



RADIO TEST REPORT

Test Report No. : 12093854S-A

Applicant : JVC KENWOOD Corporation
Type of Equipment : GPS NAVIGATION SYSTEM
Model No. : DNX775RVS
FCC ID : IOMJ5180
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 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)

Date of test: December 22, 2017 to January 11, 2018

Representative test engineer:

Yosuke Ishikawa

Engineer

Consumer Technology Division

Approved by:

Akira Sato

Engineer

Consumer Technology Division



JAB
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

REVISION HISTORY

Original Test Report No.: 12093854S-A

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SECTION 1: Customer information

Company Name	:	JVC KENWOOD Corporation
Address	:	2967-3, Ishikawa-machi, Hachioji, Tokyo 192-8525 Japan
Telephone Number	:	+81-42-646-5525
Facsimile Number	:	+81-42-646-1440
Contact Person	:	Seigo Tsutsumi

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

2.1 Identification of E.U.T.

Type of Equipment	:	GPS NAVIGATION SYSTEM
Model No.	:	DNX775RVS
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	December 19, 2017
Country of Mass-production	:	Indonesia
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: DNX775RVS (referred to as the EUT in this report) is a GPS NAVIGATION SYSTEM.

Clock frequency in the system (Maximum) : 6.3 GHz

Radio Specification

Type of radio	Bluetooth (BDR/EDR)	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2402 - 2480 MHz	2412 - 2462 MHz	2412 - 2462 MHz	5745 - 5805 MHz	2412 - 2462 MHz 5745 - 5805 MHz	5755 - 5795 MHz
Type of modulation	FHSS	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		
Channel spacing	1 MHz	5 MHz		20 MHz	2.4 GHz band 5 MHz 5 GHz band 20 MHz	2.4 GHz band 5 MHz 5 GHz band 40 MHz

Antenna type	Chip Antenna
Antenna Gain	-5.9 dBi (2.4 GHz), -5.2 dBi (5 GHz)
Power Supply (radio art input)	DC 3.6 V/ 3.3 V
Clock frequency (Maximum)	37.4 MHz

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

* The revisions made after testing date do 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	3.4 dB 466.942 MHz, QP, Hori. (Tx, 3-DH5, 2480 MHz)	Complied	Conducted/ Radiated (above 30 MHz) *2)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT has no 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)

The EUT provides stable voltage (DC 3.6 V/ 3.3 V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

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

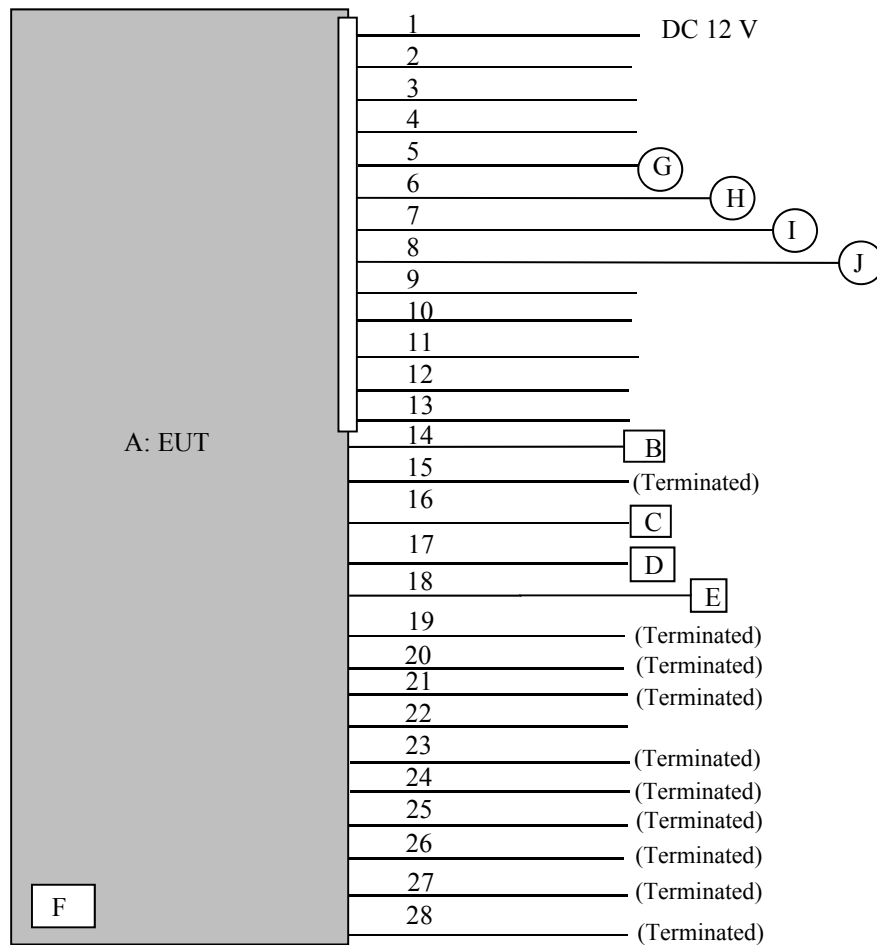
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

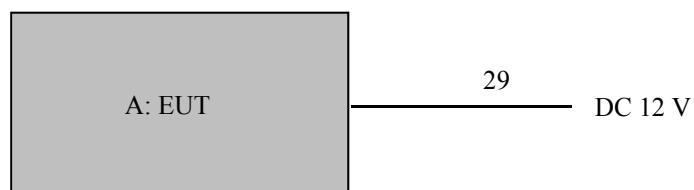
Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	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
*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 test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: Fixed Firmware: Version 1.0 *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

Radiated Emission test



Antenna Terminal conducted test



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	GPS NAVIGATION SYSTEM	DNX775RVS	PK-X0032 *1) PK-X0036 *2)	JVC KENWOOD Corporation	EUT
B	GPS Antenna	-	-	JVC KENWOOD Corporation	-
C	USB Memory	Data Traveler	-	Kingston	-
D	USB Memory	SDK-USM1GL	-	Sony	-
E	Mic	-	-	JVC KENWOOD Corporation	-
F	micro SDHC Card	4GB	-	TDK	-
G	Speaker	KFC-RS160	-	JVC KENWOOD Corporation	-
H	Speaker	KFC-RS160	-	JVC KENWOOD Corporation	-
I	Speaker	KFC-RS160	-	JVC KENWOOD Corporation	-
J	Speaker	KFC-RS160	-	JVC KENWOOD Corporation	-

*1) Used for Radiated Emission test

*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.6 + 1.8	Unshielded	Unshielded	-
2	REMOTE CONT	0.1 + 1.0	Unshielded	Unshielded	-
3	ILLUMI	0.1 + 1.0	Unshielded	Unshielded	-
4	ANT. CONT	0.1 + 1.0	Unshielded	Unshielded	-
5	Speaker Front L	0.1 + 1.9	Unshielded	Unshielded	-
6	Speaker Front R	0.1 + 1.9	Unshielded	Unshielded	-
7	Speaker Rear L	0.1 + 1.9	Unshielded	Unshielded	-
8	Speaker Rear R	0.1 + 1.9	Unshielded	Unshielded	-
9	P. CONT	0.1 + 1.0	Unshielded	Unshielded	-
10	PRK SW	0.1 + 1.0	Unshielded	Unshielded	-
11	REVERSE	0.1 + 1.0	Unshielded	Unshielded	-
12	CAM+	0.1 + 1.0	Unshielded	Unshielded	-
13	CAM-	0.1 + 1.0	Unshielded	Unshielded	-
14	GPS ANT	3.5	Shielded	Shielded	-
15	iDatalink I/F	0.7	Shielded	Shielded	-
16	USB	0.2 + 1.0	Shielded	Shielded	-
17	USB	0.2 + 1.0	Shielded	Shielded	-
18	MIC	3.0	Shielded	Shielded	-
19	FRONT AUDIO	1.0	Shielded	Shielded	-
20	REAR AUDIO	2.0	Shielded	Shielded	-
21	SW	2.0	Shielded	Shielded	-
22	I/F EXT	1.0	Unshielded	Unshielded	-
23	AV-IN	1.5	Shielded	Shielded	-
24	AV-OUT	1.5	Shielded	Shielded	-
25	VIDEO OUT	0.2 + 1.0	Shielded	Shielded	-
26	REAR VIEW CAMERA	0.2 + 1.0	Shielded	Shielded	-
27	FRONT VIEW CAMERA	0.2 + 1.0	Shielded	Shielded	-
28	ANT	0.1 + 3.0	Shielded	Shielded	-
29	DC	0.6	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

[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 – 31.5 GHz)		3.88 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 31.5 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 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 that has the maximum noise.

Worst case:

Antenna polarization	Carrier (Band edge)	Spurious			
		Below 1 GHz	Above 1 GHz		
			1 GHz – 2.8 GHz	2.8 GHz - 13 GHz	13 GHz – 31.5 GHz
Horizontal	0 deg.	30 deg.	0 deg.	0 deg.	0 deg.
Vertical	30 deg.	30 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 – 31.5 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: 50 MHz BW)
Carrier Frequency Separation	5 MHz or 3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
	30 MHz to 31.5 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 30 MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.							

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

Test data : APPENDIX
Test result : Pass

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APPENDIX 1: Test data

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

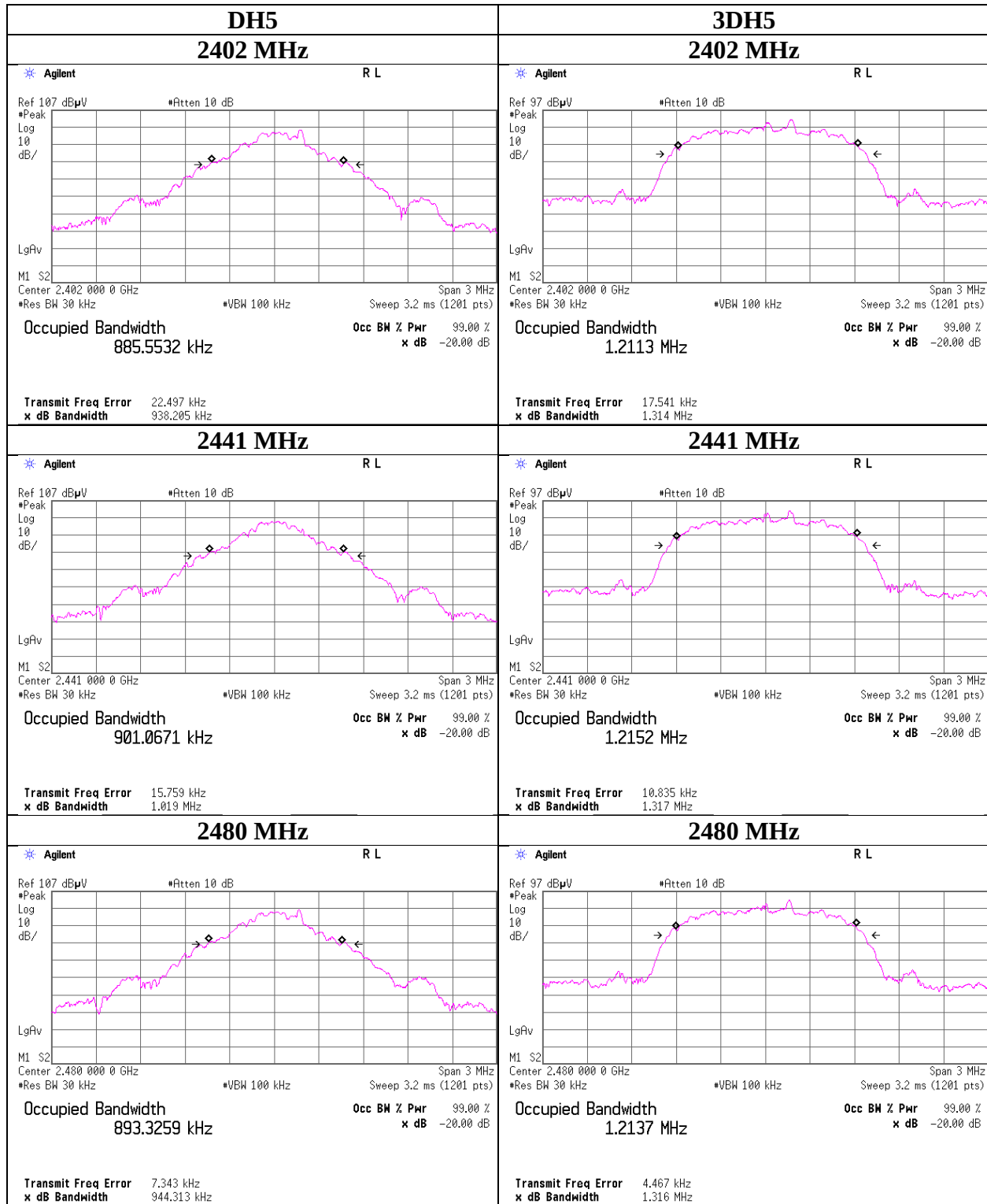
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12093854S-A
Date	December 26, 2017
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.938	885.6	1.000	≥ 0.625
DH5	2441.0	1.019	901.1	1.000	≥ 0.679
DH5	2480.0	0.944	893.3	1.000	≥ 0.629
DH5	Hopping On	-	78595.6	-	-
3DH5	2402.0	1.314	1211.3	1.000	≥ 0.876
3DH5	2441.0	1.317	1215.2	1.000	≥ 0.878
3DH5	2480.0	1.316	1213.7	1.000	≥ 0.877
3DH5	Hopping On	-	78702.8	-	-

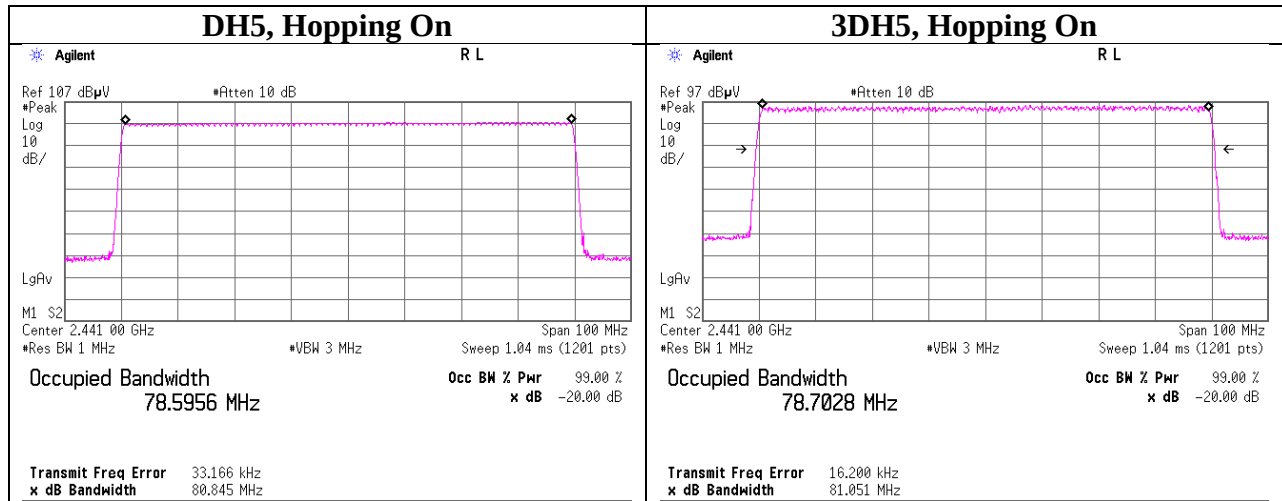
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

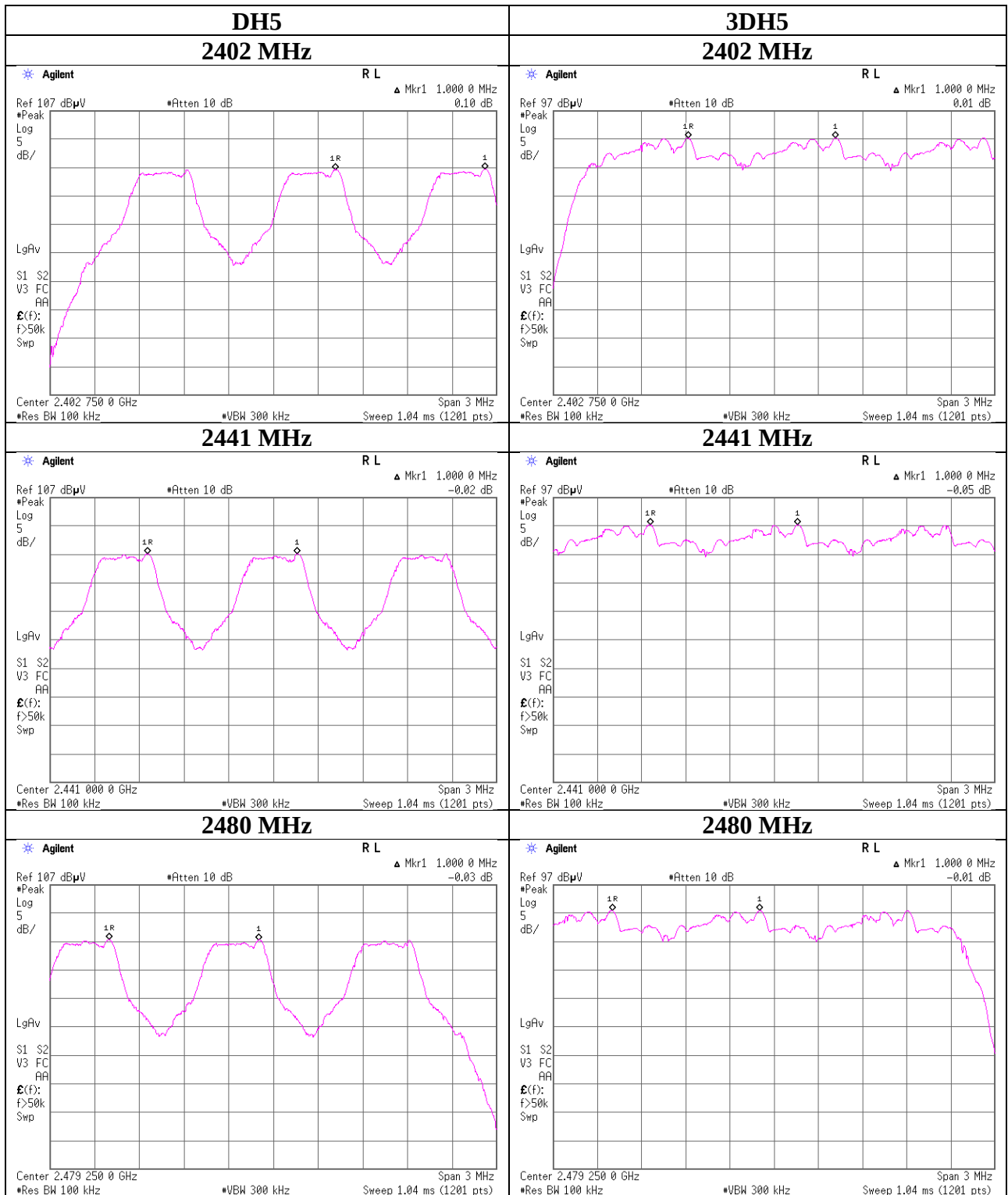
20dB Bandwidth and 99% Occupied Bandwidth



20dB Bandwidth and 99% Occupied Bandwidth



Carrier Frequency Separation



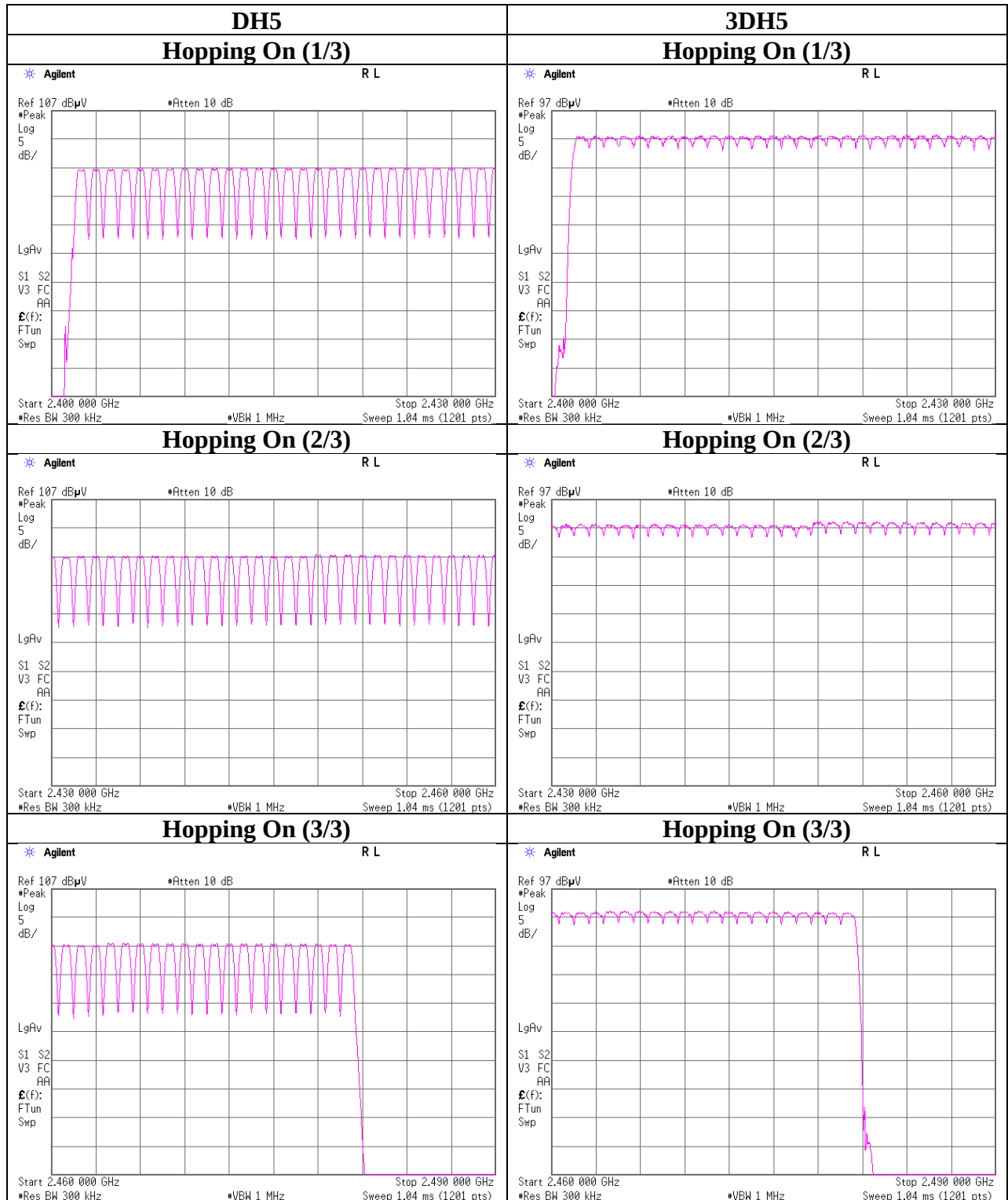
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12093854S-A
Date December 26, 2017
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Kazuya Noda
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. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
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	49.0 times	/	5 sec.	x 31.6 sec. = 310 times	0.420	130	400
DH3	27.6 times	/	5 sec.	x 31.6 sec. = 175 times	1.676	293	400
DH5	20.6 times	/	5 sec.	x 31.6 sec. = 131 times	2.925	383	400
3DH1	49.6 times	/	5 sec.	x 31.6 sec. = 314 times	0.426	134	400
3DH3	25.2 times	/	5 sec.	x 31.6 sec. = 160 times	1.677	268	400
3DH5	20.2 times	/	5 sec.	x 31.6 sec. = 128 times	2.930	375	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

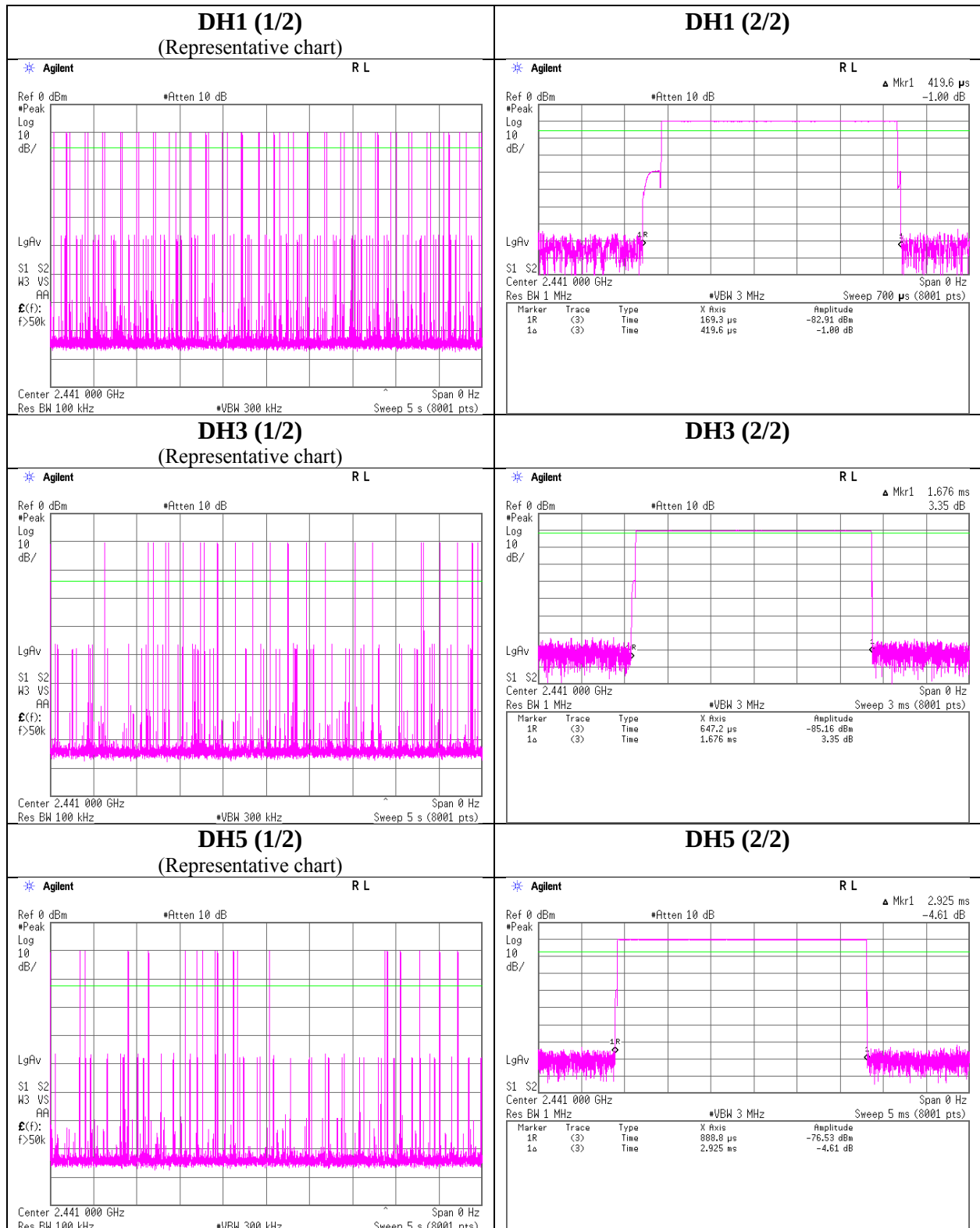
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	49	48	49	49	49.0
DH3	30	27	26	31	24	27.6
DH5	21	21	17	25	19	20.6
3DH1	48	52	49	50	49	49.6
3DH3	26	23	24	25	28	25.2
3DH5	15	18	24	23	21	20.2

Sample Calculation

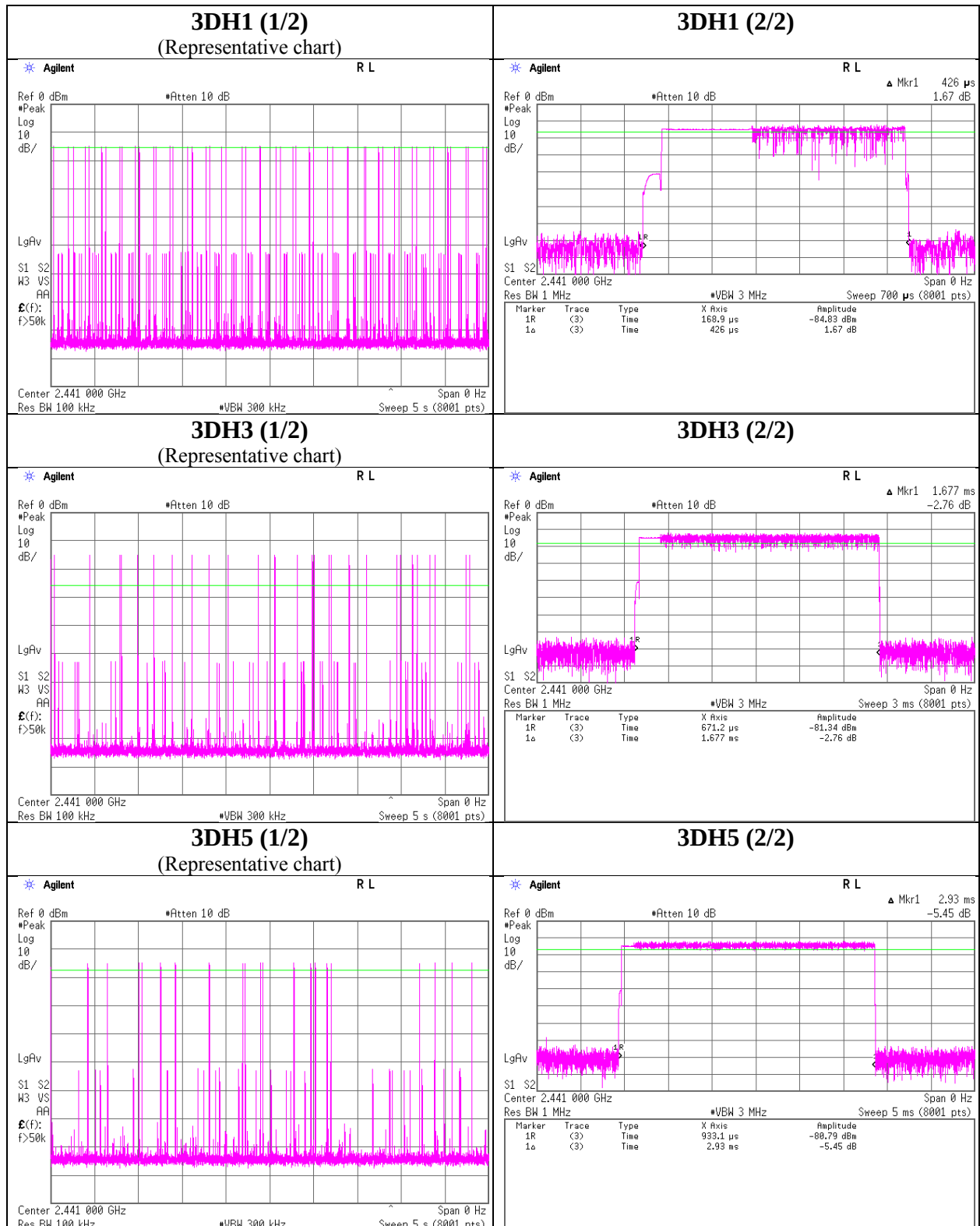
Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



Dwell time



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12093854S-A
Date	December 22, 2017
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Kazuya Noda
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	-10.48	2.34	9.85	1.71	1.48	20.96	125	19.25
DH5	2441.0	-9.86	2.36	9.84	2.34	1.71	20.96	125	18.62
DH5	2480.0	-9.51	2.37	9.84	2.70	1.86	20.96	125	18.26
2DH5	2402.0	-11.84	2.34	9.85	0.35	1.08	20.96	125	20.61
2DH5	2441.0	-11.71	2.36	9.84	0.49	1.12	20.96	125	20.47
2DH5	2480.0	-11.51	2.37	9.84	0.70	1.17	20.96	125	20.26
3DH5	2402.0	-11.49	2.34	9.85	0.70	1.17	20.96	125	20.26
3DH5	2441.0	-11.43	2.36	9.84	0.77	1.19	20.96	125	20.19
3DH5	2480.0	-11.16	2.37	9.84	1.05	1.27	20.96	125	19.91

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. 12093854S-A
Date December 22, 2017
Temperature / Humidity 23 deg. C / 37 % RH
Engineer Kazuya Noda
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	-12.04	2.34	9.85	0.15	1.04	1.08	1.23	1.33
DH5	2441.0	-11.40	2.36	9.84	0.80	1.20	1.08	1.88	1.54
DH5	2480.0	-11.07	2.37	9.84	1.14	1.30	1.08	2.22	1.67
2DH5	2402.0	-16.01	2.34	9.85	-3.82	0.41	1.07	-2.75	0.53
2DH5	2441.0	-15.95	2.36	9.84	-3.75	0.42	1.07	-2.68	0.54
2DH5	2480.0	-15.73	2.37	9.84	-3.52	0.44	1.07	-2.45	0.57
3DH5	2402.0	-15.99	2.34	9.85	-3.80	0.42	1.07	-2.73	0.53
3DH5	2441.0	-15.94	2.36	9.84	-3.74	0.42	1.07	-2.67	0.54
3DH5	2480.0	-15.71	2.37	9.84	-3.50	0.45	1.07	-2.43	0.57

Sample Calculation:

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

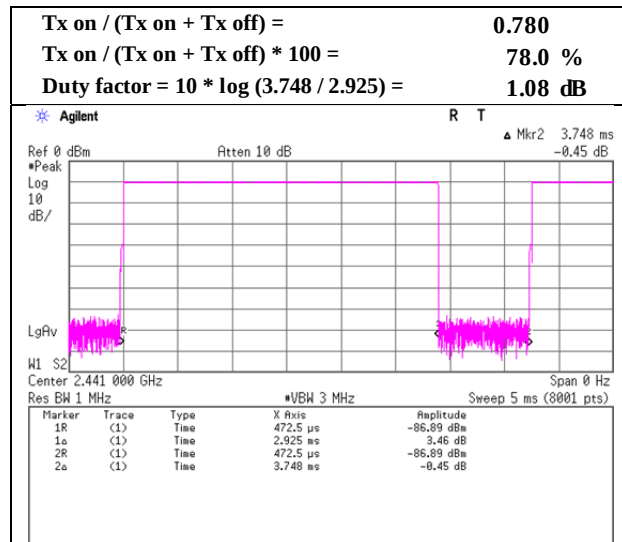
Result (Burst power average) = Time average + Duty factor

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

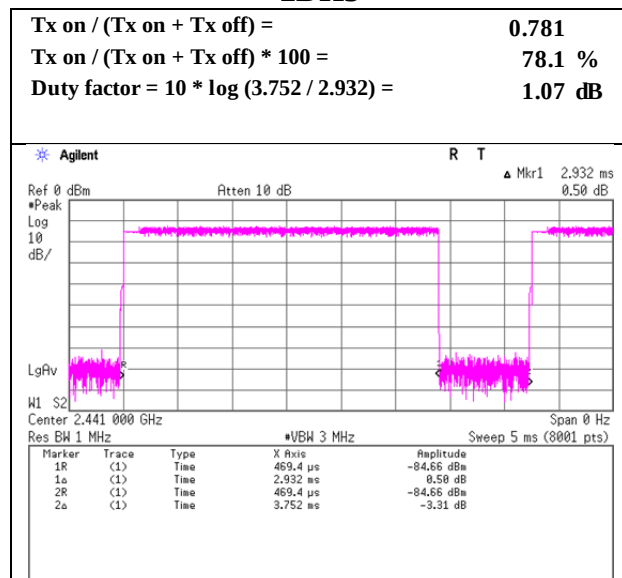
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 22, 2017
Temperature / Humidity : 23 deg. C / 37 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off

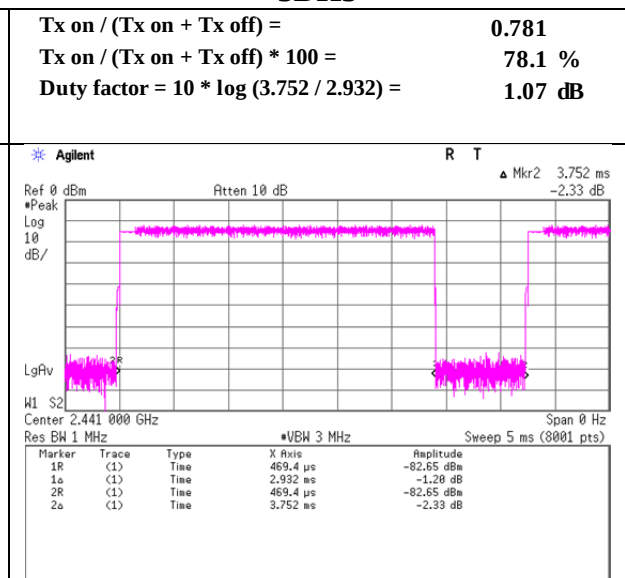
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 12093854S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 3 3
Date December 26, 2017 January 11, 2018 January 10, 2018 January 9, 2018
Temperature / Humidity 22 deg.C / 30 %RH 22 deg.C / 32 %RH 20 deg.C / 31 %RH 23 deg.C / 34 %RH
Engineer Yasumasa Owaki Kazuya Noda Yosuke Ishikawa Kazuya Noda
(30 MHz – 1000 MHz) (1 GHz - 13 GHz) (13 GHz – 26.5 GHz) (26.5 GHz – 31.5 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.	168.016	QP	41.90	15.65	8.82	31.79	0.00	34.58	43.50	8.9	194	29	
Hori.	172.031	QP	43.60	15.81	8.82	31.78	0.00	36.45	43.50	7.0	194	48	
Hori.	179.602	QP	40.40	16.11	8.80	31.78	0.00	33.53	43.50	9.9	178	245	
Hori.	191.560	QP	38.20	16.25	8.84	31.77	0.00	31.52	43.50	11.9	179	244	
Hori.	408.002	QP	47.10	15.98	7.19	31.62	0.00	38.65	46.00	7.3	100	82	
Hori.	432.000	QP	46.80	16.44	7.36	31.62	0.00	38.98	46.00	7.0	100	1	
Hori.	454.653	QP	43.90	16.89	7.50	31.61	0.00	36.68	46.00	9.3	100	186	
Hori.	466.941	QP	49.10	17.13	7.56	31.60	0.00	42.19	46.00	3.8	100	181	
Hori.	498.404	QP	38.50	17.74	7.71	31.59	0.00	32.36	46.00	13.6	179	117	
Hori.	742.499	QP	39.70	20.30	8.92	31.47	0.00	37.45	46.00	8.5	100	221	
Hori.	960.256	QP	40.30	22.55	9.94	30.40	0.00	42.39	53.90	11.5	100	283	
Hori.	2390.000	PK	48.75	27.26	14.18	44.13	2.24	48.30	73.90	25.6	152	247	
Hori.	4804.000	PK	49.81	31.40	6.75	44.45	2.24	45.75	73.90	28.1	163	138	
Hori.	7206.000	PK	47.93	36.56	8.29	43.99	2.24	51.03	73.90	22.8	150	0	
Hori.	9608.000	PK	48.51	38.61	9.37	43.83	2.24	54.90	73.90	19.0	150	0	
Hori.	2390.000	AV	36.04	27.26	14.18	44.13	2.24	35.59	53.90	18.3	152	247	
Hori.	4804.000	AV	37.72	31.40	6.75	44.45	2.24	33.66	53.90	20.2	163	138	
Hori.	7206.000	AV	35.13	36.56	8.29	43.99	2.24	38.23	53.90	15.6	150	0	
Hori.	9608.000	AV	36.41	38.61	9.37	43.83	2.24	42.80	53.90	11.1	150	0	
Vert.	67.575	QP	36.60	6.58	7.16	31.88	0.00	18.46	40.00	21.5	100	129	
Vert.	172.030	QP	43.80	15.81	8.82	31.78	0.00	36.65	43.50	6.8	100	99	
Vert.	179.700	QP	39.80	16.12	8.80	31.78	0.00	32.94	43.50	10.5	100	315	
Vert.	2390.000	PK	48.86	27.26	14.18	44.13	2.24	48.41	73.90	25.4	188	241	
Vert.	4804.000	PK	49.69	31.40	6.75	44.45	2.24	45.63	73.90	28.2	137	244	
Vert.	7206.000	PK	48.16	36.56	8.29	43.99	2.24	51.26	73.90	22.6	150	0	
Vert.	9608.000	PK	48.36	38.61	9.37	43.83	2.24	54.75	73.90	19.1	150	0	
Vert.	2390.000	AV	36.54	27.26	14.18	44.13	2.24	36.09	53.90	17.8	188	241	
Vert.	4804.000	AV	37.27	31.40	6.75	44.45	2.24	33.21	53.90	20.6	137	244	
Vert.	7206.000	AV	35.27	36.56	8.29	43.99	2.24	38.37	53.90	15.5	150	0	
Vert.	9608.000	AV	36.43	38.61	9.37	43.83	2.24	42.82	53.90	11.0	150	0	

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

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

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

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	86.71	27.29	14.19	44.14	2.24	86.29	-	-	Carrier
Hori.	2400.000	PK	39.93	27.29	14.18	44.14	2.24	39.50	66.29	26.8	
Vert.	2402.000	PK	87.95	27.29	14.19	44.14	2.24	87.53	-	-	Carrier
Vert.	2400.000	PK	39.75	27.29	14.18	44.14	2.24	39.32	67.53	28.2	

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

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

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

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Shonan EMC Lab.

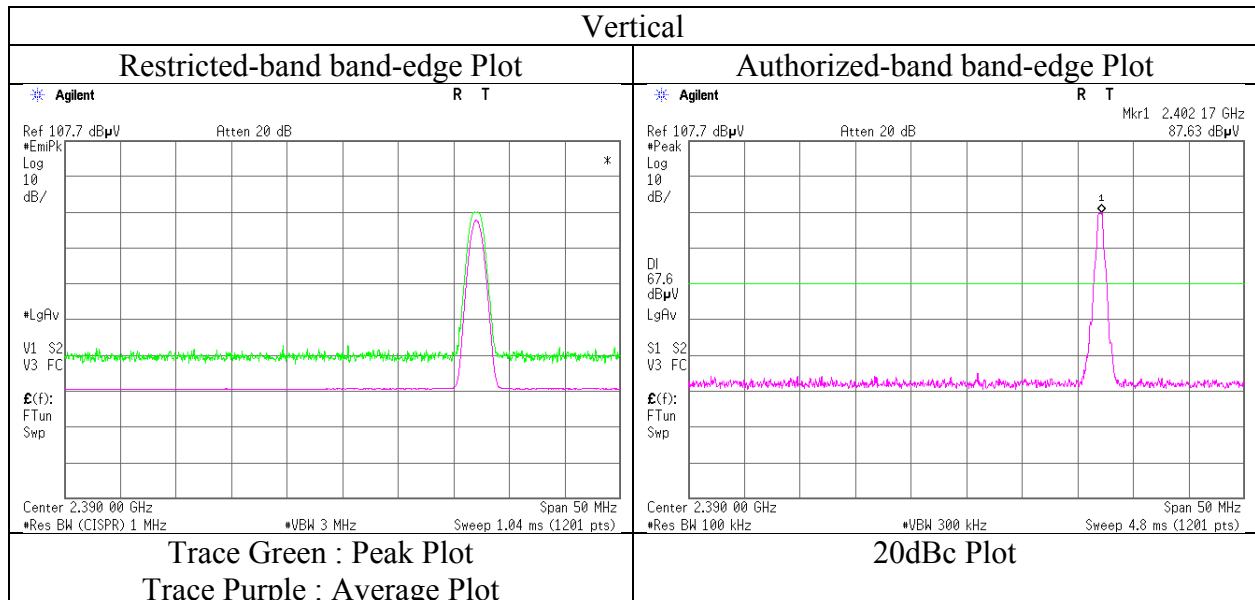
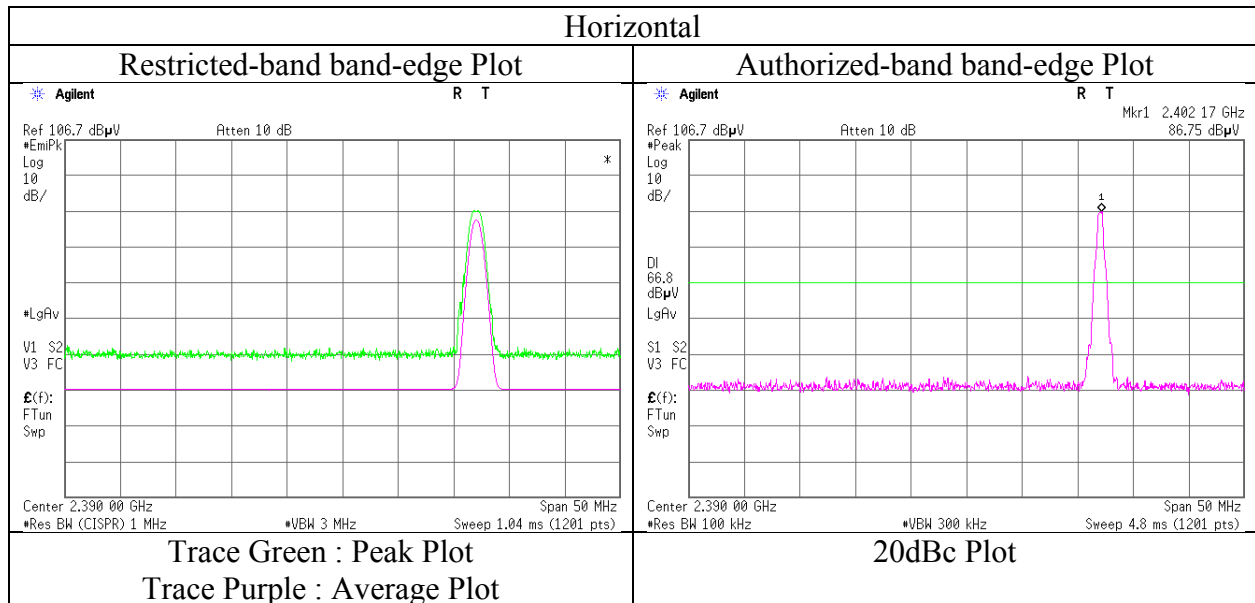
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12093854S-A
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	January 11, 2018
Temperature / Humidity	22 deg.C / 32 %RH
Engineer	Kazuya Noda
	(1 GHz - 13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 12093854S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 3 3
Date December 26, 2017 January 11, 2018 January 10, 2018 January 9, 2018
Temperature / Humidity 22 deg.C / 30 %RH 22 deg.C / 32 %RH 20 deg.C / 31 %RH 23 deg.C / 34 %RH
Engineer Yasumasa Owaki Kazuya Noda Yosuke Ishikawa Kazuya Noda
(30 MHz – 1000 MHz) (1 GHz - 13 GHz) (13 GHz – 26.5 GHz) (26.5 GHz – 31.5 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.	168.018	QP	42.00	15.65	8.82	31.79	0.00	34.68	43.50	8.8	198	34	
Hori.	172.031	QP	43.90	15.81	8.82	31.78	0.00	36.75	43.50	6.7	194	48	
Hori.	179.593	QP	40.20	16.11	8.80	31.78	0.00	33.33	43.50	10.1	192	237	
Hori.	191.647	QP	38.00	16.25	8.84	31.77	0.00	31.32	43.50	12.1	162	238	
Hori.	408.004	QP	47.10	15.98	7.19	31.62	0.00	38.65	46.00	7.3	100	85	
Hori.	432.001	QP	46.50	16.44	7.36	31.62	0.00	38.68	46.00	7.3	100	1	
Hori.	454.653	QP	43.60	16.89	7.50	31.61	0.00	36.38	46.00	9.6	100	183	
Hori.	466.943	QP	49.40	17.13	7.56	31.60	0.00	42.49	46.00	3.5	100	178	
Hori.	498.405	QP	38.70	17.74	7.71	31.59	0.00	32.56	46.00	13.4	181	112	
Hori.	742.500	QP	40.80	20.30	8.92	31.47	0.00	38.55	46.00	7.4	100	228	
Hori.	960.255	QP	40.10	22.54	9.94	30.40	0.00	42.18	53.90	11.7	100	283	
Hori.	4882.000	PK	49.87	31.62	6.84	44.48	2.24	46.09	73.90	27.8	131	92	
Hori.	7323.000	PK	48.63	36.77	8.38	44.03	2.24	51.99	73.90	21.9	150	0	
Hori.	9764.000	PK	48.42	38.80	9.45	43.85	2.24	55.06	73.90	18.8	150	0	
Hori.	4882.000	AV	37.14	31.62	6.84	44.48	2.24	33.36	53.90	20.5	131	92	
Hori.	7323.000	AV	35.57	36.77	8.38	44.03	2.24	38.93	53.90	14.9	150	0	
Hori.	9764.000	AV	35.74	38.80	9.45	43.85	2.24	42.38	53.90	11.5	150	0	
Vert.	172.033	QP	44.20	15.81	8.82	31.78	0.00	37.05	43.50	6.4	100	103	
Vert.	179.606	QP	39.80	16.11	8.80	31.78	0.00	32.93	43.50	10.5	100	317	
Vert.	191.538	QP	36.80	16.25	8.84	31.77	0.00	30.12	43.50	13.3	100	315	
Vert.	4882.000	PK	49.45	31.62	6.84	44.48	2.24	45.67	73.90	28.2	144	29	
Vert.	7323.000	PK	48.80	36.77	8.38	44.03	2.24	52.16	73.90	21.7	150	0	
Vert.	9764.000	PK	48.55	38.80	9.45	43.85	2.24	55.19	73.90	18.7	150	0	
Vert.	4882.000	AV	37.06	31.62	6.84	44.48	2.24	33.28	53.90	20.6	144	29	
Vert.	7323.000	AV	35.61	36.77	8.38	44.03	2.24	38.97	53.90	14.9	150	0	
Vert.	9764.000	AV	35.76	38.80	9.45	43.85	2.24	42.40	53.90	11.5	150	0	

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

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

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.

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Spurious Emission

Report No. 12093854S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 3 3
Date December 26, 2017 January 11, 2018 January 10, 2018 January 9, 2018
Temperature / Humidity 22 deg.C / 30 %RH 22 deg.C / 32 %RH 20 deg.C / 31 %RH 23 deg.C / 34 %RH
Engineer Yasumasa Owaki Kazuya Noda Yosuke Ishikawa Kazuya Noda
(30 MHz – 1000 MHz) (1 GHz - 13 GHz) (13 GHz – 26.5 GHz) (26.5 GHz – 31.5 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.	168.014	QP	42.20	15.65	8.82	31.79	0.00	34.88	43.50	8.6	186	33	
Hori.	172.032	QP	44.20	15.81	8.82	31.78	0.00	37.05	43.50	6.4	196	57	
Hori.	179.542	QP	40.10	16.11	8.80	31.78	0.00	33.23	43.50	10.2	190	237	
Hori.	191.582	QP	37.80	16.25	8.84	31.77	0.00	31.12	43.50	12.3	167	236	
Hori.	360.000	QP	45.90	14.85	6.87	31.61	0.00	36.01	46.00	9.9	108	170	
Hori.	408.001	QP	47.00	15.98	7.19	31.62	0.00	38.55	46.00	7.4	100	84	
Hori.	432.001	QP	46.70	16.44	7.36	31.62	0.00	38.88	46.00	7.1	100	3	
Hori.	454.655	QP	43.30	16.89	7.50	31.61	0.00	36.08	46.00	9.9	100	184	
Hori.	466.944	QP	48.90	17.13	7.56	31.60	0.00	41.99	46.00	4.0	100	180	
Hori.	498.405	QP	38.40	17.74	7.71	31.59	0.00	32.26	46.00	13.7	177	114	
Hori.	742.499	QP	40.50	20.30	8.92	31.47	0.00	38.25	46.00	7.7	100	228	
Hori.	960.257	QP	40.10	22.55	9.94	30.40	0.00	42.19	53.90	11.7	100	282	
Hori.	2483.500	PK	48.57	27.55	14.25	44.16	2.24	48.45	73.90	25.4	136	214	
Hori.	4960.000	PK	49.21	31.83	6.91	44.51	2.24	45.68	73.90	28.2	127	116	
Hori.	7440.000	PK	48.72	36.97	8.51	44.08	2.24	52.36	73.90	21.5	150	0	
Hori.	9920.000	PK	48.81	38.98	9.54	43.87	2.24	55.70	73.90	18.2	150	0	
Hori.	2483.500	AV	36.16	27.55	14.25	44.16	2.24	36.04	53.90	17.8	136	214	
Hori.	4960.000	AV	36.72	31.83	6.91	44.51	2.24	33.19	53.90	20.7	127	116	
Hori.	7440.000	AV	35.93	36.97	8.51	44.08	2.24	39.57	53.90	14.3	150	0	
Hori.	9920.000	AV	36.04	38.98	9.54	43.87	2.24	42.93	53.90	10.9	150	0	
Vert.	172.029	QP	44.60	15.81	8.82	31.78	0.00	37.45	43.50	6.0	100	98	
Vert.	179.678	QP	39.70	16.12	8.80	31.78	0.00	32.84	43.50	10.6	100	312	
Vert.	2483.500	PK	48.89	27.55	14.25	44.16	2.24	48.77	73.90	25.1	196	184	
Vert.	4960.000	PK	48.66	31.83	6.91	44.51	2.24	45.13	73.90	28.7	148	35	
Vert.	7440.000	PK	48.52	36.97	8.51	44.08	2.24	52.16	73.90	21.7	150	0	
Vert.	9920.000	PK	48.79	38.98	9.54	43.87	2.24	55.68	73.90	18.2	150	0	
Vert.	2483.500	AV	36.43	27.55	14.25	44.16	2.24	36.31	53.90	17.5	196	184	
Vert.	4960.000	AV	36.37	31.83	6.91	44.51	2.24	32.84	53.90	21.0	148	35	
Vert.	7440.000	AV	35.89	36.97	8.51	44.08	2.24	39.53	53.90	14.3	150	0	
Vert.	9920.000	AV	36.02	38.98	9.54	43.87	2.24	42.91	53.90	10.9	150	0	

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

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

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

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

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Shonan EMC Lab.

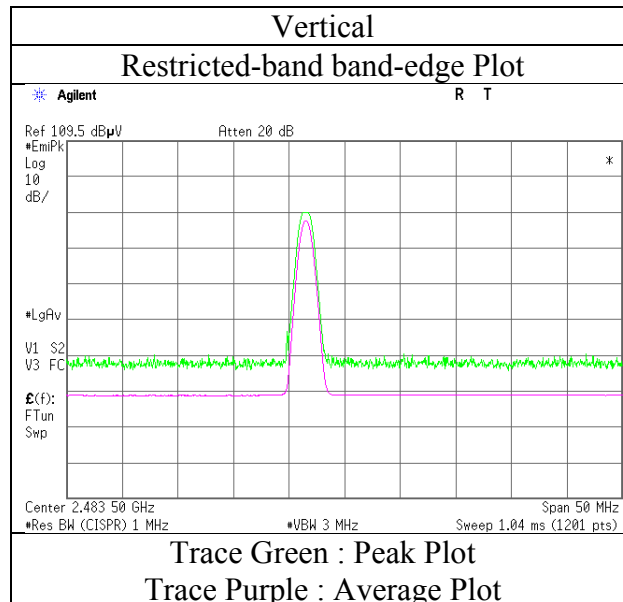
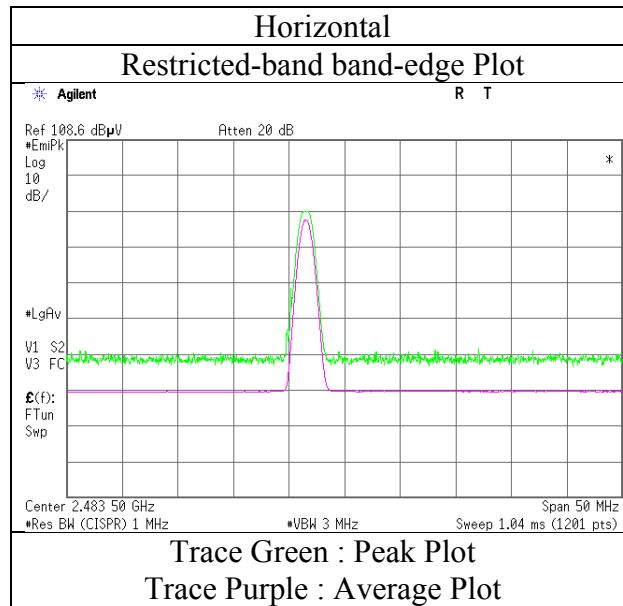
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12093854S-A
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	January 11, 2018
Temperature / Humidity	22 deg.C / 32 %RH
Engineer	Kazuya Noda
	(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. 12093854S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 3 3
Date December 26, 2017 January 11, 2018 January 10, 2018 January 9, 2018
Temperature / Humidity 22 deg.C / 30 %RH 22 deg.C / 32 %RH 20 deg.C / 31 %RH 23 deg.C / 34 %RH
Engineer Yasumasa Owaki Kazuya Noda Yosuke Ishikawa Kazuya Noda
(30 MHz – 1000 MHz) (1 GHz - 13 GHz) (13 GHz – 26.5 GHz) (26.5 GHz – 31.5 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.	42.533	QP	35.97	13.43	7.12	31.89	0.00	24.63	40.00	15.3	291	129	
Hori.	73.731	QP	51.26	6.21	7.66	31.87	0.00	33.26	40.00	6.7	265	44	
Hori.	168.000	QP	44.89	15.65	8.82	31.79	0.00	37.57	43.50	5.9	184	35	
Hori.	172.033	QP	43.78	15.81	8.82	31.78	0.00	36.63	43.50	6.8	196	48	
Hori.	179.429	QP	42.05	16.11	8.81	31.78	0.00	35.19	43.50	8.3	186	251	
Hori.	360.000	QP	47.24	14.85	6.87	31.61	0.00	37.35	46.00	8.6	100	168	
Hori.	466.942	QP	49.27	17.13	7.56	31.60	0.00	42.36	46.00	3.6	100	187	
Hori.	498.349	QP	43.35	17.74	7.71	31.59	0.00	37.21	46.00	8.7	100	6	
Hori.	742.499	QP	39.57	20.30	8.92	31.47	0.00	37.32	46.00	8.6	100	231	
Hori.	960.258	QP	41.93	22.55	9.94	30.40	0.00	44.02	53.90	9.8	100	280	
Hori.	2390.000	PK	48.68	27.26	14.18	44.13	2.24	48.23	73.90	25.6	151	247	
Hori.	4804.000	PK	48.63	31.40	6.75	44.45	2.24	44.57	73.90	29.3	150	0	
Hori.	7206.000	PK	47.66	36.56	8.29	43.99	2.24	50.76	73.90	23.1	150	0	
Hori.	9608.000	PK	48.26	38.61	9.37	43.83	2.24	54.65	73.90	19.2	150	0	
Hori.	2390.000	AV	36.35	27.26	14.18	44.13	2.24	35.90	53.90	18.0	151	247	
Hori.	4804.000	AV	36.26	31.40	6.75	44.45	2.24	32.20	53.90	21.7	150	0	
Hori.	7206.000	AV	34.88	36.56	8.29	43.99	2.24	37.98	53.90	15.9	150	0	
Hori.	9608.000	AV	36.26	38.61	9.37	43.83	2.24	42.65	53.90	11.2	150	0	
Vert.	42.078	QP	36.43	13.60	7.11	31.89	0.00	25.25	40.00	14.7	100	210	
Vert.	122.900	QP	46.27	13.13	8.06	31.83	0.00	35.63	43.50	7.8	100	184	
Vert.	172.032	QP	42.31	15.81	8.82	31.78	0.00	35.16	43.50	8.3	100	105	
Vert.	179.590	QP	43.86	16.11	8.80	31.78	0.00	36.99	43.50	6.5	100	304	
Vert.	191.834	QP	39.15	16.25	8.84	31.77	0.00	32.47	43.50	11.0	100	305	
Vert.	565.248	QP	36.32	18.64	8.06	31.62	0.00	31.40	46.00	14.6	100	233	
Vert.	2390.000	PK	49.12	27.26	14.18	44.13	2.24	48.67	73.90	25.2	201	224	
Vert.	4804.000	PK	49.12	31.40	6.75	44.45	2.24	45.06	73.90	28.8	150	0	
Vert.	7206.000	PK	47.81	36.56	8.29	43.99	2.24	50.91	73.90	22.9	150	0	
Vert.	9608.000	PK	48.41	38.61	9.37	43.83	2.24	54.80	73.90	19.1	150	0	
Vert.	2390.000	AV	36.52	27.26	14.18	44.13	2.24	36.07	53.90	17.8	201	224	
Vert.	4804.000	AV	36.42	31.40	6.75	44.45	2.24	32.36	53.90	21.5	150	0	
Vert.	7206.000	AV	34.98	36.56	8.29	43.99	2.24	38.08	53.90	15.8	150	0	
Vert.	9608.000	AV	36.28	38.61	9.37	43.83	2.24	42.67	53.90	11.2	150	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	82.71	27.29	14.19	44.14	2.24	82.29	-	-	Carrier
Hori.	2400.000	PK	39.77	27.29	14.18	44.14	2.24	39.34	62.29	23.0	
Vert.	2402.000	PK	84.33	27.29	14.19	44.14	2.24	83.91	-	-	Carrier
Vert.	2400.000	PK	40.56	27.29	14.18	44.14	2.24	40.13	63.91	23.8	

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.

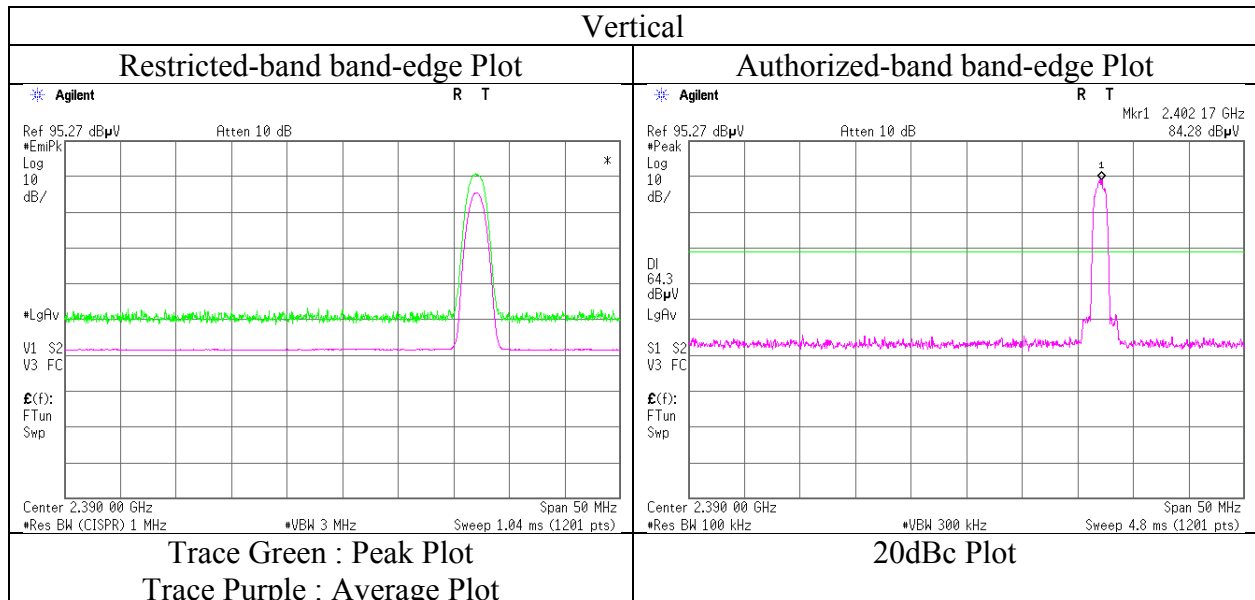
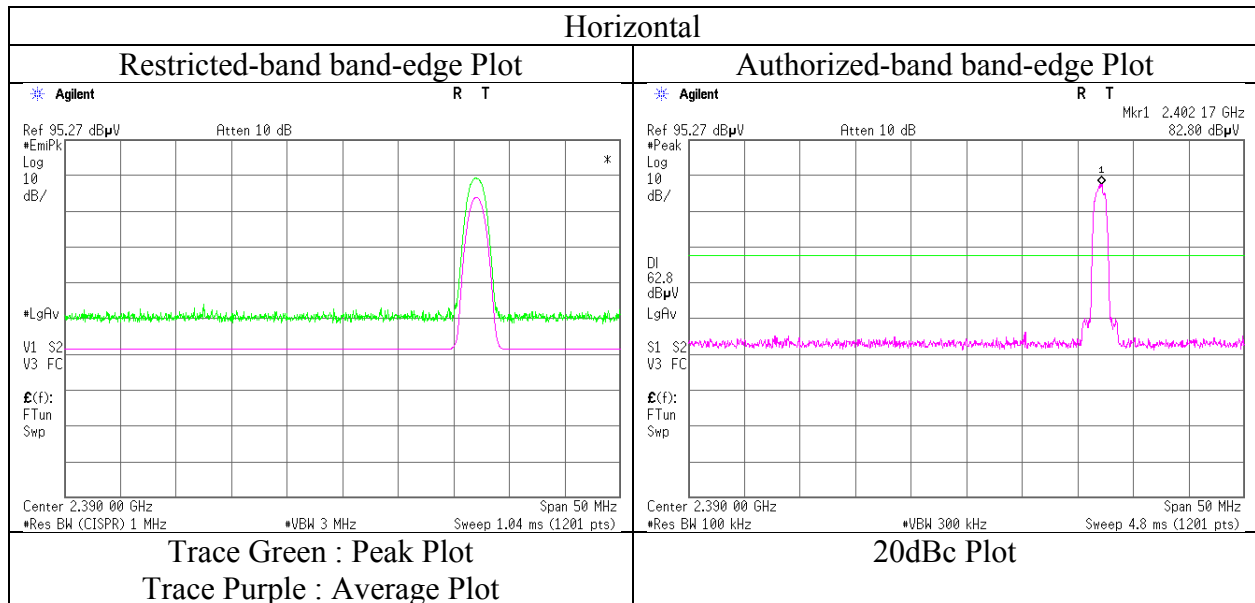
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12093854S-A
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	January 11, 2018
Temperature / Humidity	22 deg.C / 32 %RH
Engineer	Kazuya Noda
	(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. 12093854S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 3 3
Date December 26, 2017 January 11, 2018 January 10, 2018 January 9, 2018
Temperature / Humidity 22 deg.C / 30 %RH 22 deg.C / 32 %RH 20 deg.C / 31 %RH 23 deg.C / 34 %RH
Engineer Yasumasa Owaki Kazuya Noda Yosuke Ishikawa Kazuya Noda
(30 MHz – 1000 MHz) (1 GHz - 13 GHz) (13 GHz – 26.5 GHz) (26.5 GHz – 31.5 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.	168.011	QP	42.10	15.65	8.82	31.79	0.00	34.78	43.50	8.7	192	41	
Hori.	172.031	QP	43.50	15.81	8.82	31.78	0.00	36.35	43.50	7.1	188	51	
Hori.	179.704	QP	40.20	16.12	8.80	31.78	0.00	33.34	43.50	10.1	184	248	
Hori.	191.551	QP	37.90	16.25	8.84	31.77	0.00	31.22	43.50	12.2	162	235	
Hori.	408.009	QP	46.70	15.98	7.19	31.62	0.00	38.25	46.00	7.7	100	83	
Hori.	432.000	QP	46.90	16.44	7.36	31.62	0.00	39.08	46.00	6.9	100	1	
Hori.	454.655	QP	44.30	16.89	7.50	31.61	0.00	37.08	46.00	8.9	100	186	
Hori.	466.944	QP	49.30	17.13	7.56	31.60	0.00	42.39	46.00	3.6	100	183	
Hori.	498.406	QP	38.20	17.74	7.71	31.59	0.00	32.06	46.00	13.9	178	118	
Hori.	742.496	QP	40.50	20.30	8.92	31.47	0.00	38.25	46.00	7.7	100	230	
Hori.	960.268	QP	40.40	22.55	9.94	30.40	0.00	42.49	53.90	11.4	100	280	
Hori.	4882.000	PK	49.12	31.62	6.84	44.48	2.24	45.34	73.90	28.5	150	0	
Hori.	7323.000	PK	48.64	36.77	8.38	44.03	2.24	52.00	73.90	21.9	150	0	
Hori.	9764.000	PK	48.58	38.80	9.45	43.85	2.24	55.22	73.90	18.6	150	0	
Hori.	4882.000	AV	36.14	31.62	6.84	44.48	2.24	32.36	53.90	21.5	150	0	
Hori.	7323.000	AV	35.52	36.77	8.38	44.03	2.24	38.88	53.90	15.0	150	0	
Hori.	9764.000	AV	35.75	38.80	9.45	43.85	2.24	42.39	53.90	11.5	150	0	
Vert.	172.030	QP	43.20	15.81	8.82	31.78	0.00	36.05	43.50	7.4	100	103	
Vert.	179.673	QP	39.70	16.12	8.80	31.78	0.00	32.84	43.50	10.6	100	304	
Vert.	191.455	QP	36.70	16.25	8.84	31.77	0.00	30.02	43.50	13.4	100	309	
Vert.	4882.000	PK	49.02	31.62	6.84	44.48	2.24	45.24	73.90	28.6	150	0	
Vert.	7323.000	PK	48.14	36.77	8.38	44.03	2.24	51.50	73.90	22.4	150	0	
Vert.	9764.000	PK	48.85	38.80	9.45	43.85	2.24	55.49	73.90	18.4	150	0	
Vert.	4882.000	AV	36.12	31.62	6.84	44.48	2.24	32.34	53.90	21.5	150	0	
Vert.	7323.000	AV	35.40	36.77	8.38	44.03	2.24	38.76	53.90	15.1	150	0	
Vert.	9764.000	AV	35.74	38.80	9.45	43.85	2.24	42.38	53.90	11.5	150	0	

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

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

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.

UL Japan, Inc.

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

Report No. 12093854S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 3 3
Date December 26, 2017 January 11, 2018 January 10, 2018 January 9, 2018
Temperature / Humidity 22 deg.C / 30 %RH 22 deg.C / 32 %RH 20 deg.C / 31 %RH 23 deg.C / 34 %RH
Engineer Yasumasa Owaki Kazuya Noda Yosuke Ishikawa Kazuya Noda
(30 MHz – 1000 MHz) (1 GHz - 13 GHz) (13 GHz – 26.5 GHz) (26.5 GHz – 31.5 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.	168.013	QP	42.30	15.65	8.82	31.79	0.00	34.98	43.50	8.5	197	34	
Hori.	172.031	QP	43.50	15.81	8.82	31.78	0.00	36.35	43.50	7.1	197	48	
Hori.	179.627	QP	39.80	16.12	8.80	31.78	0.00	32.94	43.50	10.5	185	244	
Hori.	191.558	QP	37.60	16.25	8.84	31.77	0.00	30.92	43.50	12.5	171	239	
Hori.	360.000	QP	45.90	14.85	6.87	31.61	0.00	36.01	46.00	9.9	103	168	
Hori.	408.008	QP	46.70	15.98	7.19	31.62	0.00	38.25	46.00	7.7	100	86	
Hori.	432.001	QP	47.00	16.44	7.36	31.62	0.00	39.18	46.00	6.8	100	2	
Hori.	454.653	QP	44.10	16.89	7.50	31.61	0.00	36.88	46.00	9.1	100	187	
Hori.	466.942	QP	49.50	17.13	7.56	31.60	0.00	42.59	46.00	3.4	100	182	
Hori.	498.405	QP	37.80	17.74	7.71	31.59	0.00	31.66	46.00	14.3	178	115	
Hori.	742.500	QP	39.90	20.30	8.92	31.47	0.00	37.65	46.00	8.3	100	229	
Hori.	960.256	QP	40.20	22.55	9.94	30.40	0.00	42.29	53.90	11.6	100	281	
Hori.	2483.500	PK	48.72	27.55	14.25	44.16	2.24	48.60	73.90	25.3	138	214	
Hori.	4960.000	PK	48.75	31.83	6.91	44.51	2.24	45.22	73.90	28.6	100	0	
Hori.	7440.000	PK	48.48	36.97	8.51	44.08	2.24	52.12	73.90	21.7	100	0	
Hori.	9920.000	PK	48.84	38.98	9.54	43.87	2.24	55.73	73.90	18.1	100	0	
Hori.	2483.500	AV	36.51	27.55	14.25	44.16	2.24	36.39	53.90	17.5	138	214	
Hori.	4960.000	AV	36.10	31.83	6.91	44.51	2.24	32.57	53.90	21.3	100	0	
Hori.	7440.000	AV	35.95	36.97	8.51	44.08	2.24	39.59	53.90	14.3	100	0	
Hori.	9920.000	AV	36.10	38.98	9.54	43.87	2.24	42.99	53.90	10.9	100	0	
Vert.	172.031	QP	43.40	15.81	8.82	31.78	0.00	36.25	43.50	7.2	100	99	
Vert.	179.690	QP	39.40	16.12	8.80	31.78	0.00	32.54	43.50	10.9	100	312	
Vert.	2483.500	PK	48.71	27.55	14.25	44.16	2.24	48.59	73.90	25.3	199	187	
Vert.	4960.000	PK	48.64	31.83	6.91	44.51	2.24	45.11	73.90	28.7	150	0	
Vert.	7440.000	PK	48.52	36.97	8.51	44.08	2.24	52.16	73.90	21.7	150	0	
Vert.	9920.000	PK	48.71	38.98	9.54	43.87	2.24	55.60	73.90	18.3	150	0	
Vert.	2483.500	AV	36.55	27.55	14.25	44.16	2.24	36.43	53.90	17.4	199	187	
Vert.	4960.000	AV	36.01	31.83	6.91	44.51	2.24	32.48	53.90	21.4	150	0	
Vert.	7440.000	AV	35.89	36.97	8.51	44.08	2.24	39.53	53.90	14.3	150	0	
Vert.	9920.000	AV	36.03	38.98	9.54	43.87	2.24	42.92	53.90	10.9	150	0	

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

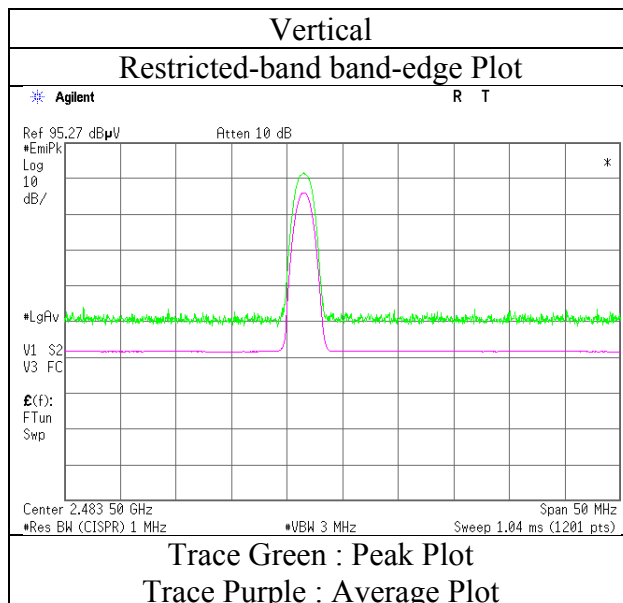
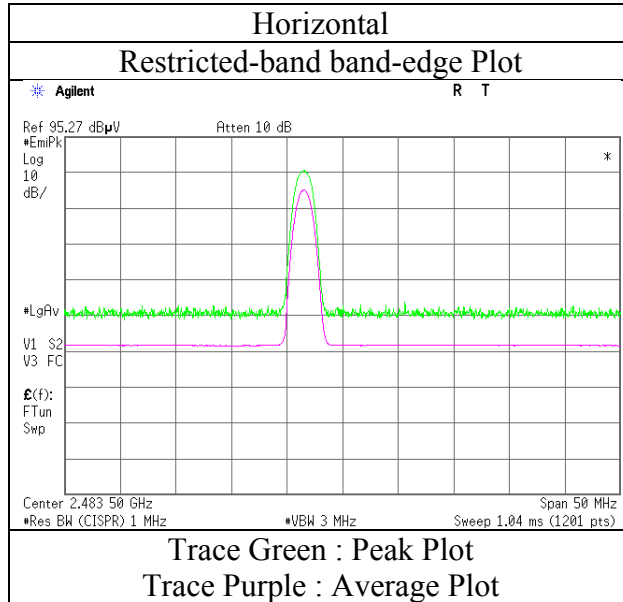
Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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)

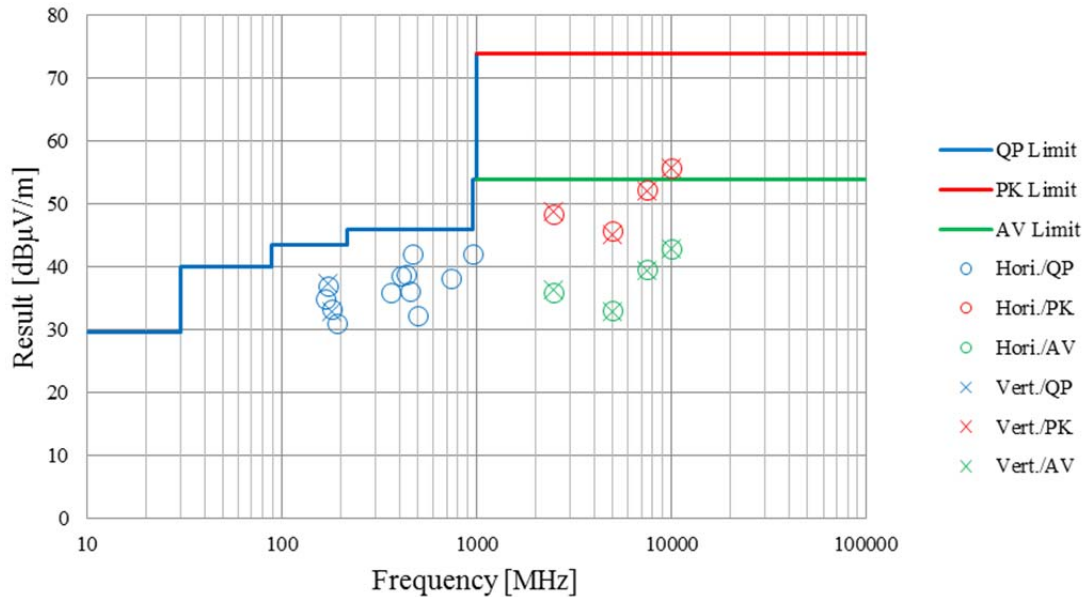
Report No.	12093854S-A
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	January 11, 2018
Temperature / Humidity	22 deg.C / 32 %RH
Engineer	Kazuya Noda
	(1 GHz - 13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission **(Plot data, Worst case)**

Report No.	12093854S-A			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	December 26, 2017	January 11, 2018	January 10, 2018	January 9, 2018
Temperature / Humidity	22 deg.C / 30 %RH	22 deg.C / 32 %RH	20 deg.C / 31 %RH	23 deg.C / 34 %RH
Engineer	Yasumasa Owaki	Kazuya Noda	Yosuke Ishikawa	Kazuya Noda
	(30 MHz – 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)	(26.5 GHz – 31.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz			

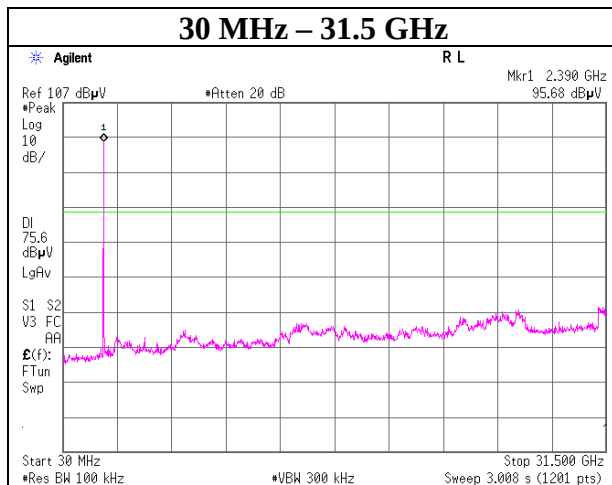
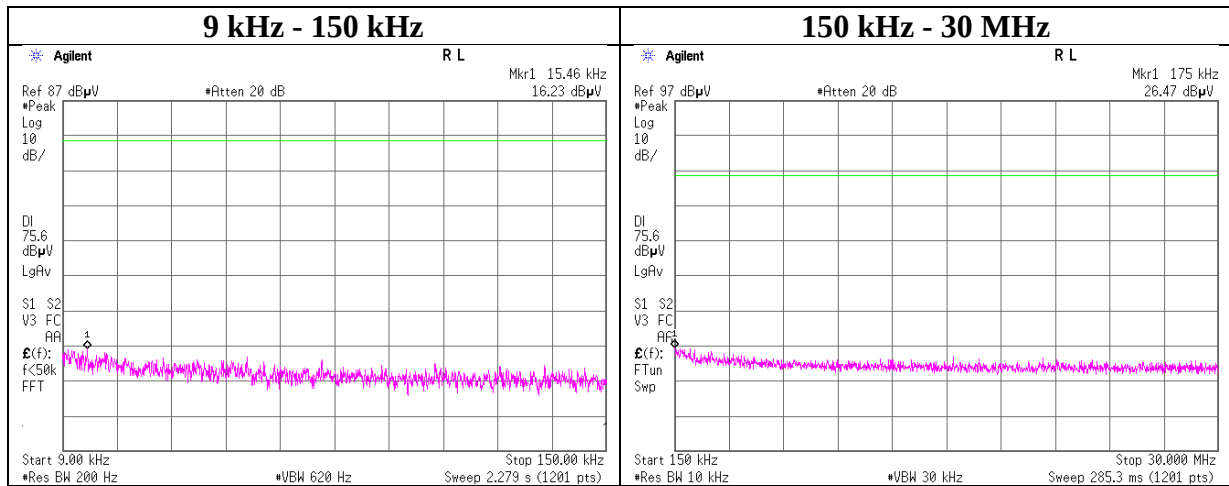


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, DH5

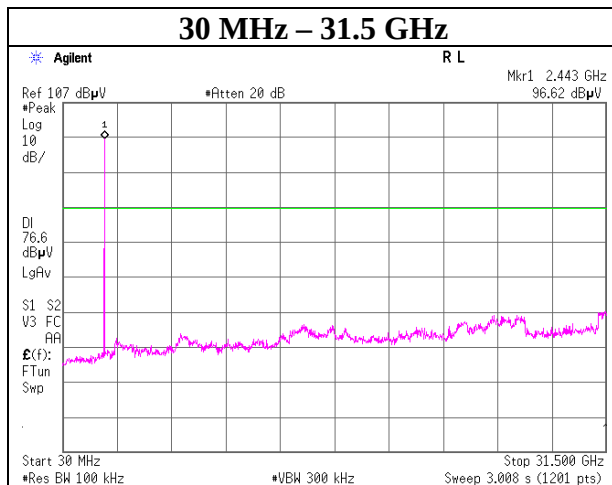
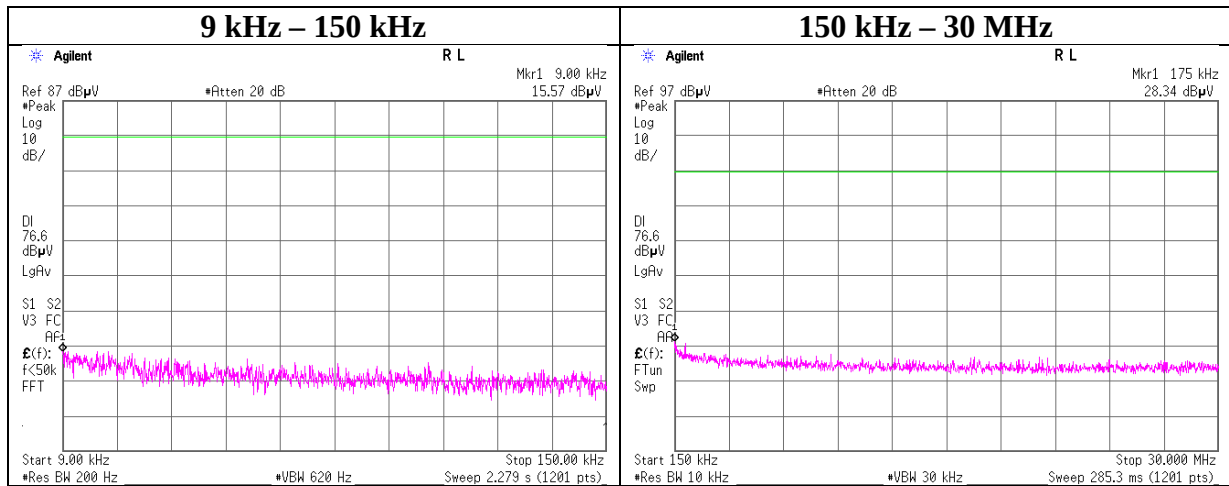
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, DH5

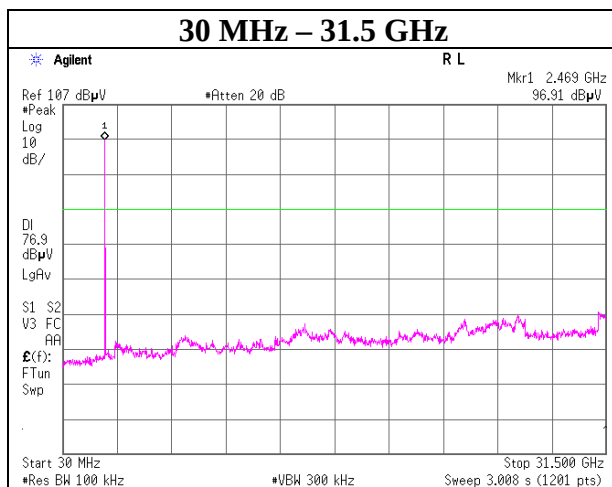
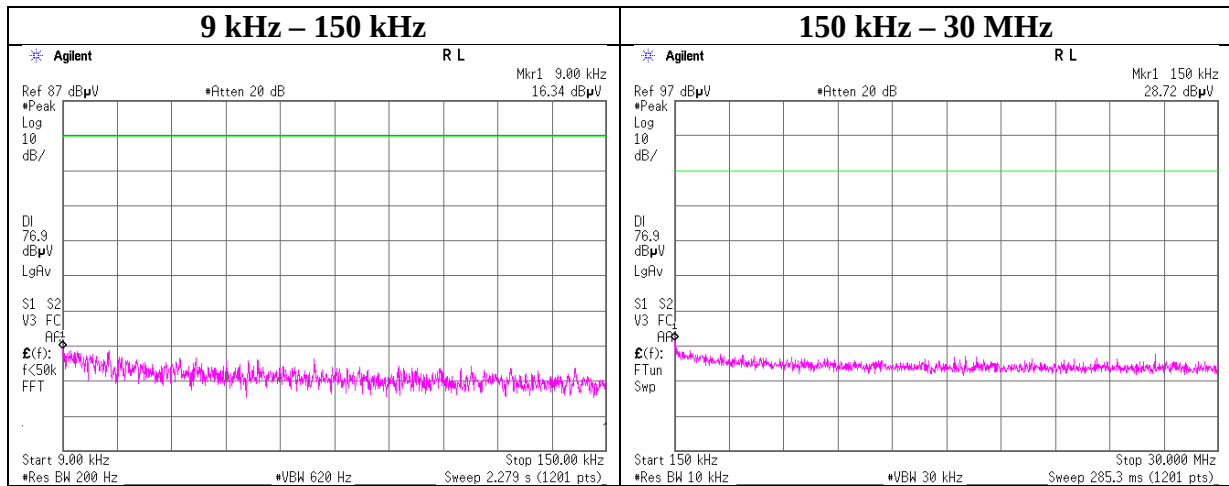
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, DH5

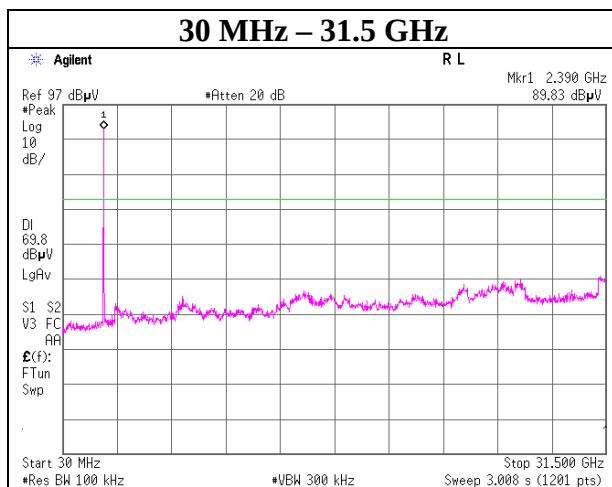
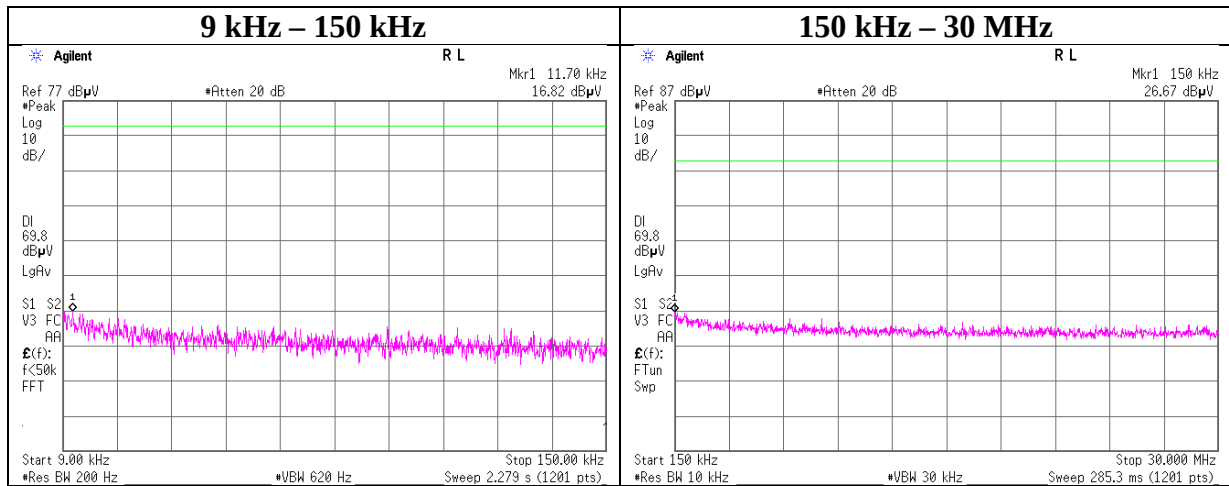
2480 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, 3DH5

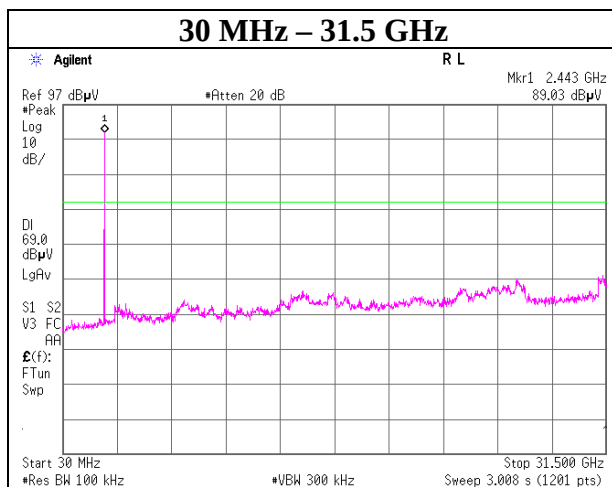
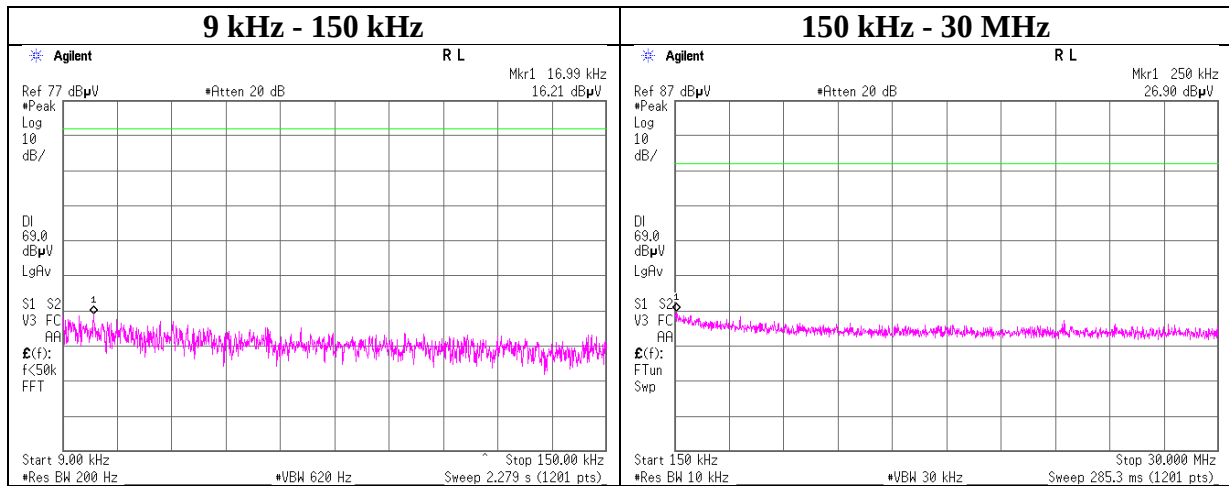
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, 3DH5

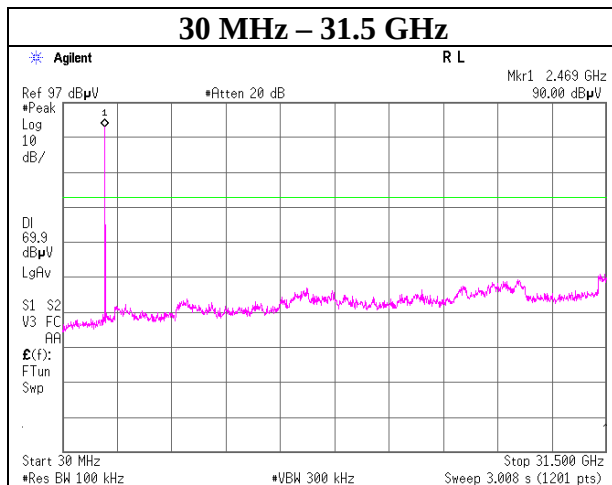
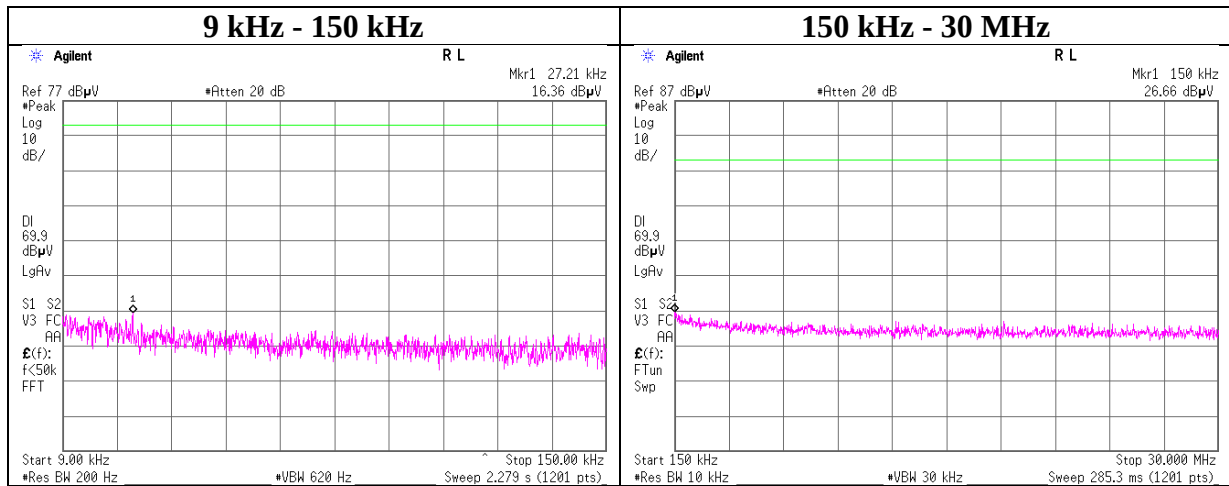
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx, Hopping Off, 3DH5

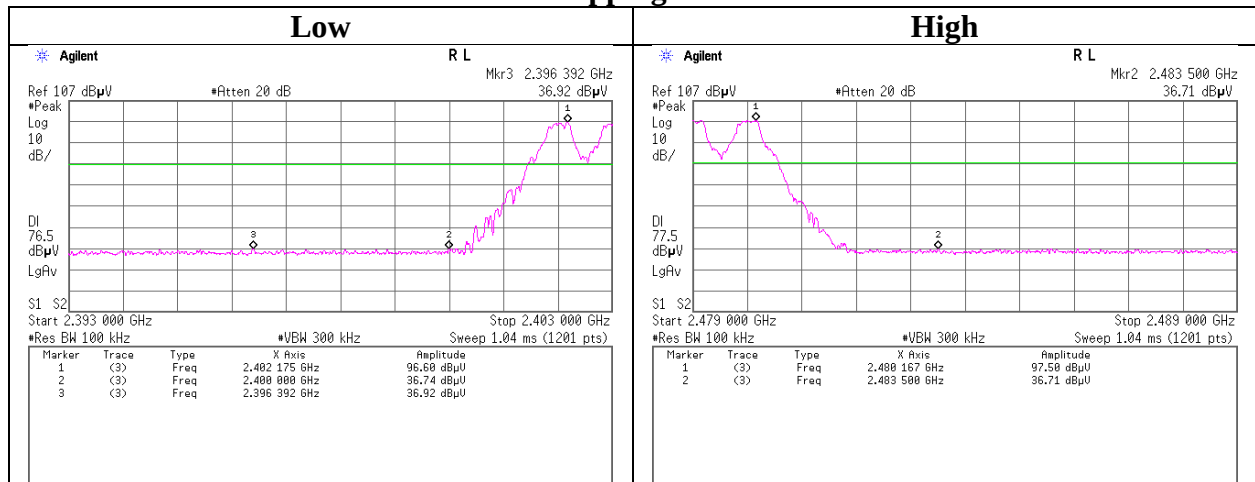
2480 MHz



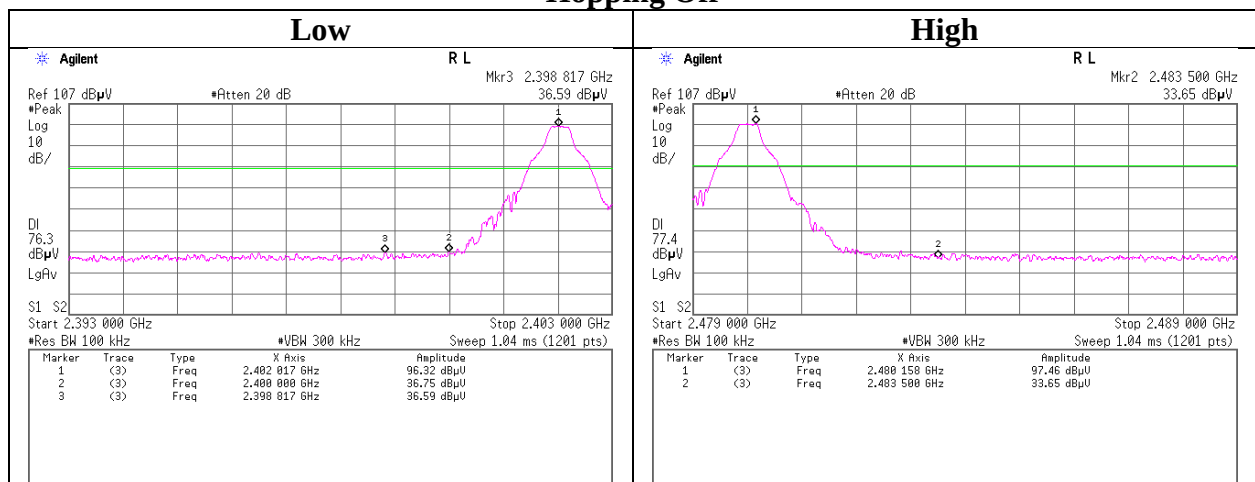
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx DH5

Hopping On



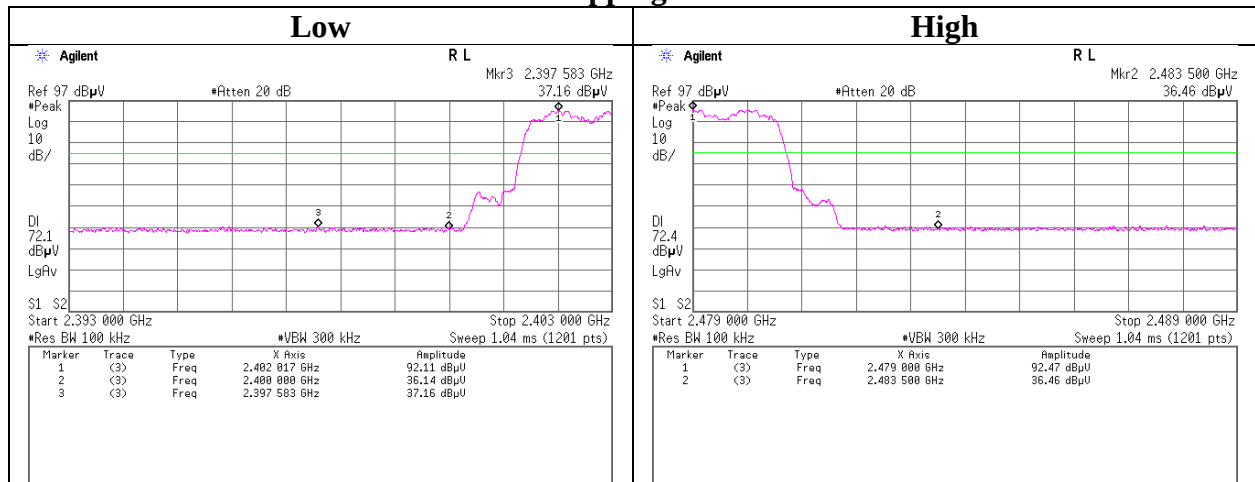
Hopping Off



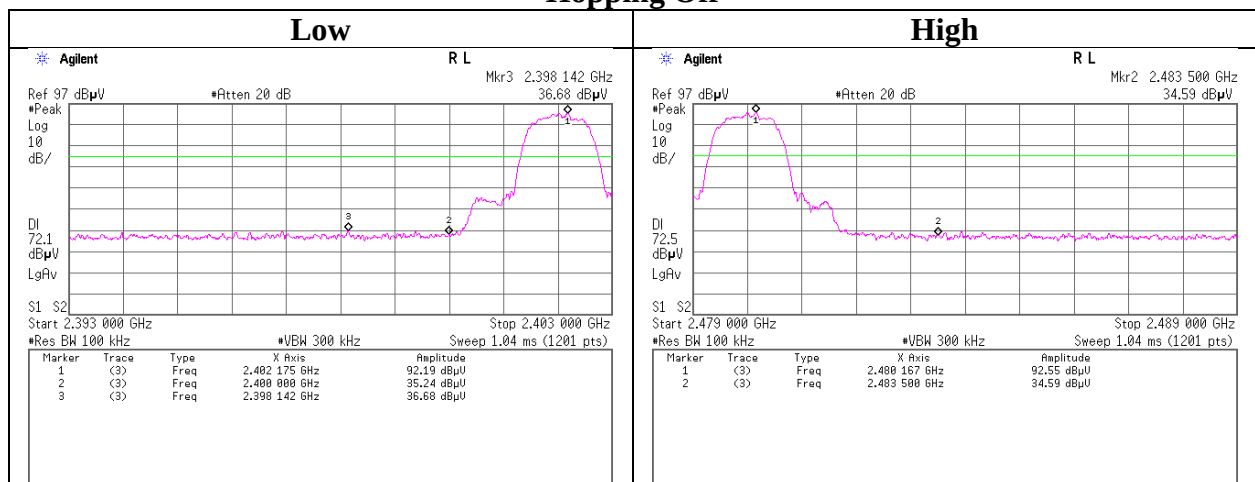
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12093854S-A
Date : December 26, 2017
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Kazuya Noda
Mode : Tx 3DH5

Hopping On



Hopping Off



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-05	Power sensor	Agilent	N1923A	MY5349008	AT	2017/05/01 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	AT	2017/10/30 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SCC-G32	Coaxial Cable	Junkosha	MWX241-02000KM SKMS	OCT-09-13-005	AT	2017/11/22 * 12
SAT10-12	Attenuator	Weinschel Corp.	54A-10	81601	AT	2017/03/23 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2017/08/20 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2017/02/09 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2017/02/09 * 12
SAT3-11	Attenuator	JFW	50HF-003N	-	RE	2017/02/23 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2017/11/23 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	RE	2017/01/05 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2017/10/30 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2017/09/26 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2017/06/08 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFL,MF)	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2017/03/08 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SAF-10	Pre Amplifier	TOYO Corporation	HAP26-40W	00000010	RE	2017/03/17 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2017/03/23 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	-	RE	2017/04/20 * 12
SHA-06	Horn Antenna	ETS LINDGREN	3160-10	LM3459	RE	2017/03/15 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2017/03/07 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2017/10/16 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 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
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000NF SNMS/B	1612S006	RE	2017/01/08 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 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
AT: Antenna Terminal Conducted test

UL Japan, Inc.

Shonan EMC Lab.

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