



RADIO TEST REPORT

Test Report No. : 11958750S-A-R1

Applicant : Sony Corporation, Japan and Sony Group Companies
Type of Equipment : 6/5 Channel Class-D Amplifier with DSP
Model No. : XM-GS6DSP
FCC ID : AK8XMGS6DSP
Test regulation : FCC Part 15 Subpart C: 2017
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. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11958750S-A. 11958750S-A is replaced with this report

Date of test: October 3 to 5, 2017

Representative test engineer:

Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by:

Akio Hayashi
Leader
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

UL Japan, Inc.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11958750S-A

[illegible]

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Radiated Spurious Emission	11
SECTION 7: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Test data	14
20dB Bandwidth and Carrier Frequency Separation.....	14
Number of Hopping Frequency	17
Dwell time.....	19
Maximum Peak Output Power	22
Average Output Power	23
Radiated Spurious Emission	25
Conducted Spurious Emission	36
Conducted Emission Band Edge compliance	42
99% Occupied Bandwidth	44
APPENDIX 2: Test instruments	46
APPENDIX 3: Photographs of test setup	47
Radiated Spurious Emission	47
Worst Case Position	48

SECTION 1: Customer information

Company Name	:	Sony Corporation, Japan and Sony Group Companies
Address	:	700/402 Moo 7, Amata Nakorn Industrial Estate, Don Hua Roh, Muang Chonburi, Chonburi 20000, Thailand
Telephone Number	:	+66 38 214900 17 Ext : 1937
Contact Person	:	Sira Sotthiphinyo

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

2.1 Identification of E.U.T.

Type of Equipment	:	6/5 Channel Class-D Amplifier with DSP
Model No.	:	XM-GS6DSP
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	September 29, 2017
Country of Mass-production	:	Thailand
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: XM-GS6DSP (referred to as the EUT in this report) is a 6/5 Channel Class-D Amplifier with DSP.

Radio Specification

[Bluetooth]

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS, GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8DPSK(3Mbps)
Power Supply (radio part input)	:	DC 3.3 V
Antenna type	:	Meander Monopole antenna
Antenna Gain	:	-4.64 dBi (Peak), -7.00 dBi (Average)
Clock frequency	:	26 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on September 20, 2017 and effective October 20, 2017

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 September 20, 2017, does not affect the test specification applied to the EUT.

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	N/A	N/A	N/A*1)
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	3.2 dB 180.620 MHz, QP, Vert. Tx, Hopping Off, DH5 2480 MHz 180.615 MHz, QP, Vert. Tx, Hopping Off, 3DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *2)

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

*1) The test is not applicable since the EUT does not have AC ports.

*2) 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 3.3 V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, 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.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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 $k=2$.
Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.91 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

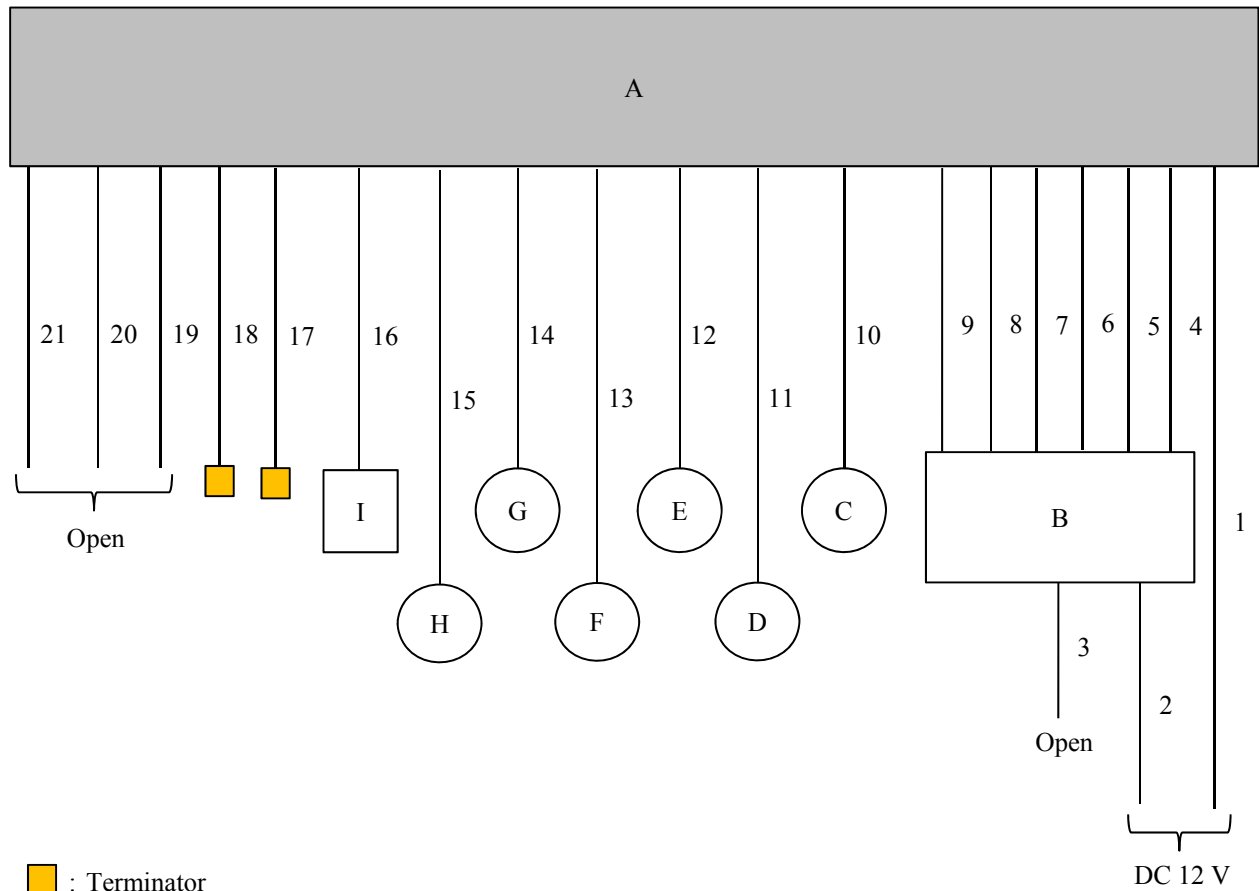
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (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; Power settings: BDR: Ext.=23, Int.=39 EDR: Ext.=73, Int.=48 Software: CSR BlueSuite Blue test3 Ver2.5.0.93 *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



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	6/5 Channel Class-D Amplifier with DSP	XM-GS6DSP	5 *1) 6 *2)	SONY	EUT
B	Car Audio	MEX-M71BT	48	SONY	-
C	Speaker	XS-PKF1621	-	SONY	-
D	Speaker	XS-PKF1621	-	SONY	-
E	Speaker	IS-10	-	SONY	-
F	Speaker	IS-10	-	SONY	-
G	Speaker	XS-PFK1621	-	SONY	-
H	Speaker	XS-PFK1621	-	SONY	-
I	Remote Controller	RM-X4S	-	SONY	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.95	Unshielded	Unshielded	-
2	DC	0.15 + 0.95	Unshielded	Unshielded	-
3	ILM	0.15	Unshielded	Unshielded	-
4	Audio(Front L)	0.1 + 1.0 + 0.15	Unshielded	Unshielded	-
5	Audio(Front R)	0.1 + 1.0 + 0.15	Unshielded	Unshielded	-
6	Audio(Rear L)	0.1 + 1.0 + 0.15	Unshielded	Unshielded	-
7	Audio(Rear R)	0.1 + 1.0 + 0.15	Unshielded	Unshielded	-
8	Remote	0.15 + 1.8 + 0.15	Unshielded	Unshielded	-
9	RCA (Front Audio Out)	0.2 + 1.5	Shielded	Shielded	-
10	Speaker	0.15 + 1.9	Unshielded	Unshielded	-
11	Speaker	0.15 + 1.9	Unshielded	Unshielded	-
12	Speaker	0.15 + 2.4	Unshielded	Unshielded	-
13	Speaker	0.15 + 2.4	Unshielded	Unshielded	-
14	Speaker	0.15 + 2.05	Unshielded	Unshielded	-
15	Speaker	0.15 + 2.05	Unshielded	Unshielded	-
16	REMOTE IN	1.9	Shielded	Shielded	-
17	RCA (Rear Audio Out)	0.2 + 1.2	Shielded	Shielded	-
18	RCA (Sub Audio Out)	0.2 + 1.0	Shielded	Shielded	-
19	Subwoofer	0.15 + 1.2	Unshielded	Unshielded	-
20	Subwoofer	0.15 + 1.2	Unshielded	Unshielded	-
21	Subwoofer	0.15 + 1.2	Unshielded	Unshielded	-

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. 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	3.82 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.82 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)

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

*2) Distance Factor: $20 \times \log(3.82 \text{ m}/3.0 \text{ m}) = 2.10 \text{ dB}$

*3) Distance Factor: $20 \times \log(1.0 \text{ m}/3.0 \text{ m}) = -9.54 \text{ dB}$

- 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.

Antenna polarization	Carrier (Band edge)	Spurious			
		Below 1 GHz	Above 1 GHz		
			1 GHz - 2.8 GHz	2.8 GHz -18 GHz	18 GHz -26.5 GHz
Horizontal	Y	Z	Y	X	X
Vertical	X	Z	X	X	X

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	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 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) The measurement was performed with Max Hold since the duty cycle was not 100 %. 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.							

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

20dB Bandwidth and Carrier Frequency Separation

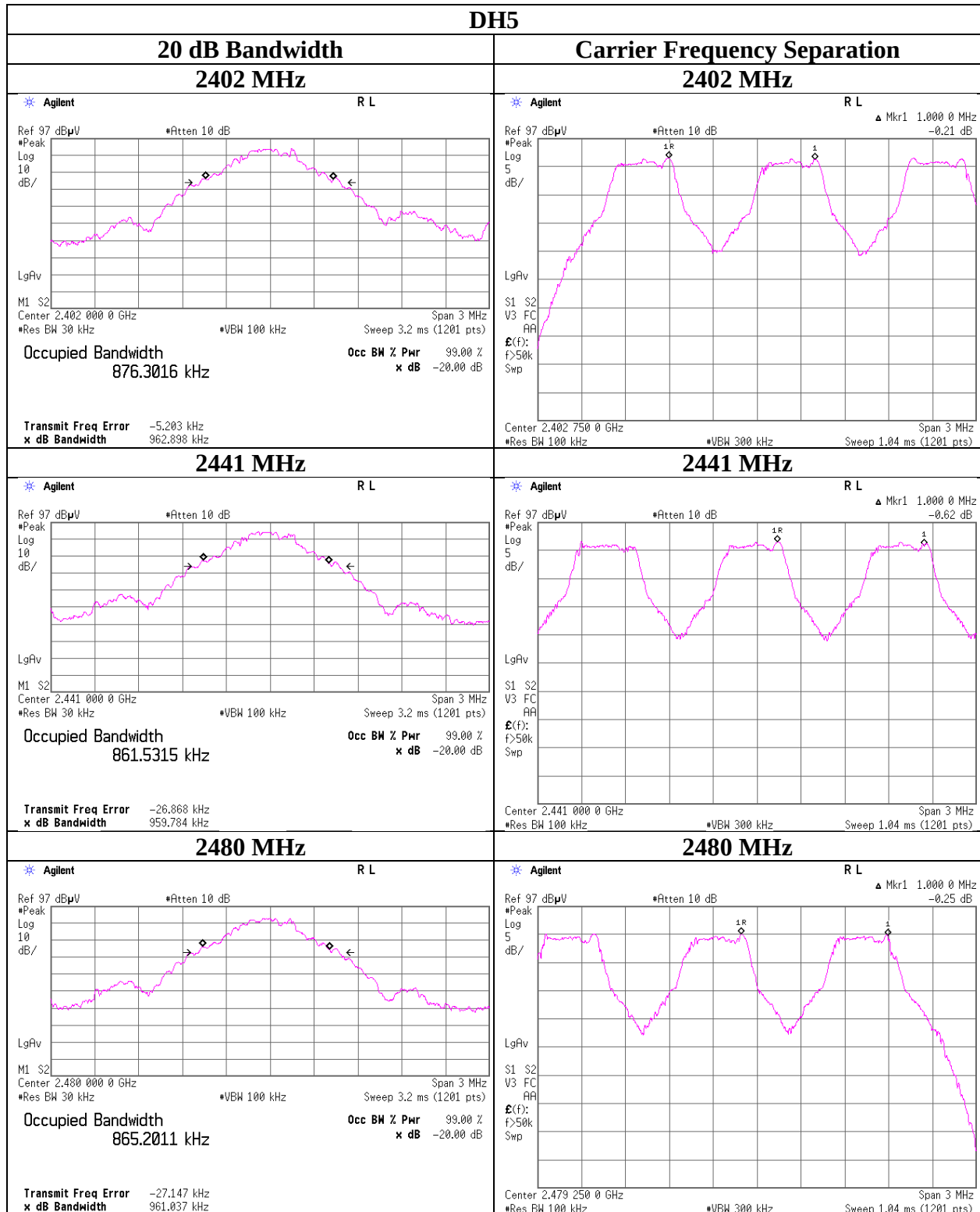
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11958750S-A-R1
Date October 3, 2017
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping On/Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.963	1.000	≥ 0.642
DH5	2441.0	0.960	1.000	≥ 0.640
DH5	2480.0	0.961	1.000	≥ 0.641
3DH5	2402.0	1.294	1.000	≥ 0.863
3DH5	2441.0	1.283	1.000	≥ 0.855
3DH5	2480.0	1.287	1.000	≥ 0.858

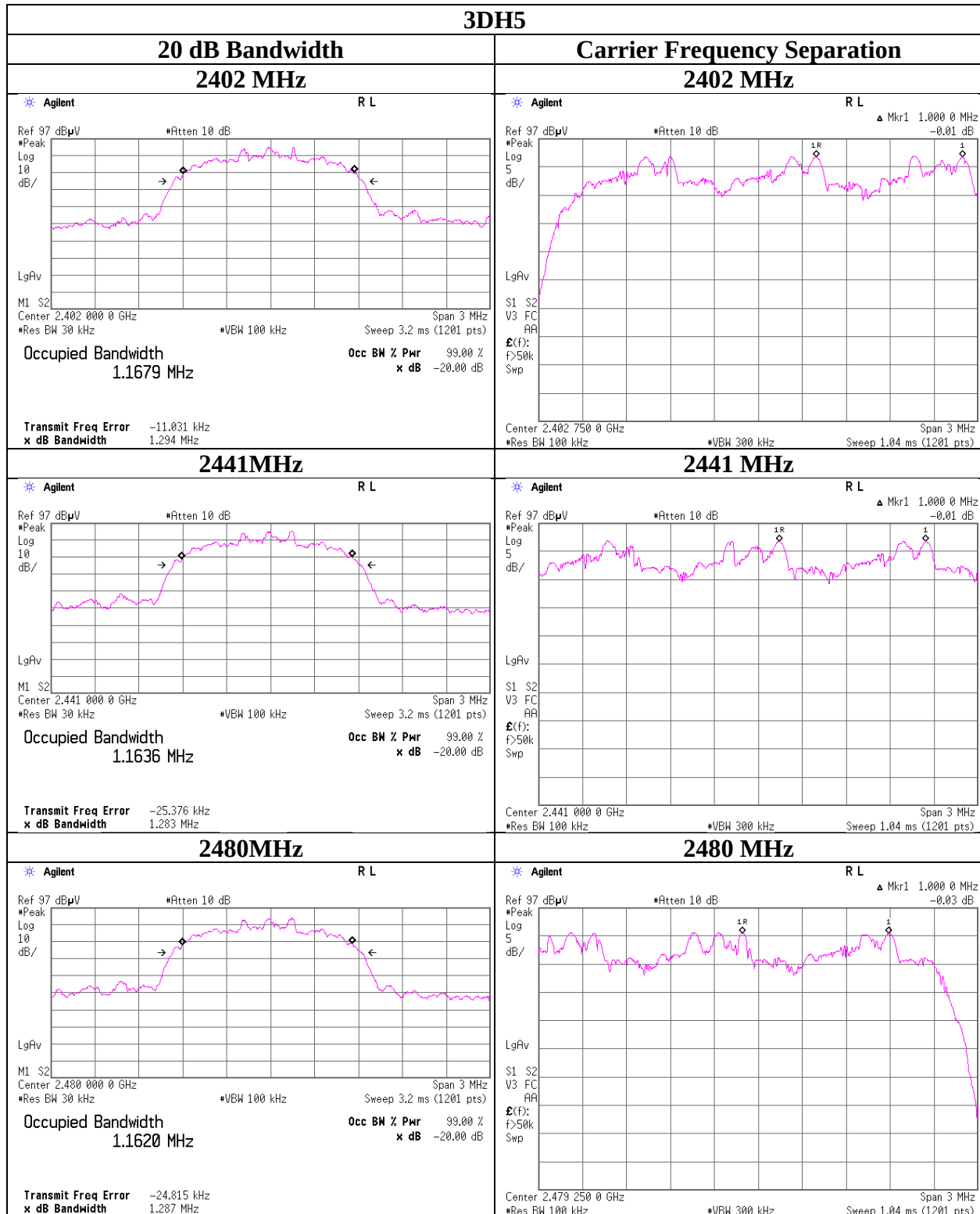
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

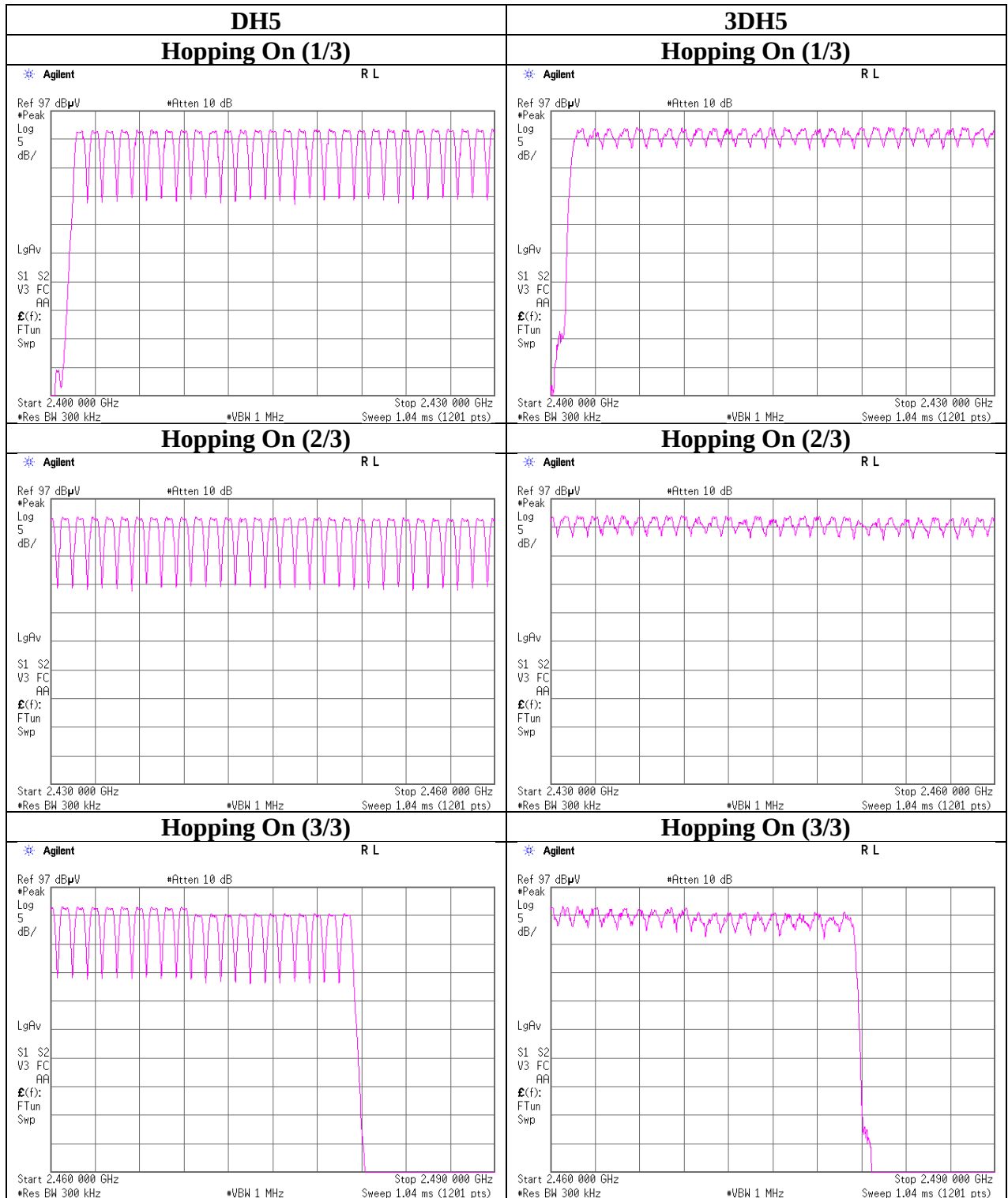
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11958750S-A-R1
Date October 3, 2017
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Shiro Kobayashi
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.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11958750S-A-R1
Date	October 3, 2017
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shiro Kobayashi
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	51.0 times	/	5 sec.	x 31.6 sec. = 323 times	0.415	134	400
DH3	26.0 times	/	5 sec.	x 31.6 sec. = 165 times	1.673	276	400
DH5	17.0 times	/	5 sec.	x 31.6 sec. = 108 times	2.925	316	400
3DH1	50.0 times	/	5 sec.	x 31.6 sec. = 316 times	0.432	137	400
3DH3	26.0 times	/	5 sec.	x 31.6 sec. = 165 times	1.685	278	400
3DH5	17.0 times	/	5 sec.	x 31.6 sec. = 108 times	2.943	318	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

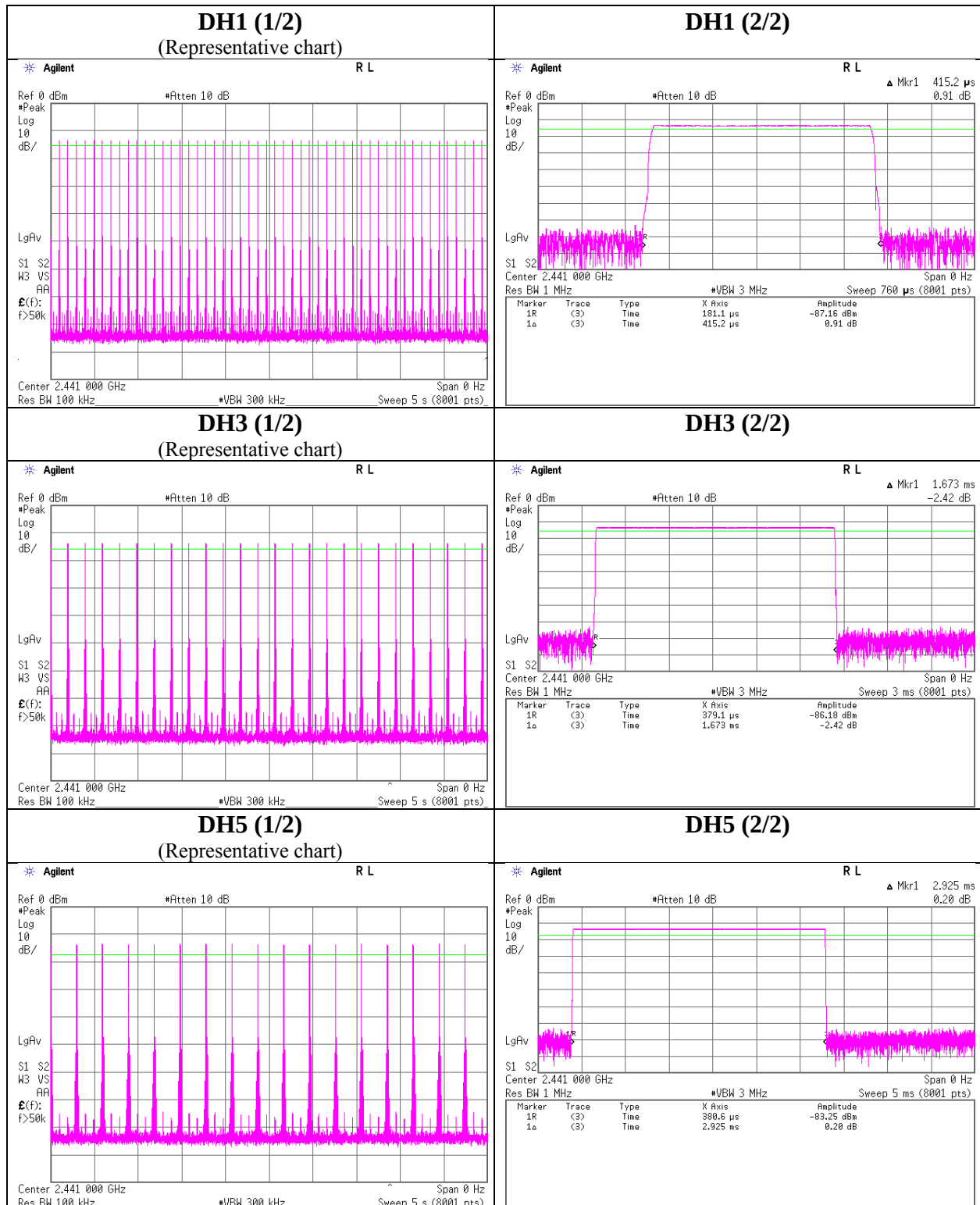
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	51	51	51
DH3	26	26	26	26	26	26
DH5	17	17	17	17	17	17
3DH1	50	50	50	50	50	50
3DH3	26	26	26	26	26	26
3DH5	17	17	17	17	17	17

Sample Calculation

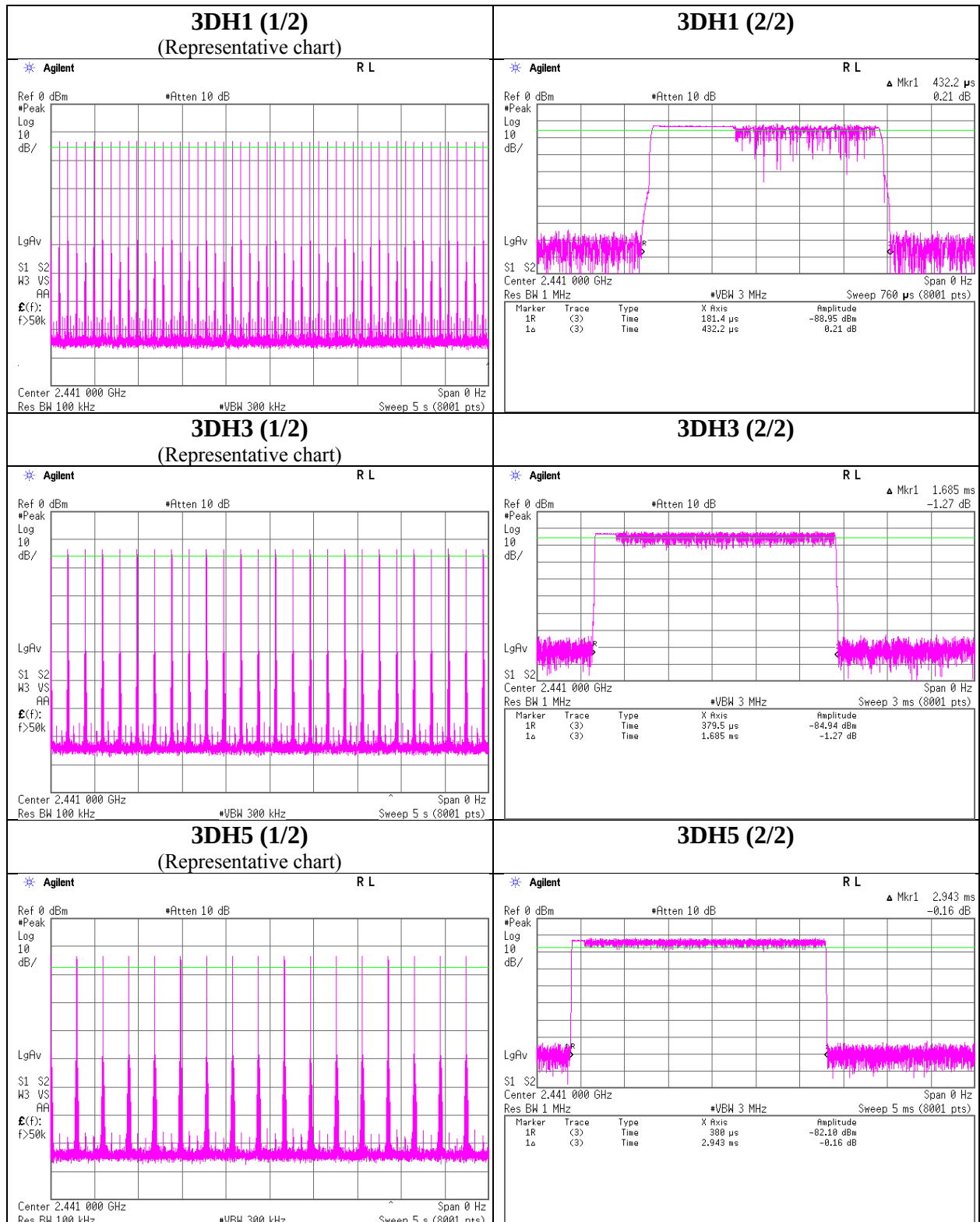
Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



Dwell time



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11958750S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
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	-12.81	1.52	9.96	-1.33	0.74	20.96	125	22.29
DH5	2441.0	-12.62	1.53	9.97	-1.12	0.77	20.96	125	22.08
DH5	2480.0	-13.87	1.55	9.97	-2.35	0.58	20.96	125	23.31
2DH5	2402.0	-11.32	1.52	9.96	0.16	1.04	20.96	125	20.80
2DH5	2441.0	-11.35	1.53	9.97	0.15	1.04	20.96	125	20.81
2DH5	2480.0	-12.55	1.55	9.97	-1.03	0.79	20.96	125	21.99
3DH5	2402.0	-10.89	1.52	9.96	0.59	1.15	20.96	125	20.37
3DH5	2441.0	-10.84	1.53	9.97	0.66	1.16	20.96	125	20.30
3DH5	2480.0	-12.12	1.55	9.97	-0.60	0.87	20.96	125	21.56

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.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Average Output Power
(Reference data for RF Exposure / SAR testing)

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11958750S-A-R1
Date October 3, 2017
Temperature / Humidity 26 deg. C / 46 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-14.68	1.52	9.96	-3.20	0.48	1.03	-2.17	0.61
DH5	2441.0	-14.55	1.53	9.97	-3.05	0.50	1.03	-2.02	0.63
DH5	2480.0	-15.98	1.55	9.97	-4.46	0.36	1.03	-3.43	0.45
2DH5	2402.0	-15.36	1.52	9.96	-3.88	0.41	1.05	-2.83	0.52
2DH5	2441.0	-15.33	1.53	9.97	-3.83	0.41	1.05	-2.78	0.53
2DH5	2480.0	-16.67	1.55	9.97	-5.15	0.31	1.05	-4.10	0.39
3DH5	2402.0	-15.37	1.52	9.96	-3.89	0.41	1.03	-2.86	0.52
3DH5	2441.0	-15.40	1.53	9.97	-3.90	0.41	1.03	-2.87	0.52
3DH5	2480.0	-16.71	1.55	9.97	-5.19	0.30	1.03	-4.16	0.38

Sample Calculation:

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

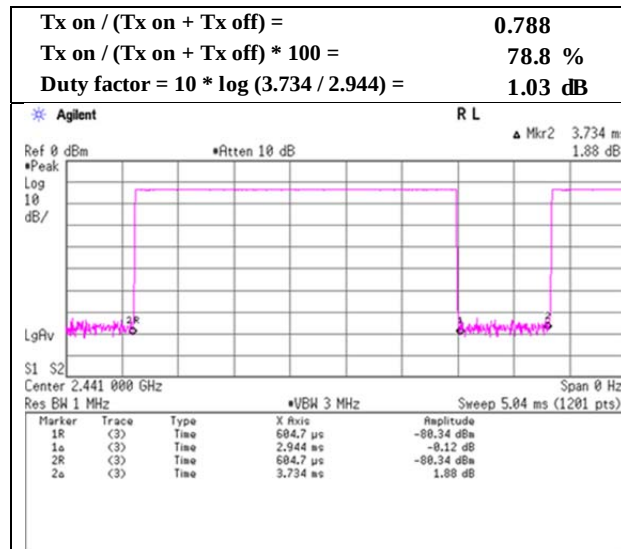
Result (Burst power average) = Time average + Duty factor

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

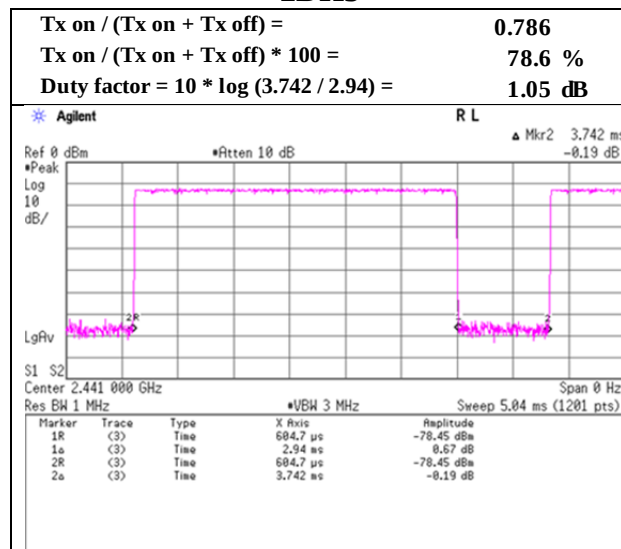
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off

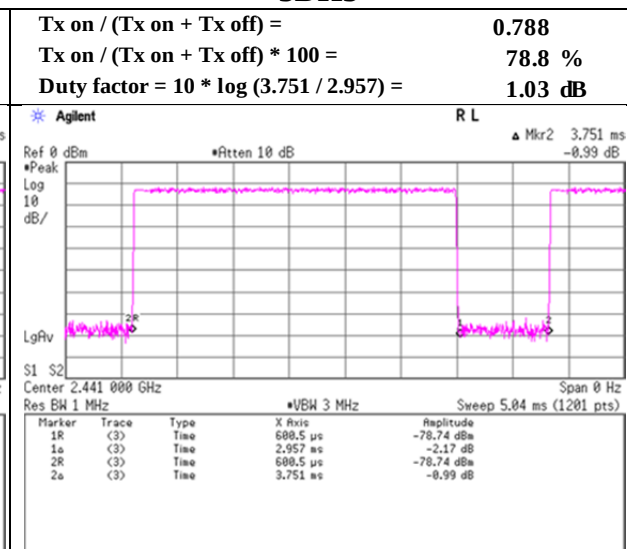
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 23 deg. C / 44 % RH
Engineer Kazuya Noda
(30 MHz -1 GHz)
(18 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz
October 5, 2017
25 deg. C / 36 % RH
Kazutaka Takeyama
(1 GHz -18 GHz)

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	39.147	QP	39.21	14.62	6.80	32.13	0.00	28.50	40.00	11.5	378	186	
Hori.	157.745	QP	45.29	15.29	8.00	32.02	0.00	36.56	43.50	6.9	294	215	
Hori.	180.623	QP	46.78	16.32	7.98	32.01	0.00	39.07	43.50	4.4	180	65	
Hori.	228.677	QP	54.23	11.56	8.32	31.95	0.00	42.16	46.00	3.8	145	50	
Hori.	237.978	QP	51.87	11.61	8.37	31.94	0.00	39.91	46.00	6.0	131	50	
Hori.	255.808	QP	51.81	11.88	8.48	31.92	0.00	40.25	46.00	5.7	122	61	
Hori.	2390.000	PK	48.39	27.26	14.15	44.13	2.10	47.77	73.90	26.1	119	316	
Hori.	4804.000	PK	50.43	31.40	6.65	44.45	2.10	46.13	73.90	27.7	150	127	
Hori.	7206.000	PK	47.48	36.56	8.26	43.99	2.10	50.41	73.90	23.4	150	0	
Hori.	9608.000	PK	48.00	38.61	9.24	43.83	2.10	54.12	73.90	19.7	150	0	
Hori.	2390.000	AV	36.41	27.26	14.15	44.13	2.10	35.79	53.90	18.1	119	316	
Hori.	4804.000	AV	39.65	31.40	6.65	44.45	2.10	35.35	53.90	18.5	150	127	
Hori.	7206.000	AV	36.24	36.56	8.26	43.99	2.10	39.17	53.90	14.7	150	0	
Hori.	9608.000	AV	36.76	38.61	9.24	43.83	2.10	42.88	53.90	11.0	150	0	
Vert.	184.100	QP	47.87	16.35	7.97	32.01	0.00	40.18	43.50	3.3	100	356	
Vert.	237.984	QP	48.98	11.61	8.37	31.94	0.00	37.02	46.00	8.9	100	49	
Vert.	2390.000	PK	48.49	27.26	14.15	44.13	2.10	47.87	73.90	26.0	148	341	
Vert.	4804.000	PK	50.07	31.40	6.65	44.45	2.10	45.77	73.90	28.1	121	314	
Vert.	7206.000	PK	47.79	36.56	8.26	43.99	2.10	50.72	73.90	23.1	150	0	
Vert.	9608.000	PK	48.24	38.61	9.24	43.83	2.10	54.36	73.90	19.5	150	0	
Vert.	2390.000	AV	36.39	27.26	14.15	44.13	2.10	35.77	53.90	18.1	148	341	
Vert.	4804.000	AV	38.46	31.40	6.65	44.45	2.10	34.16	53.90	19.7	121	314	
Vert.	7206.000	AV	35.62	36.56	8.26	43.99	2.10	38.55	53.90	15.3	150	0	
Vert.	9608.000	AV	36.27	38.61	9.24	43.83	2.10	42.39	53.90	11.5	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.45	27.29	14.16	44.14	2.10	92.86	-	-	Carrier
Hori.	2400.000	PK	43.77	27.29	14.15	44.14	2.10	43.17	72.86	29.7	
Vert.	2402.000	PK	92.80	27.29	14.16	44.14	2.10	92.21	-	-	Carrier
Vert.	2400.000	PK	42.70	27.29	14.15	44.14	2.10	42.10	72.21	30.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

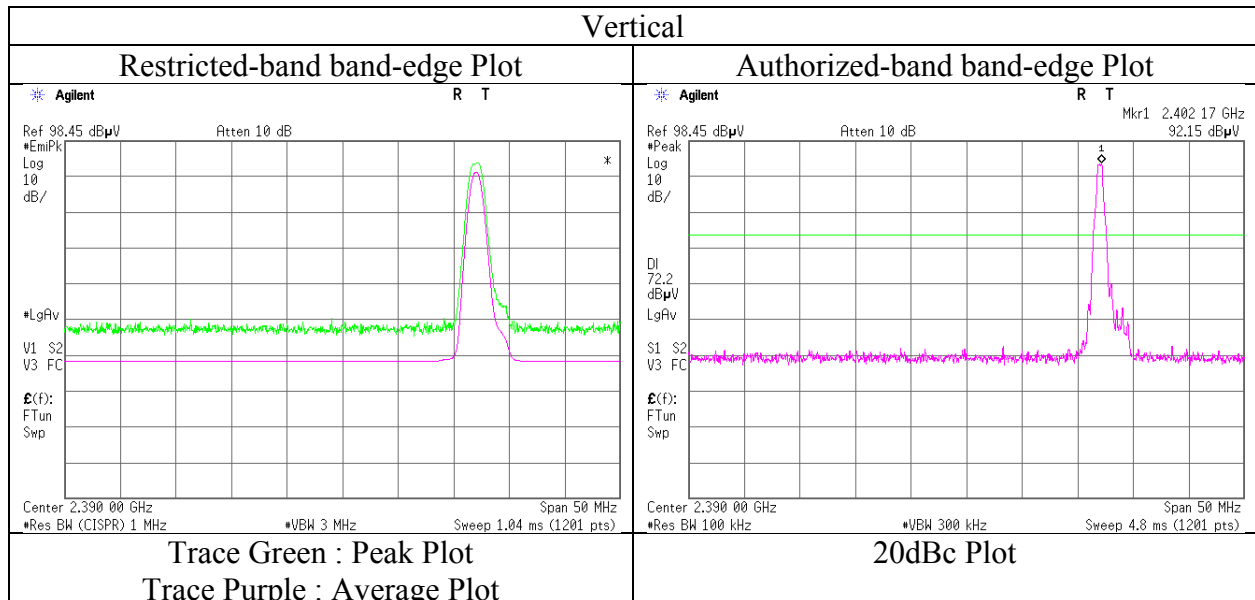
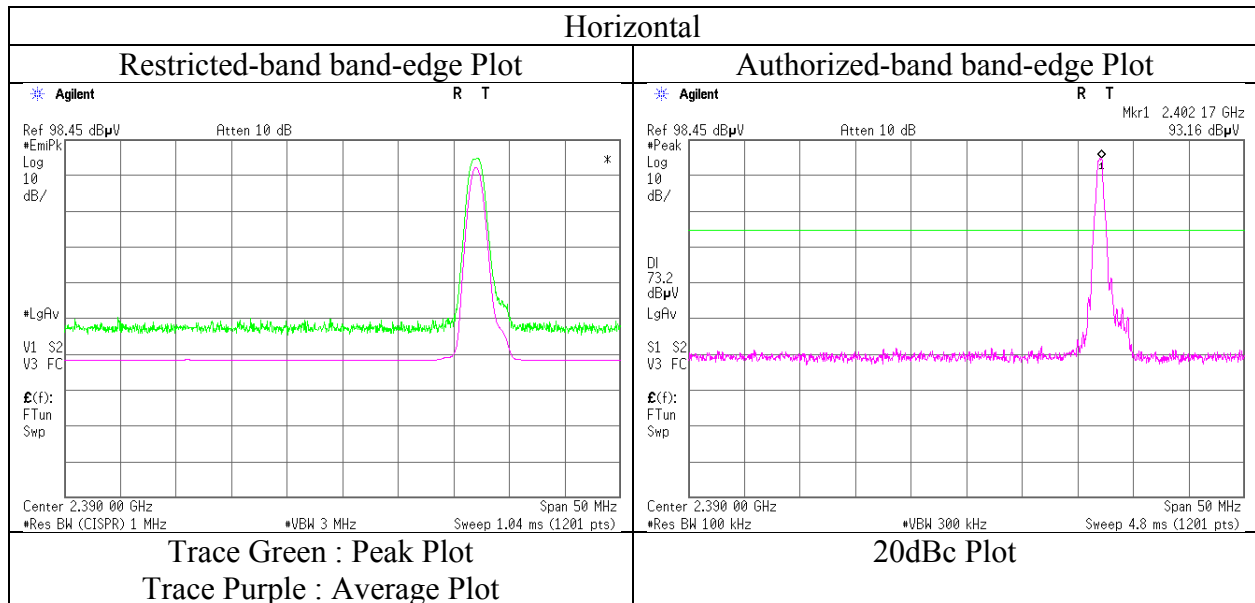
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11958750S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 5, 2017
Temperature / Humidity	25 deg. C / 36 % RH
Engineer	Kazutaka Takeyama
	(1 GHz ~2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 23 deg. C / 44 % RH
Engineer Kazuya Noda
(30 MHz -1 GHz)
(18 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2441 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.595	QP	51.82	7.65	7.74	32.09	0.00	35.12	40.00	4.8	231	278	
Hori.	179.079	QP	46.97	16.27	7.98	32.01	0.00	39.21	43.50	4.2	190	319	
Hori.	228.676	QP	53.48	11.56	8.32	31.95	0.00	41.41	46.00	4.5	139	49	
Hori.	237.200	QP	51.33	11.61	8.37	31.94	0.00	39.37	46.00	6.6	136	49	
Hori.	248.445	QP	48.87	11.67	8.43	31.92	0.00	37.05	46.00	8.9	134	63	
Hori.	4882.000	PK	50.36	31.62	6.75	44.48	2.10	46.35	73.90	27.5	119	358	
Hori.	7323.000	PK	47.78	36.77	8.39	44.03	2.10	51.01	73.90	22.8	150	0	
Hori.	9764.000	PK	47.91	38.80	9.34	43.85	2.10	54.30	73.90	19.6	150	0	
Hori.	4882.000	AV	40.63	31.62	6.75	44.48	2.10	36.62	53.90	17.2	119	358	
Hori.	7323.000	AV	36.27	36.77	8.39	44.03	2.10	39.50	53.90	14.4	150	0	
Hori.	9764.000	AV	36.48	38.80	9.34	43.85	2.10	42.87	53.90	11.0	150	0	
Vert.	182.156	QP	47.89	16.33	7.97	32.01	0.00	40.18	43.50	3.3	100	7	
Vert.	187.590	QP	46.40	16.38	7.96	32.00	0.00	38.74	43.50	4.7	100	4	
Vert.	228.657	QP	49.45	11.56	8.32	31.95	0.00	37.38	46.00	8.6	100	355	
Vert.	4882.000	PK	49.84	31.62	6.75	44.48	2.10	45.83	73.90	28.0	100	347	
Vert.	7323.000	PK	47.64	36.77	8.39	44.03	2.10	50.87	73.90	23.0	150	0	
Vert.	9764.000	PK	48.45	38.80	9.34	43.85	2.10	54.84	73.90	19.0	150	0	
Vert.	4882.000	AV	39.37	31.62	6.75	44.48	2.10	35.36	53.90	18.5	100	347	
Vert.	7323.000	AV	36.26	36.77	8.39	44.03	2.10	39.49	53.90	14.4	150	0	
Vert.	9764.000	AV	36.54	38.80	9.34	43.85	2.10	42.93	53.90	10.9	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 23 deg. C / 44 % RH
Engineer Kazuya Noda
(30 MHz -1 GHz)
(18 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.592	QP	51.58	7.65	7.74	32.09	0.00	34.88	40.00	5.1	221	280	
Hori.	156.973	QP	46.21	15.25	8.00	32.02	0.00	37.44	43.50	6.0	208	286	
Hori.	179.078	QP	46.82	16.27	7.98	32.01	0.00	39.06	43.50	4.4	188	317	
Hori.	189.130	QP	45.99	16.40	7.97	32.00	0.00	38.36	43.50	5.1	176	99	
Hori.	228.659	QP	52.20	11.56	8.32	31.95	0.00	40.13	46.00	5.8	143	48	
Hori.	2483.500	PK	48.46	27.55	14.24	44.16	2.10	48.19	73.90	25.7	142	327	
Hori.	4960.000	PK	50.62	31.83	6.83	44.51	2.10	46.87	73.90	27.0	123	358	
Hori.	7440.000	PK	48.50	36.97	8.52	44.08	2.10	52.01	73.90	21.8	150	0	
Hori.	9920.000	PK	46.91	38.98	9.42	43.87	2.10	53.54	73.90	20.3	150	0	
Hori.	2483.500	AV	36.40	27.55	14.24	44.16	2.10	36.13	53.90	17.7	142	327	
Hori.	4960.000	AV	39.73	31.83	6.83	44.51	2.10	35.98	53.90	17.9	123	358	
Hori.	7440.000	AV	36.73	36.97	8.52	44.08	2.10	40.24	53.90	13.6	150	0	
Hori.	9920.000	AV	36.12	38.98	9.42	43.87	2.10	42.75	53.90	11.1	150	0	
Vert.	180.620	QP	47.98	16.32	7.98	32.01	0.00	40.27	43.50	3.2	100	19	
Vert.	196.912	QP	46.04	16.47	7.99	32.00	0.00	38.50	43.50	5.0	100	358	
Vert.	207.778	QP	46.68	11.44	8.20	31.98	0.00	34.34	43.50	9.1	100	175	
Vert.	2483.500	PK	48.23	27.55	14.24	44.16	2.10	47.96	73.90	25.9	155	342	
Vert.	4960.000	PK	50.12	31.83	6.83	44.51	2.10	46.37	73.90	27.5	109	357	
Vert.	7440.000	PK	48.58	36.97	8.52	44.08	2.10	52.09	73.90	21.8	150	0	
Vert.	9920.000	PK	47.75	38.98	9.42	43.87	2.10	54.38	73.90	19.5	150	0	
Vert.	2483.500	AV	36.43	27.55	14.24	44.16	2.10	36.16	53.90	17.7	155	342	
Vert.	4960.000	AV	38.85	31.83	6.83	44.51	2.10	35.10	53.90	18.8	109	357	
Vert.	7440.000	AV	37.21	36.97	8.52	44.08	2.10	40.72	53.90	13.1	150	0	
Vert.	9920.000	AV	36.18	38.98	9.42	43.87	2.10	42.81	53.90	11.0	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

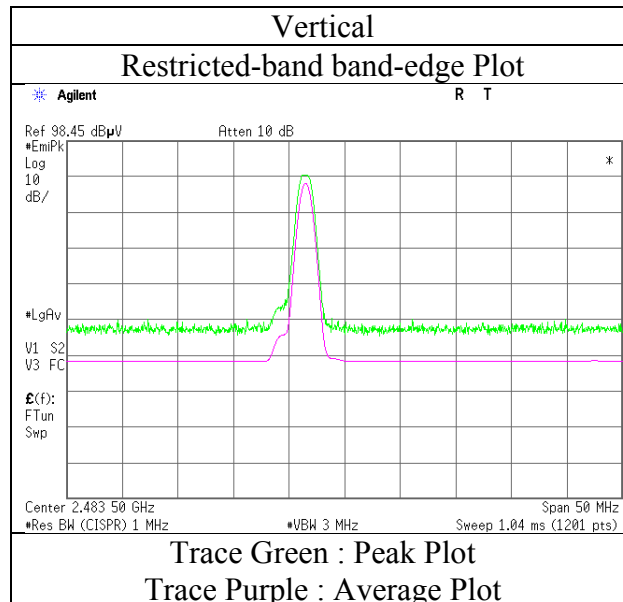
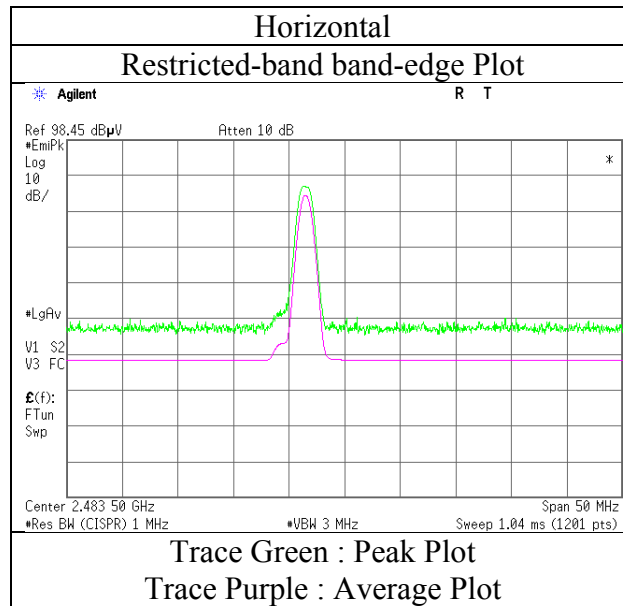
Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11958750S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 5, 2017
Temperature / Humidity	25 deg. C / 36 % RH
Engineer	Kazutaka Takeyama
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 23 deg. C / 44 % RH
Engineer Kazuya Noda
(30 MHz -1 GHz)
(18 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.595	QP	51.56	7.65	7.74	32.09	0.00	34.86	40.00	5.1	270	286	
Hori.	156.972	QP	46.38	15.25	8.00	32.02	0.00	37.61	43.50	5.8	204	283	
Hori.	162.008	QP	45.45	15.50	8.02	32.02	0.00	36.95	43.50	6.5	196	294	
Hori.	179.063	QP	46.66	16.27	7.98	32.01	0.00	38.90	43.50	4.6	183	317	
Hori.	189.126	QP	45.22	16.40	7.97	32.00	0.00	37.59	43.50	5.9	179	293	
Hori.	227.902	QP	50.17	11.56	8.31	31.95	0.00	38.09	46.00	7.9	150	47	
Hori.	2390.000	PK	48.02	27.26	14.15	44.13	2.10	47.40	73.90	26.5	103	354	
Hori.	4804.000	PK	49.37	31.40	6.65	44.45	2.10	45.07	73.90	28.8	131	126	
Hori.	7206.000	PK	48.03	36.56	8.26	43.99	2.10	50.96	73.90	22.9	150	0	
Hori.	9608.000	PK	47.34	38.61	9.24	43.83	2.10	53.46	73.90	20.4	150	0	
Hori.	2390.000	AV	36.41	27.26	14.15	44.13	2.10	35.79	53.90	18.1	103	354	
Hori.	4804.000	AV	37.58	31.40	6.65	44.45	2.10	33.28	53.90	20.6	131	126	
Hori.	7206.000	AV	37.18	36.56	8.26	43.99	2.10	40.11	53.90	13.7	150	0	
Hori.	9608.000	AV	36.41	38.61	9.24	43.83	2.10	42.53	53.90	11.3	150	0	
Vert.	180.615	QP	47.99	16.32	7.98	32.01	0.00	40.28	43.50	3.2	100	1	
Vert.	187.592	QP	46.99	16.38	7.96	32.00	0.00	39.33	43.50	4.1	100	5	
Vert.	207.785	QP	47.77	11.44	8.20	31.98	0.00	35.43	43.50	8.0	100	18	
Vert.	2390.000	PK	48.84	27.26	14.15	44.13	2.10	48.22	73.90	25.6	150	12	
Vert.	4804.000	PK	48.29	31.40	6.65	44.45	2.10	43.99	73.90	29.9	150	0	
Vert.	7206.000	PK	48.05	36.56	8.26	43.99	2.10	50.98	73.90	22.9	150	0	
Vert.	9608.000	PK	47.65	38.61	9.24	43.83	2.10	53.77	73.90	20.1	150	0	
Vert.	2390.000	AV	36.43	27.26	14.15	44.13	2.10	35.81	53.90	18.0	150	12	
Vert.	4804.000	AV	37.37	31.40	6.65	44.45	2.10	33.07	53.90	20.8	150	0	
Vert.	7206.000	AV	37.11	36.56	8.26	43.99	2.10	40.04	53.90	13.8	150	0	
Vert.	9608.000	AV	36.32	38.61	9.24	43.83	2.10	42.44	53.90	11.4	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.50	27.29	14.16	44.14	2.10	92.91	-	-	Carrier
Hori.	2400.000	PK	45.48	27.29	14.15	44.14	2.10	44.88	72.91	28.0	
Vert.	2402.000	PK	93.02	27.29	14.16	44.14	2.10	92.43	-	-	Carrier
Vert.	2400.000	PK	45.31	27.29	14.15	44.14	2.10	44.71	72.43	27.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

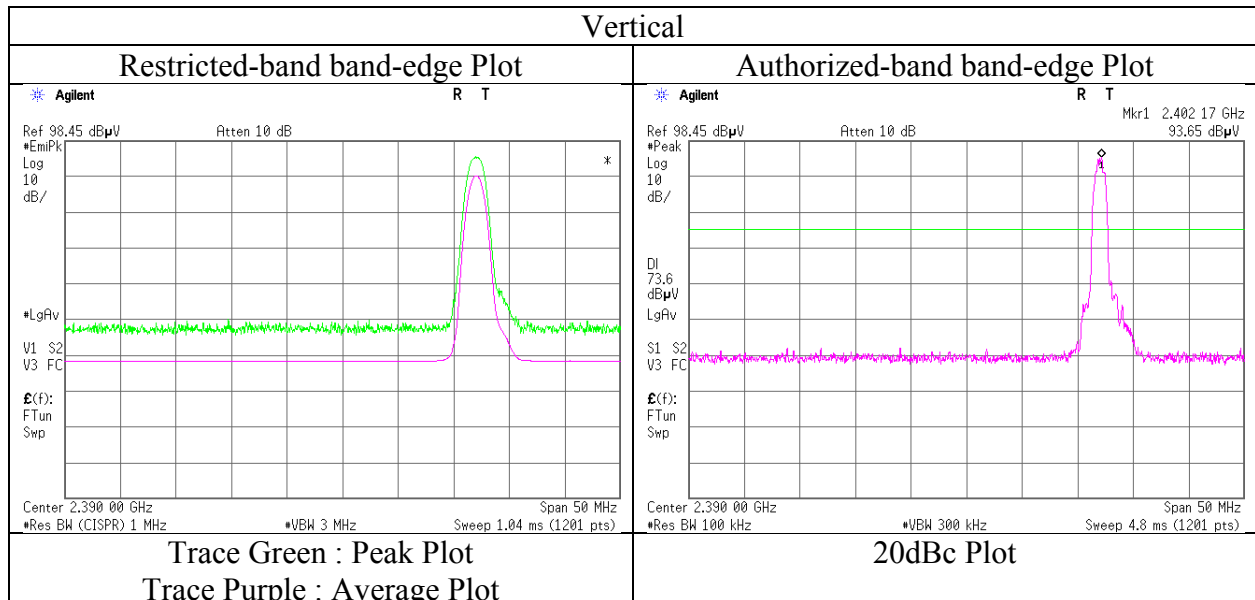
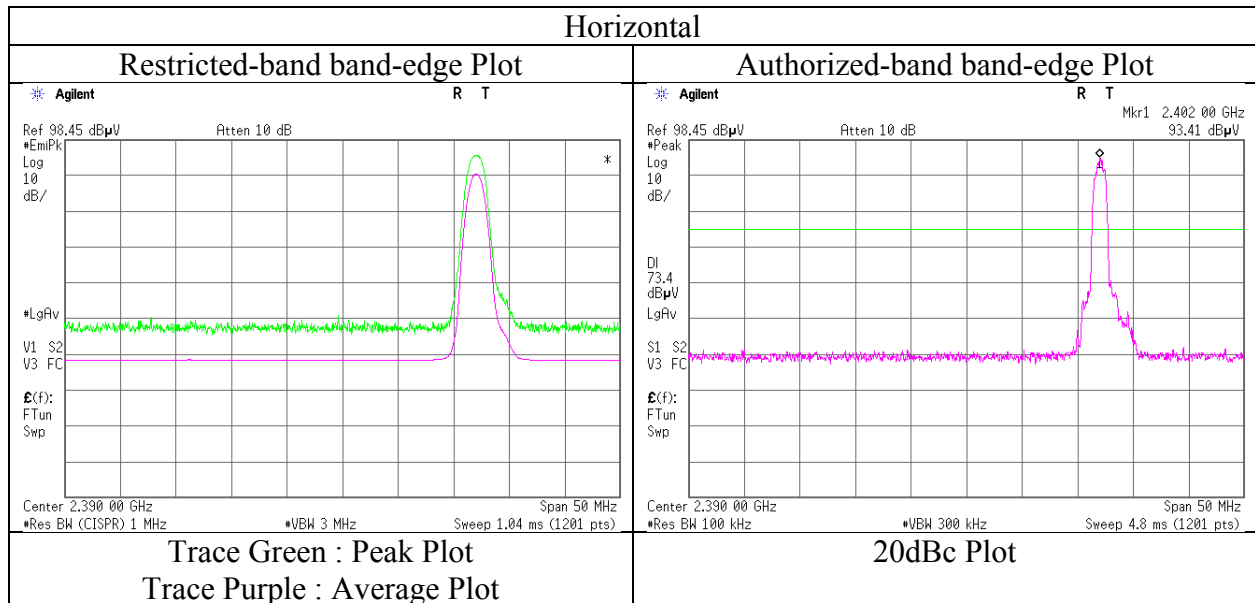
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11958750S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 5, 2017
Temperature / Humidity	25 deg. C / 36 % RH
Engineer	Kazutaka Takeyama
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 23 deg. C / 44 % RH
Engineer Kazuya Noda
(30 MHz -1 GHz)
(18 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.597	QP	44.01	7.65	7.74	32.09	0.00	27.31	40.00	12.6	224	95	
Hori.	180.621	QP	47.02	16.32	7.98	32.01	0.00	39.31	43.50	4.1	178	309	
Hori.	189.931	QP	42.52	16.40	7.97	32.00	0.00	34.89	43.50	8.6	169	64	
Hori.	196.908	QP	42.34	16.47	7.99	32.00	0.00	34.80	43.50	8.7	172	213	
Hori.	265.509	QP	46.55	12.21	8.53	31.92	0.00	35.37	46.00	10.6	120	58	
Hori.	299.216	QP	44.69	13.36	8.72	31.92	0.00	34.85	46.00	11.1	109	50	
Hori.	4882.000	PK	49.23	31.62	6.75	44.48	2.10	45.22	73.90	28.6	120	359	
Hori.	7323.000	PK	47.86	36.77	8.39	44.03	2.10	51.09	73.90	22.8	150	0	
Hori.	9764.000	PK	48.08	38.80	9.34	43.85	2.10	54.47	73.90	19.4	150	0	
Hori.	4882.000	AV	38.13	31.62	6.75	44.48	2.10	34.12	53.90	19.7	120	359	
Hori.	7323.000	AV	36.11	36.77	8.39	44.03	2.10	39.34	53.90	14.5	150	0	
Hori.	9764.000	AV	36.32	38.80	9.34	43.85	2.10	42.71	53.90	11.1	150	0	
Vert.	182.156	QP	45.98	16.33	7.97	32.01	0.00	38.27	43.50	5.2	100	11	
Vert.	187.585	QP	45.86	16.38	7.96	32.00	0.00	38.20	43.50	5.3	100	12	
Vert.	206.971	QP	50.74	11.44	8.19	31.98	0.00	38.39	43.50	5.1	100	357	
Vert.	4882.000	PK	49.31	31.62	6.75	44.48	2.10	45.30	73.90	28.6	150	0	
Vert.	7323.000	PK	47.92	36.77	8.39	44.03	2.10	51.15	73.90	22.7	150	0	
Vert.	9764.000	PK	47.65	38.80	9.34	43.85	2.10	54.04	73.90	19.8	150	0	
Vert.	4882.000	AV	37.75	31.62	6.75	44.48	2.10	33.74	53.90	20.1	150	0	
Vert.	7323.000	AV	35.63	36.77	8.39	44.03	2.10	38.86	53.90	15.0	150	0	
Vert.	9764.000	AV	36.36	38.80	9.34	43.85	2.10	42.75	53.90	11.1	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 23 deg. C / 44 % RH
Engineer Kazuya Noda
(30 MHz -1 GHz)
(18 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	86.045	QP	45.58	7.36	7.75	32.09	0.00	28.60	40.00	11.4	215	84	
Hori.	157.744	QP	40.50	15.29	8.00	32.02	0.00	31.77	43.50	11.7	196	83	
Hori.	180.614	QP	46.79	16.32	7.98	32.01	0.00	39.08	43.50	4.4	184	311	
Hori.	215.113	QP	46.34	11.48	8.24	31.97	0.00	34.09	43.50	9.4	152	121	
Hori.	225.575	QP	48.25	11.54	8.30	31.96	0.00	36.13	46.00	9.8	162	327	
Hori.	2483.500	PK	49.02	27.55	14.24	44.16	2.10	48.75	73.90	25.1	101	9	
Hori.	4960.000	PK	49.25	31.83	6.83	44.51	2.10	45.50	73.90	28.4	150	0	
Hori.	7440.000	PK	48.50	36.97	8.52	44.08	2.10	52.01	73.90	21.8	150	0	
Hori.	9920.000	PK	47.86	38.98	9.42	43.87	2.10	54.49	73.90	19.4	150	0	
Hori.	2483.500	AV	37.12	27.55	14.24	44.16	2.10	36.85	53.90	17.0	101	9	
Hori.	4960.000	AV	37.12	31.83	6.83	44.51	2.10	33.37	53.90	20.5	150	0	
Hori.	7440.000	AV	36.52	36.97	8.52	44.08	2.10	40.03	53.90	13.8	150	0	
Hori.	9920.000	AV	35.61	38.98	9.42	43.87	2.10	42.24	53.90	11.6	150	0	
Vert.	182.156	QP	46.15	16.33	7.97	32.01	0.00	38.44	43.50	5.0	100	357	
Vert.	189.132	QP	46.05	16.40	7.97	32.00	0.00	38.42	43.50	5.0	100	354	
Vert.	207.766	QP	51.72	11.44	8.20	31.98	0.00	39.38	43.50	4.1	100	351	
Vert.	2483.500	PK	48.01	27.55	14.24	44.16	2.10	47.74	73.90	26.1	158	340	
Vert.	4960.000	PK	49.15	31.83	6.83	44.51	2.10	45.40	73.90	28.5	150	0	
Vert.	7440.000	PK	48.53	36.97	8.52	44.08	2.10	52.04	73.90	21.8	150	0	
Vert.	9920.000	PK	47.61	38.98	9.42	43.87	2.10	54.24	73.90	19.6	150	0	
Vert.	2483.500	AV	36.41	27.55	14.24	44.16	2.10	36.14	53.90	17.7	158	340	
Vert.	4960.000	AV	37.32	31.83	6.83	44.51	2.10	33.57	53.90	20.3	150	0	
Vert.	7440.000	AV	36.50	36.97	8.52	44.08	2.10	40.01	53.90	13.8	150	0	
Vert.	9920.000	AV	35.72	38.98	9.42	43.87	2.10	42.35	53.90	11.5	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

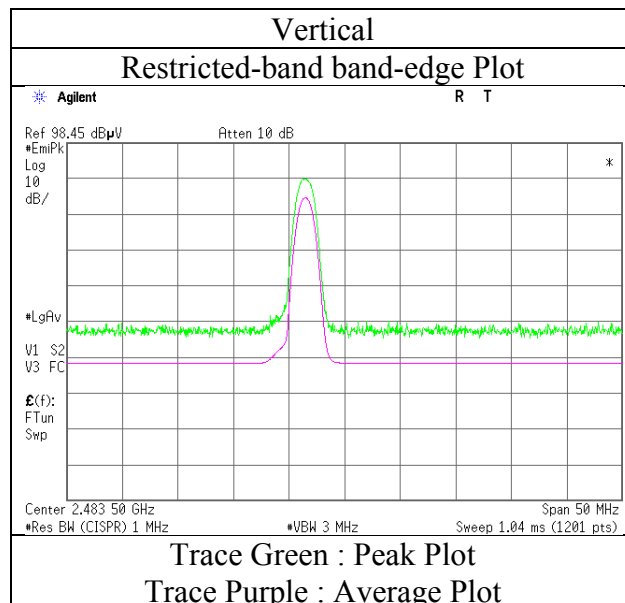
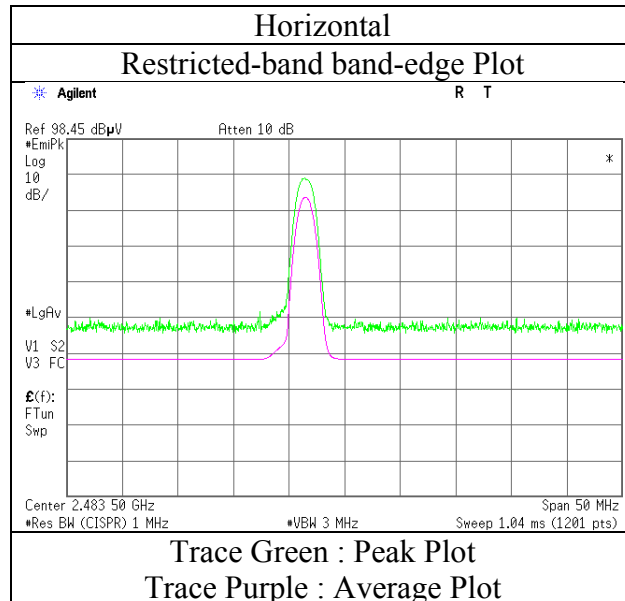
Distance factor : 1 GHz - 13 GHz : $20\log(3.82\text{ m} / 3.0\text{ m}) = 2.10\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

Radiated Spurious Emission
(Reference Plot for band-edge)

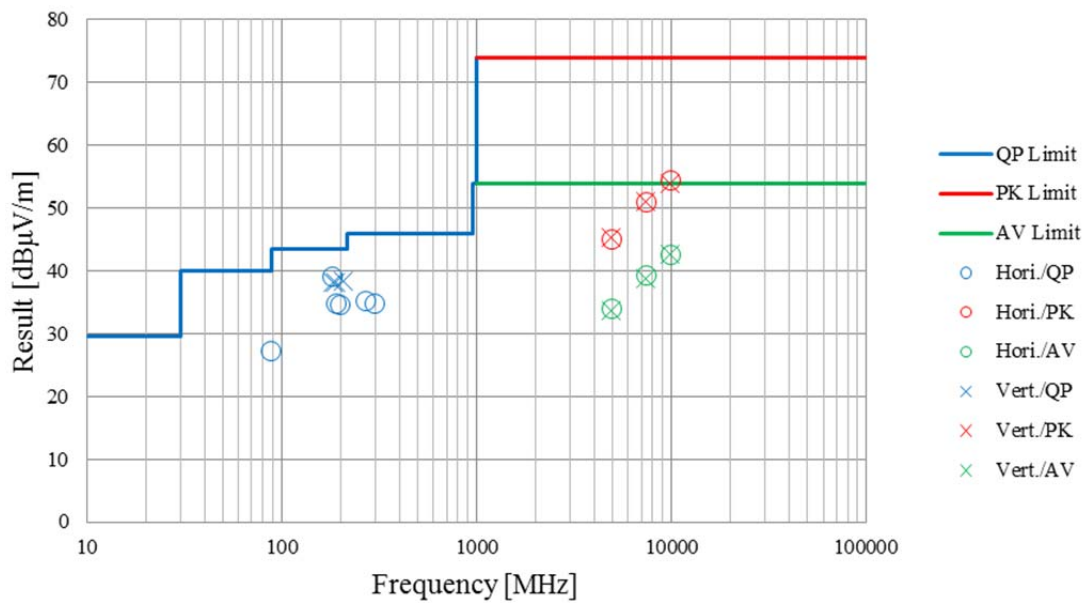
Report No. 11958750S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 5, 2017
Temperature / Humidity 25 deg. C / 36 % RH
Engineer Kazutaka Takeyama
(1 GHz ~2.8 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11958750S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	October 5, 2017	October 5, 2017
Temperature / Humidity	23 deg. C / 44 % RH	25 deg. C / 36 % RH
Engineer	Kazuya Noda (30 MHz -1 GHz) (18 GHz -26.5 GHz)	Kazutaka Takeyama (1 GHz -18 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

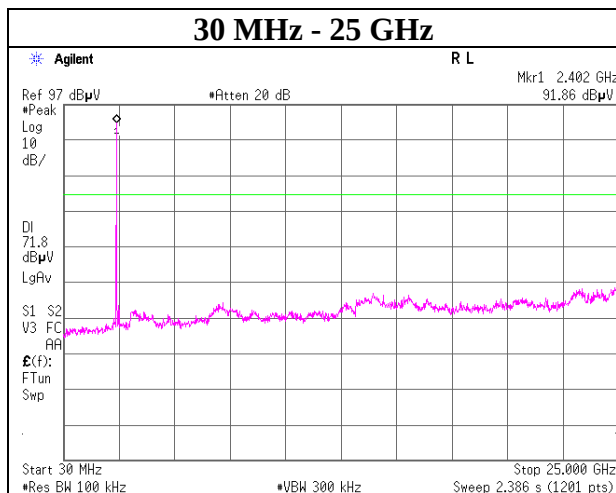
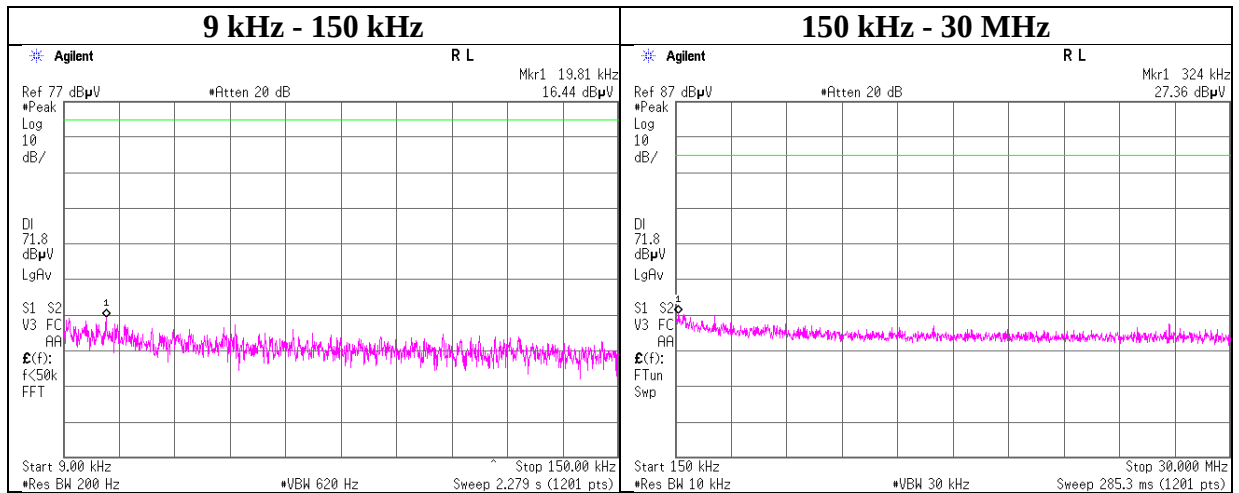


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, DH5

2402 MHz



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

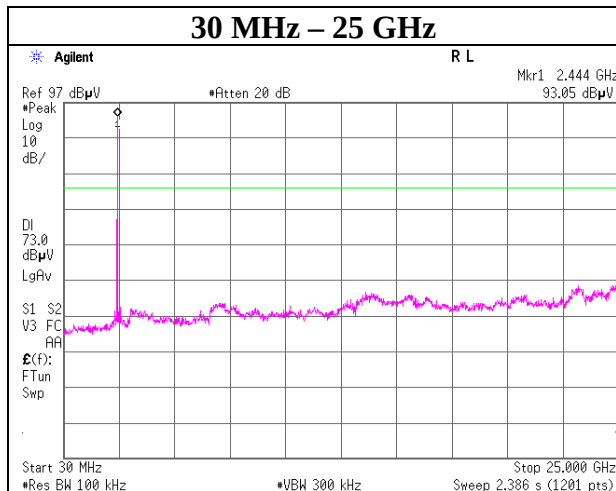
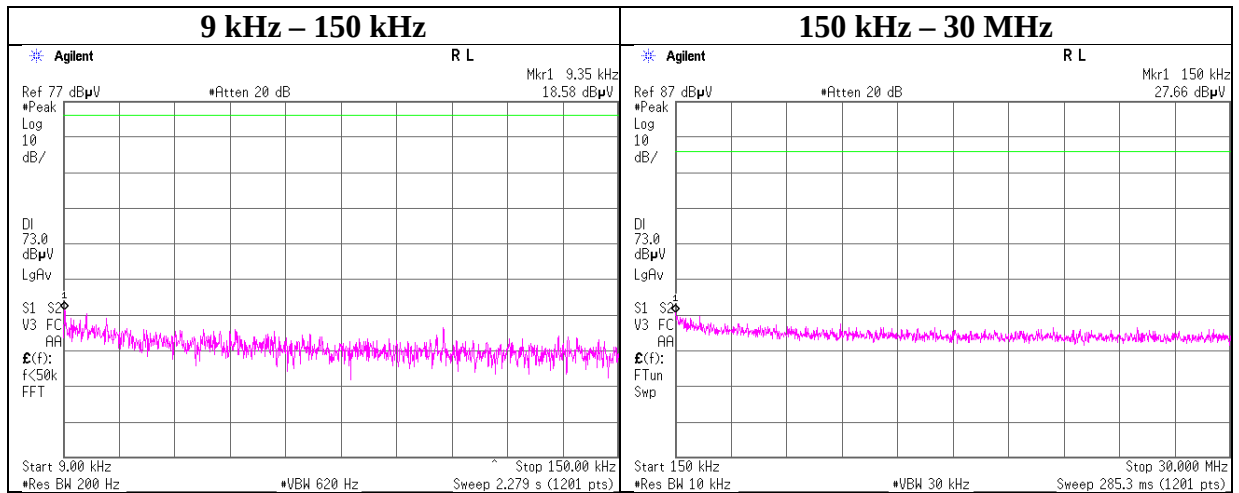
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, DH5

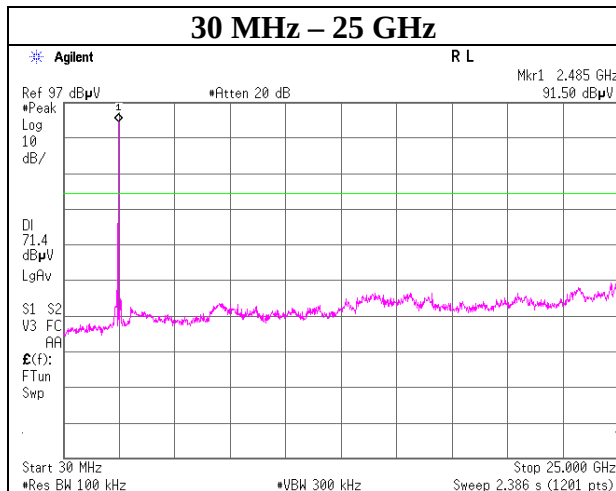
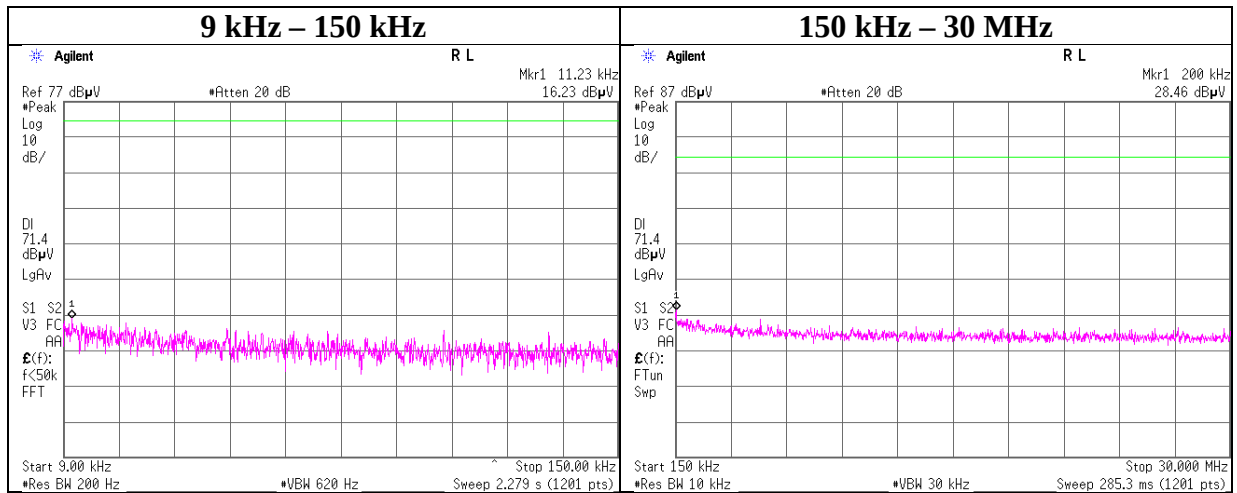
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, DH5

2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

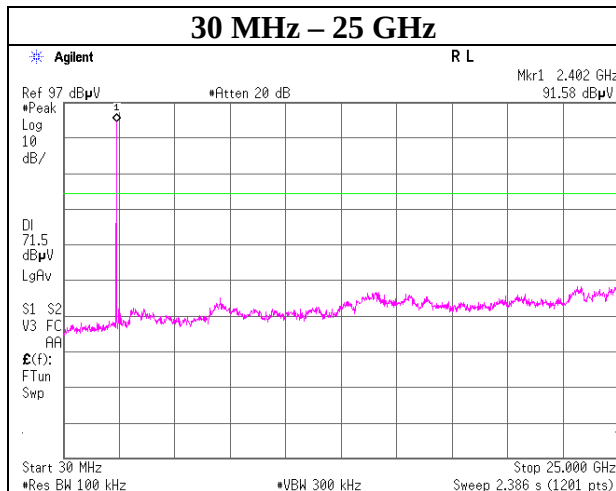
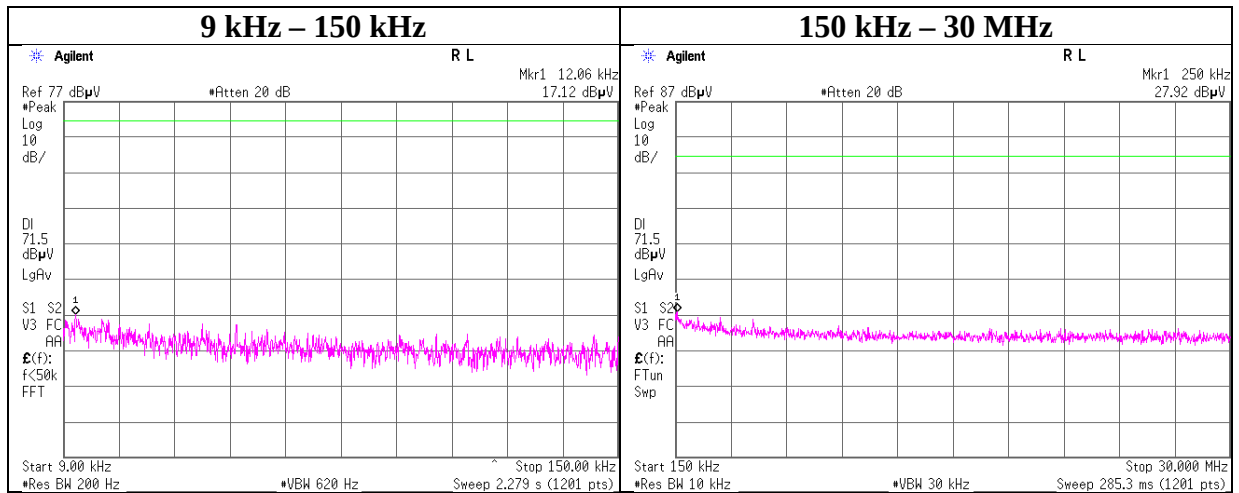
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping On, 3DH5

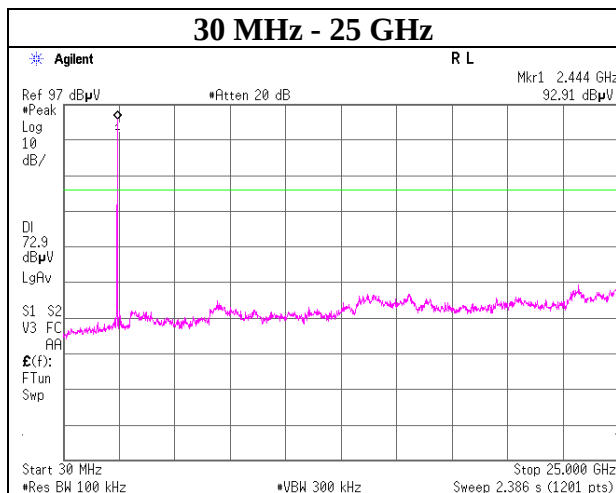
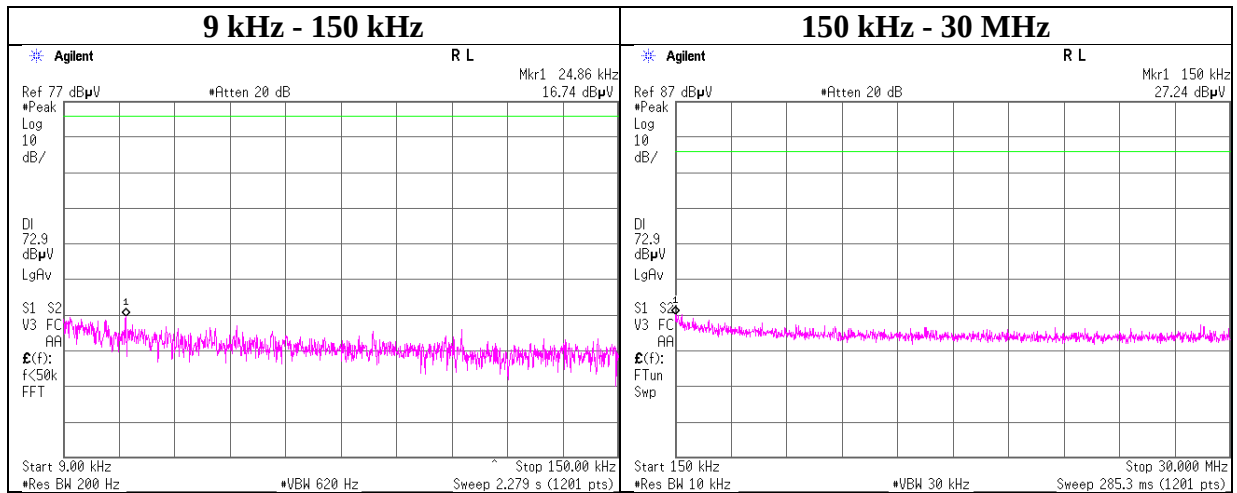
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, 3DH5

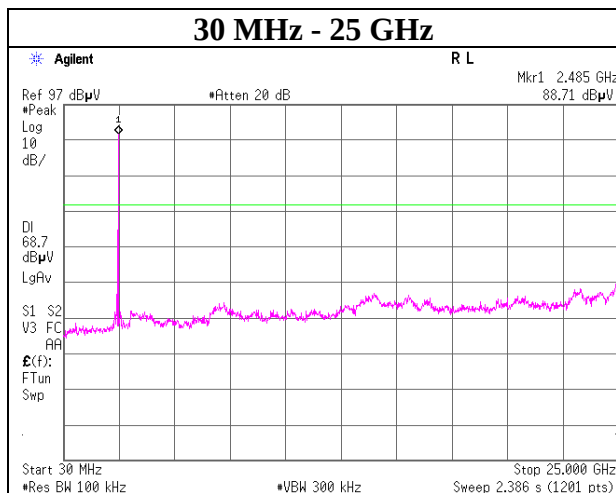
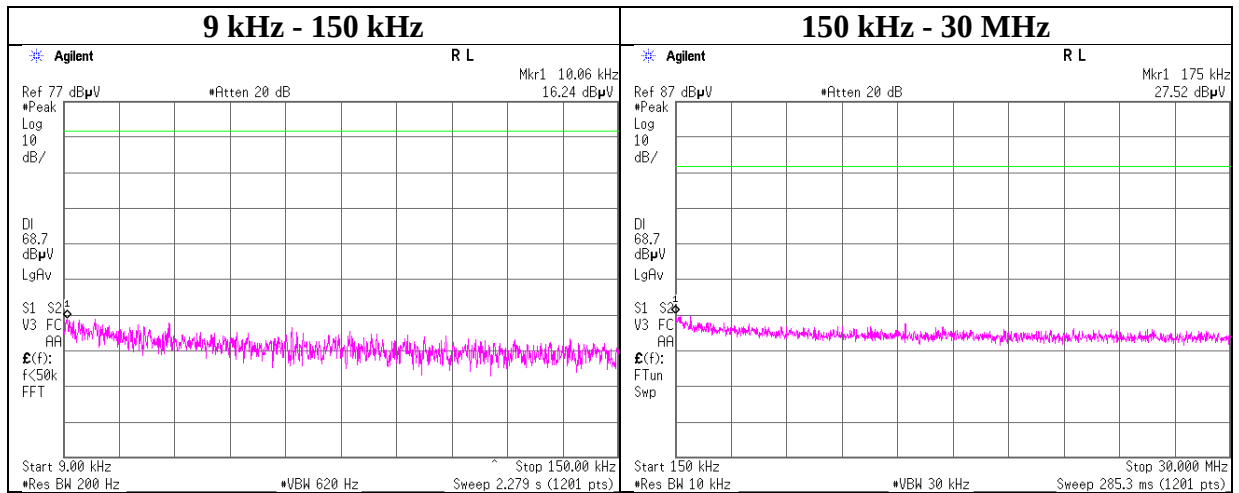
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, 3DH5

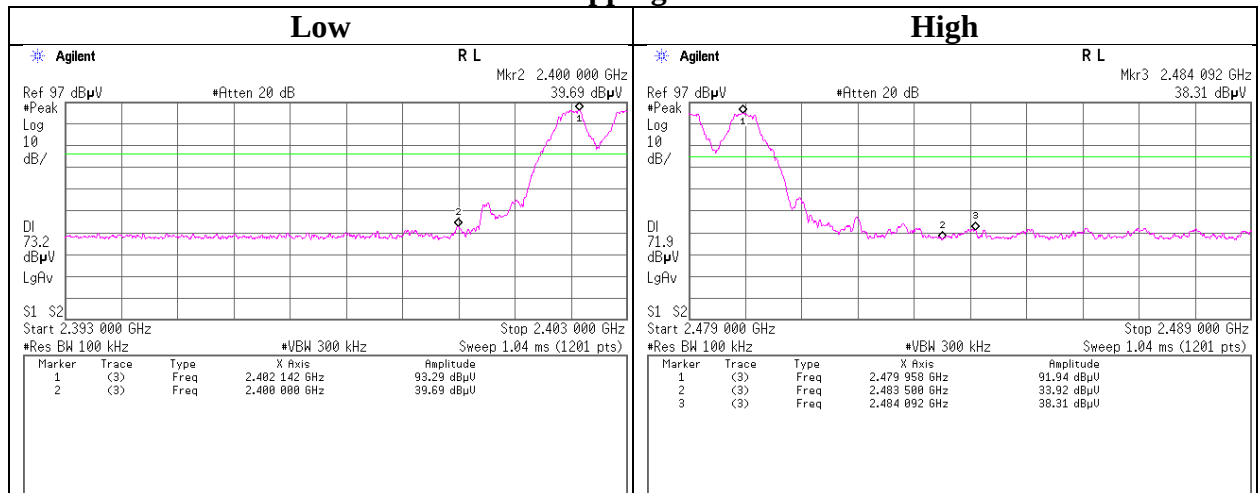
2480 MHz



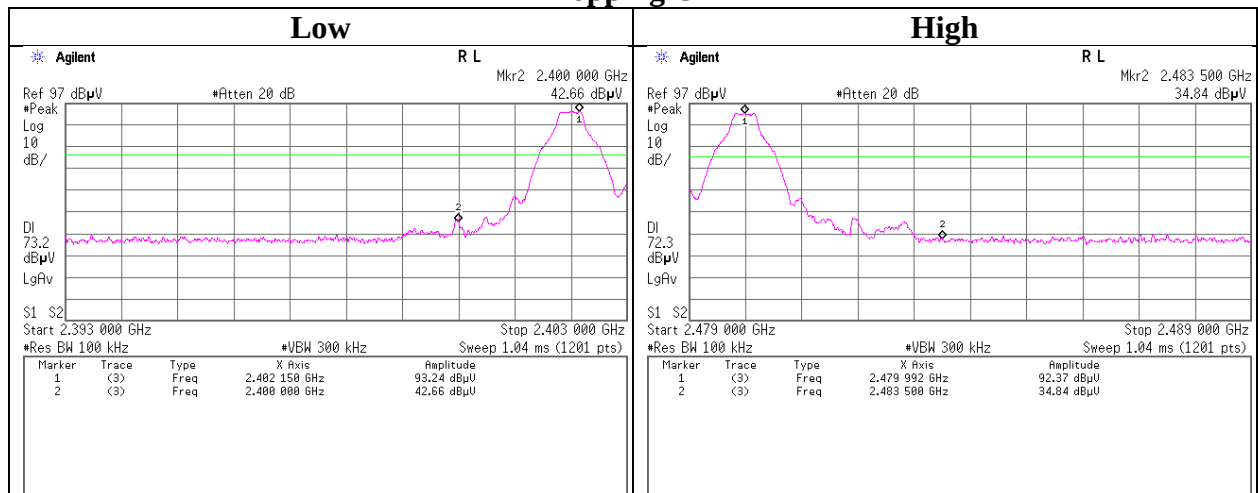
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

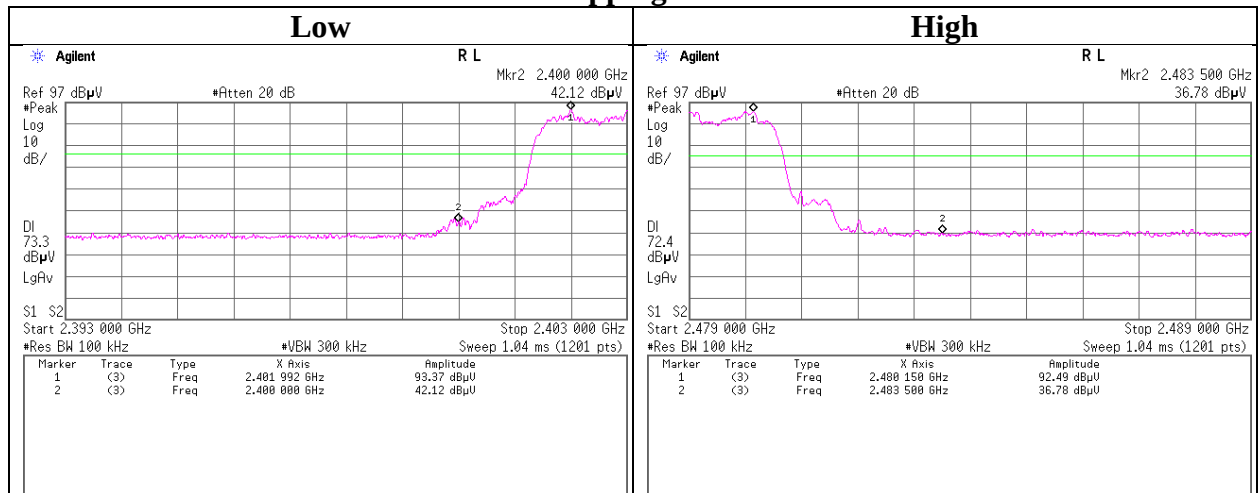
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

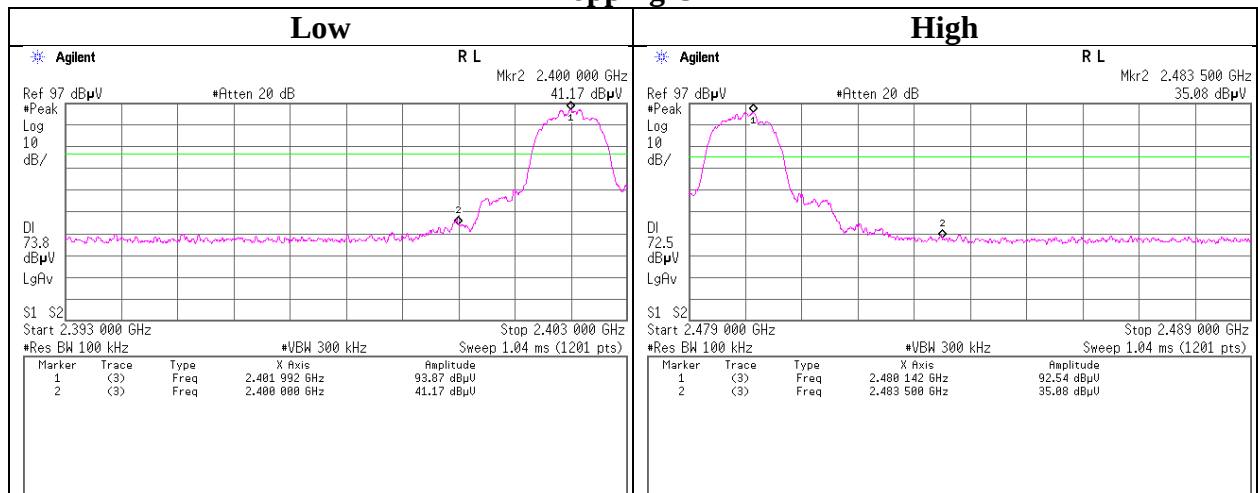
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5Shielded Room
Report No. : 11958750S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26 deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx 3DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

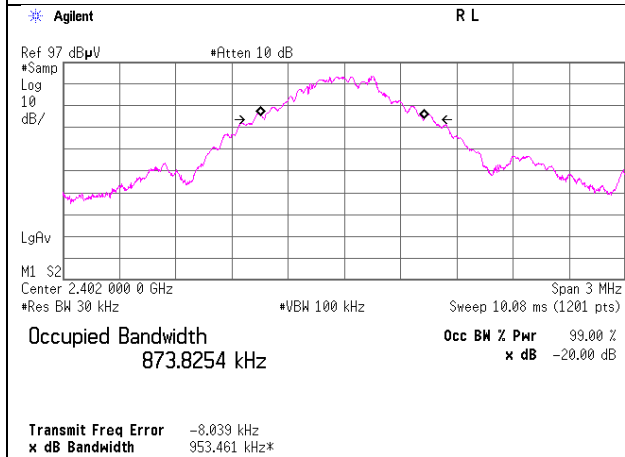
Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5	Shielded Room
Report No.	11958750S-A-R1	
Date	October 3, 2017	
Temperature / Humidity	26 deg. C / 46 % RH	
Engineer	Shiro Kobayashi	
Mode	Tx Hopping Off	

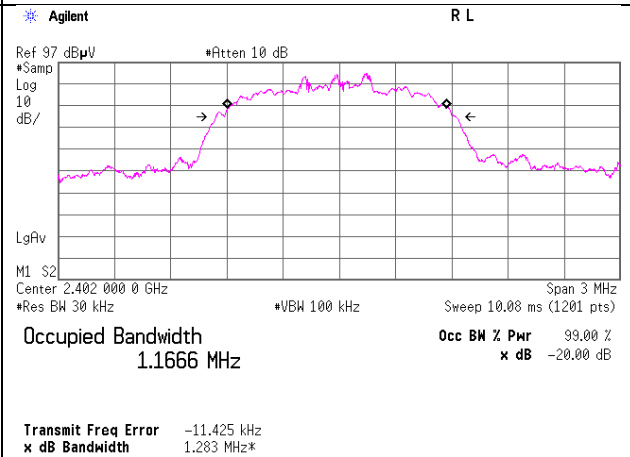
Hopping Off, DH5

2402 MHz

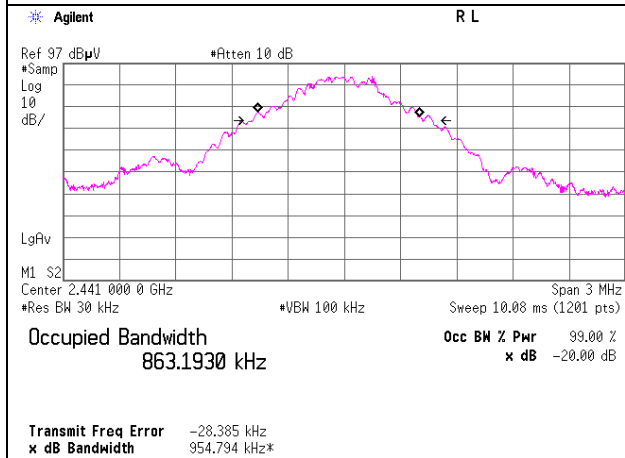


Hopping Off, 3DH5

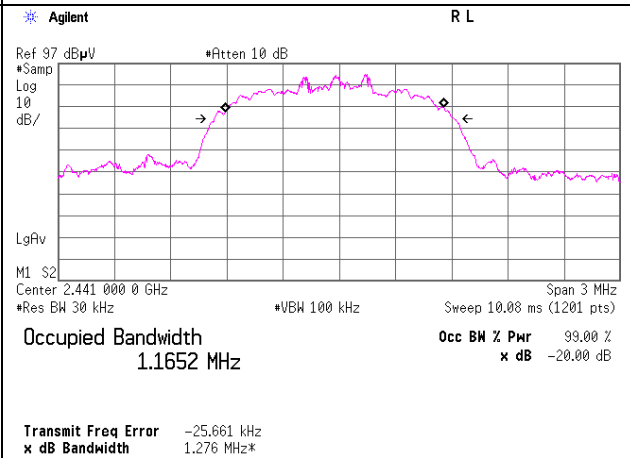
2402 MHz



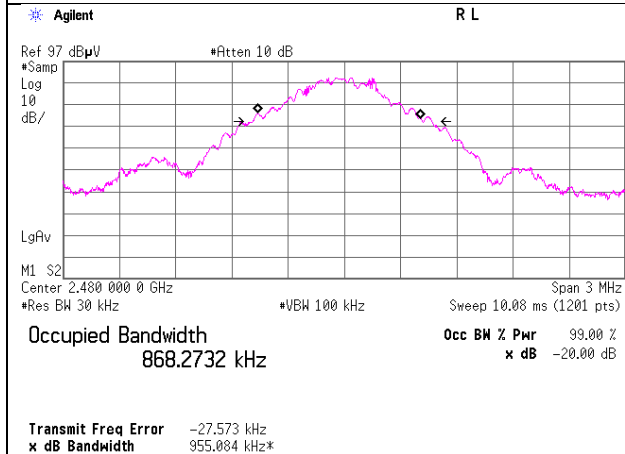
2441 MHz



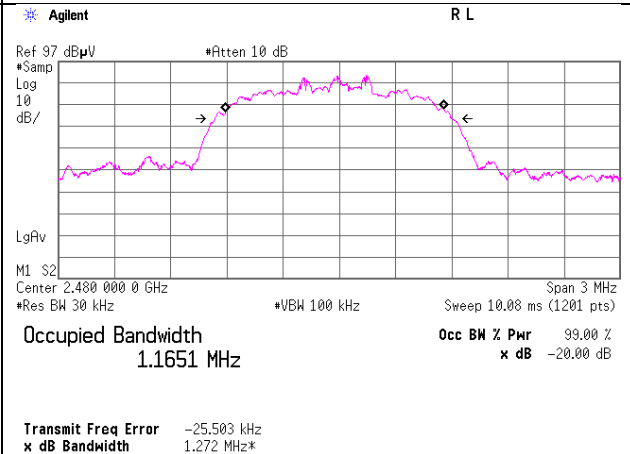
2441 MHz



2480 MHz



2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

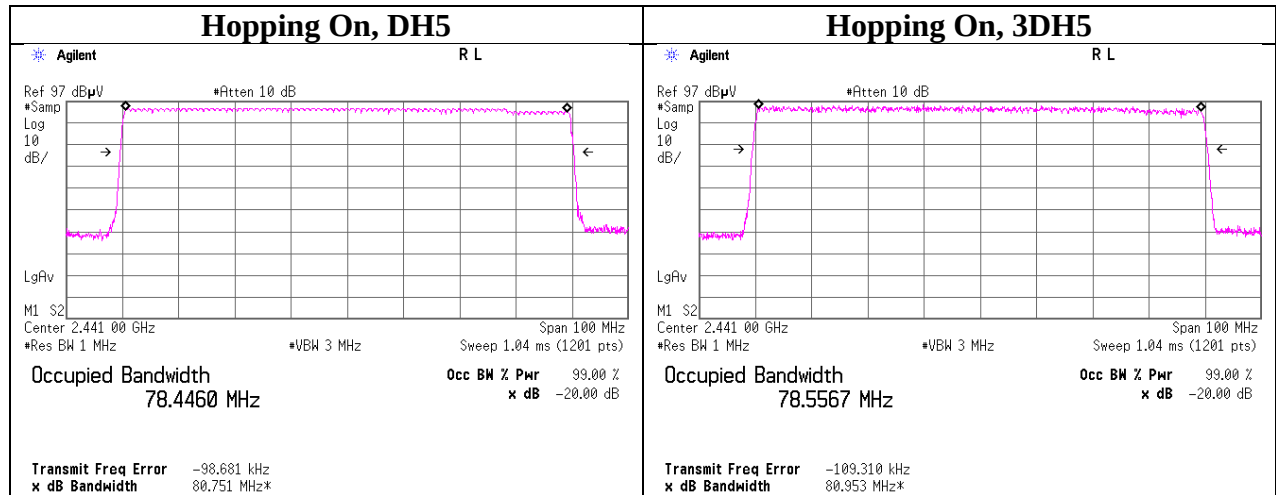
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11958750S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx Hopping On



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2016/10/17 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2017/03/23 * 12
SCC-G35	Coaxial Cable	Junkosha	MWX241-01000K MSKMS/B	1612Q033	AT	2017/01/10 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2017/05/01 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2017/08/20 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-09 1	RE	2017/06/13 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000N F SNMS/B	1612S006	RE	2017/01/08 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	RE	2016/10/24 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFL,MF)	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2016/10/17 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
KBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1926	RE	2016/11/23 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2017/01/26 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2017/04/07 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2017/02/09 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2016/11/08 * 12
SCC-G20	Coaxial Cable	Junkosha	J12J102518-00	APR-15-15-00 3	RE	2017/04/20 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K M SKMS	-	RE	2017/04/20 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 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: RE: Radiated Emission test

AT: Antenna Terminal Conducted test

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401