



Test report No. : 11008648S-E
Page : 1 of 46
Issued date : December 11, 2015
Revised date : December 16, 2015
FCC ID : ACJ932AT1602

RADIO TEST REPORT

Test Report No. : 11008648S-E

Applicant : **Panasonic Corporation**
Type of Equipment : **Car Audio System**
Model No. : **AT1602**
FCC ID : **ACJ932AT1602**
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: October 29 to November 12, 2015

Representative test engineer:



Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by:



Ichiro Isozaki
Manager
Consumer Technology Division



JAB
Testing
RTL02610

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

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13-EM-F0429

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SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-city, 224-8520, Japan
Telephone Number	:	+81-50-3689-6981
Contact Person	:	Hiroyuki Ishikawa

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

2.1 Identification of E.U.T.

Type of Equipment	:	Car Audio System
Model No.	:	AT1602
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample	:	October 27, 2015
Country of Mass-production	:	Japan, Czech, Mexico, 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: AT1602 (referred to as the EUT in this report) is a Car Audio System.

General Specification

Clock frequency(ies) in the system	:	26 MHz, 37 MHz, 48 MHz, 194 MHz, 666 MHz, 1.0 GHz
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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, DC 1.8 V
Antenna type	:	Dipole Antenna
Antenna gain with cable loss	:	-0.525 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015
 Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
 Section 15.207 Conducted limits
 Section 15.247 Operation within the bands 902-928MHz,
 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
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) ----- IC: RSS-247 5.1 (1)		-	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) ----- IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) ----- IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) ----- IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) ----- IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	8.0 dB 401.991 MHz, QP, Horizontal Tx 2480 MHz, 3-DH5	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 C63.10: 2013 is also referred.

However, there is one deviation from ANSI C 63.10:2013. (ANSI C63.10:2013 is Non-accreditation)

Measurement height is not 1.5 m, but 0.8 m.

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (RF: DC 3.3 V, I/O: DC 1.8 V).

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.6 dB	3.4 dB	3.4 dB
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	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

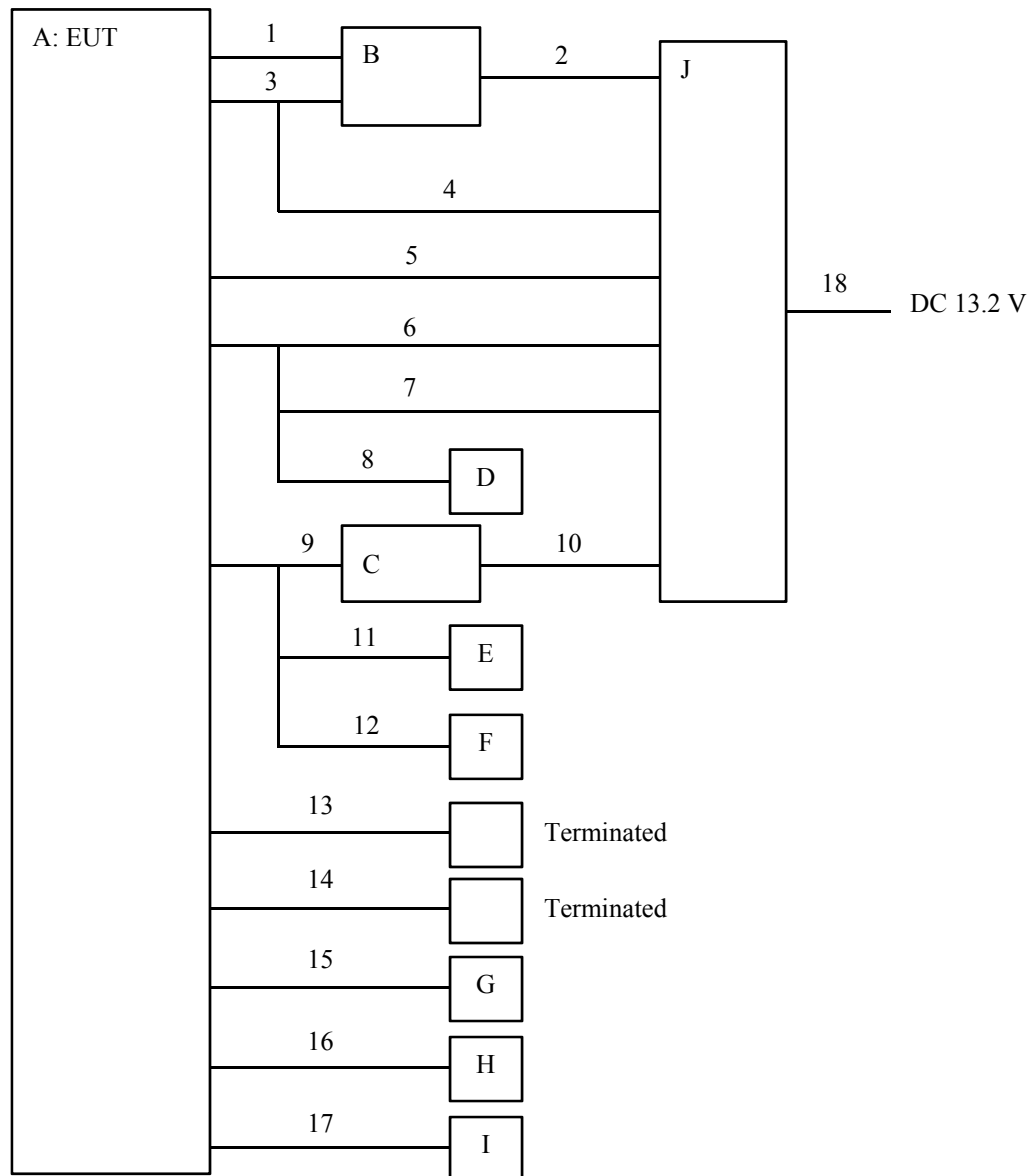
4.1 Operating Mode(s)

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

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 Inquiry	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5 Inquiry	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5 Inquiry	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5 Inquiry	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. Power settings: Fixed Software (Firmware): D17517010700001V0, Ver. 1.0		

4.2 Configuration and peripherals



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio System	AT1602	CV-CS87N48X No.179	Panasonic	EUT
A'	Car Audio System	AT1603 (Display Combined Type (T2))	CV-CS87N08X No.180	Panasonic	EUT *1)
B	DCM	-	86741-53054	DENSO	-
C	AIR-con ECU	-	-	-	-
D	Steering Switch	ST-SW-IF	31	Panasonic	-
E	Microphone	-	86730-28040	-	-
F	Back Camera	-	86730-28040	-	-
G	USB	USM4GU	-	Sony	-
H	XM Antenna	-	-	-	-
I	GPS Antenna	-	-	Panasonic	-
J	Vehicle Signal Simulator	-	-	Panasonic	-

*1) For Antenna terminal conducted test, the result of AT1603 (Display Combined Type (T2)) is used since there is no difference in the radio block of AT1602 and AT1603 (Display Combined Type (T2)).

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.9	Unshielded	Unshielded	-
2	DC Cable	0.9	Unshielded	Unshielded	-
3	Signal Cable	2.3	Unshielded	Unshielded	-
4	DC Cable	0.9	Unshielded	Unshielded	-
5	DC Cable	0.9	Unshielded	Unshielded	-
6	DC Cable	1.5	Unshielded	Unshielded	-
7	DC Cable	2.5	Unshielded	Unshielded	-
8	Signal Cable	2.0	Unshielded	Unshielded	-
9	Signal Cable	1.5	Unshielded	Unshielded	-
10	DC Cable	0.9	Unshielded	Unshielded	-
11	Signal Cable	2.0	Shielded	Shielded	-
12	Signal Cable	2.5	Unshielded	Unshielded	-
13	Speaker Cable	1.1	Unshielded	Unshielded	-
14	Radio Cable	2.8	Shielded	Shielded	-
15	USB Cable	2.0	Shielded	Shielded	-
16	XM Antenna Cable	1.1	Unshielded	Unshielded	-
17	GPS Antenna Cable	2.0	Unshielded	Unshielded	-
18	DC Cable	1.5	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

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

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 0 to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (0 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

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 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	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. *2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz) *3) Reference data							

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

Test data	: APPENDIX
Test result	: Pass

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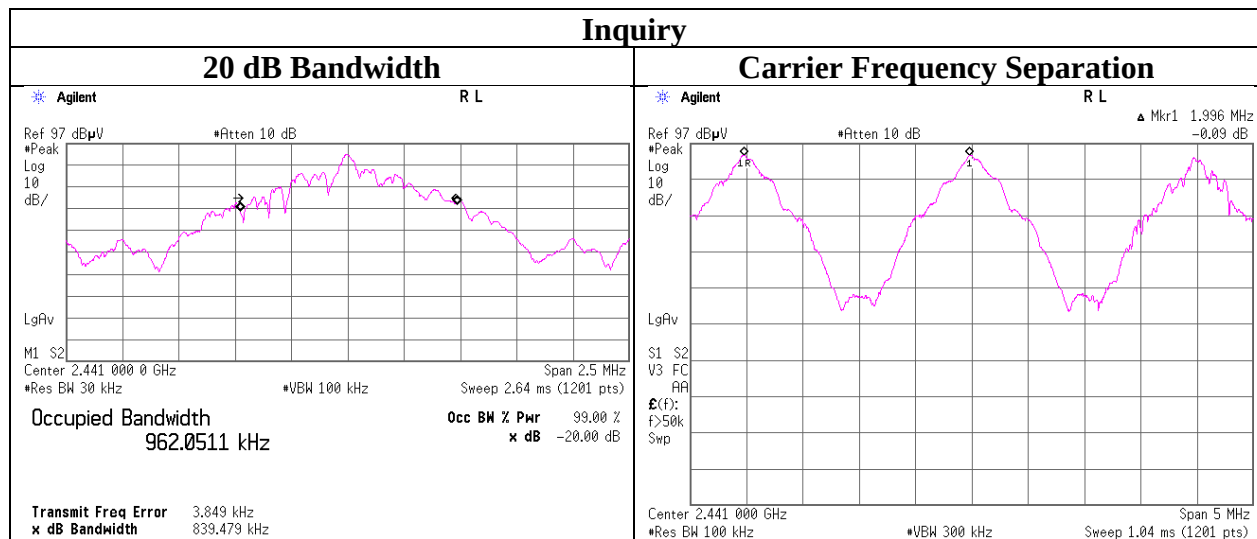
APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.958	1.000	≥ 0.639
DH5	2441.0	1.033	1.000	≥ 0.688
DH5	2480.0	0.956	1.000	≥ 0.638
3DH5	2402.0	1.299	1.000	≥ 0.866
3DH5	2441.0	1.295	1.000	≥ 0.863
3DH5	2480.0	1.299	1.000	≥ 0.866
Inquiry	2441.0	0.839	1.996	≥ 0.560

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



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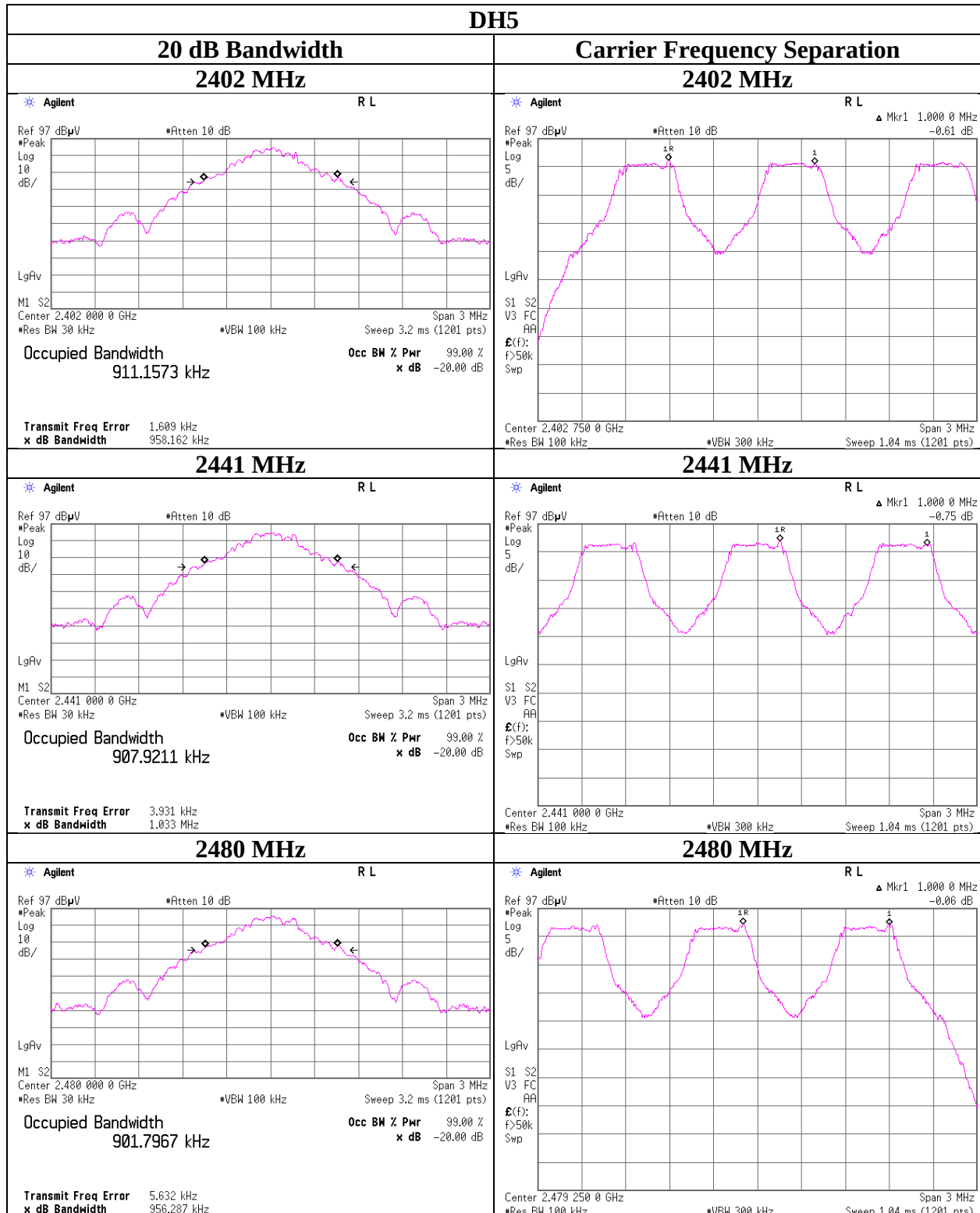
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20dB Bandwidth and Carrier Frequency Separation



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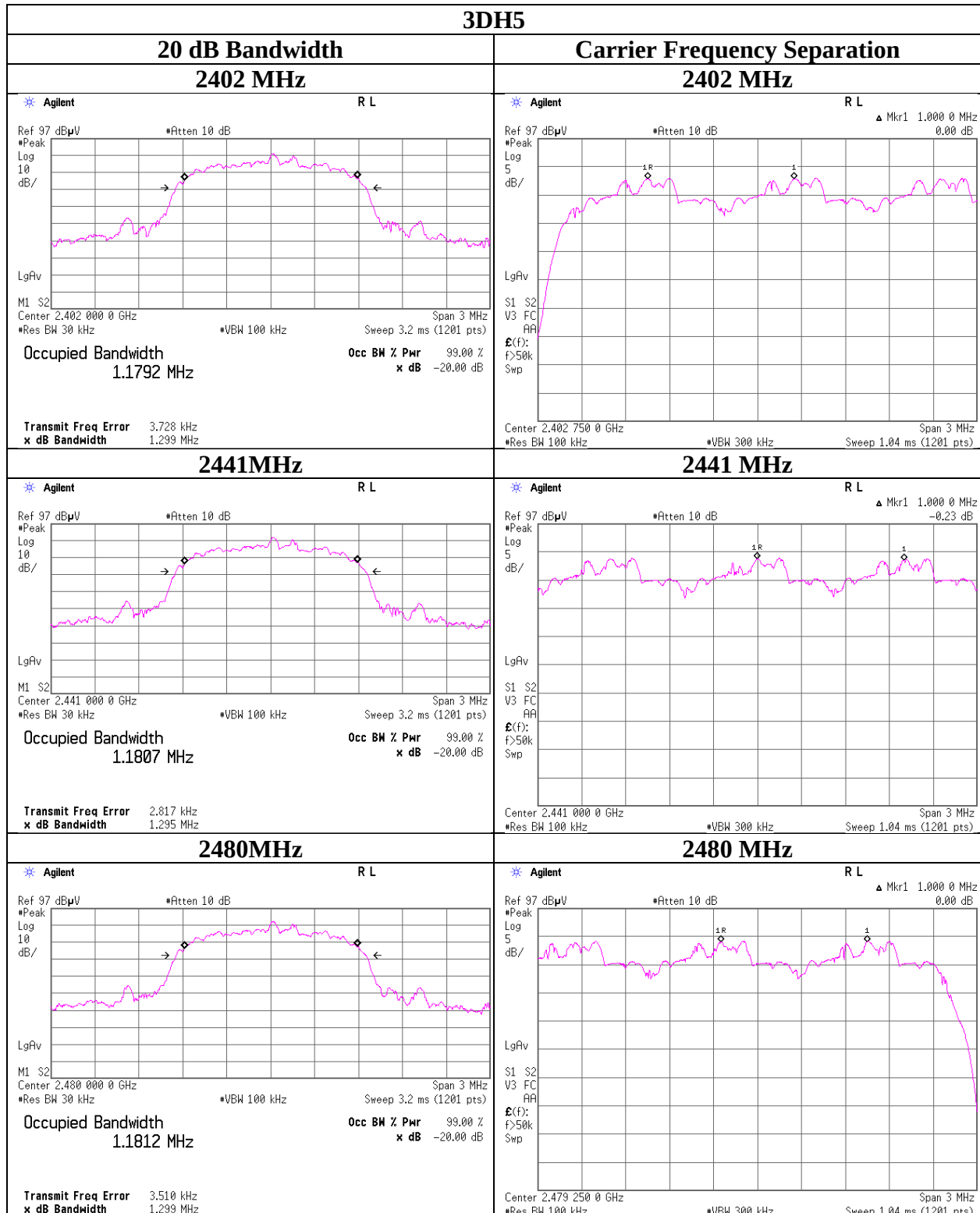
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20dB Bandwidth and Carrier Frequency Separation

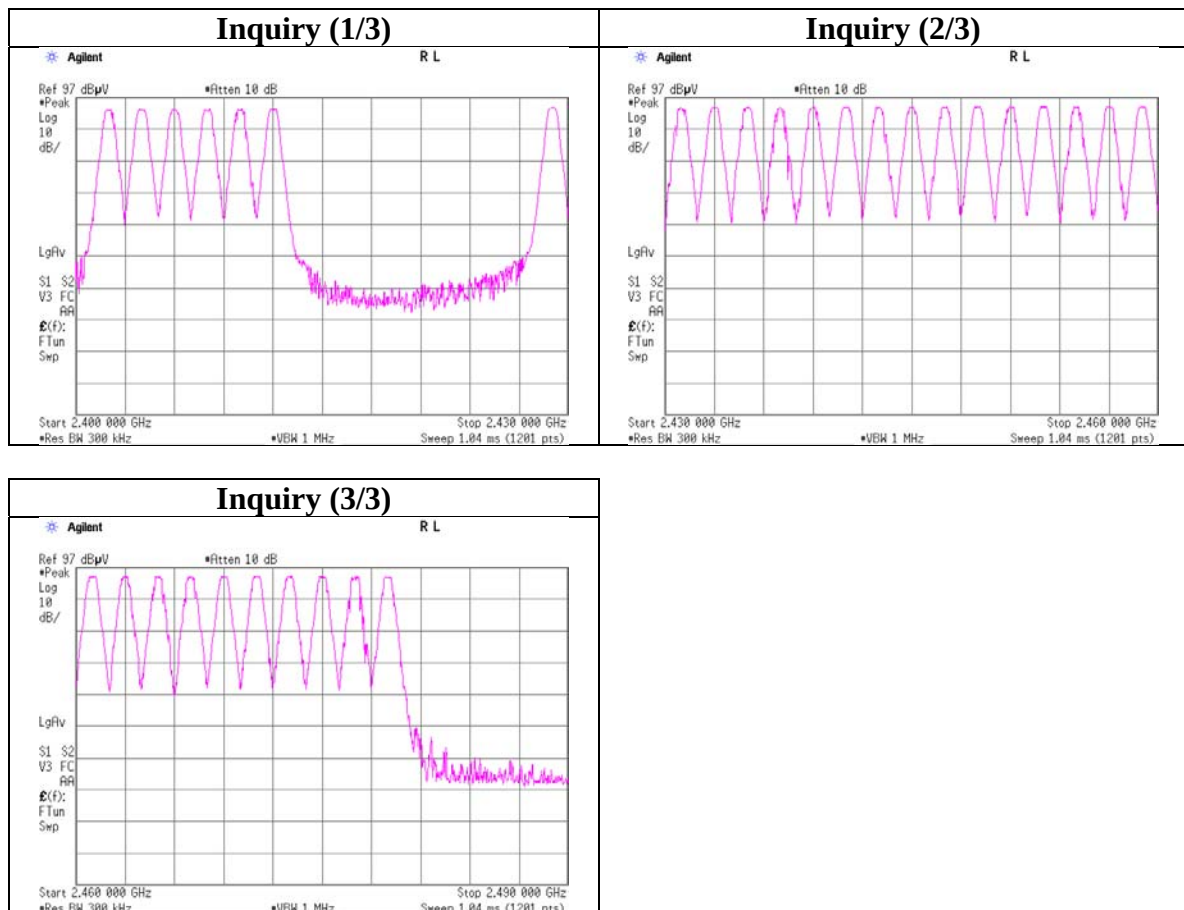


Number of Hopping Frequency

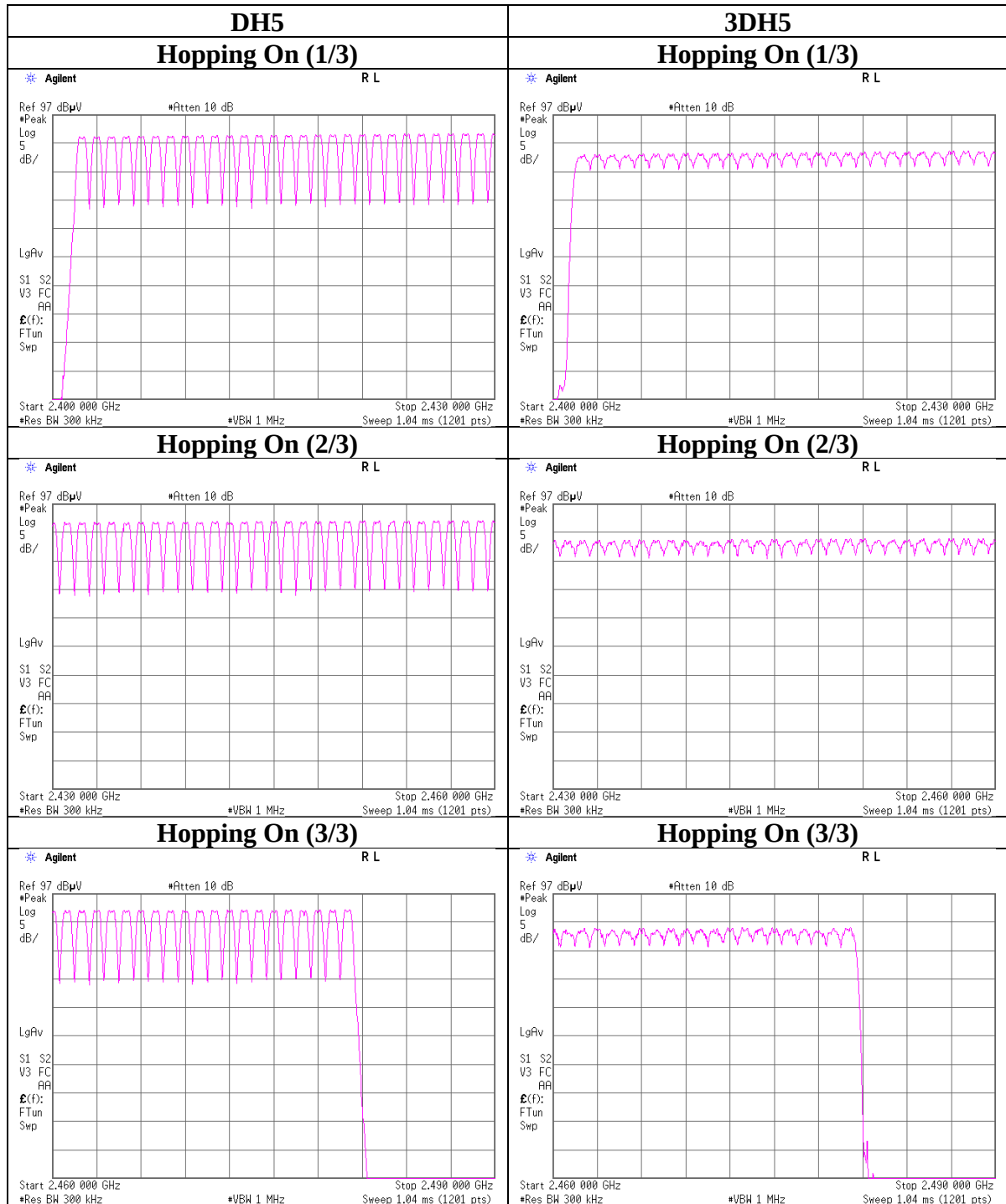
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	≥ 15
3DH5	79	≥ 15
Inquiry	32	≥ 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. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	49.6 times	/	5 sec.	x 31.6 sec. = 314 times	0.401	126	400
DH3	28.2 times	/	5 sec.	x 31.6 sec. = 179 times	1.658	297	400
DH5	19.0 times	/	5 sec.	x 31.6 sec. = 121 times	2.909	352	400
3DH1	51.6 times	/	5 sec.	x 31.6 sec. = 327 times	0.406	133	400
3DH3	25.0 times	/	5 sec.	x 31.6 sec. = 158 times	1.659	262	400
3DH5	19.4 times	/	5 sec.	x 31.6 sec. = 123 times	2.910	358	400
Inquiry	100.0 times	/	1 sec.	x 12.8 sec. = 1280 times	0.102	131	400

Sample Calculation

Result = Number of transmission x Length of transmission

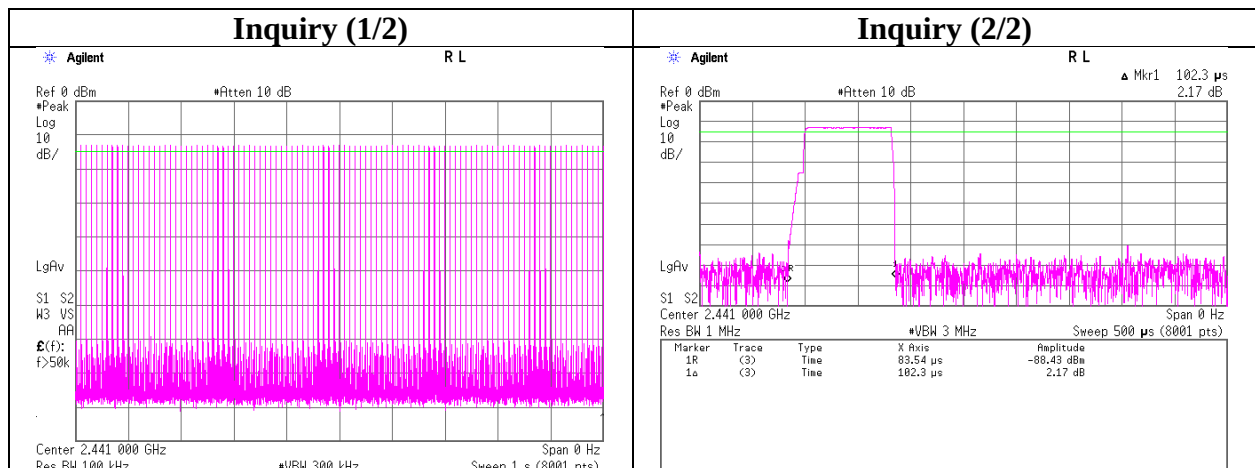
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	48	48	51	52	49.6
DH3	30	28	30	24	29	28.2
DH5	20	15	17	19	24	19
3DH1	49	59	49	51	50	51.6
3DH3	22	25	24	26	28	25
3DH5	17	25	17	15	23	19.4

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 $N \times 0.4s$, 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 $N = 79$.



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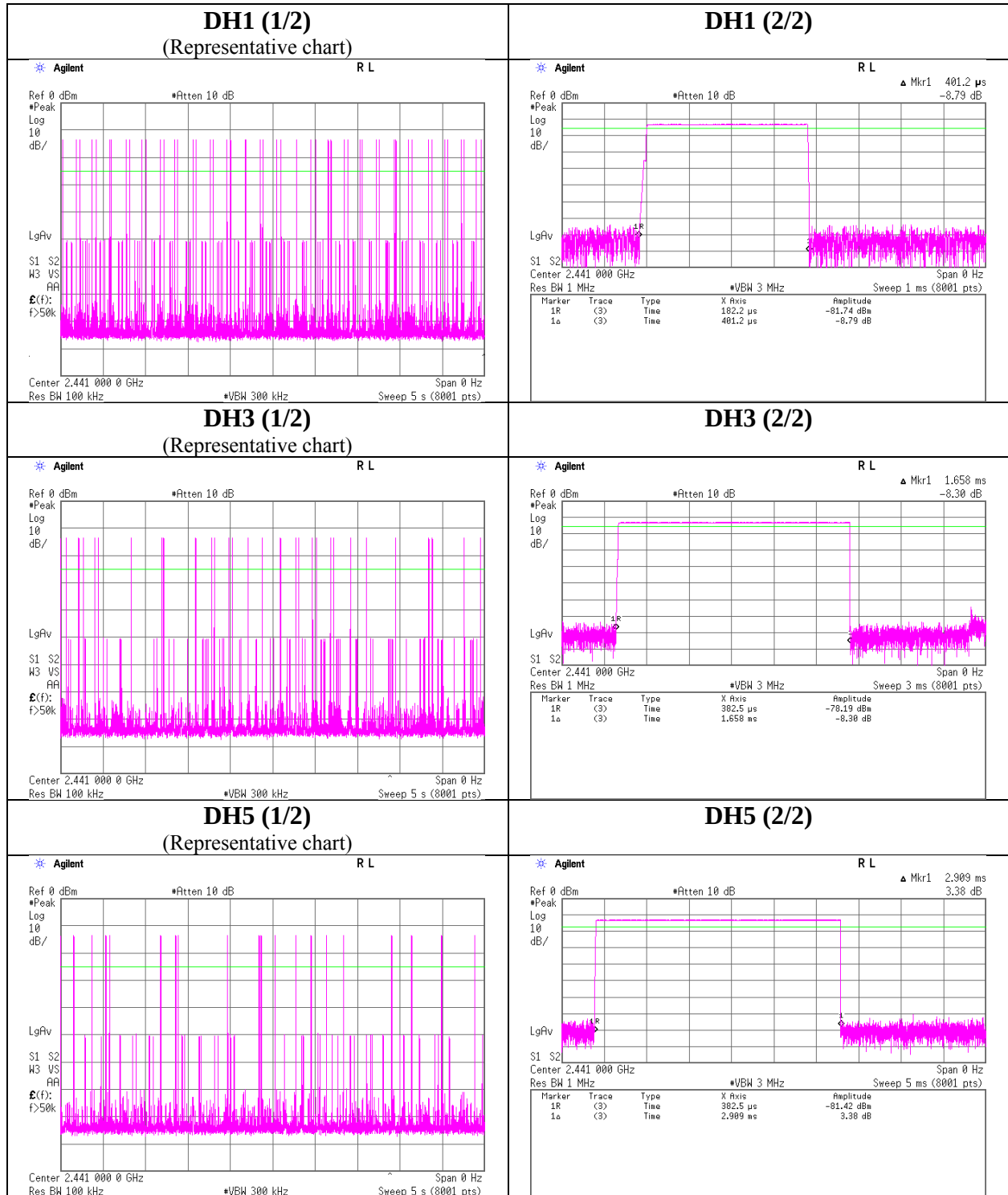
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Dwell time



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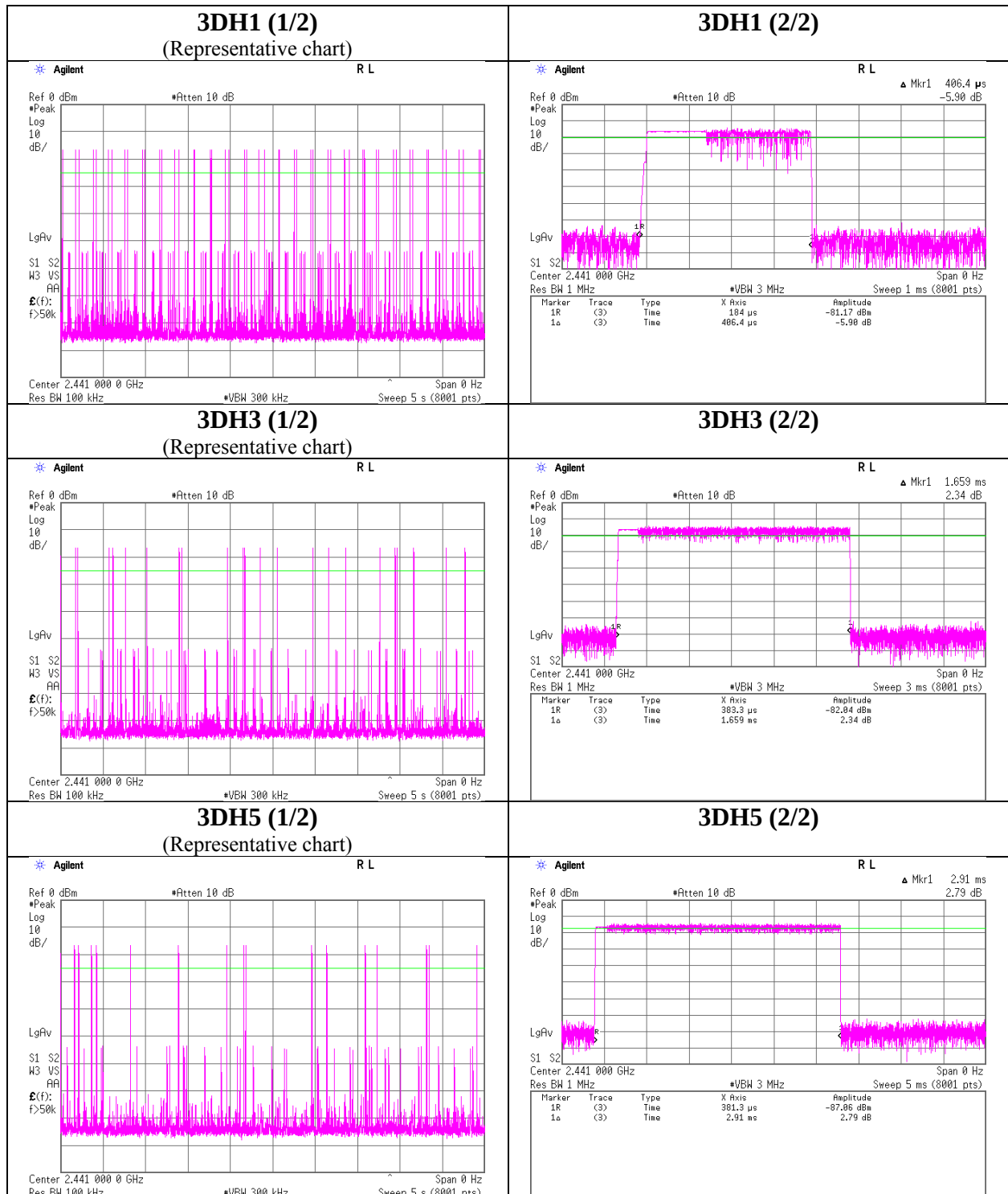
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Dwell time



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-13.06	2.03	9.63	-1.40	0.72	20.96	125	22.36
DH5	2441.0	-12.39	2.04	9.63	-0.72	0.85	20.96	125	21.68
DH5	2480.0	-12.12	2.05	9.63	-0.44	0.90	20.96	125	21.40
2DH5	2402.0	-14.30	2.03	9.63	-2.64	0.54	20.96	125	23.60
2DH5	2441.0	-13.60	2.04	9.63	-1.93	0.64	20.96	125	22.89
2DH5	2480.0	-13.37	2.05	9.63	-1.69	0.68	20.96	125	22.65
3DH5	2402.0	-13.75	2.03	9.63	-2.09	0.62	20.96	125	23.05
3DH5	2441.0	-13.03	2.04	9.63	-1.36	0.73	20.96	125	22.32
3DH5	2480.0	-12.90	2.05	9.63	-1.22	0.76	20.96	125	22.18

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)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
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	-15.02	2.03	9.63	-3.36	0.46	1.09	-2.27	0.59
DH5	2441.0	-14.27	2.04	9.63	-2.60	0.55	1.09	-1.51	0.71
DH5	2480.0	-13.98	2.05	9.63	-2.30	0.59	1.09	-1.21	0.76
2DH5	2402.0	-18.74	2.03	9.63	-7.08	0.20	1.09	-5.99	0.25
2DH5	2441.0	-18.00	2.04	9.63	-6.33	0.23	1.09	-5.24	0.30
2DH5	2480.0	-17.72	2.05	9.63	-6.04	0.25	1.09	-4.95	0.32
3DH5	2402.0	-18.69	2.03	9.63	-7.03	0.20	1.09	-5.94	0.25
3DH5	2441.0	-17.93	2.04	9.63	-6.26	0.24	1.09	-5.17	0.30
3DH5	2480.0	-17.68	2.05	9.63	-6.00	0.25	1.09	-4.91	0.32

Sample Calculation:

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

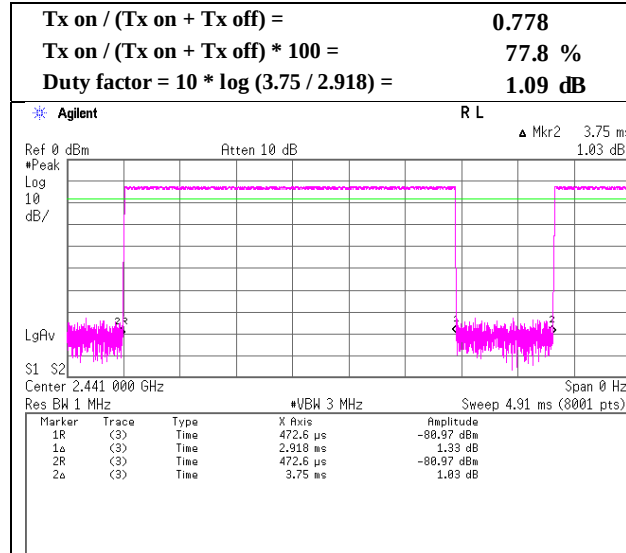
Result (Burst power) = Frame power + Duty factor

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

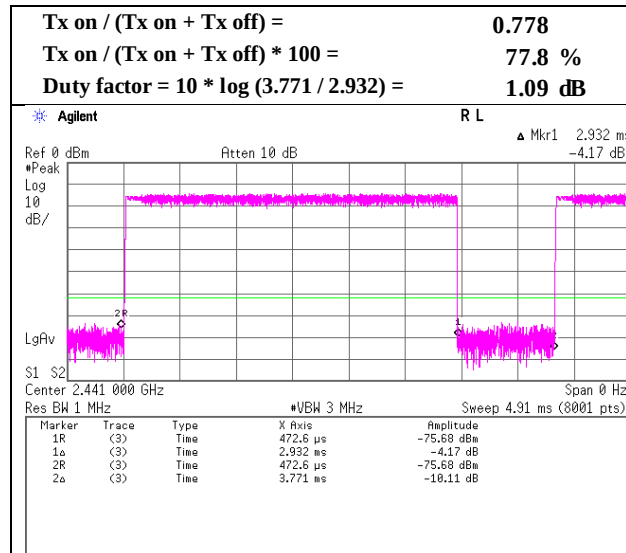
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off

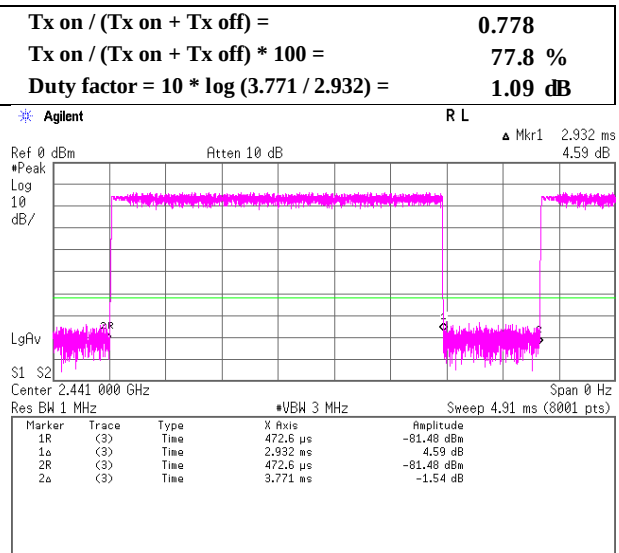
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11008648S-E		
Date	November 5, 2015	November 11, 2015	November 12, 2015
Temperature / Humidity	25 deg. C / 37 % RH	24 deg. C / 41 % RH	23 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)	Hiroyuki Morikawa (13-26 GHz)	Hiroyuki Morikawa (30-1000 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.	384.000	QP	39.0	17.2	7.1	31.7	0.0	31.6	46.0	14.4	100	129	
Hori.	396.004	QP	41.7	17.6	7.2	31.7	0.0	34.8	46.0	11.2	100	221	
Hori.	401.996	QP	43.7	17.7	7.2	31.7	0.0	36.9	46.0	9.1	100	221	
Hori.	853.208	QP	33.1	22.4	9.5	31.0	0.0	34.0	46.0	12.0	100	194	
Hori.	925.143	QP	34.2	22.7	9.9	30.6	0.0	36.2	46.0	9.8	100	58	
Hori.	2390.000	PK	45.7	27.8	13.7	41.0	2.0	48.2	73.9	25.7	100	296	
Hori.	4804.000	PK	46.7	31.4	5.7	39.6	2.0	46.2	73.9	27.7	100	191	
Hori.	7206.000	PK	45.7	36.9	7.1	40.1	2.0	51.6	73.9	22.3	100	0	
Hori.	9608.000	PK	46.3	38.5	8.2	39.6	2.0	55.4	73.9	18.5	100	0	
Hori.	2390.000	AV	33.6	27.8	13.7	41.0	2.0	36.1	53.9	17.8	100	296	
Hori.	4804.000	AV	34.1	31.4	5.7	39.6	2.0	33.6	53.9	20.3	100	191	
Hori.	7206.000	AV	33.6	36.9	7.1	40.1	2.0	39.5	53.9	14.4	100	0	
Hori.	9608.000	AV	34.4	38.5	8.2	39.6	2.0	43.5	53.9	10.4	100	0	
Vert.	814.139	QP	37.3	22.3	9.3	31.2	0.0	37.7	46.0	8.3	100	43	
Vert.	925.112	QP	30.7	22.7	9.9	30.6	0.0	32.7	46.0	13.3	100	245	
Vert.	2390.000	PK	46.3	27.8	13.7	41.0	2.0	48.8	73.9	25.1	269	6	
Vert.	4804.000	PK	45.9	31.4	5.7	39.6	2.0	45.4	73.9	28.5	100	158	
Vert.	7206.000	PK	45.3	36.9	7.1	40.1	2.0	51.2	73.9	22.7	100	0	
Vert.	9608.000	PK	45.7	38.5	8.2	39.6	2.0	54.8	73.9	19.1	100	0	
Vert.	2390.000	AV	33.7	27.8	13.7	41.0	2.0	36.2	53.9	17.7	269	6	
Vert.	4804.000	AV	34.3	31.4	5.7	39.6	2.0	33.8	53.9	20.1	100	158	
Vert.	7206.000	AV	34.1	36.9	7.1	40.1	2.0	40.0	53.9	13.9	100	0	
Vert.	9608.000	AV	33.9	38.5	8.2	39.6	2.0	43.0	53.9	10.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.75 m / 3.0 m) = 2.0 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 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	88.5	27.8	13.7	41.0	2.0	91.0	-	-	Carrier
Hori.	2400.000	PK	37.4	27.8	13.7	41.0	2.0	39.9	71.0	31.1	
Vert.	2402.000	PK	91.8	27.8	13.7	41.0	2.0	94.3	-	-	Carrier
Vert.	2400.000	PK	38.5	27.8	13.7	41.0	2.0	41.0	74.3	33.3	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.75 m / 3.0 m) = 2.0 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

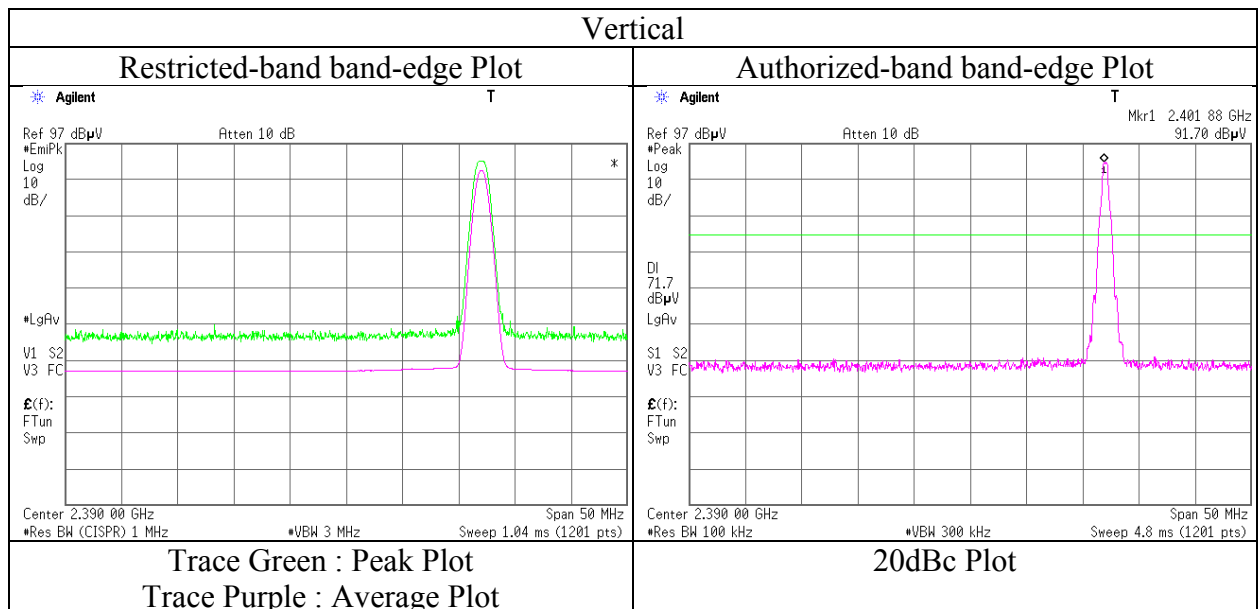
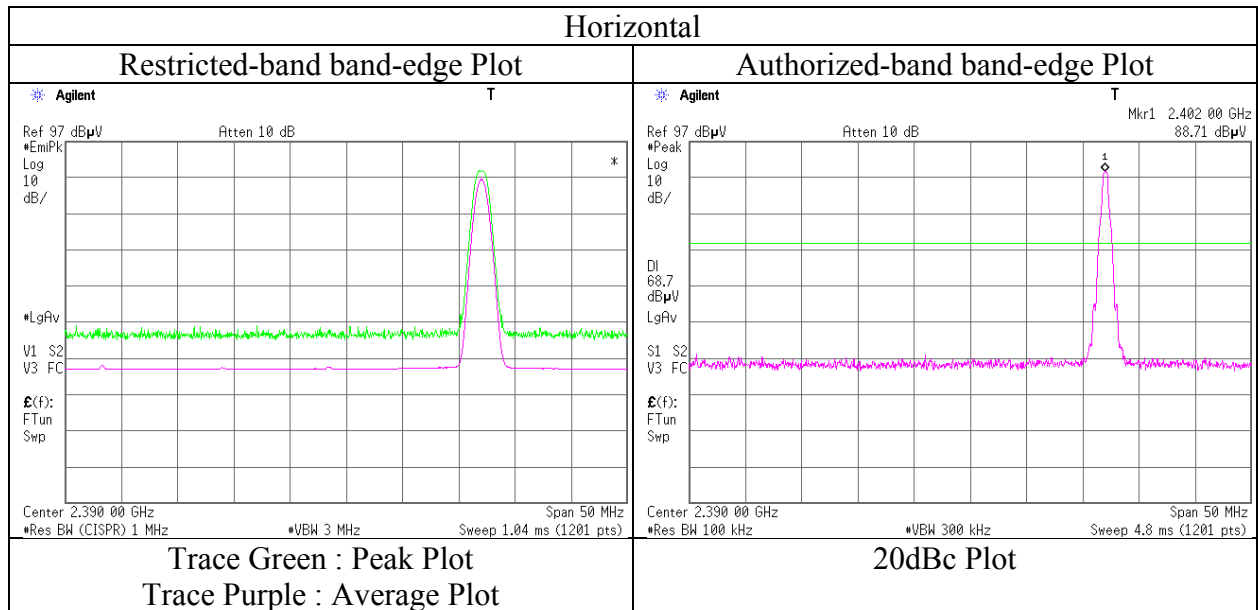
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11008648S-E
Date	November 5, 2015
Temperature / Humidity	25 deg. C / 37 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11008648S-E
Date : November 5, 2015 November 11, 2015 November 12, 2015
Temperature / Humidity : 25 deg. C / 37 % RH 24 deg. C / 41 % RH 23 deg. C / 40 % RH
Engineer : Hiroyuki Morikawa Hiroyuki Morikawa Hiroyuki Morikawa
(1-13 GHz) (13-26 GHz) (30-1000 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.	383.986	QP	37.8	17.2	7.1	31.7	0.0	30.4	46.0	15.6	100	337	
Hori.	396.005	QP	41.8	17.6	7.2	31.7	0.0	34.9	46.0	11.1	100	238	
Hori.	401.993	QP	44.1	17.7	7.2	31.7	0.0	37.3	46.0	8.7	100	225	
Hori.	853.210	QP	33.1	22.4	9.5	31.0	0.0	34.0	46.0	12.0	100	203	
Hori.	925.144	QP	33.2	22.7	9.9	30.6	0.0	35.2	46.0	10.8	100	68	
Hori.	4882.000	PK	44.2	31.7	5.8	39.5	2.0	44.2	73.9	29.7	100	200	
Hori.	7323.000	PK	45.4	36.9	7.2	40.2	2.0	51.3	73.9	22.6	100	0	
Hori.	9764.000	PK	45.4	38.5	8.2	39.5	2.0	54.6	73.9	19.3	100	0	
Hori.	4882.000	AV	32.4	31.7	5.8	39.5	2.0	32.4	53.9	21.5	100	200	
Hori.	7323.000	AV	33.1	36.9	7.2	40.2	2.0	39.0	53.9	14.9	100	0	
Hori.	9764.000	AV	33.0	38.5	8.2	39.5	2.0	42.2	53.9	11.7	100	0	
Vert.	814.140	QP	37.1	22.3	9.3	31.2	0.0	37.5	46.0	8.5	100	44	
Vert.	925.109	QP	30.4	22.7	9.9	30.6	0.0	32.4	46.0	13.6	100	241	
Vert.	4882.000	PK	44.8	31.7	5.8	39.5	2.0	44.8	73.9	29.1	100	222	
Vert.	7323.000	PK	45.1	36.9	7.2	40.2	2.0	51.0	73.9	22.9	100	0	
Vert.	9764.000	PK	44.7	38.5	8.2	39.5	2.0	53.9	73.9	20.0	100	0	
Vert.	4882.000	AV	33.2	31.7	5.8	39.5	2.0	33.2	53.9	20.7	100	222	
Vert.	7323.000	AV	33.2	36.9	7.2	40.2	2.0	39.1	53.9	14.8	100	0	
Vert.	9764.000	AV	33.1	38.5	8.2	39.5	2.0	42.3	53.9	11.6	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.75\text{ m} / 3.0\text{ m}) = 2.0\text{ dB}$

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.	11008648S-E		
Date	November 5, 2015	November 11, 2015	November 12, 2015
Temperature / Humidity	25 deg. C / 37 % RH	24 deg. C / 41 % RH	23 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)	Hiroyuki Morikawa (13-26 GHz)	Hiroyuki Morikawa (30-1000 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.	332.914	QP	46.7	15.6	6.8	31.7	0.0	37.4	46.0	8.6	100	263	
Hori.	383.984	QP	38.4	17.2	7.1	31.7	0.0	31.0	46.0	15.0	100	119	
Hori.	396.002	QP	42.4	17.6	7.2	31.7	0.0	35.5	46.0	10.5	100	237	
Hori.	401.995	QP	44.3	17.7	7.2	31.7	0.0	37.5	46.0	8.5	100	224	
Hori.	853.205	QP	33.0	22.4	9.5	31.0	0.0	33.9	46.0	12.1	100	190	
Hori.	925.166	QP	33.1	22.7	9.9	30.6	0.0	35.1	46.0	10.9	100	276	
Hori.	2483.500	PK	46.4	27.9	13.8	41.0	2.0	49.1	73.9	24.8	175	11	
Hori.	4960.000	PK	46.7	32.0	5.8	39.4	2.0	47.1	73.9	26.8	118	223	
Hori.	7440.000	PK	45.9	37.0	7.2	40.4	2.0	51.7	73.9	22.2	100	0	
Hori.	9920.000	PK	44.0	38.4	8.2	39.4	2.0	53.2	73.9	20.7	100	0	
Hori.	2483.500	AV	33.6	27.9	13.8	41.0	2.0	36.3	53.9	17.6	175	11	
Hori.	4960.000	AV	35.1	32.0	5.8	39.4	2.0	35.5	53.9	18.4	118	223	
Hori.	7440.000	AV	32.9	37.0	7.2	40.4	2.0	38.7	53.9	15.2	100	0	
Hori.	9920.000	AV	32.1	38.4	8.2	39.4	2.0	41.3	53.9	12.6	100	0	
Vert.	814.134	QP	37.2	22.3	9.3	31.2	0.0	37.6	46.0	8.4	100	42	
Vert.	925.131	QP	30.3	22.7	9.9	30.6	0.0	32.3	46.0	13.7	100	242	
Vert.	2483.500	PK	46.3	27.9	13.8	41.0	2.0	49.0	73.9	24.9	246	329	
Vert.	4960.000	PK	45.3	32.0	5.8	39.4	2.0	45.7	73.9	28.2	100	234	
Vert.	7440.000	PK	45.1	37.0	7.2	40.4	2.0	50.9	73.9	23.0	100	0	
Vert.	9920.000	PK	44.1	38.4	8.2	39.4	2.0	53.3	73.9	20.6	100	0	
Vert.	2483.500	AV	33.9	27.9	13.8	41.0	2.0	36.6	53.9	17.3	246	329	
Vert.	4960.000	AV	34.9	32.0	5.8	39.4	2.0	35.3	53.9	18.6	100	234	
Vert.	7440.000	AV	33.0	37.0	7.2	40.4	2.0	38.8	53.9	15.1	100	0	
Vert.	9920.000	AV	32.1	38.4	8.2	39.4	2.0	41.3	53.9	12.6	100	0	

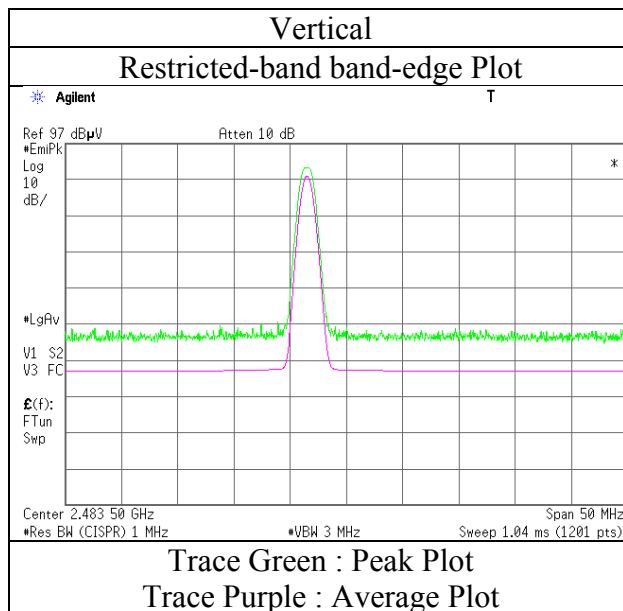
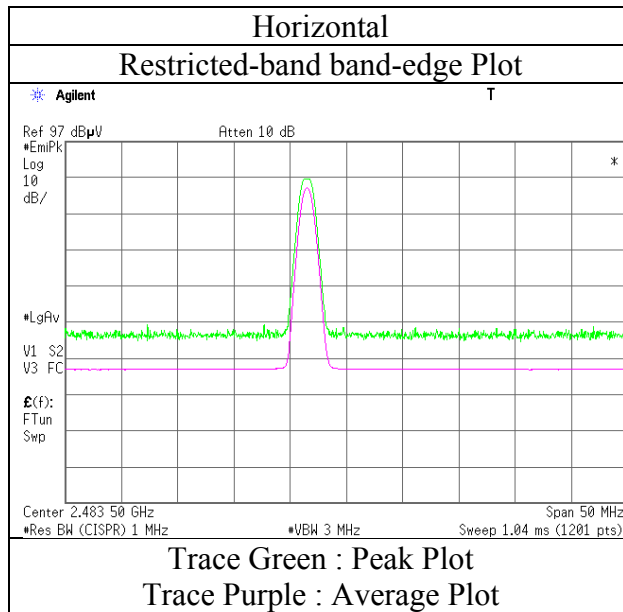
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.75 m / 3.0 m) = 2.0 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11008648S-E
Date	November 5, 2015
Temperature / Humidity	25 deg. C / 37 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11008648S-E
Date : November 5, 2015 November 11, 2015 November 12, 2015
Temperature / Humidity : 25 deg. C / 37 % RH 24 deg. C / 41 % RH 23 deg. C / 40 % RH
Engineer : Hiroyuki Morikawa Hiroyuki Morikawa Hiroyuki Morikawa
(1-13 GHz) (13-26 GHz) (30-1000 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.	333.038	QP	46.6	15.6	6.8	31.7	0.0	37.3	46.0	8.7	100	238	
Hori.	383.997	QP	39.1	17.2	7.1	31.7	0.0	31.7	46.0	14.3	100	120	
Hori.	396.003	QP	41.6	17.6	7.2	31.7	0.0	34.7	46.0	11.3	100	222	
Hori.	401.995	QP	43.5	17.7	7.2	31.7	0.0	36.7	46.0	9.3	100	238	
Hori.	853.206	QP	32.7	22.4	9.5	31.0	0.0	33.6	46.0	12.4	100	205	
Hori.	925.152	QP	32.6	22.7	9.9	30.6	0.0	34.6	46.0	11.4	100	49	
Hori.	2390.000	PK	47.2	27.8	13.7	41.0	2.0	49.7	73.9	24.2	100	295	
Hori.	4804.000	PK	45.7	31.4	5.7	39.6	2.0	45.2	73.9	28.7	155	196	
Hori.	7206.000	PK	45.1	36.9	7.1	40.1	2.0	51.0	73.9	22.9	100	0	
Hori.	9608.000	PK	46.2	38.5	8.2	39.6	2.0	55.3	73.9	18.6	100	0	
Hori.	2390.000	AV	33.7	27.8	13.7	41.0	2.0	36.2	53.9	17.7	100	295	
Hori.	4804.000	AV	34.2	31.4	5.7	39.6	2.0	33.7	53.9	20.2	155	196	
Hori.	7206.000	AV	33.6	36.9	7.1	40.1	2.0	39.5	53.9	14.4	100	0	
Hori.	9608.000	AV	33.8	38.5	8.2	39.6	2.0	42.9	53.9	11.0	100	0	
Vert.	814.134	QP	37.1	22.3	9.3	31.2	0.0	37.5	46.0	8.5	100	48	
Vert.	925.115	QP	30.1	22.7	9.9	30.6	0.0	32.1	46.0	13.9	100	244	
Vert.	2390.000	PK	46.4	27.8	13.7	41.0	2.0	48.9	73.9	25.0	263	5	
Vert.	4804.000	PK	45.3	31.4	5.7	39.6	2.0	44.8	73.9	29.1	100	161	
Vert.	7206.000	PK	45.0	36.9	7.1	40.1	2.0	50.9	73.9	23.0	100	0	
Vert.	9608.000	PK	45.9	38.5	8.2	39.6	2.0	55.0	73.9	18.9	100	0	
Vert.	2390.000	AV	33.8	27.8	13.7	41.0	2.0	36.3	53.9	17.6	263	5	
Vert.	4804.000	AV	34.3	31.4	5.7	39.6	2.0	33.8	53.9	20.1	100	161	
Vert.	7206.000	AV	33.6	36.9	7.1	40.1	2.0	39.5	53.9	14.4	100	0	
Vert.	9608.000	AV	33.9	38.5	8.2	39.6	2.0	43.0	53.9	10.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.75 m / 3.0 m) = 2.0 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 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	85.0	27.8	13.7	41.0	2.0	87.5	-	-	Carrier
Hori.	2400.000	PK	36.3	27.8	13.7	41.0	2.0	38.8	67.5	28.7	
Vert.	2402.000	PK	88.7	27.8	13.7	41.0	2.0	91.2	-	-	Carrier
Vert.	2400.000	PK	37.6	27.8	13.7	41.0	2.0	40.1	71.1	31.0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.75 m / 3.0 m) = 2.0 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

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Shonan EMC Lab.

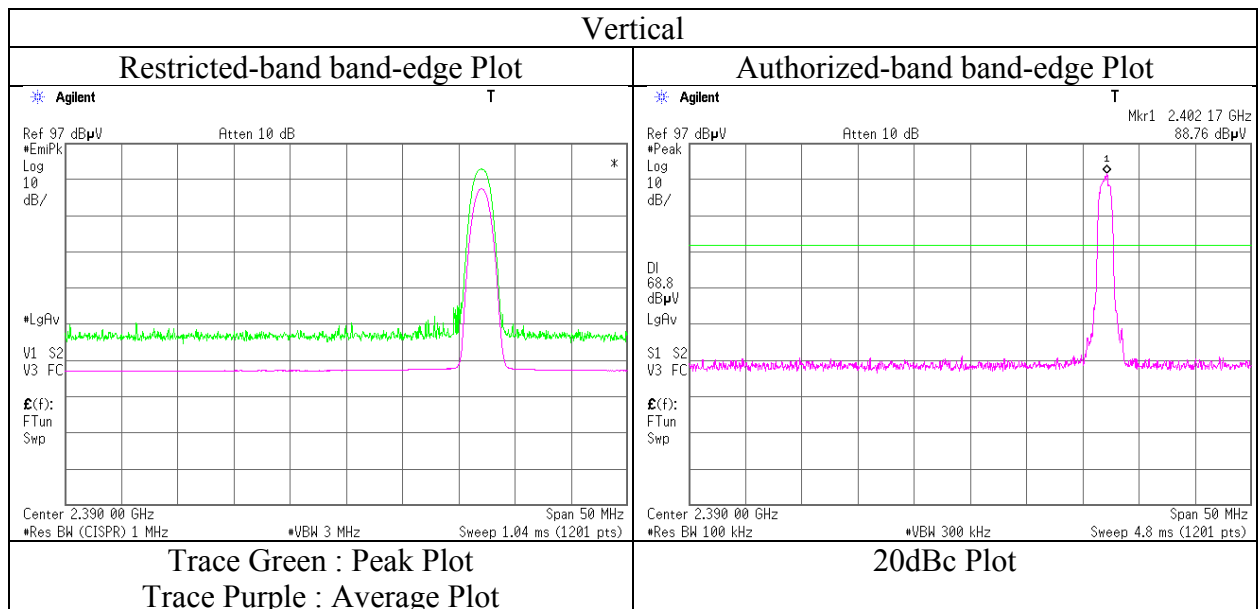
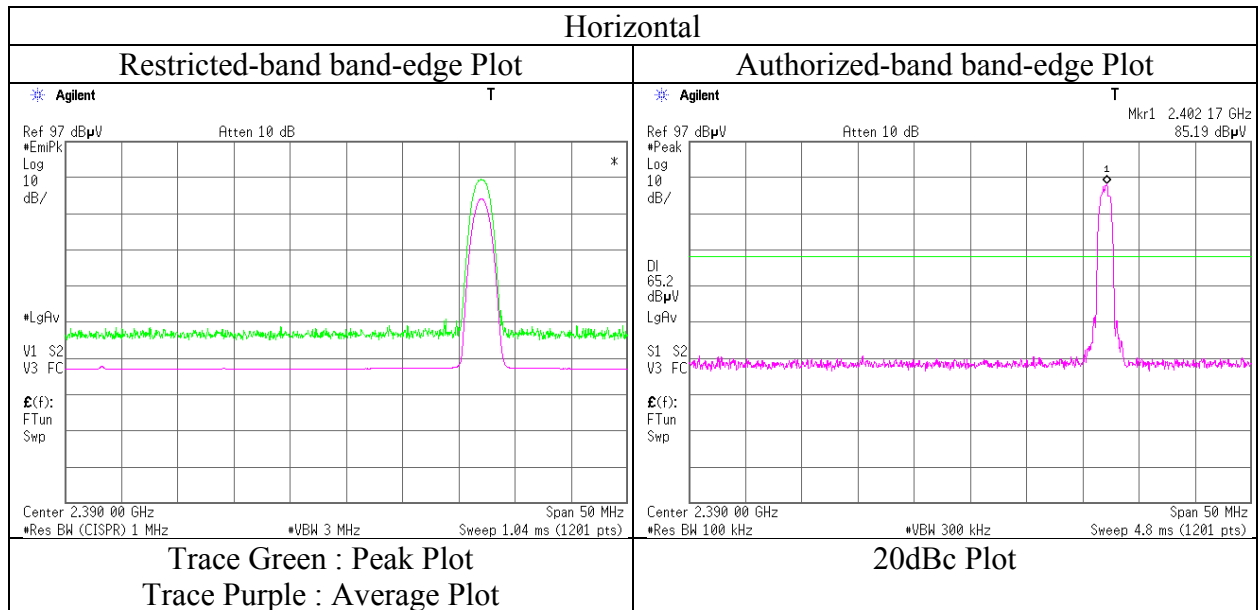
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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.	11008648S-E
Date	November 5, 2015
Temperature / Humidity	25 deg. C / 37 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11008648S-E		
Date	November 5, 2015	November 11, 2015	November 12, 2015
Temperature / Humidity	25 deg. C / 37 % RH	24 deg. C / 41 % RH	23 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)	Hiroyuki Morikawa (13-26 GHz)	Hiroyuki Morikawa (30-1000 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.	236.603	QP	30.1	17.0	9.2	31.7	0.0	24.6	46.0	21.4	141	214	
Hori.	333.054	QP	46.8	15.6	6.8	31.7	0.0	37.5	46.0	8.5	100	245	
Hori.	383.998	QP	38.4	17.2	7.1	31.7	0.0	31.0	46.0	15.0	100	123	
Hori.	396.000	QP	43.0	17.6	7.2	31.7	0.0	36.1	46.0	9.9	100	220	
Hori.	401.996	QP	44.7	17.7	7.2	31.7	0.0	37.9	46.0	8.1	100	223	
Hori.	853.202	QP	32.5	22.4	9.5	31.0	0.0	33.4	46.0	12.6	100	214	
Hori.	925.139	QP	33.0	22.7	9.9	30.6	0.0	35.0	46.0	11.0	100	69	
Hori.	4882.000	PK	45.2	31.7	5.8	39.5	2.0	45.2	73.9	28.7	100	224	
Hori.	7323.000	PK	45.2	36.9	7.2	40.2	2.0	51.1	73.9	22.8	100	0	
Hori.	9764.000	PK	44.7	38.5	8.2	39.5	2.0	53.9	73.9	20.0	100	0	
Hori.	4882.000	AV	33.5	31.7	5.8	39.5	2.0	33.5	53.9	20.4	100	224	
Hori.	7323.000	AV	33.2	36.9	7.2	40.2	2.0	39.1	53.9	14.8	100	0	
Hori.	9764.000	AV	33.1	38.5	8.2	39.5	2.0	42.3	53.9	11.6	100	0	
Vert.	814.139	QP	37.0	22.3	9.3	31.2	0.0	37.4	46.0	8.6	100	52	
Vert.	925.112	QP	30.4	22.7	9.9	30.6	0.0	32.4	46.0	13.6	100	245	
Vert.	4882.000	PK	45.5	31.7	5.8	39.5	2.0	45.5	73.9	28.4	105	159	
Vert.	7323.000	PK	44.8	36.9	7.2	40.2	2.0	50.7	73.9	23.2	100	0	
Vert.	9764.000	PK	44.7	38.5	8.2	39.5	2.0	53.9	73.9	20.0	100	0	
Vert.	4882.000	AV	33.9	31.7	5.8	39.5	2.0	33.9	53.9	20.0	105	159	
Vert.	7323.000	AV	33.2	36.9	7.2	40.2	2.0	39.1	53.9	14.8	100	0	
Vert.	9764.000	AV	33.1	38.5	8.2	39.5	2.0	42.3	53.9	11.6	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.75\text{ m} / 3.0\text{ m}) = 2.0\text{ dB}$

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.	11008648S-E		
Date	November 5, 2015	November 11, 2015	November 12, 2015
Temperature / Humidity	25 deg. C / 37 % RH	24 deg. C / 41 % RH	23 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)	Hiroyuki Morikawa (13-26 GHz)	Hiroyuki Morikawa (30-1000 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.	333.062	QP	46.3	15.6	6.8	31.7	0.0	37.0	46.0	9.0	100	250	
Hori.	384.000	QP	43.0	17.2	7.1	31.7	0.0	35.6	46.0	10.4	100	127	
Hori.	396.002	QP	40.5	17.6	7.2	31.7	0.0	33.6	46.0	12.4	100	116	
Hori.	401.991	QP	44.8	17.7	7.2	31.7	0.0	38.0	46.0	8.0	100	230	
Hori.	853.207	QP	32.7	22.4	9.5	31.0	0.0	33.6	46.0	12.4	100	220	
Hori.	925.157	QP	32.8	22.7	9.9	30.6	0.0	34.8	46.0	11.2	100	70	
Hori.	2483.500	PK	46.9	27.9	13.8	41.0	2.0	49.6	73.9	24.3	177	12	
Hori.	4960.000	PK	45.5	32.0	5.8	39.4	2.0	45.9	73.9	28.0	100	224	
Hori.	7440.000	PK	45.1	37.0	7.2	40.4	2.0	50.9	73.9	23.0	100	0	
Hori.	9920.000	PK	44.0	38.4	8.2	39.4	2.0	53.2	73.9	20.7	100	0	
Hori.	2483.500	AV	33.7	27.9	13.8	41.0	2.0	36.4	53.9	17.5	177	12	
Hori.	4960.000	AV	35.2	32.0	5.8	39.4	2.0	35.6	53.9	18.3	100	224	
Hori.	7440.000	AV	33.0	37.0	7.2	40.4	2.0	38.8	53.9	15.1	100	0	
Hori.	9920.000	AV	32.1	38.4	8.2	39.4	2.0	41.3	53.9	12.6	100	0	
Vert.	814.138	QP	37.1	22.3	9.3	31.2	0.0	37.5	46.0	8.5	100	55	
Vert.	925.114	QP	30.4	22.7	9.9	30.6	0.0	32.4	46.0	13.6	100	248	
Vert.	2483.500	PK	47.8	27.9	13.8	41.0	2.0	50.5	73.9	23.4	245	329	
Vert.	4960.000	PK	45.5	32.0	5.8	39.4	2.0	45.9	73.9	28.0	100	234	
Vert.	7440.000	PK	44.9	37.0	7.2	40.4	2.0	50.7	73.9	23.2	100	0	
Vert.	9920.000	PK	44.2	38.4	8.2	39.4	2.0	53.4	73.9	20.5	100	0	
Vert.	2483.500	AV	33.8	27.9	13.8	41.0	2.0	36.5	53.9	17.4	245	329	
Vert.	4960.000	AV	35.0	32.0	5.8	39.4	2.0	35.4	53.9	18.5	100	234	
Vert.	7440.000	AV	33.1	37.0	7.2	40.4	2.0	38.9	53.9	15.0	100	0	
Vert.	9920.000	AV	32.2	38.4	8.2	39.4	2.0	41.4	53.9	12.5	100	0	

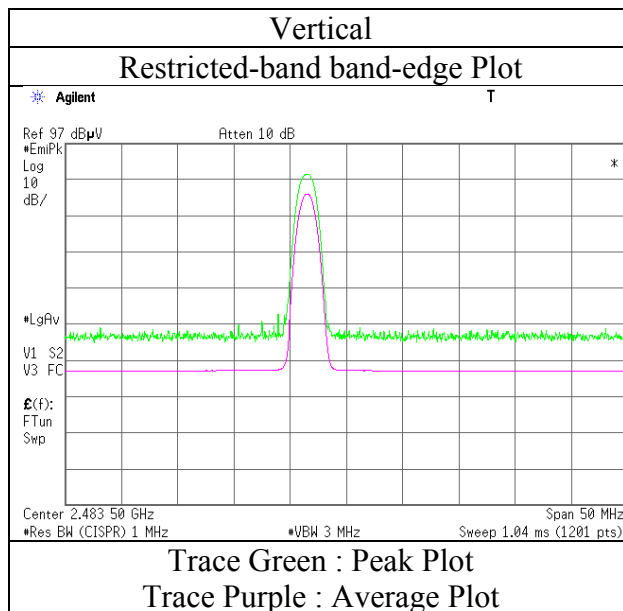
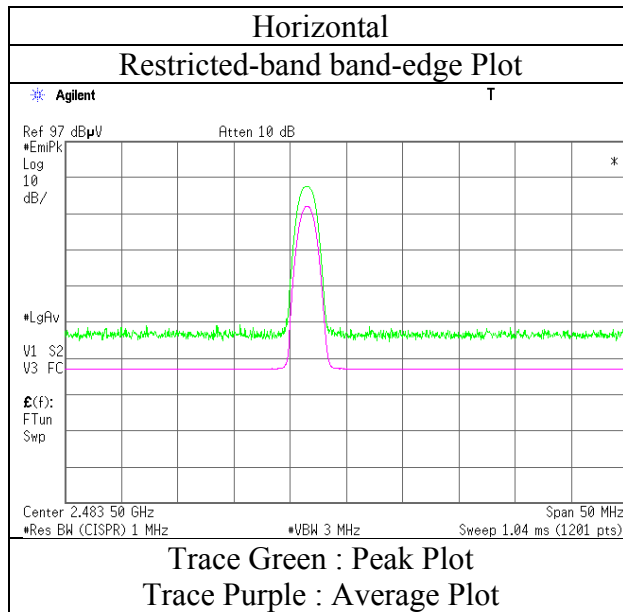
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.75\text{ m} / 3.0\text{ m}) = 2.0\text{ dB}$

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)

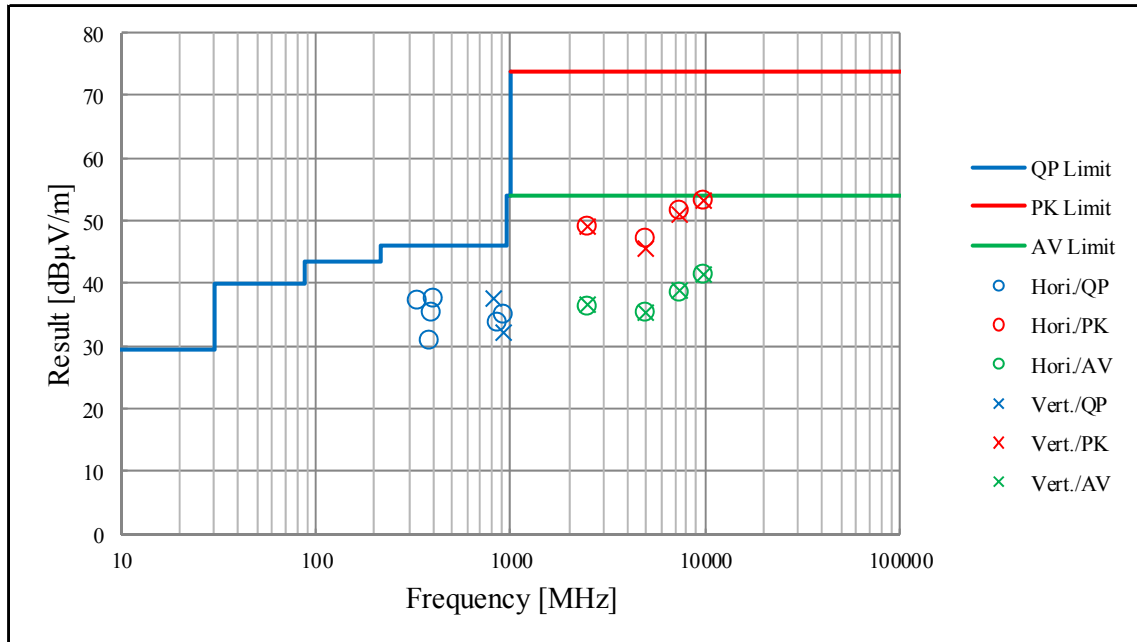
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11008648S-E
Date	November 5, 2015
Temperature / Humidity	25 deg. C / 37 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11008648S-E		
Date	November 5, 2015	November 11, 2015	November 12, 2015
Temperature / Humidity	25 deg. C / 37 % RH	24 deg. C / 41 % RH	23 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1-13 GHz)	Hiroyuki Morikawa (13-26 GHz)	Hiroyuki Morikawa (30-1000 MHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		

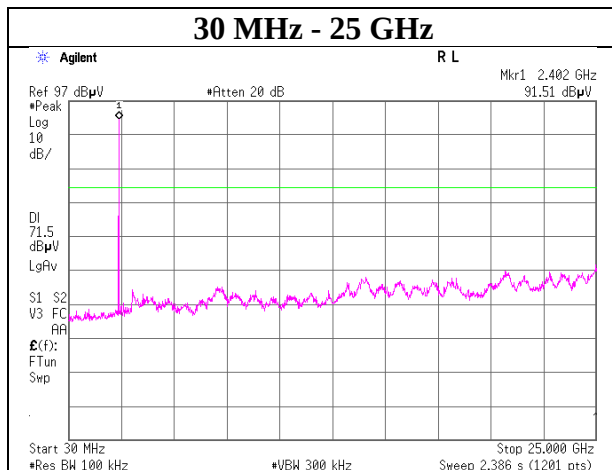
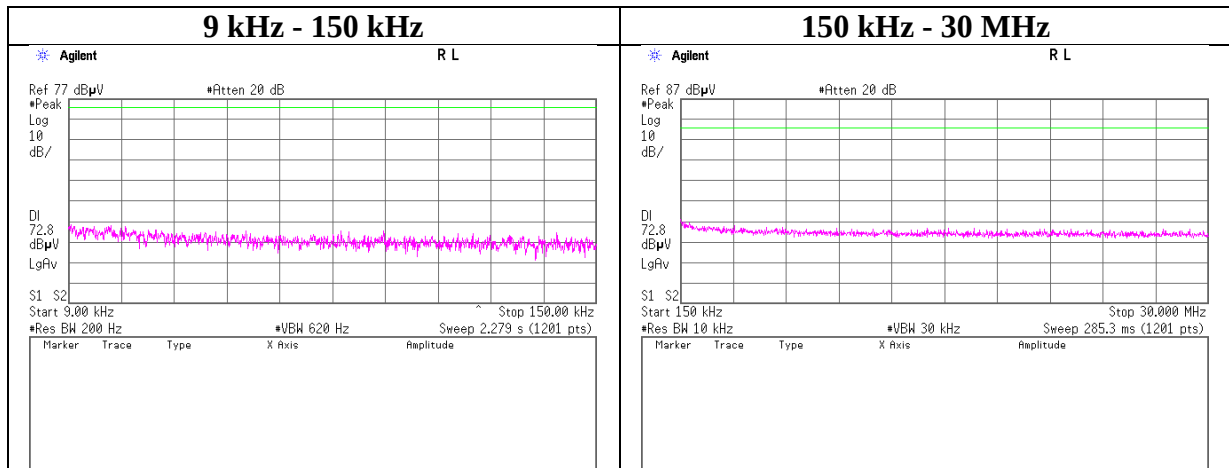


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, DH5

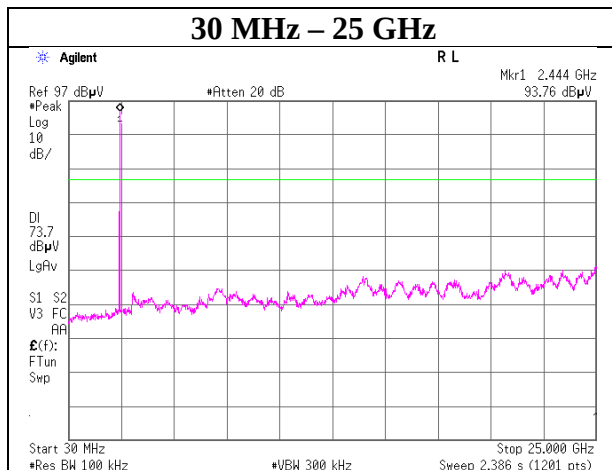
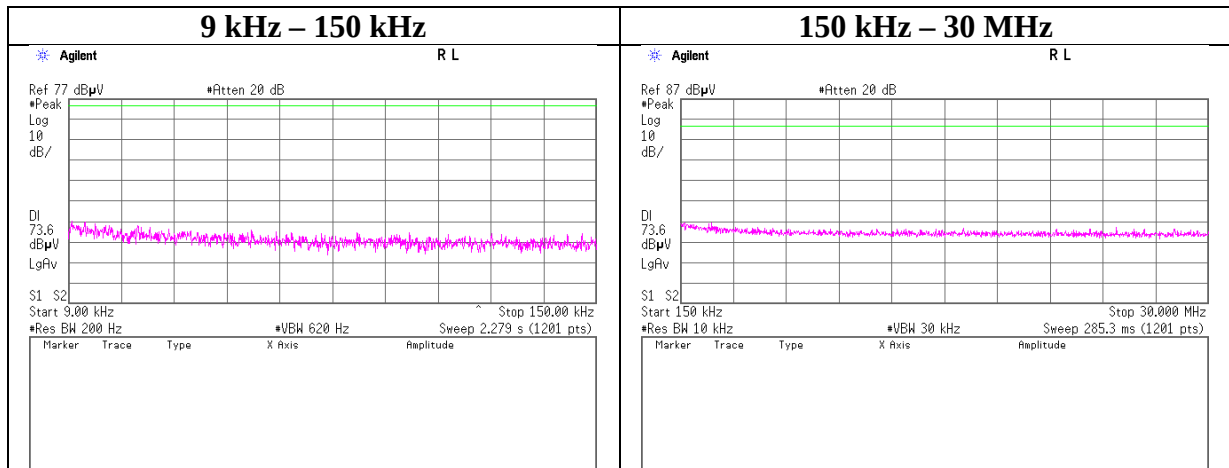
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

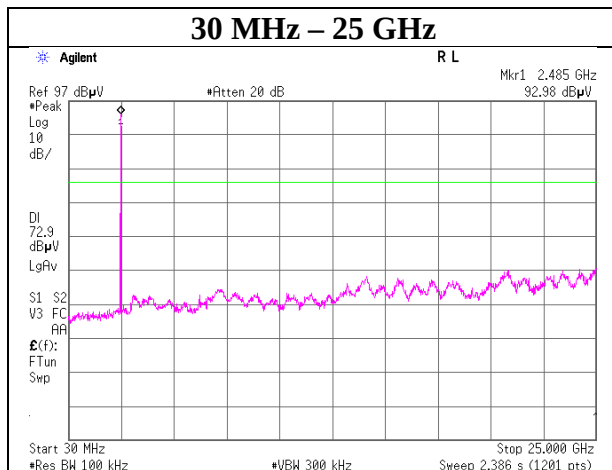
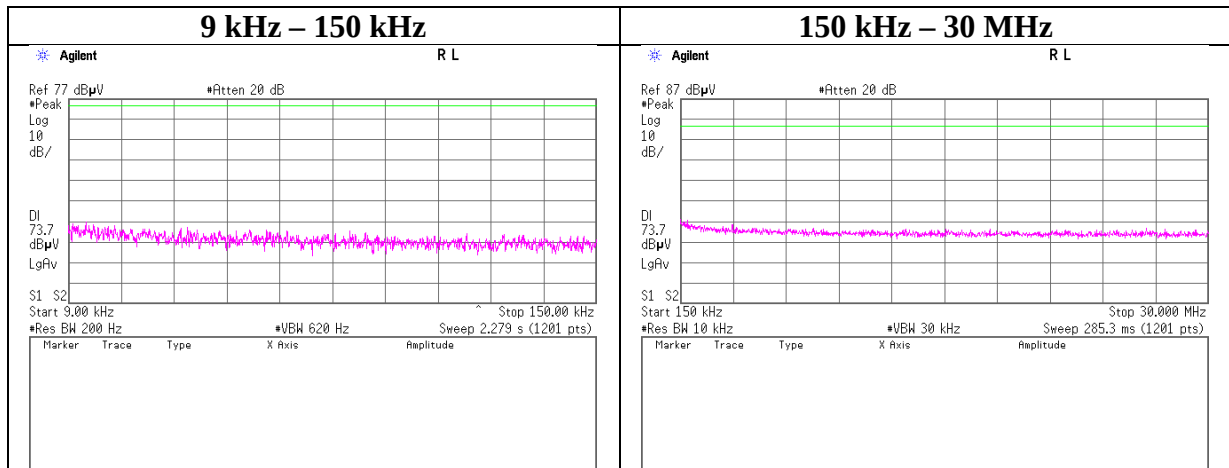
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, DH5

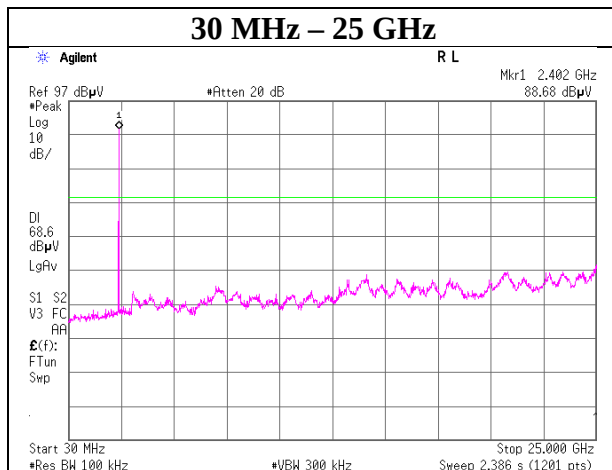
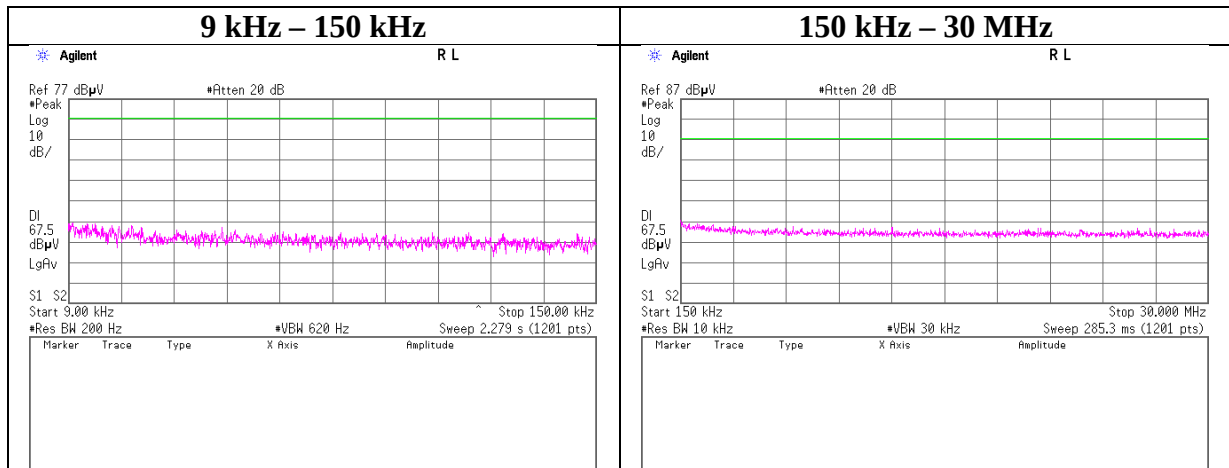
2480 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, 3DH5

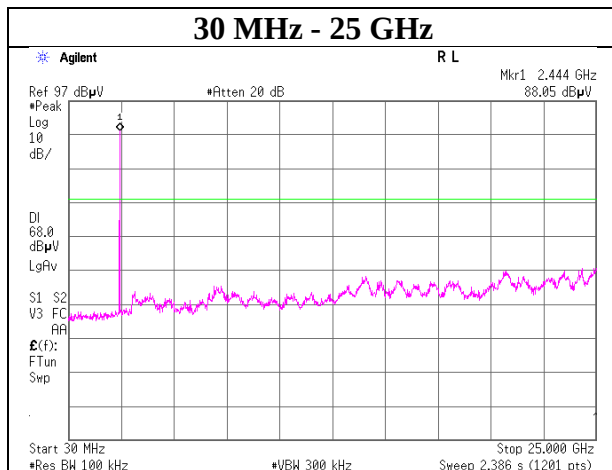
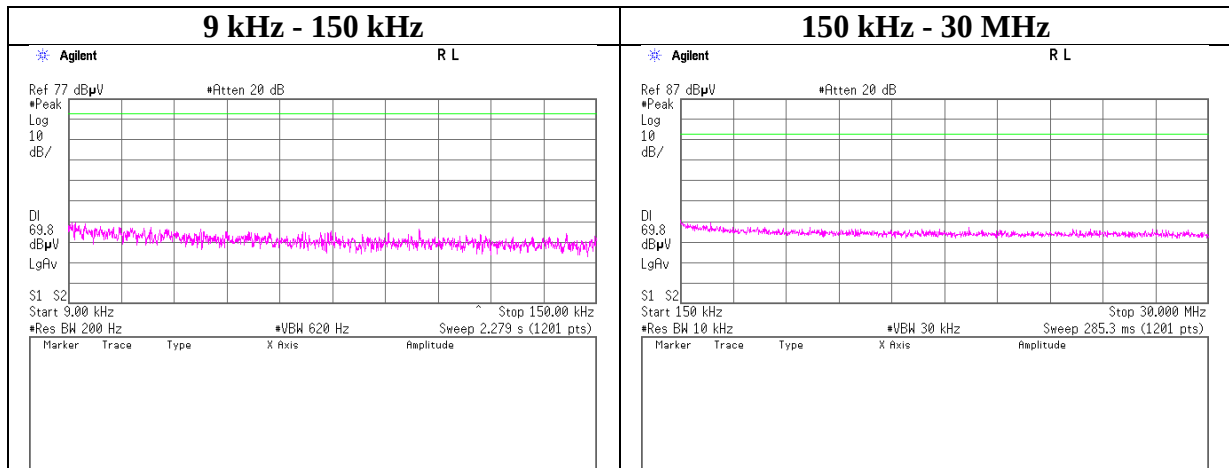
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, 3DH5

2441 MHz



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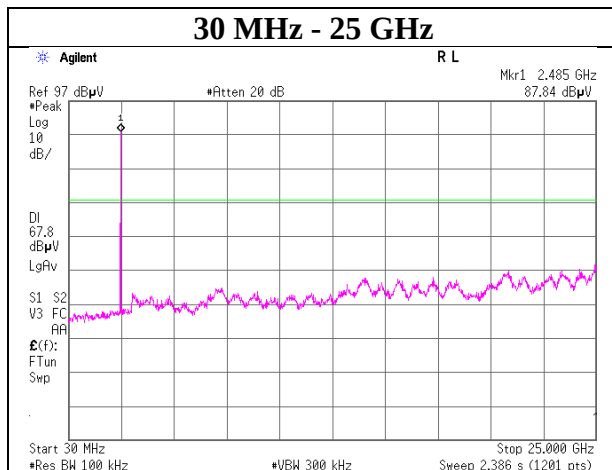
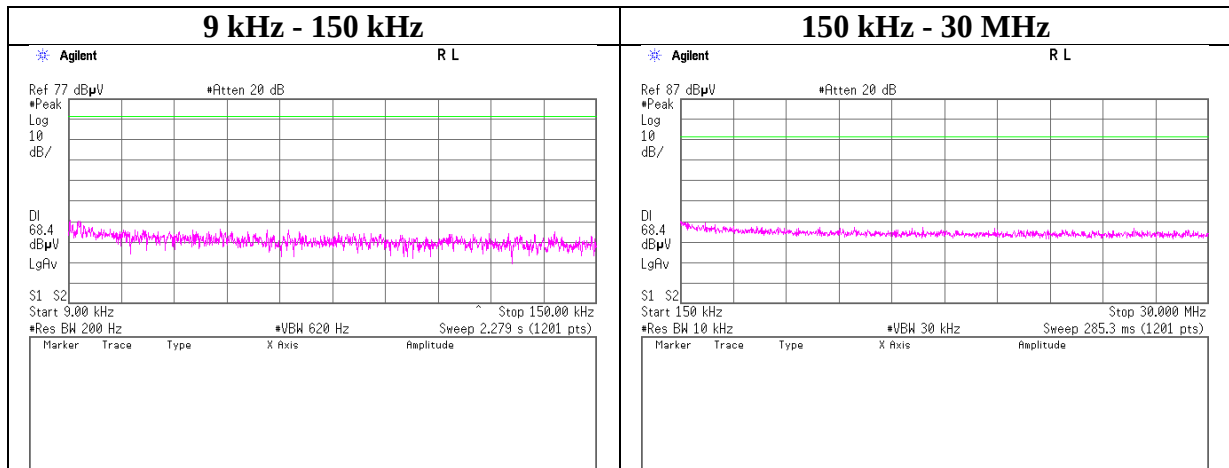
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off, 3DH5

2480 MHz



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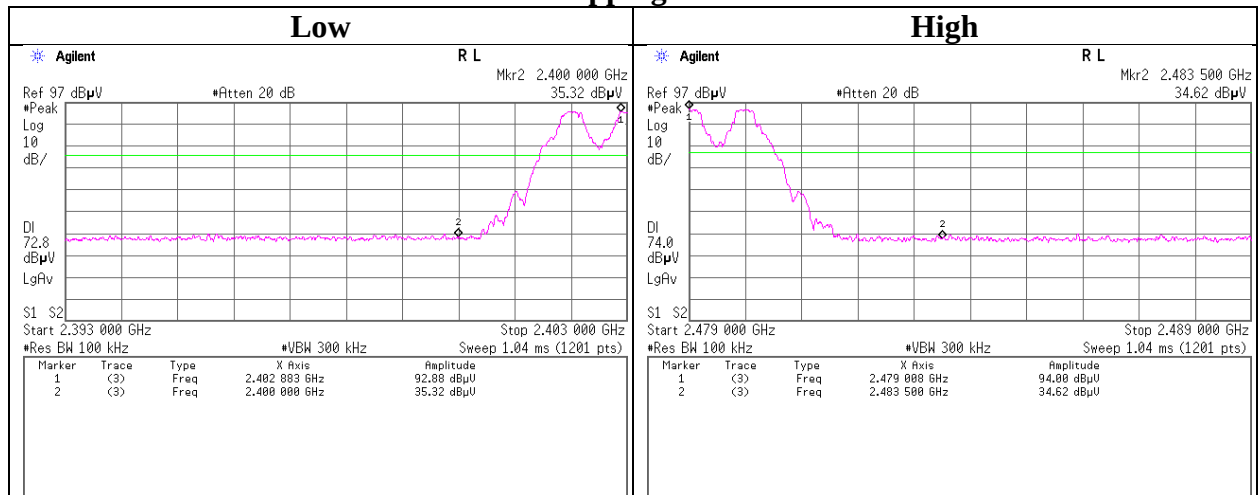
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

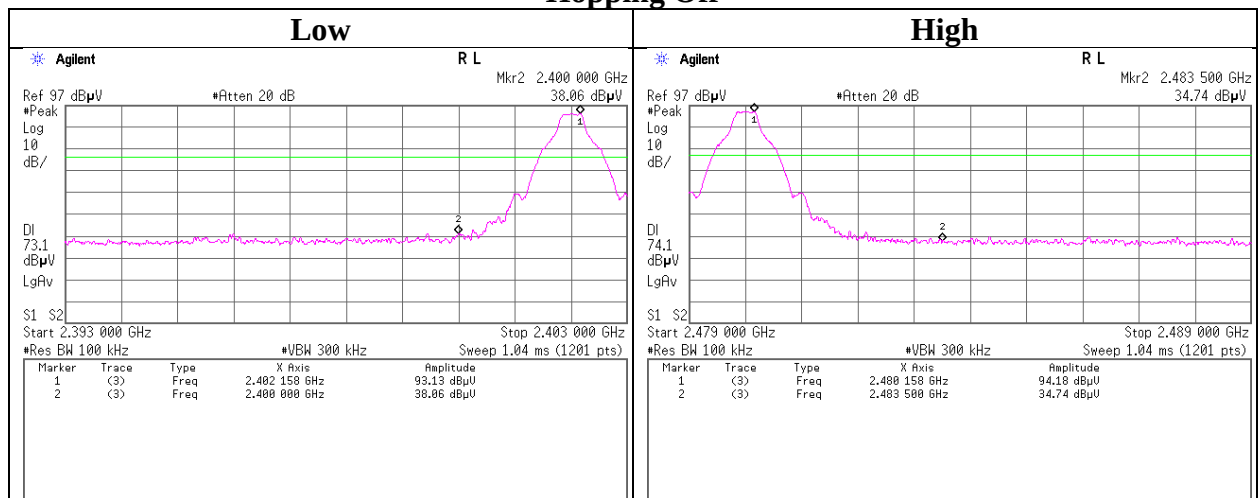
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx DH5

Hopping On



Hopping Off



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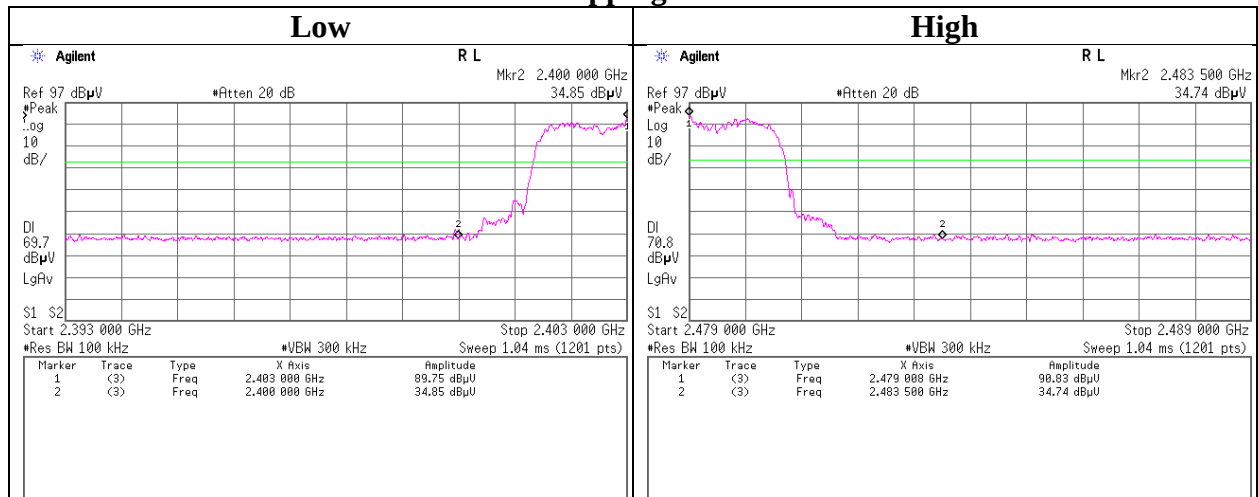
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

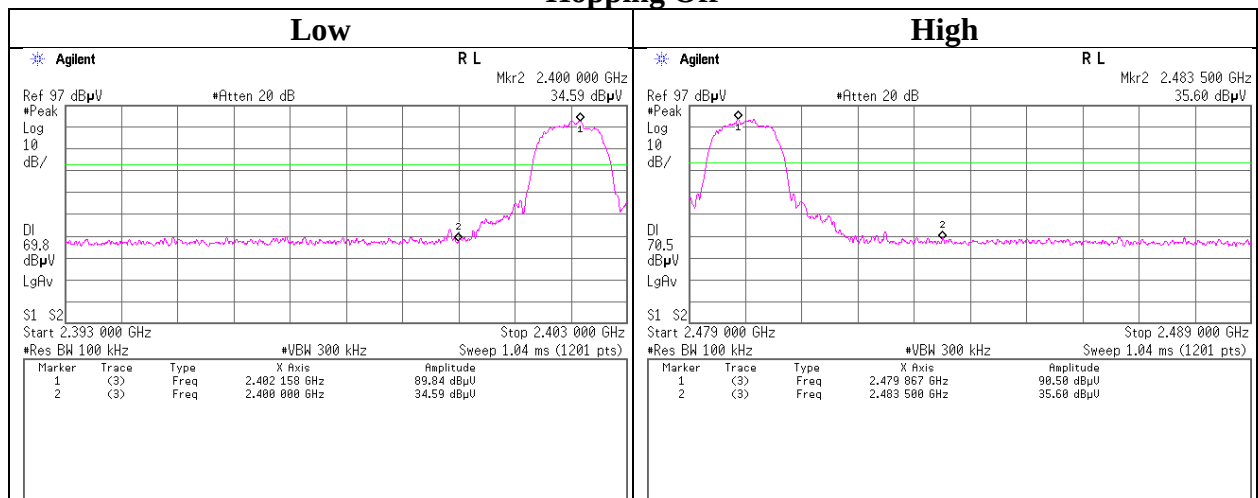
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx 3DH5

Hopping On



Hopping Off



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Shonan EMC Lab.

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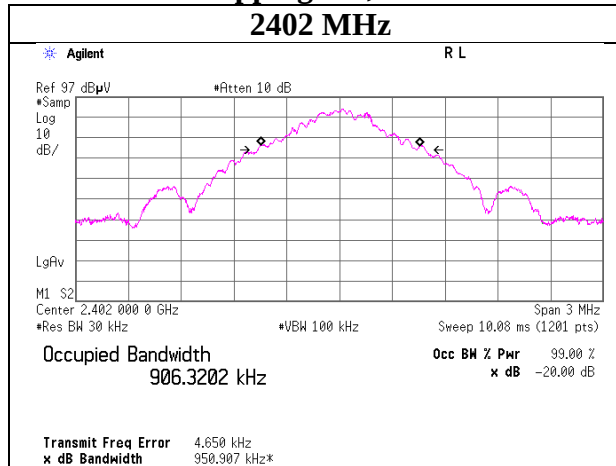
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

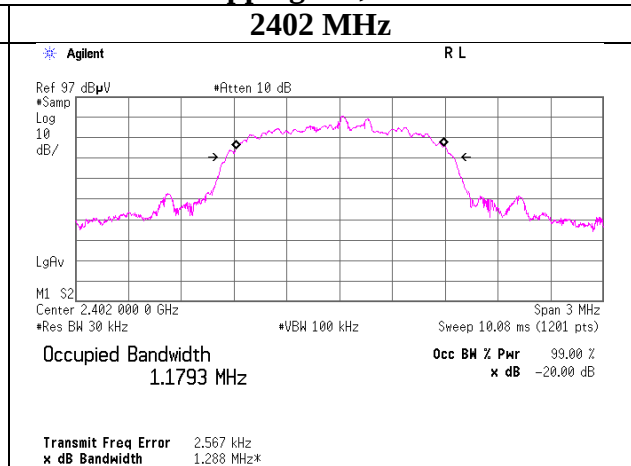
99%Occupied Bandwidth

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11008648S-E
Date : October 29, 2015
Temperature / Humidity : 23 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx Hopping Off

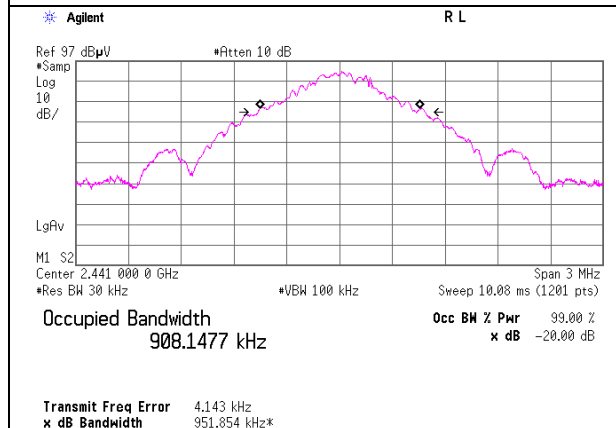
Hopping Off, DH5



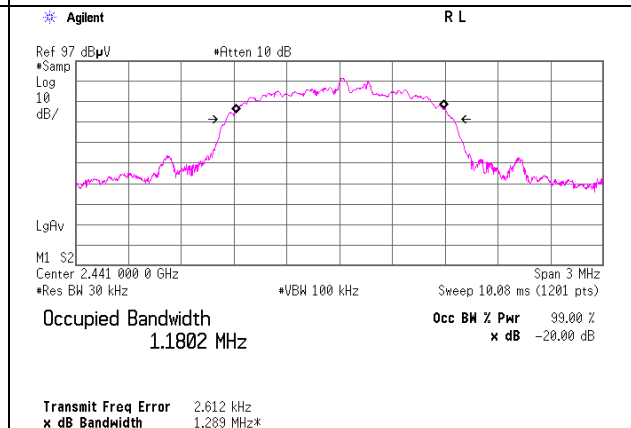
Hopping Off, 3DH5



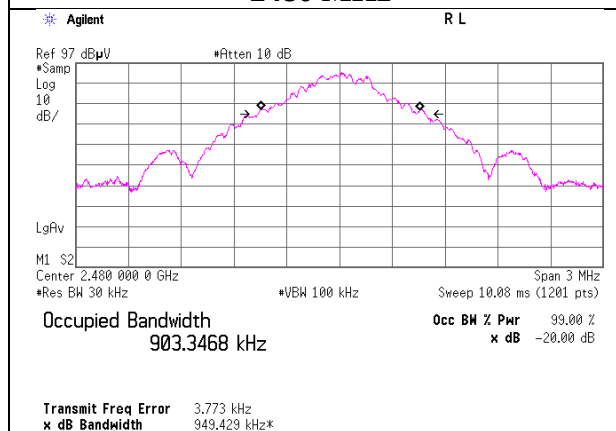
2441 MHz



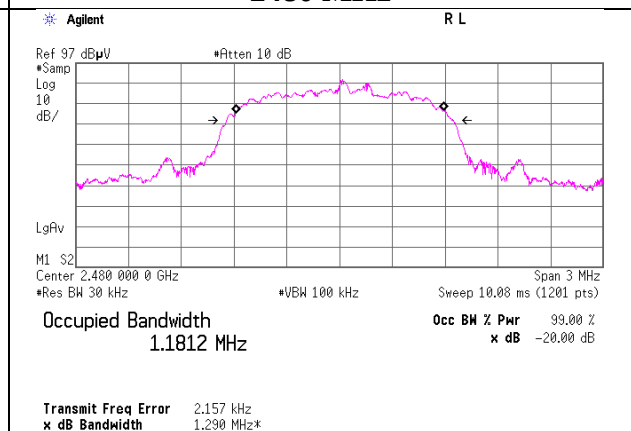
2441 MHz



2480 MHz



2480 MHz



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Shonan EMC Lab.

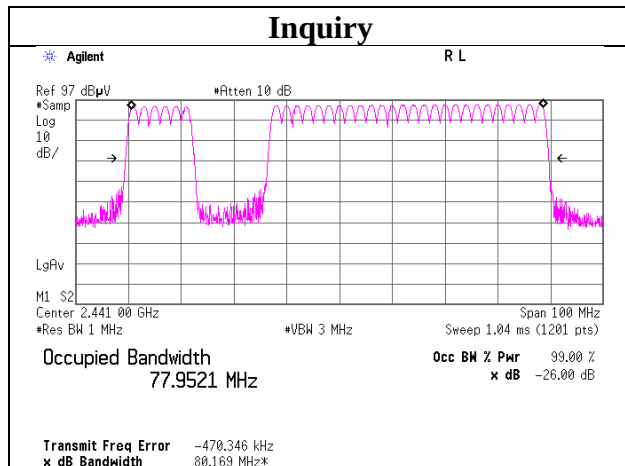
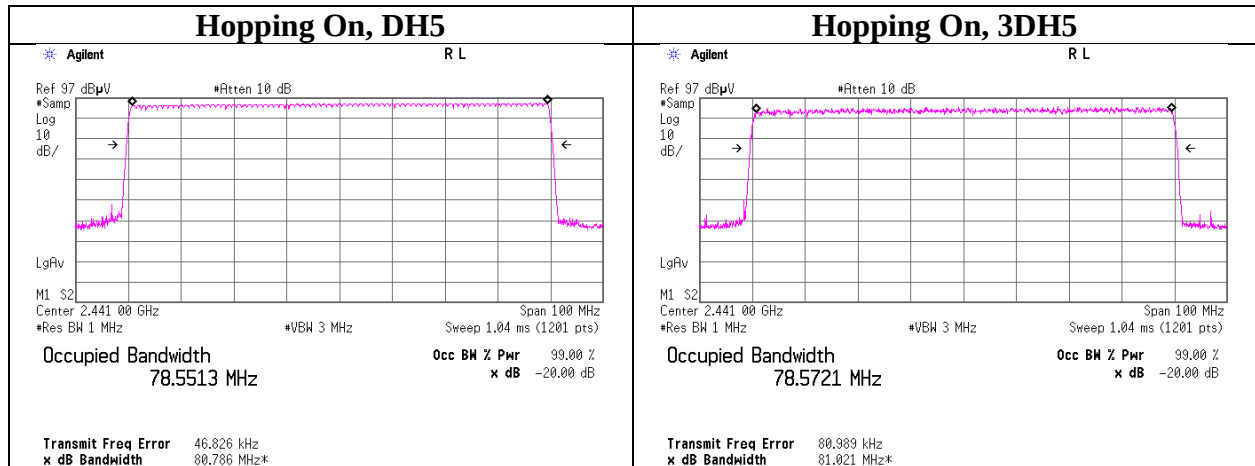
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11008648S-E
Date	October 29, 2015
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Yosuke Ishikawa
Mode	Tx Hopping On



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2015/08/28 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2015/05/27 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2015/06/08 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2015/05/19 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2015/08/11 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2015/03/23 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2015/11/18 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2015/02/18 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2015/02/18 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2015/08/31 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2015/11/02 * 12
SCC-B1/B3/B5/B7/B8/B13/SRS E-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2015/04/17 * 12
SCC-B2/B4/B6/B7/B8/B13/SRS E-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2015/04/17 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2015/11/03 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2015/10/22 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2015/09/04 * 12
SJM-14	Measure	ASKUL	-	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2015/07/15 * 12
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2015/03/10 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2015/09/08 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2015/05/11 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2015/05/19 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2015/08/10 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2015/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2015/03/17 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2015/03/11 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2015/09/16 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2015/04/02 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2015/04/02 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2015/03/11 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2015/11/04 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/12/24 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2015/11/18 * 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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