



RADIO TEST REPORT

Test Report No. : 12079942H-A

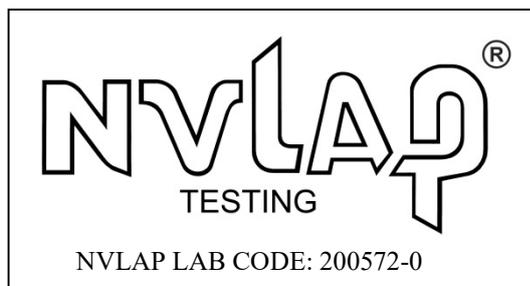
Applicant : Sony Interactive Entertainment Inc.
Type of Equipment : Wireless communication module
Model No. : J20H096
FCC ID : AK8M18DFT1
Test regulation : FCC Part 15 Subpart C: 2018
* Bluetooth part
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

Date of test: January 23 to February 7, 2018

Representative test engineer: 
Yuta Moriya
Engineer
Consumer Technology Division

Approved by: 
Takayuki Shimada
Leader
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Conducted Emission.....	11
SECTION 6: Radiated Spurious Emission	12
SECTION 7: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Test data	14
Conducted Emission	14
20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation.....	18
Number of Hopping Frequency	22
Dwell time.....	24
Maximum Peak Output Power.....	27
Average Output Power.....	28
Radiated Spurious Emission	30
Conducted Spurious Emission	44
Conducted Emission Band Edge compliance	50
APPENDIX 2: Test instruments	52
APPENDIX 3: Photographs of test setup	53
Conducted Emission	53
Radiated Spurious Emission	54
Worst Case Position.....	55
Test Configuration and peripherals.....	57

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 communication module
Model No	J20H096
Serial No	Refer to Clause 4.2
Country of Manufacture	China/Japan
Receipt Date of Sample	January 20, 2018
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

J20H096 is the Wireless communication module.

Product Specification

Clock frequency in the system (radio part)	26 MHz
Operating Temperature	-10 - +85 deg. C
Power Supply	DC 3.3 V, DC 1.8 V
Size	20 x 18 x 3.0 mm, 55pin LGA

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radio Specification

WLAN (IEEE802.11b/g/n-20)

Equipment Type	Transceiver
Frequency of Operation	2412 MHz - 2462 MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	Less than 20 MHz & 5 MHz
Method of frequency generation	Synthesizer
Antenna Type	IFA (Antenna port WA for 2.4 GHz / Antenna port WB for 2.4 GHz)
Antenna Gain: G _{ANT}	4.0 dBi (Antenna port WA for 2.4 GHz), 4.2 dBi (Antenna port WB for 2.4 GHz)
Directional Gain *1)	7.11 dBi

WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)

Equipment Type	Transceiver
Frequency of Operation	U-NII-1: 5180 MHz - 5240 MHz U-NII-2A: 5260 MHz - 5320 MHz U-NII-2C: 5500 MHz - 5700 MHz U-NII-3: 5745 MHz - 5825 MHz
Type of Modulation	OFDM
Bandwidth & Channel spacing	Less than 20 MHz / 40 MHz / 80 MHz & 20 MHz / 40 MHz / 80 MHz
Method of frequency generation	Synthesizer
Antenna Type	IFA (Antenna port WA for 5 GHz), PIFA (Antenna port WC for 5 GHz)
Antenna Gain: G _{ANT}	5.0 dBi (Antenna port WA for 5 GHz), 3.5 dBi (Antenna port WC for 5 GHz)
Directional Gain *1)	7.29 dBi

Bluetooth (BDR/EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	79 MHz & 1 MHz
Method of frequency generation	Synthesizer
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4 dBi (Antenna port WC for 2.4 GHz)

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	1 MHz & 2 MHz
Method of frequency generation	Synthesizer
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4 dBi (Antenna port WC for 2.4 GHz)

*1) Directional antenna gain = $10 \log \left(\frac{G_{ANT1}}{(10^{20}} + \frac{G_{ANT2}}{10^{20}})^2 / 2 \right)$

*This test report applies to Bluetooth.

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on February 2, 2018 and effective March 5, 2018

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 revision on February 2, 2018, does not affect the test specification applied to the EUT.

* 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 IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 33.8 dB, 0.50000 MHz, L AV 28.6 dB, 0.50000 MHz, L	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (a)		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 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		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 (b)		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		14.1 dB 3602.347 MHz, AV, Vert.	Complied

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

*1) Radiated test was selected over 30 MHz based on section 15.247(d).

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

FCC Part 15.31 (e)

The EUT has the power supply regulator. However one of the input voltages to RF part doesn't go through the regulator. The stable voltage will be supplied by the end product, which will be required to have a power supply regulator. Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has unique coupling/antenna connectors (U,FL) for antenna ports WC and also has a pattern antenna (Antenna port WA and WB) that is not removable from the EUT.
Therefore the equipment complies with the requirement of 15.203/212.

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Antenna Terminal test

Test Item	Uncertainty (+/-)
RF output power	1.3 dB
Antenna terminal conducted emission / Power density / Burst power	2.7 dB
Adjacent channel power / Channel power	
Below 3GHz	1.9 dB
3 GHz ot 6 GHz	2.1 dB

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	30 MHz to 200 MHz (Vertical)	5.0 dB
	200 MHz to 1000 MHz (Horiozntal)	5.2 dB
	200 MHz to 1000 MHz (Vertical)	6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	30 MHz to 200 MHz (Vertical)	4.9 dB
	200 MHz to 1000 MHz (Horiozntal)	5.0 dB
	200 MHz to 1000 MHz (Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 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.

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124
NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

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
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows; Power settings: Same as production model Software: MT_TEST_Tool_Ver6.3 *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>		

Simultaneously transmission

Test Item	Mode *1)
Spurious Emission (Radiated)	Tx (Hopping Off) 3DH5 2402 MHz + 11ac 5550 MHz Tx (Hopping Off) 3DH5 2441 MHz + 11ac 5550 MHz Tx (Hopping Off) 3DH5 2480 MHz + 11ac 5550 MHz
*1) The test was performed on the mode as a representative, because it had the highest power of 5GHz band at antenna terminal test.	

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, 0.5 m by 1.0 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.

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 m*2) (1 GHz - 10 GHz), 1 m*3) (10 GHz - 26.5 GHz)		4 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: $20 \times \log(4.5 \text{ m}/3.0 \text{ m}) = 3.53 \text{ dB}$

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

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

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

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

UL Japan, Inc.

Ise EMC Lab.

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

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 low enough as shown in the chart. (9 kHz - 150 kHz: RBW = 200Hz, 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.

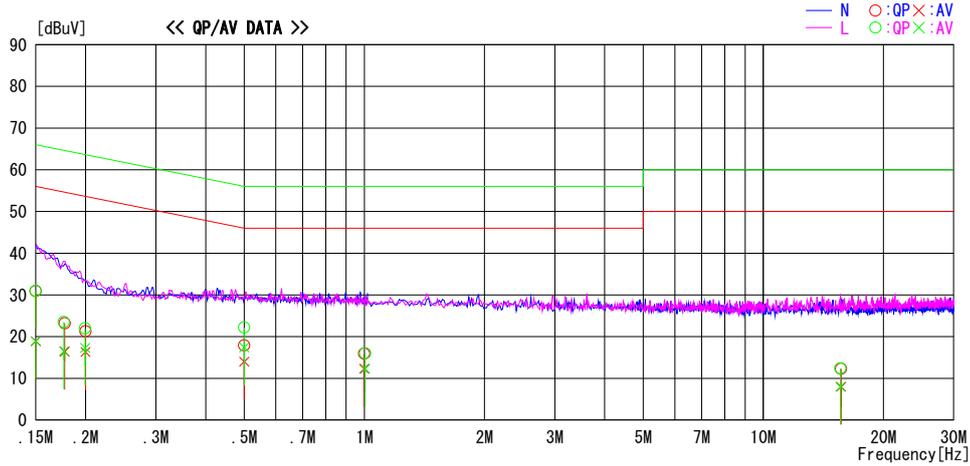
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 12079942H
Date : February 7, 2018
Temperature / Humidity : 24 deg. C / 30 % RH
Engineer : Takafumi Noguchi
Mode : Tx, Hopping Off, DH5 2402 MHz

LIMIT : FCC15. 207 QP
FCC15. 207 AV

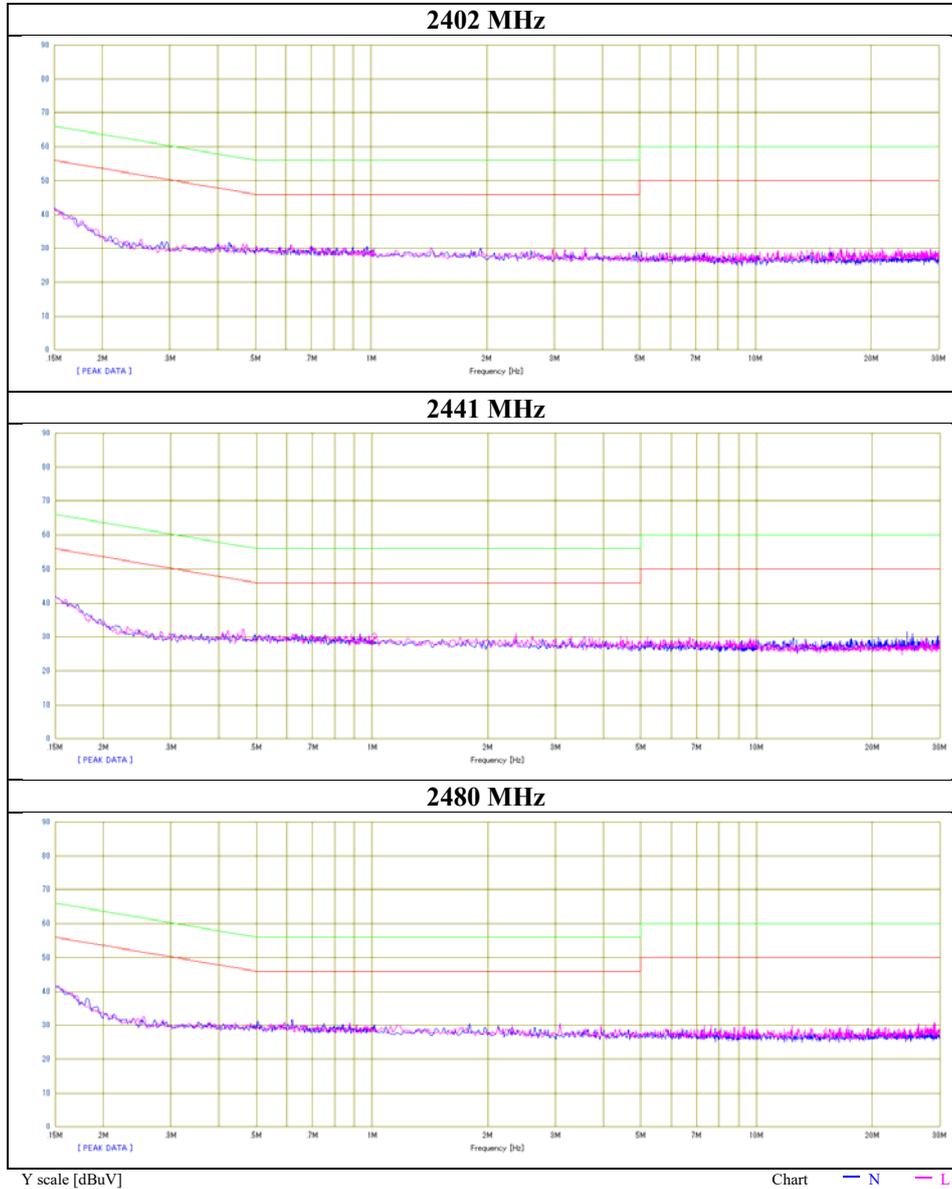


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15000	17.7	5.7	13.2	30.9	18.9	66.0	56.0	35.1	37.1	N
0.17745	10.0	3.2	13.2	23.2	16.4	64.6	54.6	41.4	38.2	N
0.19997	8.1	3.1	13.2	21.3	16.3	63.6	53.6	42.3	37.3	N
0.50000	4.6	0.7	13.3	17.9	14.0	56.0	46.0	38.1	32.0	N
0.99864	2.6	-1.0	13.3	15.9	12.3	56.0	46.0	40.1	33.7	N
15.66054	-1.9	-6.2	14.2	12.3	8.0	60.0	50.0	47.7	42.0	N
0.15000	17.8	5.7	13.2	31.0	18.9	66.0	56.0	35.0	37.1	L
0.17655	10.3	3.3	13.2	23.5	16.5	64.6	54.6	41.1	38.1	L
0.19958	8.8	4.1	13.2	22.0	17.3	63.6	53.6	41.6	36.3	L
0.50000	8.9	4.1	13.3	22.2	17.4	56.0	46.0	33.8	28.6	L
1.00464	2.7	-1.0	13.3	16.0	12.3	56.0	46.0	40.0	33.7	L
15.60037	-1.8	-6.2	14.2	12.4	8.0	60.0	50.0	47.6	42.0	L

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

Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12079942H
Date	February 7, 2018
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5



UL Japan, Inc.

Ise EMC Lab.

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

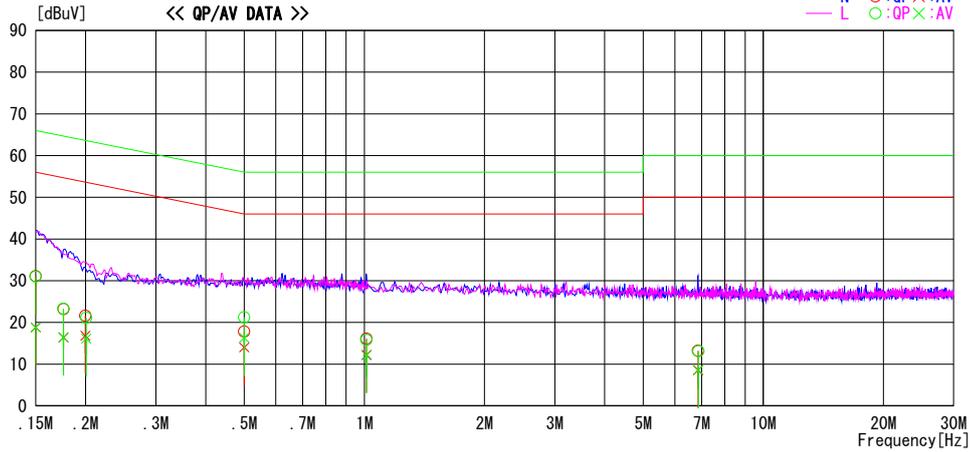
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12079942H
Date	February 7, 2018
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5 2402 MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15000	17.9	5.6	13.2	31.1	18.8	66.0	56.0	34.9	37.2	N
0.17615	10.0	3.2	13.2	23.2	16.4	64.7	54.7	41.5	38.3	N
0.19970	8.4	3.6	13.2	21.6	16.8	63.6	53.6	42.0	36.8	N
0.50000	4.5	0.7	13.3	17.8	14.0	56.0	46.0	38.2	32.0	N
1.01250	2.8	-1.1	13.3	16.1	12.2	56.0	46.0	39.9	33.8	N
6.85683	-0.6	-5.3	13.8	13.2	8.5	60.0	50.0	46.8	41.5	N
0.15000	17.8	5.6	13.2	31.0	18.8	66.0	56.0	35.0	37.2	L
0.17608	10.1	3.2	13.2	23.3	16.4	64.7	54.7	41.4	38.3	L
0.20094	7.9	2.9	13.2	21.1	16.1	63.6	53.6	42.5	37.5	L
0.50000	7.9	3.0	13.3	21.2	16.3	56.0	46.0	34.8	29.7	L
1.01158	2.5	-1.2	13.3	15.8	12.1	56.0	46.0	40.2	33.9	L
6.87559	-0.7	-5.2	13.8	13.1	8.6	60.0	50.0	46.9	41.4	L

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

UL Japan, Inc.

Ise EMC Lab.

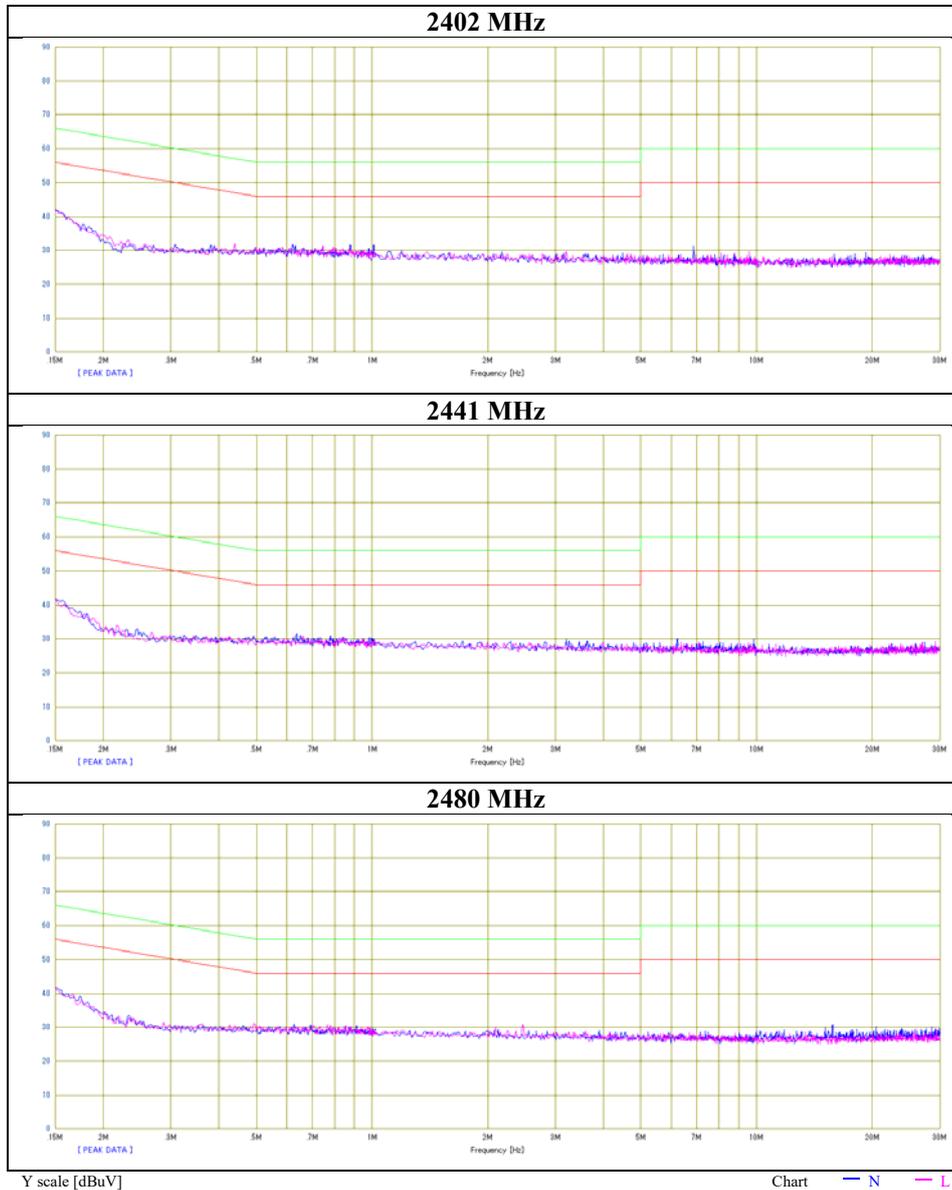
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. 12079942H
Date February 7, 2018
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off, 3DH5



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation

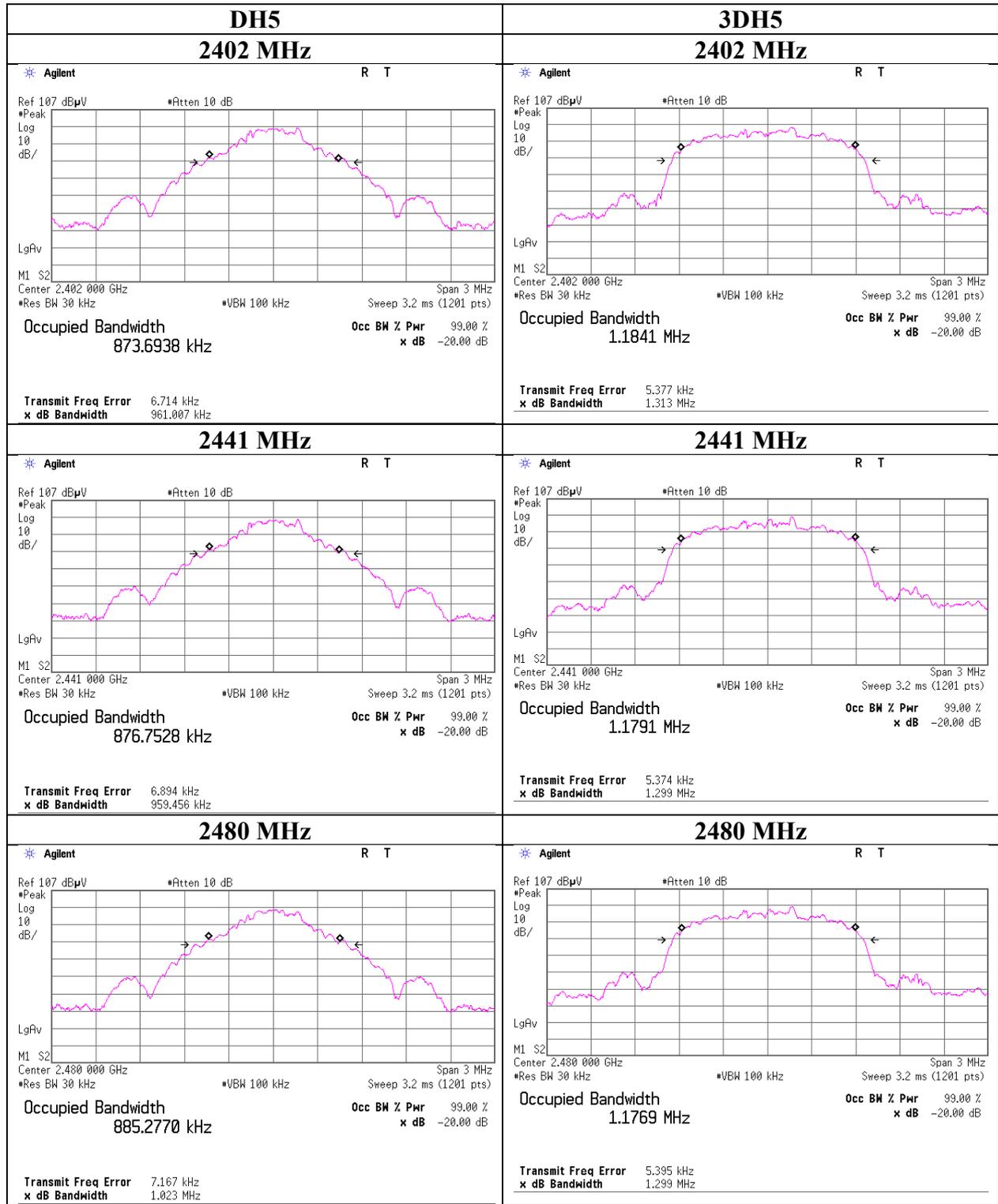
Test place Ise EMC Lab. No.11 Measurement Room
Report No. 12079942H
Date January 23, 2018
Temperature / Humidity 23 deg. C / 20 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.961	873.6938	1.000	≥ 0.641
DH5	2441.0	0.959	876.7528	1.000	≥ 0.639
DH5	2480.0	1.023	885.2770	1.000	≥ 0.682
DH5	Hopping On	-	78748.9000	-	-
3DH5	2402.0	1.313	1184.1000	1.000	≥ 0.875
3DH5	2441.0	1.299	1179.1000	1.000	≥ 0.866
3DH5	2480.0	1.299	1176.9000	1.000	≥ 0.866
3DH5	Hopping On	-	78680.7000	-	-

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



UL Japan, Inc.

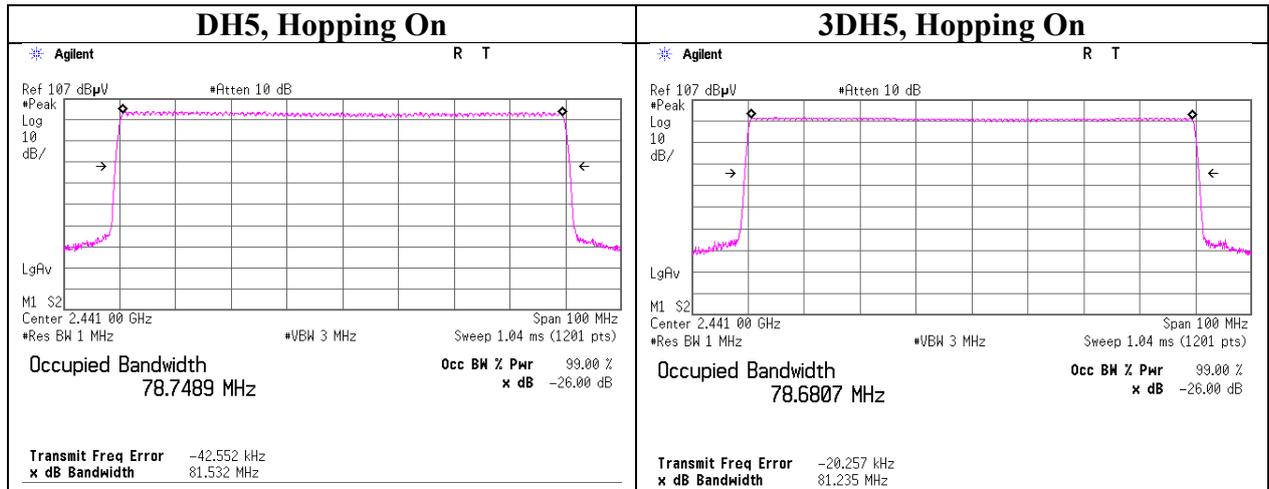
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99% Occupied Bandwidth



UL Japan, Inc.

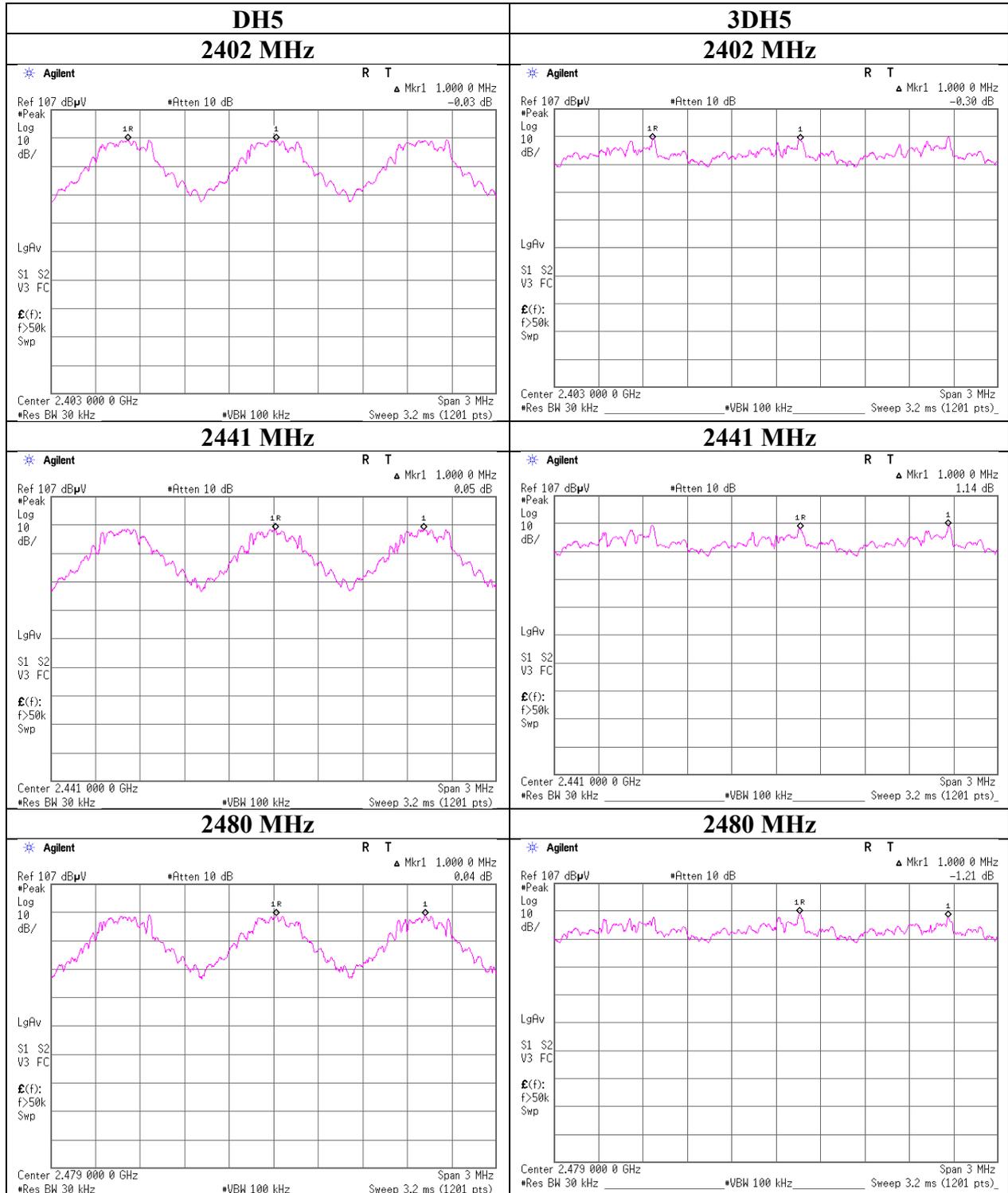
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Carrier Frequency Separation



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

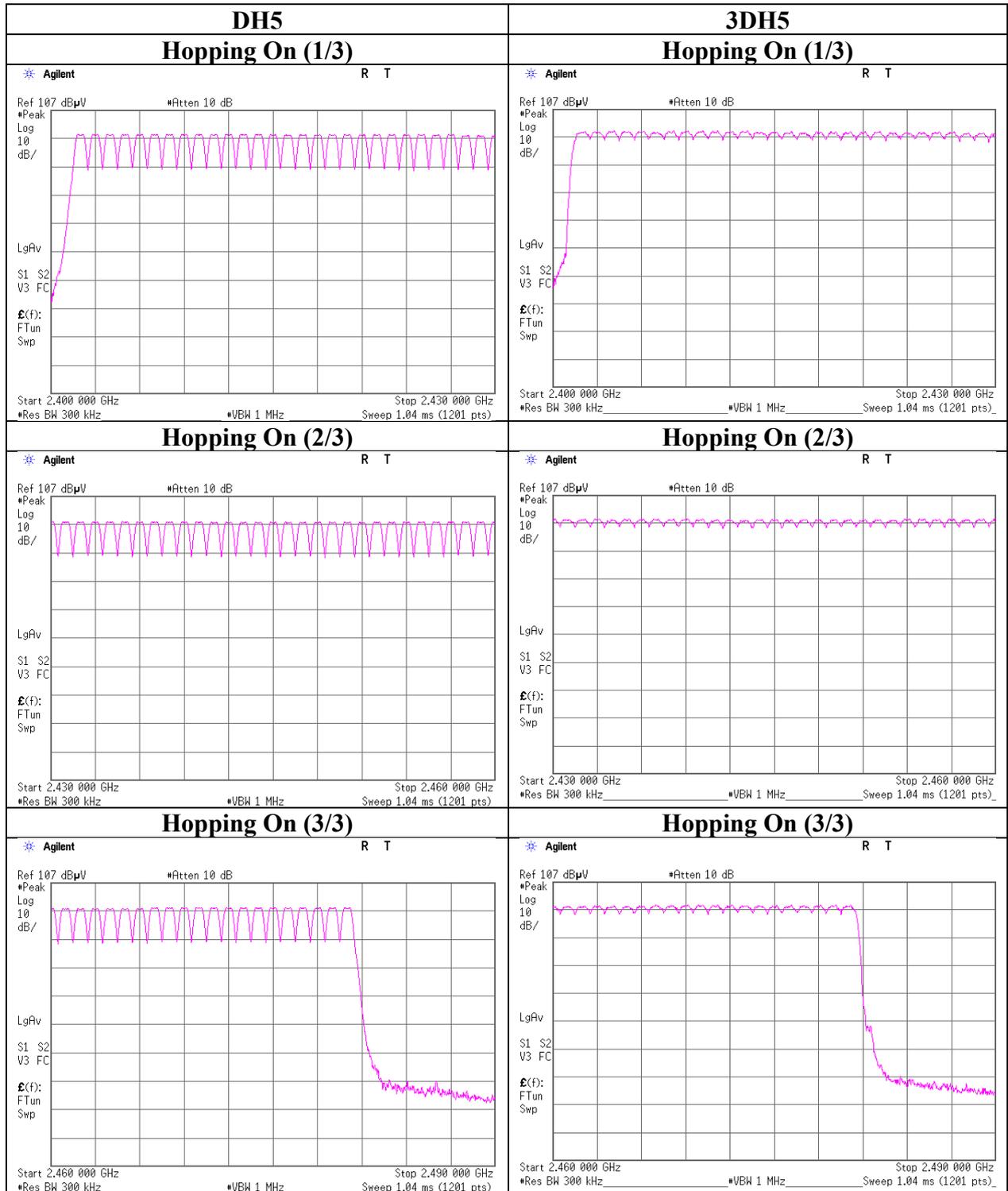
Number of Hopping Frequency

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 12079942H
Date January 23, 2018
Temperature / Humidity 23 deg. C / 20 % RH
Engineer Yuta Moriya
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



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Dwell time

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 12079942H
Date January 23, 2018
Temperature / Humidity 23 deg. C / 20 % 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]
	times /	sec. x	sec. =			
DH1	49.8 times /	5 sec. x	31.6 sec. =	315 times	0.382	120
DH3	29.0 times /	5 sec. x	31.6 sec. =	184 times	1.624	299
DH5	18.6 times /	5 sec. x	31.6 sec. =	118 times	2.893	341
3DH1	49.2 times /	5 sec. x	31.6 sec. =	311 times	0.389	121
3DH3	26.2 times /	5 sec. x	31.6 sec. =	166 times	1.642	273
3DH5	18.0 times /	5 sec. x	31.6 sec. =	114 times	2.897	330

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	49	50	50	50	49.8
DH3	26	26	33	33	27	29
DH5	21	15	19	18	20	18.6
3DH1	51	47	50	48	50	49.2
3DH3	27	25	29	21	29	26.2
3DH5	20	17	23	20	10	18

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

UL Japan, Inc.

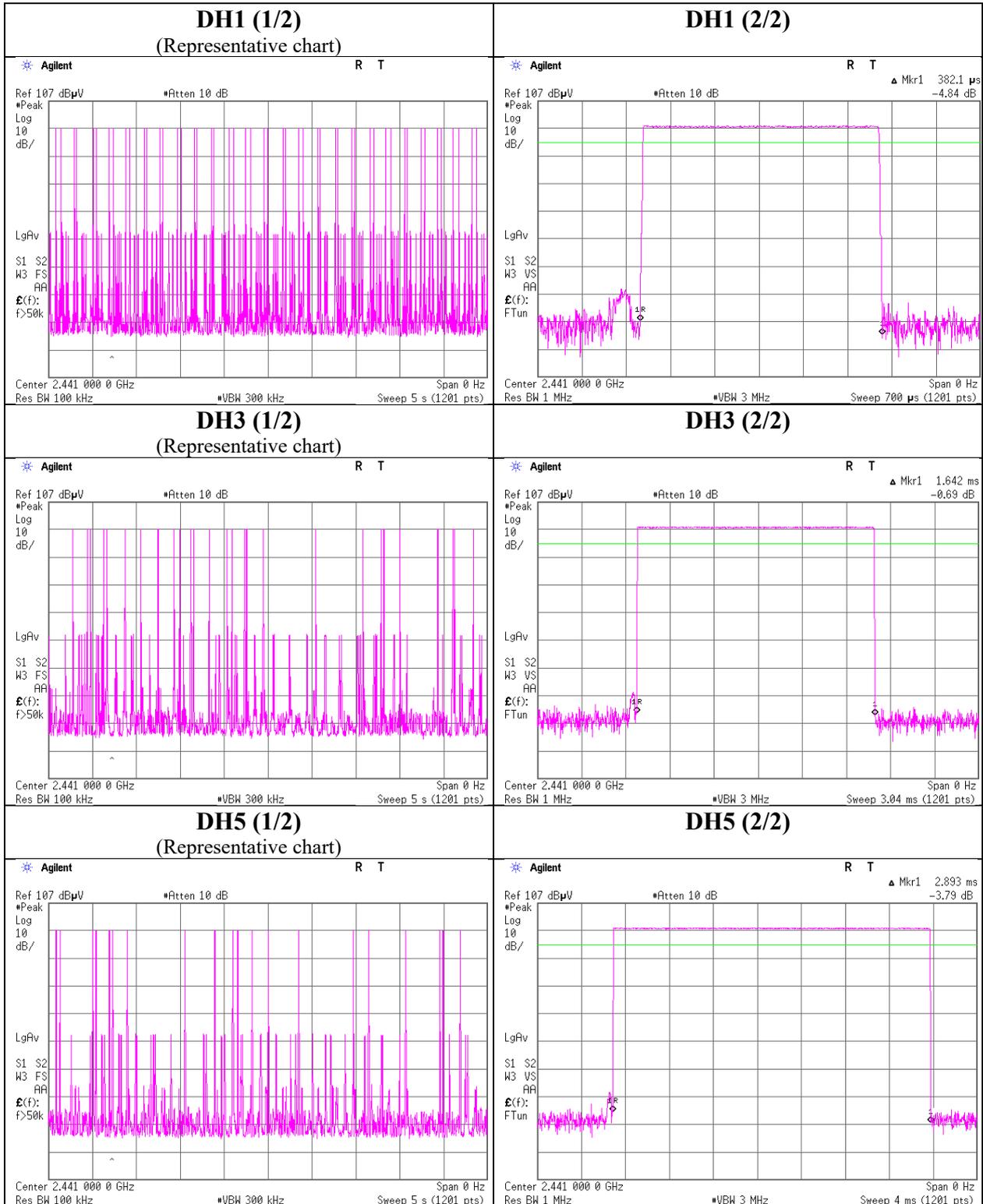
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Dwell time



UL Japan, Inc.

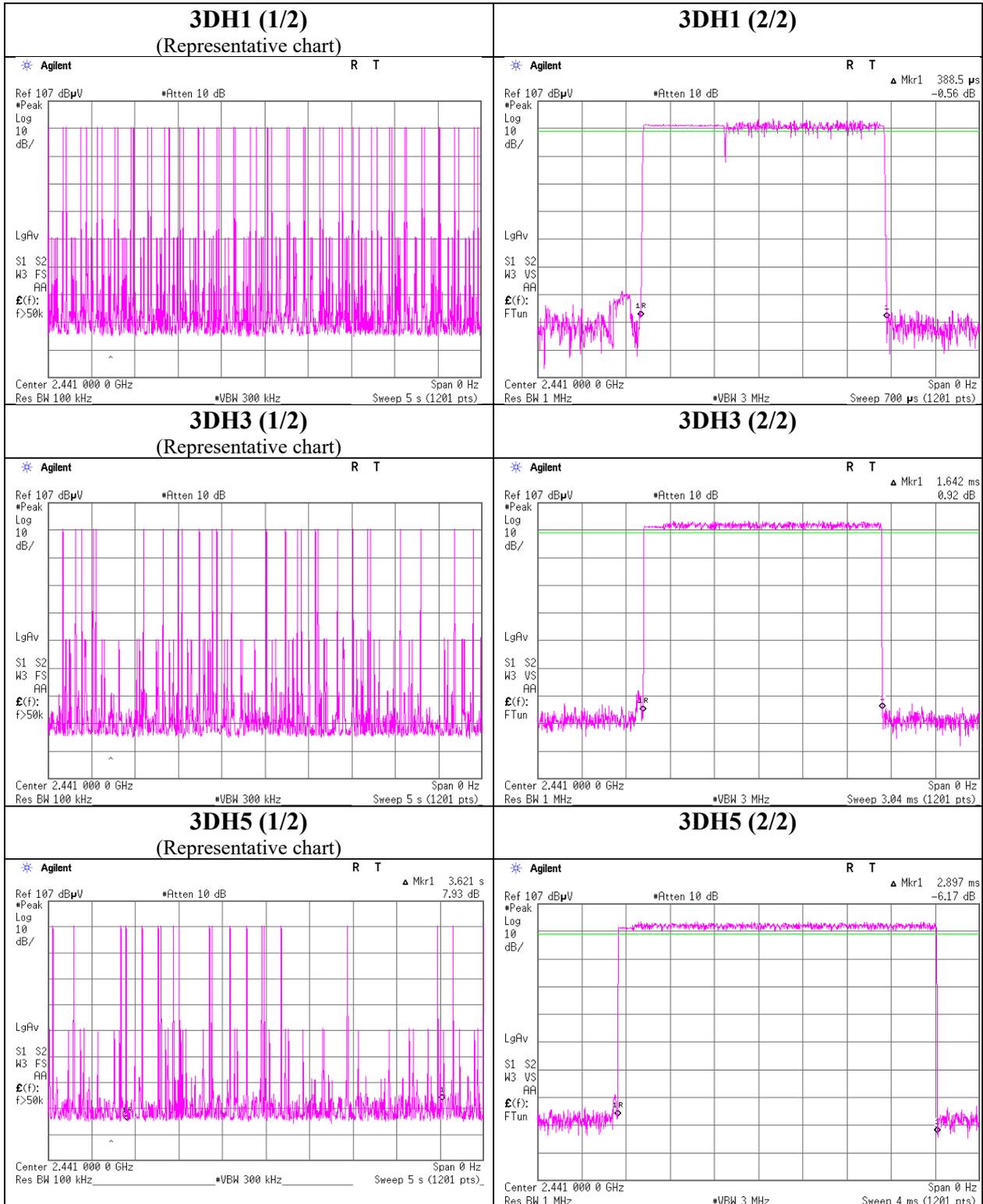
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Dwell time



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Peak Output Power

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 12079942H
Date : January 23, 2018
Temperature / Humidity : 23 deg. C / 20 % 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	-7.49	0.50	9.71	2.72	1.87	20.56	114.00	17.84
DH5	2441.0	-8.11	0.50	9.71	2.10	1.62	20.56	114.00	18.46
DH5	2480.0	-7.78	0.50	9.71	2.43	1.75	20.56	114.00	18.13
2DH5	2402.0	-4.73	0.50	9.71	5.48	3.53	20.56	114.00	15.08
2DH5	2441.0	-5.53	0.50	9.71	4.68	2.94	20.56	114.00	15.88
2DH5	2480.0	-5.23	0.50	9.71	4.98	3.15	20.56	114.00	15.58
3DH5	2402.0	-4.36	0.50	9.71	5.85	3.85	20.56	114.00	14.71
3DH5	2441.0	-5.13	0.50	9.71	5.08	3.22	20.56	114.00	15.48
3DH5	2480.0	-4.80	0.50	9.71	5.41	3.48	20.56	114.00	15.15

Sample Calculation:

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

*This Limit was reduced by the amount in dB (0.4 dB)

that the directional gain of the antenna exceeding 6 dBi.

*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. : 12079942H
Date : January 23, 2018
Temperature / Humidity : 23 deg. C / 20 % RH
Engineer : Yuta Moriya
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)	
					[dBm]	[mW]
DH5	2402.0	-8.86	0.50	9.71	1.35	1.36
DH5	2441.0	-9.46	0.50	9.71	0.75	1.19
DH5	2480.0	-9.22	0.50	9.71	0.99	1.26
2DH5	2402.0	-8.75	0.50	9.71	1.46	1.40
2DH5	2441.0	-9.47	0.50	9.71	0.74	1.19
2DH5	2480.0	-9.14	0.50	9.71	1.07	1.28
3DH5	2402.0	-8.74	0.50	9.71	1.47	1.40
3DH5	2441.0	-9.44	0.50	9.71	0.77	1.19
3DH5	2480.0	-9.06	0.50	9.71	1.15	1.30

Sample Calculation:

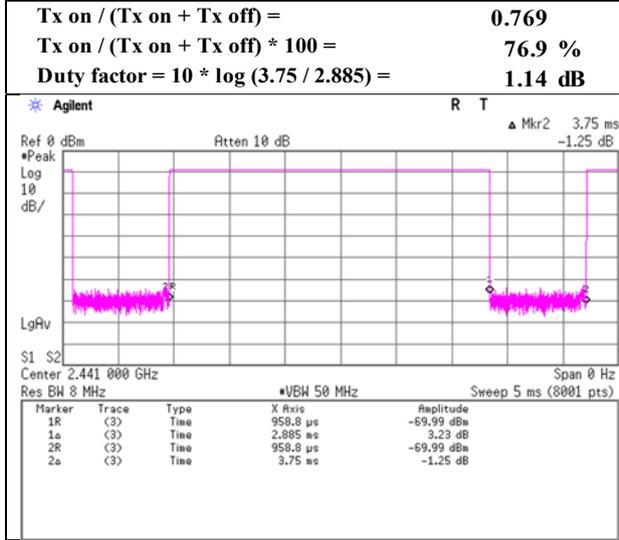
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied)

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

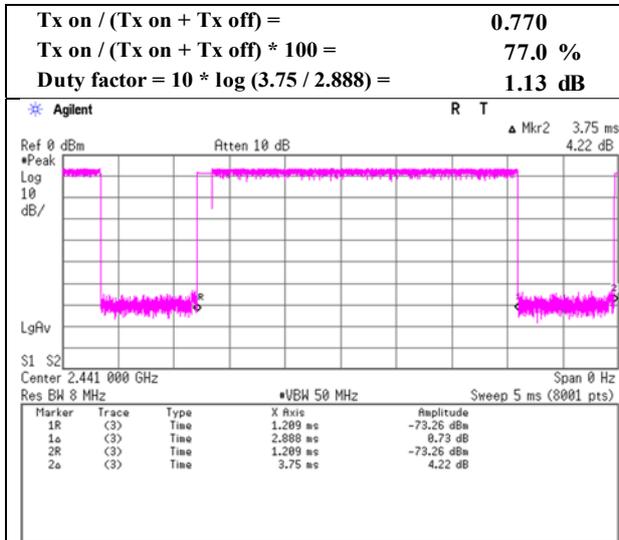
Burst Rate Confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off

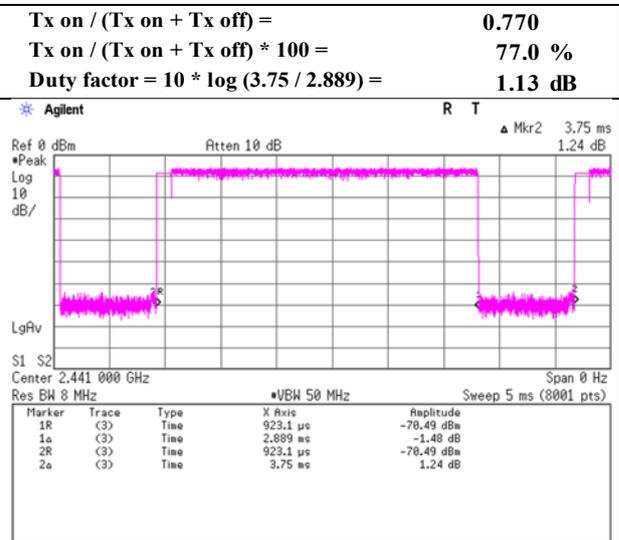
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 5, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	22 deg. C / 30 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takumi Shimada
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
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	45.121	QP	21.9	12.3	7.4	32.2	-	9.4	40.0	30.6	
Hori	94.375	QP	21.7	9.0	8.1	32.2	-	6.6	43.5	36.9	
Hori	199.210	QP	24.2	16.6	9.2	32.1	-	17.9	43.5	25.6	
Hori	249.880	QP	23.5	11.6	9.6	32.0	-	12.7	46.0	33.3	
Hori	544.761	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Hori	932.879	QP	20.4	22.0	13.7	30.8	-	25.3	46.0	20.7	
Hori	2390.000	PK	42.3	27.7	6.7	32.4	-	44.3	73.9	29.6	
Hori	3602.347	PK	45.9	29.5	7.6	31.9	-	51.1	73.9	22.8	
Hori	4804.000	PK	42.2	31.6	9.0	31.4	-	51.4	73.9	22.5	Floor noise
Hori	7206.000	PK	42.6	36.0	10.4	32.1	-	56.9	73.9	17.0	Floor noise
Hori	9608.000	PK	42.7	38.5	10.9	32.9	-	59.2	73.9	14.7	Floor noise
Hori	2390.000	AV	28.8	27.7	6.7	32.4	-	30.8	53.9	23.1	
Hori	3602.347	AV	34.5	29.5	7.6	31.9	-	39.7	53.9	14.2	
Hori	4804.000	AV	30.4	31.6	9.0	31.4	-	39.6	53.9	14.3	Floor noise
Hori	7206.000	AV	30.5	36.0	10.4	32.1	-	44.8	53.9	9.1	Floor noise
Hori	9608.000	AV	30.3	38.5	10.9	32.9	-	46.8	53.9	7.1	Floor noise
Vert	45.121	QP	22.0	12.3	7.4	32.2	-	9.5	40.0	30.5	
Vert	94.375	QP	21.7	9.0	8.1	32.2	-	6.6	43.5	36.9	
Vert	199.210	QP	29.5	16.6	9.2	32.1	-	23.2	43.5	20.3	
Vert	249.880	QP	29.1	11.6	9.6	32.0	-	18.3	46.0	27.7	
Vert	544.761	QP	21.0	18.2	11.6	32.0	-	18.8	46.0	27.2	
Vert	932.879	QP	20.4	22.0	13.7	30.8	-	25.3	46.0	20.7	
Vert	2390.000	PK	42.1	27.7	6.7	32.4	-	44.1	73.9	29.8	
Vert	3602.347	PK	45.8	29.5	7.6	31.9	-	51.0	73.9	22.9	
Vert	4804.000	PK	42.2	31.6	9.0	31.4	-	51.4	73.9	22.5	Floor noise
Vert	7206.000	PK	42.2	36.0	10.4	32.1	-	56.5	73.9	17.4	Floor noise
Vert	9608.000	PK	42.2	38.5	10.9	32.9	-	58.7	73.9	15.2	Floor noise
Vert	2390.000	AV	28.9	27.7	6.7	32.4	-	30.9	53.9	23.0	
Vert	3602.347	AV	34.6	29.5	7.6	31.9	-	39.8	53.9	14.1	
Vert	4804.000	AV	30.3	31.6	9.0	31.4	-	39.5	53.9	14.4	Floor noise
Vert	7206.000	AV	30.8	36.0	10.4	32.1	-	45.1	53.9	8.8	Floor noise
Vert	9608.000	AV	29.8	38.5	10.9	32.9	-	46.3	53.9	7.6	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	92.5	27.7	6.8	32.4	94.6	-	-	Carrier
Hori	2400.000	PK	38.1	27.7	6.8	32.4	40.2	74.6	34.4	
Vert	2402.000	PK	91.7	27.7	6.8	32.4	93.8	-	-	Carrier
Vert	2400.000	PK	36.4	27.7	6.8	32.4	38.5	73.8	35.3	

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

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

UL Japan, Inc.

Ise EMC Lab.

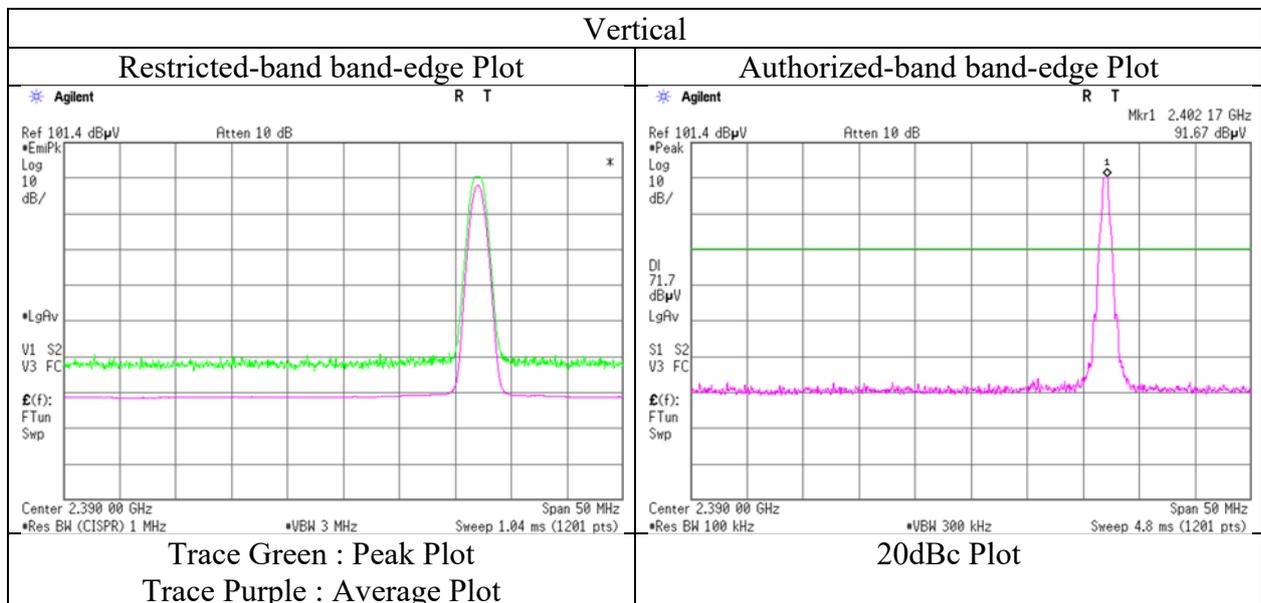
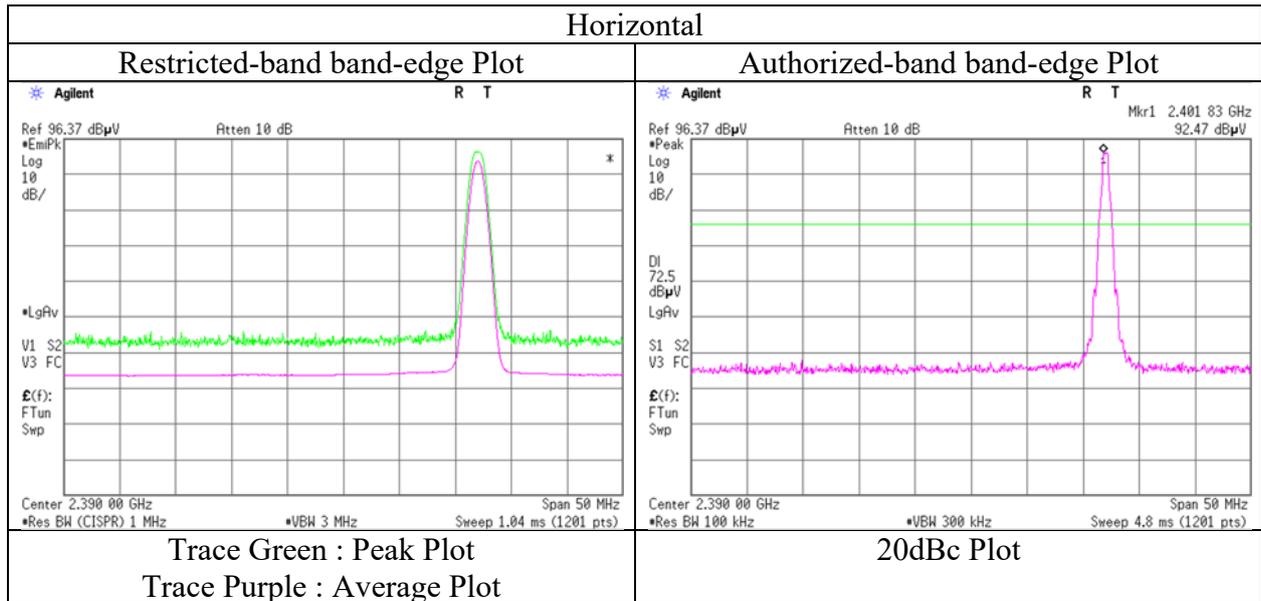
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2018
Temperature / Humidity 22 deg. C / 32 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 5, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	22 deg. C / 30 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takumi Shimada
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	44.720	QP	21.8	12.4	7.4	32.2	-	9.4	40.0	30.6	
Hori	95.561	QP	21.7	9.4	8.1	32.2	-	7.0	43.5	36.5	
Hori	199.210	QP	21.0	16.5	9.2	32.1	-	14.6	43.5	28.9	
Hori	249.840	QP	26.9	11.6	9.6	32.0	-	16.1	46.0	29.9	
Hori	544.571	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Hori	932.775	QP	20.5	22.0	13.7	30.8	-	25.4	46.0	20.6	
Hori	3664.015	PK	43.3	29.6	7.6	31.8	-	48.7	73.9	25.2	
Hori	4882.000	PK	40.7	31.9	9.0	31.4	-	50.2	73.9	23.7	Floor noise
Hori	7323.000	PK	41.4	36.2	10.4	32.2	-	55.8	73.9	18.1	Floor noise
Hori	9764.000	PK	42.0	38.7	11.0	33.0	-	58.7	73.9	15.2	Floor noise
Hori	3664.015	AV	34.1	29.6	7.6	31.8	-	39.5	53.9	14.4	
Hori	4882.000	AV	28.8	31.9	9.0	31.4	-	38.3	53.9	15.6	Floor noise
Hori	7323.000	AV	30.3	36.2	10.4	32.2	-	44.7	53.9	9.2	Floor noise
Hori	9764.000	AV	30.3	38.7	11.0	33.0	-	47.0	53.9	6.9	Floor noise
Vert	44.720	QP	21.8	12.4	7.4	32.2	-	9.4	40.0	30.6	
Vert	95.561	QP	21.7	9.4	8.1	32.2	-	7.0	43.5	36.5	
Vert	199.210	QP	27.8	16.5	9.2	32.1	-	21.4	43.5	22.1	
Vert	249.840	QP	30.9	11.6	9.6	32.0	-	20.1	46.0	25.9	
Vert	544.571	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Vert	932.775	QP	20.5	22.0	13.7	30.8	-	25.4	46.0	20.6	
Vert	3664.015	PK	43.1	29.6	7.6	31.8	-	48.5	73.9	25.4	
Vert	4882.000	PK	40.1	31.9	9.0	31.4	-	49.6	73.9	24.3	Floor noise
Vert	7323.000	PK	42.2	36.2	10.4	32.2	-	56.6	73.9	17.3	Floor noise
Vert	9764.000	PK	42.1	38.7	11.0	33.0	-	58.8	73.9	15.1	Floor noise
Vert	3664.015	AV	34.3	29.6	7.6	31.8	-	39.7	53.9	14.2	
Vert	4882.000	AV	28.9	31.9	9.0	31.4	-	38.4	53.9	15.5	Floor noise
Vert	7323.000	AV	30.3	36.2	10.4	32.2	-	44.7	53.9	9.2	Floor noise
Vert	9764.000	AV	30.3	38.7	11.0	33.0	-	47.0	53.9	6.9	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 5, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	22 deg. C / 30 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takumi Shimada (Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	46.661	QP	21.7	11.7	7.4	32.2	-	8.6	40.0	31.4	
Hori	95.651	QP	21.6	9.4	8.1	32.2	-	6.9	43.5	36.6	
Hori	199.210	QP	24.2	16.5	9.2	32.1	-	17.8	43.5	25.7	
Hori	249.852	QP	23.8	11.6	9.6	32.0	-	13.0	46.0	33.0	
Hori	546.091	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Hori	932.781	QP	20.5	22.0	13.7	30.8	-	25.4	46.0	20.6	
Hori	2483.500	PK	44.9	27.8	6.8	32.4	-	47.1	73.9	26.8	
Hori	3719.515	PK	44.5	29.6	7.7	31.8	-	50.0	73.9	23.9	
Hori	4960.000	PK	40.4	32.1	9.1	31.3	-	50.3	73.9	23.6	Floor noise
Hori	7440.000	PK	40.2	36.4	10.3	32.2	-	54.7	73.9	19.2	Floor noise
Hori	9920.000	PK	42.9	38.9	11.0	33.1	-	59.7	73.9	14.2	Floor noise
Hori	2483.500	AV	30.8	27.8	6.8	32.4	-	33.0	53.9	20.9	
Hori	3719.515	AV	30.4	29.6	7.7	31.8	-	35.9	53.9	18.0	
Hori	4960.000	AV	28.9	32.1	9.1	31.3	-	38.8	53.9	15.1	Floor noise
Hori	7440.000	AV	31.0	36.4	10.3	32.2	-	45.5	53.9	8.4	Floor noise
Hori	9920.000	AV	30.5	38.9	11.0	33.1	-	47.3	53.9	6.6	Floor noise
Vert	46.661	QP	21.8	11.7	7.4	32.2	-	8.7	40.0	31.3	
Vert	95.651	QP	22.0	9.4	8.1	32.2	-	7.3	43.5	36.2	
Vert	199.210	QP	28.2	16.5	9.2	32.1	-	21.8	43.5	21.7	
Vert	249.852	QP	28.0	11.6	9.6	32.0	-	17.2	46.0	28.8	
Vert	546.091	QP	21.0	18.2	11.6	32.0	-	18.8	46.0	27.2	
Vert	932.781	QP	20.5	22.0	13.7	30.8	-	25.4	46.0	20.6	
Vert	2483.500	PK	44.6	27.8	6.8	32.4	-	46.8	73.9	27.1	
Vert	3719.515	PK	41.4	29.6	7.7	31.8	-	46.9	73.9	27.0	
Vert	4960.000	PK	40.4	32.1	9.1	31.3	-	50.3	73.9	23.6	Floor noise
Vert	7440.000	PK	43.2	36.4	10.3	32.2	-	57.7	73.9	16.2	Floor noise
Vert	9920.000	PK	42.5	38.9	11.0	33.1	-	59.3	73.9	14.6	Floor noise
Vert	2483.500	AV	30.3	27.8	6.8	32.4	-	32.5	53.9	21.4	
Vert	3719.515	AV	29.3	29.6	7.7	31.8	-	34.8	53.9	19.1	
Vert	4960.000	AV	29.0	32.1	9.1	31.3	-	38.9	53.9	15.0	Floor noise
Vert	7440.000	AV	31.1	36.4	10.3	32.2	-	45.6	53.9	8.3	Floor noise
Vert	9920.000	AV	30.6	38.9	11.0	33.1	-	47.4	53.9	6.5	Floor noise

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

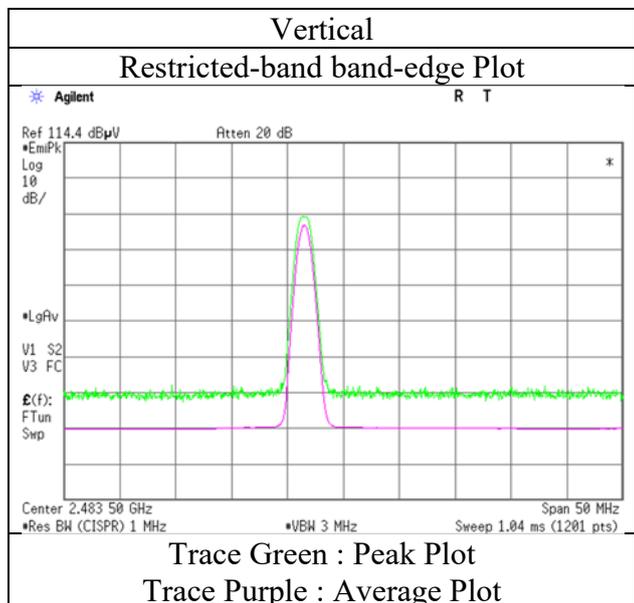
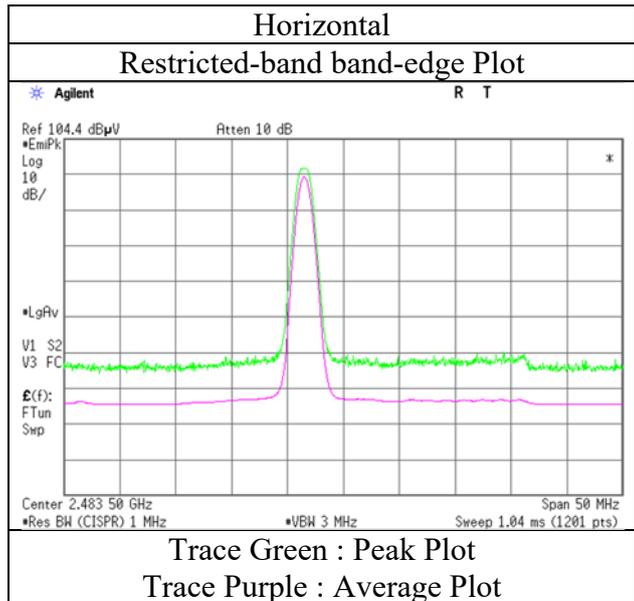
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2018
Temperature / Humidity 22 deg. C / 32 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takumi Shimada
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	46.220	QP	22.1	11.9	7.4	32.2	-	9.2	40.0	30.8	
Hori	139.104	QP	21.7	14.3	8.6	32.1	-	12.5	43.5	31.0	
Hori	199.220	QP	22.7	16.6	9.2	32.1	-	16.4	43.5	27.1	
Hori	248.974	QP	26.9	11.6	9.6	32.0	-	16.1	46.0	29.9	
Hori	541.847	QP	21.0	18.2	11.6	32.0	-	18.8	46.0	27.2	
Hori	865.961	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Hori	2390.000	PK	42.6	27.7	6.7	32.4	-	44.6	73.9	29.3	
Hori	3602.347	PK	46.2	29.5	7.6	31.9	-	51.4	73.9	22.5	
Hori	4804.000	PK	40.5	31.6	9.0	31.4	-	49.7	73.9	24.2	Floor noise
Hori	7206.000	PK	42.4	36.0	10.4	32.1	-	56.7	73.9	17.2	Floor noise
Hori	9608.000	PK	41.7	38.5	10.9	32.9	-	58.2	73.9	15.7	Floor noise
Hori	2390.000	AV	30.5	27.7	6.7	32.4	-	32.5	53.9	21.4	
Hori	3602.347	AV	32.6	29.5	7.6	31.9	-	37.8	53.9	16.1	
Hori	4804.000	AV	29.1	31.6	9.0	31.4	-	38.3	53.9	15.6	Floor noise
Hori	7206.000	AV	30.7	36.0	10.4	32.1	-	45.0	53.9	8.9	Floor noise
Hori	9608.000	AV	30.2	38.5	10.9	32.9	-	46.7	53.9	7.2	Floor noise
Vert	46.220	QP	22.0	11.9	7.4	32.2	-	9.1	40.0	30.9	
Vert	139.104	QP	21.7	14.3	8.6	32.1	-	12.5	43.5	31.0	
Vert	199.220	QP	26.5	16.6	9.2	32.1	-	20.2	43.5	23.3	
Vert	248.974	QP	29.3	11.6	9.6	32.0	-	18.5	46.0	27.5	
Vert	541.847	QP	21.0	18.2	11.6	32.0	-	18.8	46.0	27.2	
Vert	865.961	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Vert	2390.000	PK	41.5	27.7	6.7	32.4	-	43.5	73.9	30.4	
Vert	3602.347	PK	43.9	29.5	7.6	31.9	-	49.1	73.9	24.8	
Vert	4804.000	PK	41.2	31.6	9.0	31.4	-	50.4	73.9	23.5	Floor noise
Vert	7206.000	PK	41.8	36.0	10.4	32.1	-	56.1	73.9	17.8	Floor noise
Vert	9608.000	PK	41.7	38.5	10.9	32.9	-	58.2	73.9	15.7	Floor noise
Vert	2390.000	AV	29.3	27.7	6.7	32.4	-	31.3	53.9	22.6	
Vert	3602.347	AV	33.0	29.5	7.6	31.9	-	38.2	53.9	15.7	
Vert	4804.000	AV	20.1	31.6	9.0	31.4	-	29.3	53.9	24.6	Floor noise
Vert	7206.000	AV	30.6	36.0	10.4	32.1	-	44.9	53.9	9.0	Floor noise
Vert	9608.000	AV	30.2	38.5	10.9	32.9	-	46.7	53.9	7.2	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

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	92.1	27.7	6.8	32.4	94.2	-	-	Carrier
Hori	2400.000	PK	36.7	27.7	6.8	32.4	38.8	74.2	35.4	
Vert	2402.000	PK	91.0	27.7	6.8	32.4	93.1	-	-	Carrier
Vert	2400.000	PK	35.7	27.7	6.8	32.4	37.8	73.1	35.3	

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

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

UL Japan, Inc.

Ise EMC Lab.

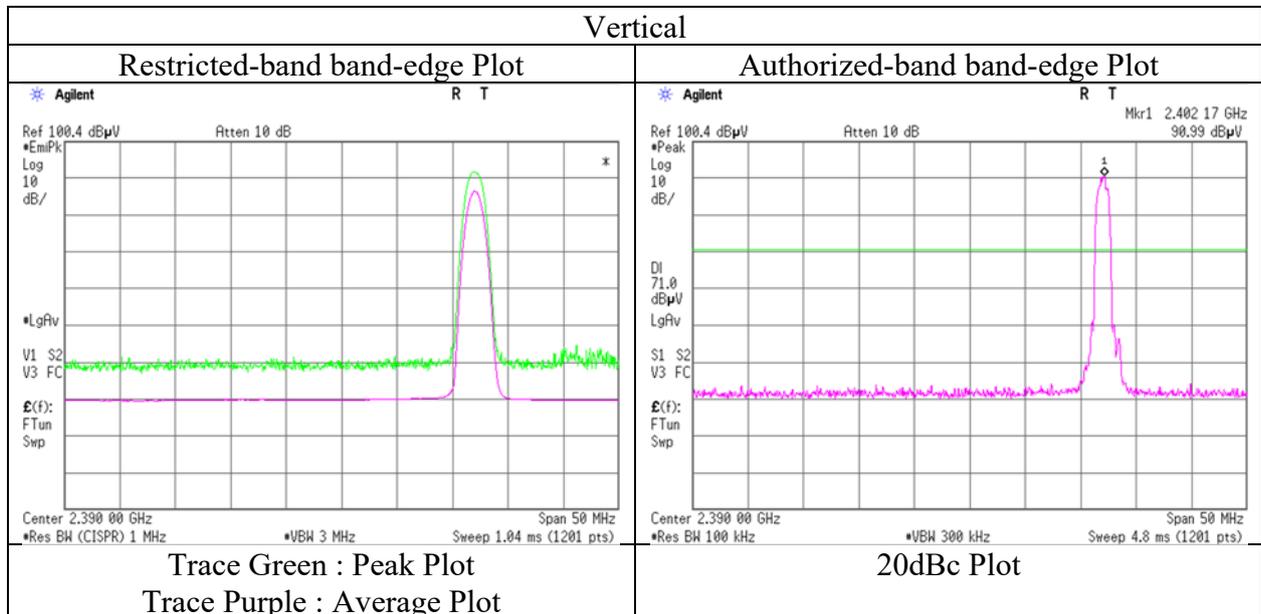
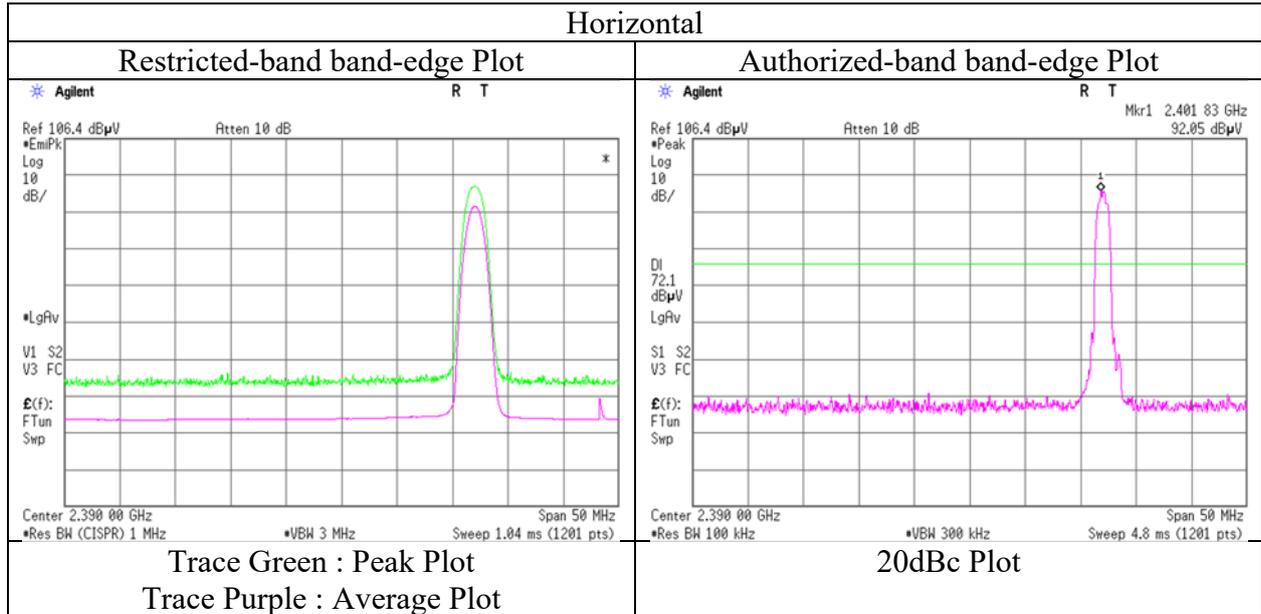
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2018
Temperature / Humidity 22 deg. C / 32 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takumi Shimada
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	46.368	QP	21.9	11.9	7.4	32.2	-	9.0	40.0	31.0	
Hori	139.098	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Hori	199.220	QP	22.8	16.6	9.2	32.1	-	16.5	43.5	27.0	
Hori	248.991	QP	26.9	11.6	9.6	32.0	-	16.1	46.0	29.9	
Hori	541.842	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Hori	866.351	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Hori	3664.015	PK	43.1	29.6	7.6	31.8	-	48.5	73.9	25.4	
Hori	4882.000	PK	40.1	31.9	9.0	31.4	-	49.6	73.9	24.3	Floor noise
Hori	7323.000	PK	40.7	36.2	10.4	32.2	-	55.1	73.9	18.8	Floor noise
Hori	9764.000	PK	40.8	38.7	11.0	33.0	-	57.5	73.9	16.4	Floor noise
Hori	3664.015	AV	34.0	29.6	7.6	31.8	-	39.4	53.9	14.5	
Hori	4882.000	AV	28.9	31.9	9.0	31.4	-	38.4	53.9	15.5	Floor noise
Hori	7323.000	AV	30.3	36.2	10.4	32.2	-	44.7	53.9	9.2	Floor noise
Hori	9764.000	AV	30.0	38.7	11.0	33.0	-	46.7	53.9	7.2	Floor noise
Vert	46.368	QP	22.0	11.9	7.4	32.2	-	9.1	40.0	30.9	
Vert	139.098	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Vert	199.220	QP	26.6	16.6	9.2	32.1	-	20.3	43.5	23.2	
Vert	248.991	QP	29.5	11.6	9.6	32.0	-	18.7	46.0	27.3	
Vert	541.842	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Vert	866.351	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Vert	3664.015	PK	43.0	29.6	7.6	31.8	-	48.4	73.9	25.5	
Vert	4882.000	PK	41.1	31.9	9.0	31.4	-	50.6	73.9	23.3	Floor noise
Vert	7323.000	PK	41.7	36.2	10.4	32.2	-	56.1	73.9	17.8	Floor noise
Vert	9764.000	PK	42.0	38.7	11.0	33.0	-	58.7	73.9	15.2	Floor noise
Vert	3664.015	AV	33.7	29.6	7.6	31.8	-	39.1	53.9	14.8	
Vert	4882.000	AV	28.8	31.9	9.0	31.4	-	38.3	53.9	15.6	Floor noise
Vert	7323.000	AV	30.3	36.2	10.4	32.2	-	44.7	53.9	9.2	Floor noise
Vert	9764.000	AV	30.3	38.7	11.0	33.0	-	47.0	53.9	6.9	Floor noise

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

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

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

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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takumi Shimada (Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	46.370	QP	21.2	11.9	7.4	32.2	-	8.3	40.0	31.7	
Hori	139.148	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Hori	199.220	QP	22.8	16.6	9.2	32.1	-	16.5	43.5	27.0	
Hori	248.993	QP	23.9	11.6	9.6	32.0	-	13.1	46.0	32.9	
Hori	541.878	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Hori	866.350	QP	20.9	21.5	13.3	31.1	-	24.6	46.0	21.4	
Hori	2483.500	PK	45.8	27.8	6.8	32.4	-	48.0	73.9	25.9	
Hori	4960.000	PK	41.0	32.1	9.1	31.3	-	50.9	73.9	23.0	Floor noise
Hori	7440.000	PK	42.8	36.4	10.3	32.2	-	57.3	73.9	16.6	Floor noise
Hori	9920.000	PK	43.1	38.9	11.0	33.1	-	59.9	73.9	14.0	Floor noise
Hori	2483.500	AV	31.1	27.8	6.8	32.4	-	33.3	53.9	20.6	
Hori	4960.000	AV	28.9	32.1	9.1	31.3	-	38.8	53.9	15.1	Floor noise
Hori	7440.000	AV	31.0	36.4	10.3	32.2	-	45.5	53.9	8.4	Floor noise
Hori	9920.000	AV	30.6	38.9	11.0	33.1	-	47.4	53.9	6.5	Floor noise
Vert	46.370	QP	21.2	11.9	7.4	32.2	-	8.3	40.0	31.7	
Vert	139.148	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Vert	199.220	QP	27.4	16.6	9.2	32.1	-	21.1	43.5	22.4	
Vert	248.993	QP	27.0	11.6	9.6	32.0	-	16.2	46.0	29.8	
Vert	541.878	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Vert	866.350	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Vert	2483.500	PK	43.7	27.8	6.8	32.4	-	45.9	73.9	28.0	
Vert	4960.000	PK	40.9	32.1	9.1	31.3	-	50.8	73.9	23.1	Floor noise
Vert	7440.000	PK	42.6	36.4	10.3	32.2	-	57.1	73.9	16.8	Floor noise
Vert	9920.000	PK	42.7	38.9	11.0	33.1	-	59.5	73.9	14.4	Floor noise
Vert	2483.500	AV	32.1	27.8	6.8	32.4	-	34.3	53.9	19.6	
Vert	4960.000	AV	28.9	32.1	9.1	31.3	-	38.8	53.9	15.1	Floor noise
Vert	7440.000	AV	31.0	36.4	10.3	32.2	-	45.5	53.9	8.4	Floor noise
Vert	9920.000	AV	30.5	38.9	11.0	33.1	-	47.3	53.9	6.6	Floor noise

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

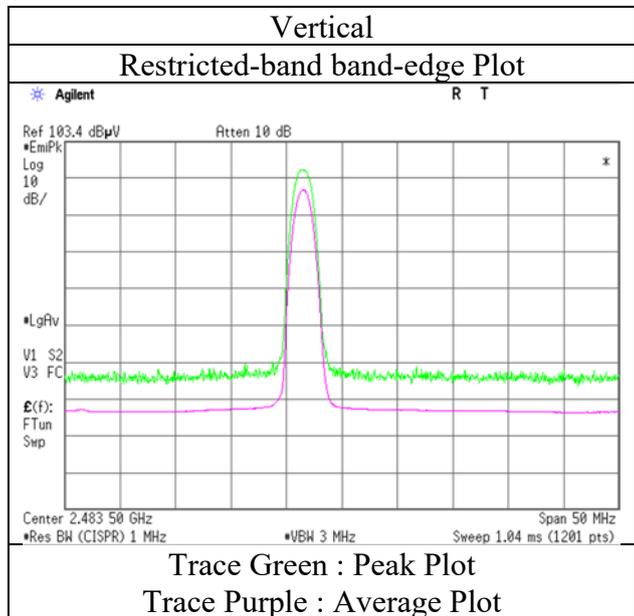
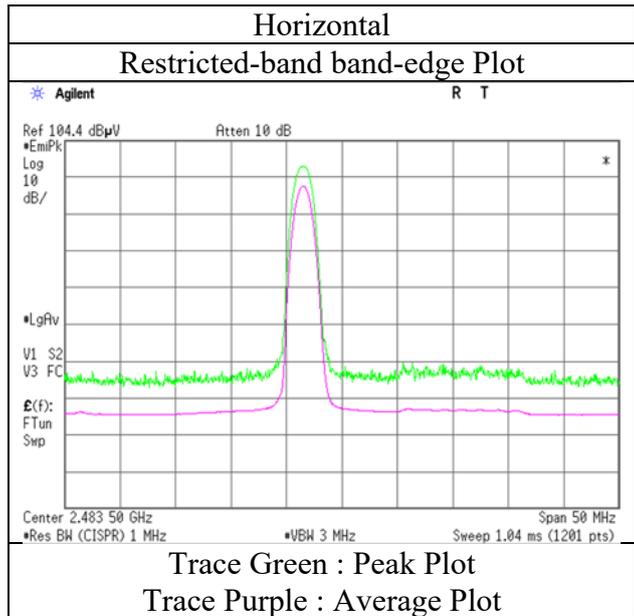
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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)

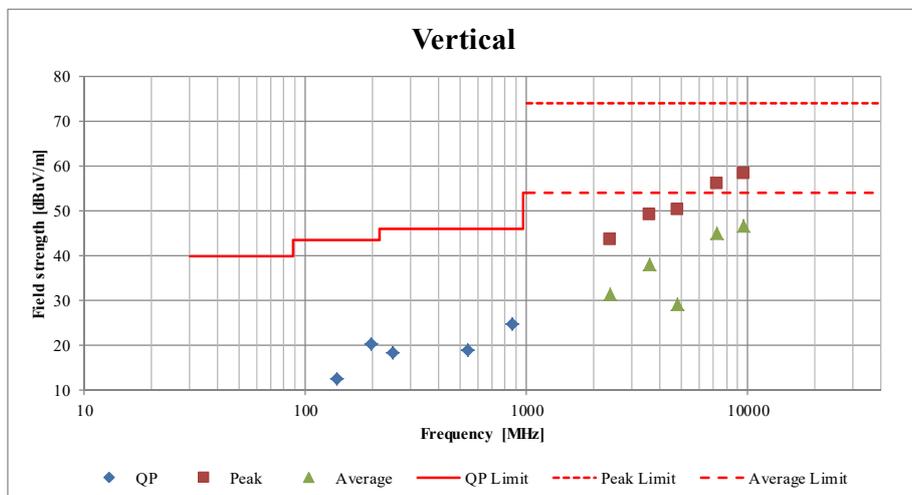
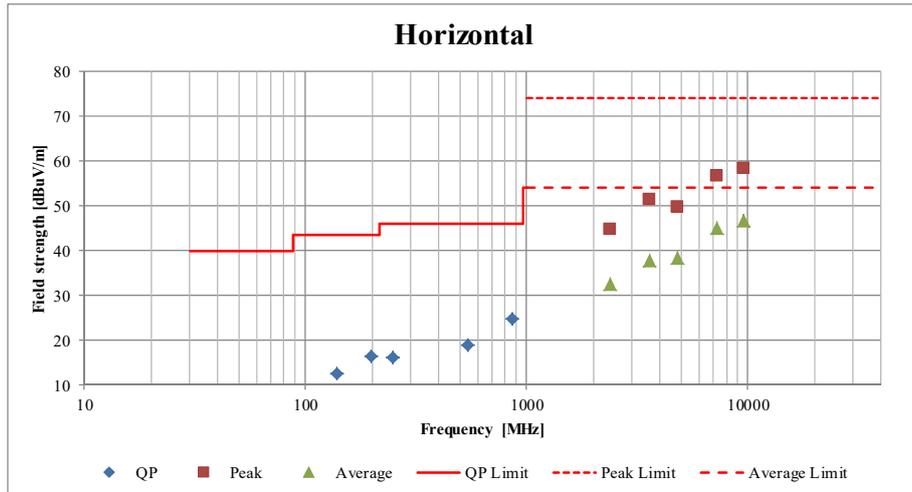
Report No.	12079942H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 29, 2018
Temperature / Humidity	22 deg. C / 32 % RH
Engineer	Ken Fujita
	(1 GHz - 10 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 29, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takumi Shimada (Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		



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

Radiated Spurious Emission

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 31, 2018
Temperature / Humidity 22 deg. C / 32 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz + Tx 11ac-40 5550 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	2390.000	PK	42.5	27.7	6.7	31.9	-	45.0	73.9	28.9	
Hori	2390.000	AV	28.9	27.7	6.7	32.4	-	30.9	53.9	23.0	
Vert	2390.000	PK	42.2	27.7	6.7	32.4	-	44.2	73.9	29.7	
Vert	2390.000	AV	28.9	27.7	6.7	32.4	-	30.9	53.9	23.0	

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$

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	95.1	27.7	6.8	32.4	97.2	-	-	Carrier
Hori	2400.000	PK	39.5	27.7	6.8	32.4	41.6	77.2	35.6	
Vert	2402.000	PK	94.2	27.7	6.8	32.4	96.3	-	-	Carrier
Vert	2400.000	PK	38.4	27.7	6.8	32.4	40.5	76.3	35.8	

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

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz))
- Gain(Amplifier) + Dwell time factor (Refer to dwell time data sheet)

*Above noise was synchronized with carrier frequency.

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$

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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 31, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 32 % RH	23 deg. C / 32 % RH	22 deg. C / 29 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takafumi Noguchi
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz + Tx 11ac-40 5550 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	52.000	QP	21.9	10.0	7.5	32.2	-	7.2	40.0	32.8	
Hori	96.574	QP	26.2	9.5	8.1	32.2	-	11.6	43.5	31.9	
Hori	150.429	QP	30.6	15.0	8.7	32.1	-	22.2	43.5	21.3	
Hori	174.573	QP	27.9	16.1	9.0	32.1	-	20.9	43.5	22.6	
Hori	215.429	QP	39.2	11.3	9.3	32.1	-	27.7	43.5	15.8	
Hori	341.717	QP	26.3	14.3	10.3	32.0	-	18.9	46.0	27.1	
Hori	3799.683	PK	43.2	29.6	7.7	31.8	-	48.7	73.9	25.2	
Hori	4882.000	PK	40.2	31.9	9.0	31.4	-	49.7	73.9	24.2	Floor noise
Hori	7323.000	PK	40.6	36.2	10.4	32.2	-	55.0	73.9	18.9	Floor noise
Hori	9764.000	PK	41.2	38.7	11.0	33.0	-	57.9	73.9	16.0	Floor noise
Hori	3799.683	AV	32.3	29.6	7.7	31.8	-	37.8	53.9	16.1	
Hori	4882.000	AV	28.4	31.9	9.0	31.4	-	37.9	53.9	16.0	Floor noise
Hori	7323.000	AV	30.6	36.2	10.4	32.2	-	45.0	53.9	8.9	Floor noise
Hori	9764.000	AV	30.1	38.7	11.0	33.0	-	46.8	53.9	7.1	Floor noise
Vert	52.000	QP	31.1	10.0	7.5	32.2	-	16.4	40.0	23.6	
Vert	96.574	QP	32.8	9.5	8.1	32.2	-	18.2	43.5	25.3	
Vert	150.429	QP	34.5	15.0	8.7	32.1	-	26.1	43.5	17.4	
Vert	174.573	QP	31.2	16.1	9.0	32.1	-	24.2	43.5	19.3	
Vert	215.429	QP	31.8	11.3	9.3	32.1	-	20.3	43.5	23.2	
Vert	341.717	QP	26.2	14.3	10.3	32.0	-	18.8	46.0	27.2	
Vert	3799.683	PK	43.2	29.6	7.7	31.8	-	48.7	73.9	25.2	
Vert	4882.000	PK	40.0	31.9	9.0	31.4	-	49.5	73.9	24.4	Floor noise
Vert	7323.000	PK	40.4	36.2	10.4	32.2	-	54.8	73.9	19.1	Floor noise
Vert	9764.000	PK	41.3	38.7	11.0	33.0	-	58.0	73.9	15.9	Floor noise
Vert	3799.683	AV	32.2	29.6	7.7	31.8	-	37.7	53.9	16.2	
Vert	4882.000	AV	28.9	31.9	9.0	31.4	-	38.4	53.9	15.5	Floor noise
Vert	7323.000	AV	30.6	36.2	10.4	32.2	-	45.0	53.9	8.9	Floor noise
Vert	9764.000	AV	30.2	38.7	11.0	33.0	-	46.9	53.9	7.0	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. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 31, 2018
Temperature / Humidity 22 deg. C / 32 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz + Tx 11ac-40 5550 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	2483.500	PK	45.3	27.8	6.8	32.4	-	47.5	73.9	26.4	
Hori	2483.500	AV	32.4	27.8	6.8	32.4	-	34.6	53.9	19.3	
Vert	2483.500	PK	43.9	27.8	6.8	32.4	-	46.1	73.9	27.8	
Vert	2483.500	AV	31.2	27.8	6.8	32.4	-	33.4	53.9	20.5	

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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$

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

UL Japan, Inc.

Ise EMC Lab.

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

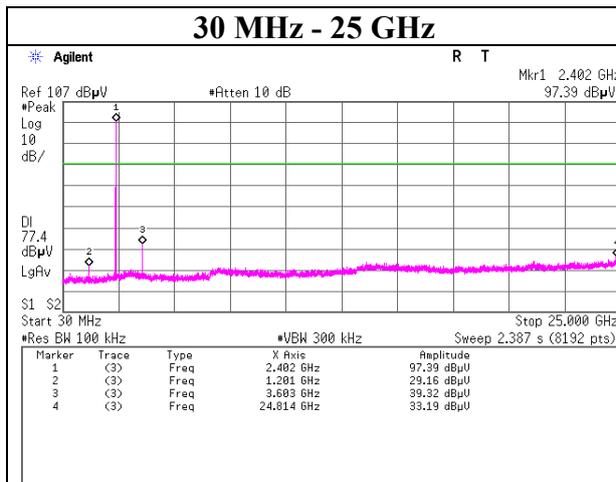
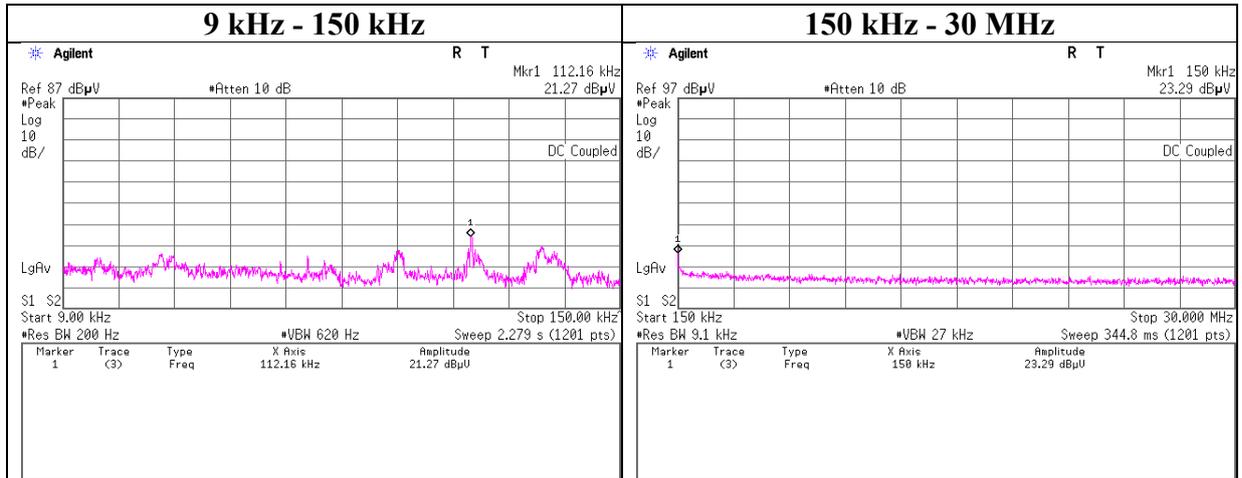
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, DH5

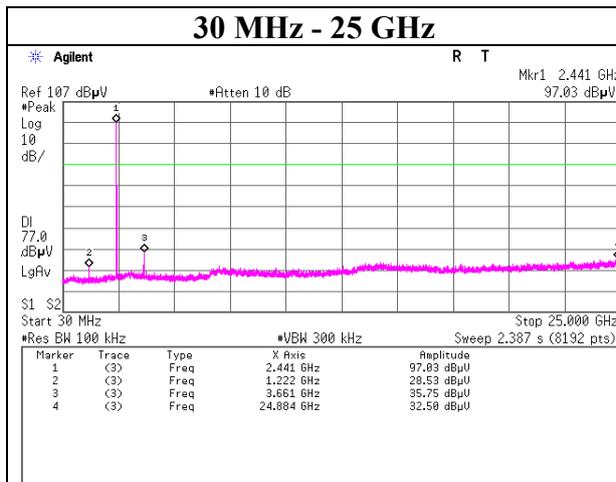
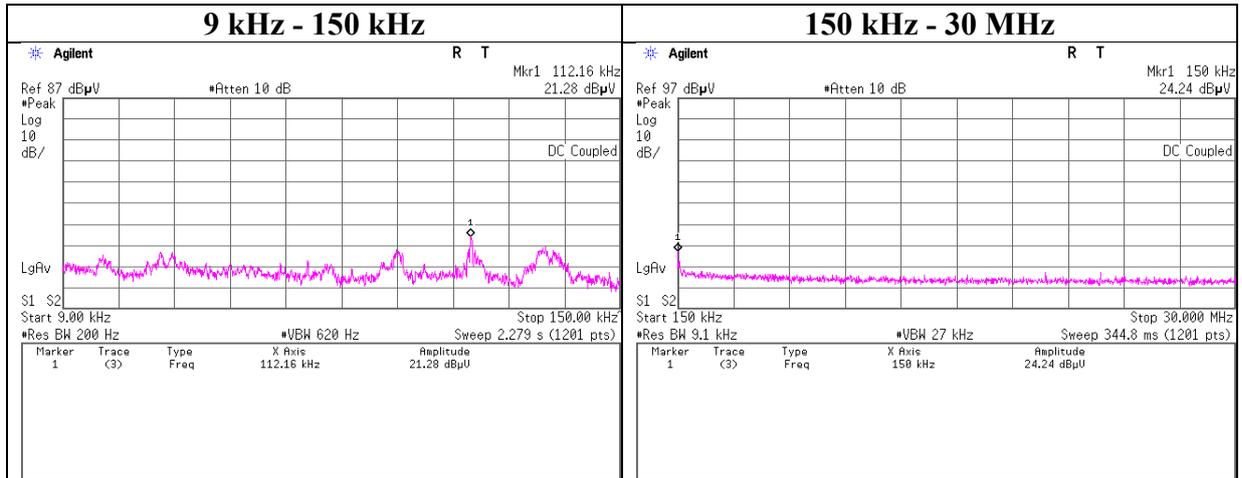
2402 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, DH5

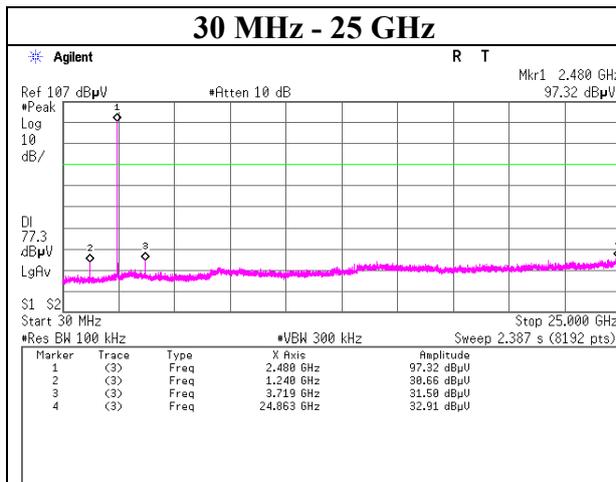
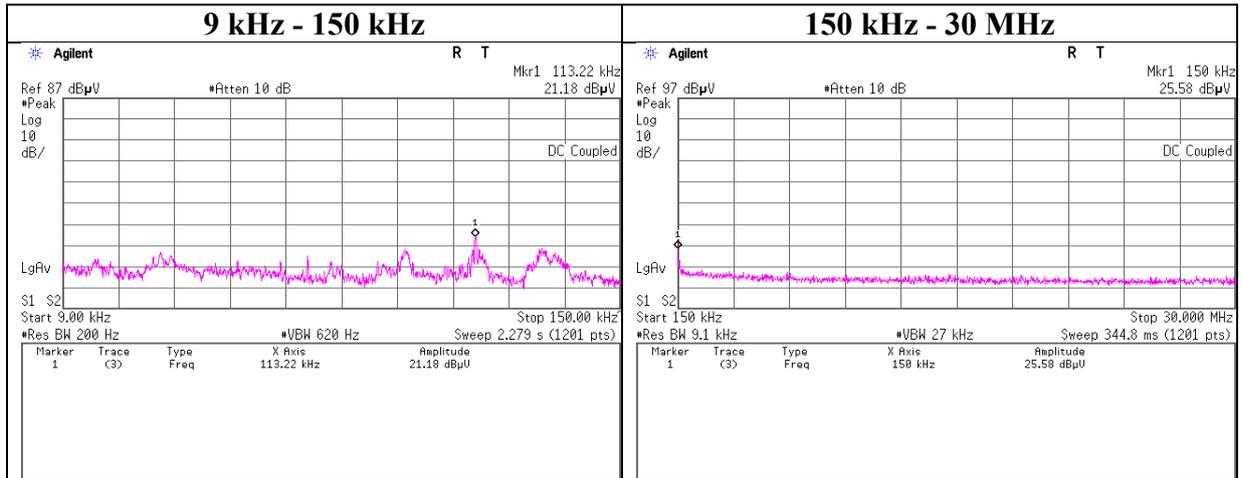
2441 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, DH5

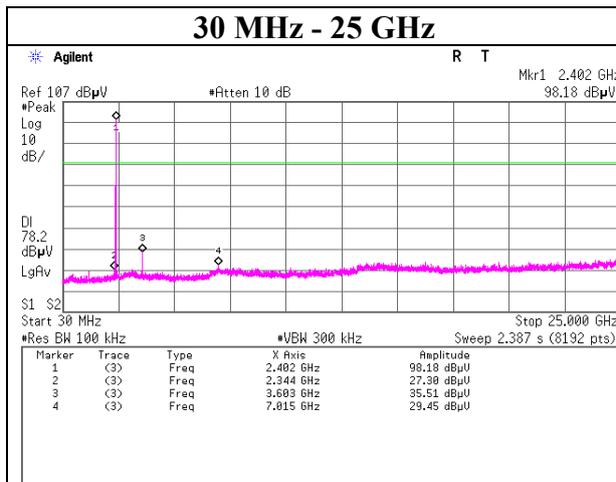
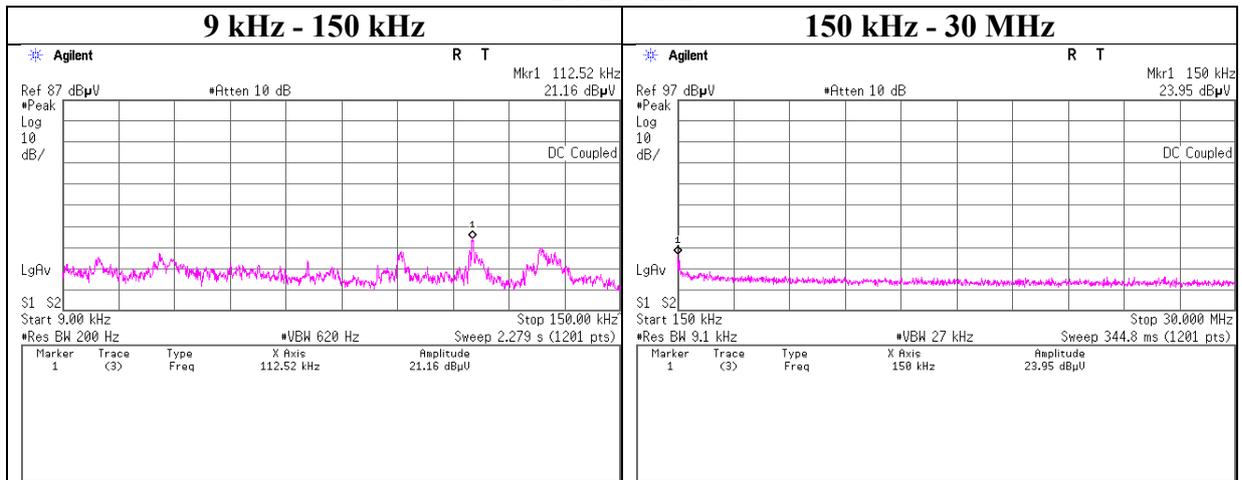
2480 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5

2402 MHz



UL Japan, Inc.

Ise EMC Lab.

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

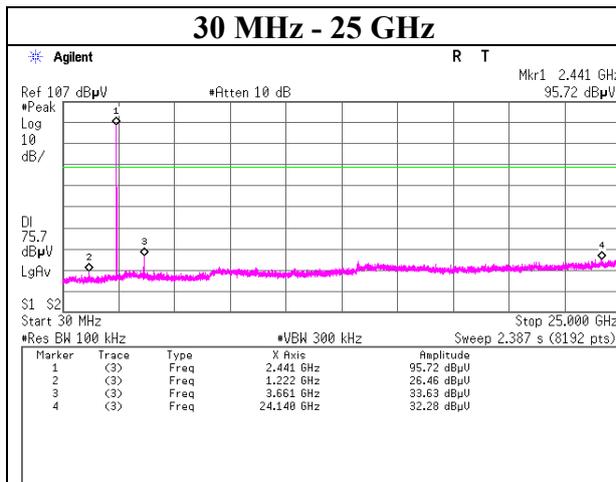
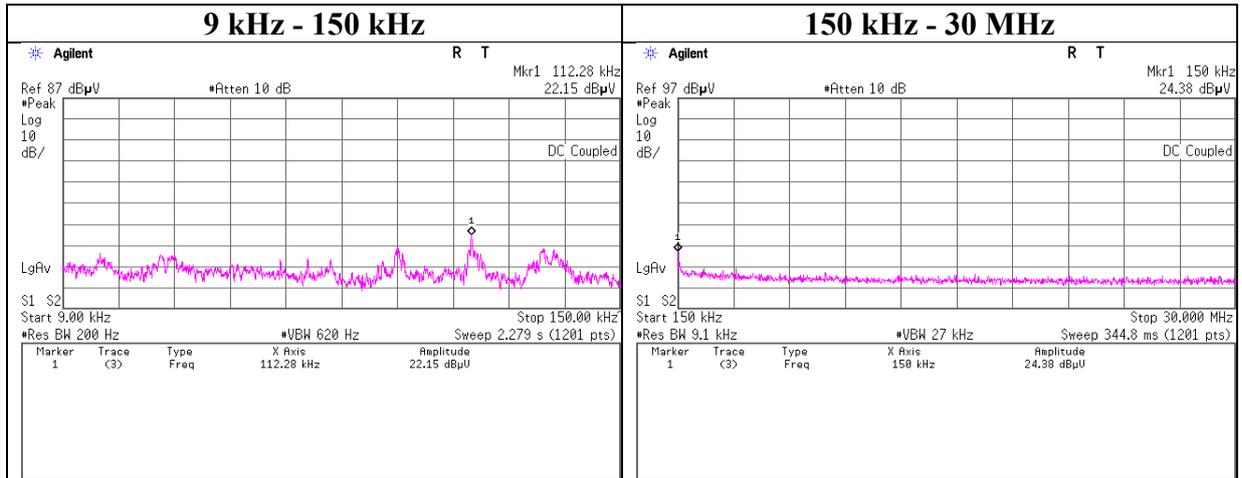
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5

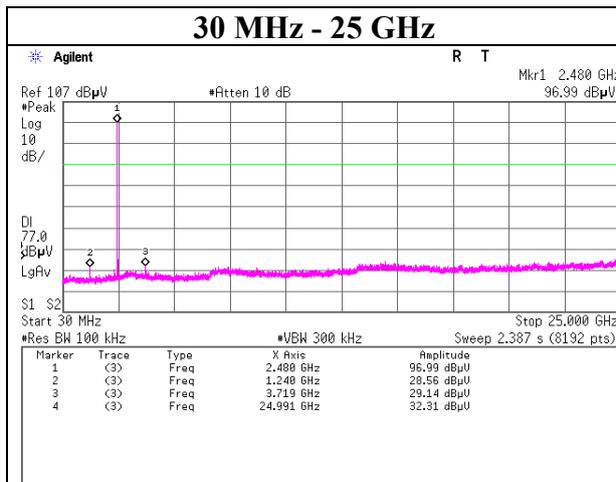
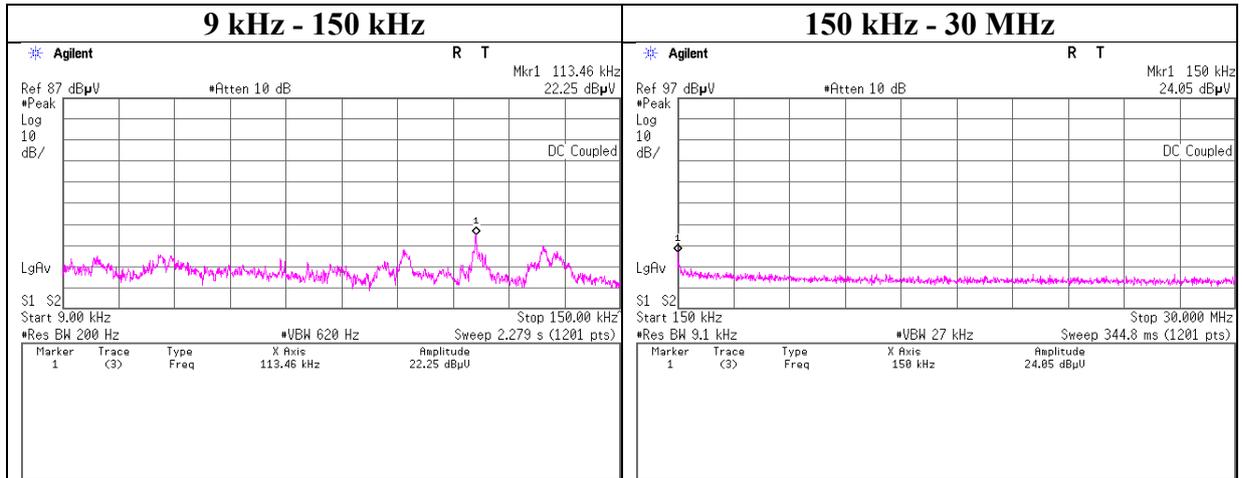
2441 MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5

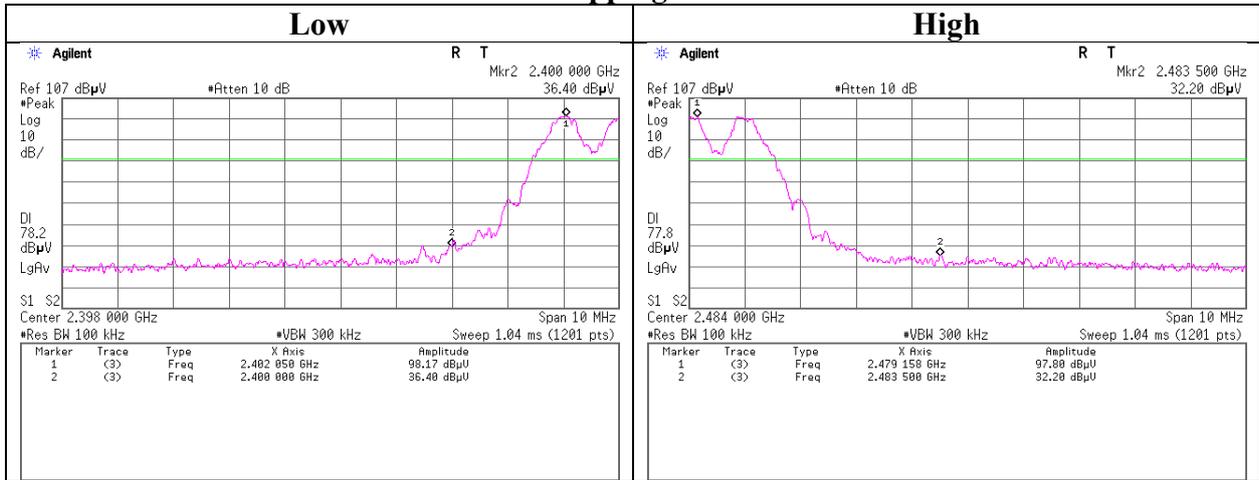
2480 MHz



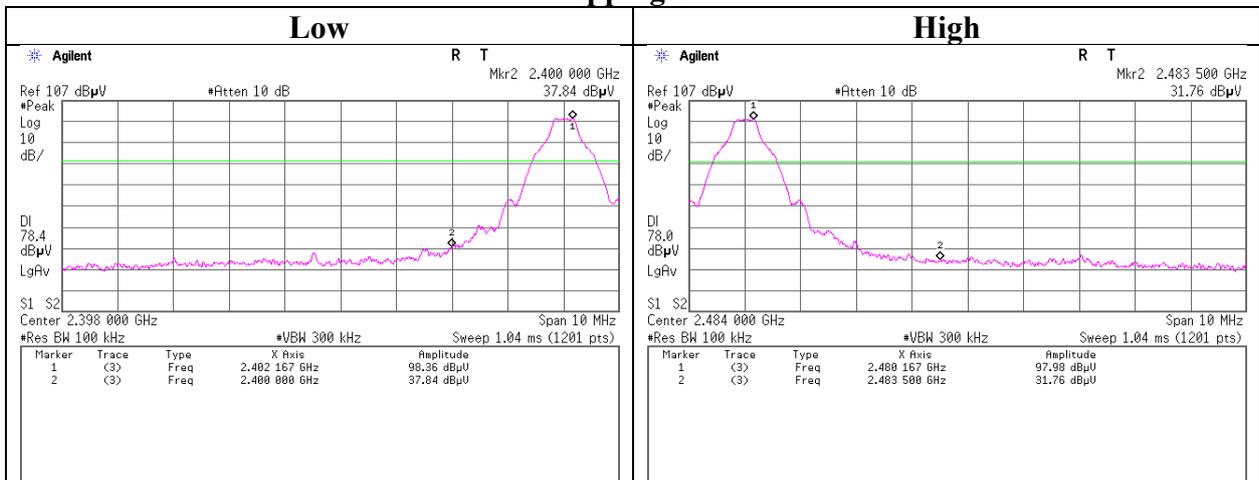
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Ise EMC Lab.

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

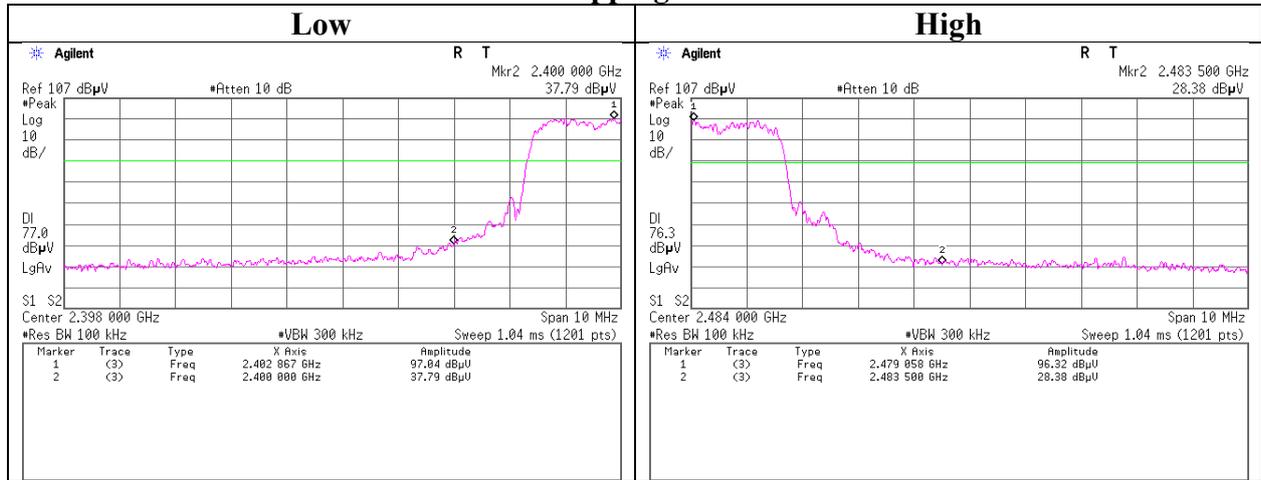
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

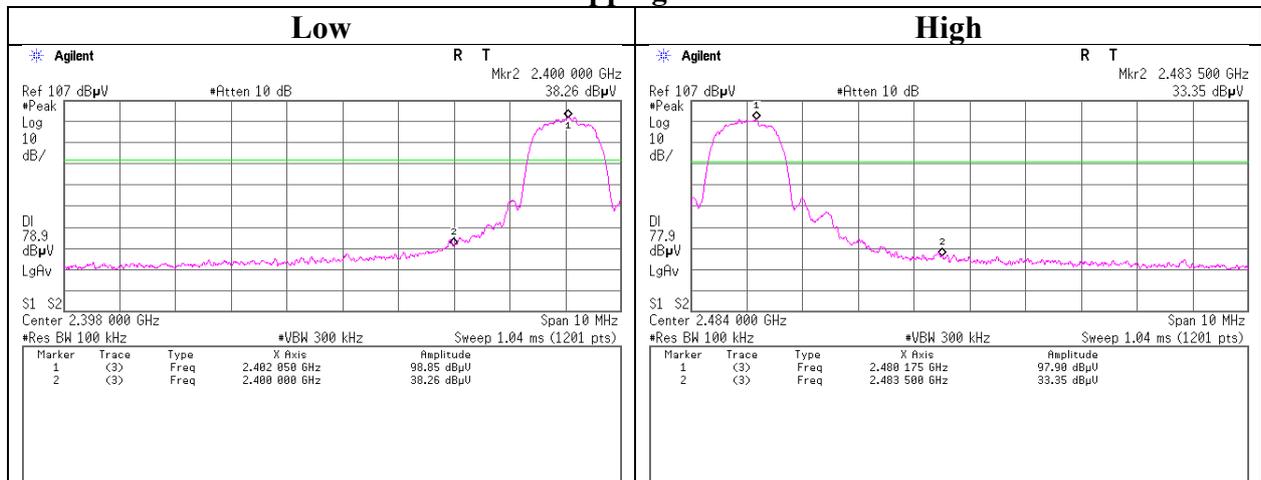
Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 23, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

Hopping On



Hopping Off



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2017/11/16 * 12
MAT-88	Attenuator	Weinschel Associates	WA56-10	56100304	AT	2017/06/12 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2017/10/13 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2017/10/13 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2017/12/21 * 12
MMM-17	DIGITAL HiTESTER	Hioki	3805	070900530	AT	2018/01/15 * 12
MCC-174	Microwave Cable	Junkosha	MWX221	1409S497	AT	2017/03/13 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE	2017/07/20 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ suoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	CE	2017/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2017/12/19 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2017/10/31 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2018/01/24 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2017/08/22 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2017/05/22 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2017/03/21 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/CE	2018/01/09 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2017/09/22 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2017/08/22 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2017/10/02 * 12
MLA-22	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2018/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2017/07/12 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2017/12/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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

Test item: **CE: Conducted Emission**
 RE: Radiated Spurious Emission
 AT: Antenna Terminal Conducted tests

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124