



RADIO TEST REPORT

Test Report No. : 11032213S-A

Applicant : PIONEER CORPORATION
Type of Equipment : Car Audio
Model No. : AVH-5268ZH
FCC ID : AJDK094
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

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

Date of test: December 4 to 7, 2015

Representative test engineer:

Hikaru Shirasawa
Engineer
Consumer Technology Division

Approved by:

Toyokazu Imamura
Leader
Consumer Technology Division



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

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13-EM-F0429

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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
Model No.	:	AVH-5268ZH
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample	:	December 4, 2015
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-5268ZH (referred to as the EUT in this report) is a Car Audio.

General Specification

Clock frequency(ies) in the system	:	Bluetooth : 512 kHz, 32.768 kHz
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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	:	Pattern
Antenna Gain	:	-0.5 dBi (max)
Operating Temperature	:	-30 deg.C to +70 deg.C.

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 902-928MHz,
 2400-2483.5MHz, and 5725-5850MHz

*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.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4-2009 7. AC powerline conducted emission measurements 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
20 dB 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	7.1 dB 12400 MHz, AV, Horizontal, Tx, 2480 MHz, DH5 7.1 dB 12400 MHz, AV, Vertical, Tx, 2480 MHz, 3DH5	Complied	Conducted/ Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT has no AC mains.					

In case any questions arise about test procedure, ANSI C 63.10:2013 is also referred. (ANSI C63.10:2013 is Non-accreditation)

FCC 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 15.203

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

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3.3 Addition to standard

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

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

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.7 dB	3.5 dB	3.5 dB
	30 MHz-300 MHz	4.9 dB	4.9 dB	4.7 dB
	300 MHz-1 GHz	5.0 dB	5.0 dB	4.8 dB
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	4.5 dB	4.3 dB	4.3 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	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

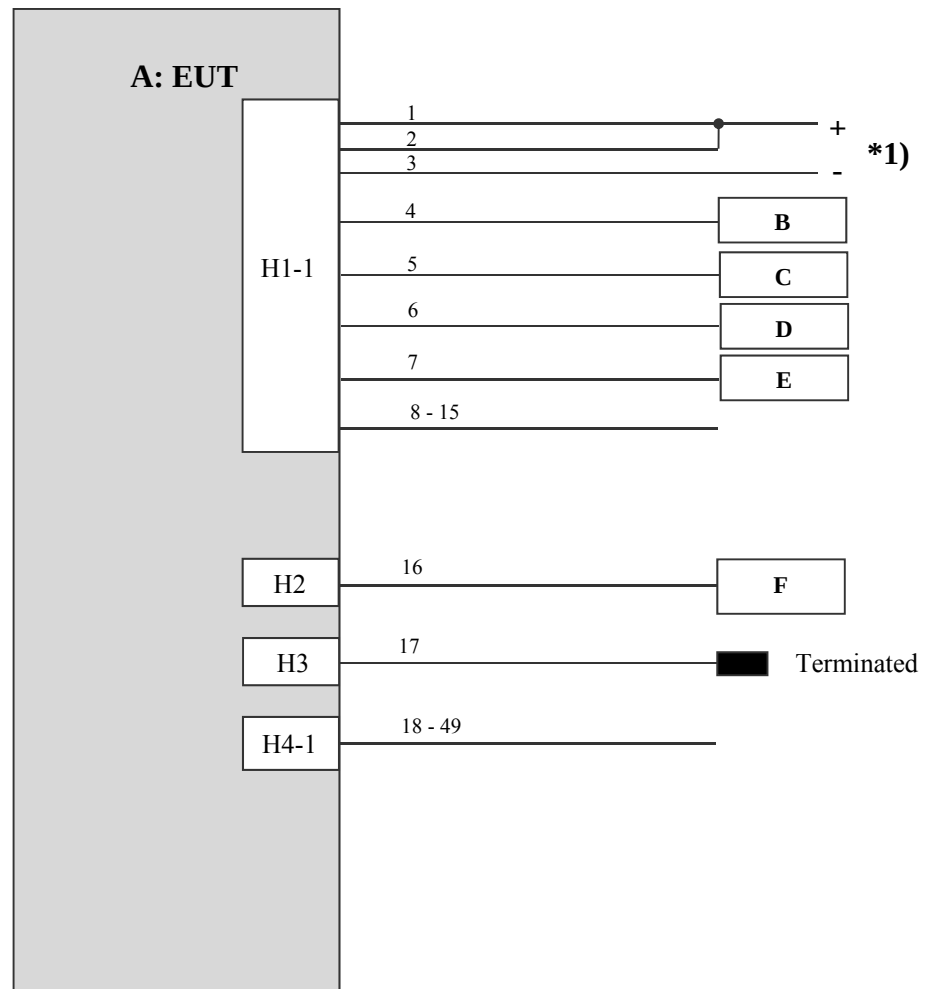
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20 dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99 % Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. Power setting: 0dBm Firmware version: SYS Ver07.14, SoC Ver99.29		

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

*1) DC power supply (Model No.: PAN35-10A) was used for DC 13.2 V input.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Car Audio	AVH-5268ZH	*2)	PIONEER	EUT
B	Speaker	LV-002	S11014200775	L&V	-
C	Speaker	LV-002	S11014200775	L&V	-
D	Speaker	LV-002	S11014200773	L&V	-
E	Speaker	LV-002	S11014200773	L&V	-
F	iPod nano	A1446	DCYM10XCF0GQ	Apple	-

*2) AAB999999CS: Radiated emission, AAB999998CS: Antenna port conducted test

List of cables used

No.	Cable name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC	0.5+2.1	No	No	ACC
2	DC	0.5+2.1	No	No	+B
3	DC	0.5+2.1	No	No	GND
4	Speaker	0.5+3.0	No	No	-
5	Speaker	0.5+3.0	No	No	-
6	Speaker	0.5+3.0	No	No	-
7	Speaker	0.5+3.0	No	No	-
8 - 15	Signal	0.5	No	No	-
16	USB	0.35+1.0	Yes	Yes	-
17	FM	0.3+3.0	Yes	Yes	Terminated(75 ohm)
18 -49	Signal	1.0	No	No	

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SECTION 5: Radiated Spurious Emission

Test Procedure

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.

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 a ground plane.

The height of the measuring antenna varied between 1 m 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 (below 13 GHz), 1 m*2) (above 13 GHz),		3 m (below 13 GHz), 1 m*2) (above 13 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: $20 \times \log(3.0 \text{ m} / 1.0 \text{ m}) = 9.5 \text{ dB}$

The carrier level and noise levels were confirmed at angle of 10 to 45 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (Below 1 GHz: 35 deg., Above 1 GHz: 10 deg.) that has the maximum noise.

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

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

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SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20 dB 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: 20 MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	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 %. 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 = 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

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APPENDIX 1: Test data

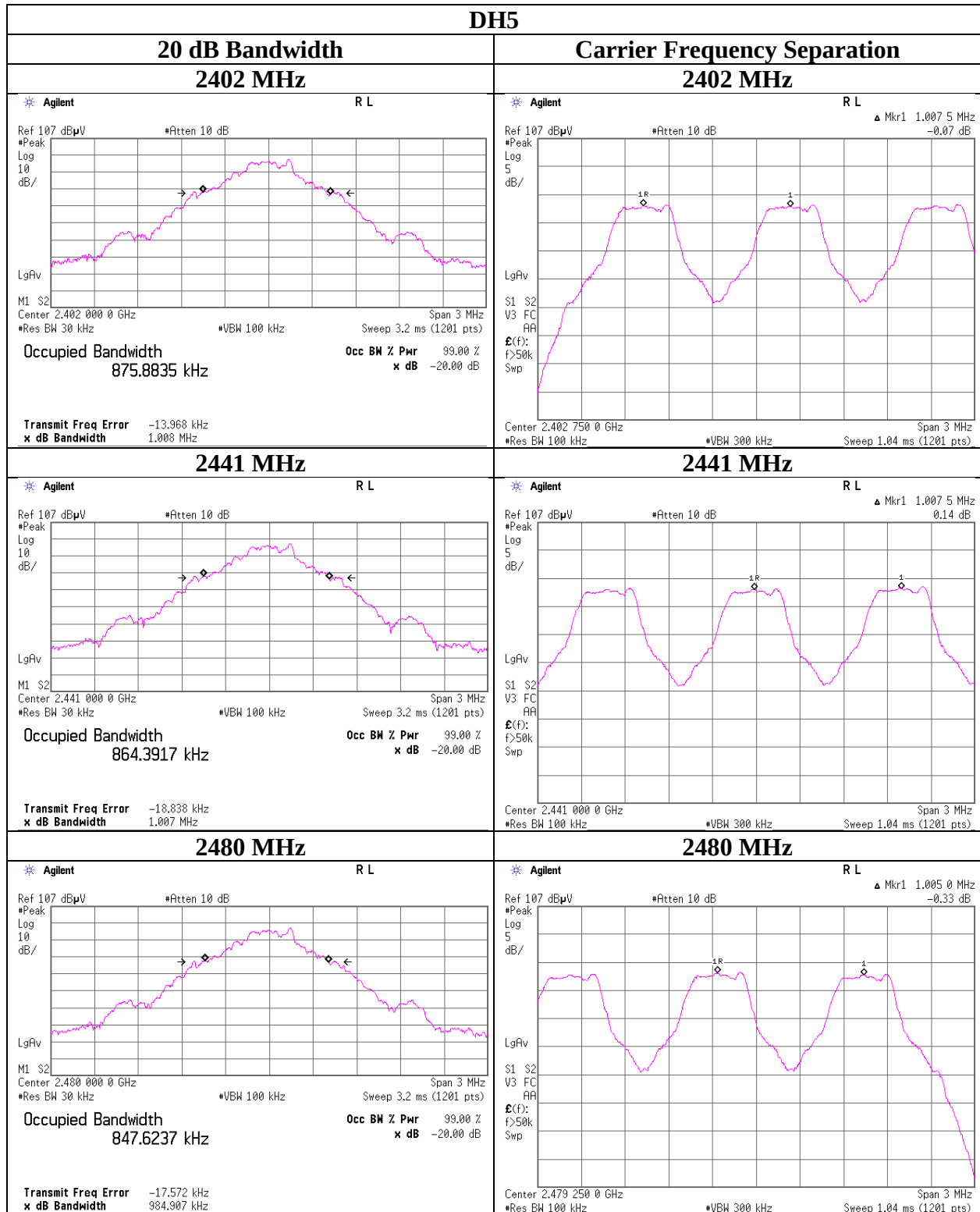
20 dB Bandwidth and Carrier Frequency Separation

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11032213S-A
Date December 4, 2015
Temperature / Humidity 27 deg. C / 31 % RH
Engineer Hikaru Shirasawa
Mode Tx, Hopping Off

Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.008	1.008	≥ 0.672
DH5	2441.0	1.007	1.008	≥ 0.671
DH5	2480.0	0.985	1.005	≥ 0.657
3DH5	2402.0	1.293	1.005	≥ 0.862
3DH5	2441.0	1.286	1.003	≥ 0.857
3DH5	2480.0	1.292	1.005	≥ 0.861

Limit: Two-thirds of 20 dB Bandwidth or 25 kHz (whichever is greater).
No limit applies to 20 dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



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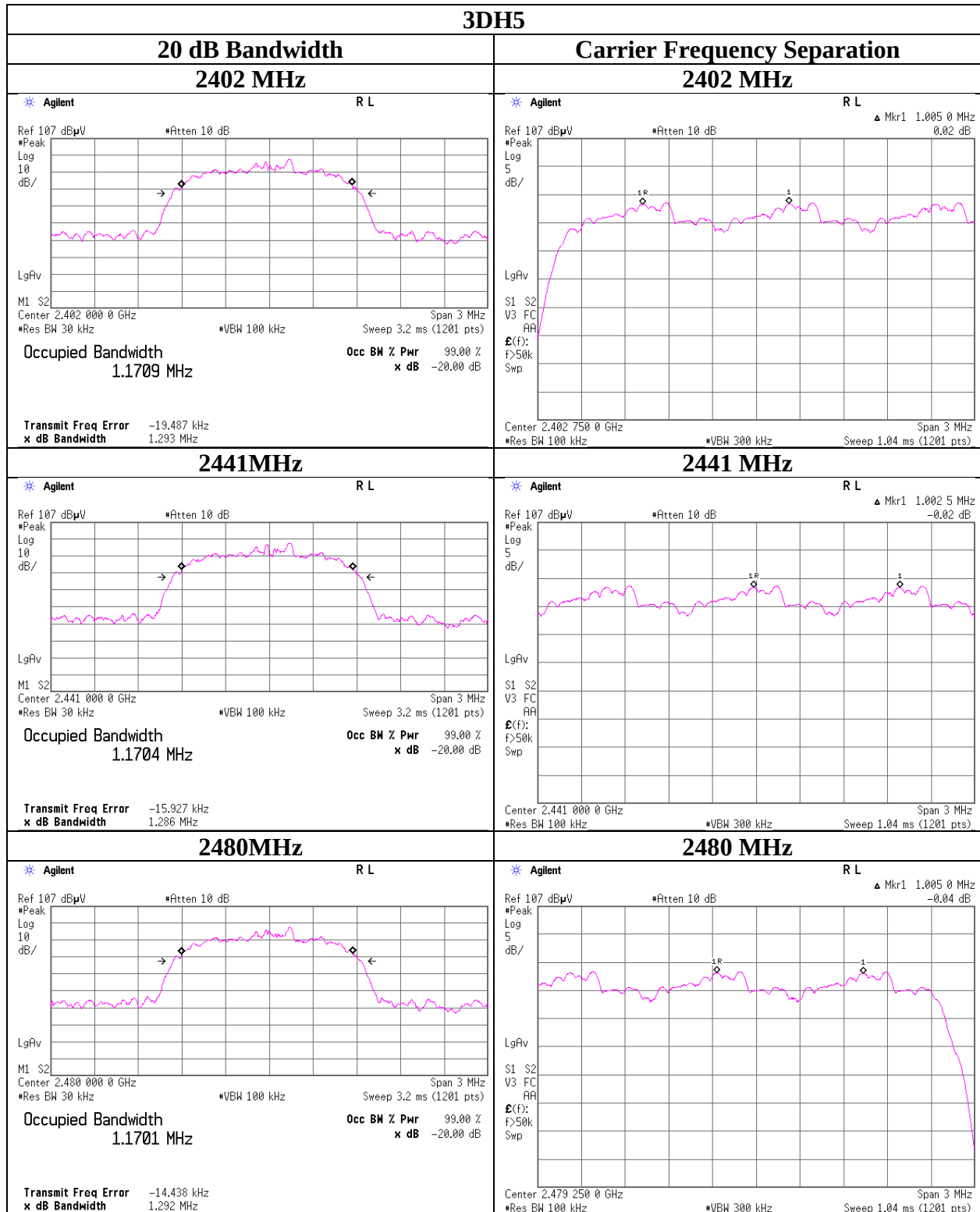
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20dB Bandwidth and Carrier Frequency Separation



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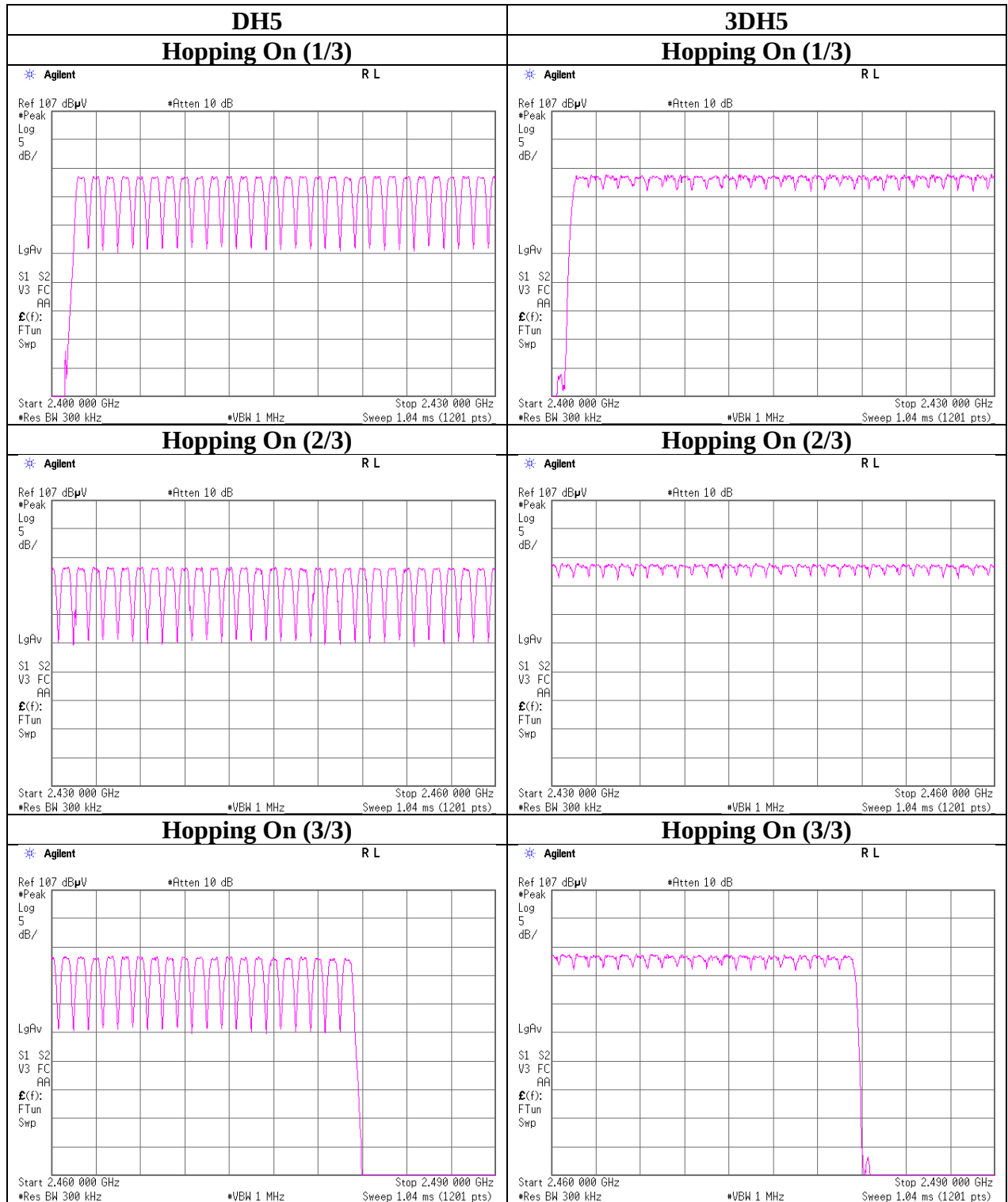
Number of Hopping Frequency

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 11032213S-A
Date December 4, 2015
Temperature / Humidity 27 deg. C / 31 % RH
Engineer Hikaru Shirasawa
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



Dwell time

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11032213S-A
Date	December 4, 2015
Temperature / Humidity	27 deg. C / 31 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	49.6 times / 5 s x 31.6 s = 314 times	0.448	141	400
DH3	29.2 times / 5 s x 31.6 s = 185 times	1.703	315	400
DH5	20.6 times / 5 s x 31.6 s = 131 times	2.953	387	400
3DH1	50.4 times / 5 s x 31.6 s = 319 times	0.453	145	400
3DH3	27.8 times / 5 s x 31.6 s = 176 times	1.705	300	400
3DH5	20.4 times / 5 s x 31.6 s = 129 times	2.956	381	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

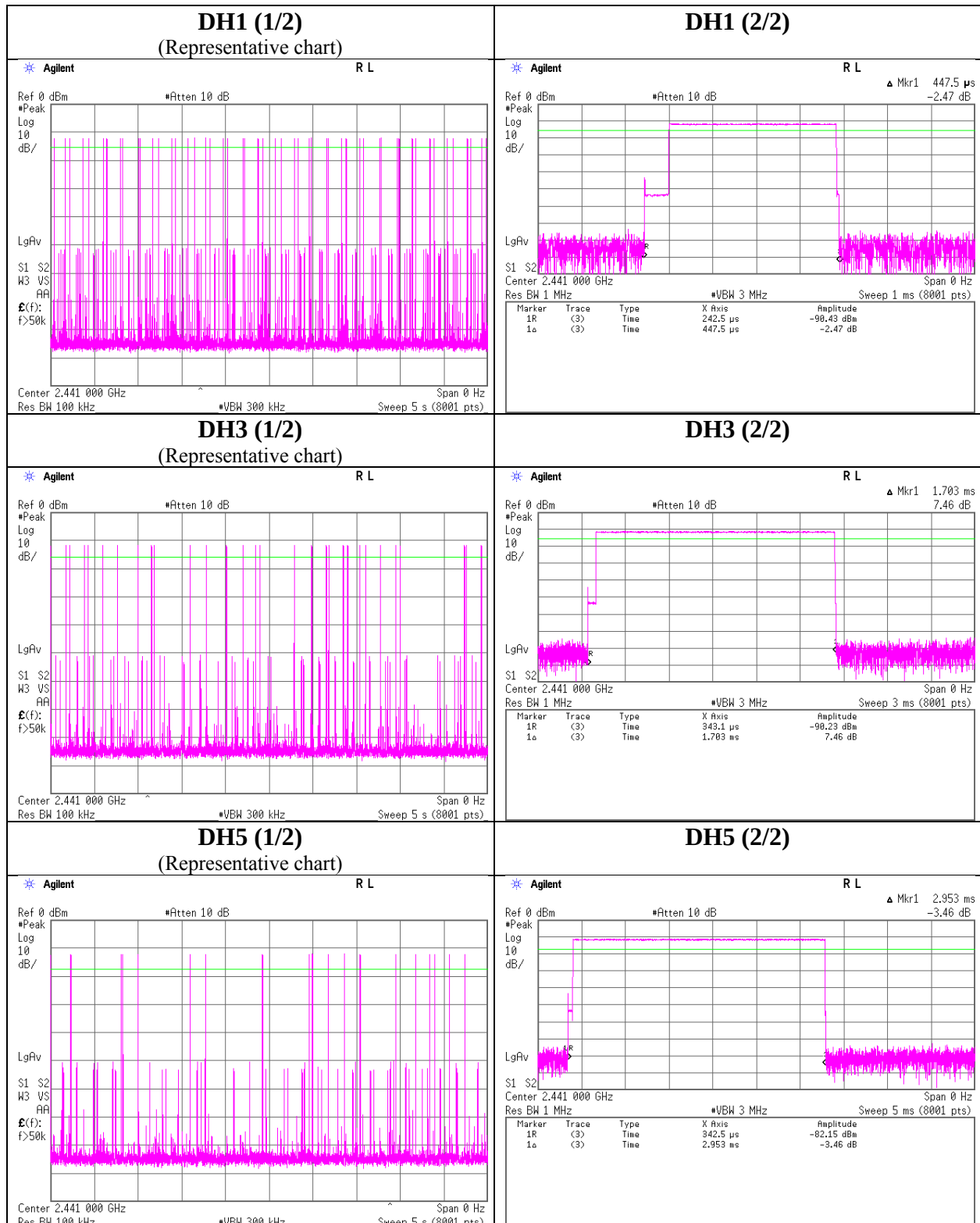
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	50	48	48	49.6
DH3	30	29	28	30	29	29.2
DH5	19	20	23	17	24	20.6
3DH1	49	49	52	50	52	50.4
3DH3	29	27	28	26	29	27.8
3DH5	25	17	26	19	15	20.4

Sample Calculation

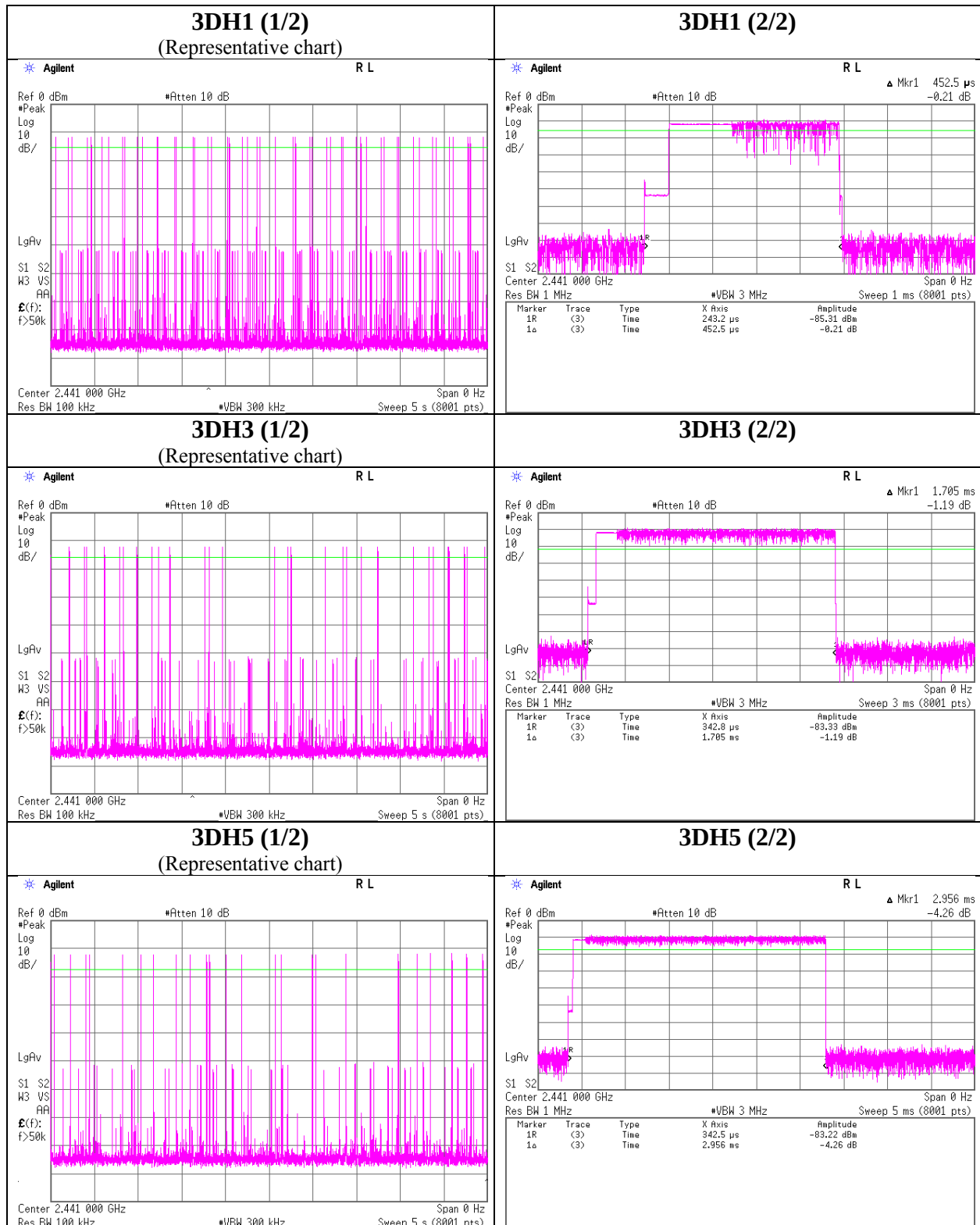
Average = Summation (Sampling 1 to 5) / 5

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 $N \times 0.4$ s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4 s 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.	11032213S-A
Date	December 4, 2015
Temperature / Humidity	27 deg. C / 31 % RH
Engineer	Hikaru Shirasawa
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	-11.52	1.33	9.93	-0.26	0.94	20.96	125	21.22
DH5	2441.0	-11.47	1.34	9.93	-0.20	0.95	20.96	125	21.16
DH5	2480.0	-11.81	1.35	9.93	-0.53	0.89	20.96	125	21.49
2DH5	2402.0	-9.79	1.33	9.93	1.47	1.40	20.96	125	19.49
2DH5	2441.0	-9.77	1.34	9.93	1.50	1.41	20.96	125	19.46
2DH5	2480.0	-10.04	1.35	9.93	1.24	1.33	20.96	125	19.72
3DH5	2402.0	-9.47	1.33	9.93	1.79	1.51	20.96	125	19.17
3DH5	2441.0	-9.44	1.34	9.93	1.83	1.52	20.96	125	19.13
3DH5	2480.0	-9.72	1.35	9.93	1.56	1.43	20.96	125	19.40

Sample Calculation:

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

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20 ch.) at AFH mode does not influence on the output power and bandwidth of the EUT.

As this device had AFH mode and frequency separation could not meet the requirement of over 20 dB BW without 2/3 relaxation, 125 mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure)

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11032213S-A
Date : December 4, 2015
Temperature / Humidity : 27 deg. C / 31 % RH
Engineer : Hikaru Shirasawa
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	-12.87	1.33	9.93	-1.61	0.69	1.04	-0.57	0.88
DH5	2441.0	-12.83	1.34	9.93	-1.56	0.70	1.04	-0.52	0.89
DH5	2480.0	-13.14	1.35	9.93	-1.86	0.65	1.04	-0.82	0.83
2DH5	2402.0	-12.58	1.33	9.93	-1.32	0.74	1.03	-0.29	0.94
2DH5	2441.0	-12.56	1.34	9.93	-1.29	0.74	1.03	-0.26	0.94
2DH5	2480.0	-12.85	1.35	9.93	-1.57	0.70	1.03	-0.54	0.88
3DH5	2402.0	-12.58	1.33	9.93	-1.32	0.74	1.03	-0.29	0.94
3DH5	2441.0	-12.54	1.34	9.93	-1.27	0.75	1.03	-0.24	0.95
3DH5	2480.0	-12.85	1.35	9.93	-1.57	0.70	1.03	-0.54	0.88

Sample Calculation:

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

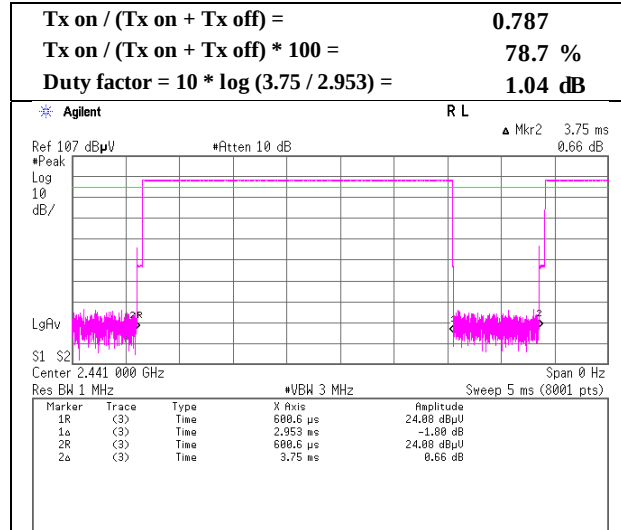
Result (Burst power) = Frame power + Duty factor

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

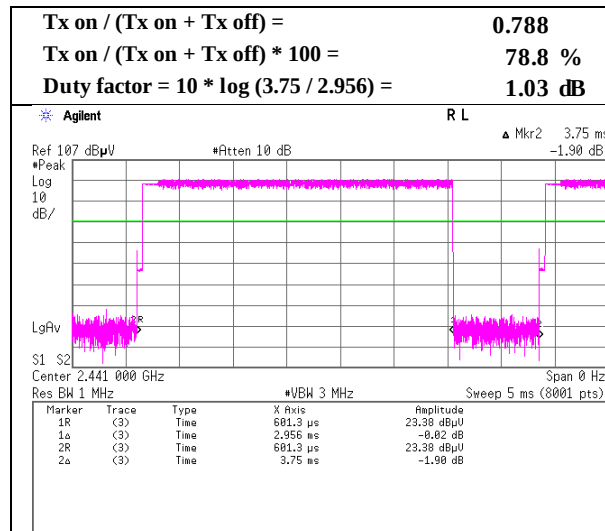
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11032213S-A
Date	December 4, 2015
Temperature / Humidity	27 deg. C / 31 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping Off

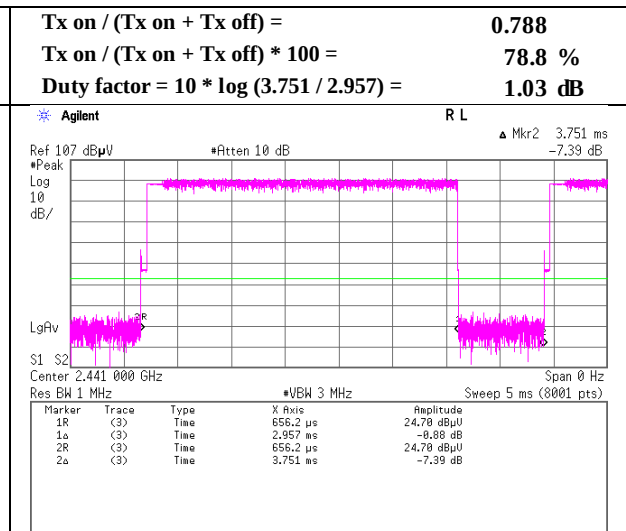
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11032213S-A
Date : December 7, 2015
Temperature / Humidity : 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer : Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 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.	240.027	QP	38.9	16.9	8.3	32.0	0.0	32.1	46.0	13.9	141	143	
Hori.	330.000	QP	41.1	14.5	8.8	31.9	0.0	32.5	46.0	13.5	150	235	
Hori.	499.998	QP	34.5	17.4	9.5	32.0	0.0	29.4	46.0	16.6	100	173	
Hori.	836.195	QP	31.0	21.5	10.8	31.3	0.0	32.0	46.0	14.0	100	6	
Hori.	2390.000	PK	45.9	27.8	13.7	41.0	3.3	49.7	73.9	24.2	314	344	
Hori.	4804.000	PK	45.4	31.4	5.8	39.6	3.3	46.3	73.9	27.6	270	159	
Hori.	7206.000	PK	44.0	36.9	7.2	40.1	3.3	51.3	73.9	22.6	150	0	
Hori.	9608.000	PK	43.5	38.5	8.2	39.6	3.3	53.9	73.9	20.0	150	0	
Hori.	12010.000	PK	44.9	39.7	9.4	39.3	3.3	58.0	73.9	15.9	150	0	
Hori.	2390.000	AV	34.1	27.8	13.7	41.0	3.3	37.9	53.9	16.0	314	344	
Hori.	4804.000	AV	35.7	31.4	5.8	39.6	3.3	36.6	53.9	17.3	270	159	
Hori.	7206.000	AV	33.4	36.9	7.2	40.1	3.3	40.7	53.9	13.2	150	0	
Hori.	9608.000	AV	32.9	38.5	8.2	39.6	3.3	43.3	53.9	10.6	150	0	
Hori.	12010.000	AV	33.3	39.7	9.4	39.3	3.3	46.4	53.9	7.5	150	0	
Vert.	240.027	QP	30.1	16.9	8.3	32.0	0.0	23.3	46.0	22.7	174	231	
Vert.	499.998	QP	32.6	17.4	9.5	32.0	0.0	27.5	46.0	18.5	100	158	
Vert.	577.525	QP	30.3	18.6	9.8	31.9	0.0	26.8	46.0	19.2	100	156	
Vert.	825.002	QP	32.0	21.3	10.7	31.4	0.0	32.6	46.0	13.4	100	208	
Vert.	2390.000	PK	45.9	27.8	13.7	41.0	3.3	49.7	73.9	24.2	122	342	
Vert.	4804.000	PK	45.6	31.4	5.8	39.6	3.3	46.5	73.9	27.4	112	236	
Vert.	7206.000	PK	43.9	36.9	7.2	40.1	3.3	51.2	73.9	22.7	150	0	
Vert.	9608.000	PK	43.3	38.5	8.2	39.6	3.3	53.7	73.9	20.2	150	0	
Vert.	12010.000	PK	45.0	39.7	9.4	39.3	3.3	58.1	73.9	15.8	150	0	
Vert.	2390.000	AV	34.2	27.8	13.7	41.0	3.3	38.0	53.9	15.9	122	342	
Vert.	4804.000	AV	35.9	31.4	5.8	39.6	3.3	36.8	53.9	17.1	112	236	
Vert.	7206.000	AV	33.3	36.9	7.2	40.1	3.3	40.6	53.9	13.3	150	0	
Vert.	9608.000	AV	32.8	38.5	8.2	39.6	3.3	43.2	53.9	10.7	150	0	
Vert.	12010.000	AV	33.4	39.7	9.4	39.3	3.3	46.5	53.9	7.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.36 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

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

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	88.1	27.8	13.7	41.0	3.3	91.9	-	-	Carrier
Hori.	2400.000	PK	38.6	27.8	13.7	41.0	3.3	42.4	71.9	29.5	
Vert.	2402.000	PK	88.0	27.8	13.7	41.0	3.3	91.8	-	-	Carrier
Vert.	2400.000	PK	37.8	27.8	13.7	41.0	3.3	41.6	71.8	30.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.36 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

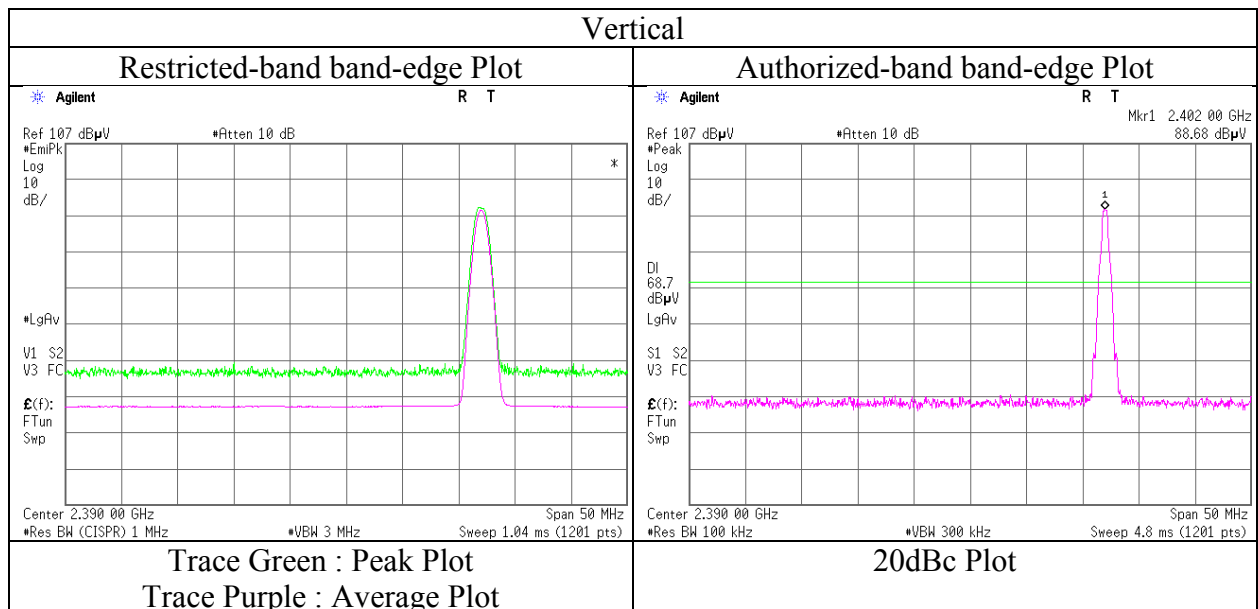
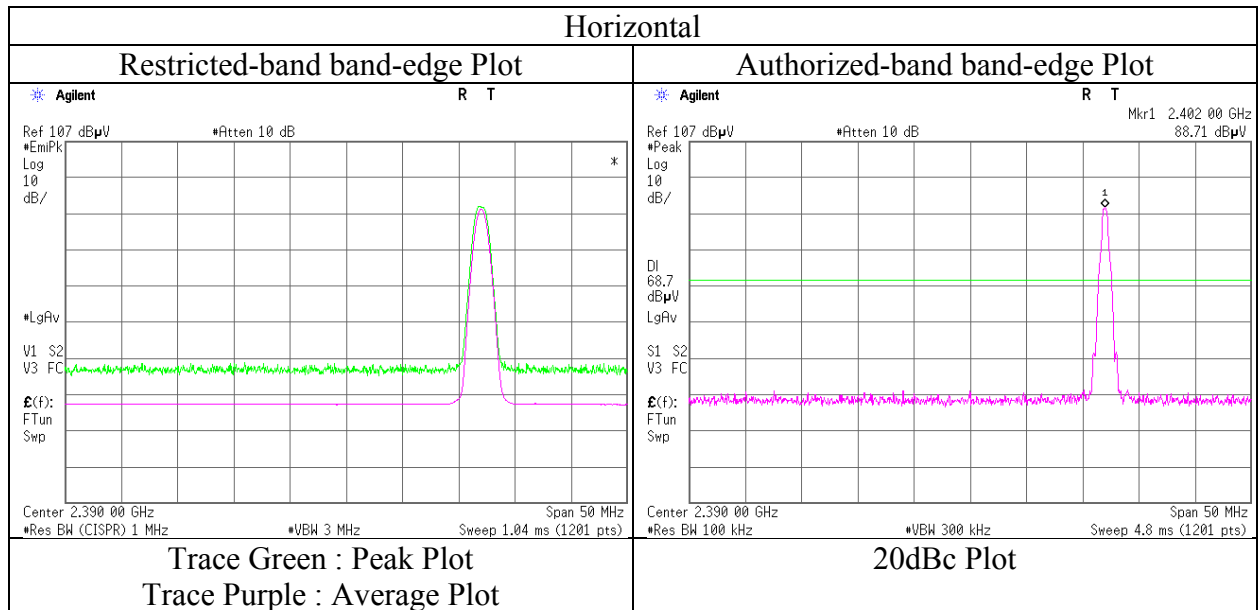
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11032213S-A		
Date	December 7, 2015		
Temperature / Humidity	24 deg. C / 36 % RH	26 deg. C / 32 % RH	
Engineer	Hikaru Shirasawa	Kenichi Adachi	
	(30 - 1000 MHz)	(1 - 26.5 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.3 Semi Anechoic Chamber
Report No. : 11032213S-A
Date : December 7, 2015
Temperature / Humidity : 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer : Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 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.	240.044	QP	40.7	16.9	8.3	32.0	0.0	33.9	46.0	12.1	149	321	
Hori.	329.997	QP	41.9	14.5	8.8	31.9	0.0	33.3	46.0	12.7	100	239	
Hori.	500.209	QP	33.4	17.4	9.5	32.0	0.0	28.3	46.0	17.7	100	160	
Hori.	825.729	QP	31.1	21.3	10.7	31.4	0.0	31.7	46.0	14.3	100	100	
Hori.	837.526	QP	30.1	21.5	10.8	31.3	0.0	31.1	46.0	14.9	100	209	
Hori.	4882.000	PK	46.7	31.7	5.9	39.5	3.3	48.1	73.9	25.8	267	162	
Hori.	7323.000	PK	45.6	36.9	7.3	40.2	3.3	52.9	73.9	21.0	150	0	
Hori.	9764.000	PK	44.5	38.5	8.3	39.5	3.3	55.1	73.9	18.8	150	0	
Hori.	12205.000	PK	45.1	39.6	9.5	39.4	3.3	58.1	73.9	15.8	150	0	
Hori.	4882.000	AV	36.1	31.7	5.9	39.5	3.3	37.5	53.9	16.4	267	162	
Hori.	7323.000	AV	33.7	36.9	7.3	40.2	3.3	41.0	53.9	12.9	150	0	
Hori.	9764.000	AV	33.0	38.5	8.3	39.5	3.3	43.6	53.9	10.3	150	0	
Hori.	12205.000	AV	33.3	39.6	9.5	39.4	3.3	46.3	53.9	7.6	150	0	
Vert.	240.332	QP	29.7	16.9	8.3	32.0	0.0	22.9	46.0	23.1	215	239	
Vert.	577.199	QP	29.5	18.6	9.8	31.9	0.0	26.0	46.0	20.0	100	163	
Vert.	825.711	QP	31.7	21.3	10.7	31.4	0.0	32.3	46.0	13.7	165	211	
Vert.	900.629	QP	32.6	22.3	11.0	30.9	0.0	35.0	46.0	11.0	136	172	
Vert.	4882.000	PK	46.0	31.7	5.9	39.5	3.3	47.4	73.9	26.5	127	238	
Vert.	7323.000	PK	45.5	36.9	7.3	40.2	3.3	52.8	73.9	21.1	150	0	
Vert.	9764.000	PK	44.6	38.5	8.3	39.5	3.3	55.2	73.9	18.7	150	0	
Vert.	12205.000	PK	45.2	39.6	9.5	39.4	3.3	58.2	73.9	15.7	150	0	
Vert.	4882.000	AV	36.3	31.7	5.9	39.5	3.3	37.7	53.9	16.2	127	238	
Vert.	7323.000	AV	33.6	36.9	7.3	40.2	3.3	40.9	53.9	13.0	150	0	
Vert.	9764.000	AV	33.1	38.5	8.3	39.5	3.3	43.7	53.9	10.2	150	0	
Vert.	12205.000	AV	33.4	39.6	9.5	39.4	3.3	46.4	53.9	7.5	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.36\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11032213S-A
Date : December 7, 2015
Temperature / Humidity : 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer : Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 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.	240.061	QP	38.8	16.9	8.3	32.0	0.0	32.0	46.0	14.0	194	144	
Hori.	329.991	QP	43.6	14.5	8.8	31.9	0.0	35.0	46.0	11.0	115	66	
Hori.	494.999	QP	30.5	17.3	9.5	32.0	0.0	25.3	46.0	20.7	100	327	
Hori.	499.995	QP	34.0	17.4	9.5	32.0	0.0	28.9	46.0	17.1	100	160	
Hori.	824.993	QP	32.5	21.3	10.7	31.4	0.0	33.1	46.0	12.9	114	109	
Hori.	900.016	QP	29.0	22.3	11.0	30.9	0.0	31.4	46.0	14.6	100	148	
Hori.	2483.500	PK	45.6	27.9	13.8	41.0	3.3	49.6	73.9	24.3	301	335	
Hori.	4960.000	PK	45.3	32.0	6.0	39.4	3.3	47.2	73.9	26.7	264	157	
Hori.	7440.000	PK	45.4	37.0	7.5	40.4	3.3	52.8	73.9	21.1	150	0	
Hori.	9920.000	PK	44.9	38.4	8.4	39.4	3.3	55.6	73.9	18.3	150	0	
Hori.	12400.000	PK	45.4	39.5	9.6	39.6	3.3	58.2	73.9	15.7	150	0	
Hori.	2483.500	AV	34.4	27.9	13.8	41.0	3.3	38.4	53.9	15.5	301	335	
Hori.	4960.000	AV	35.3	32.0	6.0	39.4	3.3	37.2	53.9	16.7	264	157	
Hori.	7440.000	AV	34.2	37.0	7.5	40.4	3.3	41.6	53.9	12.3	150	0	
Hori.	9920.000	AV	33.8	38.4	8.4	39.4	3.3	44.5	53.9	9.4	150	0	
Hori.	12400.000	AV	34.0	39.5	9.6	39.6	3.3	46.8	53.9	7.1	150	0	
Vert.	240.061	QP	25.2	16.9	8.3	32.0	0.0	18.4	46.0	27.6	100	226	
Vert.	500.004	QP	32.9	17.4	9.5	32.0	0.0	27.8	46.0	18.2	100	168	
Vert.	2483.500	PK	45.5	27.9	13.8	41.0	3.3	49.5	73.9	24.4	116	332	
Vert.	4960.000	PK	45.7	32.0	6.0	39.4	3.3	47.6	73.9	26.3	118	239	
Vert.	7440.000	PK	45.3	37.0	7.5	40.4	3.3	52.7	73.9	21.2	150	0	
Vert.	9920.000	PK	45.0	38.4	8.4	39.4	3.3	55.7	73.9	18.2	150	0	
Vert.	12400.000	PK	45.3	39.5	9.6	39.6	3.3	58.1	73.9	15.8	150	0	
Vert.	2483.500	AV	34.2	27.9	13.8	41.0	3.3	38.2	53.9	15.7	116	332	
Vert.	4960.000	AV	35.5	32.0	6.0	39.4	3.3	37.4	53.9	16.5	118	239	
Vert.	7440.000	AV	34.1	37.0	7.5	40.4	3.3	41.5	53.9	12.4	150	0	
Vert.	9920.000	AV	33.9	38.4	8.4	39.4	3.3	44.6	53.9	9.3	150	0	
Vert.	12400.000	AV	33.9	39.5	9.6	39.6	3.3	46.7	53.9	7.2	150	0	

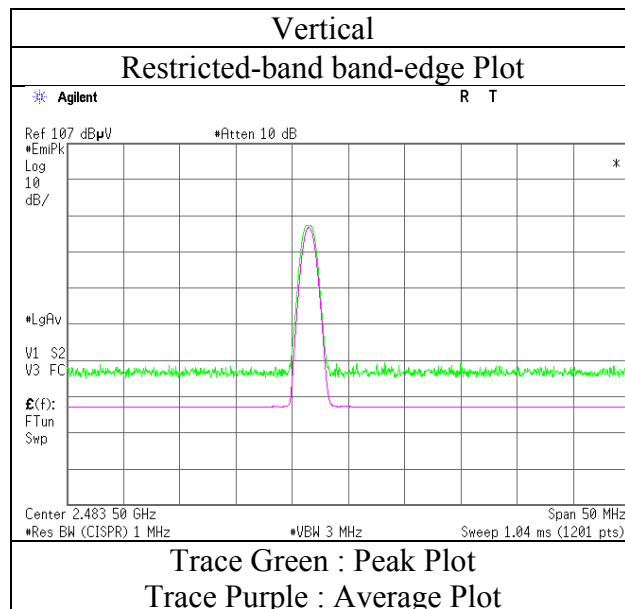
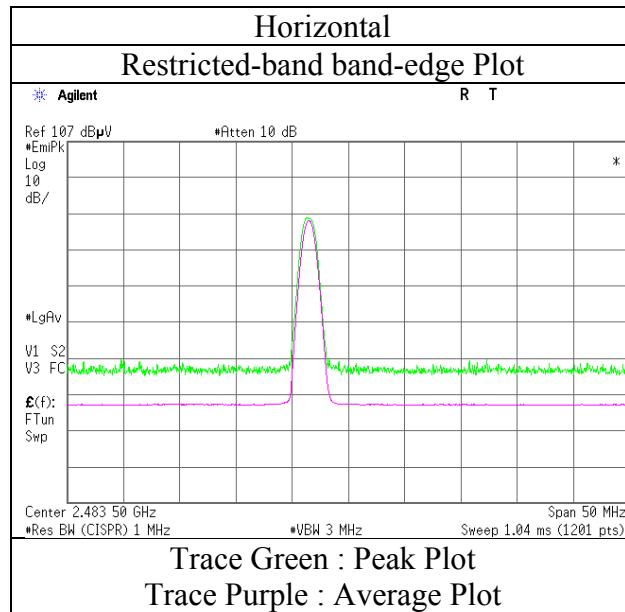
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.36\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. 11032213S-A
Date December 7, 2015
Temperature / Humidity 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 26.5 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.3 Semi Anechoic Chamber
Report No. : 11032213S-A
Date : December 7, 2015
Temperature / Humidity : 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer : Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 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.	240.045	QP	41.4	16.9	8.3	32.0	0.0	34.6	46.0	11.4	150	147	
Hori.	271.594	QP	27.5	18.0	8.5	32.0	0.0	22.0	46.0	24.0	200	47	
Hori.	330.099	QP	43.1	14.5	8.8	31.9	0.0	34.5	46.0	11.5	100	66	
Hori.	494.995	QP	27.0	17.3	9.5	32.0	0.0	21.8	46.0	24.2	150	185	
Hori.	499.994	QP	32.0	17.4	9.5	32.0	0.0	26.9	46.0	19.1	100	272	
Hori.	824.989	QP	32.5	21.3	10.7	31.4	0.0	33.1	46.0	12.9	100	97	
Hori.	900.583	QP	31.0	22.3	11.0	30.9	0.0	33.4	46.0	12.6	100	162	
Hori.	2390.000	PK	44.9	27.8	13.7	41.0	3.3	48.7	73.9	25.2	312	341	
Hori.	4804.000	PK	45.1	31.4	5.8	39.6	3.3	46.0	73.9	27.9	271	158	
Hori.	7206.000	PK	44.1	36.9	7.2	40.1	3.3	51.4	73.9	22.5	150	0	
Hori.	9608.000	PK	43.4	38.5	8.2	39.6	3.3	53.8	73.9	20.1	150	0	
Hori.	12010.000	PK	45.0	39.7	9.4	39.3	3.3	58.1	73.9	15.8	150	0	
Hori.	2390.000	AV	34.2	27.8	13.7	41.0	3.3	38.0	53.9	15.9	312	341	
Hori.	4804.000	AV	34.8	31.4	5.8	39.6	3.3	35.7	53.9	18.2	271	158	
Hori.	7206.000	AV	33.4	36.9	7.2	40.1	3.3	40.7	53.9	13.2	150	0	
Hori.	9608.000	AV	32.8	38.5	8.2	39.6	3.3	43.2	53.9	10.7	150	0	
Hori.	12010.000	AV	33.4	39.7	9.4	39.3	3.3	46.5	53.9	7.4	150	0	
Vert.	240.025	QP	28.2	16.9	8.3	32.0	0.0	21.4	46.0	24.6	100	34	
Vert.	824.996	QP	30.0	21.3	10.7	31.4	0.0	30.6	46.0	15.4	100	192	
Vert.	2390.000	PK	44.8	27.8	13.7	41.0	3.3	48.6	73.9	25.3	119	342	
Vert.	4804.000	PK	45.6	31.4	5.8	39.6	3.3	46.5	73.9	27.4	119	238	
Vert.	7206.000	PK	43.9	36.9	7.2	40.1	3.3	51.2	73.9	22.7	150	0	
Vert.	9608.000	PK	43.5	38.5	8.2	39.6	3.3	53.9	73.9	20.0	150	0	
Vert.	12010.000	PK	44.9	39.7	9.4	39.3	3.3	58.0	73.9	15.9	150	0	
Vert.	2390.000	AV	34.2	27.8	13.7	41.0	3.3	38.0	53.9	15.9	119	342	
Vert.	4804.000	AV	35.6	31.4	5.8	39.6	3.3	36.5	53.9	17.4	119	238	
Vert.	7206.000	AV	33.3	36.9	7.2	40.1	3.3	40.6	53.9	13.3	150	0	
Vert.	9608.000	AV	32.9	38.5	8.2	39.6	3.3	43.3	53.9	10.6	150	0	
Vert.	12010.000	AV	33.3	39.7	9.4	39.3	3.3	46.4	53.9	7.5	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.36 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

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

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	87.3	27.8	13.7	41.0	3.3	91.1	-	-	Carrier
Hori.	2400.000	PK	38.2	27.8	13.7	41.0	3.3	42.0	71.1	29.1	
Vert.	2402.000	PK	87.0	27.8	13.7	41.0	3.3	90.8	-	-	Carrier
Vert.	2400.000	PK	37.9	27.8	13.7	41.0	3.3	41.7	70.8	29.1	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.36 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

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

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Shonan EMC Lab.

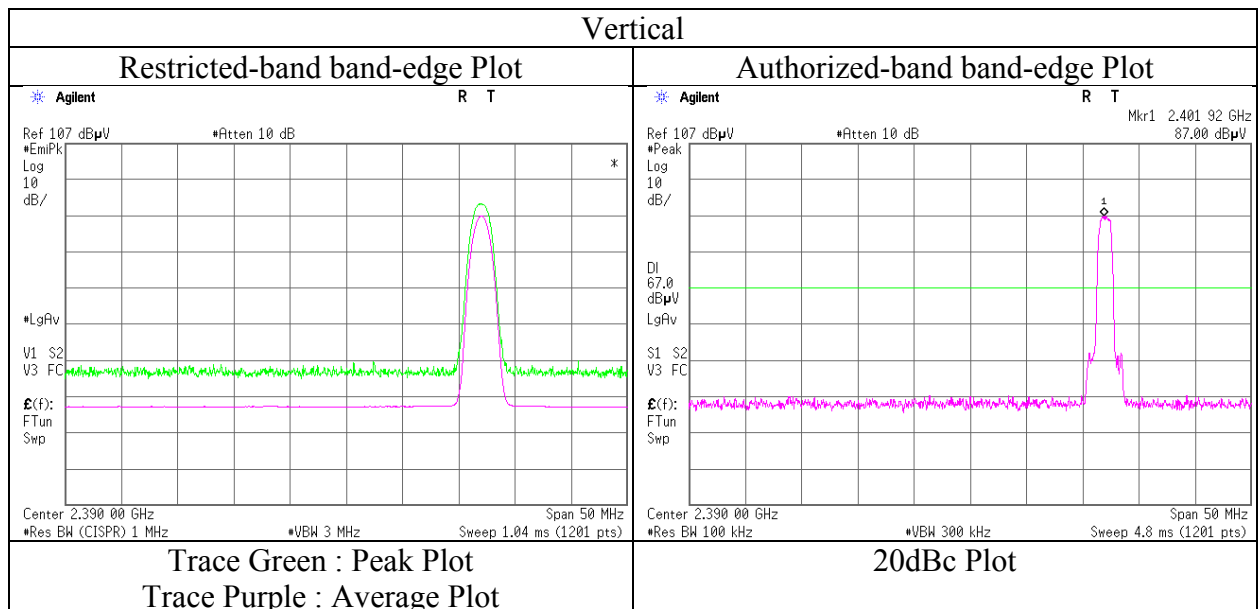
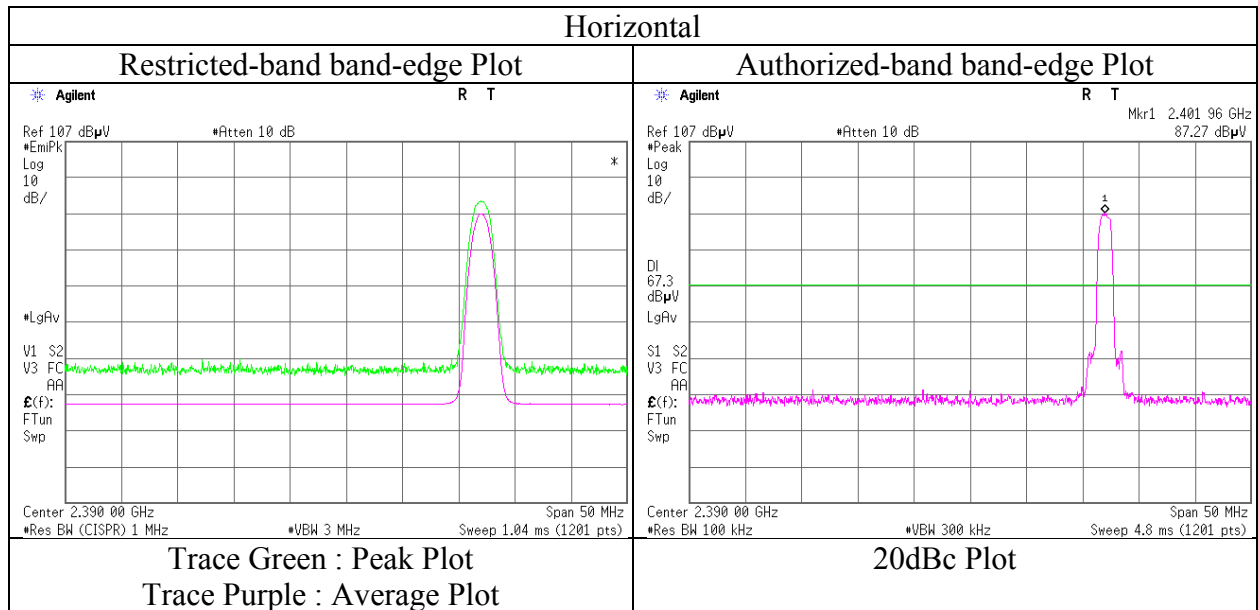
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11032213S-A		
Date	December 7, 2015		
Temperature / Humidity	24 deg. C / 36 % RH	26 deg. C / 32 % RH	
Engineer	Hikaru Shirasawa	Kenichi Adachi	
	(30 - 1000 MHz)	(1 - 26.5 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.3 Semi Anechoic Chamber
Report No. : 11032213S-A
Date : December 7, 2015
Temperature / Humidity : 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer : Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 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.	240.008	QP	41.6	16.9	8.3	32.0	0.0	34.8	46.0	11.2	150	139	
Hori.	329.998	QP	42.8	14.5	8.8	31.9	0.0	34.2	46.0	11.8	100	42	
Hori.	494.988	QP	29.2	17.3	9.5	31.9	0.0	24.1	46.0	21.9	100	45	
Hori.	499.999	QP	31.8	17.4	9.5	32.0	0.0	26.7	46.0	19.3	100	229	
Hori.	824.994	QP	32.5	21.3	10.7	31.4	0.0	33.1	46.0	12.9	100	80	
Hori.	836.646	QP	29.0	21.5	10.8	31.3	0.0	30.0	46.0	16.0	100	222	
Hori.	899.987	QP	31.3	22.3	11.0	30.9	0.0	33.7	46.0	12.3	100	152	
Hori.	4882.000	PK	45.2	31.7	5.9	39.5	3.3	46.6	73.9	27.3	269	158	
Hori.	7323.000	PK	45.5	36.9	7.3	40.2	3.3	52.8	73.9	21.1	150	0	
Hori.	9764.000	PK	44.6	38.5	8.3	39.5	3.3	55.2	73.9	18.7	150	0	
Hori.	12205.000	PK	45.2	39.6	9.5	39.4	3.3	58.2	73.9	15.7	150	0	
Hori.	4882.000	AV	35.1	31.7	5.9	39.5	3.3	36.5	53.9	17.4	269	158	
Hori.	7323.000	AV	33.6	36.9	7.3	40.2	3.3	40.9	53.9	13.0	150	0	
Hori.	9764.000	AV	33.1	38.5	8.3	39.5	3.3	43.7	53.9	10.2	150	0	
Hori.	12205.000	AV	33.4	39.6	9.5	39.4	3.3	46.4	53.9	7.5	150	0	
Vert.	240.008	QP	28.1	16.9	8.3	32.0	0.0	21.3	46.0	24.7	100	32	
Vert.	824.995	QP	30.2	21.3	10.7	31.4	0.0	30.8	46.0	15.2	100	198	
Vert.	4882.000	PK	45.4	31.7	5.9	39.5	3.3	46.8	73.9	27.1	126	236	
Vert.	7323.000	PK	45.6	36.9	7.3	40.2	3.3	52.9	73.9	21.0	150	0	
Vert.	9764.000	PK	44.5	38.5	8.3	39.5	3.3	55.1	73.9	18.8	150	0	
Vert.	12205.000	PK	45.1	39.6	9.5	39.4	3.3	58.1	73.9	15.8	150	0	
Vert.	4882.000	AV	35.2	31.7	5.9	39.5	3.3	36.6	53.9	17.3	126	236	
Vert.	7323.000	AV	33.7	36.9	7.3	40.2	3.3	41.0	53.9	12.9	150	0	
Vert.	9764.000	AV	33.0	38.5	8.3	39.5	3.3	43.6	53.9	10.3	150	0	
Vert.	12205.000	AV	33.3	39.6	9.5	39.4	3.3	46.3	53.9	7.6	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.36 \text{ m} / 3.0 \text{ m}) = 3.3 \text{ dB}$

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11032213S-A
Date : December 7, 2015
Temperature / Humidity : 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer : Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 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.	240.042	QP	41.7	16.9	8.3	32.0	0.0	34.9	46.0	11.1	144	117	
Hori.	330.104	QP	43.0	14.5	8.8	31.9	0.0	34.4	46.0	11.6	100	61	
Hori.	380.509	QP	26.0	15.6	9.0	31.9	0.0	18.7	46.0	27.3	100	311	
Hori.	825.714	QP	30.0	21.3	10.7	31.4	0.0	30.6	46.0	15.4	150	66	
Hori.	836.242	QP	29.0	21.5	10.8	31.3	0.0	30.0	46.0	16.0	150	2	
Hori.	900.618	QP	29.2	22.3	11.0	30.9	0.0	31.6	46.0	14.4	150	33	
Hori.	2483.500	PK	45.7	27.9	13.8	41.0	3.3	49.7	73.9	24.2	300	333	
Hori.	4960.000	PK	44.8	32.0	6.0	39.4	3.3	46.7	73.9	27.2	267	160	
Hori.	7440.000	PK	45.3	37.0	7.5	40.4	3.3	52.7	73.9	21.2	150	0	
Hori.	9920.000	PK	45.0	38.4	8.4	39.4	3.3	55.7	73.9	18.2	150	0	
Hori.	12400.000	PK	45.3	39.5	9.6	39.6	3.3	58.1	73.9	15.8	150	0	
Hori.	2483.500	AV	34.6	27.9	13.8	41.0	3.3	38.6	53.9	15.3	300	333	
Hori.	4960.000	AV	34.6	32.0	6.0	39.4	3.3	36.5	53.9	17.4	267	160	
Hori.	7440.000	AV	34.1	37.0	7.5	40.4	3.3	41.5	53.9	12.4	150	0	
Hori.	9920.000	AV	33.9	38.4	8.4	39.4	3.3	44.6	53.9	9.3	150	0	
Hori.	12400.000	AV	33.9	39.5	9.6	39.6	3.3	46.7	53.9	7.2	150	0	
Vert.	166.531	QP	27.8	15.3	8.0	32.0	0.0	19.1	43.5	24.4	100	2	
Vert.	330.003	QP	32.1	14.5	8.8	31.9	0.0	23.5	46.0	22.5	100	159	
Vert.	500.222	QP	32.9	17.4	9.5	32.0	0.0	27.8	46.0	18.2	100	175	
Vert.	824.989	QP	31.0	21.3	10.7	31.4	0.0	31.6	46.0	14.4	100	200	
Vert.	2483.500	PK	45.6	27.9	13.8	41.0	3.3	49.6	73.9	24.3	111	334	
Vert.	4960.000	PK	44.9	32.0	6.0	39.4	3.3	46.8	73.9	27.1	119	240	
Vert.	7440.000	PK	45.4	37.0	7.5	40.4	3.3	52.8	73.9	21.1	150	0	
Vert.	9920.000	PK	44.9	38.4	8.4	39.4	3.3	55.6	73.9	18.3	150	0	
Vert.	12400.000	PK	45.4	39.5	9.6	39.6	3.3	58.2	73.9	15.7	150	0	
Vert.	2483.500	AV	34.3	27.9	13.8	41.0	3.3	38.3	53.9	15.6	111	334	
Vert.	4960.000	AV	34.9	32.0	6.0	39.4	3.3	36.8	53.9	17.1	119	240	
Vert.	7440.000	AV	34.2	37.0	7.5	40.4	3.3	41.6	53.9	12.3	150	0	
Vert.	9920.000	AV	33.8	38.4	8.4	39.4	3.3	44.5	53.9	9.4	150	0	
Vert.	12400.000	AV	34.0	39.5	9.6	39.6	3.3	46.8	53.9	7.1	150	0	

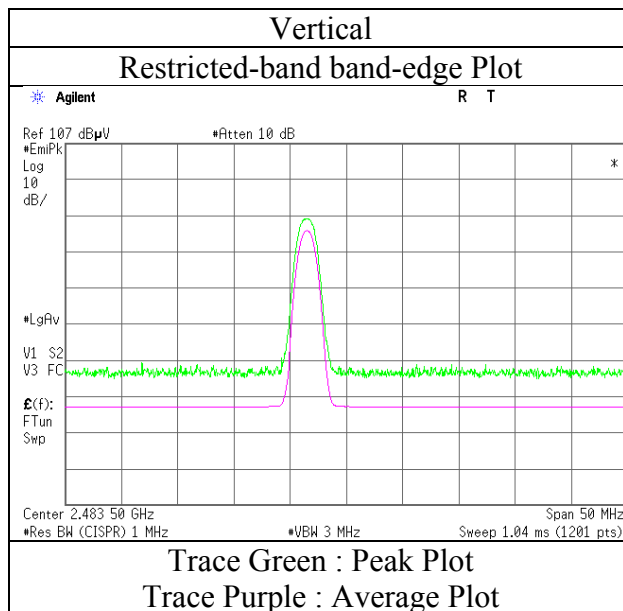
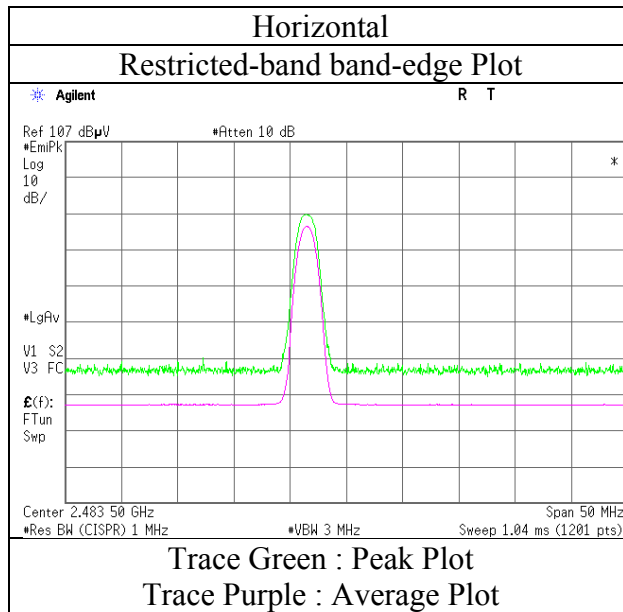
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.36\text{ m} / 3.0\text{ m}) = 3.3\text{ dB}$

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

Radiated Spurious Emission (Reference Plot for band-edge)

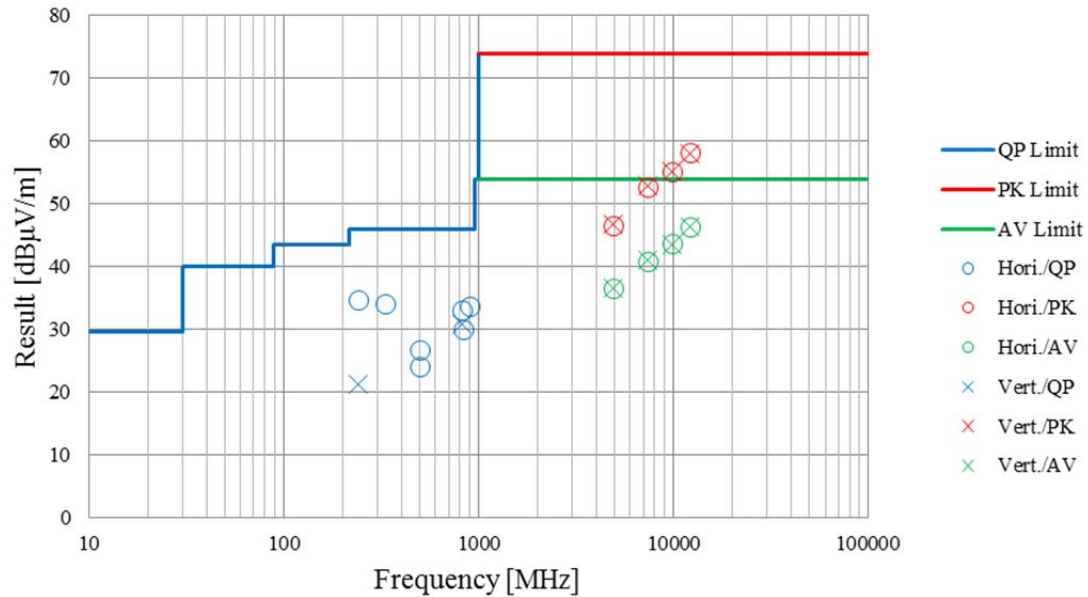
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11032213S-A		
Date	December 7, 2015		
Temperature / Humidity	24 deg. C / 36 % RH	26 deg. C / 32 % RH	
Engineer	Hikaru Shirasawa	Kenichi Adachi	
	(30 - 1000 MHz)	(1 - 26.5 GHz)	
Mode	Tx, Hopping Off, 3DH5 2480 MHz		



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

Radiated Spurious Emission (Plot data, Worst case)

Test place Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. 11032213S-A
Date December 7, 2015
Temperature / Humidity 24 deg. C / 36 % RH 26 deg. C / 32 % RH
Engineer Hikaru Shirasawa Kenichi Adachi
(30 - 1000 MHz) (1 - 26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

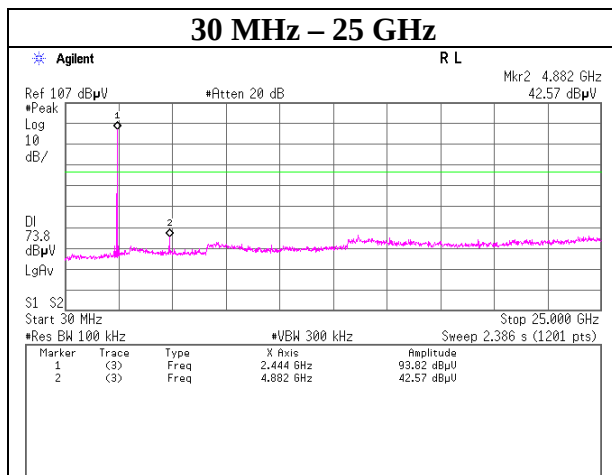
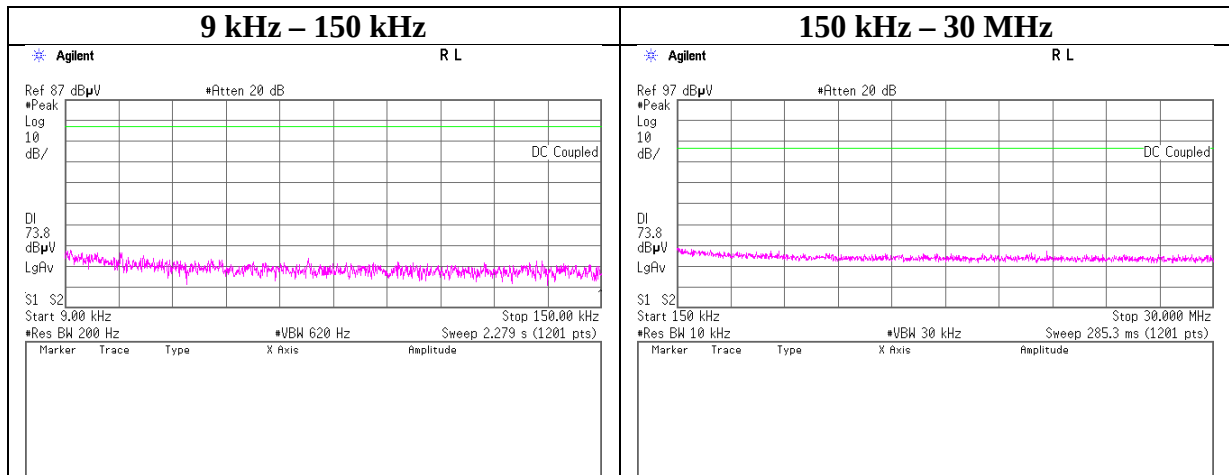


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11032213S-A
Date : December 4, 2015
Temperature / Humidity : 27 deg. C / 31 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off, DH5

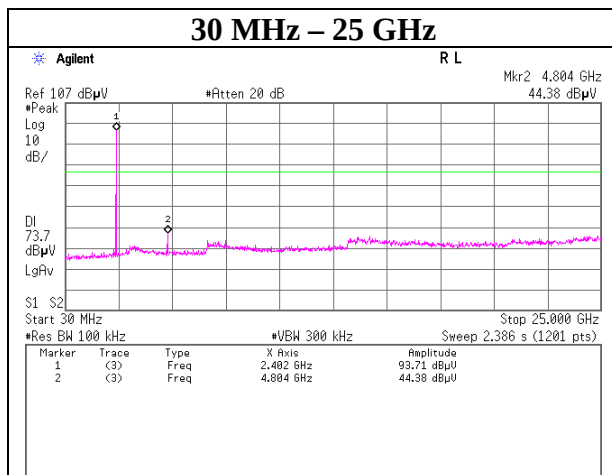
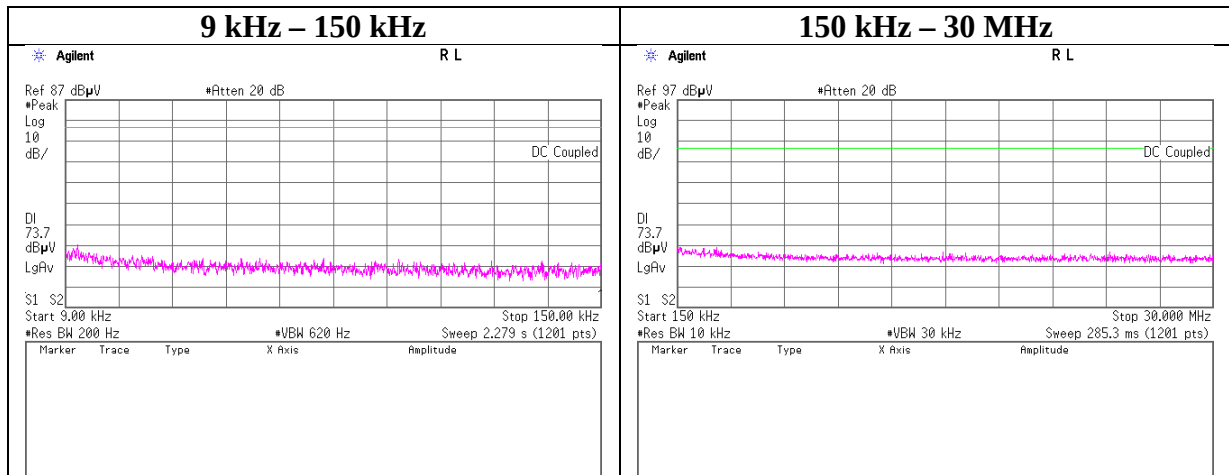
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11032213S-A
Date : December 4, 2015
Temperature / Humidity : 27 deg. C / 31 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off, DH5

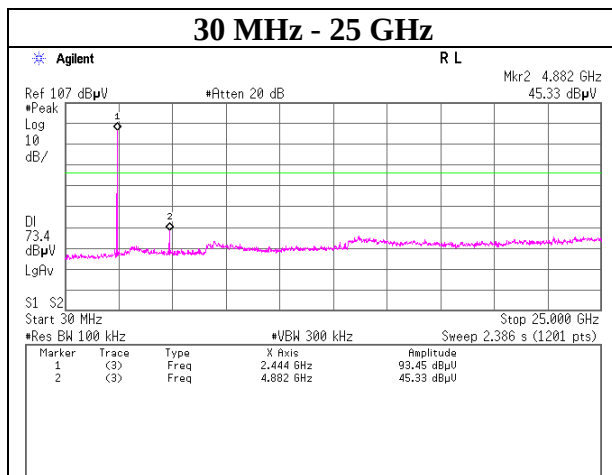
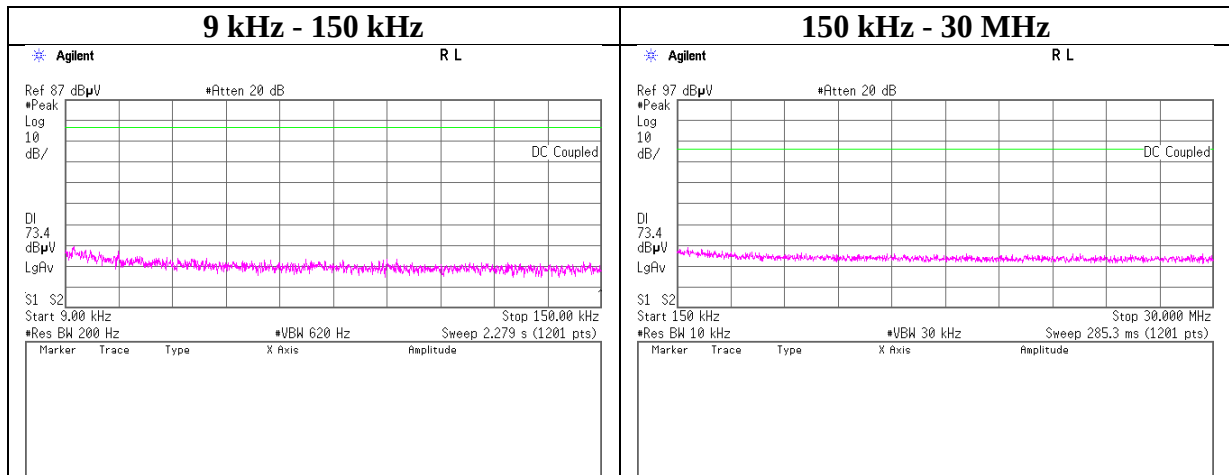
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11032213S-A
Date : December 4, 2015
Temperature / Humidity : 27 deg. C / 31 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off, 3DH5

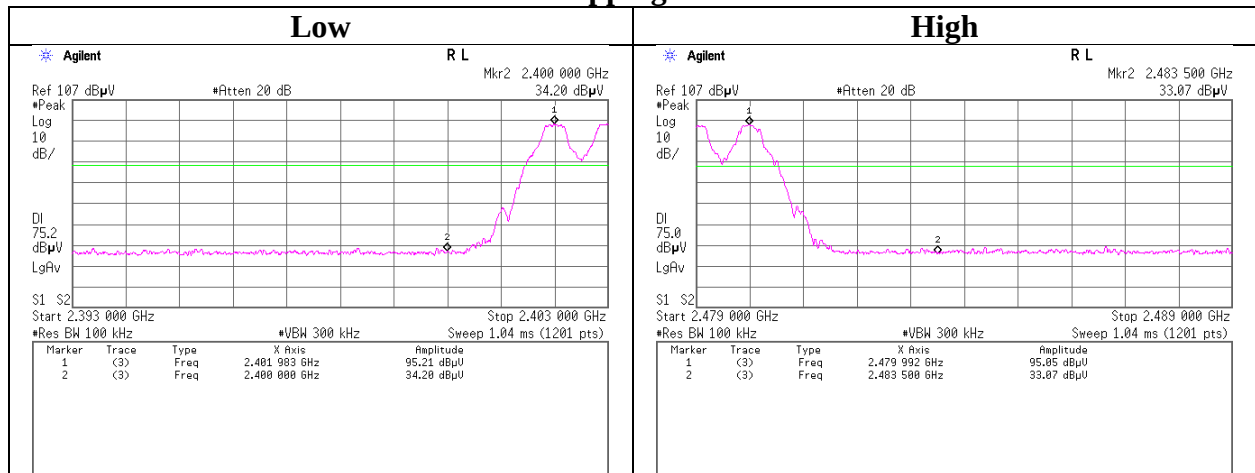
2441 MHz



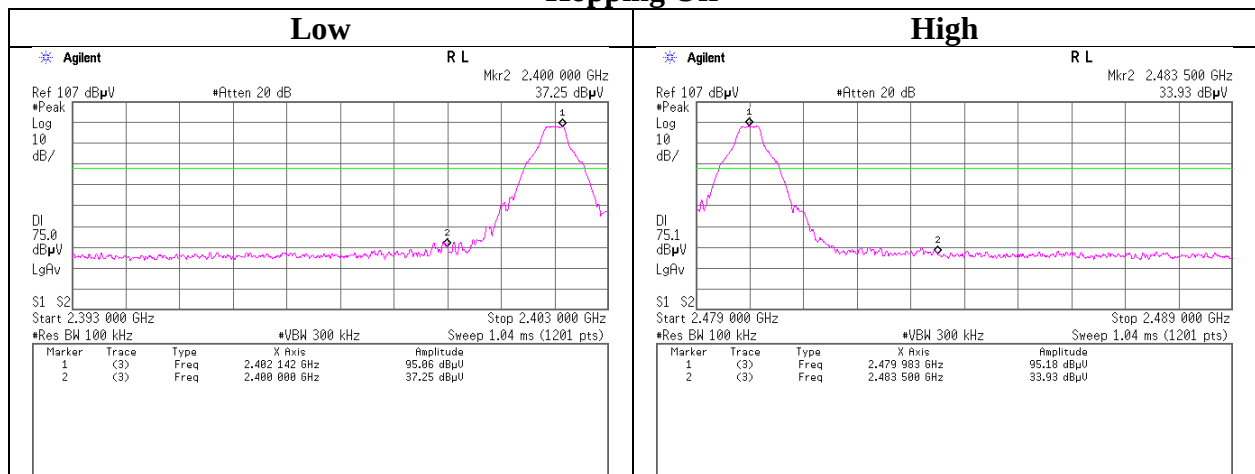
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11032213S-A
Date : December 4, 2015
Temperature / Humidity : 27 deg. C / 31 % RH
Engineer : Hikaru Shirasawa
Mode : Tx DH5

Hopping On



Hopping Off



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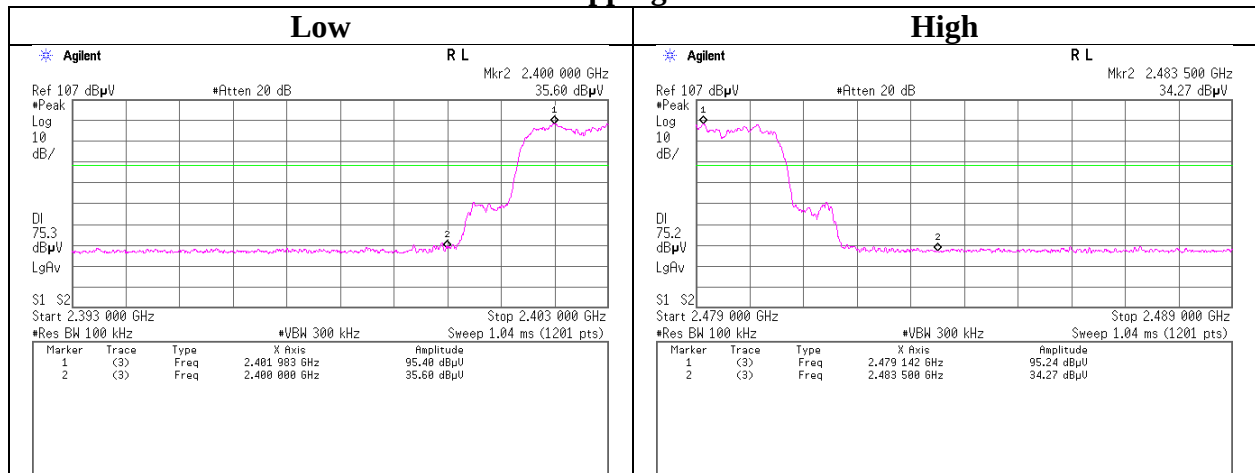
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

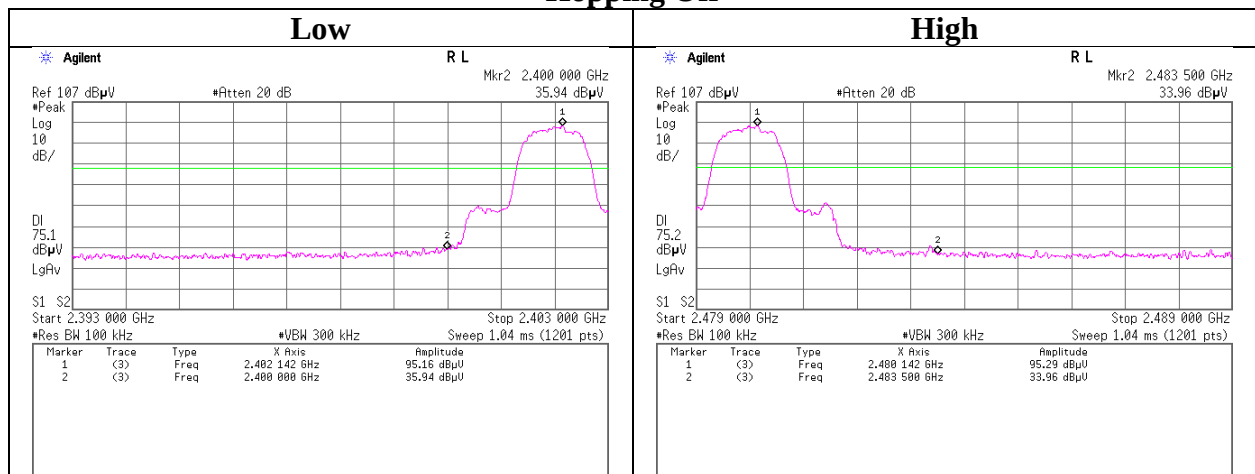
Conducted Emission Band Edge compliance

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 11032213S-A
Date : December 4, 2015
Temperature / Humidity : 27 deg. C / 31 % RH
Engineer : Hikaru Shirasawa
Mode : Tx 3DH5

Hopping On



Hopping Off



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99% Occupied Bandwidth

Test place
Report No.

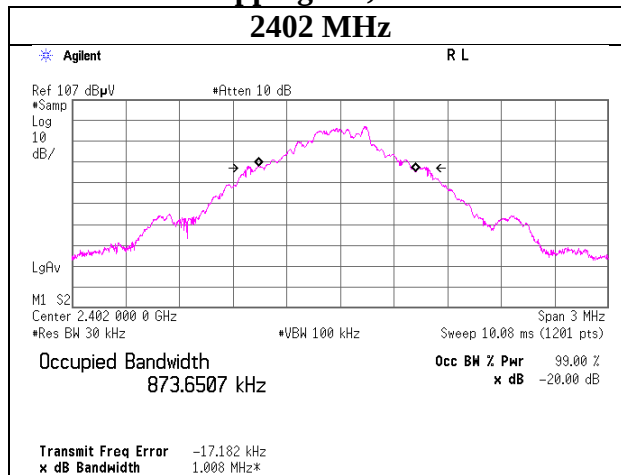
Date
Temperature / Humidity
Engineer
Mode

Shonan EMC Lab. No.1 Measurement Room
11032213S-A

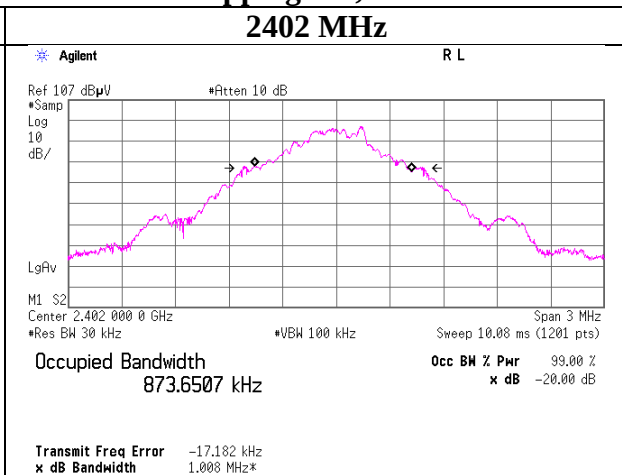
December 4, 2015
27 deg. C / 31 % RH
Hikaru Shirasawa
Tx Hopping Off

December 4, 2015
27 deg. C / 31 % RH
Hikaru Shirasawa

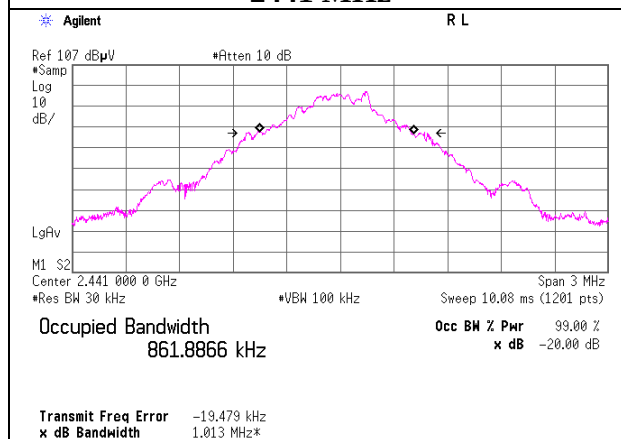
Hopping Off, DH5



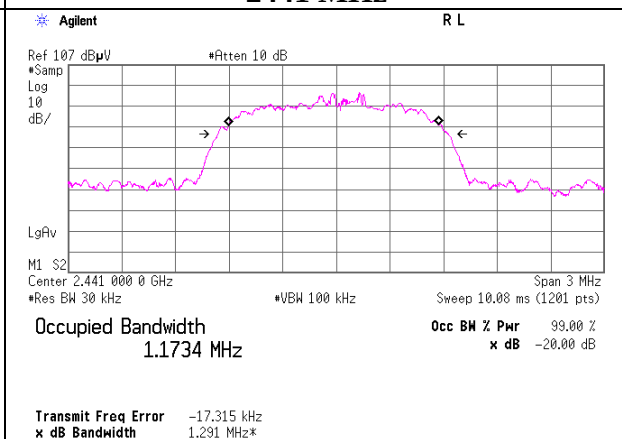
Hopping Off, 3DH5



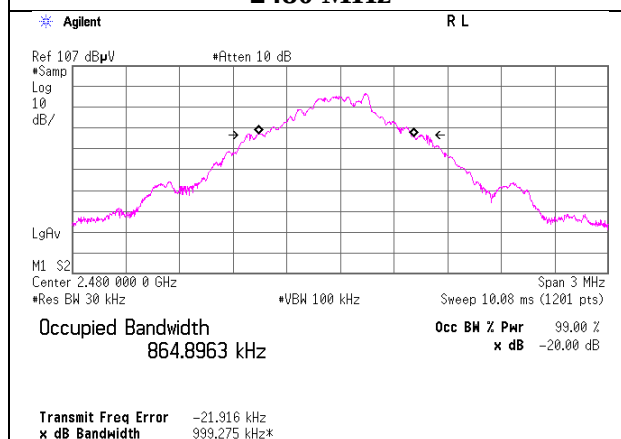
2441 MHz



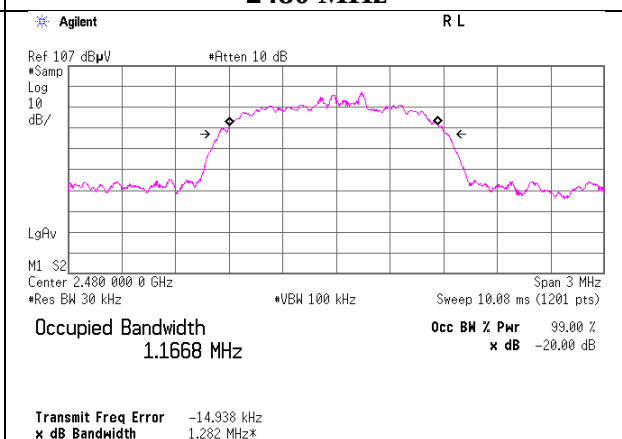
2441 MHz



2480 MHz



2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

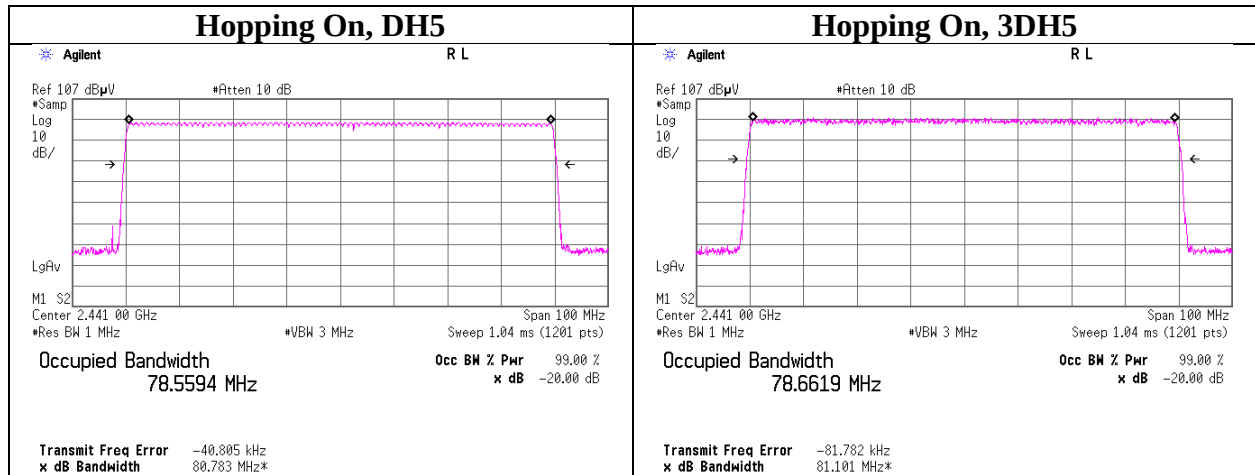
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room	
Report No.	11032213S-A	
Date	December 4, 2015	December 4, 2015
Temperature / Humidity	27 deg. C / 31 % RH	27 deg. C / 31 % RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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)
SRENT-05	Spectrum Analyzer	KEYSIGHT	E4440A	MY46187752	AT	2015/10/05 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2015/04/07 * 12
SPSS-01	Power Sensor	Anritsu	MA2444D	0738366	AT	2015/04/07 * 12
SCC-G31	Coaxial Cable	Junkosha	MWX241-0100 0KMSKMS	OCT-08-13-0 46	AT	2015/04/09 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2015/04/09 * 12
KTS-08	Digital Tester	SANWA	PC500	7019224	AT	2015/05/20 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2015/04/28 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2015/07/16 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2015/10/11 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2015/10/11 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2015/08/31 * 12
SCC-C1/C2/C3/C 4/C5/C10/SRSE- 03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner /Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-271(R F Selector)	RE	2015/04/17 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2015/02/18 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2015/03/24 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE ,CE,RFI,MF)	-	RE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2015/11/18 * 12
SAEC-03(SVSW R)	Semi-Anechoic Chamber	TDK	SAEC-03(SVS WR)	3	RE	2015/08/28 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2015/08/11 * 12
SAJ-01	Antenna Tilt Jig	Intelligent System Engineering Co., Ltd	Antenna Tilt Jig	T-S001	RE	Pre Check
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-0 18	RE	2015/06/08 * 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
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2015/05/27 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2015/05/19 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2015/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2015/03/17 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2015/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2015/03/11 * 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: CE: Conducted Emission test
RE: Radiated Emission test
AT: Antenna Terminal Conducted test

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