



Test report No. : 11234226S-E
Page : 1 of 46
Issued date : May 17, 2016
Revised date : May 19, 2016
FCC ID : AK8RMX7BT

RADIO TEST REPORT

Test Report No. : 11234226S-E

Applicant : Sony Corporation
Type of Equipment : In-car Bluetooth Commander
Model No. : RM-X7BT
FCC ID : AK8RMX7BT
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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: April 15 to May 1, 2016

Representative test engineer:

Makoto Hosaka
Engineer
Consumer Technology Division

Approved by:

Akio Hayashi
Leader
Consumer Technology Division



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

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

13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Radiated Spurious Emission	10
SECTION 6: Antenna Terminal Conducted Tests.....	11
APPENDIX 1: Test data	12
20dB Bandwidth and Carrier Frequency Separation.....	12
Number of Hopping Frequency	15
Dwell time.....	17
Maximum Peak Output Power	20
Average Output Power	21
Radiated Spurious Emission	23
Conducted Spurious Emission	34
Conducted Emission Band Edge compliance	40
99%Occupied Bandwidth	42
APPENDIX 2: Test instruments	44
APPENDIX 3: Photographs of test setup	45
Radiated Spurious Emission	45
Worst Case Position	46

SECTION 1: Customer information

Company Name	:	Sony Global Manufacturing & Operations Corporation
Address	:	8-4 Shiomi Kisarazu-shi, Chiba, 292-0834 Japan
Contact Person	:	Kazuhiko Nagano

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

2.1 Identification of E.U.T.

Type of Equipment	:	In-car Bluetooth Commander
Model No.	:	RM-X7BT
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5 V
Receipt Date of Sample	:	April 12, 2016
Country of Mass-production	:	China
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: RM-X7BT (referred to as the EUT in this report) is a In-car Bluetooth Commander.

General Specification

Clock frequency(ies) in the system	:	26 MHz
------------------------------------	---	--------

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS
Power Supply (radio part input)	:	DC 3.3 V
Antenna type	:	Chip
Antenna Gain	:	-0.3 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015
 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

*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 11234226S-G.

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 (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)		-	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	6.2 dB 19212.00 MHz, AV, Horizontal Tx 2402 MHz, 3DH5	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 is in-car device and 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)

This EUT provides stable voltage (DC3.3 V) constantly to RF Part regardless of input voltage. 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.

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

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 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	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
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

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

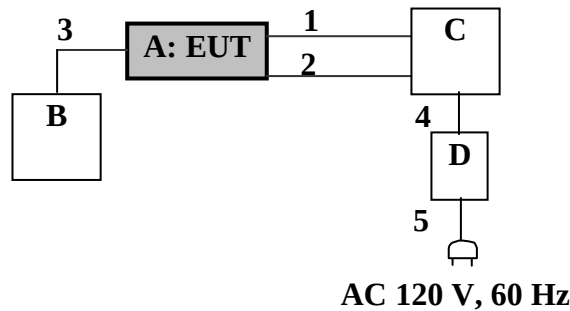
4.1 Operating Mode(s)

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
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: BDR: Ext.=23, Int.=44, PA ATTEN=1 EDR: Ext.=56, Int.=44, PA ATTEN=0 Software: CSR BlueSuite 2,5,8 BlueTest3 Version 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	Remarks
A	In-car Bluetooth Commander	RM-X7BT	TRIAL074 *1) TRIAL073 *2)	Sony	EUT
B	MIC	-	-	Sony	-
C	Notebook PC	E1Q57PA#ABJ	5CB3310KHW	Hewlett Packard	-
D	AC Adapter	PPP009L-E	3453442403	Hewlett Packard	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Cable Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	0.8	Shielded	Shielded	-
2	Audio	0.8	Shielded	Shielded	-
3	MIC	4.0	Shielded	Shielded	-
4	DC	1.7	Unshielded	Unshielded	-
5	AC	1.7	Unshielded	Unshielded	-

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 Styrofoam and covered with polyvinyl chloride. 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 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	Below 1 GHz	Above 1GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	PK	AV
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)
Test Distance	3 m	3.87 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz),	

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

*2) Distance Factor: $20 \times \log (3.87 \text{ m}/3.0 \text{ m}) = 2.2 \text{ dB}$

*3) Distance Factor: $20 \times \log (1.0 \text{ m}/3.0 \text{ m}) = -9.5 \text{ dB}$

- 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.

Frequency Antenna polarization	Carrier	Spurious			
		Below 1 GHz	1-13 GHz	13-18 GHz	18-26.5 GHz
Horizontal	Z	Z	Y	Y	Y
Vertical	Z	Z	Z	Z	Z

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

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 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	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 *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 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) Peak hold was applied as Worst-case measurement.

*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 = 9.1 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

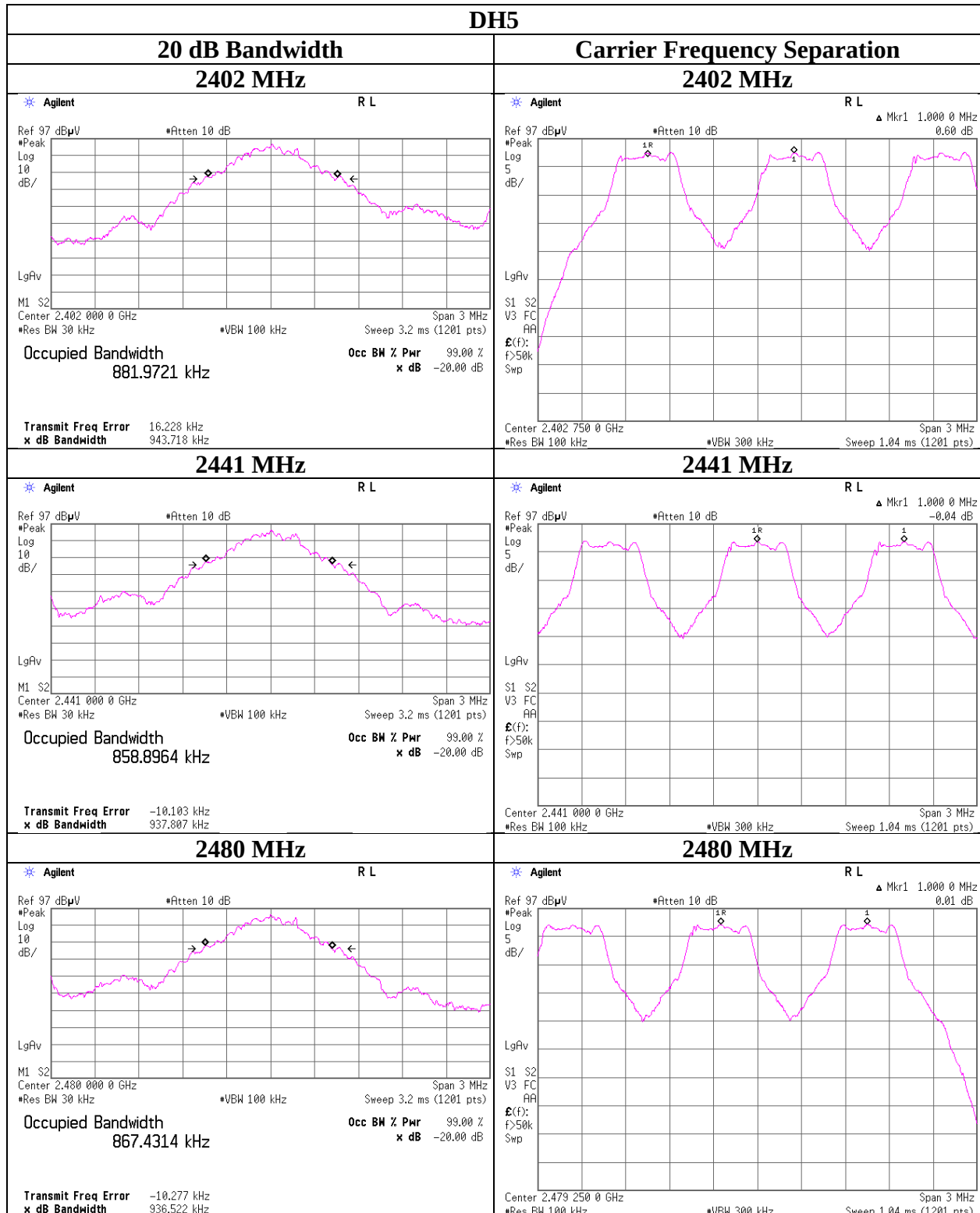
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.944	1.000	≥ 0.629
DH5	2441.0	0.938	1.000	≥ 0.625
DH5	2480.0	0.937	1.000	≥ 0.624
3DH5	2402.0	1.259	1.000	≥ 0.839
3DH5	2441.0	1.260	1.000	≥ 0.840
3DH5	2480.0	1.259	1.000	≥ 0.840

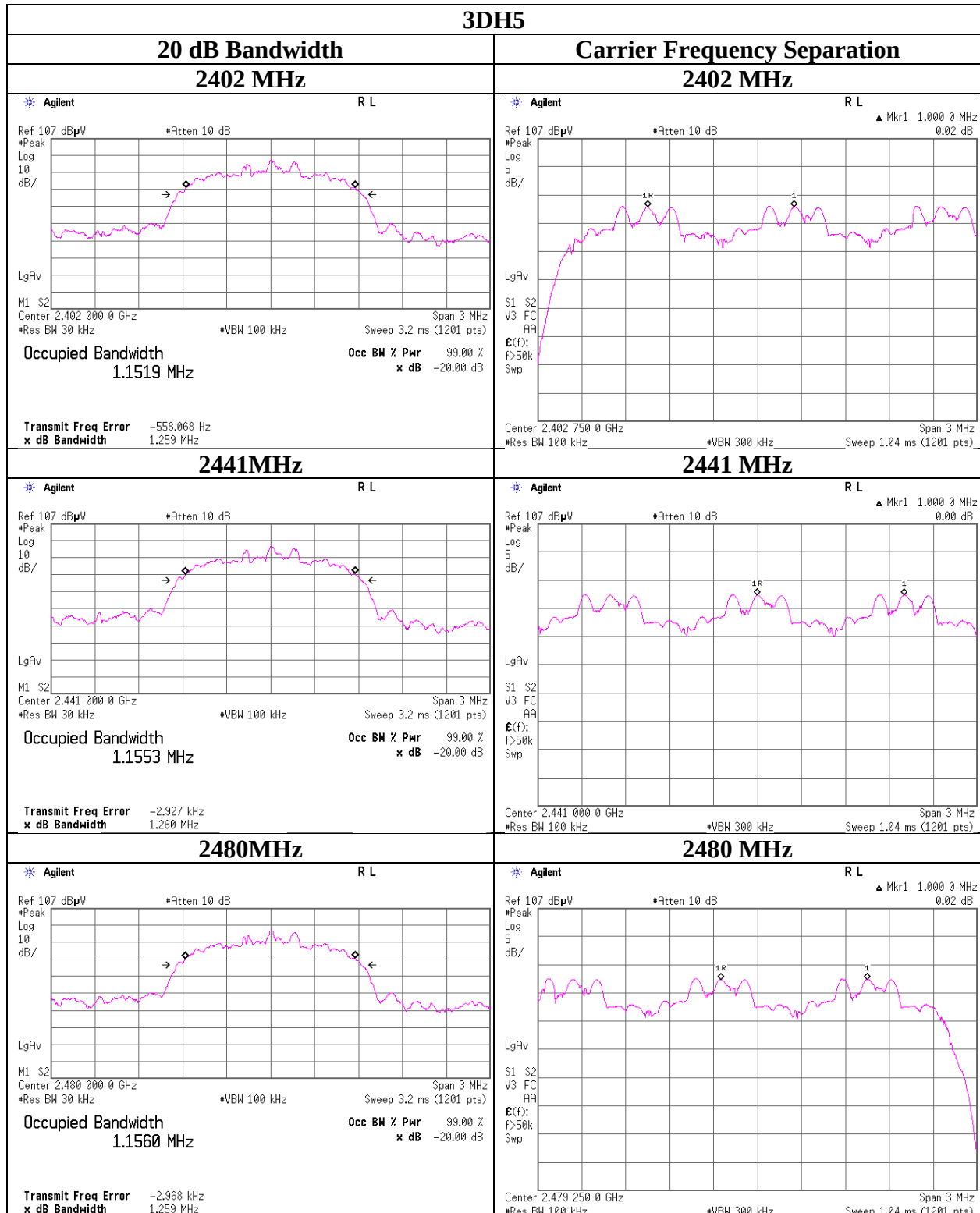
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation



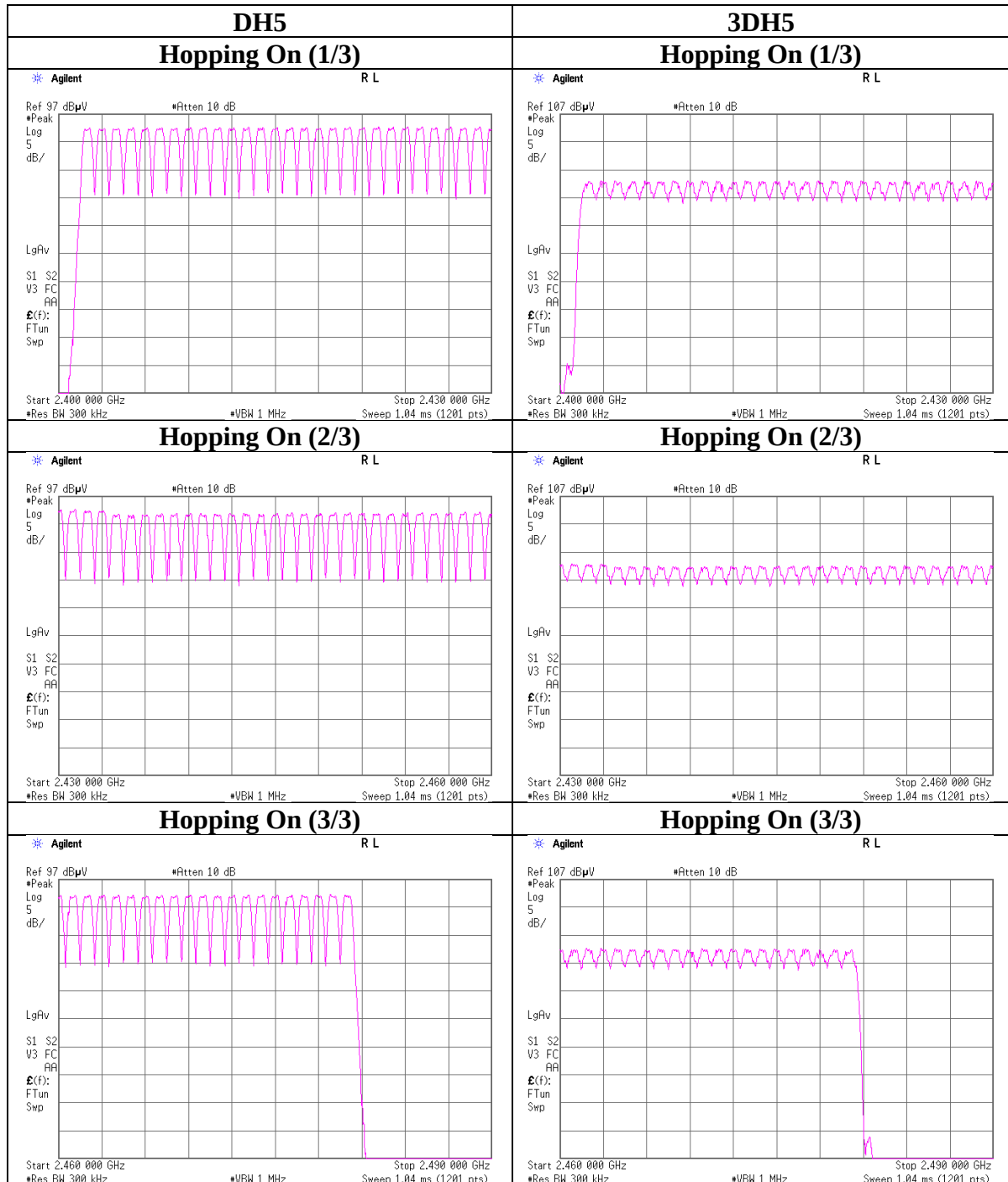
Number of Hopping Frequency

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11234226S-E
Date April 15, 2016
Temperature / Humidity 24 deg. C / 53 % RH
Engineer Makoto Hosaka
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



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

Dwell time

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping On

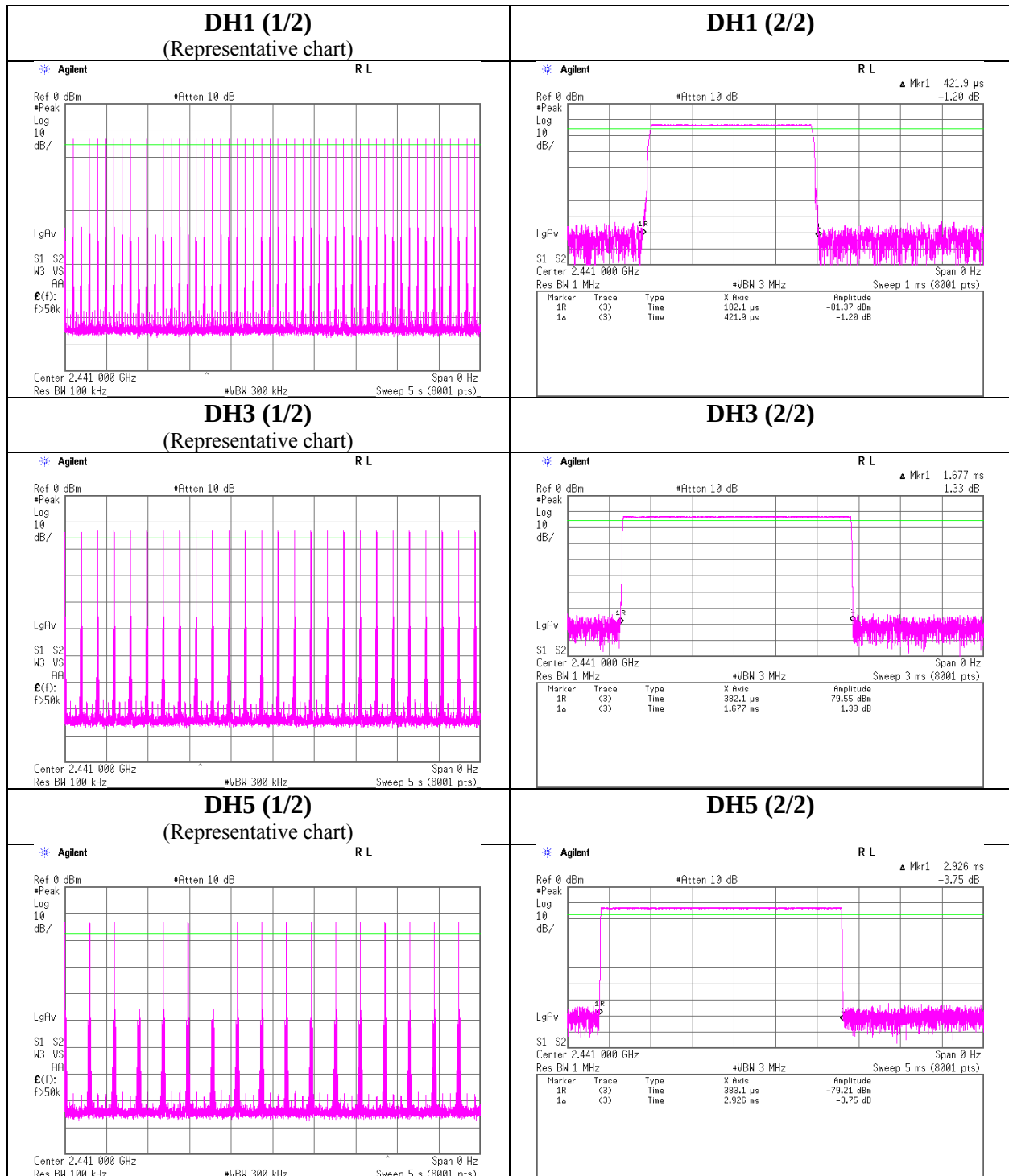
Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period					Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times	/	5 sec.	x	31.6 sec. = 323 times	0.422	136	400
DH3	26.0 times	/	5 sec.	x	31.6 sec. = 165 times	1.677	277	400
DH5	17.0 times	/	5 sec.	x	31.6 sec. = 108 times	2.926	316	400
3DH1	51.0 times	/	5 sec.	x	31.6 sec. = 323 times	0.435	141	400
3DH3	26.0 times	/	5 sec.	x	31.6 sec. = 165 times	1.685	278	400
3DH5	17.0 times	/	5 sec.	x	31.6 sec. = 108 times	2.938	317	400

Sample Calculation

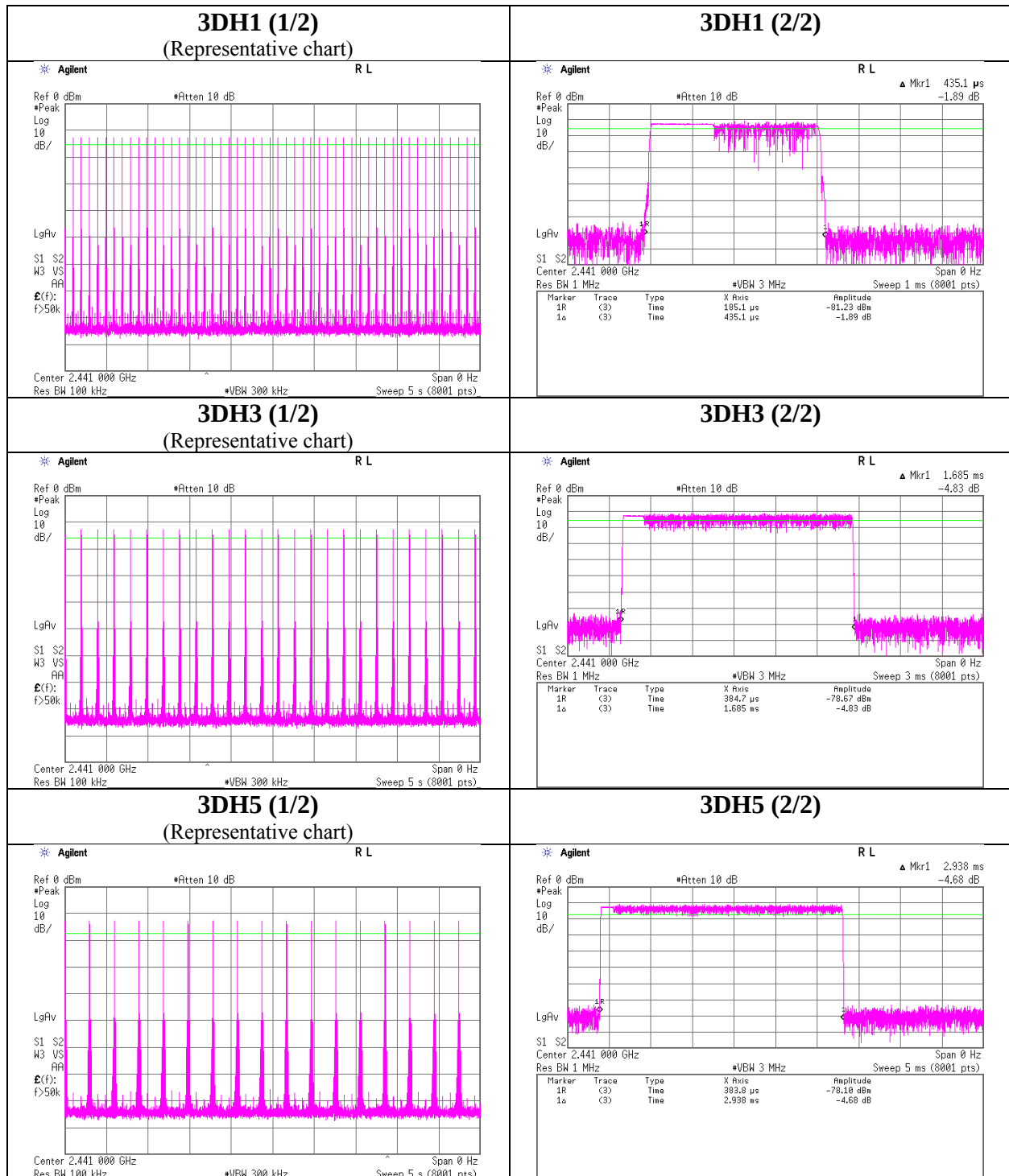
Result = Number of transmission x Length of transmission

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.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-11.94	2.52	9.67	0.25	1.06	20.96	125	20.71
DH5	2441.0	-12.49	2.52	9.67	-0.30	0.93	20.96	125	21.26
DH5	2480.0	-12.24	2.53	9.67	-0.04	0.99	20.96	125	21.00
2DH5	2402.0	-9.96	2.52	9.67	2.23	1.67	20.96	125	18.73
2DH5	2441.0	-10.62	2.52	9.67	1.57	1.44	20.96	125	19.39
2DH5	2480.0	-10.48	2.53	9.67	1.72	1.49	20.96	125	19.24
3DH5	2402.0	-9.69	2.52	9.67	2.50	1.78	20.96	125	18.46
3DH5	2441.0	-10.31	2.52	9.67	1.88	1.54	20.96	125	19.08
3DH5	2480.0	-10.06	2.53	9.67	2.14	1.64	20.96	125	18.82

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.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-13.73	2.52	9.67	-1.54	0.70	1.08	-0.46	0.90
DH5	2441.0	-14.33	2.52	9.67	-2.14	0.61	1.08	-1.06	0.78
DH5	2480.0	-14.04	2.53	9.67	-1.84	0.65	1.08	-0.76	0.84
2DH5	2402.0	-14.31	2.52	9.67	-2.12	0.61	1.06	-1.06	0.78
2DH5	2441.0	-14.89	2.52	9.67	-2.70	0.54	1.06	-1.64	0.69
2DH5	2480.0	-14.81	2.53	9.67	-2.61	0.55	1.06	-1.55	0.70
3DH5	2402.0	-14.30	2.52	9.67	-2.11	0.62	1.06	-1.05	0.79
3DH5	2441.0	-14.90	2.52	9.67	-2.71	0.54	1.06	-1.65	0.68
3DH5	2480.0	-14.81	2.53	9.67	-2.61	0.55	1.06	-1.55	0.70

Sample Calculation:

Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

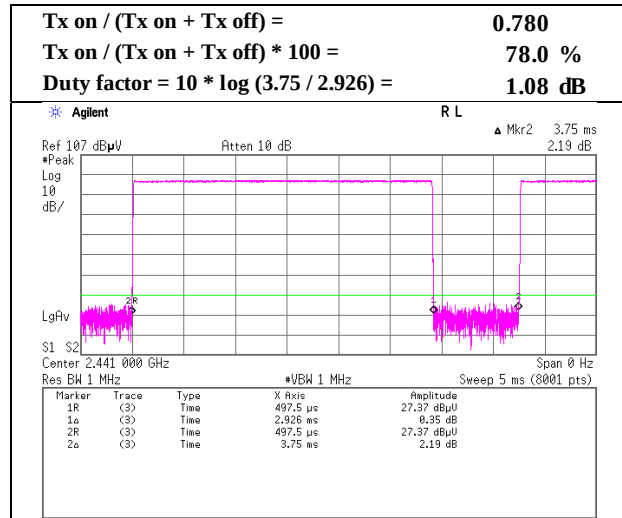
Result (Burst power) = Frame power + Duty factor

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

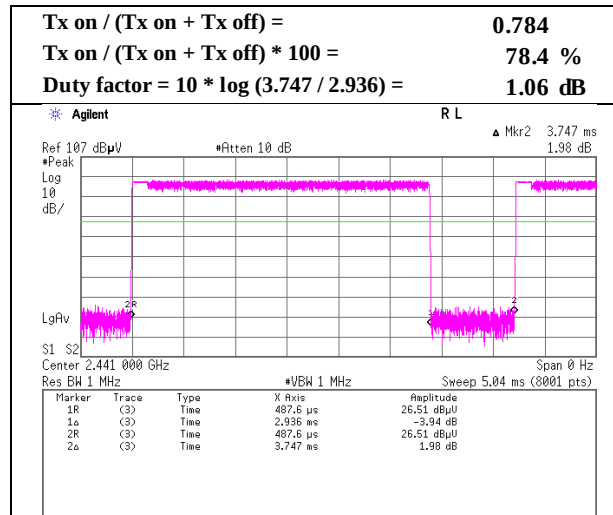
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11234226S-E
Date : April 15, 2016
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Makoto Hosaka
Mode : Tx, Hopping Off

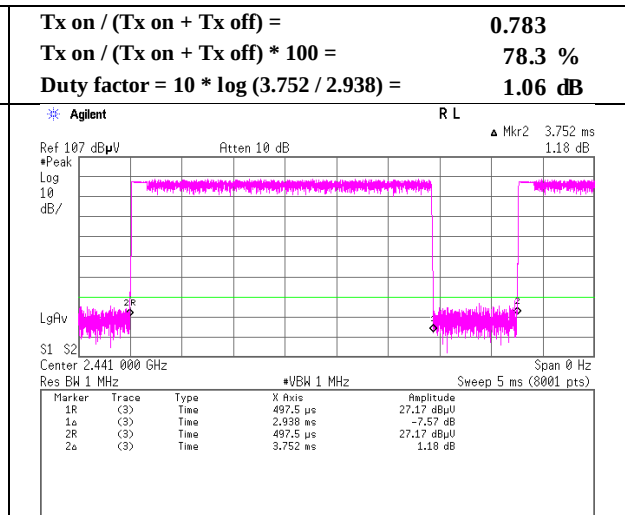
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11234226S-E
Date : April 30, 2016 May 1, 2016 May 1, 2016
Temperature / Humidity : 20 deg. C / 50 % RH 19 deg. C / 48 % RH 19 deg. C / 48 % RH
Engineer : Makoto Hosaka Makoto Hosaka Makoto Hosaka
(1-18 GHz) (30 M-1 GHz) (18-26.5 GHz)
Mode : Tx, Hopping Off, DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	260.001	QP	22.9	18.1	9.5	31.7	0.0	18.8	46.0	27.2	151	359	
Hori.	392.000	QP	29.6	16.1	7.2	31.6	0.0	21.3	46.0	24.7	159	230	
Hori.	800.000	QP	21.6	21.0	9.4	31.4	0.0	20.6	46.0	25.4	122	0	
Hori.	2390.000	PK	42.6	27.7	13.7	34.3	2.2	51.9	73.9	22.0	143	116	
Hori.	2400.000	PK	42.5	27.7	13.7	34.3	2.2	51.8	73.9	22.1	143	116	
Hori.	4804.000	PK	46.0	31.4	6.3	33.8	2.2	52.1	73.9	21.8	113	80	
Hori.	7206.000	PK	44.2	36.9	7.6	33.8	2.2	57.1	73.9	16.8	100	0	
Hori.	9608.000	PK	41.9	38.0	8.7	34.3	2.2	56.5	73.9	17.4	100	0	
Hori.	19220.000	PK	45.9	40.3	22.8	47.6	-9.5	51.9	73.9	22.0	117	92	
Hori.	2390.000	AV	30.4	27.7	13.7	34.3	2.2	39.7	53.9	14.2	143	116	
Hori.	2400.000	AV	30.4	27.7	13.7	34.3	2.2	39.7	53.9	14.2	143	116	
Hori.	4804.000	AV	36.6	31.4	6.3	33.8	2.2	42.7	53.9	11.2	113	80	
Hori.	7206.000	AV	30.4	36.9	7.6	33.8	2.2	43.3	53.9	10.6	100	0	
Hori.	9608.000	AV	31.2	38.0	8.7	34.3	2.2	45.8	53.9	8.1	100	0	
Hori.	19220.000	AV	37.8	40.3	22.8	47.6	-9.5	43.8	53.9	10.1	117	92	
Vert.	58.276	QP	31.0	8.3	7.4	31.9	0.0	14.8	40.0	25.2	100	310	
Vert.	336.467	QP	29.8	14.5	6.9	31.7	0.0	19.5	46.0	26.5	100	49	
Vert.	432.000	QP	25.6	16.7	7.5	31.6	0.0	18.2	46.0	27.8	100	226	
Vert.	2390.000	PK	42.2	27.7	13.7	34.3	2.2	51.5	73.9	22.4	100	125	
Vert.	2400.000	PK	43.2	27.7	13.7	34.3	2.2	52.5	73.9	21.4	100	125	
Vert.	4804.000	PK	44.9	31.4	6.3	33.8	2.2	51.0	73.9	22.9	100	5	
Vert.	7206.000	PK	41.8	36.9	7.6	33.8	2.2	54.7	73.9	19.2	100	0	
Vert.	9608.000	PK	43.3	38.0	8.7	34.3	2.2	57.9	73.9	16.0	100	0	
Vert.	19220.000	PK	46.2	40.3	22.8	47.6	-9.5	52.2	73.9	21.7	127	358	
Vert.	2390.000	AV	30.3	27.7	13.7	34.3	2.2	39.6	53.9	14.3	100	125	
Vert.	2400.000	AV	30.8	27.7	13.7	34.3	2.2	40.1	53.9	13.8	100	125	
Vert.	4804.000	AV	35.9	31.4	6.3	33.8	2.2	42.0	53.9	11.9	100	5	
Vert.	7206.000	AV	30.4	36.9	7.6	33.8	2.2	43.3	53.9	10.6	100	0	
Vert.	9608.000	AV	31.6	38.0	8.7	34.3	2.2	46.2	53.9	7.7	100	0	
Vert.	19220.000	AV	38.7	40.3	22.8	47.6	-9.5	44.7	53.9	9.2	127	358	

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

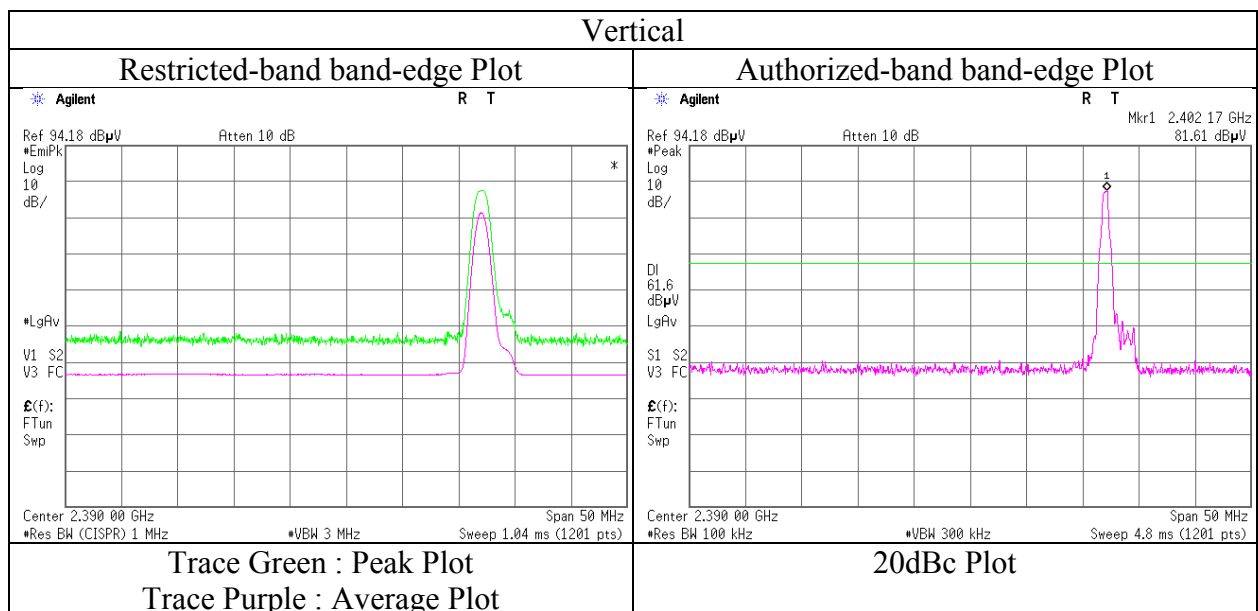
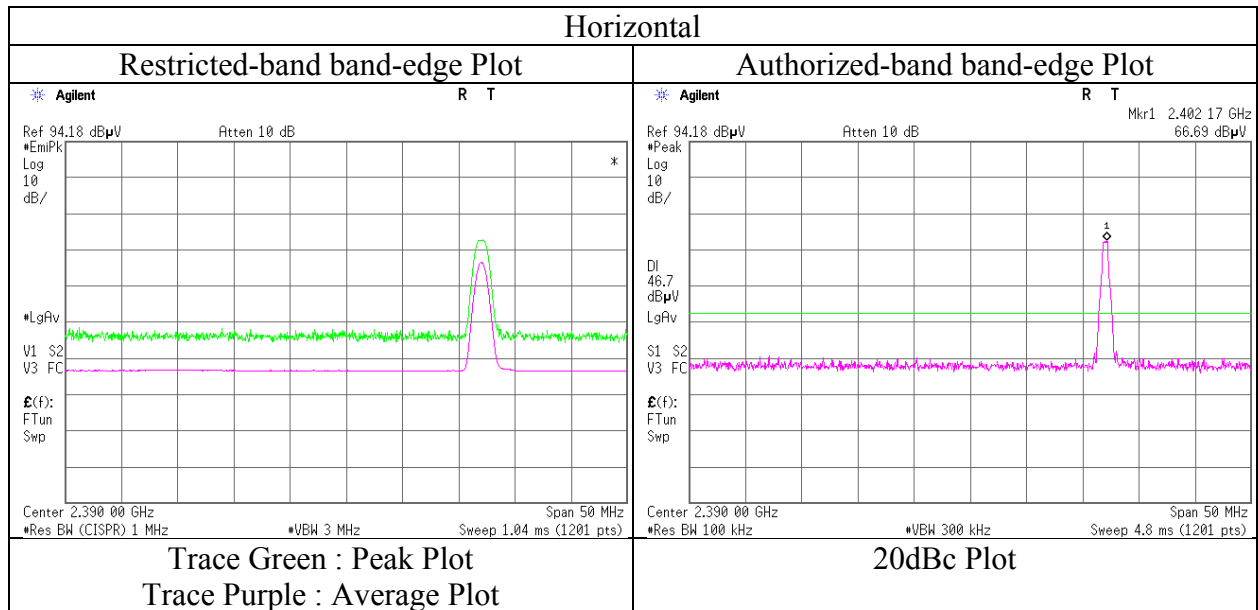
Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.2\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11234226S-E
Date	April 30, 2016
Temperature / Humidity	20 deg. C / 50 % RH
Engineer	Makoto Hosaka (1-18 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11234226S-E
Date : April 30, 2016 May 1, 2016 May 1, 2016
Temperature / Humidity : 20 deg. C / 50 % RH 19 deg. C / 48 % RH 19 deg. C / 48 % RH
Engineer : Makoto Hosaka Makoto Hosaka Makoto Hosaka
(1-18 GHz) (30 M-1 GHz) (18-26.5 GHz)
Mode : Tx, Hopping Off, DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	260.000	QP	21.8	18.1	9.5	31.7	0.0	17.7	46.0	28.3	150	185	
Hori.	392.000	QP	29.8	16.1	7.2	31.6	0.0	21.5	46.0	24.5	172	229	
Hori.	800.000	QP	21.5	21.0	9.4	31.4	0.0	20.5	46.0	25.5	100	95	
Hori.	4882.000	PK	44.8	31.6	6.4	33.8	2.2	51.2	73.9	22.7	171	80	
Hori.	7323.000	PK	40.8	36.9	7.7	33.9	2.2	53.7	73.9	20.2	100	0	
Hori.	9764.000	PK	42.0	38.1	8.8	34.3	2.2	56.8	73.9	17.1	100	0	
Hori.	19524.000	PK	45.6	40.2	22.8	47.4	-9.5	51.7	73.9	22.2	132	85	
Hori.	4882.000	AV	35.3	31.6	6.4	33.8	2.2	41.7	53.9	12.2	171	80	
Hori.	7323.000	AV	30.0	36.9	7.7	33.9	2.2	42.9	53.9	11.0	100	0	
Hori.	9764.000	AV	30.8	38.1	8.8	34.3	2.2	45.6	53.9	8.3	100	0	
Hori.	19524.000	AV	37.6	40.2	22.8	47.4	-9.5	43.7	53.9	10.2	132	85	
Vert.	58.321	QP	31.5	8.3	7.4	31.9	0.0	15.3	40.0	24.7	100	84	
Vert.	335.993	QP	27.4	14.5	6.9	31.7	0.0	17.1	46.0	28.9	100	55	
Vert.	432.000	QP	25.6	16.7	7.5	31.6	0.0	18.2	46.0	27.8	100	213	
Vert.	4882.000	PK	46.2	31.6	6.4	33.8	2.2	52.6	73.9	21.3	100	10	
Vert.	7323.000	PK	41.7	36.9	7.7	33.9	2.2	54.6	73.9	19.3	100	0	
Vert.	9764.000	PK	41.4	38.1	8.8	34.3	2.2	56.2	73.9	17.7	100	0	
Vert.	19524.000	PK	45.2	40.2	22.8	47.4	-9.5	51.3	73.9	22.6	127	12	
Vert.	4882.000	AV	35.2	31.6	6.4	33.8	2.2	41.6	53.9	12.3	100	10	
Vert.	7323.000	AV	30.0	36.9	7.7	33.9	2.2	42.9	53.9	11.0	100	0	
Vert.	9764.000	AV	31.2	38.1	8.8	34.3	2.2	46.0	53.9	7.9	100	0	
Vert.	19524.000	AV	36.7	40.2	22.8	47.4	-9.5	42.8	53.9	11.1	127	12	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.2\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11234226S-E
Date : April 30, 2016 May 1, 2016 May 1, 2016
Temperature / Humidity : 20 deg. C / 50 % RH 19 deg. C / 48 % RH 19 deg. C / 48 % RH
Engineer : Makoto Hosaka Makoto Hosaka Makoto Hosaka
(1-18 GHz) (30 M-1 GHz) (18-26.5 GHz)
Mode : Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	260.000	QP	21.7	18.1	9.5	31.7	0.0	17.6	46.0	28.4	150	45	
Hori.	392.000	QP	29.1	16.1	7.2	31.6	0.0	20.8	46.0	25.2	165	234	
Hori.	800.000	QP	21.6	21.0	9.4	31.4	0.0	20.6	46.0	25.4	100	159	
Hori.	2483.500	PK	42.6	27.9	13.8	34.3	2.2	52.2	73.9	21.7	100	35	
Hori.	4960.000	PK	46.6	31.9	6.4	33.8	2.2	53.3	73.9	20.6	116	44	
Hori.	7440.000	PK	41.0	37.0	7.8	34.0	2.2	54.0	73.9	19.9	100	0	
Hori.	9920.000	PK	42.5	38.2	8.9	34.4	2.2	57.4	73.9	16.5	100	0	
Hori.	19836.000	PK	42.8	40.2	23.2	47.3	-9.5	49.4	73.9	24.5	129	91	
Hori.	2483.500	AV	30.5	27.9	13.8	34.3	2.2	40.1	53.9	13.8	100	35	
Hori.	4960.000	AV	35.5	31.9	6.4	33.8	2.2	42.2	53.9	11.7	116	44	
Hori.	7440.000	AV	29.6	37.0	7.8	34.0	2.2	42.6	53.9	11.3	100	0	
Hori.	9920.000	AV	30.1	38.2	8.9	34.4	2.2	45.0	53.9	8.9	100	0	
Hori.	19836.000	AV	33.0	40.2	23.2	47.3	-9.5	39.6	53.9	14.3	129	91	
Vert.	58.433	QP	30.8	8.3	7.4	31.9	0.0	14.6	40.0	25.4	100	148	
Vert.	335.992	QP	27.9	14.5	6.9	31.7	0.0	17.6	46.0	28.4	100	53	
Vert.	431.990	QP	27.6	16.7	7.5	31.6	0.0	20.2	46.0	25.8	100	209	
Vert.	2483.500	PK	43.7	27.9	13.8	34.3	2.2	53.3	73.9	20.6	100	184	
Vert.	4960.000	PK	46.1	31.9	6.4	33.8	2.2	52.8	73.9	21.1	100	187	
Vert.	7440.000	PK	42.2	37.0	7.8	34.0	2.2	55.2	73.9	18.7	100	0	
Vert.	9920.000	PK	41.4	38.2	8.9	34.4	2.2	56.3	73.9	17.6	100	0	
Vert.	19836.000	PK	43.7	40.2	23.2	47.3	-9.5	50.3	73.9	23.6	130	26	
Vert.	2483.500	AV	30.5	27.9	13.8	34.3	2.2	40.1	53.9	13.8	100	184	
Vert.	4960.000	AV	35.2	31.9	6.4	33.8	2.2	41.9	53.9	12.0	100	187	
Vert.	7440.000	AV	29.7	37.0	7.8	34.0	2.2	42.7	53.9	11.2	100	0	
Vert.	9920.000	AV	30.4	38.2	8.9	34.4	2.2	45.3	53.9	8.6	100	0	
Vert.	19836.000	AV	35.1	40.2	23.2	47.3	-9.5	41.7	53.9	12.2	130	26	

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

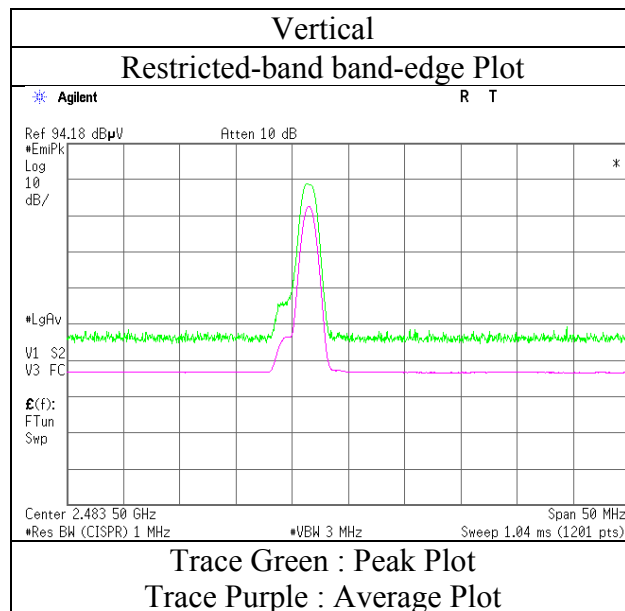
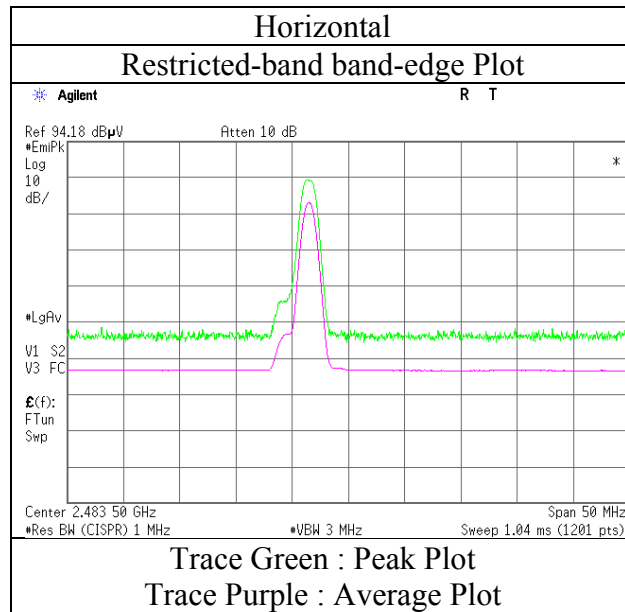
Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.2\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission **(Reference Plot for band-edge)**

Test place Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. 11234226S-E
Date April 30, 2016
Temperature / Humidity 20 deg. C / 50 % RH
Engineer Makoto Hosaka
(1-18 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11234226S-E		
Date	April 30, 2016	May 1, 2016	May 1, 2016
Temperature / Humidity	20 deg. C / 50 % RH	19 deg. C / 48 % RH	19 deg. C / 48 % RH
Engineer	Makoto Hosaka (1-18 GHz)	Makoto Hosaka (30 M-1 GHz)	Makoto Hosaka (18-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	260.000	QP	21.8	18.1	9.5	31.7	0.0	17.7	46.0	28.3	149	34	
Hori.	392.000	QP	29.2	16.1	7.2	31.6	0.0	20.9	46.0	25.1	173	225	
Hori.	800.000	QP	21.7	21.0	9.4	31.4	0.0	20.7	46.0	25.3	100	353	
Hori.	2390.000	PK	42.2	27.7	13.7	34.3	2.2	51.5	73.9	22.4	190	187	
Hori.	2400.000	PK	49.1	27.7	13.7	34.3	2.2	58.4	73.9	15.5	190	187	
Hori.	4804.000	PK	45.4	31.4	6.3	33.8	2.2	51.5	73.9	22.4	100	129	
Hori.	7206.000	PK	42.6	36.9	7.6	33.8	2.2	55.5	73.9	18.4	100	0	
Hori.	9608.000	PK	42.7	38.0	8.7	34.3	2.2	57.3	73.9	16.6	100	0	
Hori.	19212.000	PK	47.7	40.3	22.8	47.6	-9.5	53.7	73.9	20.2	129	31	
Hori.	2390.000	AV	30.3	27.7	13.7	34.3	2.2	39.6	53.9	14.3	190	187	
Hori.	2400.000	AV	36.0	27.7	13.7	34.3	2.2	45.3	53.9	8.6	190	187	
Hori.	4804.000	AV	36.1	31.4	6.3	33.8	2.2	42.2	53.9	11.7	100	129	
Hori.	7206.000	AV	30.5	36.9	7.6	33.8	2.2	43.4	53.9	10.5	100	0	
Hori.	9608.000	AV	31.3	38.0	8.7	34.3	2.2	45.9	53.9	8.0	100	0	
Hori.	19212.000	AV	41.7	40.3	22.8	47.6	-9.5	47.7	53.9	6.2	129	31	
Vert.	58.338	QP	30.6	8.3	7.4	31.9	0.0	14.4	40.0	25.6	100	142	
Vert.	335.992	QP	26.9	14.5	6.9	31.7	0.0	16.6	46.0	29.4	100	78	
Vert.	432.000	QP	27.5	16.7	7.5	31.6	0.0	20.1	46.0	25.9	100	186	
Vert.	2390.000	PK	42.2	27.7	13.7	34.3	2.2	51.5	73.9	22.4	100	111	
Vert.	2400.000	PK	49.7	27.7	13.7	34.3	2.2	59.0	73.9	14.9	100	111	
Vert.	4804.000	PK	45.6	31.4	6.3	33.8	2.2	51.7	73.9	22.2	100	142	
Vert.	7206.000	PK	41.5	36.9	7.6	33.8	2.2	54.4	73.9	19.5	100	0	
Vert.	9608.000	PK	42.6	38.0	8.7	34.3	2.2	57.2	73.9	16.7	100	0	
Vert.	19212.000	PK	46.4	40.3	22.8	47.6	-9.5	52.4	73.9	21.5	129	356	
Vert.	2390.000	AV	30.5	27.7	13.7	34.3	2.2	39.8	53.9	14.1	100	111	
Vert.	2400.000	AV	37.2	27.7	13.7	34.3	2.2	46.5	53.9	7.4	100	111	
Vert.	4804.000	AV	36.3	31.4	6.3	33.8	2.2	42.4	53.9	11.5	100	142	
Vert.	7206.000	AV	30.4	36.9	7.6	33.8	2.2	43.3	53.9	10.6	100	0	
Vert.	9608.000	AV	31.7	38.0	8.7	34.3	2.2	46.3	53.9	7.6	100	0	
Vert.	19212.000	AV	40.2	40.3	22.8	47.6	-9.5	46.2	53.9	7.7	129	356	

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

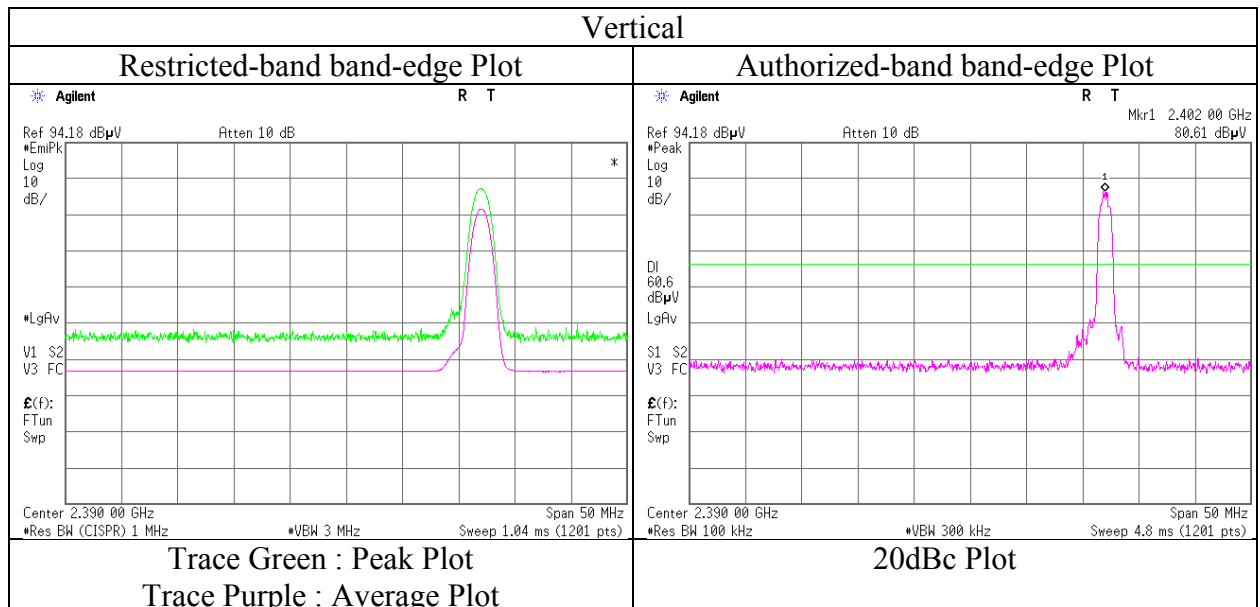
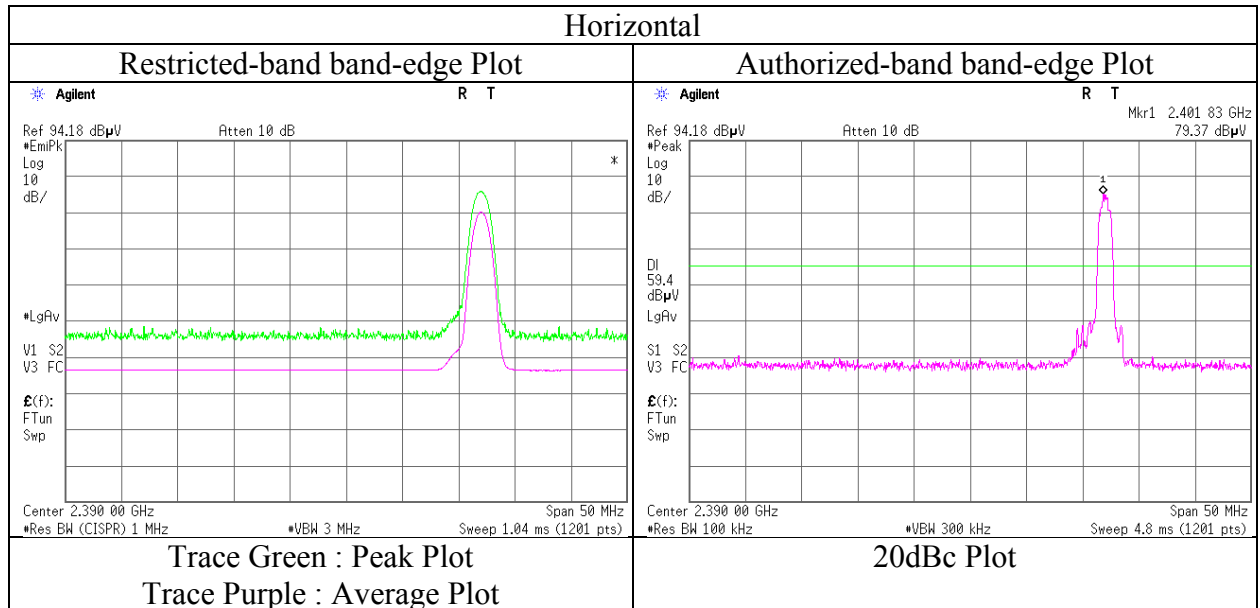
Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.2\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11234226S-E
Date	April 30, 2016
Temperature / Humidity	20 deg. C / 50 % RH
Engineer	Makoto Hosaka (1-18 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11234226S-E
Date : April 30, 2016 May 1, 2016 May 1, 2016
Temperature / Humidity : 20 deg. C / 50 % RH 19 deg. C / 48 % RH 19 deg. C / 48 % RH
Engineer : Makoto Hosaka Makoto Hosaka Makoto Hosaka
(1-18 GHz) (30 M-1 GHz) (18-26.5 GHz)
Mode : Tx, Hopping Off, 3DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	260.000	QP	21.8	18.1	9.5	31.7	0.0	17.7	46.0	28.3	149	331	
Hori.	392.000	QP	29.3	16.1	7.2	31.6	0.0	21.0	46.0	25.0	171	239	
Hori.	800.000	QP	21.7	21.0	9.4	31.4	0.0	20.7	46.0	25.3	100	348	
Hori.	4882.000	PK	45.0	31.6	6.4	33.8	2.2	51.4	73.9	22.5	100	57	
Hori.	7323.000	PK	41.0	36.9	7.7	33.9	2.2	53.9	73.9	20.0	100	0	
Hori.	9764.000	PK	41.7	38.1	8.8	34.3	2.2	56.5	73.9	17.4	100	0	
Hori.	19524.000	PK	46.0	40.2	22.8	47.4	-9.5	52.1	73.9	21.8	127	103	
Hori.	4882.000	AV	33.7	31.6	6.4	33.8	2.2	40.1	53.9	13.8	100	57	
Hori.	7323.000	AV	30.0	36.9	7.7	33.9	2.2	42.9	53.9	11.0	100	0	
Hori.	9764.000	AV	30.8	38.1	8.8	34.3	2.2	45.6	53.9	8.3	100	0	
Hori.	19524.000	AV	39.7	40.2	22.8	47.4	-9.5	45.8	53.9	8.1	127	103	
Vert.	58.290	QP	30.8	8.3	7.4	31.9	0.0	14.6	40.0	25.4	100	216	
Vert.	335.992	QP	28.3	14.5	6.9	31.7	0.0	18.0	46.0	28.0	100	52	
Vert.	432.000	QP	27.2	16.7	7.5	31.6	0.0	19.8	46.0	26.2	100	223	
Vert.	4882.000	PK	43.0	31.6	6.4	33.8	2.2	49.4	73.9	24.5	100	9	
Vert.	7323.000	PK	40.9	36.9	7.7	33.9	2.2	53.8	73.9	20.1	100	0	
Vert.	9764.000	PK	42.4	38.1	8.8	34.3	2.2	57.2	73.9	16.7	100	0	
Vert.	19524.000	PK	46.0	40.2	22.8	47.4	-9.5	52.1	73.9	21.8	127	9	
Vert.	4882.000	AV	33.2	31.6	6.4	33.8	2.2	39.6	53.9	14.3	100	9	
Vert.	7323.000	AV	30.0	36.9	7.7	33.9	2.2	42.9	53.9	11.0	100	0	
Vert.	9764.000	AV	30.7	38.1	8.8	34.3	2.2	45.5	53.9	8.4	100	0	
Vert.	19524.000	AV	39.3	40.2	22.8	47.4	-9.5	45.4	53.9	8.5	127	9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.2\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11234226S-E
Date : April 30, 2016 May 1, 2016 May 1, 2016
Temperature / Humidity : 20 deg. C / 50 % RH 19 deg. C / 48 % RH 19 deg. C / 48 % RH
Engineer : Makoto Hosaka Makoto Hosaka Makoto Hosaka
 (1-18 GHz) (30 M-1 GHz) (18-26.5 GHz)
Mode : Tx, Hopping Off, 3DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	260.000	QP	21.8	18.1	9.5	31.7	0.0	17.7	46.0	28.3	150	348	
Hori.	392.000	QP	29.4	16.1	7.2	31.6	0.0	21.1	46.0	24.9	169	233	
Hori.	800.000	QP	21.5	21.0	9.4	31.4	0.0	20.5	46.0	25.5	100	12	
Hori.	2483.500	PK	42.3	27.9	13.8	34.3	2.2	51.9	73.9	22.0	180	59	
Hori.	4960.000	PK	43.1	31.9	6.4	33.8	2.2	49.8	73.9	24.1	100	136	
Hori.	7440.000	PK	40.8	37.0	7.8	34.0	2.2	53.8	73.9	20.1	100	0	
Hori.	9920.000	PK	41.8	38.2	8.9	34.4	2.2	56.7	73.9	17.2	100	0	
Hori.	19836.000	PK	44.9	40.2	23.2	47.3	-9.5	51.5	73.9	22.4	128	101	
Hori.	2483.500	AV	30.2	27.9	13.8	34.3	2.2	39.8	53.9	14.1	180	59	
Hori.	4960.000	AV	33.2	31.9	6.4	33.8	2.2	39.9	53.9	14.0	100	136	
Hori.	7440.000	AV	29.7	37.0	7.8	34.0	2.2	42.7	53.9	11.2	100	0	
Hori.	9920.000	AV	30.0	38.2	8.9	34.4	2.2	44.9	53.9	9.0	100	0	
Hori.	19836.000	AV	38.3	40.2	23.2	47.3	-9.5	44.9	53.9	9.0	128	101	
Vert.	58.298	QP	30.9	8.3	7.4	31.9	0.0	14.7	40.0	25.3	100	157	
Vert.	335.993	QP	27.9	14.5	6.9	31.7	0.0	17.6	46.0	28.4	100	52	
Vert.	432.000	QP	27.0	16.7	7.5	31.6	0.0	19.6	46.0	26.4	100	223	
Vert.	2483.500	PK	42.7	27.9	13.8	34.3	2.2	52.3	73.9	21.6	100	34	
Vert.	4960.000	PK	43.2	31.9	6.4	33.8	2.2	49.9	73.9	24.0	124	5	
Vert.	7440.000	PK	41.7	37.0	7.8	34.0	2.2	54.7	73.9	19.2	100	0	
Vert.	9920.000	PK	41.0	38.2	8.9	34.4	2.2	55.9	73.9	18.0	100	0	
Vert.	19836.000	PK	44.1	40.2	23.2	47.3	-9.5	50.7	73.9	23.2	125	20	
Vert.	2483.500	AV	30.1	27.9	13.8	34.3	2.2	39.7	53.9	14.2	100	34	
Vert.	4960.000	AV	33.2	31.9	6.4	33.8	2.2	39.9	53.9	14.0	124	5	
Vert.	7440.000	AV	29.7	37.0	7.8	34.0	2.2	42.7	53.9	11.2	100	0	
Vert.	9920.000	AV	30.1	38.2	8.9	34.4	2.2	45.0	53.9	8.9	100	0	
Vert.	19836.000	AV	37.2	40.2	23.2	47.3	-9.5	43.8	53.9	10.1	125	20	

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

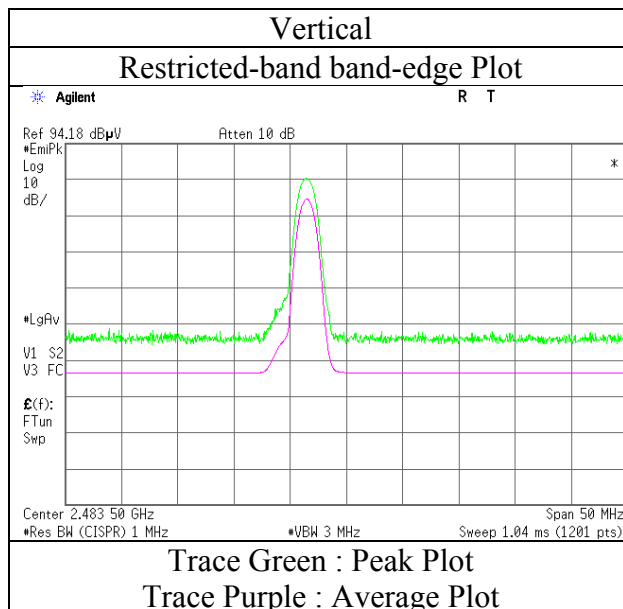
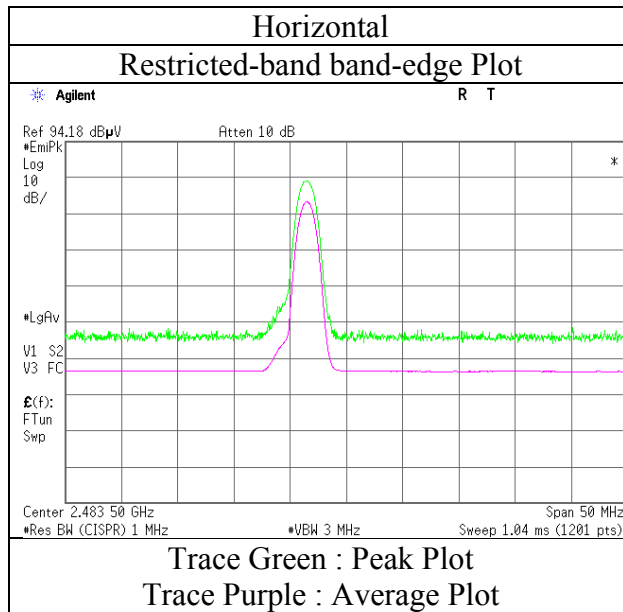
Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.2\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission **(Reference Plot for band-edge)**

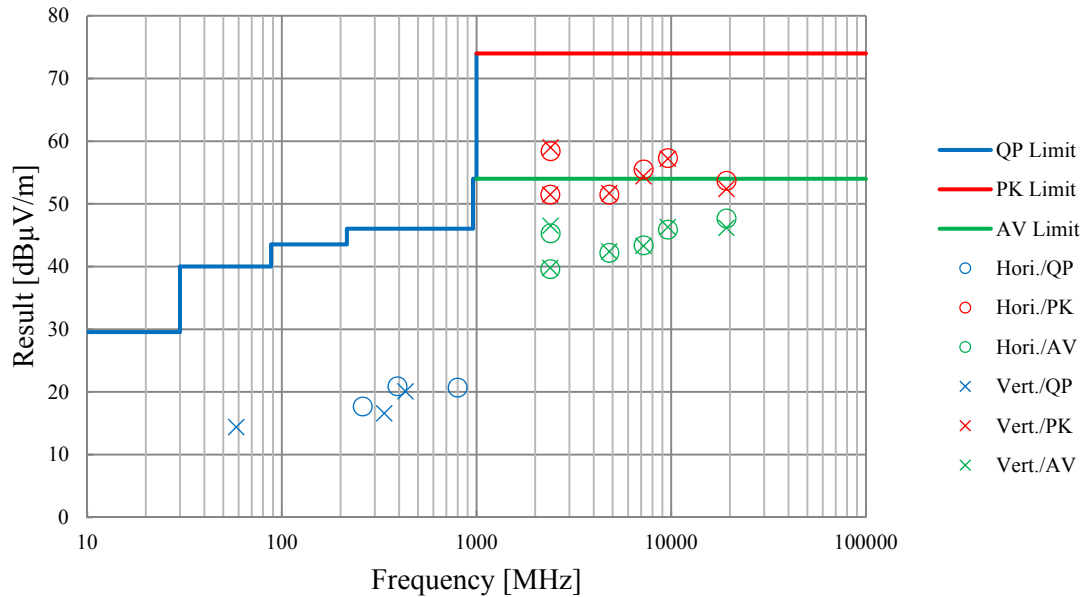
Test place Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. 11234226S-E
Date April 30, 2016
Temperature / Humidity 20 deg. C / 50 % RH
Engineer Makoto Hosaka
(1-18 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11234226S-E		
Date	April 30, 2016	May 1, 2016	May 1, 2016
Temperature / Humidity	20 deg. C / 50 % RH	19 deg. C / 48 % RH	19 deg. C / 48 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
	(1-18 GHz)	(30 M-1 GHz)	(18-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

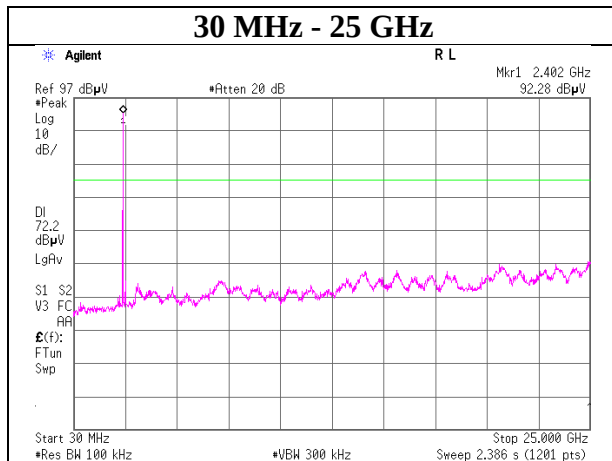
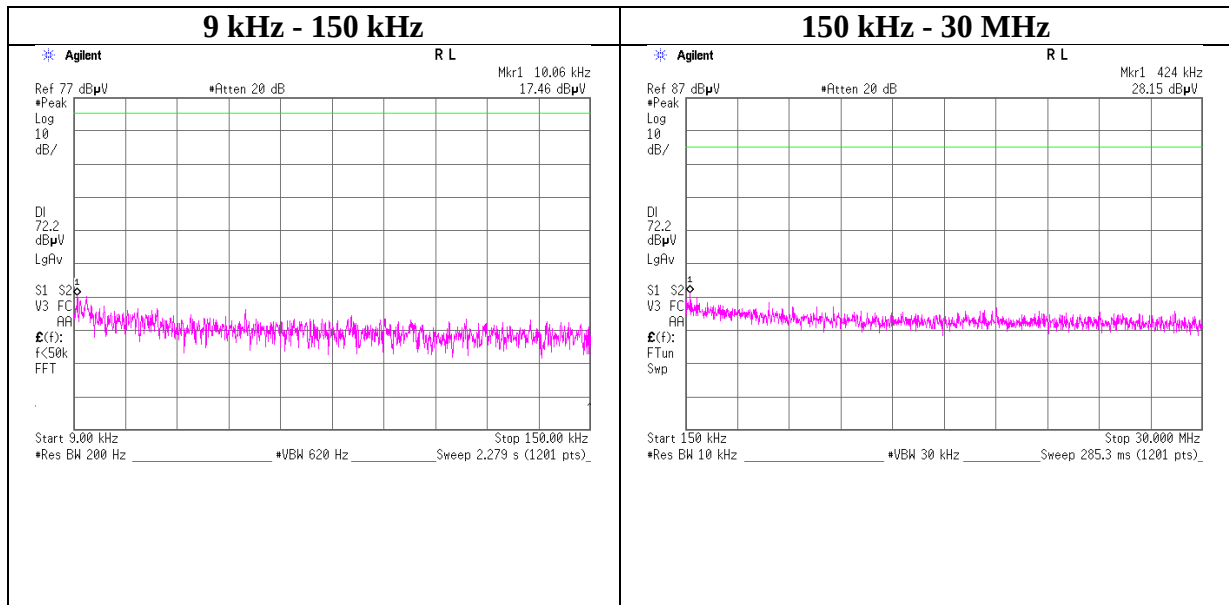


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

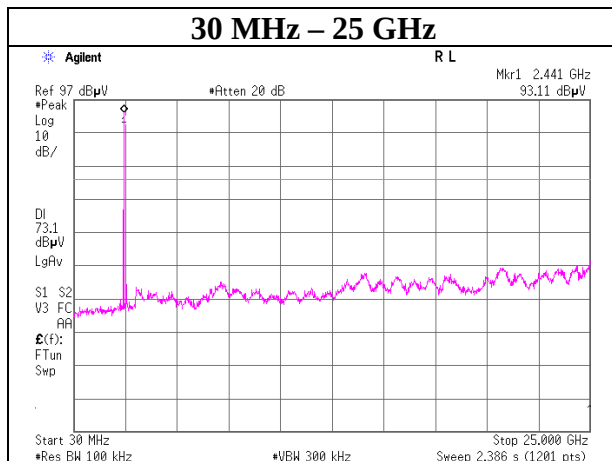
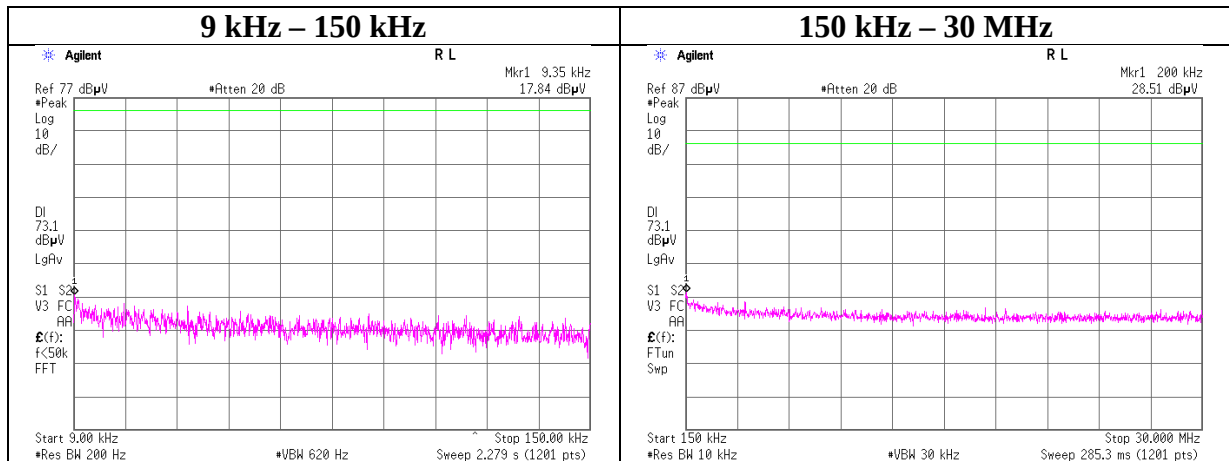
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11234226S-E
Date : April 15, 2016
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Makoto Hosaka
Mode : Tx, Hopping Off, DH5

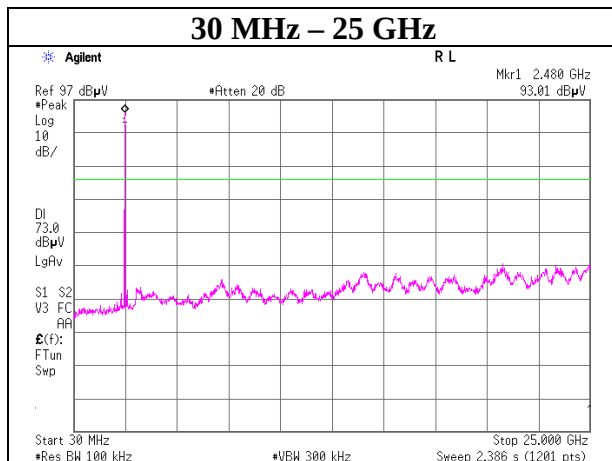
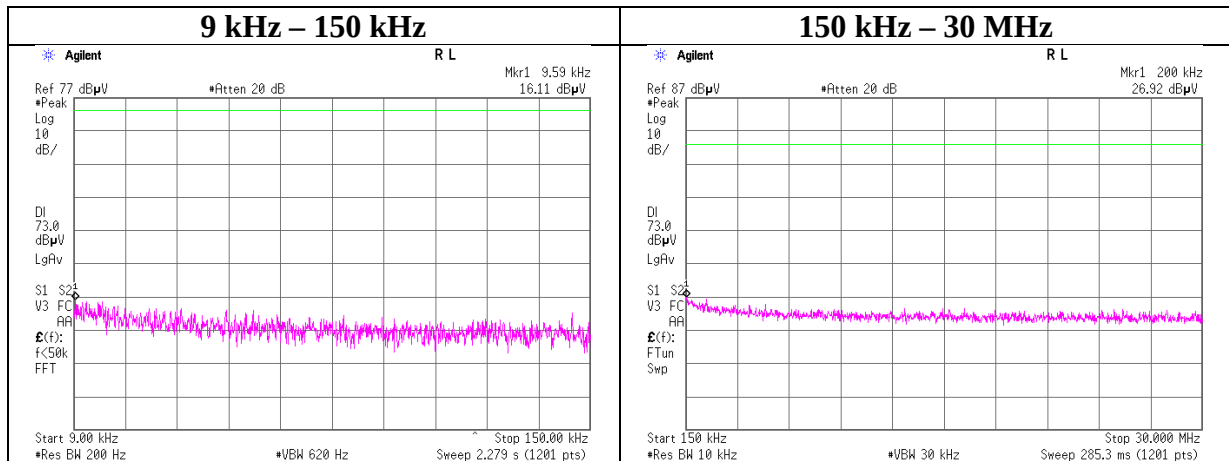
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

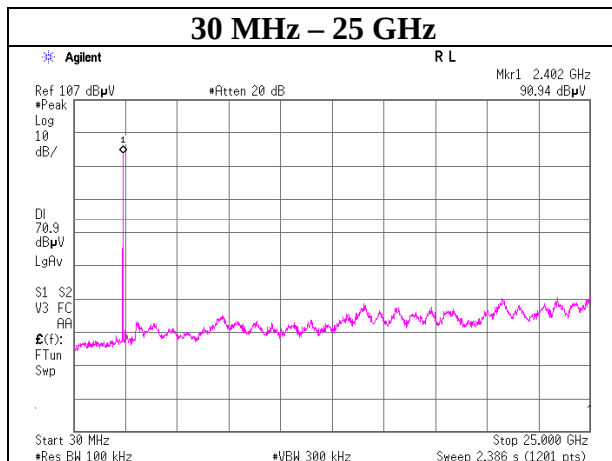
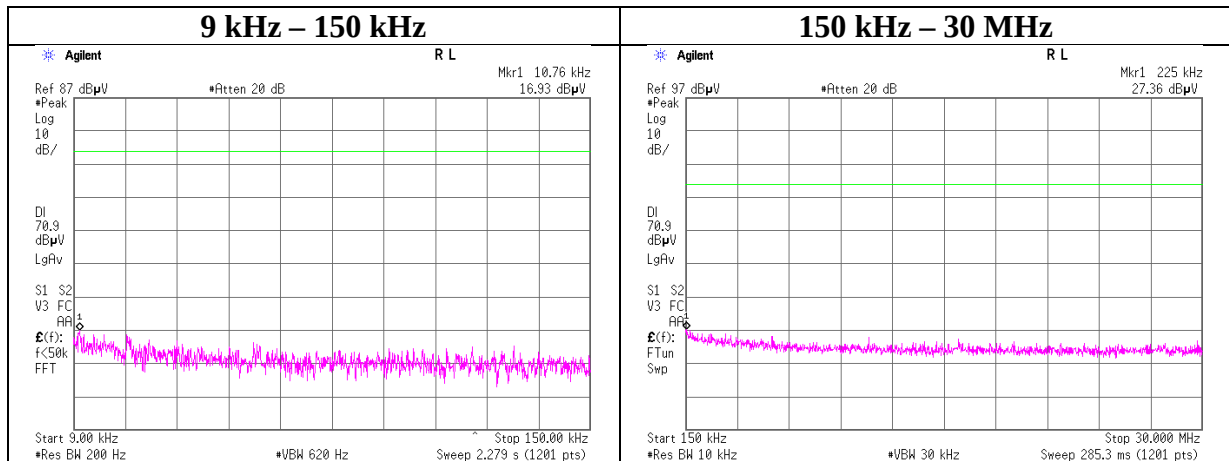
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, 3DH5

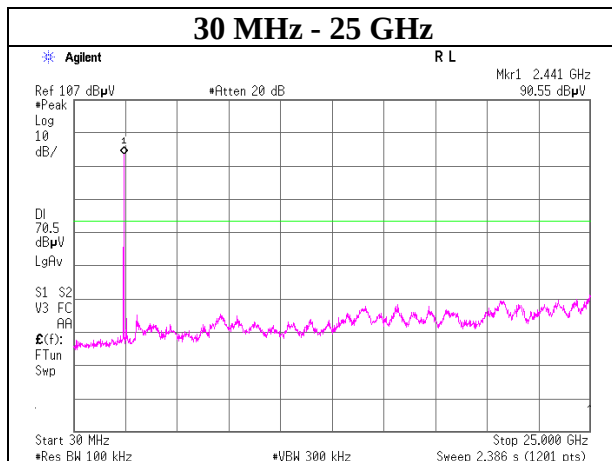
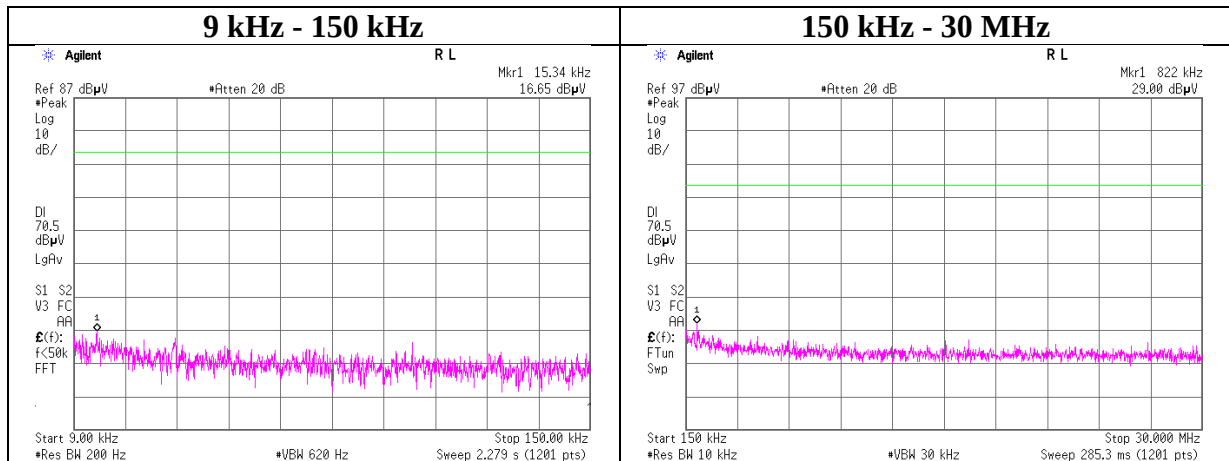
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, 3DH5

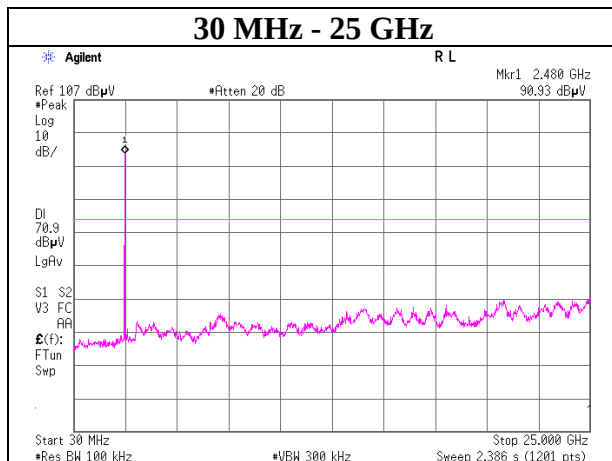
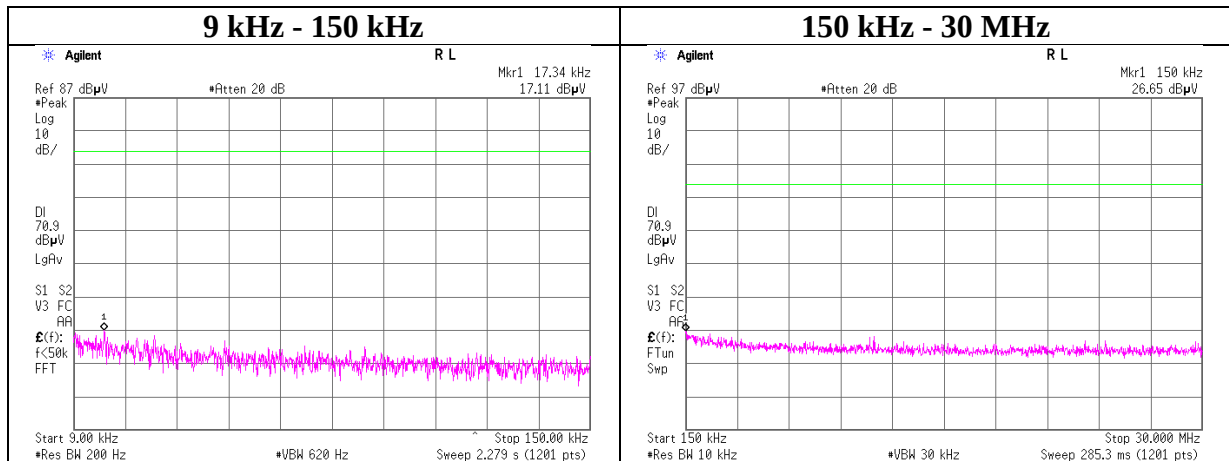
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11234226S-E
Date : April 15, 2016
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Makoto Hosaka
Mode : Tx, Hopping Off, 3DH5

2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

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

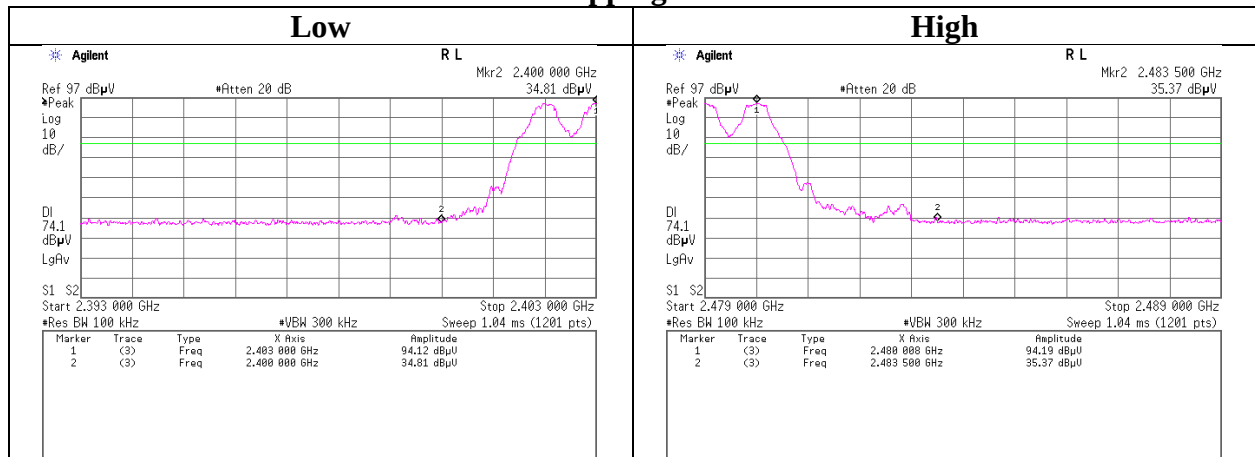
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

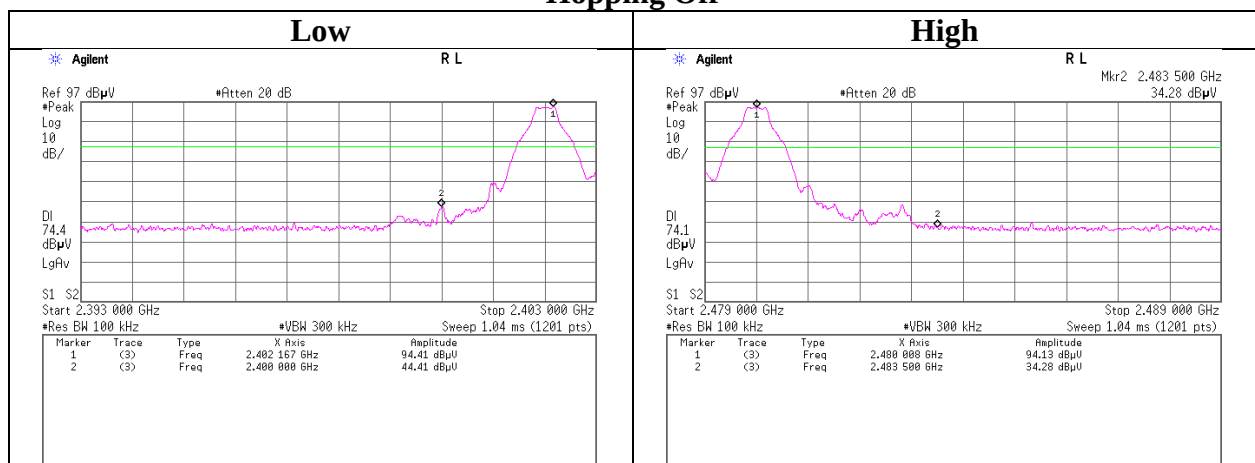
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11234226S-E
Date : April 15, 2016
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Makoto Hosaka
Mode : Tx DH5

Hopping On



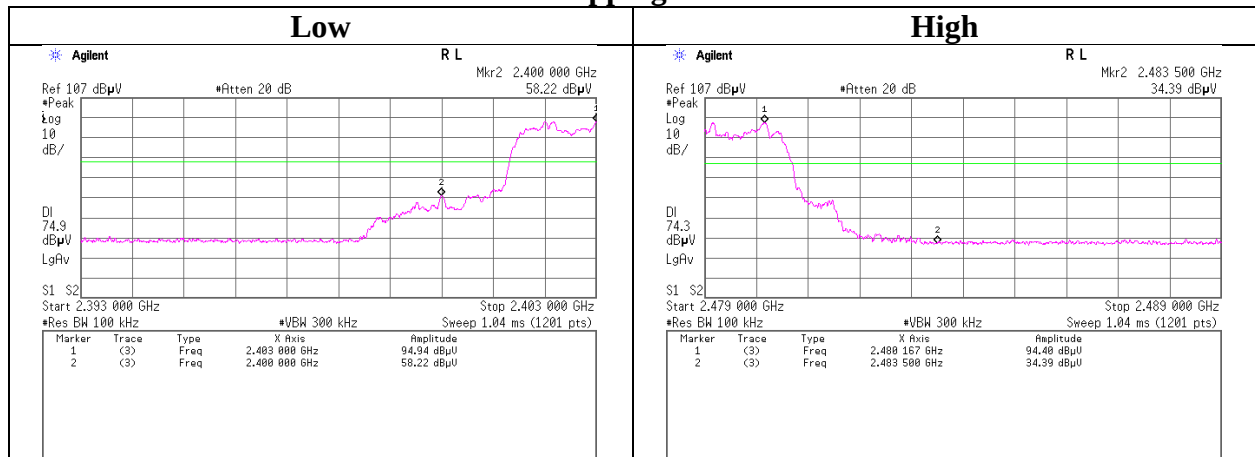
Hopping Off



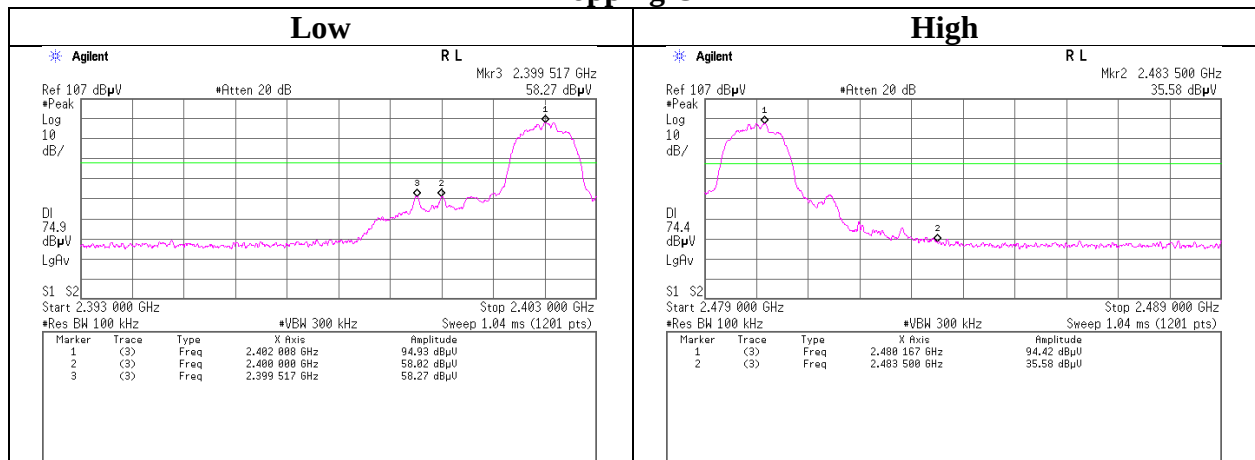
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11234226S-E
Date : April 15, 2016
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Makoto Hosaka
Mode : Tx 3DH5

Hopping On



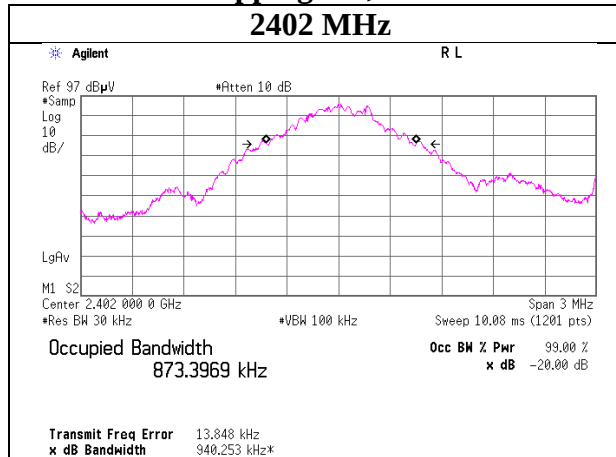
Hopping Off



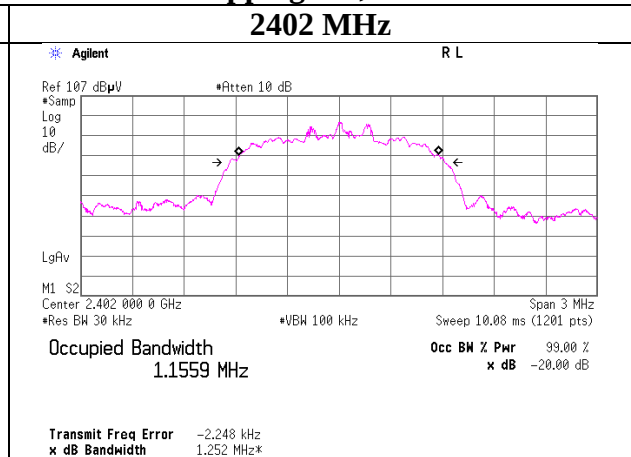
99%Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx Hopping Off

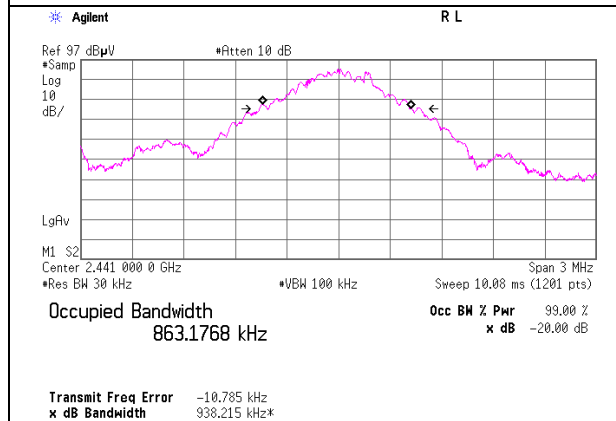
Hopping Off, DH5



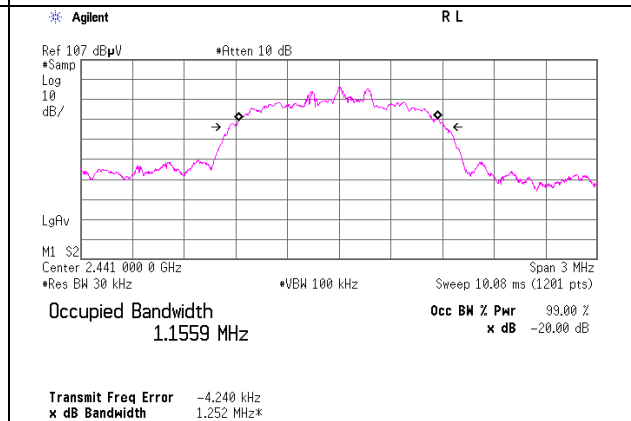
Hopping Off, 3DH5



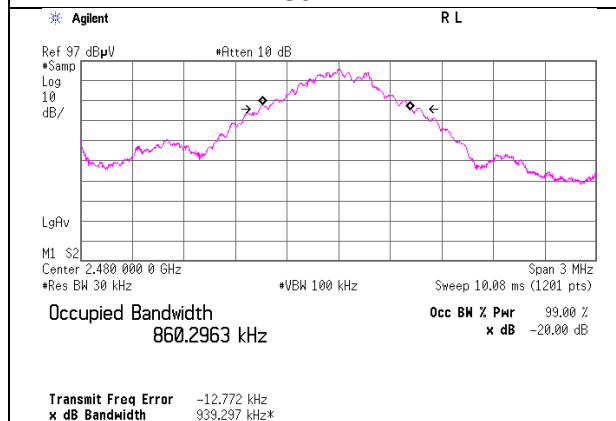
2441 MHz



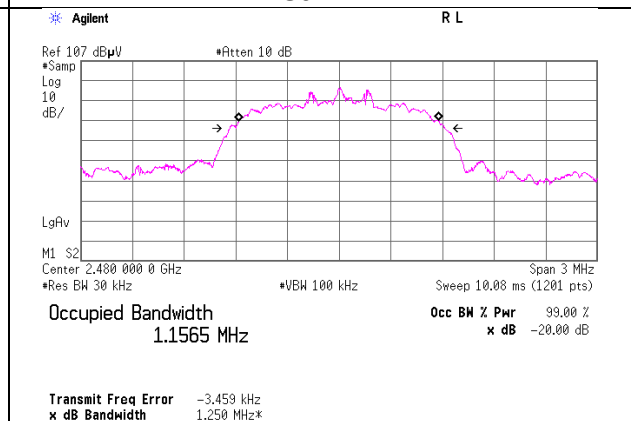
2441 MHz



2480 MHz



2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

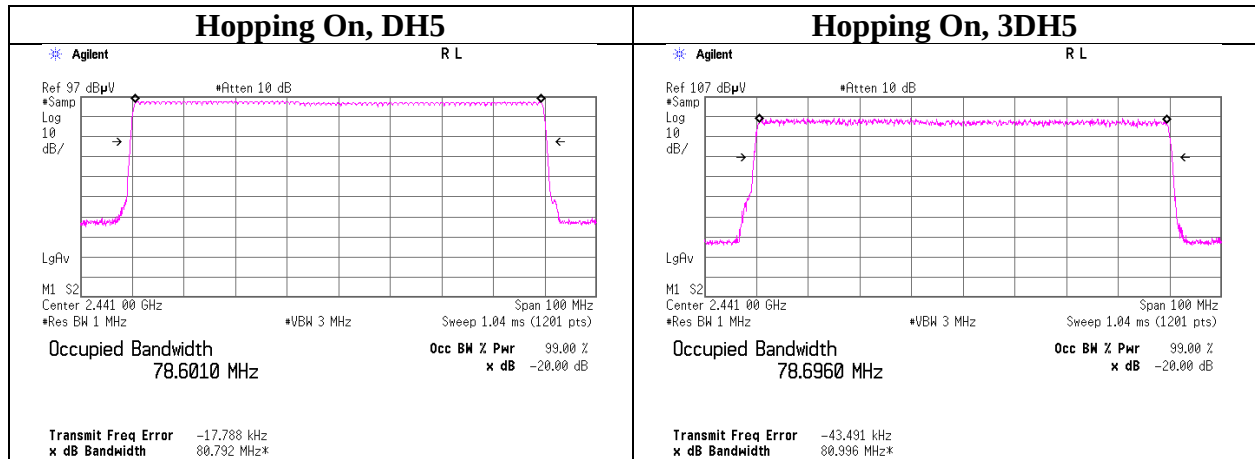
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11234226S-E
Date	April 15, 2016
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Makoto Hosaka
Mode	Tx Hopping On



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

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	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2015/09/16 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2015/11/04 * 12
SCC-g14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/23 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2015/12/07 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2015/09/04 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFL,MF)	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2016/03/22 * 12
KAF-04	Pre Amplifier	Agilent	8449B	3008A01600	RE	2016/04/22 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2015/05/11 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2015/05/19 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2015/08/10 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2015/10/22 * 12
SAEC-02(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2015/07/09 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2016/04/18 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2016/03/23 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2016/02/19 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2016/02/25 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2015/08/31 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2015/11/02 * 12
SCC-B1/B3/B5/ B7/B8/B13/SRS E-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/141 PE/141PE/141PE/14 1PE/NS4906	-/0901-270(RF Selector)	RE	2016/04/22 * 12
SCC-B2/B4/B6/ B7/B8/B13/SRS E-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/141 PE/141PE/141PE/14 1PE/NS4906	-/0901-270(RF Selector)	RE	2016/04/22 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2015/11/03 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2015/07/15 * 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