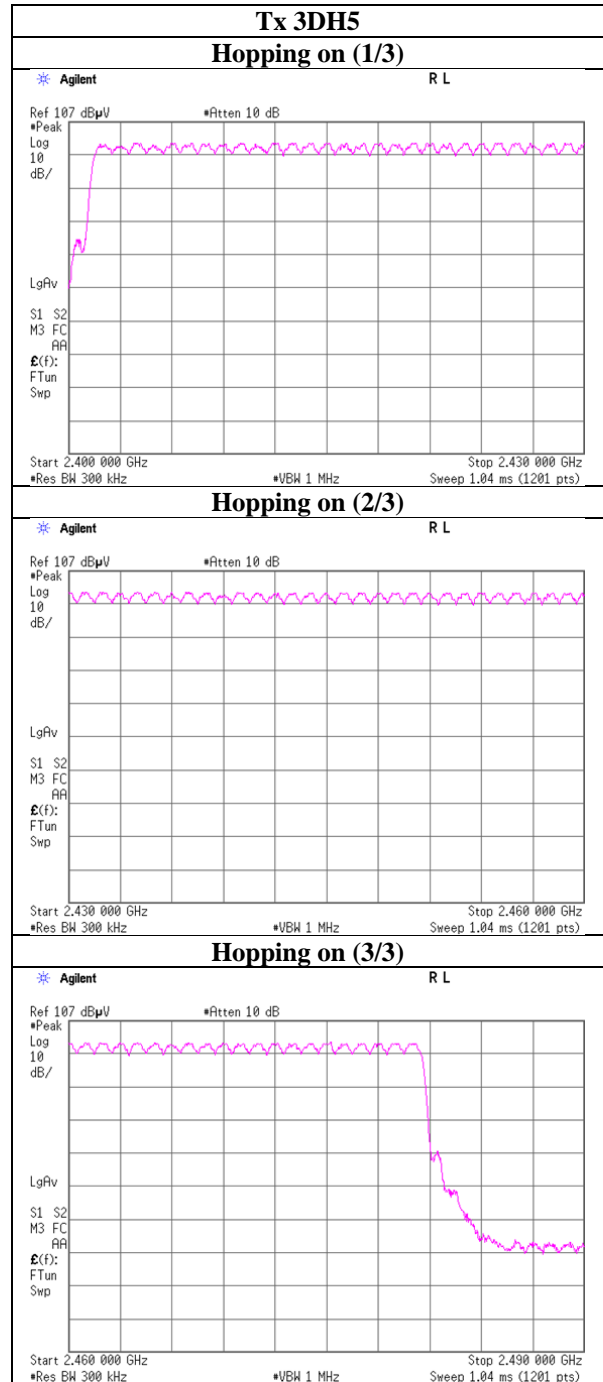
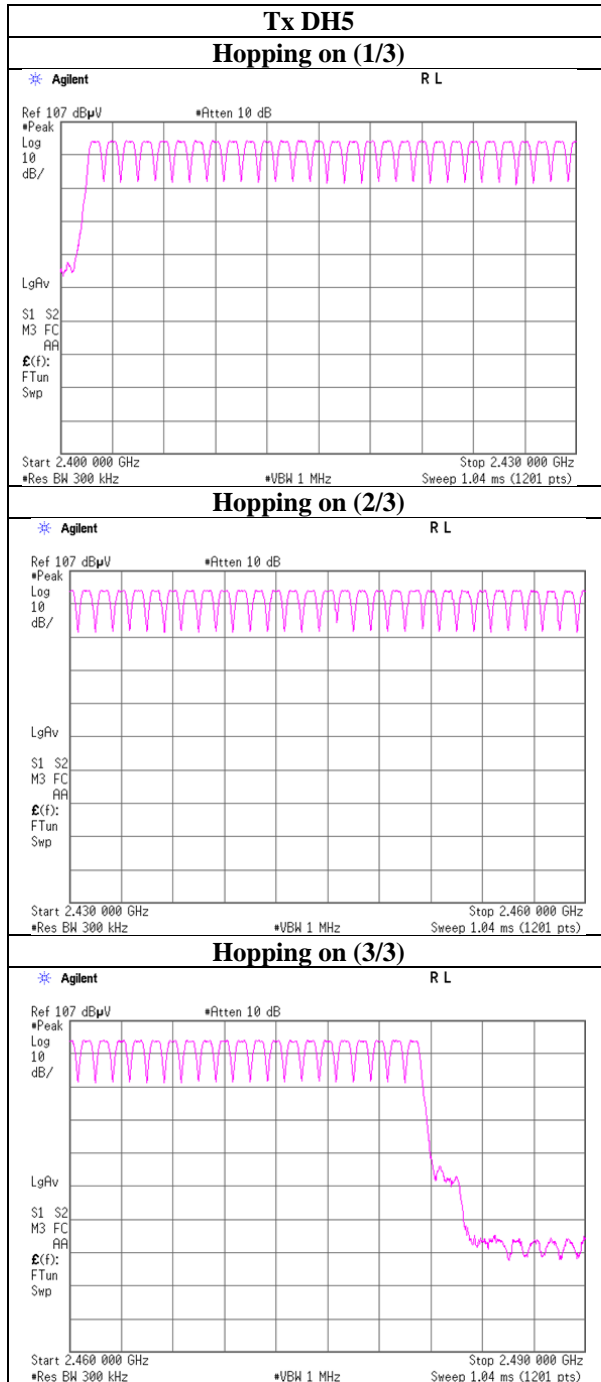
Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg. C/ 32% RH
Engineer	Tsubasa Takayama
Mode	Tx (Hopping on) DH5/3DH5/Inquiry

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



### Dwell time

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg. C/ 32% RH
Engineer	Tsubasa Takayama
Mode	Tx 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	50.8 times / 5 sec. x 31.6 sec. = 322 times	0.529	170	400
DH3	25.8 times / 5 sec. x 31.6 sec. = 164 times	1.793	294	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	3.036	328	400
3DH1	50.8 times / 5 sec. x 31.6 sec. = 322 times	0.538	173	400
3DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.792	296	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	3.058	330	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.224	286	400

Sample Calculation

Result = Number of transmission x Length of transmission time

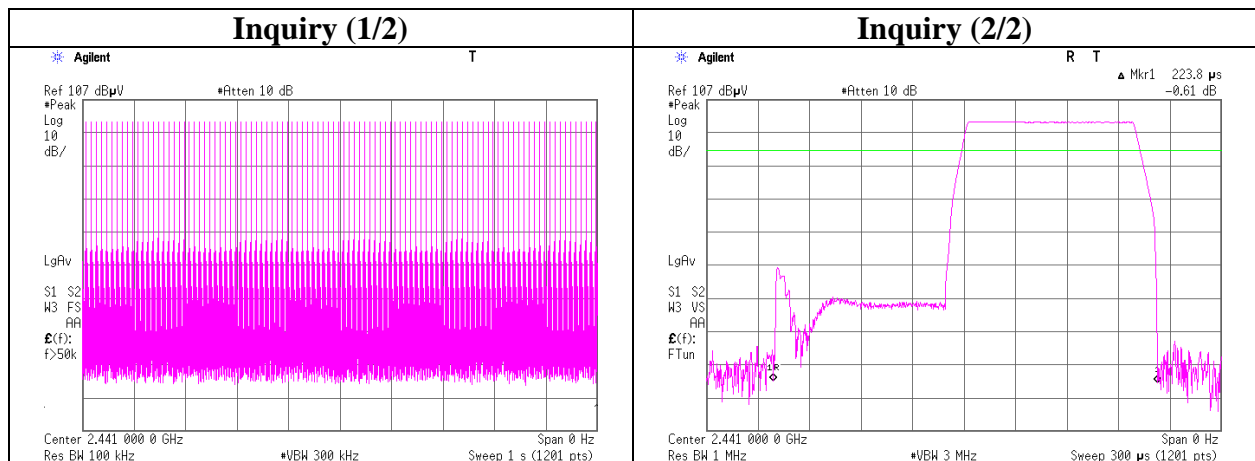
\*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	50	51	50.8
DH3	26	26	26	25	26	25.8
DH5	17	17	17	17	17	17
3DH1	51	51	51	51	50	50.8
3DH3	26	26	26	26	26	26
3DH5	17	17	17	17	17	17

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

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



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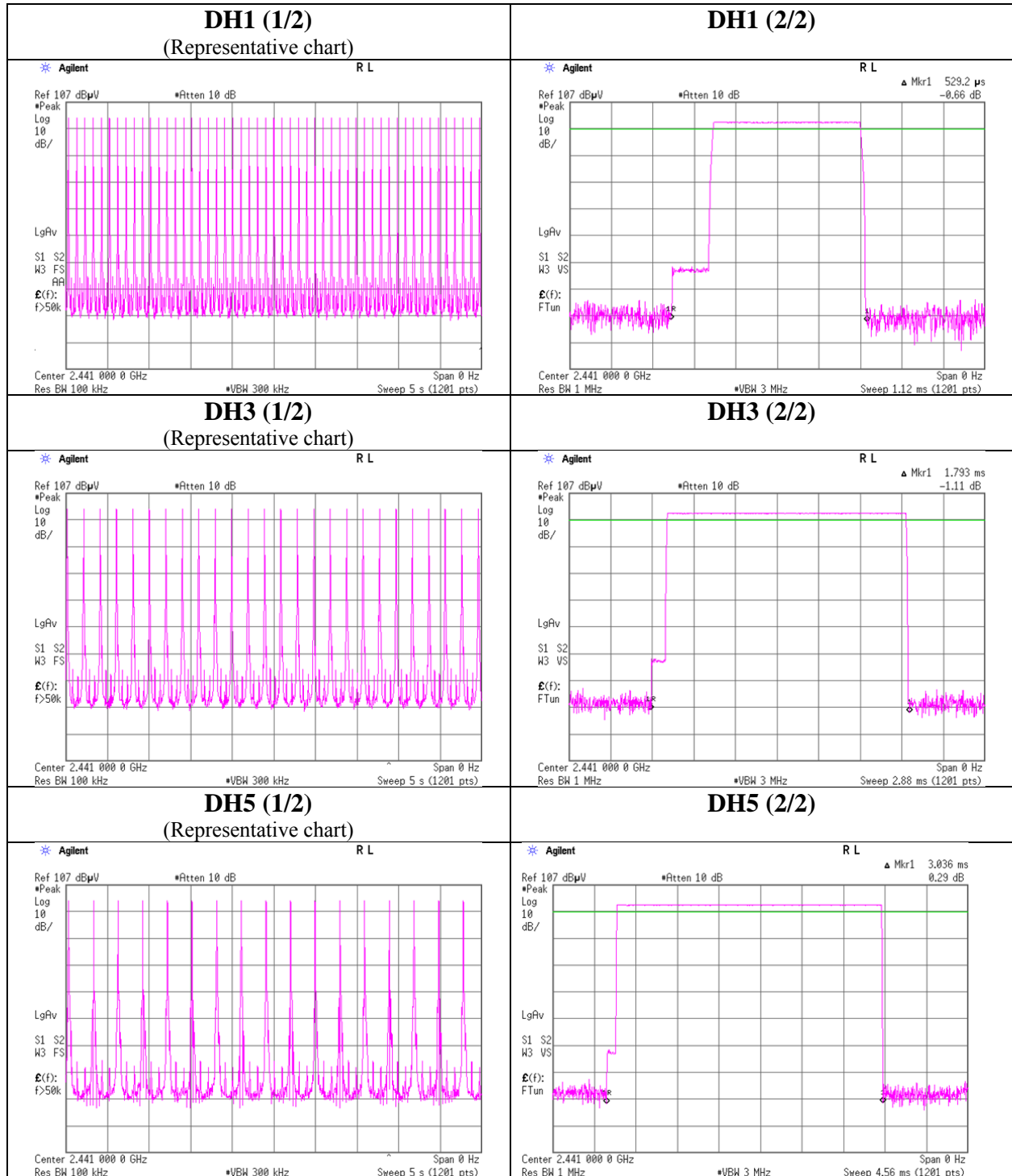
**Head Office EMC Lab.**

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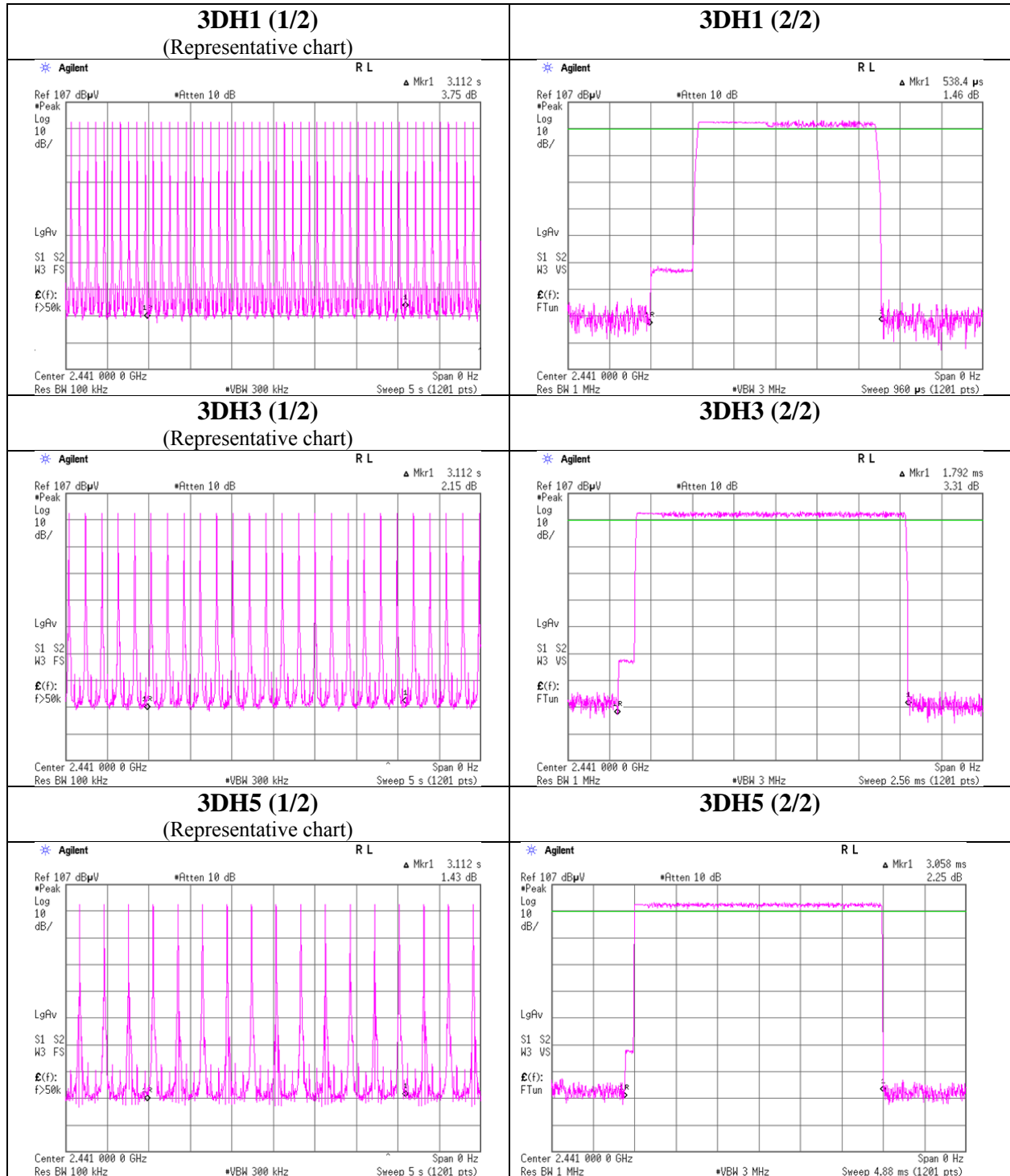
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**Dwell time**



**Dwell time**



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### Maximum Peak Output Power

Test place : Head Office EMC Lab. No.6 Measurement Room  
 Report No. : 10171657H  
 Date : 01/15/2014  
 Temperature/ Humidity : 20 deg. C/ 48% RH  
 Engineer : Masatoshi Nishiguchi  
 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	-6.06	0.80	10.01	4.75	2.99	20.96	125	16.21
DH5	2441.0	-6.08	0.80	10.01	4.73	2.97	20.96	125	16.23
DH5	2480.0	-6.01	0.80	10.01	4.80	3.02	20.96	125	16.16
2DH5	2402.0	-5.96	0.80	10.01	4.85	3.05	20.96	125	16.11
2DH5	2441.0	-6.04	0.80	10.01	4.77	3.00	20.96	125	16.19
2DH5	2480.0	-6.17	0.80	10.01	4.64	2.91	20.96	125	16.32
3DH5	2402.0	-5.78	0.80	10.01	5.03	3.18	20.96	125	15.93
3DH5	2441.0	-5.86	0.80	10.01	4.95	3.13	20.96	125	16.01
3DH5	2480.0	-5.98	0.80	10.01	4.83	3.04	20.96	125	16.13
Inquiry	2441.0	-6.49	0.80	10.01	4.32	2.70	20.96	125	16.64

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.

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

Test place                      Head Office EMC Lab. No.6 Measurement Room  
Report No.                      10171657H  
Date                              01/15/2014  
Temperature/ Humidity        20 deg. C/ 48% RH  
Engineer                        Masatoshi Nishiguchi  
Mode                              Tx (Hopping off) DH5/2DH5/3DH5/Inquiry

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
					[dBm]	[mW]
DH5	2402.0	-7.38	0.80	10.01	3.43	2.20
DH5	2441.0	-7.41	0.80	10.01	3.40	2.19
DH5	2480.0	-7.39	0.80	10.01	3.42	2.20
2DH5	2402.0	-9.13	0.80	10.01	1.68	1.47
2DH5	2441.0	-9.23	0.80	10.01	1.58	1.44
2DH5	2480.0	-9.46	0.80	10.01	1.35	1.36
3DH5	2402.0	-9.14	0.80	10.01	1.67	1.47
3DH5	2441.0	-9.24	0.80	10.01	1.57	1.44
3DH5	2480.0	-9.48	0.80	10.01	1.33	1.36
Inquiry	2441.0	-14.75	0.80	10.01	-3.94	0.40

Sample Calculation:  
Result = Reading + Cable Loss + Attenuator

### Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2&No.3 Semi Anechoic Chamber  
Report No. : 10171657H  
Date : 02/05/2014      02/10/2014      02/10/2014 night  
Temperature/ Humidity : 22 deg. C/ 40% RH      20 deg. C/ 38% RH      24 deg. C/ 30% RH  
Engineer : Kazuya Yoshioka      Kazuya Yoshioka      Takumi Shimada  
(1-10GHz)      (30-1000MHz)      (10-26.5GHz)  
Mode : Tx, DH5 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Hori.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Hori.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Hori.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Hori.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Hori.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Hori.	1602.001	PK	57.4	25.4	2.4	35.2	50.0	73.9	23.9	
Hori.	2390.000	PK	44.6	26.8	3.0	34.7	39.7	73.9	34.2	
Hori.	4804.000	PK	54.7	30.6	5.4	33.9	56.8	73.9	17.1	
Hori.	7206.000	PK	43.8	35.5	6.5	33.7	52.1	73.9	21.8	
Hori.	9608.000	PK	43.2	38.1	7.2	34.4	54.1	73.9	19.8	
Vert.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Vert.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Vert.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Vert.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Vert.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Vert.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Vert.	1602.019	PK	60.5	25.4	2.4	35.2	53.1	73.9	20.8	
Vert.	2390.000	PK	44.5	26.8	3.0	34.7	39.6	73.9	34.3	
Vert.	4804.000	PK	58.7	30.6	5.4	33.9	60.8	73.9	13.1	
Vert.	7206.000	PK	42.7	35.5	6.5	33.7	51.0	73.9	22.9	
Vert.	9608.000	PK	43.4	38.1	7.2	34.4	54.3	73.9	19.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)  
Distance factor:      10GHz-26.5GHz      20log(3.0m/1.0m)= 9.5dB  
                                  26.5GHz-40GHz      20log(3.0m/0.5m)=15.6dB

#### **Dwell time factor relaxation**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1602.001	AV	55.8	25.4	2.4	35.2	-23.5	24.8	53.9	29.1	
Hori.	2390.000	AV	32.5	26.8	3.0	34.7	-23.5	4.0	53.9	49.9	
Hori.	4804.000	AV	47.5	30.6	5.4	33.9	-23.5	26.1	53.9	27.8	
Hori.	7206.000	AV	30.8	35.5	6.5	33.7	-23.5	15.6	53.9	38.3	
Hori.	9608.000	AV	31.6	38.1	7.2	34.4	-23.5	19.0	53.9	34.9	
Vert.	1602.019	AV	59.2	25.4	2.4	35.2	-23.5	28.3	53.9	25.6	
Vert.	2390.000	AV	32.4	26.8	3.0	34.7	-23.5	4.0	53.9	49.9	
Vert.	4804.000	AV	52.1	30.6	5.4	33.9	-23.5	30.7	53.9	23.3	
Vert.	7206.000	AV	30.8	35.5	6.5	33.7	-23.5	15.6	53.9	38.3	
Vert.	9608.000	AV	31.6	38.1	7.2	34.4	-23.5	19.0	53.9	34.9	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Dwell(time)factor  
Distance factor:      10GHz-26.5GHz      20log(3.0m/1.0m)= 9.5dB  
                                  26.5GHz-40GHz      20log(3.0m/0.5m)=15.6dB

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	96.5	26.8	3.0	34.7	91.6	-	-	
Hori.	2400.000	PK	55.9	26.8	3.0	34.7	51.0	71.6	20.6	
Vert.	2402.000	PK	94.9	26.8	3.0	34.7	90.0	-	-	
Vert.	2400.000	PK	55.9	26.8	3.0	34.7	51.0	70.0	19.0	

Ant Factor + Loss (Cable) - Gain(Amplifier)

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## Radiated Spurious Emission

Test place Head Office EMC Lab. No.2&No.3 Semi Anechoic Chamber  
Report No. 10171657H  
Date 02/05/2014 02/10/2014 02/10/2014 night  
Temperature/ Humidity 22 deg.C/ 40% RH 20 deg.C/ 38% RH 24 deg.C/ 30% RH  
Engineer Kazuya Yoshioka Kazuya Yoshioka Takumi Shimada  
(1-10GHz) (30-1000MHz) (10-26.5GHz)  
Mode Tx, DH5 2441MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Hori.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Hori.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Hori.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Hori.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Hori.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Hori.	1626.684	PK	51.2	25.5	2.5	35.2	44.0	73.9	29.9	
Hori.	4882.000	PK	57.2	30.9	5.4	33.9	59.6	73.9	14.3	
Hori.	7323.000	PK	42.6	35.7	6.6	33.8	51.1	73.9	22.8	
Hori.	9764.000	PK	43.5	38.4	7.3	34.5	54.7	73.9	19.2	
Vert.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Vert.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Vert.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Vert.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Vert.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Vert.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Vert.	1626.707	PK	54.4	25.5	2.5	35.2	47.2	73.9	26.7	
Vert.	4882.000	PK	60.2	30.9	5.4	33.9	62.6	73.9	11.3	
Vert.	7323.000	PK	42.6	35.7	6.6	33.8	51.1	73.9	22.8	
Vert.	9764.000	PK	43.7	38.4	7.3	34.5	54.9	73.9	19.0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)  
Distance factor:  
10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

### Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1626.684	AV	47.7	25.5	2.5	35.2	-23.5	16.9	53.9	37.0	
Hori.	4882.000	AV	52.5	30.9	5.4	33.9	-23.5	31.3	53.9	22.6	
Hori.	7323.000	AV	30.8	35.7	6.6	33.8	-23.5	15.8	53.9	38.1	
Hori.	9764.000	AV	32.1	38.4	7.3	34.5	-23.5	19.8	53.9	34.1	
Vert.	1626.707	AV	51.6	25.5	2.5	35.2	-23.5	20.9	53.9	33.0	
Vert.	4882.000	AV	55.8	30.9	5.4	33.9	-23.5	34.7	53.9	19.3	
Vert.	7323.000	AV	30.8	35.7	6.6	33.8	-23.5	15.8	53.9	38.1	
Vert.	9764.000	AV	32.1	38.4	7.3	34.5	-23.5	19.8	53.9	34.1	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Dwell(time)factor  
Distance factor:  
10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

**UL Japan, Inc.**

**Head Office EMC Lab.**

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## Radiated Spurious Emission

Test place Head Office EMC Lab. No.2&No.3 Semi Anechoic Chamber  
Report No. 10171657H  
Date 02/05/2014 02/10/2014 02/10/2014 night  
Temperature/ Humidity 22 deg.C/ 40% RH 20 deg.C/ 38% RH 24 deg.C/ 30% RH  
Engineer Kazuya Yoshioka Kazuya Yoshioka Takumi Shimada  
(1-10GHz) (30-1000MHz) (10-26.5GHz)  
Mode Tx, DH5 2480MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Hori.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Hori.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Hori.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Hori.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Hori.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Hori.	1652.631	PK	51.3	25.6	2.5	35.2	44.2	73.9	29.7	
Hori.	2483.500	PK	47.0	26.7	3.1	34.7	42.1	73.9	31.8	
Hori.	4960.000	PK	57.5	31.1	5.4	34.0	60.0	73.9	13.9	
Hori.	7440.000	PK	43.4	35.9	6.6	33.9	52.0	73.9	21.9	
Hori.	9920.000	PK	43.5	38.7	7.3	34.5	55.0	73.9	18.9	
Vert.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Vert.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Vert.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Vert.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Vert.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Vert.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Vert.	1652.659	PK	54.3	25.6	2.5	35.2	47.2	73.9	26.7	
Vert.	2483.500	PK	48.1	26.7	3.1	34.7	43.2	73.9	30.7	
Vert.	4960.000	PK	60.0	31.1	5.4	34.0	62.5	73.9	11.4	
Vert.	7440.000	PK	42.5	35.9	6.6	33.9	51.1	73.9	22.8	
Vert.	9920.000	PK	43.2	38.7	7.3	34.5	54.7	73.9	19.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)  
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

### Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1652.631	AV	47.6	25.6	2.5	35.2	-23.5	16.9	53.9	37.0	
Hori.	2483.500	AV	35.1	26.7	3.1	34.7	-23.5	6.7	53.9	47.2	
Hori.	4960.000	AV	53.0	31.1	5.4	34.0	-23.5	32.0	53.9	21.9	
Hori.	7440.000	AV	31.2	35.9	6.6	33.9	-23.5	16.3	53.9	37.6	
Hori.	9920.000	AV	31.6	38.7	7.3	34.5	-23.5	19.5	53.9	34.4	
Vert.	1652.659	AV	51.8	25.6	2.5	35.2	-23.5	21.2	53.9	32.7	
Vert.	2483.500	AV	44.5	26.7	3.1	34.7	-23.5	16.1	53.9	37.9	
Vert.	4960.000	AV	55.7	31.1	5.4	34.0	-23.5	34.7	53.9	19.2	
Vert.	7440.000	AV	31.2	35.9	6.6	33.9	-23.5	16.3	53.9	37.6	
Vert.	9920.000	AV	31.7	38.7	7.3	34.5	-23.5	19.6	53.9	34.3	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Dwell(time)factor  
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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## Radiated Spurious Emission

Test place Head Office EMC Lab. No.2&No.3 Semi Anechoic Chamber  
Report No. 10171657H  
Date 02/05/2014 02/10/2014 02/10/2014 night  
Temperature/ Humidity 22 deg.C/ 40% RH 20 deg.C/ 38% RH 24 deg.C/ 30% RH  
Engineer Kazuya Yoshioka Kazuya Yoshioka Takumi Shimada  
(1-10GHz) (30-1000MHz) (10-26.5GHz)  
Mode Tx, 3DH5 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Hori.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Hori.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Hori.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Hori.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Hori.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Hori.	1601.954	PK	51.4	25.4	2.4	35.2	44.0	73.9	29.9	
Hori.	2390.000	PK	43.9	26.8	3.0	34.7	39.0	73.9	34.9	
Hori.	4804.000	PK	47.4	30.6	5.4	33.9	49.5	73.9	24.4	
Hori.	7206.000	PK	42.5	35.5	6.5	33.7	50.8	73.9	23.1	
Hori.	9608.000	PK	43.2	38.1	7.2	34.4	54.1	73.9	19.8	
Vert.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Vert.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Vert.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Vert.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Vert.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Vert.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Vert.	1601.954	PK	57.4	25.4	2.4	35.2	50.0	73.9	23.9	
Vert.	2390.000	PK	44.2	26.8	3.0	34.7	39.3	73.9	34.6	
Vert.	4804.000	PK	53.0	30.6	5.4	33.9	55.1	73.9	18.8	
Vert.	7206.000	PK	42.7	35.5	6.5	33.7	51.0	73.9	22.9	
Vert.	9608.000	PK	43.4	38.1	7.2	34.4	54.3	73.9	19.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)  
Distance factor:  
10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

### Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1601.954	AV	47.0	25.4	2.4	35.2	-23.5	16.1	53.9	37.8	
Hori.	2390.000	AV	32.5	26.8	3.0	34.7	-23.5	4.1	53.9	49.8	
Hori.	4804.000	AV	35.6	30.6	5.4	33.9	-23.5	14.1	53.9	39.8	
Hori.	7206.000	AV	30.8	35.5	6.5	33.7	-23.5	15.6	53.9	38.3	
Hori.	9608.000	AV	31.6	38.1	7.2	34.4	-23.5	19.0	53.9	34.9	
Vert.	1601.954	AV	55.8	25.4	2.4	35.2	-23.5	24.9	53.9	29.0	
Vert.	2390.000	AV	32.5	26.8	3.0	34.7	-23.5	4.1	53.9	49.8	
Vert.	4804.000	AV	40.5	30.6	5.4	33.9	-23.5	19.1	53.9	34.8	
Vert.	7206.000	AV	30.8	35.5	6.5	33.7	-23.5	15.6	53.9	38.3	
Vert.	9608.000	AV	31.6	38.1	7.2	34.4	-23.5	19.0	53.9	34.9	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Dwell(time)factor  
Distance factor:  
10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.6	26.8	3.0	34.7	89.7	-	-	
Hori.	2400.000	PK	48.1	26.8	3.0	34.7	43.2	69.7	26.5	
Vert.	2402.000	PK	94.2	26.8	3.0	34.7	89.3	-	-	100k/300k
Vert.	2400.000	PK	47.8	26.8	3.0	34.7	42.9	69.3	26.4	100k/300k

Ant Factor + Loss (Cable) - Gain(Amplifier)

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## Radiated Spurious Emission

Test place Head Office EMC Lab. No.2&No.3 Semi Anechoic Chamber  
Report No. 10171657H  
Date 02/05/2014 02/10/2014 02/10/2014 night  
Temperature/ Humidity 22 deg.C/ 40% RH 20 deg.C/ 38% RH 24 deg.C/ 30% RH  
Engineer Kazuya Yoshioka Kazuya Yoshioka Takumi Shimada  
Mode (1-10GHz) (30-1000MHz) (10-26.5GHz)  
Tx, 3DH5 2441MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Hori.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Hori.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Hori.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Hori.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Hori.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Hori.	1626.656	PK	51.2	25.5	2.5	35.2	44.0	73.9	29.9	
Hori.	4882.000	PK	51.5	30.9	5.4	33.9	53.9	73.9	20.0	
Hori.	7323.000	PK	42.6	35.7	6.6	33.8	51.1	73.9	22.8	
Hori.	9764.000	PK	43.5	38.4	7.3	34.5	54.7	73.9	19.2	
Vert.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Vert.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Vert.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Vert.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Vert.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Vert.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Vert.	1626.704	PK	55.5	25.5	2.5	35.2	48.3	73.9	25.6	
Vert.	4882.000	PK	52.2	30.9	5.4	33.9	54.6	73.9	19.3	
Vert.	7323.000	PK	42.9	35.7	6.6	33.8	51.4	73.9	22.5	
Vert.	9764.000	PK	44.1	38.4	7.3	34.5	55.3	73.9	18.6	

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

### Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1626.656	AV	47.5	25.5	2.5	35.2	-23.5	16.8	53.9	37.1	
Hori.	4882.000	AV	40.0	30.9	5.4	33.9	-23.5	18.9	53.9	35.0	
Hori.	7323.000	AV	30.8	35.7	6.6	33.8	-23.5	15.8	53.9	38.1	
Hori.	9764.000	AV	32.1	38.4	7.3	34.5	-23.5	19.8	53.9	34.1	
Vert.	1626.704	AV	53.0	25.5	2.5	35.2	-23.5	22.3	53.9	31.6	
Vert.	4882.000	AV	43.3	30.9	5.4	33.9	-23.5	22.2	53.9	31.8	
Vert.	7323.000	AV	30.8	35.7	6.6	33.8	-23.5	15.8	53.9	38.1	
Vert.	9764.000	AV	32.1	38.4	7.3	34.5	-23.5	19.8	53.9	34.1	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Dwell(time)factor

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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## Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2&No.3 Semi Anechoic Chamber		
Report No.	10171657H		
Date	02/05/2014	02/10/2014	02/10/2014 night
Temperature/ Humidity	22 deg.C/ 40% RH	20 deg.C/ 38% RH	24 deg.C/ 30% RH
Engineer	Kazuya Yoshioka	Kazuya Yoshioka	Takumi Shimada
	(1-10GHz)	(30-1000MHz)	(10-26.5GHz)
Mode	Tx, 3DH5 2480MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Hori.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Hori.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Hori.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Hori.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Hori.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Hori.	1652.661	PK	51.1	25.6	2.5	35.2	44.0	73.9	29.9	
Hori.	2483.500	PK	49.9	26.7	3.1	34.7	45.0	73.9	28.9	
Hori.	4960.000	PK	52.5	31.1	5.4	34.0	55.0	73.9	18.9	
Hori.	7440.000	PK	43.4	35.9	6.6	33.9	52.0	73.9	21.9	
Hori.	9920.000	PK	43.5	38.7	7.3	34.5	55.0	73.9	18.9	
Vert.	117.000	QP	23.1	12.5	8.2	32.1	11.7	43.5	31.8	
Vert.	130.000	QP	22.3	13.7	8.4	32.1	12.3	43.5	31.2	
Vert.	260.000	QP	22.0	17.8	9.6	32.1	17.3	46.0	28.7	
Vert.	390.000	QP	21.9	17.2	10.5	32.0	17.6	46.0	28.4	
Vert.	520.000	QP	21.7	18.4	11.3	32.1	19.3	46.0	26.7	
Vert.	650.000	QP	22.0	19.9	12.0	32.1	21.8	46.0	24.2	
Vert.	1652.597	PK	56.2	25.6	2.5	35.2	49.1	73.9	24.8	
Vert.	2483.500	PK	51.6	26.7	3.1	34.7	46.7	73.9	27.2	
Vert.	4960.000	PK	54.7	31.1	5.4	34.0	57.2	73.9	16.7	
Vert.	7440.000	PK	42.7	35.9	6.6	33.9	51.3	73.9	22.6	
Vert.	9920.000	PK	43.3	38.7	7.3	34.5	54.8	73.9	19.1	

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

### Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1652.661	AV	47.0	25.6	2.5	35.2	-23.5	16.3	53.9	37.6	
Hori.	2483.500	AV	41.5	26.7	3.1	34.7	-23.5	13.1	53.9	40.8	
Hori.	4960.000	AV	41.8	31.1	5.4	34.0	-23.5	20.8	53.9	33.1	
Hori.	7440.000	AV	31.2	35.9	6.6	33.9	-23.5	16.3	53.9	37.6	
Hori.	9920.000	AV	31.6	38.7	7.3	34.5	-23.5	19.5	53.9	34.4	
Vert.	1652.597	AV	54.2	25.6	2.5	35.2	-23.5	23.6	53.9	30.3	
Vert.	2483.500	AV	42.9	26.7	3.1	34.7	-23.5	14.4	53.9	39.5	
Vert.	4960.000	AV	44.7	31.1	5.4	34.0	-23.5	23.7	53.9	30.2	
Vert.	7440.000	AV	31.2	35.9	6.6	33.9	-23.5	16.3	53.9	37.6	
Vert.	9920.000	AV	31.7	38.7	7.3	34.5	-23.5	19.6	53.9	34.3	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Dwell(time)factor

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB  
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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**Head Office EMC Lab.**

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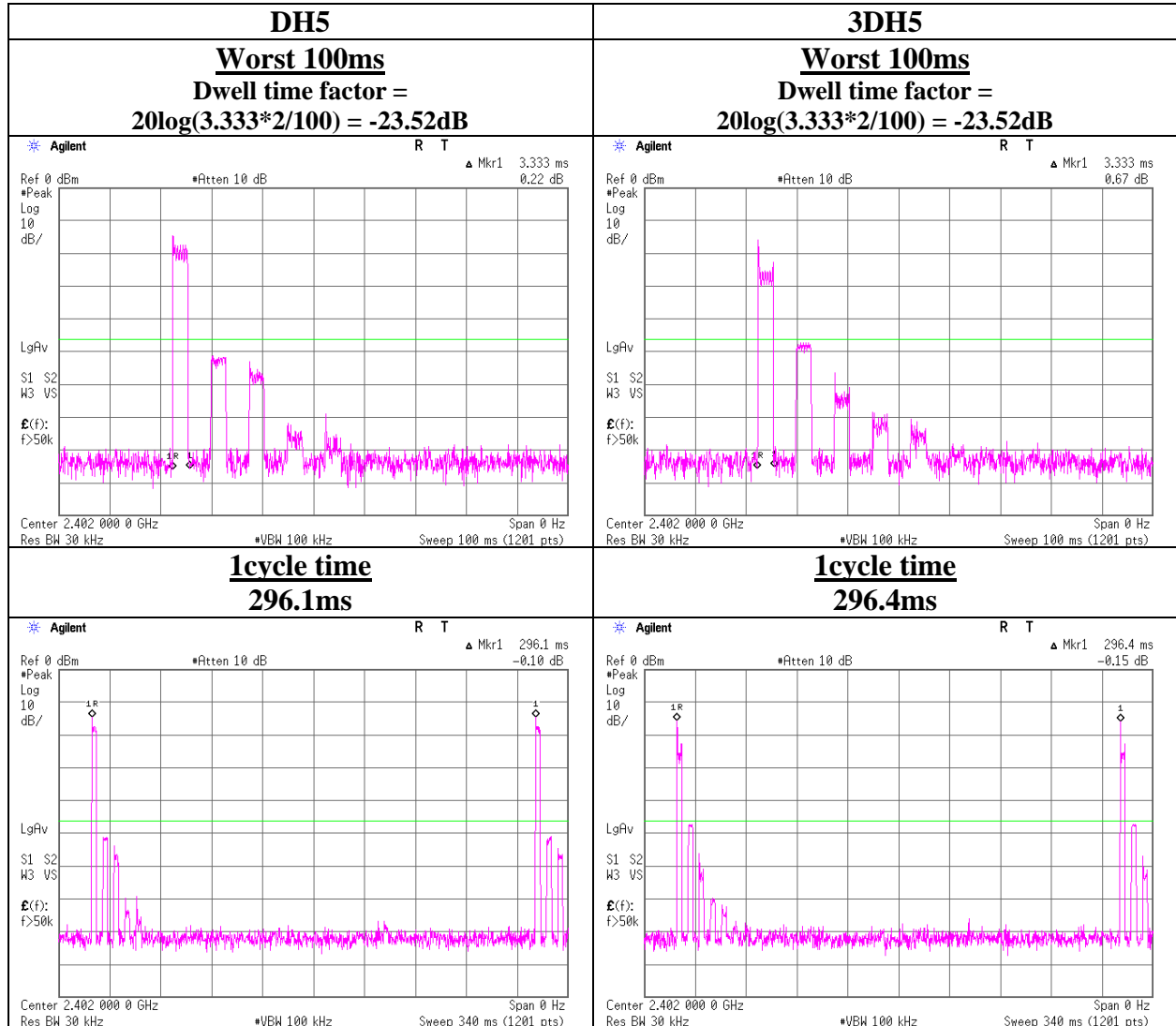
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



### Dwell time factor

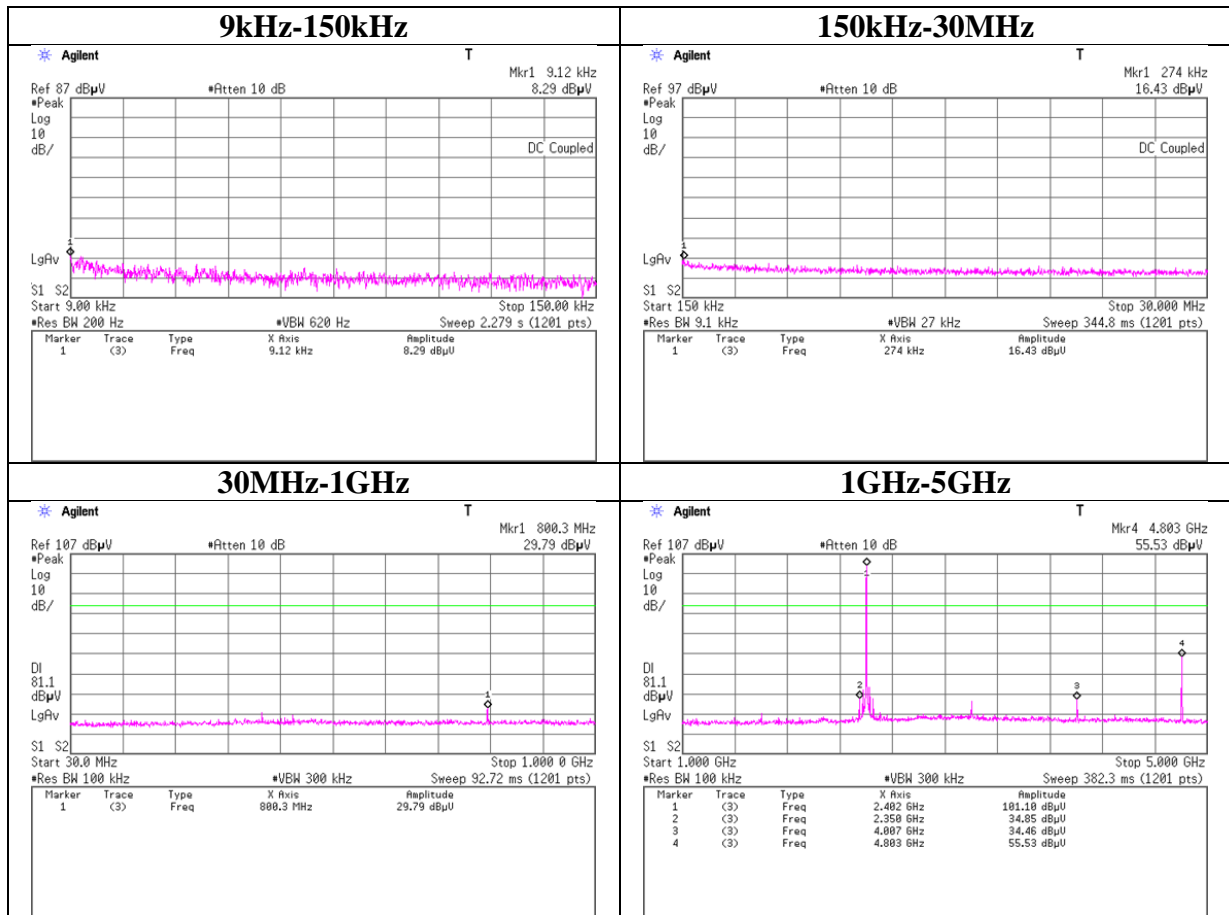
Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10171657H
Date	02/05/2014
Temperature/ Humidity	22 deg. C/ 40% RH
Engineer	Kazuya Yoshioka
Mode	Tx DH5/3DH5



## Conducted Spurious Emission

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg.C/ 32% RH
Engineer	Tsubasa Takayama
Mode	Tx DH5

### Tx DH5 2402MHz



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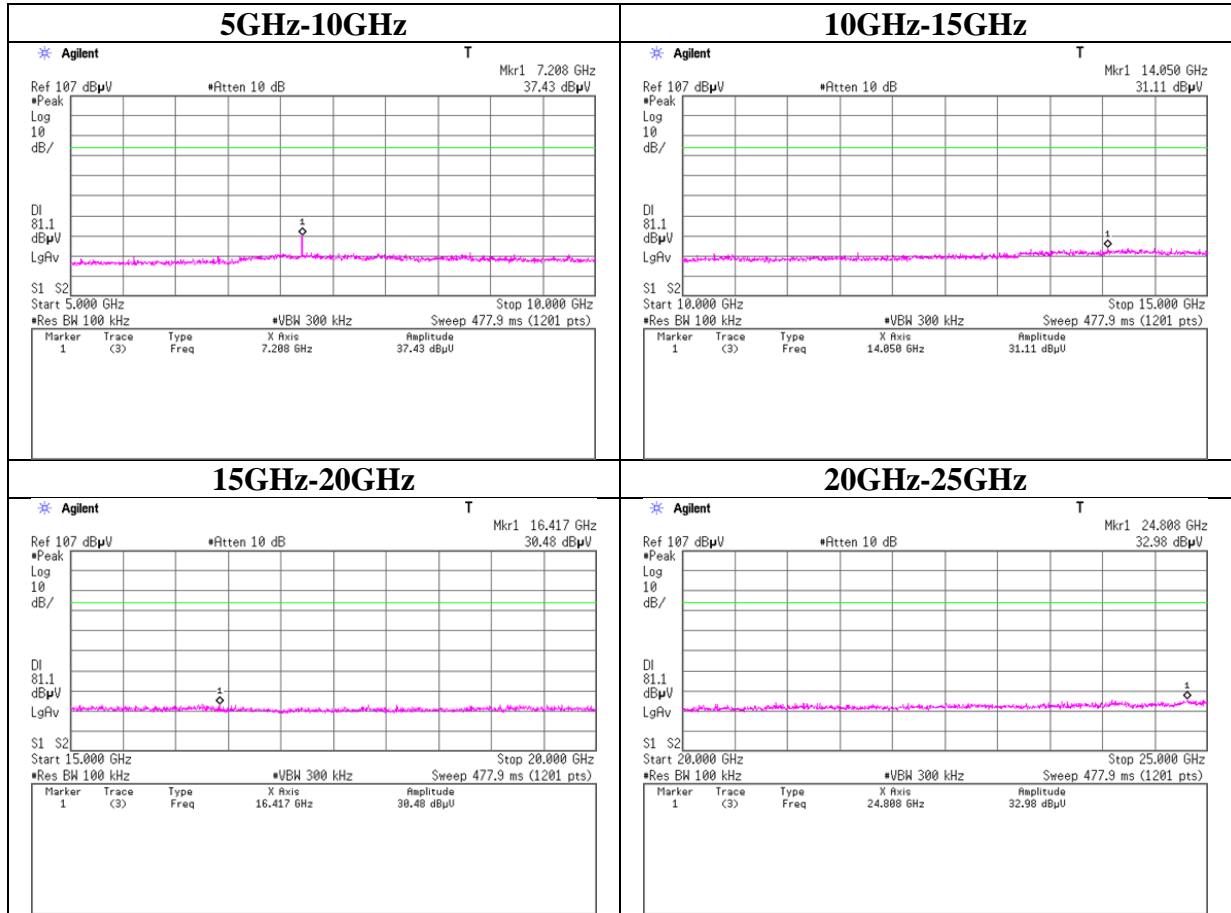
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

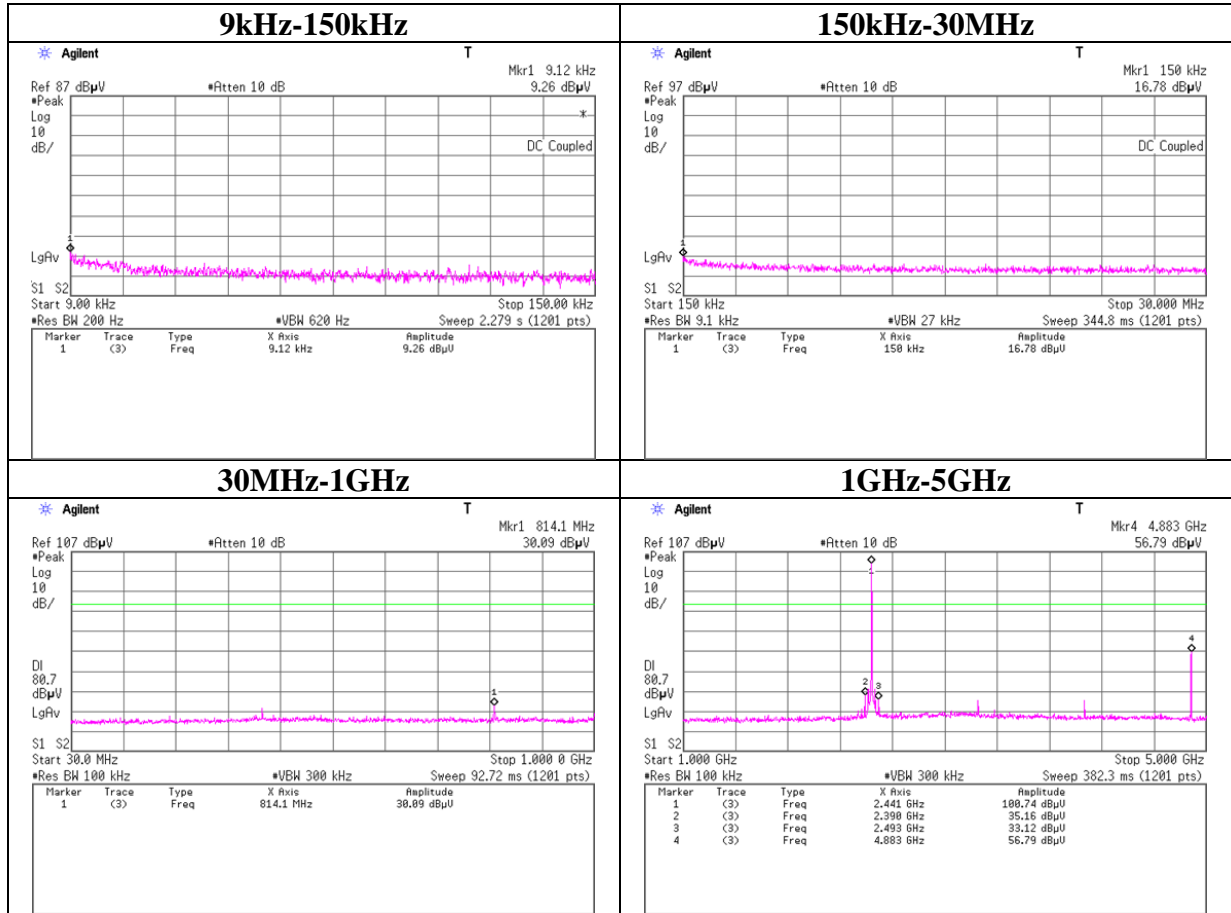
## Conducted Spurious Emission

### Tx DH5 2402MHz



## Conducted Spurious Emission

### Tx DH5 2441MHz



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**Head Office EMC Lab.**

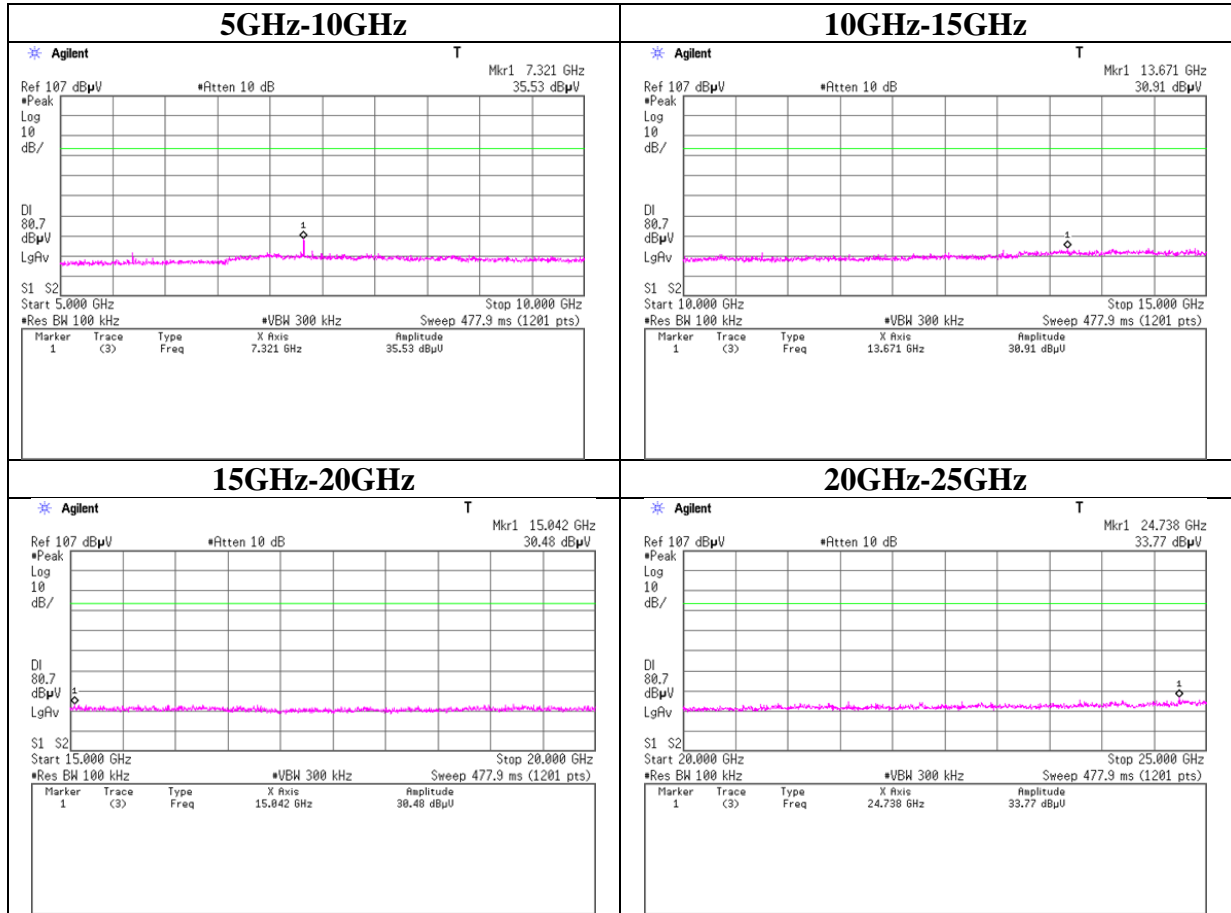
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

## Conducted Spurious Emission

### Tx DH5 2441MHz



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**Head Office EMC Lab.**

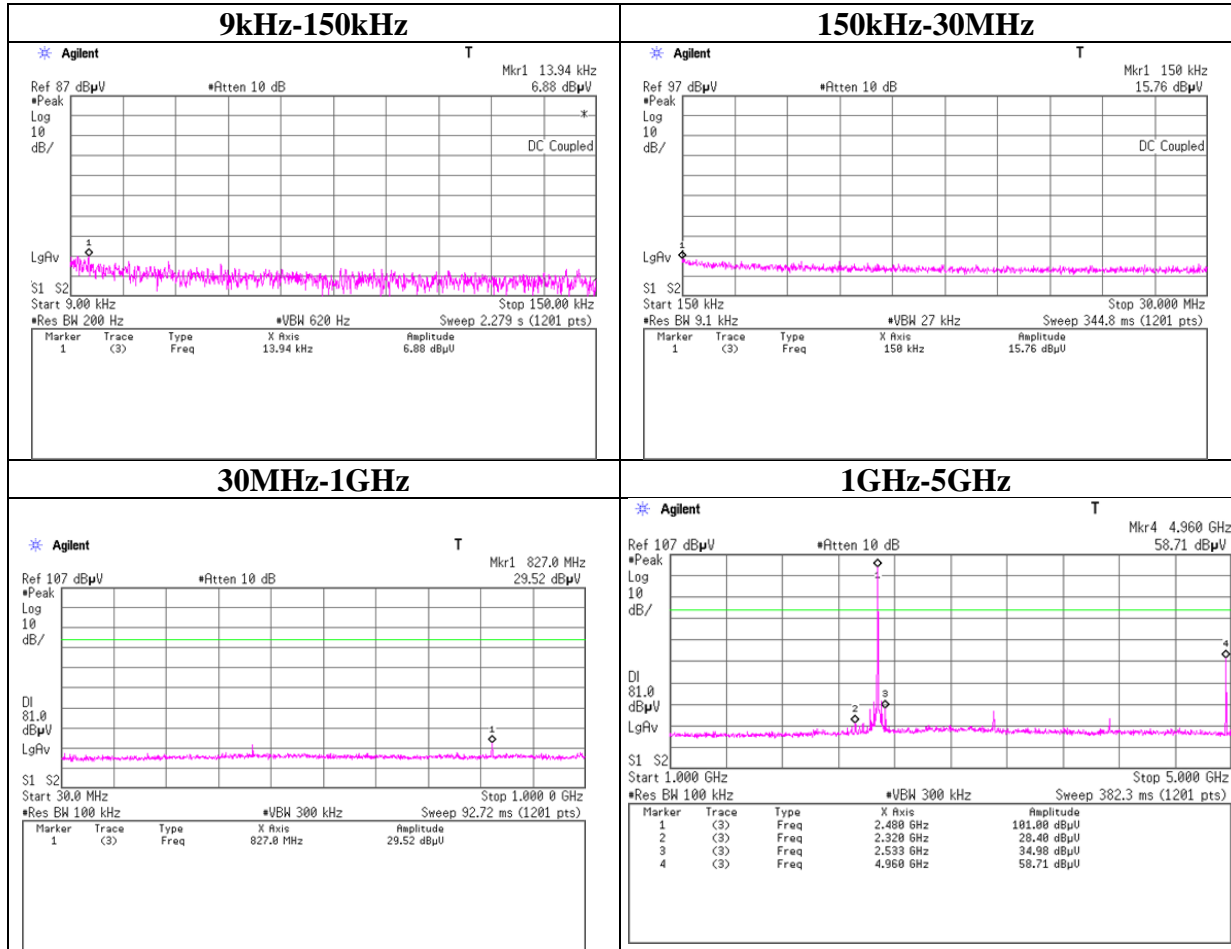
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

## Conducted Spurious Emission

### Tx DH5 2480MHz



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**Head Office EMC Lab.**

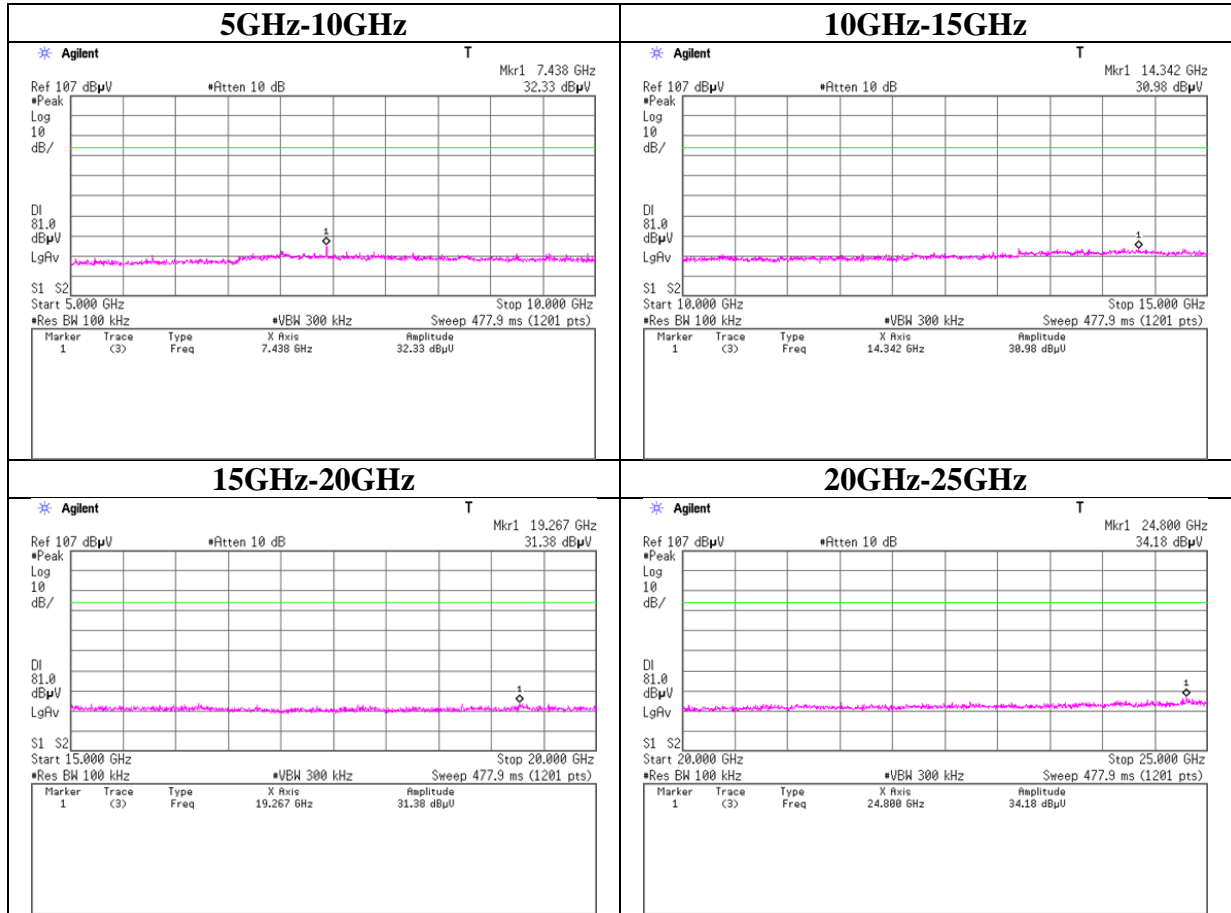
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

## Conducted Spurious Emission

### Tx DH5 2480MHz



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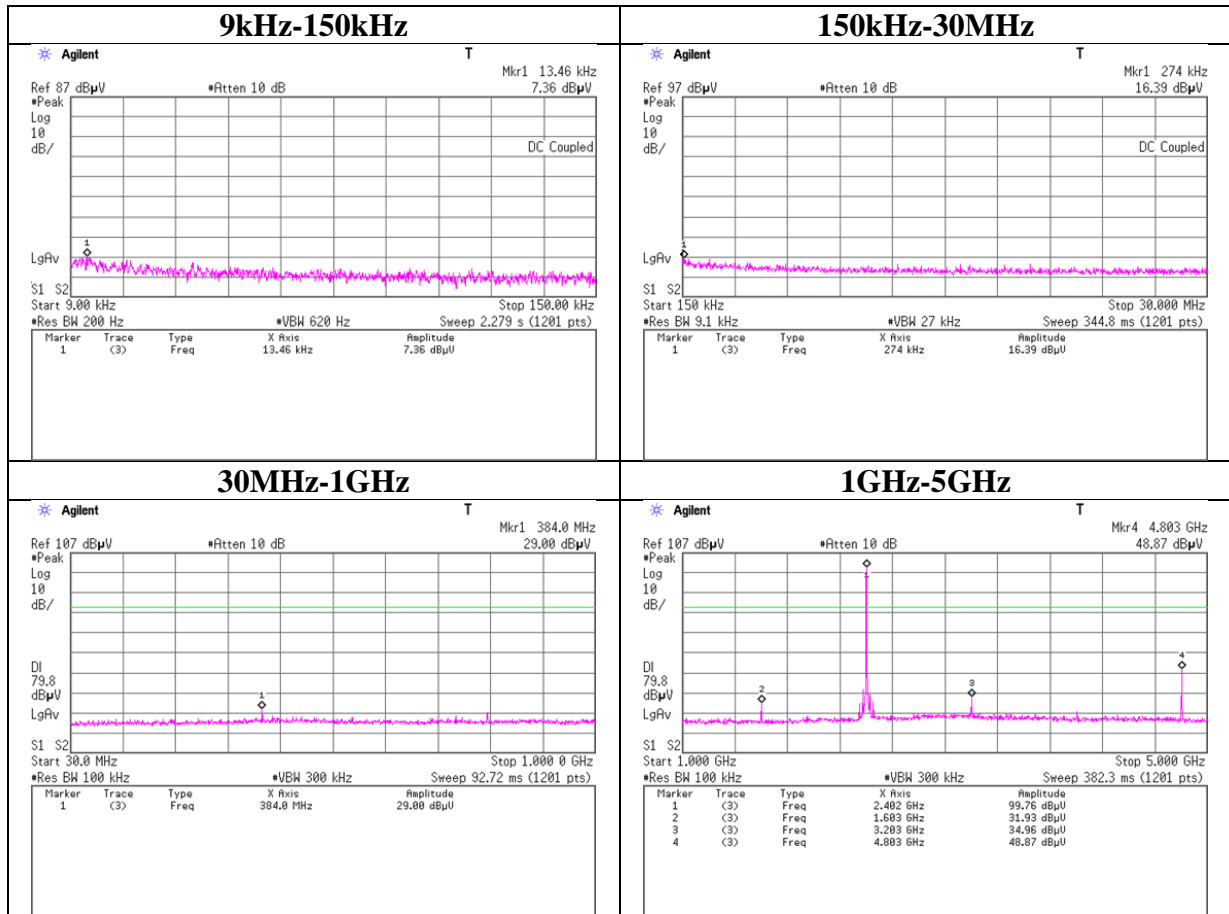
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg.C/ 32% RH
Engineer	Tsubasa Takayama
Mode	Tx 3DH5

### Tx 3DH5 2402MHz



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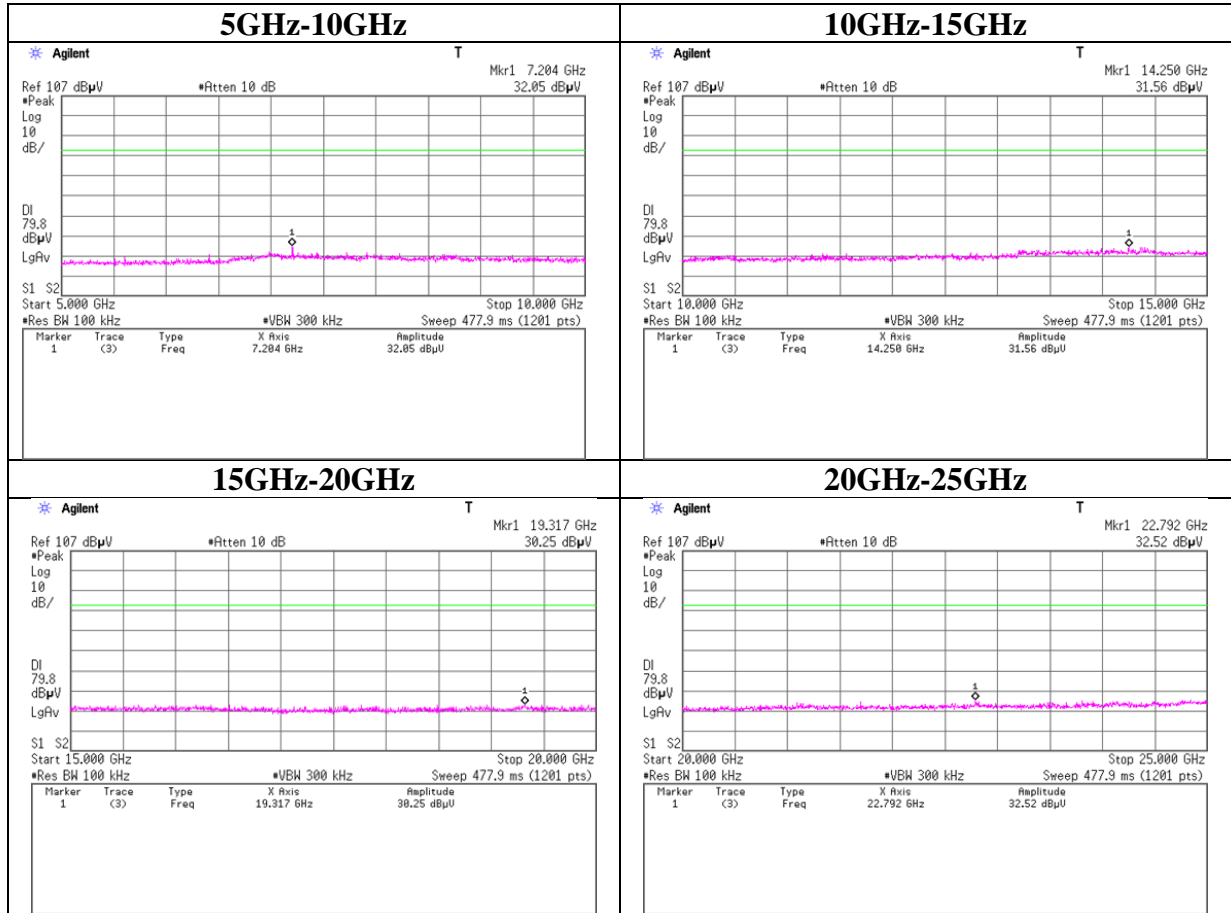
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



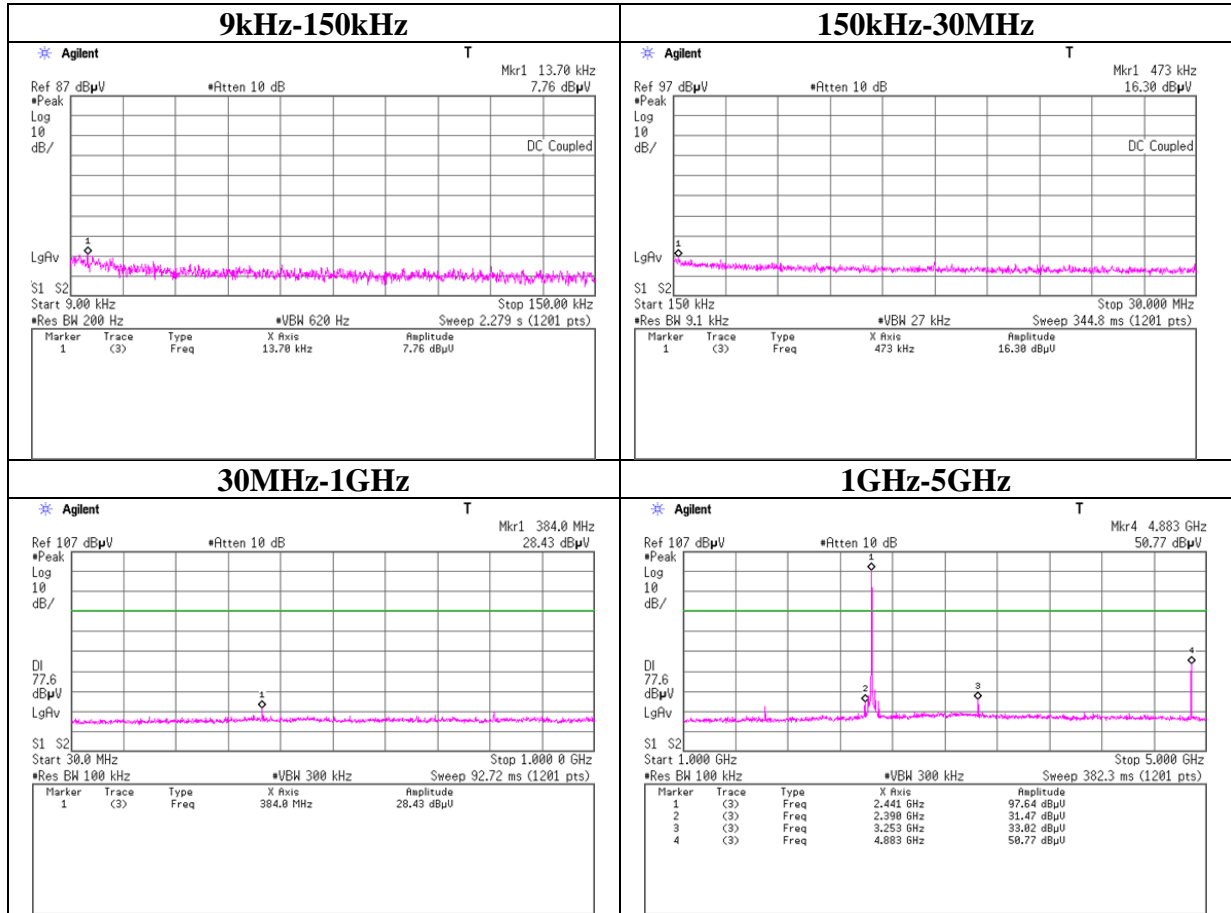
## Conducted Spurious Emission

### Tx 3DH5 2402MHz



## Conducted Spurious Emission

### Tx 3DH5 2441MHz



**UL Japan, Inc.**

**Head Office EMC Lab.**

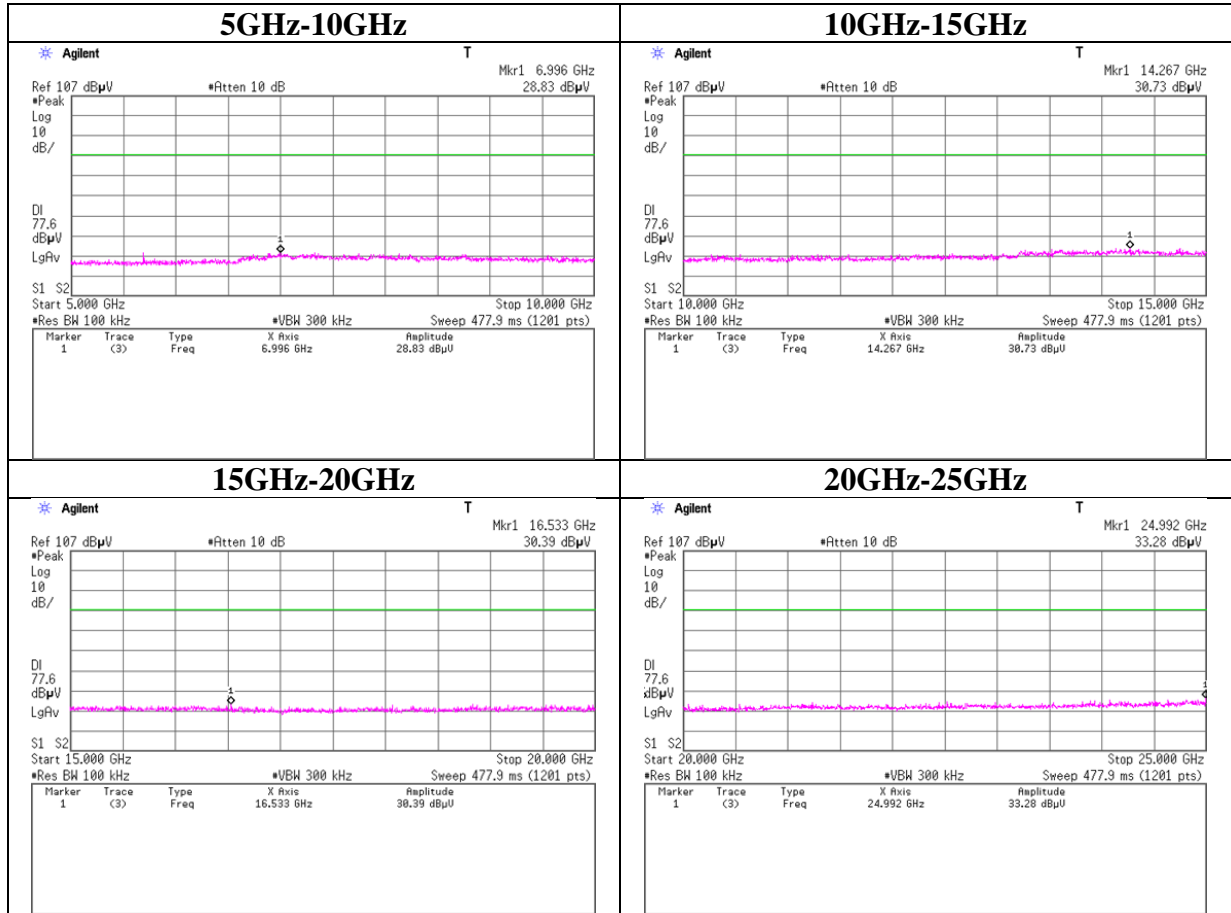
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

## Conducted Spurious Emission

### Tx 3DH5 2441MHz



**UL Japan, Inc.**

**Head Office EMC Lab.**

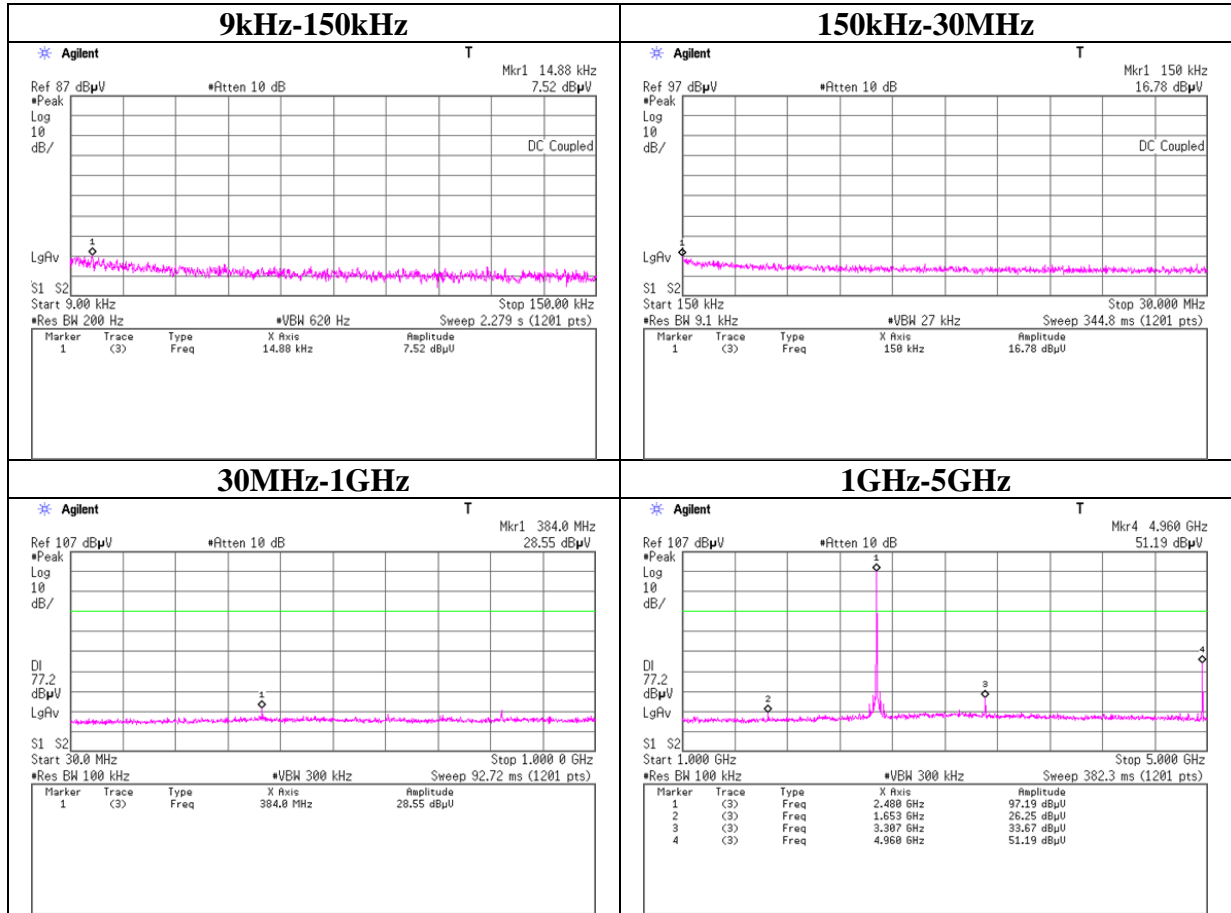
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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## Conducted Spurious Emission

### Tx 3DH5 2480MHz



**UL Japan, Inc.**

**Head Office EMC Lab.**

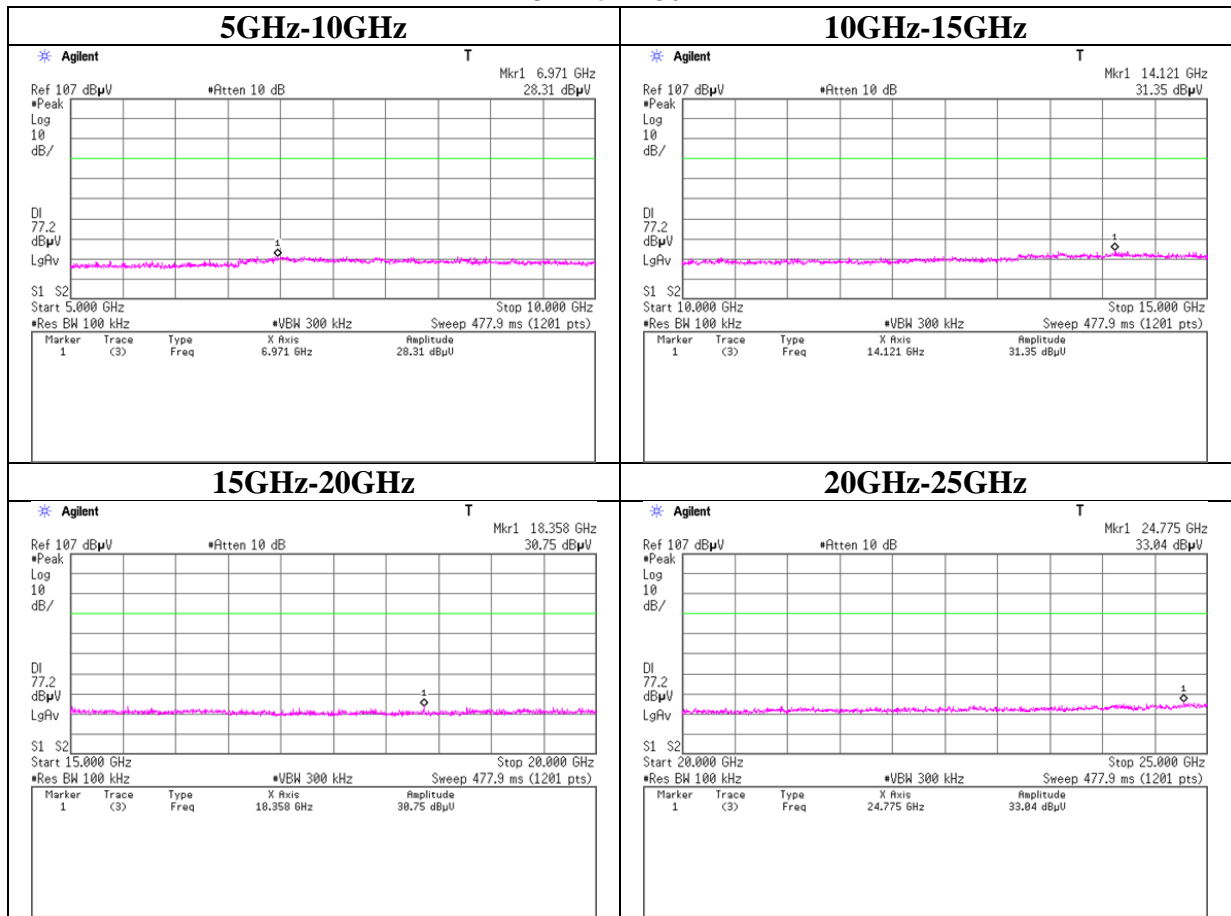
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

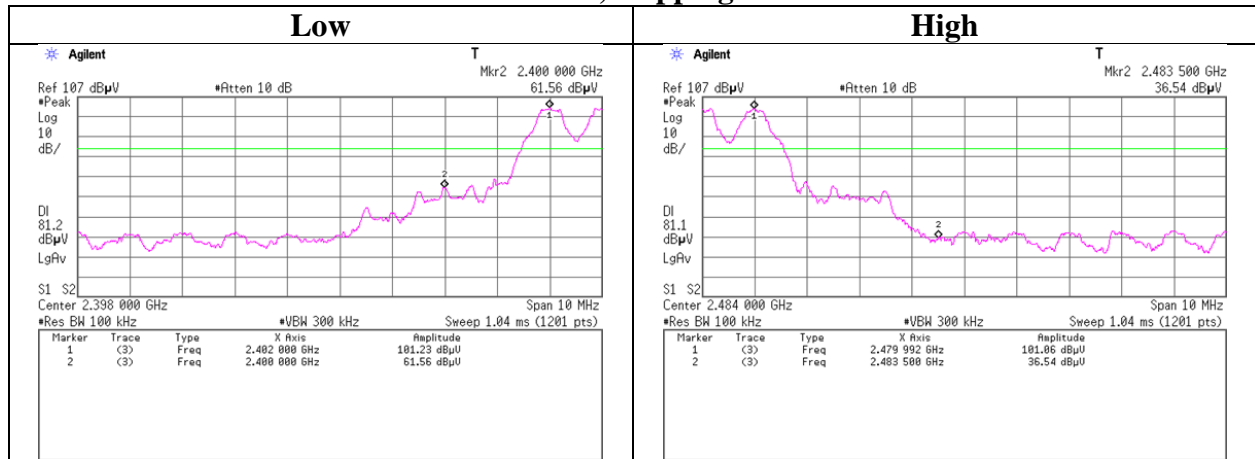
### Tx 3DH5 2480MHz



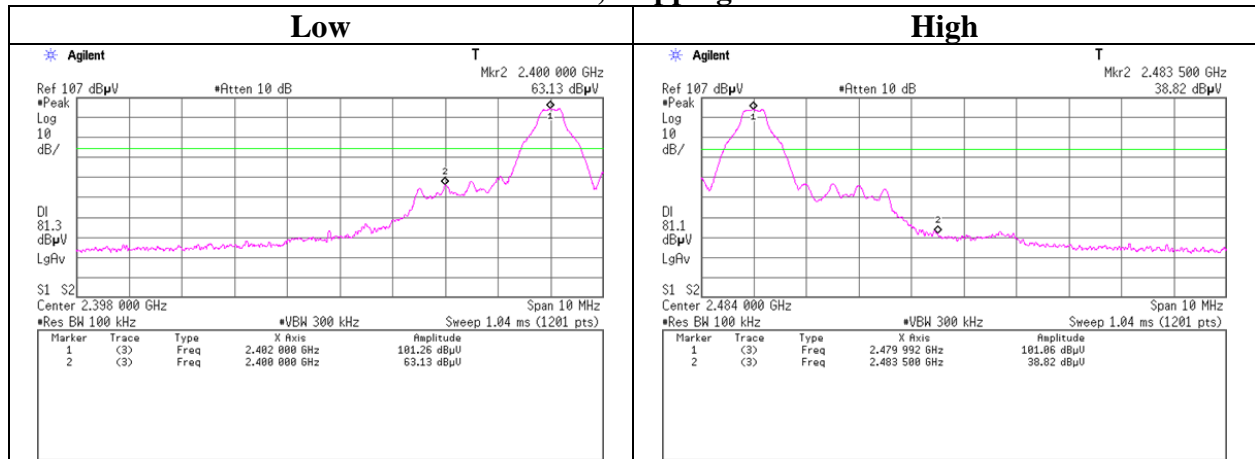
### Conducted Emission Band Edge compliance

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg.C/ 32% RH
Engineer	Tsubasa Takayama
Mode	Tx DH5 / 3DH5

#### Tx DH5, Hopping on

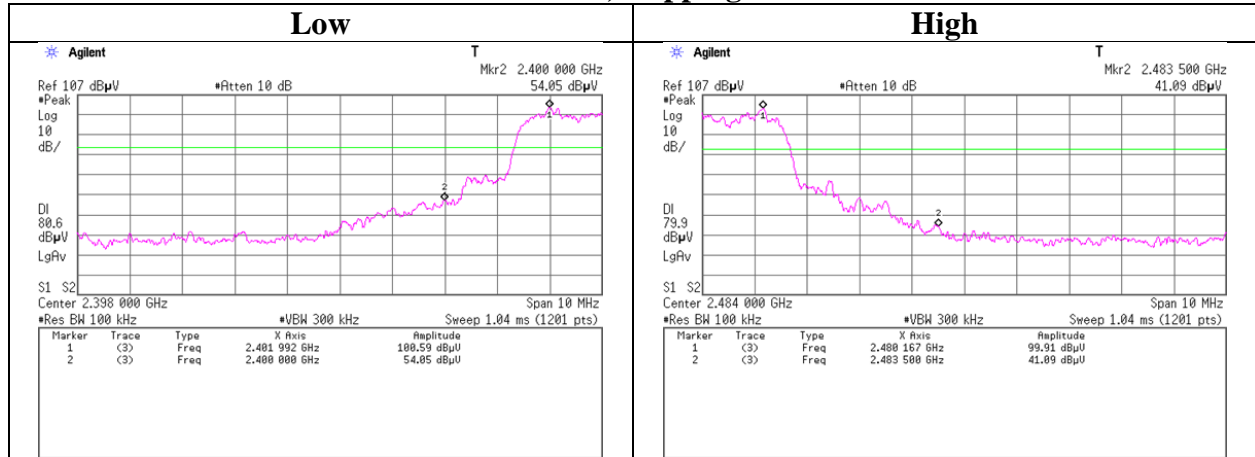


#### Tx DH5, Hopping off

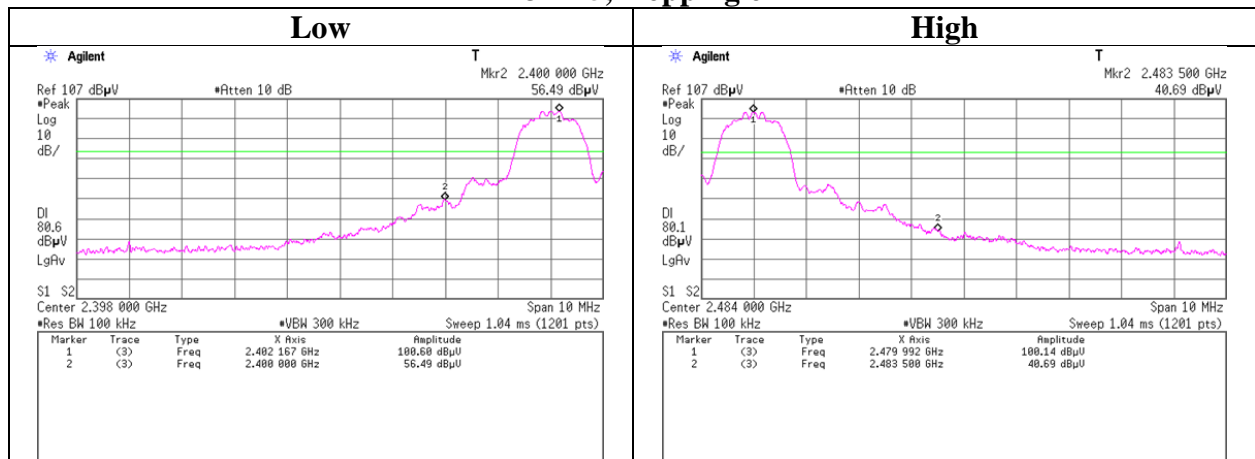


## Conducted Emission Band Edge compliance

### Tx 3DH5, Hopping on



### Tx 3DH5, Hopping off



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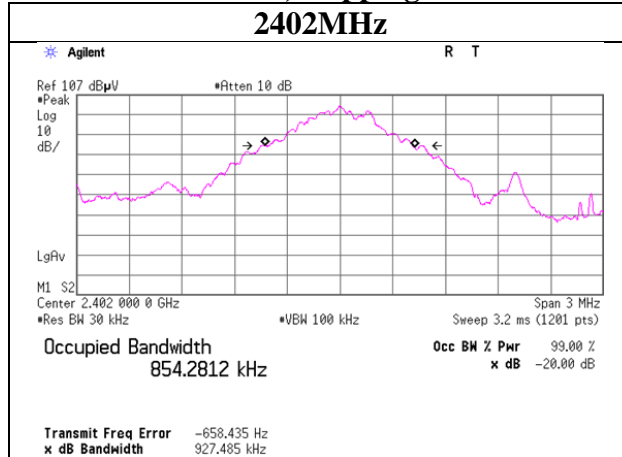
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

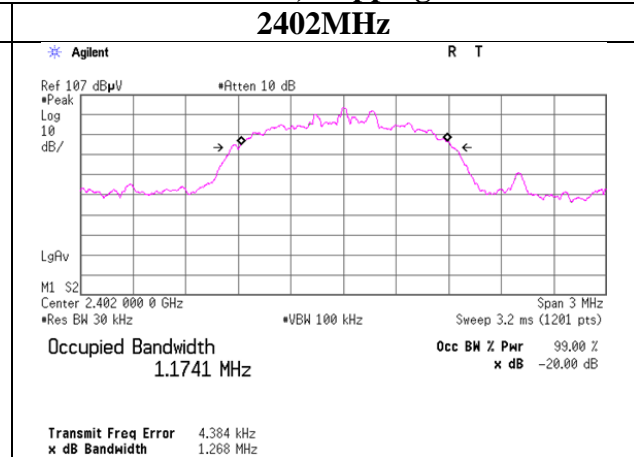
### 99% Occupied Bandwidth

Test place	Head Office EMC Lab. No.6 Measurement Room
Report No.	10171657H
Date	01/21/2014
Temperature/ Humidity	23 deg.C/ 32% RH
Engineer	Tsubasa Takayama
Mode	Tx DH5/3DH5/Inquiry

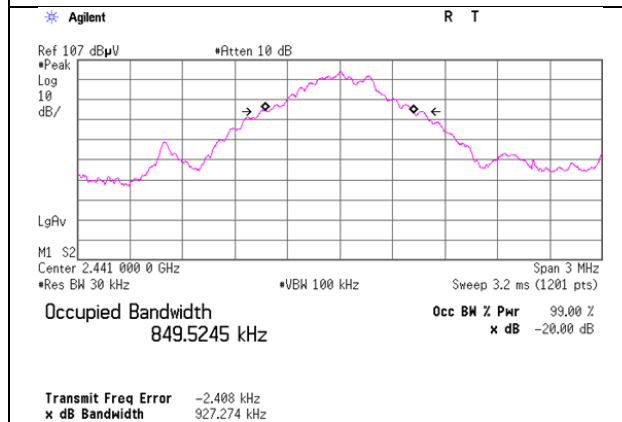
#### Tx DH5, Hopping off



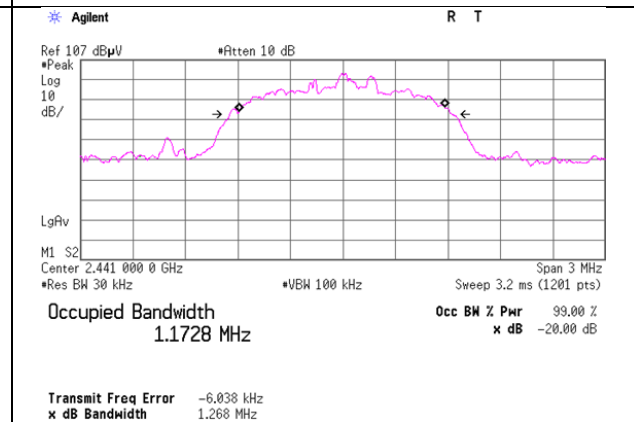
#### Tx 3DH5, Hopping off



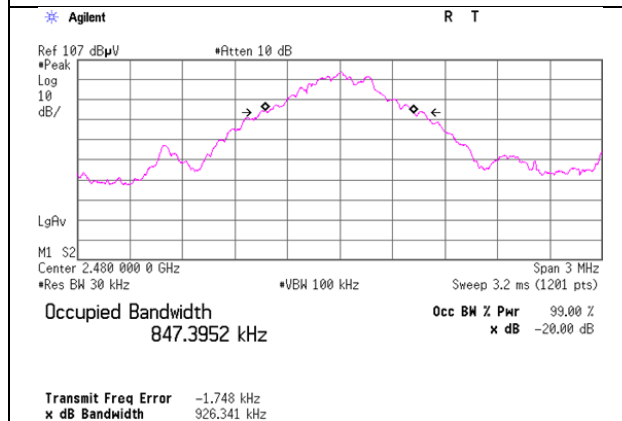
#### 2441MHz



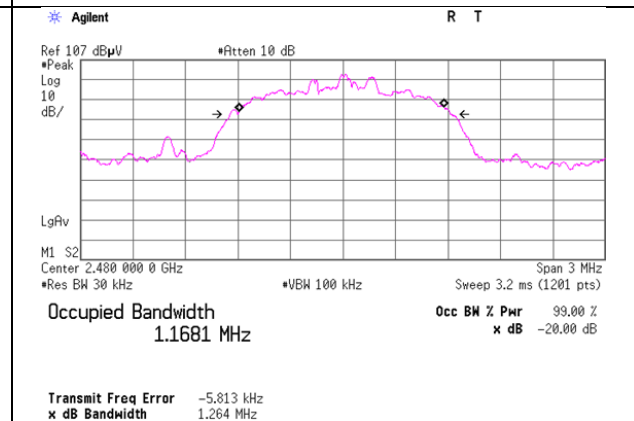
#### 2441MHz



#### 2480MHz

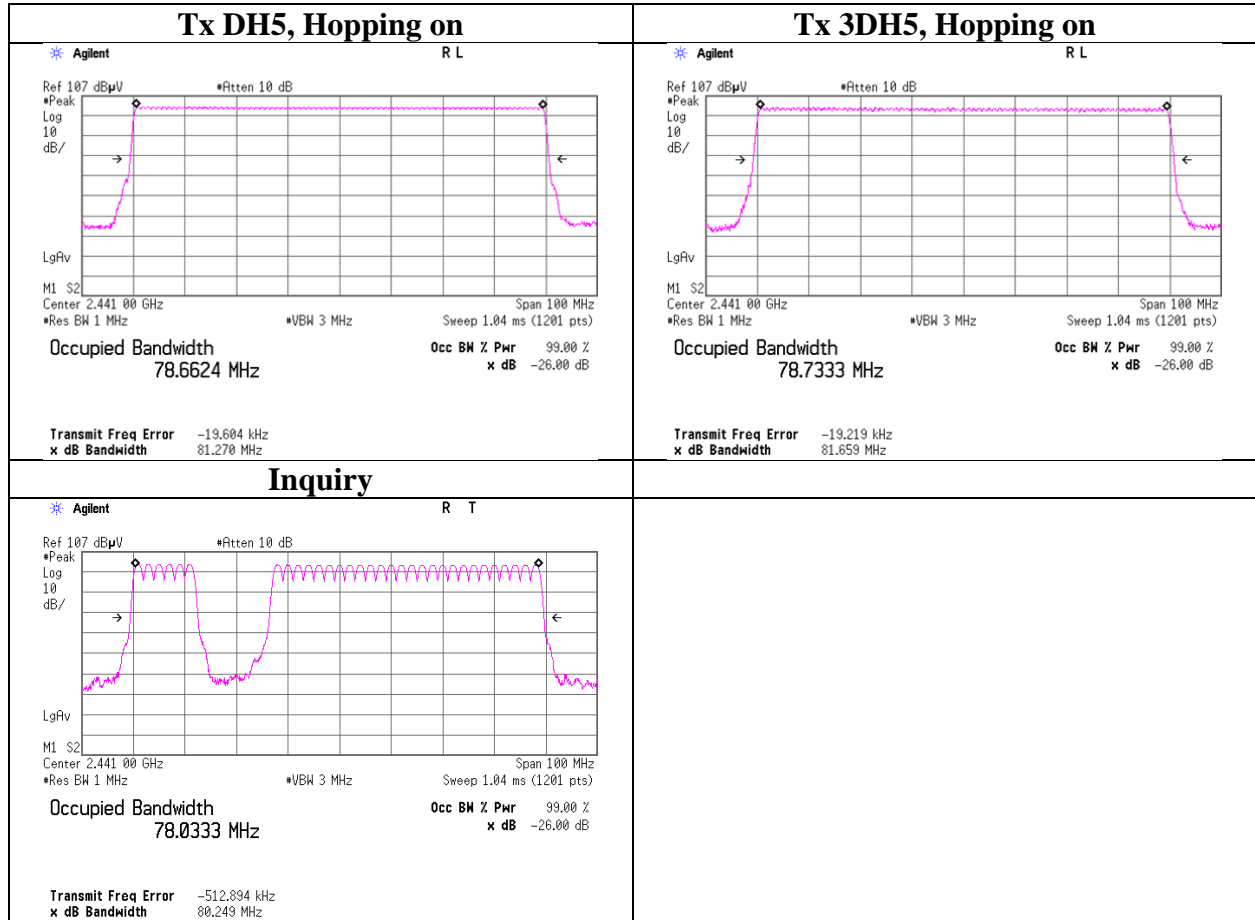


#### 2480MHz





### 99% Occupied Bandwidth



## **APPENDIX 2: Test instruments**

### **EMI test equipment (1/2)**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2013/02/26 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2013/10/21 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2013/10/21 * 12
MAT-25	Attenuator(10dB)(above1GHz)	Agilent	8493C	71642	AT	2013/06/20 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT/RE	2013/06/14 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2013/02/15 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) )/ 1311S167(5m)	RE	2013/11/27 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2013/09/01 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE/CE	2013/11/11 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(EUT)	2014/01/27 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2013/07/23 * 12

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**EMI test equipment (2/2)**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MHA-20	Horn Antenna 1- 18GHz	Schwarzbeck	BBHA9120D	258	RE	2013/05/17 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2013/09/27 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2013/03/12 * 12
MHA-16	Horn Antenna 15- 40GHz	Schwarzbeck	BBHA9170	BBHA917030 6	RE	2013/05/17 * 12
MHF-25	High Pass Filter 3.5- 18.0GHz	UL Japan	HPF SELECTOR	001	RE	2013/09/01 * 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  
RE: Radiated Emission  
AT: Antenna Terminal Conducted test**

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