



RADIO TEST REPORT

Test Report No. : 11445242S-R2

Applicant : PIONEER CORPORATION
Type of Equipment : Car Audio with Bluetooth
Model No. : AVH-5078ZH
FCC ID : AJDK100
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11445242S-R1. 11445242S-R1 is replaced with this report.

Date of test: September 24 to 29, 2016

Representative test engineer:



Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:



Akio Hayashi
Leader
Consumer Technology Division



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

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11445242S

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11445242S	October 27, 2016	-	-
1	11445242S-R1	November 2, 2016	5	Change of antenna requirement
2	11445242S-R2	November 4, 2016	5	Change of antenna requirement

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SECTION 1: Customer information

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

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

2.1 Identification of E.U.T.

Type of Equipment : Car Audio with Bluetooth
Model No. : AVH-5078ZH
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 13.2 V
Receipt Date of Sample : September 16, 2016
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: AVH-5078ZH (referred to as the EUT in this report) is a Car Audio with Bluetooth.

Clock frequency(ies) in the system : Bluetooth: 32.768 kHz

Radio Specification

[Bluetooth]

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : GFSK, π /4DQPSK, 8DPSK
Power Supply (radio part input) : DC 3.3 V
Antenna type : Planar Inverted-F Antenna
Antenna Gain : 0.34 dBi (Max) (Without cable loss), 0.71 dB (Cable loss)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 2016.

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

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	11.0 dB 9608.000 MHz, AV, Hori. Tx, Hopping Off, 3DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *2)

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

*1) The test is not applicable since the EUT does not have AC power ports.

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

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

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
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

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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)

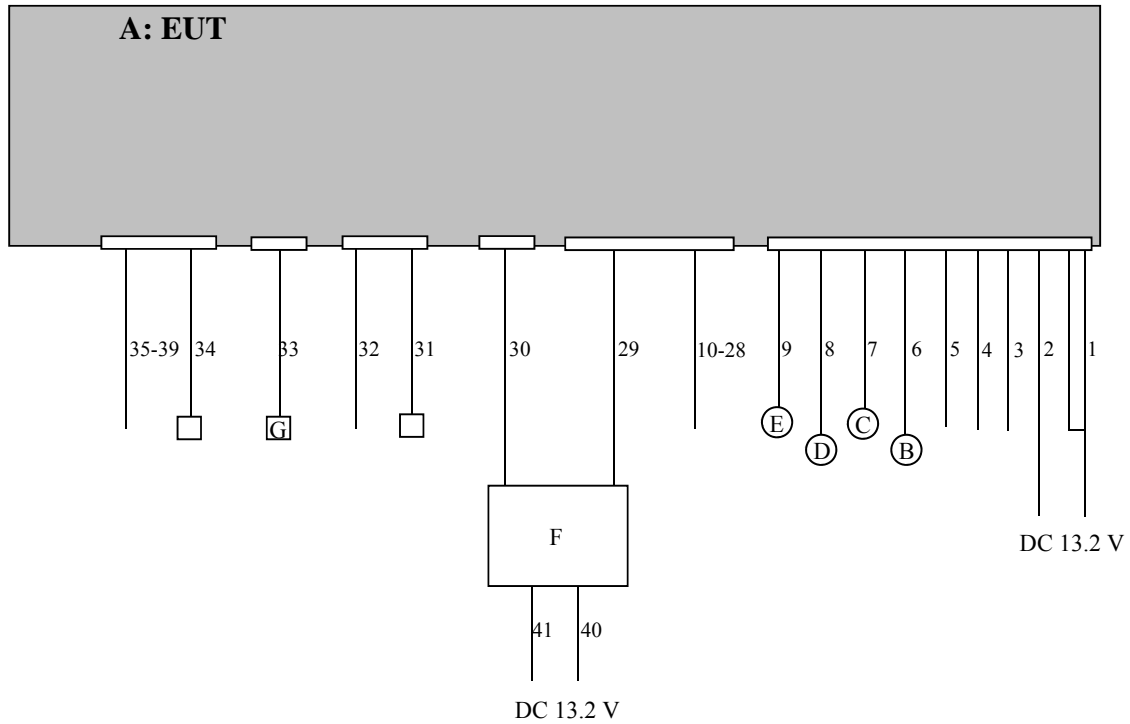
Bluetooth (BT): Transmitting (Tx) , Payload: PRBS9

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 Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*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.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows; Power settings: BDR: 0 dBm EDR: 0 dBm Software: SYS: 07.14, SoC: 99.29</p> <p>*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>		

4.2 Configuration and peripherals

□ : Terminated



*Cabling and setup 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 with Bluetooth	AVH-5078ZH	AABB999998US *1) AABB999999US *2)	PIONEER CORPORATION	EUT
B	Speaker	LV-002	S11014200773	L&V	-
C	Speaker	LV-002	S11014200773	L&V	-
D	Speaker	LV-002	S11014200775	L&V	-
E	Speaker	LV-002	S11014200775	L&V	-
F	Monitor	-	-	PIONEER CORPORATION	-
G	USB Memory	USM4GU	-	Sony	-

*1) For radiated tests.

*2) For antenna terminal conducted tests.

List of cables used

No.	Name	Length (m)	Cable Shield	Connector Shield	Remark
1	ACC, B+	1.25+2.0	Unshielded	Unshielded	-
2	GND	1.25+2.0	Unshielded	Unshielded	-
3	REMOTE GND	1.25+0.25	Unshielded	Unshielded	-
4	HFT GND	1.25+0.25	Unshielded	Unshielded	-
5	REMOTE	1.25+0.25	Unshielded	Unshielded	-
6	Speaker	1.25+3.0	Unshielded	Unshielded	-
7	Speaker	1.25+3.0	Unshielded	Unshielded	-
8	Speaker	1.25+3.0	Unshielded	Unshielded	-
9	Speaker	1.25+3.0	Unshielded	Unshielded	-
10-28	Signal	0.5+1.0	Unshielded	Unshielded	-
29	DISP CNT	0.5+0.5	Unshielded	Unshielded	-
30	LVDS	1.0	Shielded	Shielded	-
31	Antenna	0.3+1.0	Unshielded	Unshielded	-
32	Signal	0.3+1.2	Unshielded	Unshielded	-
33	USB	0.5+3.0	Shielded	Shielded	-
34	Video	0.5+1.5	Shielded	Shielded	-
35-39	Signal	0.5+1.0	Unshielded	Unshielded	-
40	B+	0.5+1.8	Unshielded	Unshielded	-
41	GND	0.5+1.8	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

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

[For above 1 GHz]

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

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

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

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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

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

Test Antennas are used as below;

Frequency	30 MHz to 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)

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

*2) Distance Factor: $20 \times \log(3.89 \text{ m}/3.0 \text{ m}) = 2.26 \text{ dB}$

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

The carrier level and noise levels were confirmed at angle of 0 deg. to 90 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

	30 MHz to 1000 MHz	1 GHz to 13 GHz	13 GHz to 18 GHz	18 GHz to 26.5 GHz
Horizontal	0 degree	0 degree	0 degree	0 degree
Vertical	0 degree	45 degree	0 degree	0 degree

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

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

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 *1)	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) 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

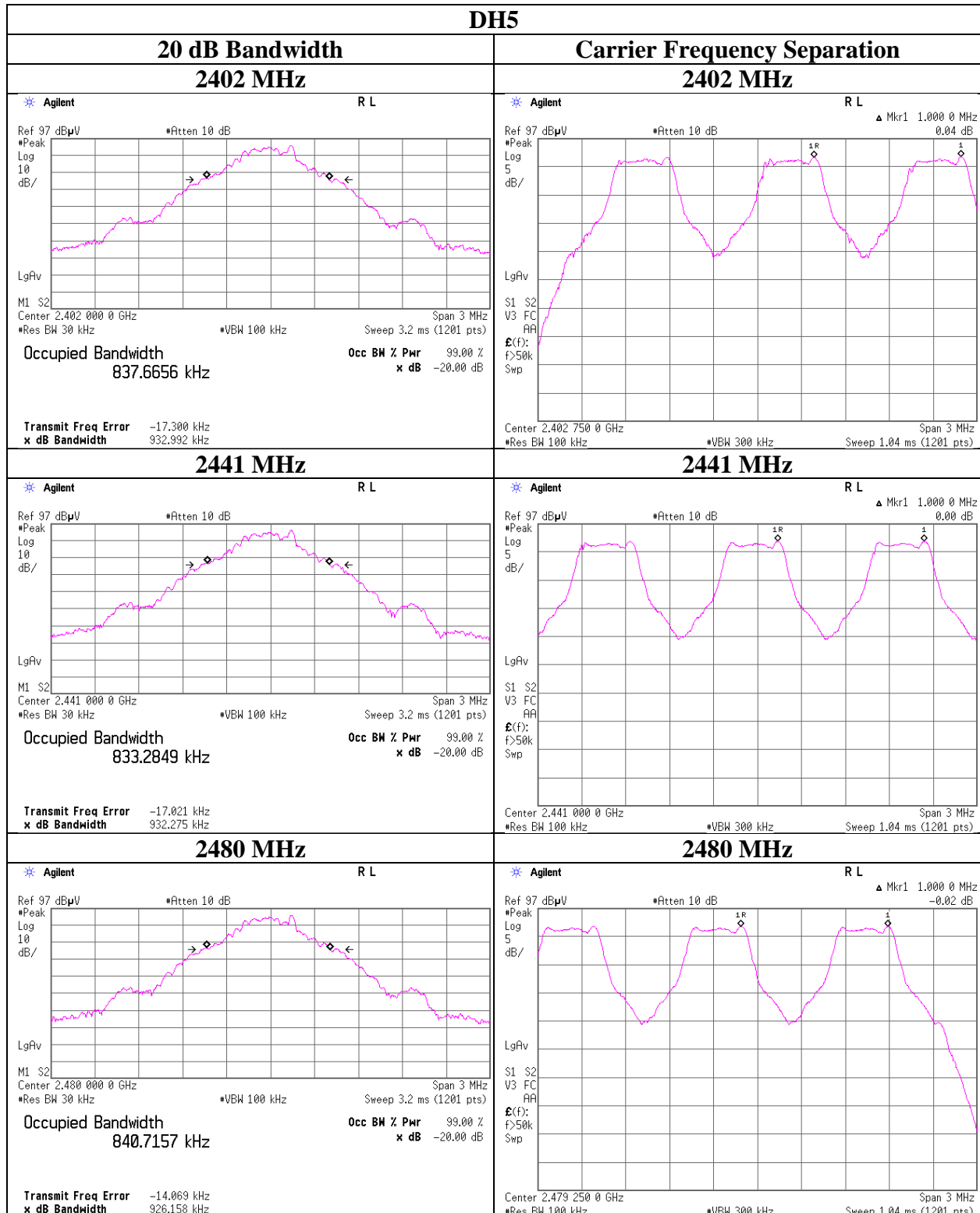
20dB Bandwidth and Carrier Frequency Separation

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11445242S-R2
Date September 29, 2016
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Hiroyuki Morikawa
Mode Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.933	1.000	≥ 0.622
DH5	2441.0	0.932	1.000	≥ 0.622
DH5	2480.0	0.926	1.000	≥ 0.617
3DH5	2402.0	1.296	1.000	≥ 0.864
3DH5	2441.0	1.292	1.000	≥ 0.861
3DH5	2480.0	1.290	1.000	≥ 0.860

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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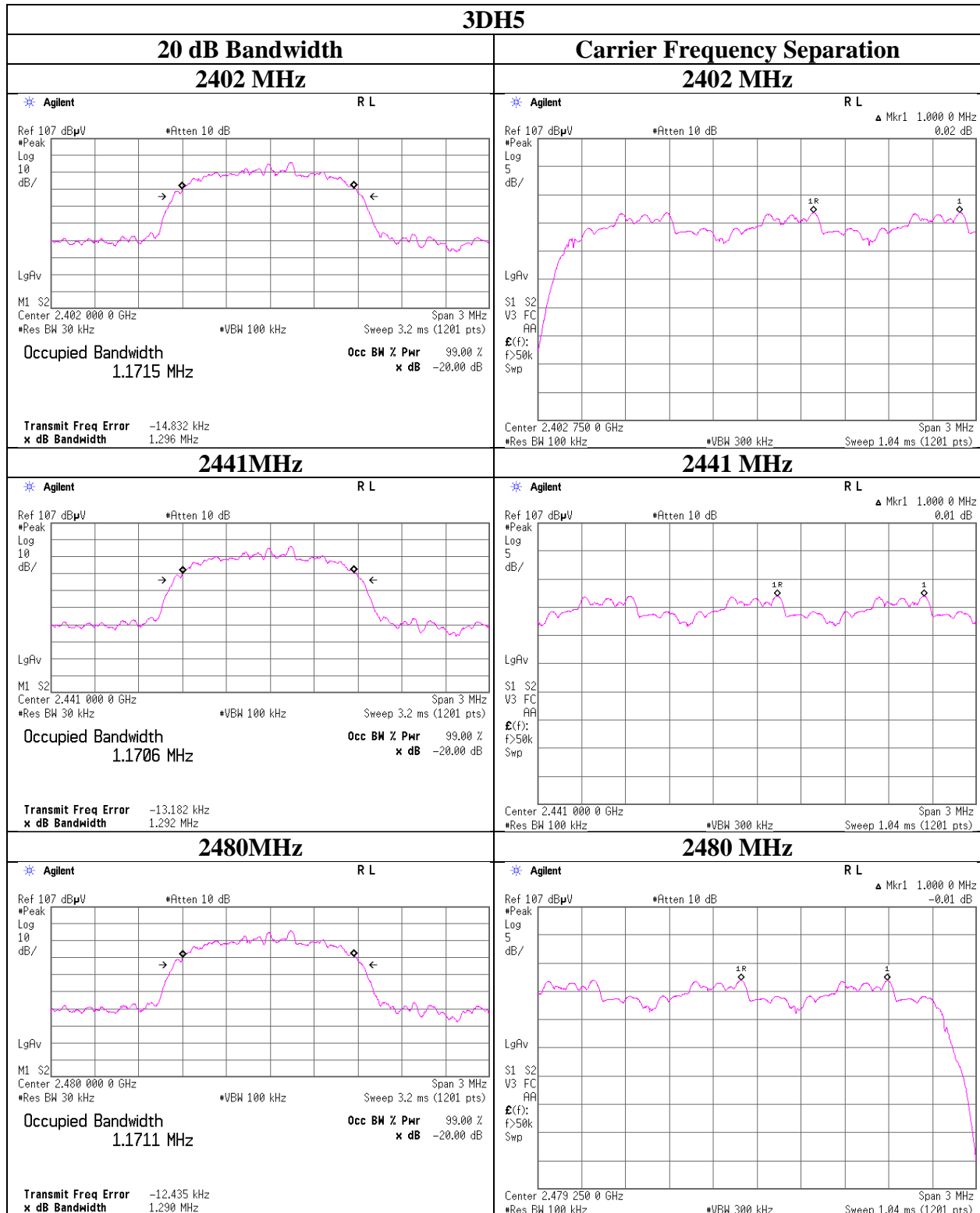
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20dB Bandwidth and Carrier Frequency Separation



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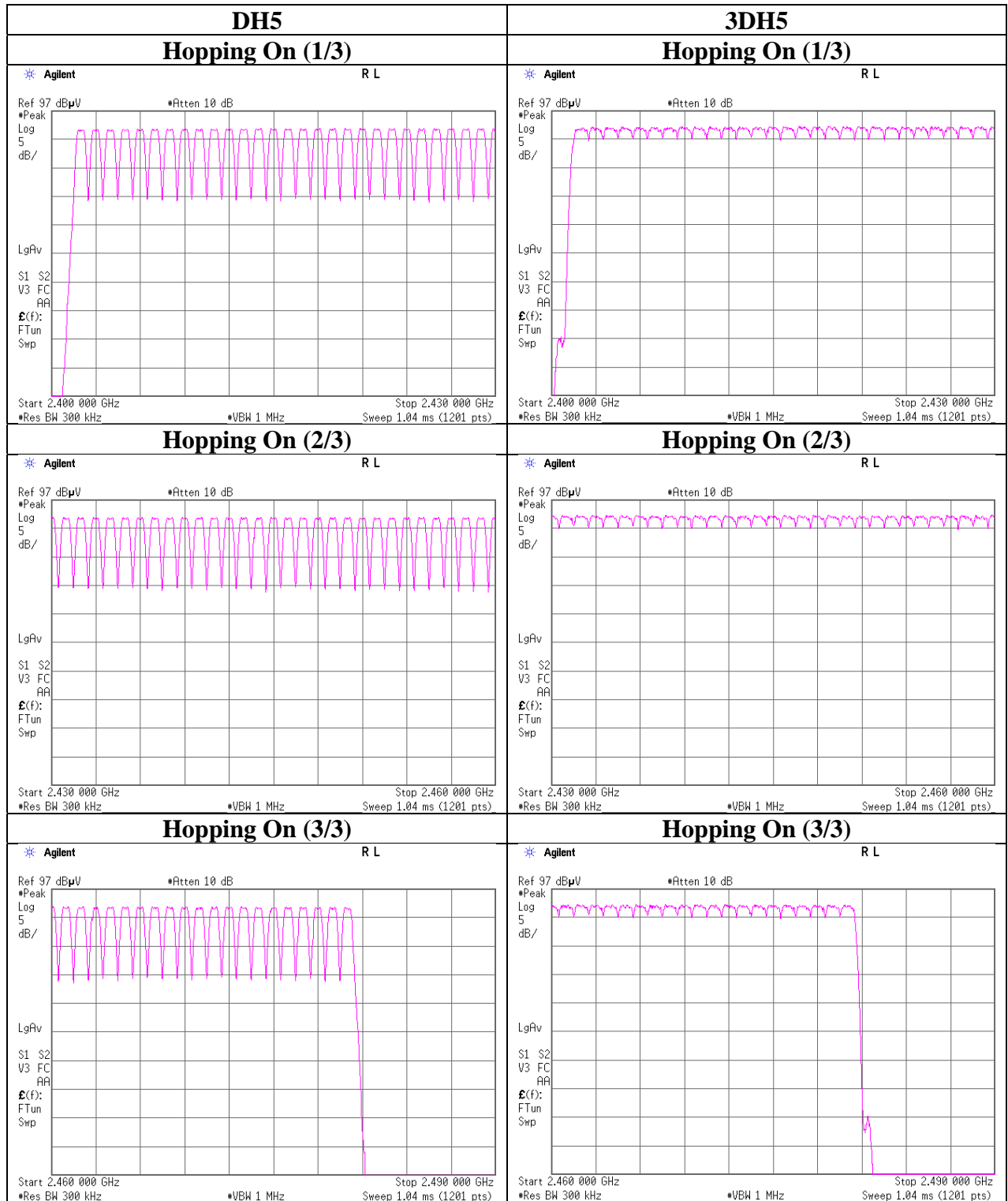
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11445242S-R2
Date September 29, 2016
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Hiroyuki Morikawa
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. 11445242S-R2
Date September 29, 2016
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Hiroyuki Morikawa
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]
	50.0 times / 5 sec.	x	31.6 sec. =			
DH1	50.0 times / 5 sec.	x	31.6 sec. =	316 times	0.448	400
DH3	26.8 times / 5 sec.	x	31.6 sec. =	170 times	1.704	400
DH5	16.8 times / 5 sec.	x	31.6 sec. =	107 times	2.956	400
3DH1	48.2 times / 5 sec.	x	31.6 sec. =	305 times	0.454	400
3DH3	26.4 times / 5 sec.	x	31.6 sec. =	167 times	1.706	400
3DH5	17.0 times / 5 sec.	x	31.6 sec. =	108 times	2.959	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

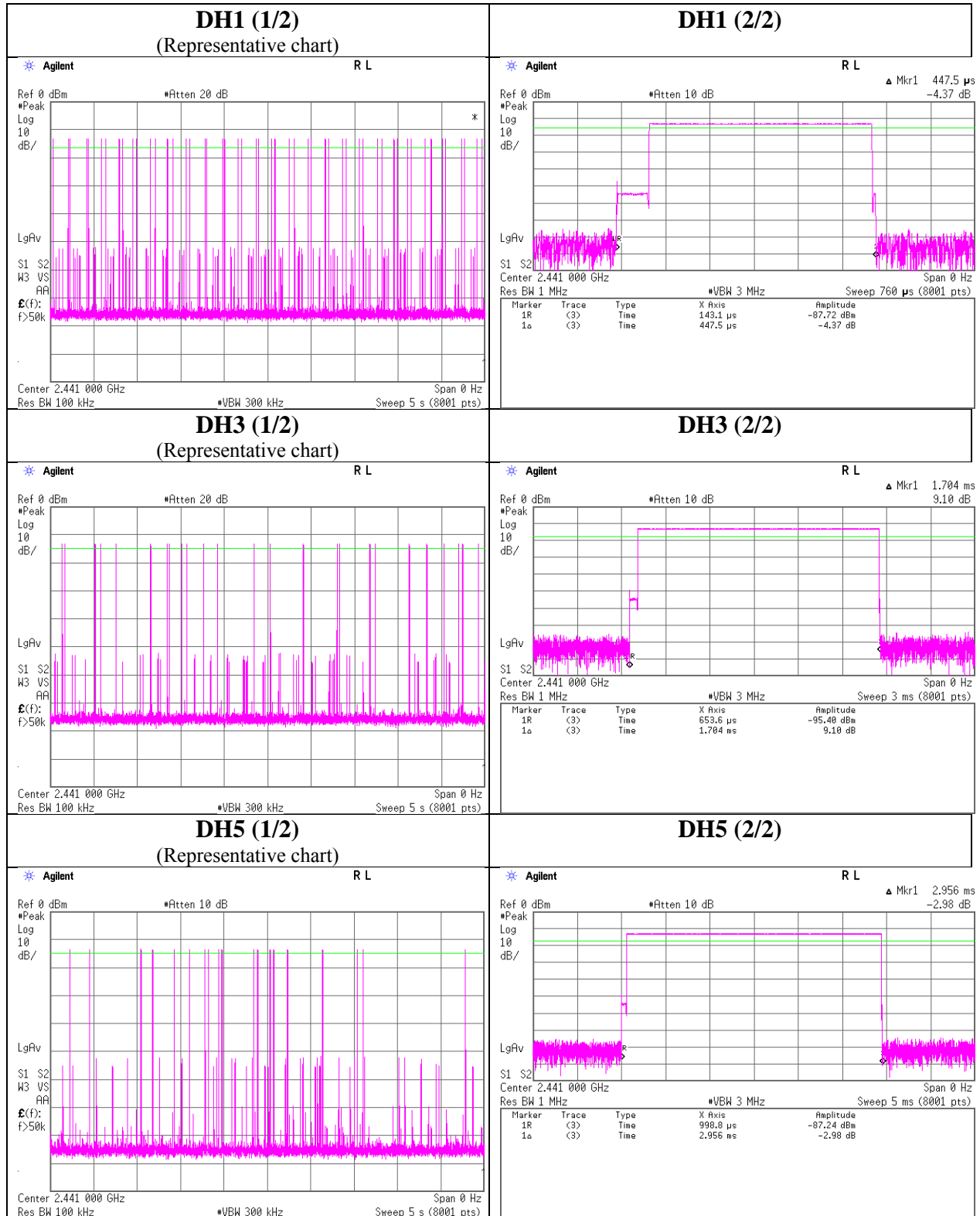
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	48	49	50
DH3	25	29	26	26	28	26.8
DH5	19	16	18	16	15	16.8
3DH1	48	50	49	46	48	48.2
3DH3	26	28	26	26	26	26.4
3DH5	17	21	19	13	15	17

Sample Calculation

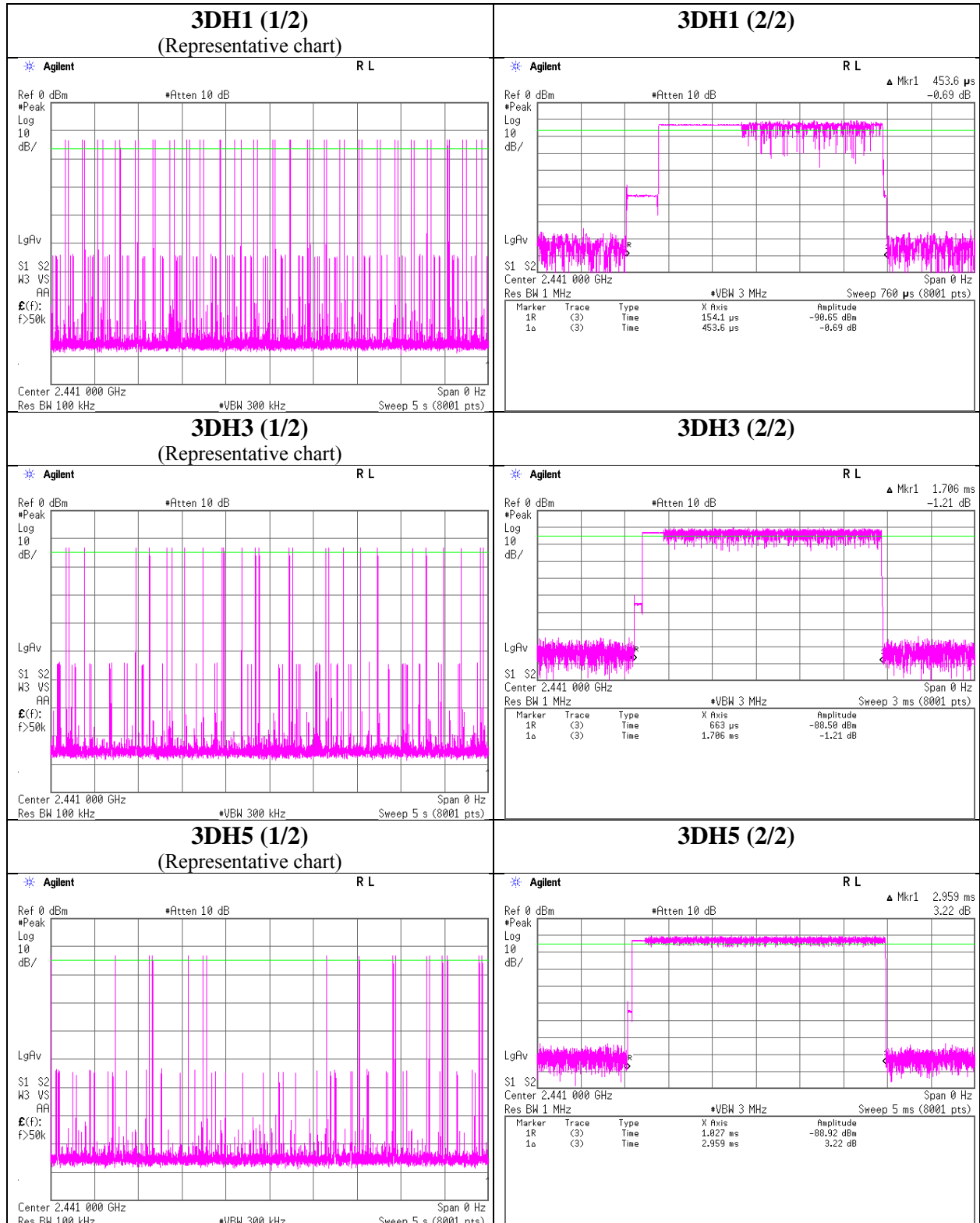
Average = Summation (Sampling 1 to 5) / 5

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



Dwell time



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Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11445242S-R2
Date : September 29, 2016
Temperature / Humidity : 25 deg. C / 46 % RH
Engineer : Hiroyuki Morikawa
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	-12.86	2.03	9.92	-0.91	0.81	20.96	125	21.87
DH5	2441.0	-12.63	2.03	9.92	-0.68	0.86	20.96	125	21.64
DH5	2480.0	-12.73	2.04	9.92	-0.77	0.84	20.96	125	21.73
2DH5	2402.0	-10.15	2.03	9.92	1.80	1.51	20.96	125	19.16
2DH5	2441.0	-9.66	2.03	9.92	2.29	1.69	20.96	125	18.67
2DH5	2480.0	-9.99	2.04	9.92	1.97	1.57	20.96	125	18.99
3DH5	2402.0	-9.99	2.03	9.92	1.96	1.57	20.96	125	19.00
3DH5	2441.0	-9.44	2.03	9.92	2.51	1.78	20.96	125	18.45
3DH5	2480.0	-9.60	2.04	9.92	2.36	1.72	20.96	125	18.60

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. 11445242S-R2
Date September 29, 2016
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Hiroyuki Morikawa
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	-14.71	2.03	9.92	-2.76	0.53	1.03	-1.73	0.67
DH5	2441.0	-14.53	2.03	9.92	-2.58	0.55	1.03	-1.55	0.70
DH5	2480.0	-14.61	2.04	9.92	-2.65	0.54	1.03	-1.62	0.69
2DH5	2402.0	-14.15	2.03	9.92	-2.20	0.60	1.03	-1.17	0.76
2DH5	2441.0	-13.67	2.03	9.92	-1.72	0.67	1.03	-0.69	0.85
2DH5	2480.0	-14.02	2.04	9.92	-2.06	0.62	1.03	-1.03	0.79
3DH5	2402.0	-14.15	2.03	9.92	-2.20	0.60	1.03	-1.17	0.76
3DH5	2441.0	-13.88	2.03	9.92	-1.93	0.64	1.03	-0.90	0.81
3DH5	2480.0	-14.03	2.04	9.92	-2.07	0.62	1.03	-1.04	0.79

Sample Calculation:

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

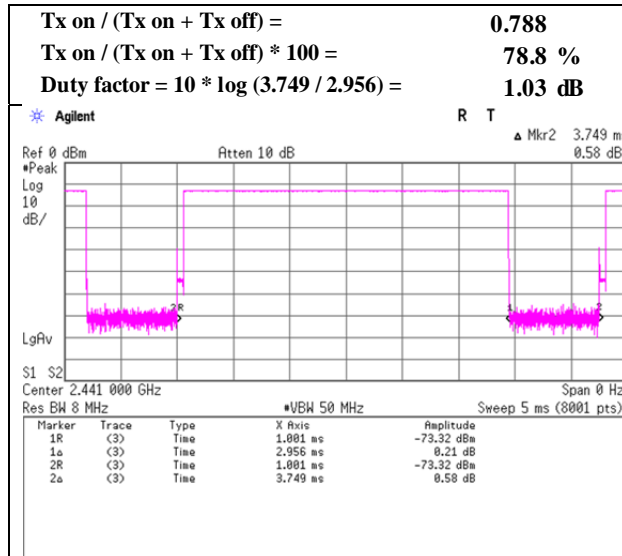
Result (Burst power average) = Time average + Duty factor

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

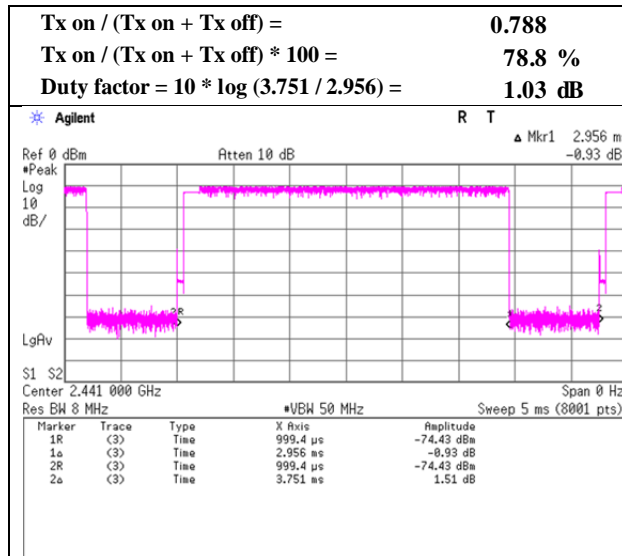
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off

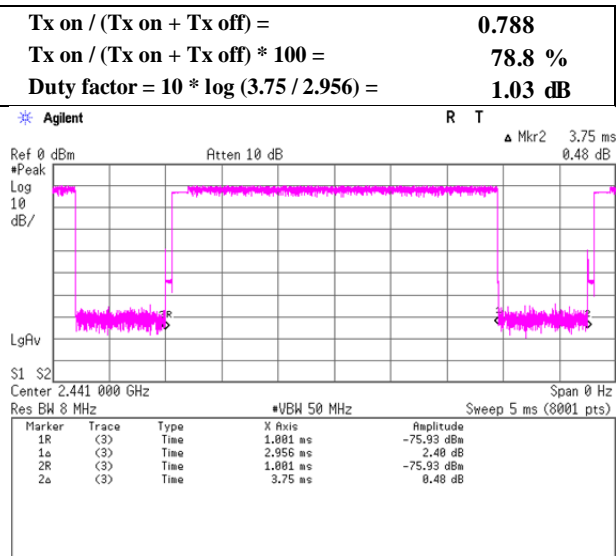
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11445242S-R2
Date : September 24, 2016 September 25, 2016
Temperature / Humidity : 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki
(1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
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.	78.000	QP	34.60	6.15	7.97	31.87	0.00	16.85	40.00	23.1	265	50	
Hori.	156.001	QP	29.30	14.88	8.67	31.80	0.00	21.05	43.50	22.4	201	55	
Hori.	329.998	QP	36.60	14.36	6.77	31.65	0.00	26.08	46.00	19.9	140	184	
Hori.	742.493	QP	27.10	20.57	9.08	31.45	0.00	25.30	46.00	20.7	138	291	
Hori.	2390.000	PK	42.50	27.17	13.70	37.06	2.26	48.57	73.90	25.3	180	297	
Hori.	4804.000	PK	46.84	31.13	5.98	37.12	2.26	49.09	73.90	24.8	266	314	
Hori.	7206.000	PK	45.14	36.43	7.40	37.84	2.26	53.39	73.90	20.5	150	0	
Hori.	9608.000	PK	46.52	38.28	7.93	39.13	2.26	55.86	73.90	18.0	150	0	
Hori.	2390.000	AV	29.84	27.17	13.70	37.06	2.26	35.91	53.90	17.9	180	297	
Hori.	4804.000	AV	37.47	31.13	5.98	37.12	2.26	39.72	53.90	14.1	266	314	
Hori.	7206.000	AV	32.05	36.43	7.40	37.84	2.26	40.30	53.90	13.6	150	0	
Hori.	9608.000	AV	33.38	38.28	7.93	39.13	2.26	42.72	53.90	11.1	150	0	
Vert.	31.995	QP	23.00	16.73	6.84	31.91	0.00	14.66	40.00	25.3	100	332	
Vert.	73.727	QP	31.90	6.18	7.62	31.88	0.00	13.82	40.00	26.1	100	259	
Vert.	147.460	QP	28.30	14.59	8.53	31.81	0.00	19.61	43.50	23.8	100	224	
Vert.	938.450	QP	20.70	22.33	10.00	30.59	0.00	22.44	46.00	23.5	100	268	
Vert.	2390.000	PK	40.99	27.17	13.70	37.06	2.26	47.06	73.90	26.8	154	167	
Vert.	4804.000	PK	45.74	31.13	5.98	37.12	2.26	47.99	73.90	25.9	158	343	
Vert.	7206.000	PK	45.28	36.43	7.40	37.84	2.26	53.53	73.90	20.3	150	0	
Vert.	9608.000	PK	46.02	38.28	7.93	39.13	2.26	55.36	73.90	18.5	150	0	
Vert.	2390.000	AV	29.66	27.17	13.70	37.06	2.26	35.73	53.90	18.1	154	167	
Vert.	4804.000	AV	33.99	31.13	5.98	37.12	2.26	36.24	53.90	17.6	158	343	
Vert.	7206.000	AV	32.12	36.43	7.40	37.84	2.26	40.37	53.90	13.5	150	0	
Vert.	9608.000	AV	33.46	38.28	7.93	39.13	2.26	42.80	53.90	11.1	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.89 m / 3.0 m) = 2.26 dB

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

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	87.02	27.21	13.71	37.05	2.26	93.15	-	-	Carrier
Hori.	2400.000	PK	24.26	27.20	13.71	37.05	2.26	30.38	73.15	42.8	
Vert.	2402.000	PK	84.57	27.21	13.71	37.05	2.26	90.70	-	-	Carrier
Vert.	2400.000	PK	33.64	27.20	13.71	37.05	2.26	39.76	70.70	30.9	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.89 m / 3.0 m) = 2.26 dB

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

UL Japan, Inc.

Shonan EMC Lab.

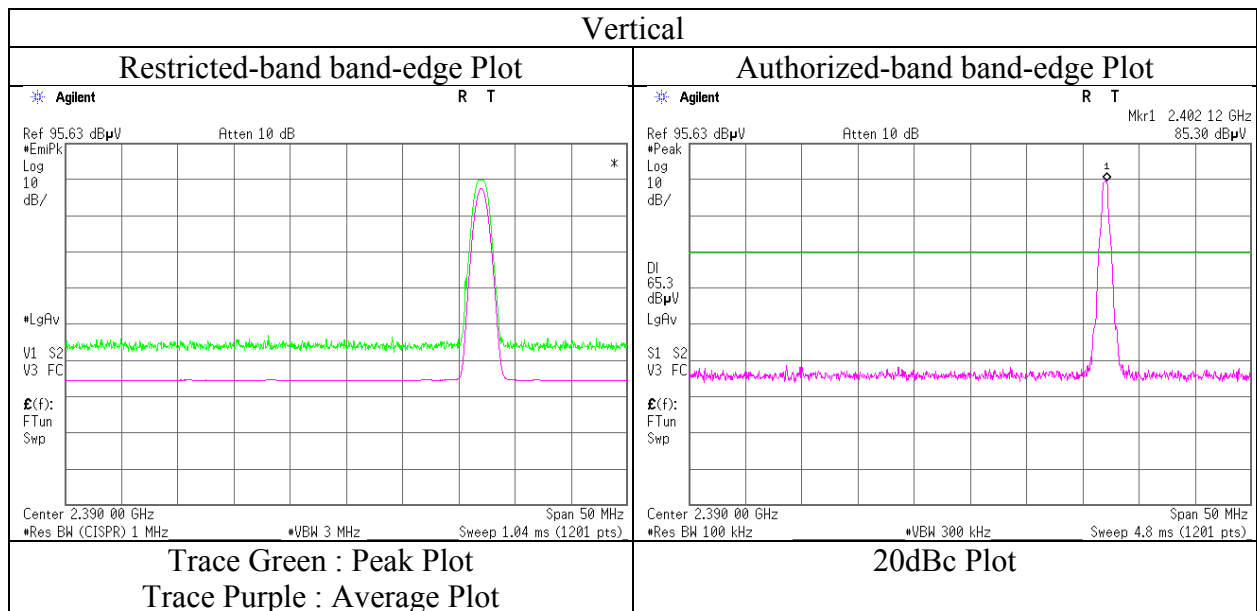
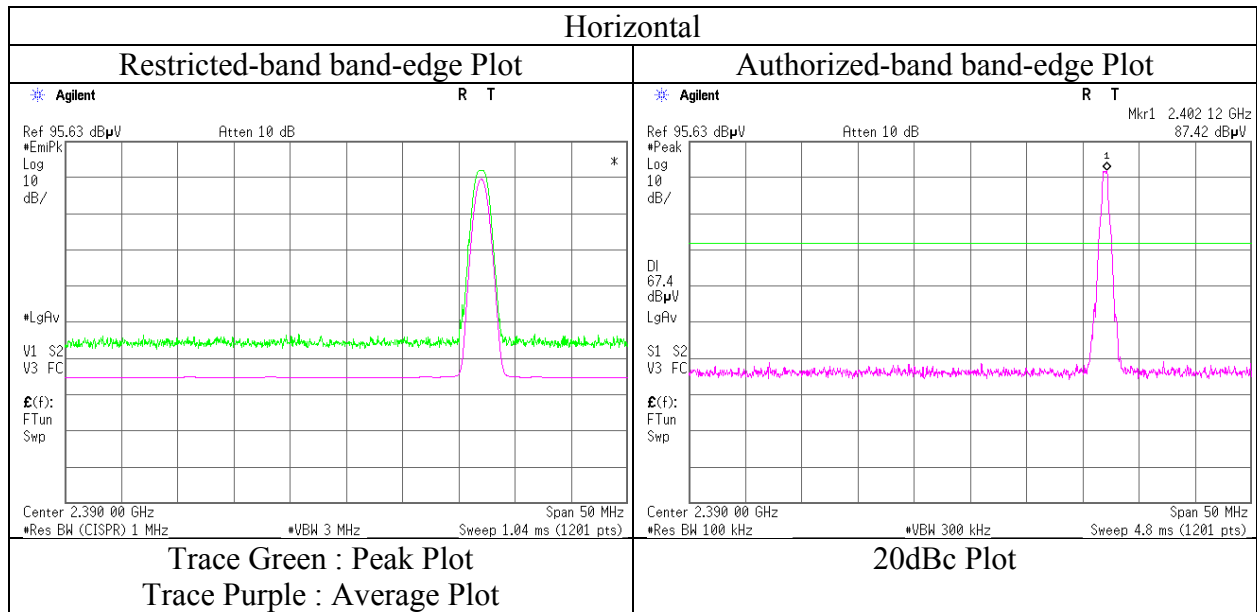
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11445242S-R2
Date : September 24, 2016
Temperature / Humidity : 23 deg. C / 60 % RH
Engineer : Hiroyuki Morikawa
(1 GHz-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. : 11445242S-R2
Date : September 24, 2016 September 25, 2016
Temperature / Humidity : 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki
(1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
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.	78.001	QP	33.90	6.15	7.97	31.87	0.00	16.15	40.00	23.8	256	50	
Hori.	156.000	QP	29.30	14.88	8.67	31.80	0.00	21.05	43.50	22.4	206	66	
Hori.	330.000	QP	35.70	14.37	6.77	31.65	0.00	25.19	46.00	20.8	152	181	
Hori.	742.499	QP	27.20	20.57	9.08	31.45	0.00	25.40	46.00	20.6	140	300	
Hori.	4882.000	PK	48.54	31.29	6.04	37.16	2.26	50.97	73.90	22.9	237	341	
Hori.	7323.000	PK	44.74	36.64	7.55	37.92	2.26	53.27	73.90	20.6	150	0	
Hori.	9764.000	PK	45.42	38.52	8.12	39.20	2.26	55.12	73.90	18.7	150	0	
Hori.	4882.000	AV	39.89	31.29	6.04	37.16	2.26	42.32	53.90	11.5	237	341	
Hori.	7323.000	AV	31.56	36.64	7.55	37.92	2.26	40.09	53.90	13.8	150	0	
Hori.	9764.000	AV	32.92	38.52	8.12	39.20	2.26	42.62	53.90	11.2	150	0	
Vert.	32.085	QP	23.00	16.71	6.85	31.91	0.00	14.65	40.00	25.3	100	295	
Vert.	73.728	QP	31.90	6.18	7.62	31.88	0.00	13.82	40.00	26.1	100	267	
Vert.	147.455	QP	28.50	14.59	8.53	31.81	0.00	19.81	43.50	23.6	100	216	
Vert.	938.560	QP	21.30	22.33	10.00	30.59	0.00	23.04	46.00	22.9	100	266	
Vert.	4882.000	PK	45.44	31.29	6.04	37.16	2.26	47.87	73.90	26.0	145	25	
Vert.	7323.000	PK	44.89	36.64	7.55	37.92	2.26	53.42	73.90	20.4	150	0	
Vert.	9764.000	PK	46.13	38.52	8.12	39.20	2.26	55.83	73.90	18.0	150	0	
Vert.	4882.000	AV	34.33	31.29	6.04	37.16	2.26	36.76	53.90	17.1	145	25	
Vert.	7323.000	AV	31.54	36.64	7.55	37.92	2.26	40.07	53.90	13.8	150	0	
Vert.	9764.000	AV	32.27	38.52	8.12	39.20	2.26	41.97	53.90	11.9	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11445242S-R2
Date : September 24, 2016 September 25, 2016
Temperature / Humidity : 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki
(1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
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.	78.000	QP	33.90	6.15	7.97	31.87	0.00	16.15	40.00	23.8	246	50	
Hori.	156.000	QP	29.40	14.88	8.67	31.80	0.00	21.15	43.50	22.3	203	57	
Hori.	329.999	QP	35.60	14.36	6.77	31.65	0.00	25.08	46.00	20.9	142	189	
Hori.	742.501	QP	27.20	20.57	9.08	31.45	0.00	25.40	46.00	20.6	131	302	
Hori.	2483.500	PK	43.15	27.49	13.79	37.01	2.26	49.68	73.90	24.2	136	304	
Hori.	4960.000	PK	47.77	31.46	6.10	37.19	2.26	50.40	73.90	23.5	241	334	
Hori.	7440.000	PK	44.58	36.84	7.69	37.99	2.26	53.38	73.90	20.5	150	0	
Hori.	9920.000	PK	45.20	38.76	8.32	39.26	2.26	55.28	73.90	18.6	150	0	
Hori.	2483.500	AV	30.26	27.49	13.79	37.01	2.26	36.79	53.90	17.1	136	304	
Hori.	4960.000	AV	38.81	31.46	6.10	37.19	2.26	41.44	53.90	12.4	241	334	
Hori.	7440.000	AV	31.02	36.84	7.69	37.99	2.26	39.82	53.90	14.0	150	0	
Hori.	9920.000	AV	32.37	38.76	8.32	39.26	2.26	42.45	53.90	11.4	150	0	
Vert.	32.099	QP	23.00	16.71	6.85	31.91	0.00	14.65	40.00	25.3	100	313	
Vert.	73.729	QP	31.80	6.18	7.62	31.88	0.00	13.72	40.00	26.2	100	259	
Vert.	147.454	QP	28.00	14.59	8.53	31.81	0.00	19.31	43.50	24.1	100	214	
Vert.	938.475	QP	20.70	22.33	10.00	30.59	0.00	22.44	46.00	23.5	100	275	
Vert.	2483.500	PK	43.44	27.49	13.79	37.01	2.26	49.97	73.90	23.9	144	165	
Vert.	4960.000	PK	45.58	31.46	6.10	37.19	2.26	48.21	73.90	25.6	131	357	
Vert.	7440.000	PK	43.93	36.84	7.69	37.99	2.26	52.73	73.90	21.1	150	0	
Vert.	9920.000	PK	44.98	38.76	8.32	39.26	2.26	55.06	73.90	18.8	150	0	
Vert.	2483.500	AV	29.97	27.49	13.79	37.01	2.26	36.50	53.90	17.4	144	165	
Vert.	4960.000	AV	34.98	31.46	6.10	37.19	2.26	37.61	53.90	16.2	131	357	
Vert.	7440.000	AV	31.42	36.84	7.69	37.99	2.26	40.22	53.90	13.6	150	0	
Vert.	9920.000	AV	31.76	38.76	8.32	39.26	2.26	41.84	53.90	12.0	150	0	

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

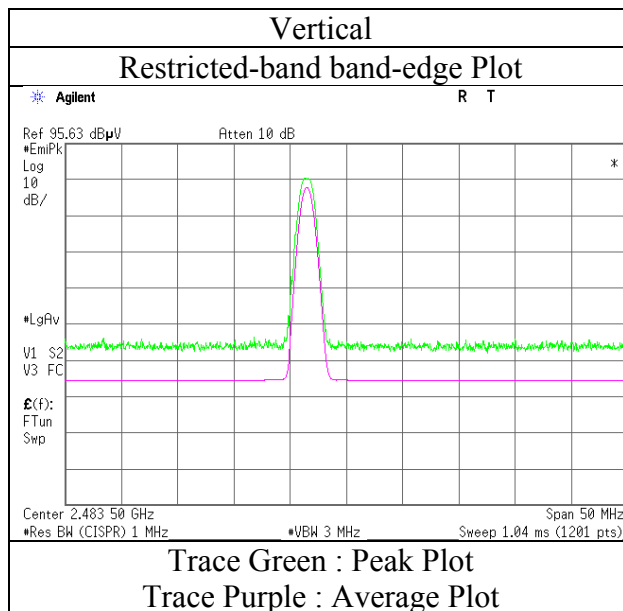
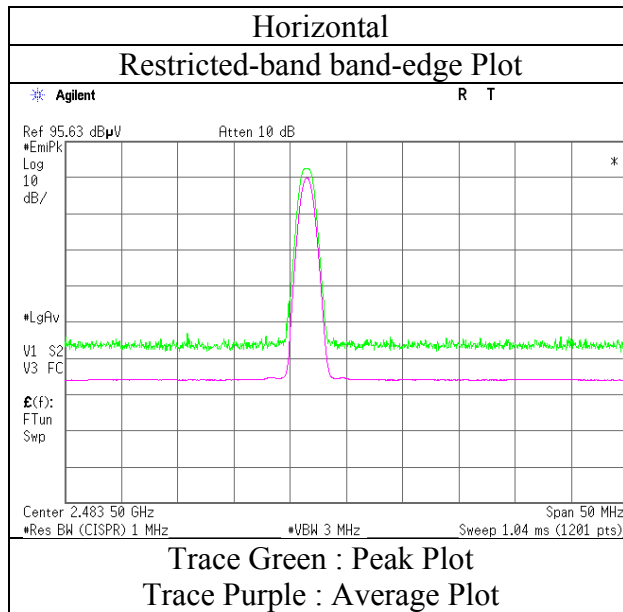
Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11445242S-R2
Date : September 24, 2016
Temperature / Humidity : 23 deg. C / 60 % RH
Engineer : Hiroyuki Morikawa
(1 GHz-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. : 11445242S-R2
Date : September 24, 2016 September 25, 2016
Temperature / Humidity : 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki
(1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
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.	78.001	QP	34.30	6.15	7.97	31.87	0.00	16.55	40.00	23.4	262	51	
Hori.	156.000	QP	29.40	14.88	8.67	31.80	0.00	21.15	43.50	22.3	208	53	
Hori.	330.001	QP	36.20	14.37	6.77	31.65	0.00	25.69	46.00	20.3	146	182	
Hori.	742.491	QP	27.10	20.57	9.08	31.45	0.00	25.30	46.00	20.7	145	302	
Hori.	2390.000	PK	44.27	27.17	13.70	37.06	2.26	50.34	73.90	23.5	140	302	
Hori.	4804.000	PK	48.75	31.13	5.98	37.12	2.26	51.00	73.90	22.9	166	346	
Hori.	7206.000	PK	45.73	36.43	7.40	37.84	2.26	53.98	73.90	19.9	150	0	
Hori.	9608.000	PK	46.43	38.28	7.93	39.13	2.26	55.77	73.90	18.1	150	0	
Hori.	2390.000	AV	30.14	27.17	13.70	37.06	2.26	36.21	53.90	17.6	140	302	
Hori.	4804.000	AV	36.40	31.13	5.98	37.12	2.26	38.65	53.90	15.2	166	346	
Hori.	7206.000	AV	32.14	36.43	7.40	37.84	2.26	40.39	53.90	13.5	150	0	
Hori.	9608.000	AV	33.49	38.28	7.93	39.13	2.26	42.83	53.90	11.0	150	0	
Vert.	32.006	QP	23.30	16.73	6.84	31.91	0.00	14.96	40.00	25.0	100	333	
Vert.	73.728	QP	31.70	6.18	7.62	31.88	0.00	13.62	40.00	26.3	100	270	
Vert.	147.457	QP	28.00	14.59	8.53	31.81	0.00	19.31	43.50	24.1	100	221	
Vert.	938.500	QP	20.80	22.33	10.00	30.59	0.00	22.54	46.00	23.4	100	272	
Vert.	2390.000	PK	43.42	27.17	13.70	37.06	2.26	49.49	73.90	24.4	176	163	
Vert.	4804.000	PK	45.04	31.13	5.98	37.12	2.26	47.29	73.90	26.6	156	341	
Vert.	7206.000	PK	46.01	36.43	7.40	37.84	2.26	54.26	73.90	19.6	150	0	
Vert.	9608.000	PK	46.33	38.28	7.93	39.13	2.26	55.67	73.90	18.2	150	0	
Vert.	2390.000	AV	29.75	27.17	13.70	37.06	2.26	35.82	53.90	18.0	176	163	
Vert.	4804.000	AV	33.79	31.13	5.98	37.12	2.26	36.04	53.90	17.8	156	341	
Vert.	7206.000	AV	32.50	36.43	7.40	37.84	2.26	40.75	53.90	13.1	150	0	
Vert.	9608.000	AV	33.46	38.28	7.93	39.13	2.26	42.80	53.90	11.1	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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	87.04	27.21	13.71	37.05	2.26	93.17	-	-	Carrier
Hori.	2400.000	PK	33.82	27.20	13.71	37.05	2.26	39.94	73.17	33.2	
Vert.	2402.000	PK	83.66	27.21	13.71	37.05	2.26	89.79	-	-	Carrier
Vert.	2400.000	PK	33.41	27.20	13.71	37.05	2.26	39.53	69.79	30.3	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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

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Shonan EMC Lab.

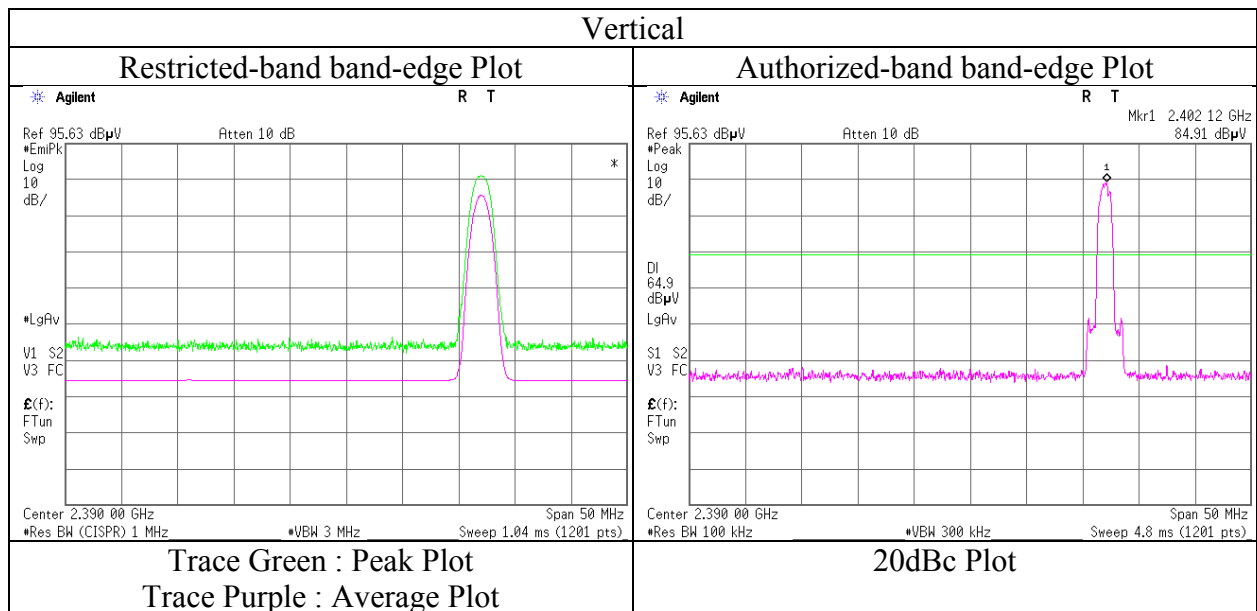
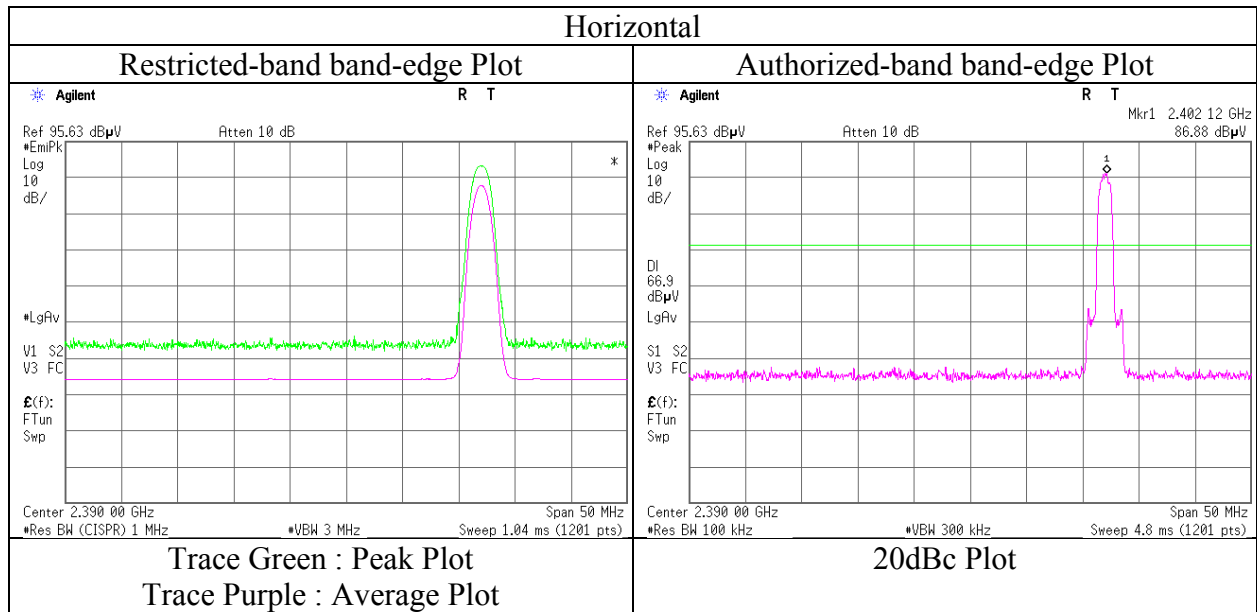
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11445242S-R2
Date	September 24, 2016
Temperature / Humidity	23 deg. C / 60 % RH
Engineer	Hiroyuki Morikawa (1 GHz-18 GHz)
Mode	Tx, Hopping On, 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. : 11445242S-R2
Date : September 24, 2016 September 25, 2016
Temperature / Humidity : 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki
 (1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
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.	77.999	QP	34.20	6.15	7.97	31.87	0.00	16.45	40.00	23.5	243	45	
Hori.	156.000	QP	29.30	14.88	8.67	31.80	0.00	21.05	43.50	22.4	207	65	
Hori.	330.001	QP	35.80	14.37	6.77	31.65	0.00	25.29	46.00	20.7	143	187	
Hori.	742.500	QP	27.00	20.57	9.08	31.45	0.00	25.20	46.00	20.8	132	294	
Hori.	4882.000	PK	47.60	31.29	6.04	37.16	2.26	50.03	73.90	23.8	193	346	
Hori.	7323.000	PK	45.01	36.64	7.55	37.92	2.26	53.54	73.90	20.3	150	0	
Hori.	9764.000	PK	45.98	38.52	8.12	39.20	2.26	55.68	73.90	18.2	150	0	
Hori.	4882.000	AV	36.89	31.29	6.04	37.16	2.26	39.32	53.90	14.5	193	346	
Hori.	7323.000	AV	31.47	36.64	7.55	37.92	2.26	40.00	53.90	13.9	150	0	
Hori.	9764.000	AV	32.43	38.52	8.12	39.20	2.26	42.13	53.90	11.7	150	0	
Vert.	32.045	QP	22.90	16.72	6.84	31.91	0.00	14.55	40.00	25.4	100	330	
Vert.	73.729	QP	31.80	6.18	7.62	31.88	0.00	13.72	40.00	26.2	100	262	
Vert.	147.452	QP	28.20	14.59	8.53	31.81	0.00	19.51	43.50	23.9	100	213	
Vert.	938.450	QP	20.70	22.33	10.00	30.59	0.00	22.44	46.00	23.5	100	270	
Vert.	4882.000	PK	45.07	31.29	6.04	37.16	2.26	47.50	73.90	26.4	157	18	
Vert.	7323.000	PK	44.98	36.64	7.55	37.92	2.26	53.51	73.90	20.3	150	0	
Vert.	9764.000	PK	45.39	38.52	8.12	39.20	2.26	55.09	73.90	18.8	150	0	
Vert.	4882.000	AV	34.17	31.29	6.04	37.16	2.26	36.60	53.90	17.3	157	18	
Vert.	7323.000	AV	31.50	36.64	7.55	37.92	2.26	40.03	53.90	13.8	150	0	
Vert.	9764.000	AV	32.38	38.52	8.12	39.20	2.26	42.08	53.90	11.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11445242S-R2
Date : September 24, 2016 September 25, 2016
Temperature / Humidity : 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki
(1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
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.	78.000	QP	33.60	6.15	7.97	31.87	0.00	15.85	40.00	24.1	252	49	
Hori.	156.002	QP	29.40	14.88	8.67	31.80	0.00	21.15	43.50	22.3	214	63	
Hori.	329.999	QP	35.50	14.36	6.77	31.65	0.00	24.98	46.00	21.0	134	184	
Hori.	742.500	QP	27.30	20.57	9.08	31.45	0.00	25.50	46.00	20.5	142	300	
Hori.	2483.500	PK	44.71	27.49	13.79	37.01	2.26	51.24	73.90	22.6	143	302	
Hori.	4960.000	PK	48.02	31.46	6.10	37.19	2.26	50.65	73.90	23.2	193	341	
Hori.	7440.000	PK	44.60	36.84	7.69	37.99	2.26	53.40	73.90	20.5	150	0	
Hori.	9920.000	PK	45.32	38.76	8.32	39.26	2.26	55.40	73.90	18.5	150	0	
Hori.	2483.500	AV	30.01	27.49	13.79	37.01	2.26	36.54	53.90	17.3	143	302	
Hori.	4960.000	AV	37.02	31.46	6.10	37.19	2.26	39.65	53.90	14.2	193	341	
Hori.	7440.000	AV	30.95	36.84	7.69	37.99	2.26	39.75	53.90	14.1	150	0	
Hori.	9920.000	AV	31.75	38.76	8.32	39.26	2.26	41.83	53.90	12.0	150	0	
Vert.	32.200	QP	23.00	16.69	6.85	31.91	0.00	14.63	40.00	25.3	100	301	
Vert.	73.729	QP	31.60	6.18	7.62	31.88	0.00	13.52	40.00	26.4	100	280	
Vert.	147.457	QP	27.80	14.59	8.53	31.81	0.00	19.11	43.50	24.3	100	215	
Vert.	938.455	QP	21.00	22.33	10.00	30.59	0.00	22.74	46.00	23.2	100	269	
Vert.	2483.500	PK	44.18	27.49	13.79	37.01	2.26	50.71	73.90	23.1	144	164	
Vert.	4960.000	PK	46.72	31.46	6.10	37.19	2.26	49.35	73.90	24.5	155	2	
Vert.	7440.000	PK	44.91	36.84	7.69	37.99	2.26	53.71	73.90	20.1	150	0	
Vert.	9920.000	PK	45.97	38.76	8.32	39.26	2.26	56.05	73.90	17.8	150	0	
Vert.	2483.500	AV	30.15	27.49	13.79	37.01	2.26	36.68	53.90	17.2	144	164	
Vert.	4960.000	AV	34.30	31.46	6.10	37.19	2.26	36.93	53.90	16.9	155	2	
Vert.	7440.000	AV	31.05	36.84	7.69	37.99	2.26	39.85	53.90	14.0	150	0	
Vert.	9920.000	AV	31.92	38.76	8.32	39.26	2.26	42.00	53.90	11.9	150	0	

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

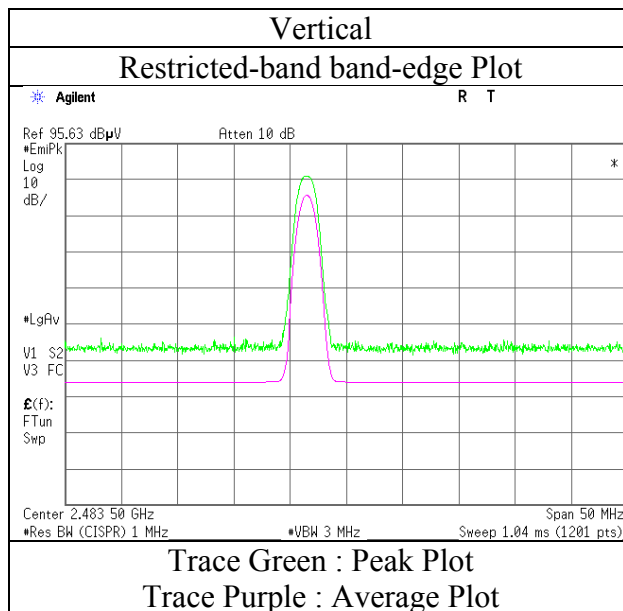
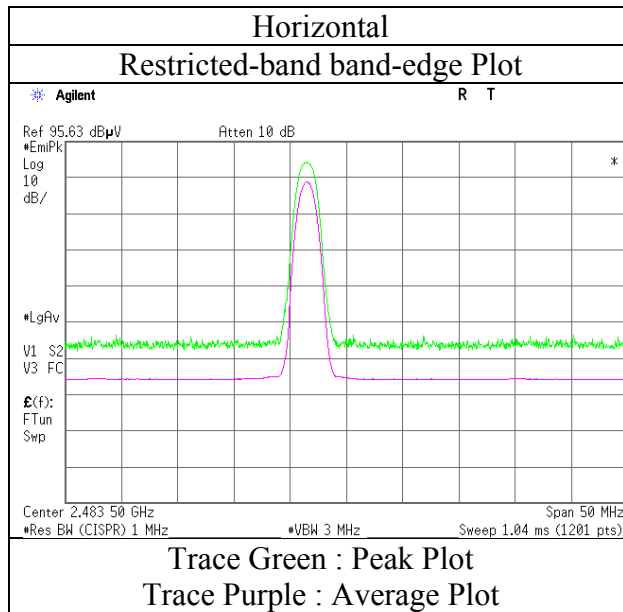
Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

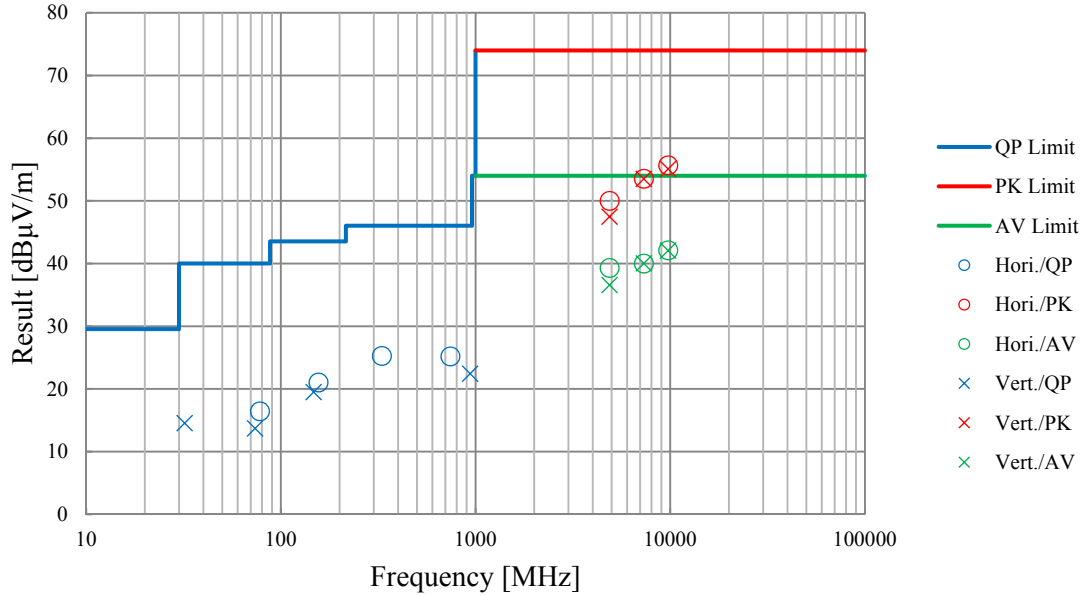
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11445242S-R2
Date	September 24, 2016
Temperature / Humidity	23 deg. C / 60 % RH
Engineer	Hiroyuki Morikawa (1 GHz-18 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



* 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. 11445242S-R2
Date September 24, 2016 September 25, 2016
Temperature / Humidity 23 deg. C / 60 % RH 23 deg. C / 68 % RH
Engineer Hiroyuki Morikawa Yasumasa Owaki
 (1 GHz-18 GHz) (18 GHz-26.5 GHz, 30 MHz-1000 MHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

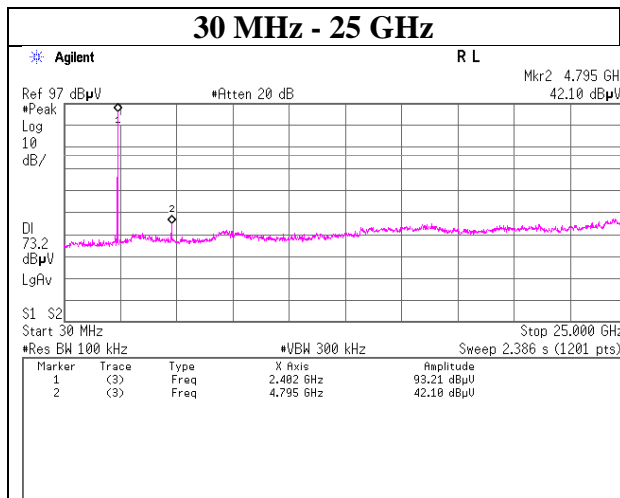
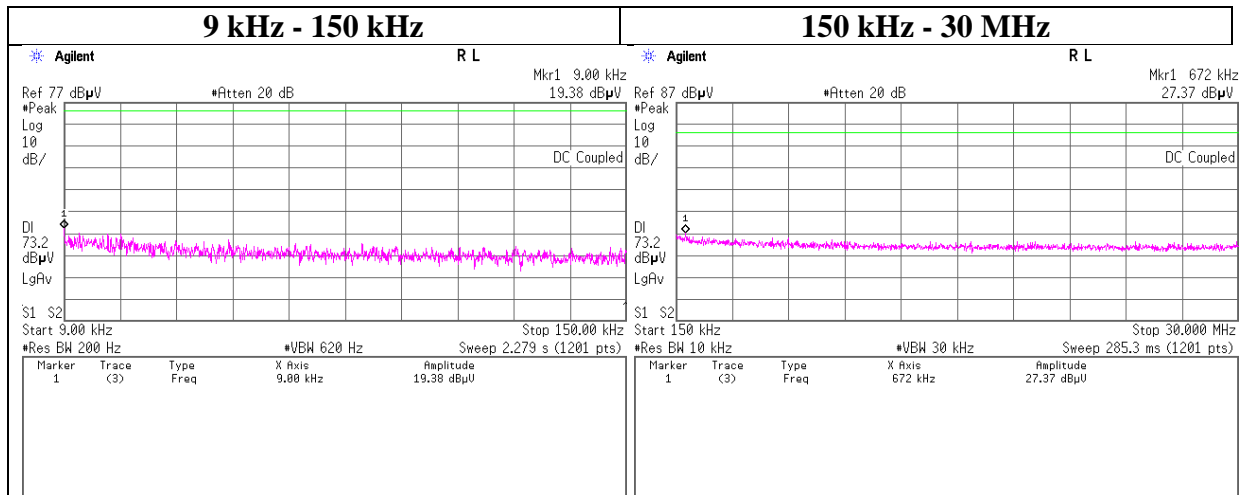


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

2402 MHz



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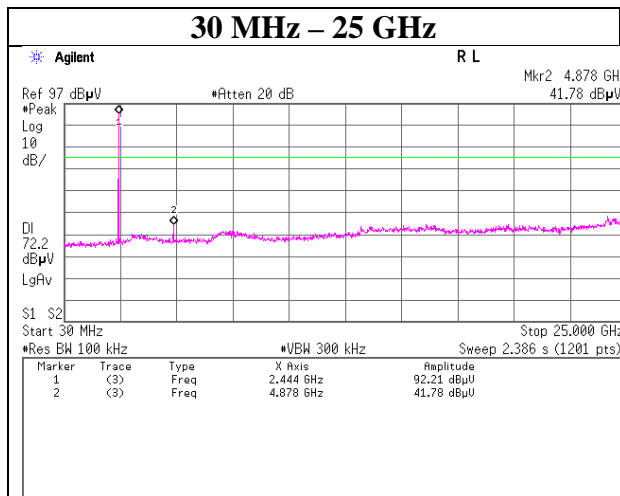
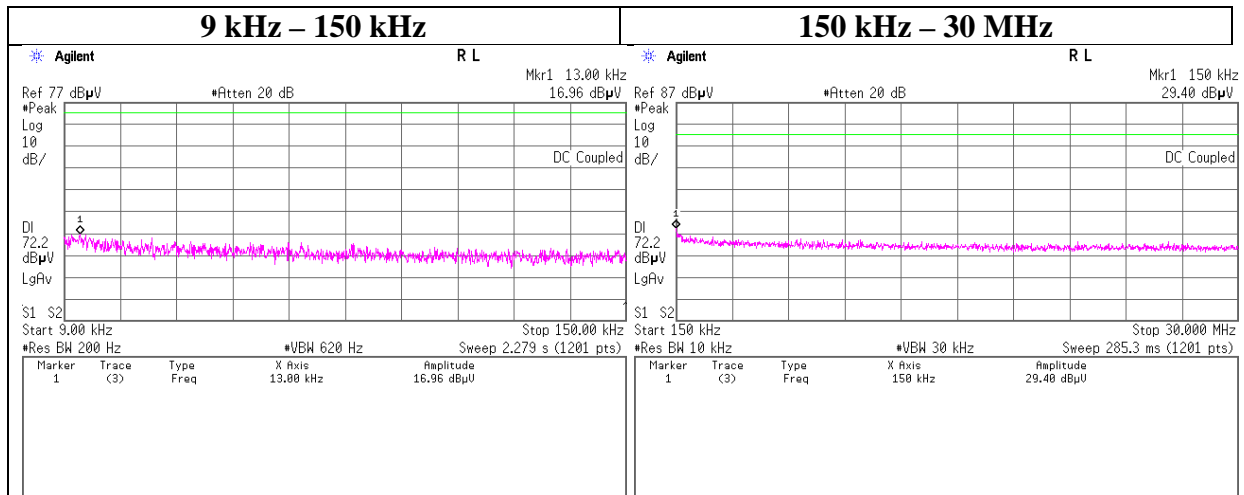
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

2441 MHz



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Shonan EMC Lab.

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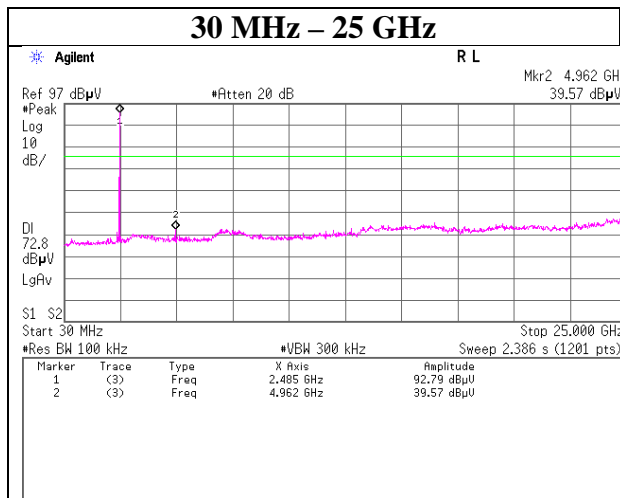
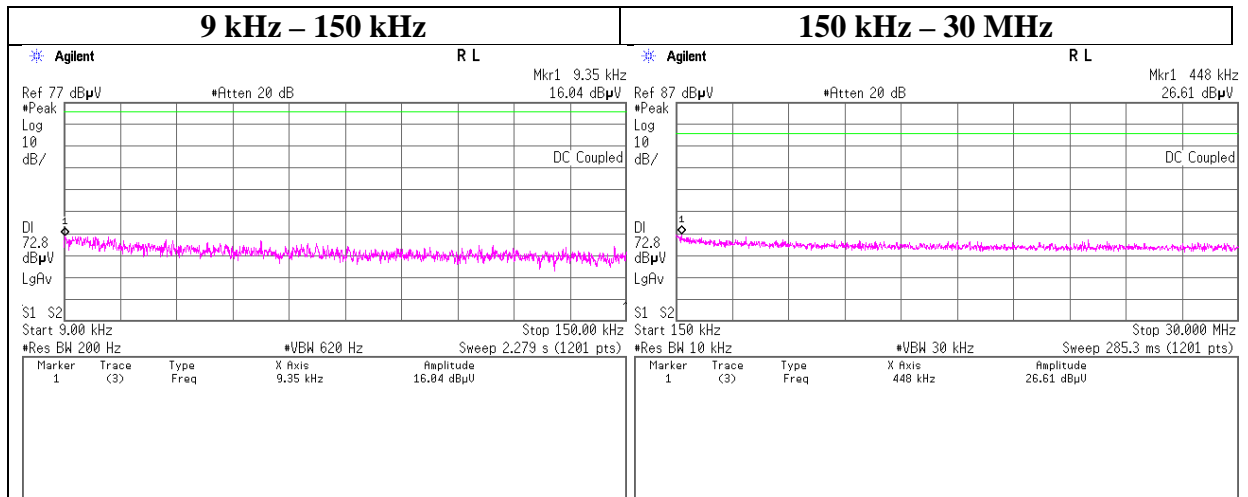
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

2480 MHz



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Shonan EMC Lab.

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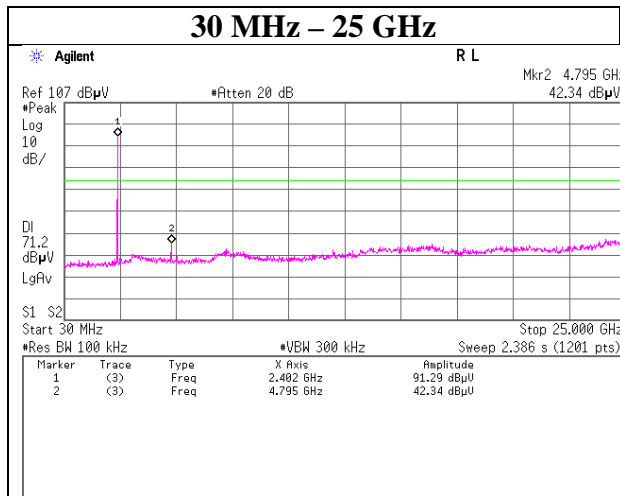
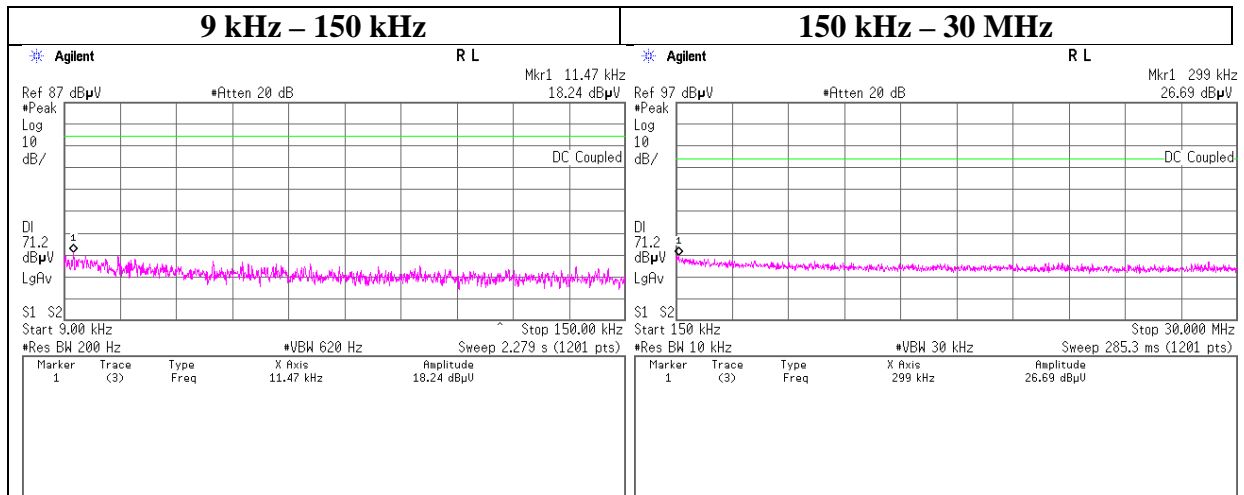
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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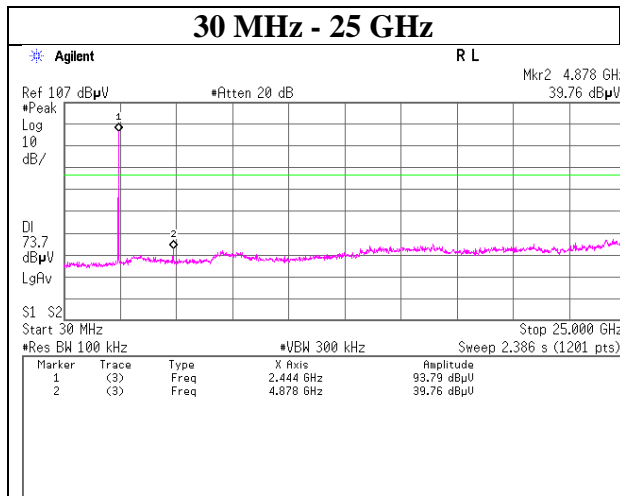
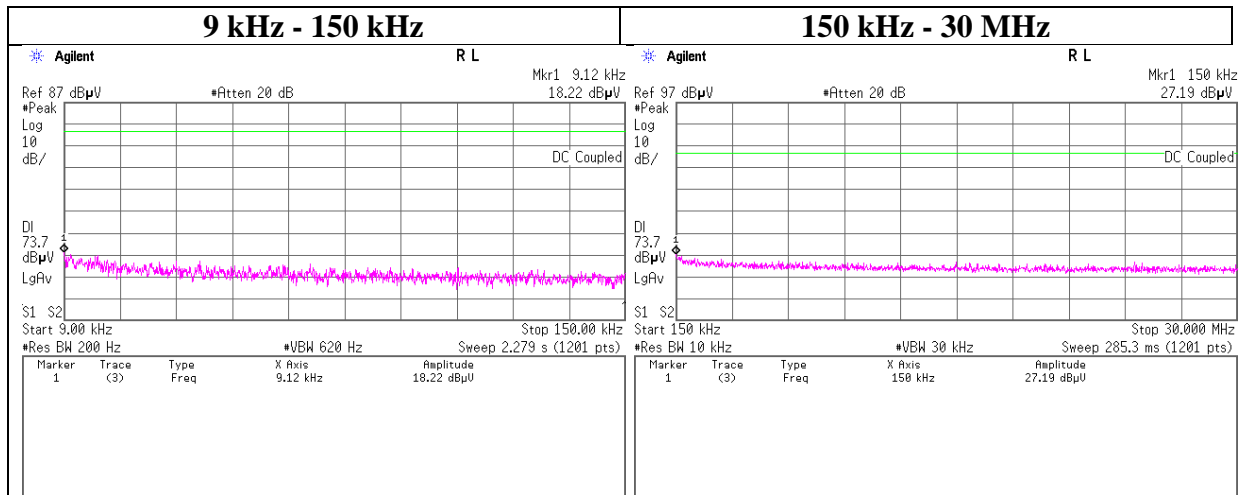
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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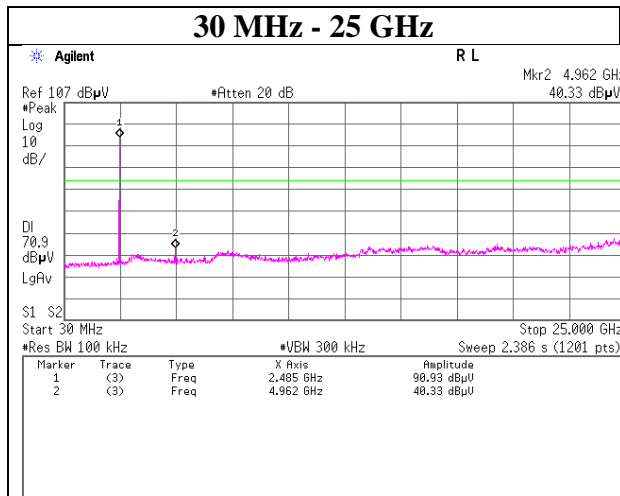
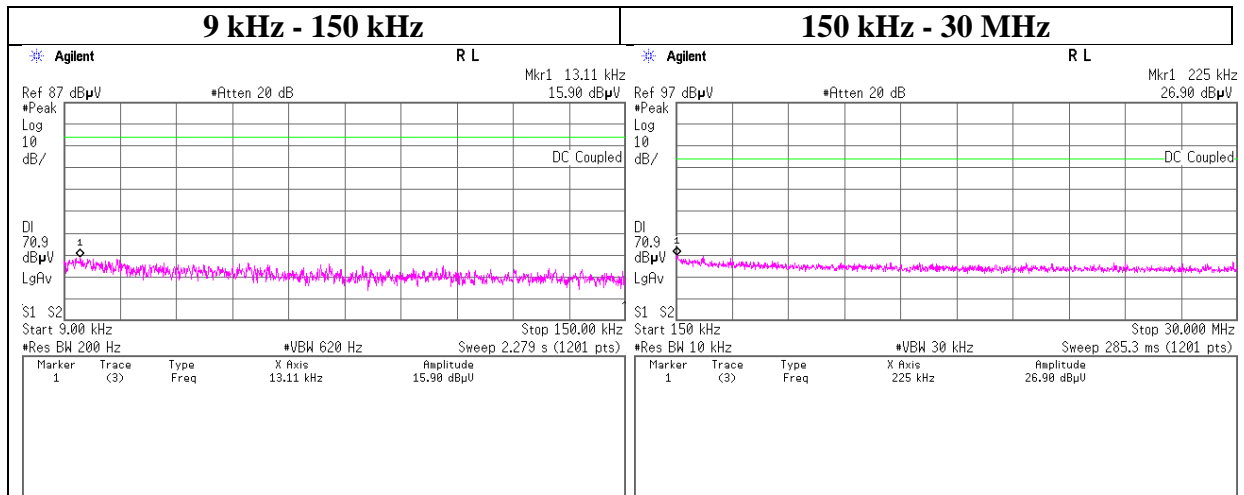
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

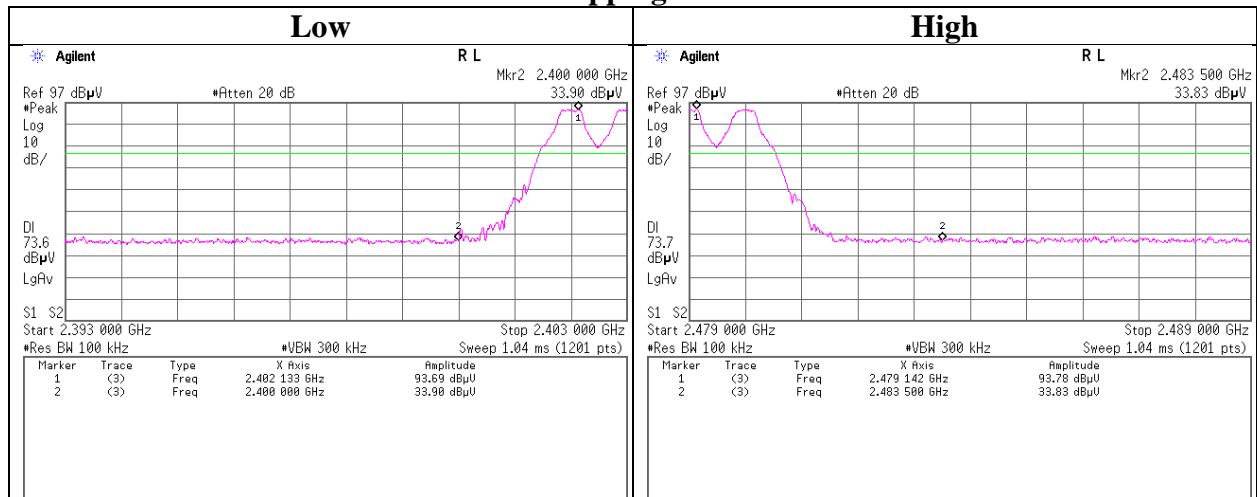
2480 MHz



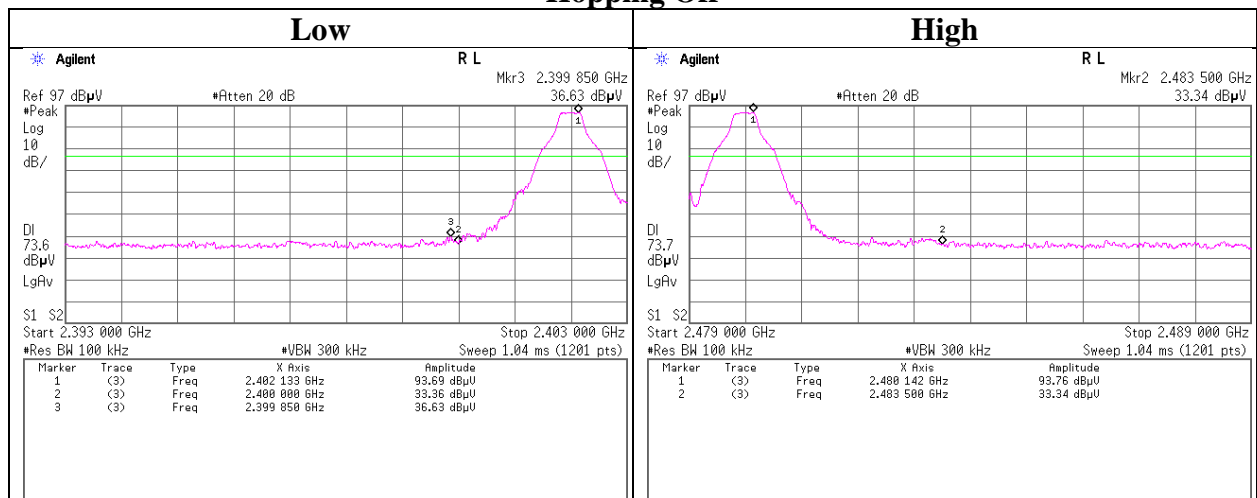
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx DH5

Hopping On



Hopping Off



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Shonan EMC Lab.

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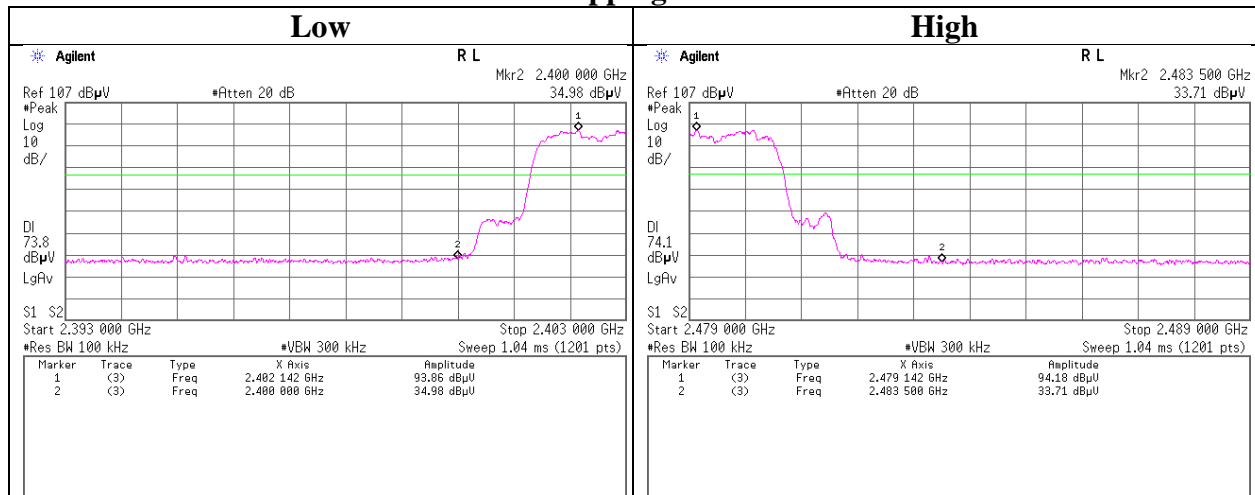
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

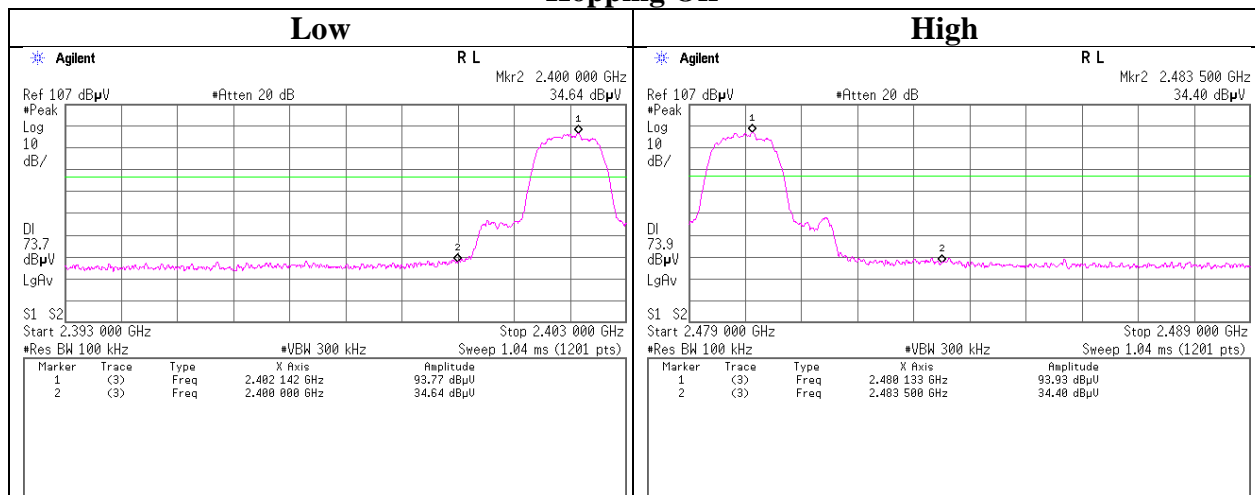
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
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

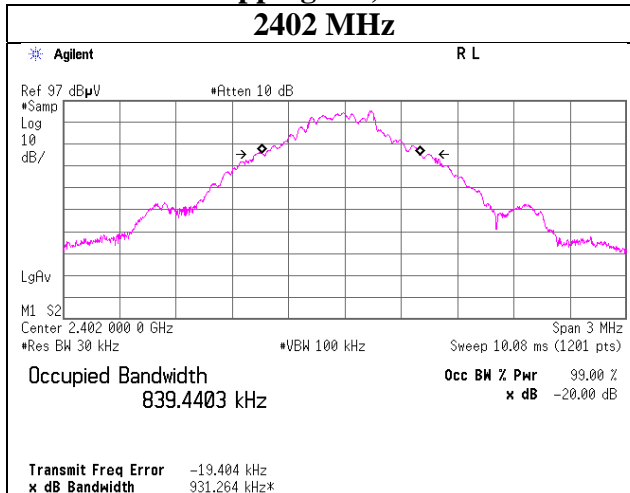
Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx Hopping Off

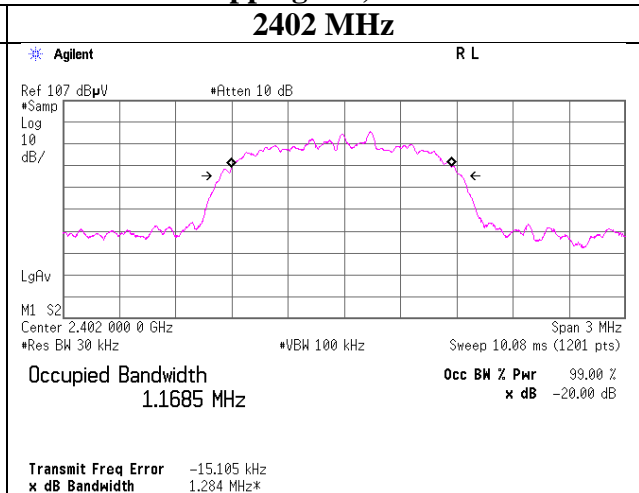
Hopping Off, DH5

2402 MHz

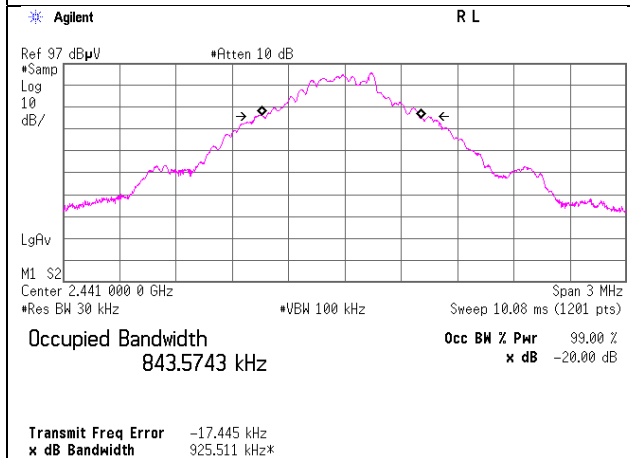


Hopping Off, 3DH5

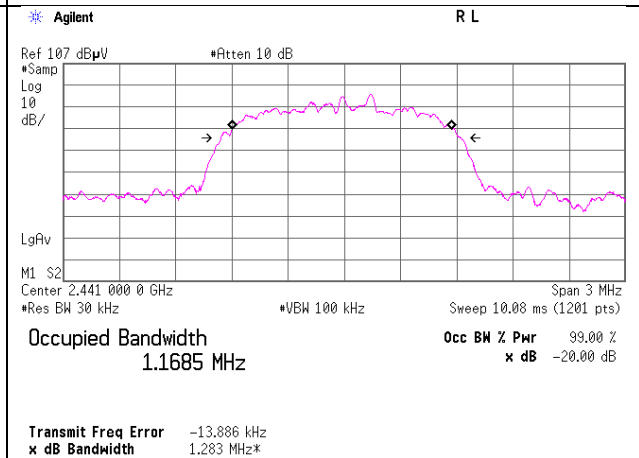
2402 MHz



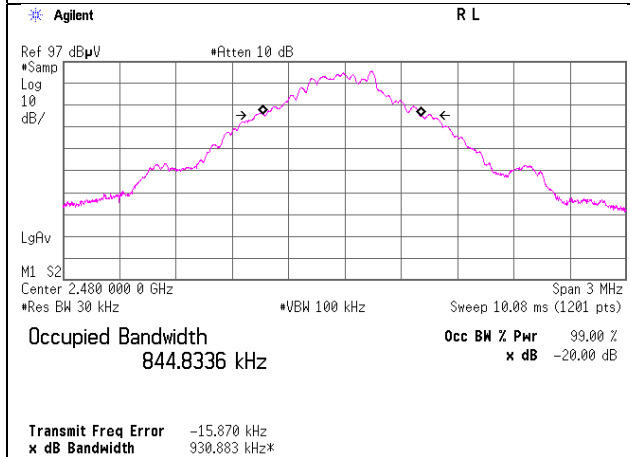
2441 MHz



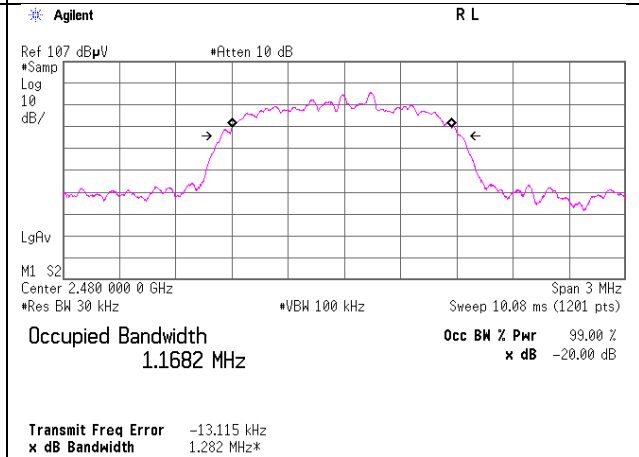
2441 MHz



2480 MHz



2480 MHz



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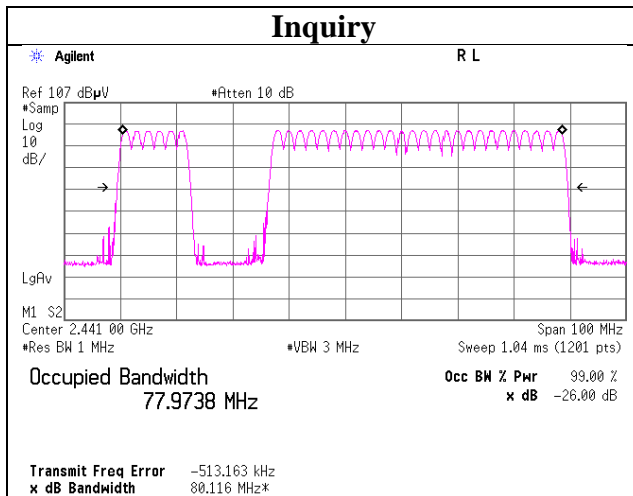
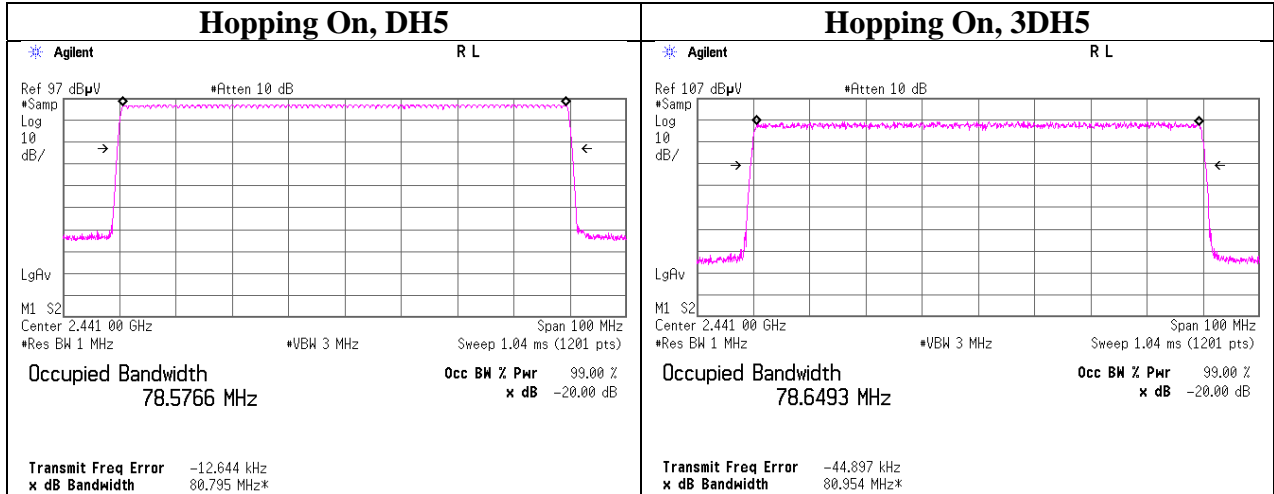
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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11445242S-R2
Date	September 29, 2016
Temperature / Humidity	25 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx Hopping On



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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)
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2016/02/10 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2016/05/24 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2016/05/11 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2016/08/09 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2015/10/22 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2016/03/23 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02 (SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2016/07/22 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV (RE,CE,RFI,MF)	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2016/03/22 * 12
SAT10-05	Attenuator (above1GHz)	Agilent	8493C-010	74864	RE	2015/11/04 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2016/03/24 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2015/09/07 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2016/04/18 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2016/02/19 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2016/02/25 * 12
KAT3-10	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2016/07/26 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2015/11/02 * 12
SCC-B1/B3/B5 /B7/B8/B13/SR SE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/S uhner/Suhner/Suhne r/Suhner/TOYO	8D2W/12DSFA/1 41PE/141PE/141P E/141PE/NS4906	-/0901-270 (RF Selector)	RE	2016/04/22 * 12
SCC-B2/B4/B6 /B7/B8/B13/SR SE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/S uhner/Suhner/Suhne r/Suhner/TOYO	8D2W/12DSFA/1 41PE/141PE/141P E/141PE/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
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2015/09/04 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2016/07/13 * 12
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	AT	2016/02/08 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/23 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2016/04/18 * 12
KTS-09	Digital Tester	SANWA	PC500	7019234	AT	2016/03/22 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2016/04/04 * 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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