



RADIO TEST REPORT

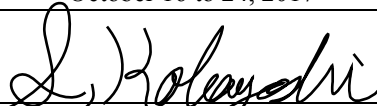
Test Report No. : 11989475S-F

Applicant : Sony Corporation
Type of Equipment : Wireless Noise Canceling Stereo Headset
Model No. : WI-SP600N
FCC ID : AK8WISP600N
Test regulation : FCC Part 15 Subpart C: 2017
Test Result : Complied


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

Date of test: October 16 to 24, 2017

Representative test engineer:


Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by:


Toyokazu Imamura
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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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
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13-EM-F0429

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SECTION 1: Customer information

Company Name : Sony Corporation
Address : 1-7-1 Konan Minato-ku, Tokyo, 108-0075, Japan
Telephone Number : +81-50-3141-6224
Contact Person : Kohei Akane

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless Noise Canceling Stereo Headset
Model No. : WI-SP600N
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.7 V: Built-in lithium-ion rechargeable battery
DC 5 V: When charged using USB
Receipt Date of Sample : September 22, 2017
Country of Mass-production : Malaysia
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: WI-SP600N (referred to as the EUT in this report) is a Wireless Noise Canceling Stereo Headset.

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : GFSK, $\pi/4$ -DQPSK, 8DPSK
Power Supply (radio part input) : DC 1.35 V
Antenna type : Chip Antenna
Antenna Gain : 1.6 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 2, 2017

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

* The revision on November 2, 2017, does not affect the test specification applied to the EUT.

* Also the EUT complies with FCC Part 15 Subpart B. Refer to the test report: 11989475S-J.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	-	-	N/A *1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 ----- IC: -	FCC: Section15.247(a)(1) ----- IC: RSS-247 5.1 (b)	See data.	Complied	Conducted
20 dB 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		8.3 dB 19840.000 MHz, AV, Vert. Tx, Hopping Off, 3DH5 2480 MHz	Complied

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The EUT operates with a battery. AC Line can be connected to the EUT via other device's USB port; however, the EUT stops transmission during recharging. Therefore, the test is not applicable to the EUT.

*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 is a battery-operated device and test was performed with the full-charged battery. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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

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

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
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

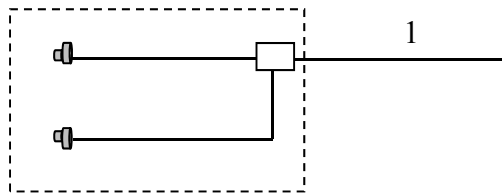
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *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.</p> <p>*EUT has the power settings by the software as follows; Power settings: BDR: Ext.=7, Int.=25 EDR: Ext.=72, Int.=36 Software: CSR BlueSuite BlueTest3 Version 2.6.6 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>		

4.2 Configuration and peripherals



A: EUT

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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Noise Canceling Stereo Headset	WI-SP600N	0100239 *1) 0100114 *2)	Sony Corporation	EUT

*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	USB Cable	0.5	Shielded	Shielded	-

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

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a platform of nominal size, 0.5 m by 1.0 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. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer. The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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

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

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.85 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.85 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: $20 \times \log(3.85 \text{ m}/3.0 \text{ m}) = 2.17 \text{ dB}$

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

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- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Frequency			
	Below 1 GHz	1 GHz - 2.8 GHz	2.8 GHz - 13 GHz	13 GHz - 26.5 GHz
Horizontal	Y	X	X	X
Vertical	X	Y	Y	X

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

Measurement range : 30 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

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

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

*2) Reference data

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

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

The equipment and cables were not used for factor 0.0 dB of the data sheets.

Test data : APPENDIX

Test result : Pass

APPENDIX 1: Test data

20 dB Bandwidth and Carrier Frequency Separation

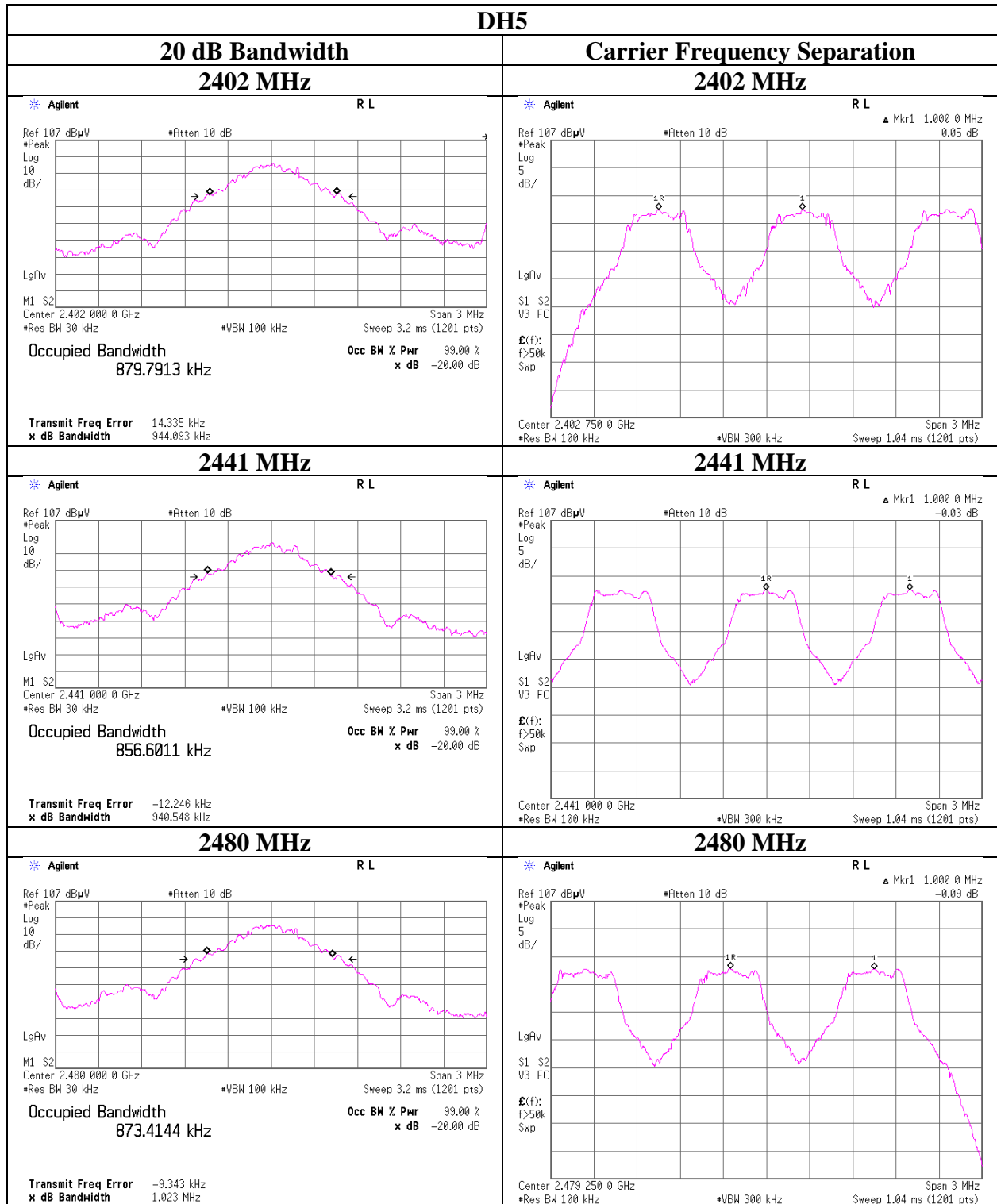
Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11989475S-F
Date October 16, 2017
Temperature / Humidity 23 deg. C / 62 % RH
Engineer Kenichi Adachi
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.944	1.000	≥ 0.629
DH5	2441.0	0.941	1.000	≥ 0.627
DH5	2480.0	1.023	1.000	≥ 0.682
3DH5	2402.0	1.261	1.000	≥ 0.841
3DH5	2441.0	1.253	1.000	≥ 0.835
3DH5	2480.0	1.262	1.000	≥ 0.842

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

No limit applies to 20 dB Bandwidth.

20 dB Bandwidth and Carrier Frequency Separation



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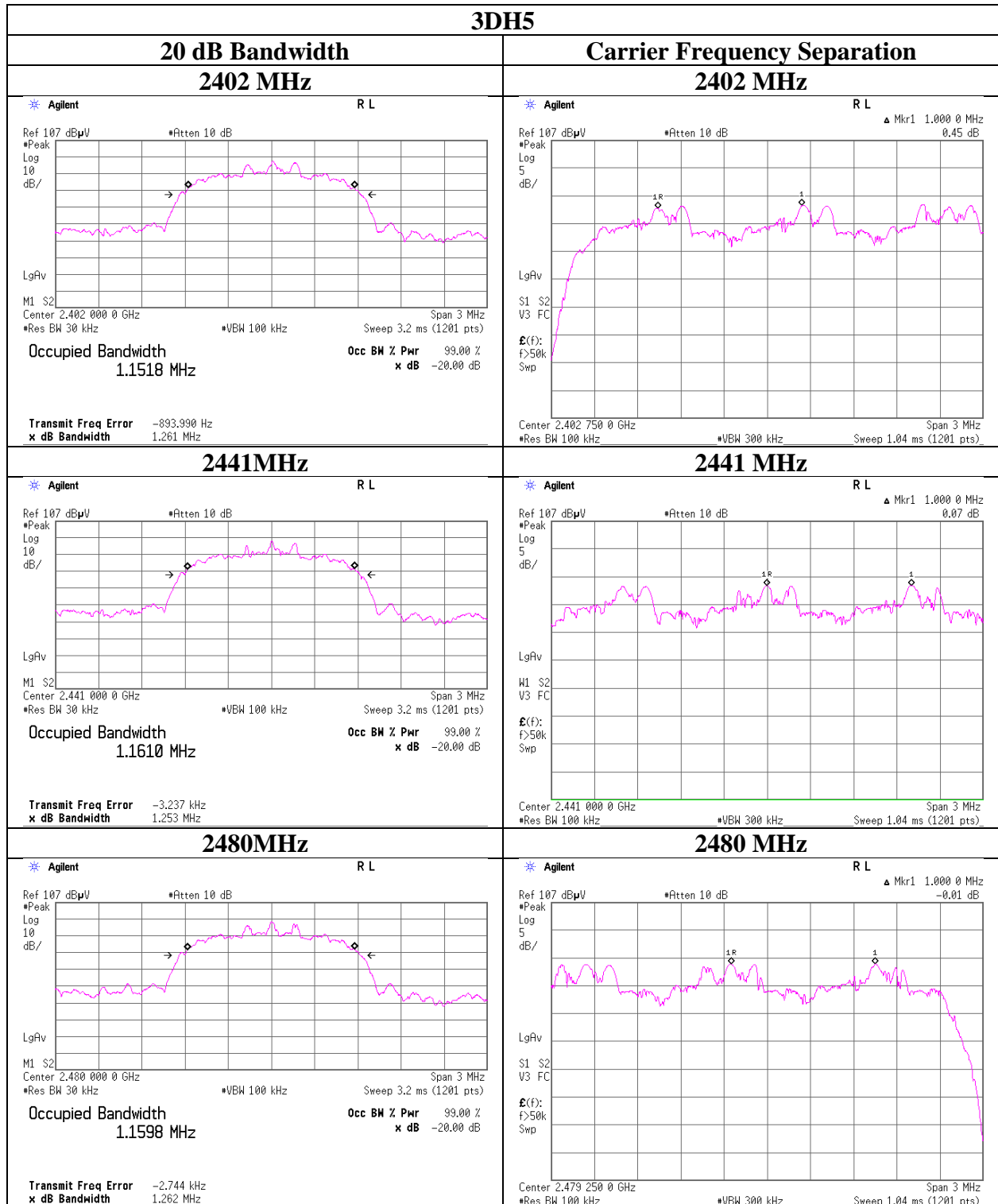
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Facsimile : +81 463 50 6401

20 dB Bandwidth and Carrier Frequency Separation



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

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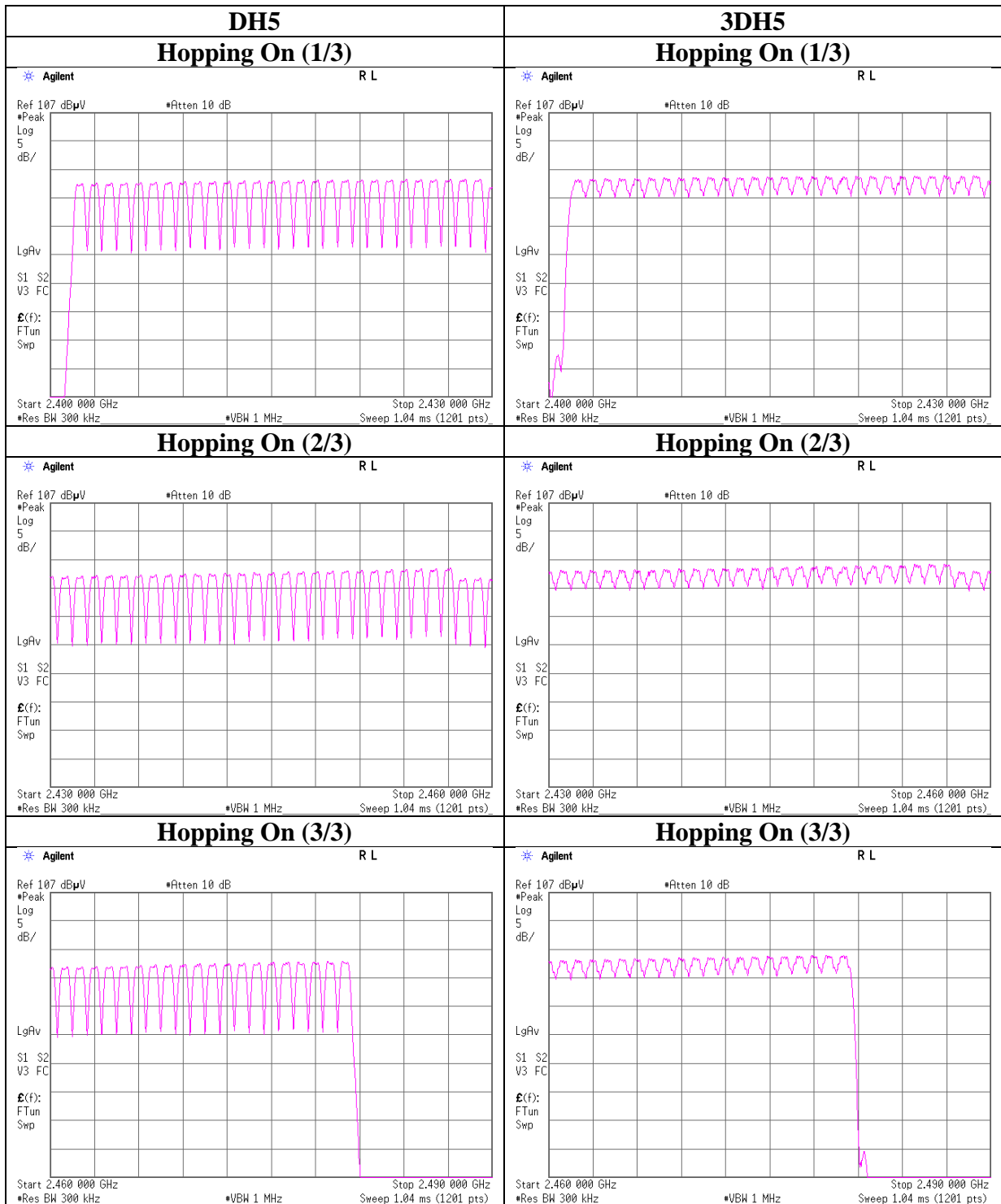
Number of Hopping Frequency

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11989475S-F
Date October 16, 2017
Temperature / Humidity 23 deg. C / 62 % RH
Engineer Kenichi Adachi
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.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping On

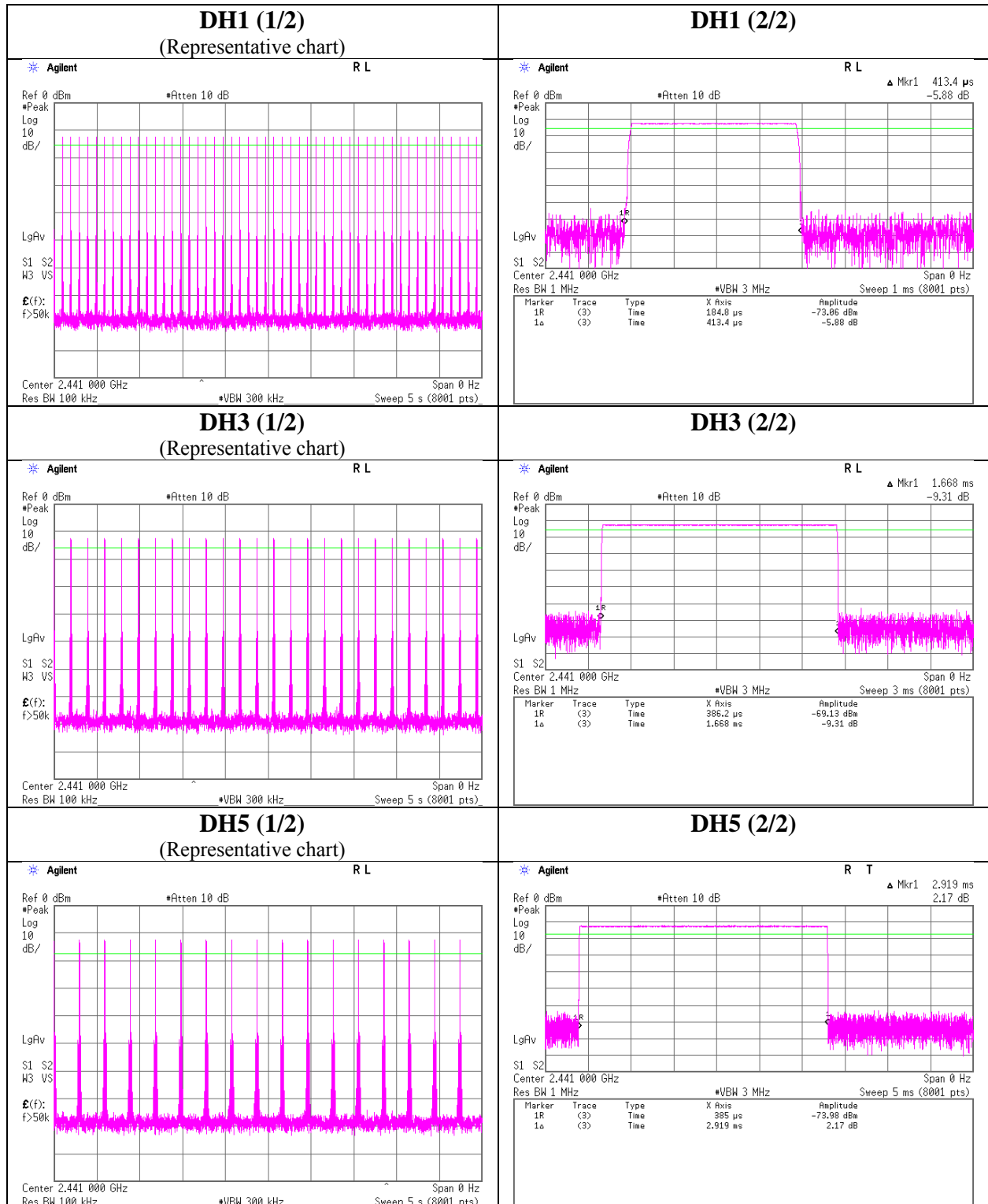
Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	51.0 times / 5 s x 31.6 s = 323 times	0.413	134	400
DH3	26.0 times / 5 s x 31.6 s = 165 times	1.668	275	400
DH5	17.0 times / 5 s x 31.6 s = 108 times	2.919	315	400
3DH1	51.0 times / 5 s x 31.6 s = 323 times	0.432	140	400
3DH3	26.0 times / 5 s x 31.6 s = 165 times	1.683	278	400
3DH5	17.0 times / 5 s x 31.6 s = 108 times	2.933	317	400

Sample Calculation

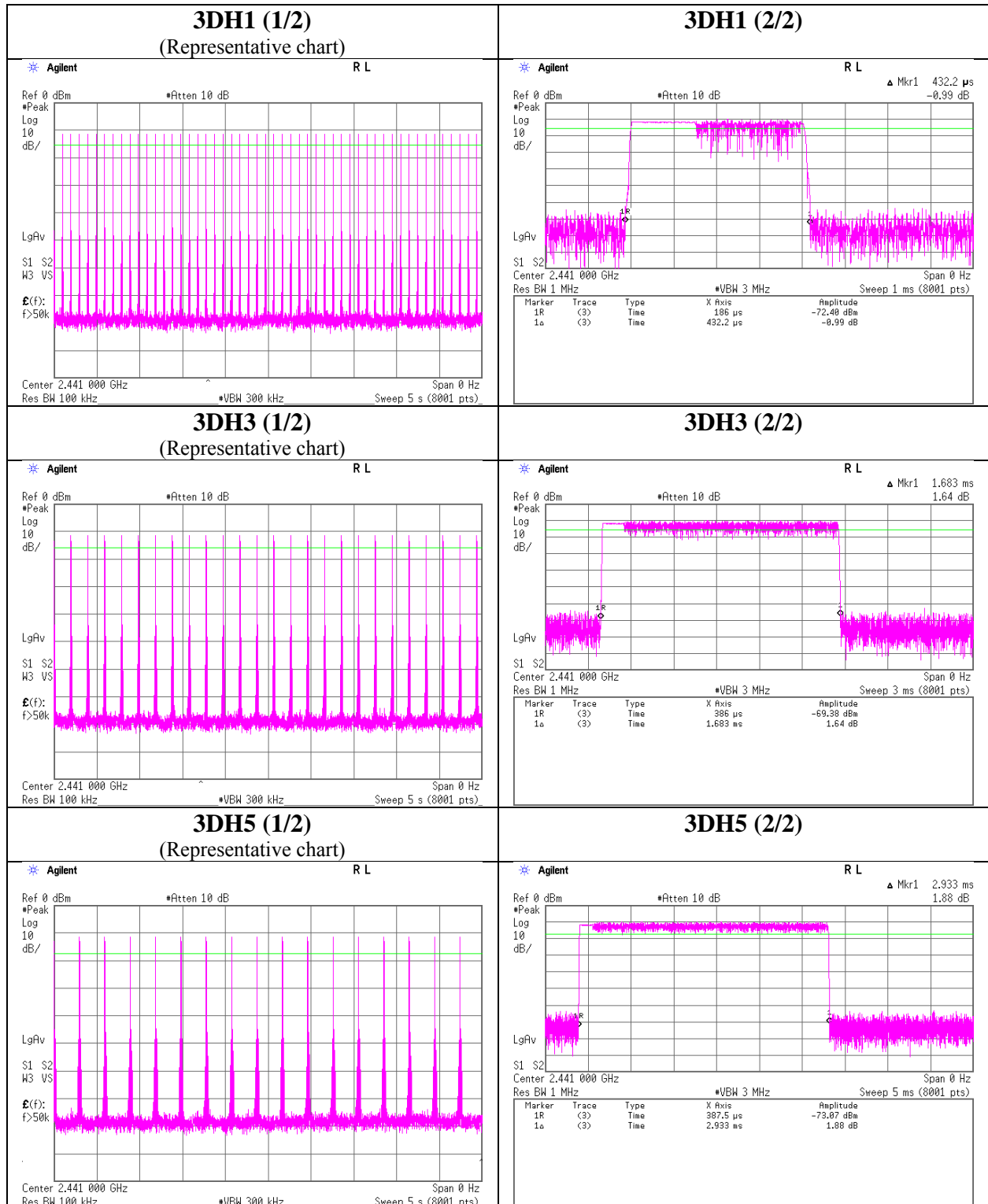
Result = Number of transmission x Length of transmission

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

Dwell time



Dwell time



Maximum Peak Output Power

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11989475S-F
Date October 16, 2017
Temperature / Humidity 23 deg. C / 62 % RH
Engineer Kenichi Adachi
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	-11.38	1.47	9.96	0.05	1.01	20.96	125	20.91
DH5	2441.0	-11.06	1.48	9.97	0.39	1.09	20.96	125	20.57
DH5	2480.0	-10.91	1.49	9.97	0.55	1.14	20.96	125	20.41
2DH5	2402.0	-9.06	1.47	9.96	2.37	1.73	20.96	125	18.59
2DH5	2441.0	-8.87	1.47	9.97	2.57	1.81	20.96	125	18.39
2DH5	2480.0	-8.52	1.49	9.97	2.94	1.97	20.96	125	18.02
3DH5	2402.0	-8.73	1.47	9.96	2.70	1.86	20.96	125	18.26
3DH5	2441.0	-8.42	1.48	9.97	3.03	2.01	20.96	125	17.93
3DH5	2480.0	-8.12	1.49	9.97	3.34	2.16	20.96	125	17.62

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: 20 ch) 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 20 dB BW without 2/3 relaxation, 125 mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure / SAR testing)

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11989475S-F
Date October 16, 2017
Temperature / Humidity 23 deg. C / 62 % RH
Engineer Kenichi Adachi
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	-13.07	1.47	9.96	-1.64	0.69	1.10	-0.54	0.88
DH5	2441.0	-12.87	1.48	9.97	-1.42	0.72	1.10	-0.32	0.93
DH5	2480.0	-12.63	1.49	9.97	-1.17	0.76	1.10	-0.07	0.98
2DH5	2402.0	-13.41	1.47	9.96	-1.98	0.63	1.07	-0.91	0.81
2DH5	2441.0	-13.12	1.48	9.97	-1.67	0.68	1.07	-0.60	0.87
2DH5	2480.0	-12.74	1.49	9.97	-1.28	0.74	1.07	-0.21	0.95
3DH5	2402.0	-13.42	1.47	9.96	-1.99	0.63	1.07	-0.92	0.81
3DH5	2441.0	-13.11	1.48	9.97	-1.66	0.68	1.07	-0.59	0.87
3DH5	2480.0	-12.73	1.49	9.97	-1.27	0.75	1.07	-0.20	0.95

Sample Calculation:

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

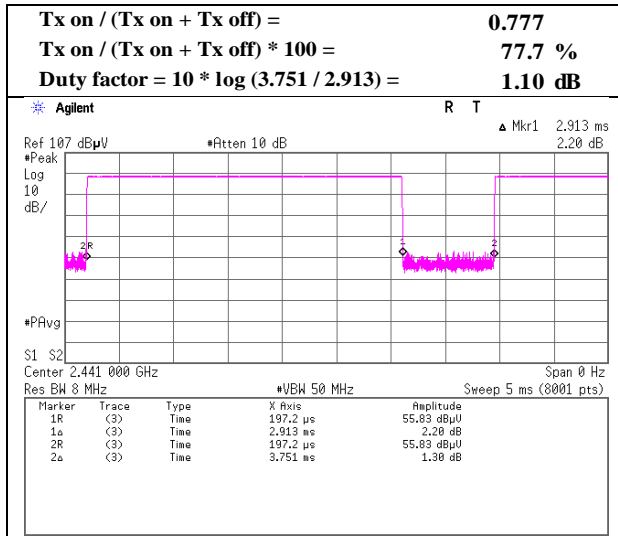
Result (Burst power average) = Time average + Duty factor

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

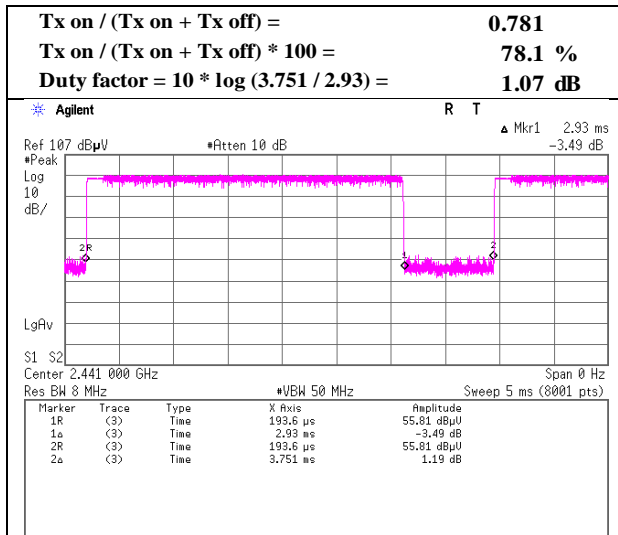
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off

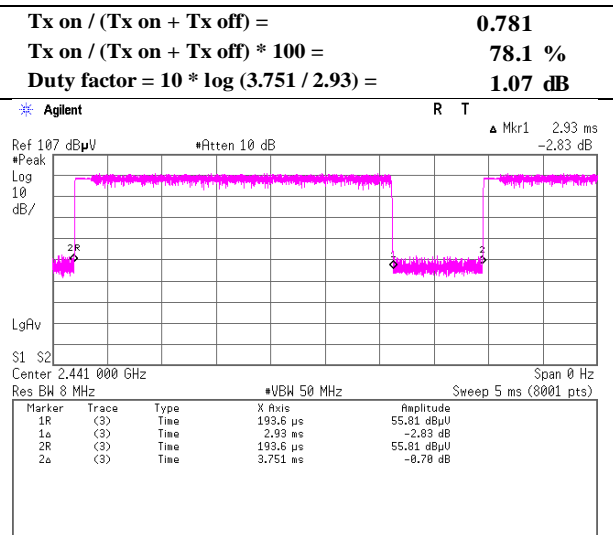
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 23, 2017 October 24, 2017
Temperature / Humidity 20 deg. C / 55 % RH 23 deg. C / 43 % RH
Engineer Yasumasa Owaki Shiro Kobayashi
(30 MHz -1 GHz, (1 GHz - 13 GHz)
13 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.	33.202	QP	21.70	16.64	6.89	31.90	0.00	13.33	40.00	26.6	300	158	
Hori.	232.007	QP	33.80	11.60	5.93	31.72	0.00	19.61	46.00	26.3	100	154	
Hori.	252.003	QP	37.70	11.80	6.09	31.69	0.00	23.90	46.00	22.1	100	158	
Hori.	259.996	QP	35.10	12.06	6.15	31.69	0.00	21.62	46.00	24.3	100	344	
Hori.	2390.000	PK	49.15	27.26	14.15	44.13	2.17	48.60	73.90	25.3	146	299	
Hori.	4804.000	PK	54.68	31.40	6.65	44.45	2.17	50.45	73.90	23.4	125	308	
Hori.	7206.000	PK	48.96	36.56	8.26	43.99	2.17	51.96	73.90	21.9	150	0	
Hori.	9608.000	PK	48.77	38.61	9.24	43.83	2.17	54.96	73.90	18.9	150	0	
Hori.	19216.000	PK	48.70	40.44	12.83	45.28	-9.54	47.15	73.90	26.7	130	78	
Hori.	2390.000	AV	37.31	27.26	14.15	44.13	2.17	36.76	53.90	17.1	146	299	
Hori.	4804.000	AV	46.42	31.40	6.65	44.45	2.17	42.19	53.90	11.7	125	308	
Hori.	7206.000	AV	36.40	36.56	8.26	43.99	2.17	39.40	53.90	14.5	150	0	
Hori.	9608.000	AV	37.35	38.61	9.24	43.83	2.17	43.54	53.90	10.3	150	0	
Hori.	19216.000	AV	43.60	40.44	12.83	45.28	-9.54	42.05	53.90	11.8	130	78	
Vert.	124.723	QP	21.50	13.29	8.09	31.83	0.00	11.05	43.50	32.4	100	187	
Vert.	211.998	QP	33.90	11.45	5.77	31.75	0.00	19.37	43.50	24.1	155	0	
Vert.	252.000	QP	36.10	11.80	6.09	31.69	0.00	22.30	46.00	23.7	133	273	
Vert.	336.001	QP	33.40	14.26	6.71	31.63	0.00	22.74	46.00	23.2	100	246	
Vert.	444.002	QP	33.10	16.68	7.44	31.61	0.00	25.61	46.00	20.3	100	236	
Vert.	2390.000	PK	48.81	27.26	14.15	44.13	2.17	48.26	73.90	25.6	140	77	
Vert.	4804.000	PK	54.45	31.40	6.65	44.45	2.17	50.22	73.90	23.6	158	11	
Vert.	7206.000	PK	48.93	36.56	8.26	43.99	2.17	51.93	73.90	21.9	150	0	
Vert.	9608.000	PK	48.92	38.61	9.24	43.83	2.17	55.11	73.90	18.7	150	0	
Vert.	19216.000	PK	50.89	40.44	12.83	45.28	-9.54	49.34	73.90	24.5	138	56	
Vert.	2390.000	AV	37.30	27.26	14.15	44.13	2.17	36.75	53.90	17.1	140	77	
Vert.	4804.000	AV	46.53	31.40	6.65	44.45	2.17	42.30	53.90	11.6	158	11	
Vert.	7206.000	AV	36.41	36.56	8.26	43.99	2.17	39.41	53.90	14.4	150	0	
Vert.	9608.000	AV	37.39	38.61	9.24	43.83	2.17	43.58	53.90	10.3	150	0	
Vert.	19216.000	AV	46.99	40.44	12.83	45.28	-9.54	45.44	53.90	8.4	138	56	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.85 m / 3.0 m) = 2.17 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	97.00	27.29	14.16	44.14	2.17	96.48	-	-	Carrier
Hori.	2399.176	PK	50.43	27.29	14.15	44.14	2.17	49.90	76.48	26.6	
Hori.	2400.000	PK	51.85	27.29	14.15	44.14	2.17	51.32	76.48	25.2	
Vert.	2402.000	PK	98.61	27.29	14.16	44.14	2.17	98.09	-	-	Carrier
Vert.	2399.171	PK	51.13	27.29	14.15	44.14	2.17	50.60	78.09	27.5	
Vert.	2400.000	PK	52.05	27.29	14.15	44.14	2.17	51.52	78.09	26.6	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.85 m / 3.0 m) = 2.17 dB

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

UL Japan, Inc.

Shonan EMC Lab.

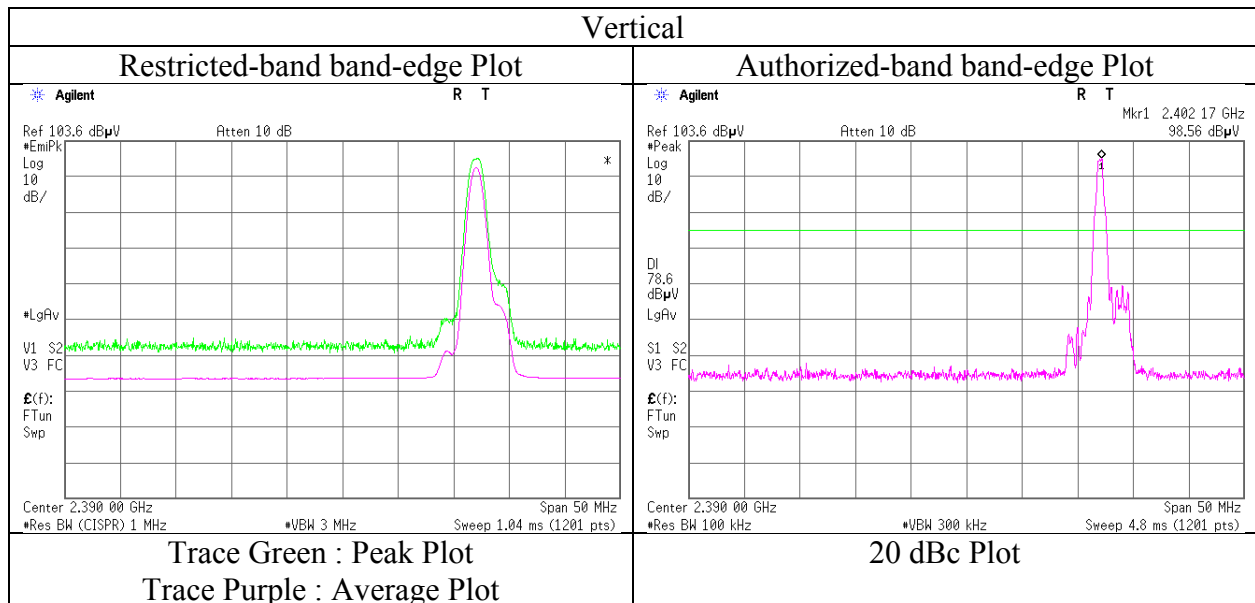
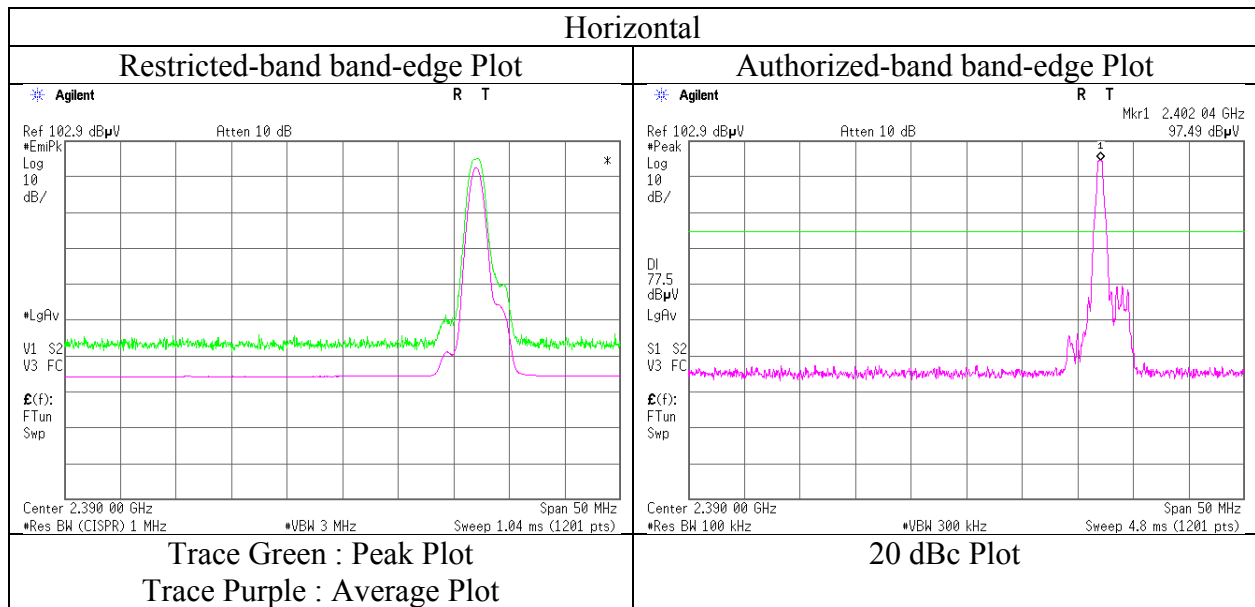
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 24, 2017
Temperature / Humidity 23 deg. C / 43 % RH
Engineer Shiro Kobayashi
(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. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 23, 2017 October 24, 2017
Temperature / Humidity 20 deg. C / 55 % RH 23 deg. C / 43 % RH
Engineer Yasumasa Owaki Shiro Kobayashi
(30 MHz - 1 GHz, (1 GHz - 13 GHz)
13 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.	86.058	QP	21.80	7.43	8.21	31.86	0.00	5.58	40.00	34.4	300	274	
Hori.	247.994	QP	35.50	11.72	6.05	31.70	0.00	21.57	46.00	24.4	100	315	
Hori.	251.954	QP	38.40	11.79	6.08	31.69	0.00	24.58	46.00	21.4	100	107	
Hori.	4882.000	PK	54.79	31.62	6.75	44.48	2.17	50.85	73.90	23.0	201	287	
Hori.	7323.000	PK	47.54	36.77	8.39	44.03	2.17	50.84	73.90	23.0	150	0	
Hori.	9764.000	PK	48.50	38.80	9.34	43.85	2.17	54.96	73.90	18.9	150	0	
Hori.	19528.000	PK	48.58	40.34	12.98	45.30	-9.54	47.06	73.90	26.8	127	78	
Hori.	4882.000	AV	47.69	31.62	6.75	44.48	2.17	43.75	53.90	10.1	201	287	
Hori.	7323.000	AV	36.24	36.77	8.39	44.03	2.17	39.54	53.90	14.3	150	0	
Hori.	9764.000	AV	36.85	38.80	9.34	43.85	2.17	43.31	53.90	10.5	150	0	
Hori.	19528.000	AV	42.82	40.34	12.98	45.30	-9.54	41.30	53.90	12.6	127	78	
Vert.	31.826	QP	22.40	16.93	6.84	31.90	0.00	14.27	40.00	25.7	100	184	
Vert.	212.003	QP	32.30	11.45	5.77	31.75	0.00	17.77	43.50	25.7	156	264	
Vert.	252.001	QP	36.10	11.80	6.09	31.69	0.00	22.30	46.00	23.7	136	245	
Vert.	335.994	QP	33.70	14.26	6.71	31.63	0.00	23.04	46.00	22.9	100	285	
Vert.	404.006	QP	30.60	15.90	7.17	31.62	0.00	22.05	46.00	23.9	103	244	
Vert.	444.063	QP	33.10	16.68	7.44	31.61	0.00	25.61	46.00	20.3	100	4	
Vert.	4882.000	PK	54.98	31.62	6.75	44.48	2.17	51.04	73.90	22.8	113	25	
Vert.	7323.000	PK	47.60	36.77	8.39	44.03	2.17	50.90	73.90	23.0	150	0	
Vert.	9764.000	PK	48.22	38.80	9.34	43.85	2.17	54.68	73.90	19.2	150	0	
Vert.	19528.000	PK	51.08	40.34	12.98	45.30	-9.54	49.56	73.90	24.3	134	58	
Vert.	4882.000	AV	47.26	31.62	6.75	44.48	2.17	43.32	53.90	10.5	113	25	
Vert.	7323.000	AV	35.78	36.77	8.39	44.03	2.17	39.08	53.90	14.8	150	0	
Vert.	9764.000	AV	36.39	38.80	9.34	43.85	2.17	42.85	53.90	11.0	150	0	
Vert.	19528.000	AV	45.83	40.34	12.98	45.30	-9.54	44.31	53.90	9.5	134	58	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.85\text{ m} / 3.0\text{ m}) = 2.17\text{ dB}$

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

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

Radiated Spurious Emission

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 23, 2017 October 24, 2017
Temperature / Humidity 20 deg. C / 55 % RH 23 deg. C / 43 % RH
Engineer Yasumasa Owaki Shiro Kobayashi
(30 MHz -1 GHz, (1 GHz - 13 GHz)
13 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.	144.905	QP	21.50	14.60	8.55	31.81	0.00	12.84	43.50	30.6	200	93	
Hori.	251.890	QP	38.50	11.79	6.08	31.69	0.00	24.68	46.00	21.3	100	303	
Hori.	259.859	QP	37.00	12.06	6.14	31.69	0.00	23.51	46.00	22.4	100	321	
Hori.	2483.500	PK	48.77	27.55	14.24	44.16	2.17	48.57	73.90	25.3	140	304	
Hori.	4960.000	PK	54.26	31.83	6.83	44.51	2.17	50.58	73.90	23.3	101	309	
Hori.	7440.000	PK	48.60	36.97	8.52	44.08	2.17	52.18	73.90	21.7	150	0	
Hori.	9920.000	PK	48.91	38.98	9.42	43.87	2.17	55.61	73.90	18.2	150	0	
Hori.	19840.000	PK	47.00	40.24	13.31	45.36	-9.54	45.65	73.90	28.2	127	89	
Hori.	2483.500	AV	38.19	27.55	14.24	44.16	2.17	37.99	53.90	15.9	140	304	
Hori.	4960.000	AV	46.39	31.83	6.83	44.51	2.17	42.71	53.90	11.1	101	309	
Hori.	7440.000	AV	37.13	36.97	8.52	44.08	2.17	40.71	53.90	13.1	150	0	
Hori.	9920.000	AV	36.88	38.98	9.42	43.87	2.17	43.58	53.90	10.3	150	0	
Hori.	19840.000	AV	41.11	40.24	13.31	45.36	-9.54	39.76	53.90	14.1	127	89	
Vert.	46.945	QP	21.60	11.90	7.22	31.89	0.00	8.83	40.00	31.1	100	3	
Vert.	212.010	QP	30.70	11.45	5.77	31.75	0.00	16.17	43.50	27.3	100	346	
Vert.	251.890	QP	36.40	11.79	6.08	31.69	0.00	22.58	46.00	23.4	100	272	
Vert.	308.008	QP	32.00	13.58	6.51	31.67	0.00	20.42	46.00	25.5	100	103	
Vert.	343.996	QP	31.70	14.46	6.77	31.62	0.00	21.31	46.00	24.6	100	239	
Vert.	444.003	QP	33.00	16.68	7.44	31.61	0.00	25.51	46.00	20.4	100	252	
Vert.	2483.500	PK	49.83	27.55	14.24	44.16	2.17	49.63	73.90	24.2	115	47	
Vert.	4960.000	PK	53.83	31.83	6.83	44.51	2.17	50.15	73.90	23.7	111	122	
Vert.	7440.000	PK	48.73	36.97	8.52	44.08	2.17	52.31	73.90	21.5	150	0	
Vert.	9920.000	PK	48.81	38.98	9.42	43.87	2.17	55.51	73.90	18.3	150	0	
Vert.	19840.000	PK	50.67	40.24	13.31	45.36	-9.54	49.32	73.90	24.5	134	60	
Vert.	2483.500	AV	38.41	27.55	14.24	44.16	2.17	38.21	53.90	15.6	115	47	
Vert.	4960.000	AV	44.70	31.83	6.83	44.51	2.17	41.02	53.90	12.8	111	122	
Vert.	7440.000	AV	37.12	36.97	8.52	44.08	2.17	40.70	53.90	13.2	150	0	
Vert.	9920.000	AV	36.90	38.98	9.42	43.87	2.17	43.60	53.90	10.3	150	0	
Vert.	19840.000	AV	45.72	40.24	13.31	45.36	-9.54	44.37	53.90	9.5	134	60	

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

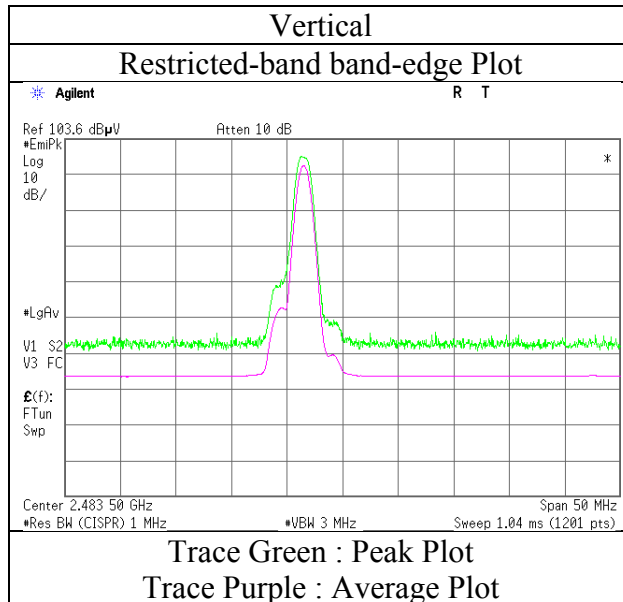
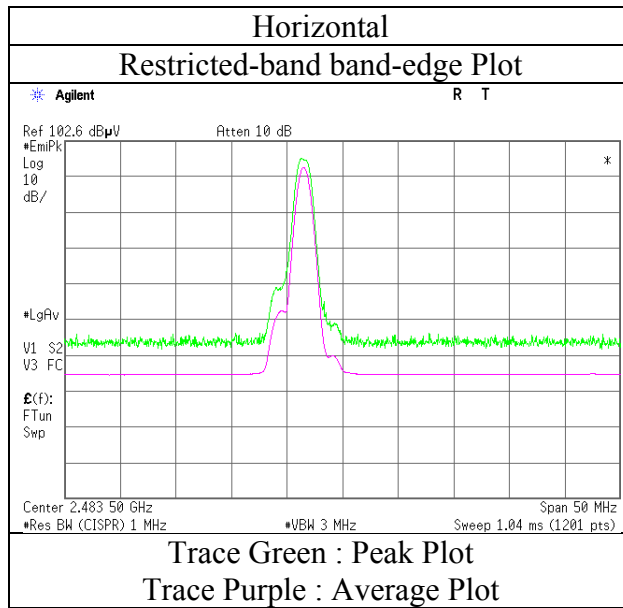
Distance factor : 1 GHz - 13 GHz : 20log(3.85 m / 3.0 m) = 2.17 dB

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11989475S-F
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 24, 2017
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Shiro Kobayashi (1 GHz – 13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 23, 2017 October 24, 2017
Temperature / Humidity 20 deg. C / 55 % RH 23 deg. C / 43 % RH
Engineer Yasumasa Owaki Shiro Kobayashi
(30 MHz -1 GHz, (1 GHz - 13 GHz)
13 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.	109.221	QP	22.60	11.42	7.97	31.84	0.00	10.15	43.50	33.3	200	49	
Hori.	212.002	QP	32.80	11.45	5.77	31.75	0.00	18.27	43.50	25.2	100	120	
Hori.	239.949	QP	35.90	11.66	5.99	31.71	0.00	21.84	46.00	24.1	100	288	
Hori.	243.896	QP	37.10	11.68	6.02	31.70	0.00	23.10	46.00	22.9	100	318	
Hori.	259.897	QP	36.00	12.06	6.15	31.69	0.00	22.52	46.00	23.4	100	308	
Hori.	2390.000	PK	48.92	27.26	14.15	44.13	2.17	48.37	73.90	25.5	145	300	
Hori.	4804.000	PK	53.74	31.40	6.65	44.45	2.17	49.51	73.90	24.3	100	308	
Hori.	7206.000	PK	47.94	36.56	8.26	43.99	2.17	50.94	73.90	22.9	150	0	
Hori.	9608.000	PK	49.21	38.61	9.24	43.83	2.17	55.40	73.90	18.5	150	0	
Hori.	19216.000	PK	45.92	40.44	12.83	45.28	-9.54	44.37	73.90	29.5	100	0	
Hori.	2390.000	AV	37.32	27.26	14.15	44.13	2.17	36.77	53.90	17.1	145	300	
Hori.	4804.000	AV	43.60	31.40	6.65	44.45	2.17	39.37	53.90	14.5	100	308	
Hori.	7206.000	AV	36.42	36.56	8.26	43.99	2.17	39.42	53.90	14.4	150	0	
Hori.	9608.000	AV	37.43	38.61	9.24	43.83	2.17	43.62	53.90	10.2	150	0	
Hori.	19216.000	AV	37.25	40.44	12.83	45.28	-9.54	35.70	53.90	18.2	100	0	
Vert.	39.525	QP	22.00	14.57	7.04	31.90	0.00	11.71	40.00	28.2	100	185	
Vert.	260.007	QP	34.10	12.06	6.15	31.69	0.00	20.62	46.00	25.3	114	239	
Vert.	336.004	QP	33.70	14.26	6.71	31.63	0.00	23.04	46.00	22.9	100	274	
Vert.	444.016	QP	32.50	16.68	7.44	31.61	0.00	25.01	46.00	20.9	100	227	
Vert.	2390.000	PK	48.91	27.26	14.15	44.13	2.17	48.36	73.90	25.5	122	68	
Vert.	4804.000	PK	53.92	31.40	6.65	44.45	2.17	49.69	73.90	24.2	130	22	
Vert.	7206.000	PK	48.19	36.56	8.26	43.99	2.17	51.19	73.90	22.7	150	0	
Vert.	9608.000	PK	48.76	38.61	9.24	43.83	2.17	54.95	73.90	18.9	150	0	
Vert.	19216.000	PK	49.86	40.44	12.83	45.28	-9.54	48.31	73.90	25.5	129	59	
Vert.	2390.000	AV	37.35	27.26	14.15	44.13	2.17	36.80	53.90	17.1	122	68	
Vert.	4804.000	AV	43.38	31.40	6.65	44.45	2.17	39.15	53.90	14.7	130	22	
Vert.	7206.000	AV	36.49	36.56	8.26	43.99	2.17	39.49	53.90	14.4	150	0	
Vert.	9608.000	AV	37.46	38.61	9.24	43.83	2.17	43.65	53.90	10.2	150	0	
Vert.	19216.000	AV	41.30	40.44	12.83	45.28	-9.54	39.75	53.90	14.1	129	59	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.85 m / 3.0 m) = 2.17 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	98.97	27.29	14.16	44.14	2.17	98.45	-	-	Carrier
Hori.	2399.508	PK	60.98	27.29	14.15	44.14	2.17	60.45	78.45	18.0	
Hori.	2400.000	PK	62.17	27.29	14.15	44.14	2.17	61.64	78.45	16.8	
Vert.	2402.000	PK	98.87	27.29	14.16	44.14	2.17	98.35	-	-	Carrier
Vert.	2399.504	PK	61.35	27.29	14.15	44.14	2.17	60.82	78.35	17.5	
Vert.	2400.000	PK	62.37	27.29	14.15	44.14	2.17	61.84	78.35	16.5	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.85 m / 3.0 m) = 2.17 dB

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

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Shonan EMC Lab.

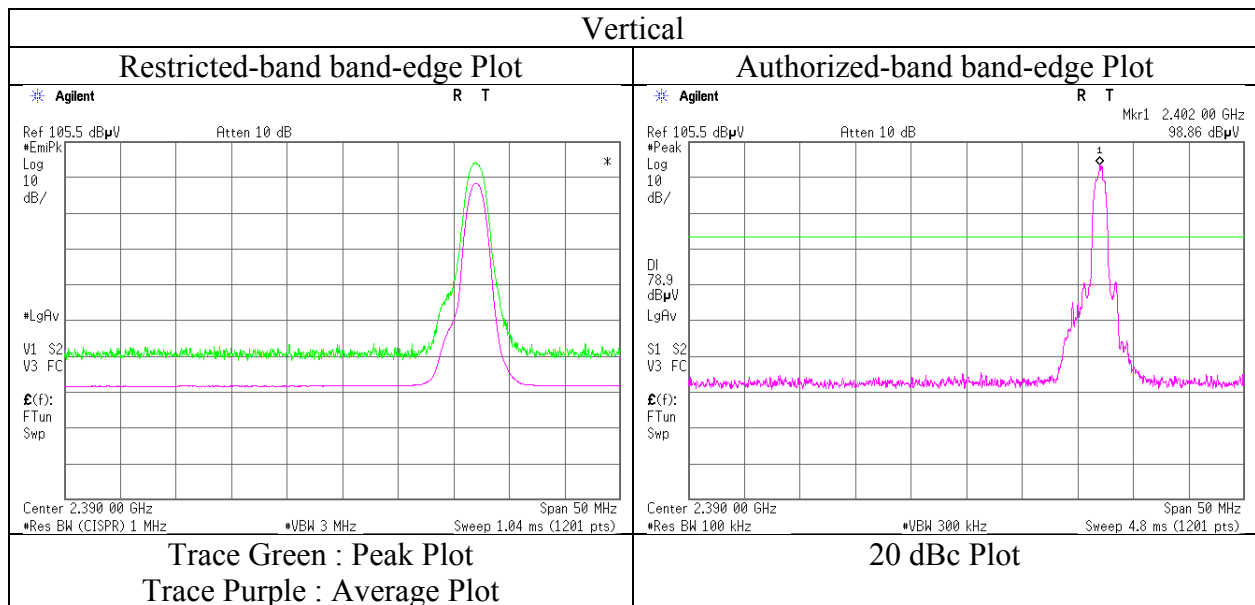
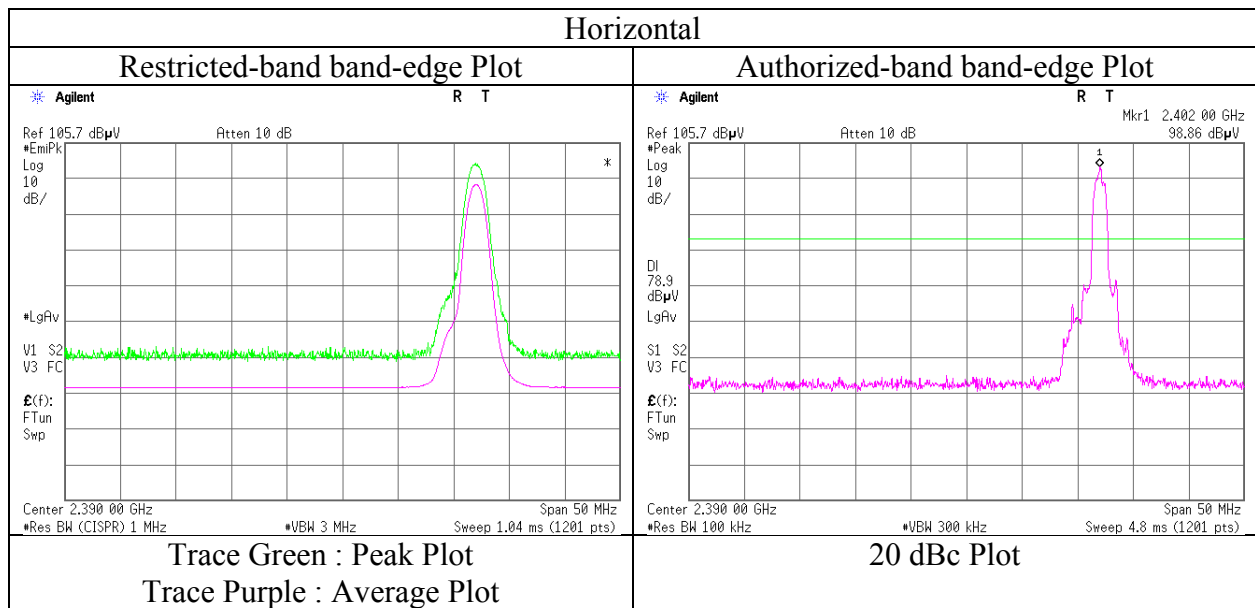
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date October 24, 2017
Temperature / Humidity 23 deg. C / 43 % RH
Engineer Shiro Kobayashi
(1 GHz – 13 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 23, 2017 October 24, 2017
Temperature / Humidity 20 deg. C / 55 % RH 23 deg. C / 43 % RH
Engineer Yasumasa Owaki Shiro Kobayashi
(30 MHz - 1 GHz, (1 GHz - 13 GHz)
13 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.	39.191	QP	22.20	14.69	7.04	31.90	0.00	12.03	40.00	27.9	300	4	
Hori.	211.946	QP	32.40	11.45	5.77	31.75	0.00	17.87	43.50	25.6	100	12	
Hori.	240.004	QP	35.30	11.66	5.99	31.71	0.00	21.24	46.00	24.7	100	359	
Hori.	243.961	QP	36.20	11.69	6.02	31.70	0.00	22.21	46.00	23.7	100	324	
Hori.	260.001	QP	34.70	12.06	6.15	31.69	0.00	21.22	46.00	24.7	100	357	
Hori.	4882.000	PK	53.44	31.62	6.75	44.48	2.17	49.50	73.90	24.4	108	308	
Hori.	7323.000	PK	48.36	36.77	8.39	44.03	2.17	51.66	73.90	22.2	150	0	
Hori.	9764.000	PK	48.10	38.80	9.34	43.85	2.17	54.56	73.90	19.3	150	0	
Hori.	19528.000	PK	45.77	40.34	12.98	45.30	-9.54	44.25	73.90	29.6	126	88	
Hori.	4882.000	AV	44.04	31.62	6.75	44.48	2.17	40.10	53.90	13.8	108	308	
Hori.	7323.000	AV	36.35	36.77	8.39	44.03	2.17	39.65	53.90	14.2	150	0	
Hori.	9764.000	AV	36.95	38.80	9.34	43.85	2.17	43.41	53.90	10.4	150	0	
Hori.	19528.000	AV	40.45	40.34	12.98	45.30	-9.54	38.93	53.90	14.9	126	88	
Vert.	94.771	QP	21.90	9.11	8.13	31.85	0.00	7.29	43.50	36.2	100	334	
Vert.	243.998	QP	35.00	11.69	6.02	31.70	0.00	21.01	46.00	24.9	100	251	
Vert.	336.004	QP	33.70	14.26	6.71	31.63	0.00	23.04	46.00	22.9	100	276	
Vert.	443.990	QP	32.30	16.68	7.44	31.61	0.00	24.81	46.00	21.1	100	231	
Vert.	4882.000	PK	53.07	31.62	6.75	44.48	2.17	49.13	73.90	24.7	125	89	
Vert.	7323.000	PK	48.69	36.77	8.39	44.03	2.17	51.99	73.90	21.9	150	0	
Vert.	9764.000	PK	48.30	38.80	9.34	43.85	2.17	54.76	73.90	19.1	150	0	
Vert.	19528.000	PK	50.04	40.34	12.98	45.30	-9.54	48.52	73.90	25.3	135	56	
Vert.	4882.000	AV	42.82	31.62	6.75	44.48	2.17	38.88	53.90	15.0	125	89	
Vert.	7323.000	AV	36.30	36.77	8.39	44.03	2.17	39.60	53.90	14.3	150	0	
Vert.	9764.000	AV	36.92	38.80	9.34	43.85	2.17	43.38	53.90	10.5	150	0	
Vert.	19528.000	AV	46.09	40.34	12.98	45.30	-9.54	44.57	53.90	9.3	135	56	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.85\text{ m} / 3.0\text{ m}) = 2.17\text{ dB}$

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

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

Radiated Spurious Emission

Report No. 11989475S-F
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 23, 2017 October 24, 2017
Temperature / Humidity 20 deg. C / 55 % RH 23 deg. C / 43 % RH
Engineer Yasumasa Owaki Shiro Kobayashi
(30 MHz -1 GHz, (1 GHz - 13 GHz)
13 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.	101.289	QP	21.60	10.30	8.02	31.85	0.00	8.07	43.50	35.4	200	7	
Hori.	211.998	QP	30.30	11.45	5.77	31.75	0.00	15.77	43.50	27.7	100	61	
Hori.	244.003	QP	35.90	11.69	6.02	31.70	0.00	21.91	46.00	24.0	100	324	
Hori.	252.000	QP	36.70	11.80	6.09	31.69	0.00	22.90	46.00	23.1	100	304	
Hori.	260.003	QP	35.70	12.06	6.15	31.69	0.00	22.22	46.00	23.7	100	3	
Hori.	2483.500	PK	50.26	27.55	14.24	44.16	2.17	50.06	73.90	23.8	102	306	
Hori.	4960.000	PK	53.35	31.83	6.83	44.51	2.17	49.67	73.90	24.2	102	309	
Hori.	7440.000	PK	49.26	36.97	8.52	44.08	2.17	52.84	73.90	21.0	150	0	
Hori.	9920.000	PK	48.90	38.98	9.42	43.87	2.17	55.60	73.90	18.3	150	0	
Hori.	19840.000	PK	47.21	40.24	13.31	45.36	-9.54	45.86	73.90	28.0	129	87	
Hori.	2483.500	AV	38.63	27.55	14.24	44.16	2.17	38.43	53.90	15.4	102	306	
Hori.	4960.000	AV	43.50	31.83	6.83	44.51	2.17	39.82	53.90	14.0	102	309	
Hori.	7440.000	AV	37.12	36.97	8.52	44.08	2.17	40.70	53.90	13.2	150	0	
Hori.	9920.000	AV	36.92	38.98	9.42	43.87	2.17	43.62	53.90	10.2	150	0	
Hori.	19840.000	AV	40.48	40.24	13.31	45.36	-9.54	39.13	53.90	14.7	129	87	
Vert.	37.177	QP	21.60	15.45	6.98	31.90	0.00	12.13	40.00	27.8	100	326	
Vert.	252.001	QP	34.60	11.80	6.09	31.69	0.00	20.80	46.00	25.2	100	263	
Vert.	335.917	QP	32.70	14.26	6.71	31.63	0.00	22.04	46.00	23.9	100	231	
Vert.	443.984	QP	31.30	16.68	7.44	31.61	0.00	23.81	46.00	22.1	100	220	
Vert.	2483.500	PK	51.12	27.55	14.24	44.16	2.17	50.92	73.90	22.9	118	88	
Vert.	4960.000	PK	52.26	31.83	6.83	44.51	2.17	48.58	73.90	25.3	133	99	
Vert.	7440.000	PK	48.64	36.97	8.52	44.08	2.17	52.22	73.90	21.6	150	0	
Vert.	9920.000	PK	48.70	38.98	9.42	43.87	2.17	55.40	73.90	18.5	150	0	
Vert.	19840.000	PK	51.27	40.24	13.31	45.36	-9.54	49.92	73.90	23.9	135	54	
Vert.	2483.500	AV	38.33	27.55	14.24	44.16	2.17	38.13	53.90	15.7	118	88	
Vert.	4960.000	AV	41.60	31.83	6.83	44.51	2.17	37.92	53.90	15.9	133	99	
Vert.	7440.000	AV	37.12	36.97	8.52	44.08	2.17	40.70	53.90	13.2	150	0	
Vert.	9920.000	AV	36.89	38.98	9.42	43.87	2.17	43.59	53.90	10.3	150	0	
Vert.	19840.000	AV	46.87	40.24	13.31	45.36	-9.54	45.52	53.90	8.3	135	54	

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

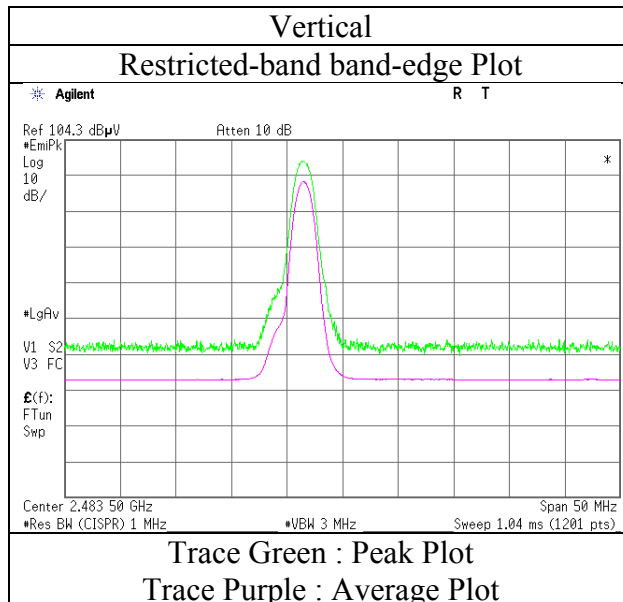
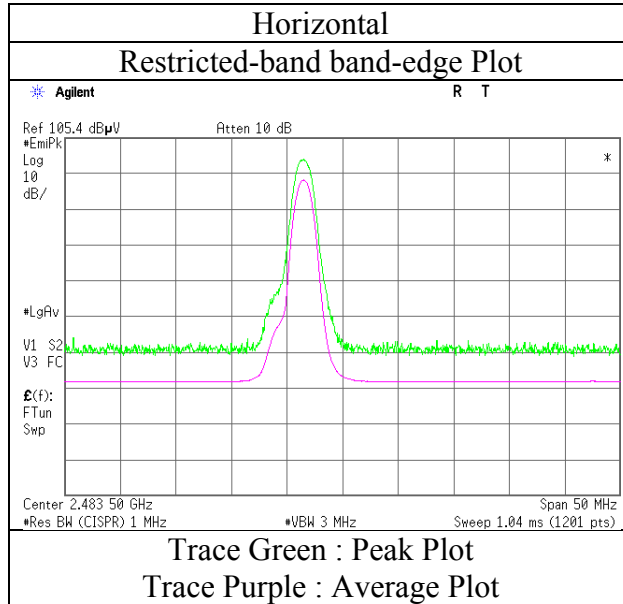
Distance factor : 1 GHz - 13 GHz : 20log(3.85 m / 3.0 m) = 2.17 dB

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

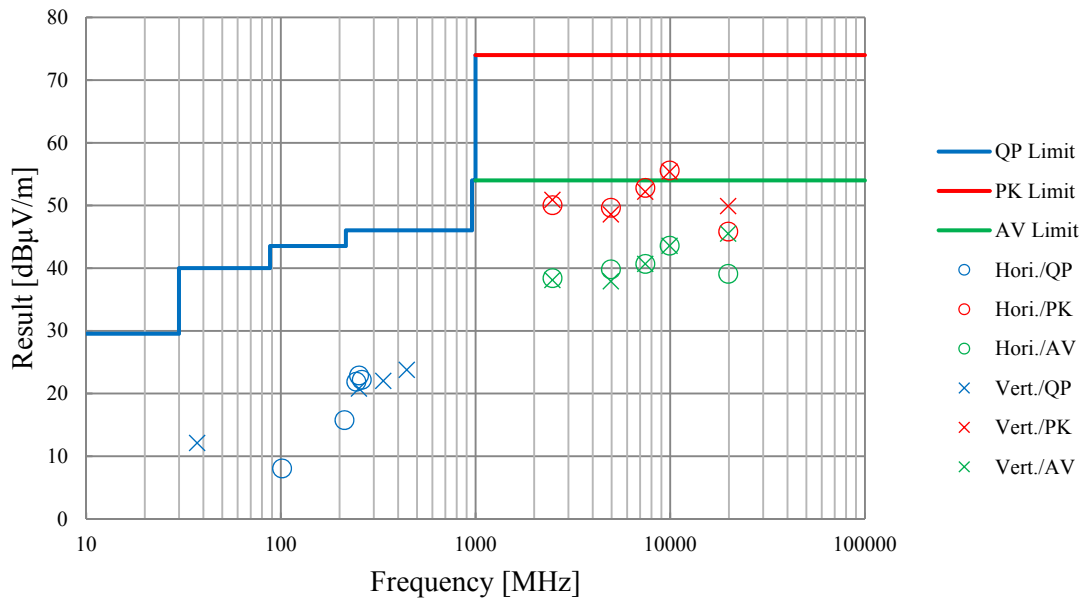
Report No.	11989475S-F
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 24, 2017
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Shiro Kobayashi (1 GHz – 13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11989475S-F	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	October 23, 2017	October 24, 2017
Temperature / Humidity	20 deg. C / 55 % RH	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki	Shiro Kobayashi
	(30 MHz -1 GHz,	(1 GHz - 13 GHz)
	13 GHz - 26.5 GHz)	
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

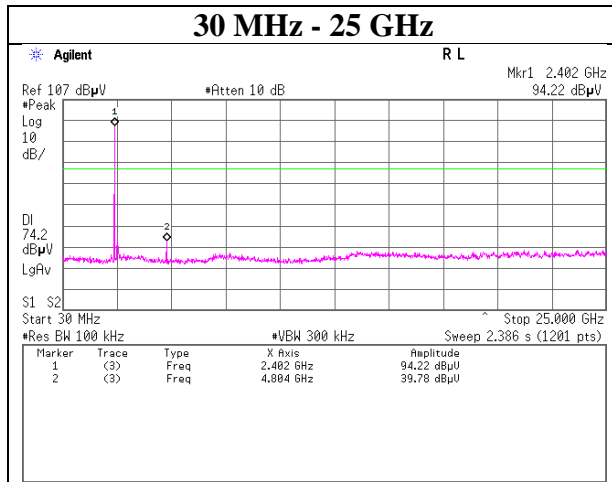
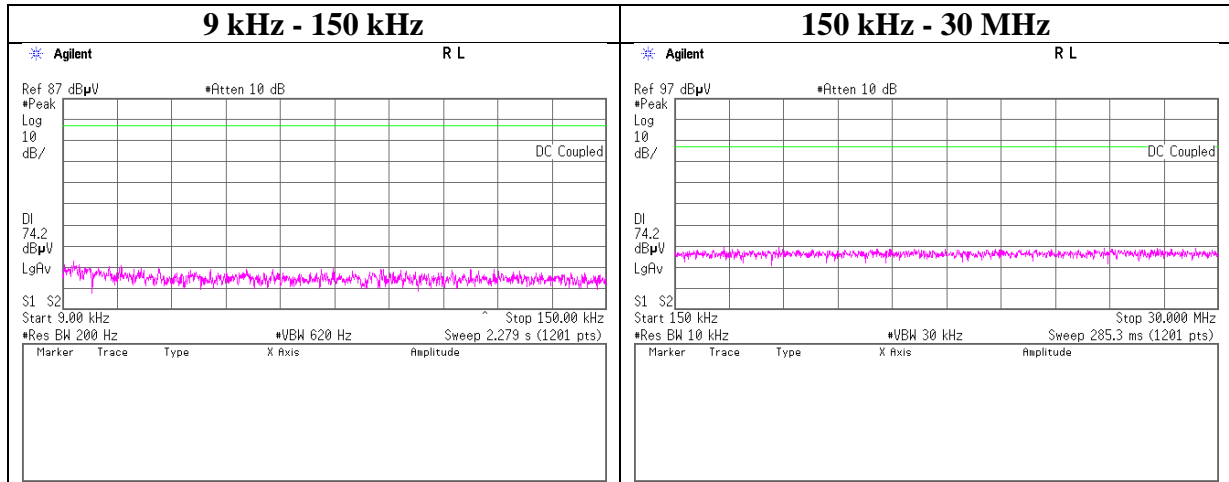


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, DH5, 2402 MHz

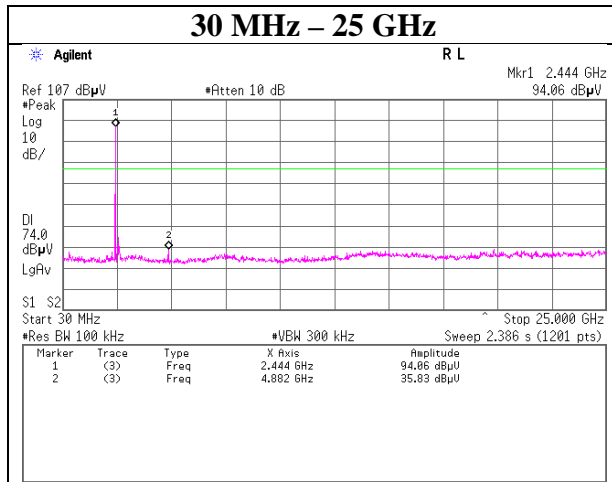
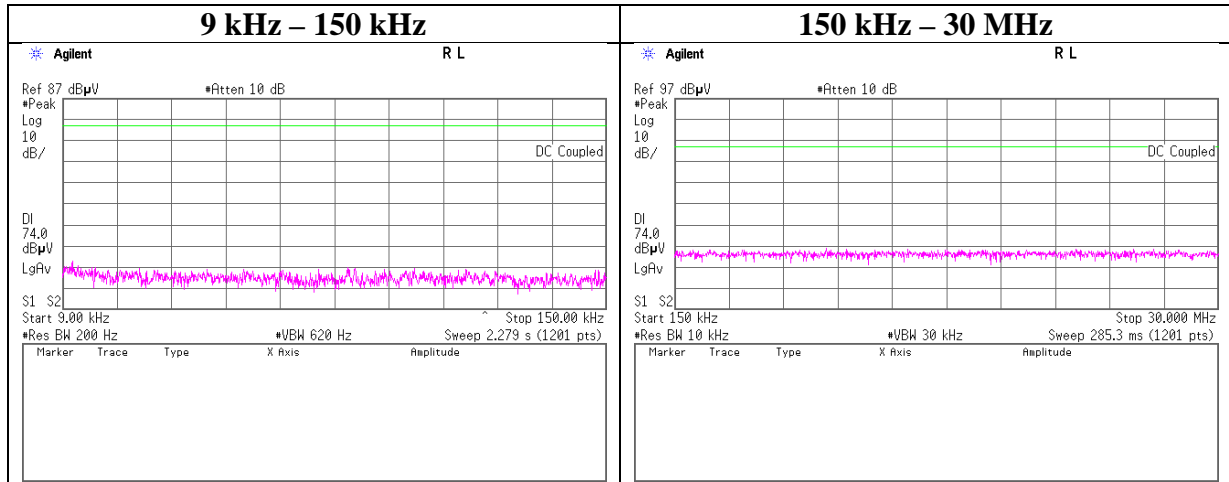
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, DH5, 2441 MHz

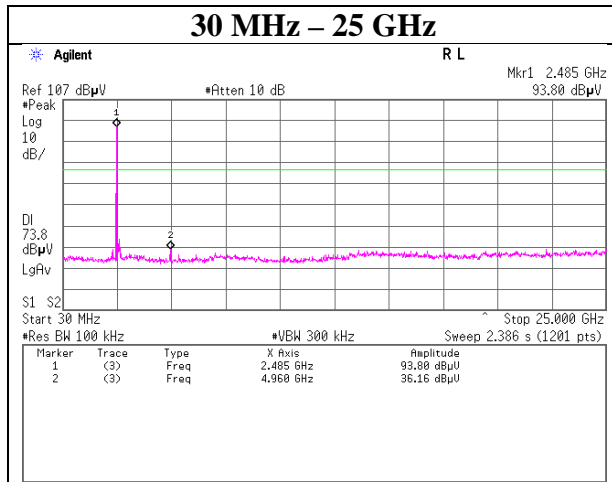
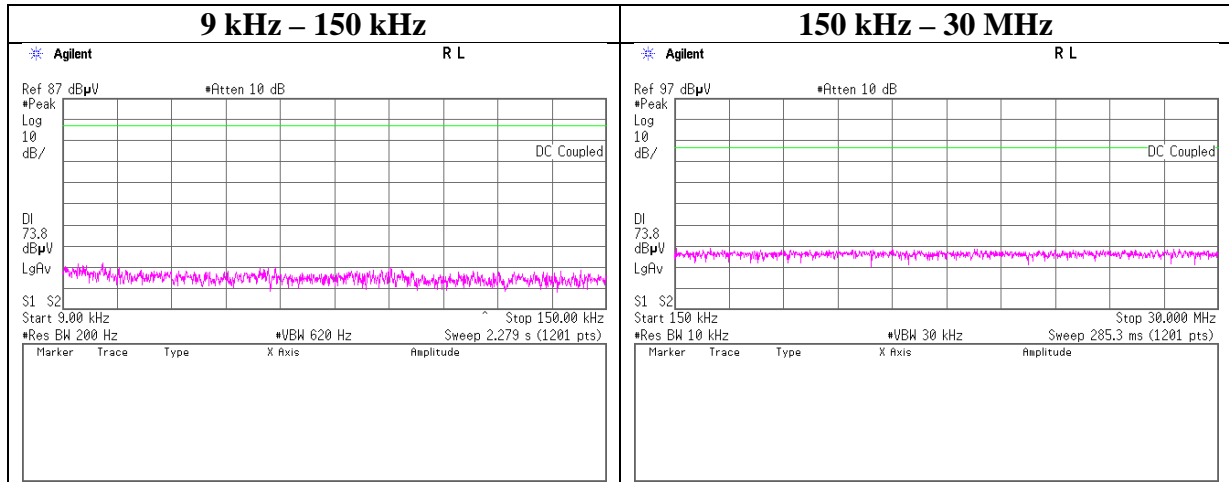
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, DH5, 2480 MHz

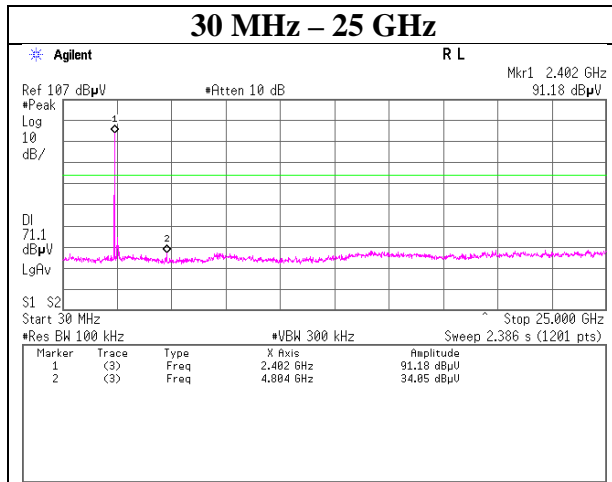
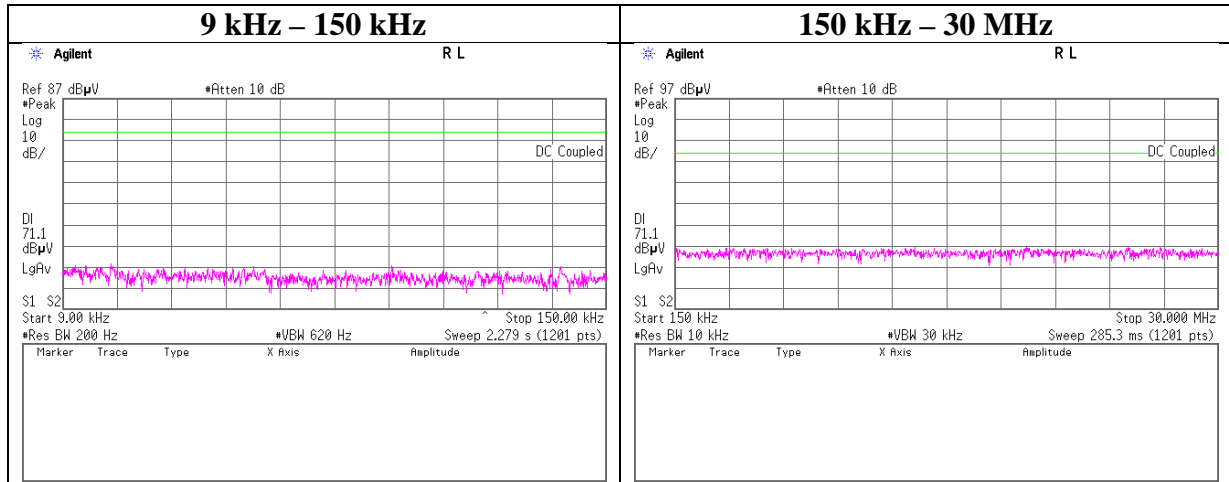
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, 3DH5, 2402 MHz

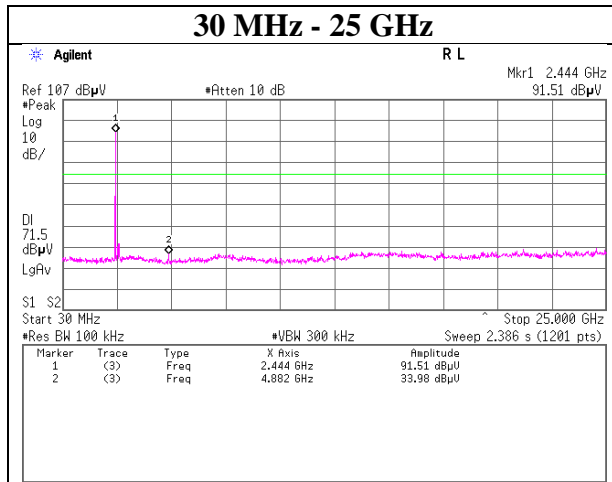
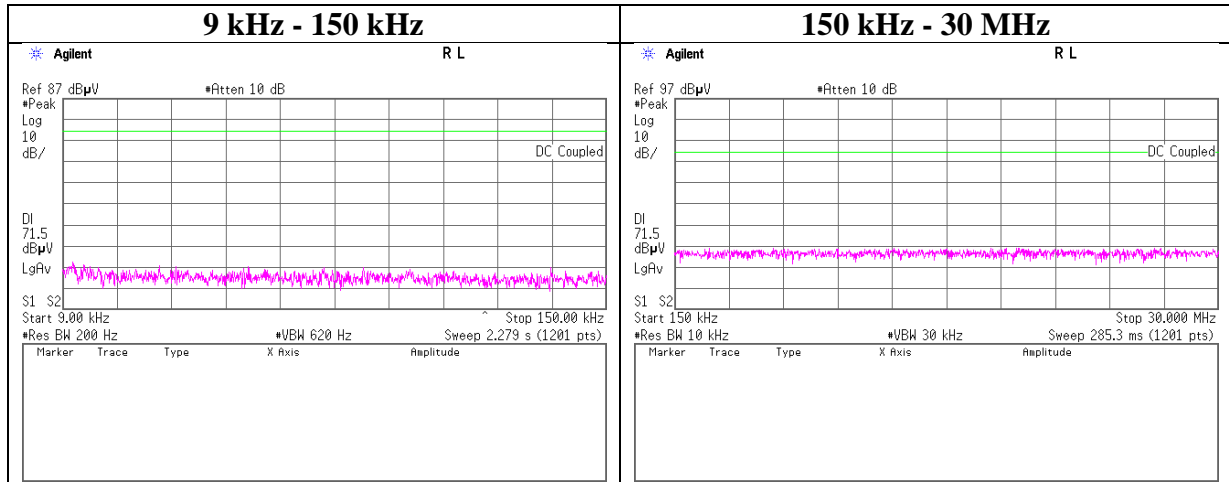
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, 3DH5, 2441 MHz

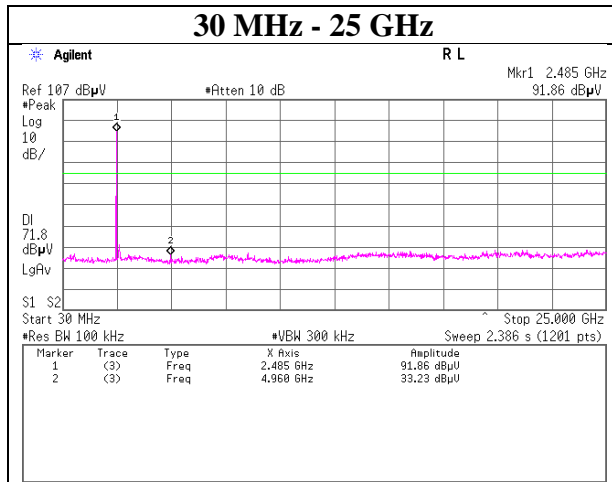
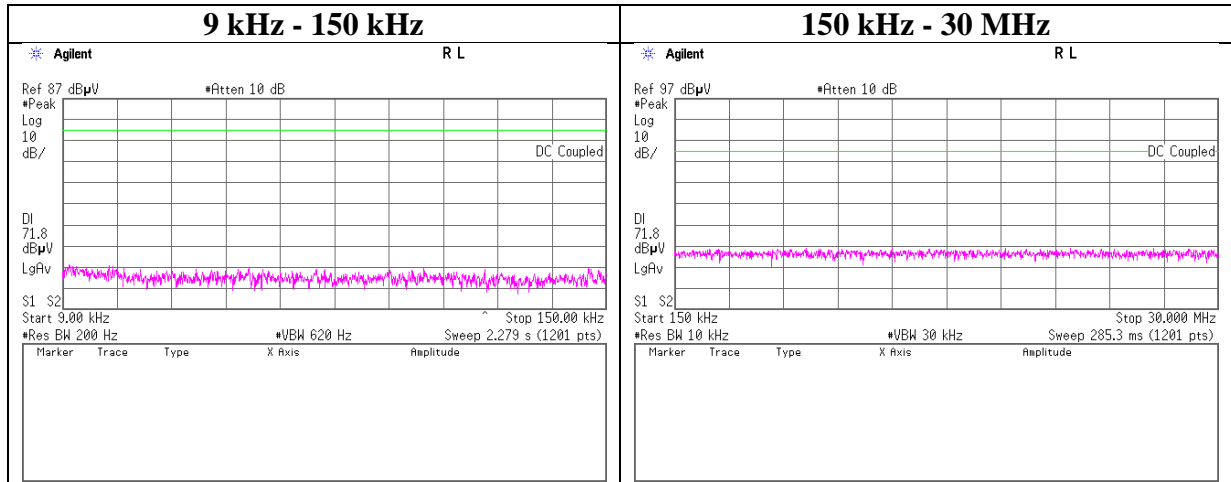
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off, 3DH5, 2480 MHz

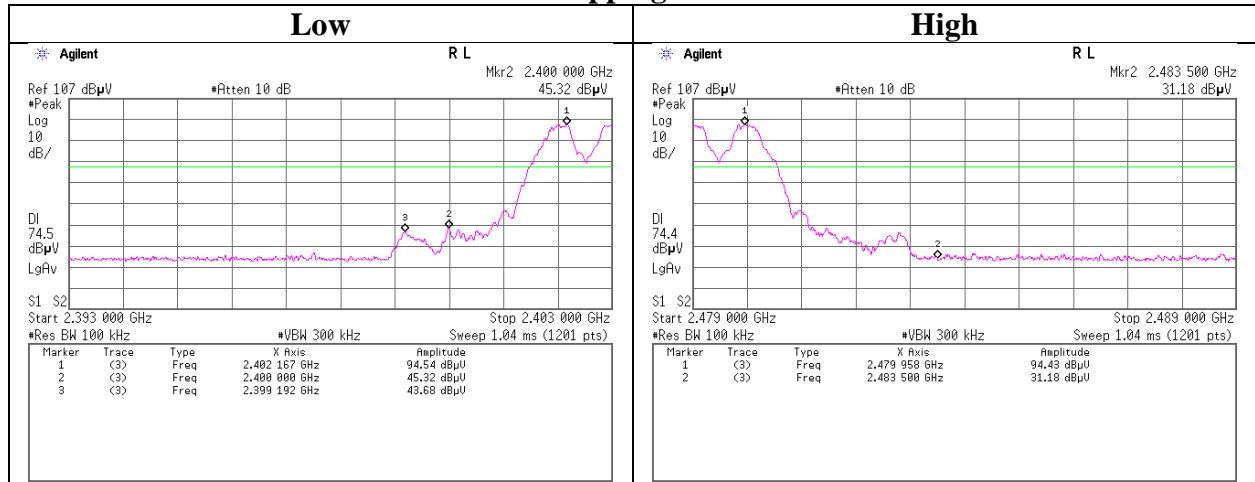
2480 MHz



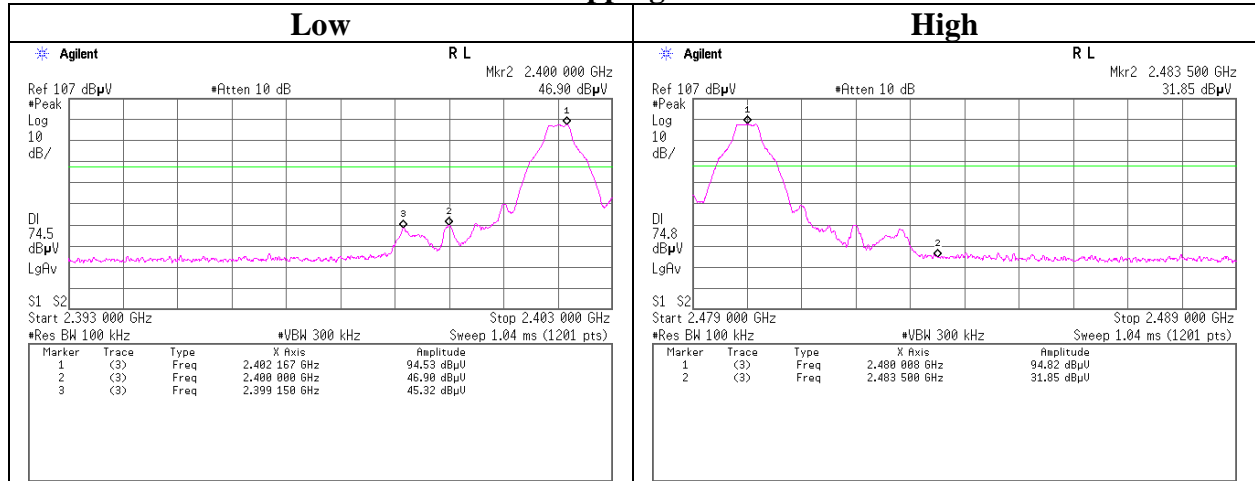
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, DH5

Hopping On



Hopping Off



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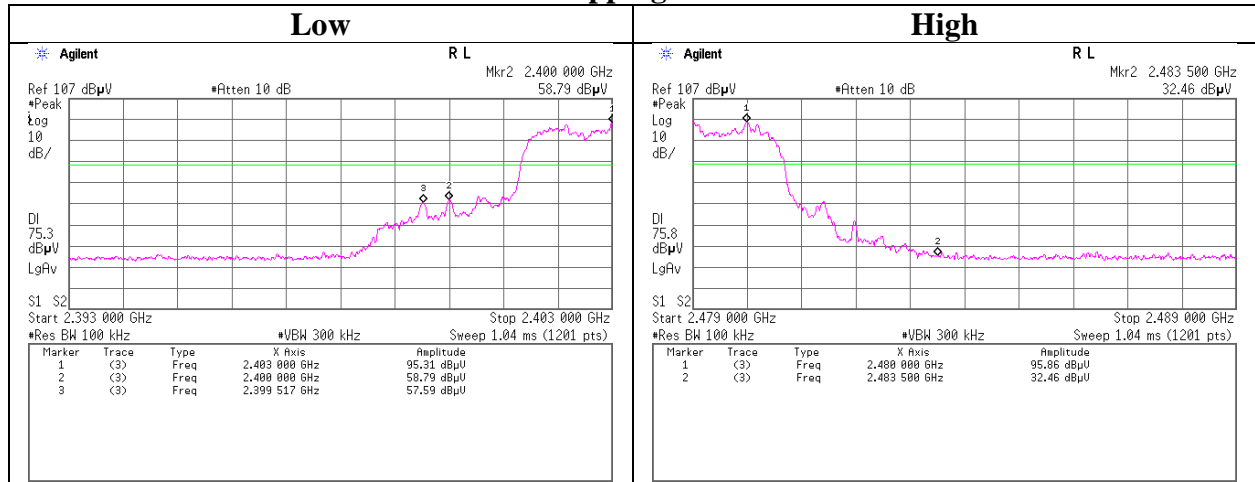
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

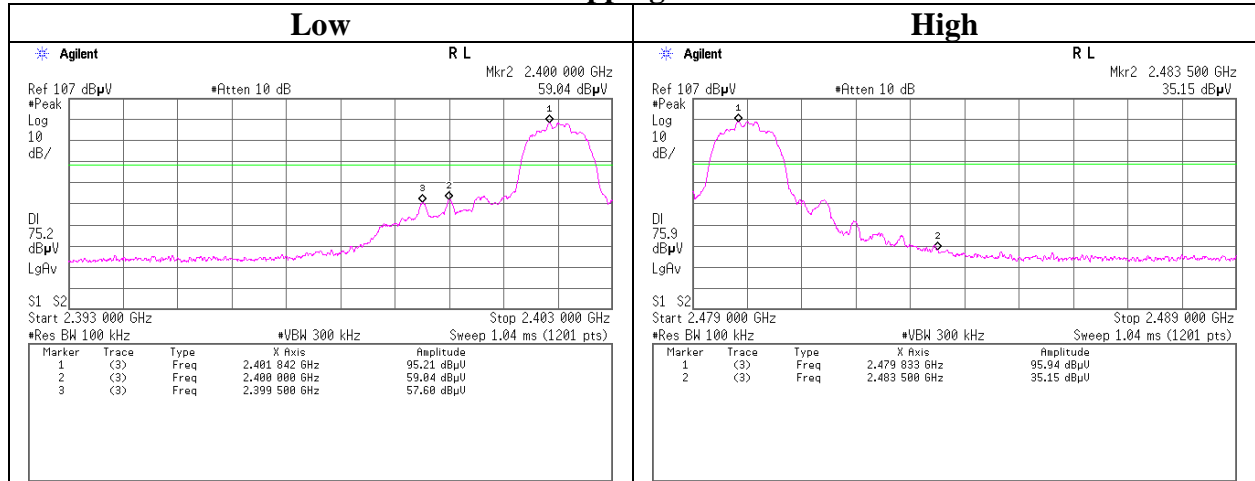
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, 3DH5

Hopping On



Hopping Off



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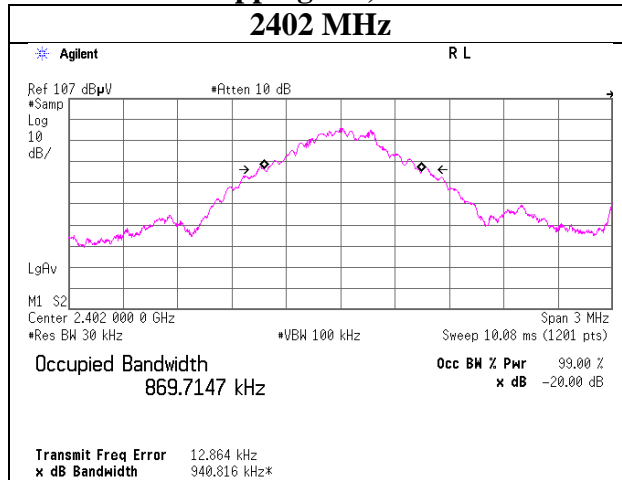
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

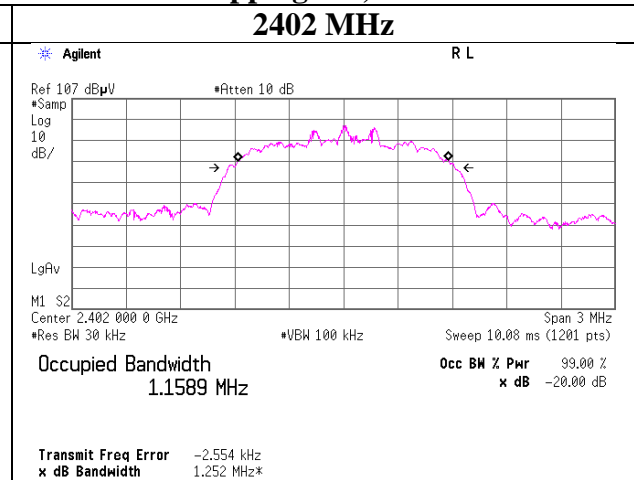
99 % Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping Off

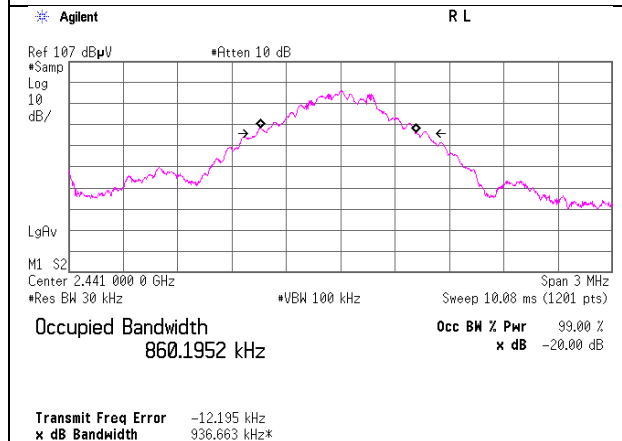
Hopping Off, DH5



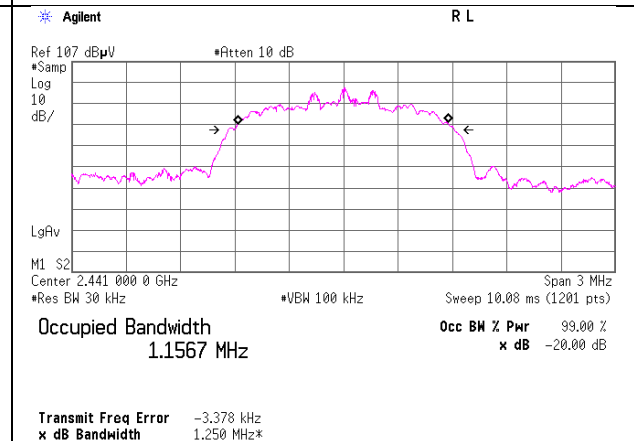
Hopping Off, 3DH5



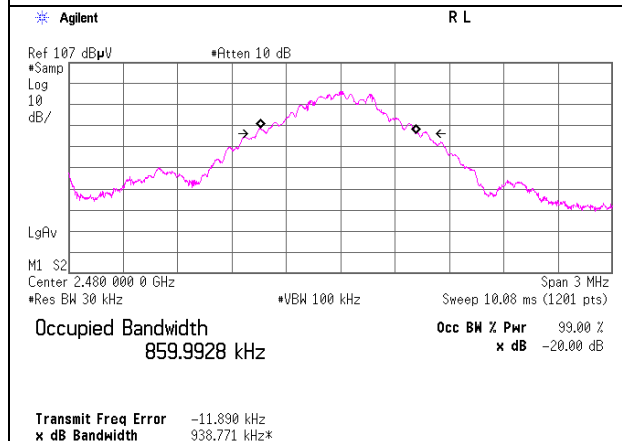
2441 MHz



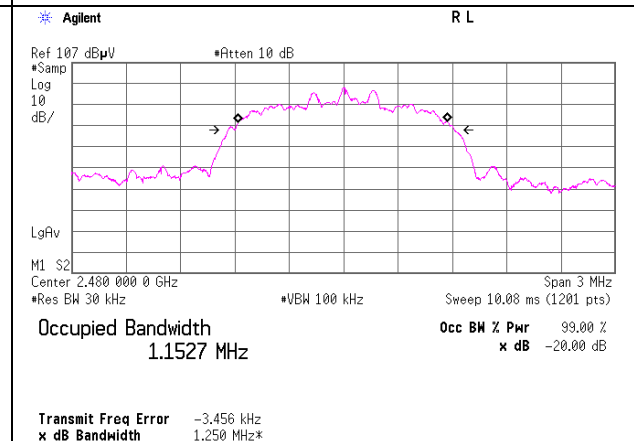
2441 MHz



2480 MHz



2480 MHz



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Shonan EMC Lab.

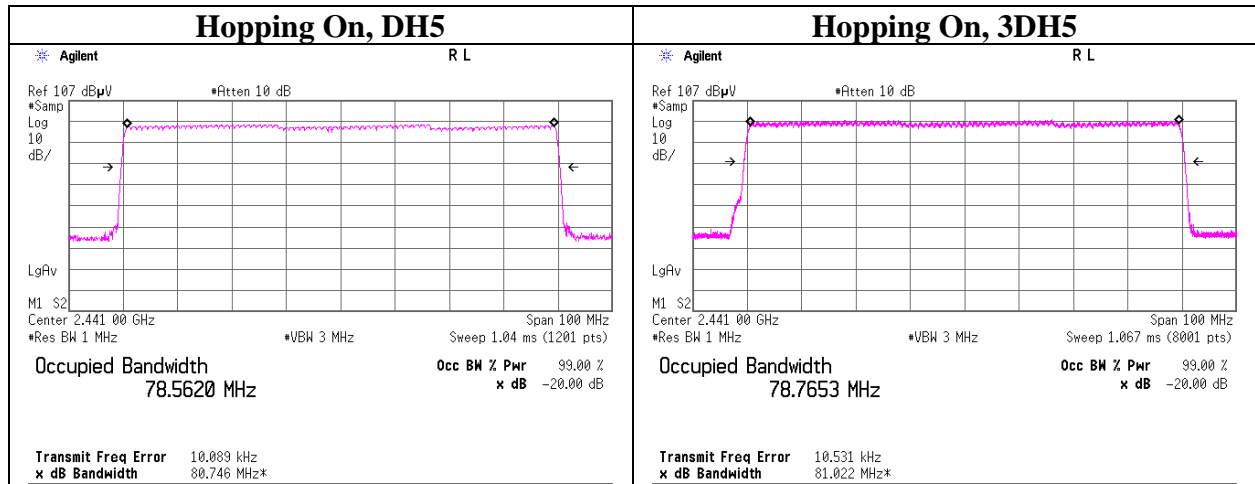
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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99 % Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11989475S-F
Date	October 16, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Kenichi Adachi
Mode	Tx, Hopping On



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2017/04/25 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2017/04/25 * 12
SRENT-09	Spectrum Analyzer	Agilent	E4440A	MY46186392	AT	2016/11/01 * 12
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2017/03/23 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2017/03/23 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2016/12/13 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2017/02/09 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2017/02/09 * 12
SAT3-11	Attenuator	JFW	50HF-003N	-	RE	2017/02/23 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2016/11/23 * 12
SCC-B1/B3/B5/B7/B8/B13/SR SE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SCC-B2/B4/B6/B7/B8/B13/SR SE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	RE	2017/01/05 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2017/09/26 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2017/06/08 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2017/02/17 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2017/01/08 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000NF SNMS/B	1612S005	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2017/08/14 * 12
SAEC-02(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2017/07/18 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2017/03/23 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2017/04/20 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2017/06/13 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000NF 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	2016/10/12 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	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

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