




RADIO TEST REPORT


Test Report No. : 10828976H-A-R1

Applicant : FUNAI ELECTRIC CO., LTD
Type of Equipment : SOUNDBAR
Model No. : FWSB405F
FCC ID : ADTXHA00UH
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

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2. The results in this report apply only to the sample tested.
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4. The test results in this report are traceable to the national or international standards.
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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 10828976H-A. 10828976H-A is replaced with this report.

Date of test: June 16 to 23, 2015

Representative test engineer: 
Yuta Moriya
Engineer
Consumer Technology Division

Approved by: 
Takahiro Hatakeda
Leader
Consumer Technology Division



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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10828976H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10828976H-A	July 3, 2015	-	-
1	10828976H-A-R1	July 10, 2015	P.4	Correction of Clock frequency(ies) in the system of BT clock

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SECTION 1: Customer information

Company Name : FUNAI ELECTRIC CO., LTD
Address : 7-1, 7-chome, Nakagaito, Daito, Osaka 574-0013, Japan
Telephone Number : +81-6-6730-8785
Facsimile Number : +81-6-6730-8786
Contact Person : Youichi Hagiwara

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

2.1 Identification of E.U.T.

Type of Equipment : SOUNDBAR
Model No. : FWSB405F
Serial No. : Refer to Section 4, Clause 4.2
Rating : AC 120 V / 60 Hz
Receipt Date of Sample : June 11, 2015
Country of Mass-production : China
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: FWSB405F (referred to as the EUT in this report) is a SOUNDBAR.

General Specification

Clock frequency(ies) in the system : System clock:18.432 MHz, SPDIF clock: 12.288 MHz,
AUDIO DAC clock: 12.288 MHz, BT clock: 16 MHz

Radio Specification

[Bluetooth (Ver. 4.1 with EDR function)]

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : FHSS
Power Supply (radio part input) : DC 3.3 V
Antenna type : Monopole Antenna
Antenna Gain : 2.3 dBi
Antenna connector : Direct Connect

Variant model

Model No. FWSB405F has variant model: No. FWSB405FS.
These difference is only the model No..
They are identical in electronic characteristics.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

* The EUT complies with FCC Part 15 Subpart B: 2015, final revised on January 21, 2015.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4-2009 7. AC powerline conducted emission measurements IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	QP 10.6 dB, 0.15664 MHz, N AV 10.8 dB, 0.33730 MHz, N 0.33615 MHz, L	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) ----- IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) ----- IC: RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) ----- IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) ----- IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) ----- IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) ----- IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10		6.0 dB 2483.500 MHz, PK, Horizontal	Complied

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: 2009 is also referred.

FCC Part 15.31 (e)

This EUT provides stable voltage(DC 3.3 V) constantly to RF Part 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 $k = 2$.
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Test site (semi anechoic chamber)	Conducted emission Uncertainty (+/-)			
	No. 1	No. 2	No. 3	No. 4
150 kHz - 30 MHz	3.5 dB	3.5 dB	3.4 dB	3.5 dB

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

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	
0.7 dB	1.5 dB	1.5 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

Conducted Emission test

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

Radiated emission test

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

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	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

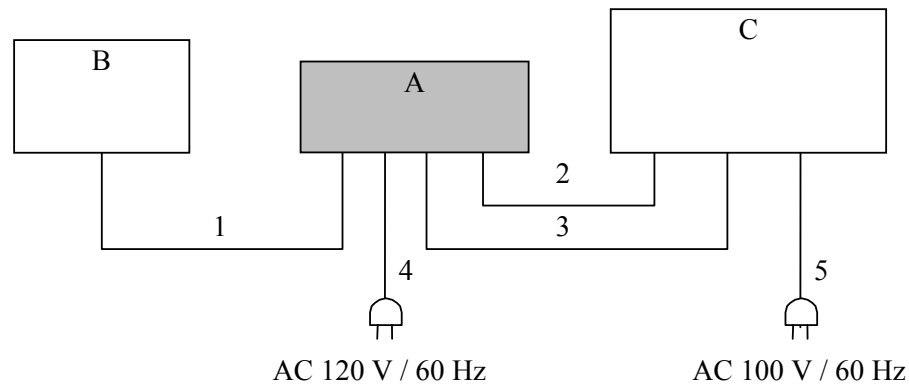
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
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 Inquiry	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
	Inquiry	2440 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5 Inquiry	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5 Inquiry	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. *EUT has the power settings by the software as follows; Power settings: 1.3dBm Software: Configuration file Version 1.1 (15/05/11) *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	SOUNDBAR	FWSB405F	2 *1) 3 *2)	FUNAI ELECTRIC CO., LTD	EUT
B	iPad	MD531J/A	F9GB34WAF196	APPLE	-
C	DVD/VCR Recorder	DXR160V	E9S23JD	FUNAI ELECTRIC CO., LTD	-

*1) Used for Conducted Emission and Radiated Spurious Emission tests.

*2) Used for Antenna Terminal Conducted tests.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Line Cable	1.0	Shielded	Shielded	-
2	Audio Cable	1.5	Shielded	Shielded	-
3	Optical Cable	2.0	Unshielded	Unshielded	-
4	AC Cable	1.5	Unshielded	Unshielded	-
5	AC Cable	1.5	Unshielded	Unshielded	-

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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

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.

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

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

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

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

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

Test Antennas are used as below;

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

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

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

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

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

The test was made on EUT at the normal use position.

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	5 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.

*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.

*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: Test data

Conducted Emission

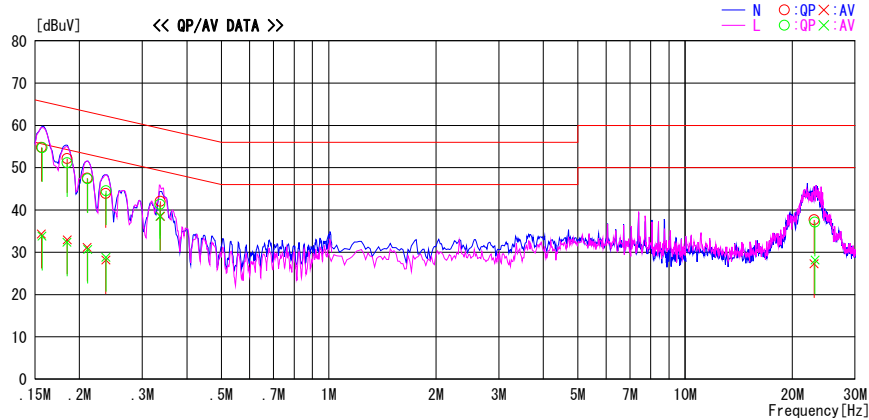
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2015/06/23

Report No. : 10828976H
 Temp./Humi. : 22deg. C / 55% RH
 Engineer : Koji Yamamoto

Mode / Remarks : Tx DH5 2402MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV

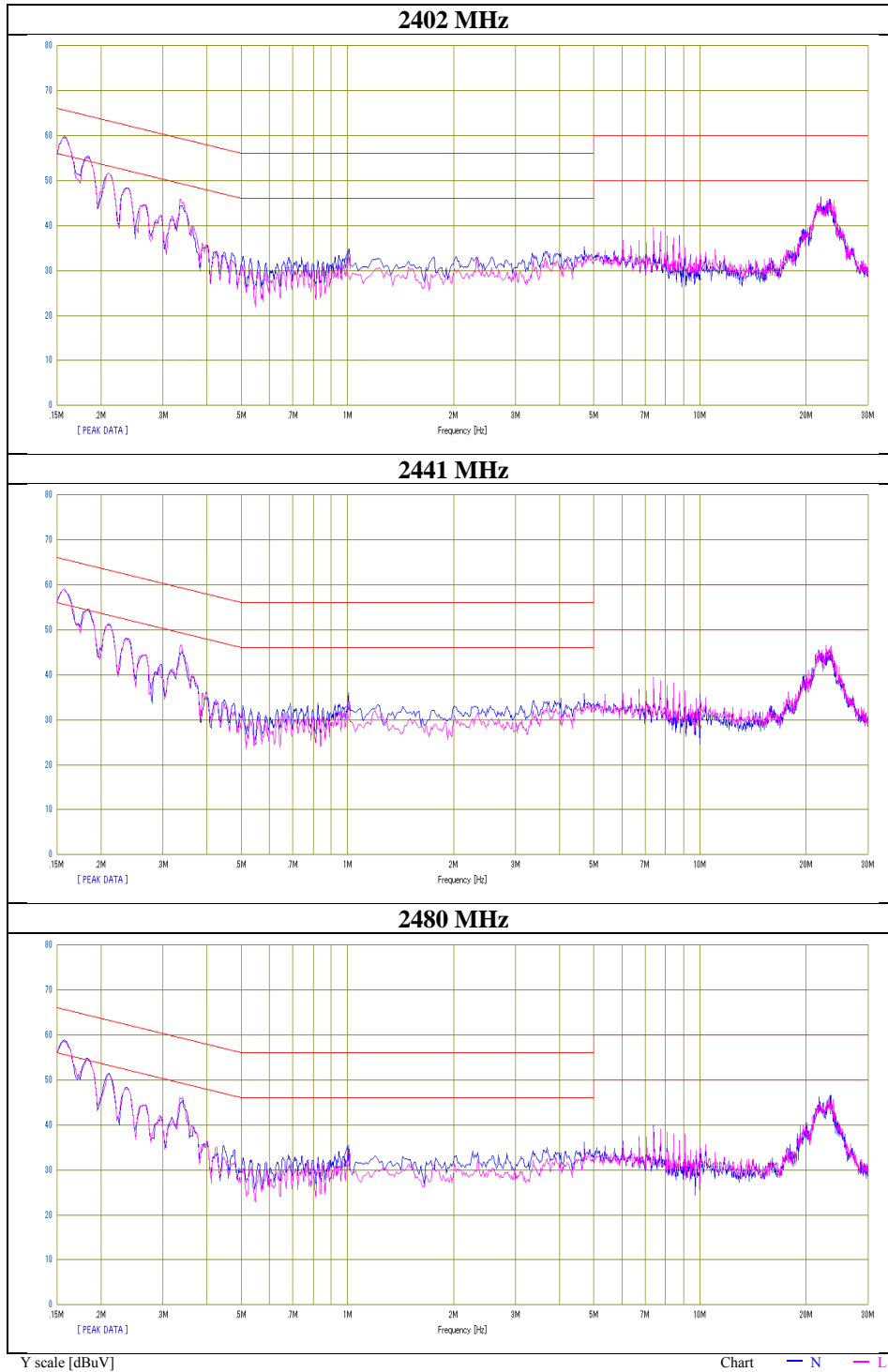


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15637	41.6	21.1	13.2	54.8	34.3	65.7	55.7	10.9	21.4	N	
0.18455	38.9	19.7	13.2	52.1	32.9	64.3	54.3	12.2	21.4	N	
0.21008	34.3	18.0	13.2	47.5	31.2	63.2	53.2	15.7	22.0	N	
0.23700	30.7	15.0	13.2	43.9	28.2	62.2	52.2	18.3	24.0	N	
0.33730	28.8	25.3	13.2	42.0	38.5	59.3	49.3	17.3	10.8	N	
22.99698	22.7	12.3	15.0	37.7	27.3	60.0	50.0	22.3	22.7	N	
0.15697	41.5	20.6	13.2	54.7	33.8	65.6	55.6	10.9	21.8	L	
0.18452	38.0	19.2	13.2	51.2	32.4	64.3	54.3	13.1	21.9	L	
0.21067	34.2	17.5	13.2	47.4	30.7	63.2	53.2	15.8	22.5	L	
0.23717	31.3	15.6	13.2	44.5	28.8	62.2	52.2	17.7	23.4	L	
0.33615	28.1	25.3	13.2	41.3	38.5	59.3	49.3	18.0	10.8	L	
23.12012	22.1	13.2	15.0	37.1	28.2	60.0	50.0	22.9	21.8	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. : 10828976H
Date : June 23, 2015
Temperature / Humidity : 22 deg. C / 55 % RH
Engineer : Koji Yamamoto
Mode : Tx DH5



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Conducted Emission

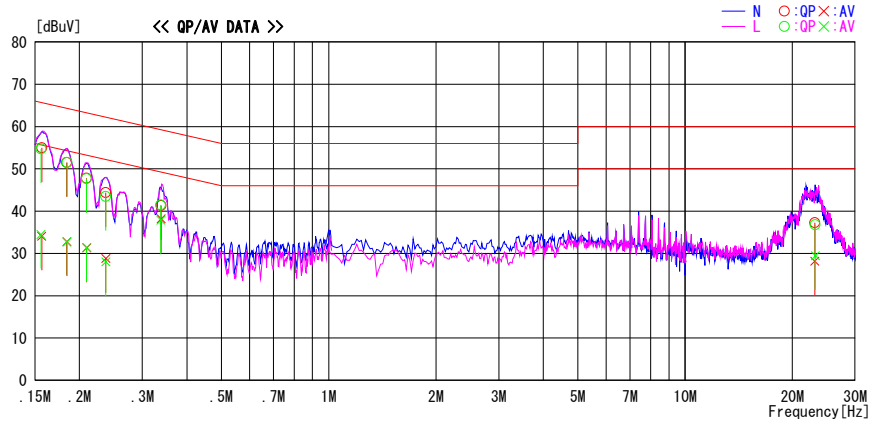
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2015/06/23

Report No. : 10828976H
 Temp./Humi. : 22deg. C / 55% RH
 Engineer : Koji Yamamoto

Mode / Remarks : Tx 3DH5 2402MHz

LIMIT : FCC15. 207 QP
 FCC15. 207 AV

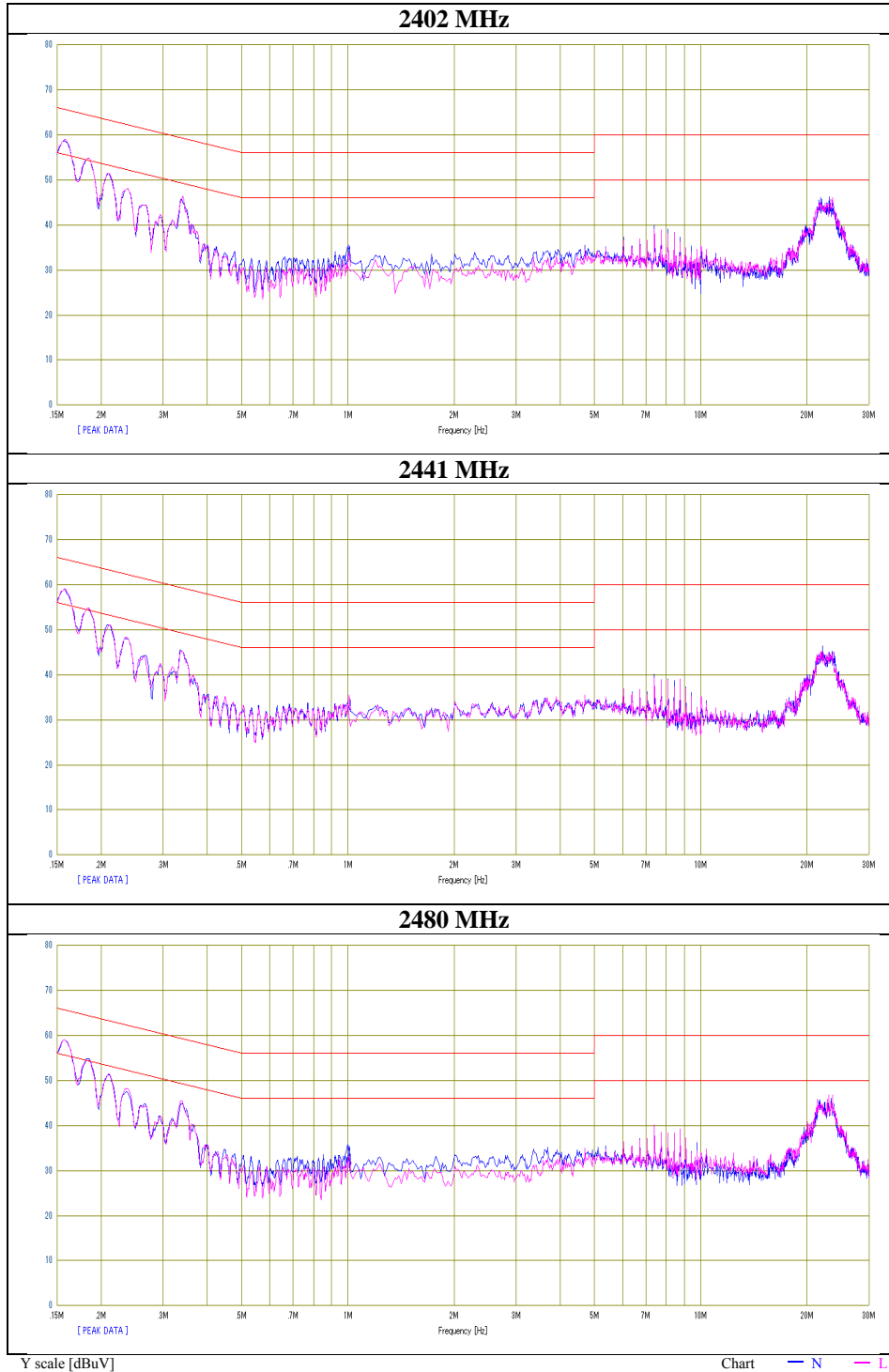


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15664	41.8	20.9	13.2	55.0	34.1	65.6	55.6	10.6	21.5	N	
0.18427	38.3	19.6	13.2	51.5	32.8	64.3	54.3	12.8	21.5	N	
0.20930	34.6	18.1	13.2	47.8	31.3	63.2	53.2	15.4	21.9	N	
0.23686	31.2	15.6	13.2	44.4	28.8	62.2	52.2	17.8	23.4	N	
0.33889	28.1	25.0	13.2	41.3	38.2	59.2	49.2	17.9	11.0	N	
23.11059	22.3	13.2	15.0	37.3	28.2	60.0	50.0	22.7	21.8	N	
0.15597	41.5	21.3	13.2	54.7	34.5	65.7	55.7	11.0	21.2	L	
0.18433	38.3	19.5	13.2	51.5	32.7	64.3	54.3	12.8	21.6	L	
0.20928	34.5	18.2	13.2	47.7	31.4	63.2	53.2	15.5	21.8	L	
0.23701	30.3	14.8	13.2	43.5	28.0	62.2	52.2	18.7	24.2	L	
0.33804	28.3	24.7	13.2	41.5	37.9	59.3	49.3	17.8	11.4	L	
23.18372	21.8	14.5	15.0	36.8	29.5	60.0	50.0	23.2	20.5	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. 10828976H
Date June 23, 2015
Temperature / Humidity 22 deg. C / 55 % RH
Engineer Koji Yamamoto
Mode Tx 3DH5

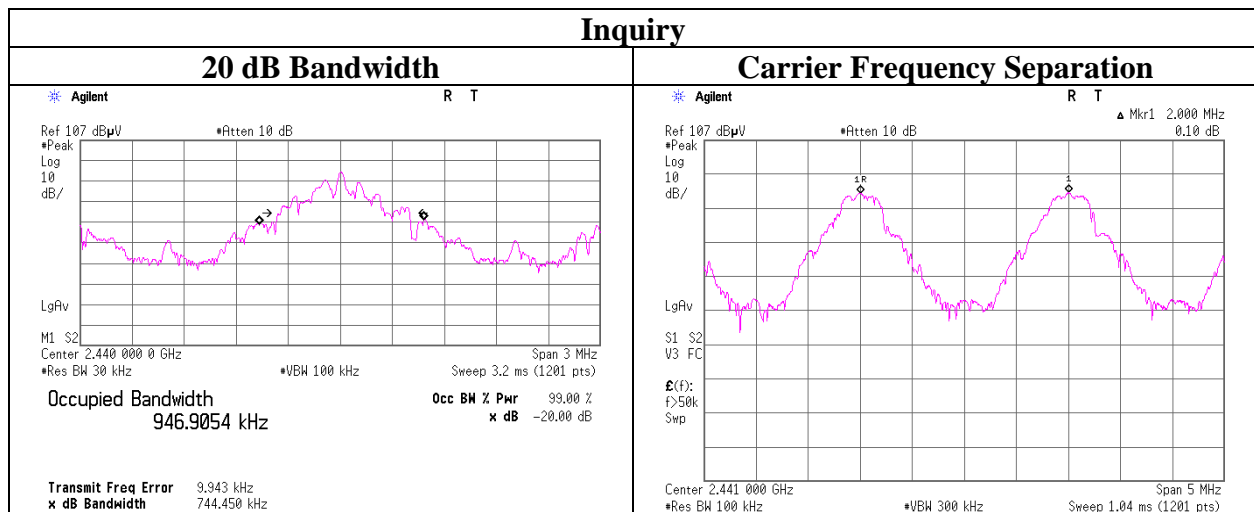


20dB Bandwidth and Carrier Frequency Separation

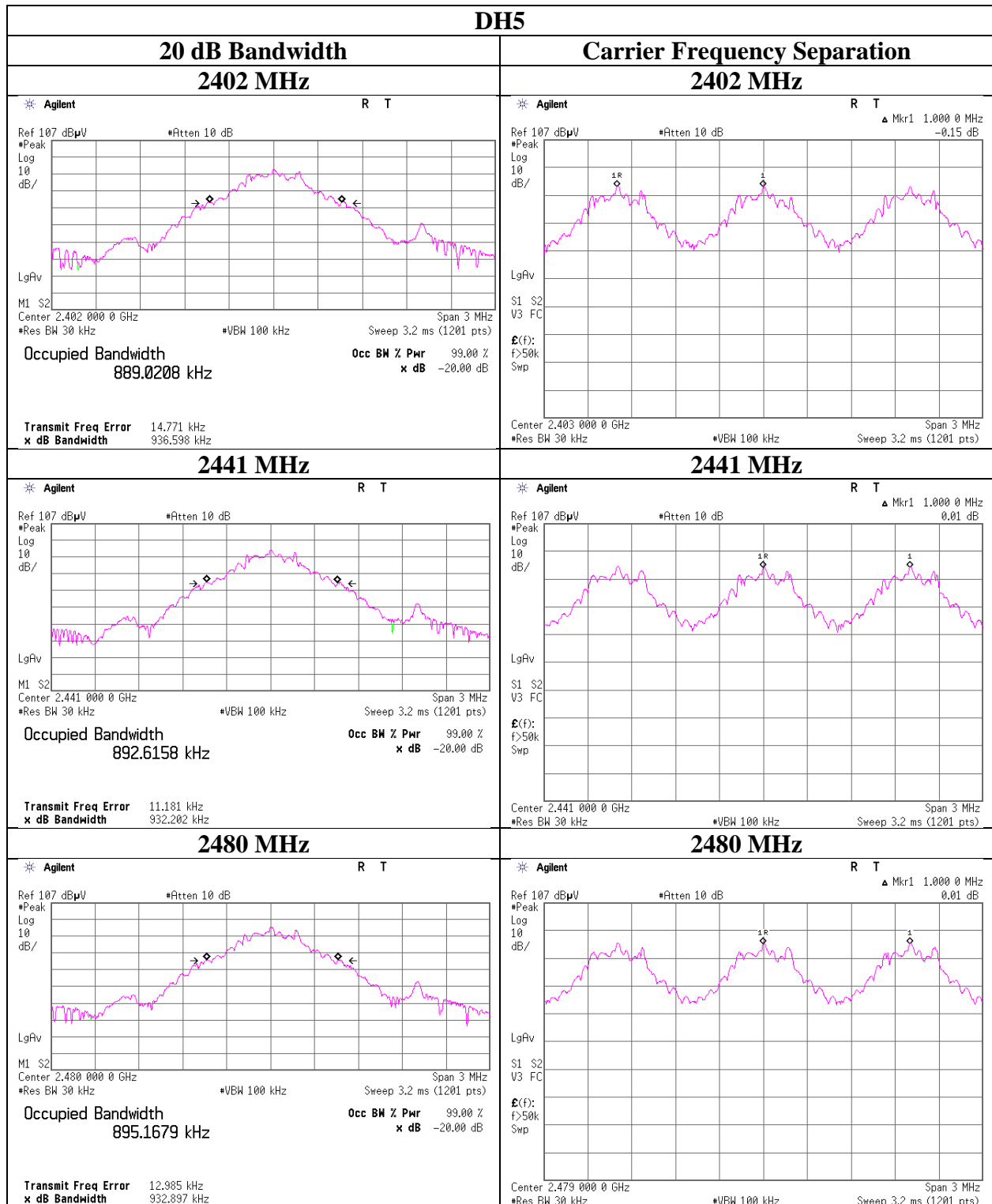
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.937	1.000	≥ 0.625
DH5	2441.0	0.932	1.000	≥ 0.621
DH5	2480.0	0.933	1.000	≥ 0.622
3DH5	2402.0	1.257	1.000	≥ 0.838
3DH5	2441.0	1.260	1.000	≥ 0.840
3DH5	2480.0	1.290	1.000	≥ 0.860
Inquiry	2440.0	0.744	2.000	≥ 0.496

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



20dB Bandwidth and Carrier Frequency Separation



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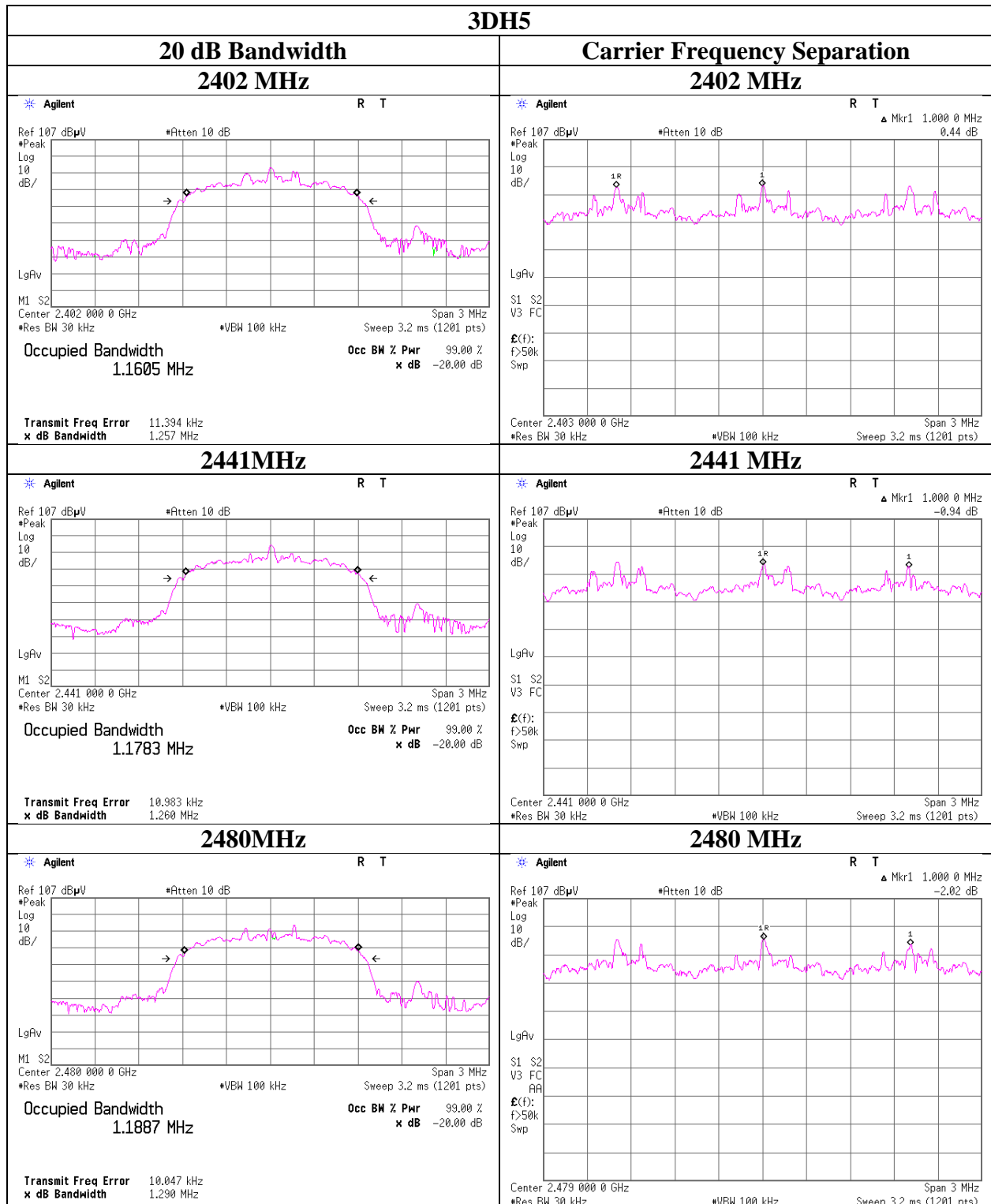
Ise EMC Lab.

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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

20dB Bandwidth and Carrier Frequency Separation



UL Japan, Inc.

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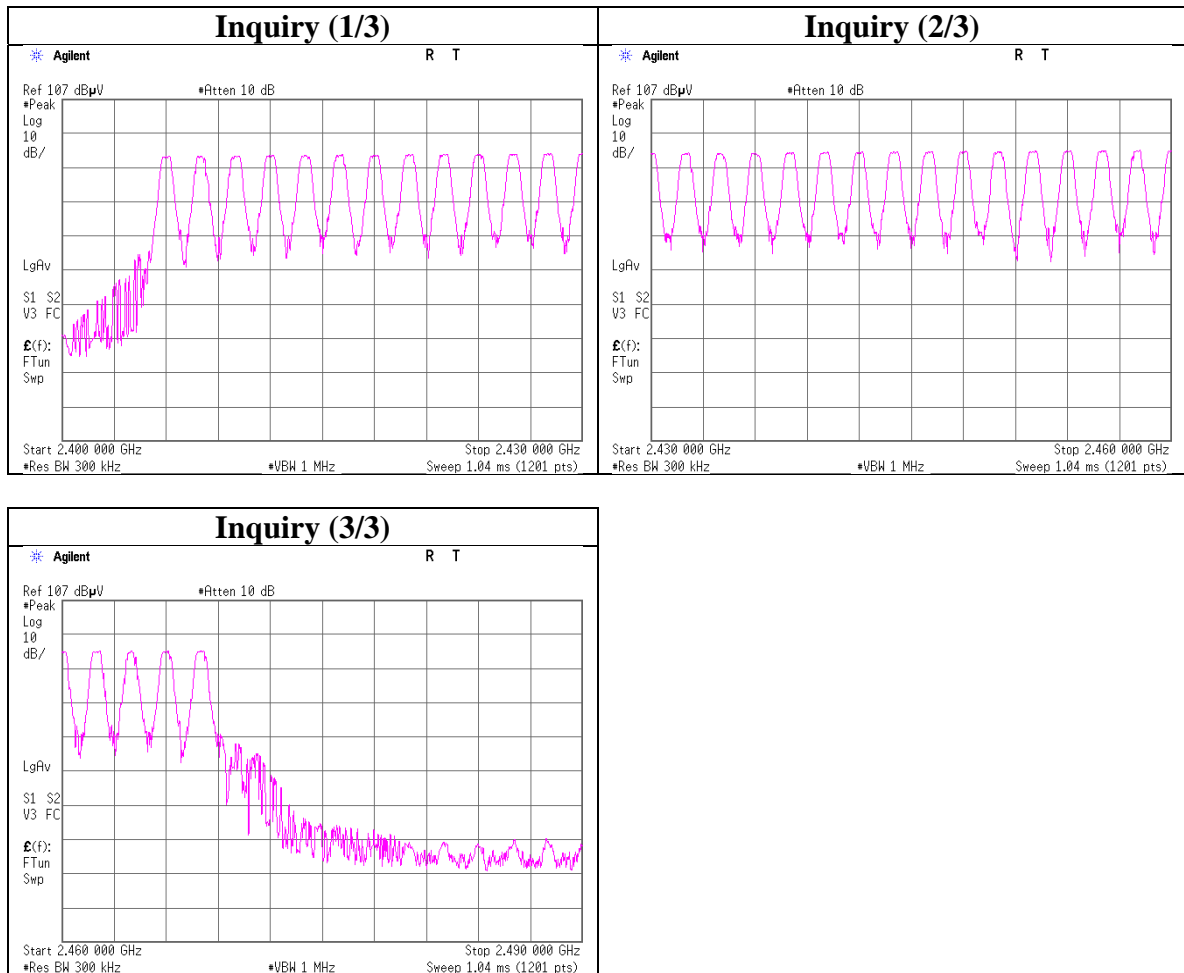
Facsimile : +81 596 24 8124

Number of Hopping Frequency

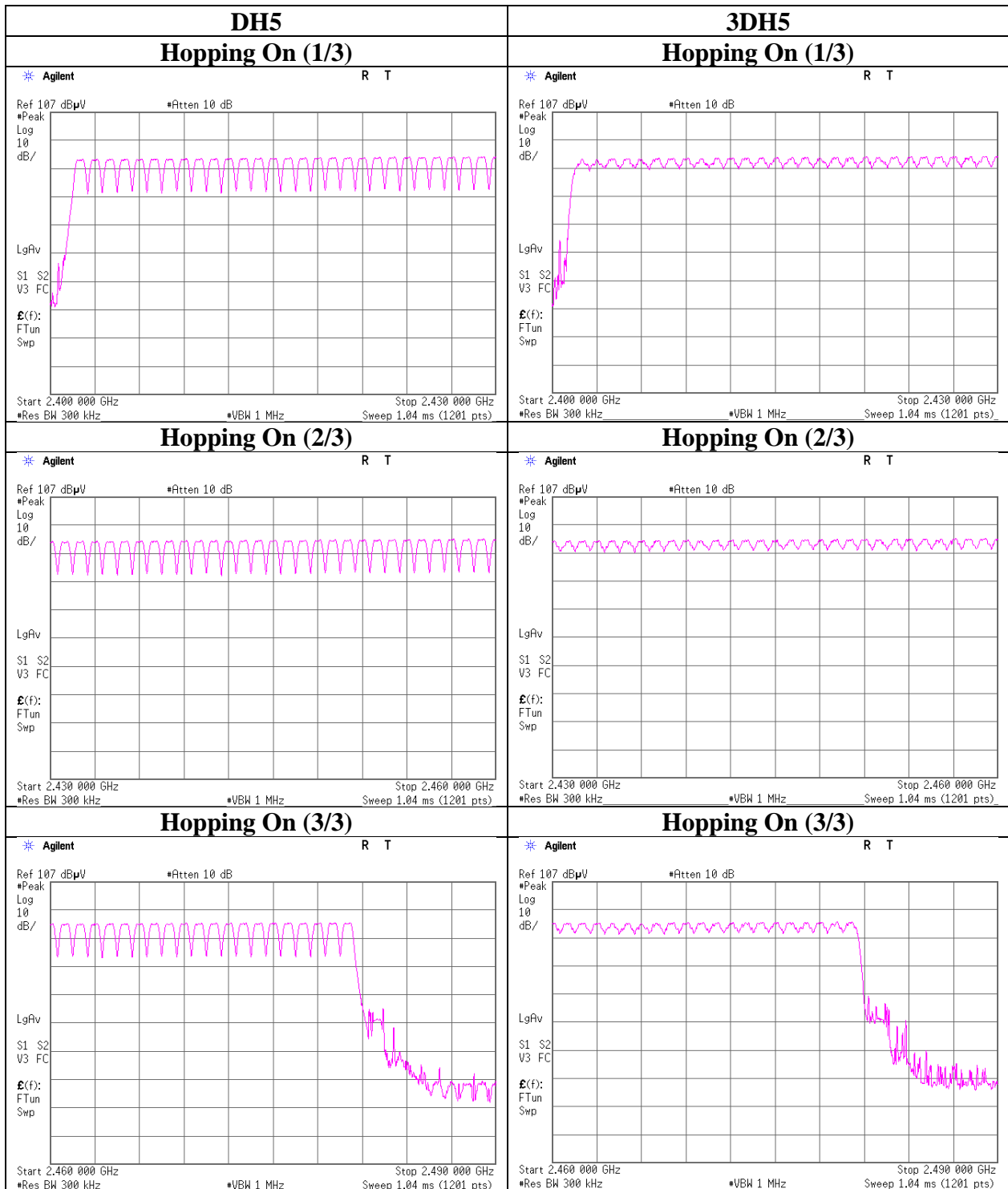
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx Hopping On

Mode	Number of channel [channels]	Limit [channels]
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

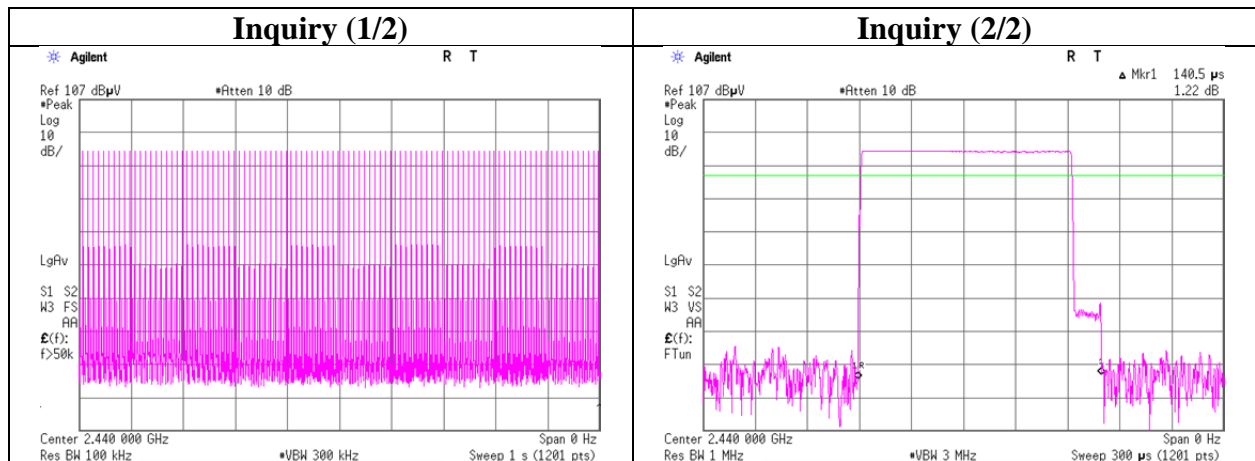
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx Hopping On

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	50.0 times / 5 sec. x 31.6 sec. = 316 times	0.442	140	400
DH3	25.0 times / 5 sec. x 31.6 sec. = 158 times	1.697	268	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.953	319	400
3DH1	50.0 times / 5 sec. x 31.6 sec. = 316 times	0.436	138	400
3DH3	25.0 times / 5 sec. x 31.6 sec. = 158 times	1.692	267	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.948	318	400
Inquiry	100.0 times / 1 sec. x 12.8 sec. = 1280 times	0.141	180	400

Sample Calculation

Result = Number of transmission x Length of transmission

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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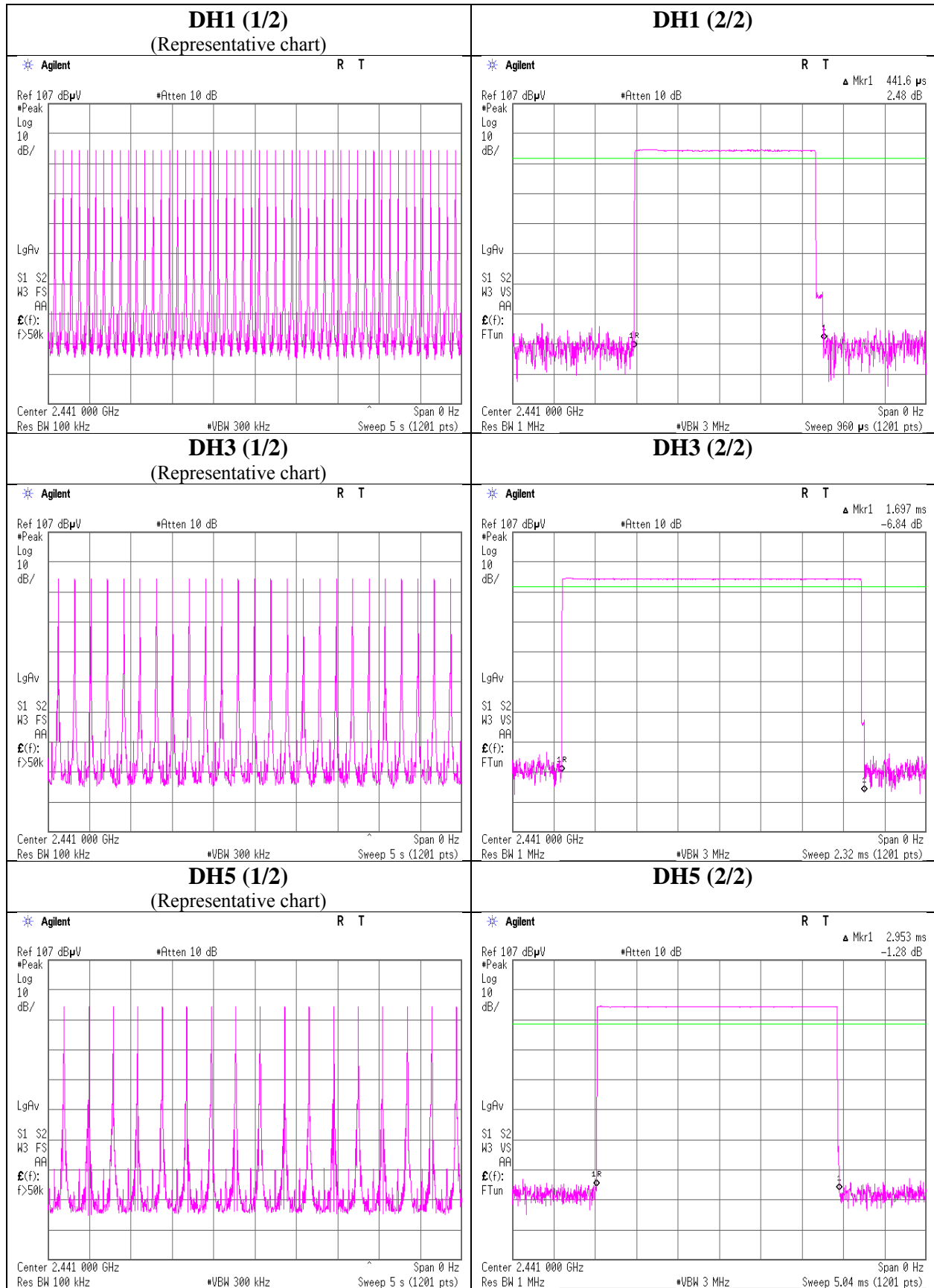
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Dwell time



UL Japan, Inc.

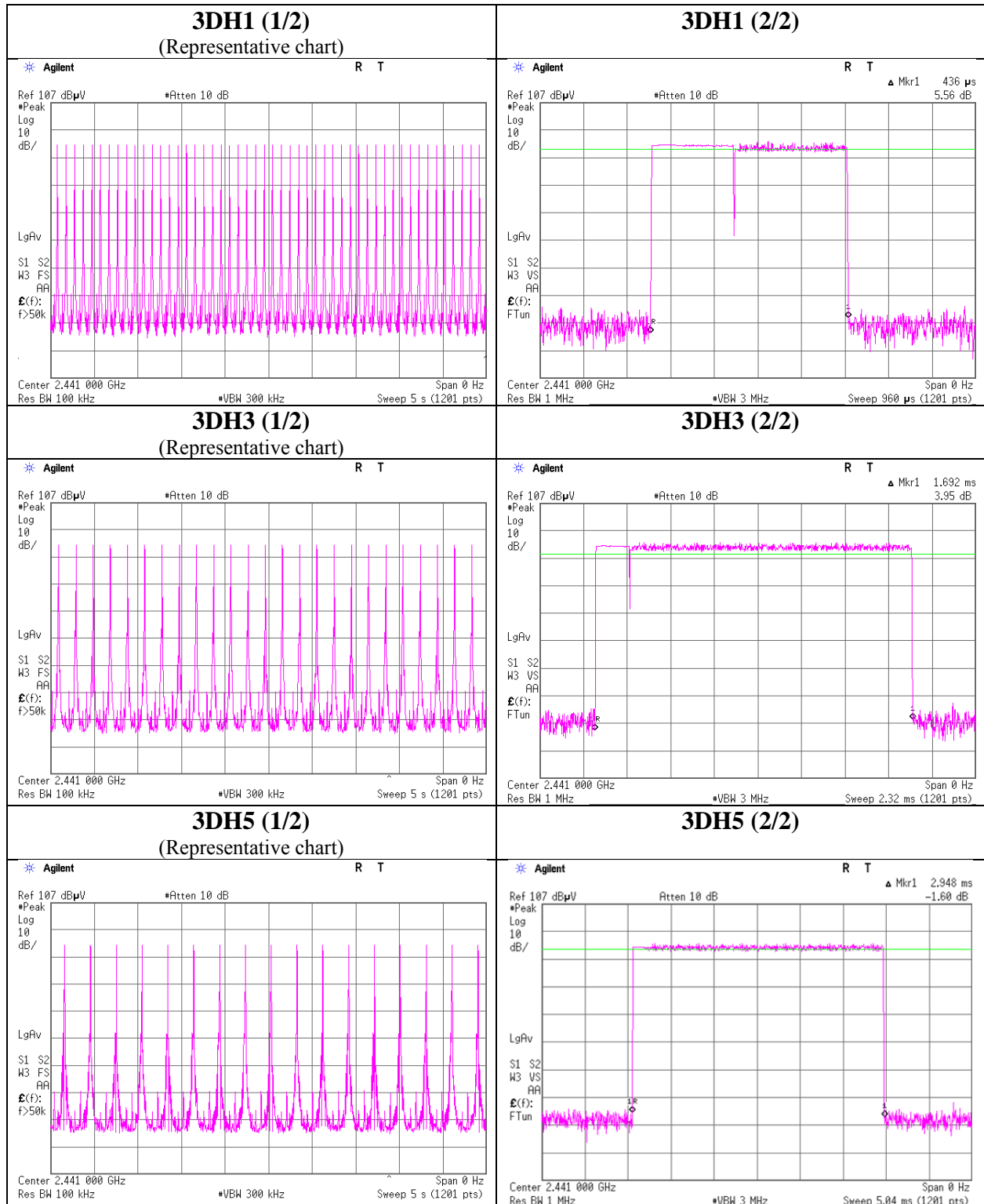
Ise EMC Lab.

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Dwell time



UL Japan, Inc.

Ise EMC Lab.

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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Peak Output Power

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10828976H
Date June 18, 2015
Temperature / Humidity 23 deg. C / 63 % RH
Engineer Yuta Moriya
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	-15.44	3.28	9.98	-2.18	0.61	20.96	125	23.14
DH5	2441.0	-14.40	3.29	9.98	-1.13	0.77	20.96	125	22.09
DH5	2480.0	-13.48	3.30	9.98	-0.20	0.95	20.96	125	21.16
2DH5	2402.0	-14.46	3.28	9.98	-1.20	0.76	20.96	125	22.16
2DH5	2441.0	-13.31	3.29	9.98	-0.04	0.99	20.96	125	21.00
2DH5	2480.0	-12.31	3.30	9.98	0.97	1.25	20.96	125	19.99
3DH5	2402.0	-14.16	3.28	9.98	-0.90	0.81	20.96	125	21.86
3DH5	2441.0	-13.00	3.29	9.98	0.27	1.06	20.96	125	20.69
3DH5	2480.0	-12.05	3.30	9.98	1.23	1.33	20.96	125	19.73
Inquiry	2441.0	-13.78	3.29	9.98	-0.51	0.89	20.96	125	21.47

Sample Calculation:

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

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

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

Average Output Power
(Reference data for RF Exposure)

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 10828976H
Date : June 18, 2015
Temperature / Humidity : 23 deg. C / 63 % RH
Engineer : Yuta Moriya
Mode : Tx Hopping Off

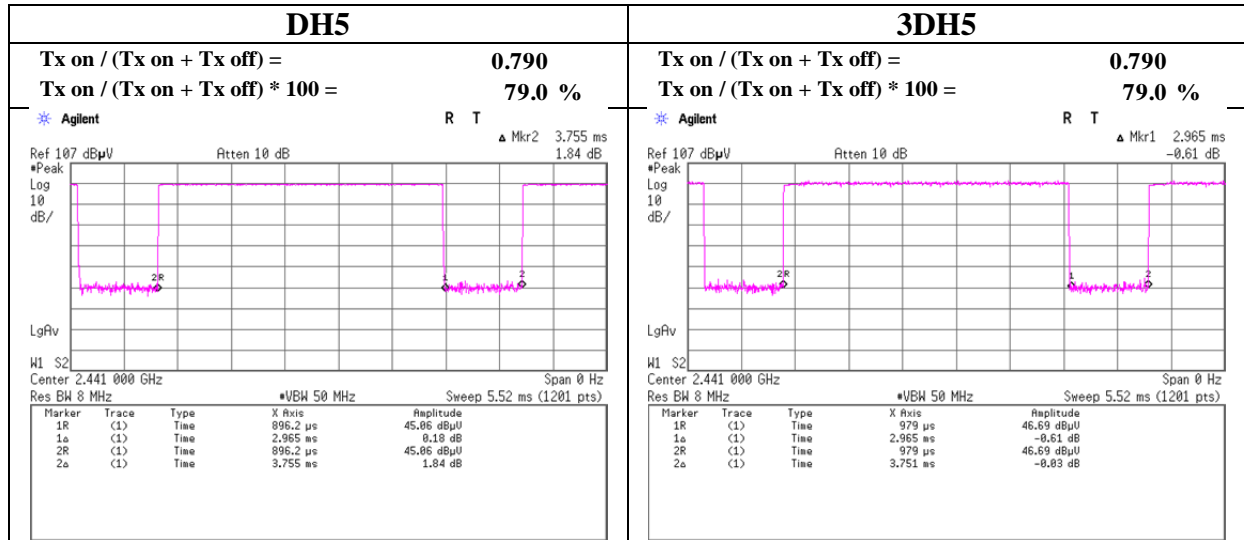
Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
					[dBm]	[mW]
DH5	2402.0	-17.43	3.28	9.98	-4.17	0.38
DH5	2441.0	-16.21	3.29	9.98	-2.94	0.51
DH5	2480.0	-15.18	3.30	9.98	-1.90	0.65
2DH5	2402.0	-18.66	3.28	9.98	-5.40	0.29
2DH5	2441.0	-17.48	3.29	9.98	-4.21	0.38
2DH5	2480.0	-16.42	3.30	9.98	-3.14	0.49
3DH5	2402.0	-18.64	3.28	9.98	-5.38	0.29
3DH5	2441.0	-17.46	3.29	9.98	-4.19	0.38
3DH5	2480.0	-16.42	3.30	9.98	-3.14	0.49

Sample Calculation:

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

Burst Rate Confirmation

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10828976H
Date	June 16, 2015
Temperature / Humidity	23 deg. C / 61 % RH
Engineer	Koji Yamamoto
Mode	Tx Hopping Off



Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10828976H
Date : June 16, 2015 June 18, 2015
Temperature / Humidity : 23 deg. C / 63 % RH 22 deg. C / 65 % RH
Engineer : Koji Yamamoto Koji Yamamoto
 (1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	31.874	QP	35.2	16.7	7.1	38.7	20.3	40.0	19.7	
Hori	61.434	QP	52.7	7.2	7.6	38.8	28.7	40.0	11.3	
Hori	84.000	QP	45.1	7.5	7.9	38.8	21.7	40.0	18.3	
Hori	95.999	QP	46.2	9.5	8.1	38.8	25.0	43.5	18.5	
Hori	98.299	QP	47.5	9.9	8.1	38.8	26.7	43.5	16.8	
Hori	147.453	QP	42.9	14.8	8.7	38.8	27.6	43.5	15.9	
Hori	2390.000	PK	46.1	27.4	3.2	32.3	44.4	73.9	29.5	
Hori	4804.000	PK	42.3	31.5	4.5	31.6	46.7	73.9	27.2	Floor Noise
Hori	7206.000	PK	43.1	36.8	5.7	32.8	52.8	73.9	21.1	Floor Noise
Hori	9608.000	PK	42.6	38.8	6.4	33.2	54.6	73.9	19.3	Floor Noise
Hori	2390.000	AV	32.5	27.4	3.2	32.3	30.8	53.9	23.1	
Hori	4804.000	AV	31.2	31.5	4.5	31.6	35.6	53.9	18.3	Floor Noise
Hori	7206.000	AV	31.3	36.8	5.7	32.8	41.0	53.9	12.9	Floor Noise
Hori	9608.000	AV	31.9	38.8	6.4	33.2	43.9	53.9	10.0	Floor Noise
Vert	31.826	QP	46.6	16.7	7.1	38.7	31.7	40.0	8.3	
Vert	61.440	QP	54.0	7.2	7.6	38.8	30.0	40.0	10.0	
Vert	83.998	QP	53.1	7.5	7.9	38.8	29.7	40.0	10.3	
Vert	96.000	QP	54.9	9.5	8.1	38.8	33.7	43.5	9.8	
Vert	98.303	QP	54.2	9.9	8.1	38.8	33.4	43.5	10.1	
Vert	147.470	QP	43.4	14.8	8.7	38.8	28.1	43.5	15.4	
Vert	2390.000	PK	45.7	27.4	3.2	32.3	44.0	73.9	29.9	
Vert	4804.000	PK	42.2	31.5	4.5	31.6	46.6	73.9	27.3	Floor Noise
Vert	7206.000	PK	43.3	36.8	5.7	32.8	53.0	73.9	20.9	Floor Noise
Vert	9608.000	PK	42.9	38.8	6.4	33.2	54.9	73.9	19.0	Floor Noise
Vert	2390.000	AV	31.8	27.4	3.2	32.3	30.1	53.9	23.8	
Vert	4804.000	AV	30.6	31.5	4.5	31.6	35.0	53.9	18.9	Floor Noise
Vert	7206.000	AV	30.6	36.8	5.7	32.8	40.3	53.9	13.6	Floor Noise
Vert	9608.000	AV	31.2	38.8	6.4	33.2	43.2	53.9	10.7	Floor Noise

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

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

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	91.4	27.4	3.2	32.3	89.7	-	-	Carrier
Hori	2400.000	PK	47.2	27.4	3.2	32.3	45.5	69.7	24.2	
Vert	2402.000	PK	87.9	27.4	3.2	32.3	86.2	-	-	Carrier
Vert	2400.000	PK	44.7	27.4	3.2	32.3	43.0	66.2	23.2	

Result = Reading + Ant Factor + Loss (Cable + Filter) - Gain (Amplifier)

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10828976H
Date June 16, 2015 June 18, 2015
Temperature / Humidity 23 deg. C / 63 % RH 22 deg. C / 65 % RH
Engineer Koji Yamamoto Koji Yamamoto
(1-10GHz) (Above 10GHz) (Below 1GHz)
Mode Tx DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	31.785	QP	34.8	16.7	7.1	38.7	19.9	40.0	20.1	
Hori	61.435	QP	51.8	7.2	7.6	38.8	27.8	40.0	12.2	
Hori	84.000	QP	45.3	7.5	7.9	38.8	21.9	40.0	18.1	
Hori	96.000	QP	46.5	9.5	8.1	38.8	25.3	43.5	18.2	
Hori	98.298	QP	47.8	9.9	8.1	38.8	27.0	43.5	16.5	
Hori	147.451	QP	43.3	14.8	8.7	38.8	28.0	43.5	15.5	
Hori	4882.000	PK	41.9	31.8	4.6	31.6	46.7	73.9	27.2	Floor Noise
Hori	7323.000	PK	42.6	37.0	5.7	32.8	52.5	73.9	21.4	Floor Noise
Hori	9764.000	PK	43.3	38.9	6.5	33.3	55.4	73.9	18.5	Floor Noise
Hori	4882.000	AV	31.1	31.8	4.6	31.6	35.9	53.9	18.0	Floor Noise
Hori	7323.000	AV	31.8	37.0	5.7	32.8	41.7	53.9	12.2	Floor Noise
Hori	9764.000	AV	31.4	38.9	6.5	33.3	43.5	53.9	10.4	Floor Noise
Vert	31.617	QP	46.9	16.7	7.1	38.7	32.0	40.0	8.0	
Vert	61.435	QP	53.1	7.2	7.6	38.8	29.1	40.0	10.9	
Vert	84.000	QP	52.8	7.5	7.9	38.8	29.4	40.0	10.6	
Vert	96.000	QP	55.2	9.5	8.1	38.8	34.0	43.5	9.5	
Vert	98.297	QP	53.7	9.9	8.1	38.8	32.9	43.5	10.6	
Vert	147.458	QP	43.5	14.8	8.7	38.8	28.2	43.5	15.3	
Vert	4882.000	PK	41.3	31.8	4.6	31.6	46.1	73.9	27.8	Floor Noise
Vert	7323.000	PK	42.6	37.0	5.7	32.8	52.5	73.9	21.4	Floor Noise
Vert	9764.000	PK	42.6	38.9	6.5	33.3	54.7	73.9	19.2	Floor Noise
Vert	4882.000	AV	30.7	31.8	4.6	31.6	35.5	53.9	18.4	Floor Noise
Vert	7323.000	AV	31.0	37.0	5.7	32.8	40.9	53.9	13.0	Floor Noise
Vert	9764.000	AV	31.3	38.9	6.5	33.3	43.4	53.9	10.5	Floor Noise

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

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

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

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10828976H
Date June 16, 2015 June 18, 2015
Temperature / Humidity 23 deg. C / 63 % RH 22 deg. C / 65 % RH
Engineer Koji Yamamoto Koji Yamamoto
(1-10GHz) (Above 10GHz) (Below 1GHz)
Mode Tx DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	31.789	QP	35.1	16.7	7.1	38.7	20.2	40.0	19.8	
Hori	61.429	QP	52.5	7.2	7.6	38.8	28.5	40.0	11.5	
Hori	84.000	QP	44.8	7.5	7.9	38.8	21.4	40.0	18.6	
Hori	96.000	QP	46.2	9.5	8.1	38.8	25.0	43.5	18.5	
Hori	98.299	QP	47.4	9.9	8.1	38.8	26.6	43.5	16.9	
Hori	153.601	QP	45.8	15.2	8.7	38.8	30.9	43.5	12.6	
Hori	2483.500	PK	69.3	27.6	3.3	32.3	67.9	73.9	6.0	
Hori	4960.000	PK	41.8	32.0	4.6	31.6	46.8	73.9	27.1	Floor Noise
Hori	7440.000	PK	42.5	37.2	5.8	32.9	52.6	73.9	21.3	Floor Noise
Hori	9920.000	PK	42.8	39.0	6.5	33.3	55.0	73.9	18.9	Floor Noise
Hori	2483.500	AV	40.3	27.6	3.3	32.3	38.9	53.9	15.0	
Hori	4960.000	AV	30.5	32.0	4.6	31.6	35.5	53.9	18.4	Floor Noise
Hori	7440.000	AV	30.8	37.2	5.8	32.9	40.9	53.9	13.0	Floor Noise
Hori	9920.000	AV	31.6	39.0	6.5	33.3	43.8	53.9	10.1	Floor Noise
Vert	31.775	QP	46.6	16.7	7.1	38.7	31.7	40.0	8.3	
Vert	61.441	QP	53.6	7.2	7.6	38.8	29.6	40.0	10.4	
Vert	84.000	QP	53.3	7.5	7.9	38.8	29.9	40.0	10.1	
Vert	96.000	QP	55.7	9.5	8.1	38.8	34.5	43.5	9.0	
Vert	98.302	QP	53.5	9.9	8.1	38.8	32.7	43.5	10.8	
Vert	147.436	QP	43.1	14.8	8.7	38.8	27.8	43.5	15.7	
Vert	2483.500	PK	66.7	27.6	3.3	32.3	65.3	73.9	8.6	
Vert	4960.000	PK	42.7	32.0	4.6	31.6	47.7	73.9	26.2	Floor Noise
Vert	7440.000	PK	42.1	37.2	5.8	32.9	52.2	73.9	21.7	Floor Noise
Vert	9920.000	PK	43.0	39.0	6.5	33.3	55.2	73.9	18.7	Floor Noise
Vert	2483.500	AV	38.1	27.6	3.3	32.3	36.7	53.9	17.2	
Vert	4960.000	AV	30.3	32.0	4.6	31.6	35.3	53.9	18.6	Floor Noise
Vert	7440.000	AV	31.3	37.2	5.8	32.9	41.4	53.9	12.5	Floor Noise
Vert	9920.000	AV	31.7	39.0	6.5	33.3	43.9	53.9	10.0	Floor Noise

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

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

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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10828976H
Date : June 16, 2015 June 18, 2015
Temperature / Humidity : 23 deg. C / 63 % RH 22 deg. C / 65 % RH
Engineer : Koji Yamamoto Koji Yamamoto
 (1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx 3DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	32.138	QP	35.6	16.6	7.1	38.7	20.6	40.0	19.4	
Hori	61.397	QP	52.2	7.2	7.6	38.8	28.2	40.0	11.8	
Hori	86.017	QP	46.8	7.8	7.9	38.8	23.7	40.0	16.3	
Hori	96.000	QP	45.8	9.5	8.1	38.8	24.6	43.5	18.9	
Hori	98.299	QP	47.9	9.9	8.1	38.8	27.1	43.5	16.4	
Hori	141.315	QP	45.0	14.5	8.6	38.8	29.3	43.5	14.2	
Hori	2390.000	PK	45.0	27.4	3.2	32.3	43.3	73.9	30.6	
Hori	4804.000	PK	42.1	31.5	4.5	31.6	46.5	73.9	27.4	Floor Noise
Hori	7206.000	PK	41.8	36.8	5.7	32.8	51.5	73.9	22.4	Floor Noise
Hori	9608.000	PK	42.5	38.8	6.4	33.2	54.5	73.9	19.4	Floor Noise
Hori	2390.000	AV	31.6	27.4	3.2	32.3	29.9	53.9	24.0	
Hori	4804.000	AV	31.4	31.5	4.5	31.6	35.8	53.9	18.1	Floor Noise
Hori	7206.000	AV	30.8	36.8	5.7	32.8	40.5	53.9	13.4	Floor Noise
Hori	9608.000	AV	31.3	38.8	6.4	33.2	43.3	53.9	10.6	Floor Noise
Vert	31.331	QP	46.5	16.8	7.1	38.7	31.7	40.0	8.3	
Vert	61.445	QP	54.3	7.2	7.6	38.8	30.3	40.0	9.7	
Vert	84.000	QP	52.6	7.5	7.9	38.8	29.2	40.0	10.8	
Vert	96.000	QP	55.7	9.5	8.1	38.8	34.5	43.5	9.0	
Vert	98.300	QP	52.6	9.9	8.1	38.8	31.8	43.5	11.7	
Vert	147.436	QP	43.5	14.8	8.7	38.8	28.2	43.5	15.3	
Vert	2390.000	PK	44.8	27.4	3.2	32.3	43.1	73.9	30.8	
Vert	4804.000	PK	42.1	31.5	4.5	31.6	46.5	73.9	27.4	Floor Noise
Vert	7206.000	PK	42.7	36.8	5.7	32.8	52.4	73.9	21.5	Floor Noise
Vert	9608.000	PK	42.5	38.8	6.4	33.2	54.5	73.9	19.4	Floor Noise
Vert	2390.000	AV	30.5	27.4	3.2	32.3	28.8	53.9	25.1	
Vert	4804.000	AV	30.8	31.5	4.5	31.6	35.2	53.9	18.7	Floor Noise
Vert	7206.000	AV	31.2	36.8	5.7	32.8	40.9	53.9	13.0	Floor Noise
Vert	9608.000	AV	31.6	38.8	6.4	33.2	43.6	53.9	10.3	Floor Noise

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

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

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	90.6	27.4	3.2	32.3	88.9	-	-	Carrier
Hori	2400.000	PK	45.1	27.4	3.2	32.3	43.4	68.9	25.5	
Vert	2402.000	PK	90.0	27.4	3.2	32.3	88.3	-	-	Carrier
Vert	2400.000	PK	45.8	27.4	3.2	32.3	44.1	68.3	24.2	

Result = Reading + Ant Factor + Loss (Cable + Filter) - Gain (Amplifier)

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10828976H
Date : June 16, 2015 June 18, 2015
Temperature / Humidity : 23 deg. C / 63 % RH 22 deg. C / 65 % RH
Engineer : Koji Yamamoto Koji Yamamoto
(1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx 3DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	31.589	QP	34.8	16.7	7.1	38.7	19.9	40.0	20.1	
Hori	61.418	QP	53.3	7.2	7.6	38.8	29.3	40.0	10.7	
Hori	86.025	QP	47.2	7.8	7.9	38.8	24.1	40.0	15.9	
Hori	96.000	QP	46.3	9.5	8.1	38.8	25.1	43.5	18.4	
Hori	98.309	QP	47.6	9.9	8.1	38.8	26.8	43.5	16.7	
Hori	141.313	QP	45.5	14.5	8.6	38.8	29.8	43.5	13.7	
Hori	4882.000	PK	41.7	31.8	4.6	31.6	46.5	73.9	27.4	Floor Noise
Hori	7323.000	PK	41.9	37.0	5.7	32.8	51.8	73.9	22.1	Floor Noise
Hori	9764.000	PK	43.6	38.9	6.5	33.3	55.7	73.9	18.2	Floor Noise
Hori	4882.000	AV	30.3	31.8	4.6	31.6	35.1	53.9	18.8	Floor Noise
Hori	7323.000	AV	31.3	37.0	5.7	32.8	41.2	53.9	12.7	Floor Noise
Hori	9764.000	AV	32.3	38.9	6.5	33.3	44.4	53.9	9.5	Floor Noise
Vert	31.529	QP	45.7	16.8	7.1	38.7	30.9	40.0	9.1	
Vert	61.438	QP	54.9	7.2	7.6	38.8	30.9	40.0	9.1	
Vert	84.000	QP	53.6	7.5	7.9	38.8	30.2	40.0	9.8	
Vert	96.000	QP	55.2	9.5	8.1	38.8	34.0	43.5	9.5	
Vert	98.300	QP	52.6	9.9	8.1	38.8	31.8	43.5	11.7	
Vert	153.606	QP	44.6	15.2	8.7	38.8	29.7	43.5	13.8	
Vert	4882.000	PK	41.5	31.8	4.6	31.6	46.3	73.9	27.6	Floor Noise
Vert	7323.000	PK	42.1	37.0	5.7	32.8	52.0	73.9	21.9	Floor Noise
Vert	9764.000	PK	42.5	38.9	6.5	33.3	54.6	73.9	19.3	Floor Noise
Vert	4882.000	AV	30.6	31.8	4.6	31.6	35.4	53.9	18.5	Floor Noise
Vert	7323.000	AV	31.5	37.0	5.7	32.8	41.4	53.9	12.5	Floor Noise
Vert	9764.000	AV	32.1	38.9	6.5	33.3	44.2	53.9	9.7	Floor Noise

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10828976H	
Date	June 16, 2015	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH	22 deg. C / 65 % RH
Engineer	Koji Yamamoto	Koji Yamamoto
	(1-10GHz)	(Above 10GHz) (Below 1GHz)
Mode	Tx 3DH5 2480 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	32.113	QP	34.8	16.6	7.1	38.7	19.8	40.0	20.2	
Hori	61.425	QP	53.7	7.2	7.6	38.8	29.7	40.0	10.3	
Hori	86.018	QP	46.6	7.8	7.9	38.8	23.5	40.0	16.5	
Hori	96.000	QP	47.1	9.5	8.1	38.8	25.9	43.5	17.6	
Hori	98.302	QP	47.9	9.9	8.1	38.8	27.1	43.5	16.4	
Hori	141.316	QP	46.4	14.5	8.6	38.8	30.7	43.5	12.8	
Hori	2483.500	PK	69.3	27.6	3.3	32.3	67.9	73.9	6.0	
Hori	4960.000	PK	41.2	32.0	4.6	31.6	46.2	73.9	27.7	Floor Noise
Hori	7440.000	PK	42.0	37.2	5.8	32.9	52.1	73.9	21.8	Floor Noise
Hori	9920.000	PK	43.6	39.0	6.5	33.3	55.8	73.9	18.1	Floor Noise
Hori	2483.500	AV	38.9	27.6	3.3	32.3	37.5	53.9	16.4	
Hori	4960.000	AV	31.1	32.0	4.6	31.6	36.1	53.9	17.8	Floor Noise
Hori	7440.000	AV	31.3	37.2	5.8	32.9	41.4	53.9	12.5	Floor Noise
Hori	9920.000	AV	32.2	39.0	6.5	33.3	44.4	53.9	9.5	Floor Noise
Vert	31.588	QP	46.0	16.7	7.1	38.7	31.1	40.0	8.9	
Vert	61.441	QP	54.6	7.2	7.6	38.8	30.6	40.0	9.4	
Vert	84.000	QP	53.2	7.5	7.9	38.8	29.8	40.0	10.2	
Vert	96.000	QP	55.9	9.5	8.1	38.8	34.7	43.5	8.8	
Vert	98.300	QP	52.6	9.9	8.1	38.8	31.8	43.5	11.7	
Vert	141.312	QP	44.5	14.5	8.6	38.8	28.8	43.5	14.7	
Vert	2483.500	PK	66.9	27.6	3.3	32.3	65.5	73.9	8.4	
Vert	4960.000	PK	42.2	32.0	4.6	31.6	47.2	73.9	26.7	Floor Noise
Vert	7440.000	PK	42.7	37.2	5.8	32.9	52.8	73.9	21.1	Floor Noise
Vert	9920.000	PK	43.3	39.0	6.5	33.3	55.5	73.9	18.4	Floor Noise
Vert	2483.500	AV	37.6	27.6	3.3	32.3	36.2	53.9	17.7	
Vert	4960.000	AV	31.3	32.0	4.6	31.6	36.3	53.9	17.6	Floor Noise
Vert	7440.000	AV	30.9	37.2	5.8	32.9	41.0	53.9	12.9	Floor Noise
Vert	9920.000	AV	31.2	39.0	6.5	33.3	43.4	53.9	10.5	Floor Noise

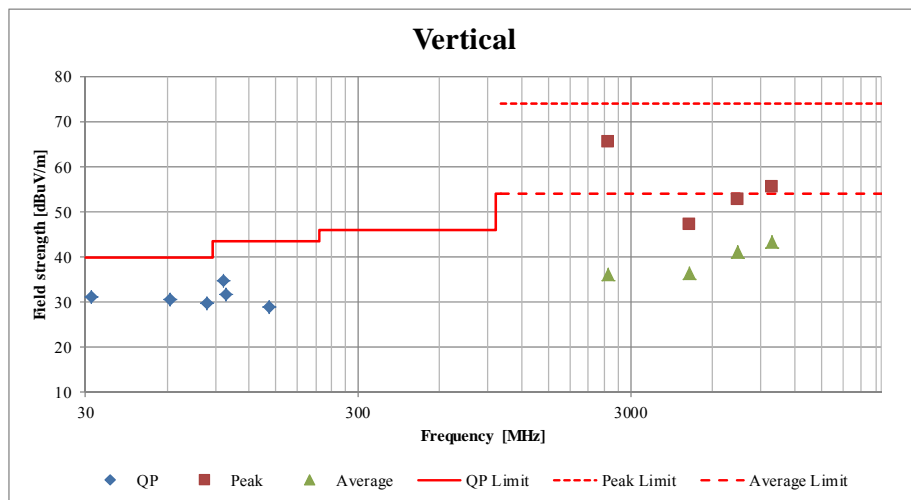
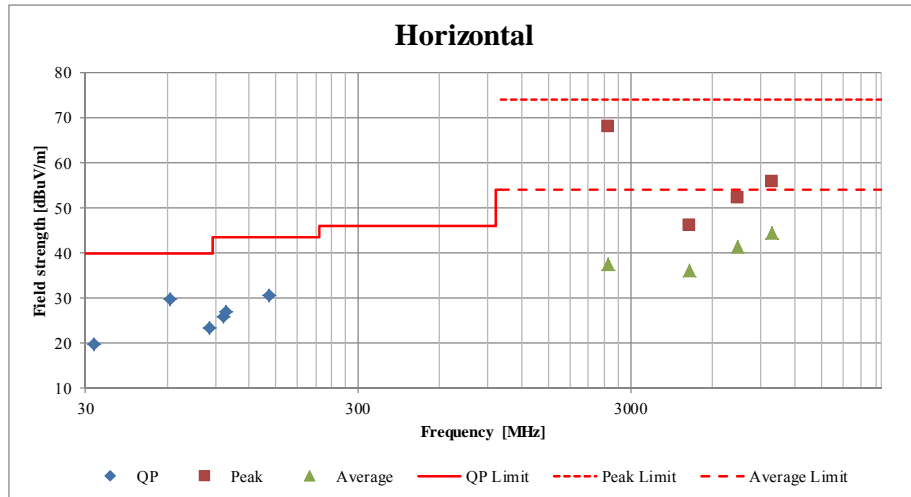
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	10828976H	
Date	June 16, 2015	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH	22 deg. C / 65 % RH
Engineer	Koji Yamamoto	Koji Yamamoto
	(1-10GHz)	(Above 10GHz) (Below 1GHz)
Mode	Tx 3DH5 2480 MHz	

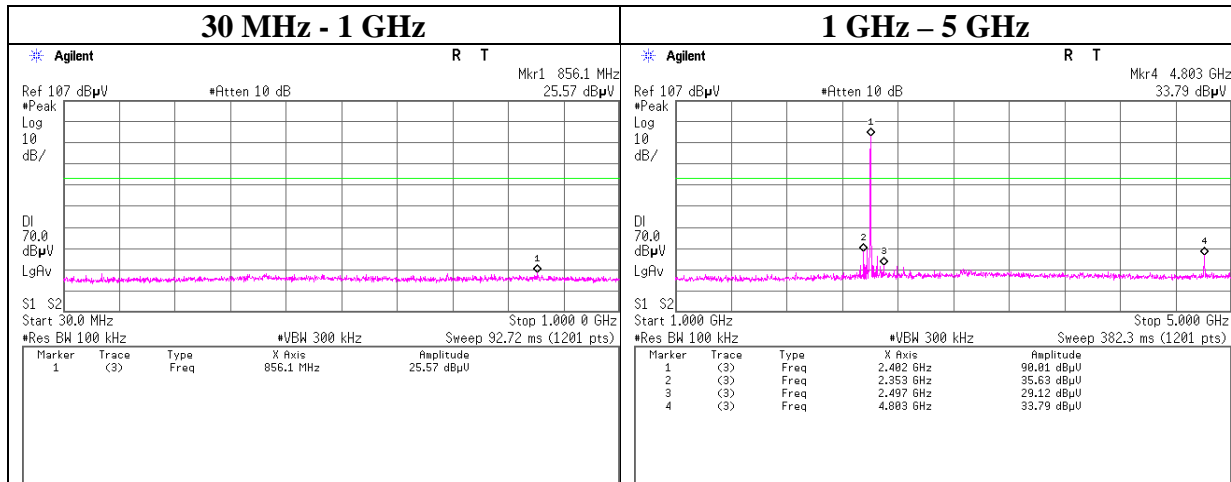
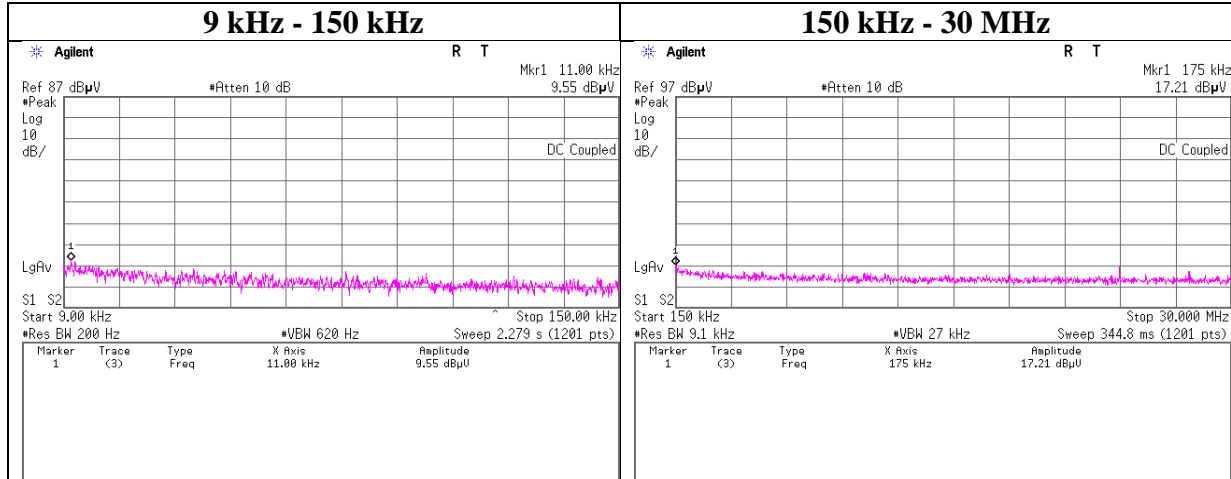


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

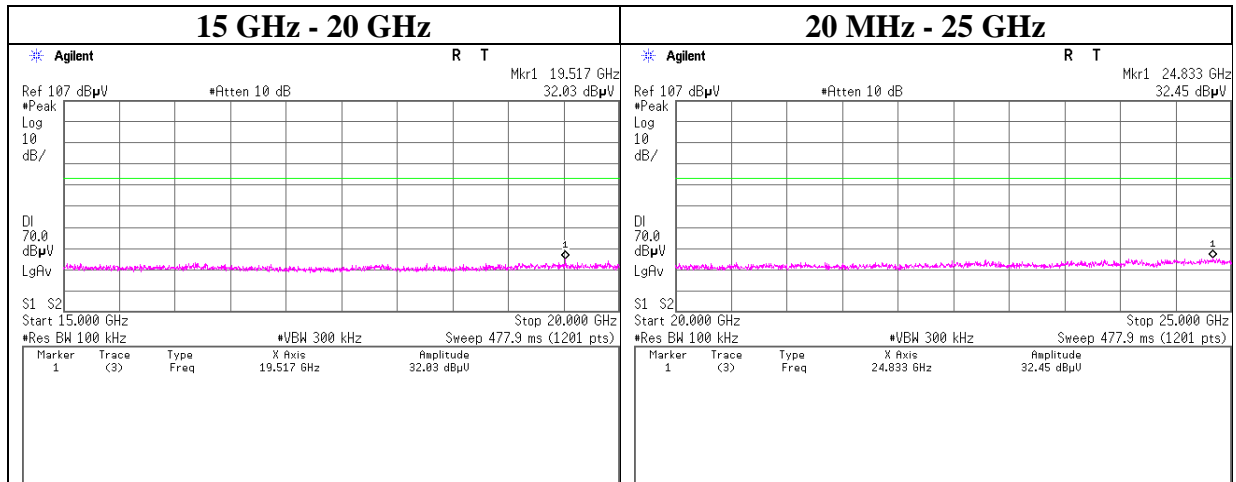
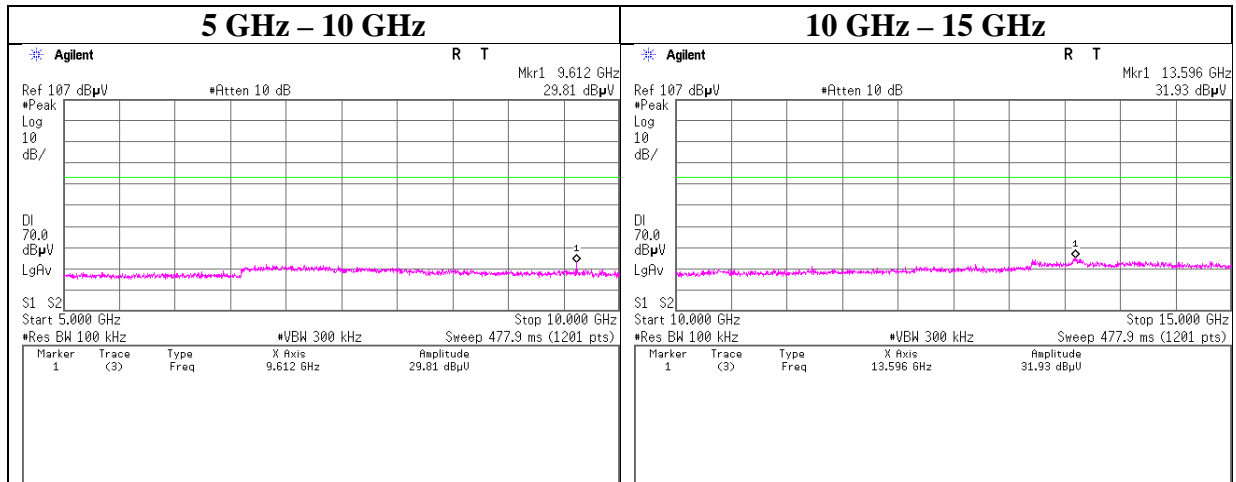
2402 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

2402 MHz



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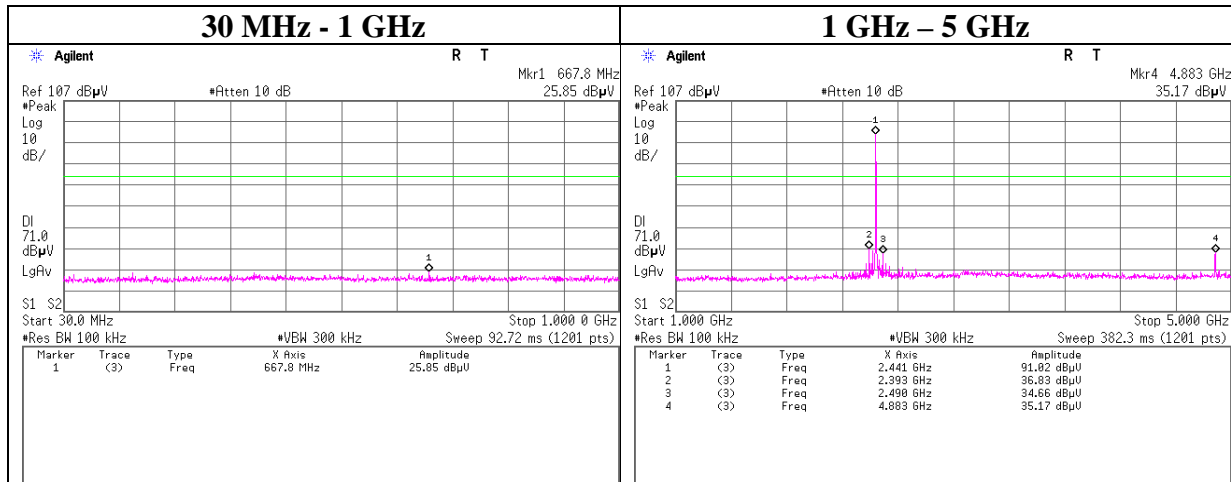
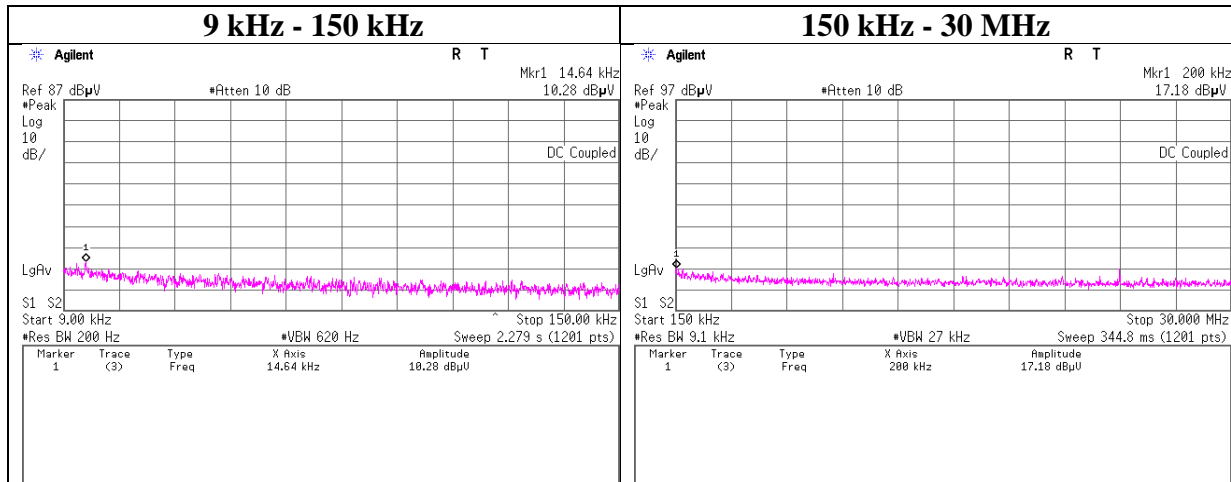
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

2441 MHz



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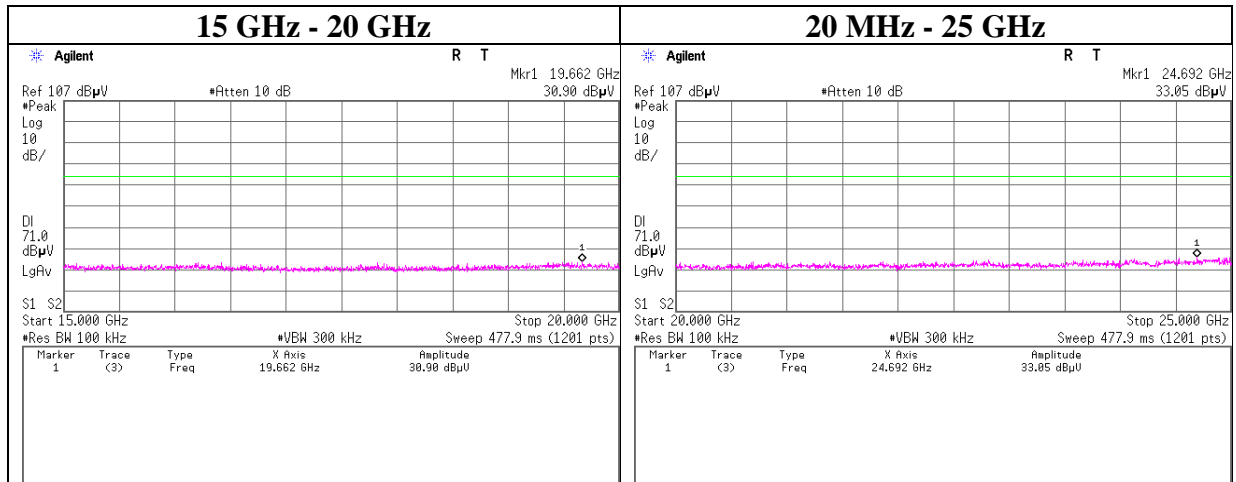
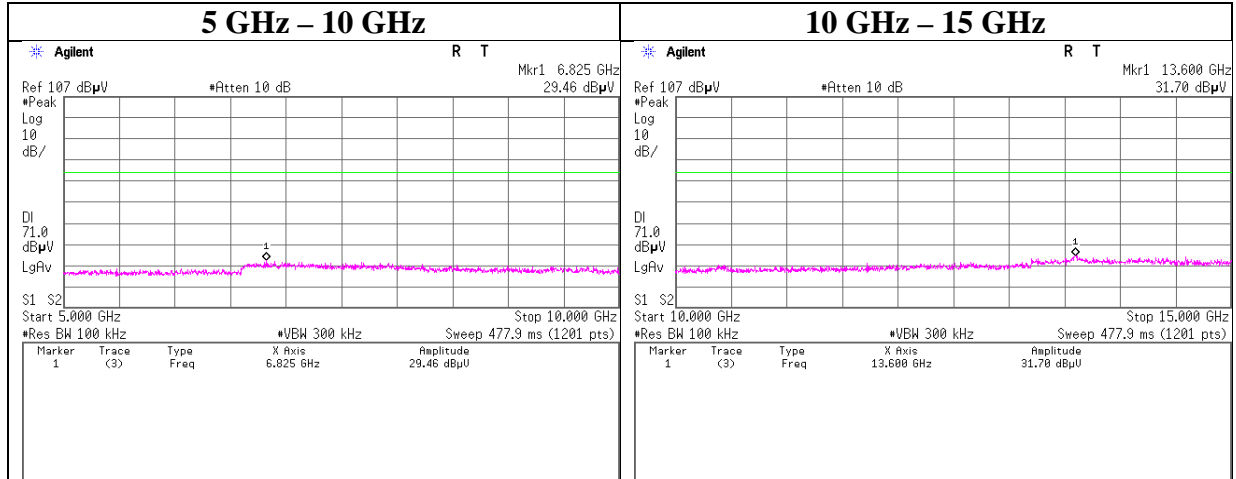
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

2441 MHz



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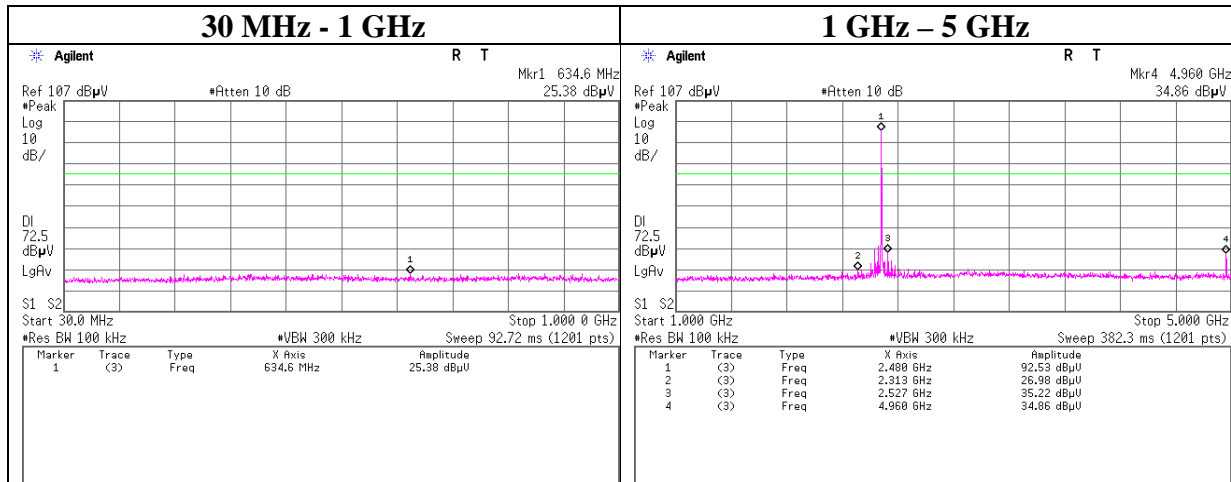
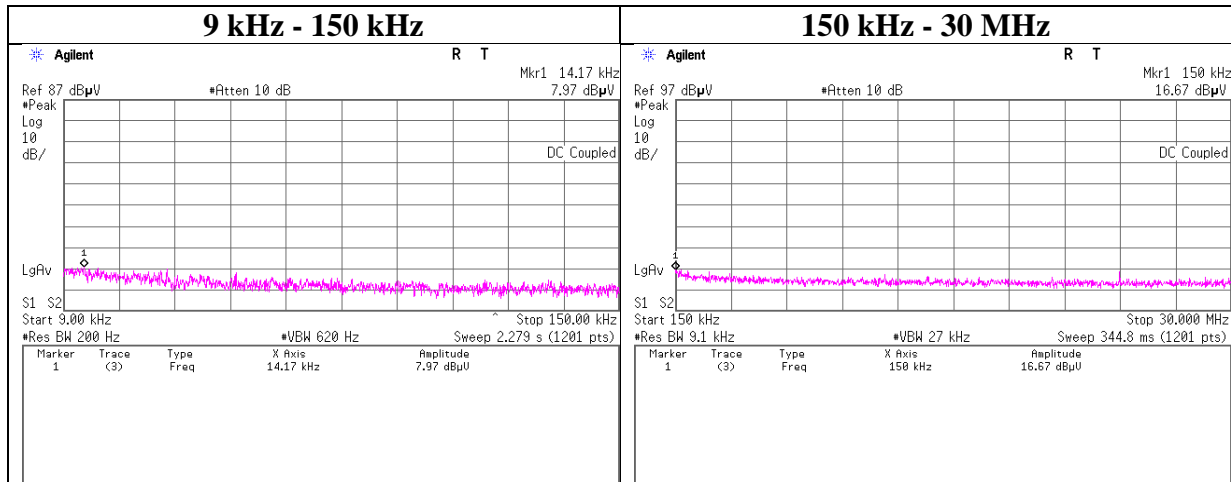
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

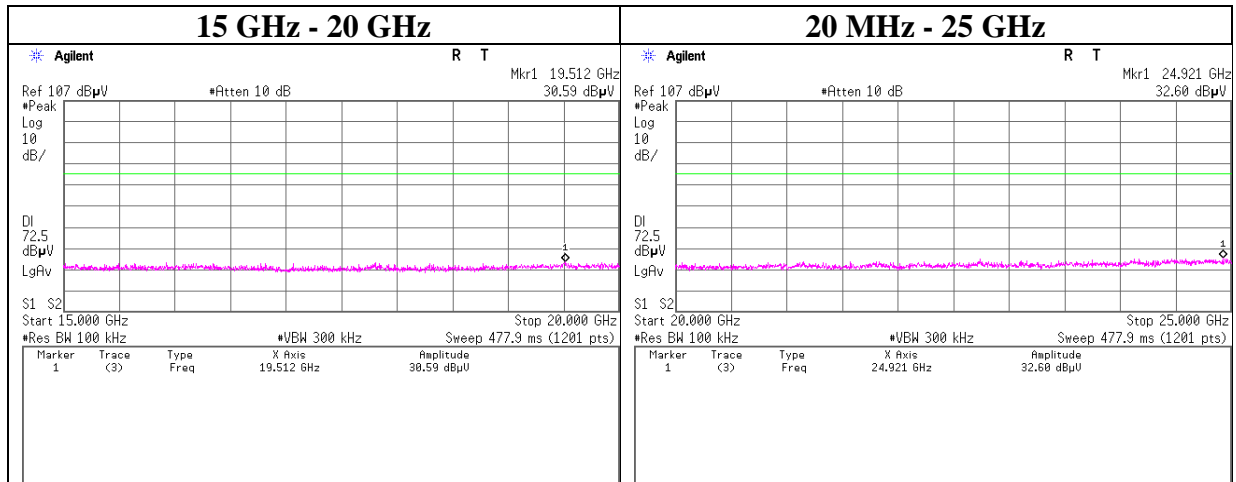
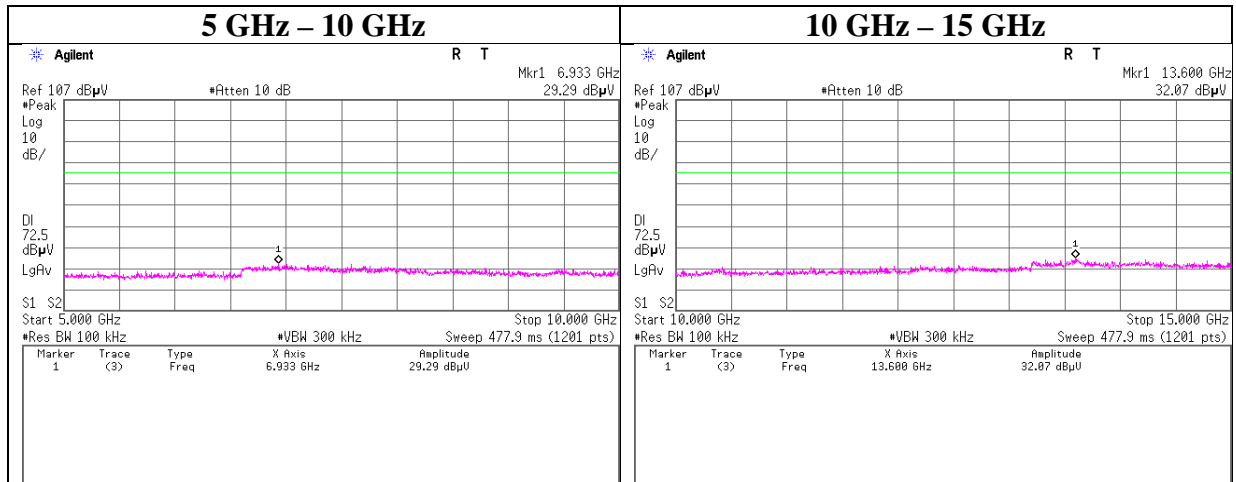
2480 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

2480 MHz



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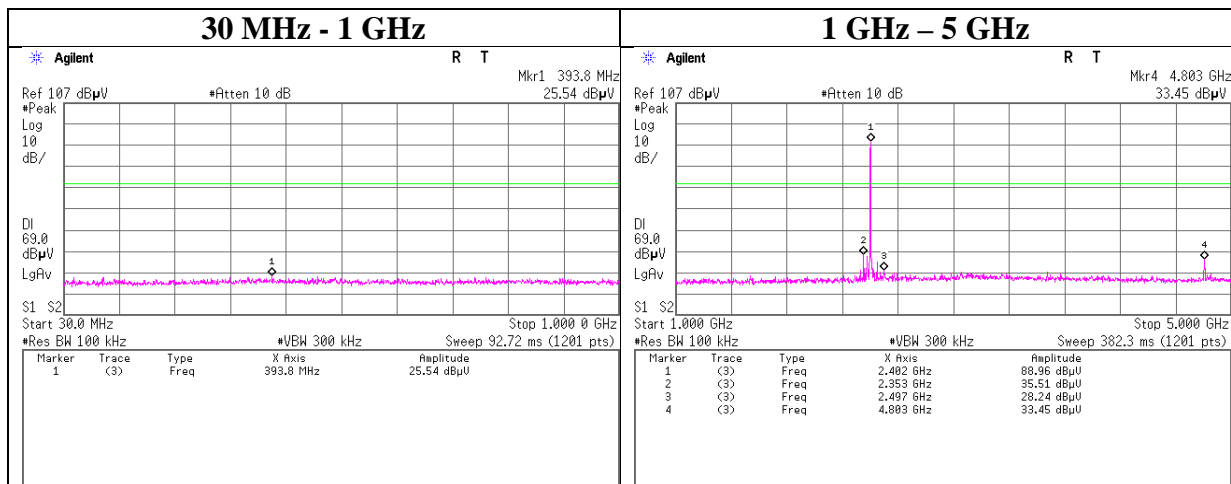
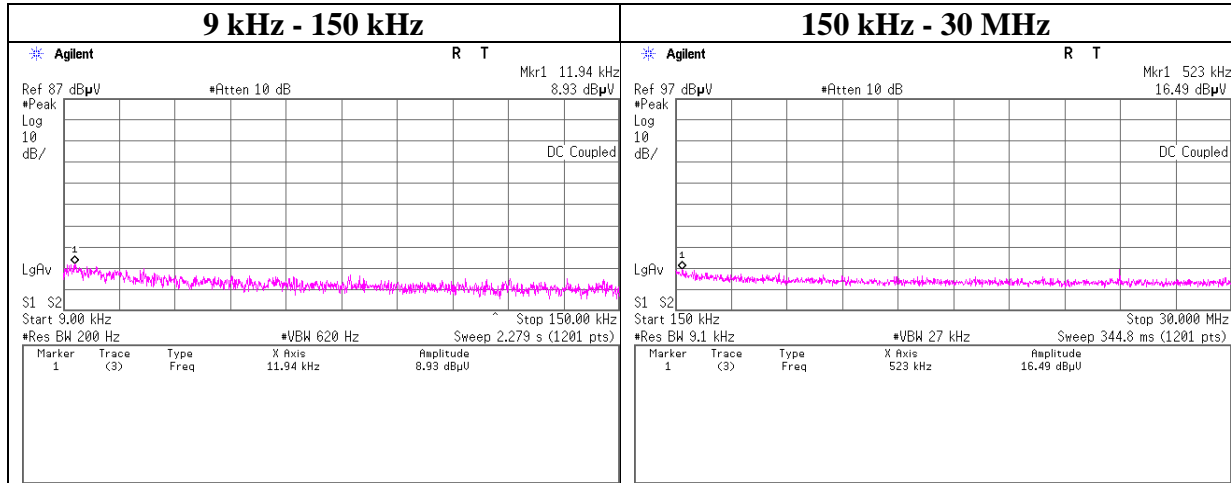
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

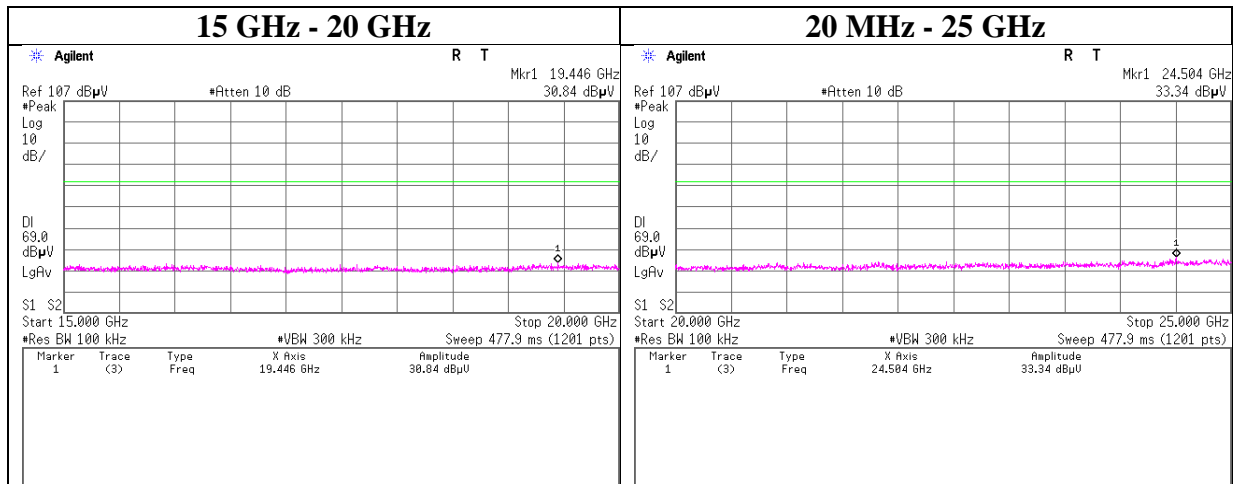
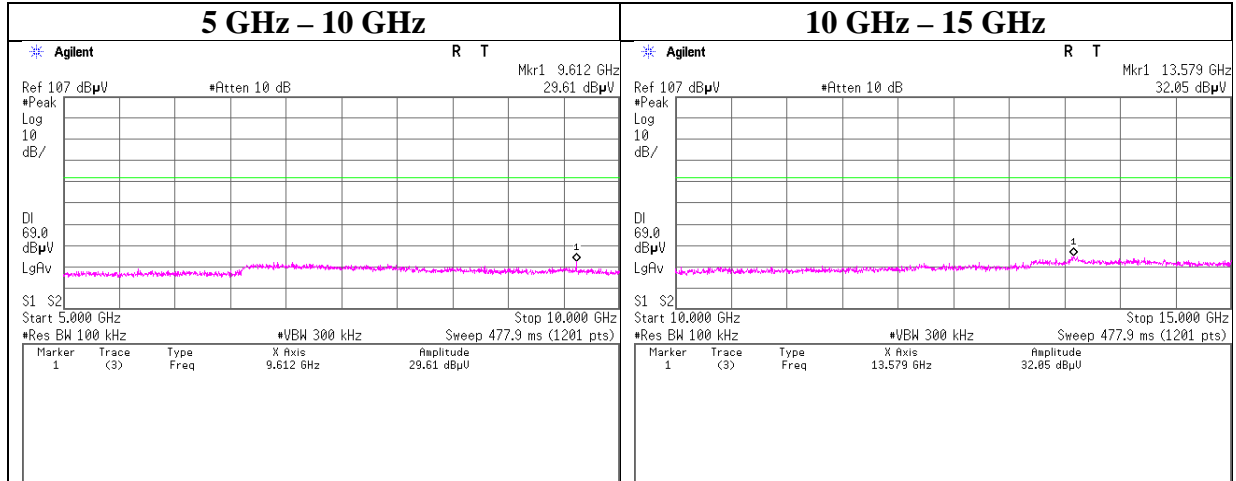
2402 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

2402 MHz



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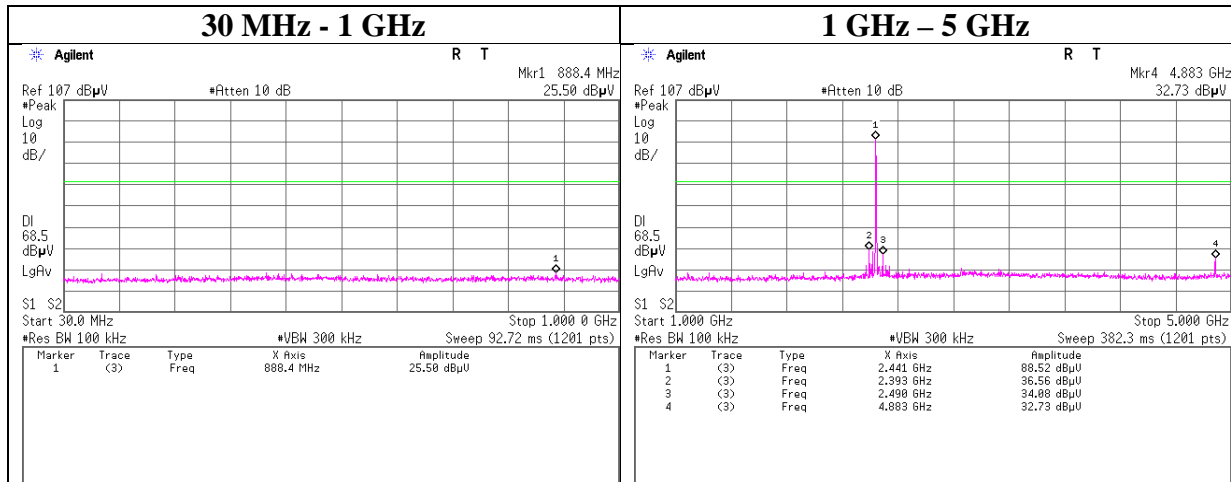
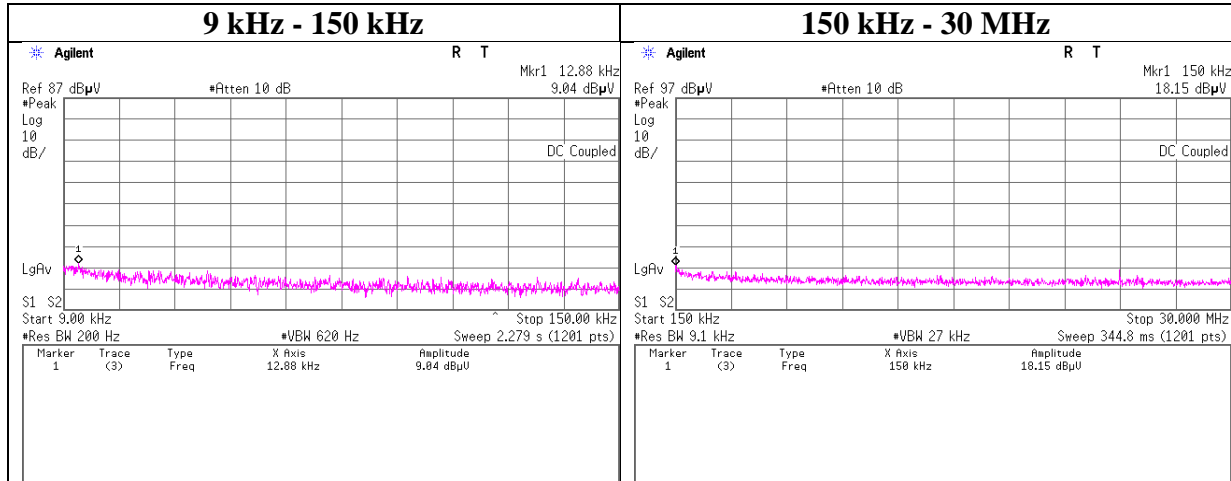
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

2441 MHz



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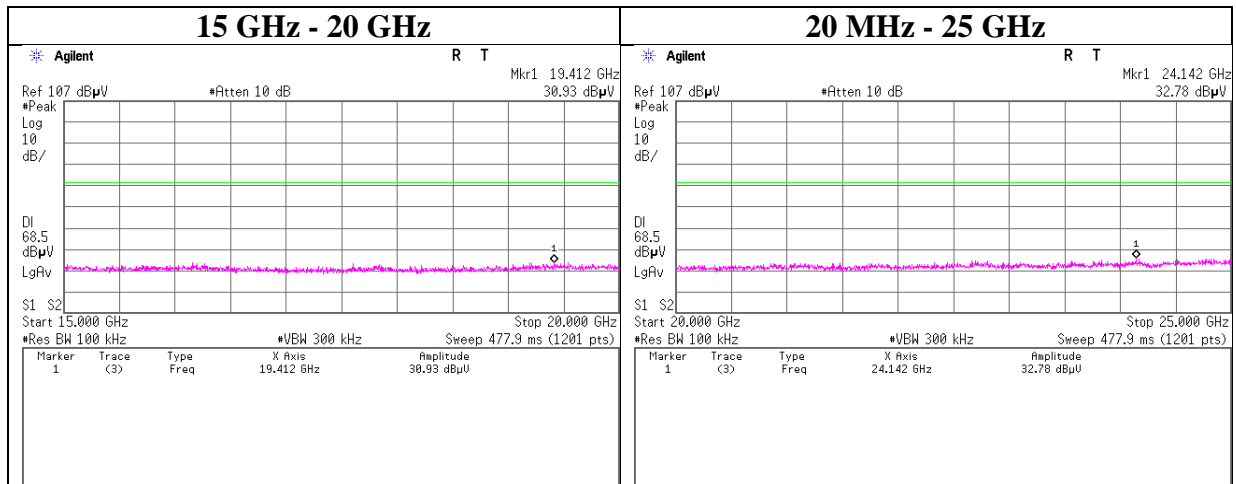
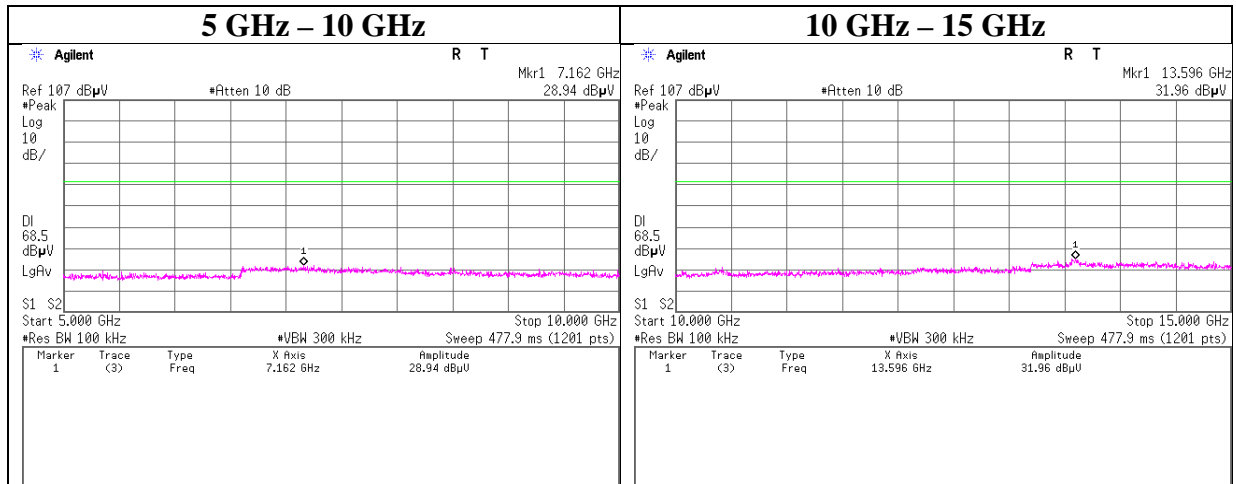
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

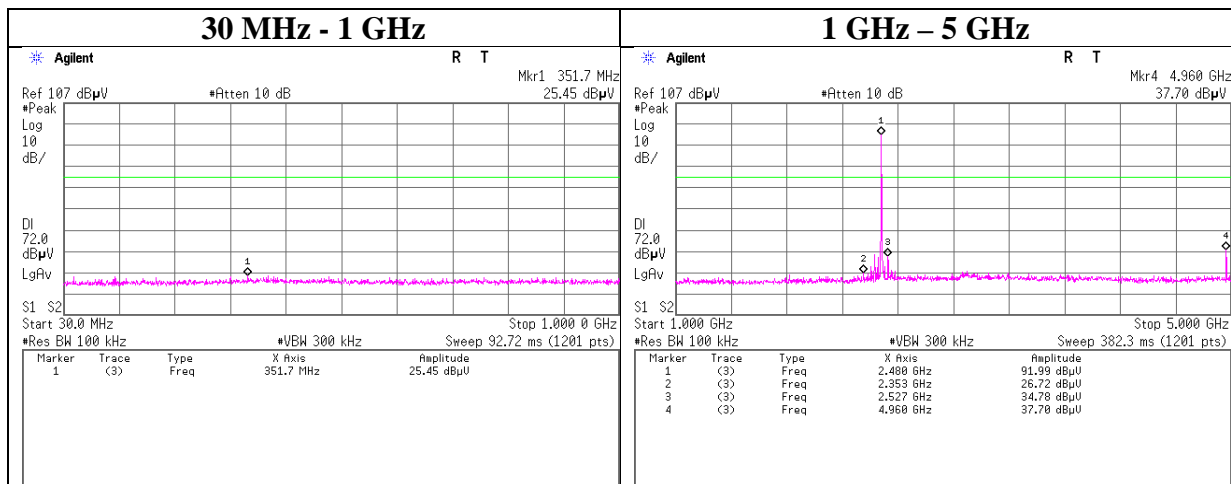
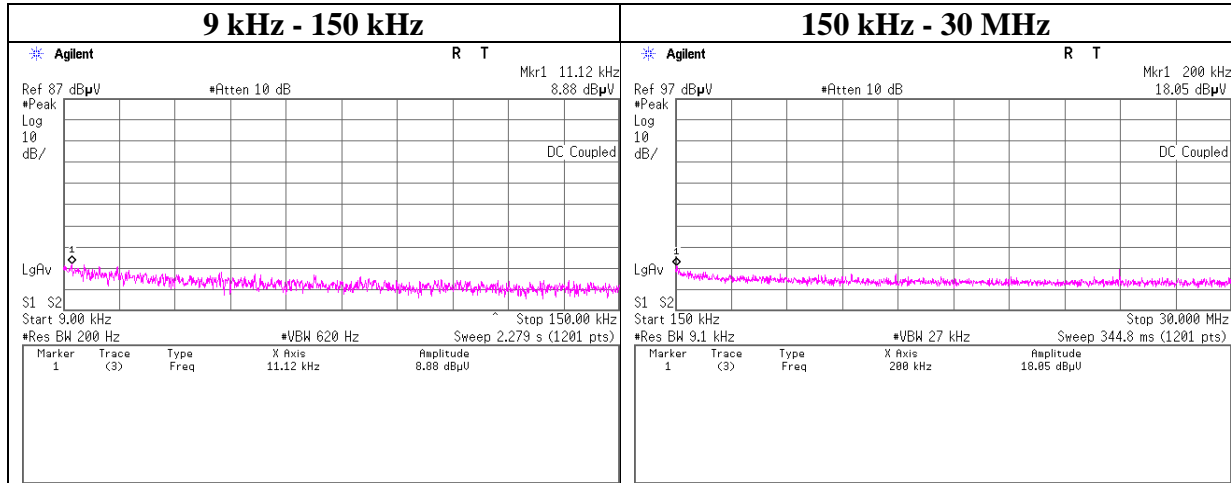
2441 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

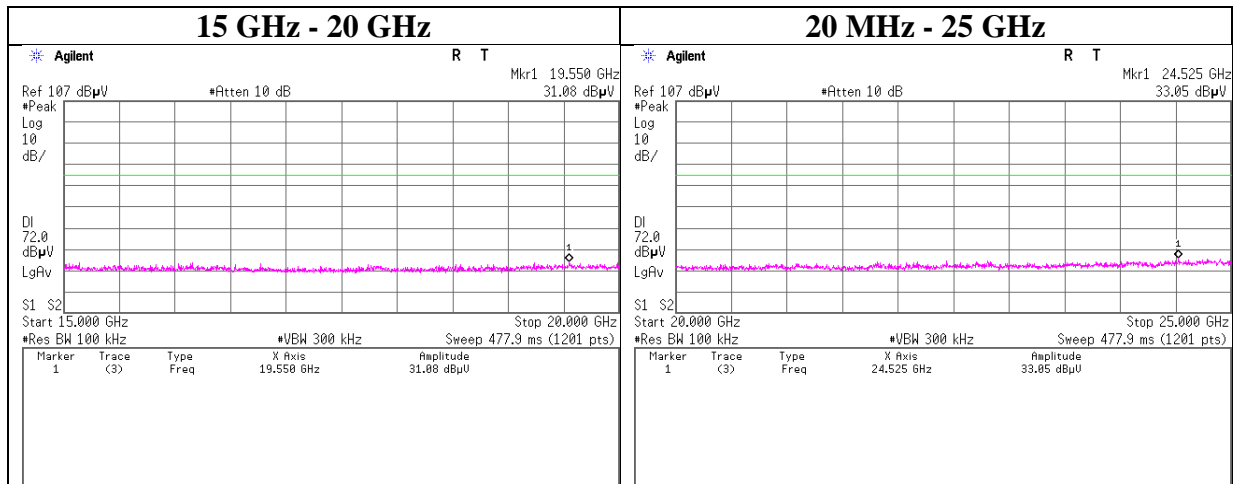
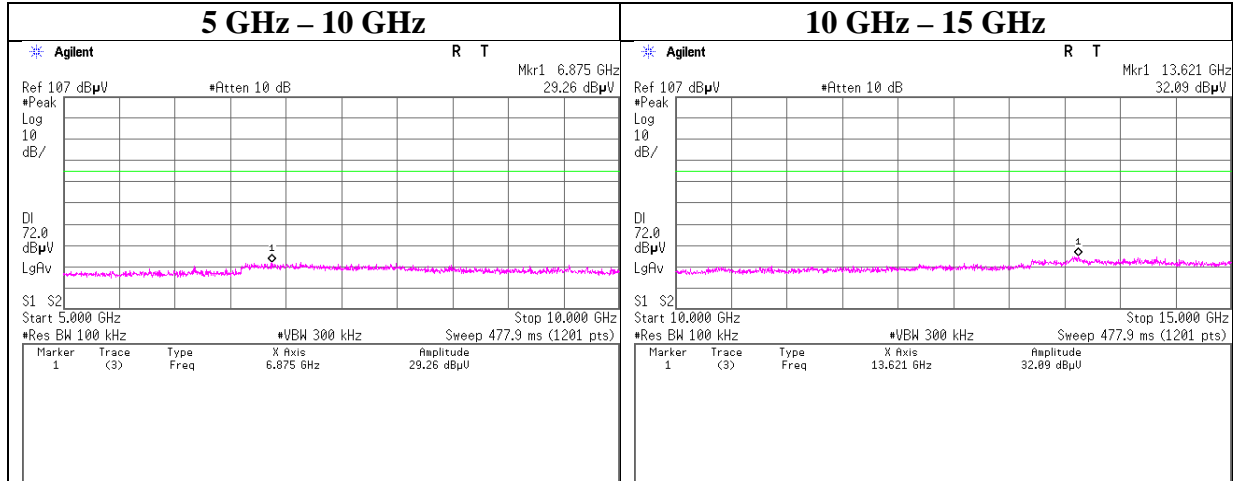
2480 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

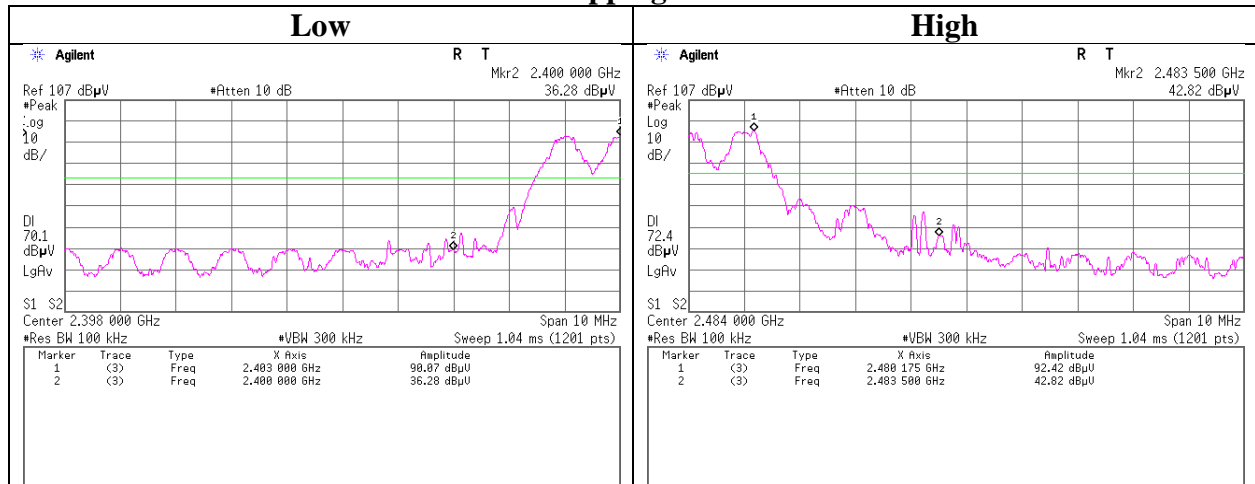
2480 MHz



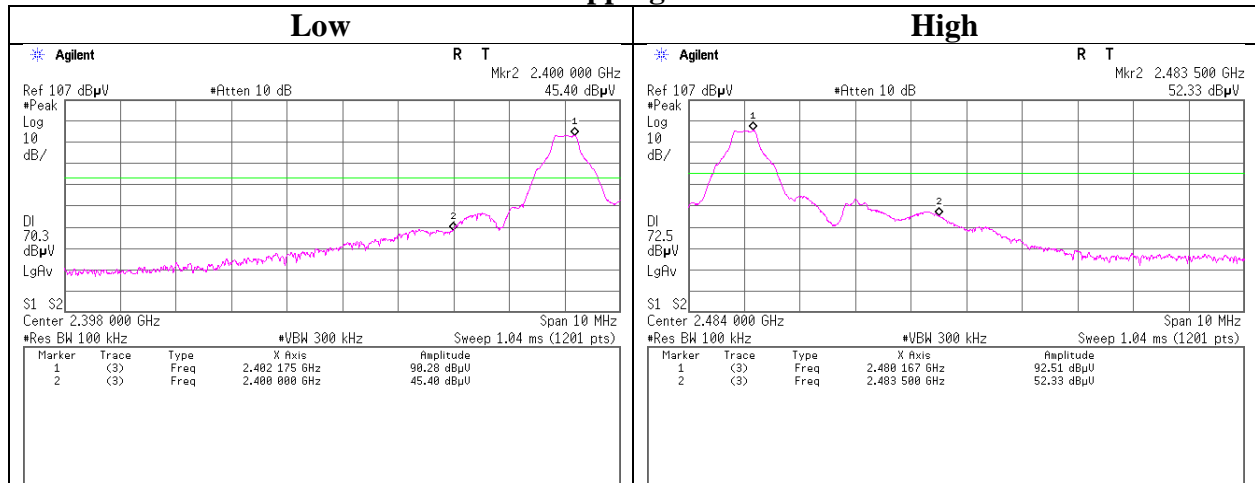
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

Hopping On



Hopping Off



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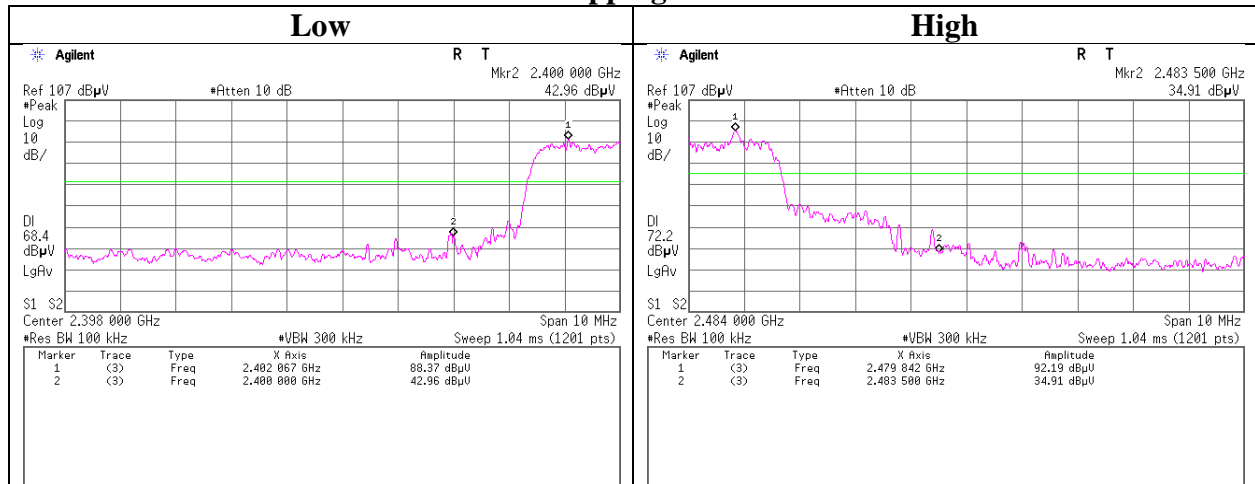
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

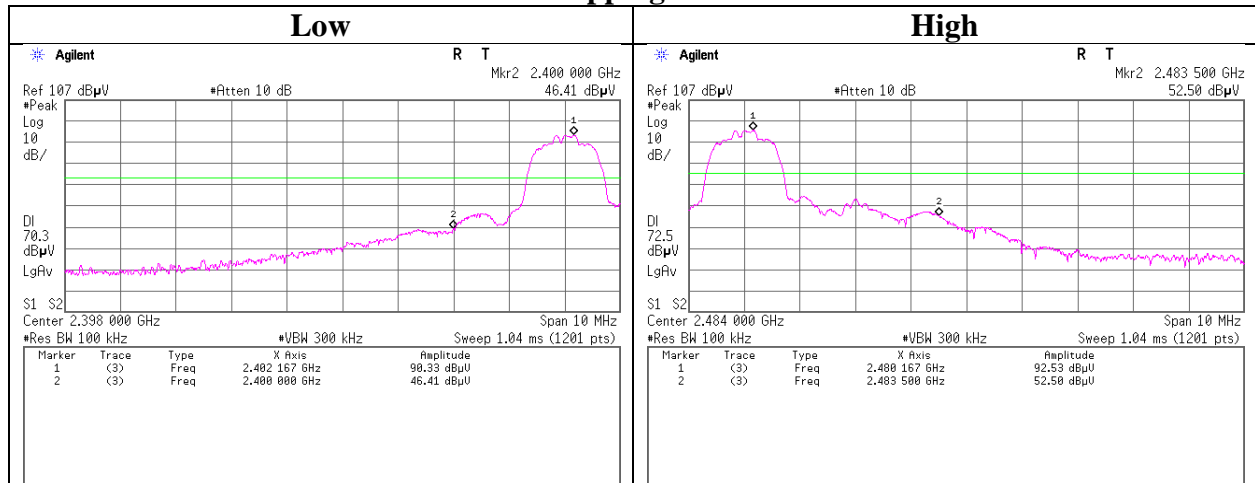
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

Hopping On



Hopping Off



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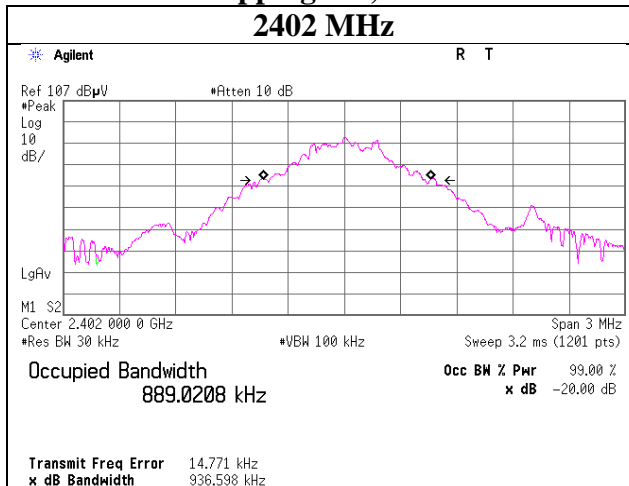
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

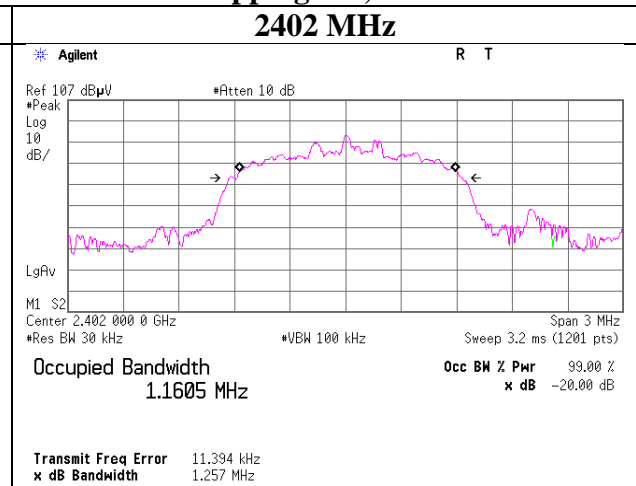
99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx Hopping Off

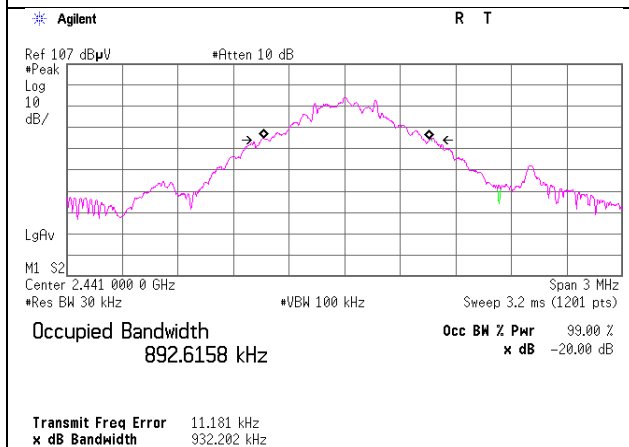
Hopping Off, DH5 2402 MHz



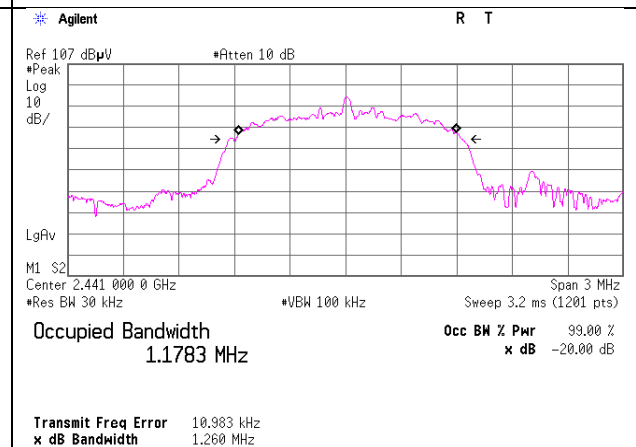
Hopping Off, 3DH5 2402 MHz



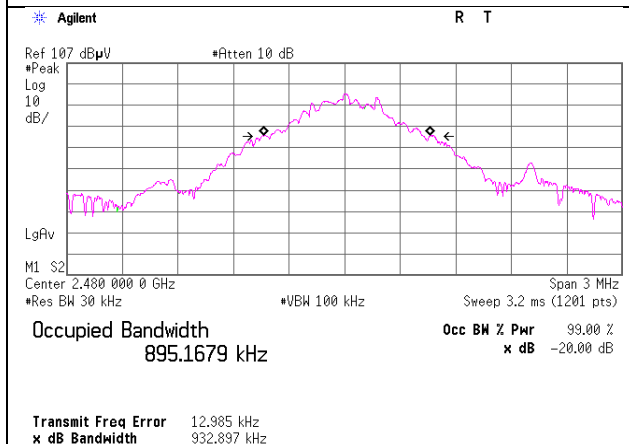
2441 MHz



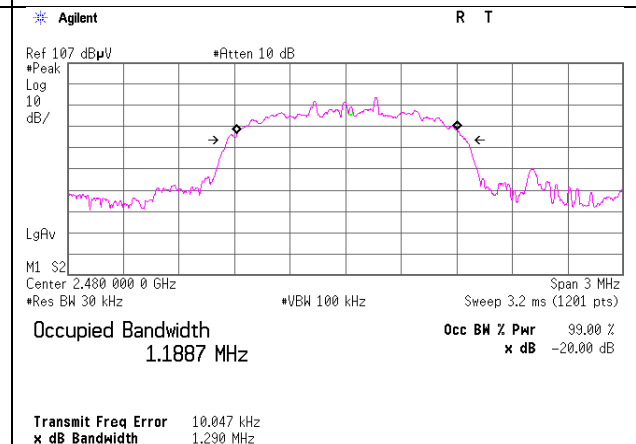
2441MHz



2480 MHz



2480MHz



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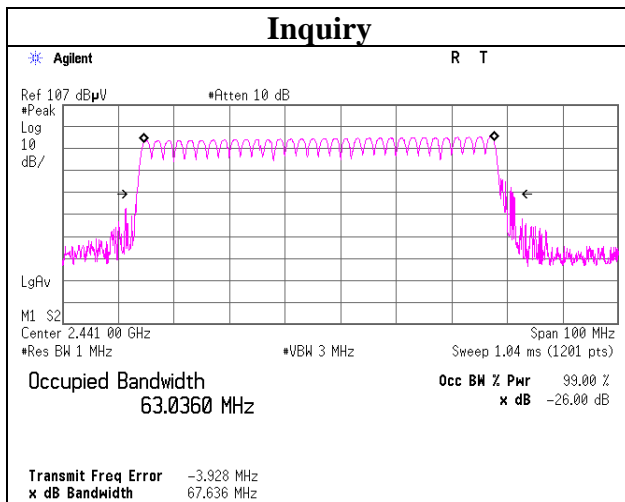
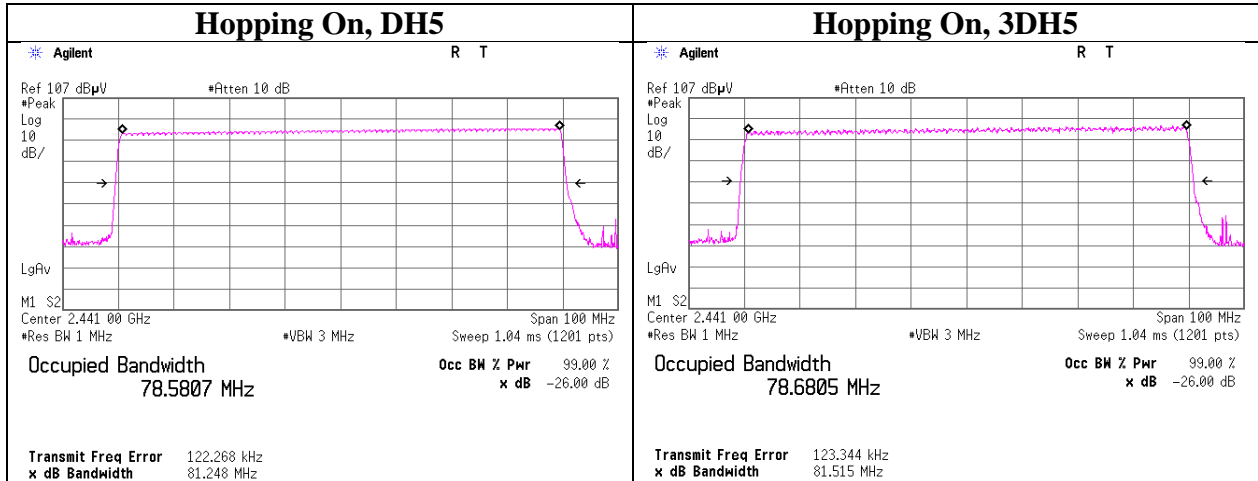
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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10828976H
Date	June 18, 2015
Temperature / Humidity	23 deg. C / 63 % RH
Engineer	Yuta Moriya
Mode	Tx Hopping On



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	CE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	CE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	CE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	CE	2014/11/12 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2015/06/08 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2014/07/10 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(AE)	2014/07/10 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2015/01/19 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2015/02/06 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/02/26 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-23	Measure	ASKUL	-	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2015/05/18 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2014/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2014/06/11 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2015/03/12 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2014/09/24 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2014/11/11 * 12
MAT-24	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71389	AT	2015/06/18 * 12
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2014/10/02 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2014/10/06 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2014/10/06 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2014/12/22 * 12
MTW-09	Torque wrench	HUBER+SUHNER	74 Z-0-0-21	72676	AT	2015/03/05 * 36
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2014/06/11 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2014/11/10 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2014/11/22 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2014/11/22 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2014/06/02 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2014/11/11 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2015/02/03 * 12

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**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**