



RADIO TEST REPORT

Test Report No. : 11549600S-A-R2

Applicant : PIONEER CORPORATION
Type of Equipment : MAIN UNIT
Model No. : D172
FCC ID : AJDK101
Test regulation : FCC Part 15 Subpart C: 2016
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 11549600S-A-R1. 11549600S-A-R1 is replaced with this report.

Date of test: December 3 to 8 , 2016

Representative test engineer:


Yosuke Ishikawa
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

REVISION HISTORY

Original Test Report No.: 11549600S-A

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SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Address	:	25-1 Yamada, Kawagoe-shi, Saitama-ken 350-8555, JAPAN
Telephone Number	:	+81-49-228-6415
Facsimile Number	:	+81-49-228-6493
Contact Person	:	Tomoyuki Tanaka

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

2.1 Identification of E.U.T.

Type of Equipment	:	MAIN UNIT
Model No.	:	D172
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample	:	November 30, 2016
Country of Mass-production	:	USA
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: D172 (referred to as the EUT in this report) is a MAIN UNIT.

Radio Specification

[Bluetooth]

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	GFSK, π /4DQPSK, 8DPSK
Power Supply (radio part input)	:	DC 3.3 V / 1.8 V
Antenna type	:	Inverted F type
Antenna Gain	:	2.94 dBi (max)
Clock frequency	:	32.768 kHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

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 November 14, 2016, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	N/A	N/A	N/A *1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1) IC: RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section 15.247(a)(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	8.9 dB 9608.000 MHz, AV, Vert. / Hori. Tx, Hopping Off, 3DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *2)

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

*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 EUT provides stable voltage (DC 3.3 V / 1.8 V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique coupling/antenna connector (U.FL). Therefore, the equipment complies with the antenna requirement of Section 15.203.

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	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

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

Radiated emission test

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

3.5 Test Location

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JAB Accreditation No. RTL02610

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

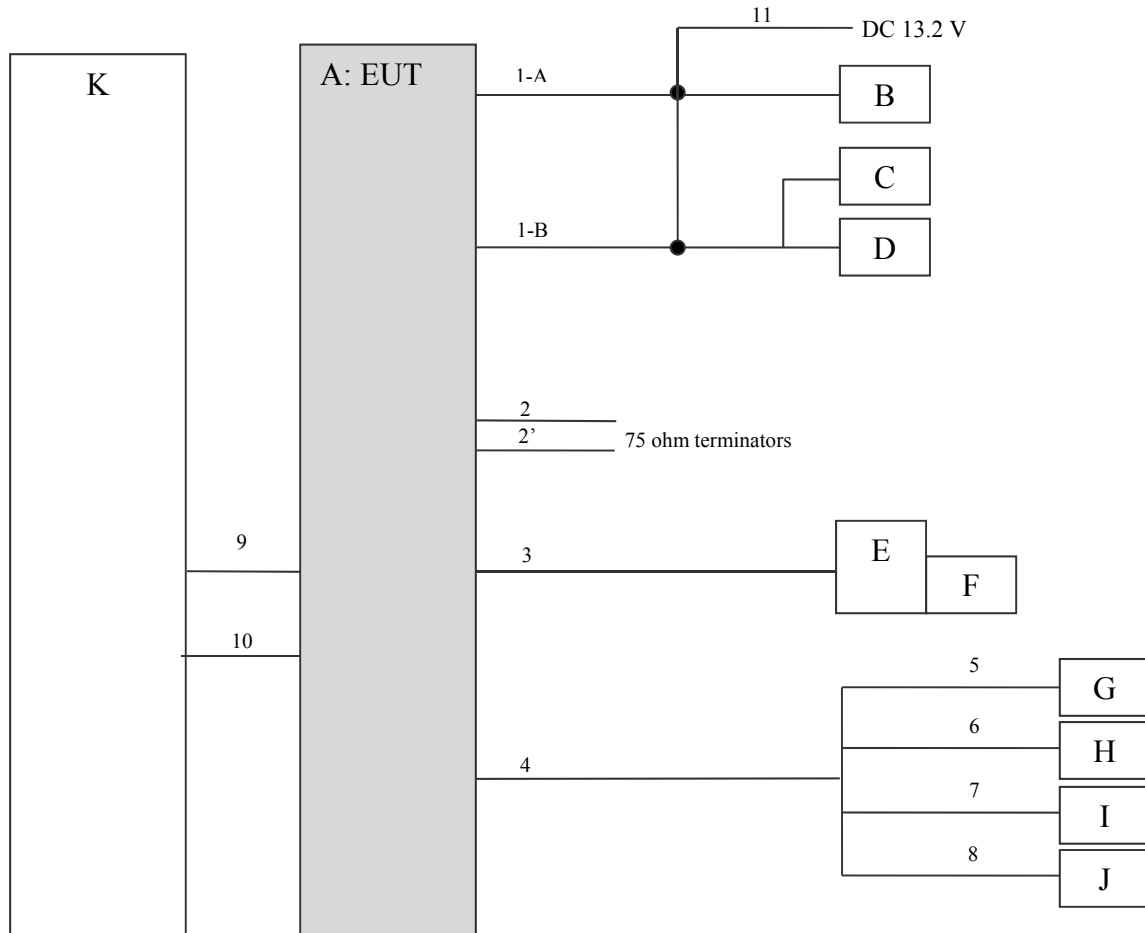
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: 0 dBm Firmware Version: B080 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.		

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	MAIN UNIT	D172	AABB999998UC *1) AABB999999UC *2)	PIONEER	EUT
B	Steering SW	75E921LH/RH	-	-	-
C	Microphone	-	-	-	-
D	Rear Camera	867B0-33090	59F0044	-	-
E	USB	-	-	-	-
F	USB Memory	-	-	-	-
G	Speaker	LV-002	S11014200775	L&V	-
H	Speaker	LV-002	S11014200775	L&V	-
I	Speaker	LV-002	S11014200773	L&V	-
J	Speaker	LV-002	S11014200773	L&V	-
K	Front Panel				-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1-A	Wire Harness Set	1.1	Unshielded	Unshielded	-
1-B	Wire Harness	1.0	Unshielded	Unshielded	-
2, 2'	Radio antenna	0.1 + 1.5	Shielded	Shielded	-
3	USB connector	2.0	Shielded	Shielded	-
4	Speaker	1.0	Unshielded	Unshielded	-
5	Speaker	1.9	Unshielded	Unshielded	-
6	Speaker	1.9	Unshielded	Unshielded	-
7	Speaker	1.9	Unshielded	Unshielded	-
8	Speaker	1.9	Unshielded	Unshielded	-
9	Flat cable	0.5	Unshielded	Unshielded	-
10	Flat cable	0.5	Shielded	Unshielded	-
11	DC	1.3	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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

The height of the measuring antenna varied between 1 m 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

Frequency	Below 1 GHz	Above 1GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	PK	AV
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)
Test Distance	3 m	3 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)	

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

*2) Distance Factor: $20 \times \log (3.88 \text{ m}/3.0 \text{ m}) = 2.23 \text{ dB}$

*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 that has the maximum noise.

	30 MHz to 1000 MHz	1 GHz to 13 GHz	13 GHz to 18 GHz	18 GHz to 26.5 GHz
Horizontal	0 degree	0 degree	0 degree	30 degree
Vertical	0 degree	0 degree	0 degree	30 degree

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

Measurement range : 30 MHz - 26.5 GHz

Test data : APPENDIX

Test result : Pass

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SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.

*2) Reference data

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

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.

(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

Test data : APPENDIX

Test result : Pass

APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

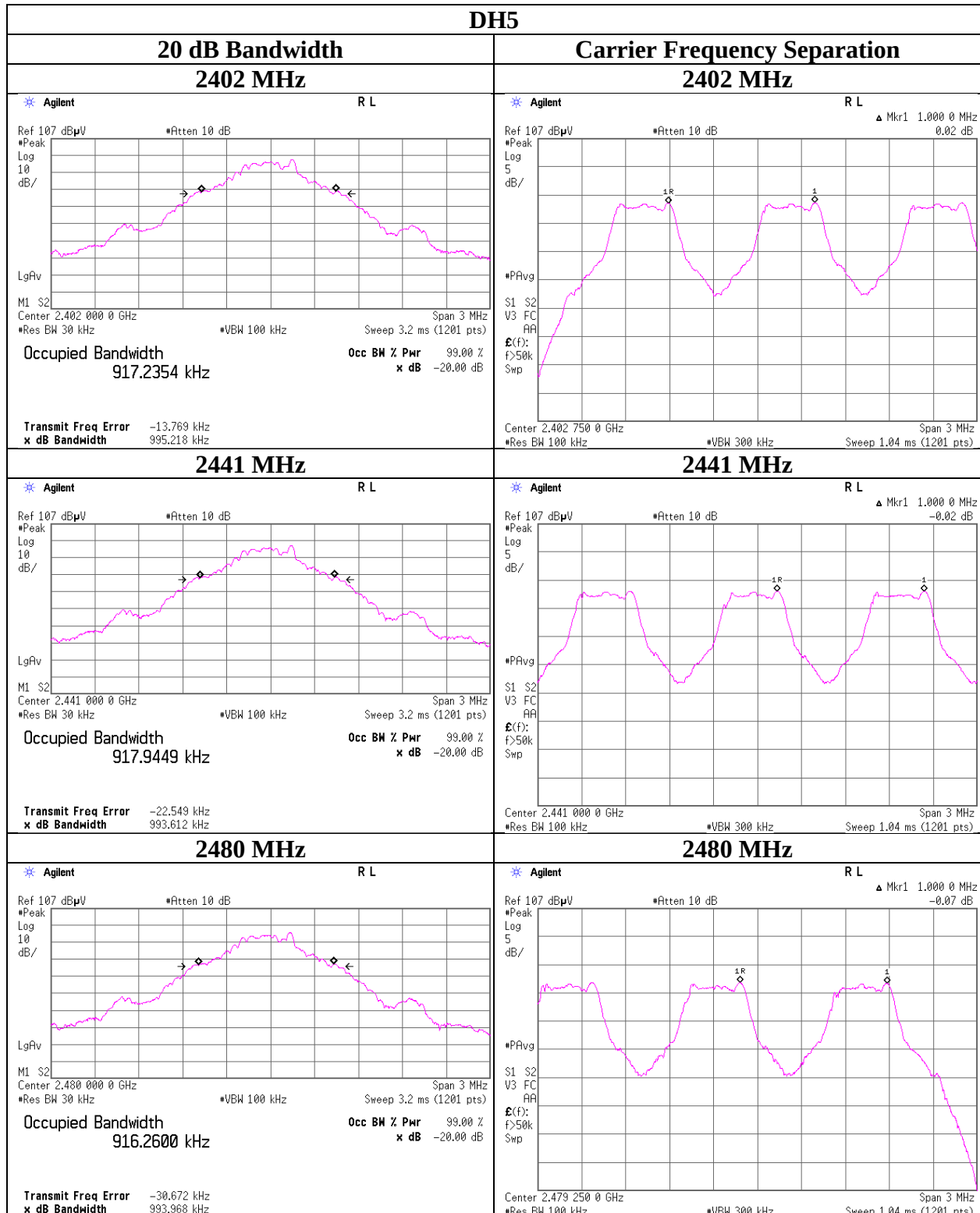
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11549600S-A-R2
Date	December 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.995	1.000	≥ 0.663
DH5	2441.0	0.994	1.000	≥ 0.662
DH5	2480.0	0.994	1.000	≥ 0.663
3DH5	2402.0	1.315	1.000	≥ 0.877
3DH5	2441.0	1.314	1.000	≥ 0.876
3DH5	2480.0	1.312	1.000	≥ 0.875

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



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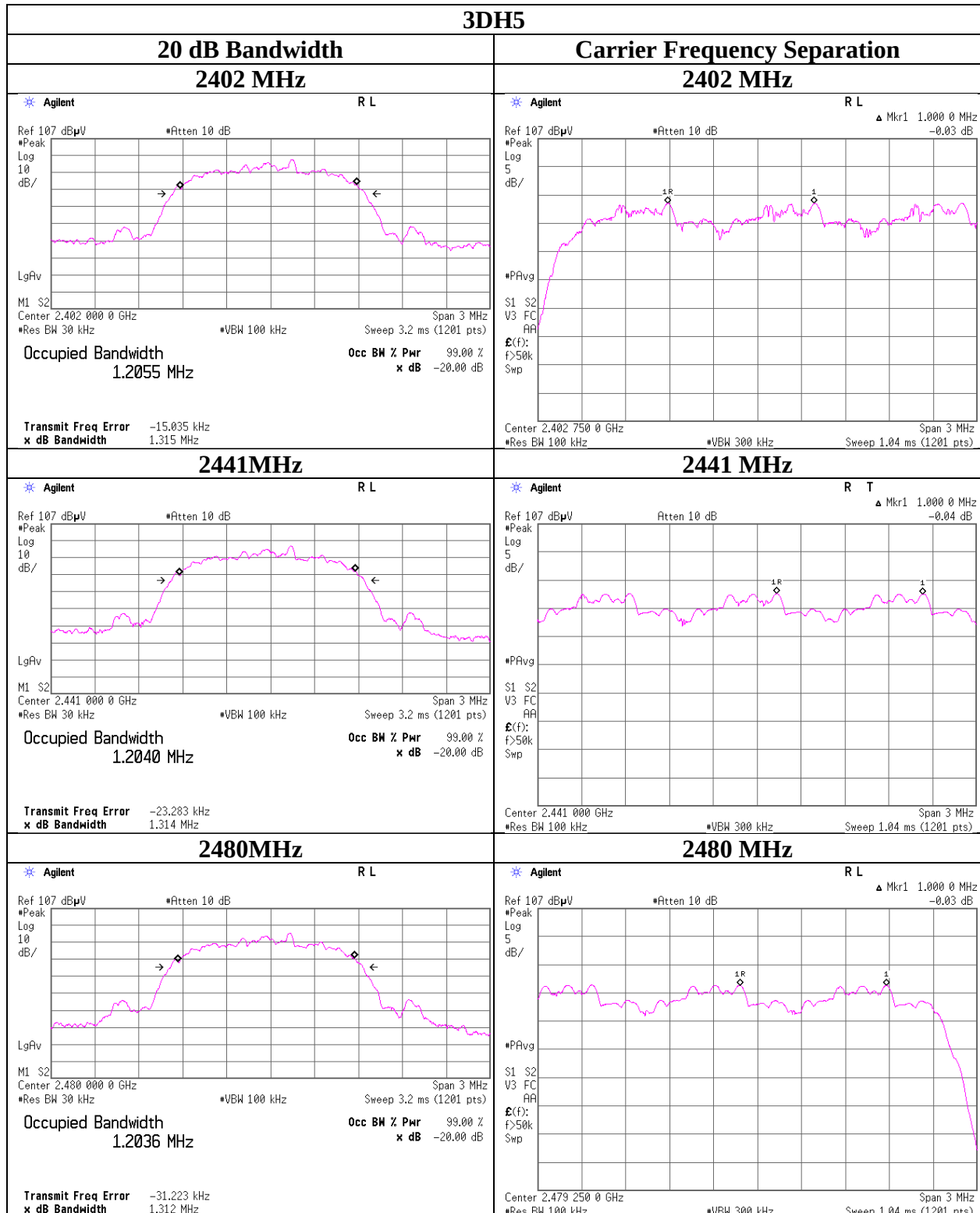
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20dB Bandwidth and Carrier Frequency Separation



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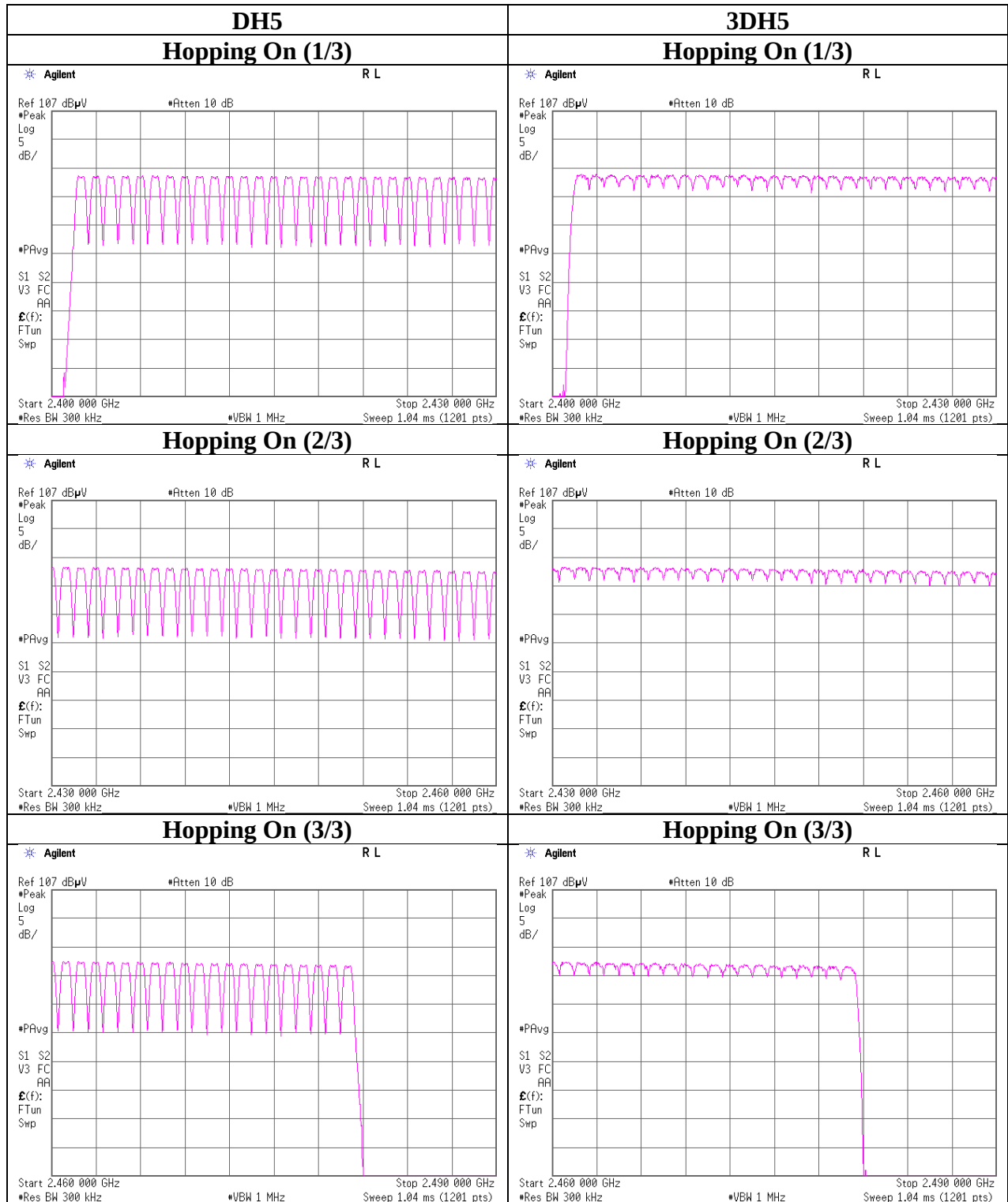
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11549600S-A-R2
Date December 8, 2016
Temperature / Humidity 21 deg. C / 38 % RH
Engineer Yosuke Ishikawa
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. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
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	0.428	133	400
DH3	26.6 times	/	5 sec. x	31.6 sec. = 169 times	1.678	284	400
DH5	19.2 times	/	5 sec. x	31.6 sec. = 122 times	2.935	358	400
3DH1	49.2 times	/	5 sec. x	31.6 sec. = 311 times	0.429	133	400
3DH3	27.0 times	/	5 sec. x	31.6 sec. = 171 times	1.682	288	400
3DH5	19.4 times	/	5 sec. x	31.6 sec. = 123 times	2.931	360	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

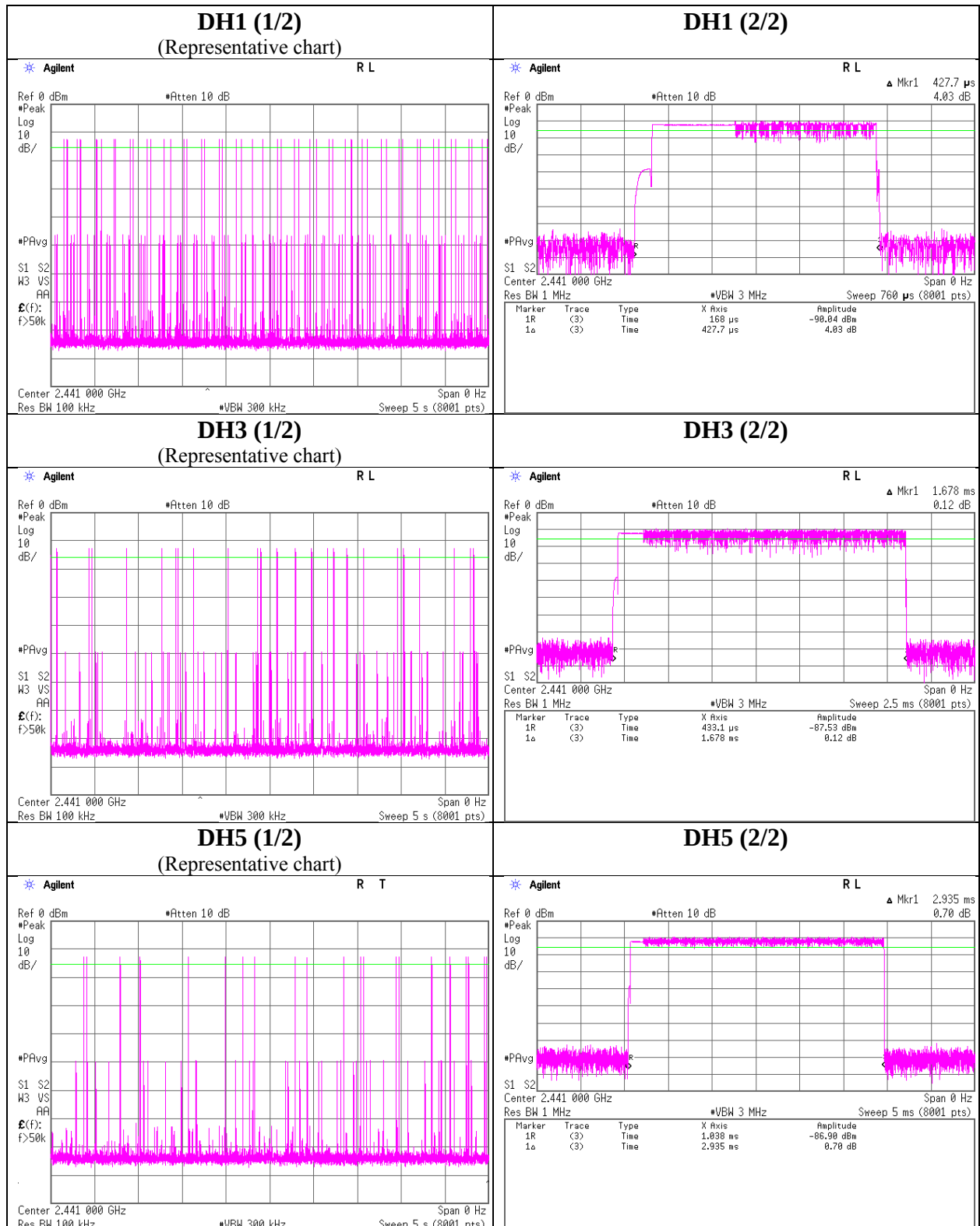
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	50	49	48	48	49
DH3	24	24	27	32	26	26.6
DH5	21	19	19	17	20	19.2
3DH1	48	49	50	49	50	49.2
3DH3	22	28	29	32	24	27
3DH5	11	17	25	21	23	19.4

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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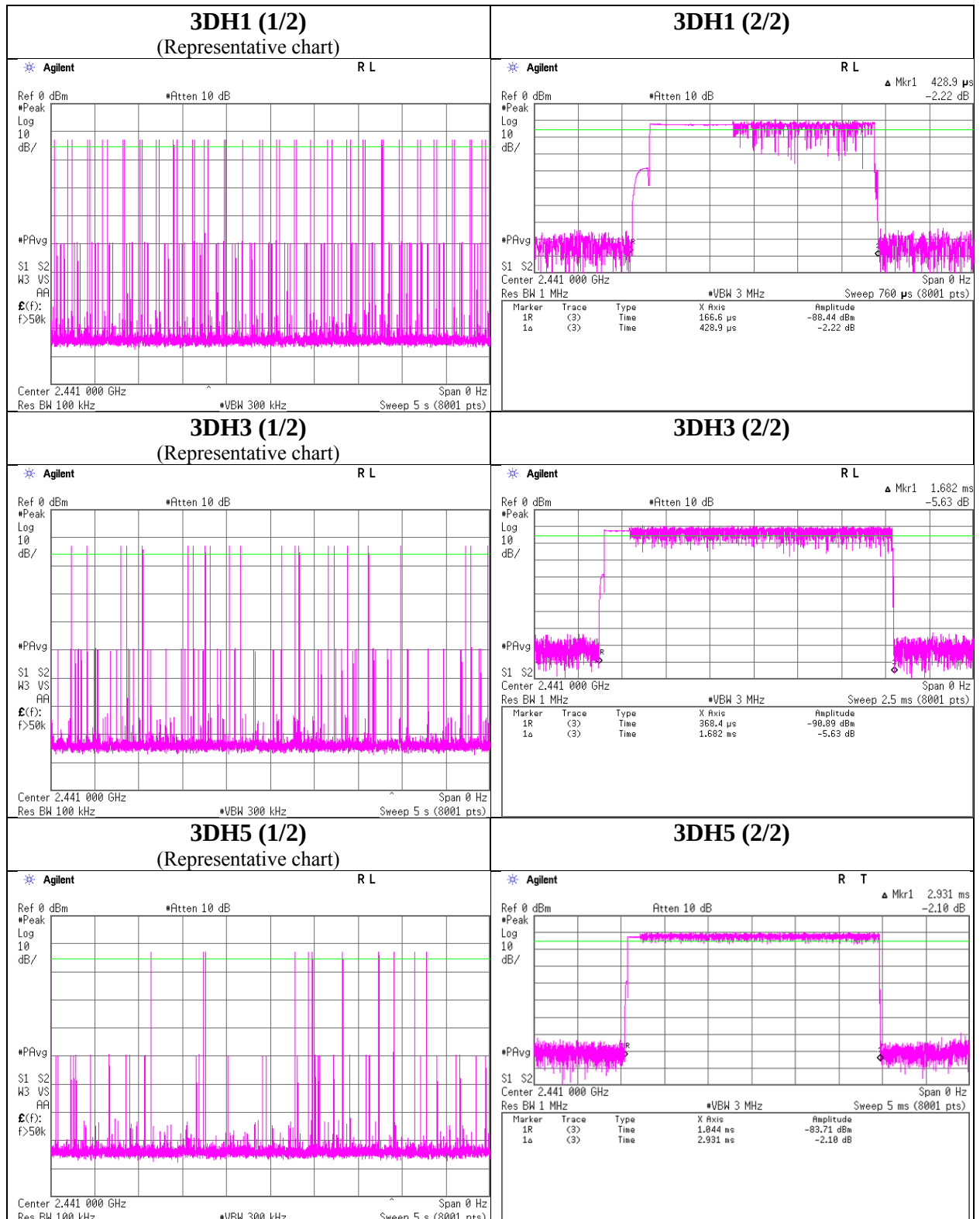
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Dwell time



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Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11549600S-A-R2
Date	December 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Yosuke Ishikawa
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	-11.37	1.91	9.64	0.18	1.04	20.96	125	20.78
DH5	2441.0	-11.72	1.91	9.64	-0.17	0.96	20.96	125	21.13
DH5	2480.0	-12.95	1.92	9.65	-1.38	0.73	20.96	125	22.34
2DH5	2402.0	-8.68	1.91	9.64	2.87	1.94	20.96	125	18.09
2DH5	2441.0	-9.42	1.91	9.64	2.13	1.63	20.96	125	18.83
2DH5	2480.0	-10.78	1.92	9.65	0.79	1.20	20.96	125	20.17
3DH5	2402.0	-8.53	1.91	9.64	3.02	2.00	20.96	125	17.94
3DH5	2441.0	-9.22	1.91	9.64	2.33	1.71	20.96	125	18.63
3DH5	2480.0	-10.59	1.92	9.65	0.98	1.25	20.96	125	19.98

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. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-13.03	1.91	9.64	-1.48	0.71	1.07	-0.41	0.91
DH5	2441.0	-13.48	1.91	9.64	-1.93	0.64	1.07	-0.86	0.82
DH5	2480.0	-14.86	1.92	9.65	-3.29	0.47	1.07	-2.22	0.60
2DH5	2402.0	-12.72	1.91	9.64	-1.17	0.76	1.07	-0.10	0.98
2DH5	2441.0	-13.48	1.91	9.64	-1.93	0.64	1.07	-0.86	0.82
2DH5	2480.0	-14.94	1.92	9.65	-3.37	0.46	1.07	-2.30	0.59
3DH5	2402.0	-12.65	1.91	9.64	-1.10	0.78	1.07	-0.03	0.99
3DH5	2441.0	-13.41	1.91	9.64	-1.86	0.65	1.07	-0.79	0.83
3DH5	2480.0	-14.92	1.92	9.65	-3.35	0.46	1.07	-2.28	0.59

Sample Calculation:

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

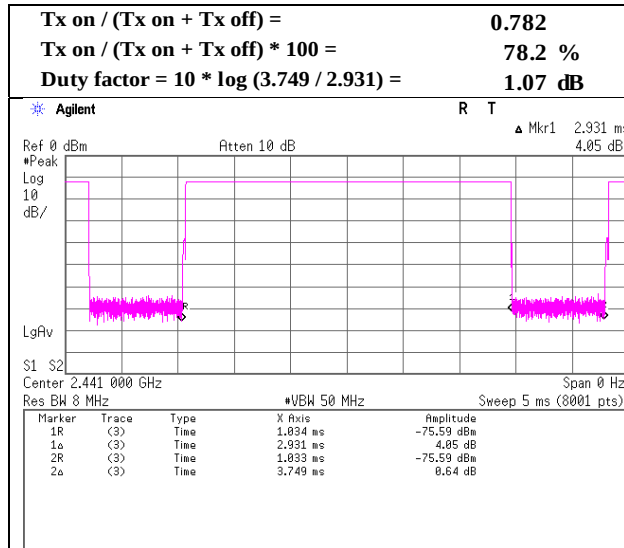
Result (Burst power average) = Time average + Duty factor

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

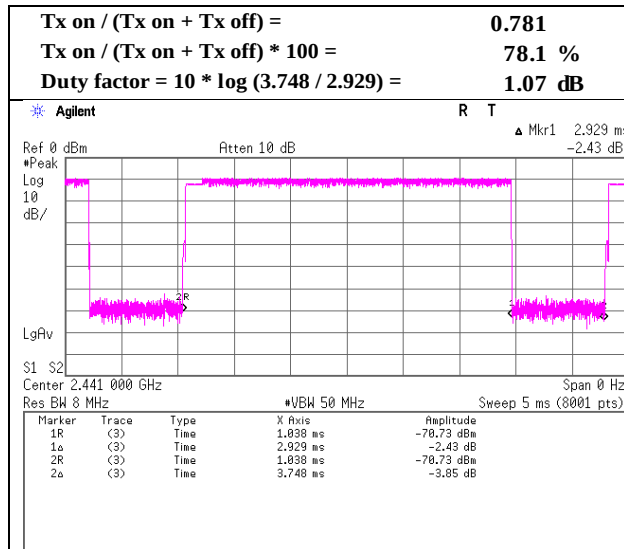
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11549600S-A-R2
Date	December 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off

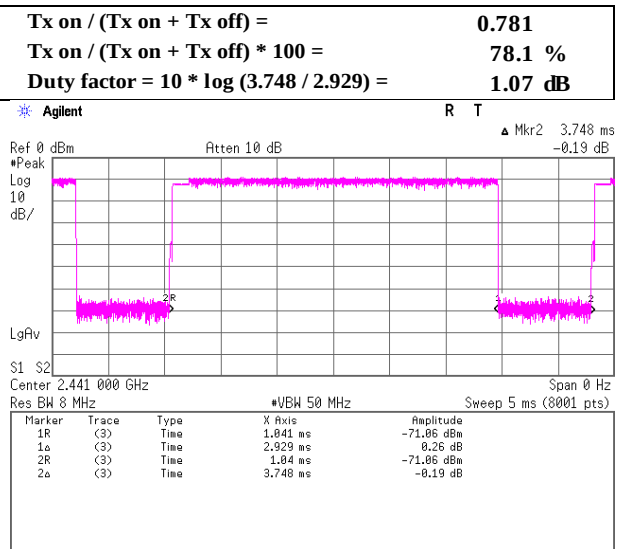
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber
Report No. 11549600S-A-R2
Anechoic Chamber No. 3 2
Date December 5, 2016 December 3, 2016
Temperature / Humidity 21 deg. C / 34 % RH 20 deg. C / 41 % RH
Engineer Shinichi Takano Hiroyuki Morikawa
(30 MHz -1000 MHz, (1 GHz -18 GHz)
18 -26.5 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	92.514	QP	36.71	8.67	7.37	32.14	0.00	20.61	43.50	22.8	225	98	
Hori.	110.885	QP	34.26	11.54	7.52	32.13	0.00	21.19	43.50	22.3	300	297	
Hori.	148.025	QP	28.51	14.74	7.79	32.09	0.00	18.95	43.50	24.5	348	238	
Hori.	185.021	QP	29.83	16.27	8.03	32.06	0.00	22.07	43.50	21.4	184	114	
Hori.	222.049	QP	38.95	11.70	8.25	32.02	0.00	26.88	46.00	19.1	159	242	
Hori.	258.958	QP	40.49	11.94	8.47	31.99	0.00	28.91	46.00	17.0	150	130	
Hori.	740.161	QP	27.61	20.13	10.52	31.79	0.00	26.47	46.00	19.5	191	245	
Hori.	2390.000	PK	42.18	27.17	15.23	37.06	2.23	49.75	73.90	24.2	100	306	
Hori.	4804.000	PK	42.33	31.13	8.45	37.12	2.23	47.02	73.90	26.9	150	0	
Hori.	7206.000	PK	44.17	36.43	9.49	37.84	2.23	54.48	73.90	19.4	150	0	
Hori.	9608.000	PK	44.97	38.28	10.12	39.13	2.23	56.47	73.90	17.4	150	0	
Hori.	22401.580	PK	43.37	40.72	14.56	47.04	-9.54	42.07	73.90	31.8	111	347	
Hori.	2390.000	AV	30.44	27.17	15.23	37.06	2.23	38.01	53.90	15.9	100	306	
Hori.	4804.000	AV	30.41	31.13	8.45	37.12	2.23	35.10	53.90	18.8	150	0	
Hori.	7206.000	AV	32.05	36.43	9.49	37.84	2.23	42.36	53.90	11.5	150	0	
Hori.	9608.000	AV	33.41	38.28	10.12	39.13	2.23	44.91	53.90	9.0	150	0	
Hori.	22401.580	AV	33.43	40.72	14.56	47.04	-9.54	32.13	53.90	21.7	111	347	
Vert.	185.036	QP	30.15	16.27	8.03	32.06	0.00	22.39	43.50	21.1	178	116	
Vert.	259.052	QP	35.45	11.95	8.47	31.99	0.00	23.88	46.00	22.1	100	50	
Vert.	2390.000	PK	42.22	27.17	15.23	37.06	2.23	49.79	73.90	24.1	145	240	
Vert.	4804.000	PK	42.22	31.13	8.45	37.12	2.23	46.91	73.90	27.0	150	0	
Vert.	7206.000	PK	44.02	36.43	9.49	37.84	2.23	54.33	73.90	19.6	150	0	
Vert.	9608.000	PK	45.89	38.28	10.12	39.13	2.23	57.39	73.90	16.5	150	0	
Vert.	22401.600	PK	45.20	40.72	14.56	47.04	-9.54	43.90	73.90	30.0	138	41	
Vert.	2390.000	AV	30.45	27.17	15.23	37.06	2.23	38.02	53.90	15.9	145	240	
Vert.	4804.000	AV	30.44	31.13	8.45	37.12	2.23	35.13	53.90	18.8	150	0	
Vert.	7206.000	AV	32.04	36.43	9.49	37.84	2.23	42.35	53.90	11.6	150	0	
Vert.	9608.000	AV	33.38	38.28	10.12	39.13	2.23	44.88	53.90	9.0	150	0	
Vert.	22401.600	AV	38.46	40.72	14.56	47.04	-9.54	37.16	53.90	16.7	138	41	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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	89.74	27.21	15.24	37.05	2.23	97.37	-	-	Carrier
Hori.	2400.000	PK	34.77	27.20	15.24	37.05	2.23	42.39	77.37	35.0	
Vert.	2402.000	PK	87.23	27.21	15.24	37.05	2.23	94.86	-	-	Carrier
Vert.	2400.000	PK	33.63	27.20	15.24	37.05	2.23	41.25	74.86	33.6	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

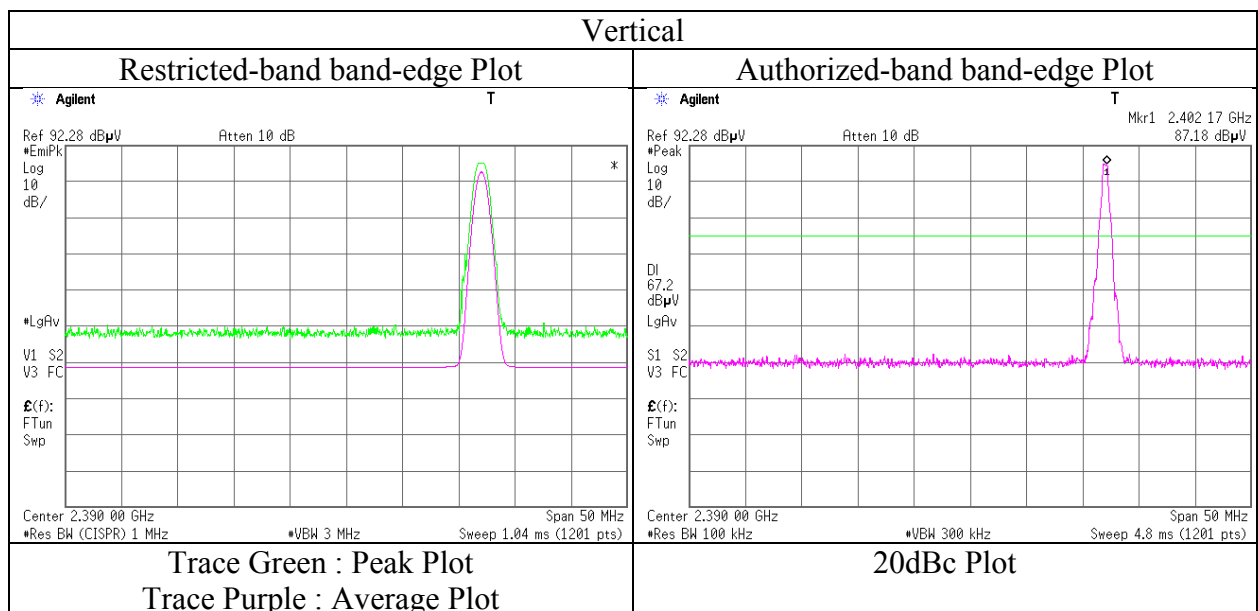
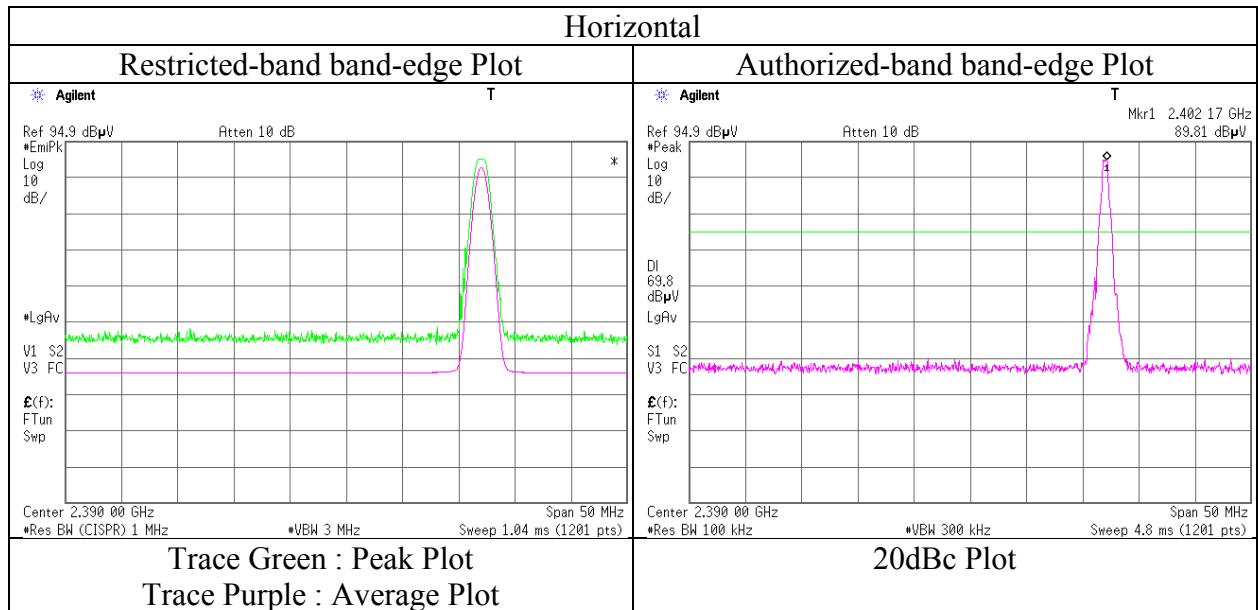
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11549600S-A-R2
Date	December 3, 2016
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Hiroyuki Morikawa (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 : Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber
Report No. : 11549600S-A-R2
Anechoic Chamber No. : 3 2
Date : December 5, 2016 December 3, 2016
Temperature / Humidity : 21 deg. C / 34 % RH 20 deg. C / 41 % RH
Engineer : Shinichi Takano Hiroyuki Morikawa
(30 MHz -1000 MHz, (1 GHz -18 GHz)
18 -26.5 GHz)
Mode : Tx, Hopping Off, DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	148.028	QP	32.28	14.74	7.79	32.09	0.00	22.72	43.50	20.7	231	229	
Hori.	185.034	QP	29.10	16.27	8.03	32.06	0.00	21.34	43.50	22.1	188	221	
Hori.	222.051	QP	36.97	11.70	8.25	32.02	0.00	24.90	46.00	21.1	154	231	
Hori.	259.050	QP	39.70	11.95	8.47	31.99	0.00	28.13	46.00	17.8	161	120	
Hori.	285.024	QP	34.20	12.94	8.61	31.99	0.00	23.76	46.00	22.2	153	225	
Hori.	740.140	QP	28.22	20.13	10.52	31.79	0.00	27.08	46.00	18.9	188	244	
Hori.	4882.000	PK	42.03	31.29	8.49	37.16	2.23	46.88	73.90	27.0	150	0	
Hori.	7323.000	PK	42.89	36.64	9.51	37.92	2.23	53.35	73.90	20.6	150	0	
Hori.	9764.000	PK	44.45	38.52	10.19	39.20	2.23	56.19	73.90	17.7	150	0	
Hori.	22401.550	PK	42.40	40.72	14.56	47.04	-9.54	41.10	73.90	32.8	156	47	
Hori.	4882.000	AV	30.50	31.29	8.49	37.16	2.23	35.35	53.90	18.6	150	0	
Hori.	7323.000	AV	31.52	36.64	9.51	37.92	2.23	41.98	53.90	11.9	150	0	
Hori.	9764.000	AV	32.89	38.52	10.19	39.20	2.23	44.63	53.90	9.3	150	0	
Hori.	22401.550	AV	35.69	40.72	14.56	47.04	-9.54	34.39	53.90	19.5	156	47	
Vert.	160.000	QP	26.41	15.39	7.87	32.08	0.00	17.59	43.50	25.9	193	159	
Vert.	259.047	QP	34.58	11.95	8.47	31.99	0.00	23.01	46.00	22.9	100	50	
Vert.	4882.000	PK	42.53	31.29	8.49	37.16	2.23	47.38	73.90	26.5	150	0	
Vert.	7323.000	PK	43.11	36.64	9.51	37.92	2.23	53.57	73.90	20.3	150	0	
Vert.	9764.000	PK	44.65	38.52	10.19	39.20	2.23	56.39	73.90	17.5	150	0	
Vert.	22401.550	PK	42.70	40.72	14.56	47.04	-9.54	41.40	73.90	32.5	145	359	
Vert.	4882.000	AV	30.40	31.29	8.49	37.16	2.23	35.25	53.90	18.7	150	0	
Vert.	7323.000	AV	31.45	36.64	9.51	37.92	2.23	41.91	53.90	12.0	150	0	
Vert.	9764.000	AV	32.87	38.52	10.19	39.20	2.23	44.61	53.90	9.3	150	0	
Vert.	22401.550	AV	35.28	40.72	14.56	47.04	-9.54	33.98	53.90	19.9	145	359	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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 : Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber
Report No. : 11549600S-A-R2
Anechoic Chamber No. : 3 2
Date : December 5, 2016 December 3, 2016
Temperature / Humidity : 21 deg. C / 34 % RH 20 deg. C / 41 % RH
Engineer : Shinichi Takano Hiroyuki Morikawa
(30 MHz -1000 MHz, (1 GHz -18 GHz)
18 -26.5 GHz)
Mode : Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	111.023	QP	37.42	11.56	7.52	32.13	0.00	24.37	43.50	19.1	301	280	
Hori.	148.083	QP	28.64	14.74	7.79	32.09	0.00	19.08	43.50	24.4	248	228	
Hori.	222.068	QP	36.20	11.70	8.25	32.02	0.00	24.13	46.00	21.8	159	240	
Hori.	259.072	QP	39.32	11.95	8.47	31.99	0.00	27.75	46.00	18.2	145	122	
Hori.	300.045	QP	32.46	13.51	8.69	31.99	0.00	22.67	46.00	23.3	100	222	
Hori.	740.130	QP	28.18	20.13	10.52	31.79	0.00	27.04	46.00	18.9	185	242	
Hori.	2483.500	PK	42.82	27.49	15.38	37.01	2.23	50.91	73.90	23.0	100	306	
Hori.	4960.000	PK	42.55	31.46	8.53	37.19	2.23	47.58	73.90	26.3	150	0	
Hori.	7440.000	PK	42.74	36.84	9.52	37.99	2.23	53.34	73.90	20.6	150	0	
Hori.	9920.000	PK	45.23	38.76	10.28	39.26	2.23	57.24	73.90	16.7	150	0	
Hori.	22401.540	PK	42.72	40.72	14.56	47.04	-9.54	41.42	73.90	32.4	151	7	
Hori.	2483.500	AV	30.59	27.49	15.38	37.01	2.23	38.68	53.90	15.2	100	306	
Hori.	4960.000	AV	30.42	31.46	8.53	37.19	2.23	35.45	53.90	18.5	150	0	
Hori.	7440.000	AV	31.25	36.84	9.52	37.99	2.23	41.85	53.90	12.1	150	0	
Hori.	9920.000	AV	32.10	38.76	10.28	39.26	2.23	44.11	53.90	9.8	150	0	
Hori.	22401.540	AV	36.12	40.72	14.56	47.04	-9.54	34.82	53.90	19.0	151	7	
Vert.	185.036	QP	28.06	16.27	8.03	32.06	0.00	20.30	43.50	23.2	100	349	
Vert.	259.048	QP	34.79	11.95	8.47	31.99	0.00	23.22	46.00	22.7	100	41	
Vert.	2483.500	PK	42.84	27.49	15.38	37.01	2.23	50.93	73.90	23.0	100	109	
Vert.	4960.000	PK	41.93	31.46	8.53	37.19	2.23	46.96	73.90	26.9	150	0	
Vert.	7440.000	PK	42.79	36.84	9.52	37.99	2.23	53.39	73.90	20.5	150	0	
Vert.	9920.000	PK	43.87	38.76	10.28	39.26	2.23	55.88	73.90	18.0	150	0	
Vert.	22401.540	PK	43.02	40.72	14.56	47.04	-9.54	41.72	73.90	32.1	144	0	
Vert.	2483.500	AV	30.42	27.49	15.38	37.01	2.23	38.51	53.90	15.4	100	109	
Vert.	4960.000	AV	30.34	31.46	8.53	37.19	2.23	35.37	53.90	18.5	150	0	
Vert.	7440.000	AV	31.19	36.84	9.52	37.99	2.23	41.79	53.90	12.1	150	0	
Vert.	9920.000	AV	32.08	38.76	10.28	39.26	2.23	44.09	53.90	9.8	150	0	
Vert.	22401.540	AV	35.27	40.72	14.56	47.04	-9.54	33.97	53.90	19.9	144	0	

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

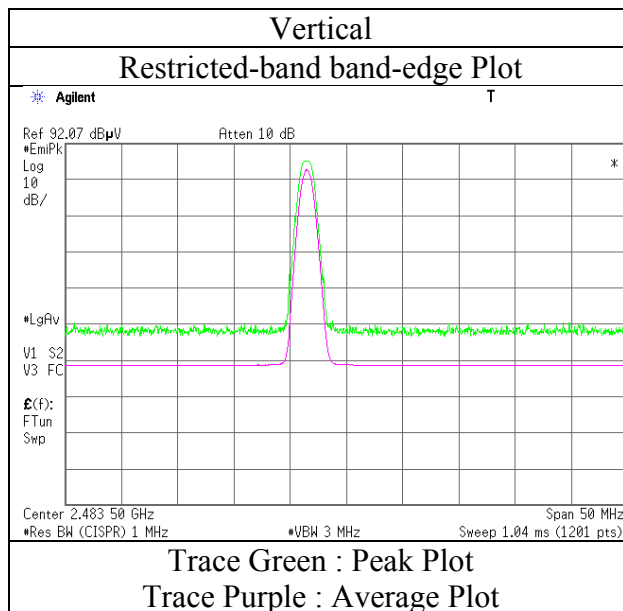
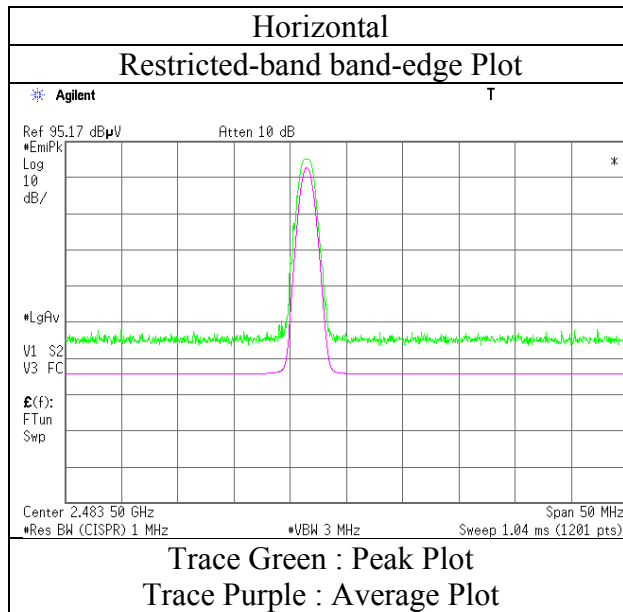
Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11549600S-A-R2
Date	December 3, 2016
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Hiroyuki Morikawa (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 : Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber
Report No. : 11549600S-A-R2
Anechoic Chamber No. : 3 2
Date : December 5, 2016 December 3, 2016
Temperature / Humidity : 21 deg. C / 34 % RH 20 deg. C / 41 % RH
Engineer : Shinichi Takano Hiroyuki Morikawa
(30 MHz -1000 MHz, (1 GHz -18 GHz)
18 -26.5 GHz)
Mode : Tx, Hopping Off, 3DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	111.020	QP	37.78	11.56	7.52	32.13	0.00	24.73	43.50	18.7	308	278	
Hori.	185.380	QP	34.59	16.27	8.03	32.06	0.00	26.83	43.50	16.6	150	227	
Hori.	222.040	QP	37.93	11.70	8.25	32.02	0.00	25.86	46.00	20.1	162	234	
Hori.	255.005	QP	35.97	11.79	8.45	31.99	0.00	24.22	46.00	21.7	184	134	
Hori.	259.048	QP	39.55	11.95	8.47	31.99	0.00	27.98	46.00	18.0	125	126	
Hori.	285.000	QP	34.02	12.94	8.61	31.99	0.00	23.58	46.00	22.4	100	223	
Hori.	740.133	QP	28.37	20.13	10.52	31.79	0.00	27.23	46.00	18.7	176	252	
Hori.	2390.000	PK	42.24	27.17	15.23	37.06	2.23	49.81	73.90	24.1	100	304	
Hori.	4804.000	PK	43.00	31.13	8.45	37.12	2.23	47.69	73.90	26.2	150	0	
Hori.	7206.000	PK	43.89	36.43	9.49	37.84	2.23	54.20	73.90	19.7	150	0	
Hori.	9608.000	PK	44.99	38.28	10.12	39.13	2.23	56.49	73.90	17.4	150	0	
Hori.	22401.600	PK	42.31	40.72	14.56	47.04	-9.54	41.01	73.90	32.8	137	5	
Hori.	2390.000	AV	30.43	27.17	15.23	37.06	2.23	38.00	53.90	15.9	100	304	
Hori.	4804.000	AV	30.46	31.13	8.45	37.12	2.23	35.15	53.90	18.8	150	0	
Hori.	7206.000	AV	32.05	36.43	9.49	37.84	2.23	42.36	53.90	11.5	150	0	
Hori.	9608.000	AV	33.47	38.28	10.12	39.13	2.23	44.97	53.90	8.9	150	0	
Hori.	22401.600	AV	32.73	40.72	14.56	47.04	-9.54	31.43	53.90	22.4	137	5	
Vert.	185.033	QP	32.30	16.27	8.03	32.06	0.00	24.54	43.50	18.9	100	358	
Vert.	259.047	QP	34.23	11.95	8.47	31.99	0.00	22.66	46.00	23.3	100	41	
Vert.	2390.000	PK	42.49	27.17	15.23	37.06	2.23	50.06	73.90	23.8	138	237	
Vert.	4804.000	PK	41.52	31.13	8.45	37.12	2.23	46.21	73.90	27.7	150	0	
Vert.	7206.000	PK	43.03	36.43	9.49	37.84	2.23	53.34	73.90	20.6	150	0	
Vert.	9608.000	PK	44.84	38.28	10.12	39.13	2.23	56.34	73.90	17.6	150	0	
Vert.	22401.600	PK	42.30	40.72	14.56	47.04	-9.54	41.00	73.90	32.9	148	359	
Vert.	2390.000	AV	30.30	27.17	15.23	37.06	2.23	37.87	53.90	16.0	138	237	
Vert.	4804.000	AV	30.35	31.13	8.45	37.12	2.23	35.04	53.90	18.9	150	0	
Vert.	7206.000	AV	32.04	36.43	9.49	37.84	2.23	42.35	53.90	11.6	150	0	
Vert.	9608.000	AV	33.47	38.28	10.12	39.13	2.23	44.97	53.90	8.9	150	0	
Vert.	22401.600	AV	34.73	40.72	14.56	47.04	-9.54	33.43	53.90	20.4	148	359	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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	89.62	27.21	15.24	37.05	2.23	97.25	-	-	Carrier
Hori.	2400.000	PK	35.15	27.20	15.24	37.05	2.23	42.77	77.25	34.5	
Vert.	2402.000	PK	86.53	27.21	15.24	37.05	2.23	94.16	-	-	Carrier
Vert.	2400.000	PK	33.30	27.20	15.24	37.05	2.23	40.92	74.16	33.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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

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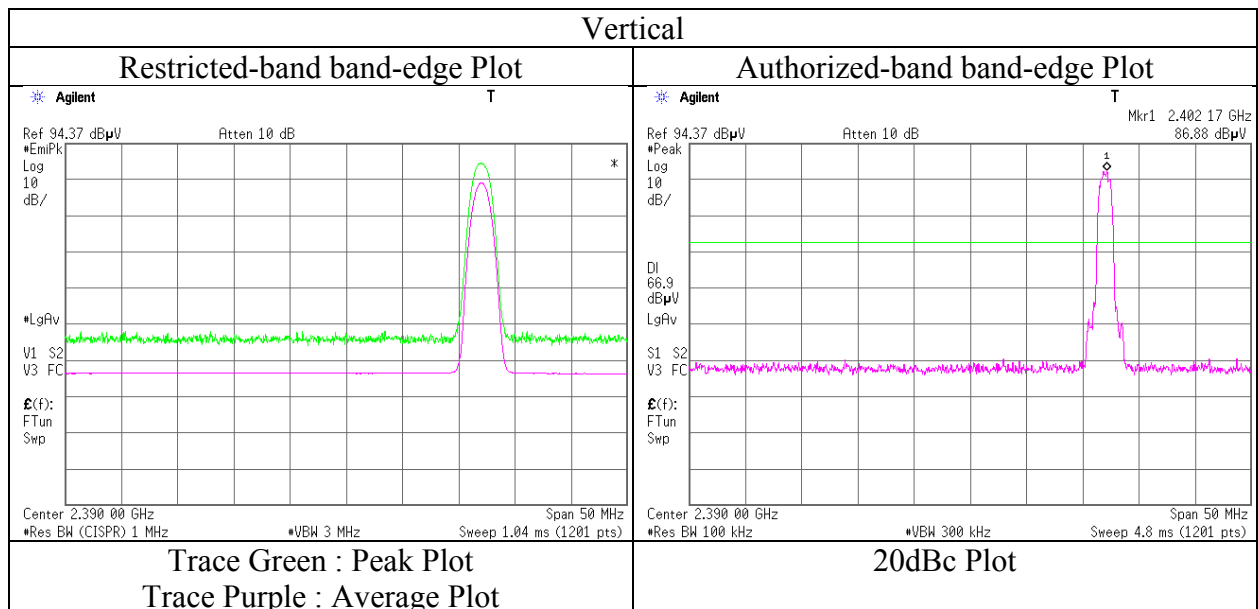
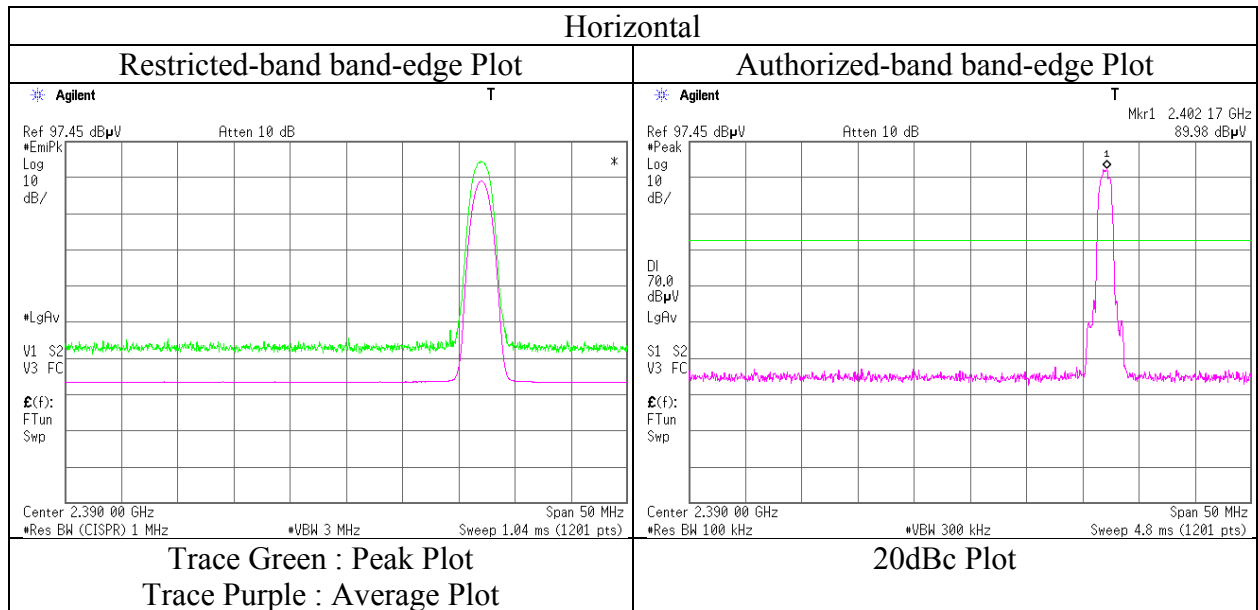
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11549600S-A-R2
Date	December 3, 2016
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Hiroyuki Morikawa (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 Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber
Report No. 11549600S-A-R2
Anechoic Chamber No. 3 2
Date December 5, 2016 December 3, 2016
Temperature / Humidity 21 deg. C / 34 % RH 20 deg. C / 41 % RH
Engineer Shinichi Takano Hiroyuki Morikawa
(30 MHz -1000 MHz, (1 GHz -18 GHz)
18 -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	111.019	QP	37.33	11.56	7.52	32.13	0.00	24.28	43.50	19.2	301	288	
Hori.	148.028	QP	33.27	14.74	7.79	32.09	0.00	23.71	43.50	19.7	242	225	
Hori.	185.035	QP	35.34	16.27	8.03	32.06	0.00	27.58	43.50	15.9	185	107	
Hori.	254.999	QP	36.38	11.79	8.45	31.99	0.00	24.63	46.00	21.3	154	134	
Hori.	259.048	QP	39.21	11.95	8.47	31.99	0.00	27.64	46.00	18.3	146	120	
Hori.	285.003	QP	34.11	12.94	8.61	31.99	0.00	23.67	46.00	22.3	118	231	
Hori.	740.133	QP	29.50	20.13	10.52	31.79	0.00	28.36	46.00	17.6	155	26	
Hori.	4882.000	PK	41.92	31.29	8.49	37.16	2.23	46.77	73.90	27.1	150	0	
Hori.	7323.000	PK	43.53	36.64	9.51	37.92	2.23	53.99	73.90	19.9	150	0	
Hori.	9764.000	PK	44.79	38.52	10.19	39.20	2.23	56.53	73.90	17.4	150	0	
Hori.	22401.540	PK	41.64	40.72	14.56	47.04	-9.54	40.34	73.90	33.5	149	47	
Hori.	4882.000	AV	30.49	31.29	8.49	37.16	2.23	35.34	53.90	18.6	150	0	
Hori.	7323.000	AV	31.56	36.64	9.51	37.92	2.23	42.02	53.90	11.9	150	0	
Hori.	9764.000	AV	33.05	38.52	10.19	39.20	2.23	44.79	53.90	9.1	150	0	
Hori.	22401.540	AV	37.86	40.72	14.56	47.04	-9.54	36.56	53.90	17.3	149	47	
Vert.	185.033	QP	32.91	16.27	8.03	32.06	0.00	25.15	43.50	18.3	100	358	
Vert.	740.131	QP	29.04	20.13	10.52	31.79	0.00	27.90	46.00	18.1	124	32	
Vert.	4882.000	PK	43.03	31.29	8.49	37.16	2.23	47.88	73.90	26.0	150	0	
Vert.	7323.000	PK	43.45	36.64	9.51	37.92	2.23	53.91	73.90	20.0	150	0	
Vert.	9764.000	PK	44.83	38.52	10.19	39.20	2.23	56.57	73.90	17.3	150	0	
Vert.	22401.450	PK	44.96	40.72	14.56	47.04	-9.54	43.66	73.90	30.2	132	39	
Vert.	4882.000	AV	30.40	31.29	8.49	37.16	2.23	35.25	53.90	18.7	150	0	
Vert.	7323.000	AV	31.52	36.64	9.51	37.92	2.23	41.98	53.90	11.9	150	0	
Vert.	9764.000	AV	33.05	38.52	10.19	39.20	2.23	44.79	53.90	9.1	150	0	
Vert.	22401.450	AV	37.86	40.72	14.56	47.04	-9.54	36.56	53.90	17.3	132	39	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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

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

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Shonan EMC Lab.

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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Test place Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber
Report No. 11549600S-A-R2
Anechoic Chamber No. 3 2
Date December 5, 2016 December 3, 2016
Temperature / Humidity 21 deg. C / 34 % RH 20 deg. C / 41 % RH
Engineer Shinichi Takano Hiroyuki Morikawa
(30 MHz -1000 MHz, (1 GHz -18 GHz)
18 -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	148.028	QP	29.37	14.74	7.79	32.09	0.00	19.81	43.50	23.6	225	234	
Hori.	185.034	QP	32.22	16.27	8.03	32.06	0.00	24.46	43.50	19.0	186	105	
Hori.	222.041	QP	37.74	11.70	8.25	32.02	0.00	25.67	46.00	20.3	148	236	
Hori.	255.006	QP	35.05	11.79	8.45	31.99	0.00	23.30	46.00	22.7	147	136	
Hori.	259.047	QP	39.74	11.95	8.47	31.99	0.00	28.17	46.00	17.8	135	210	
Hori.	299.996	QP	33.22	13.51	8.69	31.99	0.00	23.43	46.00	22.5	121	218	
Hori.	740.134	QP	28.88	20.13	10.52	31.79	0.00	27.74	46.00	18.2	156	304	
Hori.	2483.500	PK	42.45	27.49	15.38	37.01	2.23	50.54	73.90	23.4	100	307	
Hori.	4960.000	PK	41.51	31.46	8.53	37.19	2.23	46.54	73.90	27.4	150	0	
Hori.	7440.000	PK	43.21	36.84	9.52	37.99	2.23	53.81	73.90	20.1	150	0	
Hori.	9920.000	PK	43.90	38.76	10.28	39.26	2.23	55.91	73.90	18.0	150	0	
Hori.	22401.540	PK	43.01	40.72	14.56	47.04	-9.54	41.71	73.90	32.1	138	28	
Hori.	2483.500	AV	30.18	27.49	15.38	37.01	2.23	38.27	53.90	15.6	100	307	
Hori.	4960.000	AV	30.30	31.46	8.53	37.19	2.23	35.33	53.90	18.6	150	0	
Hori.	7440.000	AV	31.18	36.84	9.52	37.99	2.23	41.78	53.90	12.1	150	0	
Hori.	9920.000	AV	32.11	38.76	10.28	39.26	2.23	44.12	53.90	9.8	150	0	
Hori.	22401.540	AV	35.56	40.72	14.56	47.04	-9.54	34.26	53.90	19.6	138	28	
Vert.	185.034	QP	29.16	16.27	8.03	32.06	0.00	21.40	43.50	22.1	100	357	
Vert.	259.047	QP	34.16	11.95	8.47	31.99	0.00	22.59	46.00	23.4	100	36	
Vert.	2483.500	PK	41.87	27.49	15.38	37.01	2.23	49.96	73.90	23.9	134	111	
Vert.	4960.000	PK	41.78	31.46	8.53	37.19	2.23	46.81	73.90	27.1	150	0	
Vert.	7440.000	PK	42.42	36.84	9.52	37.99	2.23	53.02	73.90	20.9	150	0	
Vert.	9920.000	PK	43.84	38.76	10.28	39.26	2.23	55.85	73.90	18.1	150	0	
Vert.	22401.710	PK	43.64	40.72	14.56	47.04	-9.54	42.34	73.90	31.5	143	359	
Vert.	2483.500	AV	30.04	27.49	15.38	37.01	2.23	38.13	53.90	15.8	134	111	
Vert.	4960.000	AV	30.24	31.46	8.53	37.19	2.23	35.27	53.90	18.6	150	0	
Vert.	7440.000	AV	31.14	36.84	9.52	37.99	2.23	41.74	53.90	12.2	150	0	
Vert.	9920.000	AV	32.14	38.76	10.28	39.26	2.23	44.15	53.90	9.7	150	0	
Vert.	22401.710	AV	34.66	40.72	14.56	47.04	-9.54	33.36	53.90	20.5	143	359	

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

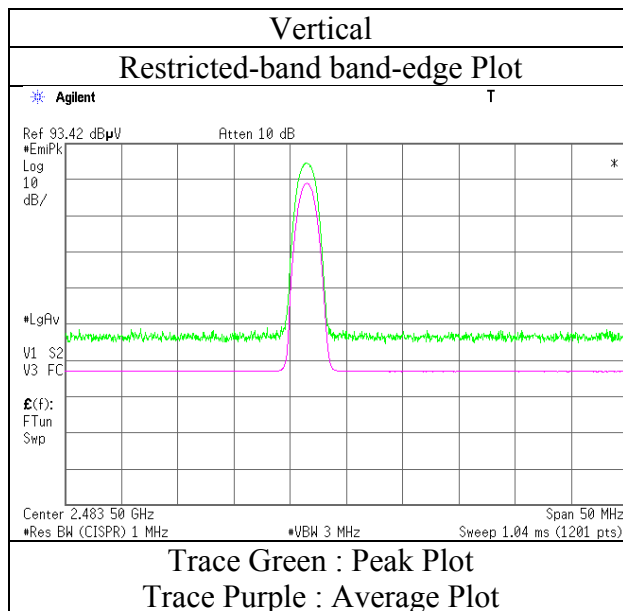
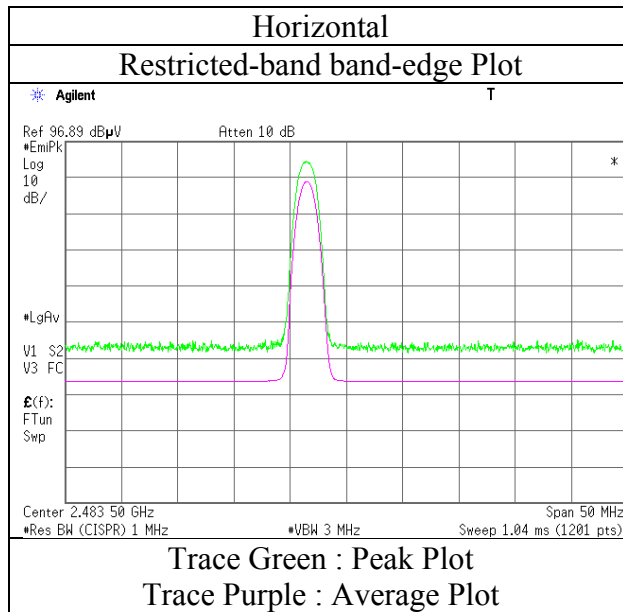
Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.23\text{ dB}$

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)

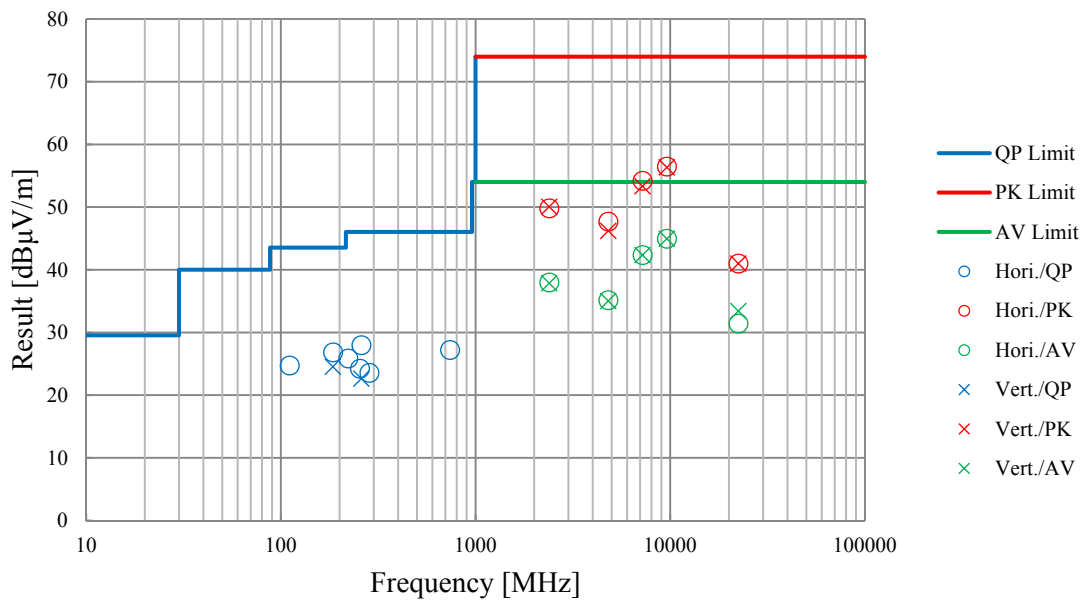
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11549600S-A-R2
Date	December 3, 2016
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Hiroyuki Morikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Test place	Shonan EMC Lab. No.2, 3 Semi Anechoic Chamber	
Report No.	11549600S-A-R2	
Anechoic Chamber No.	3	2
Date	December 5, 2016	December 3, 2016
Temperature / Humidity	21 deg. C / 34 % RH	20 deg. C / 41 % RH
Engineer	Shinichi Takano (30 MHz -1000 MHz, 18 -26.5 GHz)	Hiroyuki Morikawa (1 GHz -18 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

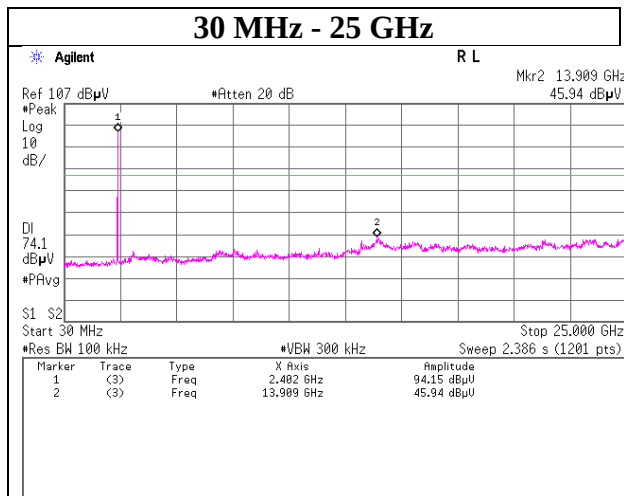
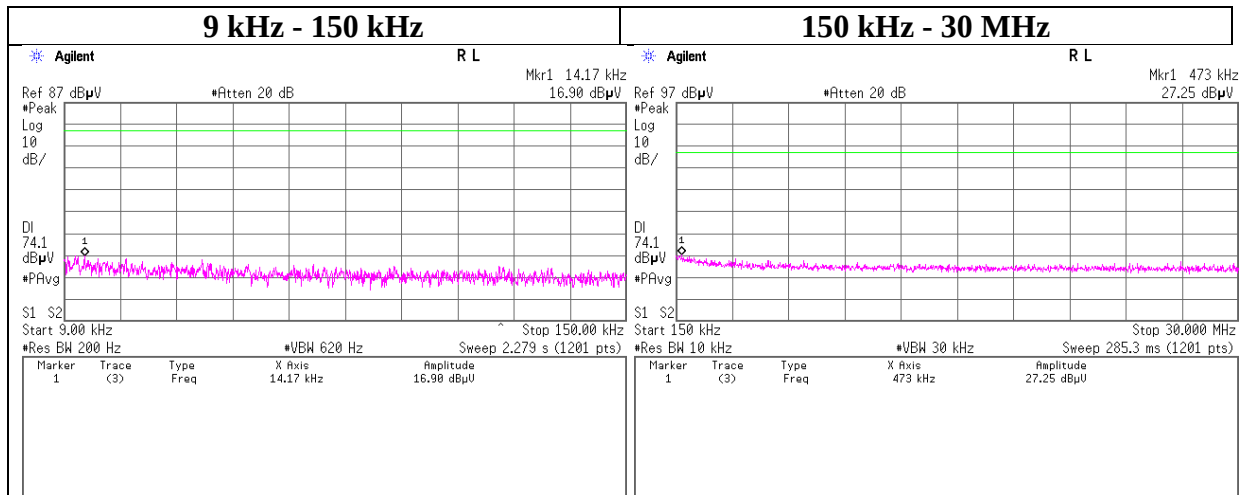


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, DH5

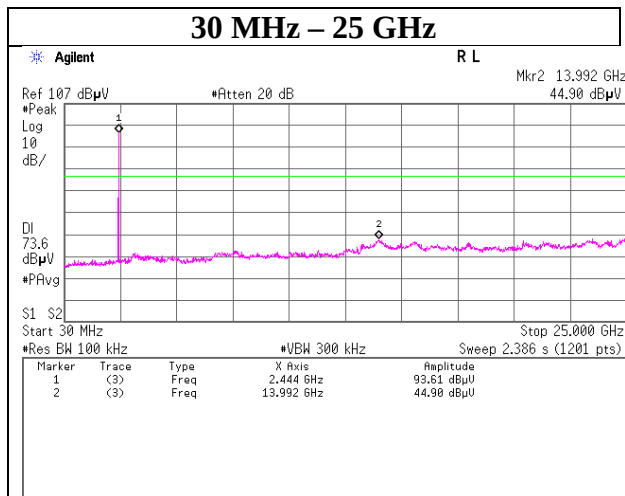
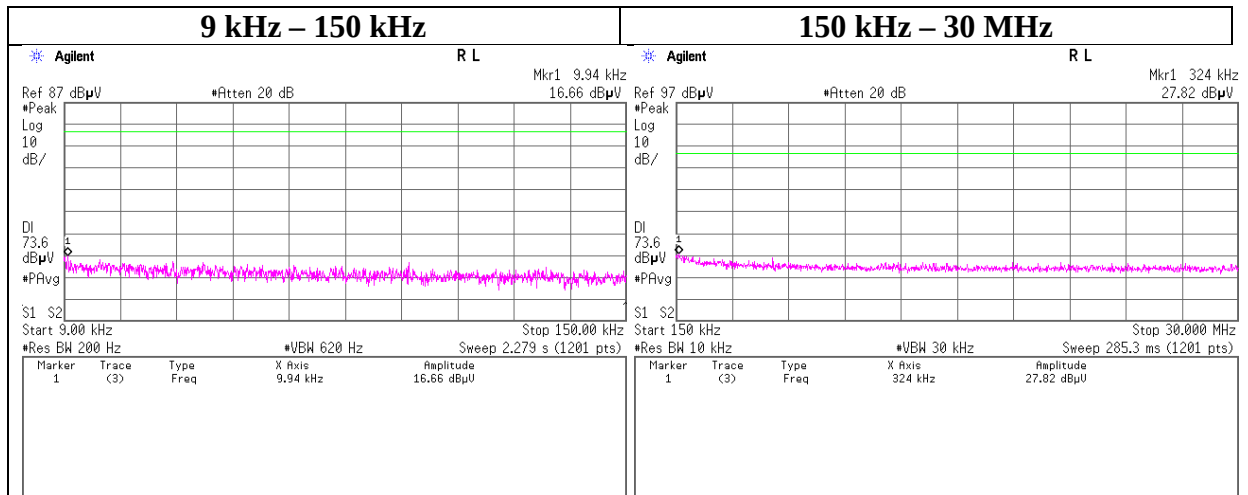
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, DH5

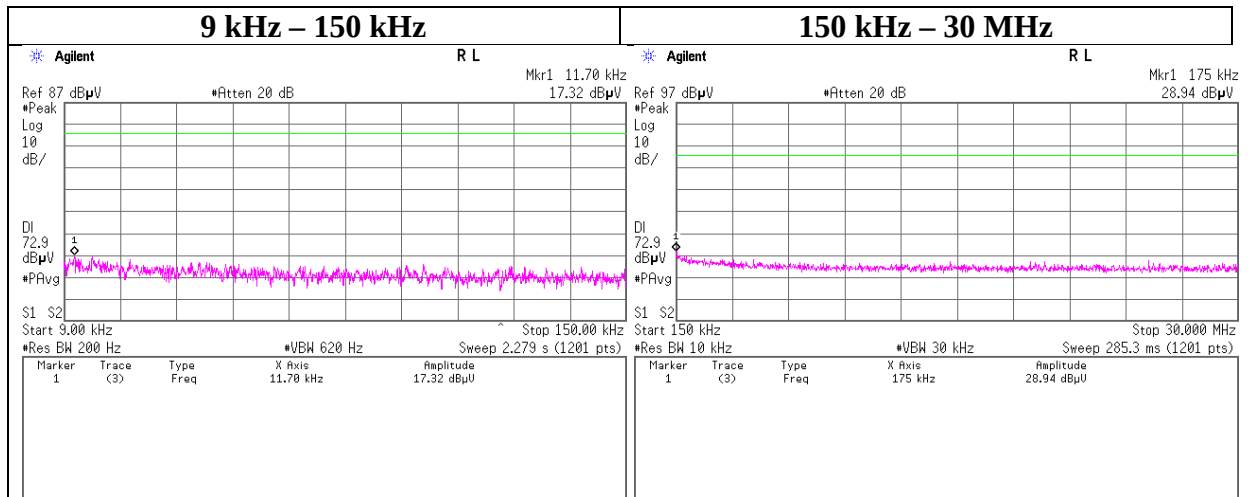
2441 MHz



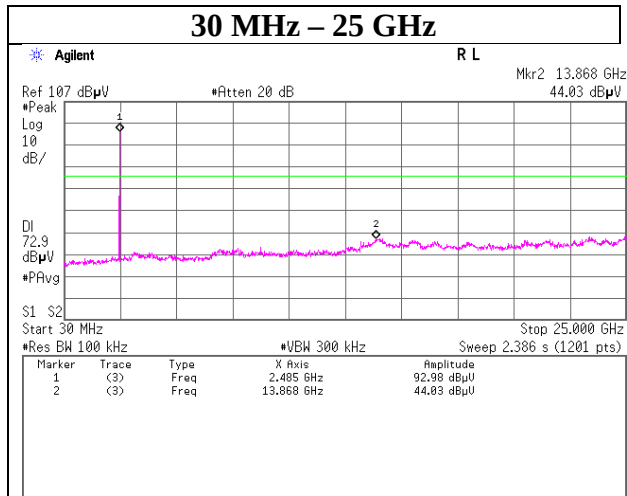
Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, DH5

2480 MHz



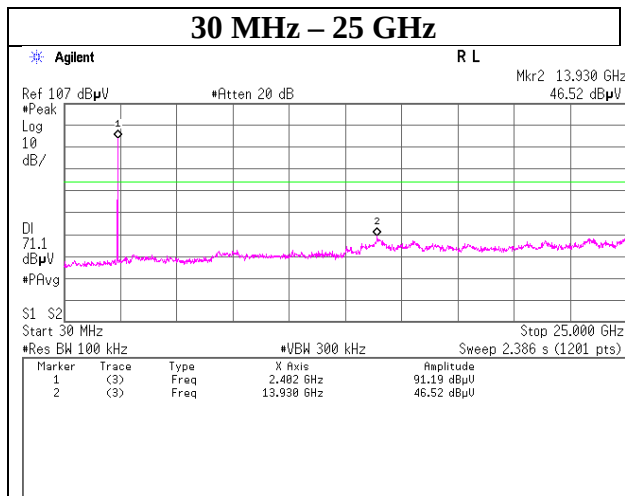
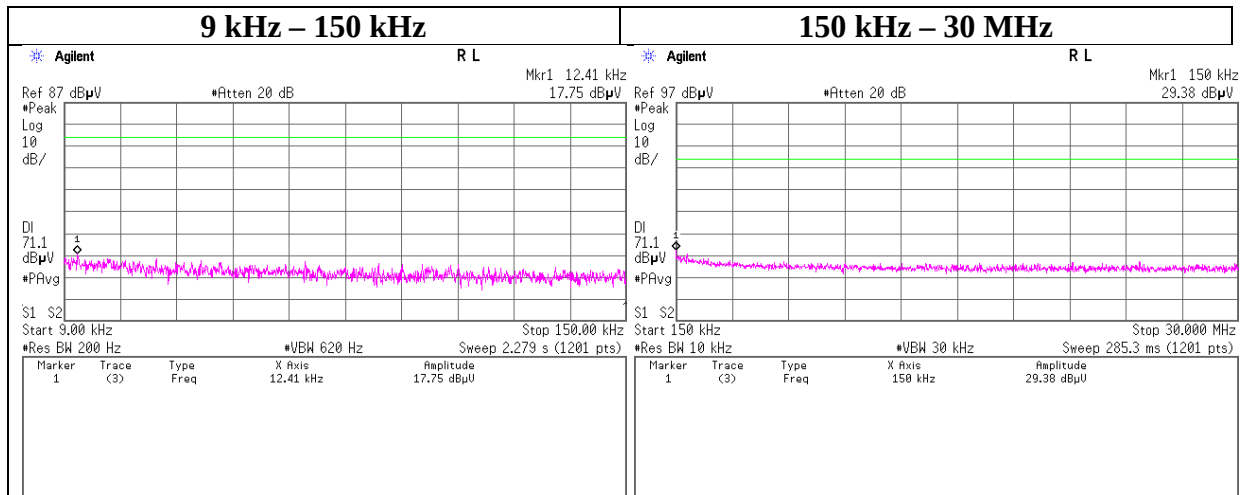
30 MHz – 25 GHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, 3DH5

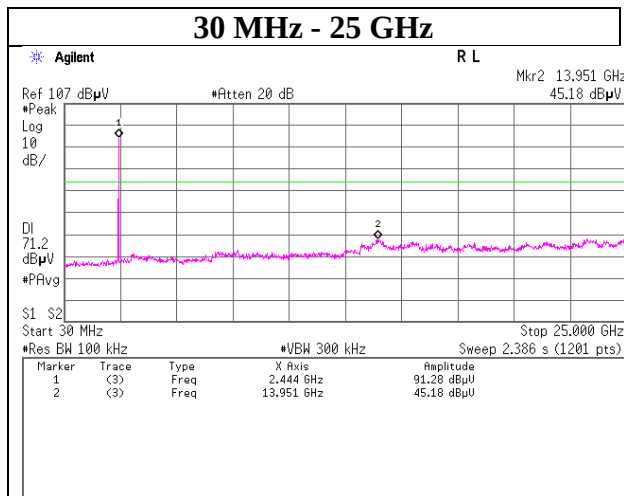
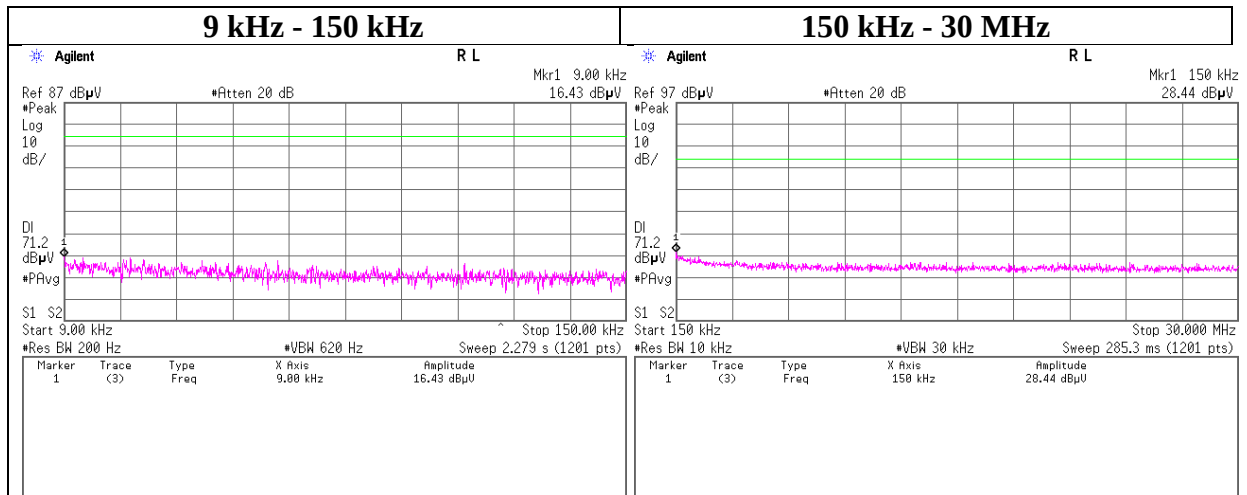
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, 3DH5

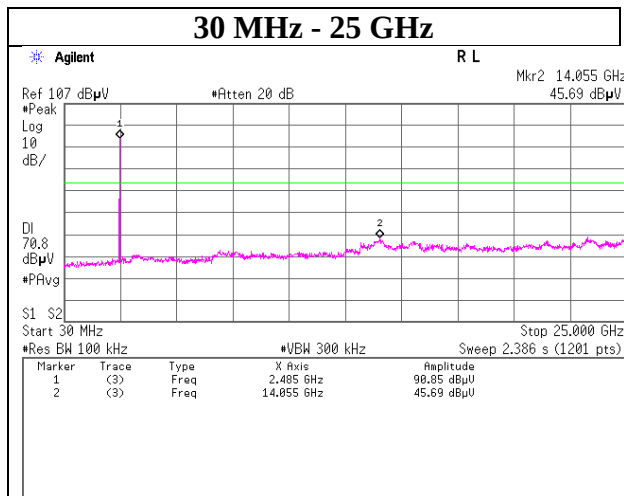
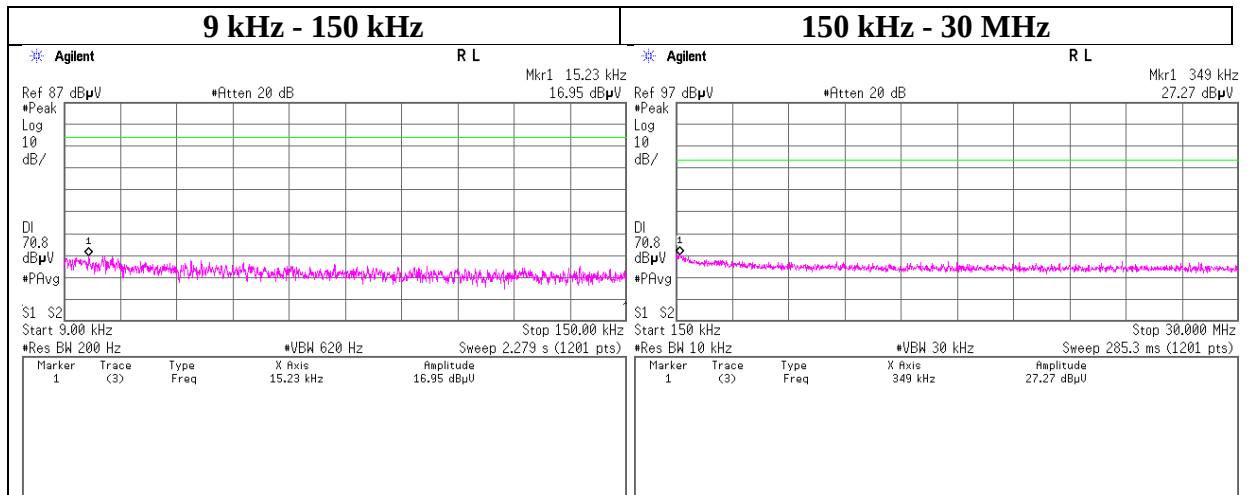
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, 3DH5

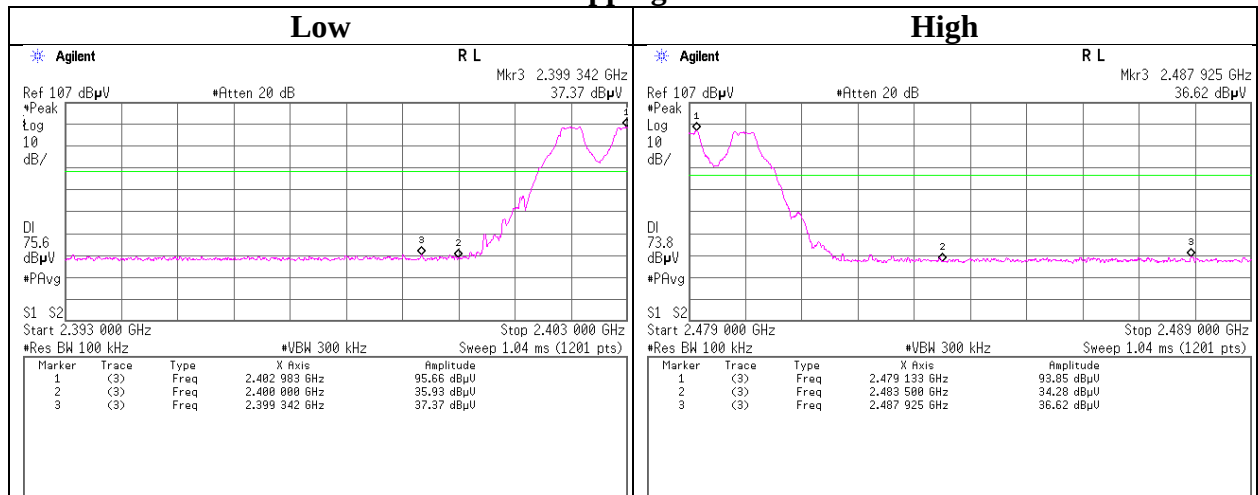
2480 MHz



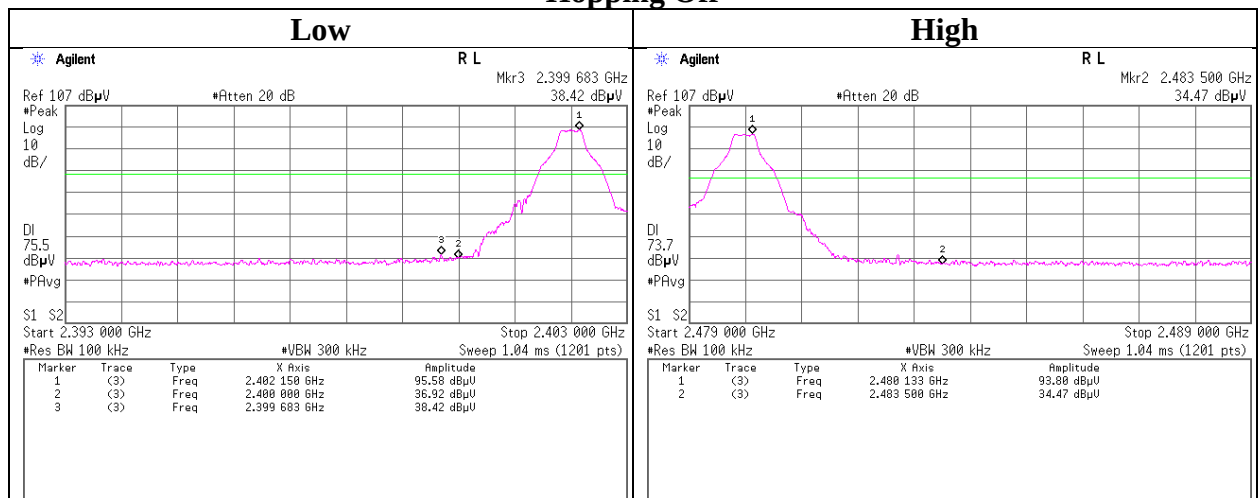
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx DH5

Hopping On



Hopping Off



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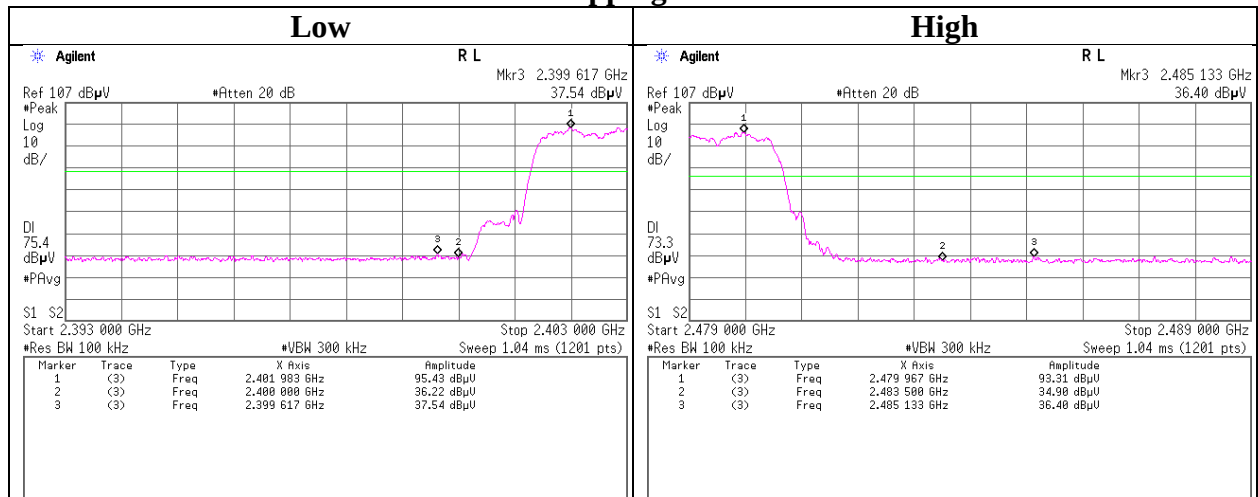
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

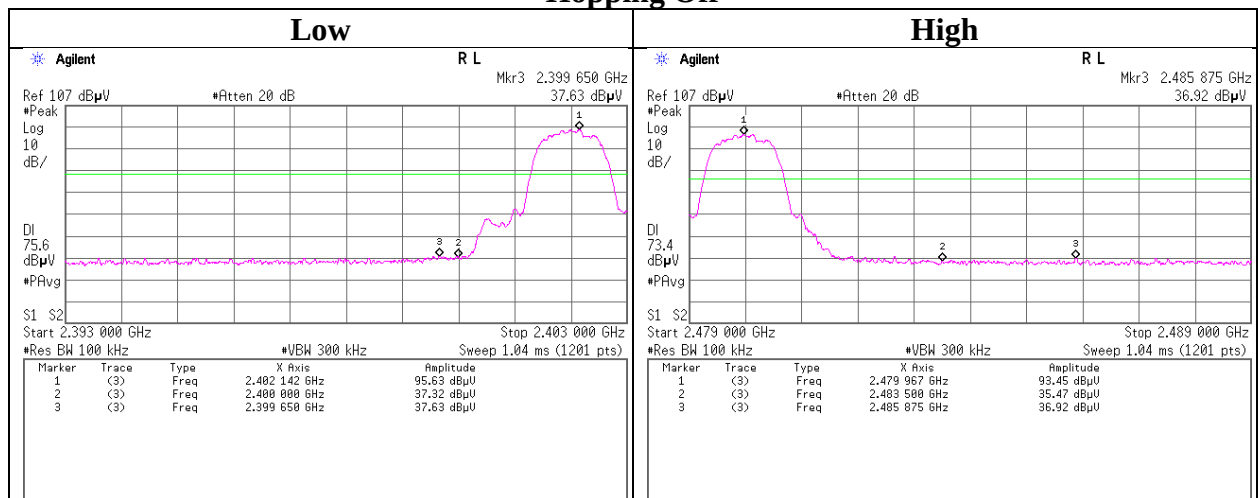
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11549600S-A-R2
Date : December 8, 2016
Temperature / Humidity : 21 deg. C / 38 % RH
Engineer : Yosuke Ishikawa
Mode : Tx 3DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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Telephone : +81 463 50 6400

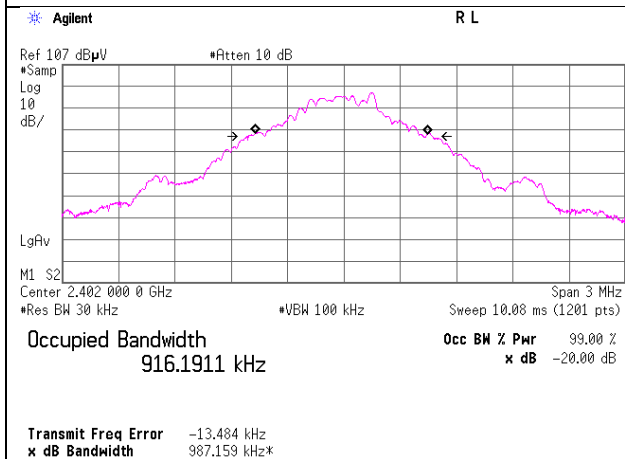
Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11549600S-A-R2
Date	December 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Yosuke Ishikawa
Mode	Tx Hopping Off

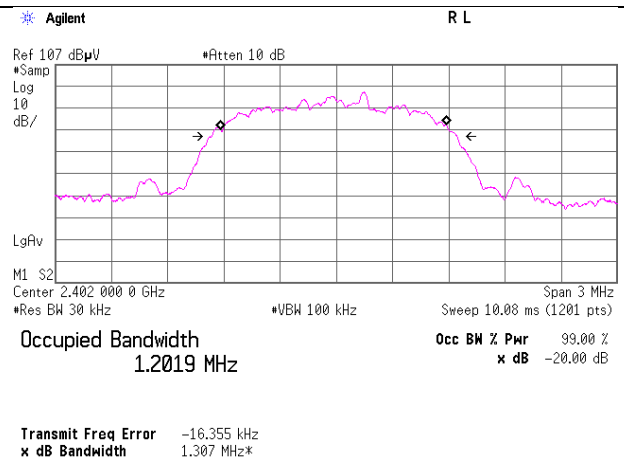
Hopping Off, DH5

2402 MHz

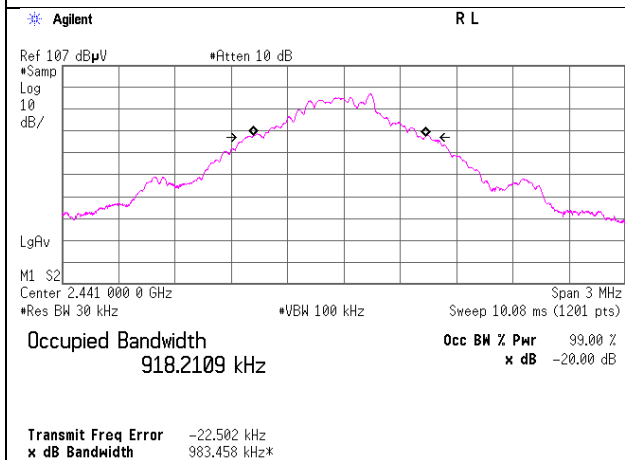


Hopping Off, 3DH5

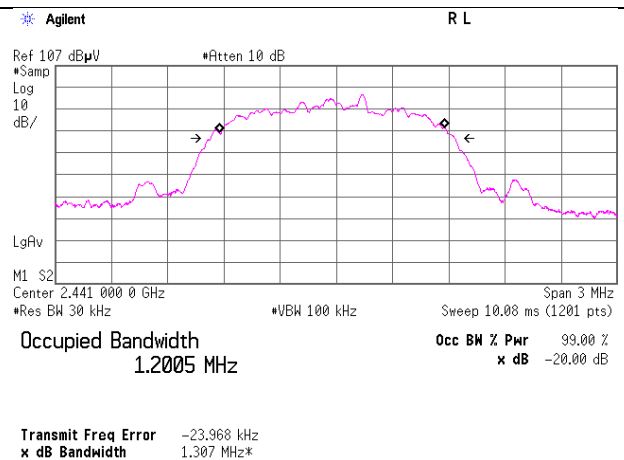
2402 MHz



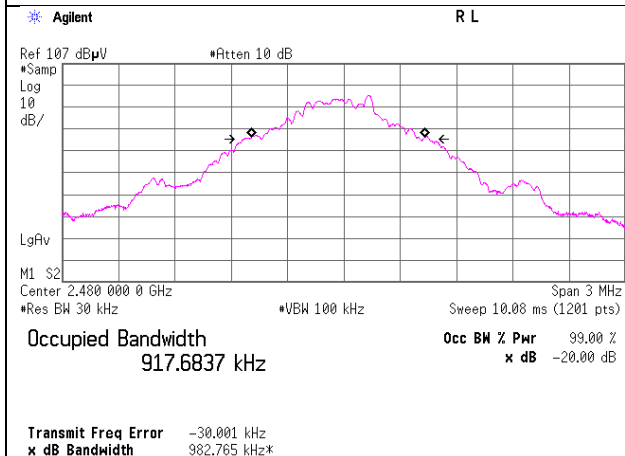
2441 MHz



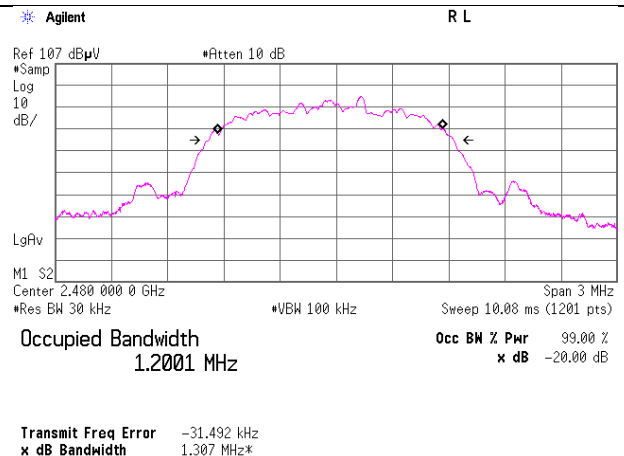
2441 MHz



2480 MHz



2480 MHz



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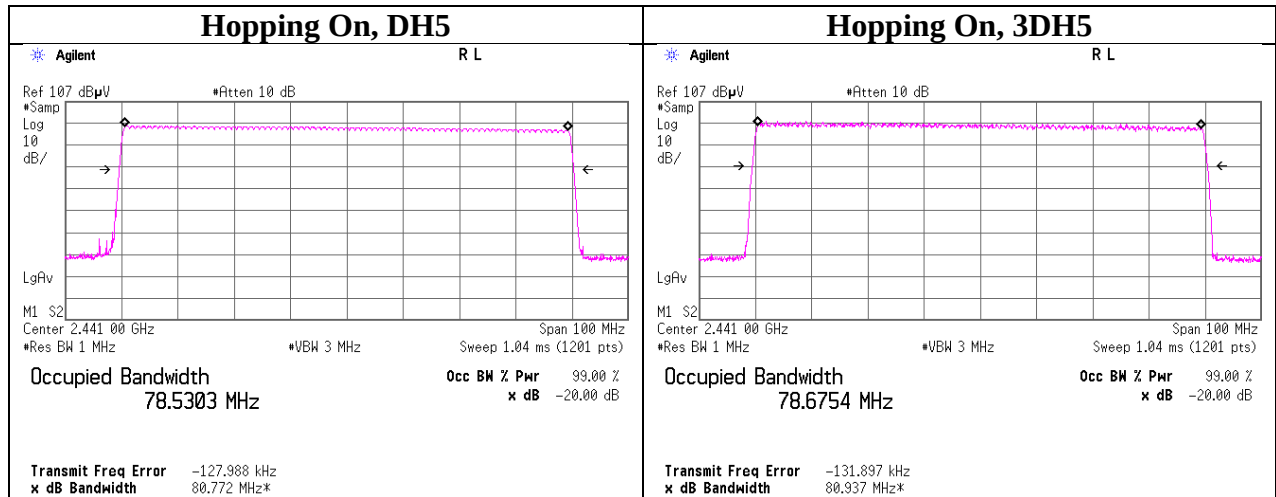
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99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11549600S-A-R2
Date	December 8, 2016
Temperature / Humidity	21 deg. C / 38 % RH
Engineer	Yosuke Ishikawa
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)
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2016/02/10 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2016/04/22 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2016/05/11 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2016/08/09 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2016/03/23 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(SVSW R)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSW R)	2	RE	2016/07/22 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE ,CE,RFI,MF)	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2016/03/22 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2016/04/18 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2016/07/15 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2016/10/18 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2016/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12
SCC-C1/C2/C3/C 4/C5/C10/SRSE- 03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner /Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-271(R F Selector)	RE	2016/04/22 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2016/02/25 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2016/03/28 * 12
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
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2016/03/24 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2016/09/27 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-0100 0KMSKMS	-	RE	2016/04/18 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2016/10/17 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	AT	2016/10/24 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12
SPSS-05	Power sensor	Agilent	N1923A	MY5349008	AT	2016/04/04 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/23 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2016/11/07 * 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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