



RADIO TEST REPORT

Test Report No. : 12051947S-A-R2

Applicant : **Panasonic Corporation**
Type of Equipment : **AV Control Unit for In-Vehicle Infotainment**
Model No. : **AM1701**
FCC ID : **ACJ932AM1701**
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)
7. This report is a revised version of 12051947S-A-R1. 12051947S-A-R1 is replaced with this report.

Date of test: November 14, 2017 to January 25, 2018

Representative test engineer:

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Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:

S. Takano

Shinichi Takano
Engineer
Consumer Technology Division



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

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13-EM-F0429

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SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa 224-8520 Japan
Telephone Number	:	+81-50-3689-7389
Facsimile Number	:	+81-45-931-0806
Contact Person	:	Yoshinori Nagatani

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

2.1 Identification of E.U.T.

Type of Equipment	:	AV Control Unit for In-Vehicle Infotainment
Model No.	:	AM1701
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample	:	October 10, 2017
Country of Mass-production	:	Thailand, Mexico
Condition of EUT	:	Engineering 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: AM1701 (referred to as the EUT in this report) is a AV Control Unit for In-Vehicle Infotainment.

Radio Specification

[Bluetooth]

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS
Power Supply (radio part input)	:	DC 3.3 V / 1.8 V
Antenna type	:	Pattern antenna
Antenna Gain	:	2 dBi
Clock frequency (Maximum)	:	48 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on January 2, 2018 and effective February 1, 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 revision on January 2, 2018, 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: 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	7.0 dB 40.131 MHz, QP, Hori Tx, Hopping On, 3DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *2)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT does not have AC power ports. *2) Radiated test was selected over 30 MHz based on section 15.247(d).					

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

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC 3.3 V / 1.8 V).
Instead of a new battery, DC power supply (DC 13.2V) 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

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users. 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-300 MHz	4.3 dB	4.3 dB	4.3 dB	-	-
	300 MHz-1 GHz	5.9 dB	5.9 dB	5.9 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

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

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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 Software: 00584 *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

This page has been submitted for separate exhibit (refer to APPENDIX 4).

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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, 1.0 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 300 MHz	300 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	3.89 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.89 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)

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

*2) Distance Factor: $20 \times \log (3.89 \text{ m}/3.0 \text{ m}) = 2.25 \text{ dB}$

*3) Distance Factor: $20 \times \log (1.0 \text{ m}/3.0 \text{ m}) = -9.54 \text{ dB}$

The test was made on EUT at the normal use position.

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

Measurement range : 30 MHz - 26.5 GHz

Test data : APPENDIX

Test result : Pass

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SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 160MHz 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 = 10 kHz)

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

Test data : APPENDIX

Test result : Pass

APPENDIX 1: Test data

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

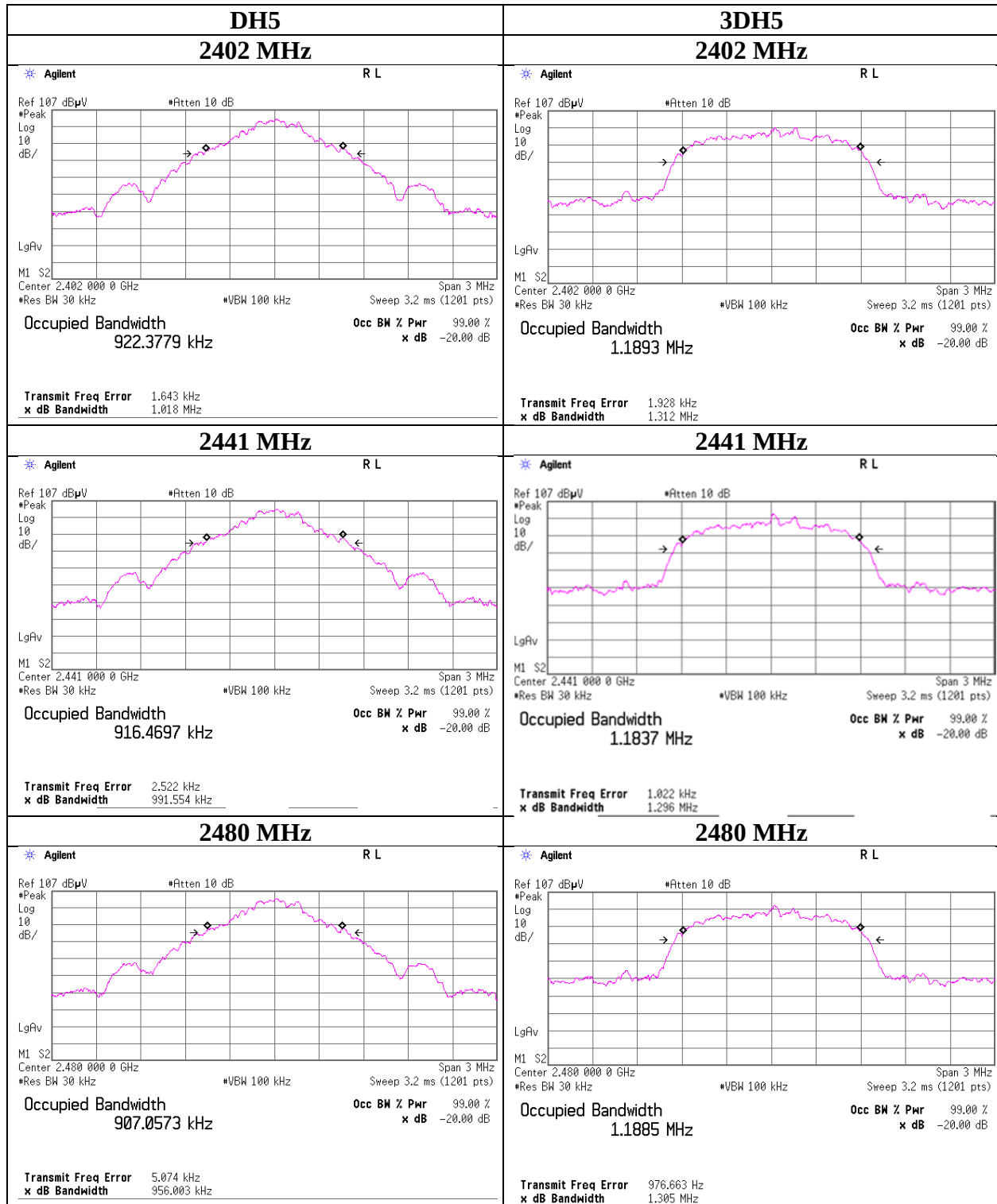
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12051947S-A-R2
Date November 14, 2017
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.018	922.4	1.003	≥ 0.679
DH5	2441.0	0.992	916.5	1.000	≥ 0.661
DH5	2480.0	0.956	907.1	0.993	≥ 0.637
DH5	Hopping On	-	78579.3	-	-
3DH5	2402.0	1.312	1189.3	1.008	≥ 0.875
3DH5	2441.0	1.296	1183.7	1.000	≥ 0.864
3DH5	2480.0	1.305	1188.5	1.000	≥ 0.870
3DH5	Hopping On	-	78388.5	-	-

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



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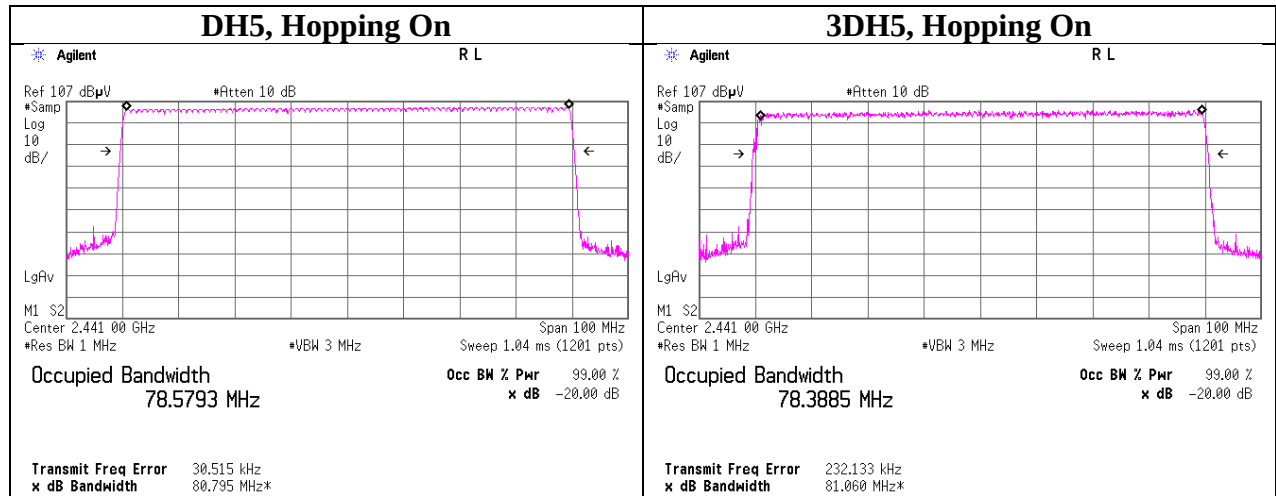
Shonan EMC Lab.

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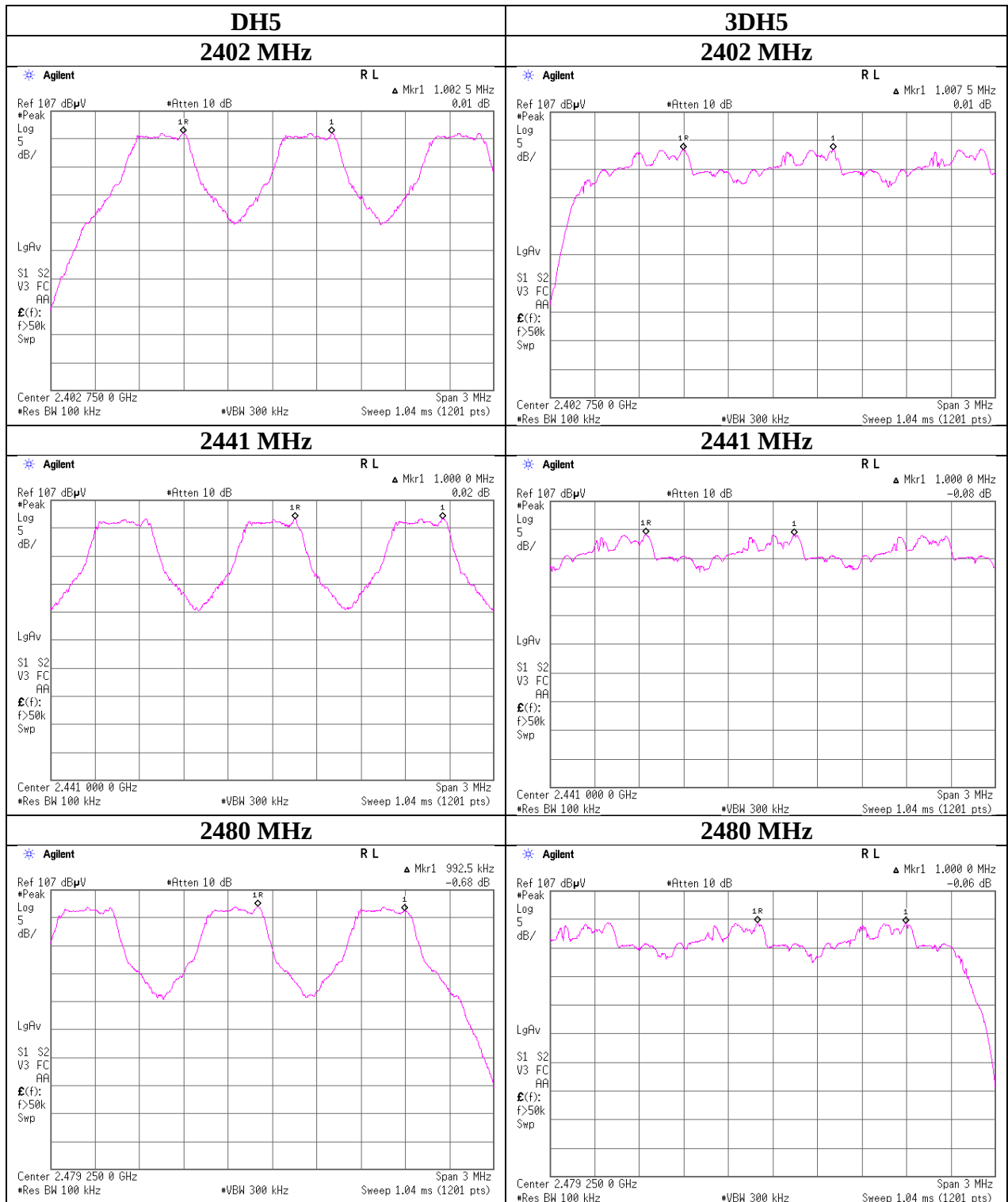
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20dB Bandwidth and 99% Occupied Bandwidth



Carrier Frequency Separation



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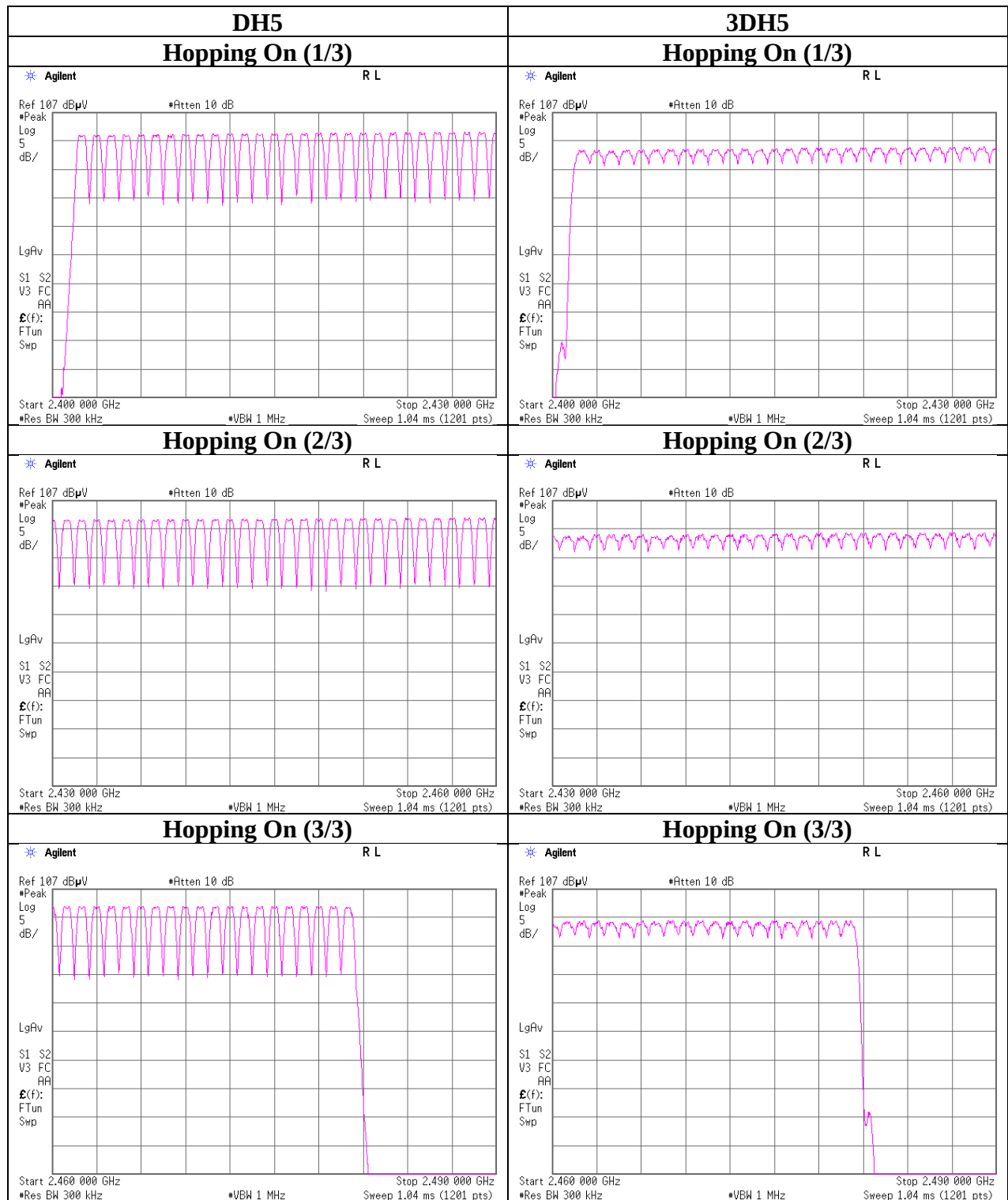
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12051947S-A-R2
Date November 14, 2017
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



Dwell time

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 12051947S-A-R2
Date November 14, 2017
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	49.6 times	/	5 sec.	x 31.6 sec. = 314 times	0.400	126	400
DH3	25.2 times	/	5 sec.	x 31.6 sec. = 160 times	1.662	266	400
DH5	20.6 times	/	5 sec.	x 31.6 sec. = 131 times	2.913	382	400
3DH1	49.0 times	/	5 sec.	x 31.6 sec. = 310 times	0.407	126	400
3DH3	25.0 times	/	5 sec.	x 31.6 sec. = 158 times	1.658	262	400
3DH5	18.6 times	/	5 sec.	x 31.6 sec. = 118 times	2.916	344	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

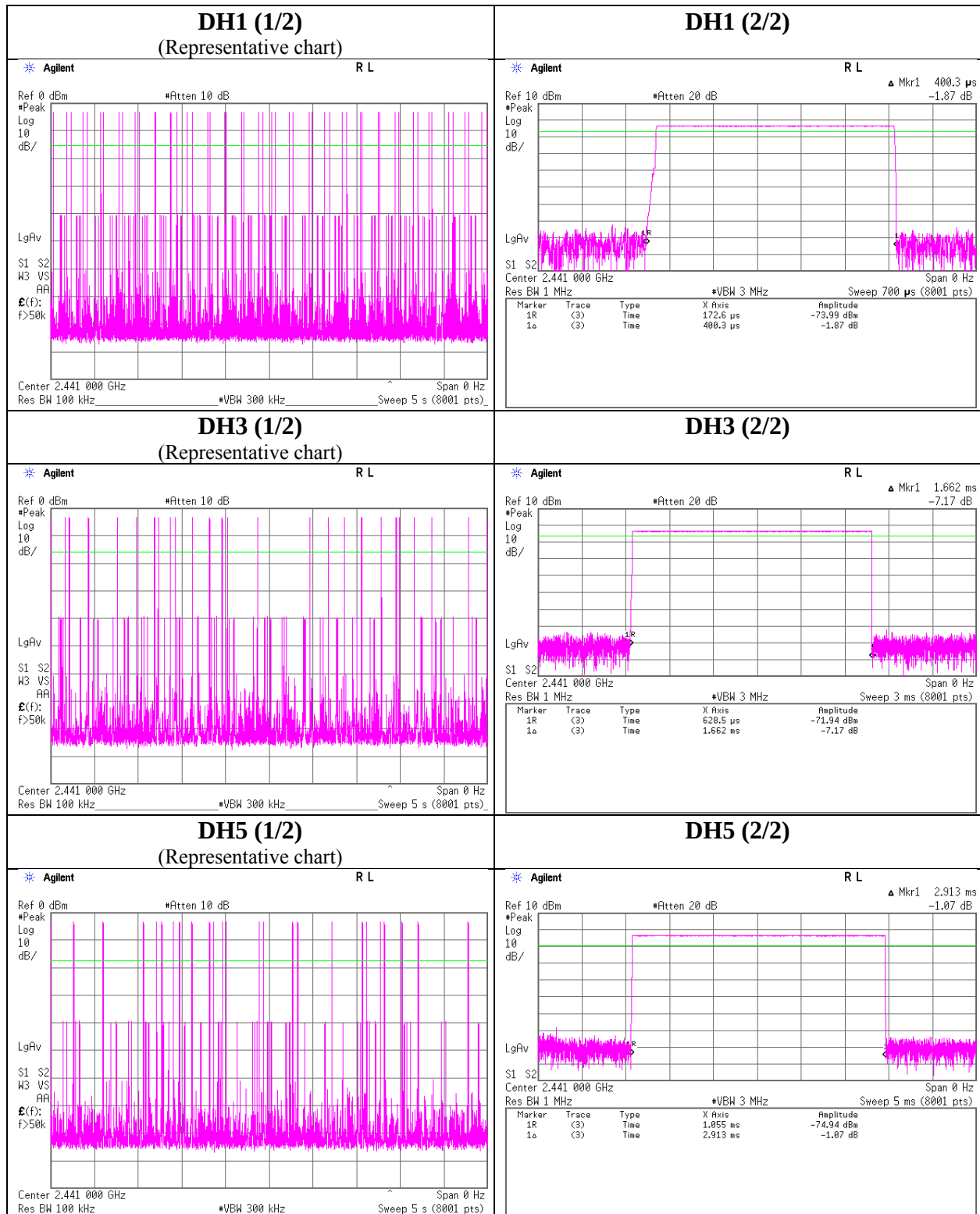
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	49	51	48	51	49.6
DH3	26	24	25	26	25	25.2
DH5	25	19	24	16	19	20.6
3DH1	48	49	49	49	50	49
3DH3	26	23	23	23	30	25
3DH5	17	19	14	25	18	18.6

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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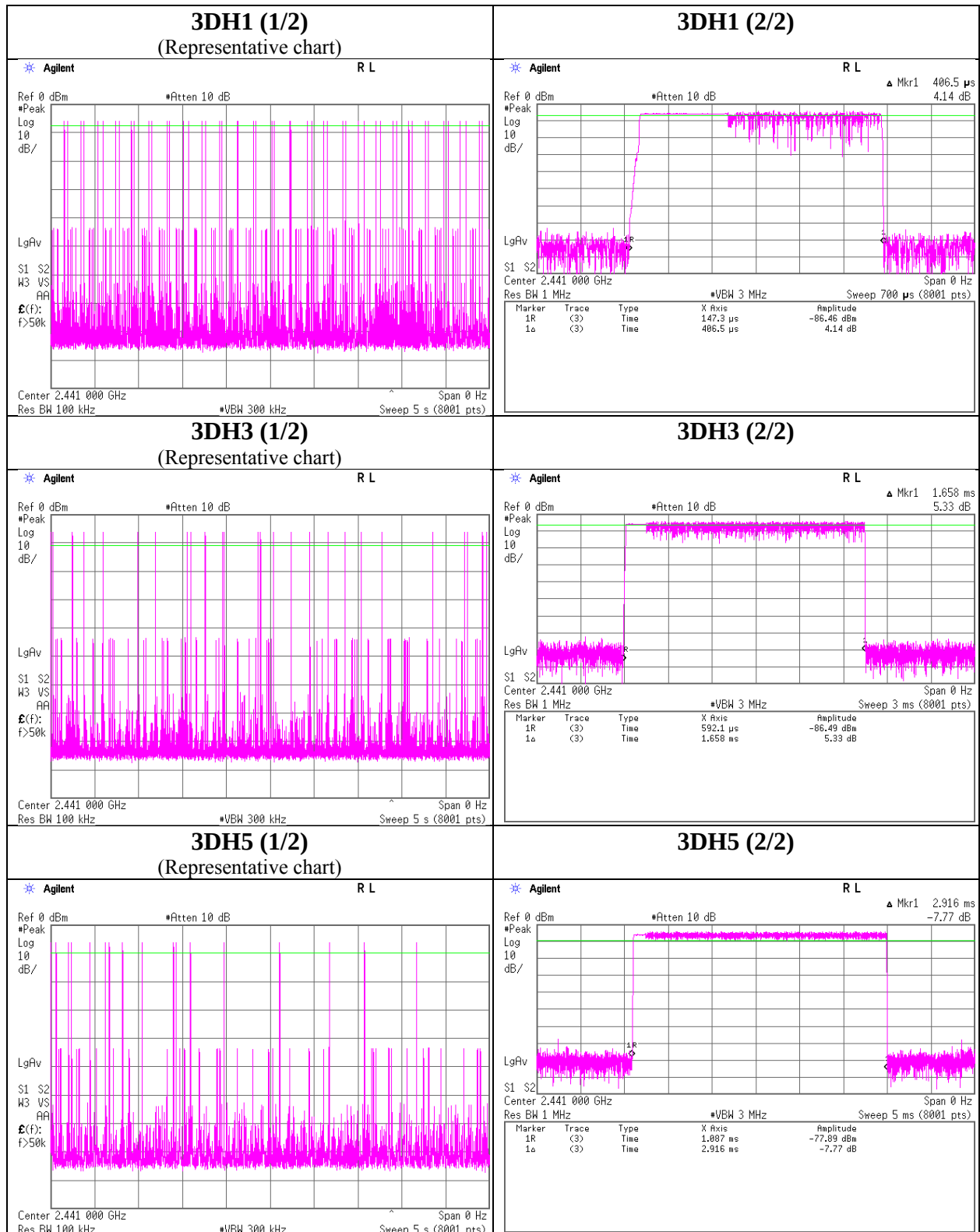
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Dwell time



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Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
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	-3.88	2.53	9.80	8.45	7.00	20.96	125	12.51
DH5	2441.0	-3.27	2.54	9.80	9.07	8.07	20.96	125	11.89
DH5	2480.0	-3.04	2.55	9.80	9.31	8.53	20.96	125	11.65
2DH5	2402.0	-4.60	2.53	9.80	7.73	5.93	20.96	125	13.23
2DH5	2441.0	-3.94	2.54	9.80	8.40	6.92	20.96	125	12.56
2DH5	2480.0	-3.73	2.55	9.80	8.62	7.28	20.96	125	12.34
3DH5	2402.0	-4.20	2.53	9.80	8.13	6.50	20.96	125	12.83
3DH5	2441.0	-3.54	2.54	9.80	8.80	7.59	20.96	125	12.16
3DH5	2480.0	-3.32	2.55	9.80	9.03	8.00	20.96	125	11.93

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. 12051947S-A-R2
Date November 14, 2017
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Tatsuya Arai
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-5.25	2.53	9.80	7.08	5.11	1.07	8.15	6.53
DH5	2441.0	-4.59	2.54	9.80	7.75	5.96	1.07	8.82	7.62
DH5	2480.0	-4.37	2.55	9.80	7.98	6.28	1.07	9.05	8.04
2DH5	2402.0	-8.32	2.53	9.80	4.01	2.52	1.07	5.08	3.22
2DH5	2441.0	-7.54	2.54	9.80	4.80	3.02	1.07	5.87	3.86
2DH5	2480.0	-7.34	2.55	9.80	5.01	3.17	1.07	6.08	4.06
3DH5	2402.0	-8.26	2.53	9.80	4.07	2.55	1.07	5.14	3.27
3DH5	2441.0	-7.50	2.54	9.80	4.84	3.05	1.07	5.91	3.90
3DH5	2480.0	-7.29	2.55	9.80	5.06	3.21	1.07	6.13	4.10

Sample Calculation:

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

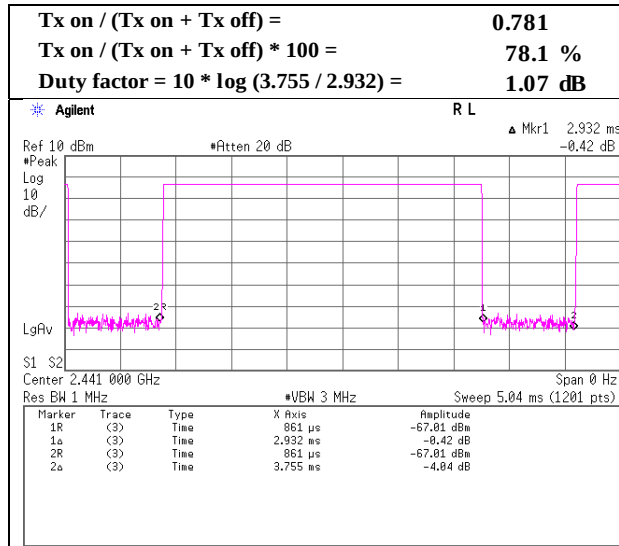
Result (Burst power average) = Time average + Duty factor

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

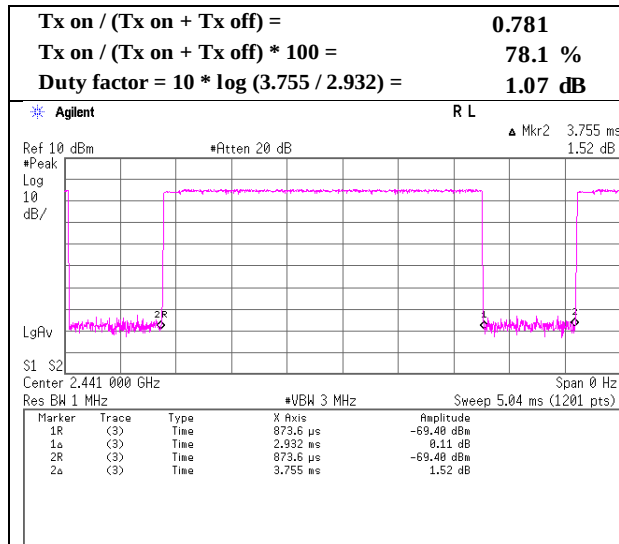
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
Mode : Tx, Hopping Off

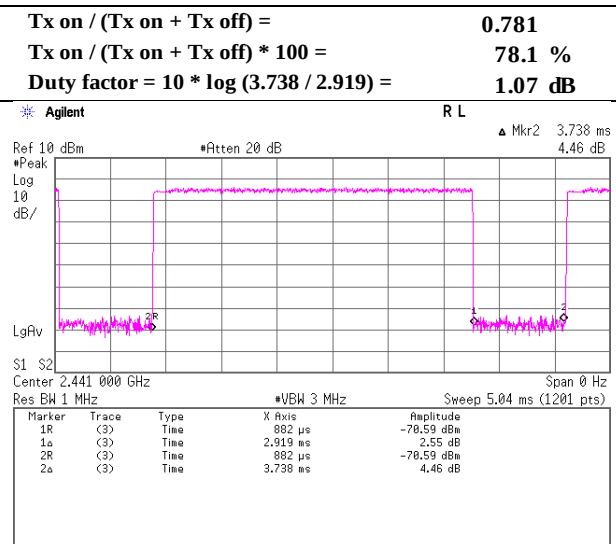
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 12051947S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No. 3
Date January 25, 2018 January 24, 2018
Temperature / Humidity 20 deg. C / 33 % RH 21 deg. C / 33 % RH
Engineer Hiroyuki Morikawa Hiroyuki Morikawa
(30 MHz -1000 MHz) (1 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.133	QP	43.34	14.23	6.82	32.12	0.00	32.27	40.00	7.7	389	165	
Hori.	233.986	QP	42.94	16.93	8.35	31.95	0.00	36.27	46.00	9.7	206	51	
Hori.	377.046	QP	42.76	15.92	9.11	31.86	0.00	35.93	46.00	10.0	100	334	
Hori.	450.696	QP	42.88	16.68	9.44	31.85	0.00	37.15	46.00	8.8	100	36	
Hori.	555.973	QP	38.57	17.88	9.85	31.88	0.00	34.42	46.00	11.5	100	331	
Hori.	745.609	QP	37.35	20.31	10.53	31.67	0.00	36.52	46.00	9.4	147	158	
Hori.	803.784	QP	37.79	20.71	10.72	31.44	0.00	37.78	46.00	8.2	142	146	
Hori.	892.825	QP	33.81	21.78	11.03	30.97	0.00	35.65	46.00	10.3	137	140	
Hori.	2390.000	PK	50.13	27.26	14.18	44.13	2.25	49.69	73.90	24.2	151	307	
Hori.	4804.000	PK	54.16	31.40	6.69	44.45	2.25	50.05	73.90	23.8	142	298	
Hori.	7206.000	PK	51.54	36.56	8.12	43.99	2.25	54.48	73.90	19.4	230	1	
Hori.	9608.000	PK	49.40	38.61	9.36	43.83	2.25	55.79	73.90	18.1	150	0	
Hori.	2390.000	AV	37.73	27.26	14.18	44.13	2.25	37.29	53.90	16.6	151	307	
Hori.	4804.000	AV	46.70	31.40	6.69	44.45	2.25	42.59	53.90	11.3	142	298	
Hori.	7206.000	AV	41.98	36.56	8.12	43.99	2.25	44.92	53.90	8.9	230	1	
Hori.	9608.000	AV	37.14	38.61	9.36	43.83	2.25	43.53	53.90	10.3	150	0	
Vert.	40.132	QP	38.88	14.23	6.82	32.12	0.00	27.81	40.00	12.1	100	319	
Vert.	741.604	QP	36.48	20.28	10.51	31.68	0.00	35.59	46.00	10.4	126	2	
Vert.	806.118	QP	34.67	20.73	10.73	31.43	0.00	34.70	46.00	11.3	100	319	
Vert.	2390.000	PK	48.06	27.26	14.18	44.13	2.25	47.62	73.90	26.2	167	258	
Vert.	4804.000	PK	55.08	31.40	6.69	44.45	2.25	50.97	73.90	22.9	202	309	
Vert.	7206.000	PK	49.59	36.56	8.12	43.99	2.25	52.53	73.90	21.3	208	257	
Vert.	9608.000	PK	49.41	38.61	9.36	43.83	2.25	55.80	73.90	18.1	150	0	
Vert.	2390.000	AV	36.05	27.26	14.18	44.13	2.25	35.61	53.90	18.2	167	258	
Vert.	4804.000	AV	48.34	31.40	6.69	44.45	2.25	44.23	53.90	9.6	202	309	
Vert.	7206.000	AV	37.42	36.56	8.12	43.99	2.25	40.36	53.90	13.5	208	257	
Vert.	9608.000	AV	37.11	38.61	9.36	43.83	2.25	43.50	53.90	10.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.25\text{ dB}$

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	103.59	27.29	14.19	44.14	2.25	103.18	-	-	Carrier
Hori.	2400.000	PK	44.73	27.29	14.18	44.14	2.25	44.31	83.18	38.9	
Vert.	2402.000	PK	98.45	27.29	14.19	44.14	2.25	98.04	-	-	Carrier
Vert.	2400.000	PK	42.11	27.29	14.18	44.14	2.25	41.69	78.04	36.4	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.25\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

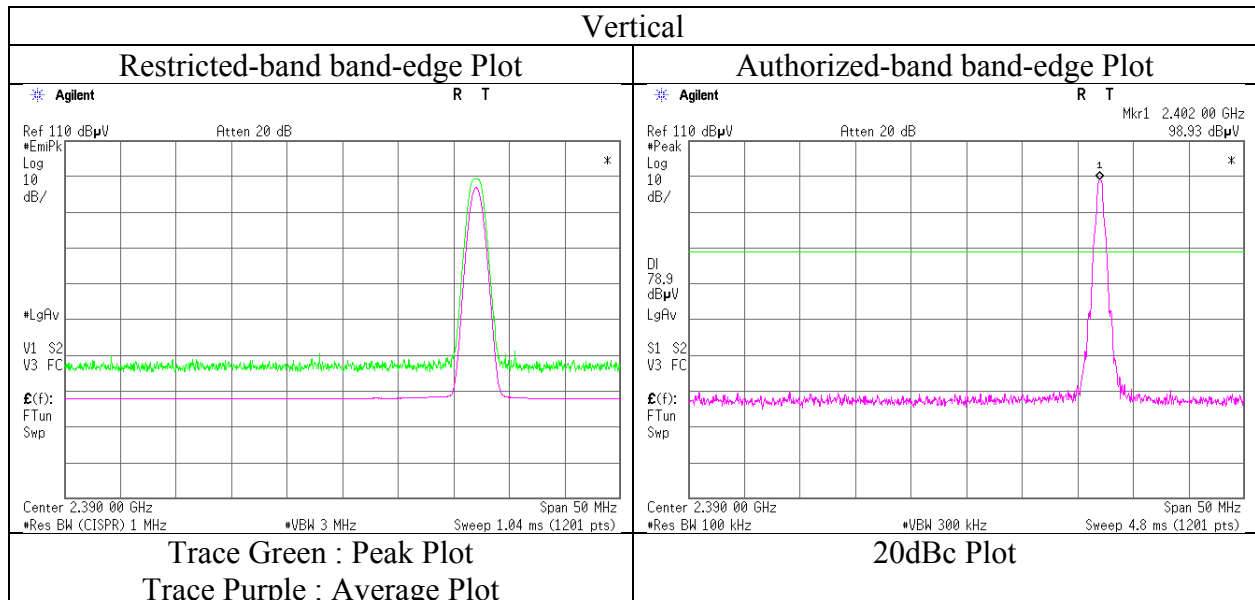
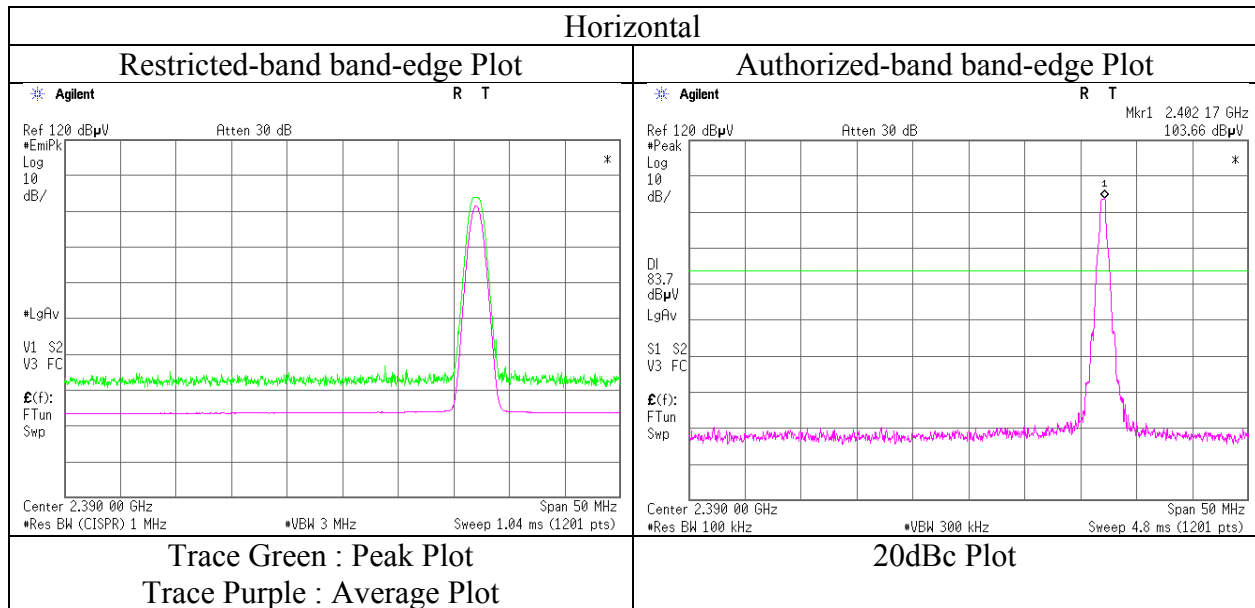
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12051947S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	21 deg. C / 33 % 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

Report No. 12051947S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No. 3 No. 3
Date January 25, 2018 January 24, 2018
Temperature / Humidity 20 deg. C / 33 % RH 21 deg. C / 33 % RH
Engineer Hiroyuki Morikawa Hiroyuki Morikawa
(30 MHz -1000 MHz) (1 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.130	QP	43.90	14.23	6.82	32.12	0.00	32.83	40.00	7.1	390	169	
Hori.	233.609	QP	42.94	16.92	8.34	31.95	0.00	36.25	46.00	9.7	206	51	
Hori.	377.700	QP	42.77	15.93	9.11	31.86	0.00	35.95	46.00	10.0	100	330	
Hori.	451.429	QP	42.91	16.68	9.45	31.85	0.00	37.19	46.00	8.8	100	35	
Hori.	555.964	QP	38.72	17.88	9.85	31.88	0.00	34.57	46.00	11.4	100	331	
Hori.	744.976	QP	37.38	20.30	10.52	31.67	0.00	36.53	46.00	9.4	147	153	
Hori.	802.639	QP	37.72	20.69	10.72	31.45	0.00	37.68	46.00	8.3	142	149	
Hori.	893.741	QP	33.31	21.79	11.03	30.96	0.00	35.17	46.00	10.8	136	137	
Hori.	4882.000	PK	53.09	31.62	6.72	44.48	2.25	49.20	73.90	24.7	128	299	
Hori.	7323.000	PK	51.38	36.77	8.12	44.03	2.25	54.49	73.90	19.4	228	357	
Hori.	9764.000	PK	48.30	38.80	9.37	43.85	2.25	54.87	73.90	19.0	150	0	
Hori.	4882.000	AV	44.20	31.62	6.72	44.48	2.25	40.31	53.90	13.5	128	299	
Hori.	7323.000	AV	39.94	36.77	8.12	44.03	2.25	43.05	53.90	10.8	228	357	
Hori.	9764.000	AV	34.85	38.80	9.37	43.85	2.25	41.42	53.90	12.4	150	0	
Vert.	40.130	QP	39.52	14.23	6.82	32.12	0.00	28.45	40.00	11.5	100	280	
Vert.	742.414	QP	35.80	20.29	10.52	31.68	0.00	34.93	46.00	11.0	122	2	
Vert.	805.913	QP	34.63	20.73	10.73	31.43	0.00	34.66	46.00	11.3	100	316	
Vert.	4882.000	PK	53.10	31.62	6.72	44.48	2.25	49.21	73.90	24.6	247	313	
Vert.	7323.000	PK	49.70	36.77	8.12	44.03	2.25	52.81	73.90	21.0	191	238	
Vert.	9764.000	PK	48.44	38.80	9.37	43.85	2.25	55.01	73.90	18.8	150	0	
Vert.	4882.000	AV	44.19	31.62	6.72	44.48	2.25	40.30	53.90	13.6	247	313	
Vert.	7323.000	AV	35.37	36.77	8.12	44.03	2.25	38.48	53.90	15.4	191	238	
Vert.	9764.000	AV	34.85	38.80	9.37	43.85	2.25	41.42	53.90	12.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.25\text{ dB}$

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

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Report No. 12051947S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No. 3
Date January 25, 2018 January 24, 2018
Temperature / Humidity 20 deg. C / 33 % RH 21 deg. C / 33 % RH
Engineer Hiroyuki Morikawa Hiroyuki Morikawa
(30 MHz -1000 MHz) (1 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.131	QP	42.64	14.23	6.82	32.12	0.00	31.57	40.00	8.4	388	169	
Hori.	233.653	QP	42.75	16.92	8.35	31.95	0.00	36.07	46.00	9.9	209	52	
Hori.	378.190	QP	43.16	15.94	9.11	31.86	0.00	36.35	46.00	9.6	100	331	
Hori.	450.216	QP	43.41	16.68	9.44	31.85	0.00	37.68	46.00	8.3	100	32	
Hori.	477.257	QP	38.04	16.80	9.55	31.84	0.00	32.55	46.00	13.4	100	215	
Hori.	716.093	QP	35.12	20.11	10.44	31.71	0.00	33.96	46.00	12.0	100	352	
Hori.	745.962	QP	37.26	20.31	10.53	31.67	0.00	36.43	46.00	9.5	147	156	
Hori.	801.614	QP	37.66	20.68	10.72	31.45	0.00	37.61	46.00	8.3	142	147	
Hori.	891.741	QP	33.98	21.77	11.02	30.98	0.00	35.79	46.00	10.2	138	139	
Hori.	2483.500	PK	54.06	27.55	14.25	44.16	2.25	53.95	73.90	19.9	227	24	
Hori.	4960.000	PK	51.95	31.83	6.74	44.51	2.25	48.26	73.90	25.6	116	296	
Hori.	7440.000	PK	50.93	36.97	8.15	44.08	2.25	54.22	73.90	19.6	209	2	
Hori.	9920.000	PK	47.45	38.98	9.39	43.87	2.25	54.20	73.90	19.7	150	0	
Hori.	2483.500	AV	38.04	27.55	14.25	44.16	2.25	37.93	53.90	15.9	227	24	
Hori.	4960.000	AV	41.40	31.83	6.74	44.51	2.25	37.71	53.90	16.1	116	296	
Hori.	7440.000	AV	39.25	36.97	8.15	44.08	2.25	42.54	53.90	11.3	209	2	
Hori.	9920.000	AV	35.38	38.98	9.39	43.87	2.25	42.13	53.90	11.7	150	0	
Vert.	40.131	QP	38.08	14.23	6.82	32.12	0.00	27.01	40.00	12.9	100	228	
Vert.	742.080	QP	35.85	20.28	10.52	31.68	0.00	34.97	46.00	11.0	128	5	
Vert.	806.901	QP	34.44	20.74	10.73	31.43	0.00	34.48	46.00	11.5	100	316	
Vert.	2483.500	PK	52.26	27.55	14.25	44.16	2.25	52.15	73.90	21.7	100	351	
Vert.	4960.000	PK	51.10	31.83	6.74	44.51	2.25	47.41	73.90	26.4	236	17	
Vert.	7440.000	PK	48.52	36.97	8.15	44.08	2.25	51.81	73.90	22.0	150	0	
Vert.	9920.000	PK	47.29	38.98	9.39	43.87	2.25	54.04	73.90	19.8	150	0	
Vert.	2483.500	AV	36.84	27.55	14.25	44.16	2.25	36.73	53.90	17.1	100	351	
Vert.	4960.000	AV	40.87	31.83	6.74	44.51	2.25	37.18	53.90	16.7	236	17	
Vert.	7440.000	AV	36.10	36.97	8.15	44.08	2.25	39.39	53.90	14.5	150	0	
Vert.	9920.000	AV	35.40	38.98	9.39	43.87	2.25	42.15	53.90	11.7	150	0	

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

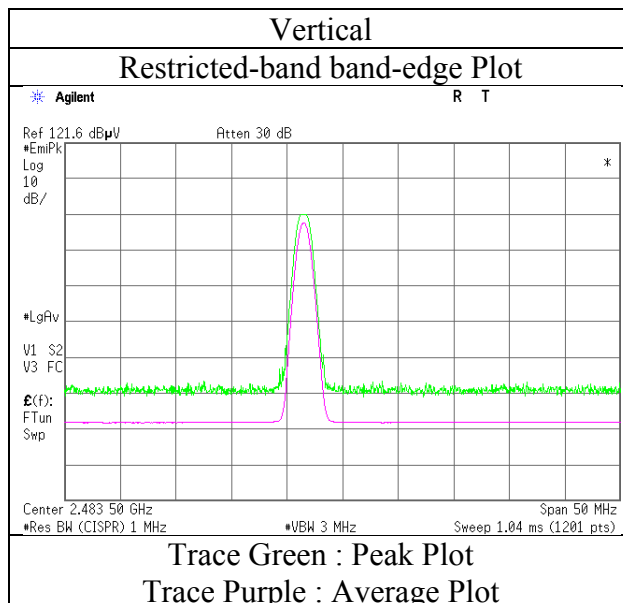
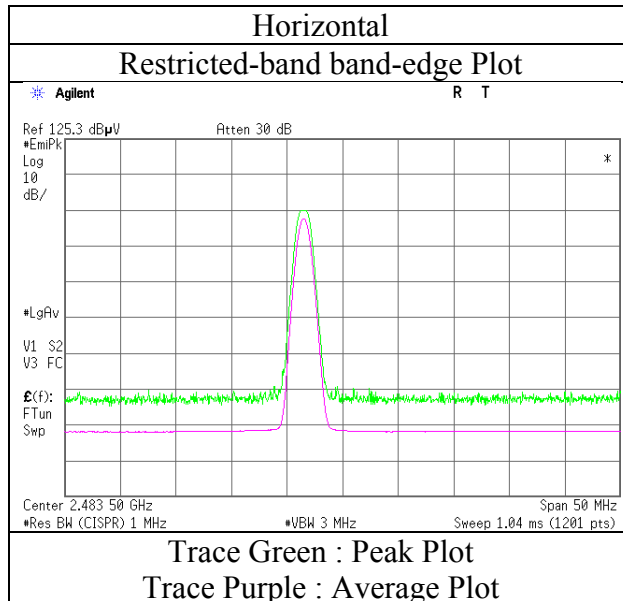
Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.25\text{ dB}$

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.	12051947S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	21 deg. C / 33 % 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

Report No. 12051947S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No. 3
Date January 25, 2018 January 24, 2018
Temperature / Humidity 20 deg. C / 33 % RH 21 deg. C / 33 % RH
Engineer Hiroyuki Morikawa Hiroyuki Morikawa
(30 MHz -1000 MHz) (1 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.131	QP	44.04	14.23	6.82	32.12	0.00	32.97	40.00	7.0	386	171	
Hori.	233.631	QP	44.85	16.92	8.35	31.95	0.00	38.17	46.00	7.8	206	51	
Hori.	377.771	QP	42.56	15.93	9.11	31.86	0.00	35.74	46.00	10.2	100	330	
Hori.	451.539	QP	43.10	16.68	9.45	31.85	0.00	37.38	46.00	8.6	100	35	
Hori.	476.124	QP	37.98	16.79	9.54	31.84	0.00	32.47	46.00	13.5	100	315	
Hori.	744.618	QP	37.76	20.30	10.52	31.68	0.00	36.90	46.00	9.1	151	155	
Hori.	801.079	QP	37.50	20.67	10.71	31.46	0.00	37.42	46.00	8.5	141	147	
Hori.	891.889	QP	33.51	21.77	11.02	30.98	0.00	35.32	46.00	10.6	136	138	
Hori.	2390.000	PK	49.69	27.26	14.18	44.13	2.25	49.25	73.90	24.6	187	7	
Hori.	4804.000	PK	52.78	31.40	6.69	44.45	2.25	48.67	73.90	25.2	100	299	
Hori.	7206.000	PK	49.17	36.56	8.12	43.99	2.25	52.11	73.90	21.7	150	0	
Hori.	9608.000	PK	49.41	38.61	9.36	43.83	2.25	55.80	73.90	18.1	150	0	
Hori.	2390.000	AV	36.33	27.26	14.18	44.13	2.25	35.89	53.90	18.0	187	7	
Hori.	4804.000	AV	41.78	31.40	6.69	44.45	2.25	37.67	53.90	16.2	100	299	
Hori.	7206.000	AV	36.18	36.56	8.12	43.99	2.25	39.12	53.90	14.7	150	0	
Hori.	9608.000	AV	37.17	38.61	9.36	43.83	2.25	43.56	53.90	10.3	150	0	
Vert.	40.132	QP	39.35	14.23	6.82	32.12	0.00	28.28	40.00	11.7	100	317	
Vert.	742.044	QP	35.62	20.28	10.52	31.68	0.00	34.74	46.00	11.2	125	2	
Vert.	809.115	QP	34.32	20.77	10.74	31.42	0.00	34.41	46.00	11.5	100	319	
Vert.	2390.000	PK	48.52	27.26	14.18	44.13	2.25	48.08	73.90	25.8	188	251	
Vert.	4804.000	PK	53.81	31.40	6.69	44.45	2.25	49.70	73.90	24.2	183	332	
Vert.	7206.000	PK	48.89	36.56	8.12	43.99	2.25	51.83	73.90	22.0	150	0	
Vert.	9608.000	PK	50.10	38.61	9.36	43.83	2.25	56.49	73.90	17.4	150	0	
Vert.	2390.000	AV	36.12	27.26	14.18	44.13	2.25	35.68	53.90	18.2	188	251	
Vert.	4804.000	AV	43.08	31.40	6.69	44.45	2.25	38.97	53.90	14.9	183	332	
Vert.	7206.000	AV	35.72	36.56	8.12	43.99	2.25	38.66	53.90	15.2	150	0	
Vert.	9608.000	AV	37.14	38.61	9.36	43.83	2.25	43.53	53.90	10.3	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 (3.89 m / 3.0 m) = 2.25 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	101.26	27.29	14.19	44.14	2.25	100.85	-	-	Carrier
Hori.	2400.000	PK	44.91	27.29	14.18	44.14	2.25	44.49	80.85	36.4	
Vert.	2402.000	PK	96.85	27.29	14.19	44.14	2.25	96.44	-	-	Carrier
Vert.	2400.000	AV	41.71	27.29	14.18	44.14	2.25	41.29	76.44	35.2	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB

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

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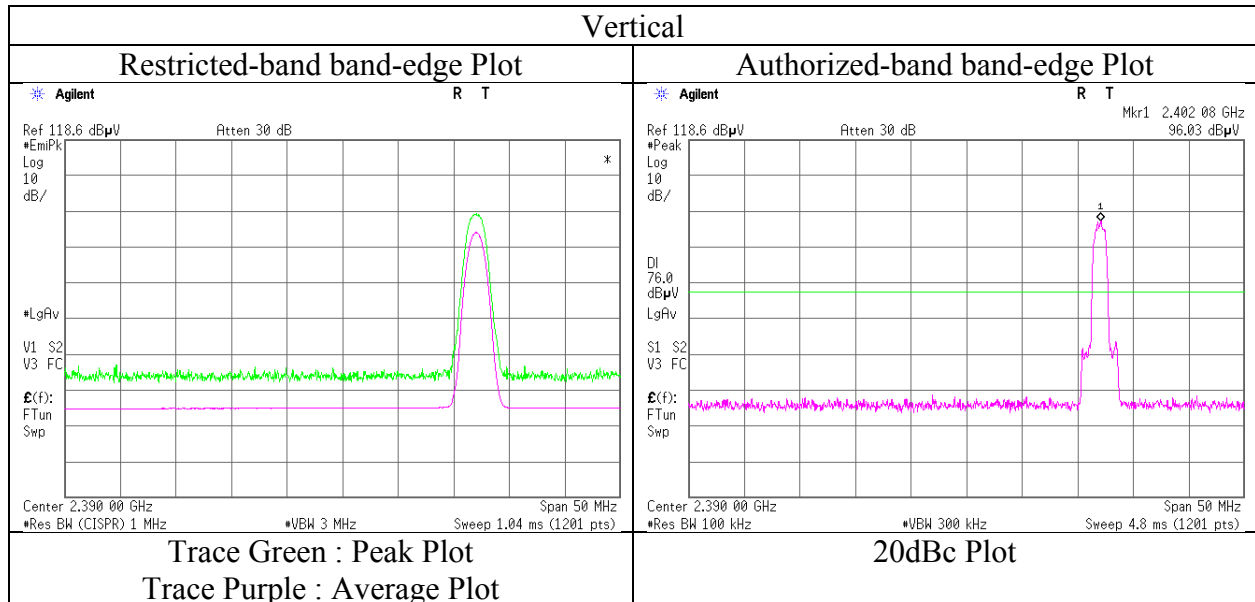
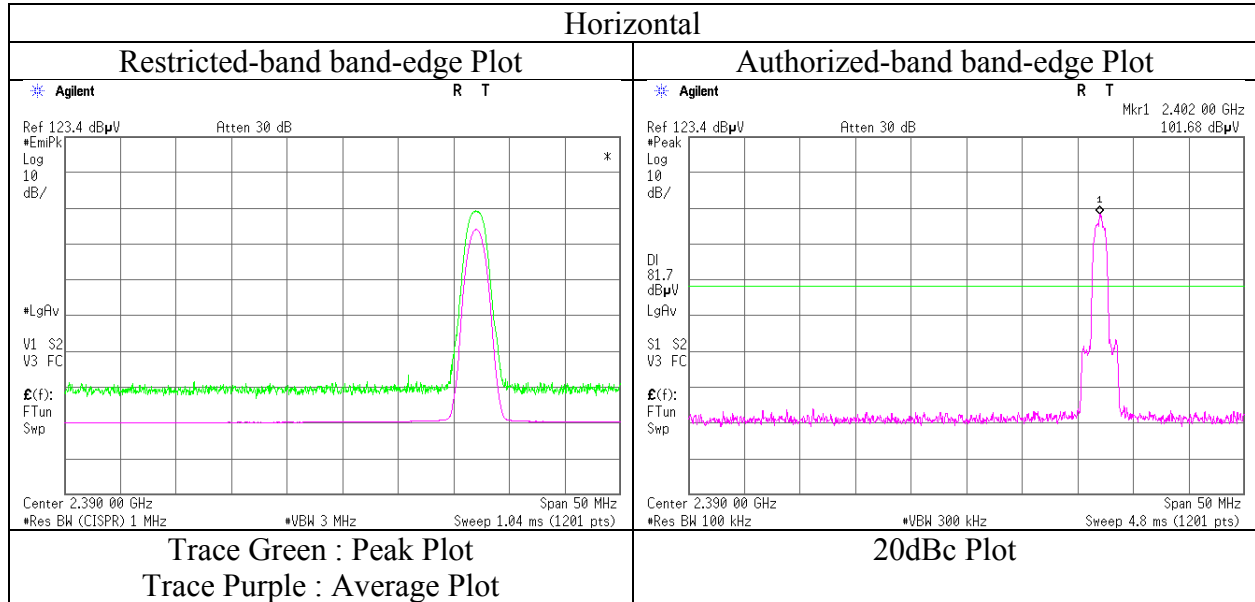
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12051947S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	21 deg. C / 33 % 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

Report No. 12051947S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No. 3
Date January 25, 2018 January 24, 2018
Temperature / Humidity 20 deg. C / 33 % RH 21 deg. C / 33 % RH
Engineer Hiroyuki Morikawa Hiroyuki Morikawa
(30 MHz -1000 MHz) (1 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.129	QP	43.32	14.23	6.82	32.12	0.00	32.25	40.00	7.7	385	168	
Hori.	233.447	QP	43.46	16.92	8.34	31.95	0.00	36.77	46.00	9.2	202	53	
Hori.	376.737	QP	42.48	15.91	9.11	31.86	0.00	35.64	46.00	10.3	100	334	
Hori.	449.970	QP	44.20	16.67	9.43	31.85	0.00	38.45	46.00	7.5	100	42	
Hori.	556.370	QP	36.49	17.89	9.85	31.88	0.00	32.35	46.00	13.6	100	335	
Hori.	745.270	QP	37.90	20.30	10.53	31.67	0.00	37.06	46.00	8.9	147	156	
Hori.	809.657	QP	37.88	20.78	10.74	31.42	0.00	37.98	46.00	8.0	141	149	
Hori.	894.094	QP	33.78	21.80	11.03	30.96	0.00	35.65	46.00	10.3	136	143	
Hori.	4882.000	PK	52.08	31.62	6.72	44.48	2.25	48.19	73.90	25.7	168	295	
Hori.	7323.000	PK	49.46	36.77	8.12	44.03	2.25	52.57	73.90	21.3	150	0	
Hori.	9764.000	PK	49.76	38.80	9.37	43.85	2.25	56.33	73.90	17.5	150	0	
Hori.	4882.000	AV	40.72	31.62	6.72	44.48	2.25	36.83	53.90	17.0	168	295	
Hori.	7323.000	AV	36.45	36.77	8.12	44.03	2.25	39.56	53.90	14.3	150	0	
Hori.	9764.000	AV	36.46	38.80	9.37	43.85	2.25	43.03	53.90	10.8	150	0	
Vert.	40.130	QP	38.29	14.23	6.82	32.12	0.00	27.22	40.00	12.7	100	236	
Vert.	741.646	QP	36.67	20.28	10.51	31.68	0.00	35.78	46.00	10.2	125	2	
Vert.	806.333	QP	34.31	20.74	10.73	31.43	0.00	34.35	46.00	11.6	100	315	
Vert.	4882.000	PK	51.90	31.62	6.72	44.48	2.25	48.01	73.90	25.8	231	322	
Vert.	7323.000	PK	49.41	36.77	8.12	44.03	2.25	52.52	73.90	21.3	150	0	
Vert.	9764.000	PK	48.96	38.80	9.37	43.85	2.25	55.53	73.90	18.3	150	0	
Vert.	4882.000	AV	40.53	31.62	6.72	44.48	2.25	36.64	53.90	17.2	231	322	
Vert.	7323.000	AV	35.97	36.77	8.12	44.03	2.25	39.08	53.90	14.8	150	0	
Vert.	9764.000	AV	36.27	38.80	9.37	43.85	2.25	42.84	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 : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.25\text{ dB}$

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

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

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Radiated Spurious Emission

Report No. 12051947S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No. 3
Date January 25, 2018 January 24, 2018
Temperature / Humidity 20 deg. C / 33 % RH 21 deg. C / 33 % RH
Engineer Hiroyuki Morikawa Hiroyuki Morikawa
(30 MHz -1000 MHz) (1 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.131	QP	43.64	14.23	6.82	32.12	0.00	32.57	40.00	7.4	384	169	
Hori.	233.720	QP	43.35	16.92	8.35	31.95	0.00	36.67	46.00	9.3	204	53	
Hori.	377.321	QP	43.25	15.92	9.11	31.86	0.00	36.42	46.00	9.5	100	326	
Hori.	451.846	QP	44.21	16.68	9.45	31.85	0.00	38.49	46.00	7.5	100	34	
Hori.	480.006	QP	39.34	16.81	9.56	31.84	0.00	33.87	46.00	12.1	100	317	
Hori.	744.399	QP	38.00	20.30	10.52	31.68	0.00	37.14	46.00	8.8	147	156	
Hori.	804.898	QP	36.82	20.72	10.73	31.44	0.00	36.83	46.00	9.1	142	149	
Hori.	891.876	QP	34.05	21.77	11.02	30.98	0.00	35.86	46.00	10.1	138	136	
Hori.	2483.500	PK	56.05	27.55	14.25	44.16	2.25	55.94	73.90	17.9	227	20	
Hori.	4960.000	PK	49.77	31.83	6.74	44.51	2.25	46.08	73.90	27.8	171	316	
Hori.	7440.000	PK	49.12	36.97	8.15	44.08	2.25	52.41	73.90	21.4	150	0	
Hori.	9920.000	PK	48.14	38.98	9.39	43.87	2.25	54.89	73.90	19.0	150	0	
Hori.	2483.500	AV	38.23	27.55	14.25	44.16	2.25	38.12	53.90	15.7	227	20	
Hori.	4960.000	AV	37.37	31.83	6.74	44.51	2.25	33.68	53.90	20.2	171	316	
Hori.	7440.000	AV	36.90	36.97	8.15	44.08	2.25	40.19	53.90	13.7	150	0	
Hori.	9920.000	AV	35.34	38.98	9.39	43.87	2.25	42.09	53.90	11.8	150	0	
Vert.	40.129	QP	39.51	14.23	6.82	32.12	0.00	28.44	40.00	11.5	100	230	
Vert.	742.874	QP	36.81	20.29	10.52	31.68	0.00	35.94	46.00	10.0	125	5	
Vert.	806.972	QP	34.89	20.74	10.73	31.43	0.00	34.93	46.00	11.0	100	317	
Vert.	2483.500	PK	53.20	27.55	14.25	44.16	2.25	53.09	73.90	20.8	304	237	
Vert.	4960.000	PK	50.11	31.83	6.74	44.51	2.25	46.42	73.90	27.4	202	18	
Vert.	7440.000	PK	48.78	36.97	8.15	44.08	2.25	52.07	73.90	21.8	150	0	
Vert.	9920.000	PK	48.41	38.98	9.39	43.87	2.25	55.16	73.90	18.7	150	0	
Vert.	2483.500	AV	37.11	27.55	14.25	44.16	2.25	37.00	53.90	16.9	304	237	
Vert.	4960.000	AV	37.73	31.83	6.74	44.51	2.25	34.04	53.90	19.8	202	18	
Vert.	7440.000	AV	35.94	36.97	8.15	44.08	2.25	39.23	53.90	14.6	150	0	
Vert.	9920.000	AV	35.40	38.98	9.39	43.87	2.25	42.15	53.90	11.7	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.25\text{ dB}$

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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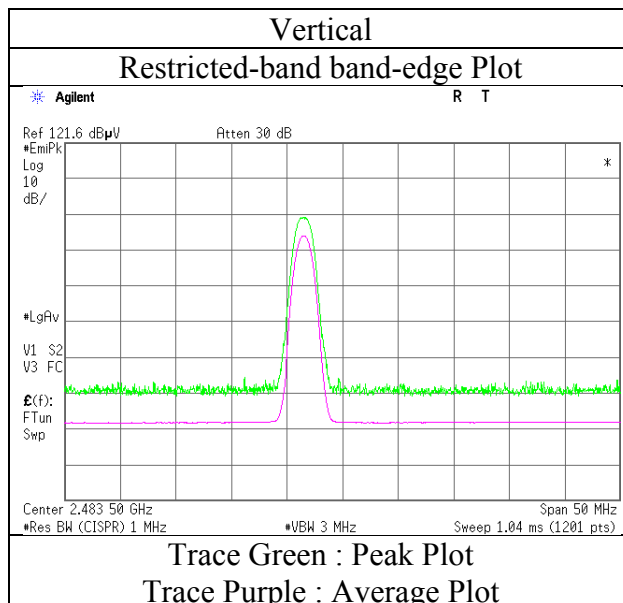
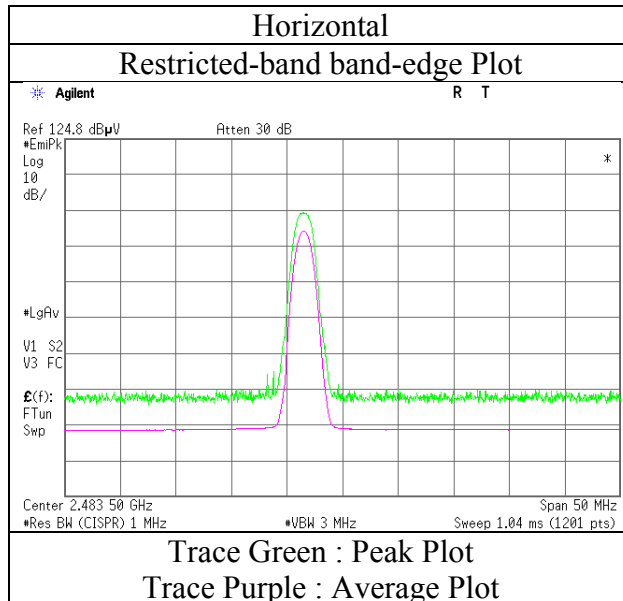
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Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

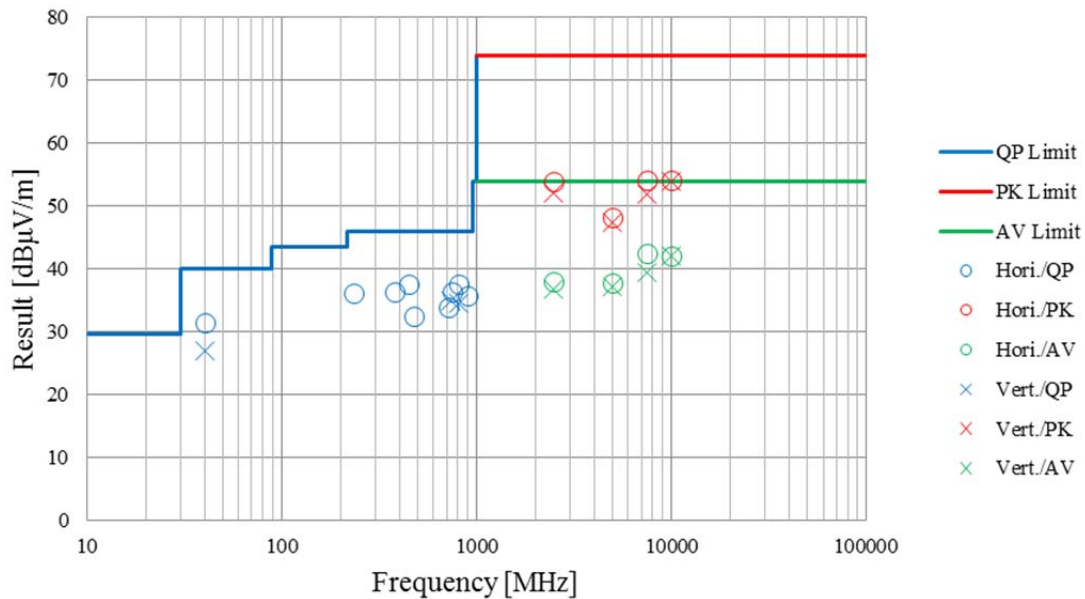
Report No.	12051947S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	21 deg. C / 33 % RH
Engineer	Hiroyuki Morikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12051947S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 25, 2018	January 24, 2018
Temperature / Humidity	20 deg. C / 33 % RH	21 deg. C / 33 % RH
Engineer	Hiroyuki Morikawa	Hiroyuki Morikawa
	(30 MHz -1000 MHz)	(1 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz	

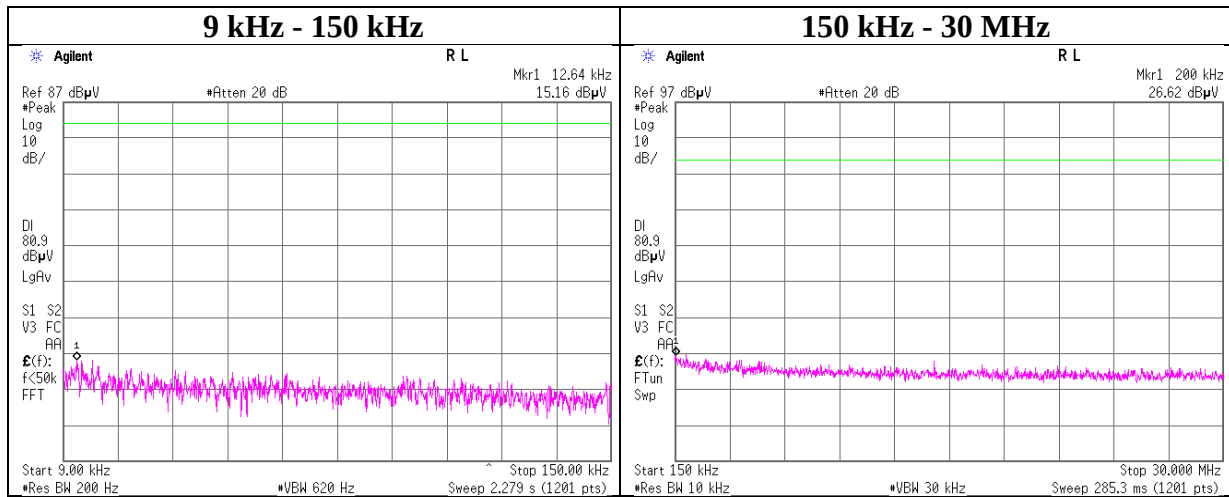


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

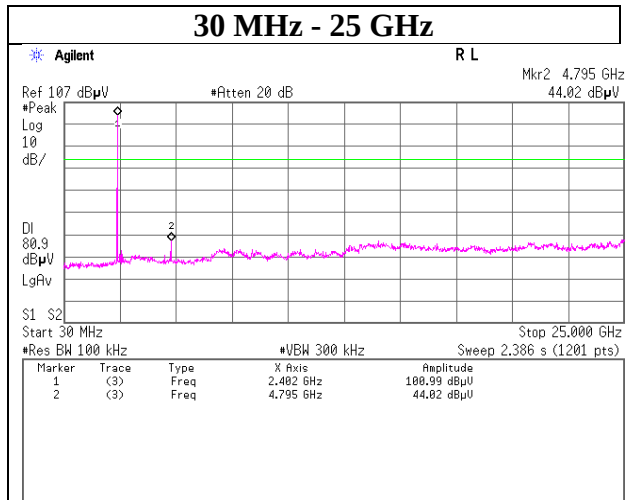
Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
Mode : Tx, Hopping Off, DH5

2402 MHz



30 MHz - 25 GHz



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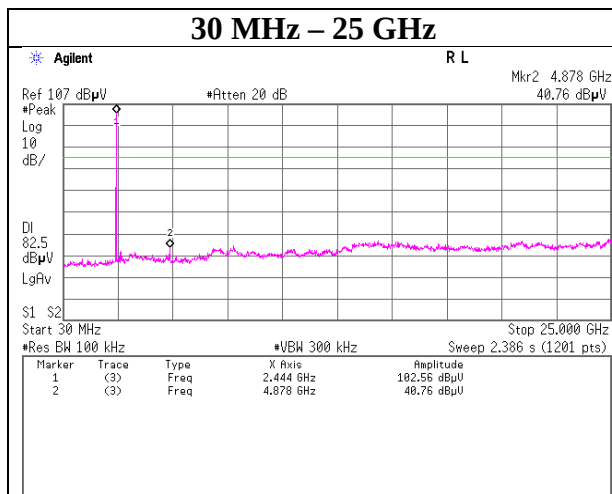
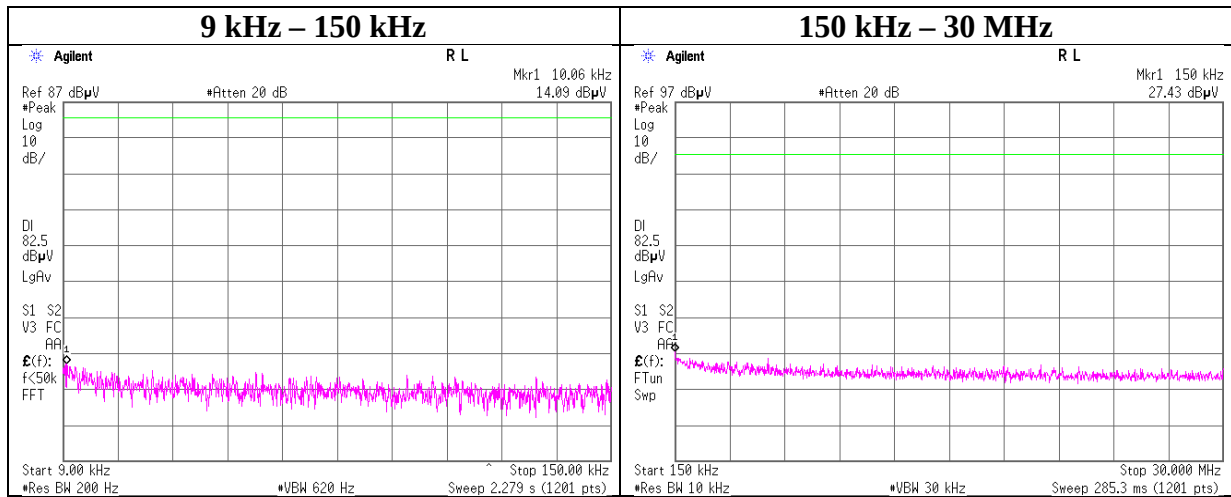
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Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
Mode : Tx, Hopping Off, DH5

2441 MHz



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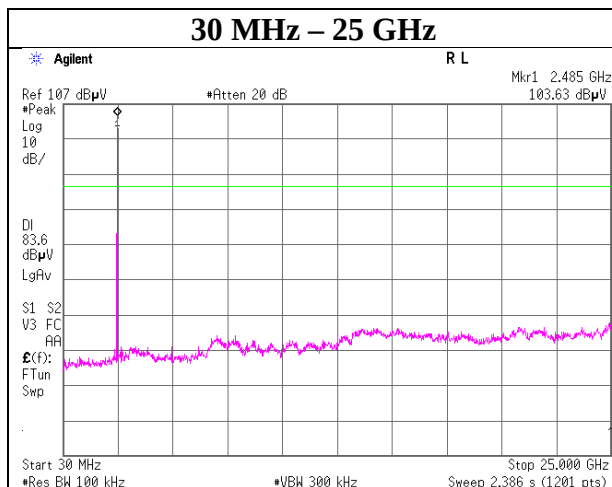
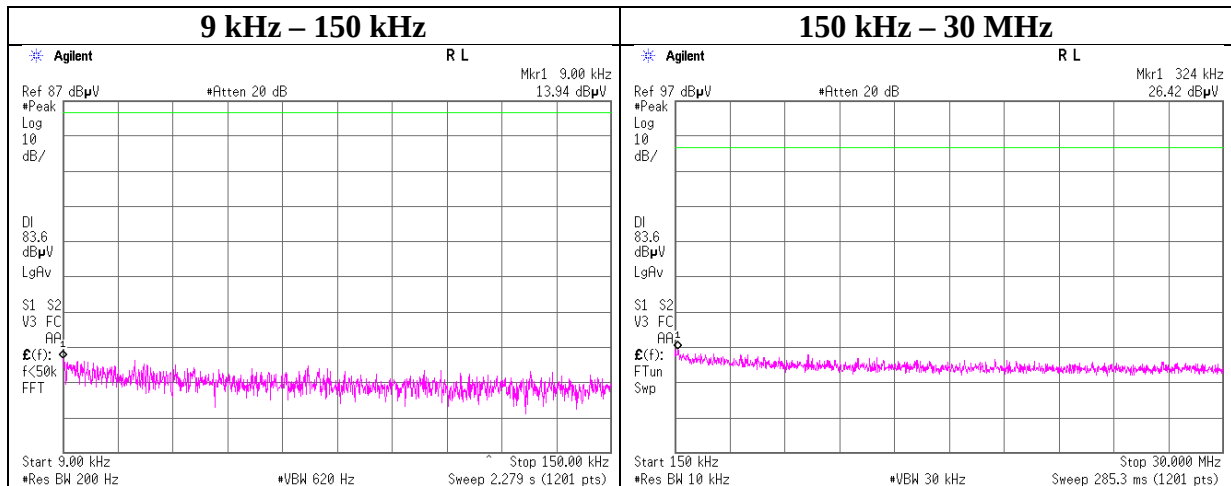
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Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
Mode : Tx, Hopping Off, DH5

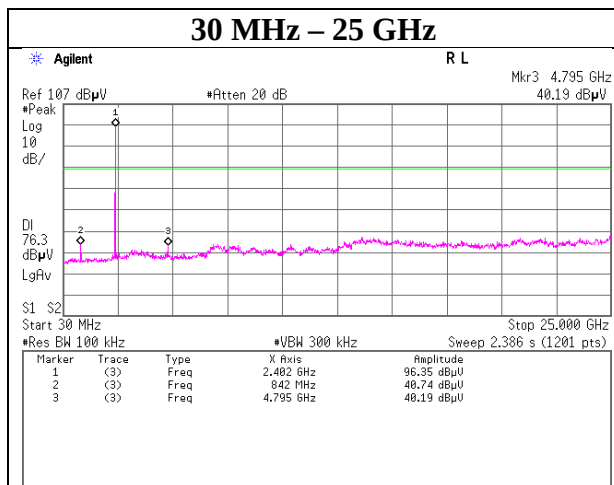
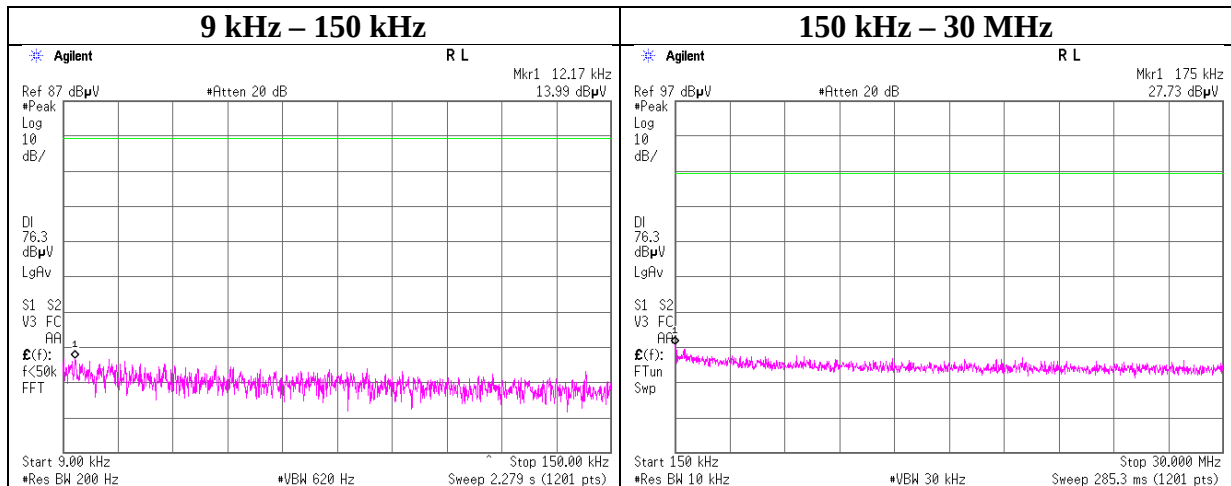
2480 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
Mode : Tx, Hopping Off, 3DH5

2402 MHz



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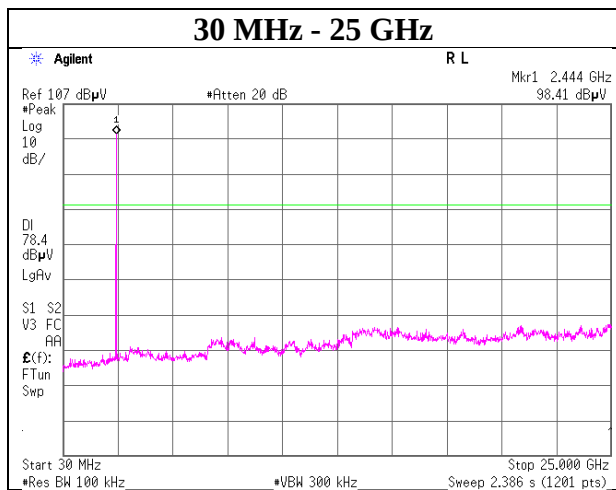
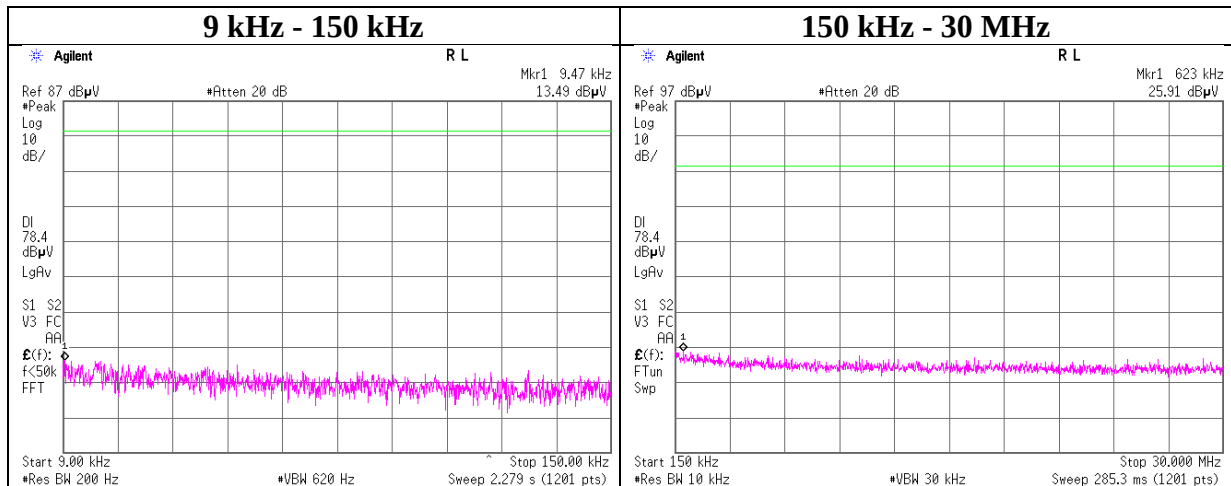
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 12051947S-A-R2
Date : November 14, 2017
Temperature / Humidity : 25 deg. C / 45 % RH
Engineer : Tatsuya Arai
Mode : Tx, Hopping Off, 3DH5

2441 MHz



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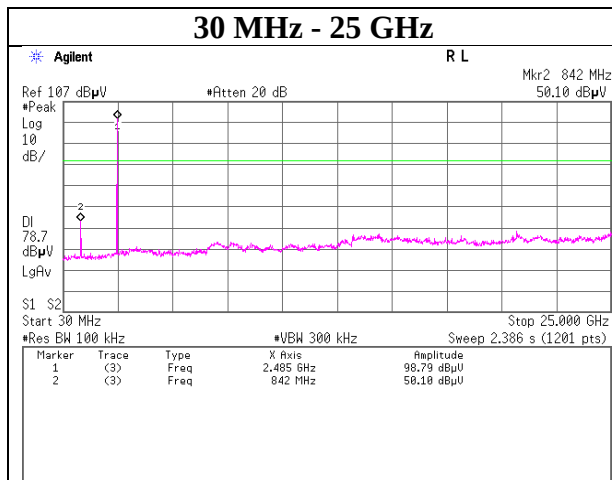
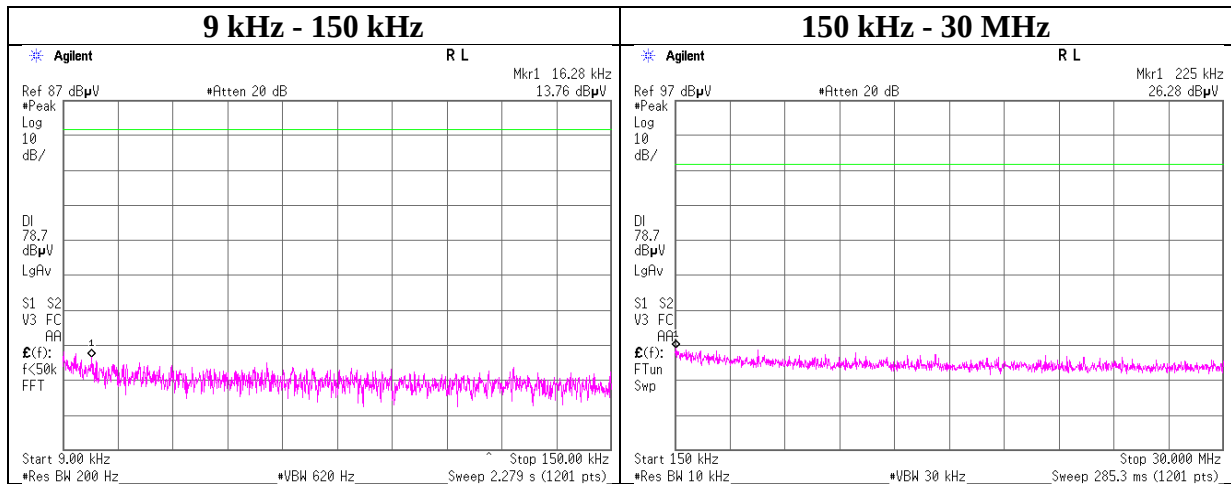
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-A-R2
Date	November 14, 2017
Temperature / Humidity	25 deg. C / 45 % RH
Engineer	Tatsuya Arai
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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Shonan EMC Lab.

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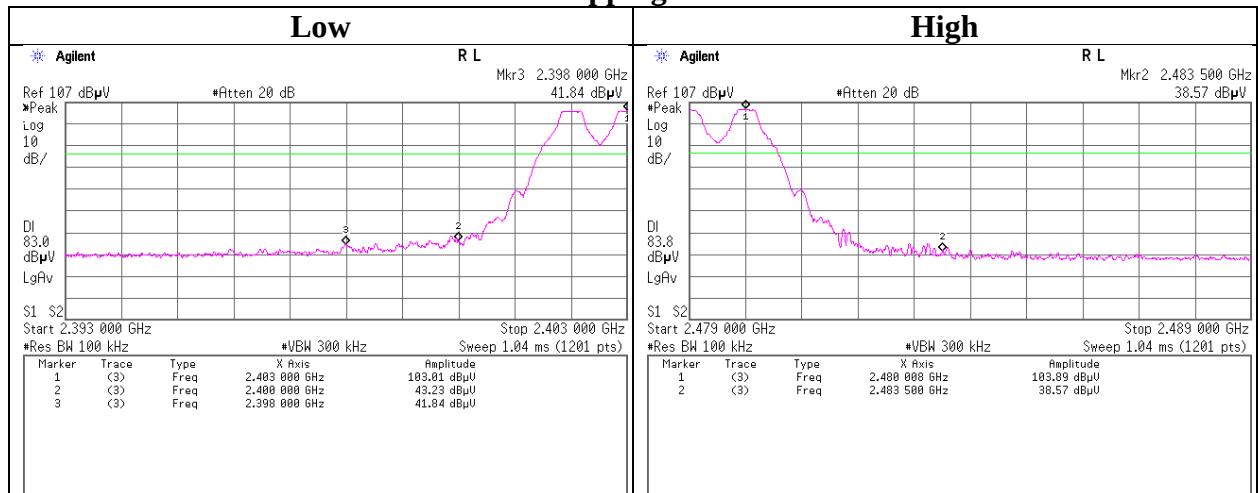
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

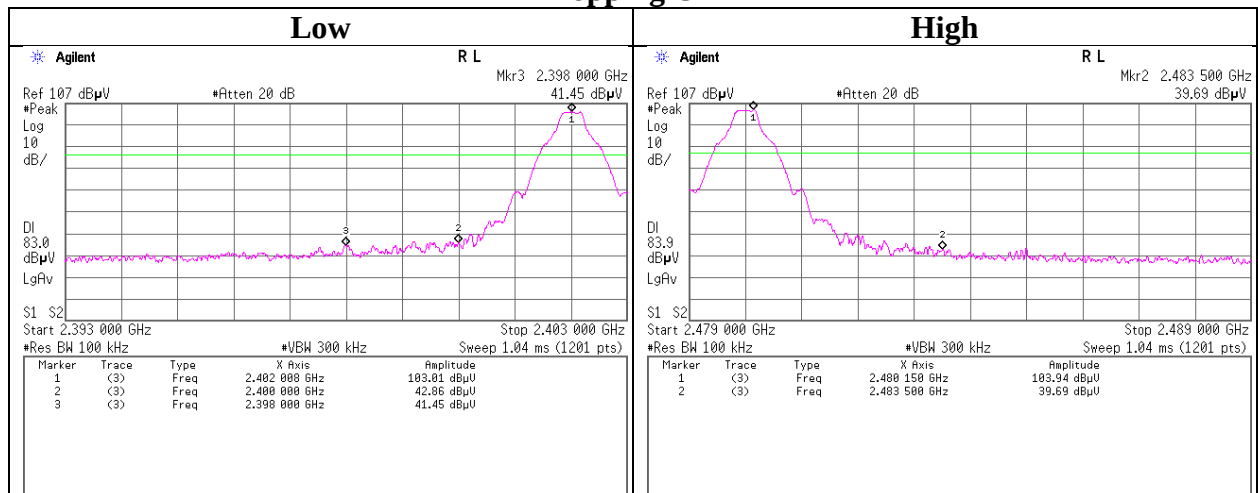
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-A-R2
Date	November 14, 2017
Temperature / Humidity	25 deg. C / 45 % RH
Engineer	Tatsuya Arai
Mode	Tx DH5

Hopping On



Hopping Off



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Shonan EMC Lab.

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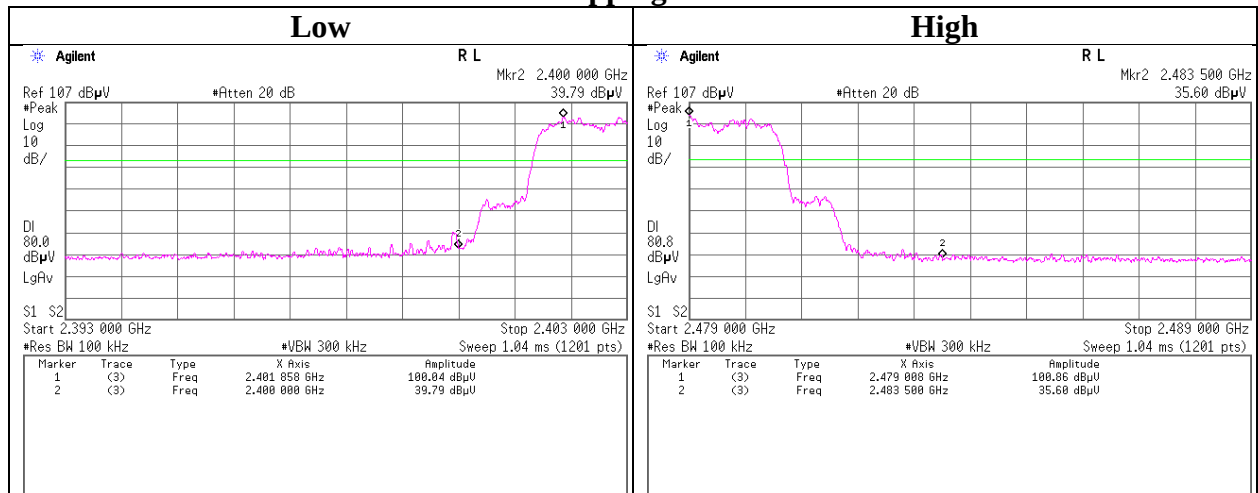
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

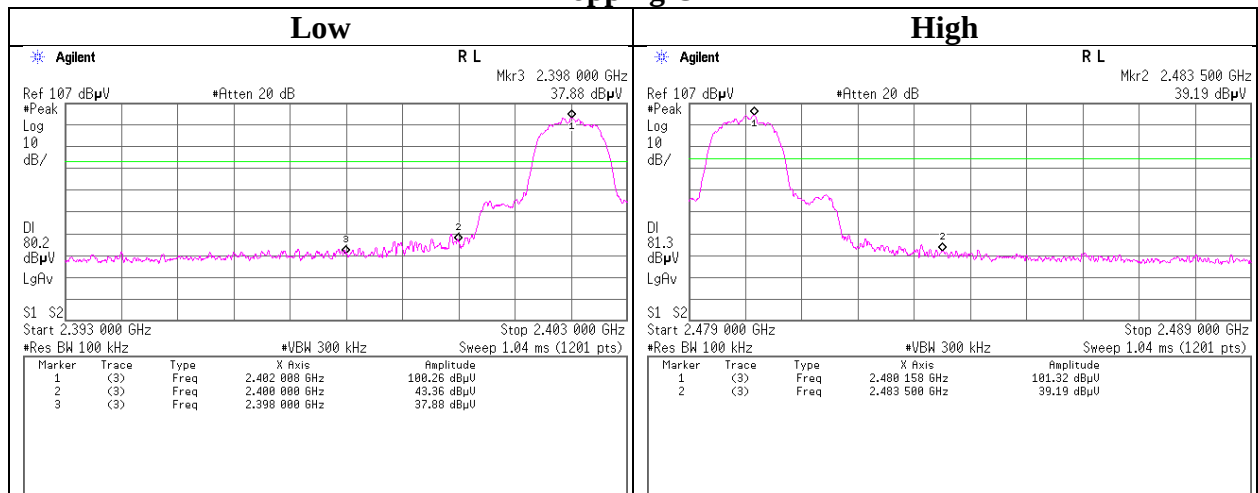
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-A-R2
Date	November 14, 2017
Temperature / Humidity	25 deg. C / 45 % RH
Engineer	Tatsuya Arai
Mode	Tx 3DH5

Hopping On



Hopping Off



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Shonan EMC Lab.

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

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APPENDIX 2: Test instruments

Test Equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT, RE	2017/03/07 * 12
SCC-G32	Coaxial Cable	Junkosha	MWX241-02000 KMSKMS	OCT-09-13-005	AT	2016/11/07 * 12 *1)
SAT10-14	Attenuator	Weinschel Corp.	54A-10	81595	AT	2017/04/20 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-05	Power sensor	Agilent	N1923A	MY5349008	AT	2017/05/01 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12 *1)
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-03 7	RE	2017/01/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000 NF SNMS/B	1612S006	RE	2017/01/08 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVSW R)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSW R)	3	RE	2017/07/17 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,C E, RFI,MF)	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2017/10/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2017/03/23 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KM SKMS	-	RE	2017/04/20 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2017/03/17 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2017/10/21 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C 3/C4/C5/C10/ SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/1 4 1PE/141PE/141P E /141PE/NS4906	-/0901-271(RF Selector)	RE	2017/04/07 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2017/02/09 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2017/11/24 * 12

*1) This test equipment was used for the tests before the expiration date of the calibration.

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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