



RADIO TEST REPORT

Test Report No. : 12250629S-A-R2

Applicant : Sony Corporation
Type of Equipment : AV Receiver
Model No. : XAV-AX210
FCC ID : AK8XAVAX210
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. This report is a revised version of 12250629S-A-R1. 12250629S-A-R1 is replaced with this report.

Date of test: April 11 to 16, 2018

Representative test engineer:

T. Arai

Tatsuya Arai
Engineer
Consumer Technology Division

Approved by:

A. Hayashi

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".

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 12250629S-A

[illegible]

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SECTION 1: Customer information

Company Name	:	Sony Global Manufacturing & Operations Corporation
Address	:	8-4 Shiomi Kisarazu-shi, Chiba, 292-0834 Japan
Contact Person	:	Kazuhiko Nagano

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

2.1 Identification of E.U.T.

Type of Equipment	:	AV Receiver
Model No.	:	XAV-AX210
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V (car battery)
Receipt Date of Sample	:	April 6, 2018
Country of Mass-production	:	China
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: XAV-AX210 (referred to as the EUT in this report) is an AV Receiver.

Radio Specification

[Bluetooth]

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS, GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna type	:	PIFA
Antenna Gain	:	1.68 dBi (Peak), 1.1 dBi (Average)
Clock frequency (Maximum)	:	26 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C

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

3.2 Procedures and results

Item	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	*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	4.8 dB 4960.000 MHz, AV, Hori. Tx, DH5 2480 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 power ports.					
*2) Radiated test was selected over 30 MHz based on section 15.247(d).					
Symbols:					
Complied	The data of this test item has enough margin, more than the measurement uncertainty.				
Complied#	The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.				

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

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	Complied	Conducted
Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

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

3.4 Uncertainty

EMI

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

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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
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.8 dB	4.9 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 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	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

3.5 Test Location

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JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

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

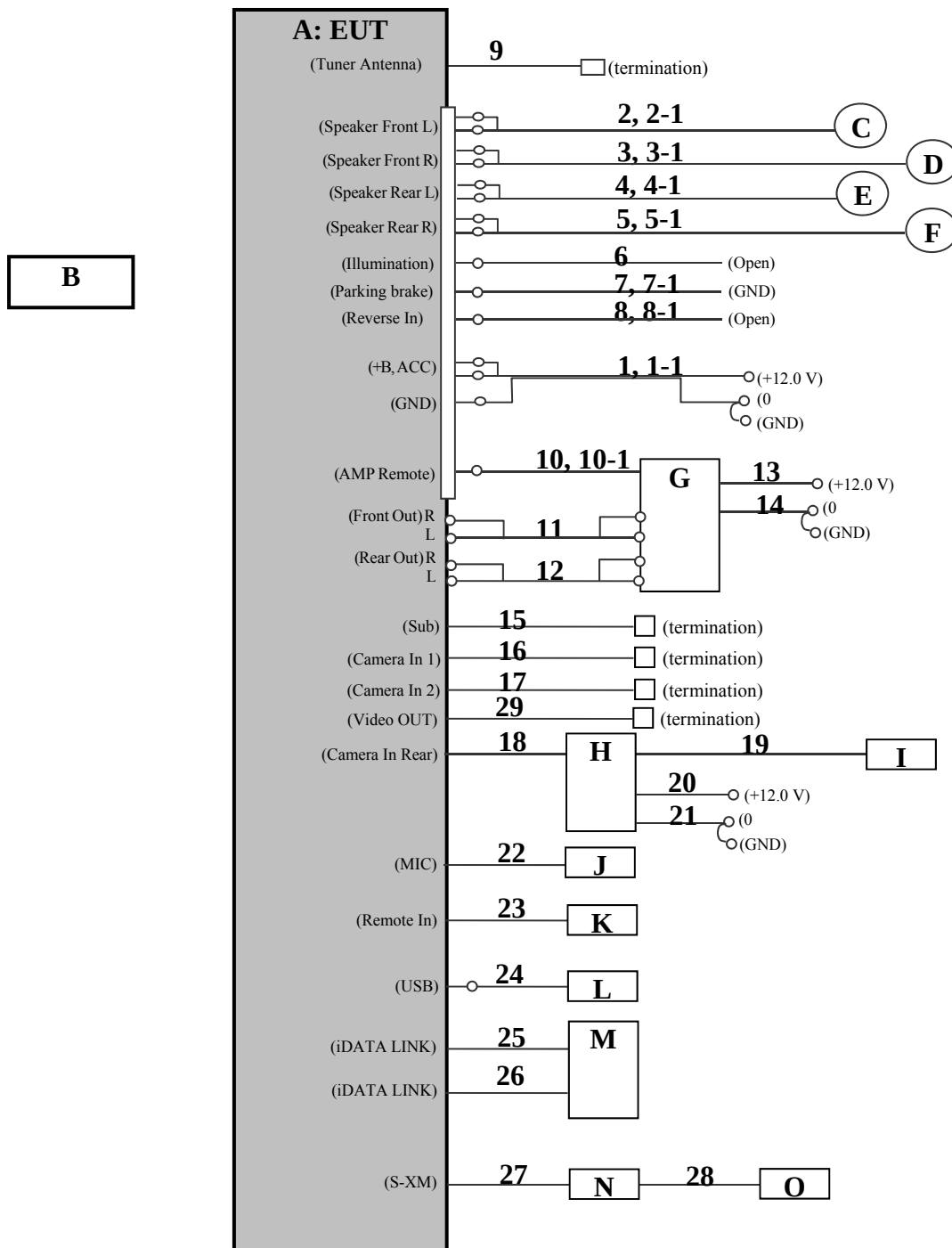
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: Fixed Software: RDA Host Controller Data Transfer Tester Application *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



Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	AV Receiver	XAV-AX210	ET00028	Sony	EUT
B	Remote Controller	RM-X170	-	Sony	-
C	Speaker 1	IS-10	-	Sony	-
D	Speaker 2	IS-10	-	Sony	-
E	Speaker 3	XS-GTF1625R	-	Sony	-
F	Speaker 4	XS-GTF1625R	-	Sony	-
G	Monaural Power Amplifier	XM-4S-020	-	Sony	-
H	Camera Box	XA-R800C	100114	Sony	-
I	Rear Camera	R800C	100114	Sony	-
J	Mic	-	-	-	-
K	Remote Controller	RM-X170	-	Sony	-
L	USB memory	SDK-USM4G-I	-	Sony	4 GB
M	idatalink maestro	ADS-MRR	2B32A49B07	ADS	-
N	SIRIUS XM Connect Vehicle Tuner	SXV300	1VH90D08	Sirius XM Radio Inc.	-
O	Vehicle Satellite Radio Antenna	NGVA3	1624A	Sirius XM Radio Inc.	-

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List of cables used

No.	Name	Length (m)	Shield (Cable)		Remarks
			Cable	Connector	
1	DC Power	0.15 +1.8	Unshielded	Unshielded	*1)
1-1	DC Power	0.15 +1.1	Unshielded	Unshielded	-
2	Speaker (1)	0.15	Unshielded	Unshielded	*1)
2-1	Speaker (1)	0.15+2.6	Unshielded	Unshielded	-
3	Speaker (2)	0.15	Unshielded	Unshielded	*1)
3-1	Speaker (2)	0.15+2.6	Unshielded	Unshielded	-
4	Speaker (3)	0.15	Unshielded	Unshielded	*1)
4-1	Speaker (3)	0.15+2.0	Unshielded	Unshielded	-
5	Speaker (4)	0.15	Unshielded	Unshielded	*1)
5-1	Speaker (4)	0.15+2.0	Unshielded	Unshielded	-
6	Parking	2.0	Unshielded	Unshielded	-
7	Illumination	0.15	Unshielded	Unshielded	*1)
7-1	Illumination	0.15+1.0	Unshielded	Unshielded	-
8	Revers in	0.15	Unshielded	Unshielded	*1)
8-1	Revers in	0.15+1.0	Unshielded	Unshielded	-
9	Tuner Antenna	1.0	Shielded	Shielded	-
10	AMP Remote	0.15	Unshielded	Unshielded	*1)
10-1	AMP Remote	0.15+1.5	Unshielded	Unshielded	-
11	RCA (Front Audio Out)	3.0	Shielded	Shielded	-
12	RCA (Rear Audio Out)	3.0	Shielded	Shielded	-
13	DC Power (+)	1.3	Unshielded	Unshielded	-
14	DC Power (-)	1.3	Unshielded	Unshielded	-
15	RCA (Sub Audio Out)	1.5	Shielded	Shielded	-
16	Video	1.5	Shielded	Shielded	-
17	Video	1.9	Shielded	Shielded	-
18	Video	3.0	Shielded	Shielded	-
19	Camera	3.0	Shielded	Shielded	-
20	DC Power (+)	1.0	Unshielded	Unshielded	-
21	DC Power (-)	1.0	Unshielded	Unshielded	-
22	MIC	3.5	Shielded	Shielded	-
23	REMOTE IN	2.0	Shielded	Shielded	-
24	USB	0.15+1.3	Shielded	Shielded	-
25	iDATA LINK	0.45	Unshielded	Unshielded	-
26	iDATA LINK	0.55	Unshielded	Unshielded	-
27	Sirius Tuner	0.65	Shielded	Shielded	-
28	Sirius Antenna	7.0	Shielded	Shielded	-
29	RCA (Sub Video Out)	1.5	Shielded	Shielded	-

*1) Used for Antenna Terminal Conducted test

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SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.5 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	3.88 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.88 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: $20 \times \log (3.88 \text{ m}/3.0 \text{ m}) = 2.24 \text{ dB}$

*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 angle of -45 deg. to 45 deg.. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	45 deg.	45 deg.	45 deg.	0 deg.	0 deg.
Vertical	45 deg.	45 deg.	45 deg.	0 deg.	0 deg.

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

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SECTION 6: 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 *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	5 MHz or 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	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

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

*2) Reference data

*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

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

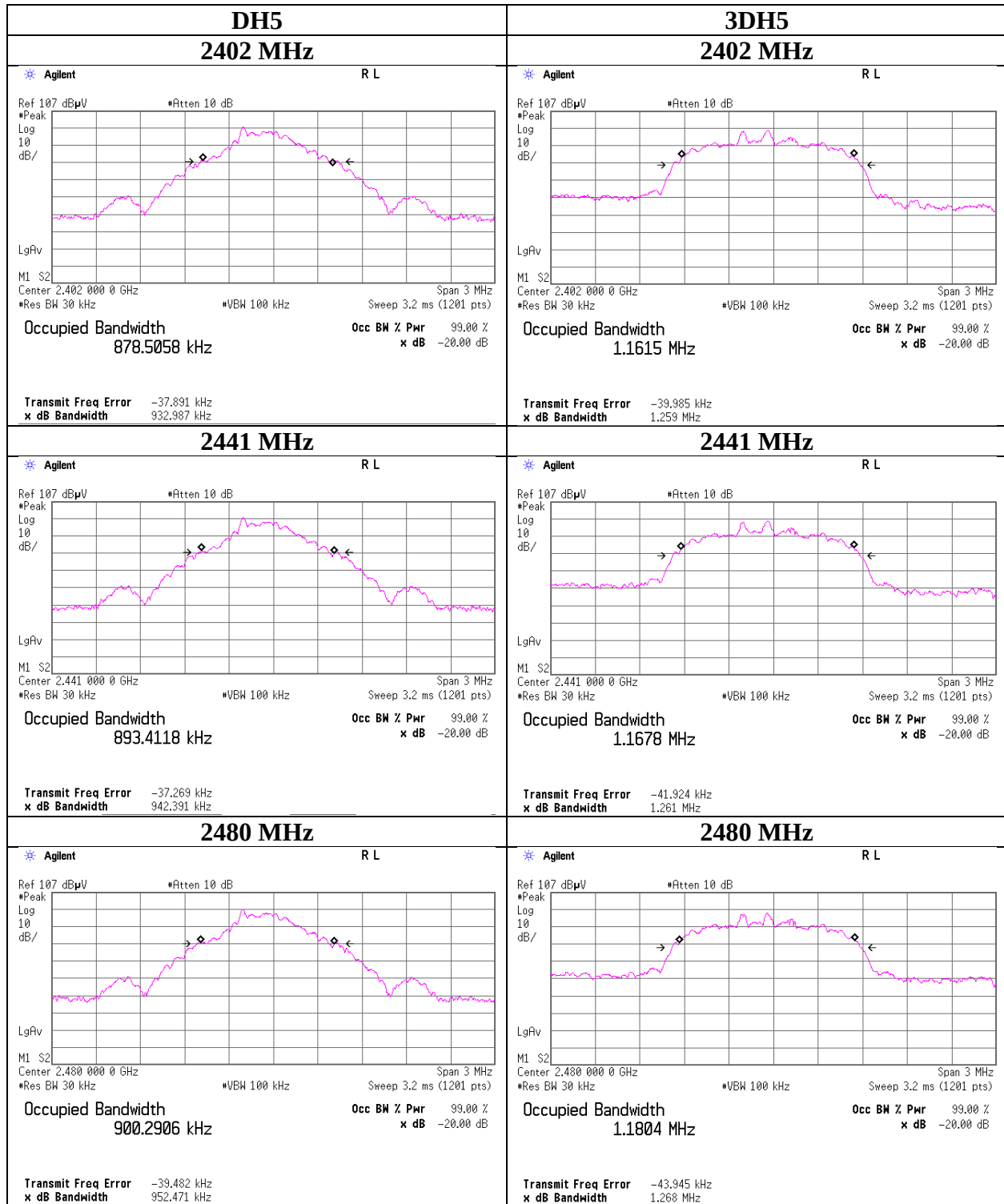
Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.933	878.5	1.000	≥ 0.622
DH5	2441.0	0.942	893.4	1.000	≥ 0.628
DH5	2480.0	0.952	900.3	1.000	≥ 0.635
DH5	Hopping On	-	78606.2	-	-
3DH5	2402.0	1.259	1161.5	1.000	≥ 0.839
3DH5	2441.0	1.261	1167.8	1.000	≥ 0.841
3DH5	2480.0	1.268	1180.4	1.000	≥ 0.846
3DH5	Hopping On	-	78700.1	-	-

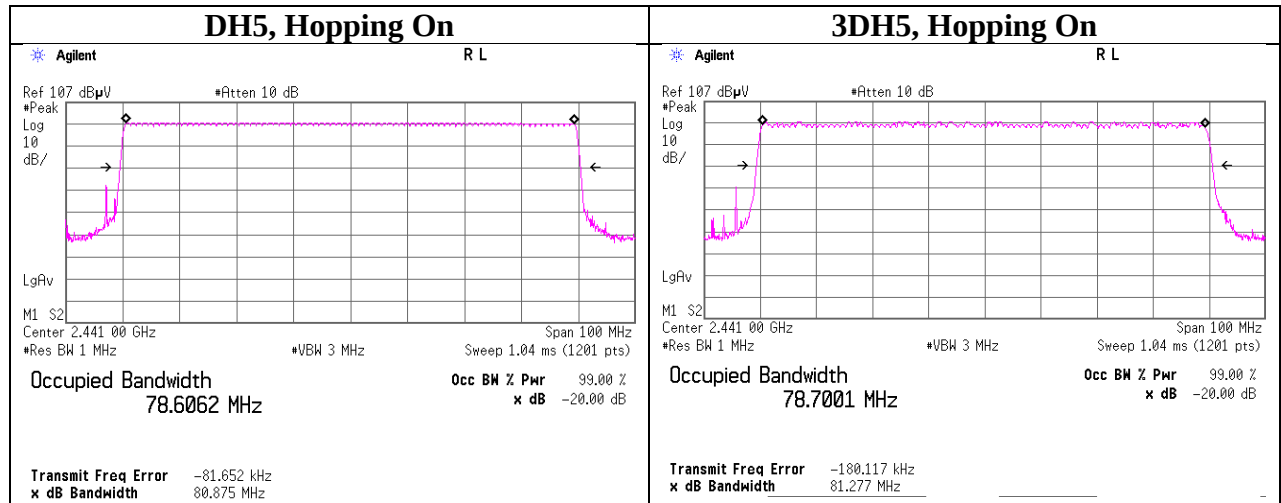
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



20dB Bandwidth and 99% Occupied Bandwidth



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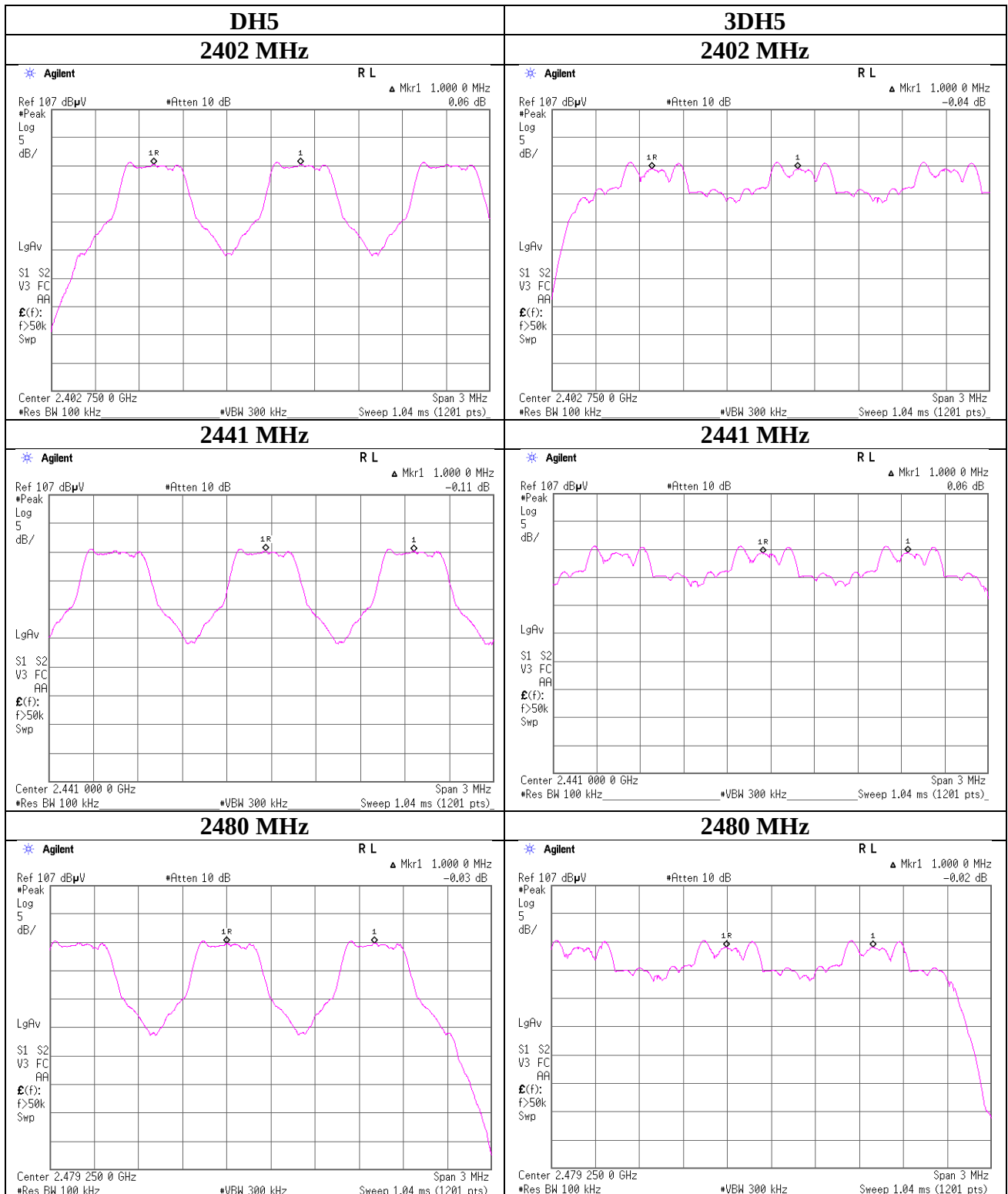
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Carrier Frequency Separation



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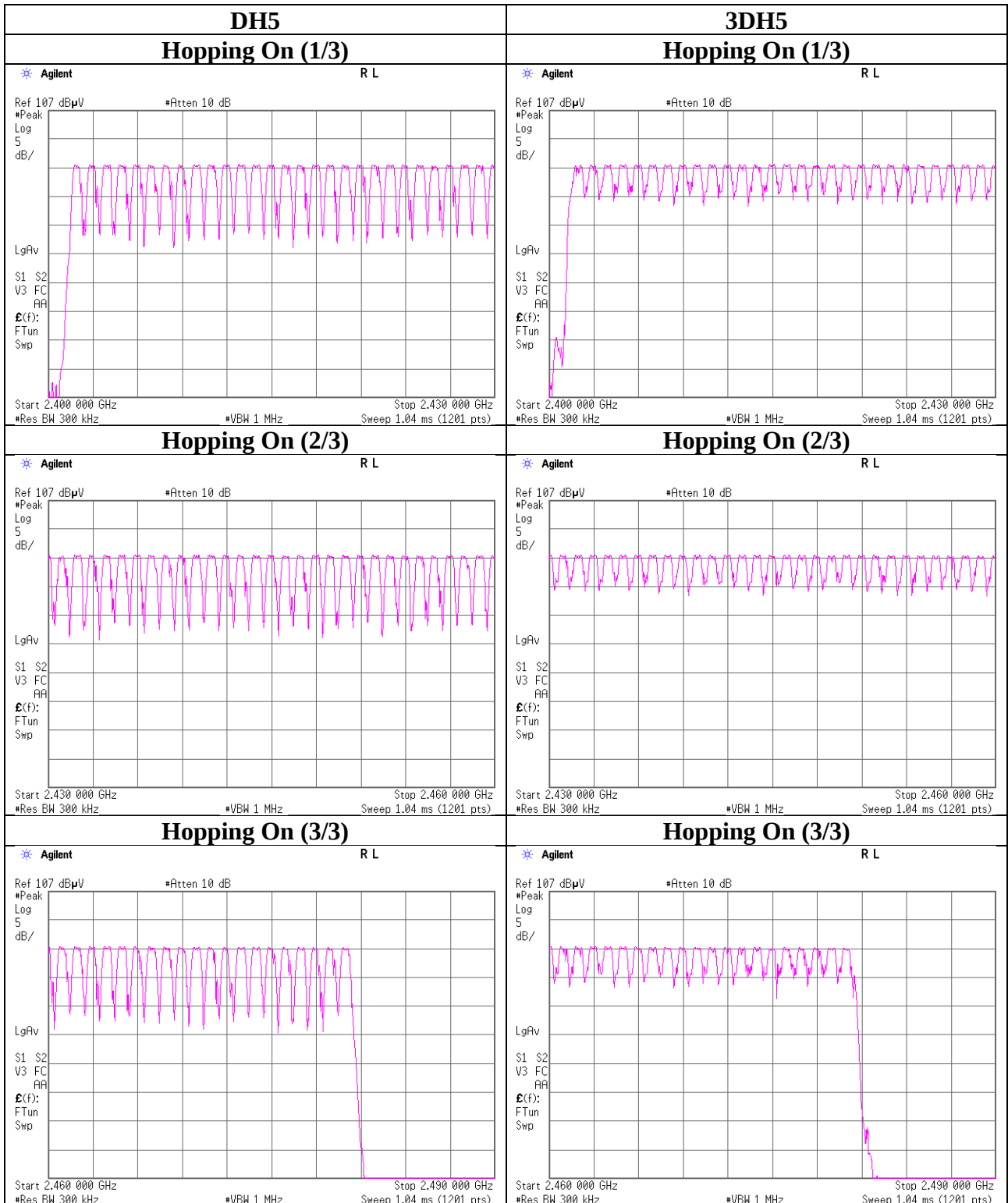
Number of Hopping Frequency

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
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



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Dwell time

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping On

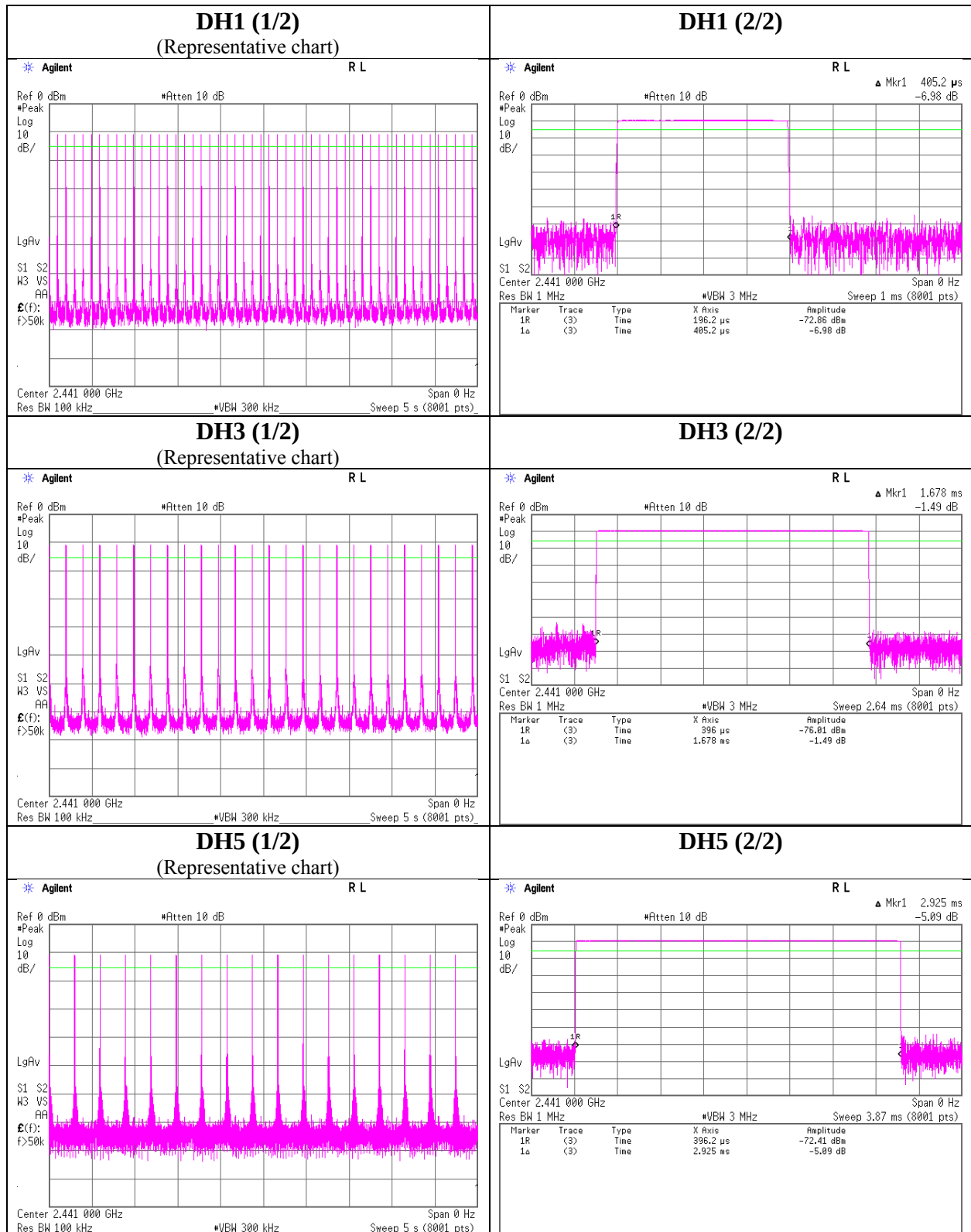
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times	/	5 sec.	x 31.6 sec. = 323 times	0.405	131	400
DH3	26.0 times	/	5 sec.	x 31.6 sec. = 165 times	1.678	277	400
DH5	17.0 times	/	5 sec.	x 31.6 sec. = 108 times	2.925	316	400
3DH1	51.0 times	/	5 sec.	x 31.6 sec. = 323 times	0.416	134	400
3DH3	26.0 times	/	5 sec.	x 31.6 sec. = 165 times	1.669	275	400
3DH5	17.0 times	/	5 sec.	x 31.6 sec. = 108 times	2.922	316	400

Sample Calculation

Result = Number of transmission x Length of transmission

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

Dwell time



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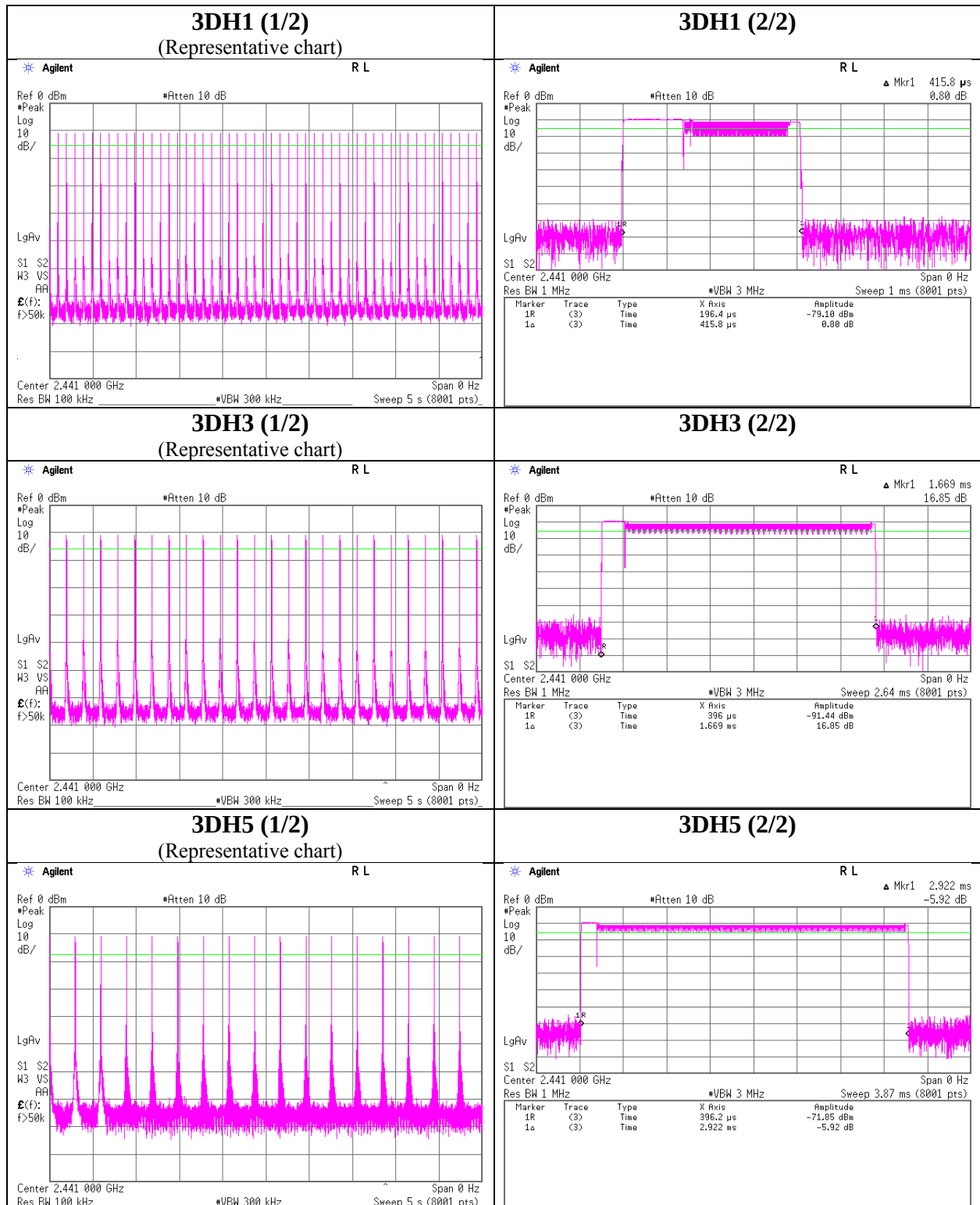
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time



Maximum Peak Output Power

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p.					
					Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-9.17	0.78	9.80	1.41	1.38	20.96	125	19.55	1.68	3.09	2.04	36.02	4000	32.93
DH5	2441.0	-9.13	0.78	9.80	1.45	1.40	20.96	125	19.51	1.68	3.13	2.06	36.02	4000	32.89
DH5	2480.0	-9.49	0.79	9.80	1.10	1.29	20.96	125	19.86	1.68	2.78	1.90	36.02	4000	33.24
2DH5	2402.0	-8.24	0.78	9.80	2.34	1.71	20.96	125	18.62	1.68	4.02	2.52	36.02	4000	32.00
2DH5	2441.0	-8.27	0.78	9.80	2.31	1.70	20.96	125	18.65	1.68	3.99	2.51	36.02	4000	32.03
2DH5	2480.0	-8.67	0.79	9.80	1.92	1.56	20.96	125	19.04	1.68	3.60	2.29	36.02	4000	32.42
3DH5	2402.0	-7.81	0.78	9.80	2.77	1.89	20.96	125	18.19	1.68	4.45	2.79	36.02	4000	31.57
3DH5	2441.0	-7.84	0.78	9.80	2.74	1.88	20.96	125	18.22	1.68	4.42	2.77	36.02	4000	31.60
3DH5	2480.0	-8.32	0.79	9.80	2.27	1.69	20.96	125	18.69	1.68	3.95	2.48	36.02	4000	32.07

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Average Output Power (Reference data for RF Exposure)

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
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	-10.38	0.78	9.80	0.20	1.05	1.06	1.26	1.34
DH5	2441.0	-10.35	0.78	9.80	0.23	1.05	1.06	1.29	1.35
DH5	2480.0	-10.72	0.79	9.80	-0.13	0.97	1.06	0.93	1.24
2DH5	2402.0	-12.06	0.78	9.80	-1.48	0.71	1.06	-0.42	0.91
2DH5	2441.0	-11.99	0.78	9.80	-1.41	0.72	1.06	-0.35	0.92
2DH5	2480.0	-12.33	0.79	9.80	-1.74	0.67	1.06	-0.68	0.86
3DH5	2402.0	-12.09	0.78	9.80	-1.51	0.71	1.06	-0.45	0.90
3DH5	2441.0	-12.01	0.78	9.80	-1.43	0.72	1.06	-0.37	0.92
3DH5	2480.0	-12.34	0.79	9.80	-1.75	0.67	1.06	-0.69	0.85

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.

UL Japan, Inc.

Shonan EMC Lab.

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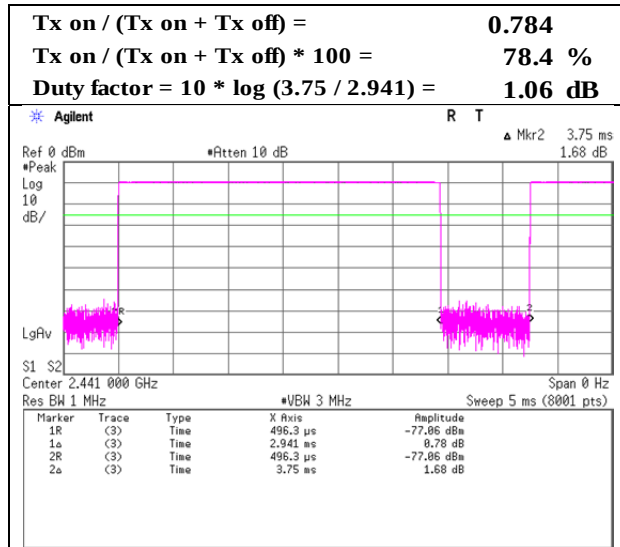
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

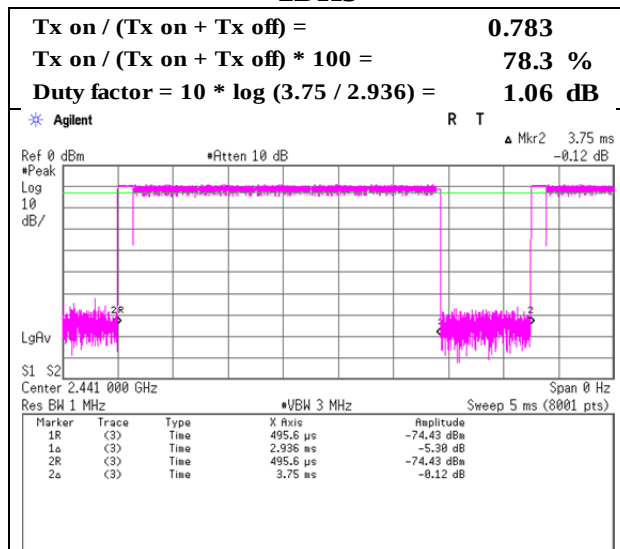
Burst Rate Confirmation

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off

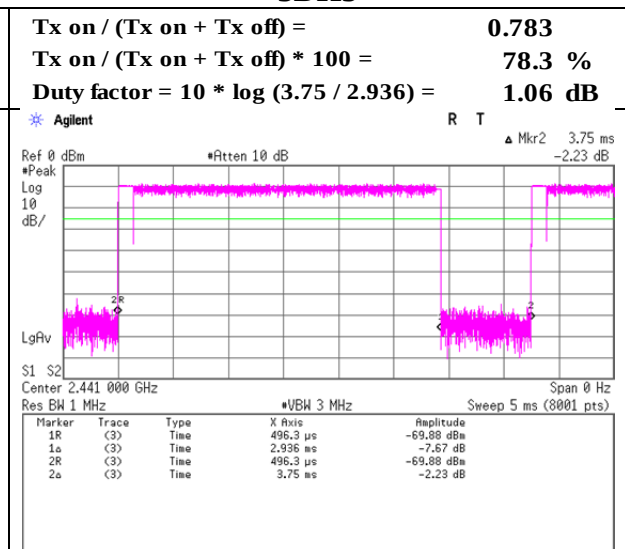
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 12250629S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3
Date April 14, 2018
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Kazutaka Takeyama
Mode Tx, Hopping Off, DH5 2402 MHz

1
April 16, 2018
22 deg. C / 36 % RH
Kazutaka Takeyama
(1 GHz -13 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.	106.601	QP	41.00	11.01	7.43	32.15	0.00	27.29	43.50	16.2	292	115	
Hori.	135.807	QP	38.00	14.04	7.66	32.13	0.00	27.57	43.50	15.9	200	296	
Hori.	137.548	QP	41.20	14.15	7.70	32.13	0.00	30.92	43.50	12.5	200	277	
Hori.	139.244	QP	46.50	14.27	7.74	32.13	0.00	36.38	43.50	7.1	200	58	
Hori.	140.952	QP	41.10	14.36	7.77	32.13	0.00	31.10	43.50	12.4	200	47	
Hori.	602.119	QP	32.20	19.04	10.03	31.95	0.00	29.32	46.00	16.6	153	212	
Hori.	960.000	QP	33.00	22.10	11.23	30.57	0.00	35.76	46.00	10.2	150	199	
Hori.	2390.000	PK	50.30	27.14	14.56	44.13	2.24	50.11	73.90	23.7	300	221	
Hori.	4804.000	PK	55.60	31.13	7.17	44.45	2.24	51.69	73.90	22.2	100	338	
Hori.	7206.000	PK	46.00	36.35	8.80	43.99	2.24	49.40	73.90	24.5	100	0	
Hori.	9608.000	PK	46.60	38.11	10.39	43.83	2.24	53.51	73.90	20.3	100	0	
Hori.	2390.000	AV	35.60	27.14	14.56	44.13	2.24	35.41	53.90	18.4	300	221	
Hori.	4804.000	AV	47.70	31.13	7.17	44.45	2.24	43.79	53.90	10.1	100	338	
Hori.	7206.000	AV	35.70	36.35	8.80	43.99	2.24	39.10	53.90	14.8	100	0	
Hori.	9608.000	AV	36.40	38.11	10.39	43.83	2.24	43.31	53.90	10.5	100	0	
Vert.	103.208	QP	41.10	10.51	7.47	32.16	0.00	26.92	43.50	16.5	100	259	
Vert.	104.869	QP	41.00	10.75	7.45	32.16	0.00	27.04	43.50	16.4	100	251	
Vert.	139.265	QP	44.30	14.27	7.74	32.13	0.00	34.18	43.50	9.3	100	285	
Vert.	675.849	QP	34.00	19.37	10.30	31.92	0.00	31.75	46.00	14.2	100	188	
Vert.	960.000	QP	33.00	22.10	11.23	30.57	0.00	35.76	46.00	10.2	100	208	
Vert.	2390.000	PK	53.50	27.14	14.56	44.13	2.24	53.31	73.90	20.5	143	302	
Vert.	4804.000	PK	55.60	31.13	7.17	44.45	2.24	51.69	73.90	22.2	100	285	
Vert.	7206.000	PK	46.00	36.35	8.80	43.99	2.24	49.40	73.90	24.5	100	0	
Vert.	9608.000	PK	46.70	38.11	10.39	43.83	2.24	53.61	73.90	20.2	100	0	
Vert.	2390.000	AV	37.10	27.14	14.56	44.13	2.24	36.91	53.90	16.9	143	302	
Vert.	4804.000	AV	47.60	31.13	7.17	44.45	2.24	43.69	53.90	10.2	100	285	
Vert.	7206.000	AV	35.50	36.35	8.80	43.99	2.24	38.90	53.90	15.0	100	0	
Vert.	9608.000	AV	36.20	38.11	10.39	43.83	2.24	43.11	53.90	10.7	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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	88.70	27.18	14.57	44.14	2.24	88.55	-	-	Carrier
Hori.	2400.000	PK	43.13	27.17	14.57	44.14	2.24	42.97	68.55	25.6	
Vert.	2402.000	PK	93.10	27.18	14.57	44.14	2.24	92.95	-	-	Carrier
Vert.	2400.000	PK	44.80	27.17	14.57	44.14	2.24	44.64	72.95	28.3	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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Shonan EMC Lab.

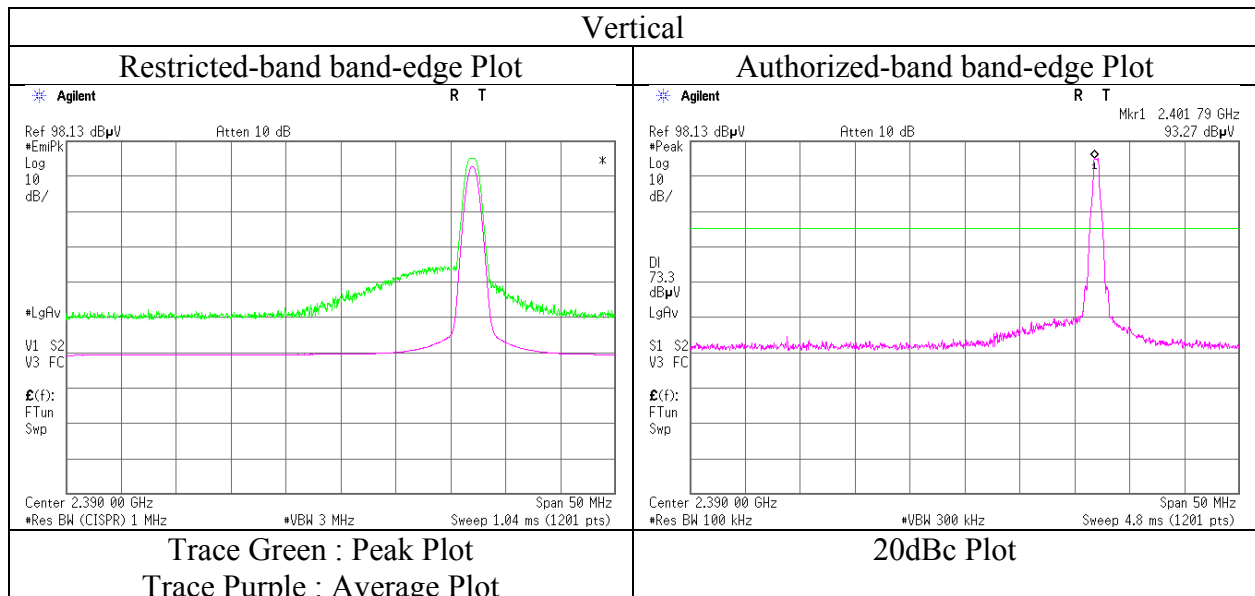
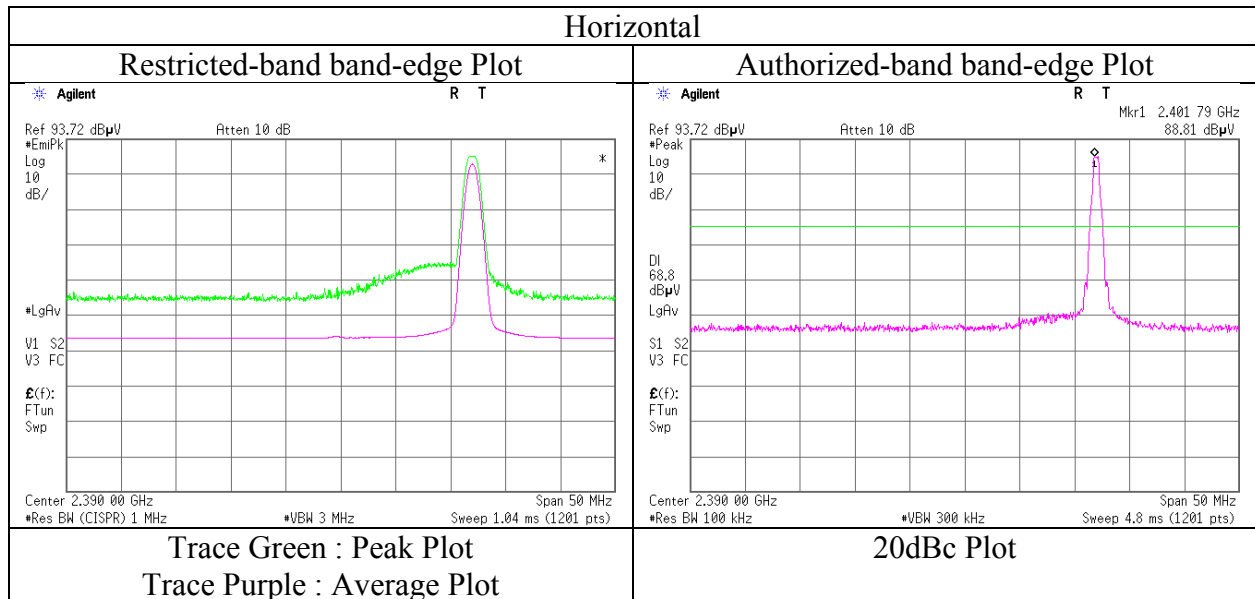
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12250629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12250629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	1
Date	April 14, 2018	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz, 13 GHz -26.5 GHz)	(1 GHz -13 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.	106.601	QP	41.00	11.01	7.43	32.15	0.00	27.29	43.50	16.2	292	115	
Hori.	135.800	QP	37.80	14.04	7.66	32.13	0.00	27.37	43.50	16.1	200	290	
Hori.	137.549	QP	41.00	14.15	7.70	32.13	0.00	30.72	43.50	12.7	200	261	
Hori.	139.287	QP	46.00	14.27	7.74	32.13	0.00	35.88	43.50	7.6	200	55	
Hori.	140.950	QP	40.70	14.36	7.77	32.13	0.00	30.70	43.50	12.8	200	49	
Hori.	356.363	QP	42.70	14.49	9.02	31.95	0.00	34.26	46.00	11.7	100	315	
Hori.	602.042	QP	32.00	19.04	10.03	31.95	0.00	29.12	46.00	16.8	150	213	
Hori.	960.000	QP	33.00	22.10	11.23	30.57	0.00	35.76	46.00	10.2	150	203	
Hori.	4882.000	PK	56.10	31.31	7.20	44.48	2.24	52.37	73.90	21.5	100	306	
Hori.	7323.000	PK	44.50	36.51	8.86	44.03	2.24	48.08	73.90	25.8	100	0	
Hori.	9764.000	PK	44.00	38.37	10.37	43.85	2.24	51.13	73.90	22.7	100	0	
Hori.	4882.000	AV	49.90	31.31	7.20	44.48	2.24	46.17	53.90	7.7	100	306	
Hori.	7323.000	AV	35.90	36.51	8.86	44.03	2.24	39.48	53.90	14.4	100	0	
Hori.	9764.000	AV	36.00	38.37	10.37	43.85	2.24	43.13	53.90	10.7	100	0	
Vert.	103.126	QP	41.00	10.50	7.47	32.16	0.00	26.81	43.50	16.6	100	261	
Vert.	104.868	QP	40.70	10.75	7.45	32.16	0.00	26.74	43.50	16.7	100	253	
Vert.	139.265	QP	44.20	14.27	7.74	32.13	0.00	34.08	43.50	9.4	100	288	
Vert.	675.841	QP	33.60	19.37	10.30	31.92	0.00	31.35	46.00	14.6	100	187	
Vert.	960.000	QP	32.90	22.10	11.23	30.57	0.00	35.66	46.00	10.3	100	203	
Vert.	4882.000	PK	55.00	31.31	7.20	44.48	2.24	51.27	73.90	22.6	287	275	
Vert.	7323.000	PK	47.00	36.51	8.86	44.03	2.24	50.58	73.90	23.3	100	0	
Vert.	9764.000	PK	46.20	38.37	10.37	43.85	2.24	53.33	73.90	20.5	100	0	
Vert.	4882.000	AV	47.30	31.31	7.20	44.48	2.24	43.57	53.90	10.3	287	275	
Vert.	7323.000	AV	35.90	36.51	8.86	44.03	2.24	39.48	53.90	14.4	100	0	
Vert.	9764.000	AV	36.10	38.37	10.37	43.85	2.24	43.23	53.90	10.6	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

Report No.	12250629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	1
Date	April 14, 2018	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz, 13 GHz -26.5 GHz)	(1 GHz -13 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.	106.600	QP	40.60	11.01	7.43	32.15	0.00	26.89	43.50	16.6	300	111	
Hori.	135.884	QP	38.00	14.04	7.66	32.13	0.00	27.57	43.50	15.9	200	299	
Hori.	137.550	QP	40.80	14.15	7.70	32.13	0.00	30.52	43.50	12.9	200	262	
Hori.	139.222	QP	45.70	14.27	7.74	32.13	0.00	35.58	43.50	7.9	200	55	
Hori.	140.958	QP	41.00	14.36	7.77	32.13	0.00	31.00	43.50	12.5	200	45	
Hori.	356.366	QP	42.70	14.49	9.02	31.95	0.00	34.26	46.00	11.7	100	319	
Hori.	602.112	QP	32.10	19.04	10.03	31.95	0.00	29.22	46.00	16.7	150	200	
Hori.	960.000	QP	32.80	22.10	11.23	30.57	0.00	35.56	46.00	10.4	150	204	
Hori.	2483.500	PK	46.80	27.45	14.66	44.16	2.24	46.99	73.90	26.9	100	102	
Hori.	4960.000	PK	58.80	31.48	7.22	44.51	2.24	55.23	73.90	18.6	100	310	
Hori.	7440.000	PK	46.00	36.68	8.94	44.08	2.24	49.78	73.90	24.1	100	0	
Hori.	9920.000	PK	45.00	38.63	10.34	43.87	2.24	52.34	73.90	21.5	100	0	
Hori.	2483.500	AV	37.30	27.45	14.66	44.16	2.24	37.49	53.90	16.4	100	102	
Hori.	4960.000	AV	52.60	31.48	7.22	44.51	2.24	49.03	53.90	4.8	100	310	
Hori.	7440.000	AV	36.40	36.68	8.94	44.08	2.24	40.18	53.90	13.7	100	0	
Hori.	9920.000	AV	36.30	38.63	10.34	43.87	2.24	43.64	53.90	10.2	100	0	
Vert.	103.202	QP	40.70	10.51	7.47	32.16	0.00	26.52	43.50	16.9	100	266	
Vert.	104.868	QP	40.70	10.75	7.45	32.16	0.00	26.74	43.50	16.7	100	253	
Vert.	139.273	QP	44.10	14.27	7.74	32.13	0.00	33.98	43.50	9.5	100	5	
Vert.	675.842	QP	33.70	19.37	10.30	31.92	0.00	31.45	46.00	14.5	100	191	
Vert.	960.000	QP	32.30	22.10	11.23	30.57	0.00	35.06	46.00	10.9	100	200	
Vert.	2483.500	PK	57.30	27.45	14.66	44.16	2.24	57.49	73.90	16.4	119	304	
Vert.	4960.000	PK	56.60	31.48	7.22	44.51	2.24	53.03	73.90	20.8	128	245	
Vert.	7440.000	PK	46.60	36.68	8.94	44.08	2.24	50.38	73.90	23.5	100	0	
Vert.	9920.000	PK	45.50	38.63	10.34	43.87	2.24	52.84	73.90	21.0	100	0	
Vert.	2483.500	AV	40.60	27.45	14.66	44.16	2.24	40.79	53.90	13.1	119	304	
Vert.	4960.000	AV	50.00	31.48	7.22	44.51	2.24	46.43	53.90	7.4	128	245	
Vert.	7440.000	AV	36.20	36.68	8.94	44.08	2.24	39.98	53.90	13.9	100	0	
Vert.	9920.000	AV	36.00	38.63	10.34	43.87	2.24	43.34	53.90	10.5	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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.

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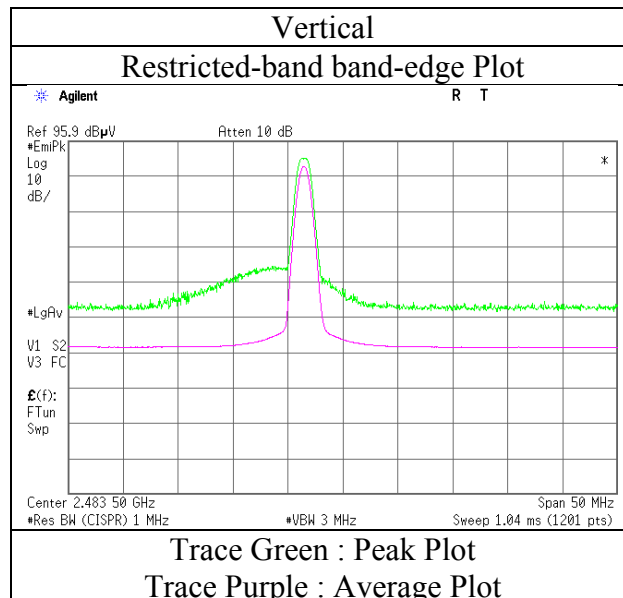
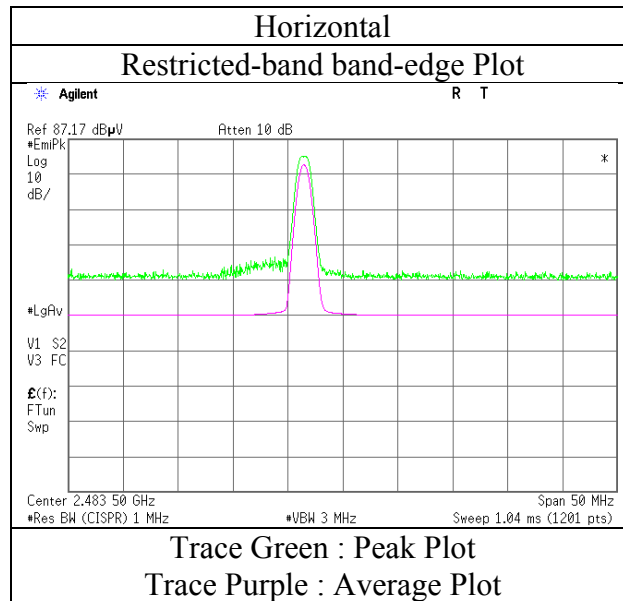
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12250629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No.	12250629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	1
Date	April 14, 2018	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz, 13 GHz -26.5 GHz)	(1 GHz -13 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.	106.603	QP	40.50	11.01	7.43	32.15	0.00	26.79	43.50	16.7	300	112	
Hori.	135.813	QP	37.10	14.04	7.66	32.13	0.00	26.67	43.50	16.8	200	299	
Hori.	137.546	QP	40.70	14.15	7.70	32.13	0.00	30.42	43.50	13.0	200	266	
Hori.	139.227	QP	45.20	14.27	7.74	32.13	0.00	35.08	43.50	8.4	200	53	
Hori.	140.924	QP	40.30	14.36	7.77	32.13	0.00	30.30	43.50	13.2	200	48	
Hori.	356.205	QP	42.20	14.49	9.02	31.95	0.00	33.76	46.00	12.2	100	315	
Hori.	602.111	QP	32.20	19.04	10.03	31.95	0.00	29.32	46.00	16.6	150	191	
Hori.	960.000	QP	32.40	22.10	11.23	30.57	0.00	35.16	46.00	10.8	150	27	
Hori.	2390.000	PK	49.40	27.14	14.56	44.13	2.24	49.21	73.90	24.6	232	237	
Hori.	4804.000	PK	56.50	31.13	7.17	44.45	2.24	52.59	73.90	21.3	130	234	
Hori.	7206.000	PK	46.30	36.35	8.80	43.99	2.24	49.70	73.90	24.2	100	0	
Hori.	9608.000	PK	46.40	38.11	10.39	43.83	2.24	53.31	73.90	20.5	100	0	
Hori.	2390.000	AV	37.00	27.14	14.56	44.13	2.24	36.81	53.90	17.0	232	237	
Hori.	4804.000	AV	49.00	31.13	7.17	44.45	2.24	45.09	53.90	8.8	130	234	
Hori.	7206.000	AV	35.80	36.35	8.80	43.99	2.24	39.20	53.90	14.7	100	0	
Hori.	9608.000	AV	36.30	38.11	10.39	43.83	2.24	43.21	53.90	10.6	100	0	
Vert.	104.867	QP	39.90	10.75	7.45	32.16	0.00	25.94	43.50	17.5	100	251	
Vert.	139.265	QP	43.00	14.27	7.74	32.13	0.00	32.88	43.50	10.6	100	283	
Vert.	307.204	QP	36.70	13.47	8.76	32.00	0.00	26.93	46.00	19.0	100	3	
Vert.	675.845	QP	34.20	19.37	10.30	31.92	0.00	31.95	46.00	14.0	100	199	
Vert.	960.000	QP	32.70	22.10	11.23	30.57	0.00	35.46	46.00	10.5	100	212	
Vert.	2390.000	PK	55.20	27.14	14.56	44.13	2.24	55.01	73.90	18.8	130	310	
Vert.	4804.000	PK	56.00	31.13	7.17	44.45	2.24	52.09	73.90	21.8	196	295	
Vert.	7206.000	PK	46.10	36.35	8.80	43.99	2.24	49.50	73.90	24.4	100	0	
Vert.	9608.000	PK	46.50	38.11	10.39	43.83	2.24	53.41	73.90	20.4	100	0	
Vert.	2390.000	AV	37.20	27.14	14.56	44.13	2.24	37.01	53.90	16.8	130	310	
Vert.	4804.000	AV	48.60	31.13	7.17	44.45	2.24	44.69	53.90	9.2	196	295	
Vert.	7206.000	AV	35.60	36.35	8.80	43.99	2.24	39.00	53.90	14.9	100	0	
Vert.	9608.000	AV	36.00	38.11	10.39	43.83	2.24	42.91	53.90	10.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 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	88.00	27.18	14.57	44.14	2.24	87.85	-	-	Carrier
Hori.	2400.000	PK	44.30	27.17	14.57	44.14	2.24	44.14	67.85	23.7	
Vert.	2402.000	PK	93.40	27.18	14.57	44.14	2.24	93.25	-	-	Carrier
Vert.	2400.000	PK	49.80	27.17	14.57	44.14	2.24	49.64	73.25	23.6	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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Shonan EMC Lab.

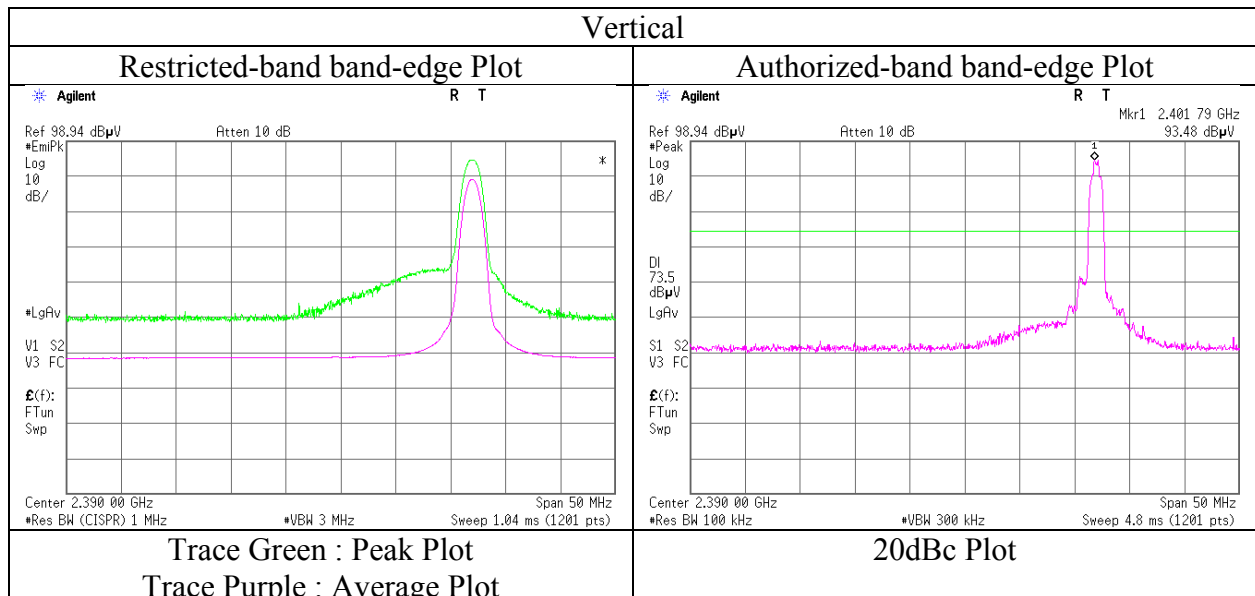
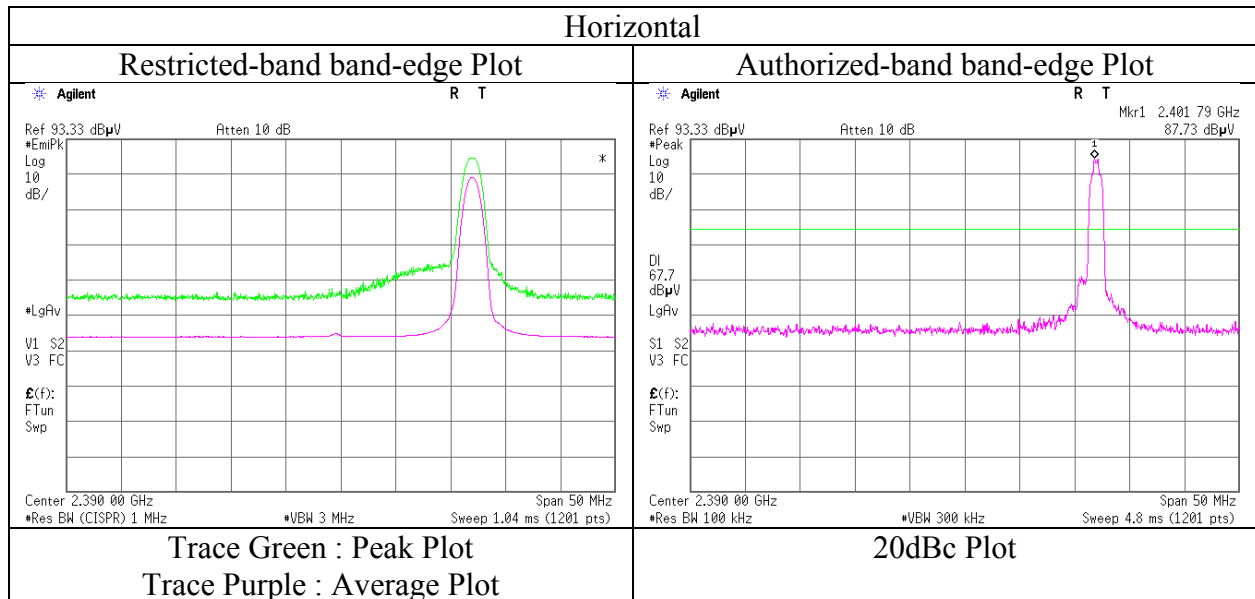
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12250629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama (1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	12250629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	1
Date	April 14, 2018	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz, 13 GHz -26.5 GHz)	(1 GHz -13 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.	106.607	QP	40.10	11.03	7.51	32.15	0.00	26.49	43.50	17.0	300	111	
Hori.	135.806	QP	36.60	14.15	7.72	32.13	0.00	26.34	43.50	17.1	200	291	
Hori.	137.543	QP	40.20	14.28	7.73	32.13	0.00	30.08	43.50	13.4	200	255	
Hori.	139.220	QP	44.40	14.40	7.74	32.13	0.00	34.41	43.50	9.0	200	55	
Hori.	140.930	QP	39.70	14.51	7.75	32.13	0.00	29.83	43.50	13.6	200	41	
Hori.	356.218	QP	39.70	14.49	9.02	31.95	0.00	31.26	46.00	14.7	100	319	
Hori.	960.000	QP	31.80	22.10	11.23	30.57	0.00	34.56	46.00	11.4	150	200	
Hori.	4882.000	PK	55.10	31.31	7.20	44.48	2.24	51.37	73.90	22.5	100	309	
Hori.	7323.000	PK	45.40	36.51	8.86	44.03	2.24	48.98	73.90	24.9	100	0	
Hori.	9764.000	PK	46.10	38.37	10.37	43.85	2.24	53.23	73.90	20.6	100	0	
Hori.	4882.000	AV	46.40	31.31	7.20	44.48	2.24	42.67	53.90	11.2	100	309	
Hori.	7323.000	AV	36.00	36.51	8.86	44.03	2.24	39.58	53.90	14.3	100	0	
Hori.	9764.000	AV	36.10	38.37	10.37	43.85	2.24	43.23	53.90	10.6	100	0	
Vert.	103.209	QP	40.10	10.53	7.48	32.16	0.00	25.95	43.50	17.5	100	249	
Vert.	104.865	QP	40.00	10.77	7.50	32.16	0.00	26.11	43.50	17.3	100	251	
Vert.	139.263	QP	44.20	14.41	7.74	32.13	0.00	34.22	43.50	9.2	100	276	
Vert.	675.845	QP	33.30	19.37	10.30	31.92	0.00	31.05	46.00	14.9	100	182	
Vert.	960.000	QP	32.50	22.10	11.23	30.57	0.00	35.26	46.00	10.7	100	199	
Vert.	4882.000	PK	54.00	31.31	7.20	44.48	2.24	50.27	73.90	23.6	293	289	
Vert.	7323.000	PK	46.00	36.51	8.86	44.03	2.24	49.58	73.90	24.3	100	0	
Vert.	9764.000	PK	46.50	38.37	10.37	43.85	2.24	53.63	73.90	20.2	100	0	
Vert.	4882.000	AV	46.60	31.31	7.20	44.48	2.24	42.87	53.90	11.0	293	289	
Vert.	7323.000	AV	35.90	36.51	8.86	44.03	2.24	39.48	53.90	14.4	100	0	
Vert.	9764.000	AV	35.90	38.37	10.37	43.85	2.24	43.03	53.90	10.8	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

Report No.	12250629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	1
Date	April 14, 2018	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz, 13 GHz -26.5 GHz)	(1 GHz -13 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.	106.590	QP	40.60	11.01	7.43	32.15	0.00	26.89	43.50	16.6	300	144	
Hori.	135.804	QP	37.60	14.04	7.66	32.13	0.00	27.17	43.50	16.3	200	300	
Hori.	137.544	QP	40.40	14.15	7.70	32.13	0.00	30.12	43.50	13.3	200	261	
Hori.	139.245	QP	44.80	14.27	7.74	32.13	0.00	34.68	43.50	8.8	200	279	
Hori.	140.963	QP	40.20	14.36	7.77	32.13	0.00	30.20	43.50	13.3	200	283	
Hori.	356.200	QP	39.50	14.49	9.02	31.95	0.00	31.06	46.00	14.9	100	307	
Hori.	602.114	QP	32.00	19.04	10.03	31.95	0.00	29.12	46.00	16.8	150	212	
Hori.	960.000	QP	32.00	22.10	11.23	30.57	0.00	34.76	46.00	11.2	150	190	
Hori.	2483.500	PK	48.20	27.45	14.66	44.16	2.24	48.39	73.90	25.5	165	72	
Hori.	4960.000	PK	59.10	31.48	7.22	44.51	2.24	55.53	73.90	18.3	100	313	
Hori.	7440.000	PK	46.00	36.68	8.94	44.08	2.24	49.78	73.90	24.1	100	0	
Hori.	9920.000	PK	45.10	38.63	10.34	43.87	2.24	52.44	73.90	21.4	100	0	
Hori.	2483.500	AV	37.60	27.45	14.66	44.16	2.24	37.79	53.90	16.1	165	72	
Hori.	4960.000	AV	51.20	31.48	7.22	44.51	2.24	47.63	53.90	6.2	100	313	
Hori.	7440.000	AV	36.30	36.68	8.94	44.08	2.24	40.08	53.90	13.8	100	0	
Hori.	9920.000	AV	36.30	38.63	10.34	43.87	2.24	43.64	53.90	10.2	100	0	
Vert.	103.143	QP	39.70	10.50	7.47	32.16	0.00	25.51	43.50	17.9	100	254	
Vert.	104.870	QP	39.80	10.75	7.45	32.16	0.00	25.84	43.50	17.6	100	253	
Vert.	139.224	QP	42.90	14.27	7.74	32.13	0.00	32.78	43.50	10.7	100	288	
Vert.	675.847	QP	33.20	19.37	10.30	31.92	0.00	30.95	46.00	15.0	100	190	
Vert.	960.000	QP	32.10	22.10	11.23	30.57	0.00	34.86	46.00	11.1	100	208	
Vert.	2483.500	PK	52.70	27.45	14.66	44.16	2.24	52.89	73.90	21.0	100	310	
Vert.	4960.000	PK	54.80	31.48	7.22	44.51	2.24	51.23	73.90	22.6	100	253	
Vert.	7440.000	PK	46.40	36.68	8.94	44.08	2.24	50.18	73.90	23.7	100	0	
Vert.	9920.000	PK	45.50	38.63	10.34	43.87	2.24	52.84	73.90	21.0	100	0	
Vert.	2483.500	AV	39.90	27.45	14.66	44.16	2.24	40.09	53.90	13.8	100	310	
Vert.	4960.000	AV	46.60	31.48	7.22	44.51	2.24	43.03	53.90	10.8	100	253	
Vert.	7440.000	AV	36.00	36.68	8.94	44.08	2.24	39.78	53.90	14.1	100	0	
Vert.	9920.000	AV	36.00	38.63	10.34	43.87	2.24	43.34	53.90	10.5	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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.

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Shonan EMC Lab.

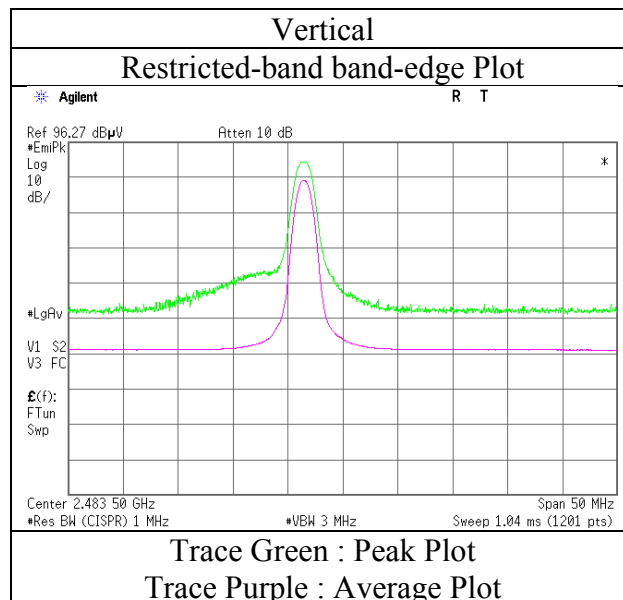
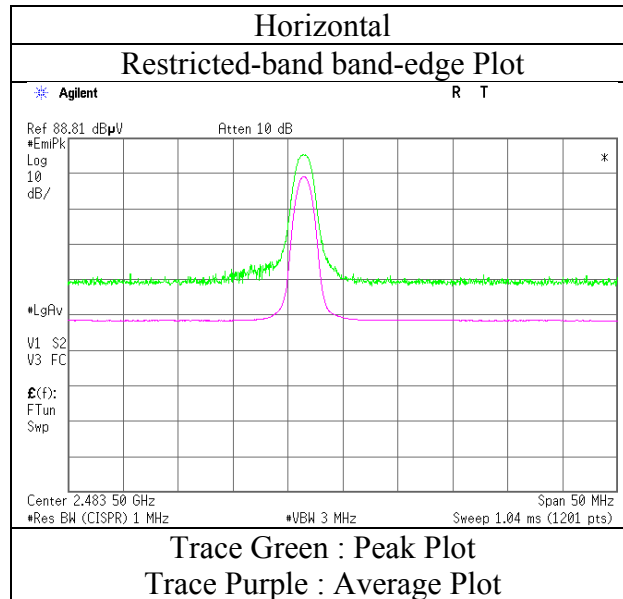
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Radiated Spurious Emission
(Reference Plot for band-edge)

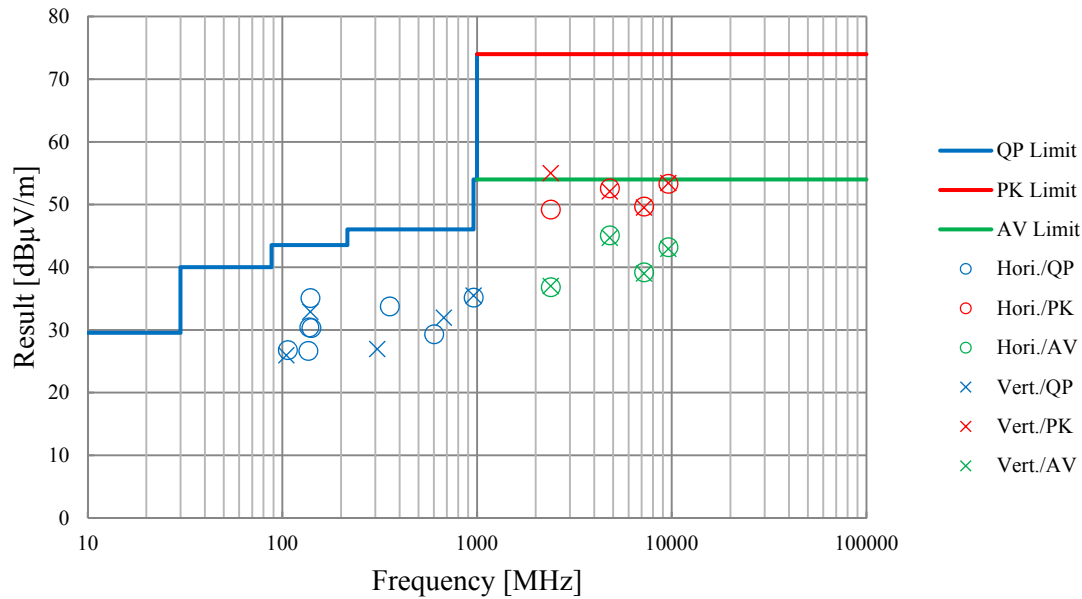
Report No. 12250629S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 1
Date April 16, 2018
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Kazutaka Takeyama
(1 GHz -13 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12250629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	1
Date	April 14, 2018	April 16, 2018
Temperature / Humidity	22 deg. C / 36 % RH	22 deg. C / 36 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz, 13 GHz -26.5 GHz)	(1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

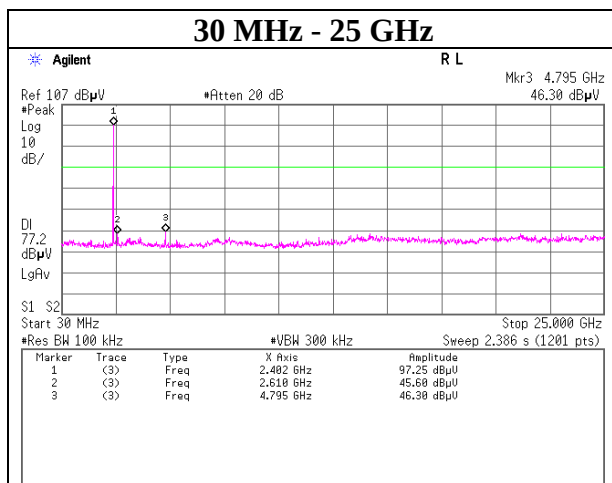
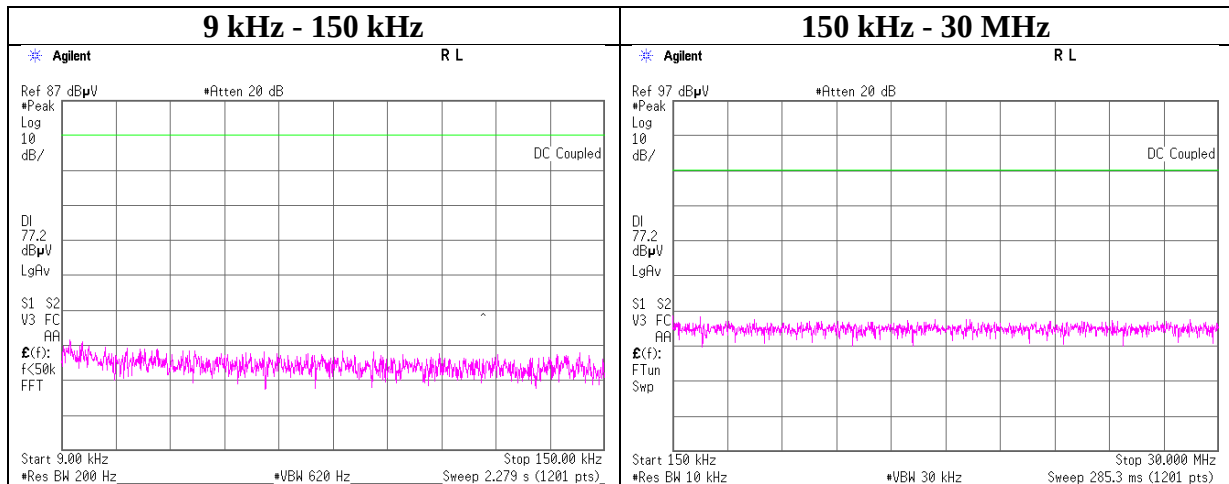


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off, DH5

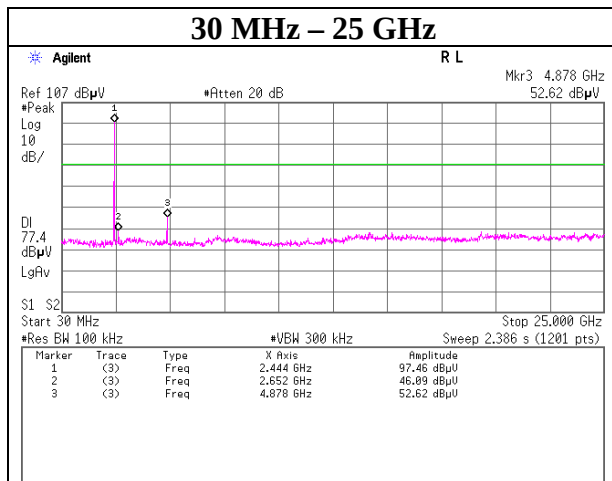
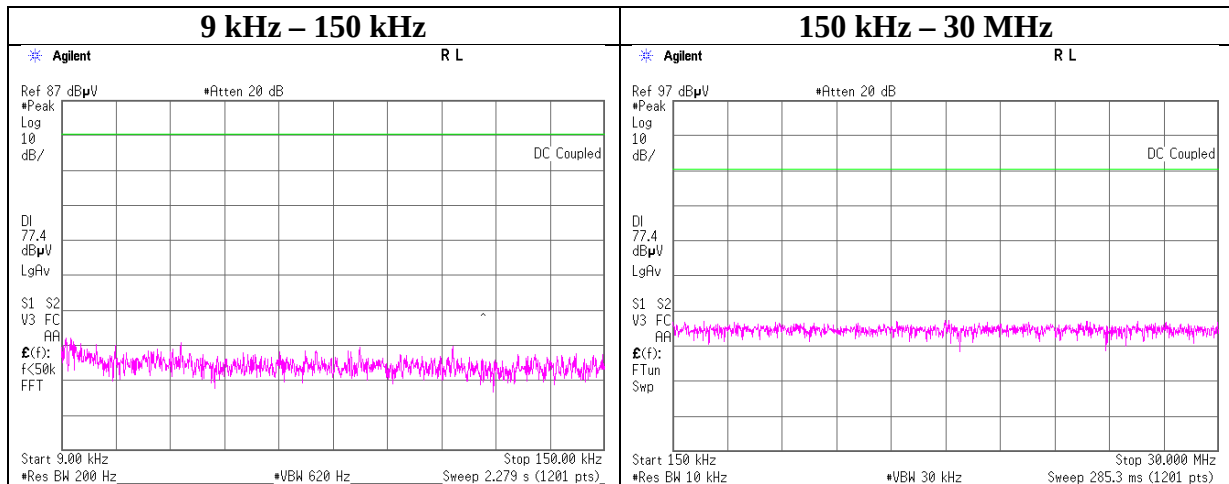
2402 MHz



Conducted Spurious Emission

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off, DH5

2441 MHz



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Shonan EMC Lab.

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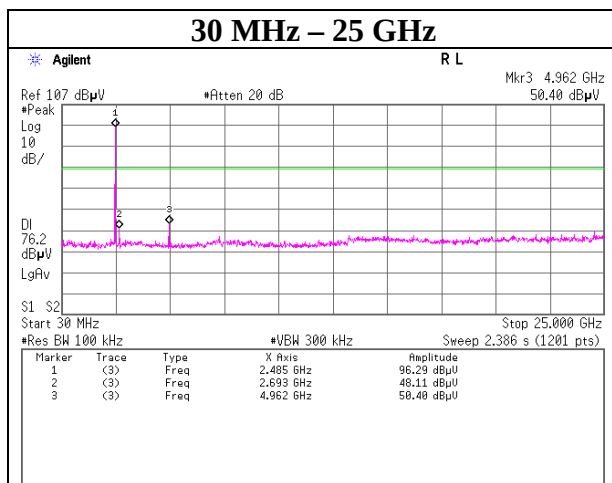
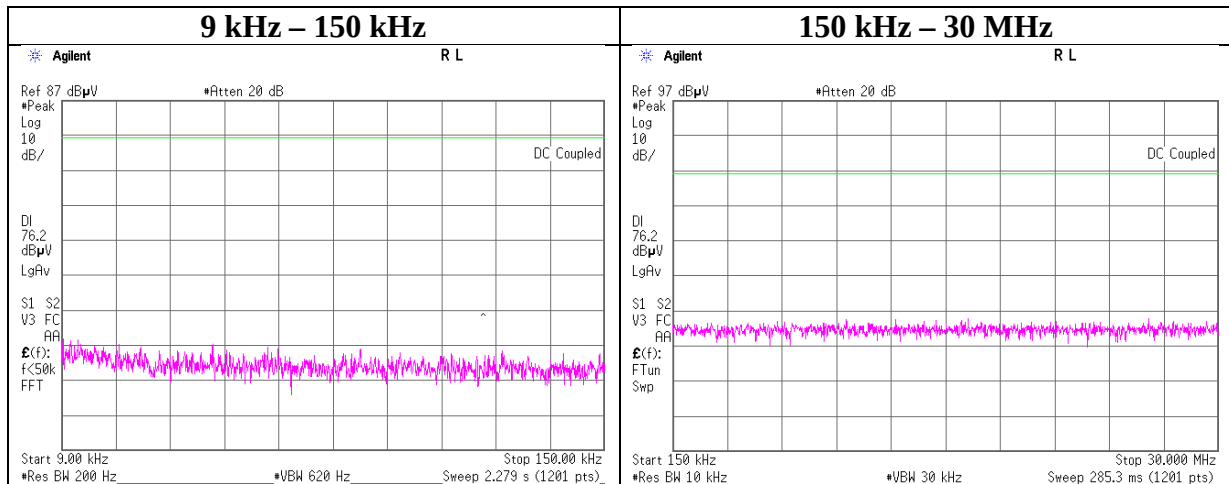
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off, DH5

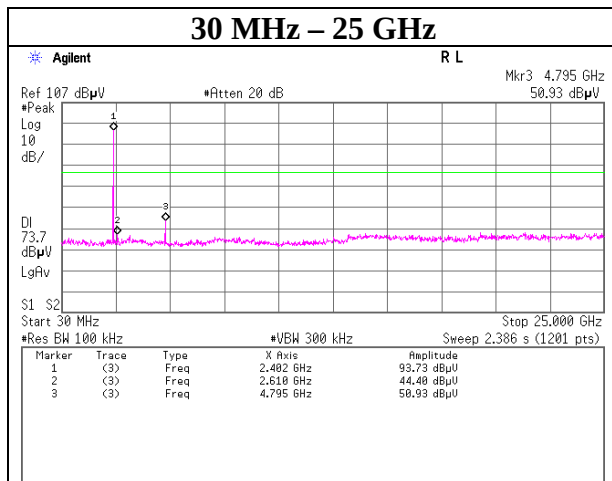
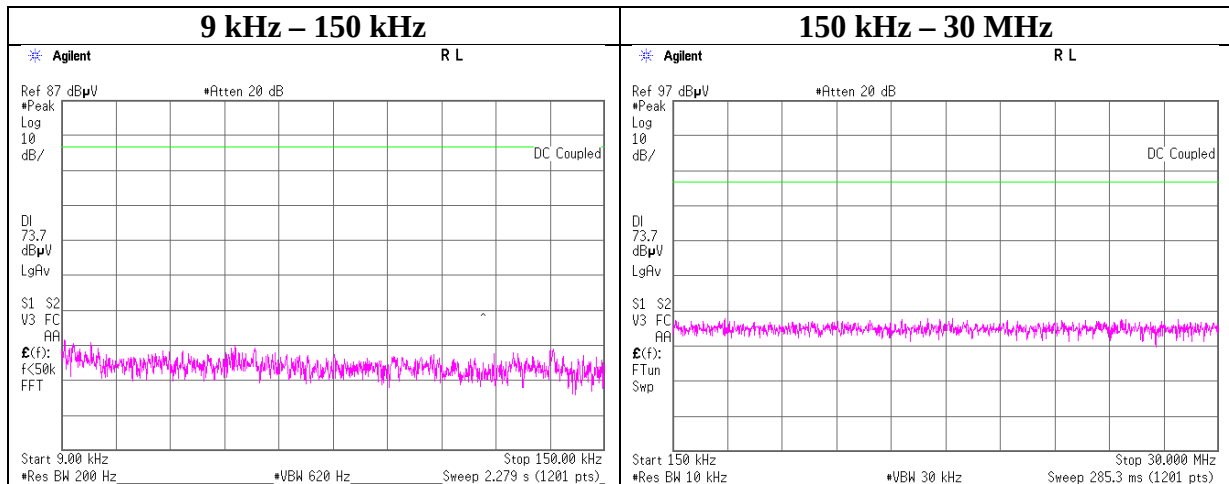
2480 MHz



Conducted Spurious Emission

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off, 3DH5

2402 MHz



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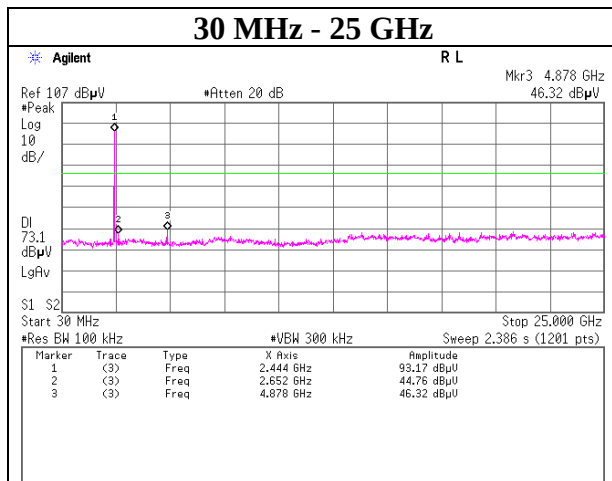
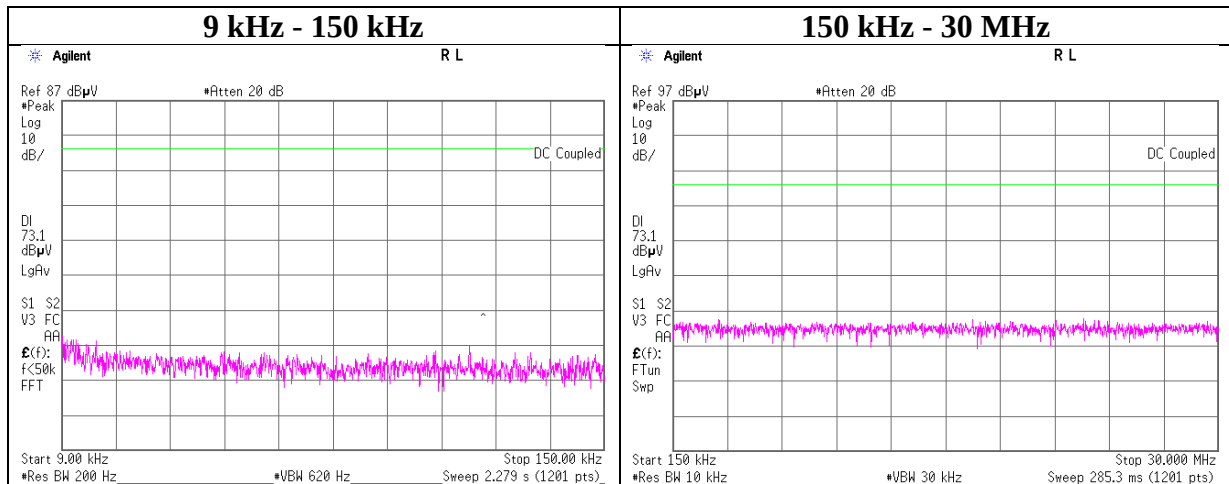
Telephone : +81 463 50 6400

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Conducted Spurious Emission

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off, 3DH5

2441 MHz



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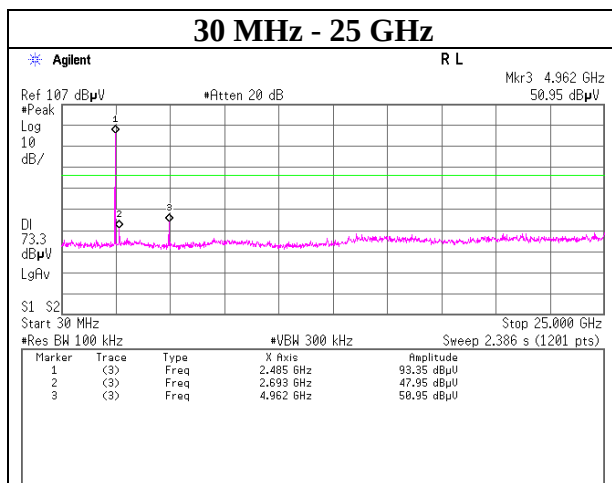
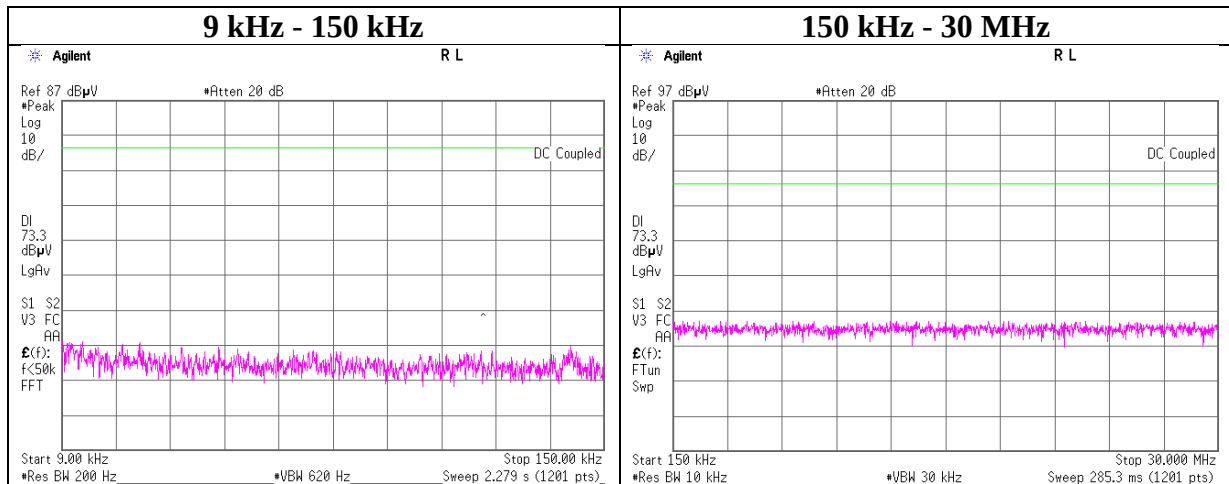
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No.	12250629S-A-R2
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 11, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Tatsuya Arai
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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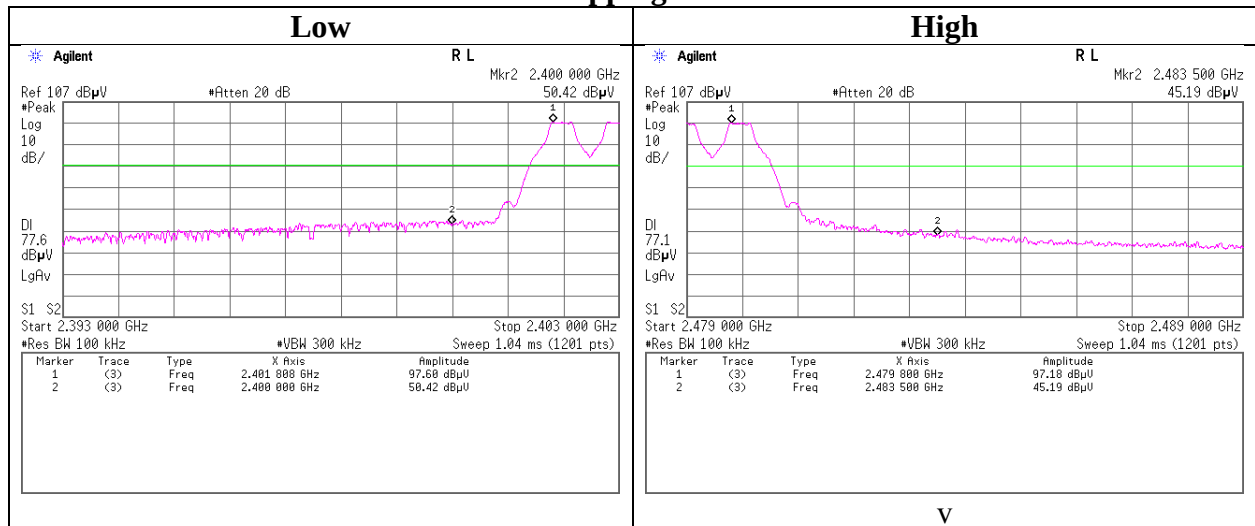
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

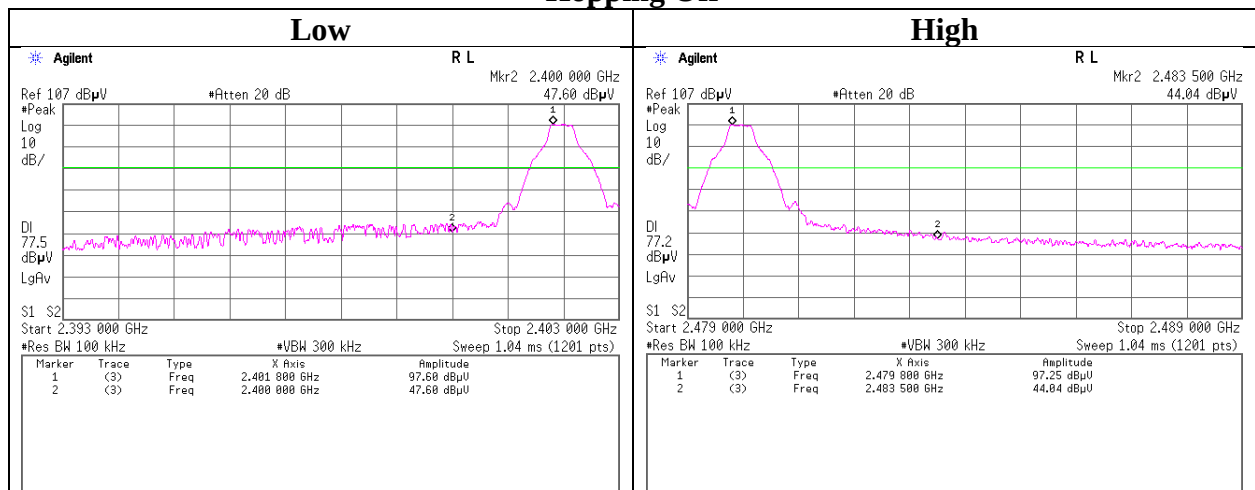
Conducted Emission Band Edge compliance

Report No. 12250629S-A-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 11, 2018
Temperature / Humidity 24 deg. C / 35 % RH
Engineer Tatsuya Arai
Mode Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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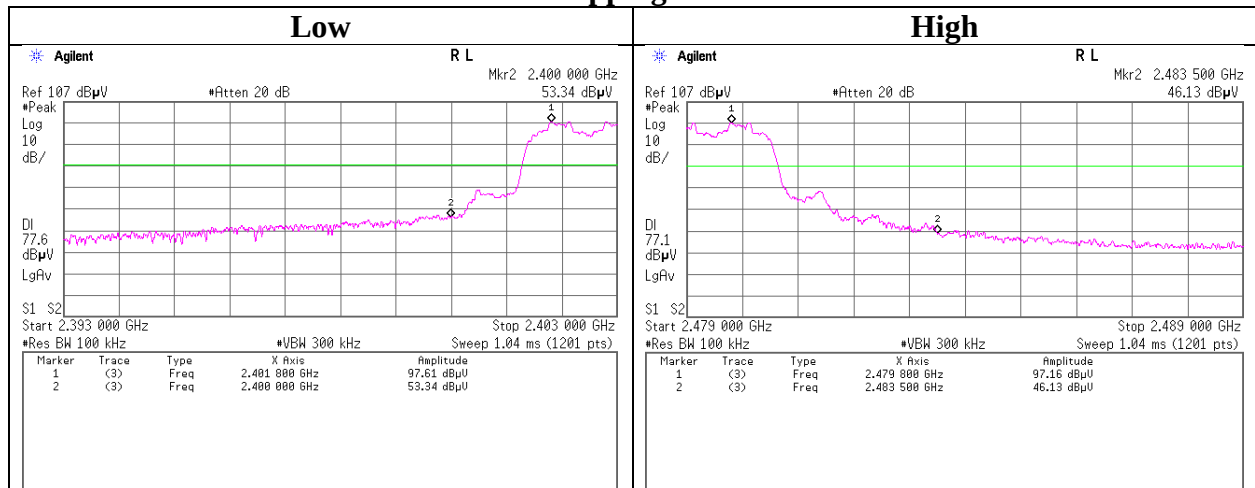
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

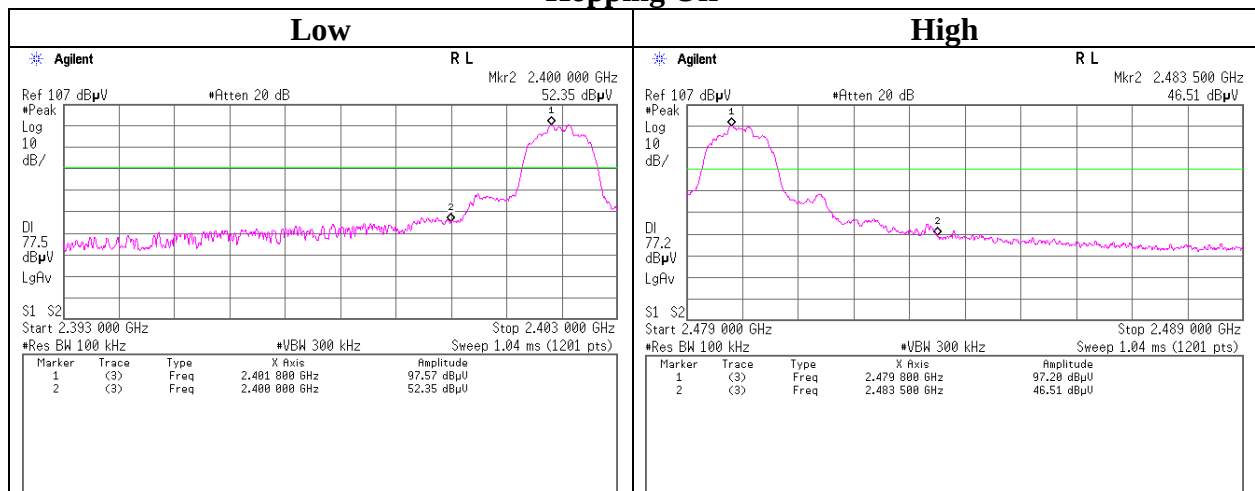
Conducted Emission Band Edge compliance

Report No.	12250629S-A-R2
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 11, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Tatsuya Arai
Mode	Tx 3DH5

Hopping On



Hopping Off



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APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SRENT-09	Spectrum Analyzer	Agilent	E4440A	MY46186392	AT	2017/11/08 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2017/04/25 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2017/04/25 * 12
SAT10-14	Attenuator	Weinschel Corp.	54A-10	81595	AT	2017/04/20 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2018/03/19 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2017/12/21 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/01/30 * 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	2018/02/16 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2017/11/24 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,C E,RFI,MF)	-	RE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2017/10/16 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2017/06/13 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2017/04/20 * 12
SCC-G45	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102 E	800137/2EA	RE	2018/03/28 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2018/01/29 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
SAT10-05	Attenuator(above 1 GHz)	Agilent	8493C-010	74864	RE	2017/11/22 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	RE	2017/07/20 * 12
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000N FSNMS/B	1612S006	RE	2018/01/29 * 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

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