



RADIO TEST REPORT

Test Report No. : 11967268S-A-R1

Applicant : Sony Corporation
Type of Equipment : AV Receiver
Model No. : XAV-AX5000
FCC ID : AK8XAVAX5000
Test regulation : FCC Part 15 Subpart C: 2017
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11967268S-A. 11967268S-A is replaced with this report.

Date of test: September 30 to October 3, 2017

Representative test engineer:

Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by:

Akio Hayashi
Leader
Consumer Technology Division



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

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13-EM-F0429

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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-AX5000
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12 V (car battery)
Receipt Date of Sample : September 20, 2017
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-AX5000 (referred to as the EUT in this report) is an AV Receiver.

General Specification

Clock frequency(ies) in the system : 25 MHz, 24 MHz, 12 MHz, 9.25 MHz, 32.768 kHz

Radio Specification

[Bluetooth]

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : FHSS
Power Supply (radio part input) : DC 3.3 V
Antenna type : Monopole Antenna
Antenna Gain : -0.63 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 September 20, 2017 and effective October 20, 2017

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

* The revision on September 20, 2017, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	N/A	N/A	*1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (b)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.9 dB 121.818 MHz, QP, Hori. Tx, 2480 MHz, DH5	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).

* 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 (DC 3.3 V). 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 requirement.

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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	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

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

Radiated emission test

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

3.5 Test Location

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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

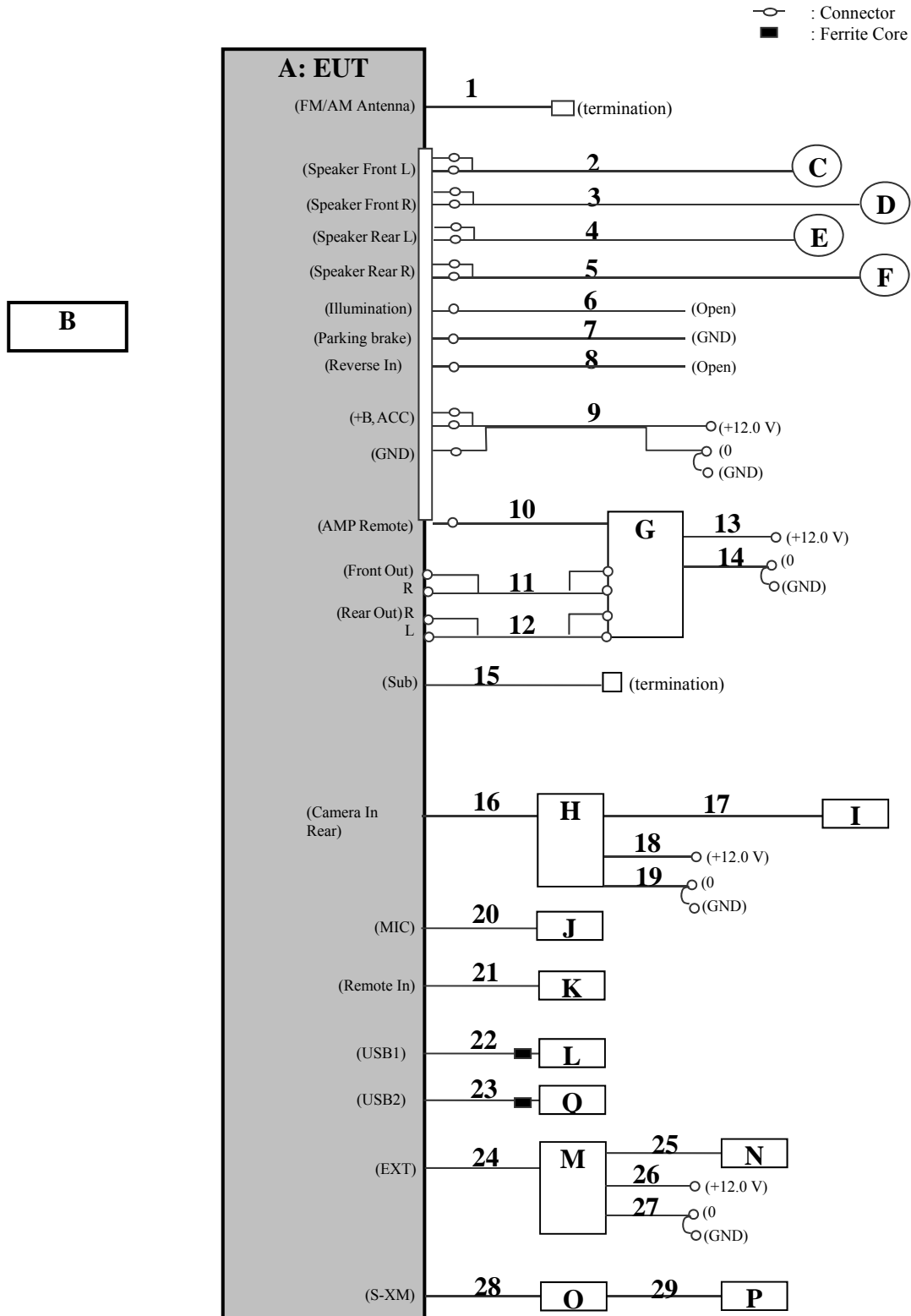
4.1 Operating Mode(s)

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
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.</p> <p>*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 2.5.0.93 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>		

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-AX5000	37 *1) 36 *2)	Sony Corporation	EUT
B	Remote Commander	RM-X170	-	Sony Corporation	-
C	Speaker 1	IS-10	-	Sony Corporation	-
D	Speaker 2	IS-10	-	Sony Corporation	-
E	Speaker 3	XS-GTF1625R	-	Sony Corporation	-
F	Speaker 4	XS-GTF1625R	-	Sony Corporation	-
G	Stereo Power Amplifier	XM-4S-020	SoC5	Sony Corporation	-
H	Rear View Camera	XA-R800C	100114	Sony Corporation	-
I	Camera	-	-	Sony Corporation	-
J	MIC	-	-	Sony Corporation	-
K	Wired Remote Controller	RM-X4S	-	Sony Corporation	-
L	USB Memory	SDK-USM4GL(B)	10615MEDB	Sony Corporation	-
M	Navigation Module	XA-NV400	EPP0024	Sony Corporation	-
N	GPS Antenna	-	-	Sony Corporation	-
O	Vehicle Tuner	SXV300	1QM90DWR	Sony Corporation	-
P	Antenna	NGVA3	1624A	Sony Corporation	-
Q	USB Memory	JetFlash 128MHz	-	Transcend	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield (Cable)	Shield (Connector)	Remarks
1	FM antenna	1.0	Shielded	Shielded	-
2	Speaker (1)	0.15+2.4	Unshielded	Unshielded	-
3	Speaker (2)	0.15+2.4	Unshielded	Unshielded	-
4	Speaker (3)	0.15+1.9	Unshielded	Unshielded	-
5	Speaker (4)	0.15+1.9	Unshielded	Unshielded	-
6	Illumination	0.15+1.7	Unshielded	Unshielded	-
7	Parking	2.0	Unshielded	Unshielded	-
8	Reverse In	0.15+1.0	Unshielded	Unshielded	-
9	DC Power	0.15+2.0	Unshielded	Unshielded	-
10	AMP Remote	0.15+1.4	Unshielded	Unshielded	-
11	RCA (Front Audio Out)	5.0	Shielded	Shielded	-
12	RCA (Rear Audio Out)	5.0	Shielded	Shielded	-
13	DC Power (+)	1.1	Unshielded	Unshielded	-
14	DC Power (-)	1.1	Unshielded	Unshielded	-
15	RCA (Sub Audio Out)	1.2	Shielded	Shielded	-
16	Video	3.0	Shielded	Shielded	-
17	Camera	3.0	Shielded	Shielded	-
18	DC Power (+)	0.9+0.8	Unshielded	Unshielded	-
19	DC Power (-)	0.9+0.8	Unshielded	Unshielded	-
20	MIC	3.5	Shielded	Shielded	-
21	REMOTE IN	1.9	Shielded	Shielded	-
22	USB	1.5	Shielded	Shielded	-
23	USB	1.5	Shielded	Shielded	-
24	EXT	1.5	Shielded	Shielded	-
25	Antenna	2.9	Shielded	Shielded	-
26	DC Power (+)	1.5	Unshielded	Unshielded	-
27	DC Power (-)	1.5	Unshielded	Unshielded	-
28	S-XM	0.6	Shielded	Shielded	-
29	Antenna	7.0	Shielded	Shielded	-

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SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.88 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 0 deg. to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (30 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 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	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	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %.

*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 = 10 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 and Carrier Frequency Separation

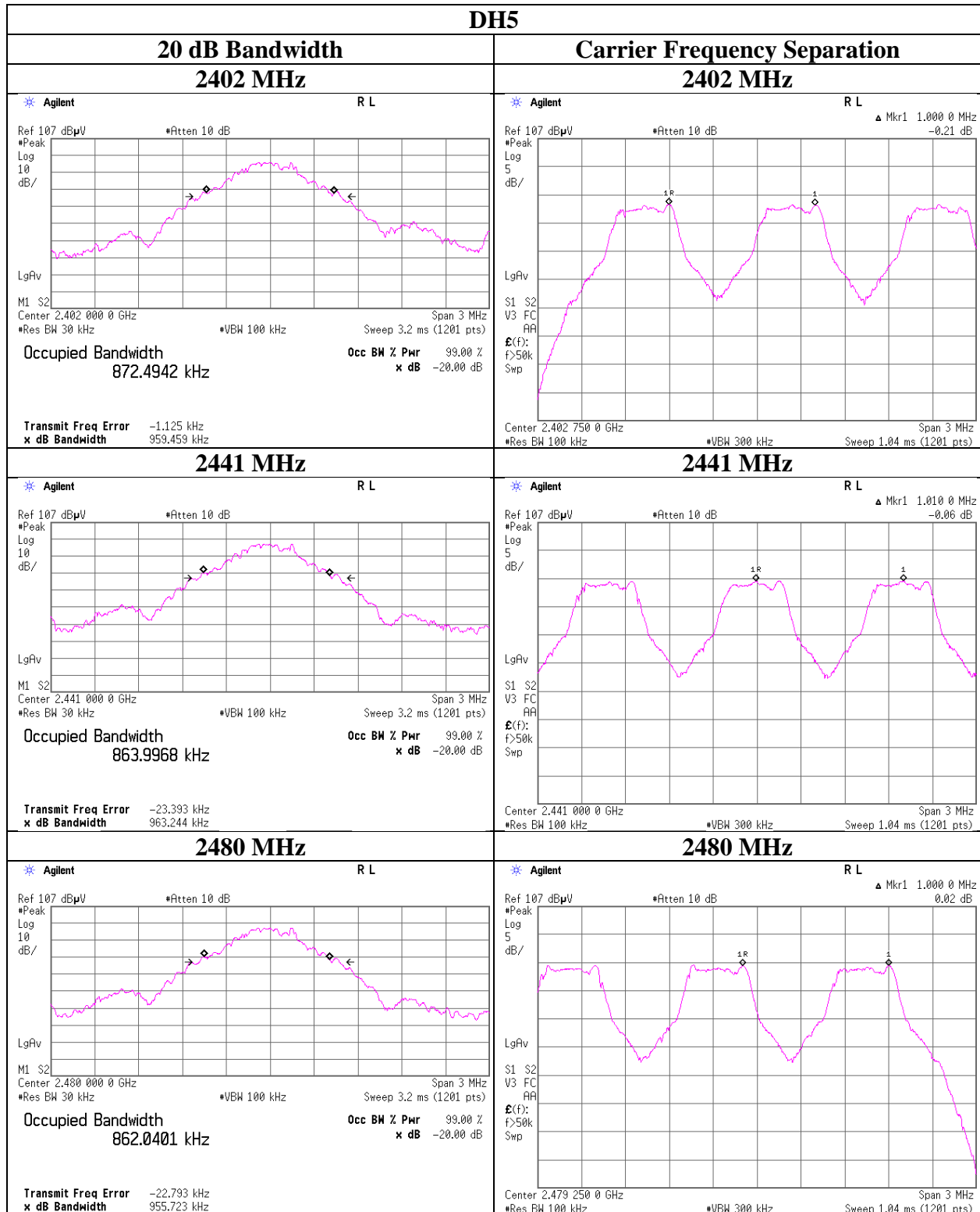
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11967268S-A-R1
Date October 3, 2017
Temperature / Humidity 26deg. C / 46 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.959	1.000	>= 0.640
DH5	2441.0	0.963	1.010	>= 0.642
DH5	2480.0	0.956	1.000	>= 0.637
3DH5	2402.0	1.292	1.000	>= 0.861
3DH5	2441.0	1.285	1.000	>= 0.857
3DH5	2480.0	1.286	1.000	>= 0.857

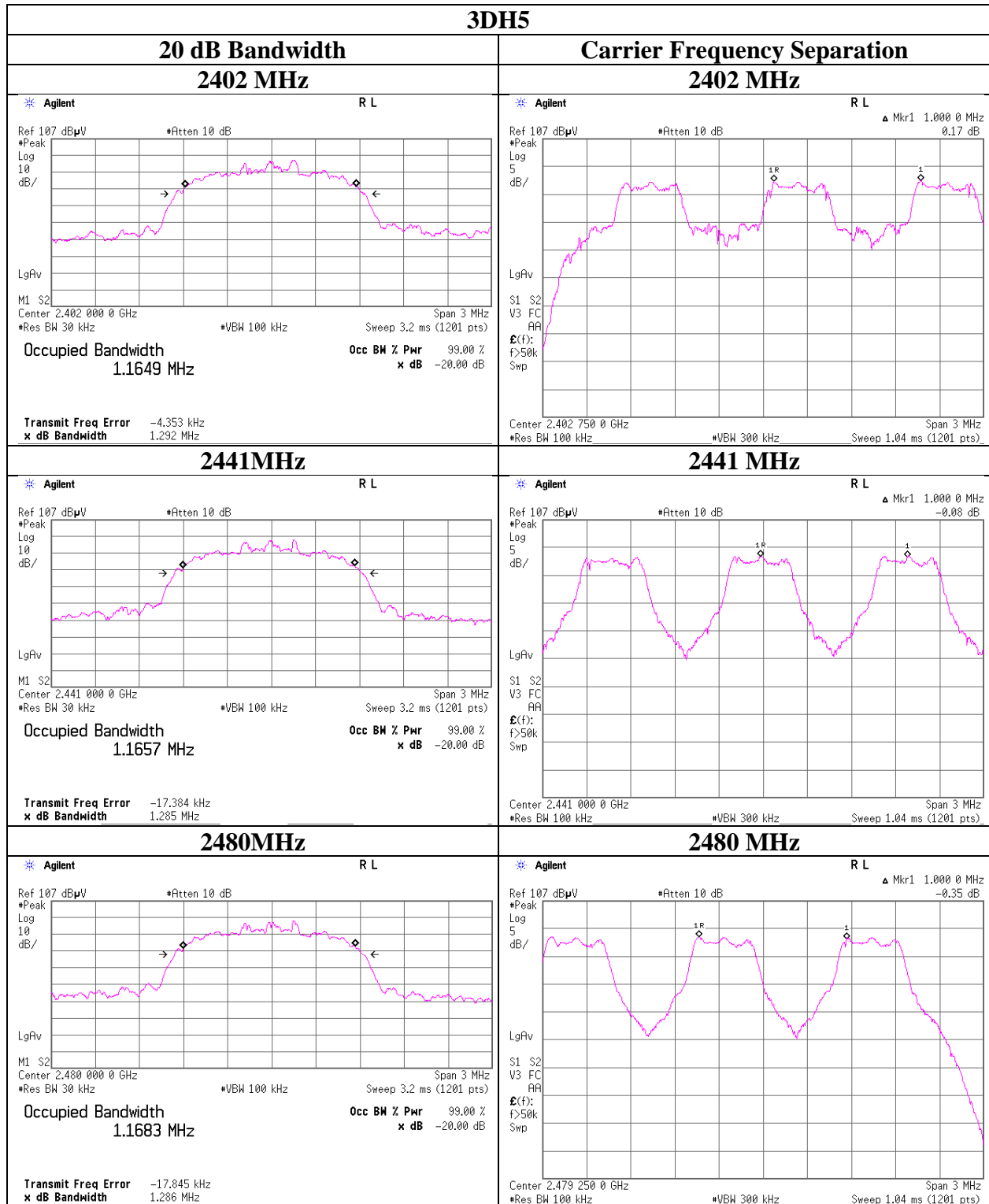
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation



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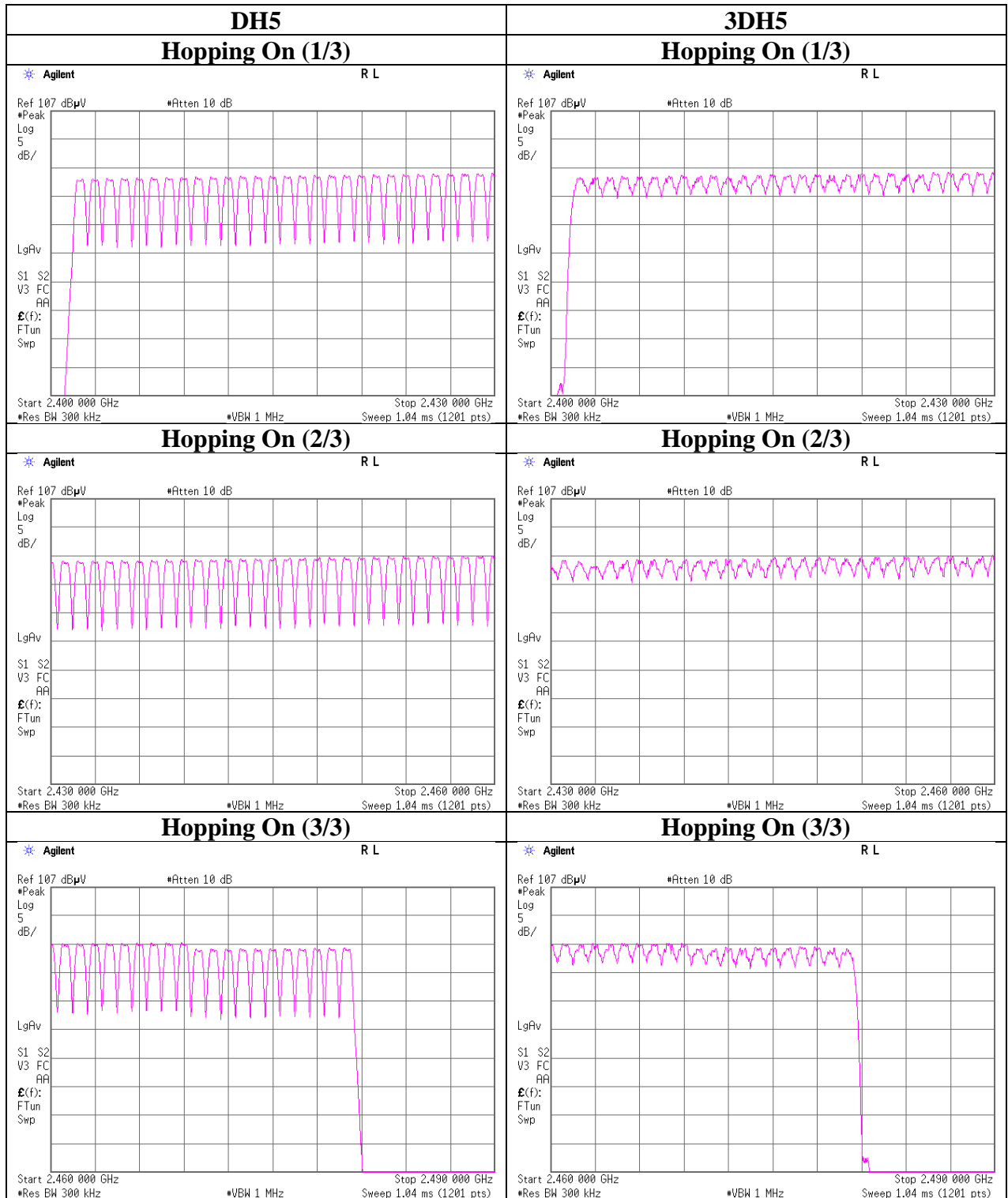
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11967268S-A-R1
Date October 3, 2017
Temperature / Humidity 26deg. C / 46 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



Dwell time

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11967268S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
	50.4 times / 5 sec.	x	31.6 sec. =	319 times			
DH1	50.4 times / 5 sec.	x	31.6 sec. =	319 times	0.414	132	400
DH3	25.6 times / 5 sec.	x	31.6 sec. =	162 times	1.671	271	400
DH5	16.6 times / 5 sec.	x	31.6 sec. =	105 times	2.919	306	400
3DH1	50.8 times / 5 sec.	x	31.6 sec. =	322 times	0.431	139	400
3DH3	25.2 times / 5 sec.	x	31.6 sec. =	160 times	1.684	269	400
3DH5	17.0 times / 5 sec.	x	31.6 sec. =	108 times	2.934	317	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

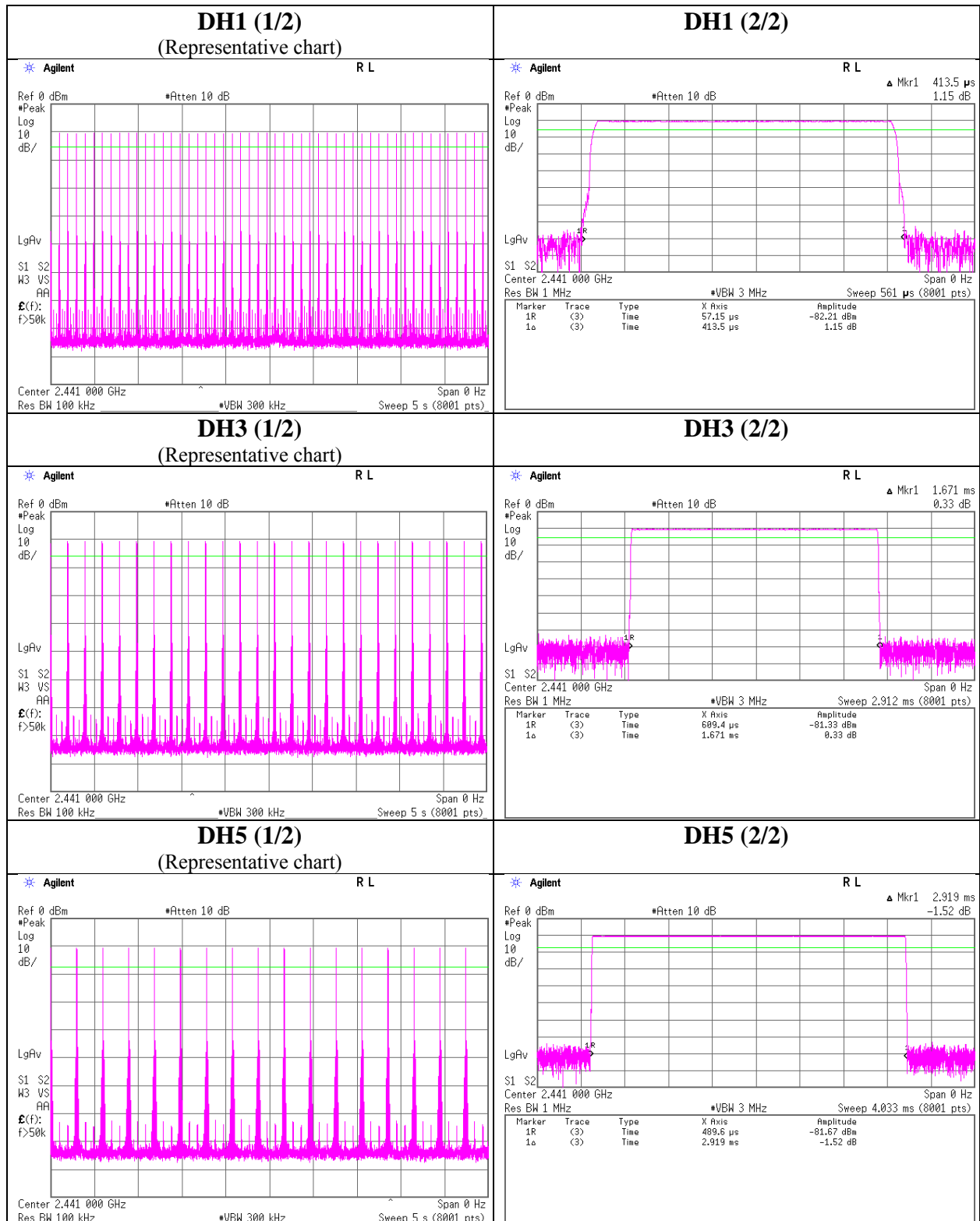
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	51	51	50	51	50.4
DH3	26	26	25	25	26	25.6
DH5	17	17	16	17	16	16.6
3DH1	50	51	51	51	51	50.8
3DH3	26	24	25	26	25	25.2
3DH5	17	17	17	17	17	17

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



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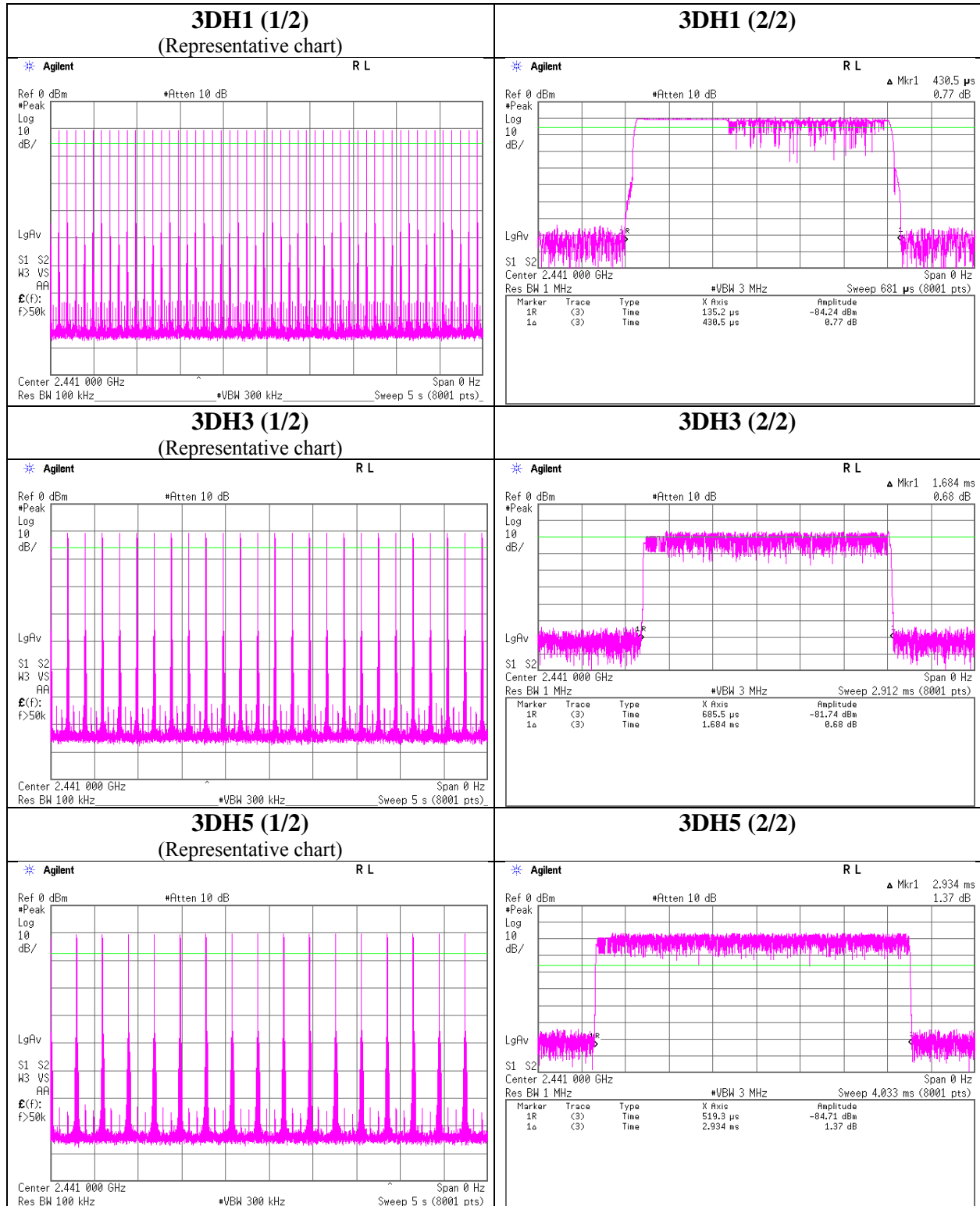
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Dwell time



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11967268S-A-R1
Date : October 3, 2017
Temperature / Humidity : 26deg. C / 46 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-12.08	1.74	9.80	-0.54	0.88	20.96	125	21.50
DH5	2441.0	-10.61	1.75	9.80	0.94	1.24	20.96	125	20.02
DH5	2480.0	-10.64	1.76	9.80	0.92	1.24	20.96	125	20.04
2DH5	2402.0	-10.77	1.74	9.80	0.77	1.19	20.96	125	20.19
2DH5	2441.0	-9.72	1.75	9.80	1.83	1.52	20.96	125	19.13
2DH5	2480.0	-9.61	1.76	9.80	1.95	1.57	20.96	125	19.01
3DH5	2402.0	-10.27	1.74	9.80	1.27	1.34	20.96	125	19.69
3DH5	2441.0	-9.29	1.75	9.80	2.26	1.68	20.96	125	18.70
3DH5	2480.0	-9.21	1.76	9.80	2.35	1.72	20.96	125	18.61

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. 11967268S-A-R1
Date October 3, 2017
Temperature / Humidity 26deg. C / 46 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-14.05	1.74	9.80	-2.51	0.56	1.08	-1.43	0.72
DH5	2441.0	-12.49	1.75	9.80	-0.94	0.81	1.08	0.14	1.03
DH5	2480.0	-12.53	1.76	9.80	-0.97	0.80	1.08	0.11	1.03
2DH5	2402.0	-14.80	1.74	9.80	-3.26	0.47	1.07	-2.19	0.60
2DH5	2441.0	-13.67	1.75	9.80	-2.12	0.61	1.07	-1.05	0.79
2DH5	2480.0	-13.63	1.76	9.80	-2.07	0.62	1.07	-1.00	0.79
3DH5	2402.0	-14.77	1.74	9.80	-3.23	0.48	1.06	-2.17	0.61
3DH5	2441.0	-13.65	1.75	9.80	-2.10	0.62	1.06	-1.04	0.79
3DH5	2480.0	-13.60	1.76	9.80	-2.04	0.63	1.06	-0.98	0.80

Sample Calculation:

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

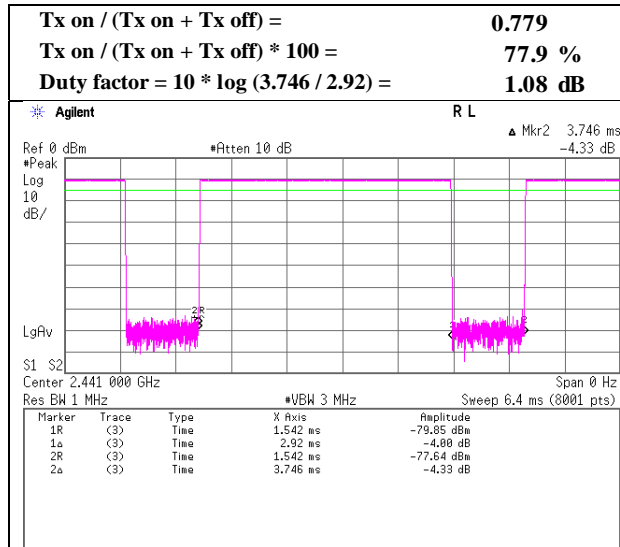
Result (Burst power average) = Time average + Duty factor

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

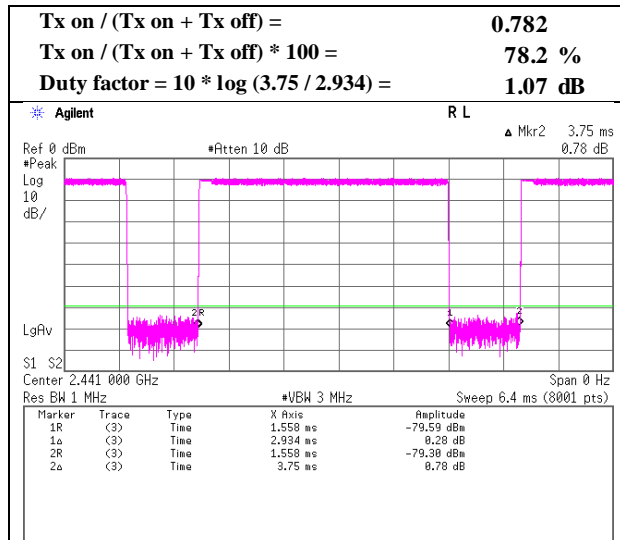
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off

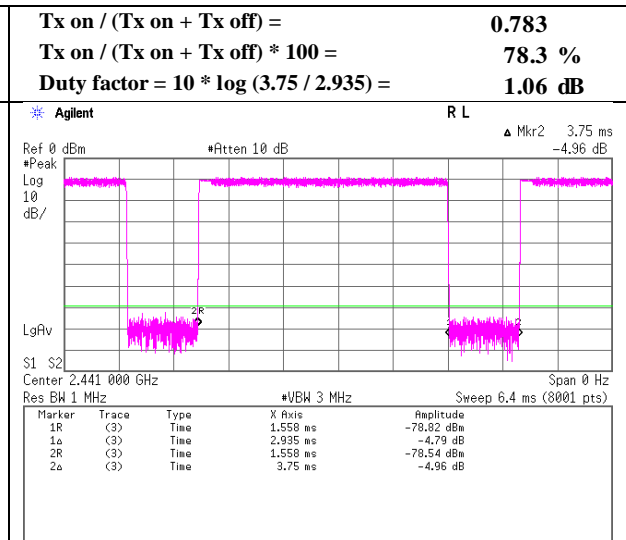
DH5



2DH5



3DH5



UL Japan, Inc.

Shonan EMC Lab.

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Radiated Spurious Emission

Test place : No.3 Semi Anechoic Chamber
Date : September 30, 2017 October 1, 2017
Temperature / Humidity : 24 deg.C, 51 %RH 22 deg.C, 54 %RH
Engineer : Hikaru Shirasawa Makoto Hosaka
Mode : Tx, 2402 MHz
Tx, Bluetooth, DH5, PRBS9,

(* 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.	125.369	QP	49.80	13.32	7.47	32.05	0.00	38.54	43.50	4.9	150	271	
Hori.	331.721	QP	49.45	14.10	8.88	31.87	0.00	40.56	46.00	5.4	100	42	
Hori.	431.100	QP	43.10	16.25	9.35	31.86	0.00	36.84	46.00	9.1	101	249	
Hori.	498.456	QP	44.26	17.61	9.63	31.84	0.00	39.66	46.00	6.3	100	87	
Hori.	552.871	QP	44.41	18.33	9.84	31.89	0.00	40.69	46.00	5.3	100	185	
Hori.	931.026	QP	35.88	22.04	11.15	30.65	0.00	38.42	46.00	7.5	100	178	
Hori.	2390.000	PK	48.94	27.26	14.19	44.13	2.24	48.50	73.90	25.4	338	316	
Hori.	4804.000	PK	53.09	31.40	6.65	44.45	2.24	48.93	73.90	24.9	241	73	
Hori.	7206.000	PK	48.22	36.56	8.26	43.99	2.24	51.29	73.90	22.6	100	0	
Hori.	9608.000	PK	48.00	38.61	9.24	43.83	2.24	54.26	73.90	19.6	100	0	
Hori.	12010.000	PK	49.08	39.30	10.64	43.36	2.24	57.90	73.90	16.0	100	0	
Hori.	2390.000	AV	36.81	27.26	14.19	44.13	2.24	36.37	53.90	17.5	338	316	
Hori.	4804.000	AV	44.29	31.40	6.65	44.45	2.24	40.13	53.90	13.7	241	73	
Hori.	7206.000	AV	35.95	36.56	8.26	43.99	2.24	39.02	53.90	14.8	100	0	
Hori.	9608.000	AV	36.76	38.61	9.24	43.83	2.24	43.02	53.90	10.8	100	0	
Hori.	12010.000	AV	36.91	39.30	10.64	43.36	2.24	45.73	53.90	8.1	100	0	
Vert.	93.206	QP	46.67	8.69	7.66	32.09	0.00	30.93	43.50	12.5	104	84	
Vert.	95.005	QP	45.17	9.02	7.62	32.08	0.00	29.73	43.50	13.7	116	92	
Vert.	136.240	QP	42.56	14.08	7.67	32.04	0.00	32.27	43.50	11.2	100	295	
Vert.	331.720	QP	47.85	14.10	8.88	31.87	0.00	38.96	46.00	7.0	100	217	
Vert.	2390.000	PK	49.06	27.26	14.19	44.13	2.24	48.62	73.90	25.2	235	192	
Vert.	4804.000	PK	52.12	31.40	6.65	44.45	2.24	47.96	73.90	25.9	272	58	
Vert.	7206.000	PK	48.21	36.56	8.26	43.99	2.24	51.28	73.90	22.6	100	0	
Vert.	9608.000	PK	49.87	38.61	9.24	43.83	2.24	56.13	73.90	17.7	100	0	
Vert.	12010.000	PK	48.64	39.30	10.64	43.36	2.24	57.46	73.90	16.4	100	0	
Vert.	2390.000	AV	36.80	27.26	14.19	44.13	2.24	36.36	53.90	17.5	235	192	
Vert.	4804.000	AV	43.54	31.40	6.65	44.45	2.24	39.38	53.90	14.5	272	58	
Vert.	7206.000	AV	35.94	36.56	8.26	43.99	2.24	39.01	53.90	14.8	100	0	
Vert.	9608.000	AV	36.73	38.61	9.24	43.83	2.24	42.99	53.90	10.9	100	0	
Vert.	12010.000	AV	36.92	39.30	10.64	43.36	2.24	45.74	53.90	8.1	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	85.16	27.29	14.20	44.14	2.24	84.75	-	-	Carrier
Hori.	2400.000	PK	41.77	27.29	14.19	44.14	2.24	41.35	64.75	23.4	
Vert.	2402.000	PK	93.82	27.29	14.20	44.14	2.24	93.41	-	-	Carrier
Vert.	2400.000	PK	45.90	27.29	14.19	44.14	2.24	45.48	73.41	27.9	

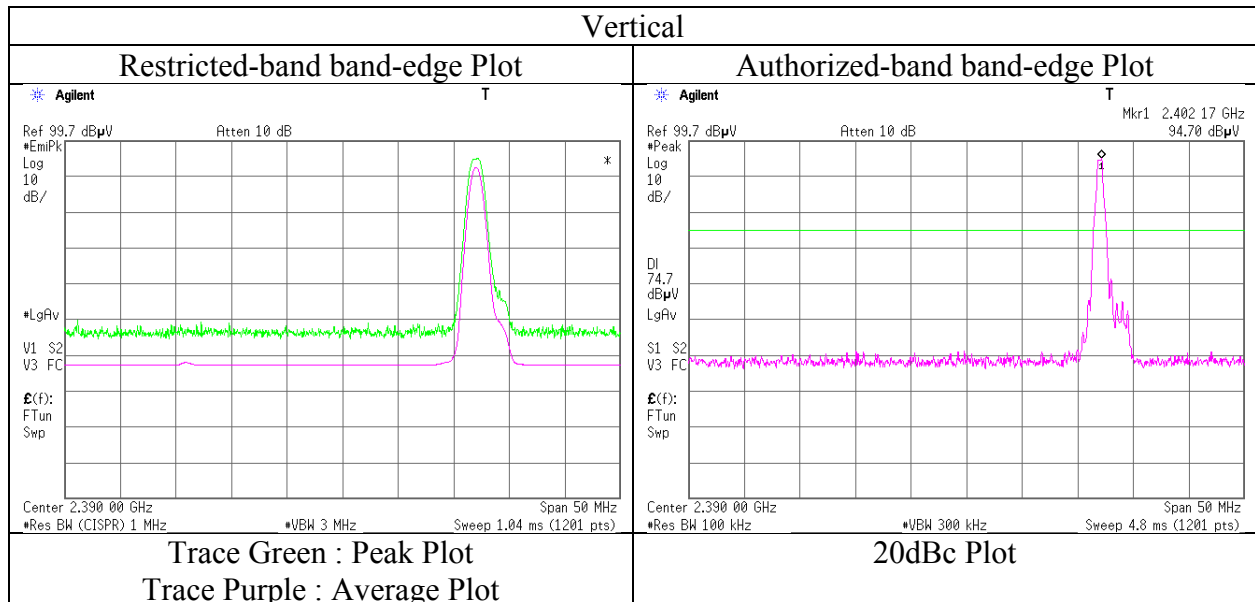
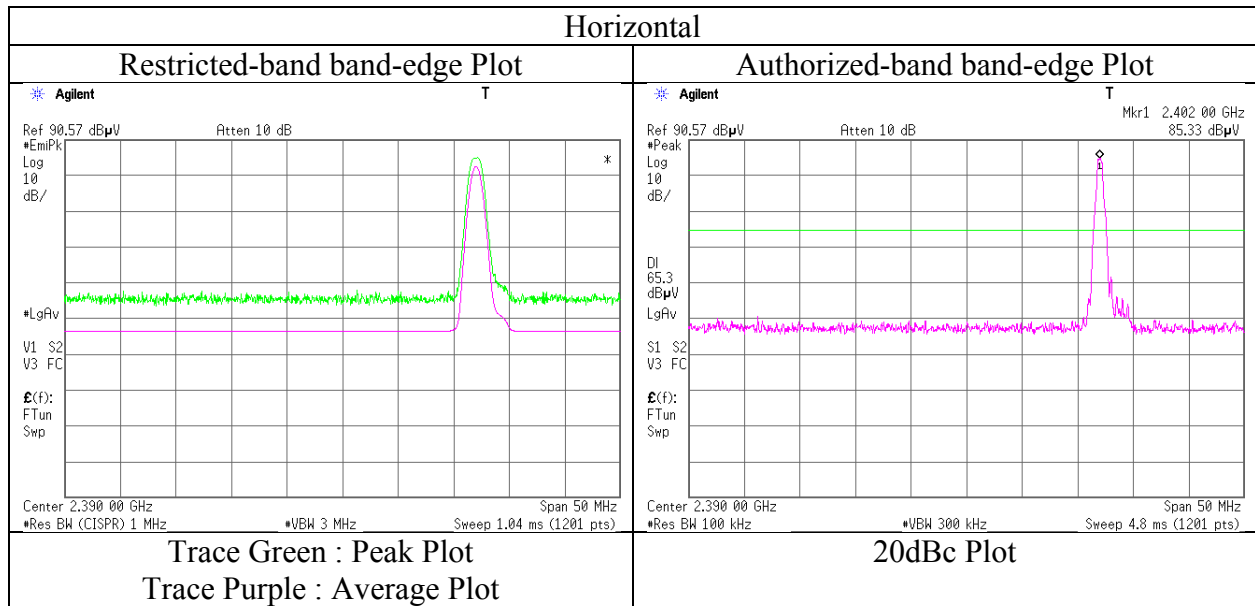
Result = Reading + Ant. Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 11967268S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 1, 2017
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Makoto Hosaka
(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

Test place No.3 Semi Anechoic Chamber
Date September 30, 2017 October 1, 2017
Temperature / Humidity 24 deg.C, 51 %RH 22 deg.C, 54 %RH
Engineer Hikaru Shirasawa Makoto Hosaka
Mode Tx, 2441 MHz
Tx, Bluetooth, DH5, PRBS9,

(* 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.	121.930	QP	50.70	13.08	7.43	32.06	0.00	39.15	43.50	4.3	163	270	
Hori.	331.722	QP	47.98	14.10	8.88	31.87	0.00	39.09	46.00	6.9	100	43	
Hori.	431.994	QP	44.65	16.27	9.35	31.86	0.00	38.41	46.00	7.5	100	341	
Hori.	479.157	QP	45.56	17.22	9.56	31.84	0.00	40.50	46.00	5.5	100	220	
Hori.	498.456	QP	44.12	17.61	9.63	31.84	0.00	39.52	46.00	6.4	100	248	
Hori.	552.874	QP	43.61	18.33	9.84	31.89	0.00	39.89	46.00	6.1	100	187	
Hori.	4882.000	PK	52.98	31.62	6.75	44.48	2.24	49.11	73.90	24.7	153	47	
Hori.	7323.000	PK	49.00	36.77	8.39	44.03	2.24	52.37	73.90	21.5	100	0	
Hori.	9764.000	PK	48.31	38.80	9.34	43.85	2.24	54.84	73.90	19.0	100	0	
Hori.	12205.000	PK	48.54	39.28	10.77	43.36	2.24	57.47	73.90	16.4	100	0	
Hori.	4882.000	AV	44.90	31.62	6.75	44.48	2.24	41.03	53.90	12.8	153	47	
Hori.	7323.000	AV	36.08	36.77	8.39	44.03	2.24	39.45	53.90	14.4	100	0	
Hori.	9764.000	AV	36.29	38.80	9.34	43.85	2.24	42.82	53.90	11.0	100	0	
Hori.	12205.000	AV	35.89	39.28	10.77	43.36	2.24	44.82	53.90	9.0	100	0	
Vert.	95.001	QP	47.48	9.02	7.62	32.08	0.00	32.04	43.50	11.4	100	101	
Vert.	331.721	QP	47.18	14.10	8.88	31.87	0.00	38.29	46.00	7.7	100	187	
Vert.	4882.000	PK	53.98	31.62	6.75	44.48	2.24	50.11	73.90	23.7	150	116	
Vert.	7323.000	PK	47.99	36.77	8.39	44.03	2.24	51.36	73.90	22.5	100	0	
Vert.	9764.000	PK	48.31	38.80	9.34	43.85	2.24	54.84	73.90	19.0	100	0	
Vert.	12205.000	PK	47.99	39.28	10.77	43.36	2.24	56.92	73.90	16.9	100	0	
Vert.	4882.000	AV	45.94	31.62	6.75	44.48	2.24	42.07	53.90	11.8	150	116	
Vert.	7323.000	AV	36.08	36.77	8.39	44.03	2.24	39.45	53.90	14.4	100	0	
Vert.	9764.000	AV	36.01	38.80	9.34	43.85	2.24	42.54	53.90	11.3	100	0	
Vert.	12205.000	AV	35.77	39.28	10.77	43.36	2.24	44.70	53.90	9.2	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.

Radiated Spurious Emission

Test place : No.3 Semi Anechoic Chamber
Date : September 30, 2017 October 1, 2017
Temperature / Humidity : 24 deg.C, 51 %RH 22 deg.C, 54 %RH
Engineer : Hikaru Shirasawa Makoto Hosaka
Mode : Tx, 2480 MHz
Tx, Bluetooth, DH5, PRBS9,

(* 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.	94.950	QP	48.34	9.01	7.62	32.08	0.00	32.89	43.50	10.6	206	88	
Hori.	121.818	QP	51.14	13.08	7.43	32.06	0.00	39.59	43.50	3.9	296	266	
Hori.	331.722	QP	50.22	14.10	8.88	31.87	0.00	41.33	46.00	4.6	100	41	
Hori.	431.992	QP	43.65	16.27	9.35	31.86	0.00	37.41	46.00	8.5	100	334	
Hori.	479.157	QP	45.12	17.22	9.56	31.84	0.00	40.06	46.00	5.9	100	220	
Hori.	498.456	QP	43.17	17.61	9.63	31.84	0.00	38.57	46.00	7.4	100	135	
Hori.	552.872	QP	44.22	18.33	9.84	31.89	0.00	40.50	46.00	5.5	100	3	
Hori.	2483.500	PK	49.06	27.55	14.29	44.16	2.24	48.98	73.90	24.9	298	240	
Hori.	4960.000	PK	52.66	31.83	6.83	44.51	2.24	49.05	73.90	24.8	160	67	
Hori.	7440.000	PK	49.47	36.97	8.52	44.08	2.24	53.12	73.90	20.7	100	0	
Hori.	9920.000	PK	48.49	38.98	9.42	43.87	2.24	55.26	73.90	18.6	100	0	
Hori.	12400.000	PK	48.74	39.26	10.91	43.36	2.24	57.79	73.90	16.1	100	0	
Hori.	2483.500	AV	36.73	27.55	14.29	44.16	2.24	36.65	53.90	17.2	298	240	
Hori.	4960.000	AV	42.94	31.83	6.83	44.51	2.24	39.33	53.90	14.5	160	67	
Hori.	7440.000	AV	37.04	36.97	8.52	44.08	2.24	40.69	53.90	13.2	100	0	
Hori.	9920.000	AV	36.14	38.98	9.42	43.87	2.24	42.91	53.90	10.9	100	0	
Hori.	12400.000	AV	36.01	39.26	10.91	43.36	2.24	45.06	53.90	8.8	100	0	
Vert.	96.723	QP	48.89	9.34	7.59	32.08	0.00	33.74	43.50	9.7	100	102	
Vert.	331.723	QP	47.57	14.10	8.88	31.87	0.00	38.68	46.00	7.3	100	158	
Vert.	2483.500	PK	49.07	27.55	14.29	44.16	2.24	48.99	73.90	24.9	287	198	
Vert.	4960.000	PK	52.50	31.83	6.83	44.51	2.24	48.89	73.90	25.0	235	55	
Vert.	7440.000	PK	49.16	36.97	8.52	44.08	2.24	52.81	73.90	21.0	100	0	
Vert.	9920.000	PK	48.03	38.98	9.42	43.87	2.24	54.80	73.90	19.1	100	0	
Vert.	12400.000	PK	48.57	39.26	10.91	43.36	2.24	57.62	73.90	16.2	100	0	
Vert.	2483.500	AV	36.94	27.55	14.29	44.16	2.24	36.86	53.90	17.0	287	198	
Vert.	4960.000	AV	43.59	31.83	6.83	44.51	2.24	39.98	53.90	13.9	235	55	
Vert.	7440.000	AV	36.97	36.97	8.52	44.08	2.24	40.62	53.90	13.2	100	0	
Vert.	9920.000	AV	36.08	38.98	9.42	43.87	2.24	42.85	53.90	11.0	100	0	
Vert.	12400.000	AV	35.99	39.26	10.91	43.36	2.24	45.04	53.90	8.8	100	0	

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

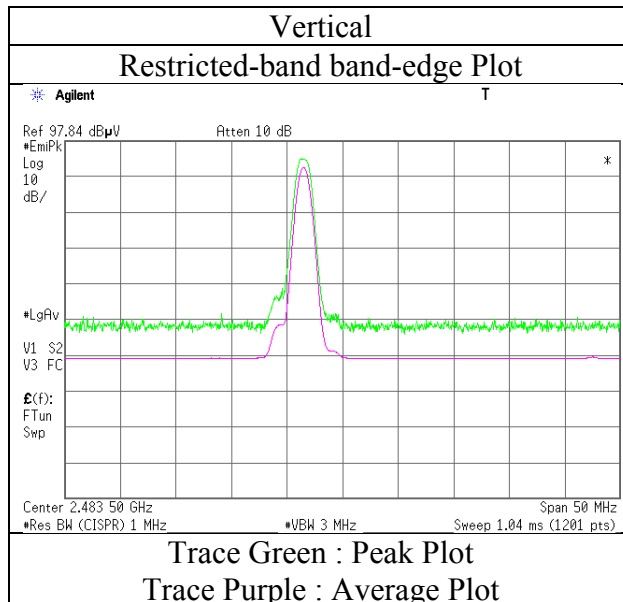
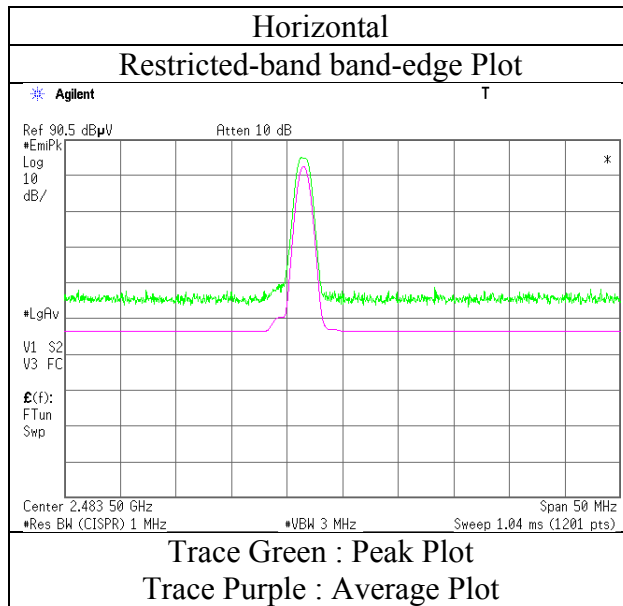
Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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
(Reference Plot for band-edge)

Report No. 11967268S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 1, 2017
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Makoto Hosaka
(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

Test place No.3 Semi Anechoic Chamber
Date September 30, 2017 October 1, 2017
Temperature / Humidity 24 deg.C, 51 %RH 22 deg.C, 54 %RH
Engineer Hikaru Shirasawa Makoto Hosaka
Mode Tx, 2402 MHz
Tx, Bluetooth, 3-DH5, PRBS9,

(* 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.	94.920	QP	47.98	9.01	7.62	32.08	0.00	32.53	43.50	10.9	296	67	
Hori.	121.796	QP	50.76	13.07	7.43	32.06	0.00	39.20	43.50	4.3	317	275	
Hori.	331.724	QP	50.71	14.10	8.88	31.87	0.00	41.82	46.00	4.1	100	39	
Hori.	431.993	QP	43.17	16.27	9.35	31.86	0.00	36.93	46.00	9.0	100	335	
Hori.	479.157	QP	44.91	17.22	9.56	31.84	0.00	39.85	46.00	6.1	100	220	
Hori.	498.455	QP	42.05	17.61	9.63	31.84	0.00	37.45	46.00	8.5	100	140	
Hori.	552.871	QP	44.56	18.33	9.84	31.89	0.00	40.84	46.00	5.1	100	3	
Hori.	2390.000	PK	49.70	27.26	14.19	44.13	2.24	49.26	73.90	24.6	328	246	
Hori.	4804.000	PK	50.18	31.40	6.65	44.45	2.24	46.02	73.90	27.8	160	53	
Hori.	7206.000	PK	48.87	36.56	8.26	43.99	2.24	51.94	73.90	21.9	100	0	
Hori.	9608.000	PK	49.03	38.61	9.24	43.83	2.24	55.29	73.90	18.6	100	0	
Hori.	12010.000	PK	49.01	39.30	10.64	43.36	2.24	57.83	73.90	16.0	100	0	
Hori.	2390.000	AV	36.82	27.26	14.19	44.13	2.24	36.38	53.90	17.5	328	246	
Hori.	4804.000	AV	38.49	31.40	6.65	44.45	2.24	34.33	53.90	19.5	160	53	
Hori.	7206.000	AV	36.03	36.56	8.26	43.99	2.24	39.10	53.90	14.8	100	0	
Hori.	9608.000	AV	36.80	38.61	9.24	43.83	2.24	43.06	53.90	10.8	100	0	
Hori.	12010.000	AV	37.03	39.30	10.64	43.36	2.24	45.85	53.90	8.0	100	0	
Vert.	96.710	QP	42.65	9.34	7.59	32.08	0.00	27.50	43.50	16.0	100	260	
Vert.	331.723	QP	47.86	14.10	8.88	31.87	0.00	38.97	46.00	7.0	100	175	
Vert.	2375.840	PK	49.85	27.21	14.17	44.13	2.24	49.34	73.90	24.5	148	229	
Vert.	2390.000	PK	49.23	27.26	14.19	44.13	2.24	48.79	73.90	25.1	229	173	
Vert.	4804.000	PK	50.05	31.40	6.65	44.45	2.24	45.89	73.90	28.0	226	65	
Vert.	7206.000	PK	48.68	36.56	8.26	43.99	2.24	51.75	73.90	22.1	100	0	
Vert.	9608.000	PK	49.82	38.61	9.24	43.83	2.24	56.08	73.90	17.8	100	0	
Vert.	12010.000	PK	49.24	39.30	10.64	43.36	2.24	58.06	73.90	15.8	100	0	
Vert.	2375.840	AV	39.10	27.21	14.17	44.13	2.24	38.59	53.90	15.3	148	229	
Vert.	2390.000	AV	36.84	27.26	14.19	44.13	2.24	36.40	53.90	17.5	229	173	
Vert.	4804.000	AV	39.80	31.40	6.65	44.45	2.24	35.64	53.90	18.2	226	65	
Vert.	7206.000	AV	36.01	36.56	8.26	43.99	2.24	39.08	53.90	14.8	100	0	
Vert.	9608.000	AV	37.05	38.61	9.24	43.83	2.24	43.31	53.90	10.5	100	0	
Vert.	12010.000	AV	37.04	39.30	10.64	43.36	2.24	45.86	53.90	8.0	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	88.22	27.29	14.20	44.14	2.24	87.81	-	-	Carrier
Hori.	2400.000	PK	42.81	27.29	14.19	44.14	2.24	42.39	67.81	25.4	
Vert.	2402.000	PK	93.98	27.29	14.20	44.14	2.24	93.57	-	-	Carrier
Vert.	2400.000	PK	46.11	27.29	14.19	44.14	2.24	45.69	73.57	27.9	

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.

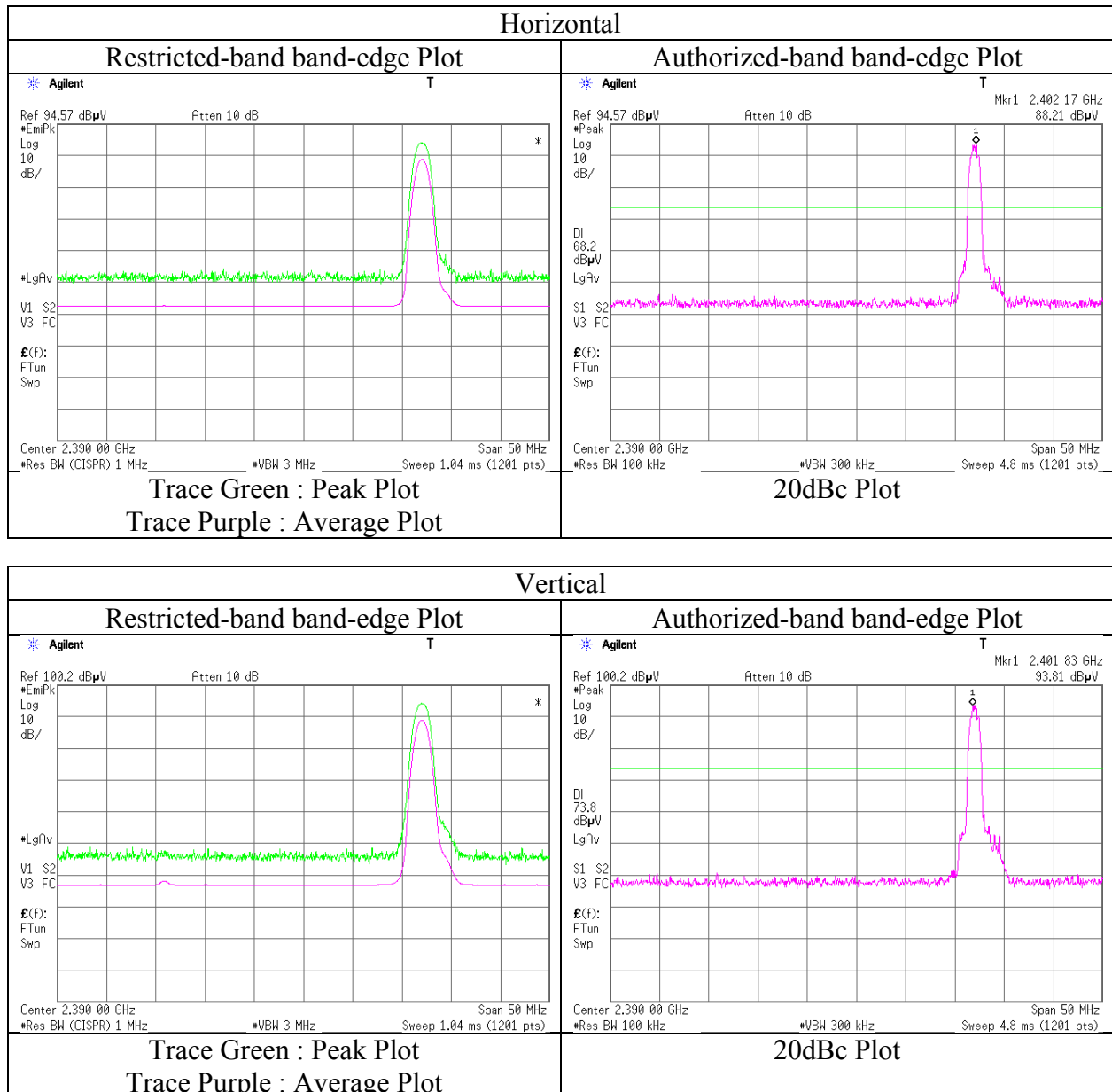
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11967268S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 1, 2017
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Makoto Hosaka (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

Test place No.3 Semi Anechoic Chamber
Date September 30, 2017 October 1, 2017
Temperature / Humidity 24 deg.C, 51 %RH 22 deg.C, 54 %RH
Engineer Hikaru Shirasawa Makoto Hosaka
Mode Tx, 2441 MHz
Tx, Bluetooth, 3-DH5, PRBS9,

(* 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.	94.261	QP	50.29	8.88	7.64	32.08	0.00	34.73	43.50	8.7	278	93	
Hori.	121.774	QP	50.88	13.07	7.43	32.06	0.00	39.32	43.50	4.1	312	268	
Hori.	331.723	QP	50.81	14.10	8.88	31.87	0.00	41.92	46.00	4.0	100	39	
Hori.	431.995	QP	44.19	16.27	9.35	31.86	0.00	37.95	46.00	8.0	100	336	
Hori.	479.157	QP	44.81	17.22	9.56	31.84	0.00	39.75	46.00	6.2	100	218	
Hori.	498.459	QP	43.08	17.61	9.63	31.84	0.00	38.48	46.00	7.5	100	139	
Hori.	552.832	QP	44.48	18.33	9.84	31.89	0.00	40.76	46.00	5.2	100	3	
Hori.	4882.000	PK	52.98	31.62	6.75	44.48	2.24	49.11	73.90	24.7	153	47	
Hori.	7323.000	PK	49.00	36.77	8.39	44.03	2.24	52.37	73.90	21.5	100	0	
Hori.	9764.000	PK	48.31	38.80	9.34	43.85	2.24	54.84	73.90	19.0	100	0	
Hori.	12205.000	PK	48.54	39.28	10.77	43.36	2.24	57.47	73.90	16.4	100	0	
Hori.	4882.000	AV	44.90	31.62	6.75	44.48	2.24	41.03	53.90	12.8	153	47	
Hori.	7323.000	AV	36.08	36.77	8.39	44.03	2.24	39.45	53.90	14.4	100	0	
Hori.	9764.000	AV	36.29	38.80	9.34	43.85	2.24	42.82	53.90	11.0	100	0	
Hori.	12205.000	AV	35.89	39.28	10.77	43.36	2.24	44.82	53.90	9.0	100	0	
Vert.	93.707	QP	49.26	8.78	7.64	32.09	0.00	33.59	43.50	9.9	100	108	
Vert.	331.724	QP	47.85	14.10	8.88	31.87	0.00	38.96	46.00	7.0	100	168	
Vert.	4882.000	PK	53.98	31.62	6.75	44.48	2.24	50.11	73.90	23.7	150	116	
Vert.	7323.000	PK	47.99	36.77	8.39	44.03	2.24	51.36	73.90	22.5	100	0	
Vert.	9764.000	PK	48.31	38.80	9.34	43.85	2.24	54.84	73.90	19.0	100	0	
Vert.	12205.000	PK	47.99	39.28	10.77	43.36	2.24	56.92	73.90	16.9	100	0	
Vert.	4882.000	AV	45.94	31.62	6.75	44.48	2.24	42.07	53.90	11.8	150	116	
Vert.	7323.000	AV	36.08	36.77	8.39	44.03	2.24	39.45	53.90	14.4	100	0	
Vert.	9764.000	AV	36.01	38.80	9.34	43.85	2.24	42.54	53.90	11.3	100	0	
Vert.	12205.000	AV	35.77	39.28	10.77	43.36	2.24	44.70	53.90	9.2	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

Test place No.3 Semi Anechoic Chamber
Date September 30, 2017 October 1, 2017
Temperature / Humidity 24 deg.C, 51 %RH 22 deg.C, 54 %RH
Engineer Hikaru Shirasawa Makoto Hosaka
Mode Tx, 2480 MHz
Tx, Bluetooth, 3-DH5, PRBS9,

(* 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.	121.757	QP	50.81	13.07	7.43	32.06	0.00	39.25	43.50	4.2	305	260	
Hori.	331.722	QP	50.88	14.10	8.88	31.87	0.00	41.99	46.00	4.0	100	44	
Hori.	405.439	QP	41.28	15.73	9.23	31.87	0.00	34.37	46.00	11.6	100	214	
Hori.	431.992	QP	44.14	16.27	9.35	31.86	0.00	37.90	46.00	8.1	100	337	
Hori.	479.156	QP	44.68	17.22	9.56	31.84	0.00	39.62	46.00	6.3	100	223	
Hori.	498.457	QP	43.17	17.61	9.63	31.84	0.00	38.57	46.00	7.4	100	138	
Hori.	552.872	QP	44.52	18.33	9.84	31.89	0.00	40.80	46.00	5.2	100	2	
Hori.	2483.500	PK	49.64	27.55	14.29	44.16	2.24	49.56	73.90	24.3	298	240	
Hori.	4960.000	PK	50.26	31.83	6.83	44.51	2.24	46.65	73.90	27.2	164	95	
Hori.	7440.000	PK	48.71	36.97	8.52	44.08	2.24	52.36	73.90	21.5	100	0	
Hori.	9920.000	PK	49.48	38.98	9.42	43.87	2.24	56.25	73.90	17.6	100	0	
Hori.	12400.000	PK	49.42	39.26	10.91	43.36	2.24	58.47	73.90	15.4	100	0	
Hori.	2483.500	AV	36.72	27.55	14.29	44.16	2.24	36.64	53.90	17.2	298	240	
Hori.	4960.000	AV	38.43	31.83	6.83	44.51	2.24	34.82	53.90	19.0	164	95	
Hori.	7440.000	AV	36.90	36.97	8.52	44.08	2.24	40.55	53.90	13.3	100	0	
Hori.	9920.000	AV	36.09	38.98	9.42	43.87	2.24	42.86	53.90	11.0	100	0	
Hori.	12400.000	AV	35.94	39.26	10.91	43.36	2.24	44.99	53.90	8.9	100	0	
Vert.	95.821	QP	48.56	9.17	7.61	32.08	0.00	33.26	43.50	10.2	100	99	
Vert.	331.723	QP	47.89	14.10	8.88	31.87	0.00	39.00	46.00	7.0	100	169	
Vert.	2483.500	PK	49.03	27.55	14.29	44.16	2.24	48.95	73.90	24.9	282	199	
Vert.	4960.000	PK	51.08	31.83	6.83	44.51	2.24	47.47	73.90	26.4	138	57	
Vert.	7440.000	PK	48.62	36.97	8.52	44.08	2.24	52.27	73.90	21.6	100	0	
Vert.	9920.000	PK	47.68	38.98	9.42	43.87	2.24	54.45	73.90	19.4	100	0	
Vert.	12400.000	PK	47.56	39.26	10.91	43.36	2.24	56.61	73.90	17.2	100	0	
Vert.	2483.500	AV	36.84	27.55	14.29	44.16	2.24	36.76	53.90	17.1	282	199	
Vert.	4960.000	AV	38.93	31.83	6.83	44.51	2.24	35.32	53.90	18.5	138	57	
Vert.	7440.000	AV	37.00	36.97	8.52	44.08	2.24	40.65	53.90	13.2	100	0	
Vert.	9920.000	AV	36.17	38.98	9.42	43.87	2.24	42.94	53.90	10.9	100	0	
Vert.	12400.000	AV	35.92	39.26	10.91	43.36	2.24	44.97	53.90	8.9	100	0	

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

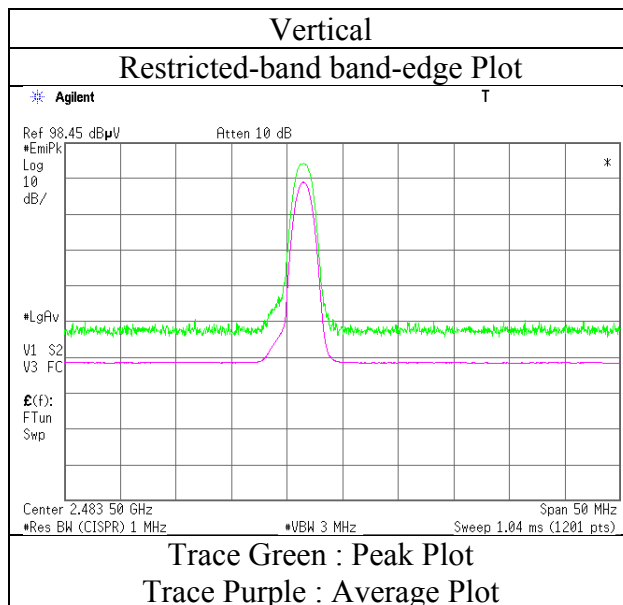
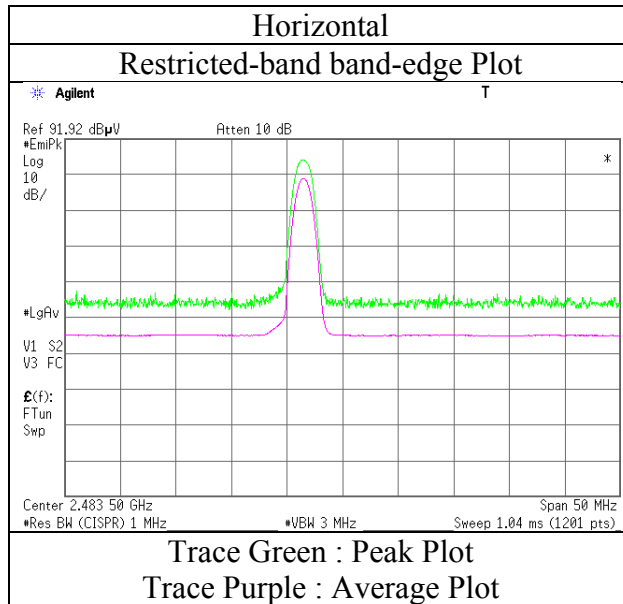
Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.24 dB

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.

Radiated Spurious Emission
(Reference Plot for band-edge)

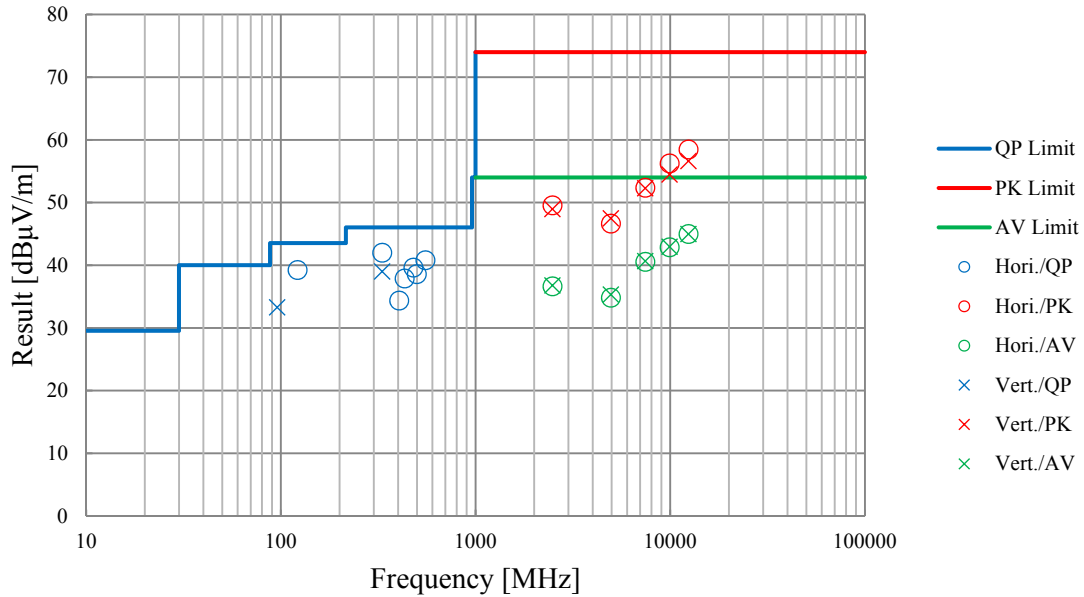
Report No.	11967268S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 1, 2017
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Makoto Hosaka (1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Report No.	11967268S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	September 30, 2017	October 1, 2017
Temperature / Humidity	24 deg. C / 51 % RH	22 deg. C / 54 % RH
Engineer	Hikaru Shirasawa	Makoto Hosaka
	(30 MHz -1 GHz)	(1 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

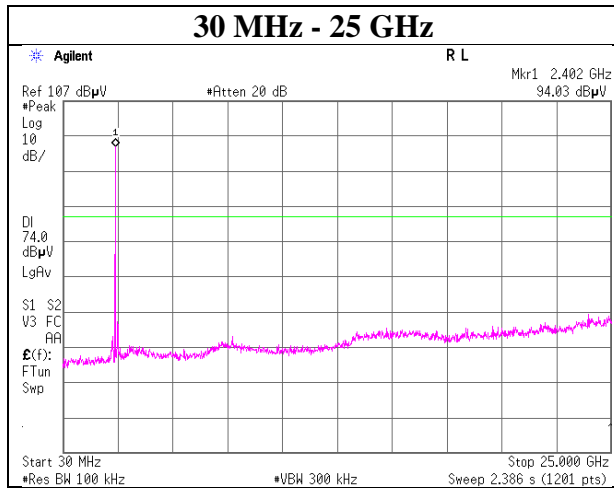
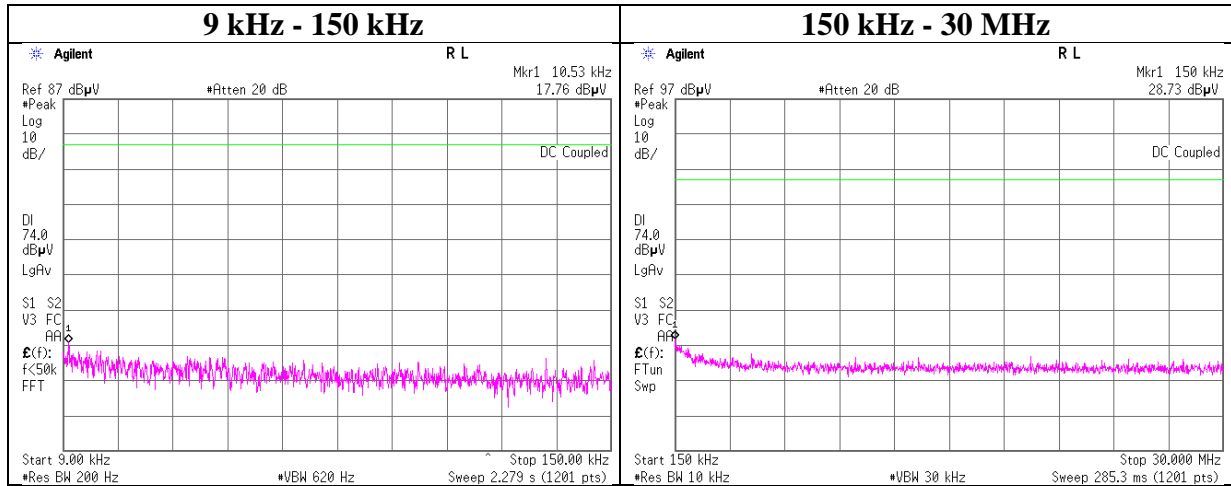


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

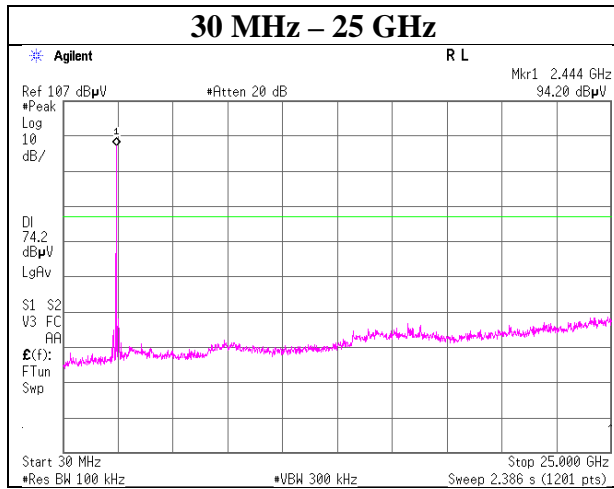
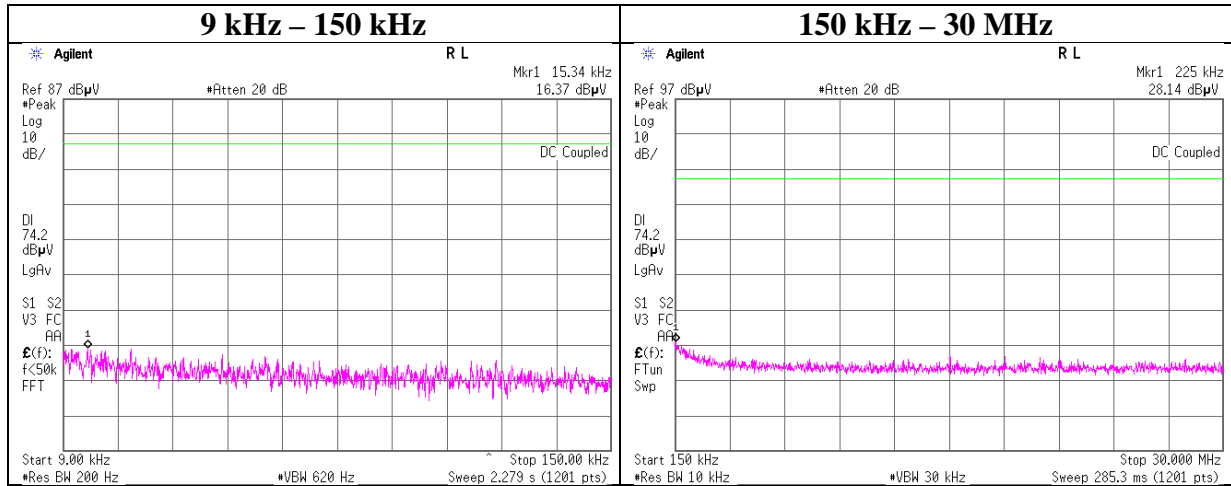
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

2441 MHz



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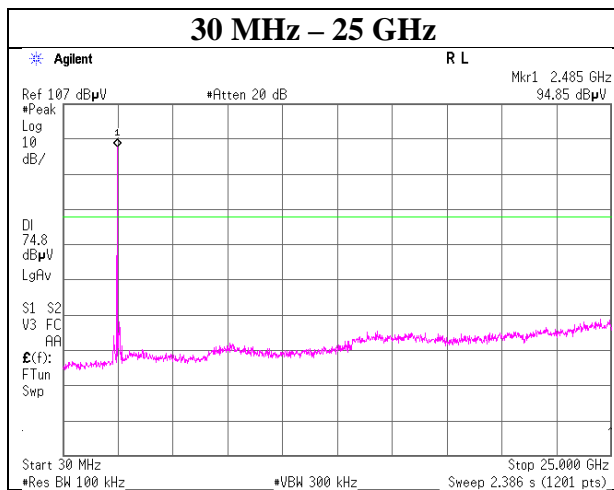
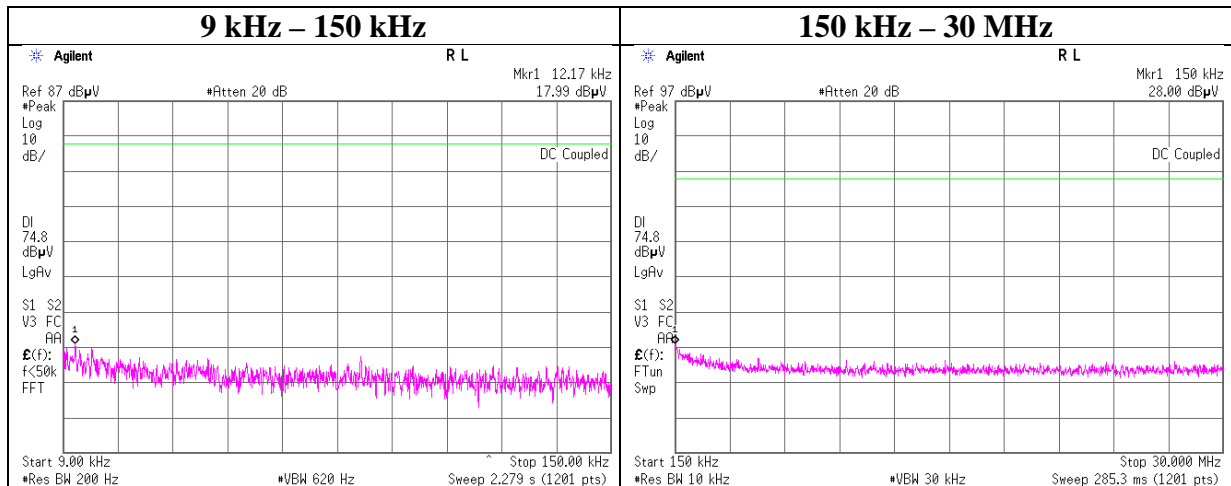
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Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

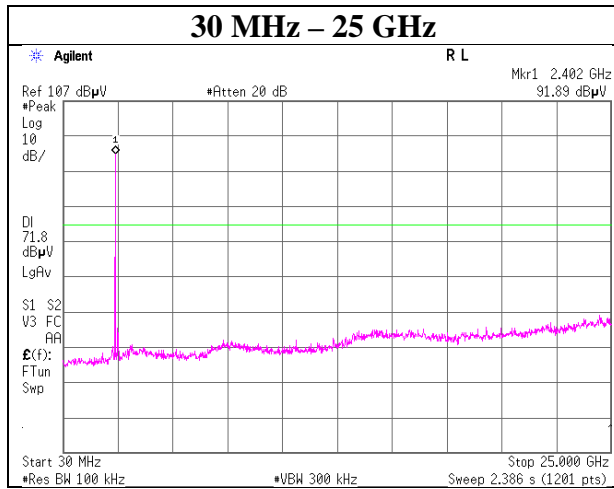
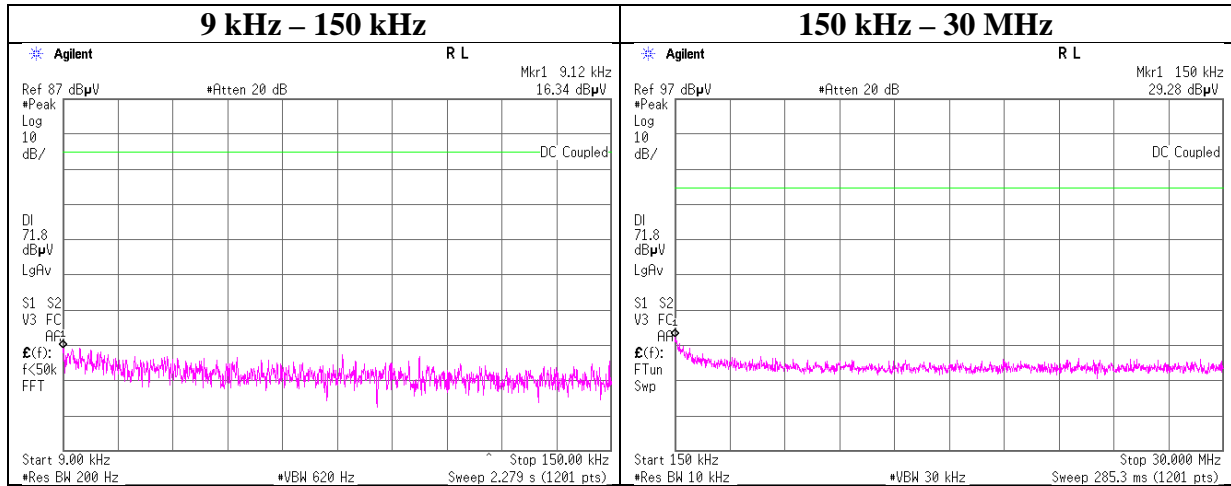
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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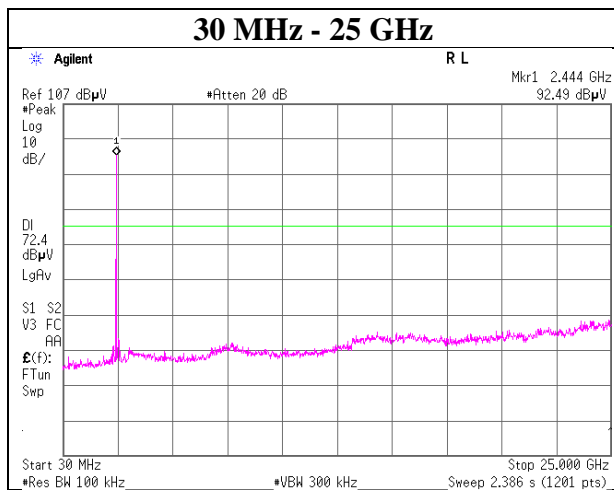
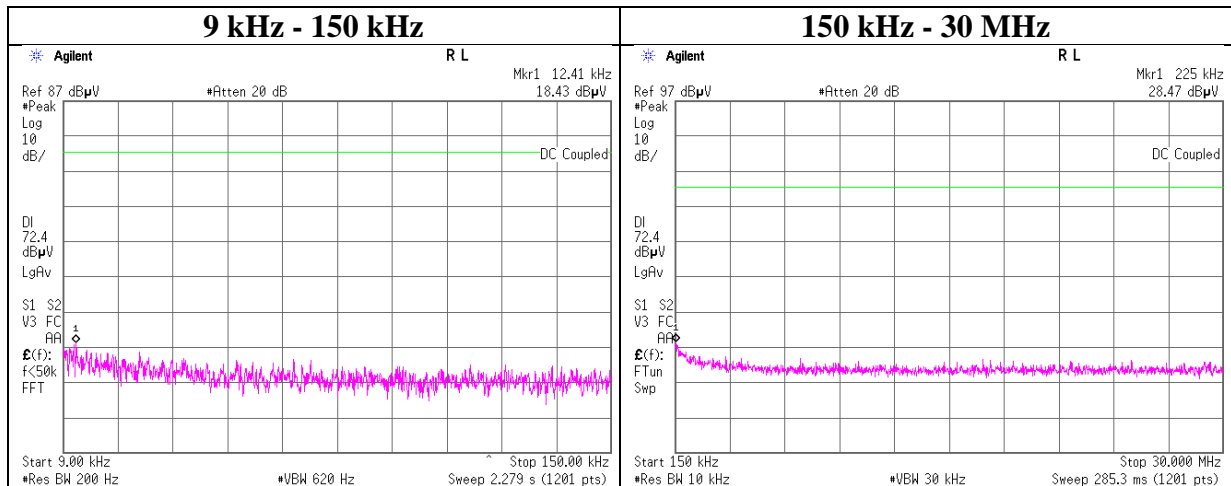
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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Shonan EMC Lab.

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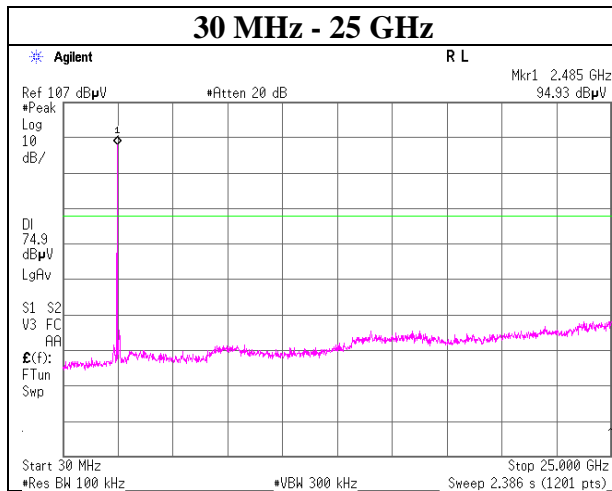
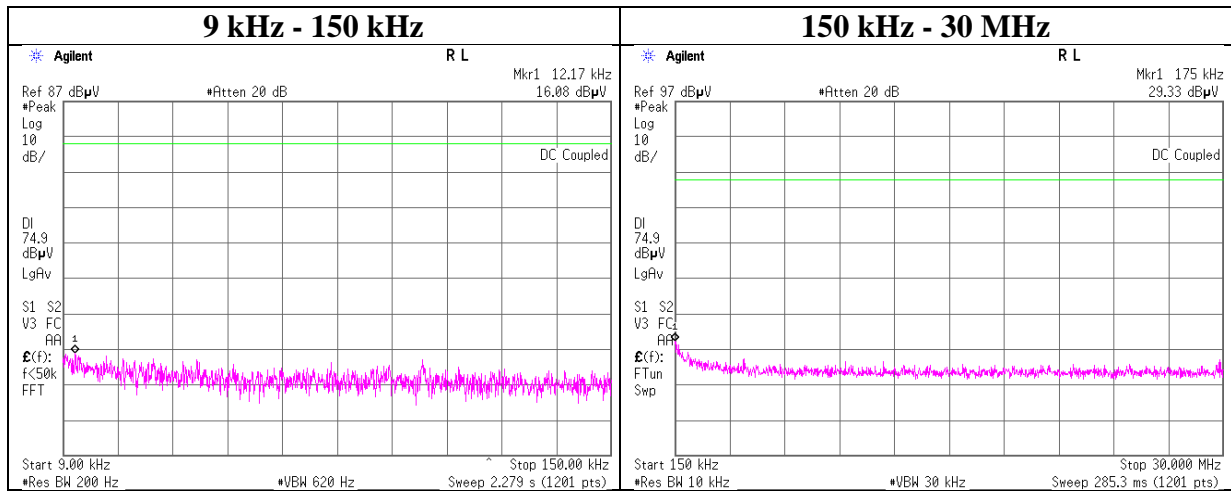
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

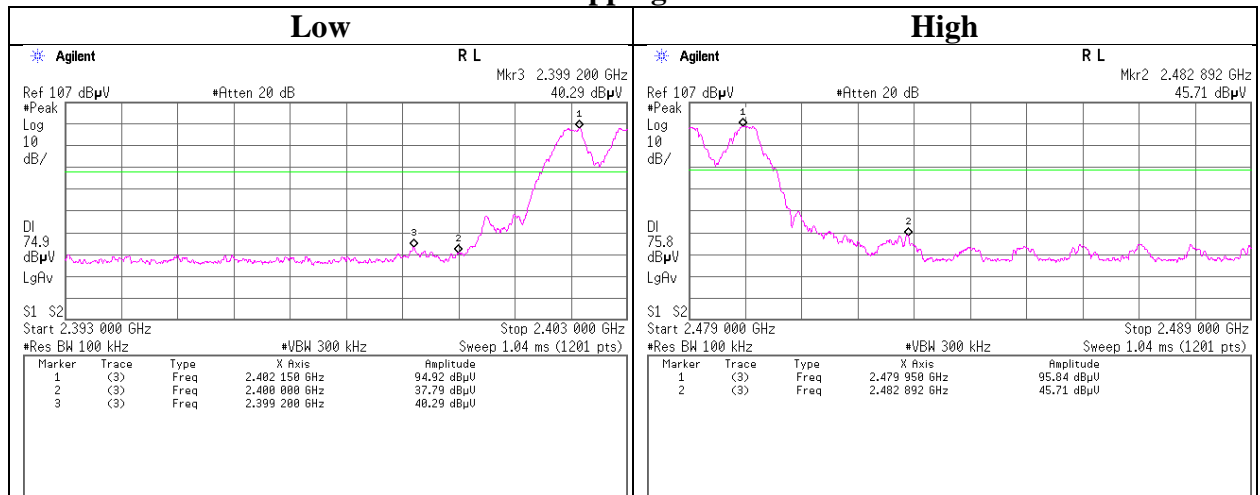
2480 MHz



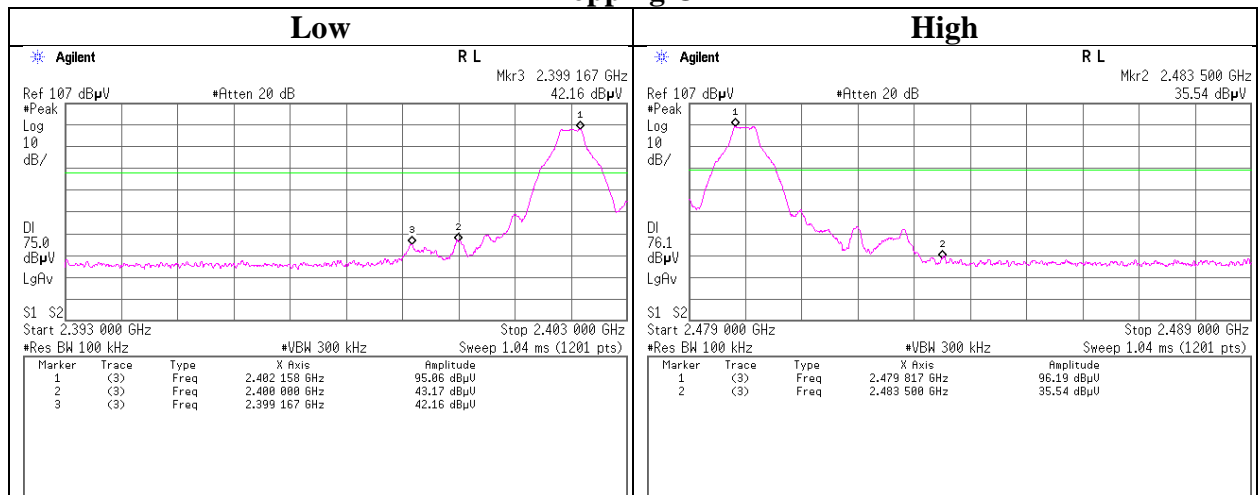
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx DH5

Hopping On



Hopping Off



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Shonan EMC Lab.

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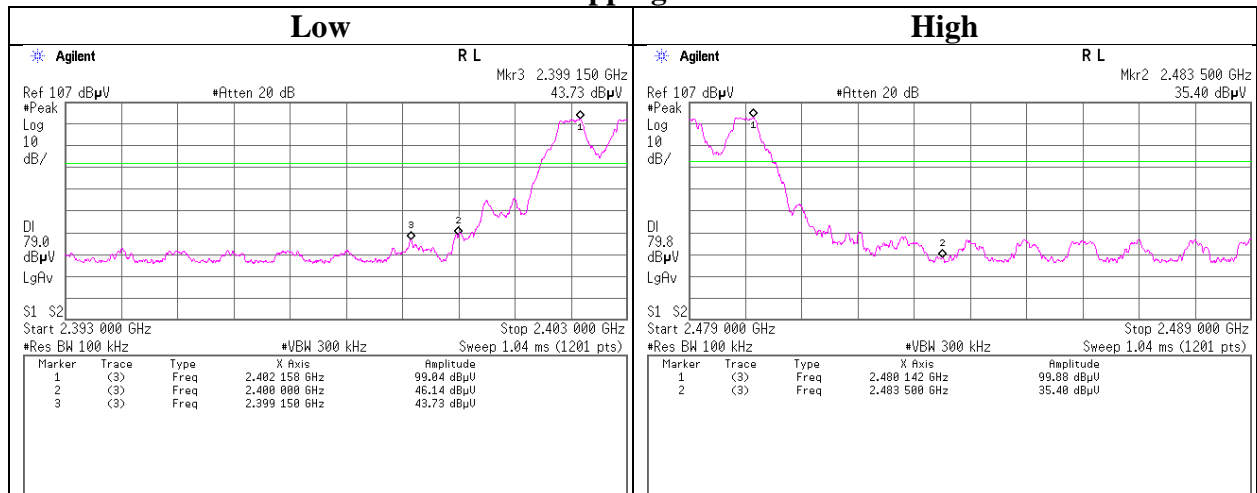
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

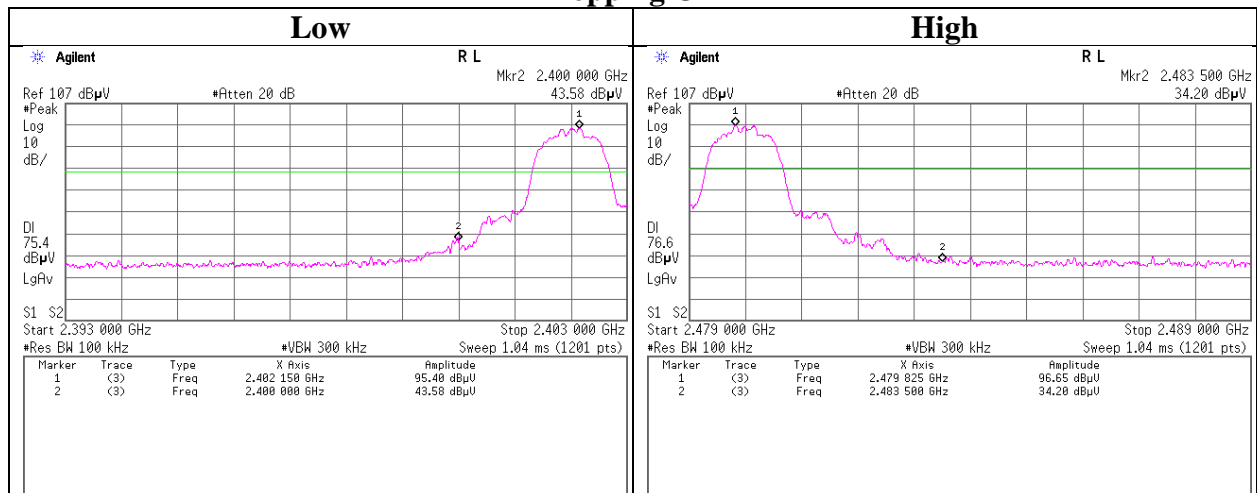
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx 3DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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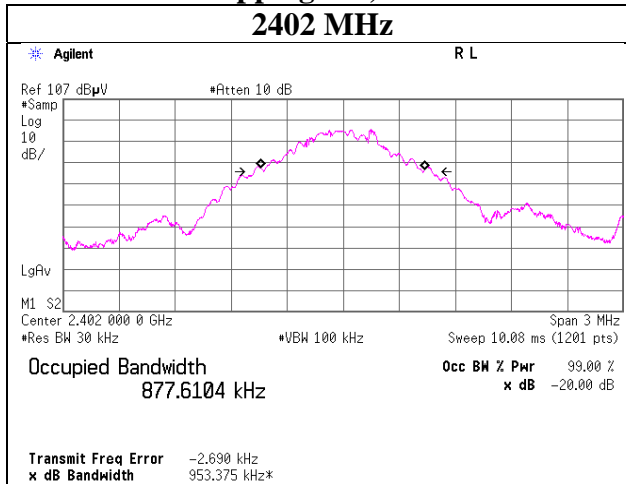
Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx Hopping Off

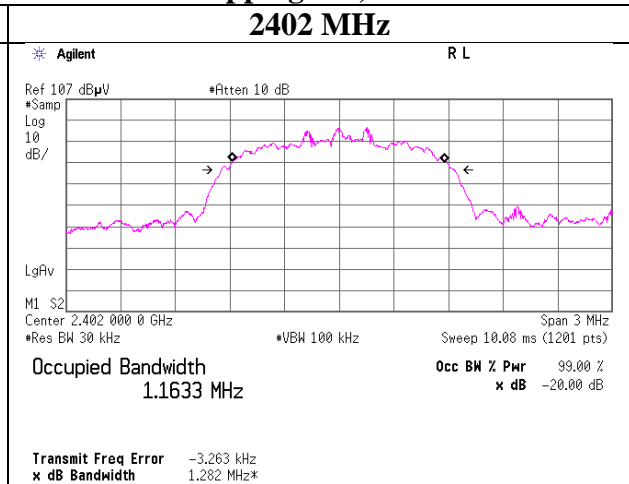
Hopping Off, DH5

2402 MHz

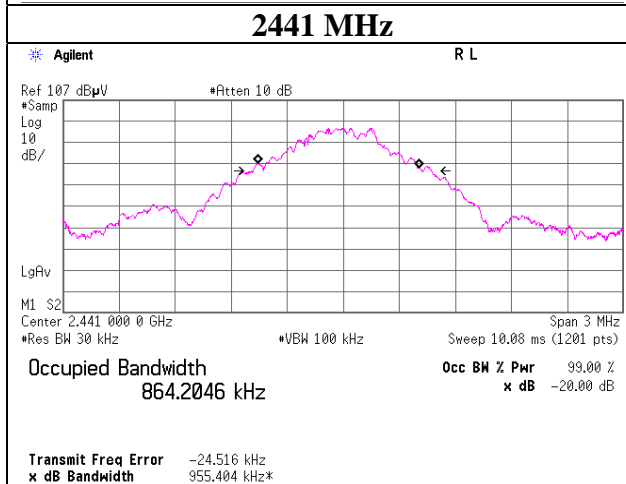


Hopping Off, 3DH5

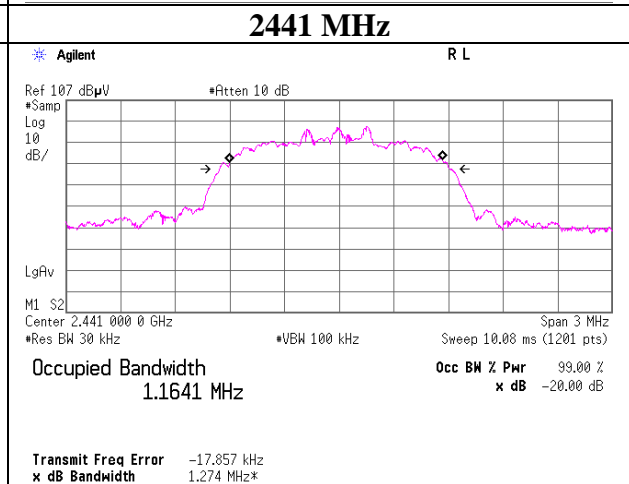
2402 MHz



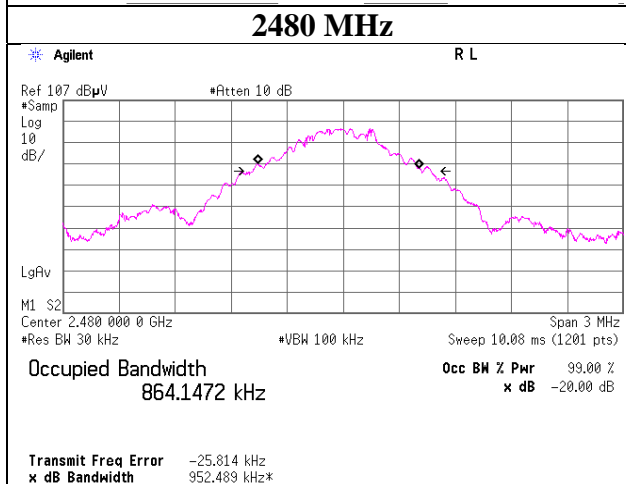
2441 MHz



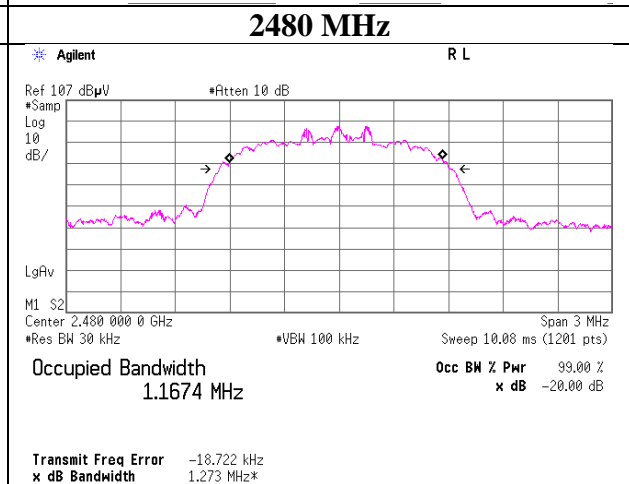
2441 MHz



2480 MHz



2480 MHz



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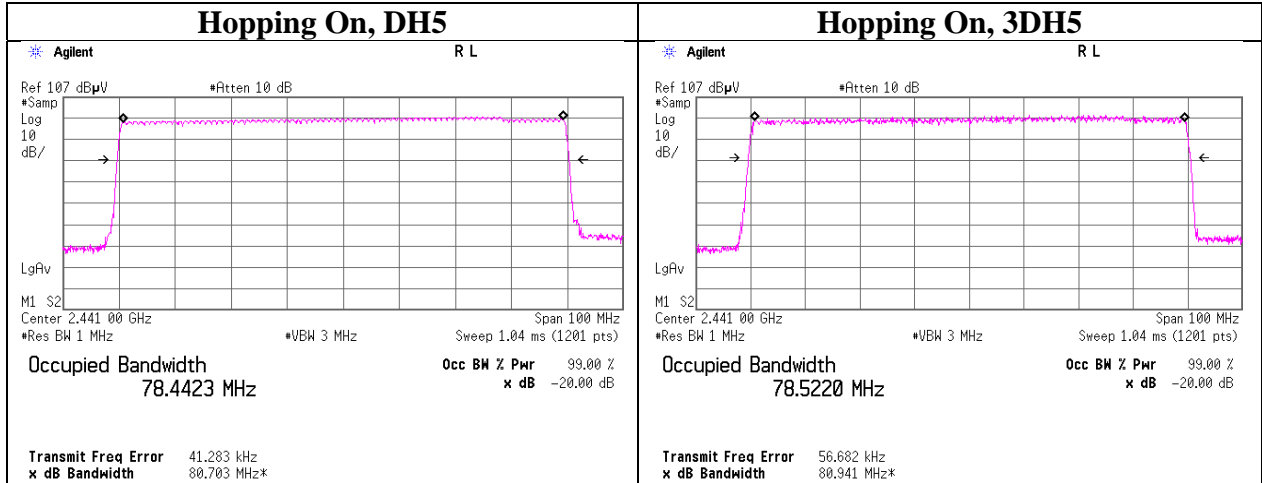
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Telephone : +81 463 50 6400

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99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11967268S-A-R1
Date	October 3, 2017
Temperature / Humidity	26 deg. C / 46 % RH
Engineer	Shiro Kobayashi
Mode	Tx Hopping On



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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
KBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1926	RE	2016/11/23 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2017/01/26 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2017/04/07 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2017/02/09 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2016/11/08 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFI,MF)	-	RE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2016/10/17 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	RE	2016/10/24 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2017/04/20 * 12
SCC-G20	Coaxial Cable	Junkosha	J12J102518-00	APR-15-15-003	RE	2017/04/20 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2016/11/07 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2017/06/13 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S006	RE	2017/01/08 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-05	Power sensor	Agilent	N1923A	MY5349008	AT	2017/05/01 * 12
SRENT-10	Spectrum Analyzer	Agilent	E4440A	US41421511	AT	2016/12/05 * 12
SAT10-14	Attenuator	Weinschel Corp.	54A-10	81595	AT	2017/04/20 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2017/03/23 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2016/10/17 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12

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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