



RADIO TEST REPORT

Test Report No. : 12236091S-A-R1

Applicant : Sony Corporation
Type of Equipment : AV Receiver
Model No. : XAV-AX1000
FCC ID : AX8XAVAX1000
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.
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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 12236091S-A. 12236091S-A is replaced with this report.

Date of test: March 30 to April 12, 2018

Representative test engineer:

Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by:

Akio Hayashi
Leader
Consumer Technology Division



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Testing
RTL02610

- ☐ 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

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SECTION 1: Customer information

Company Name : Sony Corporation
Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 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-AX1000
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12 V (car battery)
Receipt Date of Sample : March 27, 2018
Country of Mass-production : Thailand
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-AX1000 (referred to as the EUT in this report) is an AV Receiver.

Similar model: XAV-V10BT

	XAV-AX1000	XAV-V10BT	Remarks
Software	Apple Car Play compliant	Apple Car Play non-compliant	-
Substrate	DISPLAY substrate: -w/ Apple certified tip	DISPLAY substrate: -w/o Apple certified tip -w/o other related parts	-
F panel M/N	XAV-AX1000	XAV-V10BT	-
Nameplate	XAV-AX1000	XAV-V10BT	-

General Specification

Clock frequency(ies) in the system : 26 MHz (BT)

Radio Specification

Equipment Type : Transceiver
Frequency of Operation : 2402 MHz – 2480 MHz
Type of Modulation : FHSS
Antenna Type : Monopole Antenna
Antenna Gain : -1.059 dBi
Operating Temperature : -20 deg. C to +60 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

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

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	*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	4.9 dB 142.707 MHz, QP, Hori. 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 mains. *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 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.

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3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

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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	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.3 dB	4.3 dB	4.3 dB	-	-
	200 MHz-1 GHz	5.9 dB	5.9 dB	5.9 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	-	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	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 %

Radiated emission test

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

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

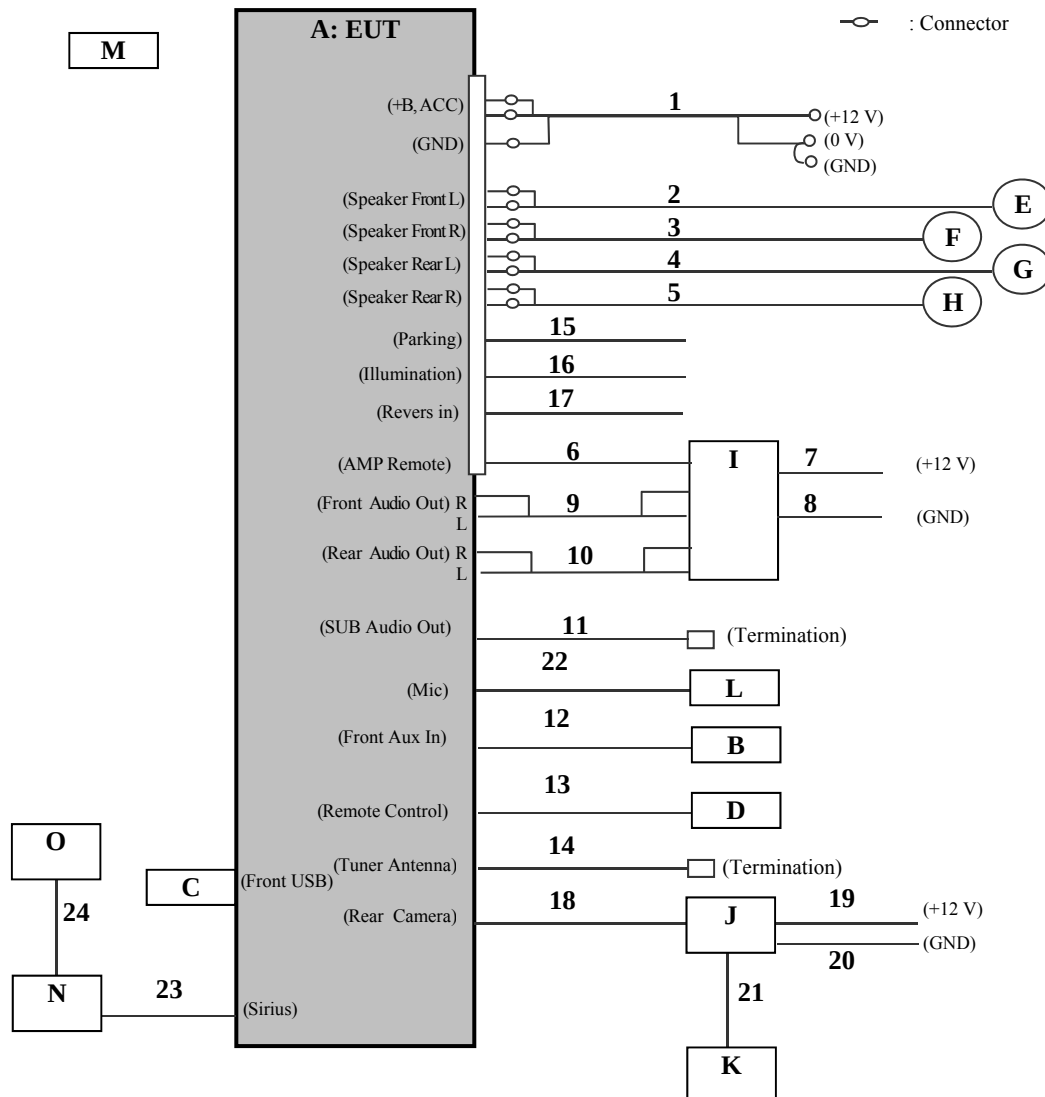
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, 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 BlueTest3 Version 2.5.0 *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 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	AV Receiver	XAV-AX1000	034 *1) 035 *2)	Sony	EUT
B	Digital Media Player	NW-A828	5072265	Sony	-
C	USB memory	SDK-USM4G-I	-	Sony	4 GB
D	Wired Remote Controller	RM-X4S	-	Sony	-
E	Speaker 1	IS-10	-	-	-
F	Speaker 2	IS-10	-	-	-
G	Speaker 3	XS-PKF1621	-	Sony	-
H	Speaker 4	XS-PKF1621	-	Sony	-
I	Monaural Power Amplifier	XM-4S-020	-	Sony	-
J	Camera Box	XA-R800C	100114	Sony	-
K	Rear Camera	R800C	100114	Sony	-
L	Mic	-	-	-	-
M	Remote Controller	RM-X170	-	Sony	-
N	SIRIUS XM Connect Vehicle Tuner	SXV300	1VH90D08	Sirius XM Radio Inc.	-
O	Vehicle Satellite Radio Antenna	NGVA3	1624A	Sirius XM Radio Inc.	-

*1) Used for Radiated emission tests.

*2) Used for Antenna terminal conducted tests.

List of cables used

No.	Name	Length (m)	Shield (Cable)		Remarks
			Cable	Connector	
1	DC Power	0.15 +1.1	Unshielded	Unshielded	-
2	Speaker (1)	0.15 +2.6	Unshielded	Unshielded	-
3	Speaker (2)	0.15 +2.6	Unshielded	Unshielded	-
4	Speaker (3)	0.15 +2.0	Unshielded	Unshielded	-
5	Speaker (4)	0.15 +2.0	Unshielded	Unshielded	-
6	AMP Remote	0.15 +1.5	Unshielded	Unshielded	-
7	DC Power (+)	1.3	Unshielded	Unshielded	-
8	DC Power (-)	1.3	Unshielded	Unshielded	-
9	RCA (Rear Audio Out)	3.0	Shielded	Shielded	-
10	RCA (Rear Audio Out)	3.0	Shielded	Shielded	-
11	RCA (SUB Audio Out)	1.9	Shielded	Shielded	-
12	Stereo mini (Front AUX)	3.0	Shielded	Shielded	-
13	Remote Control	2.0	Shielded	Shielded	-
14	Tuner Antenna	1.1	Shielded	Shielded	-
15	Parking	2.0	Unshielded	Unshielded	-
16	Illumination	0.15 + 1.0	Unshielded	Unshielded	-
17	Revers in	0.15 + 1.0	Unshielded	Unshielded	-
18	RCA (Rear Camera)	3.0	Shielded	Shielded	-
19	DC Power (+)	1.0	Unshielded	Unshielded	-
20	DC Power (-)	1.0	Unshielded	Unshielded	-
21	Camera	3.0	Shielded	Shielded	-
22	Mic	3.5	Unshielded	Unshielded	-
23	Sirius Tuner	0.65	Shielded	Shielded	-
24	Sirius Antenna	7.0	Shielded	Shielded	-

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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	3.9 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.9 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: $20 \times \log (3.9 \text{ m}/3.0 \text{ m}) = 2.28 \text{ dB}$

*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 0 deg. and 30 deg. angle of EUT to see the angle 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	30 deg.	0 deg.	30 deg.	0 deg.	0 deg.
Vertical	30 deg.	0 deg.	30 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

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	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) Peak hold was applied as Worst-case measurement.

*2) Reference data

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

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

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

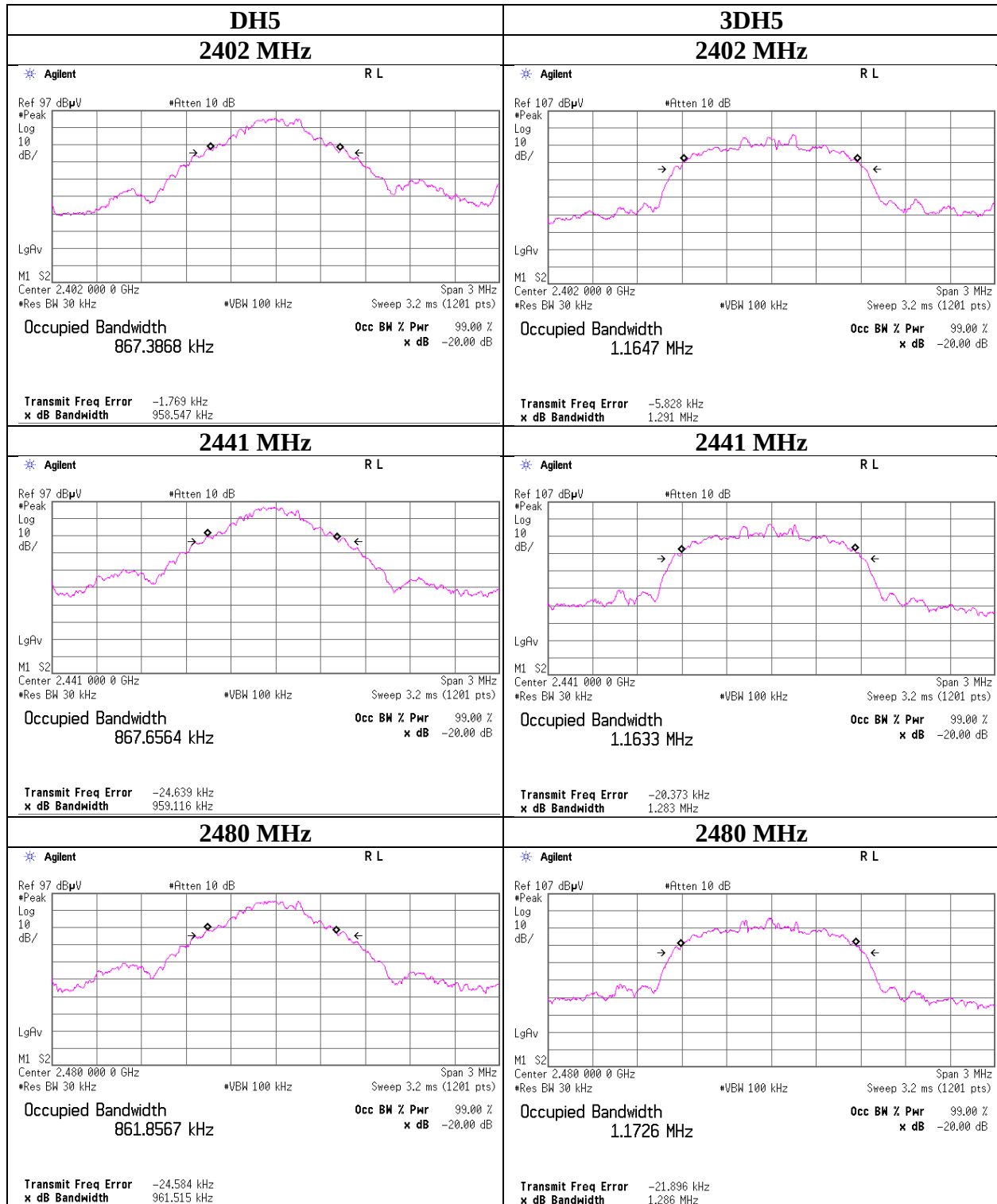
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12236091S-A-R1
Date March 30, 2018
Temperature / Humidity 25 deg. C / 30 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.959	867.387	1.000	≥ 0.639
DH5	2441.0	0.959	867.656	1.000	≥ 0.639
DH5	2480.0	0.962	861.857	1.000	≥ 0.641
DH5	Hopping On	-	78439.430	-	-
3DH5	2402.0	1.291	1164.695	1.000	≥ 0.861
3DH5	2441.0	1.283	1163.340	1.000	≥ 0.855
3DH5	2480.0	1.286	1172.581	1.000	≥ 0.857
3DH5	Hopping On	-	78519.320	-	-

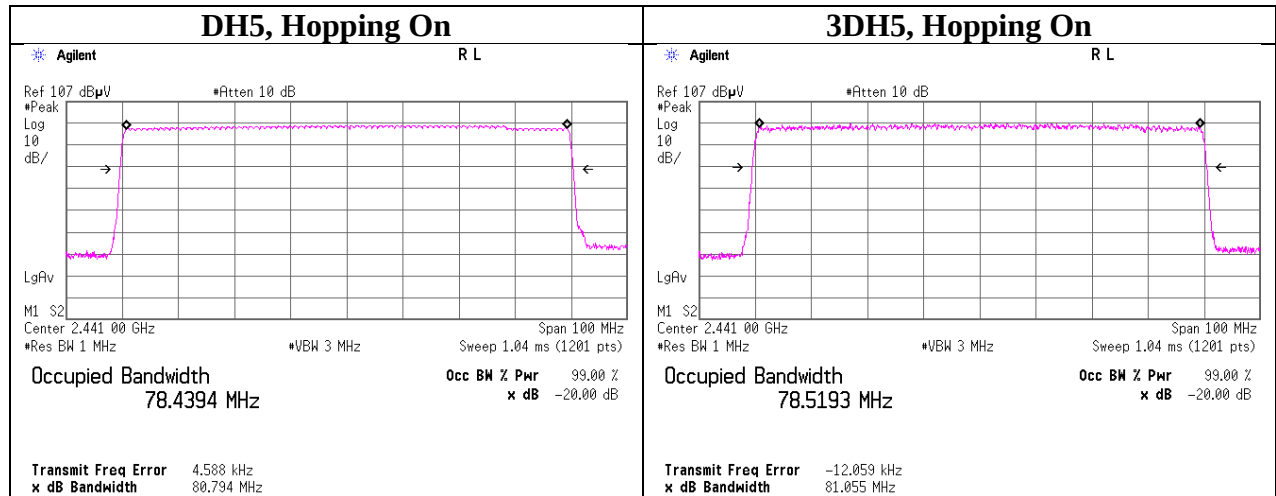
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



20dB Bandwidth and 99% Occupied Bandwidth



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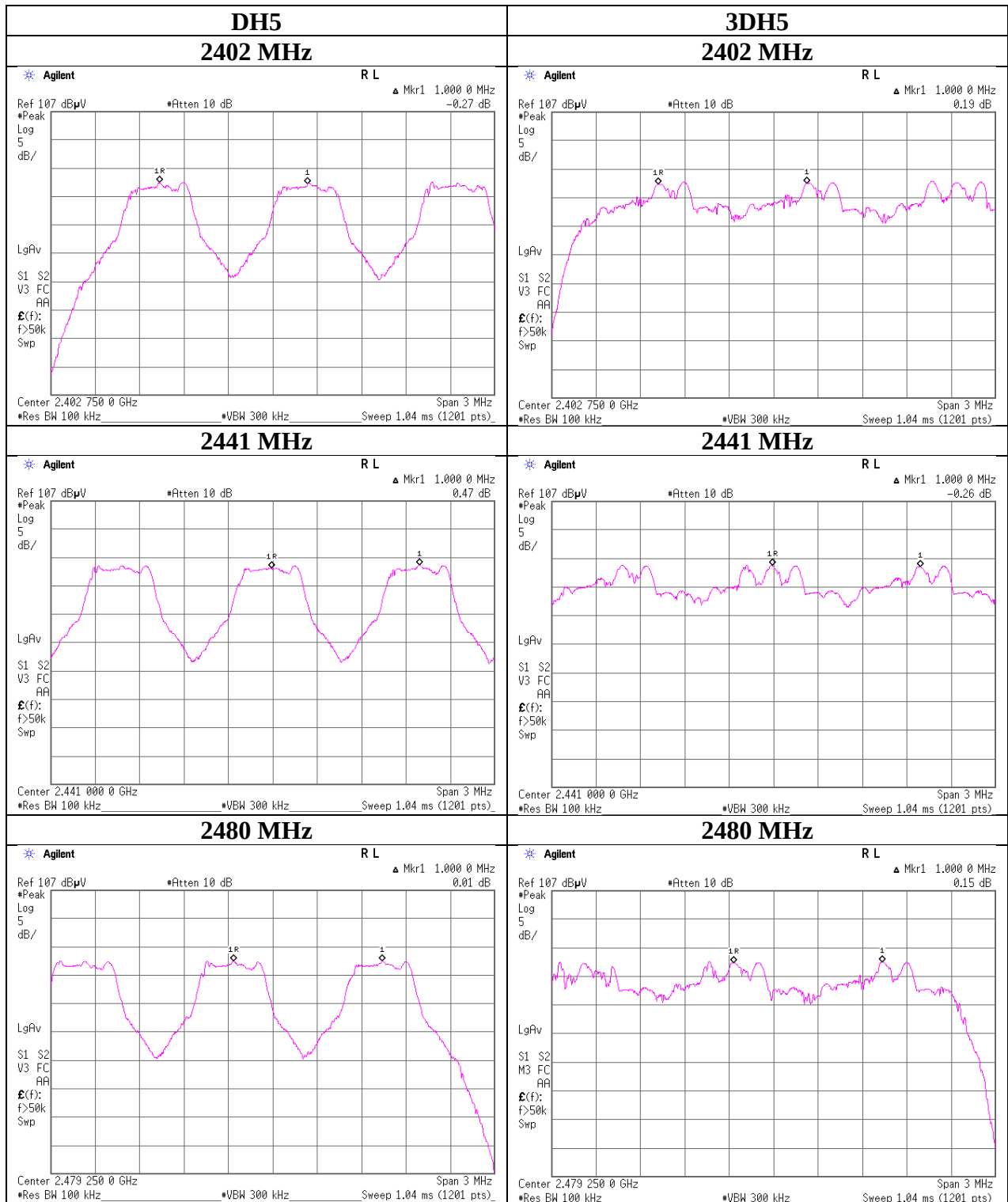
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Carrier Frequency Separation



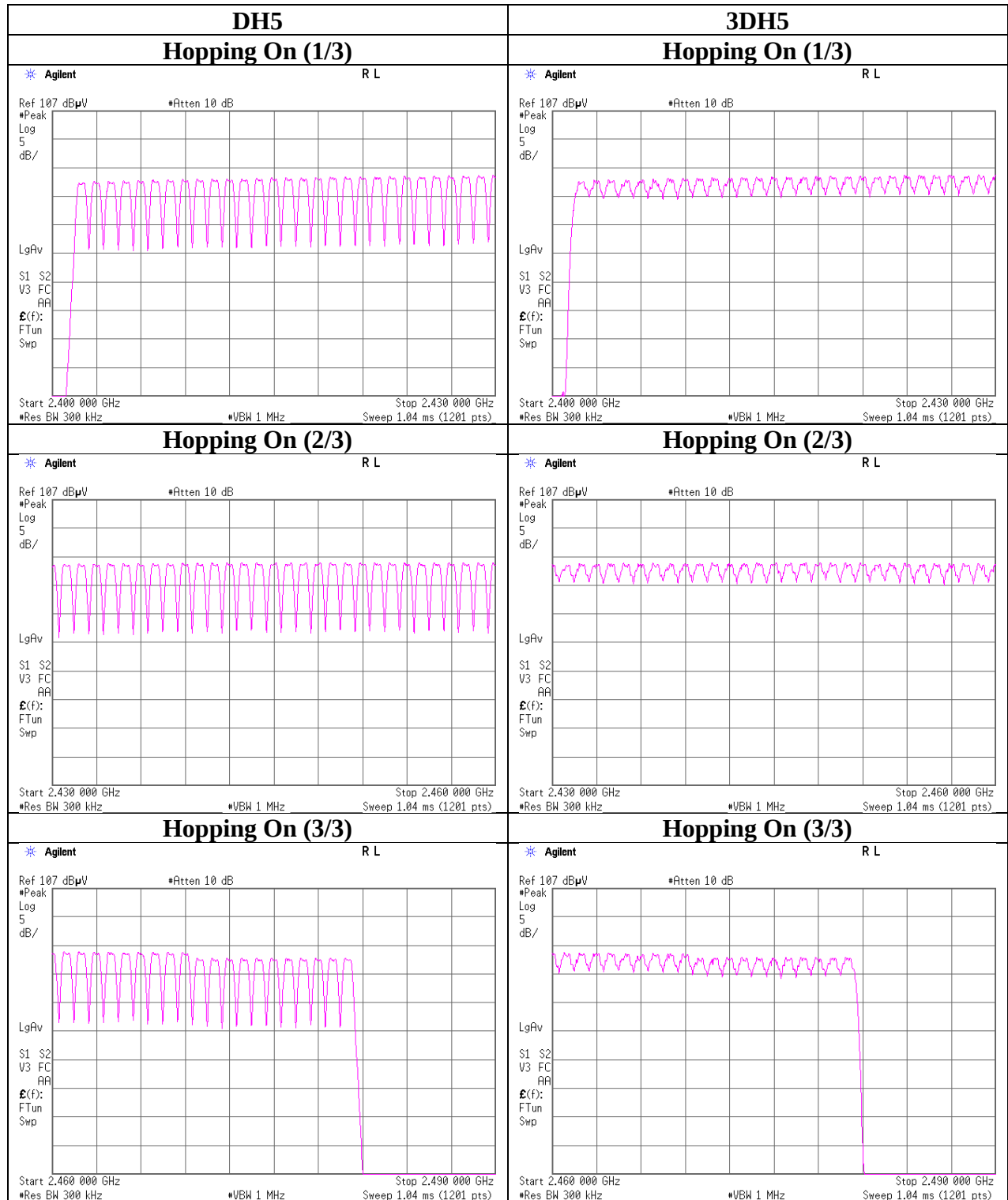
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12236091S-A-R1
Date March 30, 2018
Temperature / Humidity 25 deg. C / 30 % RH
Engineer Makoto Hosaka
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

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12236091S-A-R1
Date March 30, 2018
Temperature / Humidity 25 deg. C / 30 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping On

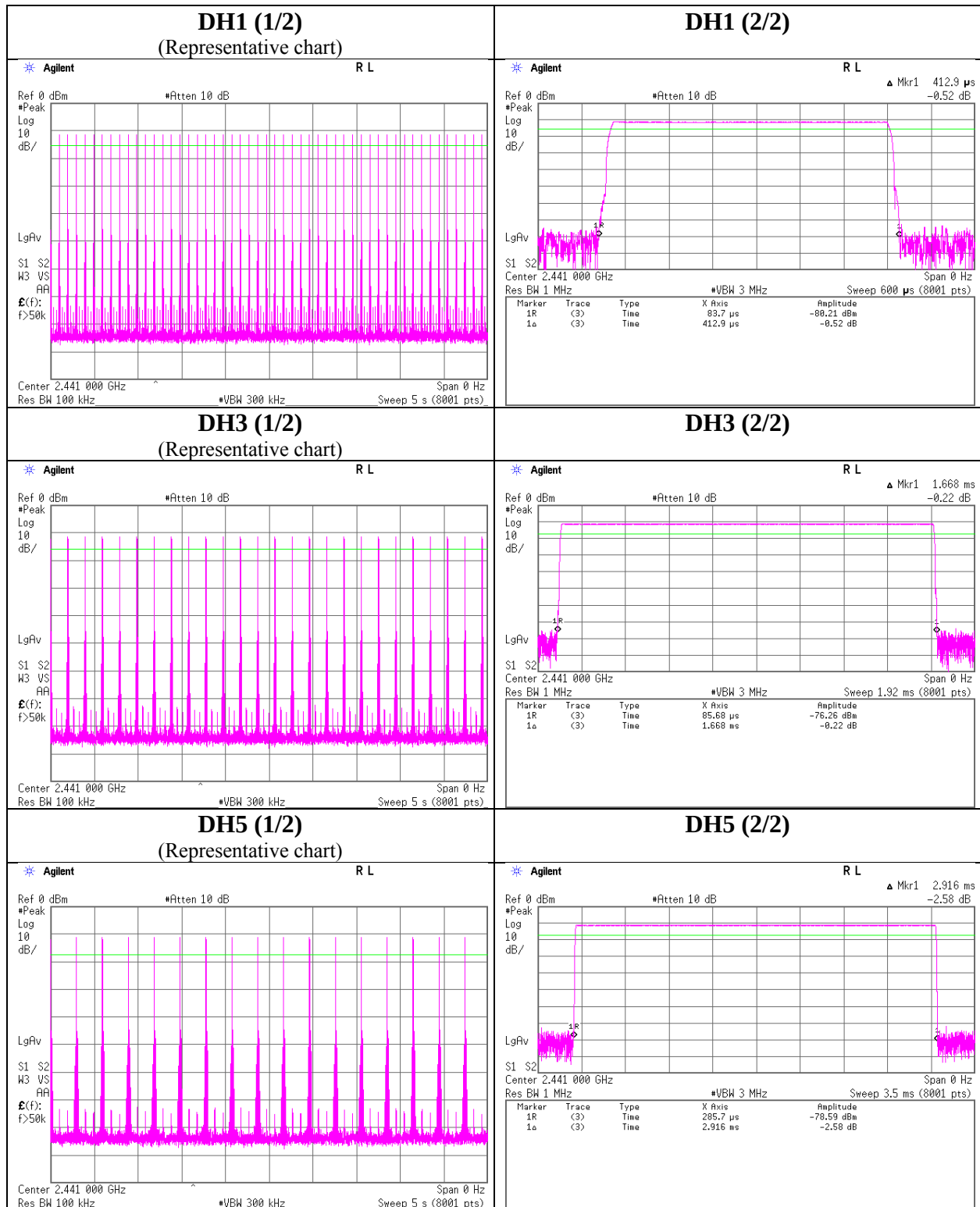
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times	/	5 sec.	x 31.6 sec. = 323 times	0.413	133	400
DH3	26.0 times	/	5 sec.	x 31.6 sec. = 165 times	1.668	275	400
DH5	17.0 times	/	5 sec.	x 31.6 sec. = 108 times	2.916	315	400
3DH1	51.0 times	/	5 sec.	x 31.6 sec. = 323 times	0.429	139	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	2.933	317	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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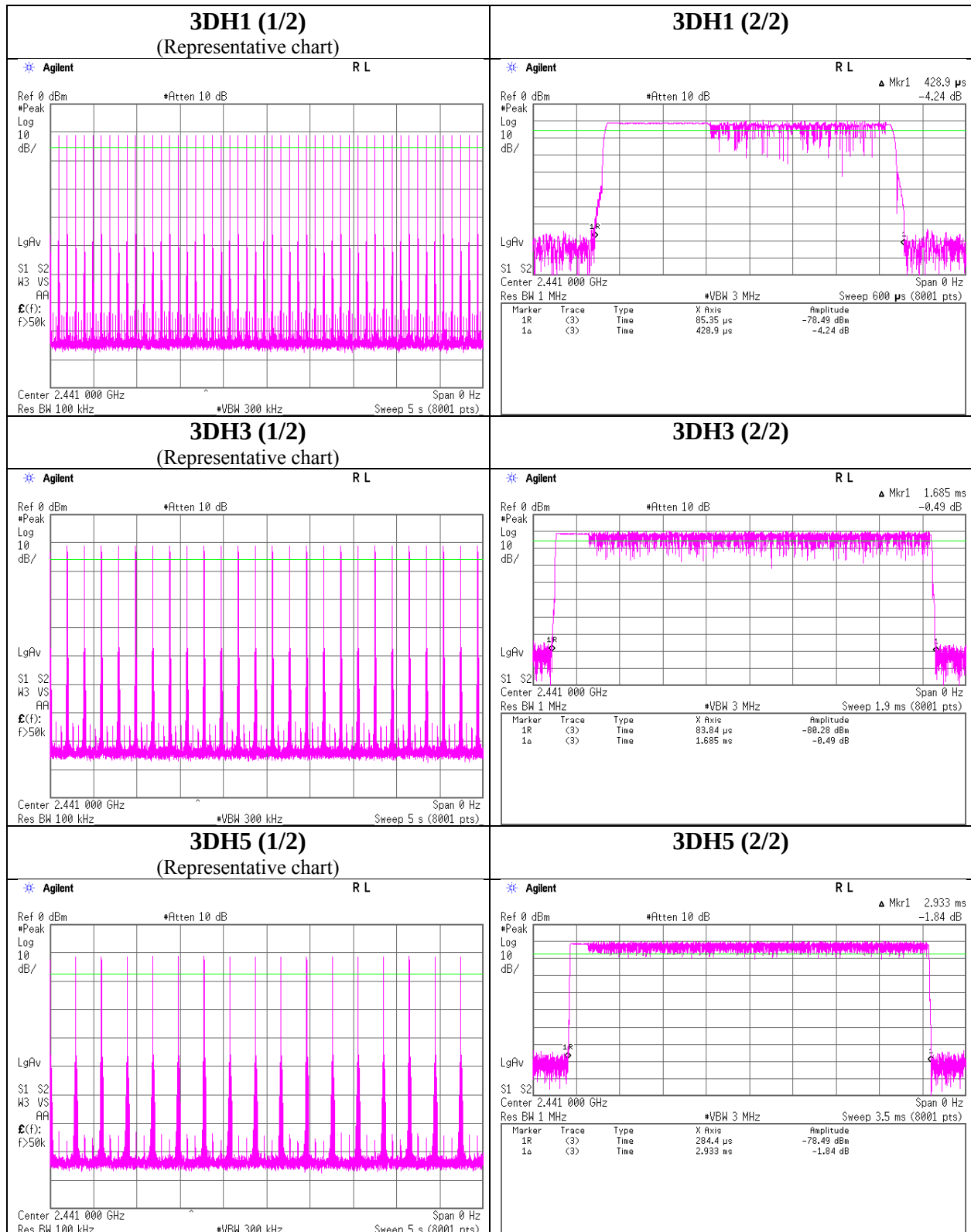
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Dwell time



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Shonan EMC Lab.

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Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12236091S-A-R1
Date : March 30, 2018
Temperature / Humidity : 25 deg. C / 30 % RH
Engineer : Makoto Hosaka
Mode : Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-11.26	1.70	9.96	0.40	1.10	20.96	125	20.56
DH5	2441.0	-10.39	1.71	9.97	1.29	1.35	20.96	125	19.67
DH5	2480.0	-11.11	1.72	9.97	0.58	1.14	20.96	125	20.38
2DH5	2402.0	-10.37	1.70	9.96	1.29	1.35	20.96	125	19.67
2DH5	2441.0	-9.32	1.71	9.97	2.36	1.72	20.96	125	18.60
2DH5	2480.0	-10.28	1.72	9.97	1.41	1.38	20.96	125	19.55
3DH5	2402.0	-10.24	1.70	9.96	1.42	1.39	20.96	125	19.54
3DH5	2441.0	-9.03	1.71	9.97	2.65	1.84	20.96	125	18.31
3DH5	2480.0	-10.00	1.72	9.97	1.69	1.48	20.96	125	19.27

Sample Calculation:

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

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

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

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

Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12236091S-A-R1
Date	March 30, 2018
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
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	-13.27	1.70	9.96	-1.61	0.69	1.09	-0.52	0.89
DH5	2441.0	-12.25	1.71	9.97	-0.57	0.88	1.09	0.52	1.13
DH5	2480.0	-13.09	1.72	9.97	-1.40	0.72	1.09	-0.31	0.93
2DH5	2402.0	-14.22	1.70	9.96	-2.56	0.55	1.07	-1.49	0.71
2DH5	2441.0	-13.25	1.71	9.97	-1.57	0.70	1.07	-0.50	0.89
2DH5	2480.0	-14.15	1.72	9.97	-2.46	0.57	1.07	-1.39	0.73
3DH5	2402.0	-14.50	1.70	9.96	-2.84	0.52	1.07	-1.77	0.67
3DH5	2441.0	-13.48	1.71	9.97	-1.80	0.66	1.07	-0.73	0.85
3DH5	2480.0	-14.41	1.72	9.97	-2.72	0.53	1.07	-1.65	0.68

Sample Calculation:

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

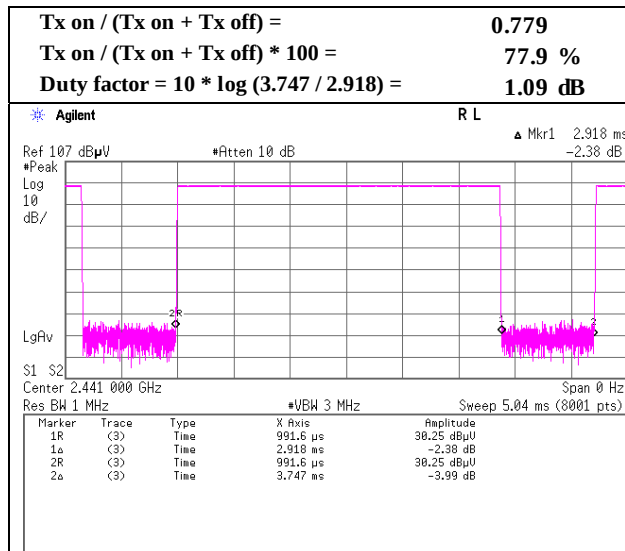
Result (Burst power average) = Time average + Duty factor

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

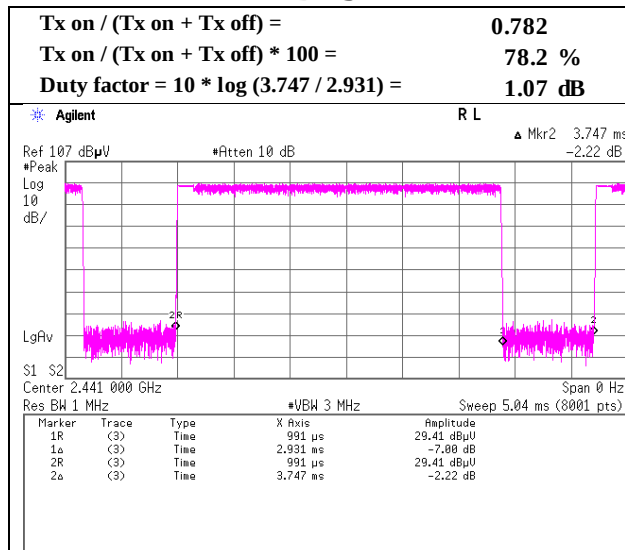
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Semi Anechoic Chamber
Report No.	12236091S-A-R1
Date	March 30, 2018
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

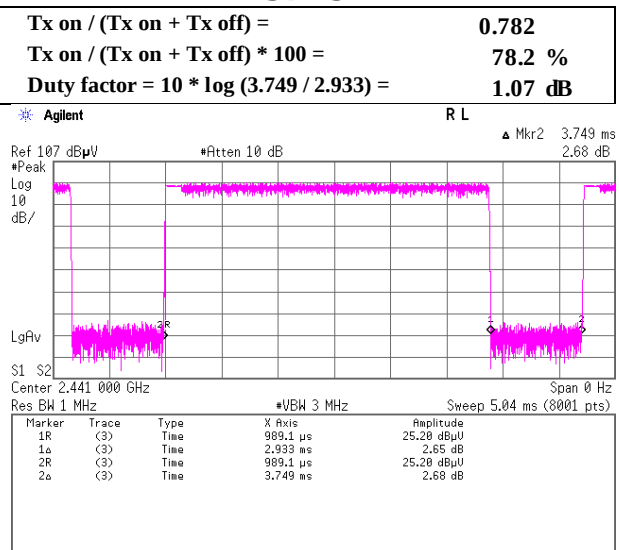
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 12236091S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1 No.1
Date April 11, 2018 April 12, 2018
Temperature / Humidity 23 deg. C / 37 % RH 21 deg. C / 52 % RH
Engineer Shiro Kobayashi Shiro Kobayashi
(1 GHz -18 GHz) (30 MHz -1000 MHz,
18 GHz – 26.5 GHz)
Mode Tx, Hopping Off, DH5 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.	106.601	QP	43.89	10.97	8.17	31.81	0.00	31.22	43.50	12.2	305	138	
Hori.	137.546	QP	45.64	14.21	8.56	31.79	0.00	36.62	43.50	6.8	227	320	
Hori.	142.712	QP	46.87	14.43	8.68	31.78	0.00	38.20	43.50	5.3	217	329	
Hori.	165.017	QP	41.77	15.22	8.97	31.78	0.00	34.18	43.50	9.3	202	291	
Hori.	389.371	QP	41.01	15.35	7.54	31.82	0.00	32.08	46.00	13.9	100	36	
Hori.	423.229	QP	45.07	16.06	7.77	31.86	0.00	37.04	46.00	8.9	100	40	
Hori.	495.018	QP	42.46	17.56	8.14	31.89	0.00	36.27	46.00	9.7	100	46	
Hori.	731.525	QP	38.42	20.09	9.22	31.97	0.00	35.76	46.00	10.2	148	324	
Hori.	2390.000	PK	50.42	27.14	14.60	44.13	2.28	50.31	73.90	23.5	174	238	
Hori.	4804.000	PK	51.87	31.13	7.23	44.45	2.28	48.06	73.90	25.8	174	252	
Hori.	7206.000	PK	48.87	36.35	8.97	43.99	2.28	52.48	73.90	21.4	155	0	
Hori.	9608.000	PK	49.63	38.11	10.40	43.83	2.28	56.59	73.90	17.3	155	0	
Hori.	2390.000	AV	37.42	27.14	14.60	44.13	2.28	37.31	53.90	16.5	174	238	
Hori.	4804.000	AV	39.23	31.13	7.23	44.45	2.28	35.42	53.90	18.4	174	252	
Hori.	7206.000	AV	35.53	36.35	8.97	43.99	2.28	39.14	53.90	14.7	155	0	
Hori.	9608.000	AV	36.68	38.11	10.40	43.83	2.28	43.64	53.90	10.2	155	0	
Vert.	33.740	QP	29.60	16.47	7.11	31.84	0.00	21.34	40.00	18.6	100	252	
Vert.	118.637	QP	40.54	12.98	8.18	31.80	0.00	29.90	43.50	13.6	100	192	
Vert.	135.832	QP	45.36	14.11	8.51	31.79	0.00	36.19	43.50	7.3	100	303	
Vert.	137.552	QP	45.71	14.21	8.56	31.79	0.00	36.69	43.50	6.8	100	301	
Vert.	731.526	QP	39.54	20.09	9.22	31.97	0.00	36.88	46.00	9.1	100	290	
Vert.	2390.000	PK	50.33	27.14	14.60	44.13	2.28	50.22	73.90	23.6	204	188	
Vert.	4804.000	PK	52.26	31.13	7.23	44.45	2.28	48.45	73.90	25.4	204	358	
Vert.	7206.000	PK	49.26	36.35	8.97	43.99	2.28	52.87	73.90	21.0	155	0	
Vert.	9608.000	PK	49.81	38.11	10.40	43.83	2.28	56.77	73.90	17.1	155	0	
Vert.	2390.000	AV	37.43	27.14	14.60	44.13	2.28	37.32	53.90	16.5	204	188	
Vert.	4804.000	AV	40.00	31.13	7.23	44.45	2.28	36.19	53.90	17.7	204	358	
Vert.	7206.000	AV	35.73	36.35	8.97	43.99	2.28	39.34	53.90	14.5	155	0	
Vert.	9608.000	AV	36.65	38.11	10.40	43.83	2.28	43.61	53.90	10.2	155	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

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	85.92	27.18	14.61	44.14	2.28	85.85	-	-	Carrier
Hori.	2400.000	PK	41.78	27.17	14.61	44.14	2.28	41.70	65.85	24.2	
Vert.	2402.000	PK	91.80	27.18	14.61	44.14	2.28	91.73	-	-	Carrier
Vert.	2400.000	PK	43.26	27.17	14.61	44.14	2.28	43.18	71.73	28.6	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

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

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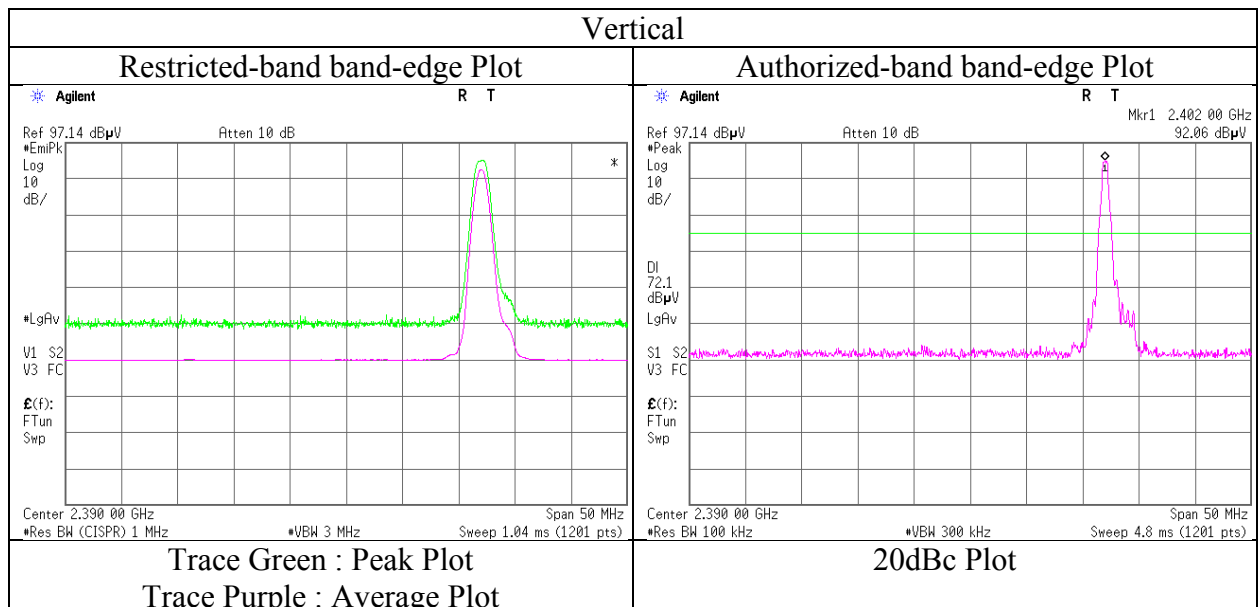
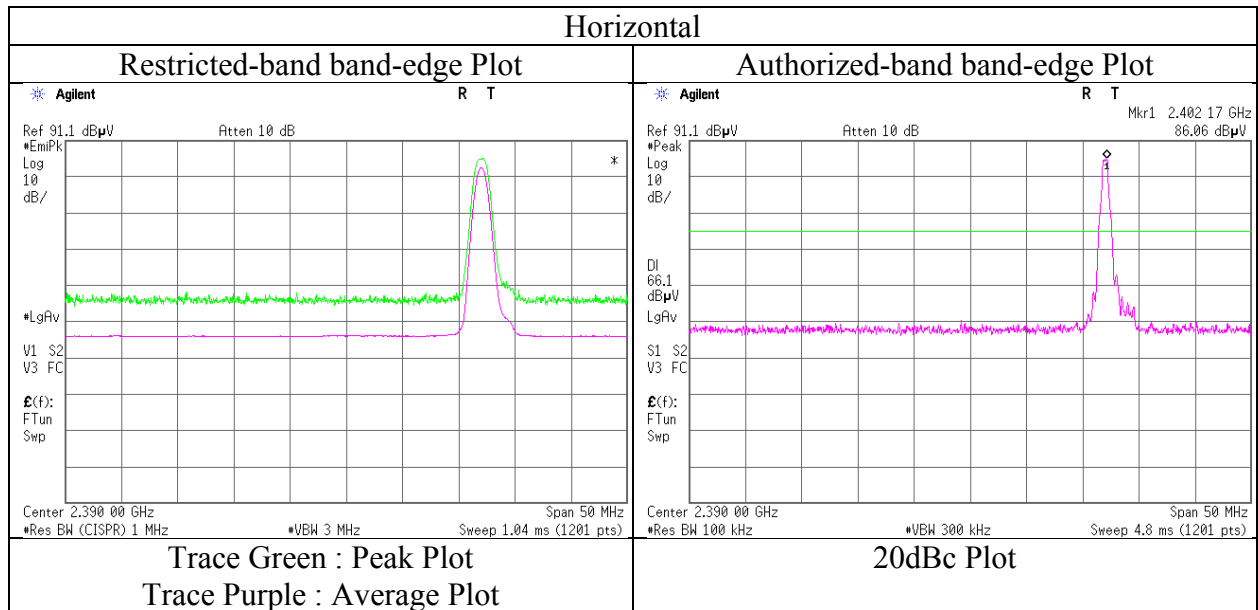
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12236091S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Shiro Kobayashi
	(1 GHz -18 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 12236091S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1 No.1
Date April 11, 2018 April 12, 2018
Temperature / Humidity 23 deg. C / 37 % RH 21 deg. C / 52 % RH
Engineer Shiro Kobayashi Shiro Kobayashi
(1 GHz -18 GHz) (30 MHz -1000 MHz,
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.	107.100	QP	41.50	11.05	8.18	31.81	0.00	28.92	43.50	14.5	295	129	
Hori.	118.610	QP	39.20	12.98	8.18	31.80	0.00	28.56	43.50	14.9	273	134	
Hori.	142.722	QP	47.03	14.43	8.68	31.78	0.00	38.36	43.50	5.1	221	321	
Hori.	165.006	QP	38.12	15.22	8.97	31.78	0.00	30.53	43.50	12.9	273	297	
Hori.	389.371	QP	46.32	15.35	7.54	31.82	0.00	37.39	46.00	8.6	100	335	
Hori.	423.229	QP	45.27	16.06	7.77	31.86	0.00	37.24	46.00	8.7	100	41	
Hori.	741.270	QP	37.51	20.18	9.26	31.96	0.00	34.99	46.00	11.0	141	358	
Hori.	960.000	QP	38.35	22.20	10.19	30.89	0.00	39.85	46.00	6.1	100	120	
Hori.	4882.000	PK	52.56	31.31	7.32	44.48	2.28	48.99	73.90	24.9	160	82	
Hori.	7323.000	PK	50.27	36.51	9.12	44.03	2.28	54.15	73.90	19.7	155	0	
Hori.	9764.000	PK	50.36	38.37	10.45	43.85	2.28	57.61	73.90	16.2	155	0	
Hori.	4882.000	AV	41.20	31.31	7.32	44.48	2.28	37.63	53.90	16.2	160	82	
Hori.	7323.000	AV	36.57	36.51	9.12	44.03	2.28	40.45	53.90	13.4	155	0	
Hori.	9764.000	AV	36.63	38.37	10.45	43.85	2.28	43.88	53.90	10.0	155	0	
Vert.	34.400	QP	28.20	16.29	7.13	31.84	0.00	19.78	40.00	20.2	100	219	
Vert.	118.630	QP	39.42	12.98	8.18	31.80	0.00	28.78	43.50	14.7	100	219	
Vert.	135.825	QP	45.49	14.11	8.51	31.79	0.00	36.32	43.50	7.1	100	304	
Vert.	137.544	QP	45.67	14.21	8.56	31.79	0.00	36.65	43.50	6.8	100	304	
Vert.	731.525	QP	39.63	20.09	9.22	31.97	0.00	36.97	46.00	9.0	100	293	
Vert.	4882.000	PK	52.45	31.31	7.32	44.48	2.28	48.88	73.90	25.0	171	202	
Vert.	7323.000	PK	51.23	36.51	9.12	44.03	2.28	55.11	73.90	18.7	155	0	
Vert.	9764.000	PK	50.22	38.37	10.45	43.85	2.28	57.47	73.90	16.4	155	0	
Vert.	4882.000	AV	38.36	31.31	7.32	44.48	2.28	34.79	53.90	19.1	171	202	
Vert.	7323.000	AV	36.57	36.51	9.12	44.03	2.28	40.45	53.90	13.4	155	0	
Vert.	9764.000	AV	36.68	38.37	10.45	43.85	2.28	43.93	53.90	9.9	155	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

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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Radiated Spurious Emission

Report No.	12236091S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	April 11, 2018	April 12, 2018
Temperature / Humidity	23 deg. C / 37 % RH	21 deg. C / 52 % RH
Engineer	Shiro Kobayashi (1 GHz -18 GHz)	Shiro Kobayashi (30 MHz -1000 MHz, 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.	106.595	QP	44.16	10.96	8.17	31.81	0.00	31.48	43.50	12.0	301	132	
Hori.	137.551	QP	45.81	14.21	8.56	31.79	0.00	36.79	43.50	6.7	231	314	
Hori.	142.698	QP	47.17	14.43	8.68	31.78	0.00	38.50	43.50	5.0	213	321	
Hori.	144.426	QP	45.76	14.48	8.71	31.78	0.00	37.17	43.50	6.3	216	326	
Hori.	389.372	QP	46.08	15.35	7.54	31.82	0.00	37.15	46.00	8.8	114	338	
Hori.	423.229	QP	45.05	16.06	7.77	31.86	0.00	37.02	46.00	8.9	100	39	
Hori.	495.016	QP	42.58	17.56	8.14	31.89	0.00	36.39	46.00	9.6	100	63	
Hori.	731.527	QP	38.09	20.09	9.22	31.97	0.00	35.43	46.00	10.5	142	321	
Hori.	2483.500	PK	51.42	27.45	14.70	44.16	2.28	51.69	73.90	22.2	189	242	
Hori.	4960.000	PK	52.16	31.48	7.39	44.51	2.28	48.80	73.90	25.1	182	358	
Hori.	7440.000	PK	51.23	36.68	9.30	44.08	2.28	55.41	73.90	18.4	155	0	
Hori.	9920.000	PK	50.47	38.63	10.49	43.87	2.28	58.00	73.90	15.9	155	0	
Hori.	2483.500	AV	37.50	27.45	14.70	44.16	2.28	37.77	53.90	16.1	189	242	
Hori.	4960.000	AV	39.66	31.48	7.39	44.51	2.28	36.30	53.90	17.6	182	358	
Hori.	7440.000	AV	36.86	36.68	9.30	44.08	2.28	41.04	53.90	12.8	155	0	
Hori.	9920.000	AV	36.75	38.63	10.49	43.87	2.28	44.28	53.90	9.6	155	0	
Vert.	33.410	QP	29.23	16.55	7.11	31.84	0.00	21.05	40.00	18.9	100	236	
Vert.	118.638	QP	40.72	12.98	8.18	31.80	0.00	30.08	43.50	13.4	100	206	
Vert.	135.829	QP	45.16	14.11	8.51	31.79	0.00	35.99	43.50	7.5	100	307	
Vert.	137.549	QP	45.34	14.21	8.56	31.79	0.00	36.32	43.50	7.1	100	304	
Vert.	731.527	QP	38.61	20.09	9.22	31.97	0.00	35.95	46.00	10.0	100	292	
Vert.	2483.500	PK	51.22	27.45	14.70	44.16	2.28	51.49	73.90	22.4	169	185	
Vert.	4960.000	PK	52.71	31.48	7.39	44.51	2.28	49.35	73.90	24.5	172	186	
Vert.	7440.000	PK	50.26	36.68	9.30	44.08	2.28	54.44	73.90	19.4	155	0	
Vert.	9920.000	PK	50.65	38.63	10.49	43.87	2.28	58.18	73.90	15.7	155	0	
Vert.	2483.500	AV	37.72	27.45	14.70	44.16	2.28	37.99	53.90	15.9	169	185	
Vert.	4960.000	AV	42.35	31.48	7.39	44.51	2.28	38.99	53.90	14.9	172	186	
Vert.	7440.000	AV	36.80	36.68	9.30	44.08	2.28	40.98	53.90	12.9	155	0	
Vert.	9920.000	AV	36.87	38.63	10.49	43.87	2.28	44.40	53.90	9.5	155	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

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.

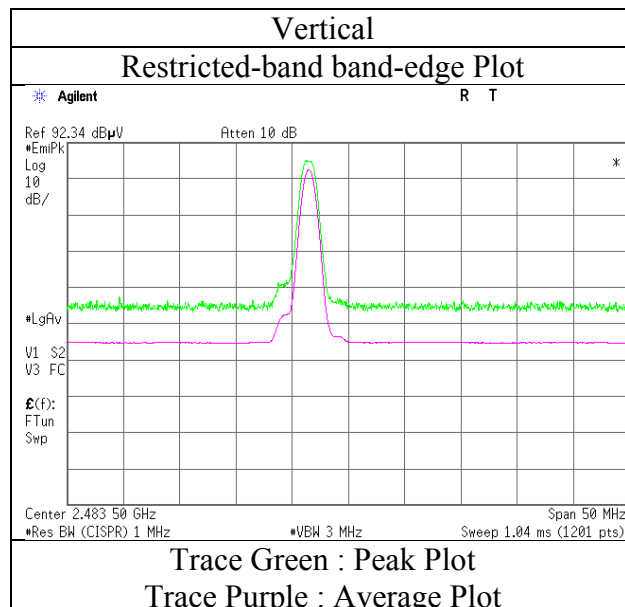
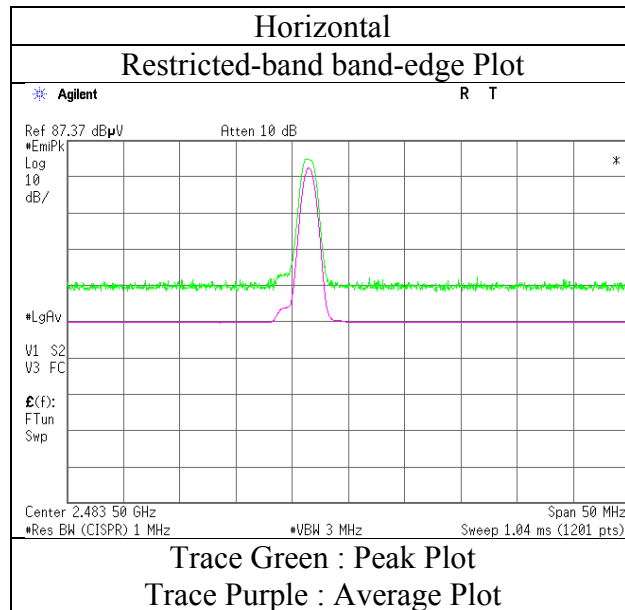
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12236091S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Shiro Kobayashi (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. 12236091S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date April 11, 2018 No.1
Temperature / Humidity 23 deg. C / 37 % RH April 12, 2018
Engineer Shiro Kobayashi Shiro Kobayashi
(1 GHz -18 GHz) (30 MHz -1000 MHz,
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.	106.600	QP	44.18	10.97	8.17	31.81	0.00	31.51	43.50	11.9	290	126	
Hori.	113.460	QP	39.18	12.11	8.16	31.80	0.00	27.65	43.50	15.8	284	130	
Hori.	137.545	QP	45.62	14.21	8.56	31.79	0.00	36.60	43.50	6.9	233	322	
Hori.	142.707	QP	47.23	14.43	8.68	31.78	0.00	38.56	43.50	4.9	221	325	
Hori.	144.427	QP	45.67	14.48	8.71	31.78	0.00	37.08	43.50	6.4	225	324	
Hori.	389.371	QP	45.92	15.35	7.54	31.82	0.00	36.99	46.00	9.0	116	337	
Hori.	423.230	QP	44.86	16.06	7.77	31.86	0.00	36.83	46.00	9.1	100	38	
Hori.	495.019	QP	42.73	17.56	8.14	31.89	0.00	36.54	46.00	9.4	100	79	
Hori.	731.524	QP	38.85	20.09	9.22	31.97	0.00	36.19	46.00	9.8	153	324	
Hori.	2390.000	PK	50.61	27.14	14.60	44.13	2.28	50.50	73.90	23.4	126	44	
Hori.	4804.000	PK	52.54	31.13	7.23	44.45	2.28	48.73	73.90	25.1	148	159	
Hori.	7206.000	PK	49.65	36.35	8.97	43.99	2.28	53.26	73.90	20.6	155	0	
Hori.	9608.000	PK	50.53	38.11	10.40	43.83	2.28	57.49	73.90	16.4	155	0	
Hori.	2390.000	AV	37.45	27.14	14.60	44.13	2.28	37.34	53.90	16.5	126	44	
Hori.	4804.000	AV	38.51	31.13	7.23	44.45	2.28	34.70	53.90	19.2	148	159	
Hori.	7206.000	AV	35.85	36.35	8.97	43.99	2.28	39.46	53.90	14.4	155	0	
Hori.	9608.000	AV	37.00	38.11	10.40	43.83	2.28	43.96	53.90	9.9	155	0	
Vert.	33.610	QP	29.63	16.50	7.11	31.84	0.00	21.40	40.00	18.6	100	265	
Vert.	47.519	QP	34.51	11.91	7.42	31.82	0.00	22.02	40.00	17.9	100	2	
Vert.	118.632	QP	40.48	12.98	8.18	31.80	0.00	29.84	43.50	13.6	100	202	
Vert.	135.825	QP	44.92	14.11	8.51	31.79	0.00	35.75	43.50	7.7	100	303	
Vert.	137.552	QP	45.09	14.21	8.56	31.79	0.00	36.07	43.50	7.4	100	308	
Vert.	731.524	QP	39.53	20.09	9.22	31.97	0.00	36.87	46.00	9.1	100	290	
Vert.	2390.000	PK	50.50	27.14	14.60	44.13	2.28	50.39	73.90	23.5	137	342	
Vert.	4804.000	PK	52.16	31.13	7.23	44.45	2.28	48.35	73.90	25.5	148	178	
Vert.	7206.000	PK	49.83	36.35	8.97	43.99	2.28	53.44	73.90	20.4	155	0	
Vert.	9608.000	PK	51.13	38.11	10.40	43.83	2.28	58.09	73.90	15.8	155	0	
Vert.	2390.000	AV	37.50	27.14	14.60	44.13	2.28	37.39	53.90	16.5	137	342	
Vert.	4804.000	AV	39.53	31.13	7.23	44.45	2.28	35.72	53.90	18.1	148	178	
Vert.	7206.000	AV	36.17	36.35	8.97	43.99	2.28	39.78	53.90	14.1	155	0	
Vert.	9608.000	AV	37.05	38.11	10.40	43.83	2.28	44.01	53.90	9.8	155	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.90 m / 3.0 m) = 2.28 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	81.56	27.18	14.61	44.14	2.28	81.49	-	-	Carrier
Hori.	2400.000	PK	41.32	27.17	14.61	44.14	2.28	41.24	61.49	20.3	
Vert.	2402.000	PK	91.54	27.18	14.61	44.14	2.28	91.47	-	-	Carrier
Vert.	2400.000	PK	42.47	27.17	14.61	44.14	2.28	42.39	71.47	29.1	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.90 m / 3.0 m) = 2.28 dB

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

UL Japan, Inc.

Shonan EMC Lab.

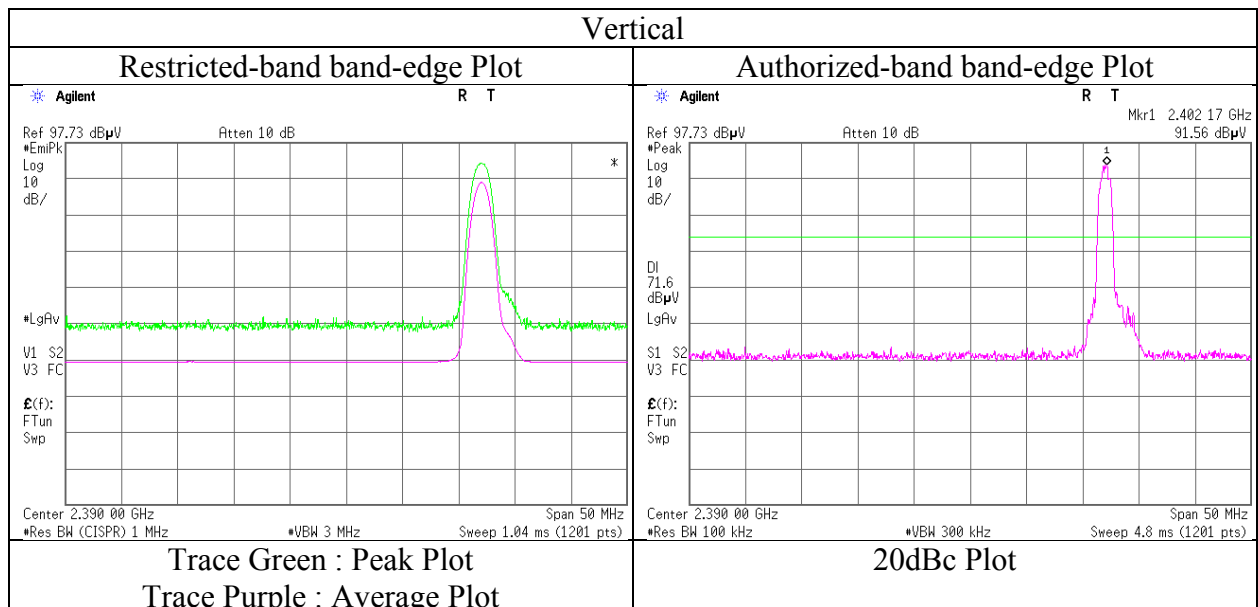
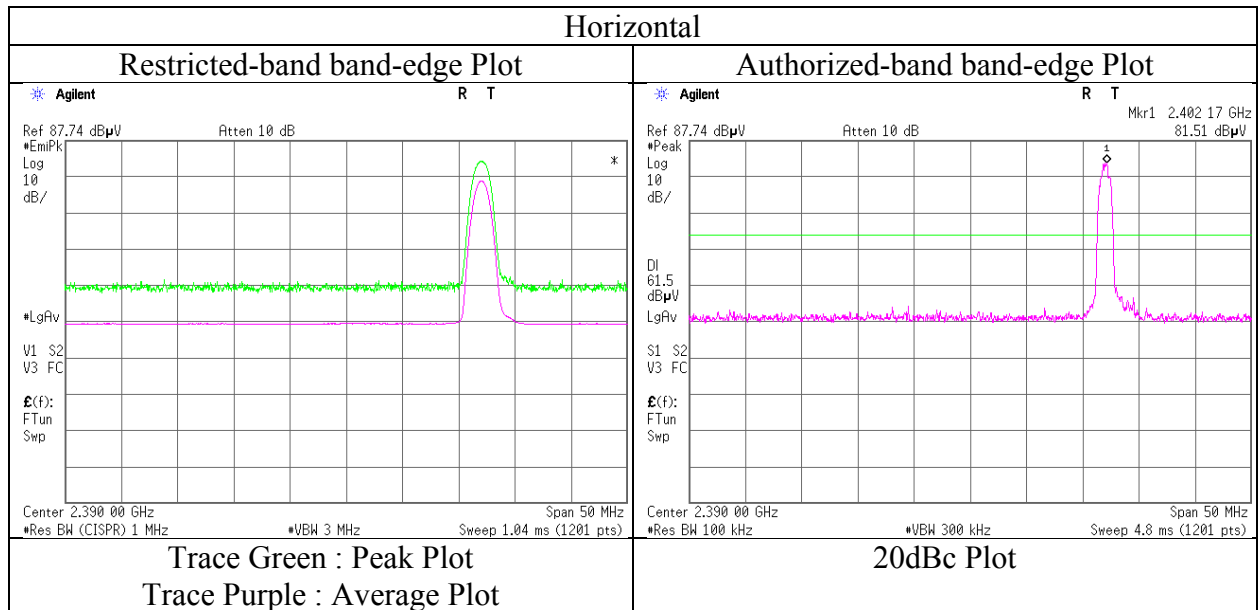
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12236091S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Shiro Kobayashi
	(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. 12236091S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1 No.1
Date April 11, 2018 April 12, 2018
Temperature / Humidity 23 deg. C / 37 % RH 21 deg. C / 52 % RH
Engineer Shiro Kobayashi Shiro Kobayashi
(1 GHz -18 GHz) (30 MHz -1000 MHz,
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.	106.603	QP	43.71	10.97	8.17	31.81	0.00	31.04	43.50	12.4	303	130	
Hori.	137.540	QP	45.28	14.21	8.56	31.79	0.00	36.26	43.50	7.2	228	318	
Hori.	142.690	QP	46.97	14.43	8.68	31.78	0.00	38.30	43.50	5.2	220	325	
Hori.	144.416	QP	45.52	14.48	8.71	31.78	0.00	36.93	43.50	6.5	219	327	
Hori.	389.372	QP	46.25	15.35	7.54	31.82	0.00	37.32	46.00	8.6	115	336	
Hori.	423.230	QP	45.08	16.06	7.77	31.86	0.00	37.05	46.00	8.9	213	97	
Hori.	495.021	QP	42.62	17.56	8.14	31.89	0.00	36.43	46.00	9.5	100	60	
Hori.	731.527	QP	38.51	20.09	9.22	31.97	0.00	35.85	46.00	10.1	145	319	
Hori.	4882.000	PK	52.00	31.31	7.32	44.48	2.28	48.43	73.90	25.4	163	150	
Hori.	7323.000	PK	50.13	36.51	9.12	44.03	2.28	54.01	73.90	19.8	155	0	
Hori.	9764.000	PK	51.03	38.37	10.45	43.85	2.28	58.28	73.90	15.6	155	0	
Hori.	4882.000	AV	37.32	31.31	7.32	44.48	2.28	33.75	53.90	20.1	163	150	
Hori.	7323.000	AV	36.68	36.51	9.12	44.03	2.28	40.56	53.90	13.3	155	0	
Hori.	9764.000	AV	36.48	38.37	10.45	43.85	2.28	43.73	53.90	10.1	155	0	
Vert.	33.880	QP	29.99	16.43	7.12	31.84	0.00	21.70	40.00	18.3	100	274	
Vert.	113.480	QP	39.48	12.12	8.16	31.80	0.00	27.96	43.50	15.5	121	54	
Vert.	135.822	QP	44.61	14.11	8.51	31.79	0.00	35.44	43.50	8.0	100	313	
Vert.	137.533	QP	42.83	14.21	8.56	31.79	0.00	33.81	43.50	9.6	100	306	
Vert.	731.527	QP	39.73	20.09	9.22	31.97	0.00	37.07	46.00	8.9	100	293	
Vert.	4882.000	PK	52.23	31.31	7.32	44.48	2.28	48.66	73.90	25.2	156	249	
Vert.	7323.000	PK	50.00	36.51	9.12	44.03	2.28	53.88	73.90	20.0	155	0	
Vert.	9764.000	PK	50.46	38.37	10.45	43.85	2.28	57.71	73.90	16.1	155	0	
Vert.	4882.000	AV	38.26	31.31	7.32	44.48	2.28	34.69	53.90	19.2	156	249	
Vert.	7323.000	AV	36.46	36.51	9.12	44.03	2.28	40.34	53.90	13.5	155	0	
Vert.	9764.000	AV	36.52	38.37	10.45	43.85	2.28	43.77	53.90	10.1	155	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

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. 12236091S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1 No.1
Date April 11, 2018 April 12, 2018
Temperature / Humidity 23 deg. C / 37 % RH 21 deg. C / 52 % RH
Engineer Shiro Kobayashi Shiro Kobayashi
(1 GHz -18 GHz) (30 MHz -1000 MHz,
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.	106.590	QP	43.89	10.96	8.17	31.81	0.00	31.21	43.50	12.2	295	125	
Hori.	118.607	QP	39.29	12.98	8.18	31.80	0.00	28.65	43.50	14.8	282	126	
Hori.	137.532	QP	44.52	14.21	8.56	31.79	0.00	35.50	43.50	8.0	226	321	
Hori.	140.970	QP	45.10	14.38	8.64	31.79	0.00	36.33	43.50	7.1	224	320	
Hori.	142.690	QP	46.71	14.43	8.68	31.78	0.00	38.04	43.50	5.4	221	319	
Hori.	389.370	QP	46.02	15.35	7.54	31.82	0.00	37.09	46.00	8.9	113	339	
Hori.	423.229	QP	44.74	16.06	7.77	31.86	0.00	36.71	46.00	9.2	100	43	
Hori.	495.020	QP	42.67	17.56	8.14	31.89	0.00	36.48	46.00	9.5	100	79	
Hori.	731.526	QP	37.39	20.09	9.22	31.97	0.00	34.73	46.00	11.2	145	320	
Hori.	2483.500	PK	51.26	27.45	14.70	44.16	2.28	51.53	73.90	22.3	189	143	
Hori.	4960.000	PK	51.37	31.48	7.39	44.51	2.28	48.01	73.90	25.8	151	299	
Hori.	7440.000	PK	50.68	36.68	9.30	44.08	2.28	54.86	73.90	19.0	155	0	
Hori.	9920.000	PK	51.07	38.63	10.49	43.87	2.28	58.60	73.90	15.3	155	0	
Hori.	2483.500	AV	37.45	27.45	14.70	44.16	2.28	37.72	53.90	16.1	189	143	
Hori.	4960.000	AV	37.65	31.48	7.39	44.51	2.28	34.29	53.90	19.6	151	299	
Hori.	7440.000	AV	37.00	36.68	9.30	44.08	2.28	41.18	53.90	12.7	155	0	
Hori.	9920.000	AV	36.92	38.63	10.49	43.87	2.28	44.45	53.90	9.4	155	0	
Vert.	33.660	QP	29.55	16.49	7.11	31.84	0.00	21.31	40.00	18.6	100	255	
Vert.	113.463	QP	39.47	12.11	8.16	31.80	0.00	27.94	43.50	15.5	134	59	
Vert.	137.518	QP	44.46	14.21	8.56	31.79	0.00	35.44	43.50	8.0	100	317	
Vert.	142.682	QP	42.83	14.43	8.68	31.78	0.00	34.16	43.50	9.3	100	303	
Vert.	731.526	QP	38.57	20.09	9.22	31.97	0.00	35.91	46.00	10.0	100	294	
Vert.	2483.500	PK	51.14	27.45	14.70	44.16	2.28	51.41	73.90	22.4	178	189	
Vert.	4960.000	PK	52.77	31.48	7.39	44.51	2.28	49.41	73.90	24.4	177	187	
Vert.	7440.000	PK	50.87	36.68	9.30	44.08	2.28	55.05	73.90	18.8	155	0	
Vert.	9920.000	PK	50.36	38.63	10.49	43.87	2.28	57.89	73.90	16.0	155	0	
Vert.	2483.500	AV	37.46	27.45	14.70	44.16	2.28	37.73	53.90	16.1	178	189	
Vert.	4960.000	AV	40.00	31.48	7.39	44.51	2.28	36.64	53.90	17.2	177	187	
Vert.	7440.000	AV	37.01	36.68	9.30	44.08	2.28	41.19	53.90	12.7	155	0	
Vert.	9920.000	AV	36.93	38.63	10.49	43.87	2.28	44.46	53.90	9.4	155	0	

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

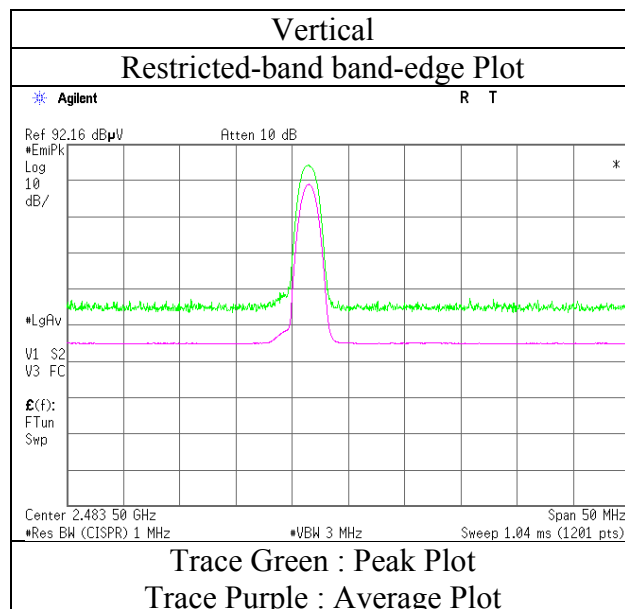
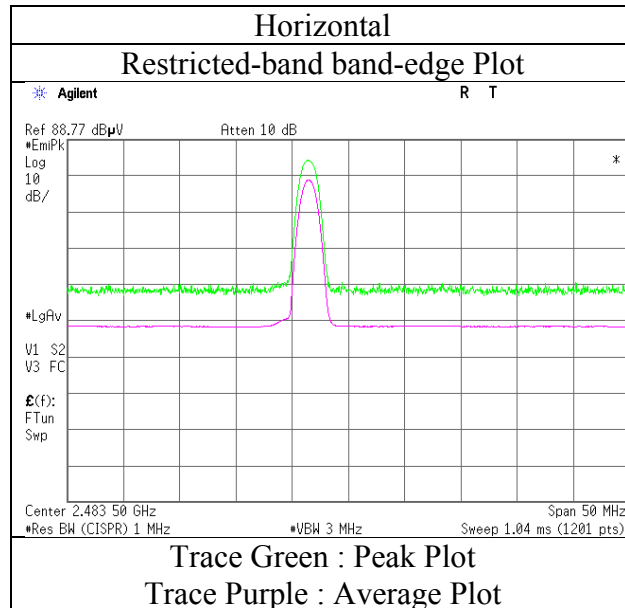
Distance factor : 1 GHz - 13 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

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)

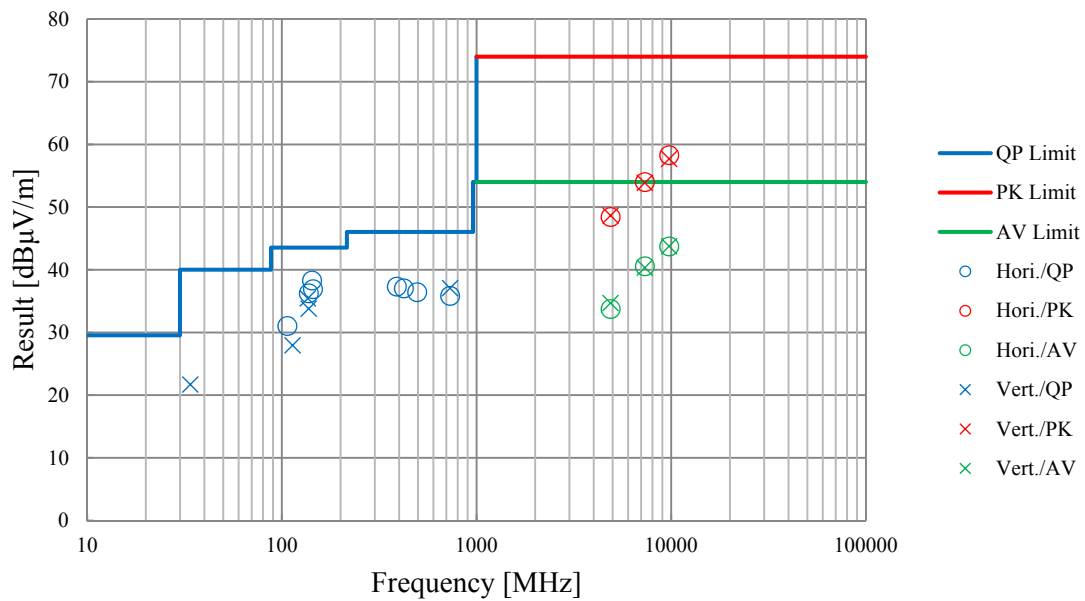
Report No.	12236091S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Shiro Kobayashi
	(1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12236091S-A-R1	No.1
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	
Date	April 11, 2018	April 12, 2018
Temperature / Humidity	23 deg. C / 37 % RH	21 deg. C / 52 % RH
Engineer	Shiro Kobayashi	Shiro Kobayashi
	(1 GHz -18 GHz)	(30 MHz -1000 MHz, 18 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

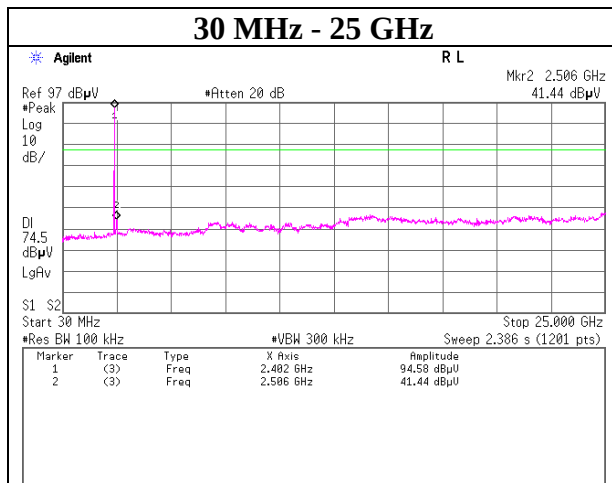
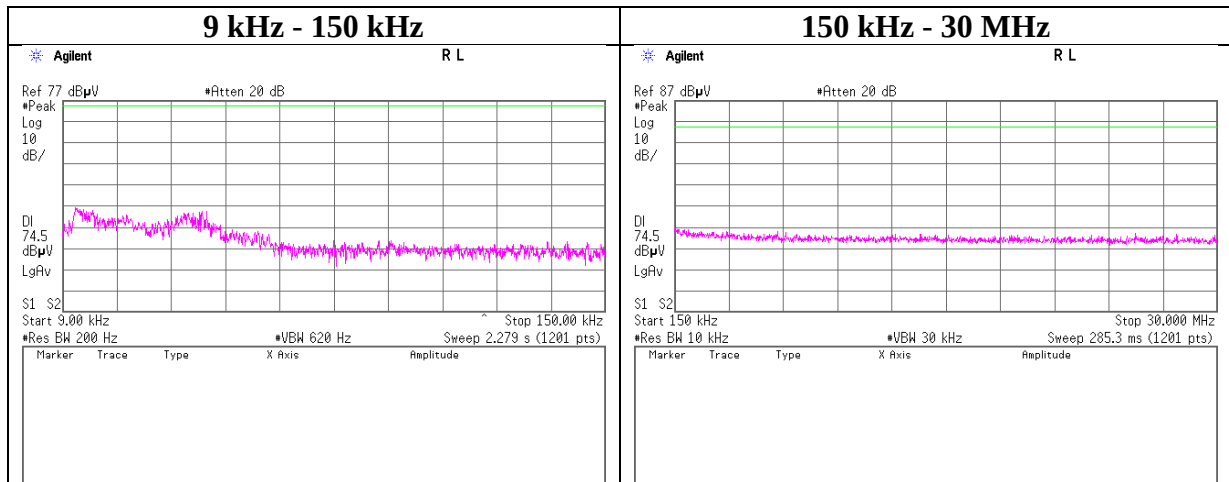


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12236091S-A-R1
Date	March 30, 2018
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

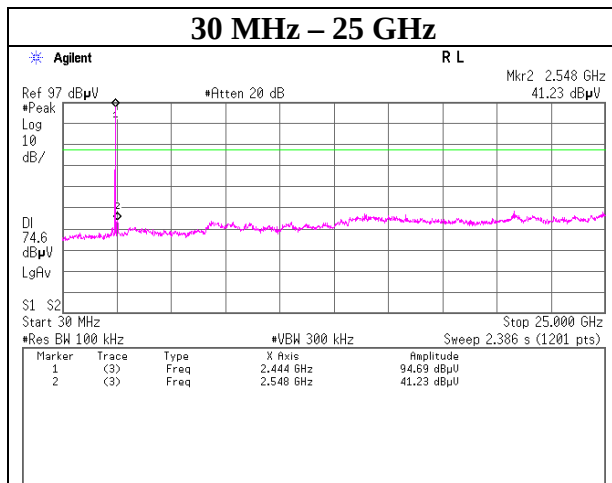
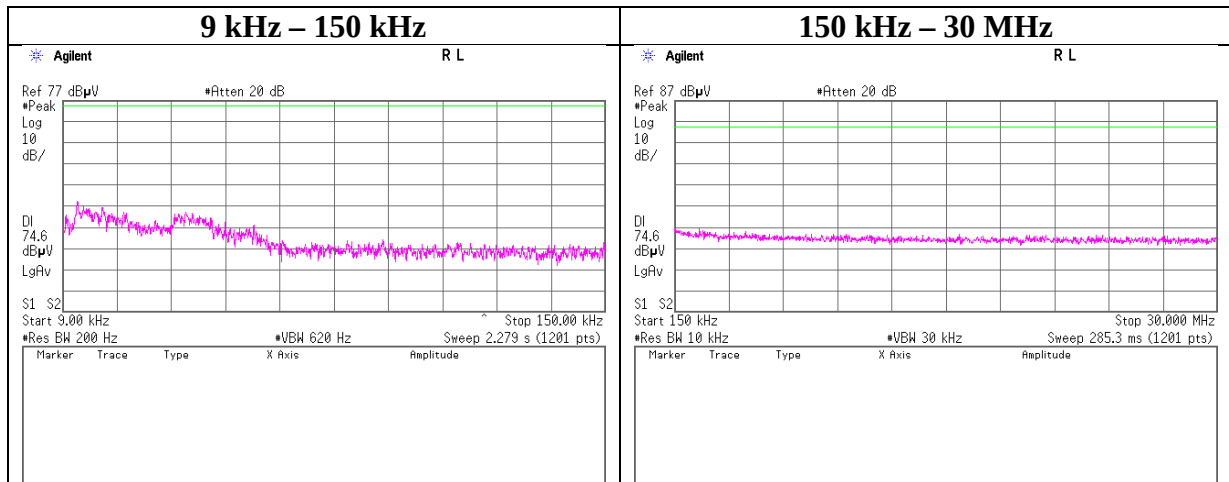
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12236091S-A-R1
Date	March 30, 2018
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

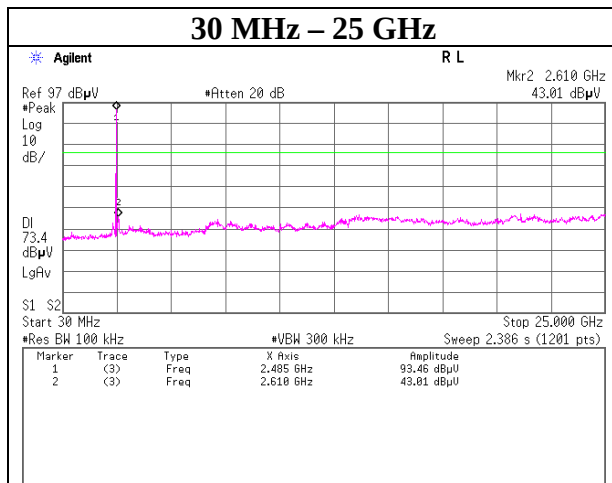
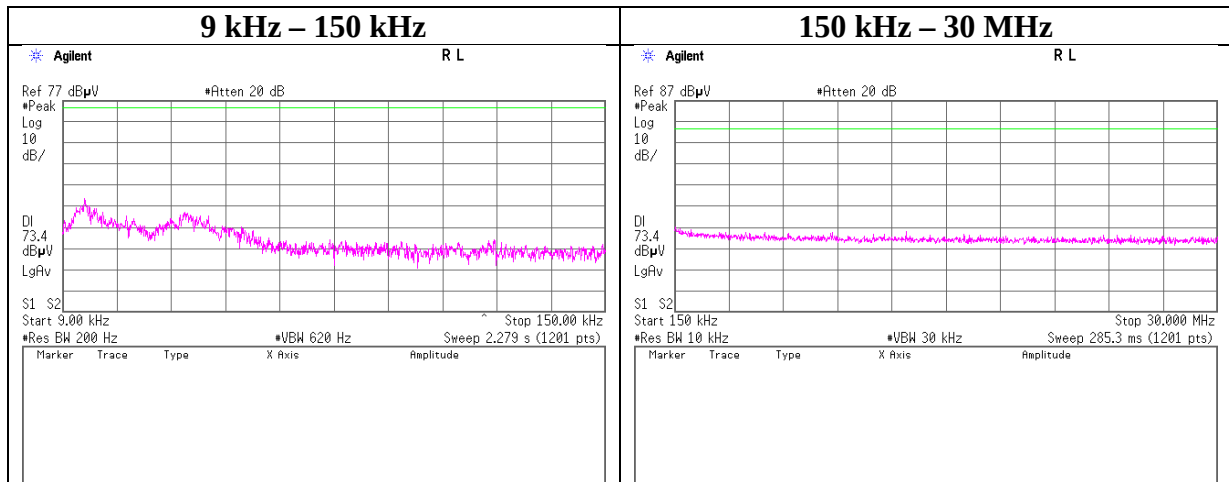
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12236091S-A-R1
Date	March 30, 2018
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

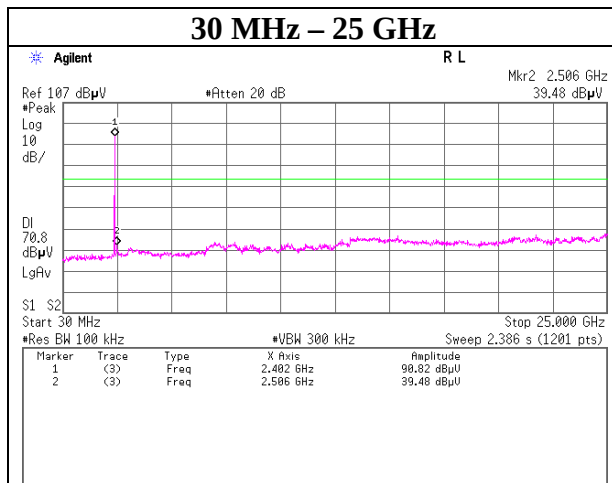
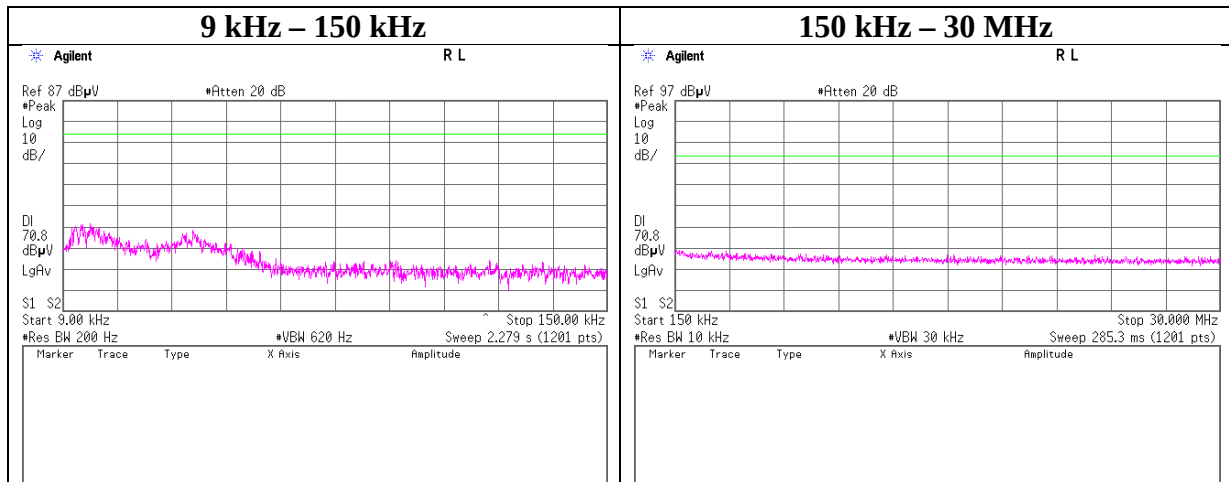
2480 MHz



Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12236091S-A-R1
Date March 30, 2018
Temperature / Humidity 25 deg. C / 30 % RH
Engineer Makoto Hosaka
Mode Tx, Hopping Off, DH5

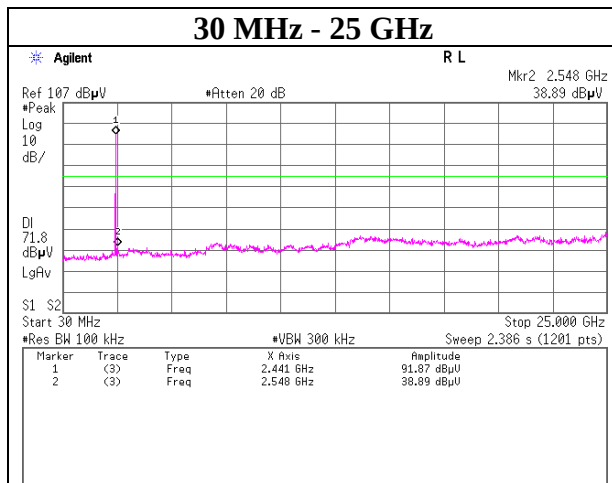
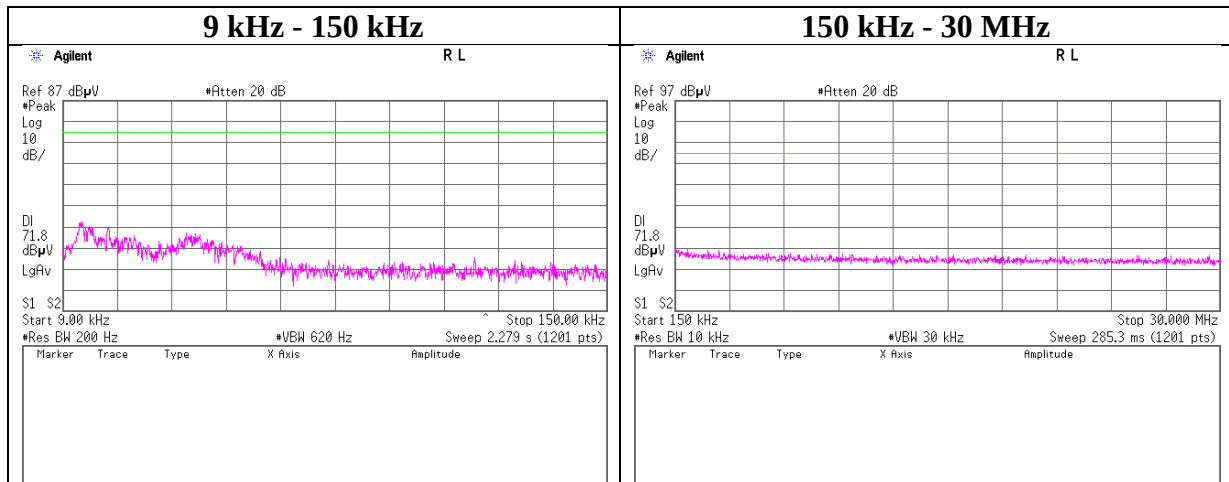
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12236091S-A-R1
Date : March 30, 2018
Temperature / Humidity : 25 deg. C / 30 % RH
Engineer : Makoto Hosaka
Mode : Tx, Hopping Off, 3DH5

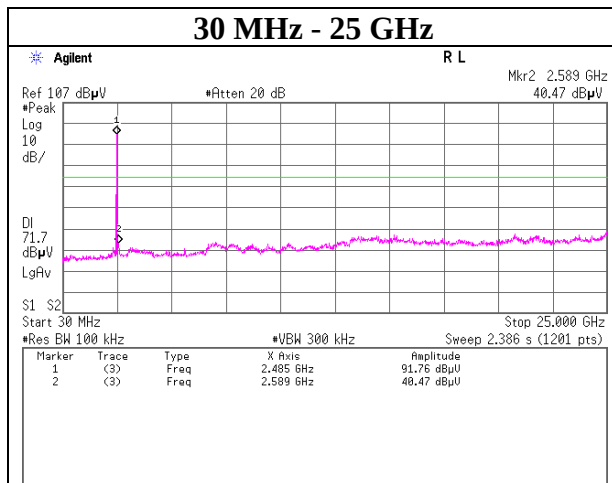
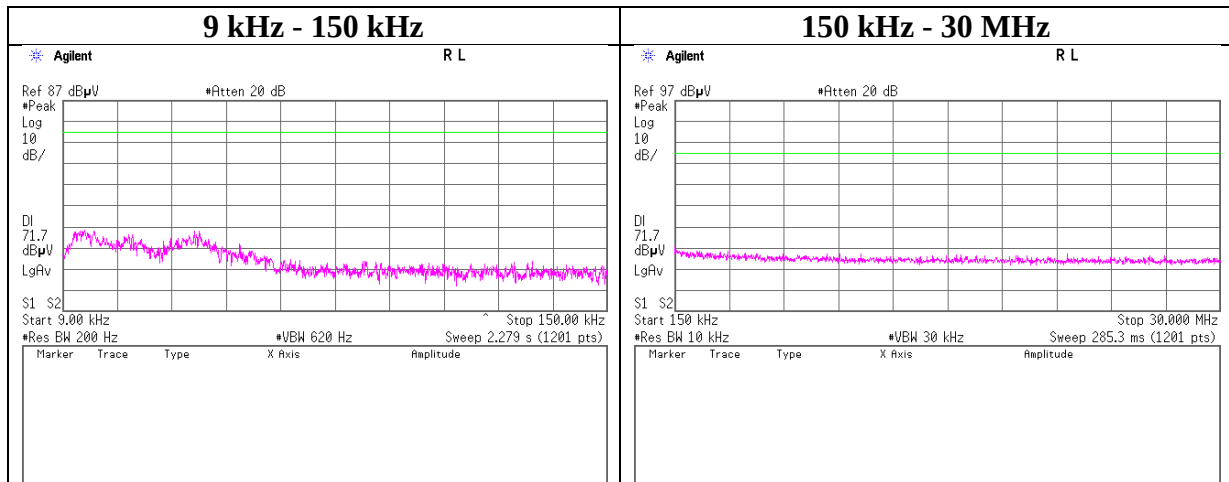
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12236091S-A-R1
Date : March 30, 2018
Temperature / Humidity : 25 deg. C / 30 % RH
Engineer : Makoto Hosaka
Mode : Tx, Hopping Off, 3DH5

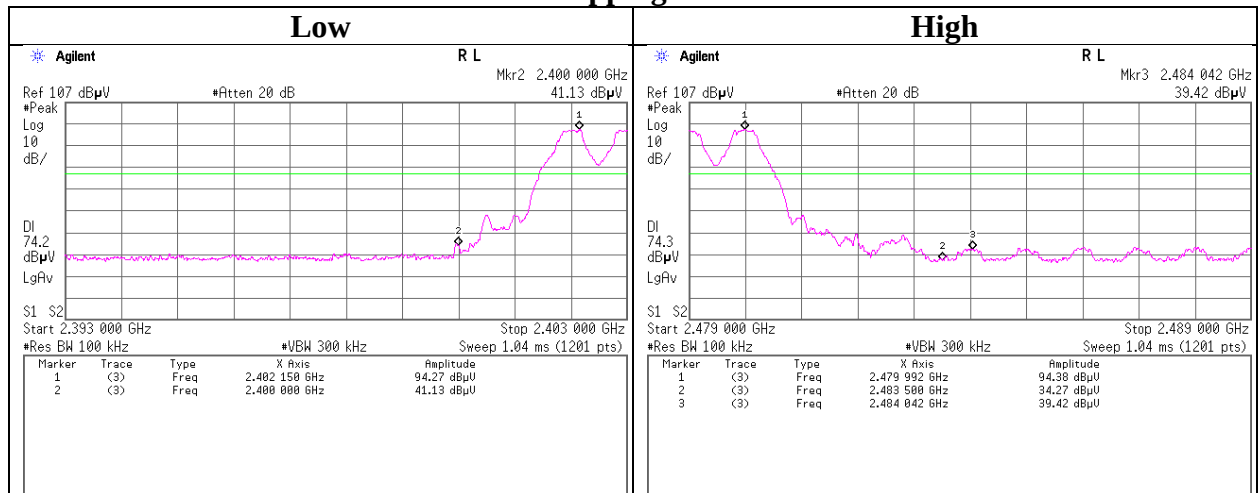
2480 MHz



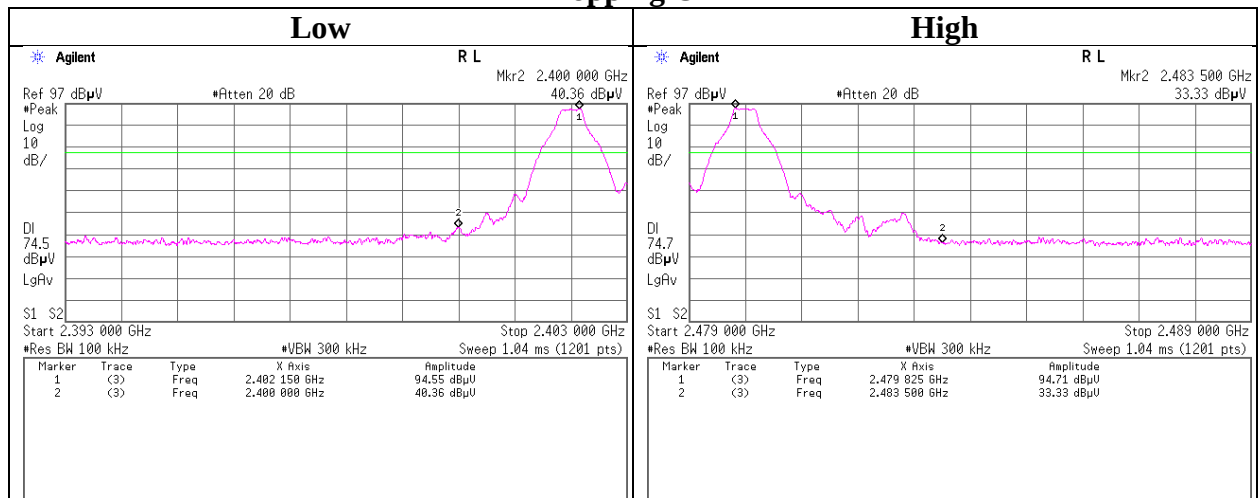
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12236091S-A-R1
Date : March 30, 2018
Temperature / Humidity : 25 deg. C / 30 % RH
Engineer : Makoto Hosaka
Mode : Tx DH5

Hopping On



Hopping Off



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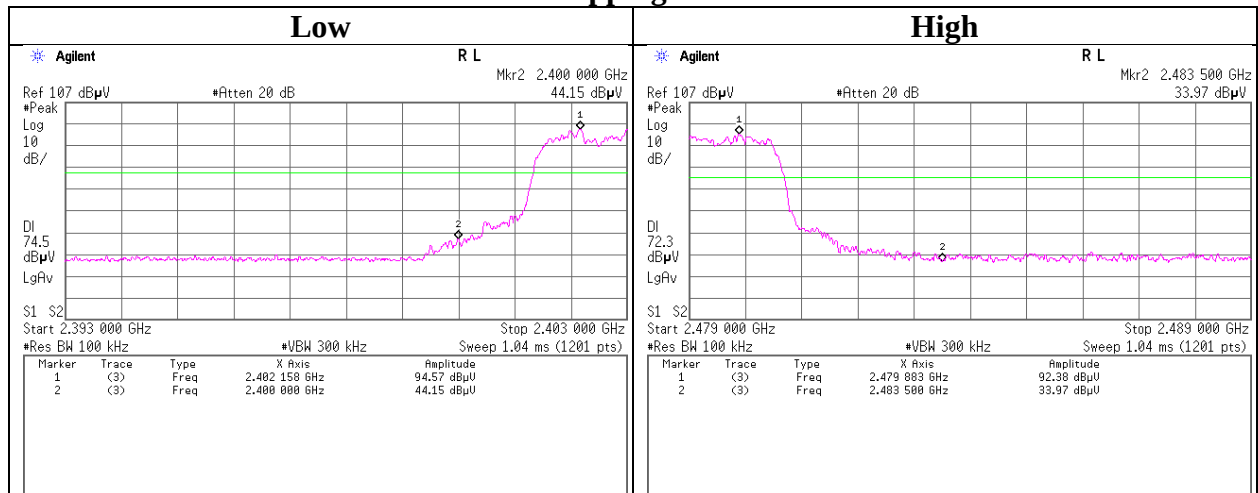
Telephone : +81 463 50 6400

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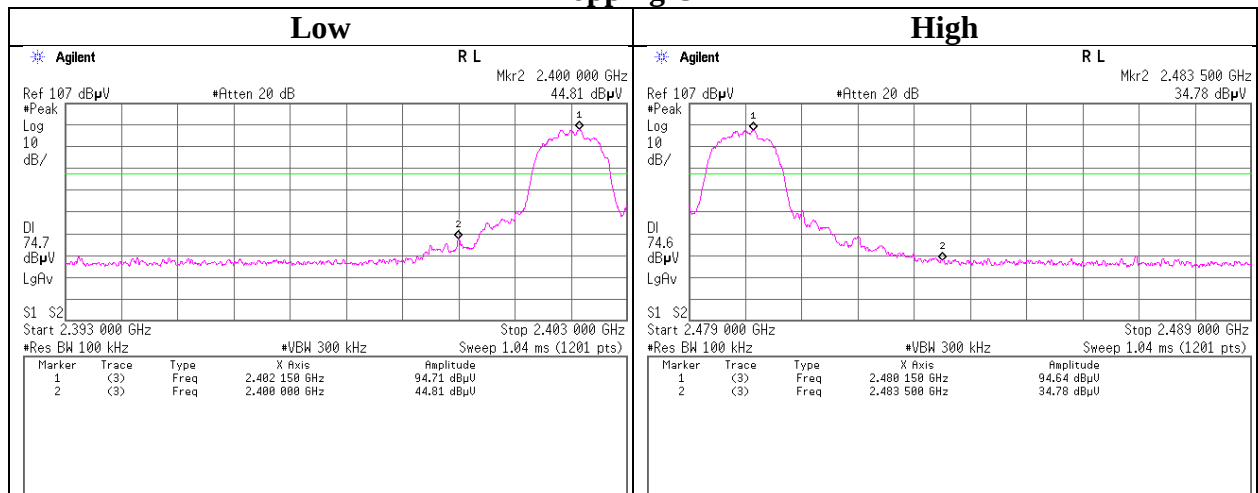
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12236091S-A-R1
Date : March 30, 2018
Temperature / Humidity : 25 deg. C / 30 % RH
Engineer : Makoto Hosaka
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)
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2017/05/01 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2018/03/05 * 12
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2018/03/19 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2018/03/19 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 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
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S006	RE	2018/01/29 * 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
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSW R)	1	RE	2017/07/20 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFI,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2018/03/19 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2017/04/20 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2018/03/20 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2018/02/16 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2017/12/14 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2017/08/24 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2017/10/21 * 12
SCC-A1/A3/A5/ A7/A8/A13/SRS E-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/ 141PE/141PE/14 1PE/141PE/NS4 906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SCC-A2/A4/A6/ A7/A8/A13/SRS E-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/ 141PE/141PE/14 1PE/141PE/NS4 906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/12/10 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2018/03/22 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 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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