



RADIO TEST REPORT

Test Report No. : 11949431S-A

Applicant : Alpine Electronics, Inc.
Type of Equipment : CAR AUDIO
Model No. : CDE-172BT
FCC ID : A269ZUA154
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: September 12 to October 3, 2017

Representative test engineer:

Shiro Kobayashi
Engineer

Consumer Technology Division

Approved by:

Akio Hayashi
Leader

Consumer Technology Division



JAB
Testing
RTL02610

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

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11949431S-A

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SECTION 1: Customer information

Company Name	:	Alpine Electronics, Inc.
Address	:	20-1 Yoshima-Kogyodanchi, Iwaki-shi, Fukushima, 970-1192 Japan
Telephone Number	:	+81-246-36-4111
Facsimile Number	:	+81-246-36-6090
Contact Person	:	Mitsuru Yoshida

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

2.1 Identification of E.U.T.

Type of Equipment	:	CAR AUDIO
Model No.	:	CDE-172BT
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	September 9, 2017
Country of Mass-production	:	Thailand
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: CDE-172BT (referred to as the EUT in this report) is a CAR AUDIO.

General Specification

Clock frequency(ies) in the system	:	26 MHz
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Radio Specification (Bluetooth)

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz to 2480 MHz, 1 MHz each
Modulation	:	FHSS/ GFSK/ $\pi/4$ DQPSK/ 8DPSK
Power Supply (radio part input)	:	DC 3.3 V
Antenna type	:	Top-GND-coupled loop
Antenna Gain	:	Peak Gain -1.8 dBi, Ave.Gain -5.2 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test specification : FCC Part 15 Subpart C
FCC Part 15 final revised on September 20, 2017 and effective October 20, 2017

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	N/A	N/A	*1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (1)		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 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	6.3 dB 48.005 MHz, QP, Vertical Tx 2402 MHz, DH5	Complied	Conducted/ Radiated (above 30 MHz) *2)

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

*1) The test is not applicable since the EUT has no AC mains.

*2) Radiated test was selected over 30 MHz based on section 15.247(d).

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

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

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

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

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
(Measurement distance: 3 m)	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	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
(Measurement distance: 1 m)	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

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

Radiated emission test

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

3.5 Test Location

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JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
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

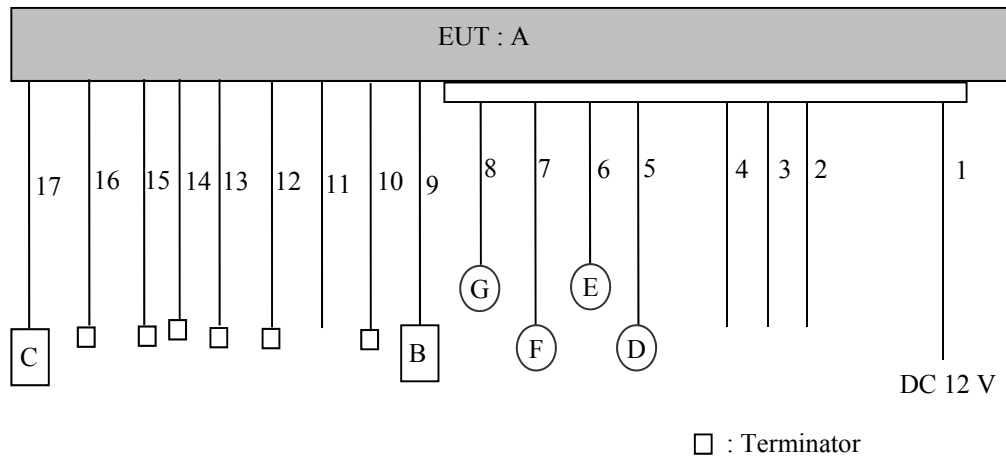
4.1 Operating Mode(s)

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
20 dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99 % Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: BDR: Ext.=23, Int.=39 EDR: Ext.=73, Int.=48 Software: CSR BlueSuite BlueTest3 Ver. 2.5.8.667 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.		

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	CAR AUDIO	CDE-172BT	018 *1) 016 *2)	ALPINE Electronics, Inc.	EUT
B	Microphone	-	-	ALPINE Electronics, Inc.	-
C	USB Memory	USM4GU	-	Sony	-
D	Speaker	LV-002	S11014200775	L&V	-
E	Speaker	LV-002	S11014200775	L&V	-
F	Speaker	LV-002	S11014200773	L&V	-
G	Speaker	LV-002	S11014200773	L&V	-

*1) for Antenna Terminal Conducted Tests

*2) for Radiated Spurious Emission test Tests

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC	0.2+2.0	Unshielded	Unshielded	-
2	Illumination	0.2+1.0	Unshielded	Unshielded	-
3	Remote Turn-On	0.3+1.0	Unshielded	Unshielded	-
4	Power Antenna	0.2+1.0	Unshielded	Unshielded	-
5	Speaker	0.3+2.9	Unshielded	Unshielded	Front R
6	Speaker	0.3+2.9	Unshielded	Unshielded	Front L
7	Speaker	0.3+2.9	Unshielded	Unshielded	Rear R
8	Speaker	0.3+2.9	Unshielded	Unshielded	Rear L
9	Microphone	3.5	Shielded	Shielded	-
10	Antenna	1.2	Shielded	Shielded	-
11	Remote	2.0	Shielded	Shielded	-
12	RCA	1.5	Shielded	Shielded	Front
13	RCA	1.5	Shielded	Shielded	Rear
14	RCA	1.5	Shielded	Shielded	SUB
15	Audio	3.0	Shielded	Shielded	AUX
16	Signal	1.2	Shielded	Shielded	-
17	USB	1.0	Shielded	Shielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 m by 1.5 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	3.88 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.88 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)

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

*2) Distance Factor: $20 \times \log(3.88 \text{ m}/3.0 \text{ m}) = 2.24 \text{ dB}$

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

Worst case:

Antenna polarization	Carrier (Band edge)	Spurious			
		Below 1 GHz	Above 1 GHz		
			1 GHz – 2.8 GHz	2.8 GHz - 13 GHz	13 GHz – 26.5 GHz
Horizontal	30 deg.	30 deg.	30 deg.	30 deg.	0 deg.
Vertical	30 deg.	30 deg.	30 deg.	30 deg.	0 deg.

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

Measurement range : 30 MHz - 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
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 160 MHz 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 *2)	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) 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) *3) Reference data							

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

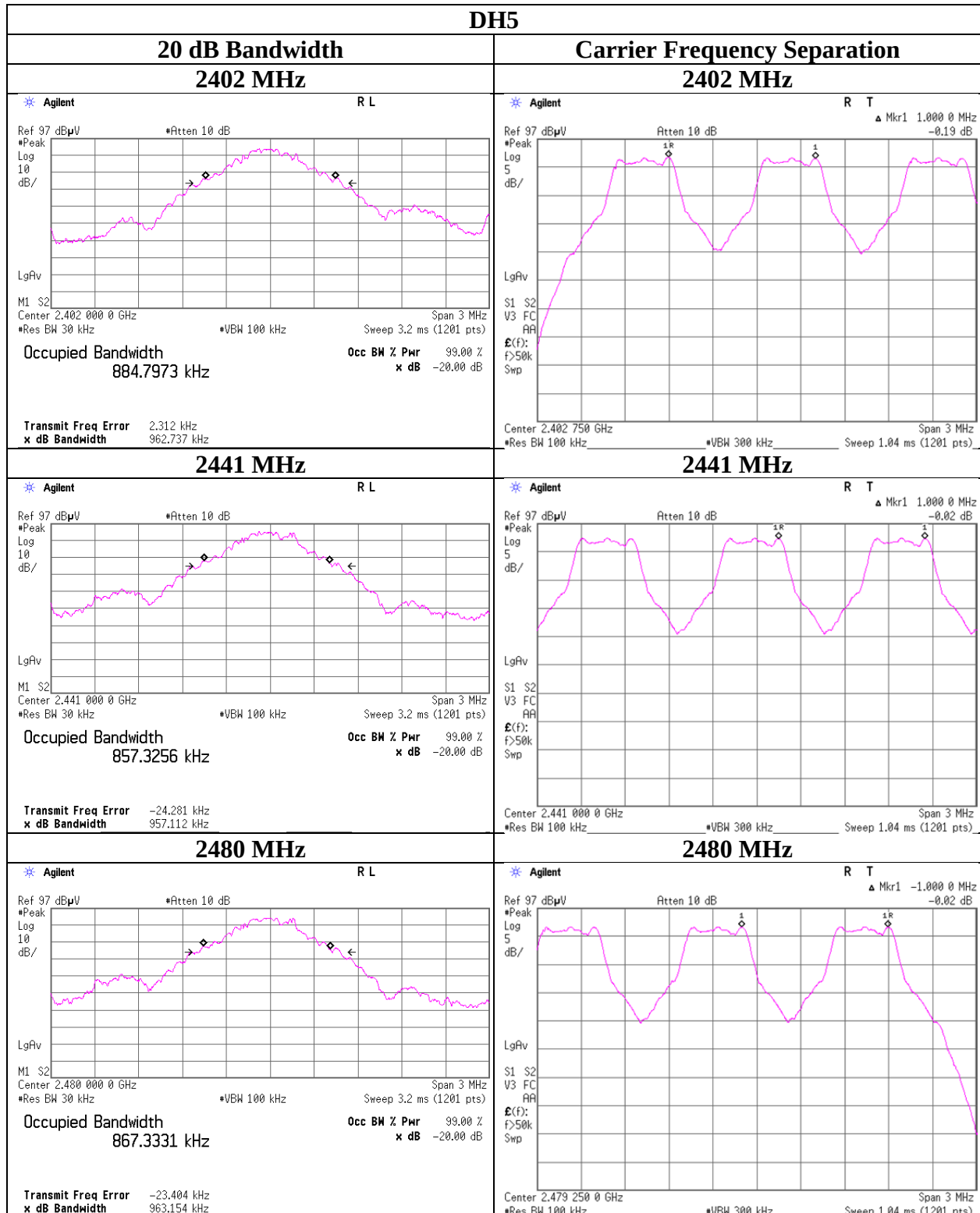
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.963	1.000	≥ 0.642
DH5	2441.0	0.957	1.000	≥ 0.638
DH5	2480.0	0.963	1.000	≥ 0.642
3DH5	2402.0	1.287	1.000	≥ 0.858
3DH5	2441.0	1.287	1.000	≥ 0.858
3DH5	2480.0	1.296	1.000	≥ 0.864

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



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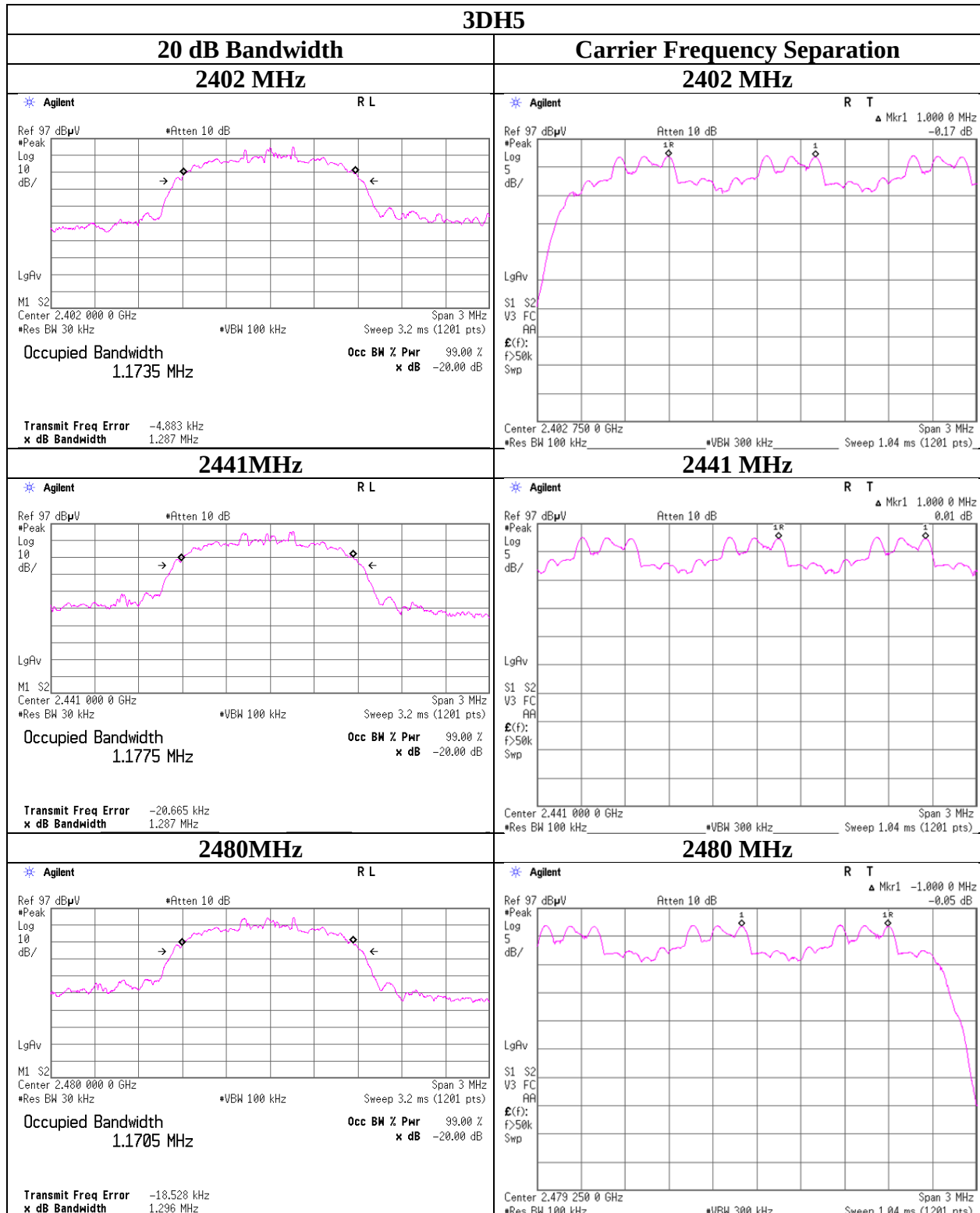
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20dB Bandwidth and Carrier Frequency Separation



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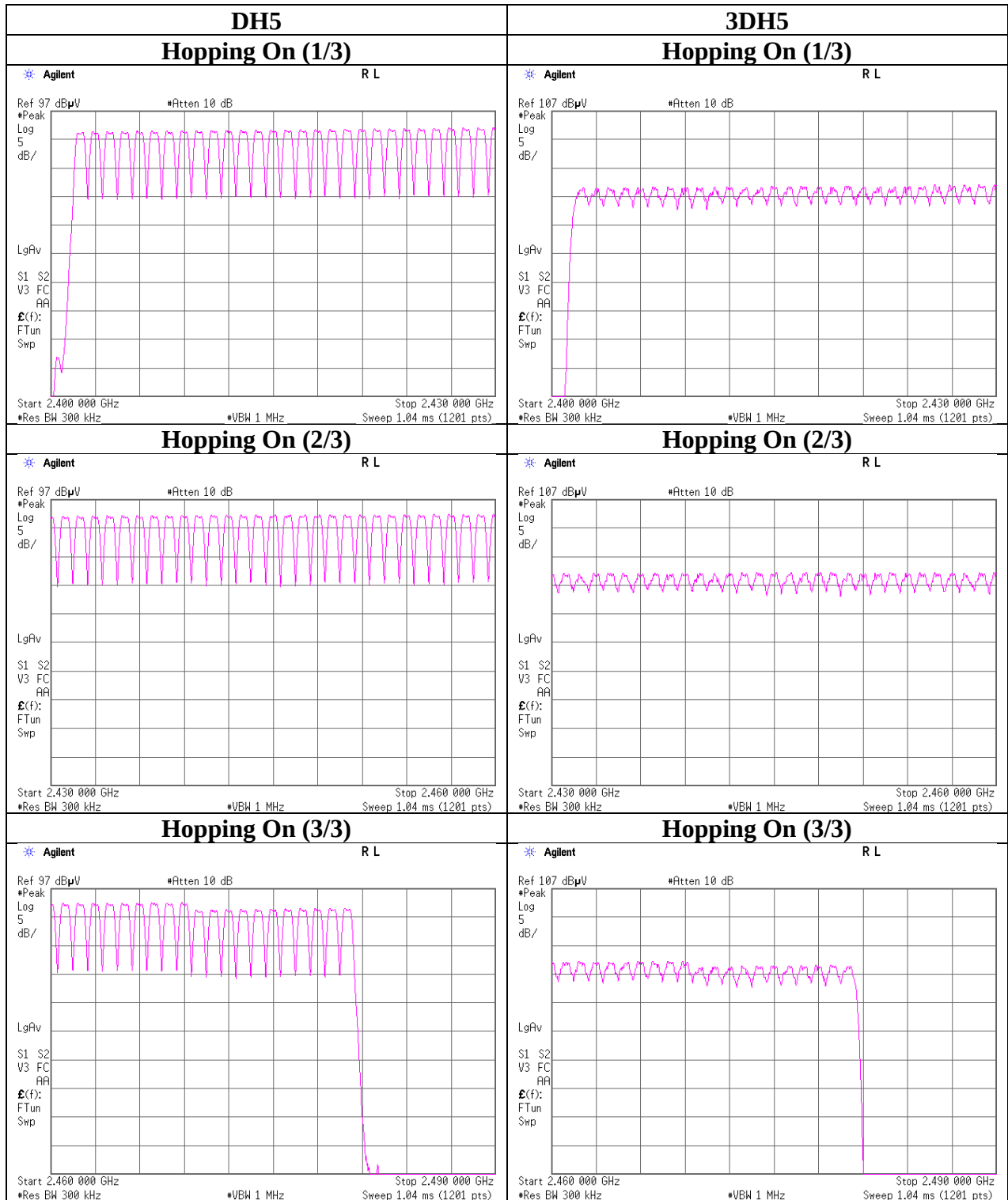
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11949431S-A
Date September 12, 2017
Temperature / Humidity 25 deg. C / 58 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



Dwell time

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	50.6 times	/	5 sec. x	31.6 sec. = 320 times	0.419	134	400
DH3	25.6 times	/	5 sec. x	31.6 sec. = 162 times	1.672	271	400
DH5	17.0 times	/	5 sec. x	31.6 sec. = 108 times	2.919	315	400
3DH1	50.4 times	/	5 sec. x	31.6 sec. = 319 times	0.427	136	400
3DH3	25.6 times	/	5 sec. x	31.6 sec. = 162 times	1.681	272	400
3DH5	17.0 times	/	5 sec. x	31.6 sec. = 108 times	2.932	317	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

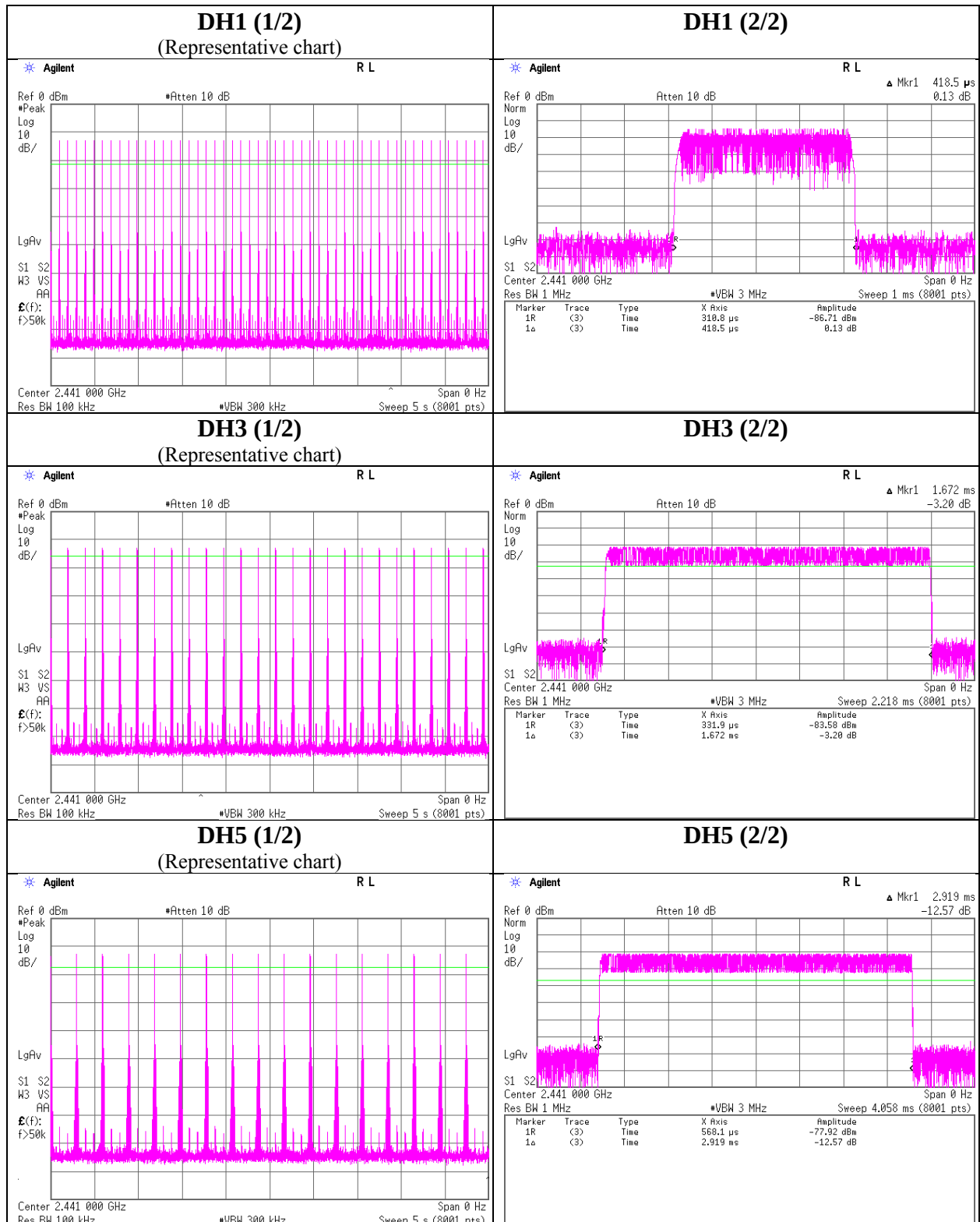
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	51	50	51	51	50.6
DH3	26	26	26	25	25	25.6
DH5	17	17	17	17	17	17
3DH1	50	50	50	51	51	50.4
3DH3	26	26	26	25	25	25.6
3DH5	17	17	17	17	17	17

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



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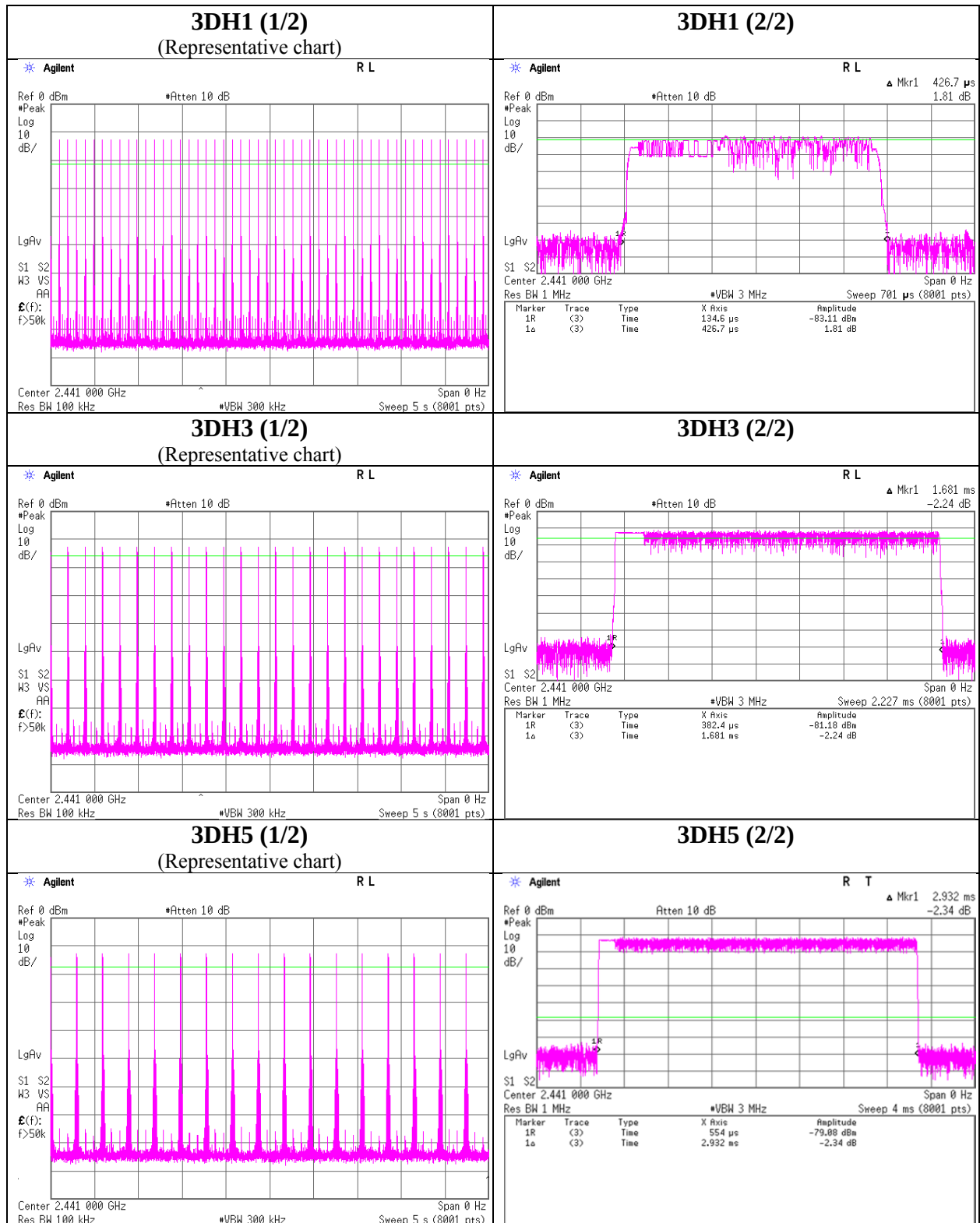
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Dwell time



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Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-13.90	1.86	9.96	-2.08	0.62	20.96	125	23.04
DH5	2441.0	-12.82	1.87	9.97	-0.98	0.80	20.96	125	21.94
DH5	2480.0	-13.53	1.88	9.97	-1.68	0.68	20.96	125	22.64
2DH5	2402.0	-12.29	1.86	9.96	-0.47	0.90	20.96	125	21.43
2DH5	2441.0	-11.64	1.87	9.97	0.20	1.05	20.96	125	20.76
2DH5	2480.0	-12.19	1.88	9.97	-0.34	0.92	20.96	125	21.30
3DH5	2402.0	-12.03	1.86	9.96	-0.21	0.95	20.96	125	21.17
3DH5	2441.0	-11.26	1.87	9.97	0.58	1.14	20.96	125	20.38
3DH5	2480.0	-11.88	1.88	9.97	-0.03	0.99	20.96	125	20.99

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.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-15.73	1.86	9.96	-3.91	0.41	1.09	-2.82	0.52
DH5	2441.0	-14.85	1.87	9.97	-3.01	0.50	1.09	-1.92	0.64
DH5	2480.0	-15.56	1.88	9.97	-3.71	0.43	1.09	-2.62	0.55
2DH5	2402.0	-16.46	1.86	9.96	-4.64	0.34	1.08	-3.56	0.44
2DH5	2441.0	-15.83	1.87	9.97	-3.99	0.40	1.08	-2.91	0.51
2DH5	2480.0	-16.38	1.88	9.97	-4.53	0.35	1.08	-3.45	0.45
3DH5	2402.0	-16.43	1.86	9.96	-4.61	0.35	1.07	-3.54	0.44
3DH5	2441.0	-15.81	1.87	9.97	-3.97	0.40	1.07	-2.90	0.51
3DH5	2480.0	-16.37	1.88	9.97	-4.52	0.35	1.07	-3.45	0.45

Sample Calculation:

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

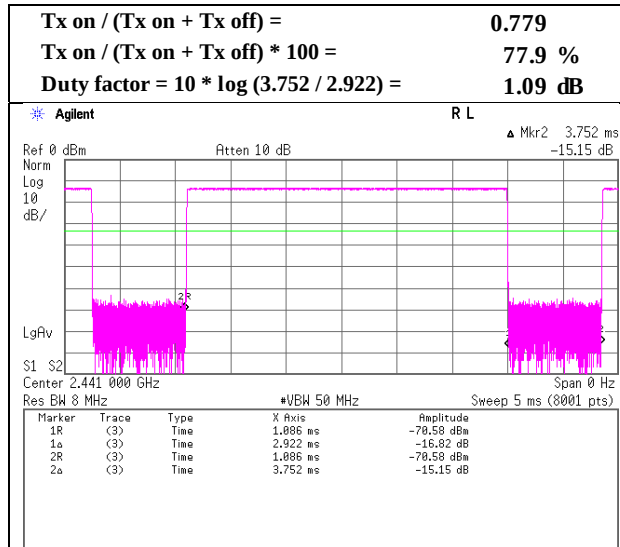
Result (Burst power average) = Time average + Duty factor

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

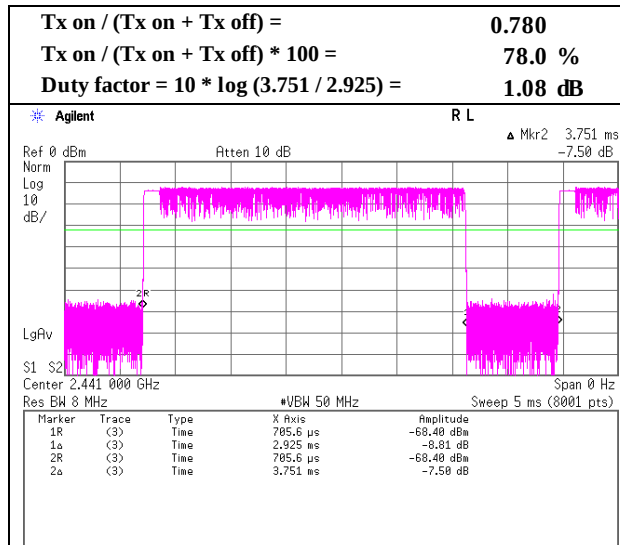
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off

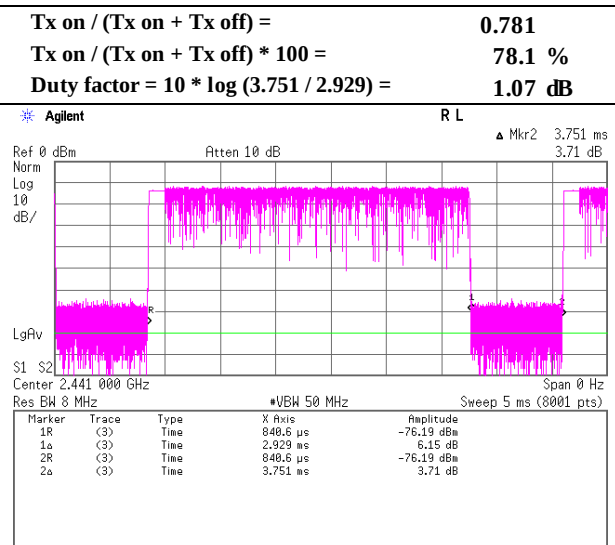
DH5



2DH5



3DH5



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Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11949431S-A
Date : October 3, 2017 October 2, 2017
Temperature / Humidity : 25 deg. C / 52 % RH 24 deg. C / 48 % RH
Engineer : Kazuya Noda Kazuya Noda
(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.	47.973	QP	37.79	11.51	7.43	31.82	0.00	24.91	40.00	15.0	310	332	
Hori.	60.005	QP	40.39	7.84	7.26	31.82	0.00	23.67	40.00	16.3	304	318	
Hori.	68.602	QP	46.54	6.56	7.43	31.81	0.00	28.72	40.00	11.2	266	170	
Hori.	186.165	QP	27.58	16.36	8.98	31.77	0.00	21.15	43.50	22.3	168	204	
Hori.	192.001	QP	32.84	16.39	9.01	31.77	0.00	26.47	43.50	17.0	166	5	
Hori.	287.938	QP	46.13	13.07	6.67	31.75	0.00	34.12	46.00	11.8	100	49	
Hori.	2390.000	PK	46.91	27.14	14.23	40.85	2.24	49.67	73.90	24.2	155	161	
Hori.	4804.000	PK	50.52	31.13	6.72	41.86	2.24	48.75	73.90	25.1	102	158	
Hori.	7206.000	PK	47.63	36.35	8.21	41.18	2.24	53.25	73.90	20.6	150	0	
Hori.	9608.000	PK	47.14	38.11	9.37	40.59	2.24	56.27	73.90	17.6	150	0	
Hori.	2390.000	AV	34.19	27.14	14.23	40.85	2.24	36.95	53.90	16.9	155	161	
Hori.	4804.000	AV	40.17	31.13	6.72	41.86	2.24	38.40	53.90	15.5	102	158	
Hori.	7206.000	AV	34.82	36.35	8.21	41.18	2.24	40.44	53.90	13.4	150	0	
Hori.	9608.000	AV	33.74	38.11	9.37	40.59	2.24	42.87	53.90	11.0	150	0	
Vert.	48.005	QP	46.56	11.50	7.43	31.82	0.00	33.67	40.00	6.3	100	13	
Vert.	60.012	QP	41.88	7.84	7.26	31.82	0.00	25.16	40.00	14.8	100	155	
Vert.	63.307	QP	38.33	7.35	7.22	31.81	0.00	21.09	40.00	18.9	100	214	
Vert.	180.001	QP	27.88	16.33	8.97	31.77	0.00	21.41	43.50	22.0	100	204	
Vert.	2390.000	PK	47.07	27.14	14.23	40.85	2.24	49.83	73.90	24.0	160	0	
Vert.	4804.000	PK	49.68	31.13	6.72	41.86	2.24	47.91	73.90	25.9	131	178	
Vert.	7206.000	PK	47.18	36.35	8.21	41.18	2.24	52.80	73.90	21.1	150	0	
Vert.	9608.000	PK	46.74	38.11	9.37	40.59	2.24	55.87	73.90	18.0	150	0	
Vert.	2390.000	AV	34.17	27.14	14.23	40.85	2.24	36.93	53.90	16.9	160	0	
Vert.	4804.000	AV	39.15	31.13	6.72	41.86	2.24	37.38	53.90	16.5	131	178	
Vert.	7206.000	AV	34.73	36.35	8.21	41.18	2.24	40.35	53.90	13.5	150	0	
Vert.	9608.000	AV	33.71	38.11	9.37	40.59	2.24	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 : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	83.31	27.18	14.24	40.84	2.24	86.13	-	-	Carrier
Hori.	2400.000	PK	38.11	27.17	14.23	40.84	2.24	40.91	66.13	25.2	
Vert.	2400.000	PK	88.26	27.18	14.24	40.84	2.24	91.08	-	-	
Vert.	2402.000	PK	38.72	27.17	14.23	40.84	2.24	41.52	71.08	29.6	Carrier

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

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

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

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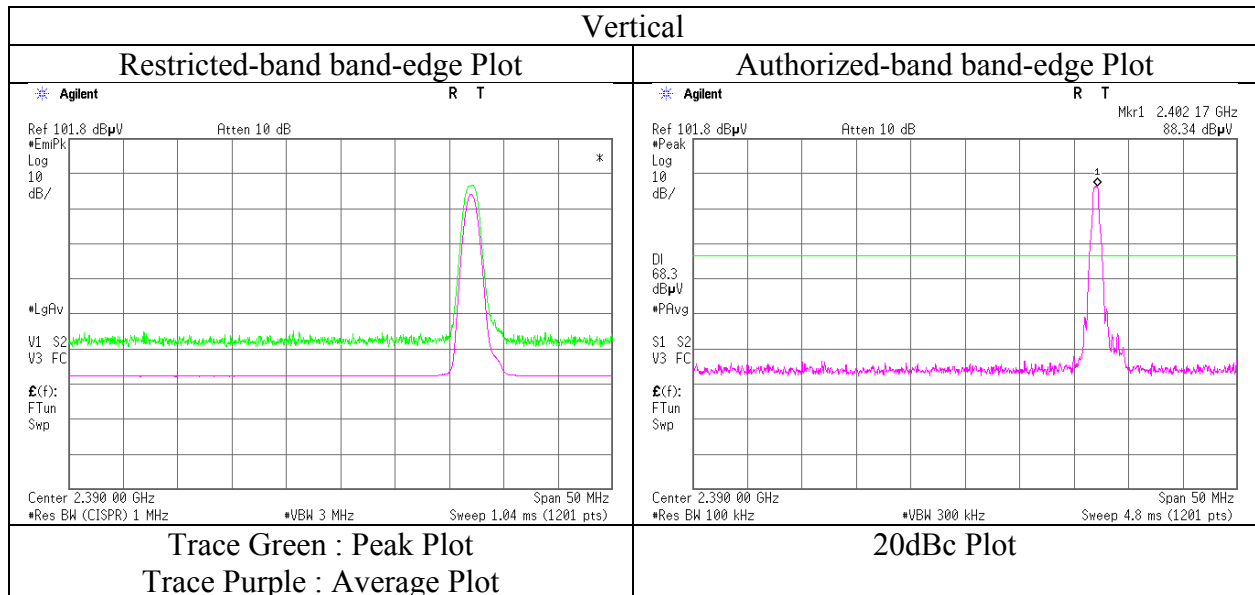
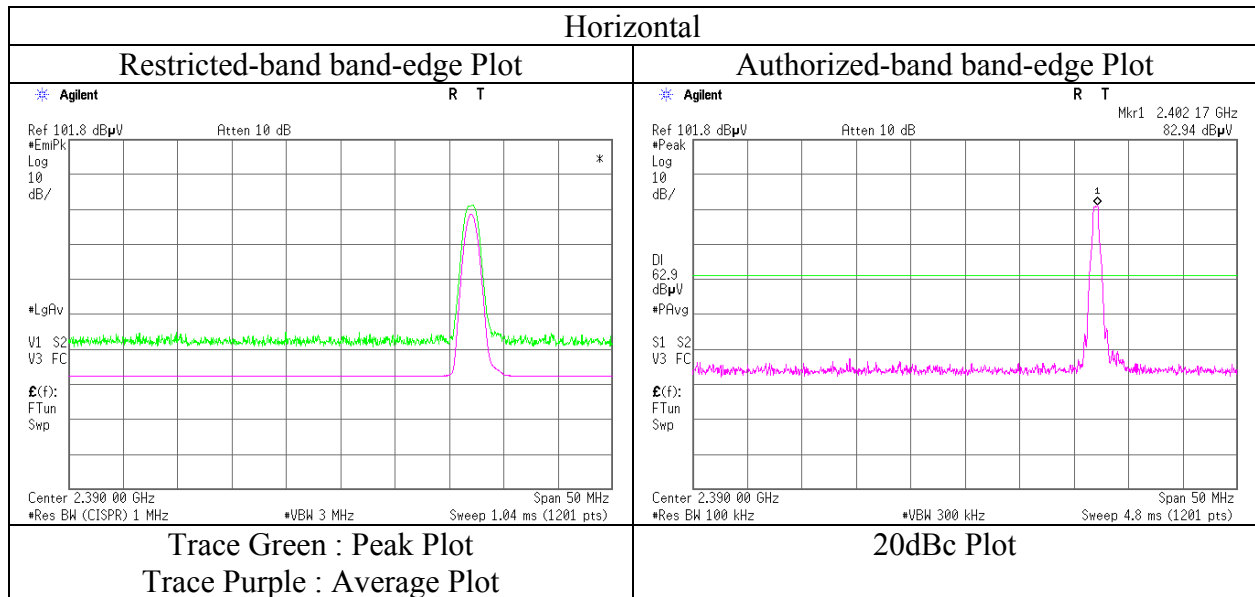
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11949431S-A
Date	October 2, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Kazuya Noda
	(1 GHz - 13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11949431S-A
Date : October 3, 2017 October 2, 2017
Temperature / Humidity : 25 deg. C / 52 % RH 24 deg. C / 48 % RH
Engineer : Kazuya Noda Kazuya Noda
(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.	47.991	QP	37.02	11.51	7.43	31.82	0.00	24.14	40.00	15.8	313	319	
Hori.	60.001	QP	39.52	7.84	7.26	31.82	0.00	22.80	40.00	17.2	301	310	
Hori.	68.601	QP	46.22	6.56	7.43	31.81	0.00	28.40	40.00	11.6	271	163	
Hori.	186.117	QP	27.63	16.36	8.98	31.77	0.00	21.20	43.50	22.3	150	9	
Hori.	191.953	QP	33.62	16.39	9.01	31.77	0.00	27.25	43.50	16.2	157	4	
Hori.	288.005	QP	43.52	13.07	6.67	31.75	0.00	31.51	46.00	14.4	100	54	
Hori.	4882.000	PK	50.73	31.31	6.74	41.76	2.24	49.26	73.90	24.6	100	155	
Hori.	7323.000	PK	47.76	36.51	8.24	41.27	2.24	53.48	73.90	20.4	100	0	
Hori.	9764.000	PK	46.53	38.37	9.41	40.62	2.24	55.93	73.90	17.9	150	0	
Hori.	4882.000	AV	41.07	31.31	6.74	41.76	2.24	39.60	53.90	14.3	100	155	
Hori.	7323.000	AV	35.32	36.51	8.24	41.27	2.24	41.04	53.90	12.8	100	0	
Hori.	9764.000	AV	33.77	38.37	9.41	40.62	2.24	43.17	53.90	10.7	150	0	
Vert.	48.004	QP	45.82	11.50	7.43	31.82	0.00	32.93	40.00	7.0	100	7	
Vert.	60.046	QP	42.03	7.83	7.26	31.82	0.00	25.30	40.00	14.7	100	156	
Vert.	63.301	QP	37.53	7.35	7.22	31.81	0.00	20.29	40.00	19.7	100	211	
Vert.	180.019	QP	27.89	16.33	8.97	31.77	0.00	21.42	43.50	22.0	100	201	
Vert.	4882.000	PK	50.20	31.31	6.74	41.76	2.24	48.73	73.90	25.1	138	179	
Vert.	7323.000	PK	48.31	36.51	8.24	41.27	2.24	54.03	73.90	19.8	150	0	
Vert.	9764.000	PK	46.71	38.37	9.41	40.62	2.24	56.11	73.90	17.7	150	0	
Vert.	4882.000	AV	39.40	31.31	6.74	41.76	2.24	37.93	53.90	15.9	138	179	
Vert.	7323.000	AV	35.32	36.51	8.24	41.27	2.24	41.04	53.90	12.8	150	0	
Vert.	9764.000	AV	33.79	38.37	9.41	40.62	2.24	43.19	53.90	10.7	150	0	

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

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

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

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11949431S-A
Date : October 3, 2017 October 2, 2017
Temperature / Humidity : 25 deg. C / 52 % RH 24 deg. C / 48 % RH
Engineer : Kazuya Noda Kazuya Noda
(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.	48.001	QP	37.02	11.50	7.43	31.82	0.00	24.13	40.00	15.8	305	312	
Hori.	60.001	QP	39.01	7.84	7.26	31.82	0.00	22.29	40.00	17.7	318	306	
Hori.	68.601	QP	46.41	6.56	7.43	31.81	0.00	28.59	40.00	11.4	277	158	
Hori.	186.182	QP	28.91	16.36	8.98	31.77	0.00	22.48	43.50	21.0	173	3	
Hori.	191.942	QP	34.23	16.39	9.01	31.77	0.00	27.86	43.50	15.6	160	2	
Hori.	288.002	QP	45.21	13.07	6.67	31.75	0.00	33.20	46.00	12.8	100	51	
Hori.	2483.500	PK	46.71	27.45	14.32	40.81	2.24	49.91	73.90	23.9	165	166	
Hori.	4960.000	PK	49.44	31.48	6.76	41.65	2.24	48.27	73.90	25.6	100	159	
Hori.	7440.000	PK	48.61	36.68	8.29	41.36	2.24	54.46	73.90	19.4	150	0	
Hori.	9920.000	PK	47.18	38.63	9.45	40.66	2.24	56.84	73.90	17.0	150	0	
Hori.	2483.500	AV	33.92	27.45	14.32	40.81	2.24	37.12	53.90	16.7	165	166	
Hori.	4960.000	AV	38.78	31.48	6.76	41.65	2.24	37.61	53.90	16.2	100	159	
Hori.	7440.000	AV	35.22	36.68	8.29	41.36	2.24	41.07	53.90	12.8	150	0	
Hori.	9920.000	AV	33.78	38.63	9.45	40.66	2.24	43.44	53.90	10.4	150	0	
Vert.	48.005	QP	46.05	11.50	7.43	31.82	0.00	33.16	40.00	6.8	100	15	
Vert.	60.012	QP	42.04	7.84	7.26	31.82	0.00	25.32	40.00	14.6	100	159	
Vert.	63.298	QP	38.15	7.35	7.22	31.81	0.00	20.91	40.00	19.0	100	214	
Vert.	180.016	QP	26.99	16.33	8.97	31.77	0.00	20.52	43.50	22.9	100	208	
Vert.	2483.500	PK	47.24	27.45	14.32	40.81	2.24	50.44	73.90	23.4	167	0	
Vert.	4960.000	PK	49.15	31.48	6.76	41.65	2.24	47.98	73.90	25.9	131	181	
Vert.	7440.000	PK	47.98	36.68	8.29	41.36	2.24	53.83	73.90	20.0	150	0	
Vert.	9920.000	PK	46.37	38.63	9.45	40.66	2.24	56.03	73.90	17.8	150	0	
Vert.	2483.500	AV	34.21	27.45	14.32	40.81	2.24	37.41	53.90	16.4	167	0	
Vert.	4960.000	AV	37.66	31.48	6.76	41.65	2.24	36.49	53.90	17.4	131	181	
Vert.	7440.000	AV	35.26	36.68	8.29	41.36	2.24	41.11	53.90	12.7	150	0	
Vert.	9920.000	AV	33.76	38.63	9.45	40.66	2.24	43.42	53.90	10.4	150	0	

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

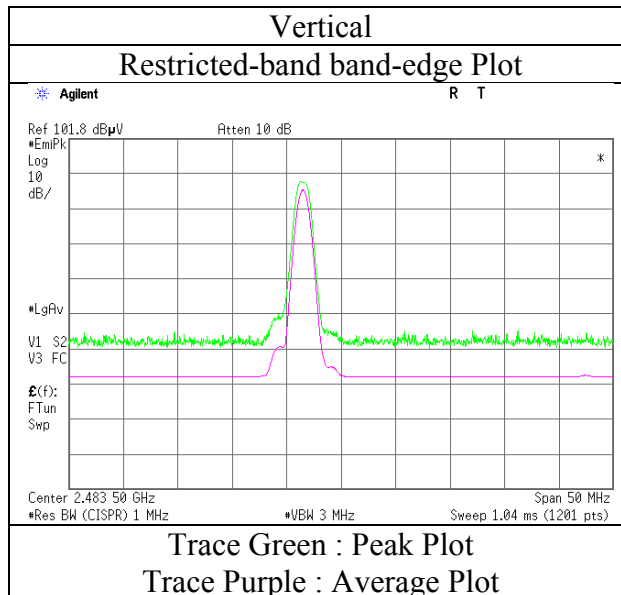
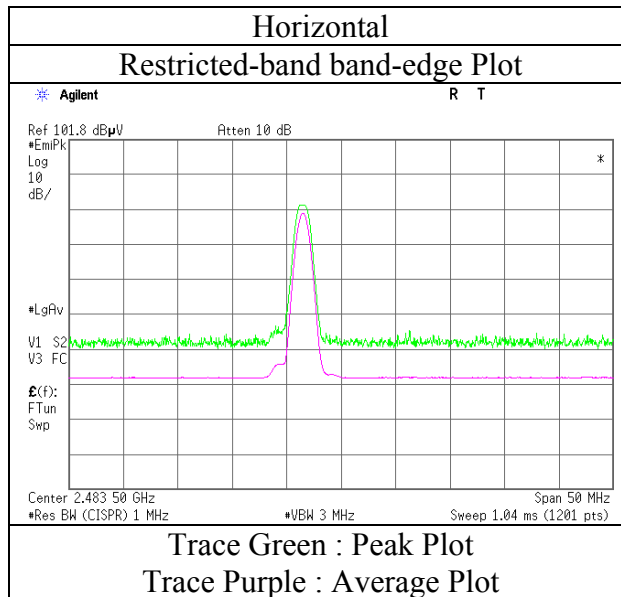
Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11949431S-A
Date	October 2, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Kazuya Noda (1 GHz - 13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11949431S-A
Date : October 3, 2017 October 2, 2017
Temperature / Humidity : 25 deg. C / 52 % RH 24 deg. C / 48 % RH
Engineer : Kazuya Noda Kazuya Noda
(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.	48.001	QP	37.21	11.50	7.43	31.82	0.00	24.32	40.00	15.6	313	302	
Hori.	60.005	QP	40.21	7.84	7.26	31.82	0.00	23.49	40.00	16.5	301	324	
Hori.	68.603	QP	46.33	6.56	7.43	31.81	0.00	28.51	40.00	11.4	300	167	
Hori.	186.182	QP	29.14	16.36	8.98	31.77	0.00	22.71	43.50	20.7	166	4	
Hori.	191.941	QP	33.78	16.39	9.01	31.77	0.00	27.41	43.50	16.0	165	4	
Hori.	288.003	QP	44.23	13.07	6.67	31.75	0.00	32.22	46.00	13.7	100	55	
Hori.	2390.000	PK	47.11	27.14	14.23	40.85	2.24	49.87	73.90	24.0	155	163	
Hori.	4804.000	PK	49.74	31.13	6.72	41.86	2.24	47.97	73.90	25.9	100	155	
Hori.	7206.000	PK	47.86	36.35	8.21	41.18	2.24	53.48	73.90	20.4	150	0	
Hori.	9608.000	PK	46.68	38.11	9.37	40.59	2.24	55.81	73.90	18.0	150	0	
Hori.	2390.000	AV	34.14	27.14	14.23	40.85	2.24	36.90	53.90	17.0	155	163	
Hori.	4804.000	AV	37.59	31.13	6.72	41.86	2.24	35.82	53.90	18.0	100	155	
Hori.	7206.000	AV	34.86	36.35	8.21	41.18	2.24	40.48	53.90	13.4	150	0	
Hori.	9608.000	AV	33.78	38.11	9.37	40.59	2.24	42.91	53.90	10.9	150	0	
Vert.	47.977	QP	45.99	11.51	7.43	31.82	0.00	33.11	40.00	6.8	100	3	
Vert.	60.002	QP	43.64	7.84	7.26	31.82	0.00	26.92	40.00	13.0	100	145	
Vert.	63.311	QP	37.98	7.35	7.22	31.81	0.00	20.74	40.00	19.2	100	224	
Vert.	180.021	QP	27.01	16.33	8.97	31.77	0.00	20.54	43.50	22.9	100	202	
Vert.	2390.000	PK	47.41	27.14	14.23	40.85	2.24	50.17	73.90	23.7	159	0	
Vert.	4804.000	PK	48.75	31.13	6.72	41.86	2.24	46.98	73.90	26.9	136	180	
Vert.	7206.000	PK	47.50	36.35	8.21	41.18	2.24	53.12	73.90	20.7	150	0	
Vert.	9608.000	PK	46.92	38.11	9.37	40.59	2.24	56.05	73.90	17.8	150	0	
Vert.	2390.000	AV	34.05	27.14	14.23	40.85	2.24	36.81	53.90	17.0	159	0	
Vert.	4804.000	AV	36.18	31.13	6.72	41.86	2.24	34.41	53.90	19.4	136	180	
Vert.	7206.000	AV	34.67	36.35	8.21	41.18	2.24	40.29	53.90	13.6	150	0	
Vert.	9608.000	AV	33.77	38.11	9.37	40.59	2.24	42.90	53.90	11.0	150	0	

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

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

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

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	82.61	27.18	14.24	40.84	2.24	85.43	-	-	Carrier
Hori.	2400.000	PK	38.11	27.17	14.23	40.84	2.24	40.91	65.43	24.5	
Vert.	2402.000	PK	88.30	27.18	14.24	40.84	2.24	91.12	-	-	Carrier
Vert.	2400.000	PK	41.29	27.17	14.23	40.84	2.24	44.09	71.12	27.0	

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

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

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

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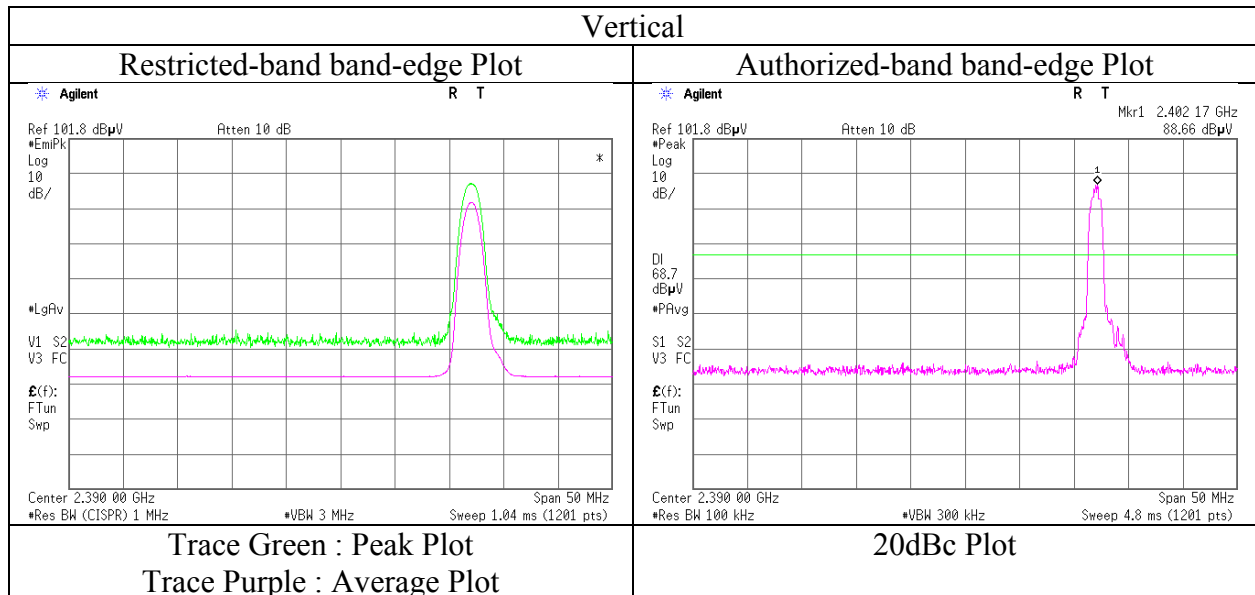
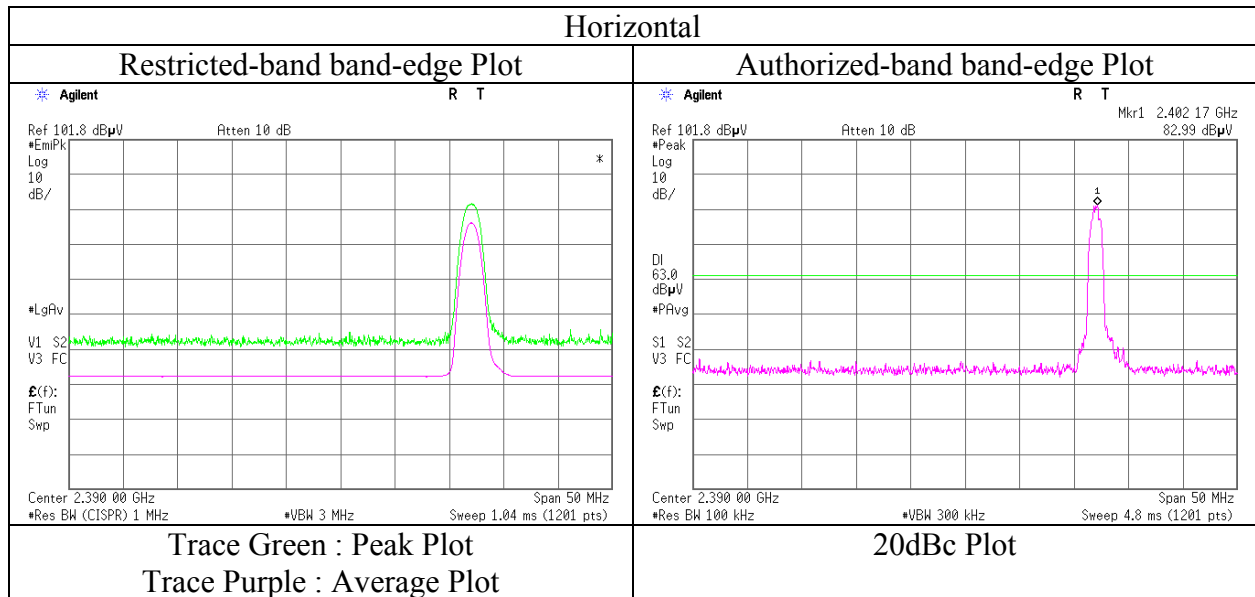
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11949431S-A
Date	October 2, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Kazuya Noda
	(1 GHz - 13 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11949431S-A
Date : October 3, 2017 October 2, 2017
Temperature / Humidity : 25 deg. C / 52 % RH 24 deg. C / 48 % RH
Engineer : Kazuya Noda Kazuya Noda
(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.	48.008	QP	37.82	11.50	7.43	31.82	0.00	24.93	40.00	15.0	310	302	
Hori.	60.000	QP	40.06	7.84	7.26	31.82	0.00	23.34	40.00	16.6	311	331	
Hori.	68.601	QP	46.78	6.56	7.43	31.81	0.00	28.96	40.00	11.0	281	155	
Hori.	186.181	QP	29.27	16.36	8.98	31.77	0.00	22.84	43.50	20.6	162	2	
Hori.	191.956	QP	33.97	16.39	9.01	31.77	0.00	27.60	43.50	15.9	155	7	
Hori.	288.011	QP	44.53	13.07	6.67	31.75	0.00	32.52	46.00	13.4	100	57	
Hori.	4882.000	PK	48.38	31.31	6.74	41.76	2.24	46.91	73.90	26.9	154	157	
Hori.	7323.000	PK	47.74	36.51	8.24	41.27	2.24	53.46	73.90	20.4	150	0	
Hori.	9764.000	PK	46.29	38.37	9.41	40.62	2.24	55.69	73.90	18.2	150	0	
Hori.	4882.000	AV	36.92	31.31	6.74	41.76	2.24	35.45	53.90	18.4	154	157	
Hori.	7323.000	AV	35.23	36.51	8.24	41.27	2.24	40.95	53.90	12.9	150	0	
Hori.	9764.000	AV	33.72	38.37	9.41	40.62	2.24	43.12	53.90	10.7	150	0	
Vert.	48.002	QP	45.83	11.50	7.43	31.82	0.00	32.94	40.00	7.0	100	4	
Vert.	60.026	QP	42.83	7.84	7.26	31.82	0.00	26.11	40.00	13.8	100	148	
Vert.	63.287	QP	38.21	7.35	7.22	31.81	0.00	20.97	40.00	19.0	100	211	
Vert.	180.021	QP	27.91	16.33	8.97	31.77	0.00	21.44	43.50	22.0	100	202	
Vert.	4882.000	PK	48.53	31.31	6.74	41.76	2.24	47.06	73.90	26.8	140	180	
Vert.	7323.000	PK	47.25	36.51	8.24	41.27	2.24	52.97	73.90	20.9	150	0	
Vert.	9764.000	PK	46.37	38.37	9.41	40.62	2.24	55.77	73.90	18.1	150	0	
Vert.	4882.000	AV	36.50	31.31	6.74	41.76	2.24	35.03	53.90	18.8	140	180	
Vert.	7323.000	AV	35.28	36.51	8.24	41.27	2.24	41.00	53.90	12.9	150	0	
Vert.	9764.000	AV	33.69	38.37	9.41	40.62	2.24	43.09	53.90	10.8	150	0	

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

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

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

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

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Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11949431S-A
Date : October 3, 2017 October 2, 2017
Temperature / Humidity : 25 deg. C / 52 % RH 24 deg. C / 48 % RH
Engineer : Kazuya Noda Kazuya Noda
(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.	48.003	QP	37.01	11.50	7.43	31.82	0.00	24.12	40.00	15.8	312	320	
Hori.	60.002	QP	40.12	7.84	7.26	31.82	0.00	23.40	40.00	16.6	312	314	
Hori.	68.604	QP	46.44	6.56	7.43	31.81	0.00	28.62	40.00	11.3	261	167	
Hori.	186.176	QP	29.51	16.36	8.98	31.77	0.00	23.08	43.50	20.4	163	2	
Hori.	191.931	QP	33.88	16.39	9.01	31.77	0.00	27.51	43.50	15.9	153	4	
Hori.	288.011	QP	43.21	13.07	6.67	31.75	0.00	31.20	46.00	14.8	100	57	
Hori.	2483.500	PK	46.12	27.45	14.32	40.81	2.24	49.32	73.90	24.5	164	165	
Hori.	4960.000	PK	49.11	31.48	6.76	41.65	2.24	47.94	73.90	25.9	100	158	
Hori.	7440.000	PK	47.93	36.68	8.29	41.36	2.24	53.78	73.90	20.1	150	0	
Hori.	9920.000	PK	47.20	38.63	9.45	40.66	2.24	56.86	73.90	17.0	150	0	
Hori.	2483.500	AV	33.85	27.45	14.32	40.81	2.24	37.05	53.90	16.8	164	165	
Hori.	4960.000	AV	36.41	31.48	6.76	41.65	2.24	35.24	53.90	18.6	100	158	
Hori.	7440.000	AV	35.17	36.68	8.29	41.36	2.24	41.02	53.90	12.8	150	0	
Hori.	9920.000	AV	33.63	38.63	9.45	40.66	2.24	43.29	53.90	10.6	150	0	
Vert.	48.004	QP	46.21	11.50	7.43	31.82	0.00	33.32	40.00	6.6	100	4	
Vert.	60.011	QP	43.58	7.84	7.26	31.82	0.00	26.86	40.00	13.1	100	147	
Vert.	63.302	QP	38.51	7.35	7.22	31.81	0.00	21.27	40.00	18.7	100	211	
Vert.	180.003	QP	27.91	16.33	8.97	31.77	0.00	21.44	43.50	22.0	100	201	
Vert.	2483.500	PK	46.56	27.45	14.32	40.81	2.24	49.76	73.90	24.1	171	0	
Vert.	4960.000	PK	48.64	31.48	6.76	41.65	2.24	47.47	73.90	26.4	135	180	
Vert.	7440.000	PK	48.22	36.68	8.29	41.36	2.24	54.07	73.90	19.8	150	0	
Vert.	9920.000	PK	47.24	38.63	9.45	40.66	2.24	56.90	73.90	17.0	150	0	
Vert.	2483.500	AV	33.79	27.45	14.32	40.81	2.24	36.99	53.90	16.9	171	0	
Vert.	4960.000	AV	35.73	31.48	6.76	41.65	2.24	34.56	53.90	19.3	135	180	
Vert.	7440.000	AV	35.16	36.68	8.29	41.36	2.24	41.01	53.90	12.8	150	0	
Vert.	9920.000	AV	33.60	38.63	9.45	40.66	2.24	43.26	53.90	10.6	150	0	

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

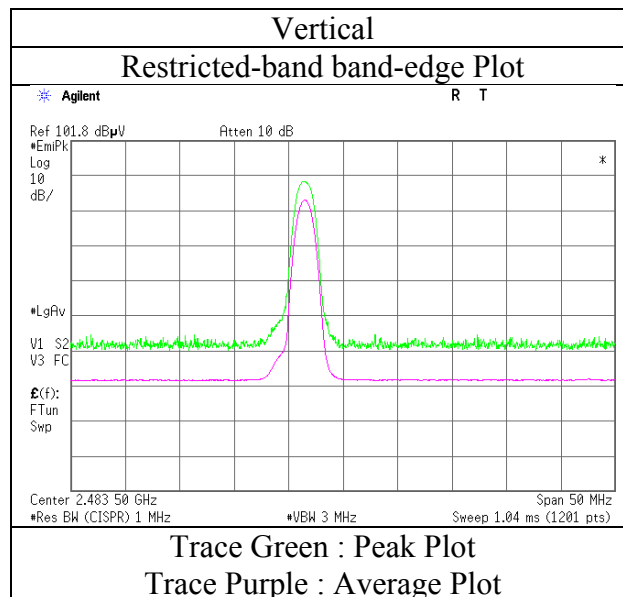
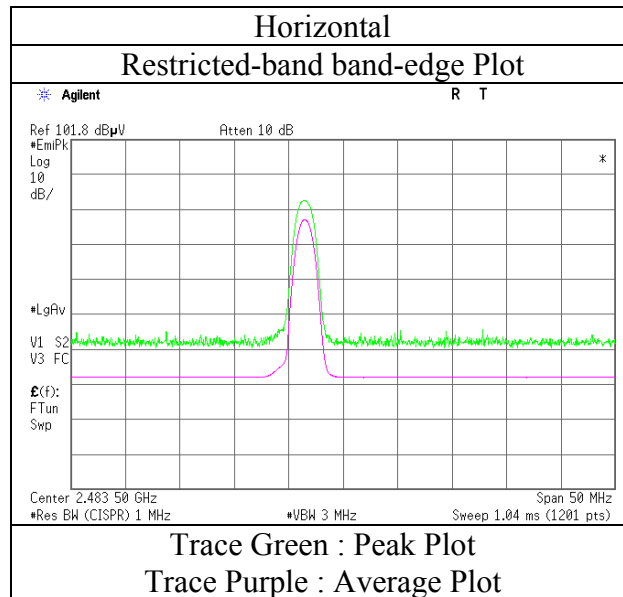
Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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

Radiated Spurious Emission (Reference Plot for band-edge)

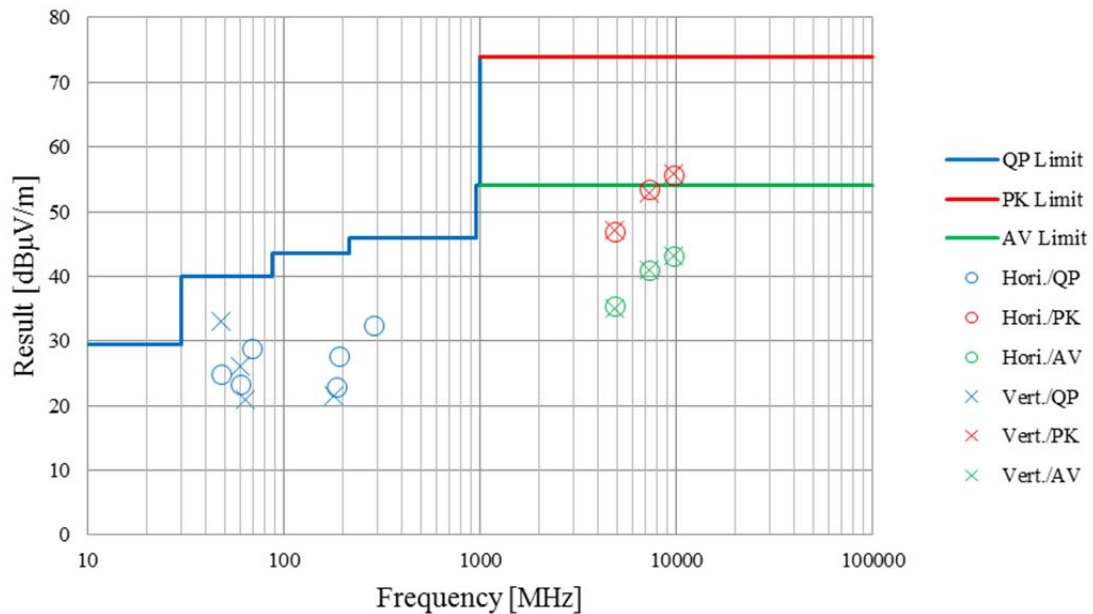
Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11949431S-A
Date	October 2, 2017
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Kazuya Noda
	(1 GHz - 13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

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

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	
Report No.	11949431S-A	
Date	October 3, 2017	October 2, 2017
Temperature / Humidity	25 deg. C / 52 % RH	24 deg. C / 48 % RH
Engineer	Kazuya Noda	Kazuya Noda
	(30 MHz - 1 GHz)	(1 GHz - 13 GHz)
	(13 GHz -26.5 GHz)	
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

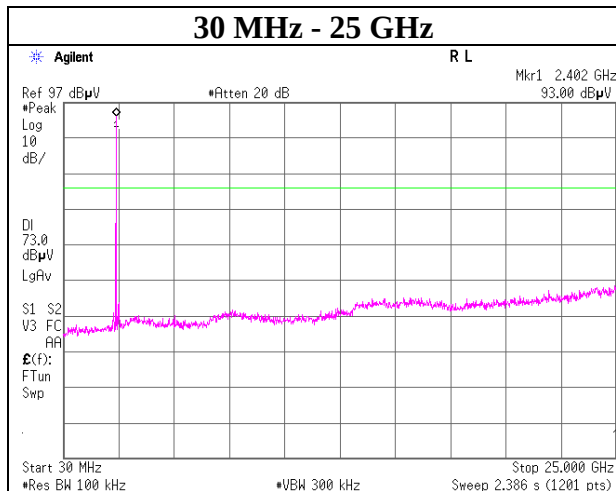
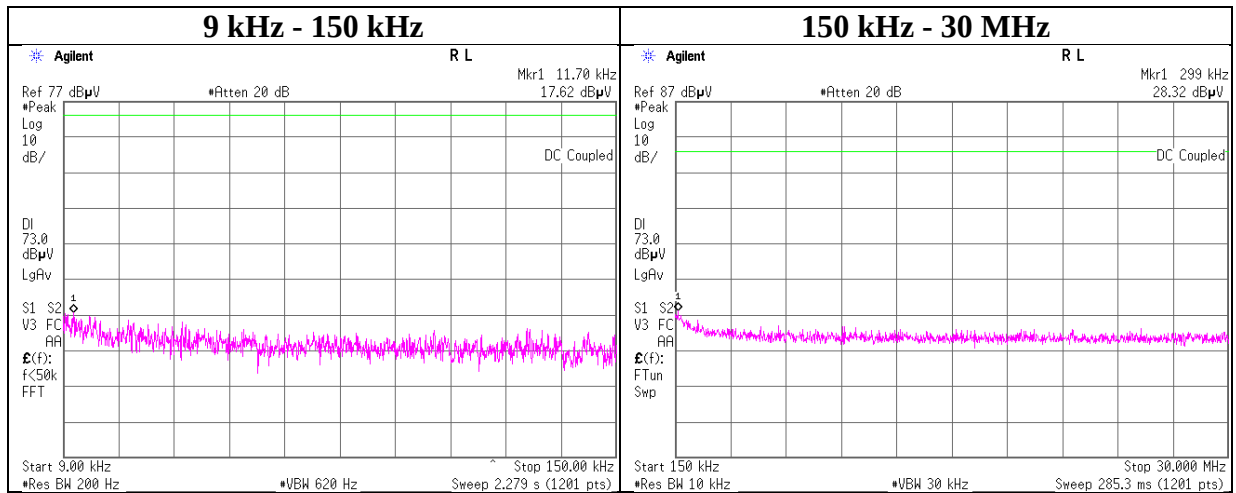


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11949431S-A
Date : September 12, 2017
Temperature / Humidity : 25 deg. C / 58 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, DH5

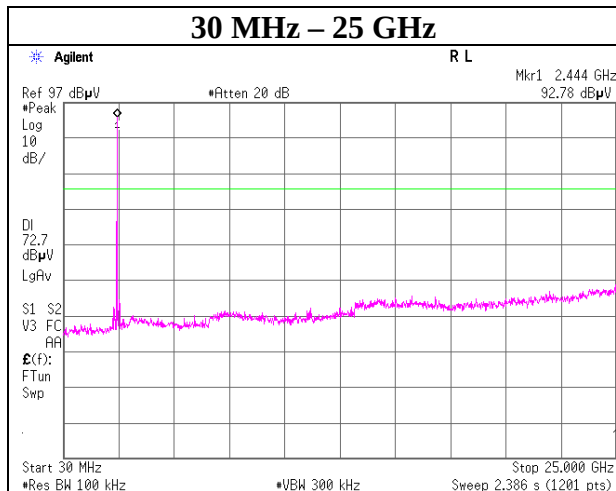
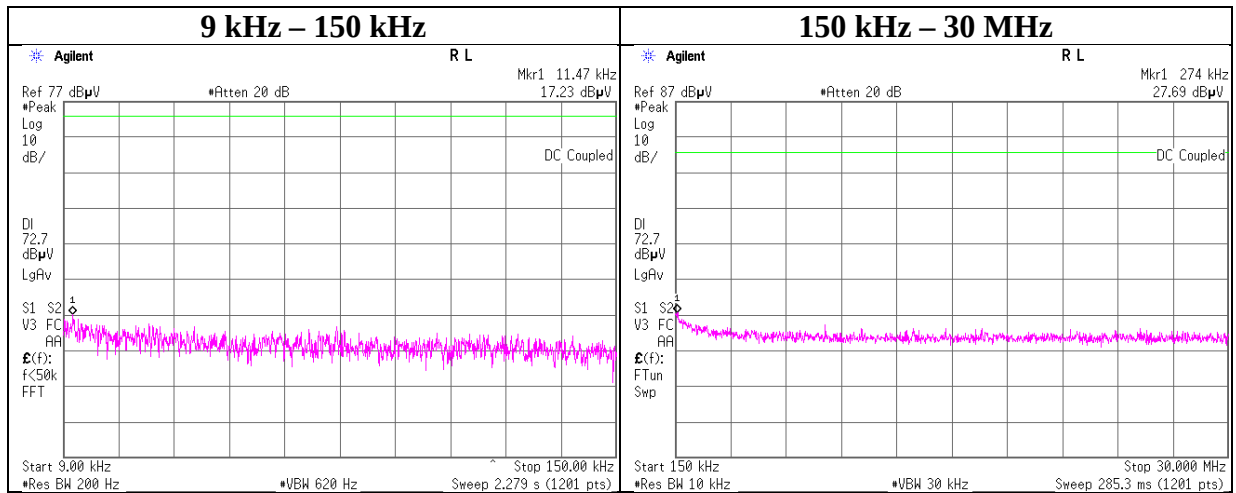
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11949431S-A
Date : September 12, 2017
Temperature / Humidity : 25 deg. C / 58 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, DH5

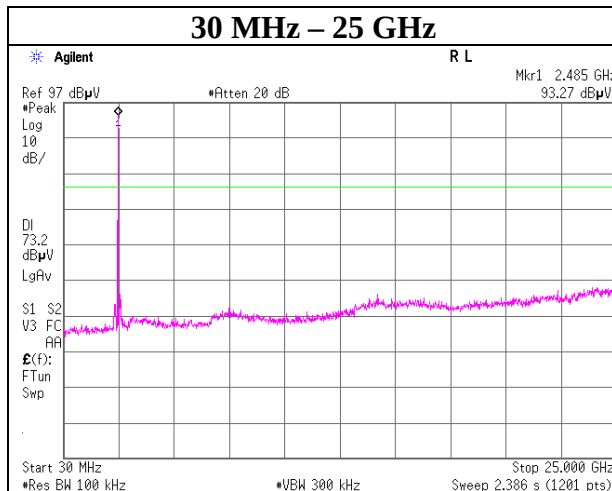
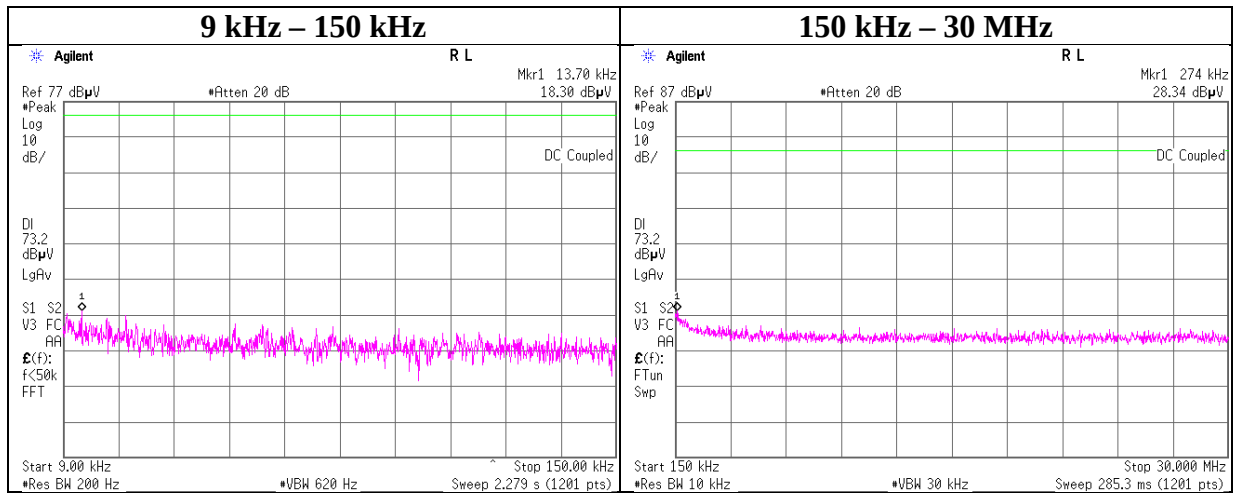
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11949431S-A
Date : September 12, 2017
Temperature / Humidity : 25 deg. C / 58 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, DH5

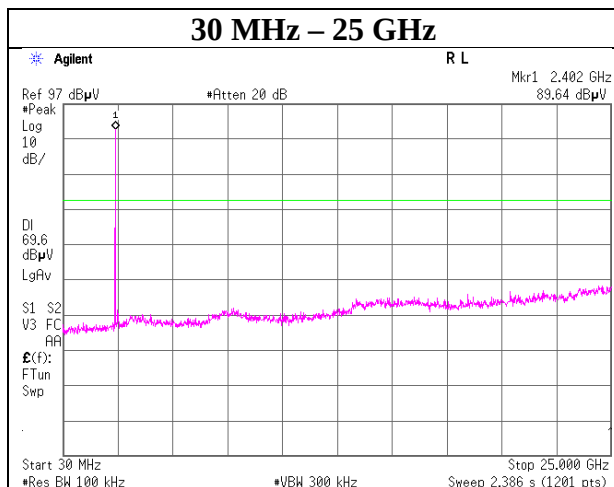
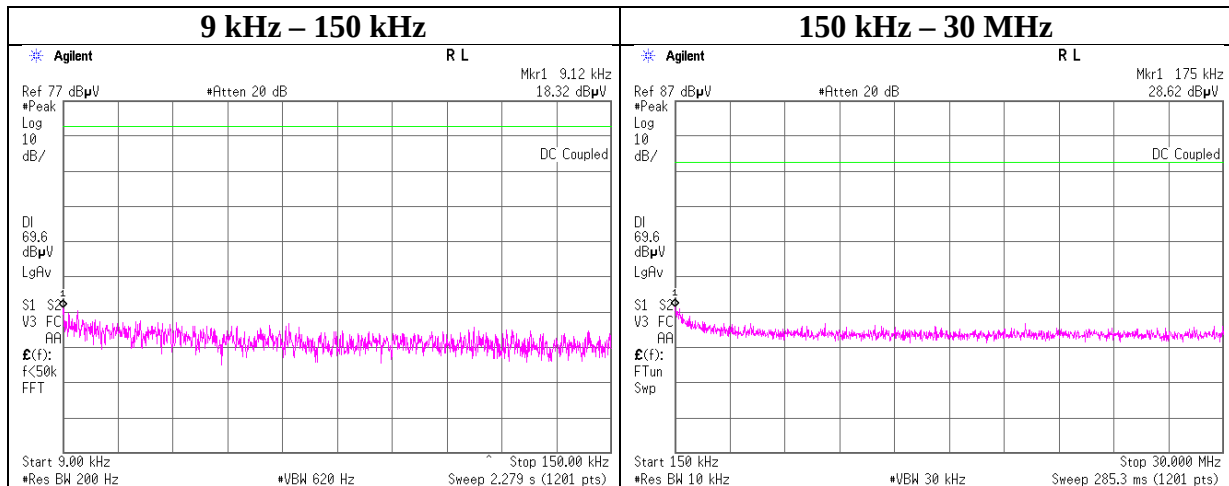
2480 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11949431S-A
Date : September 12, 2017
Temperature / Humidity : 25 deg. C / 58 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping On, 3DH5

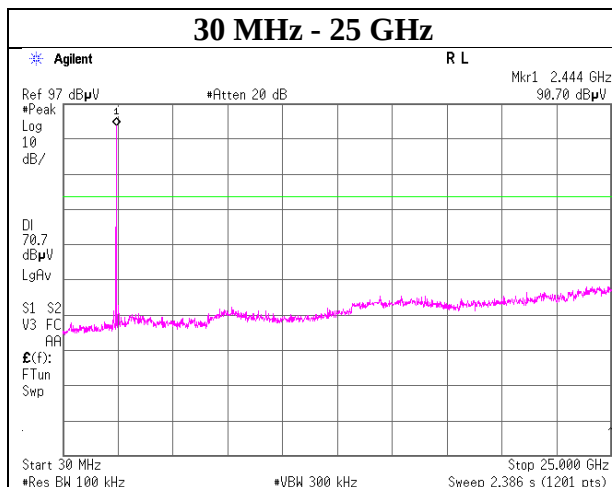
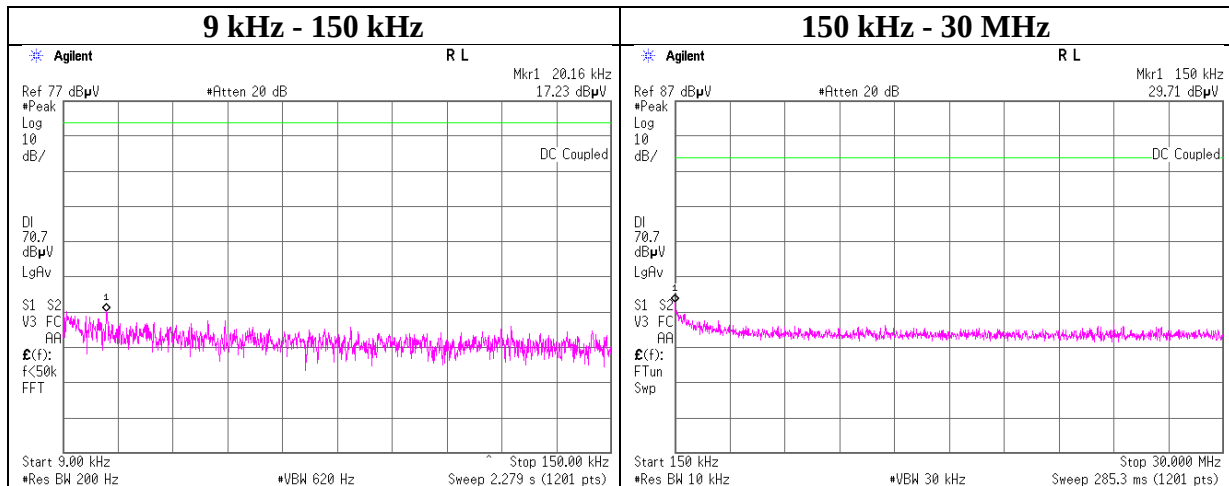
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11949431S-A
Date : September 12, 2017
Temperature / Humidity : 25 deg. C / 58 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off, 3DH5

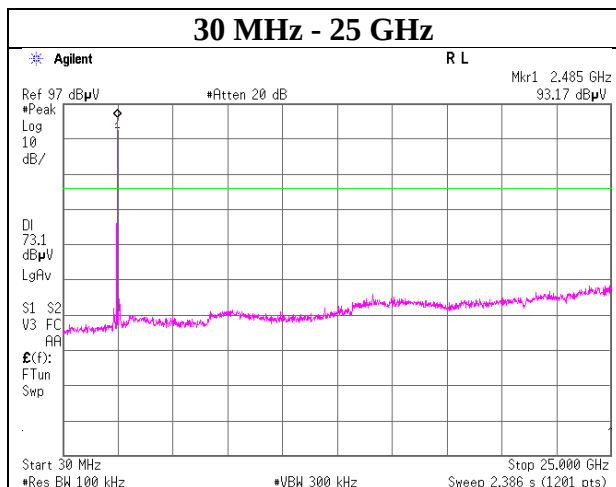
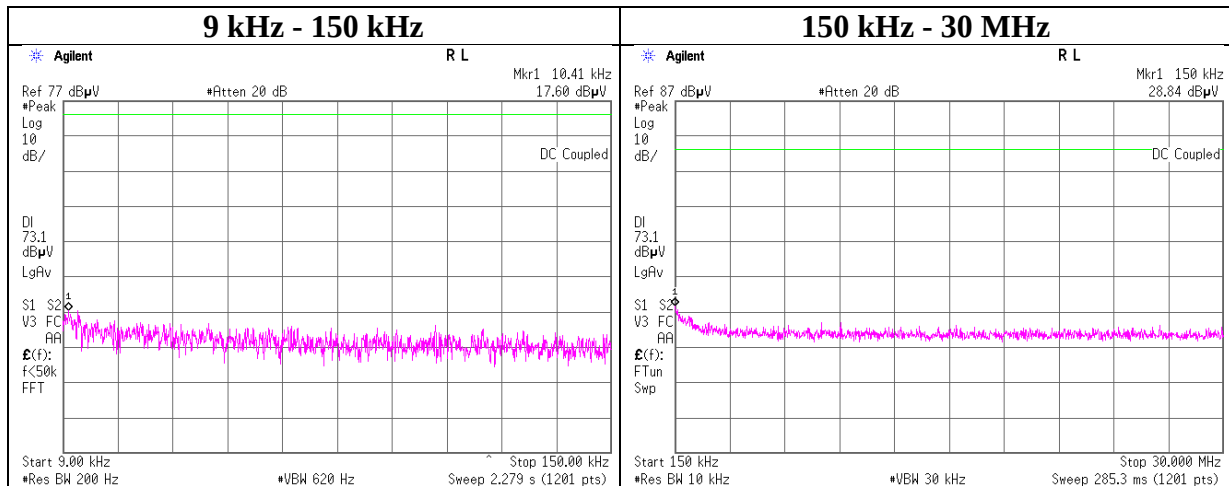
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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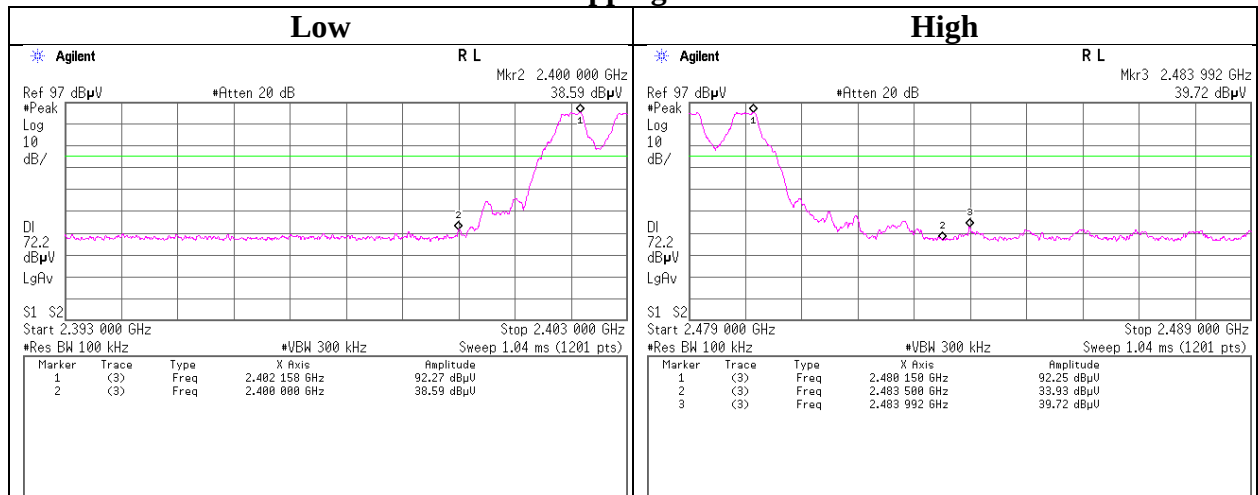
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

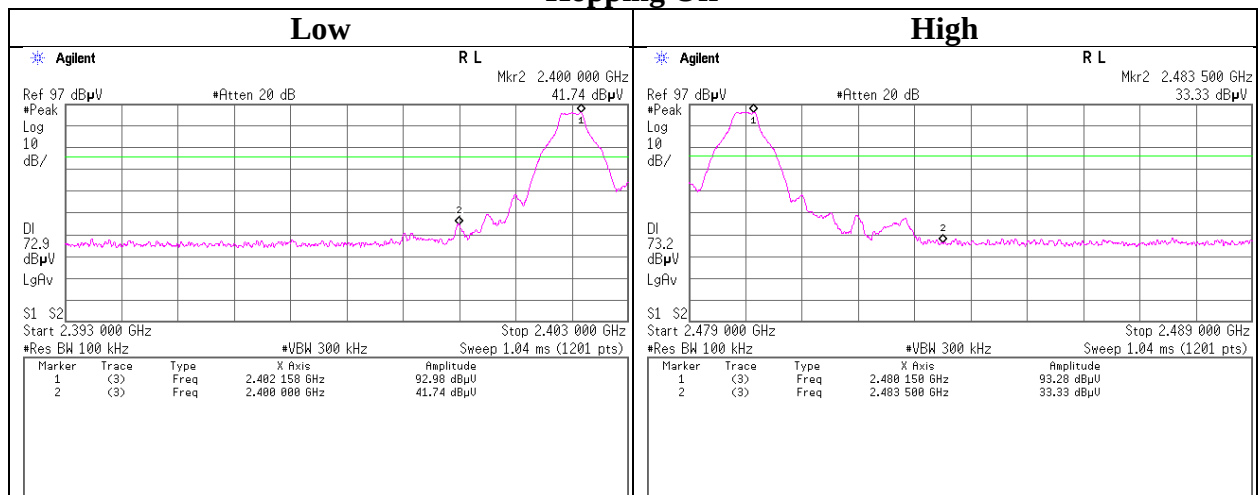
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx DH5

Hopping On



Hopping Off



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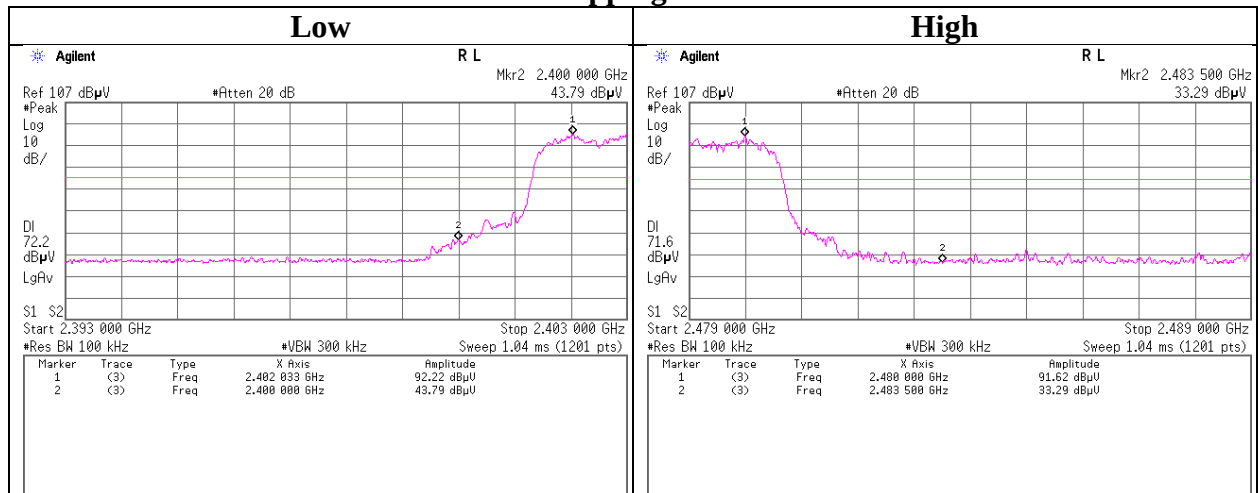
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

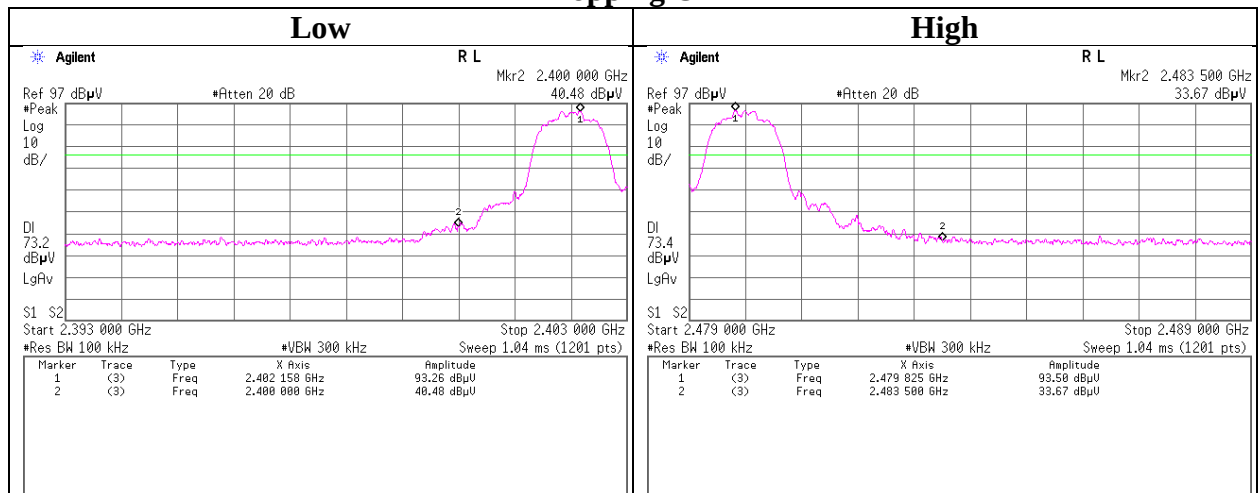
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
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

Telephone : +81 463 50 6400

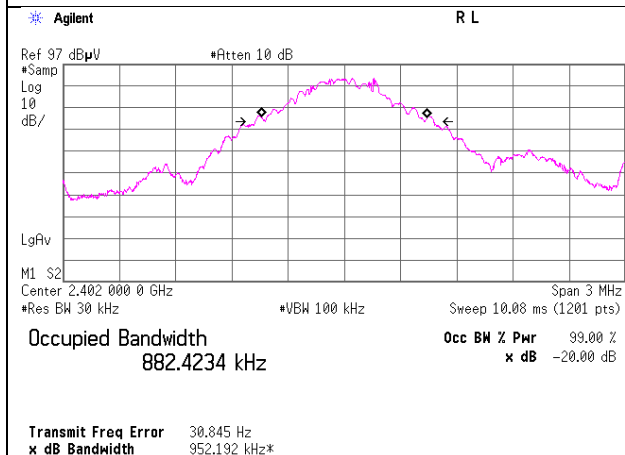
Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx Hopping Off

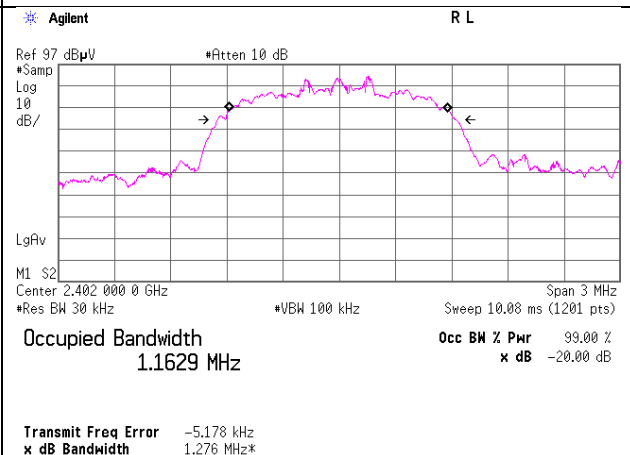
Hopping Off, DH5

2402 MHz

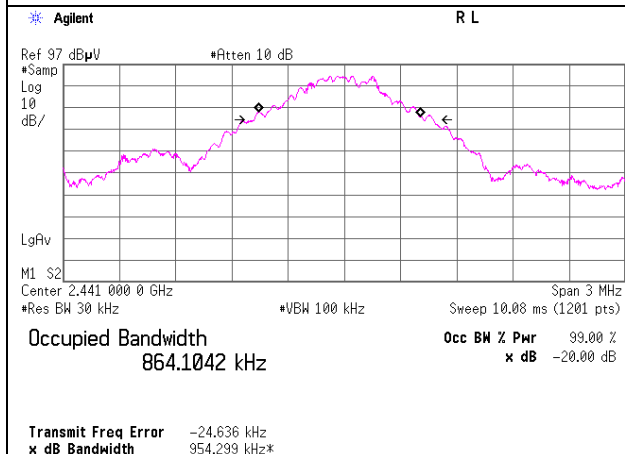


Hopping Off, 3DH5

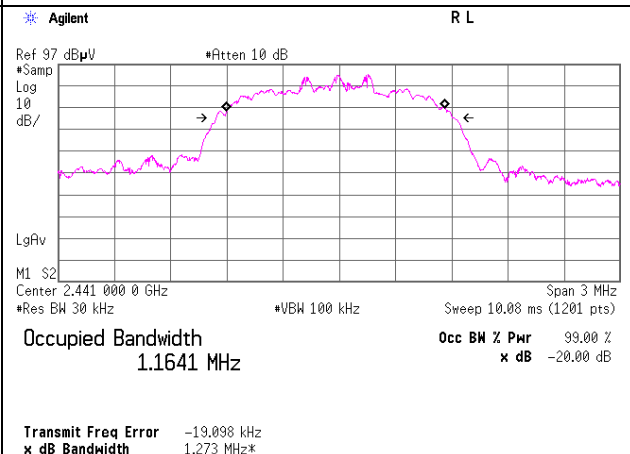
2402 MHz



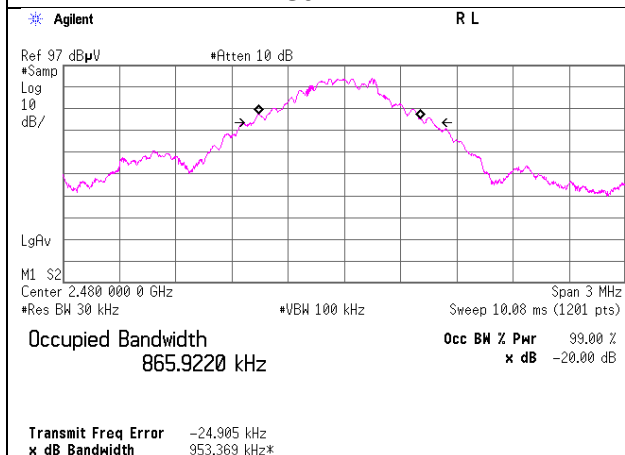
2441 MHz



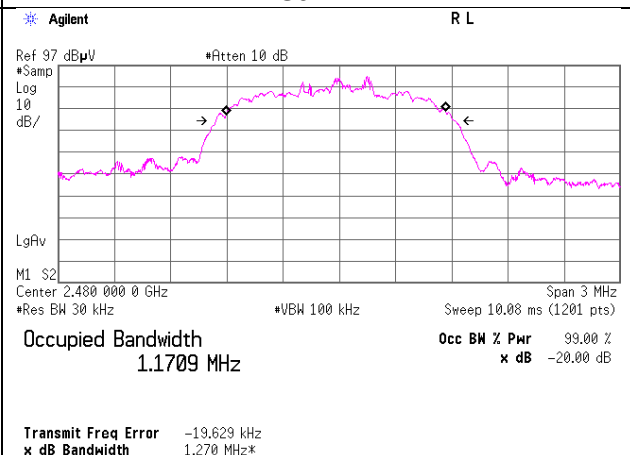
2441 MHz



2480 MHz



2480 MHz



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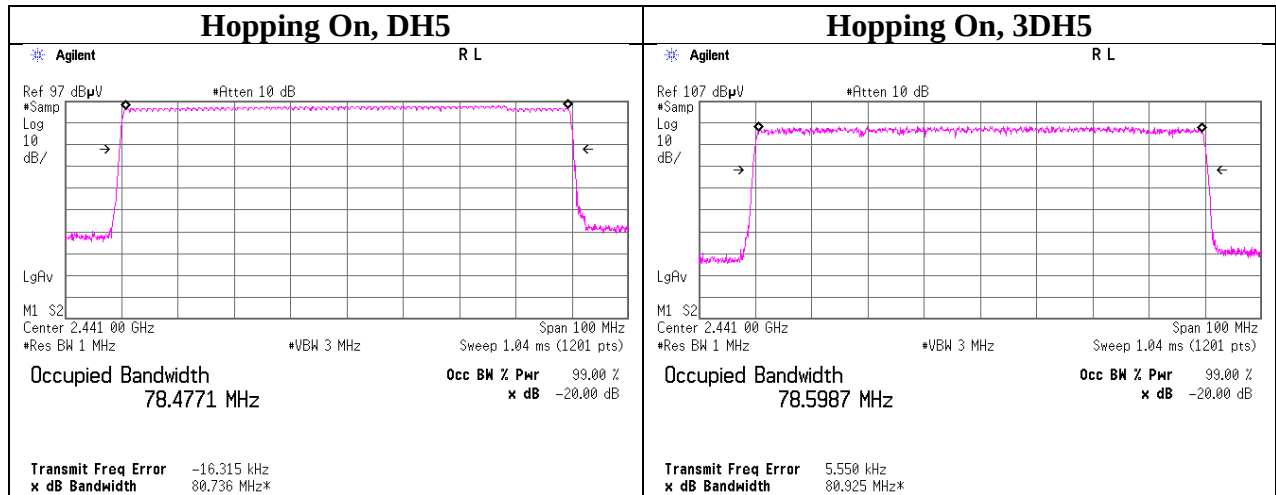
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11949431S-A
Date	September 12, 2017
Temperature / Humidity	25 deg. C / 58 % RH
Engineer	Shiro Kobayashi
Mode	Tx Hopping On



*Refer to 20dB Bandwidth for 99% Bandwidth inquiry mode.

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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2016/10/17 * 12
SRENT-10	Spectrum Analyzer	Agilent	E4440A	US41421511	AT	2016/12/05 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2017/03/23 * 12
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2017/03/23 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2017/05/01 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2017/03/17 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2016/10/12 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	RE	2016/10/24 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	RE	2017/07/20 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2016/10/17 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-0100 ONFSNMS/B	1612S005	RE	2017/01/08 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 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-G20	Coaxial Cable	Junkosha	J12J102518-00	APR-15-15-03	RE	2017/04/20 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-0100 0KMSKMS	-	RE	2017/04/20 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2017/02/09 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2016/12/15 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2017/08/24 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2016/10/15 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS4906	-/0901-269(R F Selector)	RE	2017/04/07 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS4906	-/0901-269(R F Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/01/05 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2017/09/26 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: RE: Radiated Emission test
AT: Antenna Terminal Conducted test

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