RADIO TEST REPORT

Test Report No. : 11854935S-B-R2

Applicant	:	**PIONEER CORPORATION**
Type of Equipment	:	**MAIN UNIT**
Model No.	:	**D172G5**
FCC ID	:	**AJDK104**
Test regulation	:	**FCC Part 15 Subpart C: 2017**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11854935S-B-R1.

Date of test: July 24 and 25, 2017

Representative test engineer:
Y. Ishikawa
Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by:
A. Hayashi
Akio Hayashi
Leader
Consumer Technology Division

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

RTL02610

REVISION HISTORY

Original Test Report No.: 11854935S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11854935S-B	August 28, 2017	-	-
1	11854935S-B-R1	September 13, 2017	4	Correction of Operating Temperature.
2	11854935S-B-R2	September 19, 2017	4 14	Correction of Antenna type. Correction of Data.

CONTENTS PAGE

SECTION 1: Customer information....4
SECTION 2: Equipment under test (E.U.T.)....4
SECTION 3: Test specification, procedures & results....5
SECTION 4: Operation of E.U.T. during testing....8
SECTION 5: Radiated Spurious Emission....11
SECTION 6: Antenna Terminal Conducted Tests....13
APPENDIX 1: Test data....14
20dB Bandwidth and Carrier Frequency Separation....14
Number of Hopping Frequency....17
Dwell time....19
Maximum Peak Output Power....22
Average Output Power....23
Burst Rate Confirmation....24
Radiated Spurious Emission....25
Conducted Spurious Emission....36
Conducted Emission Band Edge compliance....42
99%Occupied Bandwidth....44
APPENDIX 2: Test instruments....46
APPENDIX 3: Photographs of test setup....47
Radiated Spurious Emission....47

SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Address	:	25-1, Yamada, Kawagoe-shi, Saitama-ken 350-8555, JAPAN
Telephone Number	:	+81-49-228-7787
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	:	MAIN UNIT
Model No.	:	D172G5
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	July 22, 2017
Country of Mass-production	:	Japan
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: D172G5 (referred to as the EUT in this report) is a MAIN UNIT.

Clock frequency(ies) in the system	:	Oscillator	(Module) 0.032768 MHz
		Internal Communication	(Module) 195 MHz

Radio Specification

Bluetooth

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	GFSK, π/ 4DQPSK, 8DPSK
Power Supply (radio part input)	:	DC 3.3 V / 1.8 V
Antenna type	:	inverted F type
Antenna Gain	:	2.94 dBi (max)
Operating Temperature	:	-20 deg. C to +65 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	N/A	N/A	N/A*1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		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 (b)		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	9.3 dB 9920.000 MHz, AV, Hori. Tx 3DH5, 2480 MHz 9.3 dB 9920.000 MHz, AV, Vert. Tx 3DH5, 2480 MHz	Complied	Conducted/ Radiated (above 30 MHz) *1)

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 does not have AC power ports.
*2) Radiated test was selected over 30 MHz based on section 15.247(d)

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3 V / 1.8 V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, Therefore this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique coupling/antenna connector (U.FL). Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

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

Radiated emission test

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

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610

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

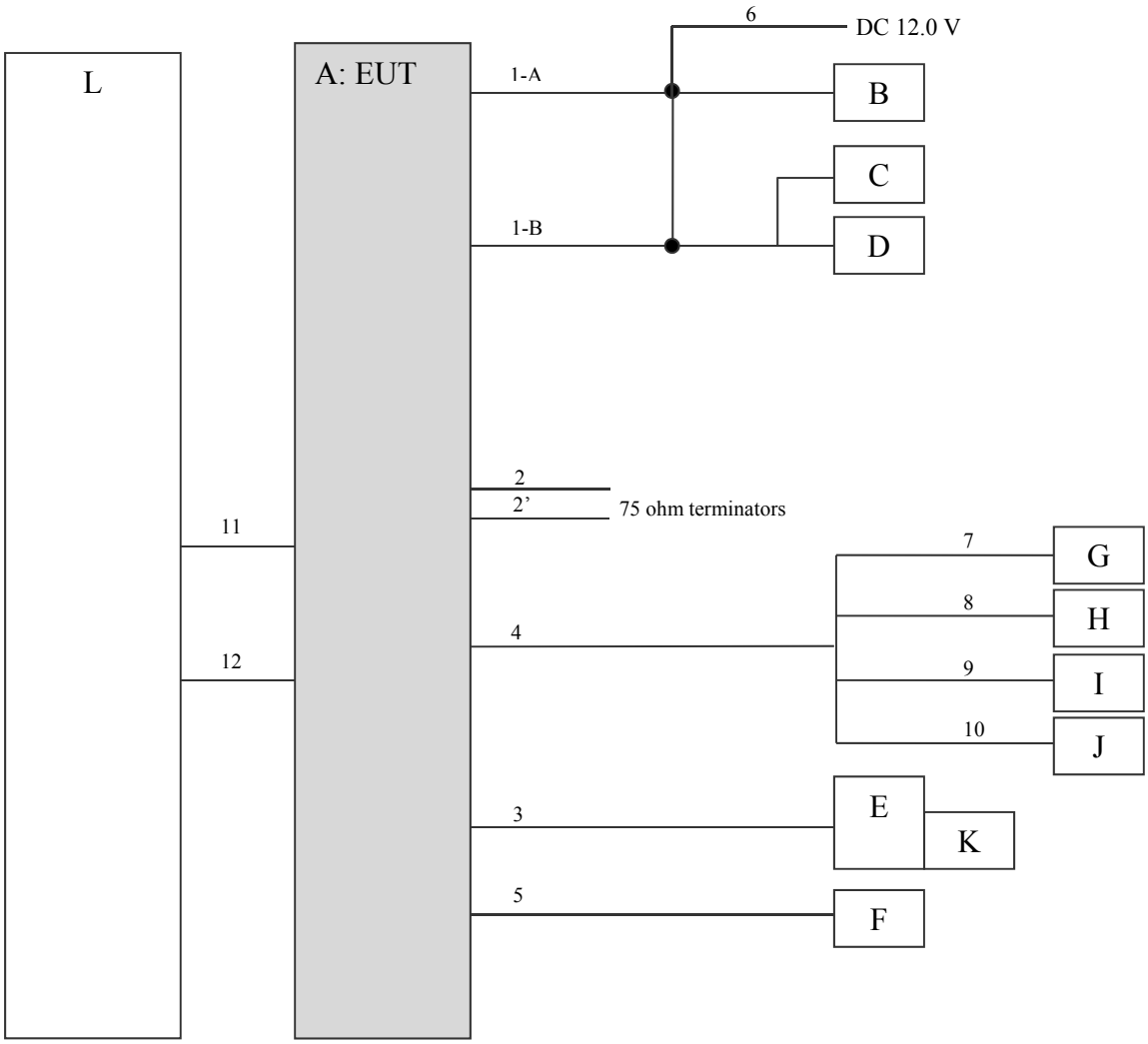
Details of Operating Mode(s)

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 (2 Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.

*EUT has the power settings by the software as follows;
Power settings: Table Index (Fixed)
Software: BT: B080
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	MAIN UNIT	D172G5	AABB999998CS *1) AABB999999CS *2)	PIONEER	EUT
B	Steering SW	-	-	-	-
C	Mic	-	-	-	-
D	Rear Camera	-	-	-	-
E	USB	-	-	-	-
F	GPS Antenna	86860-71011	-	AISIN	-
G	Speaker	TS-F1030	V44QAH2	PIONEER	-
H	Speaker	TS-F1030	V44QAH2	PIONEER	-
I	Speaker	TS-F1030	V44QBA1	PIONEER	-
J	Speaker	TS-F1030	V44QBA1	PIONEER	-
K	USB Memory	-	-	-	-
L	Display	-	-	PIONEER	-

*1) Used for Radiated Emission test
*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1-A	Wire Harness Set	1.0	Unshielded	Unshielded	-
1-B	Wire Harness	1.0	Unshielded	Unshielded	-
2, 2’	Radio antenna	1.5	Shielded	Shielded	-
3	USB connector	1.1	Shielded	Shielded	-
4	Speaker	1.1	Unshielded	Unshielded	-
5	GPS antenna connector	1.7	Shielded	Shielded	-
6	DC	1.0	Shielded	Unshielded	-
7	Speaker	2.0	Unshielded	Unshielded	-
8	Speaker	2.0	Unshielded	Unshielded	-
9	Speaker	2.0	Unshielded	Unshielded	-
10	Speaker	2.0	Unshielded	Unshielded	-
11	Flat cable	0.5	Unshielded	Unshielded	-
12	Flat cable	0.5	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.25 m by 0.25 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.87 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.87 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)

*1) Although 00-705 accepts VBW = 10 Hz for AV measurements, confirmed that superfluous smoothing was not performed.
*2) Distance Factor: 20 x log (3.87 m/3.0 m) = 2.22 dB
*3) Distance Factor: 20 x log (1.0 m/3.0 m) = -9.54 dB

The carrier level and noise levels were confirmed at angle of 0 deg. to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Worst case:

Antenna polarization	Carrier (Band edge)	Spurious		
		Below 1 GHz	Above 1 GHz	
			1 GHz - 18 GHz	18 GHz – 26.5 GHz
Horizontal	0 deg.	30 deg.	0 deg.	0 deg.
Vertical	0 deg.	30 deg.	0 deg.	0 deg.

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

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

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
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	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50 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 *3)	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 %. Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) 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)

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.032	1.000	>= 0.688
DH5	2441.0	1.030	1.000	>= 0.686
DH5	2480.0	1.026	1.000	>= 0.684
3DH5	2402.0	1.315	1.000	>= 0.877
3DH5	2441.0	1.327	1.000	>= 0.885
3DH5	2480.0	1.315	1.000	>= 0.876

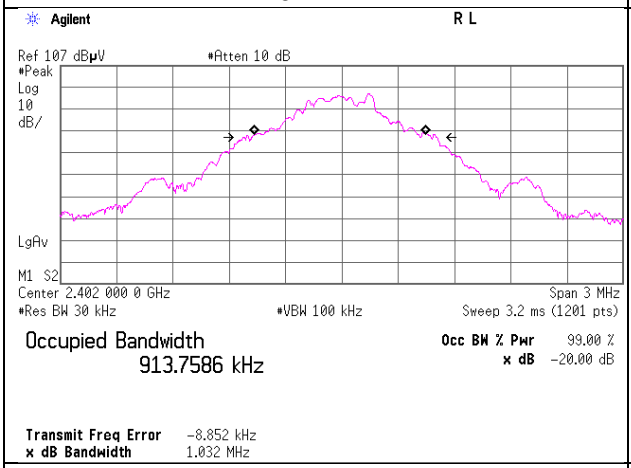
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation

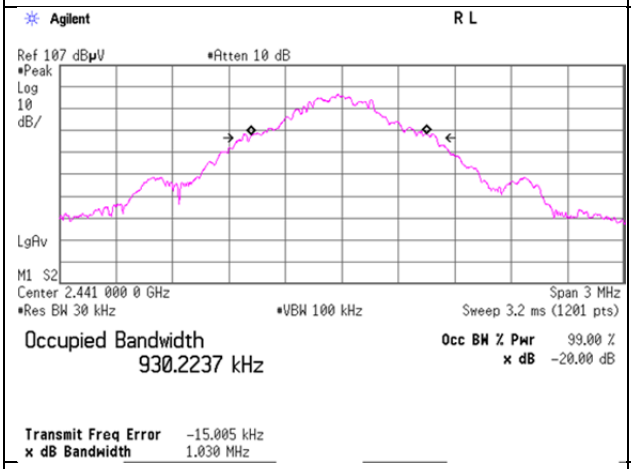
DH5

20 dB Bandwidth

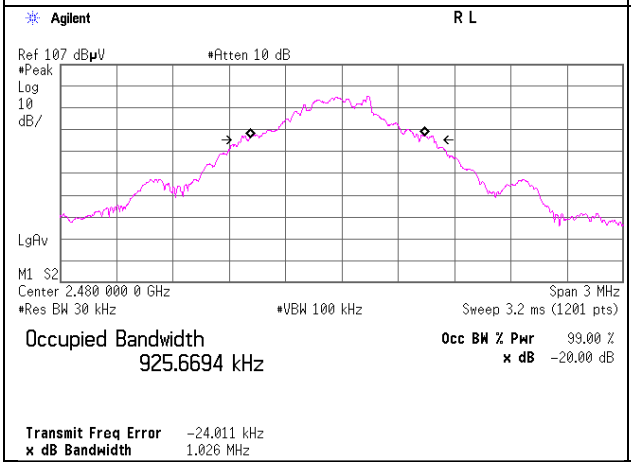
2402 MHz



2441 MHz

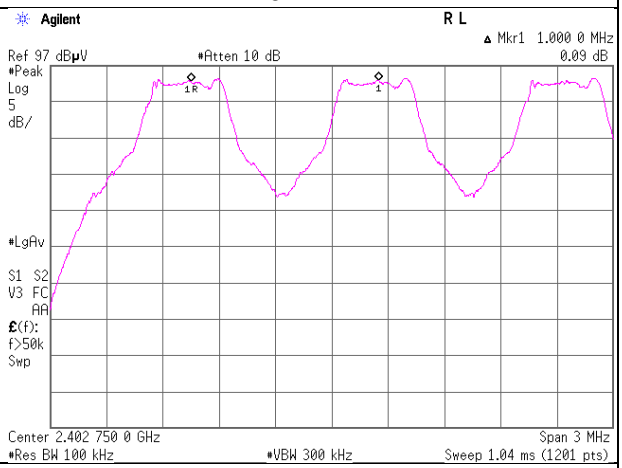


2480 MHz



Carrier Frequency Separation

2402 MHz



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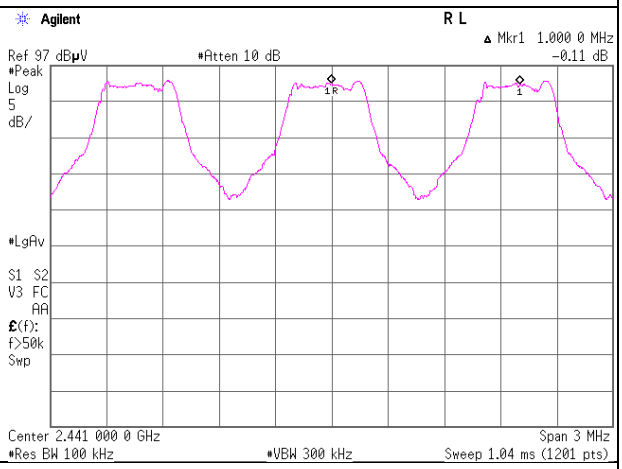

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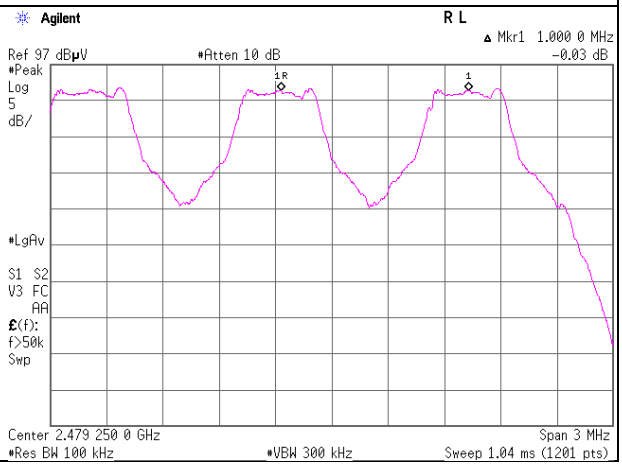
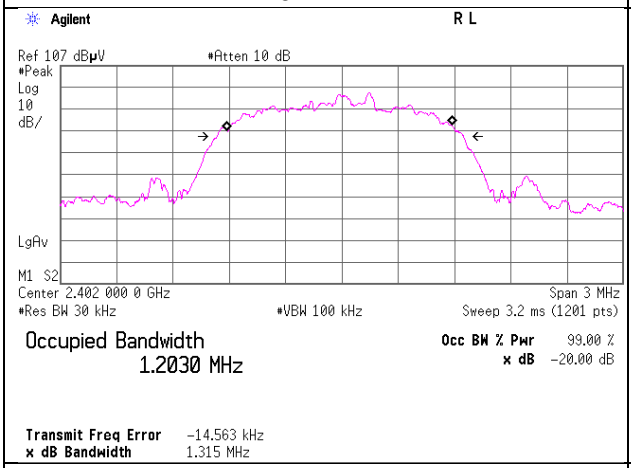


20dB Bandwidth and Carrier Frequency Separation

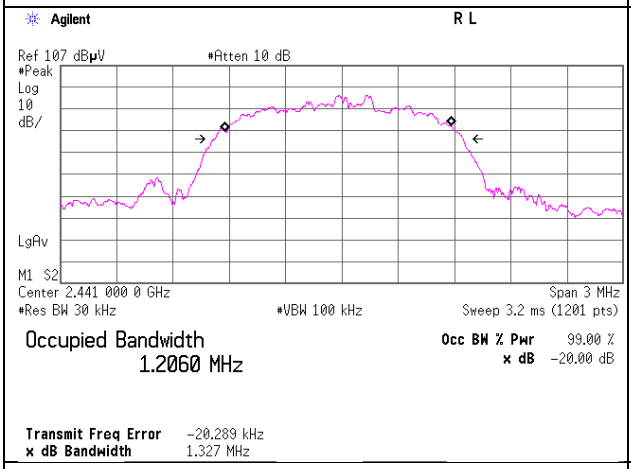
3DH5

20 dB Bandwidth

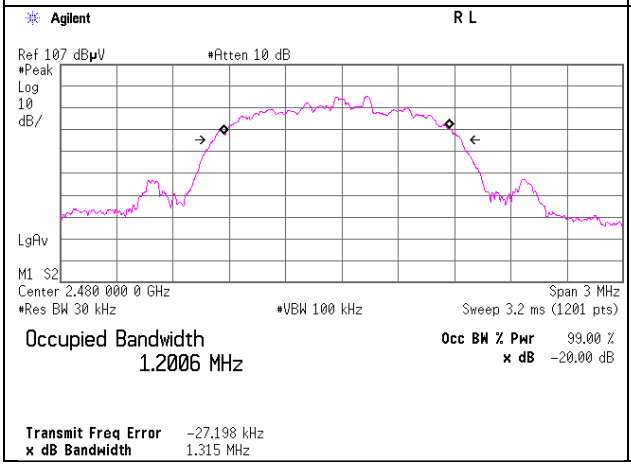
2402 MHz



2441MHz

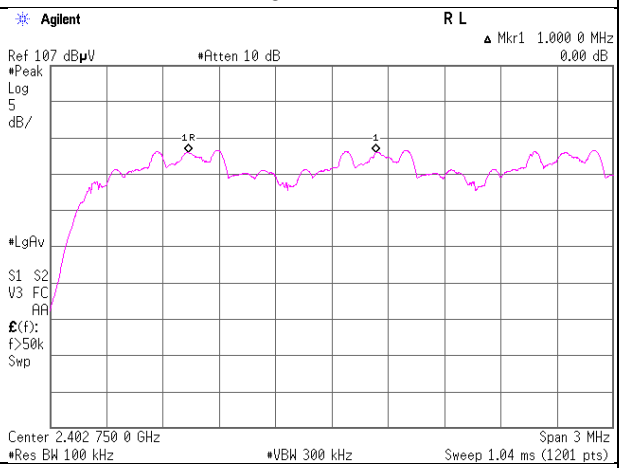


2480MHz

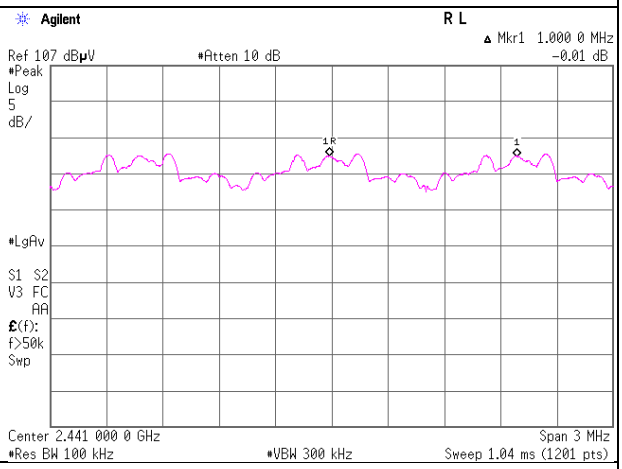


Carrier Frequency Separation

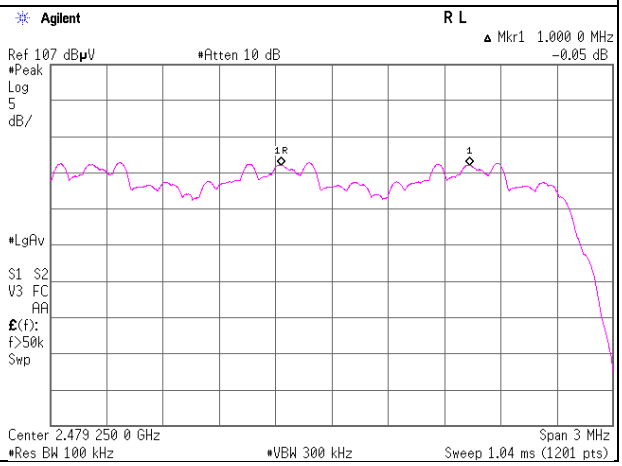
2402 MHz



2441 MHz



2480 MHz



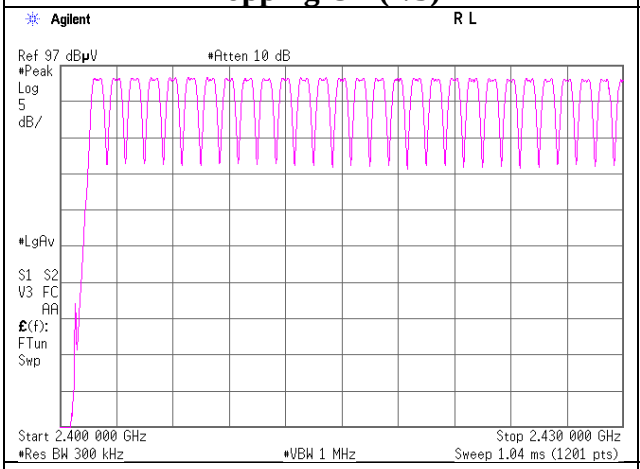
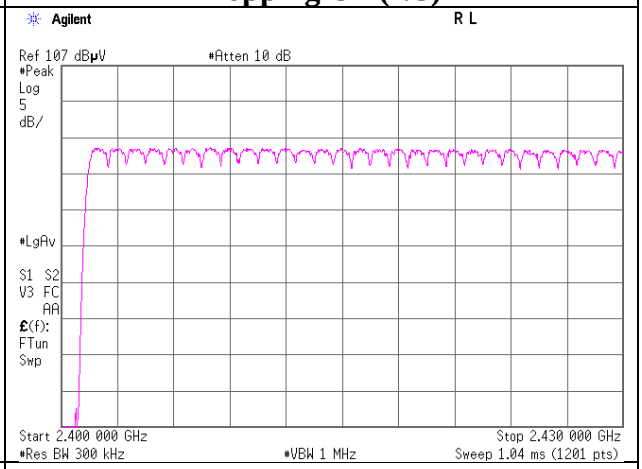
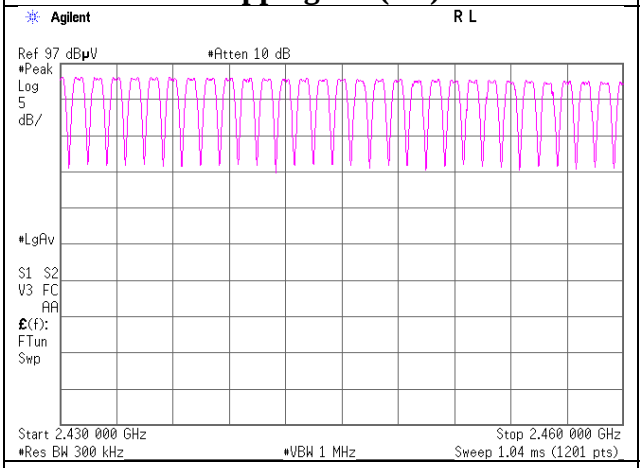
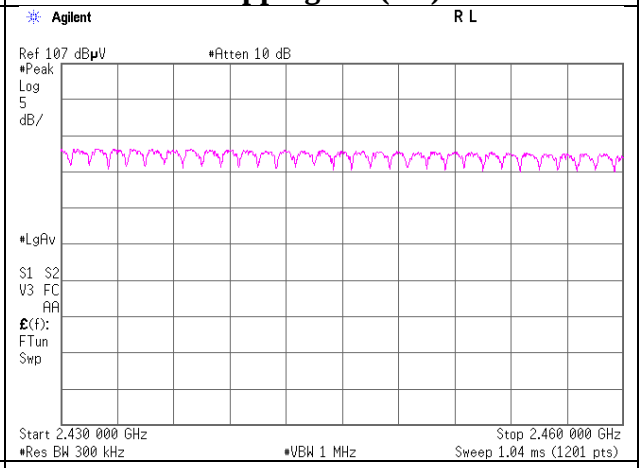
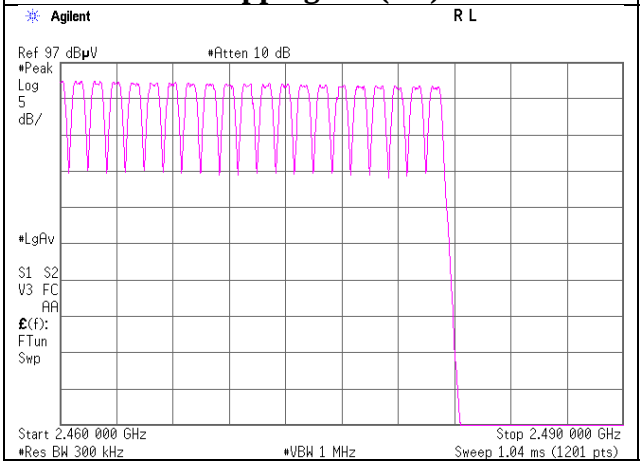
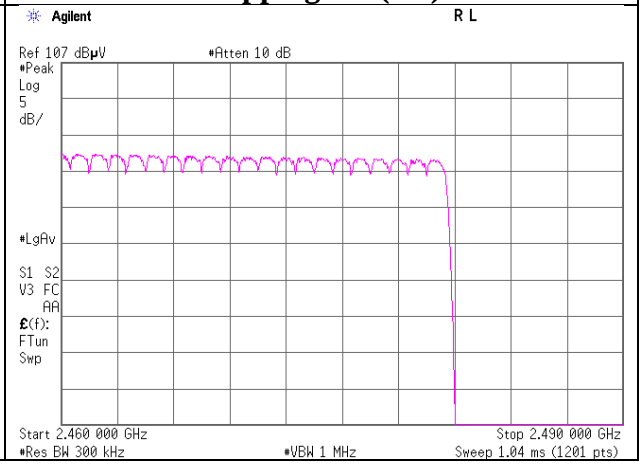
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping On

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

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

Number of Hopping Frequency

DH5	3DH5
Hopping On (1/3)	**Hopping On (1/3)**
	
Hopping On (2/3)	**Hopping On (2/3)**
	
Hopping On (3/3)	**Hopping On (3/3)**
	

Dwell time

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.420	136	400
DH3	27.2 times / 5 sec. x 31.6 sec. = 172 times	1.693	291	400
DH5	18.6 times / 5 sec. x 31.6 sec. = 118 times	2.957	349	400
3DH1	49.6 times / 5 sec. x 31.6 sec. = 314 times	0.427	134	400
3DH3	25.4 times / 5 sec. x 31.6 sec. = 161 times	1.680	270	400
3DH5	21.2 times / 5 sec. x 31.6 sec. = 134 times	2.929	392	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

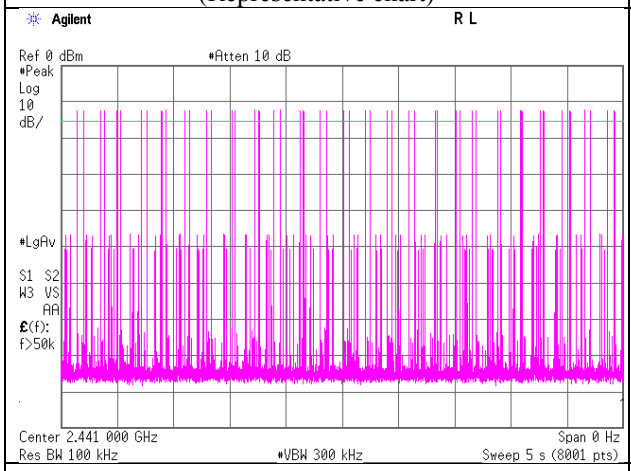
Mode	Sampling [times] 1	2	3	4	5	Average [times]
DH1	50	51	51	51	52	51
DH3	27	26	26	29	28	27.2
DH5	16	17	21	18	21	18.6
3DH1	50	51	49	51	47	49.6
3DH3	26	28	24	23	26	25.4
3DH5	25	18	25	12	26	21.2

Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

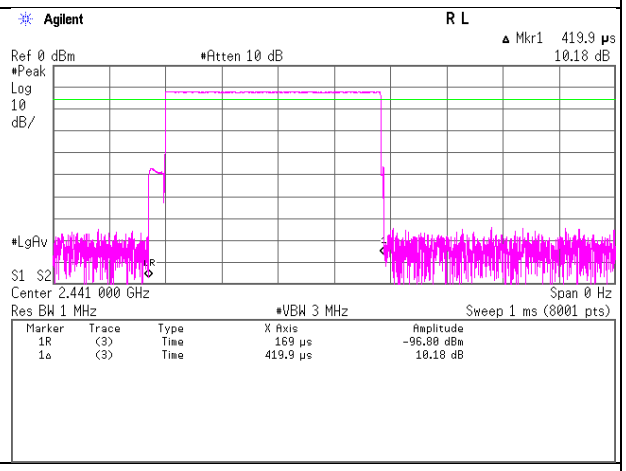
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

Dwell time

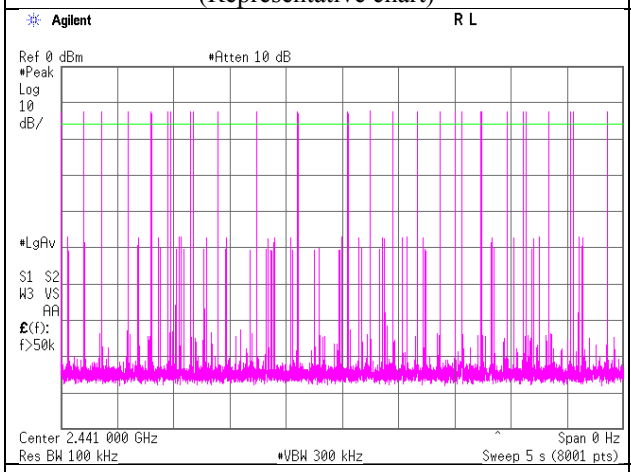
DH1 (1/2)
(Representative chart)



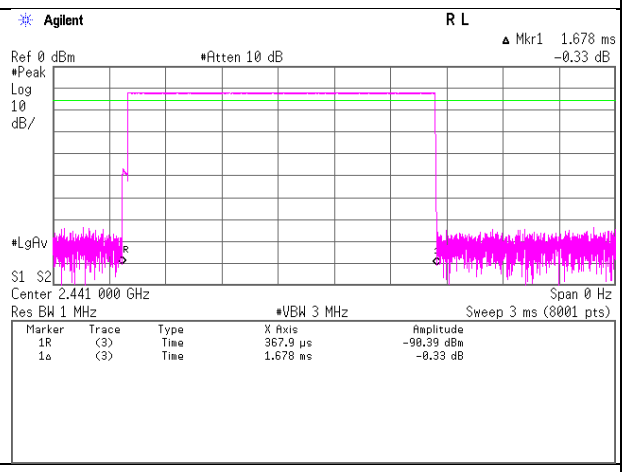
DH1 (2/2)



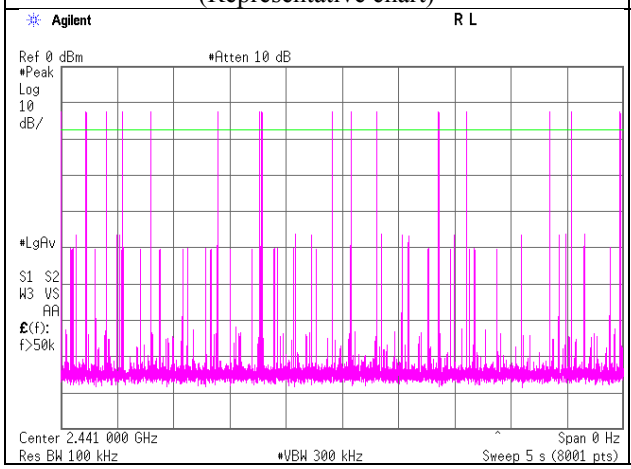
DH3 (1/2)
(Representative chart)



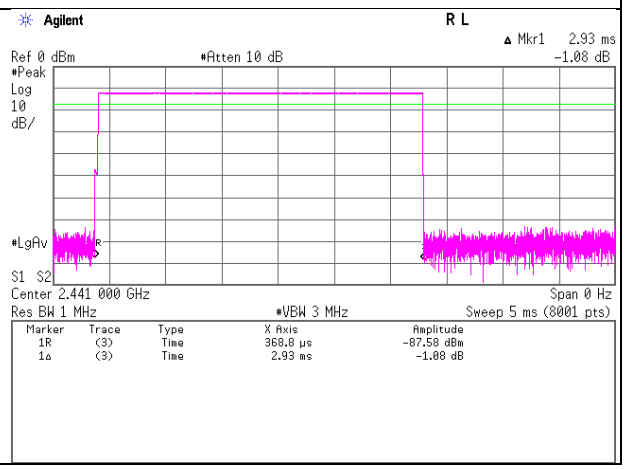
DH3 (2/2)



DH5 (1/2)
(Representative chart)

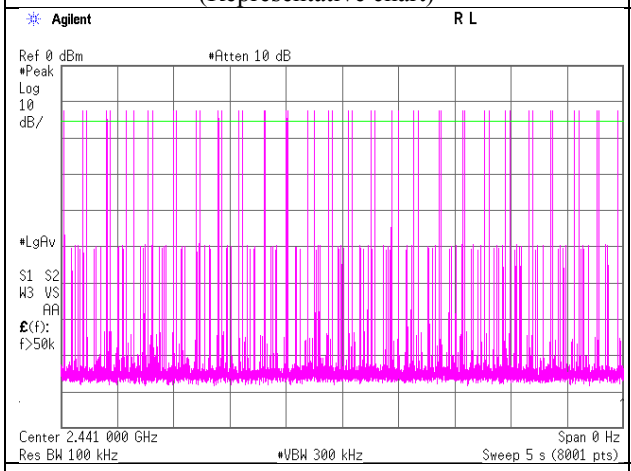


DH5 (2/2)

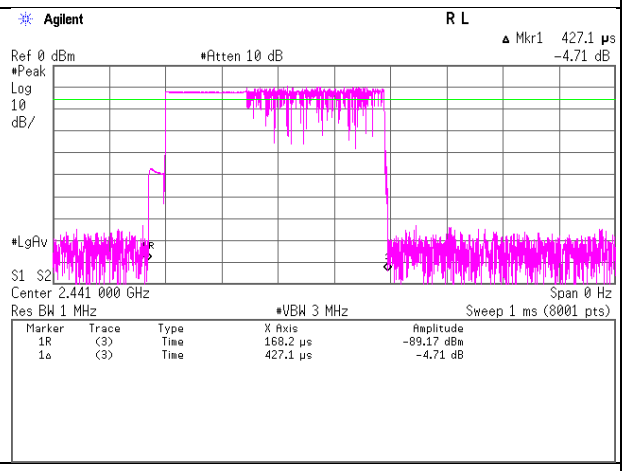


Dwell time

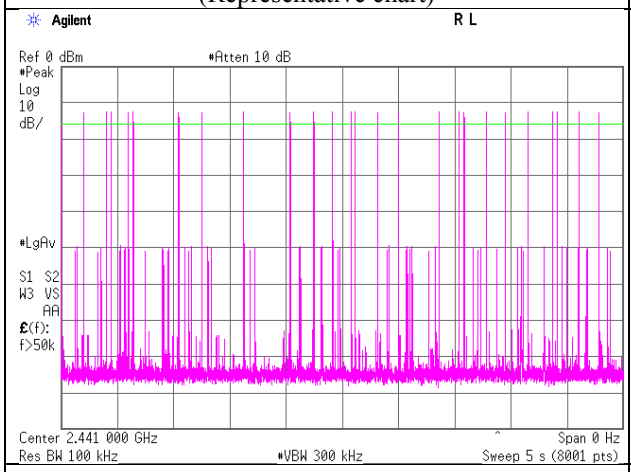
3DH1 (1/2)
(Representative chart)



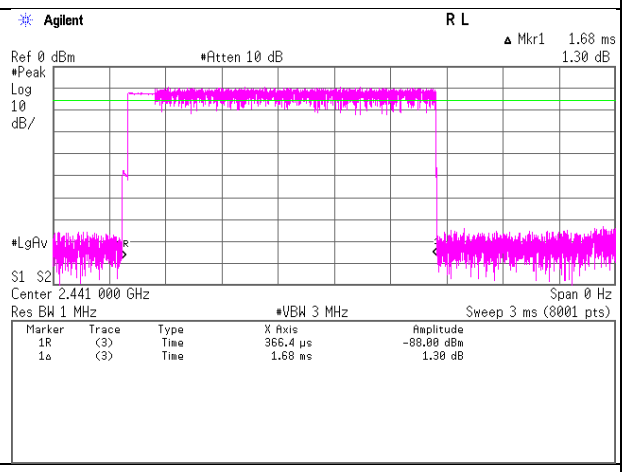
3DH1 (2/2)



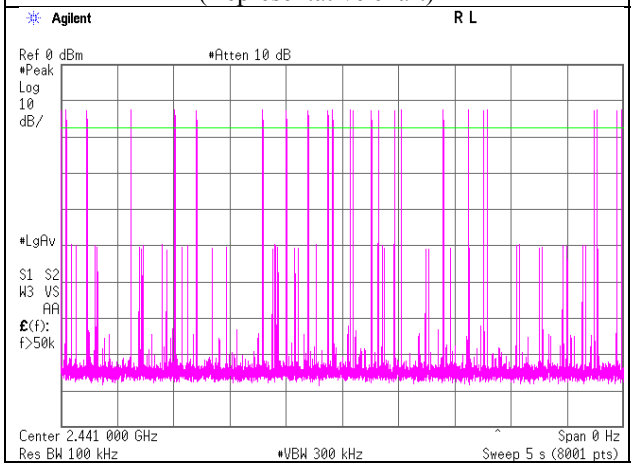
3DH3 (1/2)
(Representative chart)



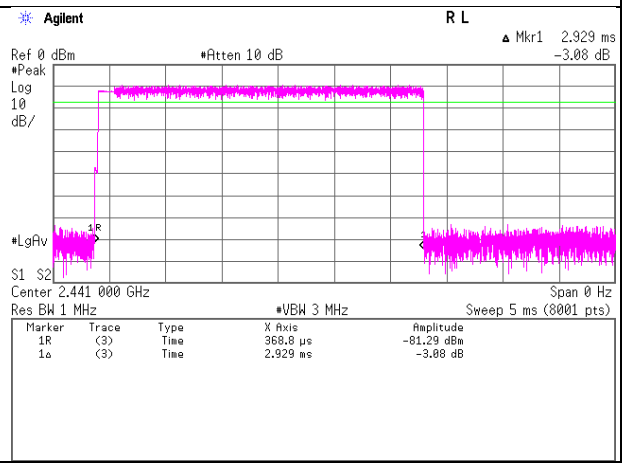
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
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	-11.42	1.87	9.64	0.09	1.02	20.96	125	20.87
DH5	2441.0	-11.68	1.88	9.64	-0.16	0.96	20.96	125	21.12
DH5	2480.0	-12.72	1.89	9.65	-1.18	0.76	20.96	125	22.14
2DH5	2402.0	-8.79	1.87	9.64	2.72	1.87	20.96	125	18.24
2DH5	2441.0	-9.25	1.88	9.64	2.27	1.69	20.96	125	18.69
2DH5	2480.0	-10.46	1.89	9.65	1.08	1.28	20.96	125	19.88
3DH5	2402.0	-8.57	1.87	9.64	2.94	1.97	20.96	125	18.02
3DH5	2441.0	-8.99	1.88	9.64	2.53	1.79	20.96	125	18.43
3DH5	2480.0	-10.21	1.89	9.65	1.33	1.36	20.96	125	19.63

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

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402.0	-12.92	1.87	9.64	-1.41	0.72	1.07	-0.34	0.92
DH5	2441.0	-13.21	1.88	9.64	-1.69	0.68	1.07	-0.62	0.87
DH5	2480.0	-14.38	1.89	9.65	-2.84	0.52	1.07	-1.77	0.67
2DH5	2402.0	-12.63	1.87	9.64	-1.12	0.77	1.07	-0.05	0.99
2DH5	2441.0	-13.12	1.88	9.64	-1.60	0.69	1.07	-0.53	0.89
2DH5	2480.0	-14.45	1.89	9.65	-2.91	0.51	1.07	-1.84	0.65
3DH5	2402.0	-12.63	1.87	9.64	-1.12	0.77	1.07	-0.05	0.99
3DH5	2441.0	-13.13	1.88	9.64	-1.61	0.69	1.07	-0.54	0.88
3DH5	2480.0	-14.47	1.89	9.65	-2.93	0.51	1.07	-1.86	0.65

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

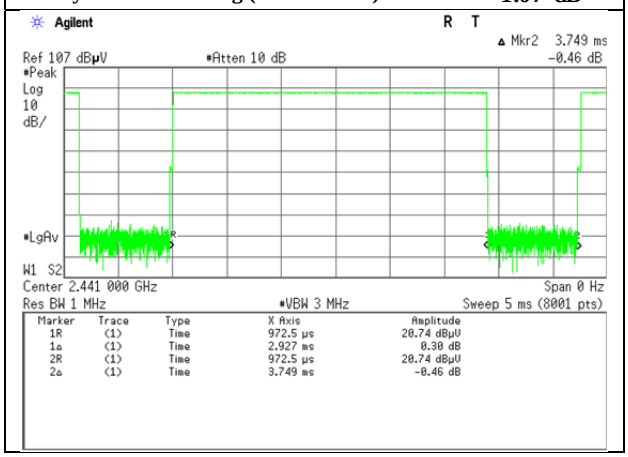
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off

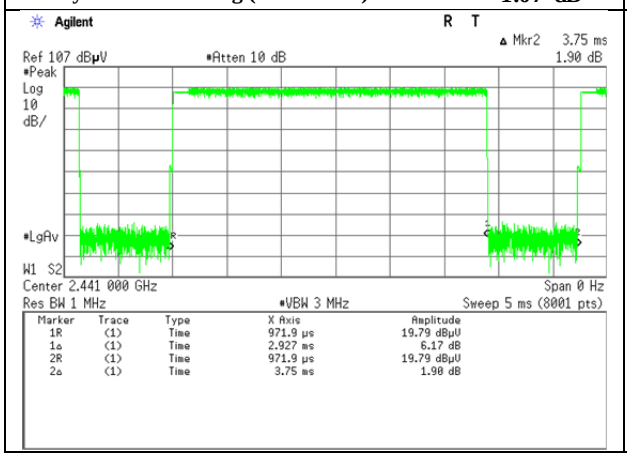
DH5

Tx on / (Tx on + Tx off) =	**0.781**
Tx on / (Tx on + Tx off) * 100 =	**78.1 %**
Duty factor = 10 * log (3.749 / 2.927) =	**1.07 dB**



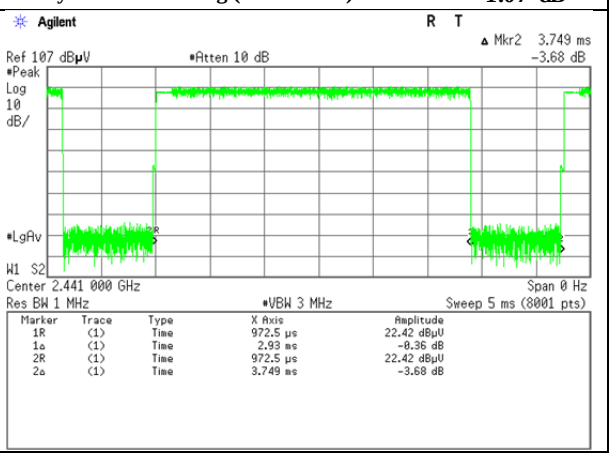
2DH5

Tx on / (Tx on + Tx off) =	**0.781**
Tx on / (Tx on + Tx off) * 100 =	**78.1 %**
Duty factor = 10 * log (3.75 / 2.927) =	**1.07 dB**



3DH5

Tx on / (Tx on + Tx off) =	**0.782**
Tx on / (Tx on + Tx off) * 100 =	**78.2 %**
Duty factor = 10 * log (3.749 / 2.93) =	**1.07 dB**



Radiated Spurious Emission

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	66.644	QP	31.30	6.78	7.11	31.88	0.00	13.31	40.00	26.6	318	79	
Hori.	74.013	QP	42.20	6.26	7.68	31.87	0.00	24.27	40.00	15.7	301	245	
Hori.	128.005	QP	31.10	13.52	8.15	31.82	0.00	20.95	43.50	22.5	251	207	
Hori.	148.036	QP	31.00	14.74	8.62	31.80	0.00	22.56	43.50	20.9	227	234	
Hori.	185.038	QP	30.00	16.19	8.81	31.78	0.00	23.22	43.50	20.2	163	251	
Hori.	259.050	QP	34.50	12.03	6.32	31.69	0.00	21.16	46.00	24.8	131	311	
Hori.	407.080	QP	34.10	15.96	7.37	31.62	0.00	25.81	46.00	20.1	100	124	
Hori.	2390.000	PK	44.18	27.41	13.48	36.83	2.22	50.46	73.90	23.4	125	18	
Hori.	4804.000	PK	44.02	31.13	5.72	36.99	2.22	46.10	73.90	27.8	150	0	
Hori.	7206.000	PK	45.21	36.44	7.03	37.81	2.22	53.09	73.90	20.8	150	0	
Hori.	9608.000	PK	46.49	38.63	7.86	38.48	2.22	56.72	73.90	17.1	150	0	
Hori.	2390.000	AV	32.79	27.41	13.48	36.83	2.22	39.07	53.90	14.8	125	18	
Hori.	4804.000	AV	32.39	31.13	5.72	36.99	2.22	34.47	53.90	19.4	150	0	
Hori.	7206.000	AV	33.51	36.44	7.03	37.81	2.22	41.39	53.90	12.5	150	0	
Hori.	9608.000	AV	34.24	38.63	7.86	38.48	2.22	44.47	53.90	**9.4**	150	0	
Vert.	71.620	QP	31.00	6.27	7.47	31.87	0.00	12.87	40.00	27.1	100	68	
Vert.	74.012	QP	44.50	6.26	7.68	31.87	0.00	26.57	40.00	13.4	100	66	
Vert.	629.131	QP	32.30	19.33	8.57	31.59	0.00	28.61	46.00	17.3	124	52	
Vert.	2390.000	PK	44.73	27.41	13.48	36.83	2.22	51.01	73.90	22.8	134	91	
Vert.	4804.000	PK	44.21	31.13	5.72	36.99	2.22	46.29	73.90	27.6	150	0	
Vert.	7206.000	PK	44.80	36.44	7.03	37.81	2.22	52.68	73.90	21.2	150	0	
Vert.	9608.000	PK	45.87	38.63	7.86	38.48	2.22	56.10	73.90	17.8	150	0	
Vert.	2390.000	AV	32.78	27.41	13.48	36.83	2.22	39.06	53.90	14.8	134	91	
Vert.	4804.000	AV	32.36	31.13	5.72	36.99	2.22	34.44	53.90	19.4	150	0	
Vert.	7206.000	AV	33.52	36.44	7.03	37.81	2.22	41.40	53.90	12.5	150	0	
Vert.	9608.000	AV	34.22	38.63	7.86	38.48	2.22	44.45	53.90	**9.4**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.82	27.46	13.49	36.83	2.22	97.16	-	-	Carrier
Hori.	2400.000	PK	36.05	27.45	13.49	36.83	2.22	42.38	77.16	34.8	
Vert.	2402.000	PK	89.59	27.46	13.49	36.83	2.22	95.93	-	-	Carrier
Vert.	2400.000	PK	35.21	27.45	13.49	36.83	2.22	41.54	75.93	34.4	

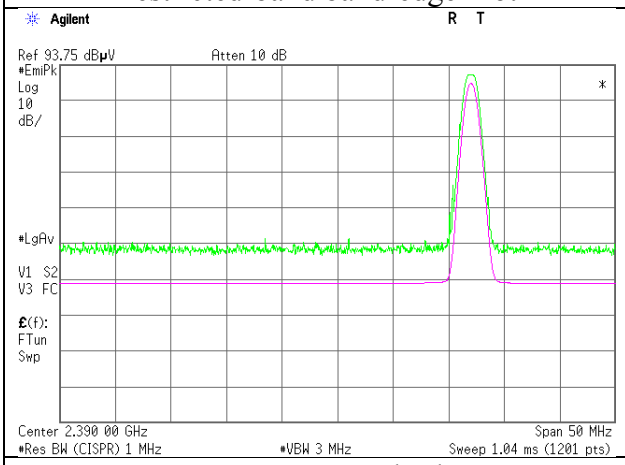
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11854935S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Yosuke Ishikawa (1 GHz -18 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

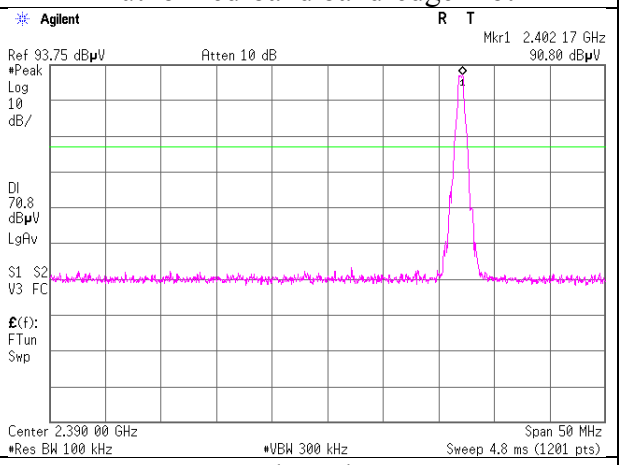
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

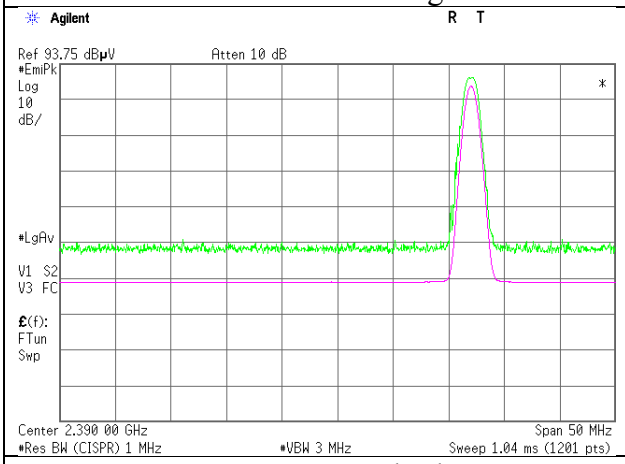
Authorized-band band-edge Plot



20dBc Plot

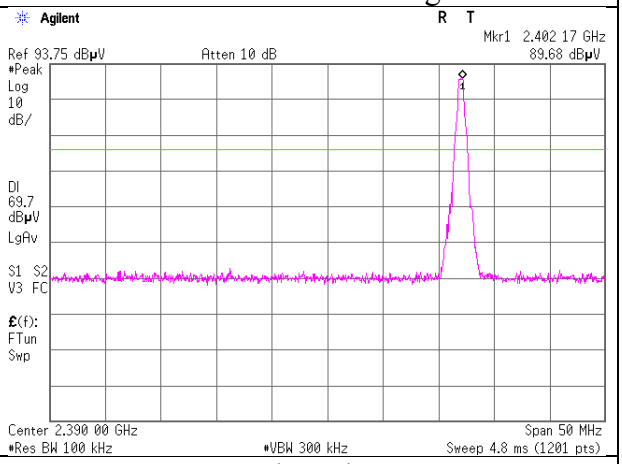
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	66.673	QP	31.40	6.78	7.11	31.88	0.00	13.41	40.00	26.5	317	80	
Hori.	74.024	QP	42.50	6.26	7.68	31.87	0.00	24.57	40.00	15.4	300	246	
Hori.	128.010	QP	31.30	13.52	8.15	31.82	0.00	21.15	43.50	22.3	250	208	
Hori.	148.029	QP	31.60	14.74	8.62	31.80	0.00	23.16	43.50	20.3	227	233	
Hori.	185.029	QP	30.00	16.19	8.81	31.78	0.00	23.22	43.50	20.2	162	250	
Hori.	259.050	QP	34.70	12.03	6.32	31.69	0.00	21.36	46.00	24.6	130	312	
Hori.	407.083	QP	34.30	15.96	7.37	31.62	0.00	26.01	46.00	19.9	100	125	
Hori.	4882.000	PK	44.65	31.29	5.79	37.03	2.22	46.92	73.90	26.9	150	0	
Hori.	7323.000	PK	46.47	36.77	7.18	37.88	2.22	54.76	73.90	19.1	150	0	
Hori.	9764.000	PK	47.63	38.75	7.98	38.67	2.22	57.91	73.90	15.9	150	0	
Hori.	4882.000	AV	32.30	31.29	5.79	37.03	2.22	34.57	53.90	19.3	150	0	
Hori.	7323.000	AV	33.43	36.77	7.18	37.88	2.22	41.72	53.90	12.1	150	0	
Hori.	9764.000	AV	34.17	38.75	7.98	38.67	2.22	44.45	53.90	**9.4**	150	0	
Vert.	71.173	QP	31.70	6.27	7.42	31.87	0.00	13.52	40.00	26.4	100	67	
Vert.	74.024	QP	44.60	6.26	7.68	31.87	0.00	26.67	40.00	13.3	100	66	
Vert.	629.118	QP	31.30	19.33	8.57	31.59	0.00	27.61	46.00	18.3	125	52	
Vert.	4882.000	PK	44.70	31.29	5.79	37.03	2.22	46.97	73.90	26.9	150	0	
Vert.	7323.000	PK	46.25	36.77	7.18	37.88	2.22	54.54	73.90	19.3	150	0	
Vert.	9764.000	PK	47.21	38.75	7.98	38.67	2.22	57.49	73.90	16.4	150	0	
Vert.	4882.000	AV	32.35	31.29	5.79	37.03	2.22	34.62	53.90	19.2	150	0	
Vert.	7323.000	AV	33.47	36.77	7.18	37.88	2.22	41.76	53.90	12.1	150	0	
Vert.	9764.000	AV	34.19	38.75	7.98	38.67	2.22	44.47	53.90	**9.4**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	66.716	QP	31.60	6.77	7.11	31.88	0.00	13.60	40.00	26.4	320	79	
Hori.	74.011	QP	42.40	6.26	7.68	31.87	0.00	24.47	40.00	15.5	300	246	
Hori.	128.005	QP	31.30	13.52	8.15	31.82	0.00	21.15	43.50	22.3	252	210	
Hori.	148.044	QP	31.50	14.74	8.62	31.80	0.00	23.06	43.50	20.4	230	234	
Hori.	185.036	QP	30.30	16.19	8.81	31.78	0.00	23.52	43.50	19.9	163	250	
Hori.	259.048	QP	35.00	12.03	6.32	31.69	0.00	21.66	46.00	24.3	133	310	
Hori.	407.080	QP	34.60	15.96	7.37	31.62	0.00	26.31	46.00	19.6	100	125	
Hori.	2483.500	PK	44.15	27.79	13.55	36.79	2.22	50.92	73.90	22.9	112	21	
Hori.	4960.000	PK	44.01	31.45	5.86	37.07	2.22	46.47	73.90	27.4	150	0	
Hori.	7440.000	PK	44.74	37.11	7.32	37.95	2.22	53.44	73.90	20.4	150	0	
Hori.	9920.000	PK	45.95	38.87	8.10	38.87	2.22	56.27	73.90	17.6	150	0	
Hori.	2483.500	AV	32.75	27.79	13.55	36.79	2.22	39.52	53.90	14.3	112	21	
Hori.	4960.000	AV	32.28	31.45	5.86	37.07	2.22	34.74	53.90	19.1	150	0	
Hori.	7440.000	AV	32.91	37.11	7.32	37.95	2.22	41.61	53.90	12.2	150	0	
Hori.	9920.000	AV	34.14	38.87	8.10	38.87	2.22	44.46	53.90	**9.4**	150	0	
Vert.	42.456	QP	26.80	13.53	7.11	31.89	0.00	15.55	40.00	24.4	100	11	
Vert.	74.017	QP	45.10	6.26	7.68	31.87	0.00	27.17	40.00	12.8	100	65	
Vert.	629.128	QP	32.70	19.33	8.57	31.59	0.00	29.01	46.00	16.9	125	52	
Vert.	2483.500	PK	44.14	27.79	13.55	36.79	2.22	50.91	73.90	22.9	122	89	
Vert.	4960.000	PK	43.99	31.45	5.86	37.07	2.22	46.45	73.90	27.4	150	0	
Vert.	7440.000	PK	44.57	37.11	7.32	37.95	2.22	53.27	73.90	20.6	150	0	
Vert.	9920.000	PK	45.87	38.87	8.10	38.87	2.22	56.19	73.90	17.7	150	0	
Vert.	2483.500	AV	32.69	27.79	13.55	36.79	2.22	39.46	53.90	14.4	122	89	
Vert.	4960.000	AV	32.28	31.45	5.86	37.07	2.22	34.74	53.90	19.1	150	0	
Vert.	7440.000	AV	32.88	37.11	7.32	37.95	2.22	41.58	53.90	12.3	150	0	
Vert.	9920.000	AV	34.15	38.87	8.10	38.87	2.22	44.47	53.90	**9.4**	150	0	

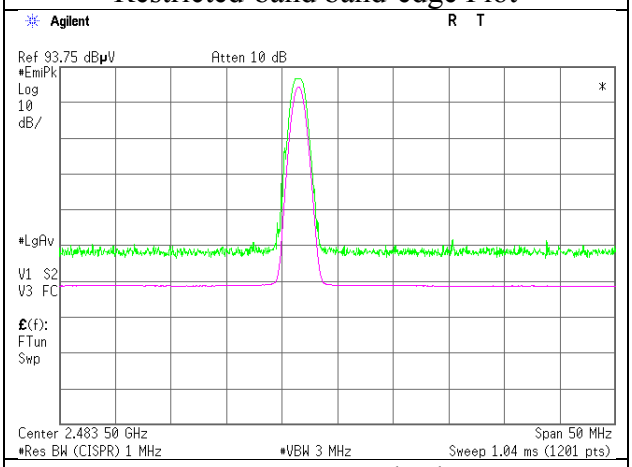
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11854935S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Yosuke Ishikawa (1 GHz -18 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

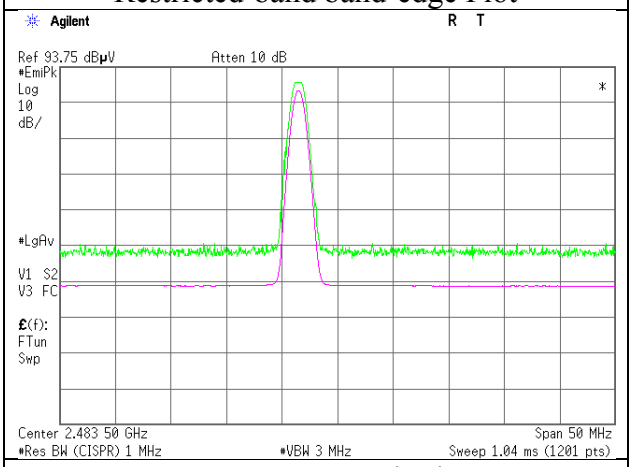
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	66.454	QP	32.00	6.81	7.10	31.88	0.00	14.03	40.00	25.9	317	80	
Hori.	74.012	QP	42.60	6.26	7.68	31.87	0.00	24.67	40.00	15.3	300	245	
Hori.	128.006	QP	31.60	13.52	8.15	31.82	0.00	21.45	43.50	22.0	250	209	
Hori.	148.022	QP	31.50	14.74	8.62	31.80	0.00	23.06	43.50	20.4	231	235	
Hori.	185.041	QP	31.10	16.19	8.81	31.78	0.00	24.32	43.50	19.1	162	250	
Hori.	259.048	QP	34.70	12.03	6.32	31.69	0.00	21.36	46.00	24.6	130	313	
Hori.	407.080	QP	34.50	15.96	7.37	31.62	0.00	26.21	46.00	19.7	100	125	
Hori.	2390.000	PK	44.31	27.41	13.48	36.83	2.22	50.59	73.90	23.3	127	19	
Hori.	4804.000	PK	43.95	31.13	5.72	36.99	2.22	46.03	73.90	27.8	150	0	
Hori.	7206.000	PK	45.11	36.44	7.03	37.81	2.22	52.99	73.90	20.9	150	0	
Hori.	9608.000	PK	46.15	38.63	7.86	38.48	2.22	56.38	73.90	17.5	150	0	
Hori.	2390.000	AV	32.72	27.41	13.48	36.83	2.22	39.00	53.90	14.9	127	19	
Hori.	4804.000	AV	32.41	31.13	5.72	36.99	2.22	34.49	53.90	19.4	150	0	
Hori.	7206.000	AV	33.40	36.44	7.03	37.81	2.22	41.28	53.90	12.6	150	0	
Hori.	9608.000	AV	34.27	38.63	7.86	38.48	2.22	44.50	53.90	**9.4**	150	0	
Vert.	71.158	QP	31.60	6.27	7.42	31.87	0.00	13.42	40.00	26.5	100	70	
Vert.	74.014	QP	44.80	6.26	7.68	31.87	0.00	26.87	40.00	13.1	100	65	
Vert.	629.119	QP	32.60	19.33	8.57	31.59	0.00	28.91	46.00	17.0	124	53	
Vert.	2390.000	PK	44.62	27.41	13.48	36.83	2.22	50.90	73.90	23.0	112	92	
Vert.	4804.000	PK	43.92	31.13	5.72	36.99	2.22	46.00	73.90	27.9	150	0	
Vert.	7206.000	PK	44.85	36.44	7.03	37.81	2.22	52.73	73.90	21.1	150	0	
Vert.	9608.000	PK	45.91	38.63	7.86	38.48	2.22	56.14	73.90	17.7	150	0	
Vert.	2390.000	AV	32.68	27.41	13.48	36.83	2.22	38.96	53.90	14.9	112	92	
Vert.	4804.000	AV	32.40	31.13	5.72	36.99	2.22	34.48	53.90	19.4	150	0	
Vert.	7206.000	AV	33.44	36.44	7.03	37.81	2.22	41.32	53.90	12.5	150	0	
Vert.	9608.000	AV	34.26	38.63	7.86	38.48	2.22	44.49	53.90	**9.4**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.85	27.46	13.49	36.83	2.22	97.19	-	-	Carrier
Hori.	2400.000	PK	35.64	27.45	13.49	36.83	2.22	41.97	77.19	35.2	
Vert.	2402.000	PK	89.44	27.46	13.49	36.83	2.22	95.78	-	-	Carrier
Vert.	2400.000	PK	35.43	27.45	13.49	36.83	2.22	41.76	75.78	34.0	

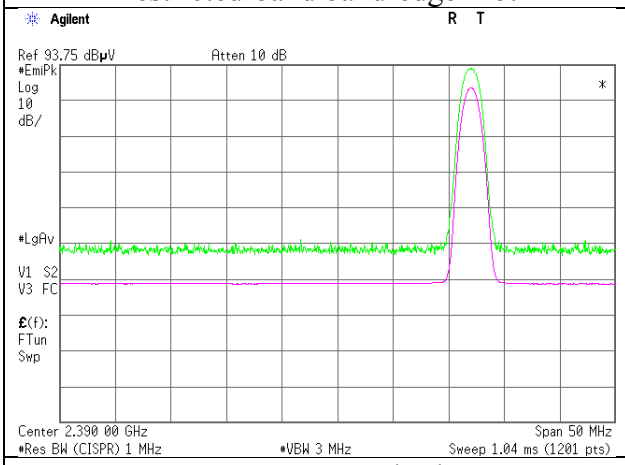
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11854935S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Yosuke Ishikawa (1 GHz -18 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

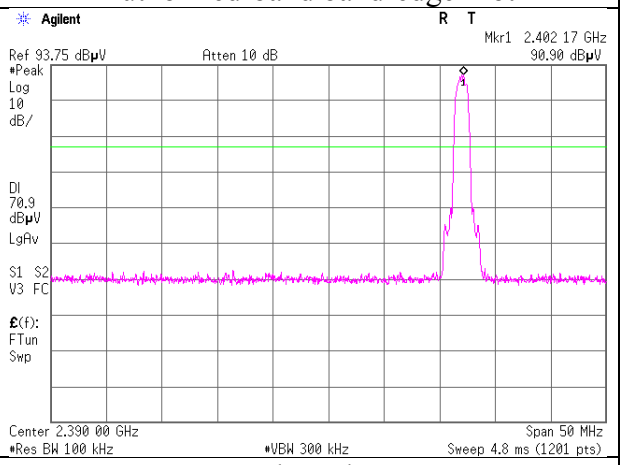
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

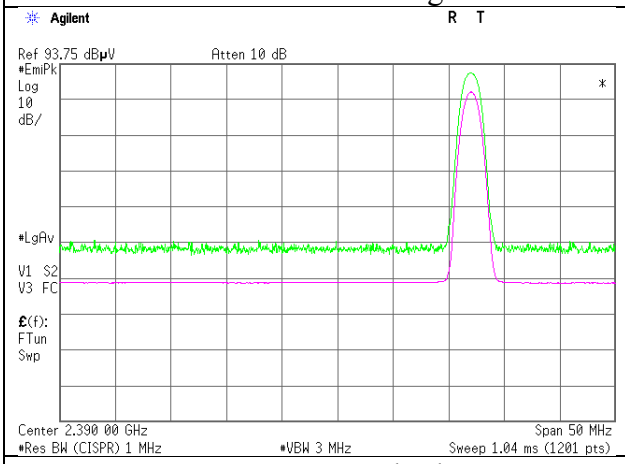
Authorized-band band-edge Plot



20dBc Plot

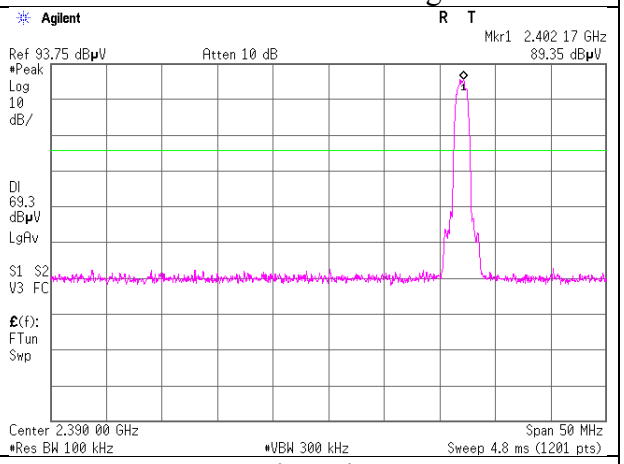
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	67.323	QP	31.70	6.68	7.15	31.88	0.00	13.65	40.00	26.3	320	81	
Hori.	74.013	QP	42.70	6.26	7.68	31.87	0.00	24.77	40.00	15.2	300	246	
Hori.	128.013	QP	31.50	13.52	8.15	31.82	0.00	21.35	43.50	22.1	250	210	
Hori.	148.041	QP	31.80	14.74	8.62	31.80	0.00	23.36	43.50	20.1	230	232	
Hori.	185.049	QP	30.60	16.19	8.81	31.78	0.00	23.82	43.50	19.6	165	250	
Hori.	259.053	QP	34.70	12.03	6.32	31.69	0.00	21.36	46.00	24.6	133	311	
Hori.	407.072	QP	34.50	15.96	7.37	31.62	0.00	26.21	46.00	19.7	100	125	
Hori.	4882.000	PK	43.71	31.29	5.79	37.03	2.22	45.98	73.90	27.9	150	0	
Hori.	7323.000	PK	44.61	36.77	7.18	37.88	2.22	52.90	73.90	21.0	150	0	
Hori.	9764.000	PK	45.58	38.75	7.98	38.67	2.22	55.86	73.90	18.0	150	0	
Hori.	4882.000	AV	32.12	31.29	5.79	37.03	2.22	34.39	53.90	19.5	150	0	
Hori.	7323.000	AV	33.45	36.77	7.18	37.88	2.22	41.74	53.90	12.1	150	0	
Hori.	9764.000	AV	34.08	38.75	7.98	38.67	2.22	44.36	53.90	**9.5**	150	0	
Vert.	42.416	QP	26.60	13.54	7.11	31.89	0.00	15.36	40.00	24.6	100	262	
Vert.	74.018	QP	45.70	6.26	7.68	31.87	0.00	27.77	40.00	12.2	100	67	
Vert.	629.126	QP	32.80	19.33	8.57	31.59	0.00	29.11	46.00	16.8	125	55	
Vert.	4882.000	PK	43.00	31.29	5.79	37.03	2.22	45.27	73.90	28.6	150	0	
Vert.	7323.000	PK	44.45	36.77	7.18	37.88	2.22	52.74	73.90	21.1	150	0	
Vert.	9764.000	PK	45.69	38.75	7.98	38.67	2.22	55.97	73.90	17.9	150	0	
Vert.	4882.000	AV	32.13	31.29	5.79	37.03	2.22	34.40	53.90	19.5	150	0	
Vert.	7323.000	AV	33.42	36.77	7.18	37.88	2.22	41.71	53.90	12.1	150	0	
Vert.	9764.000	AV	34.10	38.75	7.98	38.67	2.22	44.38	53.90	**9.5**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	66.614	QP	31.30	6.79	7.11	31.88	0.00	13.32	40.00	26.6	320	78	
Hori.	74.018	QP	42.70	6.26	7.68	31.87	0.00	24.77	40.00	15.2	300	244	
Hori.	128.011	QP	31.30	13.52	8.15	31.82	0.00	21.15	43.50	22.3	250	208	
Hori.	148.025	QP	31.60	14.74	8.62	31.80	0.00	23.16	43.50	20.3	230	235	
Hori.	185.036	QP	30.00	16.19	8.81	31.78	0.00	23.22	43.50	20.2	165	252	
Hori.	259.048	QP	35.00	12.03	6.32	31.69	0.00	21.66	46.00	24.3	133	310	
Hori.	407.086	QP	34.30	15.96	7.37	31.62	0.00	26.01	46.00	19.9	100	125	
Hori.	2483.500	PK	44.21	27.79	13.55	36.79	2.22	50.98	73.90	22.9	114	19	
Hori.	4960.000	PK	43.58	31.45	5.86	37.07	2.22	46.04	73.90	27.8	150	0	
Hori.	7440.000	PK	44.18	37.11	7.32	37.95	2.22	52.88	73.90	21.0	150	0	
Hori.	9920.000	PK	46.15	38.87	8.10	38.87	2.22	56.47	73.90	17.4	150	0	
Hori.	2483.500	AV	32.75	27.79	13.55	36.79	2.22	39.52	53.90	14.3	114	19	
Hori.	4960.000	AV	32.35	31.45	5.86	37.07	2.22	34.81	53.90	19.0	150	0	
Hori.	7440.000	AV	32.97	37.11	7.32	37.95	2.22	41.67	53.90	12.2	150	0	
Hori.	9920.000	AV	34.21	38.87	8.10	38.87	2.22	44.53	53.90	**9.3**	150	0	
Vert.	71.177	QP	31.10	6.27	7.42	31.87	0.00	12.92	40.00	27.0	100	70	
Vert.	74.018	QP	44.70	6.26	7.68	31.87	0.00	26.77	40.00	13.2	100	67	
Vert.	629.128	QP	32.60	19.33	8.57	31.59	0.00	28.91	46.00	17.0	125	53	
Vert.	2483.500	PK	44.26	27.79	13.55	36.79	2.22	51.03	73.90	22.8	135	90	
Vert.	4960.000	PK	43.89	31.45	5.86	37.07	2.22	46.35	73.90	27.5	150	0	
Vert.	7440.000	PK	43.99	37.11	7.32	37.95	2.22	52.69	73.90	21.2	150	0	
Vert.	9920.000	PK	46.13	38.87	8.10	38.87	2.22	56.45	73.90	17.4	150	0	
Vert.	2483.500	AV	32.70	27.79	13.55	36.79	2.22	39.47	53.90	14.4	135	90	
Vert.	4960.000	AV	32.51	31.45	5.86	37.07	2.22	34.97	53.90	18.9	150	0	
Vert.	7440.000	AV	32.98	37.11	7.32	37.95	2.22	41.68	53.90	12.2	150	0	
Vert.	9920.000	AV	34.19	38.87	8.10	38.87	2.22	44.51	53.90	**9.3**	150	0	

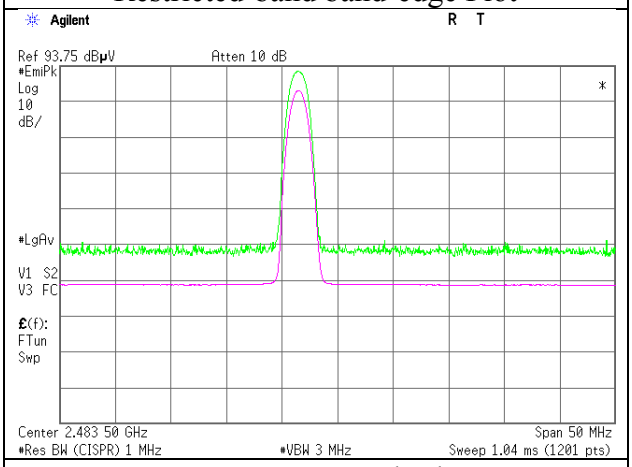
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.22 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11854935S-B-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Yosuke Ishikawa (1 GHz -18 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

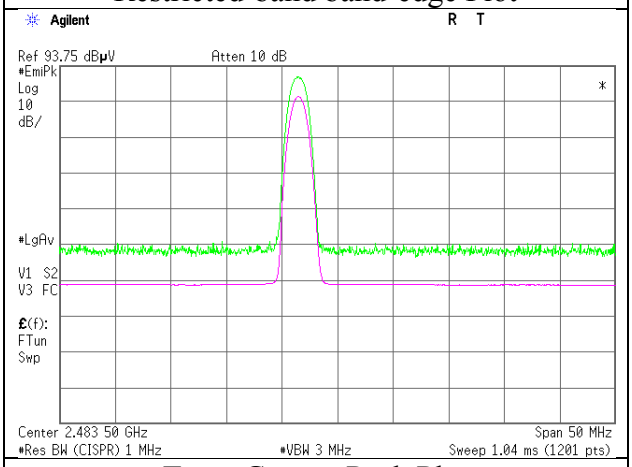
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

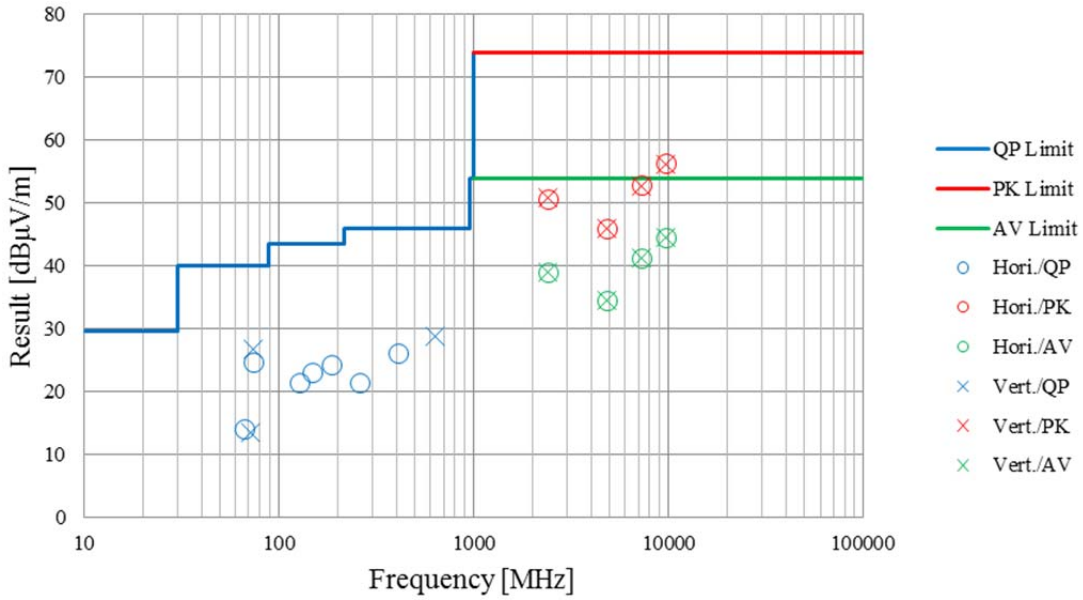


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11854935S-B-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 2
Date	July 24, 2017	July 25, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 60 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz -18 GHz)	(30 MHz – 1000 MHz, 18 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	



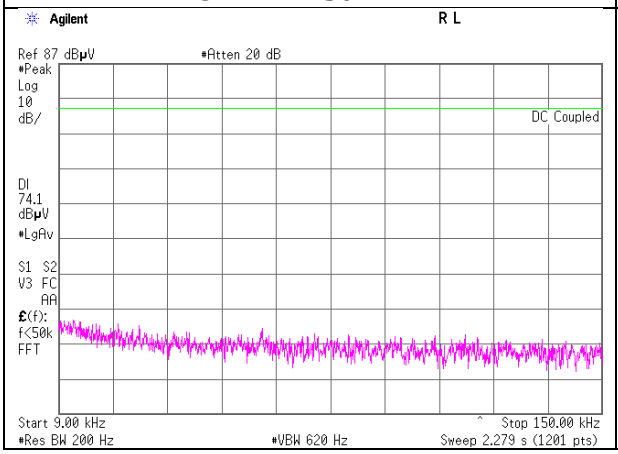
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

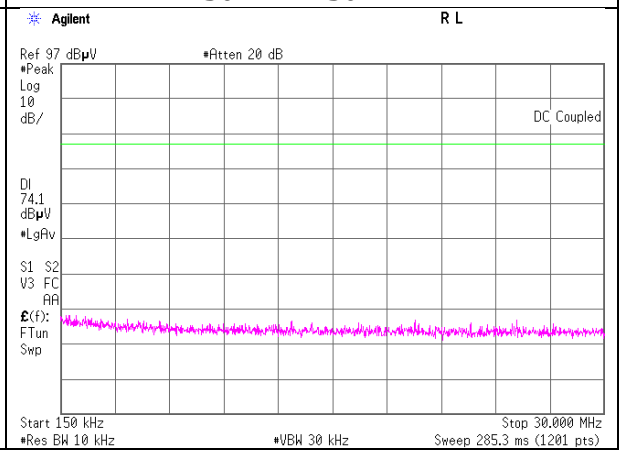
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

2402 MHz

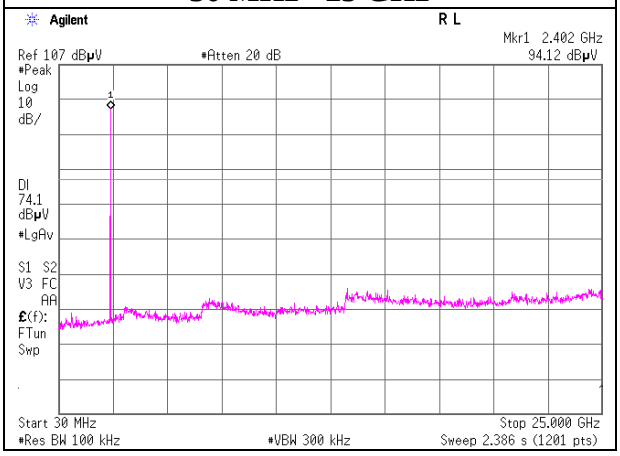
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

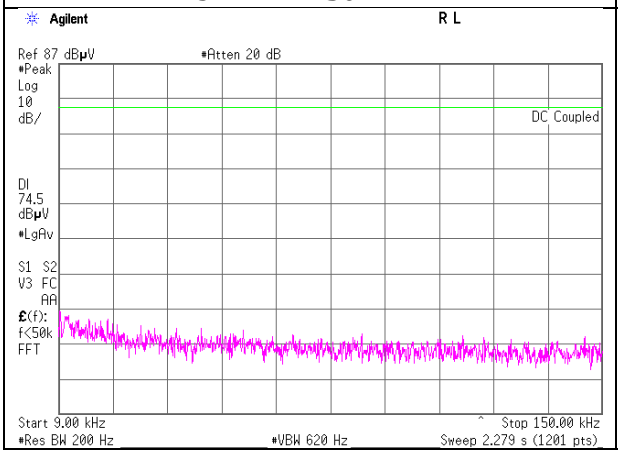


Conducted Spurious Emission

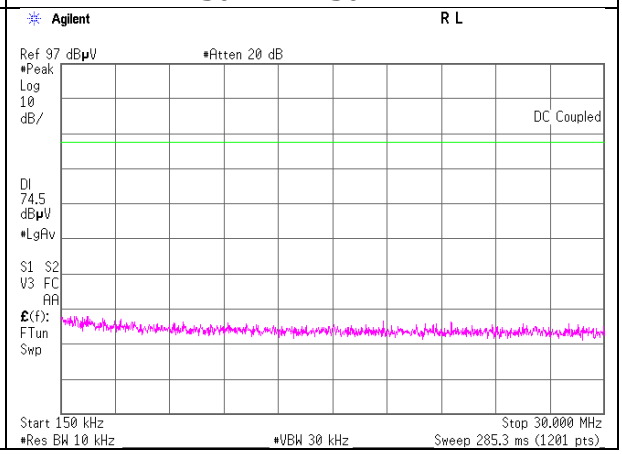
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

2441 MHz

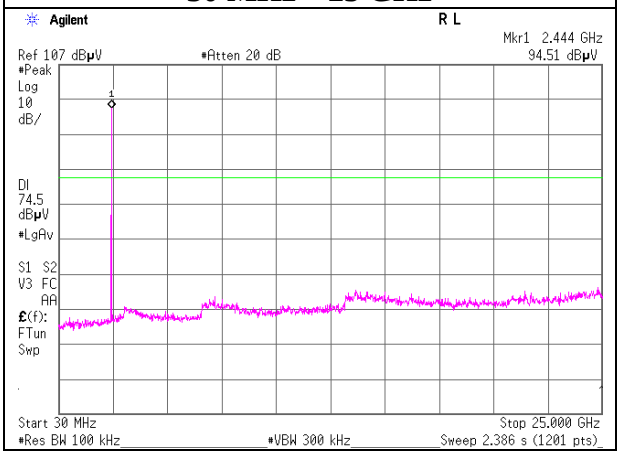
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

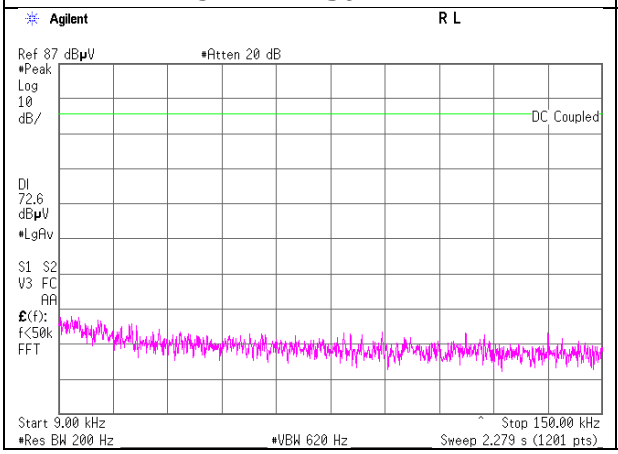


Conducted Spurious Emission

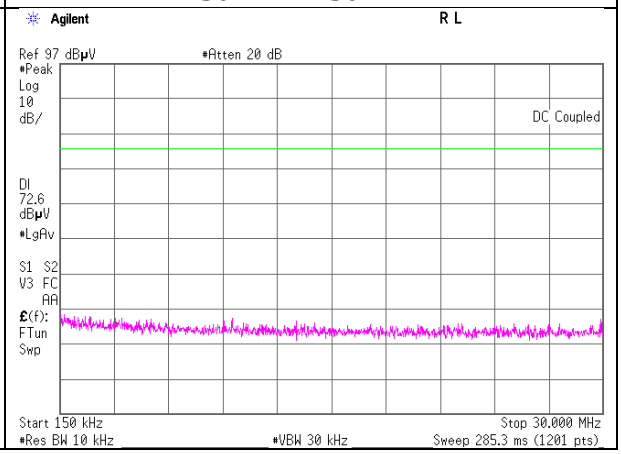
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

2480 MHz

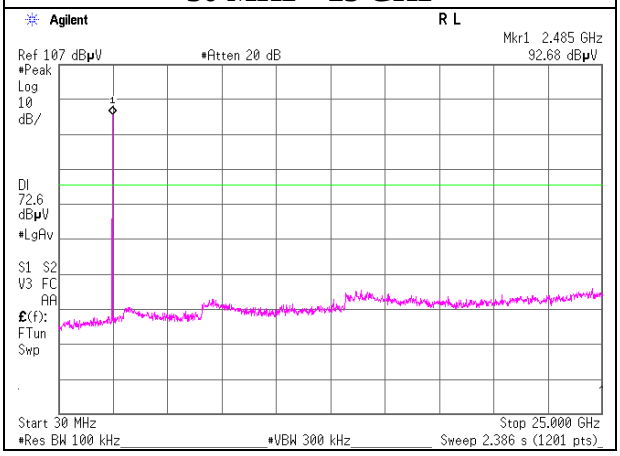
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

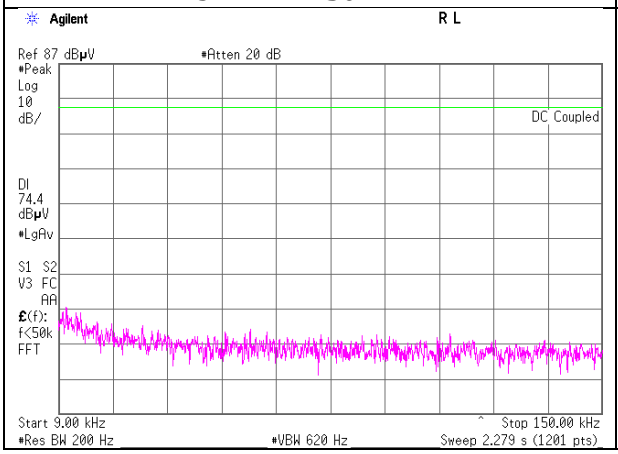


Conducted Spurious Emission

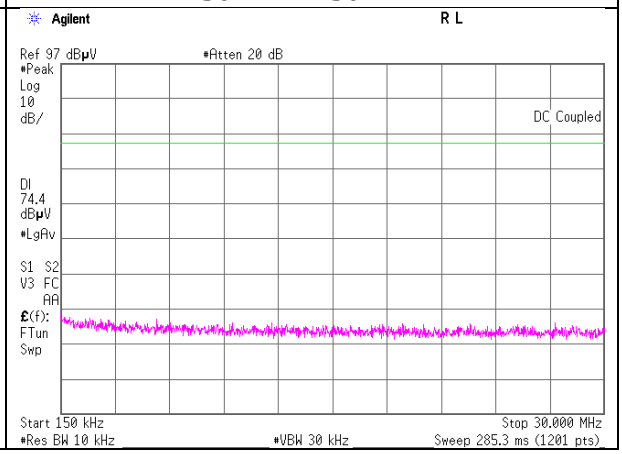
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

2402 MHz

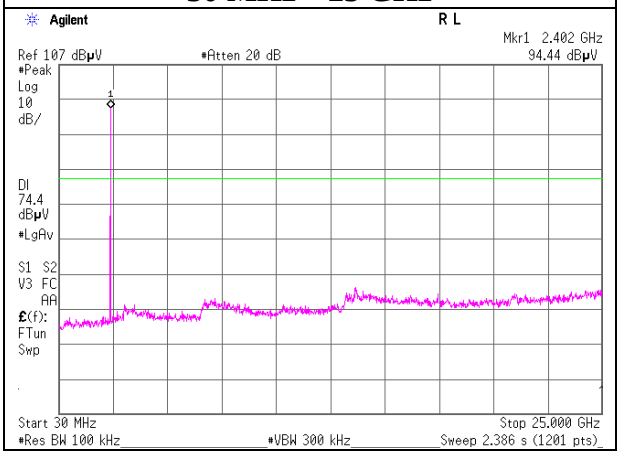
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

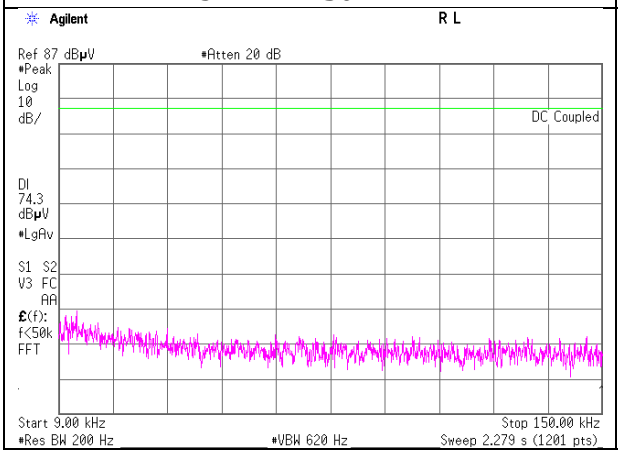


Conducted Spurious Emission

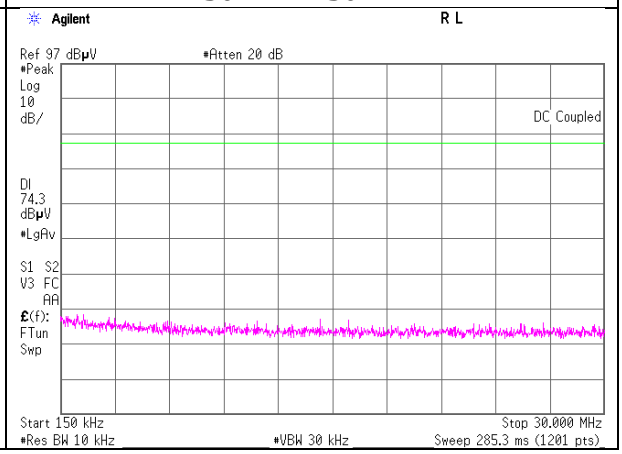
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

2441 MHz

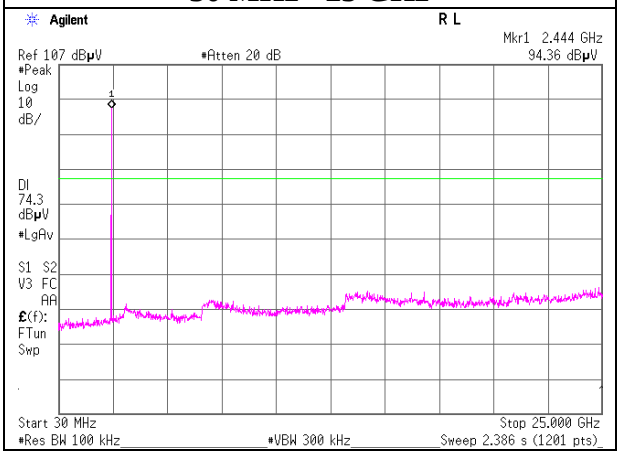
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

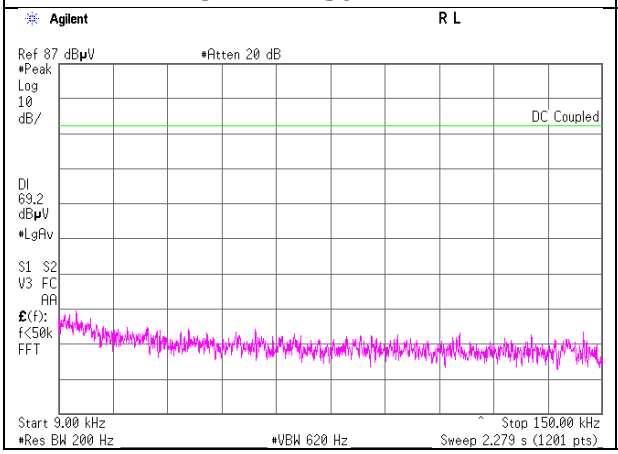


Conducted Spurious Emission

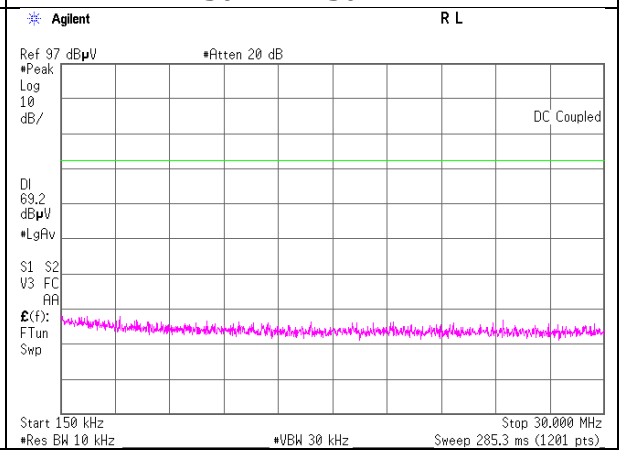
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

2480 MHz

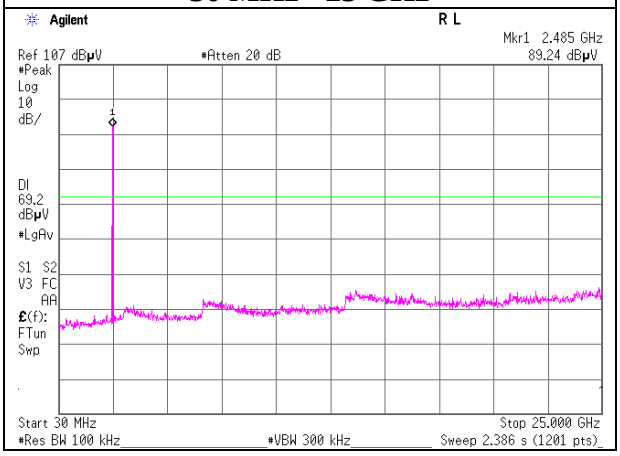
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

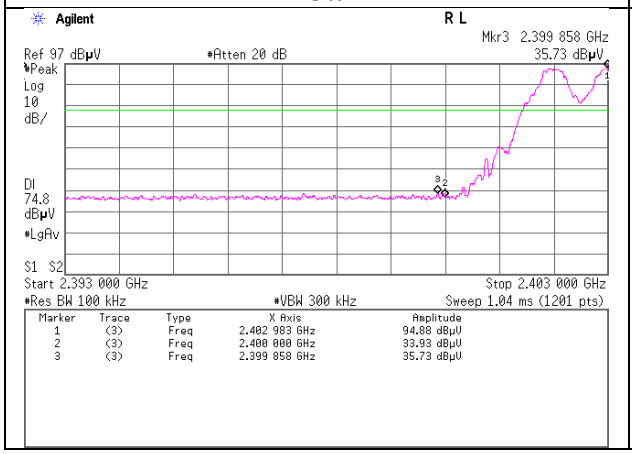


Conducted Emission Band Edge compliance

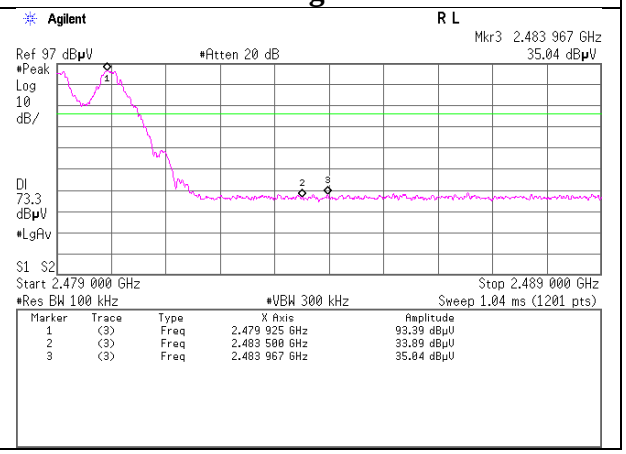
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx DH5

Hopping On

Low

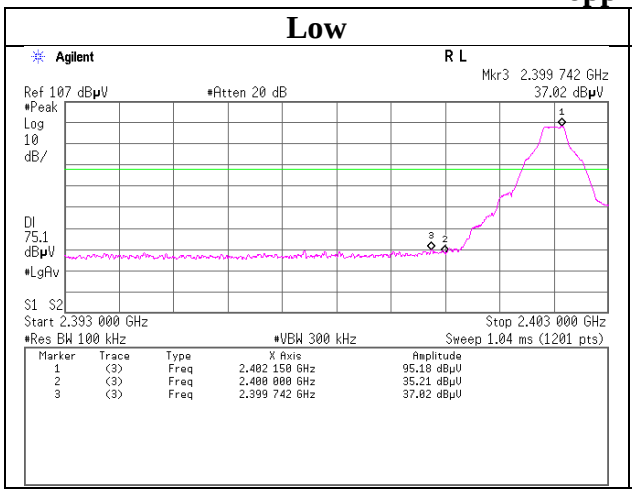


High

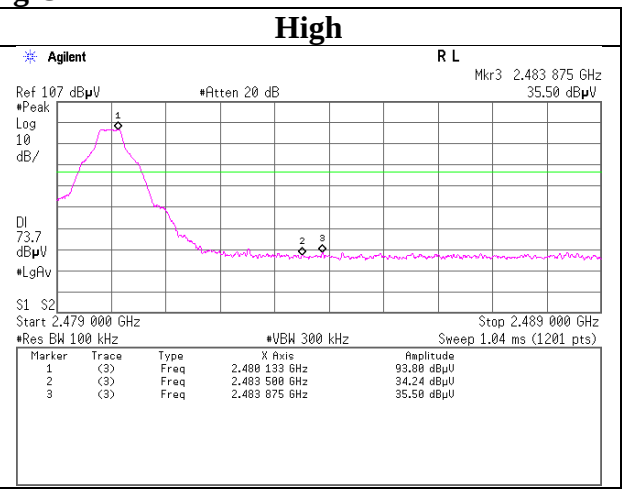


Hopping Off

Low



High

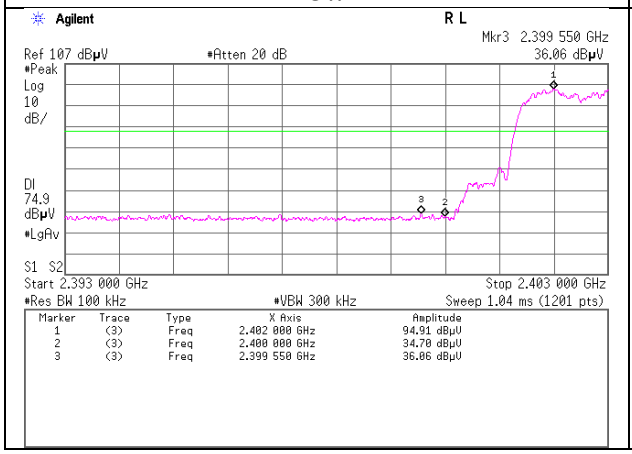


Conducted Emission Band Edge compliance

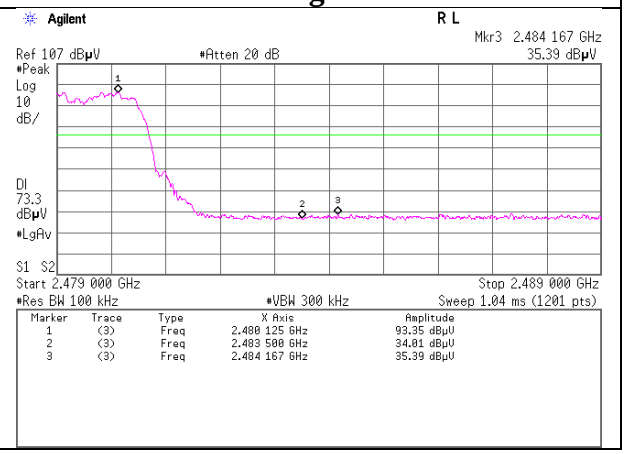
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx 3DH5

Hopping On

Low

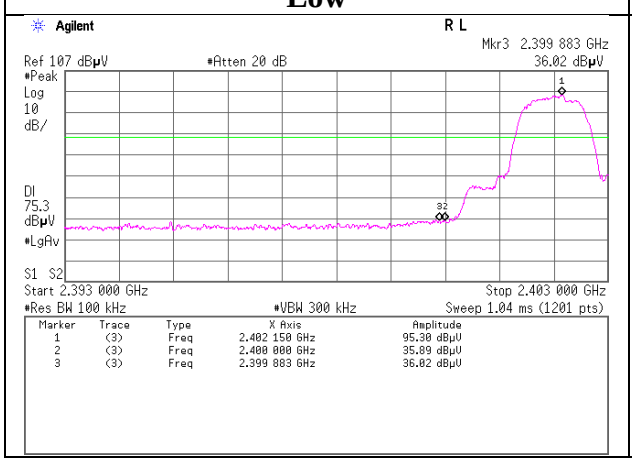


High

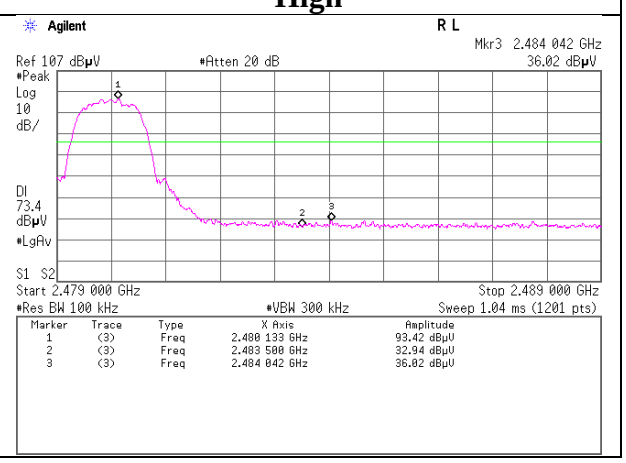


Hopping Off

Low



High

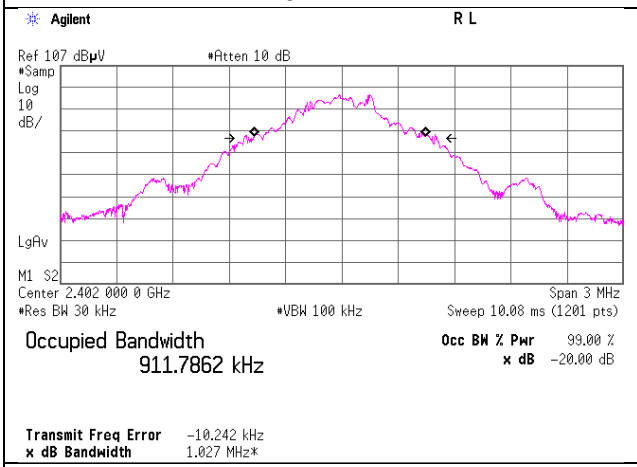


99%Occupied Bandwidth

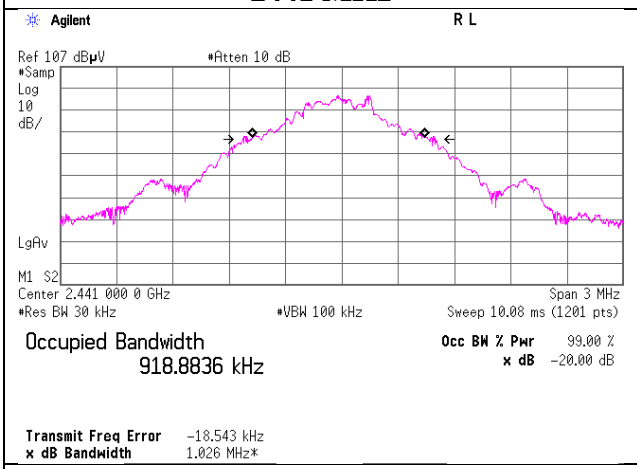
Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx Hopping Off

Hopping Off, DH5

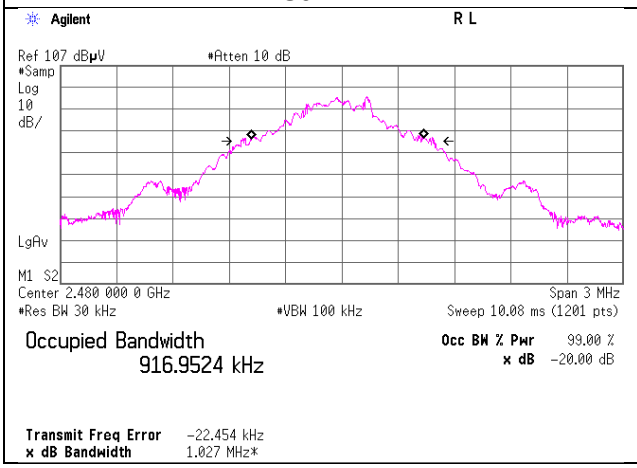
2402 MHz



2441 MHz

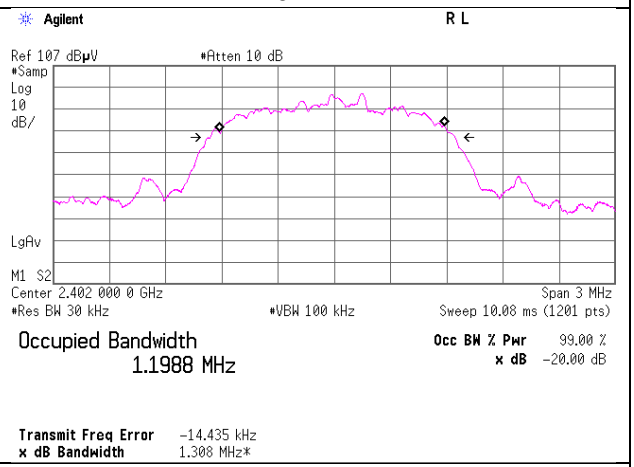


2480 MHz

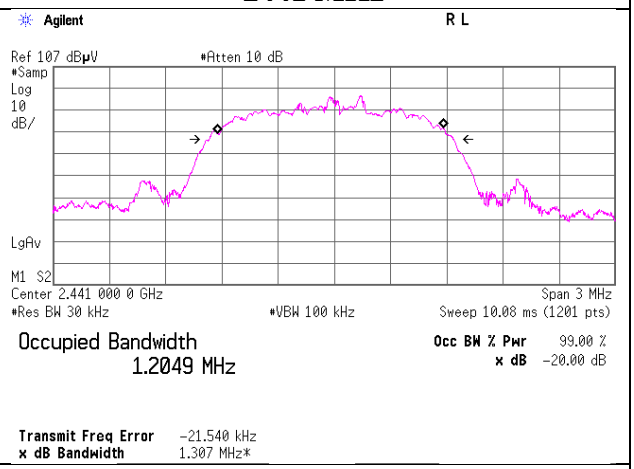


Hopping Off, 3DH5

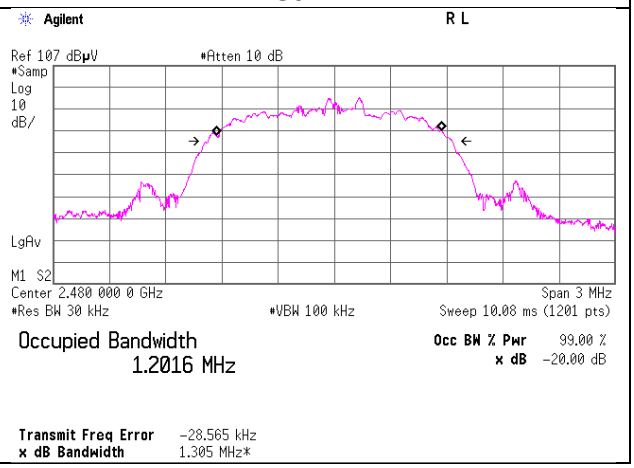
2402 MHz



2441 MHz



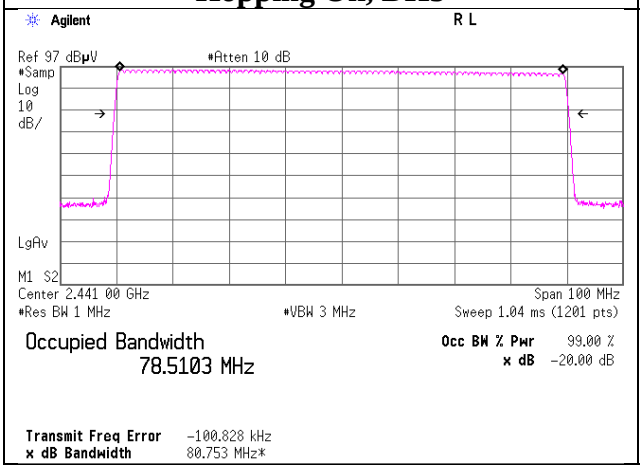
2480 MHz



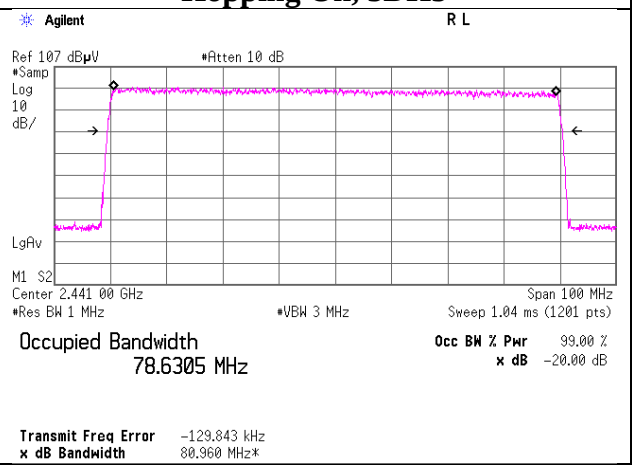
99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	11854935S-B-R2
Date	July 24, 2017
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx Hopping On

Hopping On, DH5



Hopping On, 3DH5



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	2016/11/04 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2017/04/25 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2017/04/25 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2016/11/07 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2017/03/23 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2016/12/13 * 12
KTS-08	Digital Tester	SANWA	PC500	7019224	AT	2017/03/08 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2017/02/17 * 12
SCC-G07	Coaxial Cable	Junkosha	J12J103316-00	MAY-25-17-008	RE	2017/06/13 * 12
SCC-G43	Coaxial Cable	HUBER+SUHNER	SUCOFLEX_104_E	SN MY 13406/4E	RE	2017/07/10 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2016/08/22 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2016/10/11 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2016/10/17 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2017/02/09 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2017/02/09 * 12
KAT3-10	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2017/07/24 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2016/11/23 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	RE	2017/01/05 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2016/09/28 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2017/06/08 * 12
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2017/03/08 * 12
SAJ-02	Antenna Tilt Jig	Intelligent System Engineering Co., Ltd	Antenna Tilt Jig	T-S002	RE	Pre Check
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2016/09/27 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMS KMS	-	RE	2017/04/20 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2017/03/23 * 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