RADIO TEST REPORT

Test Report No. : 11712578H-A

Applicant	:	**Sony Interactive Entertainment Inc.**
Type of Equipment	:	**Wireless Controller**
Model No.	:	**CECH-ZCM2U**
FCC ID	:	**AK8CECHZCM2**
Test regulation	:	**FCC Part 15 Subpart C: 2016**
Test Result	:	**Complied**

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

Date of test: April 13 to 15, 2017

Representative test engineer:
Takumi Shimada
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP TESTING
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.
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REVISION HISTORY

Original Test Report No.: 11712578H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11712578H-A	May 18, 2017	-	-

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SECTION 1: Customer information

Company Name	Sony Interactive Entertainment Inc.
Brand Name	SONY
Address	1-7-1 Konan, Minato-ku, Tokyo, 108-0075 Japan
Telephone Number	+81-50-3807-5639
Facsimile Number	+81-50-3807-9594
Contact Person	Kiyoto Sasaki

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

2.1 Identification of E.U.T.

Type of Equipment	Wireless Controller
Model No	CECH-ZCM2U
Serial No	See Clause 4.2
Country of Manufacture	China
Receipt Date of Sample	April 12, 2017
Condition of EUT	Engineering 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: CECH-ZCM2U (referred to as the EUT in this report) is a Wireless Controller.

Product Specification

Maximum clock frequency in the system (except radio part)	80 MHz
Clock frequency in the system (radio part)	26 MHz
Operating Temperature	5 deg. C to 35 deg. C
Power Supply	DC 5 V (USB Bus Power)
Battery Supply	DC 3.6 V
Size	Approx. 200 x 46 mm
Weight	Approx. 145 g

Radio Specification: Bluetooth (Ver. 2.1+EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, π/4DQPSK, 8DPSK)
Bandwidth & Channel spacing	79MHz & 1MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.2 V
Antenna Type	IFA
Antenna Gain	3.5 dBi max

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	**QP** 23.8 dB, 0.15467 MHz, N **AV** 19.9 dB, 2.56129 MHz, N	Complied	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)	See data.	Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (b)			
20dB Bandwidth	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)(iii)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (d)			
Dwell time	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(1)(iii)		Complied	Conducted
	IC: -	**IC:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(a)(b)(1)		Complied	Conducted
	IC: RSS-Gen 6.12	**IC:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** FCC Public Notice DA 00-705	**FCC:** Section15.247(d)	15.9 dB 487.828 MHz, Vertical, QP	Complied	Conducted/ Radiated (above 30 MHz) *1)
	IC: RSS-Gen 6.13	**IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on section 15.247(d).					

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.2 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.

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Ise EMC Lab.

Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.5 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz - 0.15 MHz	3.5 dB
0.15 MHz - 30 MHz	3.0 dB

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

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

Radiated emission (Above 1 GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 GHz - 6 GHz	6 GHz - 18 GHz	10 GHz - 26.5 GHz	26.5 GHz - 40 GHz	1 GHz - 18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

*Measurement distance

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

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

3.5 Test Location

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

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Details of Operating Mode(s)

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	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.

*EUT has the power settings by the software as follows (setting value might be different from product specification value);
- Power settings: 7
- Software: BT tool Version: W1620
*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.

4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

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

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

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

SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	4.5 m*2) (1 GHz – 10 GHz), 1 m*3) (10 GHz – 26.5 GHz)		4.5 m*2) (1 GHz – 10 GHz), 1 m*3) (10 GHz – 26.5 GHz)

*1) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.
*2) Distance Factor: 20 x log (4.5 m/3.0 m) = 3.53 dB
*3) Distance Factor: 20 x log (1.0 m/3.0 m) = -9.5 dB

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

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

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

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 *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	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) Reference data
*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

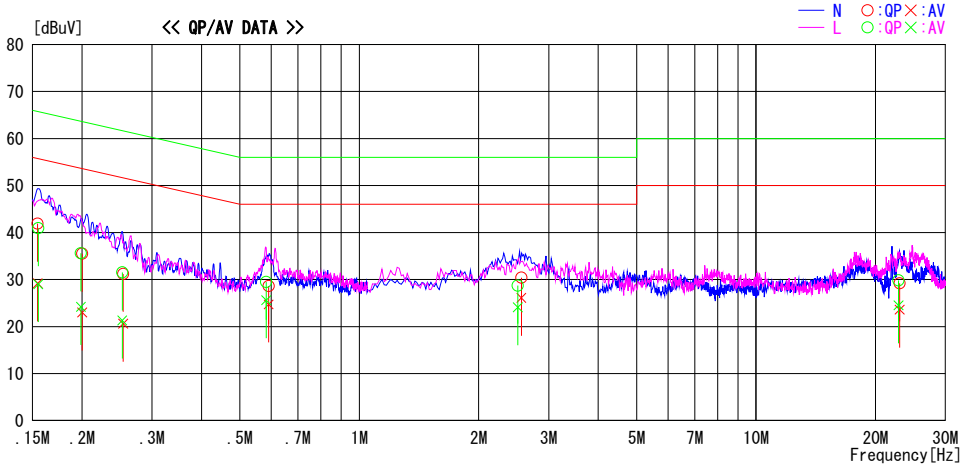
UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2017/04/15

Report No. : 11712578H

Temp./Humi. : 21deg. C / 42% RH
Engineer : Yuta Moriya

Mode / Remarks : Tx DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



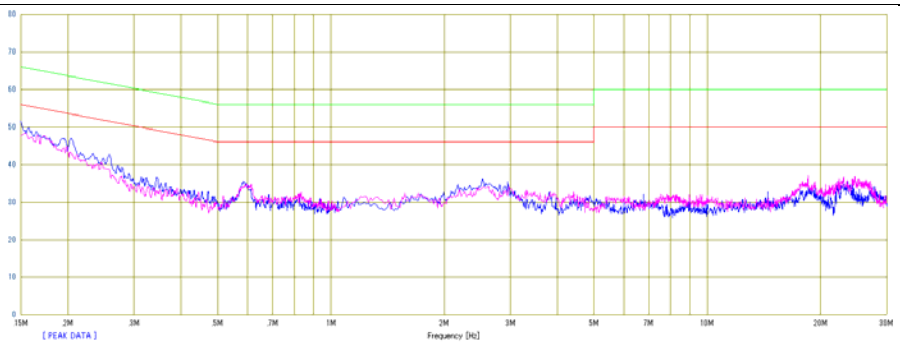
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15467	28.4	15.7	13.5	41.9	29.2	65.7	55.7	23.8	26.5	N	
0.15525	27.4	15.5	13.5	40.9	29.0	65.7	55.7	24.8	26.7	L	
0.19881	22.1	10.7	13.5	35.6	24.2	63.7	53.7	28.1	29.5	L	
0.20024	22.0	9.5	13.5	35.5	23.0	63.6	53.6	28.1	30.6	N	
0.25404	17.7	7.1	13.5	31.2	20.6	61.6	51.6	30.4	31.0	N	
0.25267	18.0	7.8	13.5	31.5	21.3	61.7	51.7	30.2	30.4	L	
0.59095	15.1	11.2	13.5	28.6	24.7	56.0	46.0	27.4	21.3	N	
0.58237	16.0	12.1	13.5	29.5	25.6	56.0	46.0	26.5	20.4	L	
2.50835	14.9	10.3	13.8	28.7	24.1	56.0	46.0	27.3	21.9	L	
2.56129	16.6	12.3	13.8	30.4	26.1	56.0	46.0	25.6	19.9	N	
22.85686	15.0	9.7	14.8	29.8	24.5	60.0	50.0	30.2	25.5	L	
22.99874	14.4	8.8	14.8	29.2	23.6	60.0	50.0	30.8	26.4	N	

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.

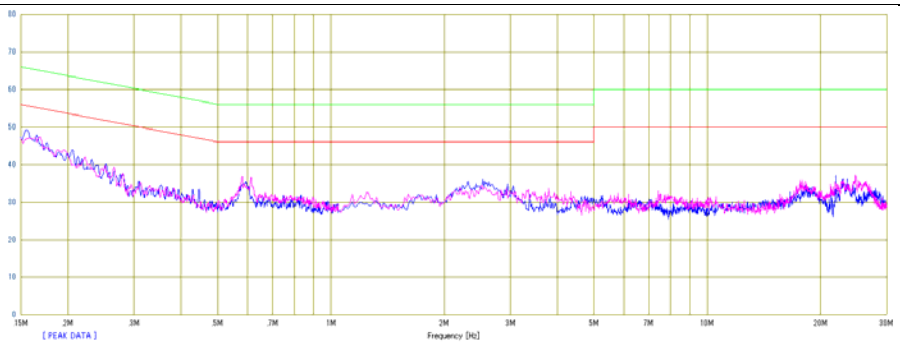
Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11712578H
Date	April 15, 2017
Temperature / Humidity	21 deg. C / 42 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, DH5

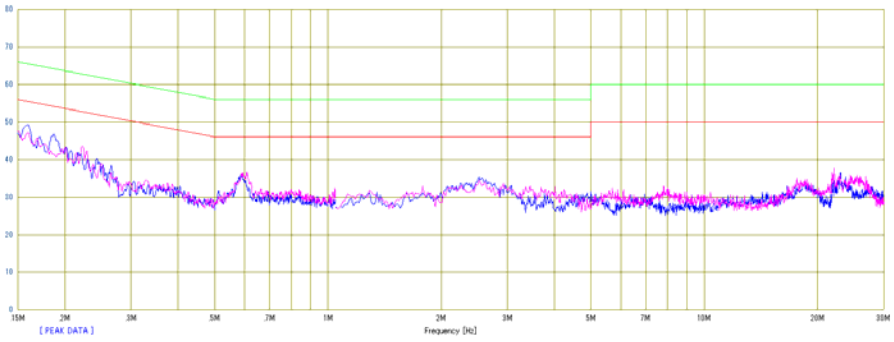
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2017/04/15

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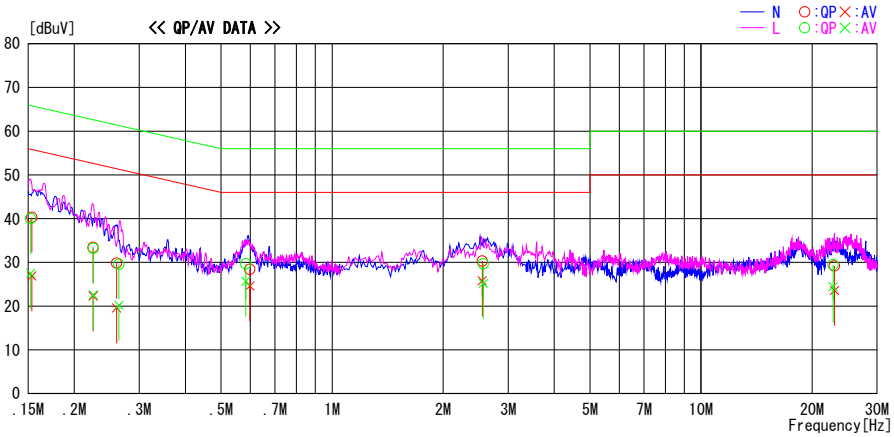
Temp./Humi. : 21deg. C / 42% RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 3DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



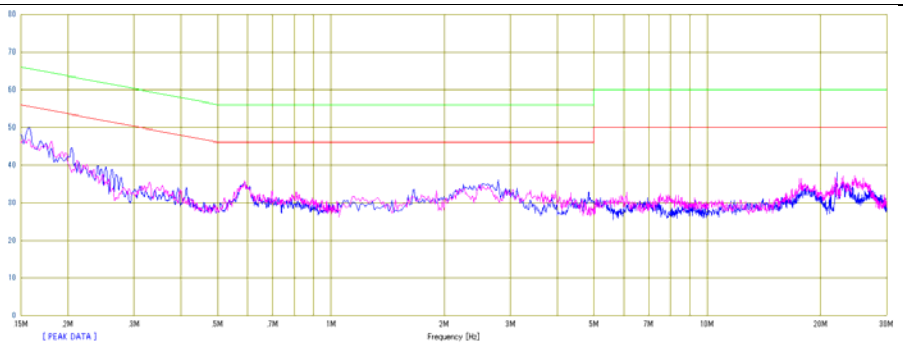
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15350	26.8	13.4	13.5	40.3	26.9	65.8	55.8	25.5	28.9	N	
0.22508	19.9	8.8	13.5	33.4	22.3	62.6	52.6	29.2	30.3	N	
0.26035	16.3	6.1	13.5	29.8	19.6	61.4	51.4	31.6	31.8	N	
0.59845	14.9	11.1	13.5	28.4	24.6	56.0	46.0	27.6	21.4	N	
2.55054	16.5	12.0	13.8	30.3	25.8	56.0	46.0	25.7	20.2	N	
22.98439	14.4	8.8	14.8	29.2	23.6	60.0	50.0	30.8	26.4	N	
0.15233	26.5	14.0	13.5	40.0	27.5	65.9	55.9	25.9	28.4	L	
0.22525	19.7	9.1	13.5	33.2	22.6	62.6	52.6	29.4	30.0	L	
0.26433	16.1	6.7	13.5	29.6	20.2	61.3	51.3	31.7	31.1	L	
0.58332	16.2	12.2	13.5	29.7	25.7	56.0	46.0	26.3	20.3	L	
2.56857	15.9	11.4	13.8	29.7	25.2	56.0	46.0	26.3	20.8	L	
22.78424	14.7	9.7	14.8	29.5	24.5	60.0	50.0	30.5	25.5	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.

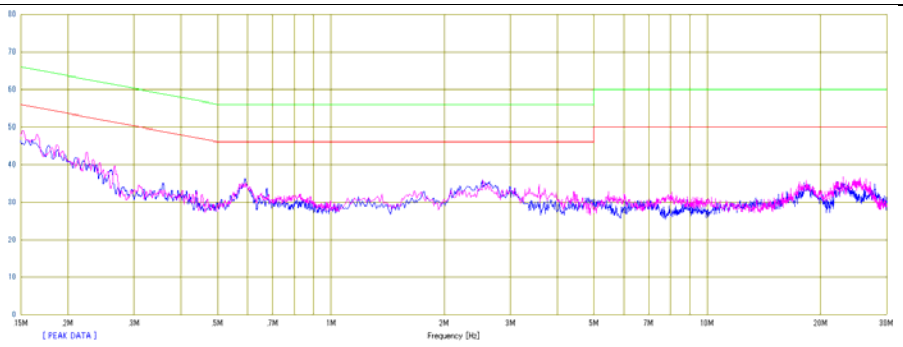
Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11712578H
Date	April 15, 2017
Temperature / Humidity	21 deg. C / 42 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5

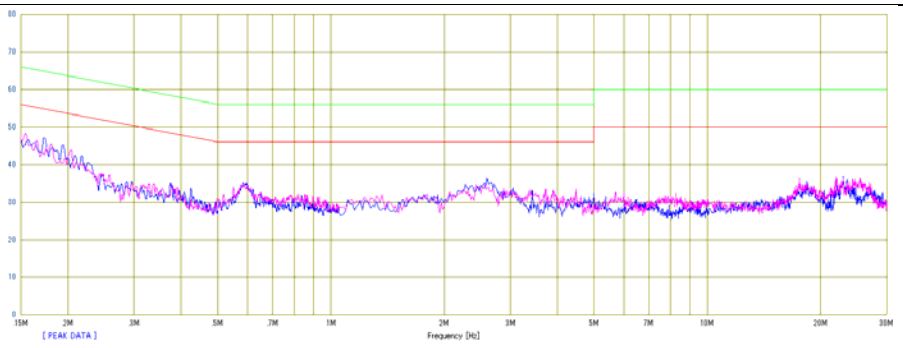
2402 MHz



2441 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

20dB Bandwidth and Carrier Frequency Separation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.018	1.000	>= 0.679
DH5	2441.0	0.967	1.000	>= 0.644
DH5	2480.0	0.967	1.000	>= 0.645
3DH5	2402.0	1.311	1.000	>= 0.874
3DH5	2441.0	1.304	1.000	>= 0.869
3DH5	2480.0	1.325	1.000	>= 0.883

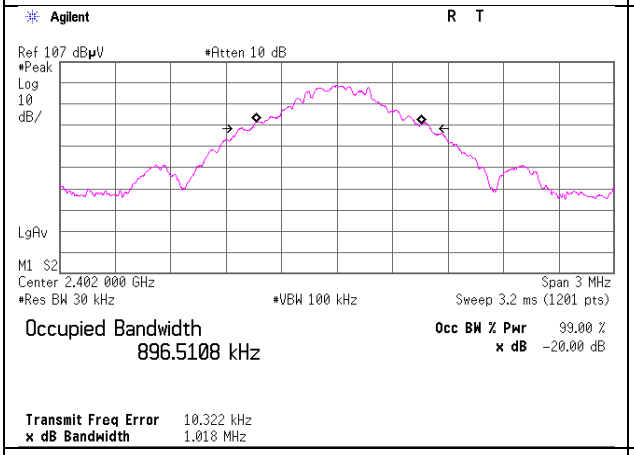
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation

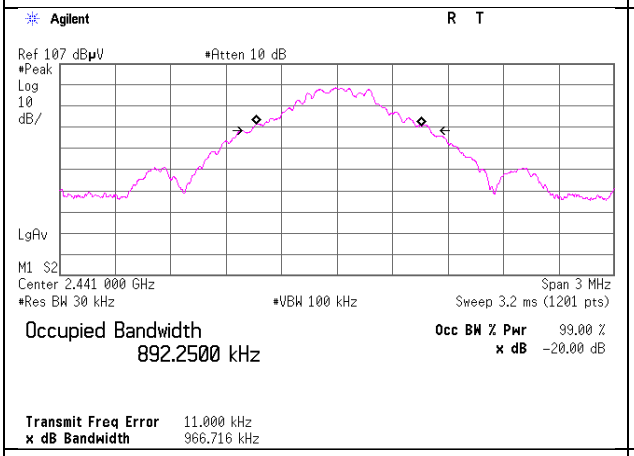
DH5

20 dB Bandwidth

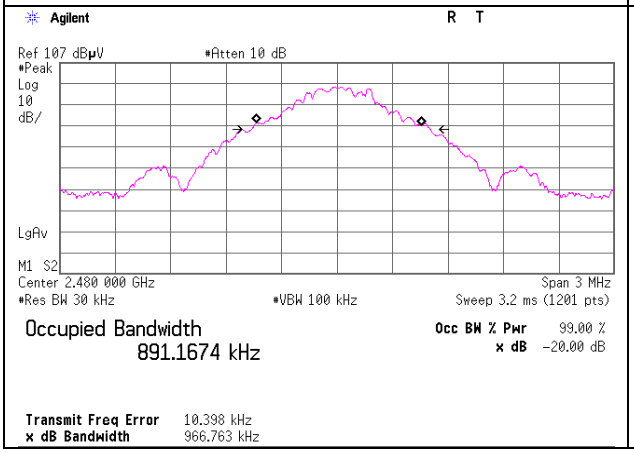
2402 MHz



2441 MHz

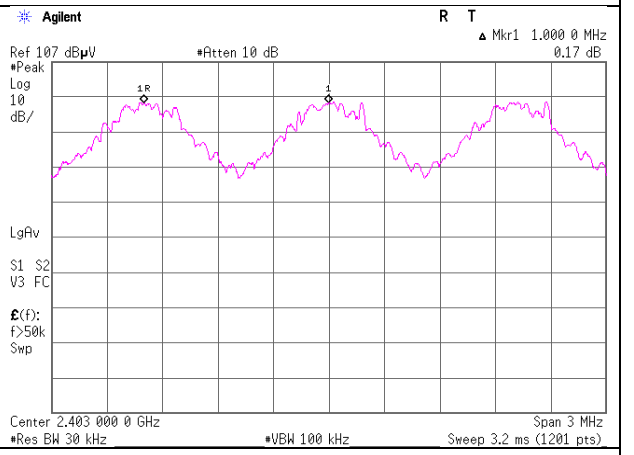


2480 MHz

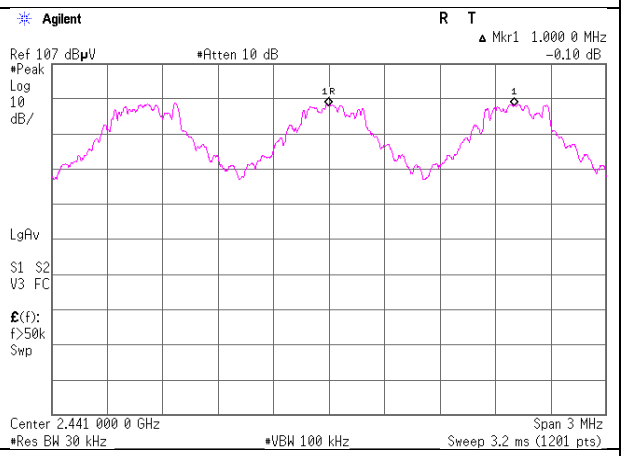


Carrier Frequency Separation

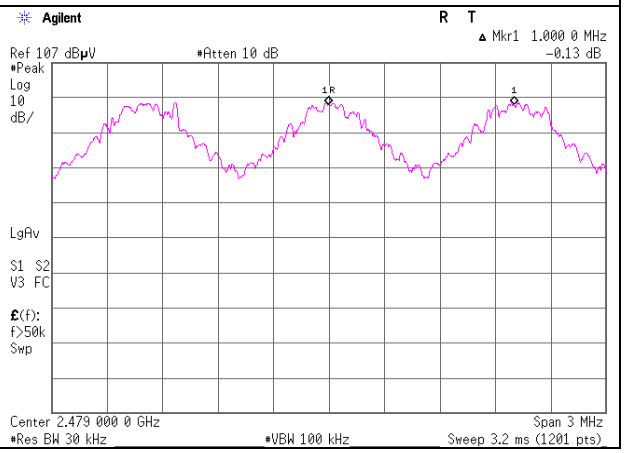
2402 MHz



2441 MHz



2480 MHz

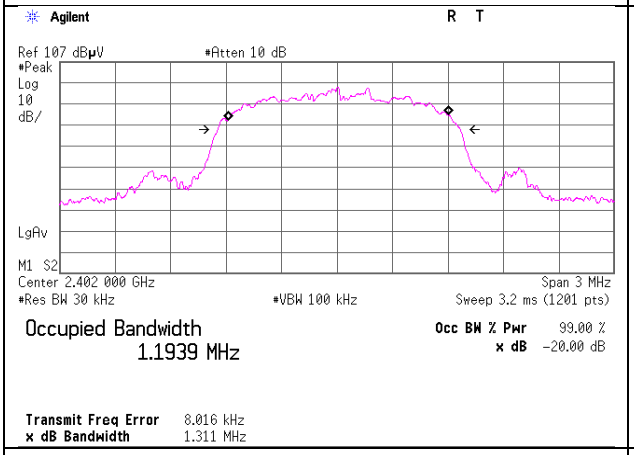


20dB Bandwidth and Carrier Frequency Separation

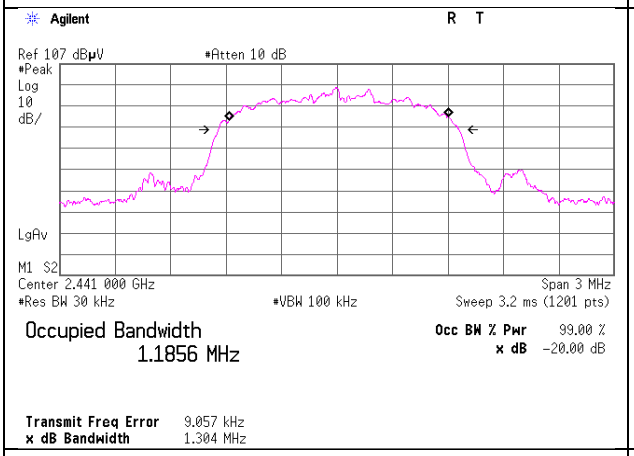
3DH5

20 dB Bandwidth

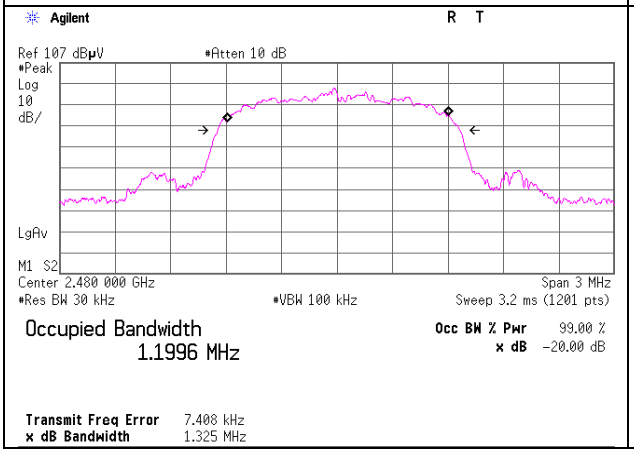
2402 MHz



2441MHz

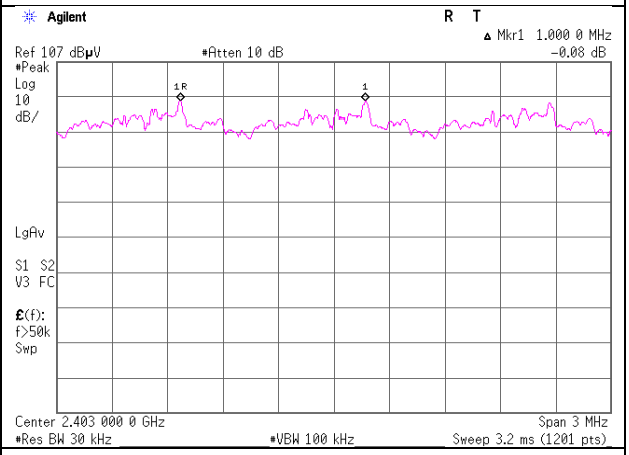


2480MHz

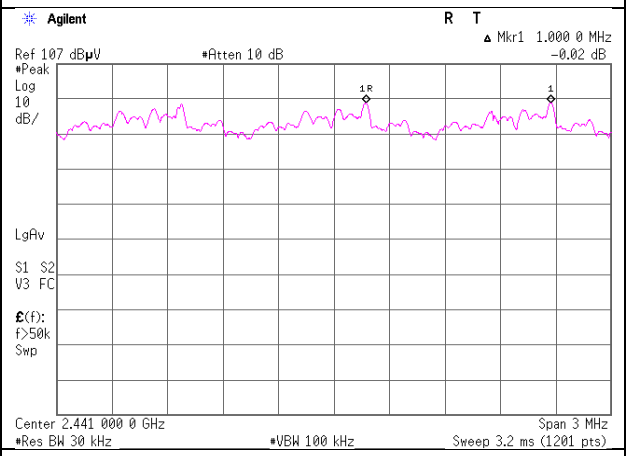


Carrier Frequency Separation

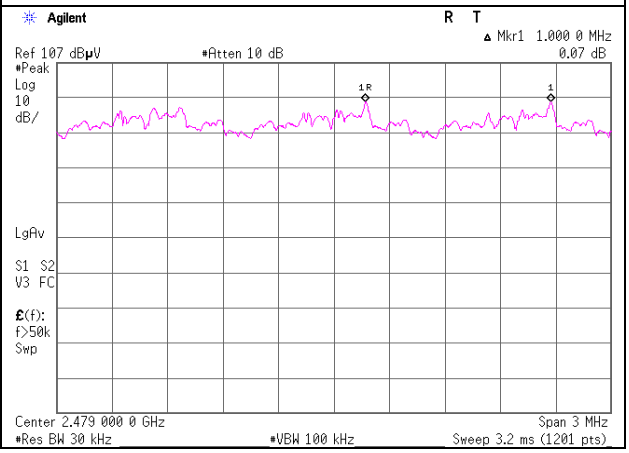
2402 MHz



2441 MHz



2480 MHz



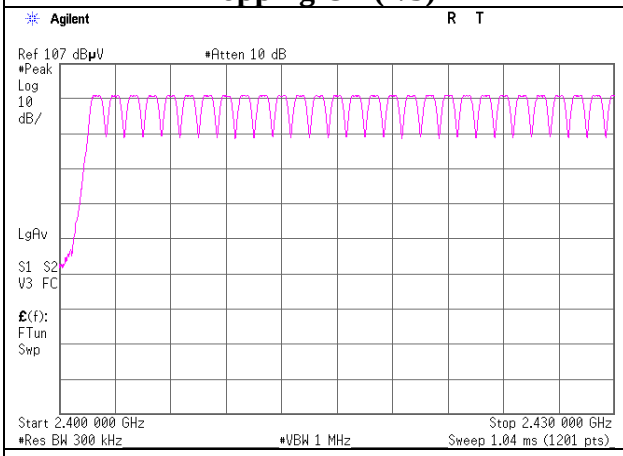
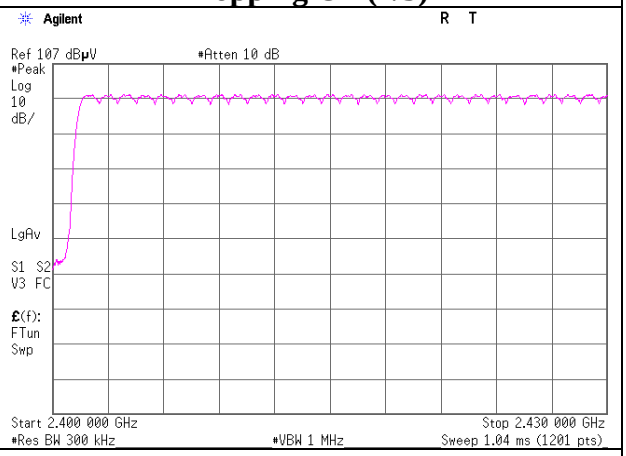
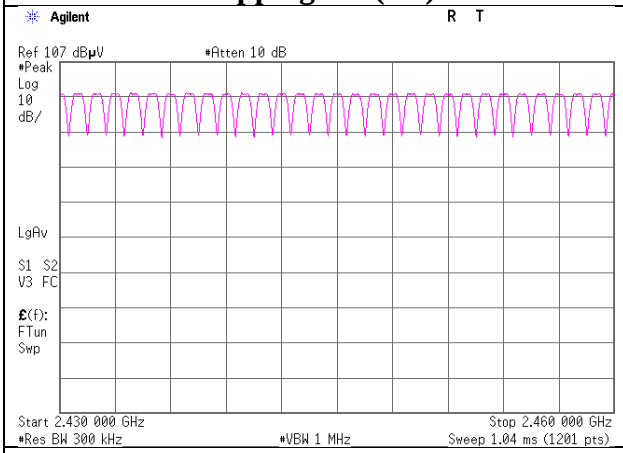
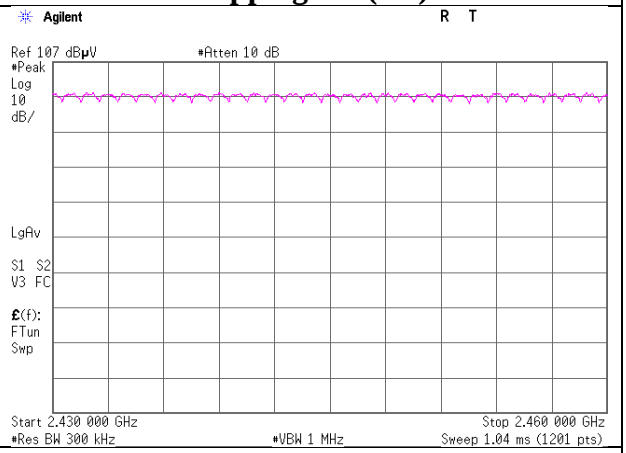
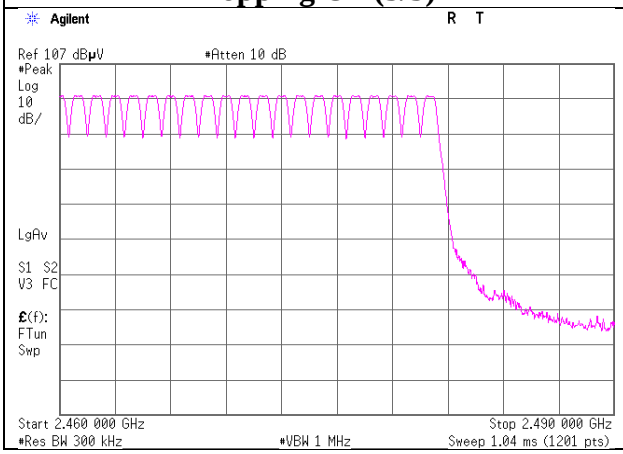
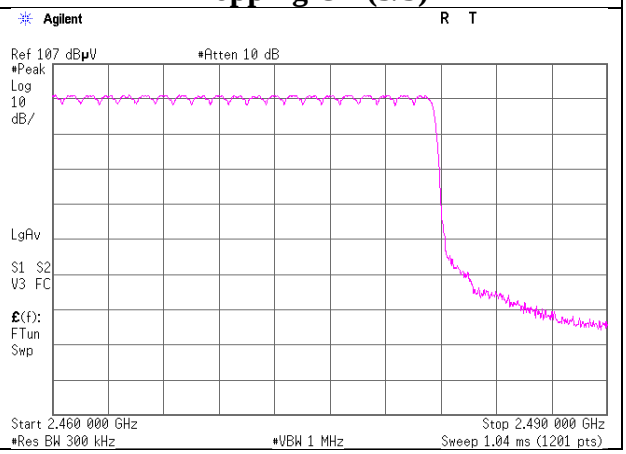
Number of Hopping Frequency

Test place	Ise EMC Lab. No.1 1Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping On

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

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

Number of Hopping Frequency

DH5	3DH5
Hopping On (1/3)	**Hopping On (1/3)**
	
Hopping On (2/3)	**Hopping On (2/3)**
	
Hopping On (3/3)	**Hopping On (3/3)**
	

Dwell time

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
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	0.387	122	400
DH3	24.6 times / 5 sec. x 31.6 sec. = 156 times	1.647	257	400
DH5	19.2 times / 5 sec. x 31.6 sec. = 122 times	2.906	355	400
3DH1	50.0 times / 5 sec. x 31.6 sec. = 316 times	0.394	124	400
3DH3	24.2 times / 5 sec. x 31.6 sec. = 153 times	1.649	252	400
3DH5	18.4 times / 5 sec. x 31.6 sec. = 117 times	2.911	341	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

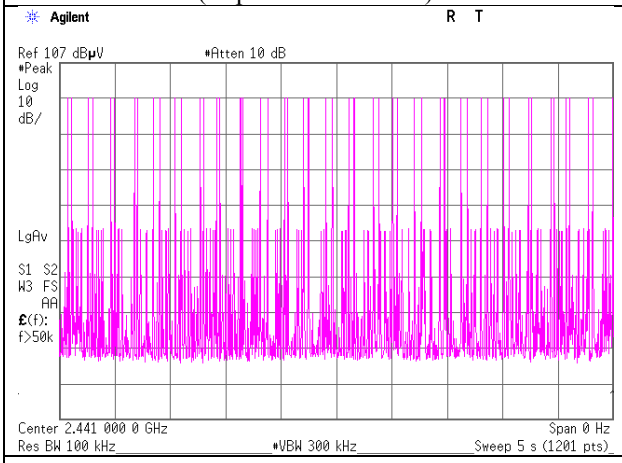
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	50	50	50	50	50
DH3	26	23	27	22	25	24.6
DH5	18	19	18	21	20	19.2
3DH1	50	51	50	49	50	50
3DH3	27	24	24	23	23	24.2
3DH5	16	17	21	21	17	18.4

Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

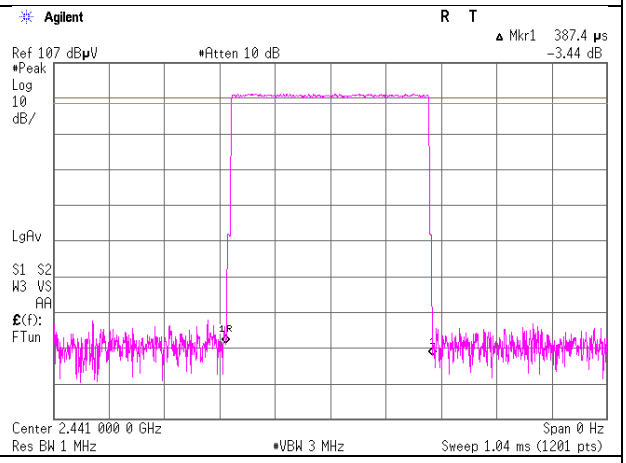
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

Dwell time

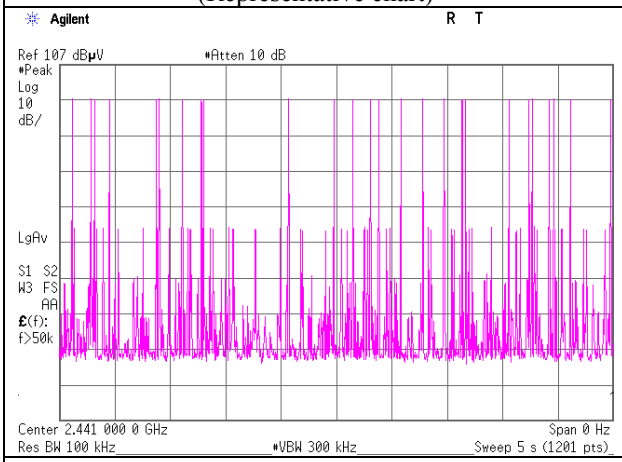
DH1 (1/2)
(Representative chart)



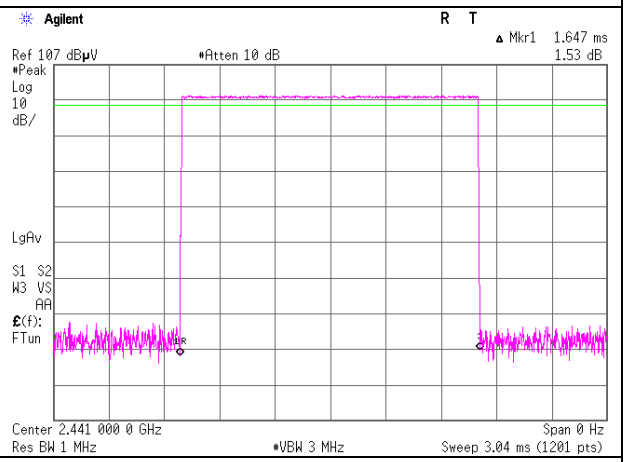
DH1 (2/2)



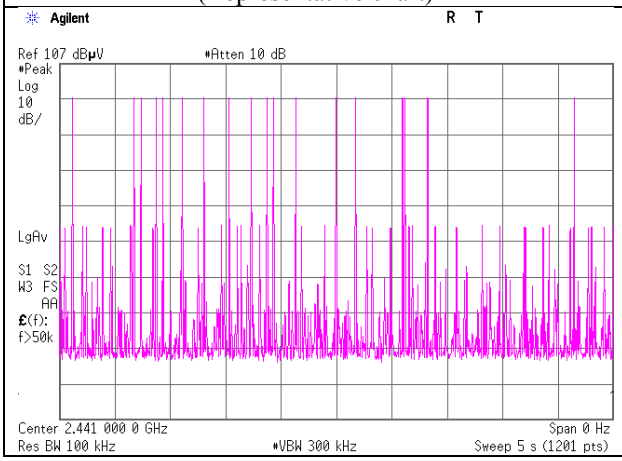
DH3 (1/2)
(Representative chart)



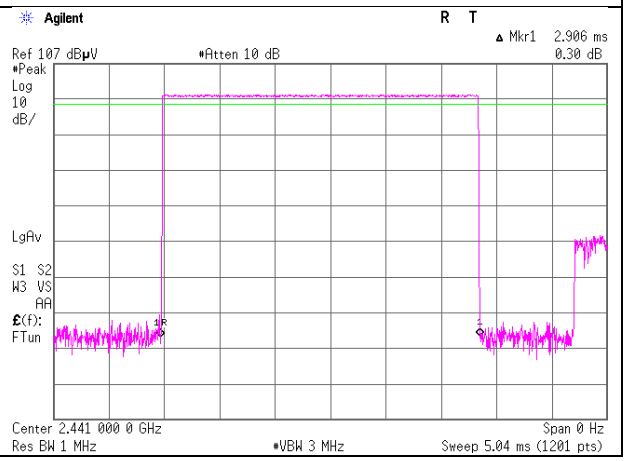
DH3 (2/2)



DH5 (1/2)
(Representative chart)



DH5 (2/2)



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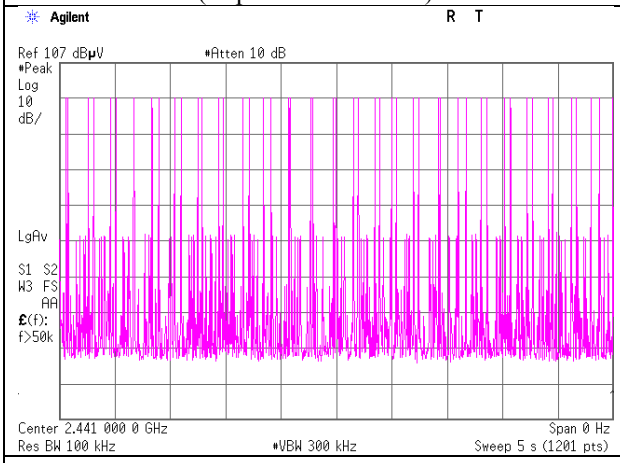
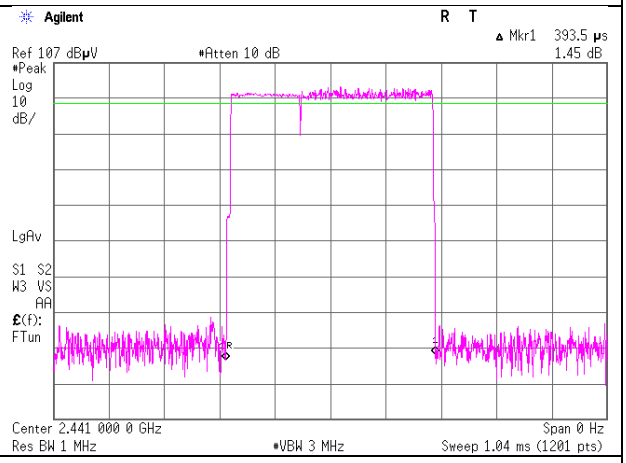
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Dwell time

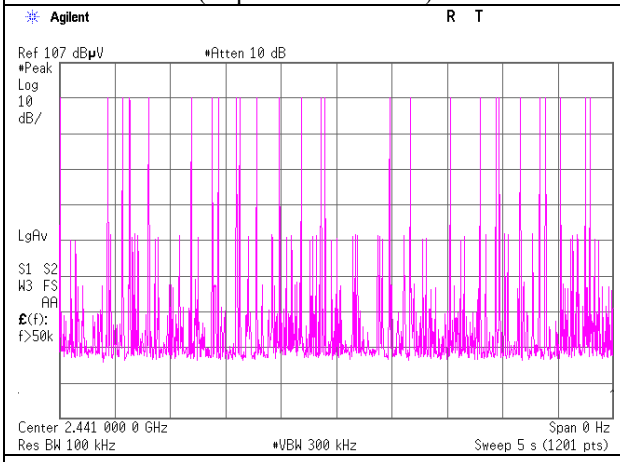
3DH1 (1/2)
(Representative chart)



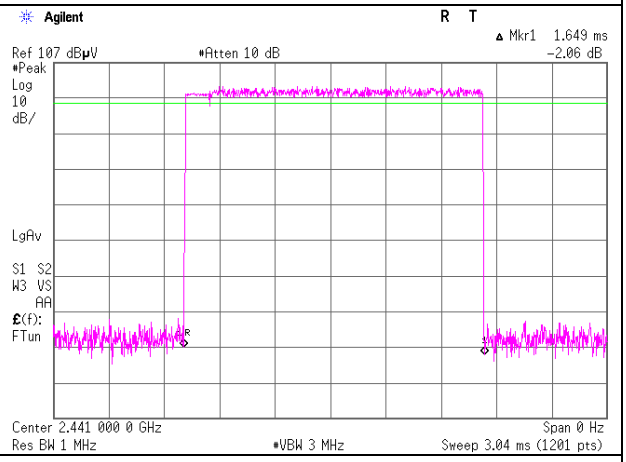
3DH1 (2/2)



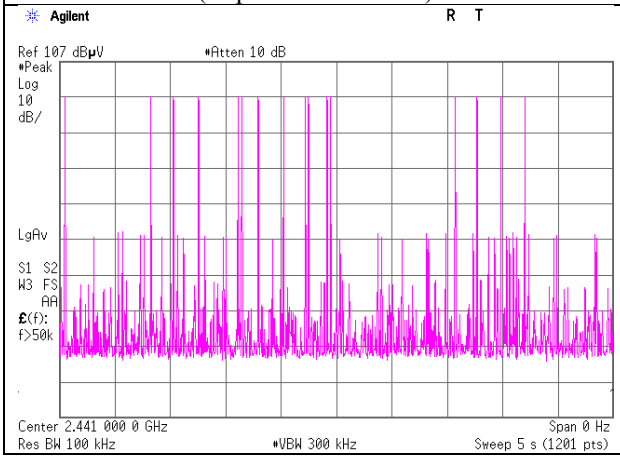
3DH3 (1/2)
(Representative chart)



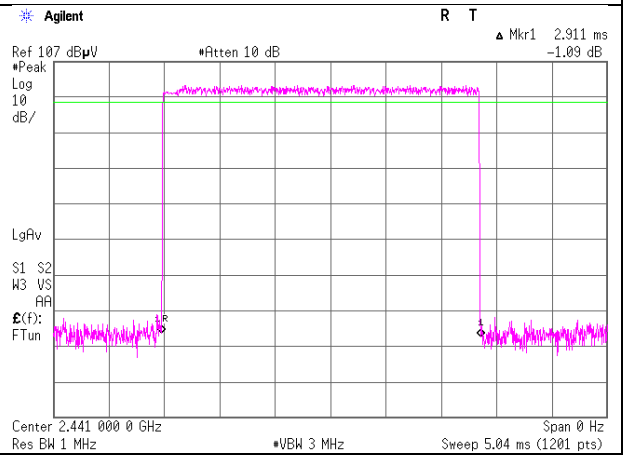
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 13, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-8.99	0.80	10.06	1.87	1.54	20.96	125	19.09
DH5	2441.0	-8.91	0.80	10.06	1.95	1.57	20.96	125	19.01
DH5	2480.0	-9.02	0.80	10.06	1.84	1.53	20.96	125	19.12
2DH5	2402.0	-6.58	0.80	10.06	4.28	2.68	20.96	125	16.68
2DH5	2441.0	-6.51	0.80	10.06	4.35	2.72	20.96	125	16.61
2DH5	2480.0	-6.63	0.80	10.06	4.23	2.65	20.96	125	16.73
3DH5	2402.0	-6.47	0.80	10.06	4.39	2.75	20.96	125	16.57
3DH5	2441.0	-6.42	0.80	10.06	4.44	2.78	20.96	125	16.52
3DH5	2480.0	-6.54	0.80	10.06	4.32	2.70	20.96	125	16.64

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

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 13, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-10.51	0.80	10.06	0.35	1.08	1.10	1.45	1.40
DH5	2441.0	-10.45	0.80	10.06	0.41	1.10	1.10	1.51	1.42
DH5	2480.0	-10.62	0.80	10.06	0.24	1.06	1.10	1.34	1.36
2DH5	2402.0	-10.75	0.80	10.06	0.11	1.03	1.10	1.21	1.32
2DH5	2441.0	-10.69	0.80	10.06	0.17	1.04	1.10	1.27	1.34
2DH5	2480.0	-10.82	0.80	10.06	0.04	1.01	1.10	1.14	1.30
3DH5	2402.0	-10.71	0.80	10.06	0.15	1.04	1.10	1.25	1.33
3DH5	2441.0	-10.63	0.80	10.06	0.23	1.05	1.10	1.33	1.36
3DH5	2480.0	-10.79	0.80	10.06	0.07	1.02	1.10	1.17	1.31

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

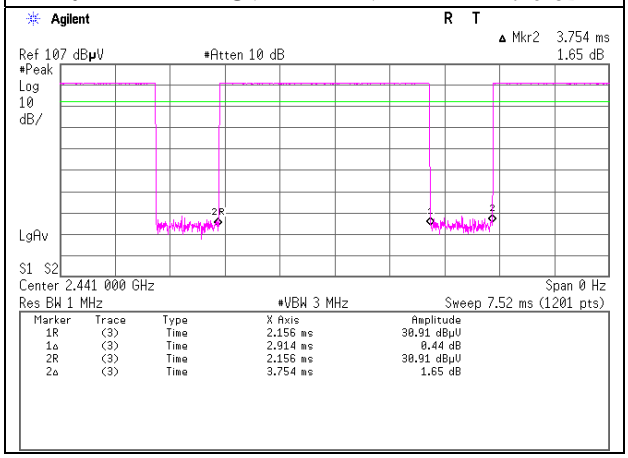
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 13, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off

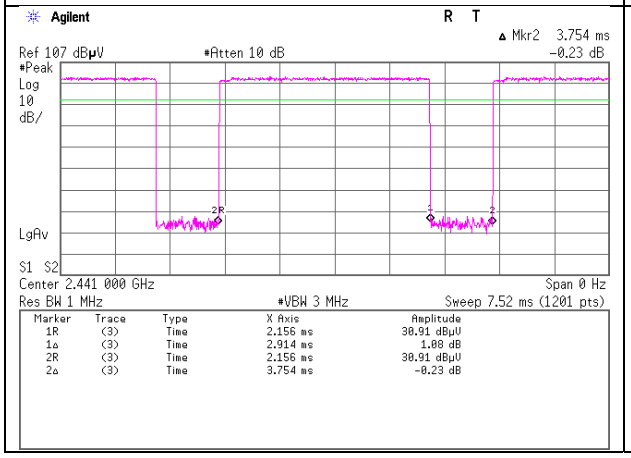
DH5

Tx on / (Tx on + Tx off) = 0.776
Tx on / (Tx on + Tx off) * 100 = 77.6 %
Duty factor = 10 * log (3.754 / 2.914) = 1.10 dB



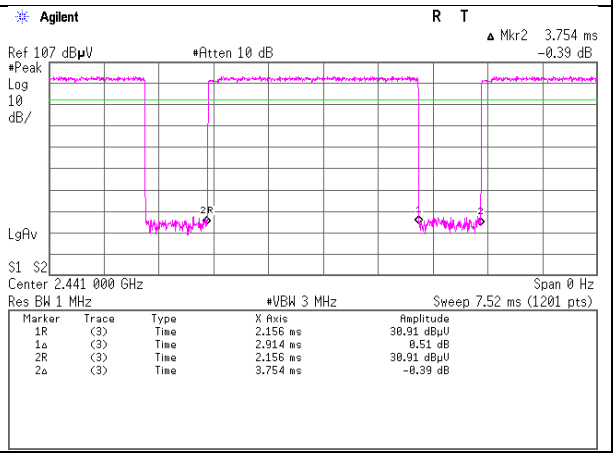
2DH5

Tx on / (Tx on + Tx off) = 0.776
Tx on / (Tx on + Tx off) * 100 = 77.6 %
Duty factor = 10 * log (3.754 / 2.914) = 1.10 dB



3DH5

Tx on / (Tx on + Tx off) = 0.776
Tx on / (Tx on + Tx off) * 100 = 77.6 %
Duty factor = 10 * log (3.754 / 2.914) = 1.10 dB



Radiated Spurious Emission

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, DH5 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	57.595	QP	27.6	8.2	7.7	32.1	-	11.4	40.0	28.6	
Hori	127.435	QP	31.7	13.4	8.5	32.0	-	21.6	43.5	21.9	
Hori	129.139	QP	29.7	13.5	8.5	32.0	-	19.7	43.5	23.8	
Hori	359.996	QP	29.7	14.9	10.2	31.9	-	22.9	46.0	23.1	
Hori	407.998	QP	33.2	15.9	10.5	32.0	-	27.6	46.0	18.4	
Hori	487.828	QP	27.2	17.5	11.0	32.1	-	23.6	46.0	22.4	
Hori	2390.000	PK	41.9	27.4	6.7	32.1	-	43.9	73.9	30.0	
Hori	4808.000	PK	40.5	30.8	9.3	31.2	-	49.4	73.9	24.5	Floor noise
Hori	7206.000	PK	42.7	36.2	10.2	32.4	-	56.7	73.9	17.2	Floor noise
Hori	9608.000	PK	42.0	38.4	11.1	32.7	-	58.8	73.9	15.1	Floor noise
Hori	2390.000	AV	29.3	27.4	6.7	32.1	-	31.3	53.9	22.6	
Hori	4808.000	AV	28.1	30.8	9.3	31.2	-	37.0	53.9	16.9	Floor noise
Hori	7206.000	AV	29.8	36.2	10.2	32.4	-	43.8	53.9	10.1	Floor noise
Hori	9608.000	AV	29.4	38.4	11.1	32.7	-	46.2	53.9	7.7	Floor noise
Vert	57.595	QP	34.5	8.2	7.7	32.1	-	18.3	40.0	21.7	
Vert	127.435	QP	33.4	13.4	8.5	32.0	-	23.3	43.5	20.2	
Vert	129.479	QP	35.6	13.5	8.5	32.0	-	25.6	43.5	17.9	
Vert	359.996	QP	32.2	14.9	10.2	31.9	-	25.4	46.0	20.6	
Vert	407.998	QP	35.3	15.9	10.5	32.0	-	29.7	46.0	16.3	
Vert	487.828	QP	33.6	17.5	11.0	32.1	-	30.0	46.0	16.0	
Vert	2390.000	PK	43.5	27.4	6.7	32.1	-	45.5	73.9	28.4	
Vert	4808.000	PK	40.7	30.8	9.3	31.2	-	49.6	73.9	24.3	Floor noise
Vert	7206.000	PK	42.4	36.2	10.2	32.4	-	56.4	73.9	17.5	Floor noise
Vert	9608.000	PK	41.7	38.4	11.1	32.7	-	58.5	73.9	15.4	Floor noise
Vert	2390.000	AV	27.8	27.4	6.7	32.1	-	29.8	53.9	24.1	
Vert	4808.000	AV	26.6	30.8	9.3	31.2	-	35.5	53.9	18.4	Floor noise
Vert	7206.000	AV	28.3	36.2	10.2	32.4	-	42.3	53.9	11.6	Floor noise
Vert	9608.000	AV	28.7	38.4	11.1	32.7	-	45.5	53.9	8.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit dBuV/m	Margin [dB]	Remark
Hori	2402.000	PK	95.2	27.4	6.7	32.1	97.2	-	-	Carrier
Hori	2400.000	PK	45.1	27.4	6.7	32.1	47.1	77.2	30.1	
Vert	2402.000	PK	91.9	27.4	6.7	32.1	93.9	-	-	Carrier
Vert	2400.000	PK	44.2	27.4	6.7	32.1	46.2	73.9	27.7	

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

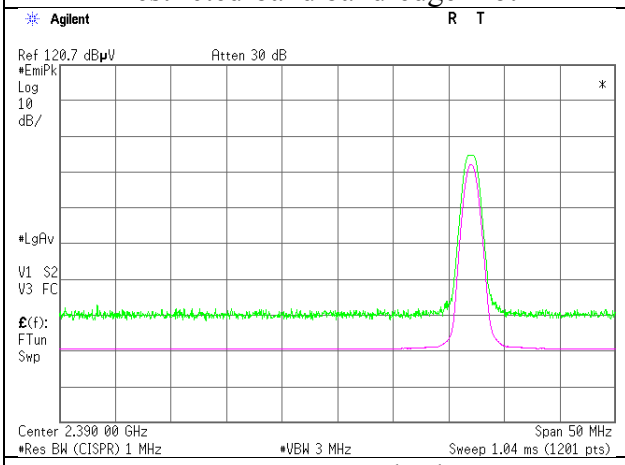
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11712578H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 13, 2017
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, DH5 2402 MHz

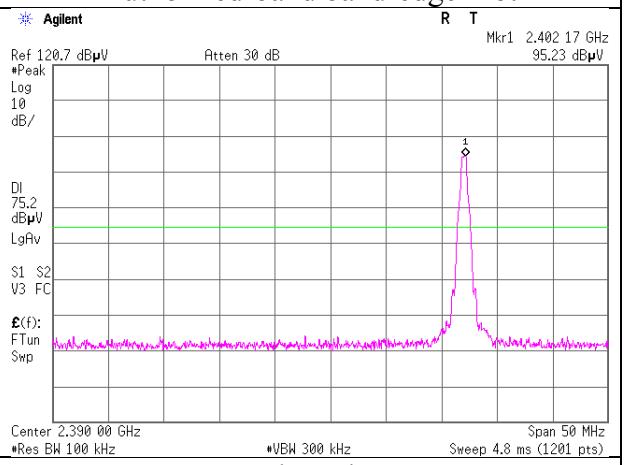
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

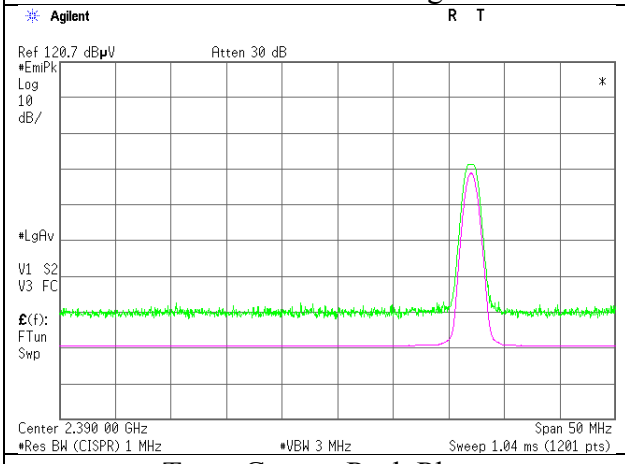
Authorized-band band-edge Plot



20dBc Plot

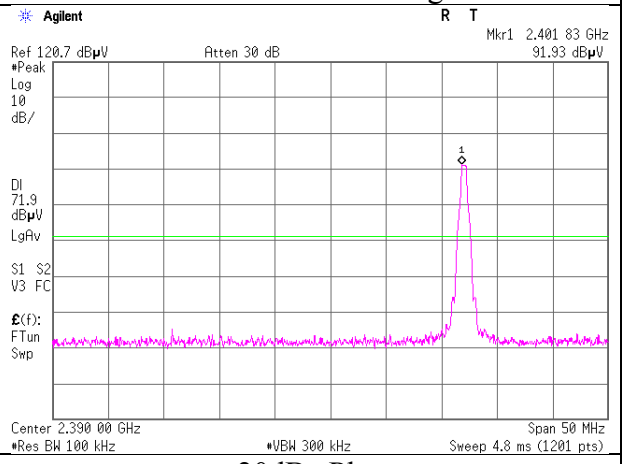
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, DH5 2441 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	57.595	QP	27.8	8.2	7.7	32.1	-	11.6	40.0	28.4	
Hori	127.435	QP	31.2	13.4	8.5	32.0	-	21.1	43.5	22.4	
Hori	129.139	QP	28.2	13.5	8.5	32.0	-	18.2	43.5	25.3	
Hori	359.996	QP	29.5	14.9	10.2	31.9	-	22.7	46.0	23.3	
Hori	407.998	QP	33.5	15.9	10.5	32.0	-	27.9	46.0	18.1	
Hori	487.828	QP	30.3	17.5	11.0	32.1	-	26.7	46.0	19.3	
Hori	4882.000	PK	40.8	31.1	9.2	31.2	-	49.9	73.9	24.0	Floor noise
Hori	7323.000	PK	42.6	36.4	10.2	32.5	-	56.7	73.9	17.2	Floor noise
Hori	9764.000	PK	40.9	38.6	11.1	32.8	-	57.8	73.9	16.1	Floor noise
Hori	4882.000	AV	28.5	31.1	9.2	31.2	-	37.6	53.9	16.3	Floor noise
Hori	7323.000	AV	29.5	36.4	10.2	32.5	-	43.6	53.9	10.3	Floor noise
Hori	9764.000	AV	28.8	38.6	11.1	32.8	-	45.7	53.9	8.2	Floor noise
Vert	57.595	QP	33.8	8.2	7.7	32.1	-	17.6	40.0	22.4	
Vert	127.435	QP	33.9	13.4	8.5	32.0	-	23.8	43.5	19.7	
Vert	129.479	QP	30.4	13.5	8.5	32.0	-	20.4	43.5	23.1	
Vert	359.996	QP	31.4	14.9	10.2	31.9	-	24.6	46.0	21.4	
Vert	407.998	QP	35.2	15.9	10.5	32.0	-	29.6	46.0	16.4	
Vert	487.828	QP	32.0	17.5	11.0	32.1	-	28.4	46.0	17.6	
Vert	4882.000	PK	40.8	31.1	9.2	31.2	-	49.9	73.9	24.0	Floor noise
Vert	7323.000	PK	41.1	36.4	10.2	32.5	-	55.2	73.9	18.7	Floor noise
Vert	9764.000	PK	40.9	38.6	11.1	32.8	-	57.8	73.9	16.1	Floor noise
Vert	4882.000	AV	29.1	31.1	9.2	31.2	-	38.2	53.9	15.7	Floor noise
Vert	7323.000	AV	29.6	36.4	10.2	32.5	-	43.7	53.9	10.2	Floor noise
Vert	9764.000	AV	28.8	38.6	11.1	32.8	-	45.7	53.9	8.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, DH5 2480 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	57.595	QP	27.3	8.2	7.7	32.1	-	11.1	40.0	28.9	
Hori	127.435	QP	30.2	13.4	8.5	32.0	-	20.1	43.5	23.4	
Hori	129.139	QP	28.8	13.5	8.5	32.0	-	18.8	43.5	24.7	
Hori	359.996	QP	29.8	14.9	10.2	31.9	-	23.0	46.0	23.0	
Hori	407.998	QP	33.5	15.9	10.5	32.0	-	27.9	46.0	18.1	
Hori	487.828	QP	30.4	17.5	11.0	32.1	-	26.8	46.0	19.2	
Hori	2483.500	PK	45.7	27.4	6.9	32.0	-	48.0	73.9	25.9	
Hori	4960.000	PK	41.2	31.4	9.3	31.1	-	50.8	73.9	23.1	Floor noise
Hori	7440.000	PK	42.3	36.5	10.2	32.5	-	56.5	73.9	17.4	Floor noise
Hori	9920.000	PK	41.4	38.8	11.2	32.9	-	58.5	73.9	15.4	Floor noise
Hori	2483.500	AV	31.2	27.4	6.9	32.0	-	33.5	53.9	20.4	
Hori	4960.000	AV	27.3	31.4	9.3	31.1	-	36.9	53.9	17.0	Floor noise
Hori	7440.000	AV	28.3	36.5	10.2	32.5	-	42.5	53.9	11.4	Floor noise
Hori	9920.000	AV	28.3	38.8	11.2	32.9	-	45.4	53.9	8.5	Floor noise
Vert	57.595	QP	34.3	8.2	7.7	32.1	-	18.1	40.0	21.9	
Vert	127.435	QP	32.4	13.4	8.5	32.0	-	22.3	43.5	21.2	
Vert	129.479	QP	32.4	13.5	8.5	32.0	-	22.4	43.5	21.1	
Vert	359.996	QP	34.4	14.9	10.2	31.9	-	27.6	46.0	18.4	
Vert	407.998	QP	35.2	15.9	10.5	32.0	-	29.6	46.0	16.4	
Vert	487.828	QP	33.7	17.5	11.0	32.1	-	30.1	46.0	15.9	
Vert	2483.500	PK	44.8	27.4	6.9	32.0	-	47.1	73.9	26.8	
Vert	4960.000	PK	42.0	31.4	9.3	31.1	-	51.6	73.9	22.3	Floor noise
Vert	7440.000	PK	42.3	36.5	10.2	32.5	-	56.5	73.9	17.4	Floor noise
Vert	9920.000	PK	41.6	38.8	11.2	32.9	-	58.7	73.9	15.2	Floor noise
Vert	2483.500	AV	32.3	27.4	6.9	32.0	-	34.6	53.9	19.3	
Vert	4960.000	AV	28.5	31.4	9.3	31.1	-	38.1	53.9	15.8	Floor noise
Vert	7440.000	AV	28.4	36.5	10.2	32.5	-	42.6	53.9	11.3	Floor noise
Vert	9920.000	AV	28.3	38.8	11.2	32.9	-	45.4	53.9	8.5	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

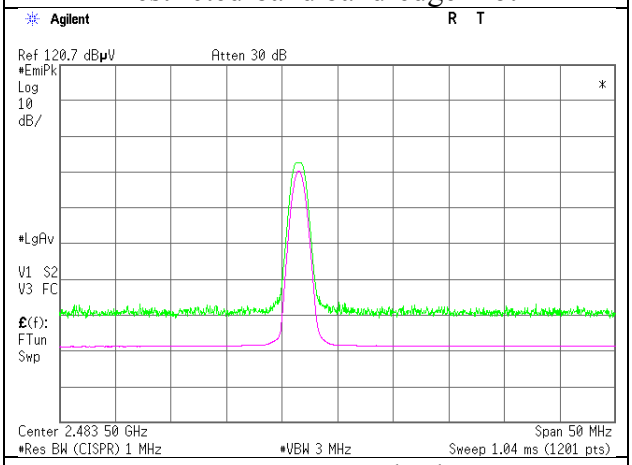
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11712578H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 13, 2017
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

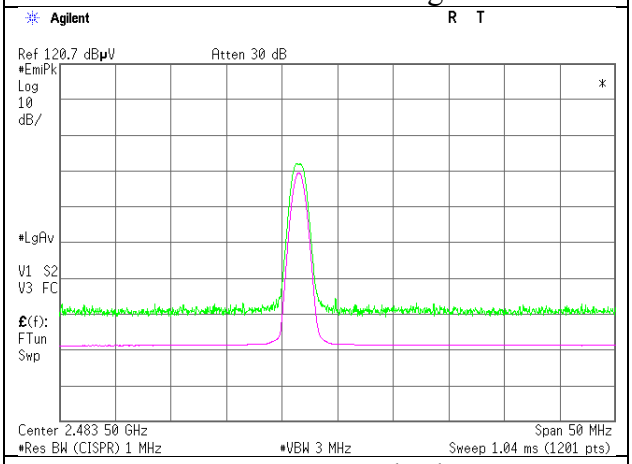
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	57.595	QP	27.0	8.2	7.7	32.1	-	10.8	40.0	29.2	
Hori	127.435	QP	30.3	13.4	8.5	32.0	-	20.2	43.5	23.3	
Hori	129.139	QP	31.1	13.5	8.5	32.0	-	21.1	43.5	22.4	
Hori	359.996	QP	30.7	14.9	10.2	31.9	-	23.9	46.0	22.1	
Hori	407.998	QP	33.2	15.9	10.5	32.0	-	27.6	46.0	18.4	
Hori	487.828	QP	32.4	17.5	11.0	32.1	-	28.8	46.0	17.2	
Hori	2390.000	PK	43.2	27.4	6.7	32.1	-	45.2	73.9	28.7	
Hori	4808.000	PK	41.1	30.8	9.3	31.2	-	50.0	73.9	23.9	Floor noise
Hori	7206.000	PK	42.1	36.2	10.2	32.4	-	56.1	73.9	17.8	Floor noise
Hori	9608.000	PK	41.5	38.4	11.1	32.7	-	58.3	73.9	15.6	Floor noise
Hori	2390.000	AV	29.4	27.4	6.7	32.1	-	31.4	53.9	22.5	
Hori	4808.000	AV	27.9	30.8	9.3	31.2	-	36.8	53.9	17.1	Floor noise
Hori	7206.000	AV	29.9	36.2	10.2	32.4	-	43.9	53.9	10.0	Floor noise
Hori	9608.000	AV	29.3	38.4	11.1	32.7	-	46.1	53.9	7.8	Floor noise
Vert	57.595	QP	35.4	8.2	7.7	32.1	-	19.2	40.0	20.8	
Vert	127.435	QP	32.2	13.4	8.5	32.0	-	22.1	43.5	21.4	
Vert	129.479	QP	31.6	13.5	8.5	32.0	-	21.6	43.5	21.9	
Vert	359.996	QP	34.5	14.9	10.2	31.9	-	27.7	46.0	18.3	
Vert	407.998	QP	34.4	15.9	10.5	32.0	-	28.8	46.0	17.2	
Vert	487.828	QP	33.3	17.5	11.0	32.1	-	29.7	46.0	16.3	
Vert	2390.000	PK	41.6	27.4	6.7	32.1	-	43.6	73.9	30.3	
Vert	4808.000	PK	41.2	30.8	9.3	31.2	-	50.1	73.9	23.8	Floor noise
Vert	7206.000	PK	42.1	36.2	10.2	32.4	-	56.1	73.9	17.8	Floor noise
Vert	9608.000	PK	41.6	38.4	11.1	32.7	-	58.4	73.9	15.5	Floor noise
Vert	2390.000	AV	29.3	27.4	6.7	32.1	-	31.3	53.9	22.6	
Vert	4808.000	AV	26.5	30.8	9.3	31.2	-	35.4	53.9	18.5	Floor noise
Vert	7206.000	AV	28.4	36.2	10.2	32.4	-	42.4	53.9	11.5	Floor noise
Vert	9608.000	AV	28.7	38.4	11.1	32.7	-	45.5	53.9	8.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	95.5	27.4	6.7	32.1	97.5	-	-	Carrier
Hori	2400.000	PK	44.9	27.4	6.7	32.1	46.9	77.5	30.6	
Vert	2402.000	PK	91.6	27.4	6.7	32.1	93.6	-	-	Carrier
Vert	2400.000	PK	42.5	27.4	6.7	32.1	44.5	73.6	29.1	

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

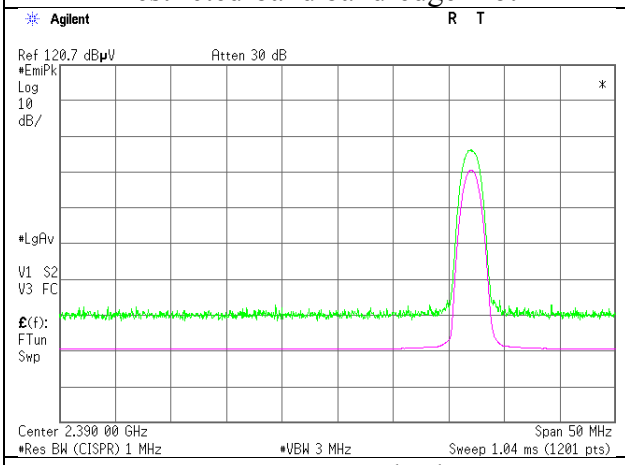
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11712578H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 13, 2017
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5 2402 MHz

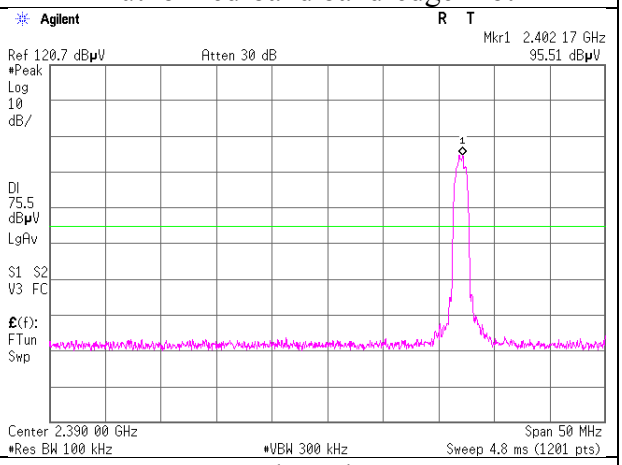
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

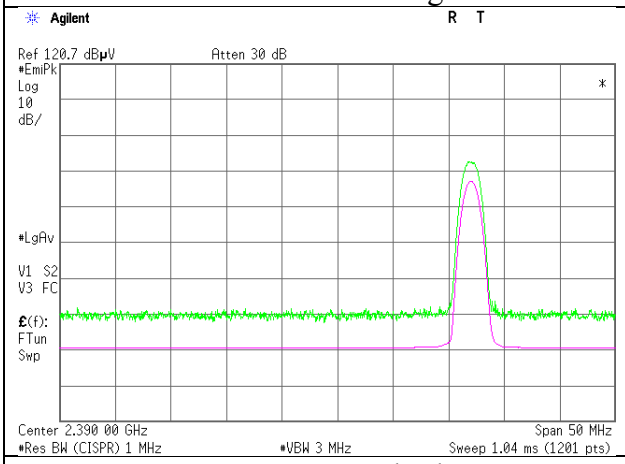
Authorized-band band-edge Plot



20dBc Plot

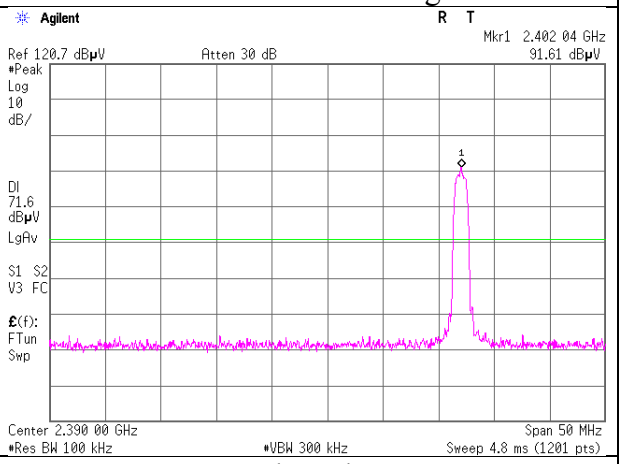
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	57.595	QP	28.6	8.2	7.7	32.1	-	12.4	40.0	27.6	
Hori	127.435	QP	29.3	13.4	8.5	32.0	-	19.2	43.5	24.3	
Hori	129.139	QP	29.0	13.5	8.5	32.0	-	19.0	43.5	24.5	
Hori	359.996	QP	30.7	14.9	10.2	31.9	-	23.9	46.0	22.1	
Hori	407.998	QP	33.2	15.9	10.5	32.0	-	27.6	46.0	18.4	
Hori	487.828	QP	32.2	17.5	11.0	32.1	-	28.6	46.0	17.4	
Hori	4882.000	PK	40.6	31.1	9.2	31.2	-	49.7	73.9	24.2	Floor noise
Hori	7323.000	PK	41.8	36.4	10.2	32.5	-	55.9	73.9	18.0	Floor noise
Hori	9764.000	PK	40.8	38.6	11.1	32.8	-	57.7	73.9	16.2	Floor noise
Hori	4882.000	AV	28.5	31.1	9.2	31.2	-	37.6	53.9	16.3	Floor noise
Hori	7323.000	AV	29.5	36.4	10.2	32.5	-	43.6	53.9	10.3	Floor noise
Hori	9764.000	AV	28.7	38.6	11.1	32.8	-	45.6	53.9	8.3	Floor noise
Vert	57.595	QP	35.4	8.2	7.7	32.1	-	19.2	40.0	20.8	
Vert	127.435	QP	32.2	13.4	8.5	32.0	-	22.1	43.5	21.4	
Vert	129.479	QP	31.6	13.5	8.5	32.0	-	21.6	43.5	21.9	
Vert	359.996	QP	34.4	14.9	10.2	31.9	-	27.6	46.0	18.4	
Vert	407.998	QP	35.2	15.9	10.5	32.0	-	29.6	46.0	16.4	
Vert	487.828	QP	31.3	17.5	11.0	32.1	-	27.7	46.0	18.3	
Vert	4882.000	PK	42.3	31.1	9.2	31.2	-	51.4	73.9	22.5	Floor noise
Vert	7323.000	PK	42.4	36.4	10.2	32.5	-	56.5	73.9	17.4	Floor noise
Vert	9764.000	PK	41.1	38.6	11.1	32.8	-	58.0	73.9	15.9	Floor noise
Vert	4882.000	AV	28.9	31.1	9.2	31.2	-	38.0	53.9	15.9	Floor noise
Vert	7323.000	AV	29.5	36.4	10.2	32.5	-	43.6	53.9	10.3	Floor noise
Vert	9764.000	AV	28.8	38.6	11.1	32.8	-	45.7	53.9	8.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	57.595	QP	28.8	8.2	7.7	32.1	-	12.6	40.0	27.4	
Hori	127.435	QP	28.9	13.4	8.5	32.0	-	18.8	43.5	24.7	
Hori	129.139	QP	29.2	13.5	8.5	32.0	-	19.2	43.5	24.3	
Hori	359.996	QP	29.8	14.9	10.2	31.9	-	23.0	46.0	23.0	
Hori	407.998	QP	33.4	15.9	10.5	32.0	-	27.8	46.0	18.2	
Hori	487.828	QP	31.4	17.5	11.0	32.1	-	27.8	46.0	18.2	
Hori	2483.500	PK	47.1	27.4	6.9	32.0	-	49.4	73.9	24.5	
Hori	4960.000	PK	40.7	31.4	9.3	31.1	-	50.3	73.9	23.6	Floor noise
Hori	7440.000	PK	41.8	36.5	10.2	32.5	-	56.0	73.9	17.9	Floor noise
Hori	9920.000	PK	41.6	38.8	11.2	32.9	-	58.7	73.9	15.2	Floor noise
Hori	2483.500	AV	33.1	27.4	6.9	32.0	-	35.4	53.9	18.5	
Hori	4960.000	AV	28.8	31.4	9.3	31.1	-	38.4	53.9	15.5	Floor noise
Hori	7440.000	AV	29.8	36.5	10.2	32.5	-	44.0	53.9	9.9	Floor noise
Hori	9920.000	AV	29.7	38.8	11.2	32.9	-	46.8	53.9	7.1	Floor noise
Vert	57.595	QP	34.8	8.2	7.7	32.1	-	18.6	40.0	21.4	
Vert	127.435	QP	32.4	13.4	8.5	32.0	-	22.3	43.5	21.2	
Vert	129.479	QP	30.8	13.5	8.5	32.0	-	20.8	43.5	22.7	
Vert	359.996	QP	33.9	14.9	10.2	31.9	-	27.1	46.0	18.9	
Vert	407.998	QP	35.2	15.9	10.5	32.0	-	29.6	46.0	16.4	
Vert	487.828	QP	31.2	17.5	11.0	32.1	-	27.6	46.0	18.4	
Vert	2483.500	PK	45.1	27.4	6.9	32.0	-	47.4	73.9	26.5	
Vert	4960.000	PK	40.5	31.4	9.3	31.1	-	50.1	73.9	23.8	Floor noise
Vert	7440.000	PK	42.1	36.5	10.2	32.5	-	56.3	73.9	17.6	Floor noise
Vert	9920.000	PK	42.6	38.8	11.2	32.9	-	59.7	73.9	14.2	Floor noise
Vert	2483.500	AV	30.8	27.4	6.9	32.0	-	33.1	53.9	20.8	
Vert	4960.000	AV	28.4	31.4	9.3	31.1	-	38.0	53.9	15.9	Floor noise
Vert	7440.000	AV	29.9	36.5	10.2	32.5	-	44.1	53.9	9.8	Floor noise
Vert	9920.000	AV	29.7	38.8	11.2	32.9	-	46.8	53.9	7.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

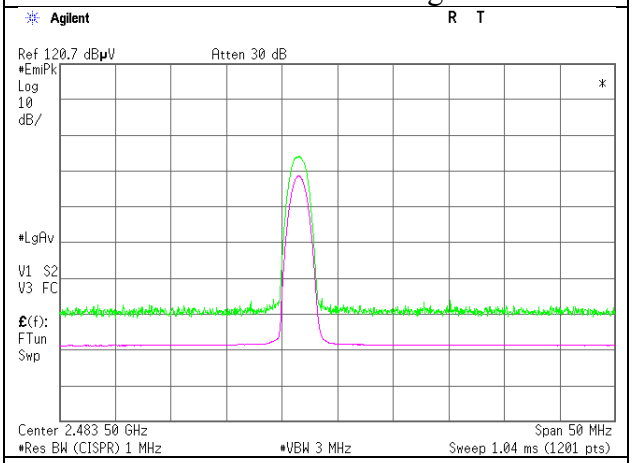
***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11712578H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 13, 2017
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

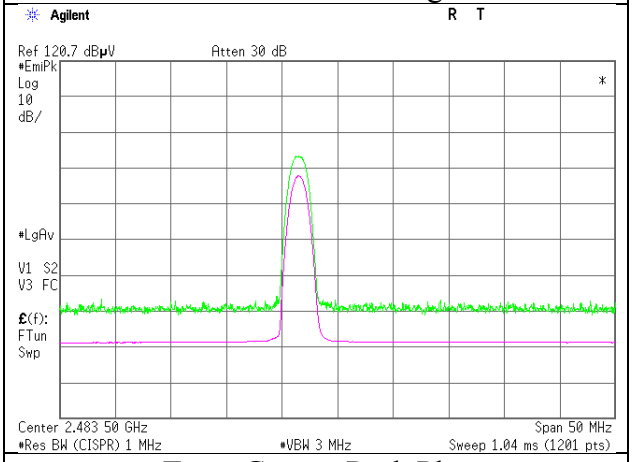
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

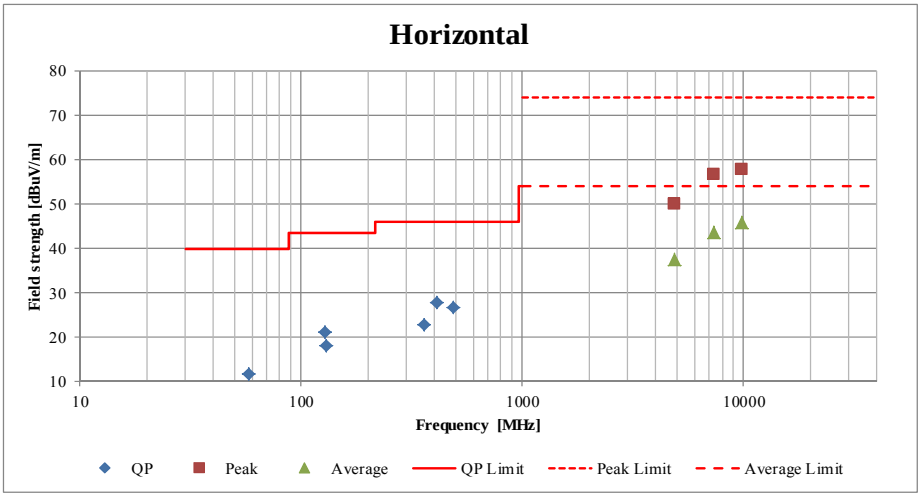


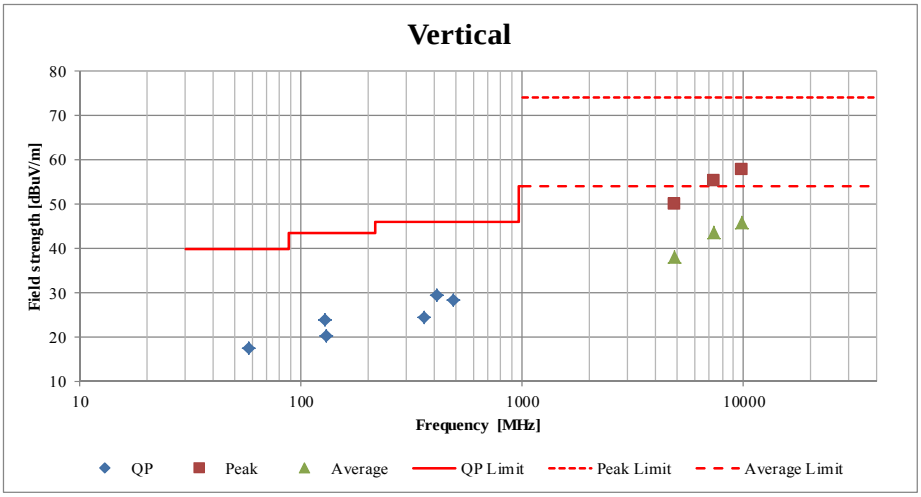
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11712578H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	April 13, 2017	April 15, 2017
Temperature / Humidity	23 deg. C / 36 % RH	23 deg. C / 26 % RH
Engineer	Yuta Moriya	Yuta Moriya
	Above 1GHz	Below 1GHz
Mode	Tx, Hopping Off, 3DH5 2441 MHz	





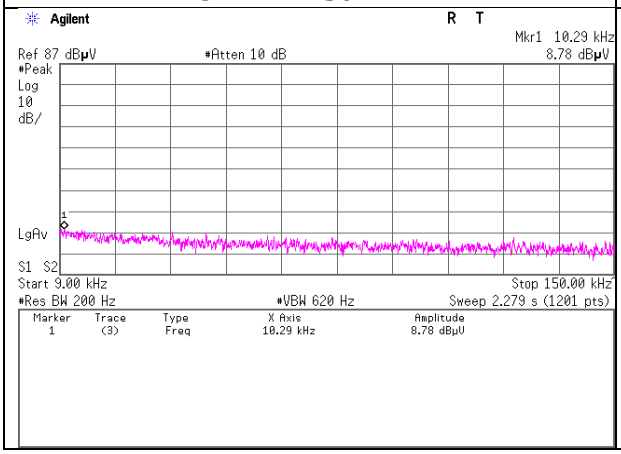
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

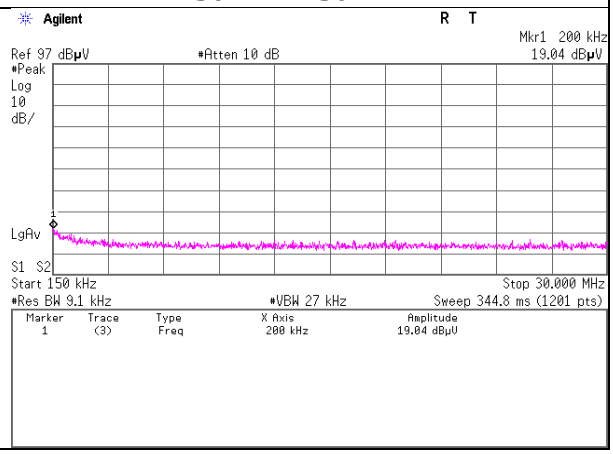
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, DH5

2402 MHz

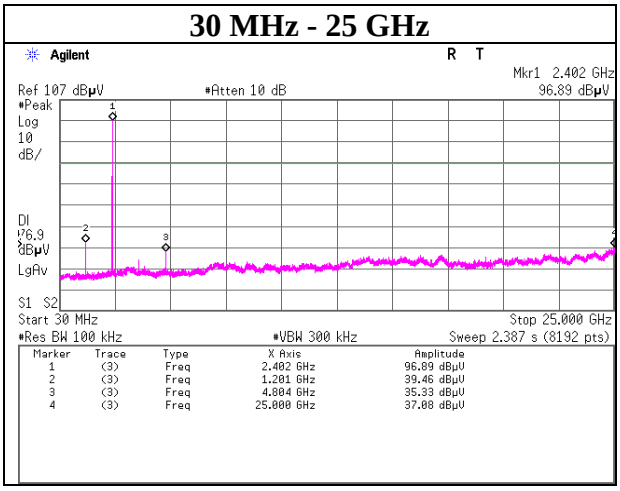
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

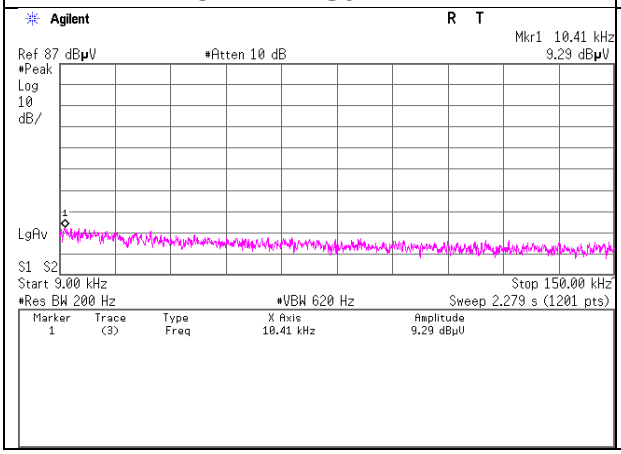


Conducted Spurious Emission

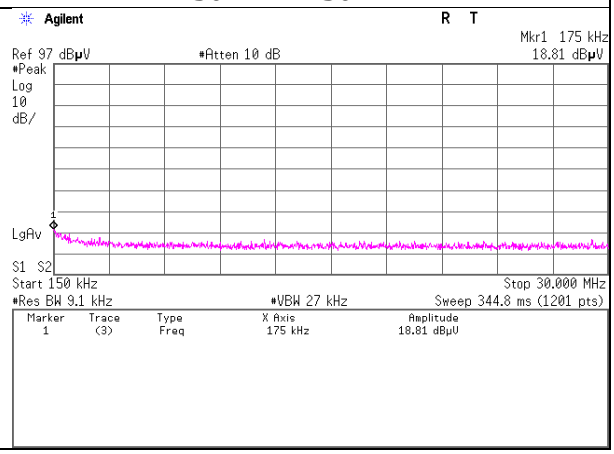
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, DH5

2441 MHz

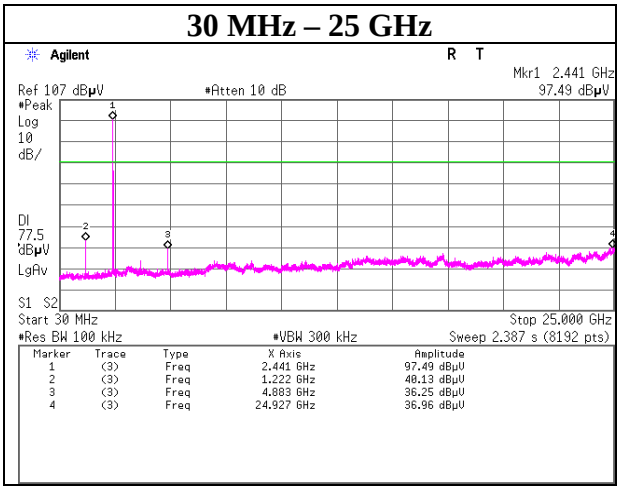
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

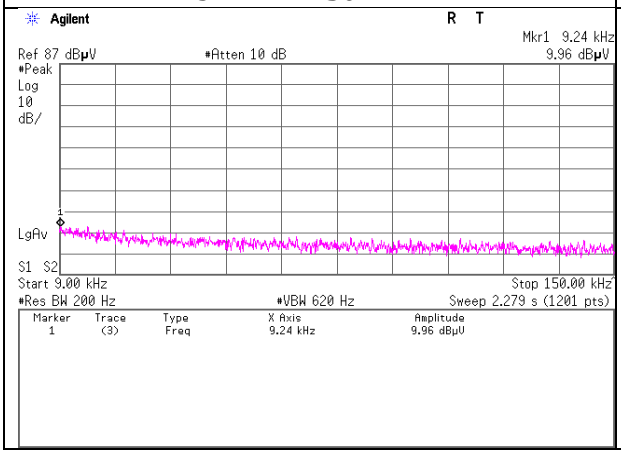


Conducted Spurious Emission

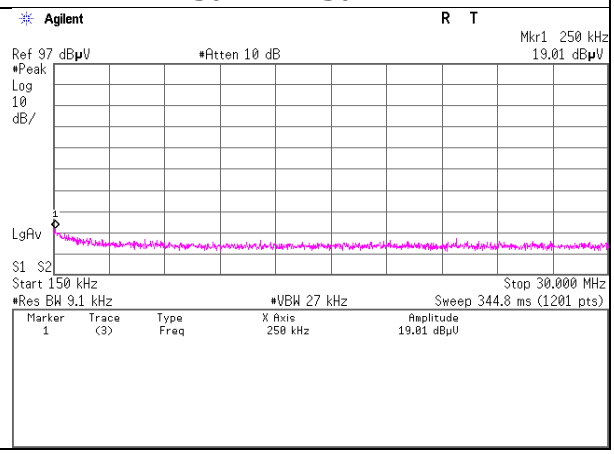
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, DH5

2480 MHz

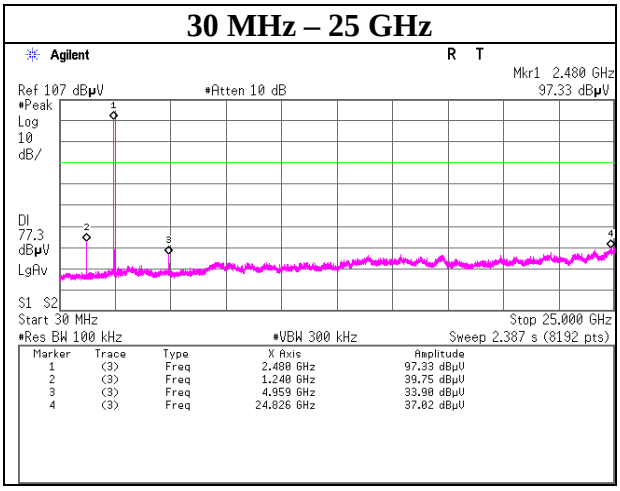
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

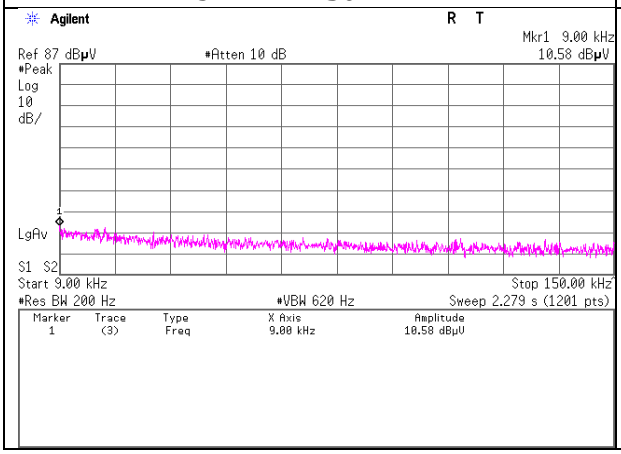


Conducted Spurious Emission

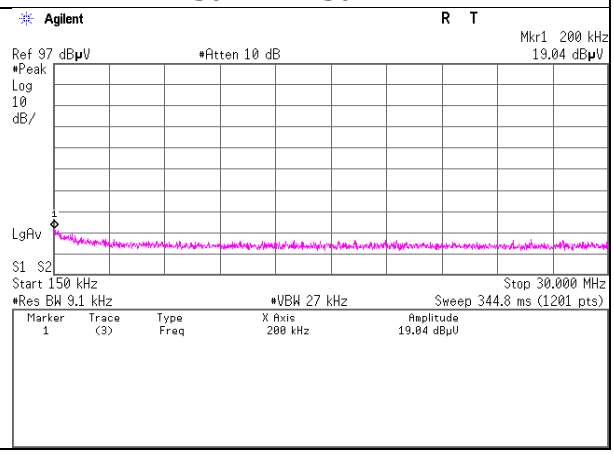
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, 3DH5

2402 MHz

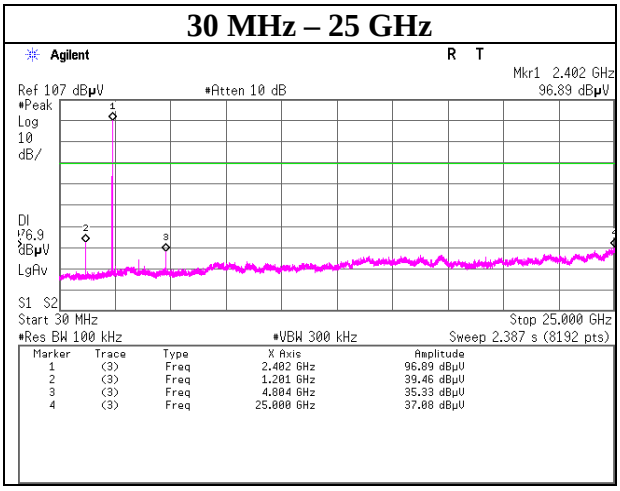
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

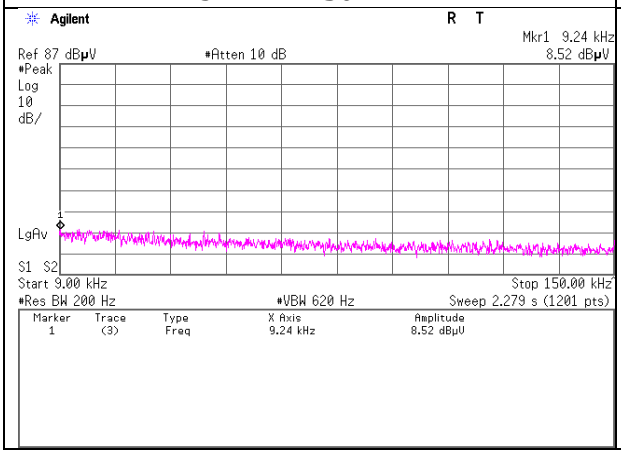


Conducted Spurious Emission

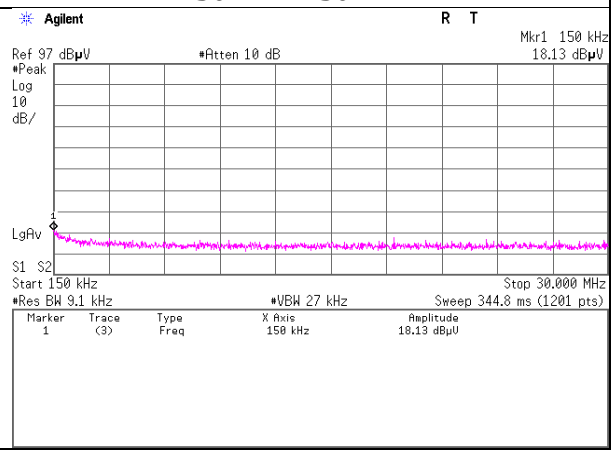
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, 3DH5

2441 MHz

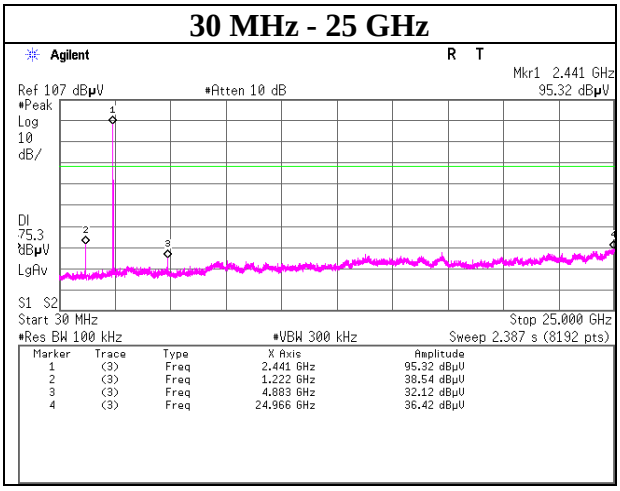
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

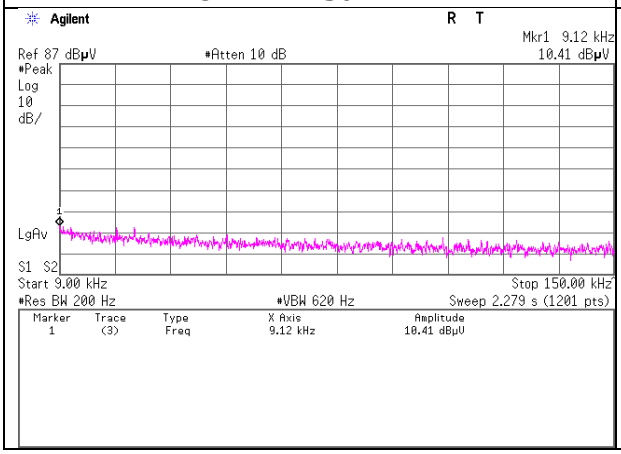


Conducted Spurious Emission

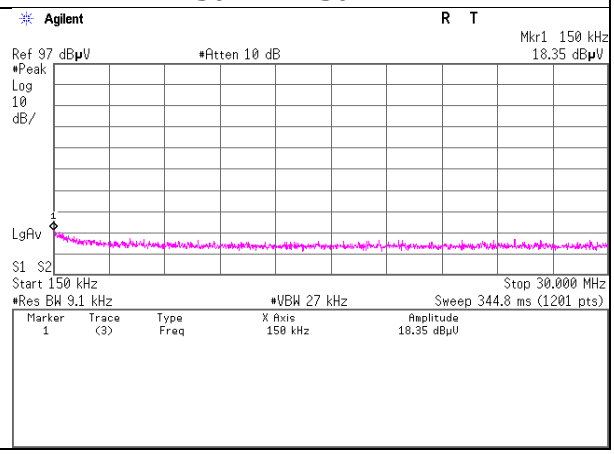
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx, Hopping Off, 3DH5

2480 MHz

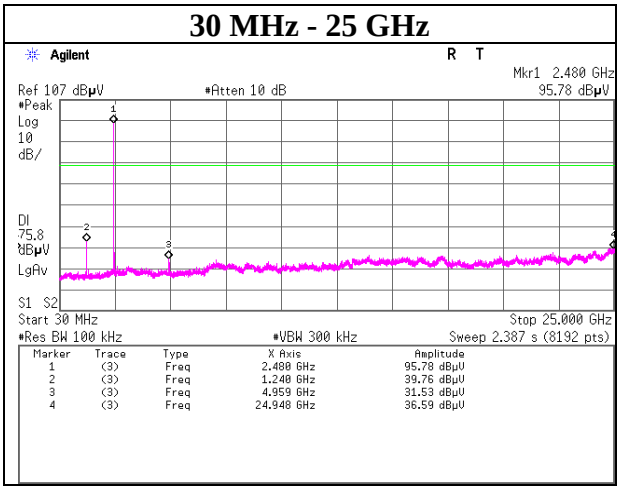
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

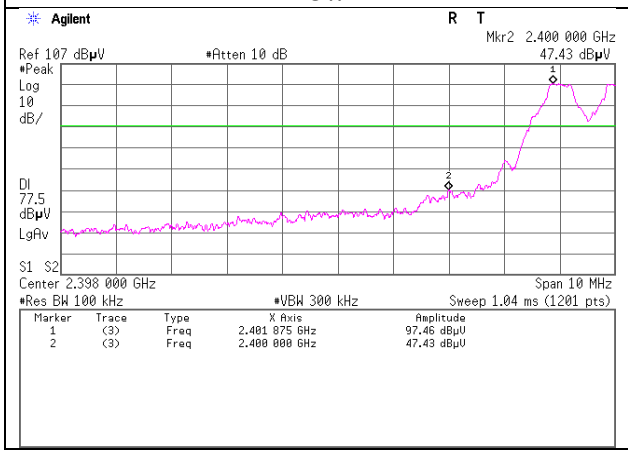


Conducted Emission Band Edge compliance

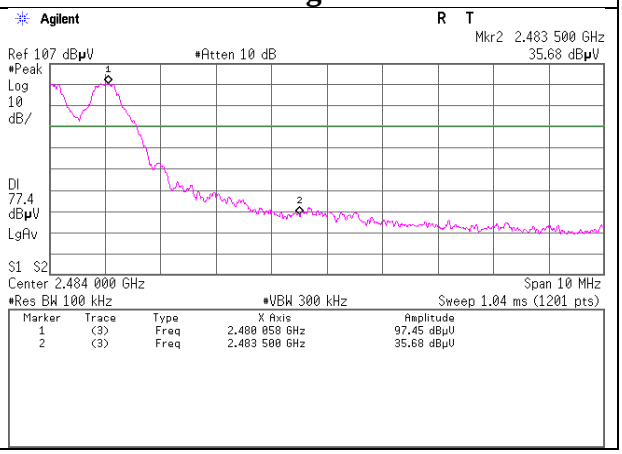
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx DH5

Hopping On

Low

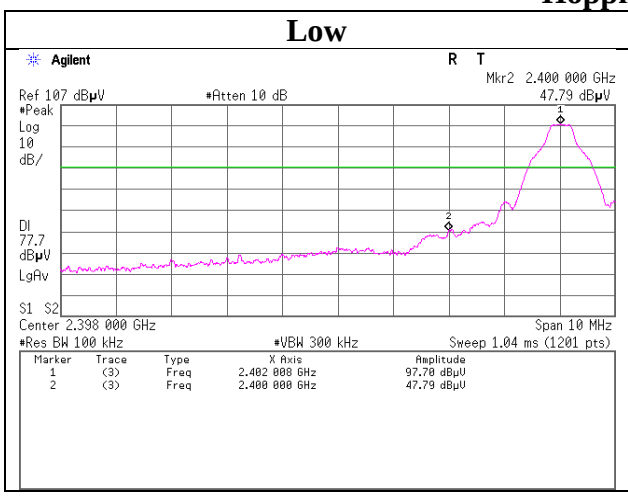


High

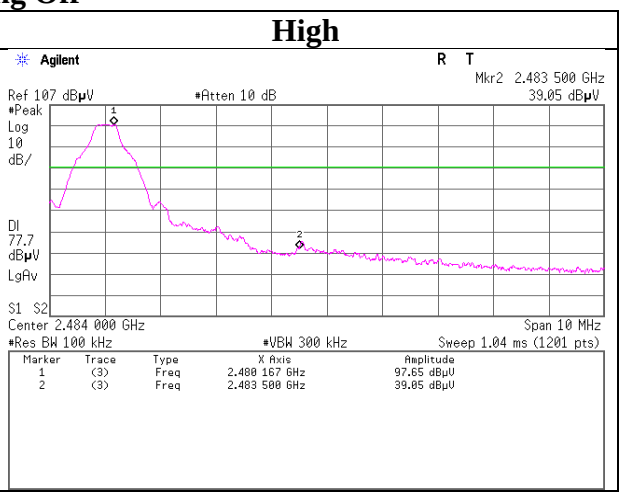


Hopping Off

Low



High

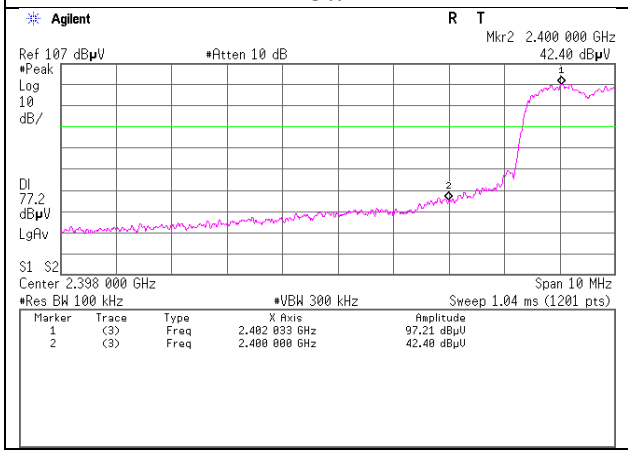


Conducted Emission Band Edge compliance

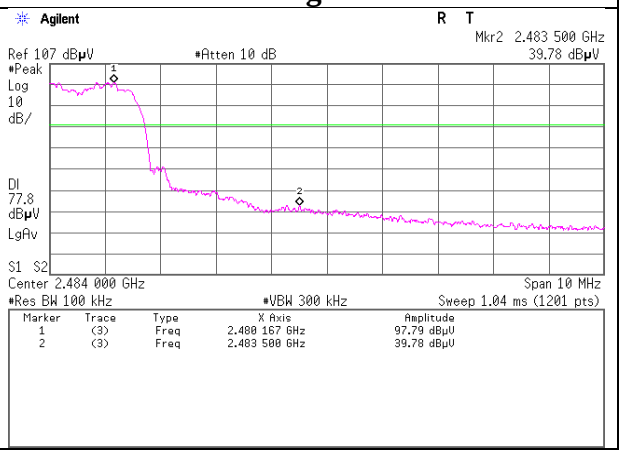
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx 3DH5

Hopping On

Low

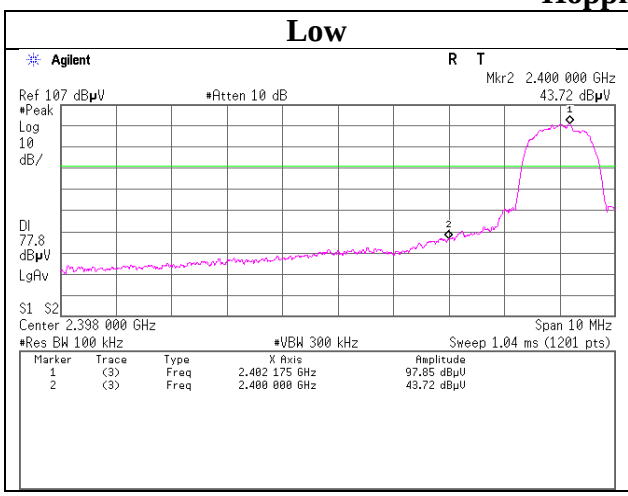


High

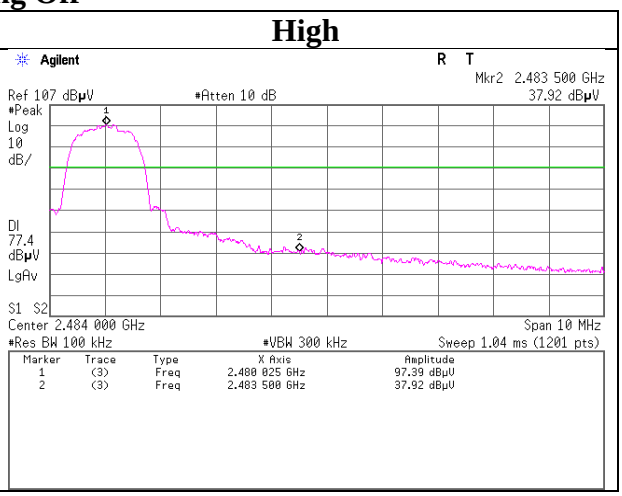


Hopping Off

Low



High

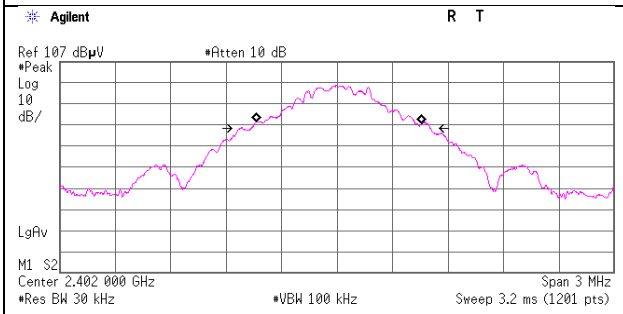


99%Occupied Bandwidth

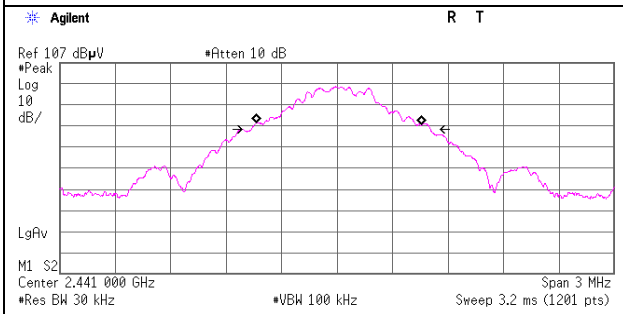
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx Hopping Off

Hopping Off, DH5

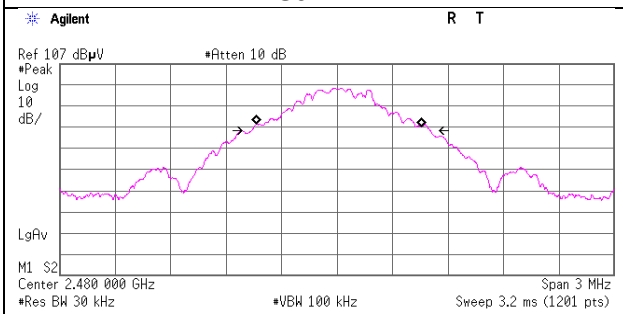
2402 MHz



2441 MHz

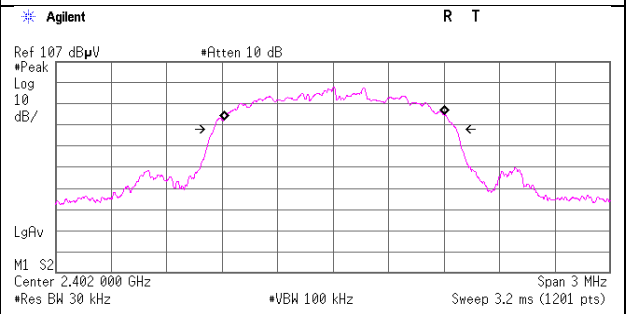


2480 MHz

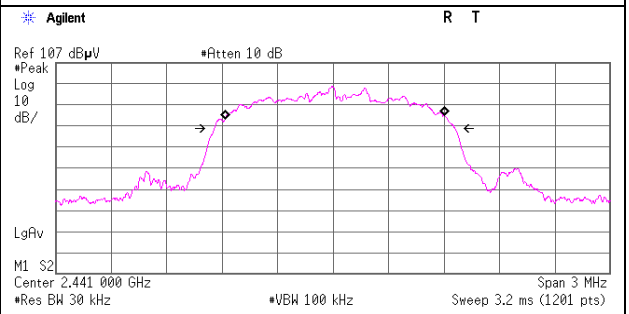


Hopping Off, 3DH5

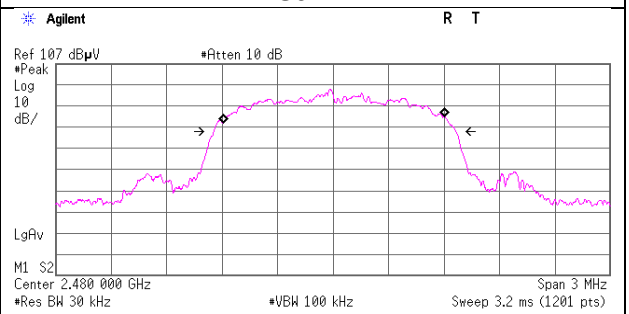
2402 MHz



2441MHz



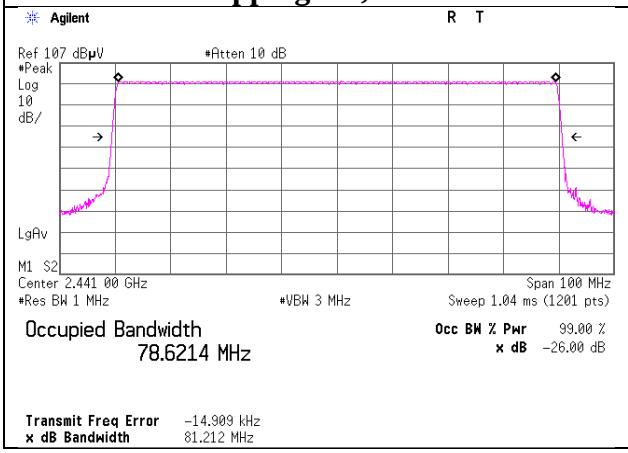
2480MHz



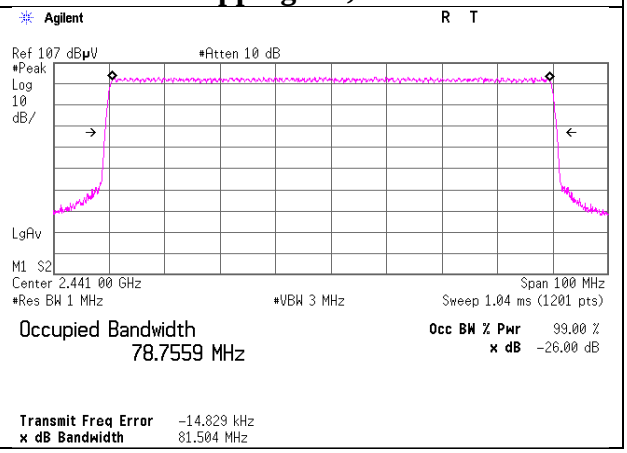
99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11712578H
Date	April 14, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Shimada
Mode	Tx Hopping On

Hopping On, DH5



Hopping On, 3DH5



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2016/10/17 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2016/10/17 * 12
MAT-58	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2016/12/15 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2016/12/13 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2016/05/19 * 12
MBTR15	CBT Bluetooth Tester	Rohde & Schwarz	CBT	100401	AT,RE,CE	2016/06/24 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE,CE	2016/10/19 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE,CE	2017/01/20 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE,CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE,CE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE,CE	2016/10/14 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2016/09/28 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2016/10/21 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2016/06/24 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE,CE	2017/01/19 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2016/09/19 * 12
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE,CE	2017/01/12 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2016/11/23 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2017/01/26 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MAT-97	Attenuator	KEYSIGHT	8491A	MY52462282	RE	2016/10/31 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2017/03/27 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE	2016/07/07 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/12/24 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM1 41(5m)/421-010(1m) /sucoform141-PE(1 m)/RFM-E121(Switc her)	-/04178	CE	2016/07/20 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test