




# RADIO TEST REPORT

**Test Report No. : 12180028S-A-R1**

**Applicant** : PIONEER CORPORATION  
**Type of Equipment** : DVD RDS AV RECEIVER  
**Model No.** : AVH-110BT  
**FCC ID** : AJDK106  
**Test regulation** : FCC Part 15 Subpart C: 2018  
**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 limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers EMC technical requirements.
7. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
8. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
9. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
10. This report is a revised version of 12180028S-A. 12180028S-A is replaced with this report.

**Date of test:** April 17 to 21, 2018

**Representative test engineer:**   
Tatsuya Arai  
Engineer  
Consumer Technology Division

**Approved by:**   
Hikaru Shirasawa  
Engineer  
Consumer Technology Division



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

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## **SECTION 1: Customer information**

Company Name : PIONEER CORPORATION  
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Contact Person : Hiroshi Fuse

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

### **2.1 Identification of E.U.T.**

Type of Equipment : DVD RDS AV RECEIVER  
Model No. : AVH-110BT  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 14.4 V  
Receipt Date of Sample : April 12, 2018  
Country of Mass-production : Thailand  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model: AVH-110BT (referred to as the EUT in this report) is a DVD RDS AV RECEIVER.

DC/DC CONVERTER : 365.8 kHz /413.9 kHz  
D/A CONVERTER : 12.288 MHz  
DISC PRO SYS LSI : 27 MHz  
DC/DC CONVERTER : 700.5 kHz /1008 kHz  
BT MODULE : 26 MHz  
LCD BACK LIGHT : 469 kHz /520.8 kHz  
FM/AM TUNER : 9.216 MHz (VCO: 5.9904 GHz/6.2208 GHz)  
SYSTEM MICRO COMPUTER : 12.5 MHz

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : FHSS  
Antenna type : Inverted F-Type PCB Antenna  
Antenna Gain : -12.57 dBi

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

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

### **3.2 Procedures and results**

Item	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		1.2 dB 4804.00 MHz, AV, Horizontal Tx 2402 MHz DH5	Complied#

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).

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

#### **FCC Part 15.31 (e)**

The EUT provides stable voltage (DC 3.3 V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply (DC 14.4 V) was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

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

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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	Complied	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	No. 4 SAC / SR	No. 5,6,8 SR
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-13 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 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	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

### 3.5 Test Location

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JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

### **4.1 Operating Mode(s)**

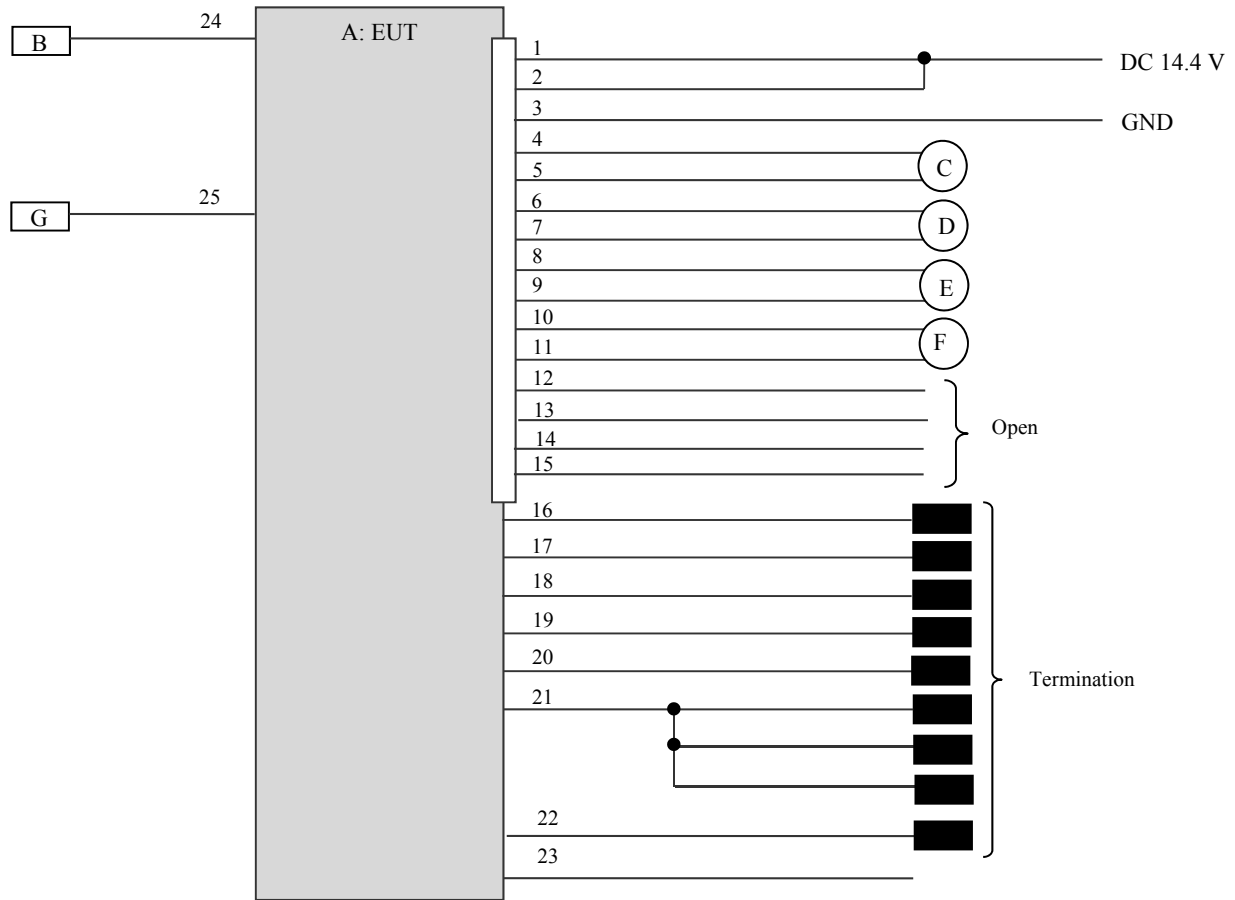
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

<b>Test Item</b>	<b>Mode</b>	<b>Tested frequency</b>
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows;  Power settings: 15  Software: HC_Data_Test Ver. 1.3.1  *This setting of software is the worst case.  Any conditions under the normal use do not exceed the condition of setting.  In addition, end users cannot change the settings of the output power of the product.</p>		



## 4.2 Configuration and peripherals



\* 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	DVD RDS AV RECEIVER	AVH-110BT	RCTM000007UC *1) RCTM000006UC *2)	PIONEER	EUT
B	USB Memory	USM4GU	-	Sony	-
C	Speaker	TS-F1030	V44QAH2	PIONEER	-
D	Speaker	TS-F1030	V44QAH2	PIONEER	-
E	Speaker	TS-F1030	V44QAH2	PIONEER	-
F	Speaker	TS-F1030	V44QAH2	PIONEER	-
G	Jig Board	-	-	-	-

\*1) Used for AT test

\*2) Used for RE test

**List of cables used**

No.	Cable name	Length (m)	Shield		Remarks
			Cable	Connector	
1	ACC	0.15+1.3	Unshielded	Unshielded	-
2	+B	0.15+1.3	Unshielded	Unshielded	-
3	GND	0.15+1.3	Unshielded	Unshielded	-
4	Front L SP+	0.15+2.0	Unshielded	Unshielded	-
5	Front L SP -	0.15+2.0	Unshielded	Unshielded	-
6	Front R SP +	0.15+2.0	Unshielded	Unshielded	-
7	Front R SP -	0.15+2.0	Unshielded	Unshielded	-
8	Rear L SP +	0.15+2.0	Unshielded	Unshielded	-
9	Rear L SP -	0.15+2.0	Unshielded	Unshielded	-
10	Rear R SP +	0.15+2.0	Unshielded	Unshielded	-
11	Rear R SP -	0.15+2.0	Unshielded	Unshielded	-
12	SYSTEM REMOTE CONTROL	0.15+1.0	Unshielded	Unshielded	-
13	ILLMINATION	0.15+1.0	Unshielded	Unshielded	-
14	Reverse Gear	0.1+1.0	Unshielded	Unshielded	-
15	PARKING BRAKE	2.0	Unshielded	Unshielded	-
16	Front Audio OUT L	3.6	Shielded	Shielded	-
17	Front Audio OUT R	3.6	Shielded	Shielded	-
18	Rear Audio OUT L	3.6	Shielded	Shielded	-
19	Rear Audio OUT R	3.6	Shielded	Shielded	-
20	ANTENNA	3.0	Shielded	Shielded	-
21	AUX	3.0	Shielded	Shielded	-
22	RearCamera	3.0	Shielded	Shielded	-
23	Wired Remote	2.0	Shielded	Shielded	-
24	USB	2.0	Shielded	Shielded	-
25	Signal	0.25	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

[For below 1 GHz]

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

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

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

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

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

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

### **Test Antennas are used as below;**

Frequency	30 MHz to 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	3.88 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 40 GHz)		3.88 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 40 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:  $20 \times \log(3.88 \text{ m}/3.0 \text{ m}) = 2.27 \text{ dB}$

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

- The carrier level and noise levels were confirmed at each position of 0 deg. and 30 deg. of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

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

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## **SECTION 6: Antenna Terminal Conducted Tests**

### **Test Procedure**

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

<b>Test</b>	<b>Span</b>	<b>RBW</b>	<b>VBW</b>	<b>Sweep time</b>	<b>Detector</b>	<b>Trace</b>	<b>Instrument used</b>
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	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 *3)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
*1) Peak hold was applied as Worst-case measurement. *2) 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, 99%Occupied Bandwidth and Carrier Frequency Separation

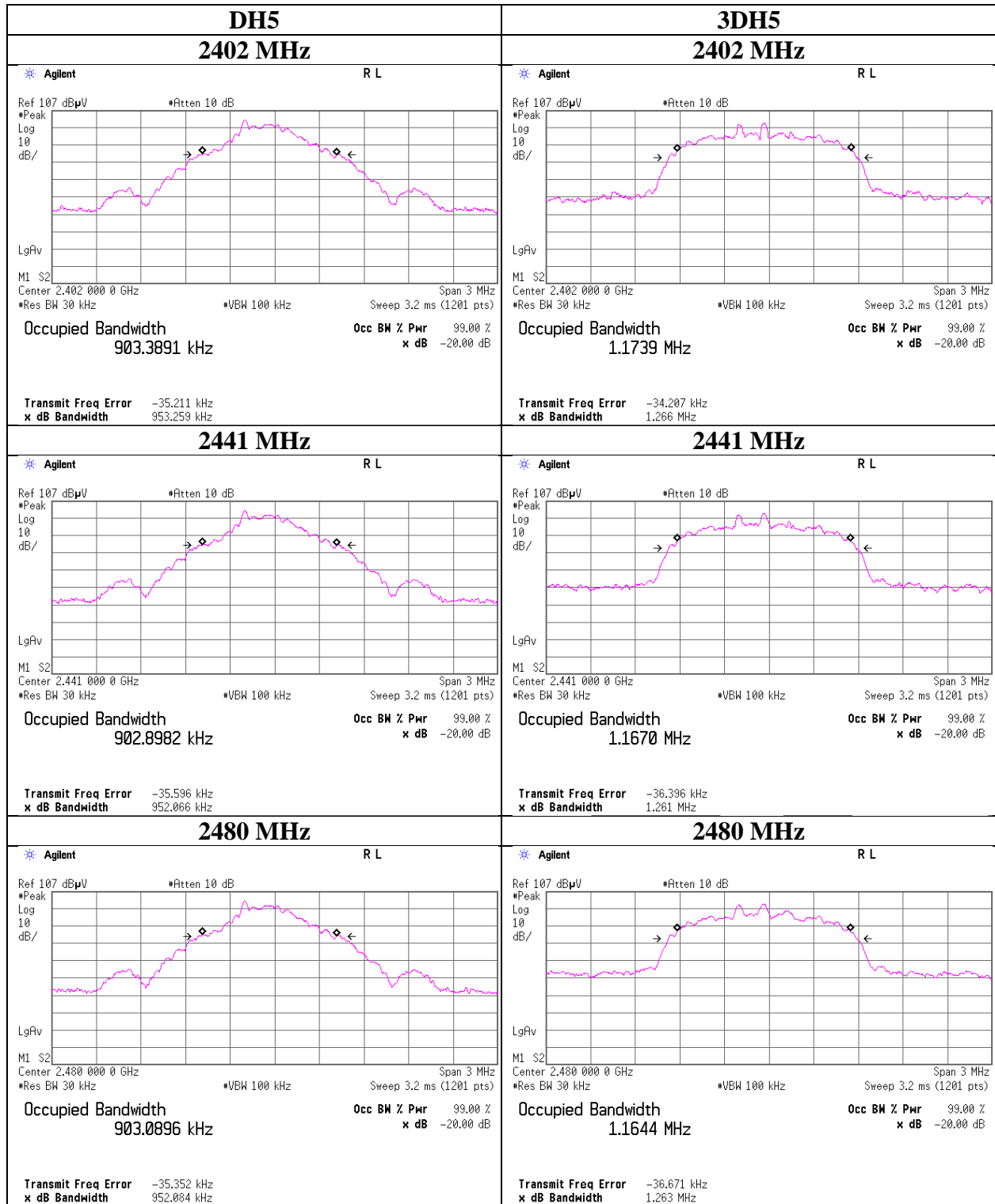
Report No. 12180028S-A-R1  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date April 17, 2018  
Temperature / Humidity 24 deg. C / 31 % RH  
Engineer Tatsuya Arai  
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.953	903.389	1.000	>= 0.636
DH5	2441.0	0.952	902.898	1.000	>= 0.635
DH5	2480.0	0.952	903.090	1.000	>= 0.635
DH5	Hopping On	-	78630.0	-	-
3DH5	2402.0	1.266	1173.9	1.000	>= 0.844
3DH5	2441.0	1.261	1167.0	1.000	>= 0.841
3DH5	2480.0	1.263	1164.4	1.000	>= 0.842
3DH5	Hopping On	-	78804.1	-	-

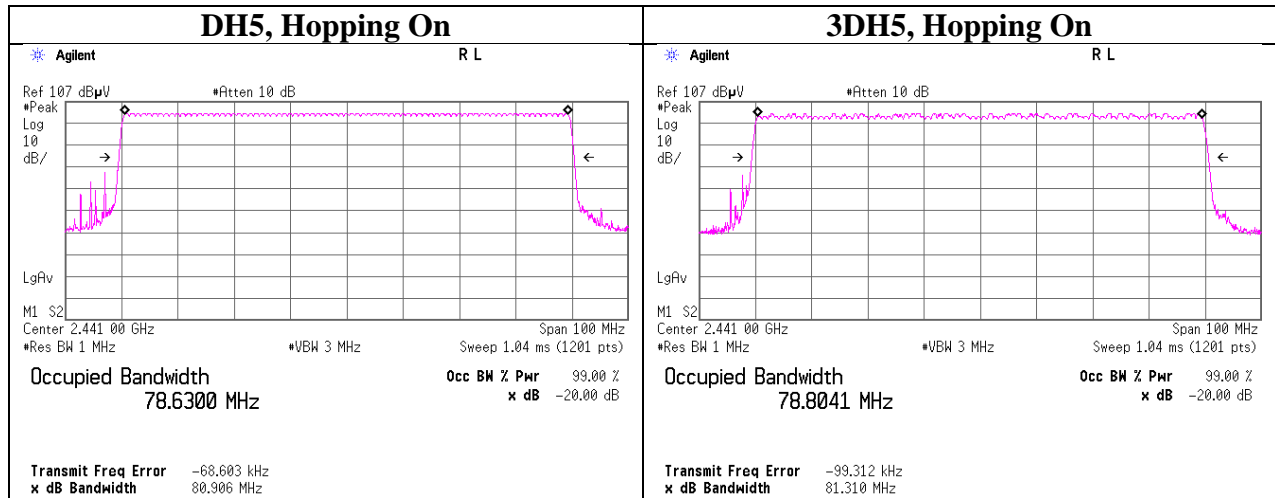
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

### 20dB Bandwidth and 99% Occupied Bandwidth



**20dB Bandwidth and 99% Occupied Bandwidth**



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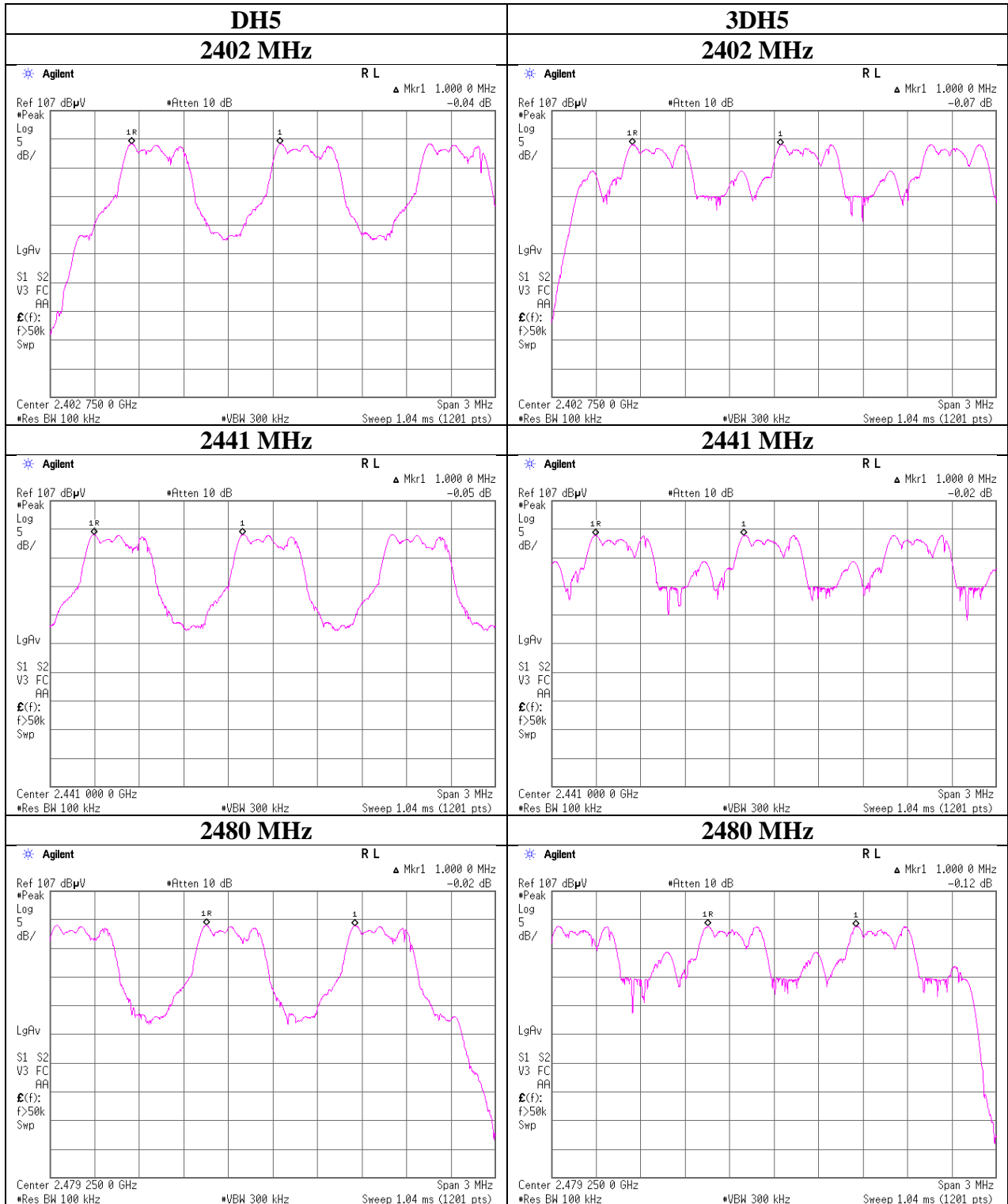
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### Carrier Frequency Separation



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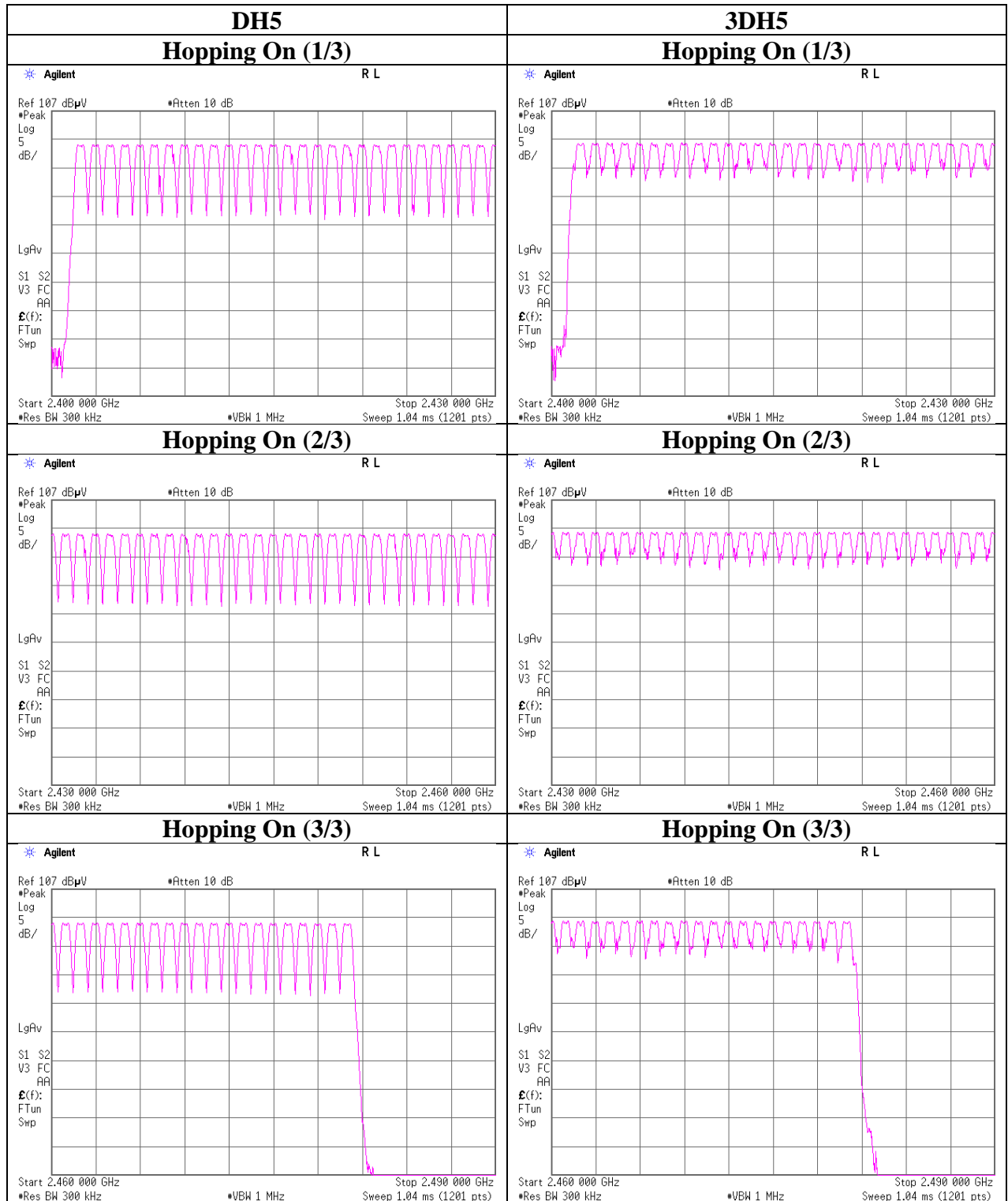
### Number of Hopping Frequency

Report No. 12180028S-A-R1  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date April 17, 2018 April 18, 2018  
Temperature / Humidity 24 deg. C / 31 % RH 23 deg. C / 44 % RH  
Engineer Tatsuya Arai Tatsuya Arai  
Mode Tx, Hopping On

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

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

**Number of Hopping Frequency**



### Dwell time

Report No. 12180028S-A-R1  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date April 17, 2018  
Temperature / Humidity 24 deg. C / 31 % RH  
Engineer Tatsuya Arai  
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]
	24.4 times /	5 sec. x	31.6 sec. =			
DH1	24.4 times /	5 sec. x	31.6 sec. = 155 times	0.413	61	400
DH3	16.4 times /	5 sec. x	31.6 sec. = 104 times	1.685	236	400
DH5	16.6 times /	5 sec. x	31.6 sec. = 105 times	2.927	369	400
3DH1	25.4 times /	5 sec. x	31.6 sec. = 161 times	0.335	54	400
3DH3	17.2 times /	5 sec. x	31.6 sec. = 109 times	1.676	183	400
3DH5	16.4 times /	5 sec. x	31.6 sec. = 104 times	2.924	304	400

Sample Calculation

Result = Number of transmission x Length of transmission

\*Average data of 5 tests.(except Inquiry)

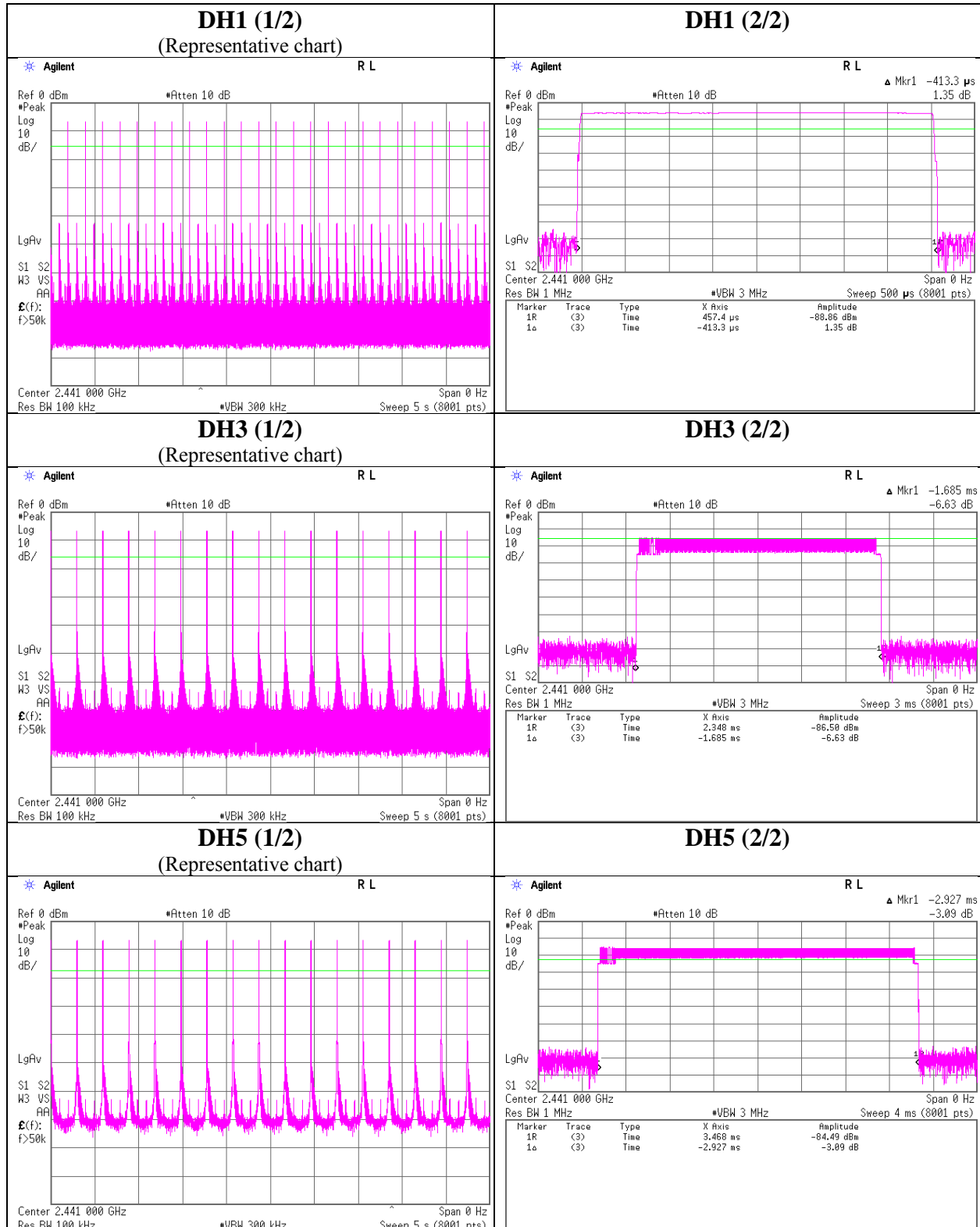
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	24	24	25	24	25	24.4
DH3	17	16	16	16	17	16.4
DH5	17	17	17	16	16	16.6
3DH1	25	25	26	25	26	25.4
3DH3	17	17	17	17	18	17.2
3DH5	17	16	17	16	16	16.4

Sample Calculation

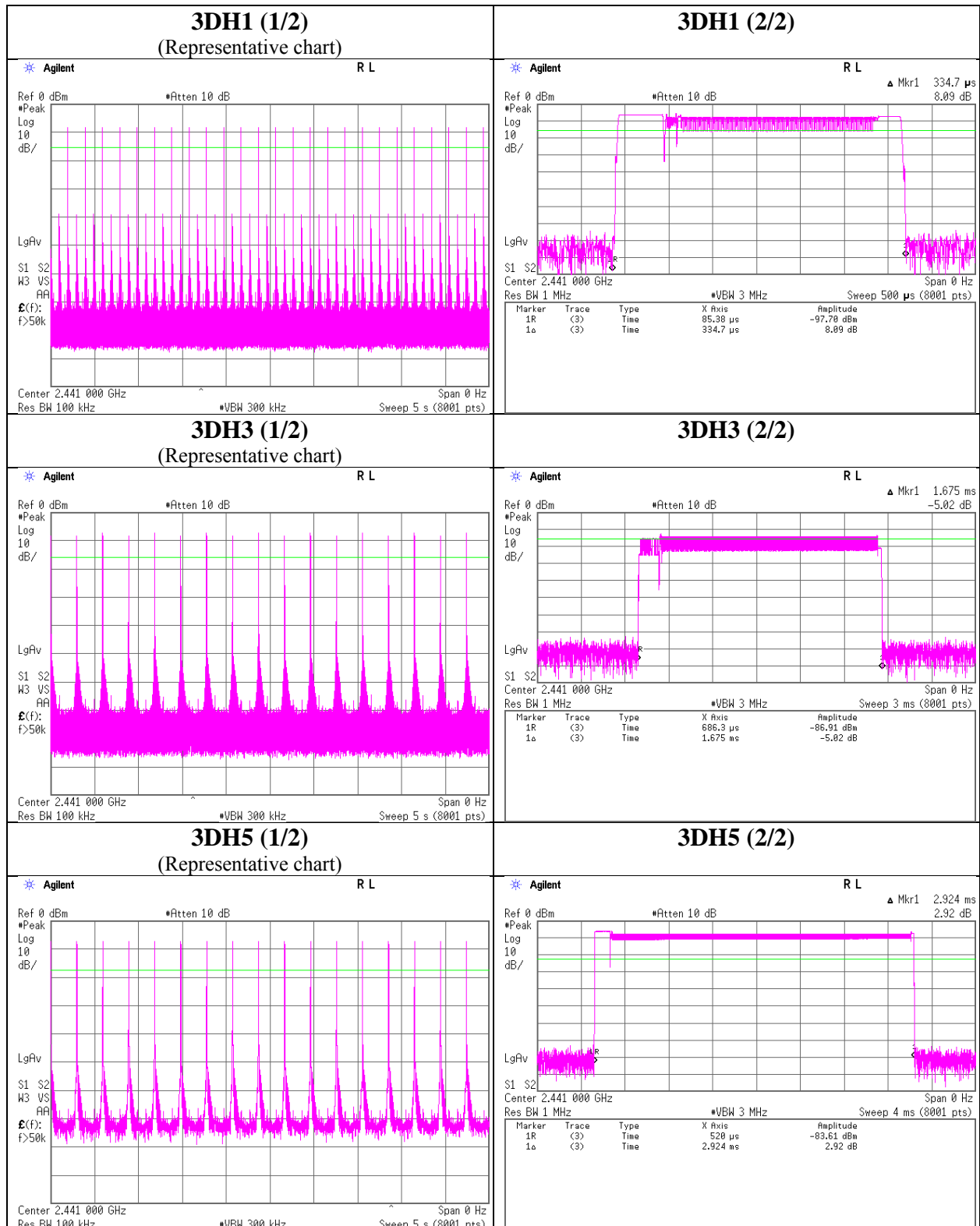
Average = Summation (Sampling 1 to 5) / 5

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  $N = 79$ .

### Dwell time



**Dwell time**



## Maximum Peak Output Power

Report No. 12180028S-A-R1  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date April 17, 2018  
Temperature / Humidity 24 deg. C / 31 % RH  
Engineer Tatsuya Arai  
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p.					
					Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-5.79	1.45	9.88	5.54	3.58	20.96	125	15.42	-12.57	-7.03	0.20	36.02	4000	43.05
DH5	2441.0	-5.81	1.73	9.88	5.80	3.80	20.96	125	15.16	-12.57	-6.77	0.21	36.02	4000	42.79
DH5	2480.0	-5.86	2.03	9.88	6.05	4.03	20.96	125	14.91	-12.57	-6.52	0.22	36.02	4000	42.54
2DH5	2402.0	-4.56	1.45	9.88	6.77	4.75	20.96	125	14.19	-12.57	-5.80	0.26	36.02	4000	41.82
2DH5	2441.0	-4.52	1.73	9.88	7.09	5.12	20.96	125	13.87	-12.57	-5.48	0.28	36.02	4000	41.50
2DH5	2480.0	-4.57	2.03	9.88	7.34	5.42	20.96	125	13.62	-12.57	-5.23	0.30	36.02	4000	41.25
3DH5	2402.0	-4.55	1.45	9.88	6.78	4.76	20.96	125	14.18	-12.57	-5.79	0.26	36.02	4000	41.81
3DH5	2441.0	-4.51	1.73	9.88	7.10	5.13	20.96	125	13.86	-12.57	-5.47	0.28	36.02	4000	41.49
3DH5	2480.0	-4.55	2.03	9.88	7.36	5.45	20.96	125	13.60	-12.57	-5.21	0.30	36.02	4000	41.23

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss  
e.i.r.p. Result = Conducted Power Result + Antenna Gain

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.  
However, the limit level 125mW of AFH mode was used for the test.

**Average Output Power**  
**(Reference data for RF Exposure / SAR testing)**

Report No. 12180028S-A-R1  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date April 17, 2018  
Temperature / Humidity 24 deg. C / 31 % RH  
Engineer Tatsuya Arai  
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-7.07	1.45	9.88	4.26	2.67	1.06	5.32	3.40
DH5	2441.0	-7.10	1.73	9.88	4.51	2.82	1.06	5.57	3.61
DH5	2480.0	-7.16	2.03	9.88	4.75	2.99	1.06	5.81	3.81
2DH5	2402.0	-9.45	1.45	9.88	1.88	1.54	1.06	2.94	1.97
2DH5	2441.0	-9.52	1.73	9.88	2.09	1.62	1.06	3.15	2.07
2DH5	2480.0	-9.57	2.03	9.88	2.34	1.71	1.06	3.40	2.19
3DH5	2402.0	-8.54	1.45	9.88	2.79	1.90	1.06	3.85	2.43
3DH5	2441.0	-8.58	1.73	9.88	3.03	2.01	1.06	4.09	2.56
3DH5	2480.0	-8.64	2.03	9.88	3.27	2.12	1.06	4.33	2.71

Sample Calculation:

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

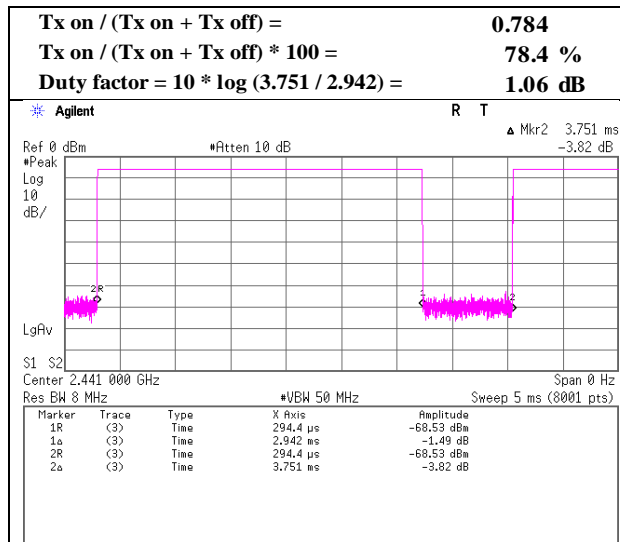
Result (Burst power average) = Time average + Duty factor

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

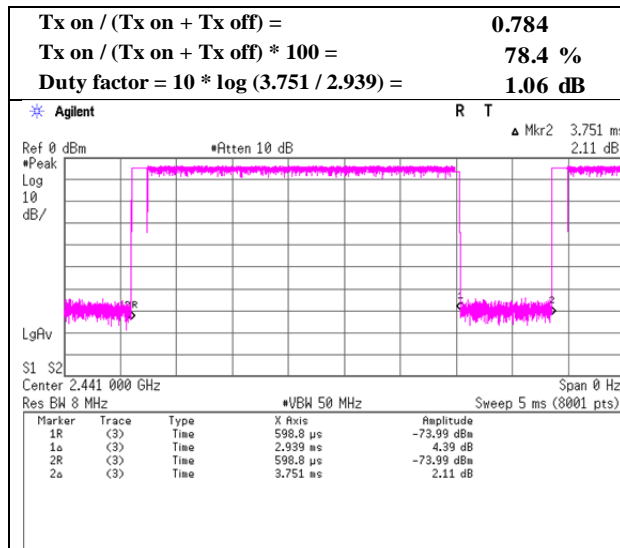
## Burst Rate Confirmation

Report No. 12180028S-A-R1  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date April 17, 2018  
Temperature / Humidity 24 deg. C / 31 % RH  
Engineer Tatsuya Arai  
Mode Tx, Hopping Off

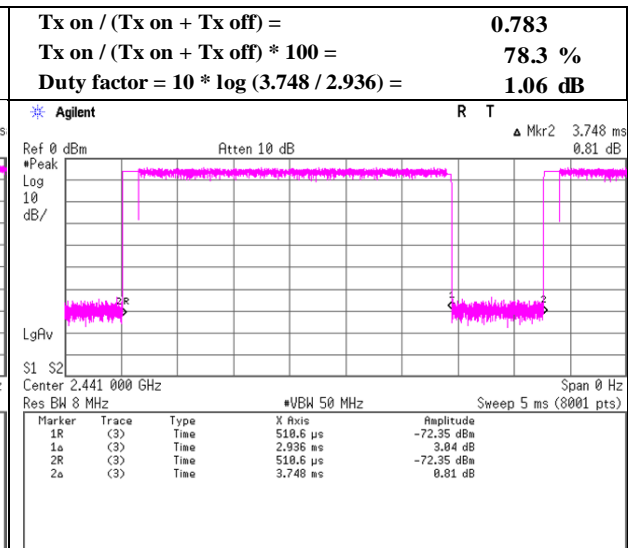
### DH5



### 2DH5



### 3DH5





## Radiated Spurious Emission

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 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.	221.214	QP	46.60	11.57	6.05	31.76	0.00	32.46	46.00	13.5	100	7	
Hori.	337.504	QP	50.00	14.26	7.10	31.77	0.00	39.59	46.00	6.4	100	6	
Hori.	516.970	QP	36.20	17.91	8.24	31.95	0.00	30.40	46.00	15.6	100	206	
Hori.	665.296	QP	33.70	19.57	8.92	32.06	0.00	30.13	46.00	15.8	100	268	
Hori.	785.706	QP	35.50	20.59	9.43	31.91	0.00	33.61	46.00	12.3	100	138	
Hori.	826.613	QP	36.50	21.06	9.63	31.73	0.00	35.46	46.00	10.5	100	86	
Hori.	2390.000	PK	44.69	27.14	14.56	36.58	2.24	52.05	73.90	21.8	110	295	
Hori.	4804.000	PK	55.09	31.13	7.17	36.88	2.24	58.75	73.90	15.1	149	214	
Hori.	7206.000	PK	46.06	36.35	8.80	37.26	2.24	56.19	73.90	17.7	128	267	
Hori.	9608.000	PK	45.28	38.11	10.39	38.47	2.24	57.55	73.90	16.3	150	0	
Hori.	2390.000	AV	31.32	27.14	14.56	36.58	2.24	38.68	53.90	15.2	110	295	
Hori.	4804.000	AV	48.99	31.13	7.17	36.88	2.24	52.65	53.90	1.2	149	214	
Hori.	7206.000	AV	36.42	36.35	8.80	37.26	2.24	46.55	53.90	7.3	128	267	
Hori.	9608.000	AV	33.78	38.11	10.39	38.47	2.24	46.05	53.90	7.8	150	0	
Vert.	145.971	QP	36.30	14.53	8.75	31.78	0.00	27.80	43.50	15.7	100	184	
Vert.	337.511	QP	45.70	14.26	7.10	31.77	0.00	35.29	46.00	10.7	100	147	
Vert.	528.981	QP	36.20	18.09	8.30	31.99	0.00	30.60	46.00	15.4	100	359	
Vert.	657.823	QP	37.20	19.53	8.88	32.06	0.00	33.55	46.00	12.4	100	322	
Vert.	680.315	QP	37.60	19.67	9.00	32.05	0.00	34.22	46.00	11.7	100	322	
Vert.	2390.000	PK	43.30	27.14	14.56	36.58	2.24	50.66	73.90	23.2	146	164	
Vert.	4804.000	PK	53.82	31.13	7.17	36.88	2.24	57.48	73.90	16.4	111	299	
Vert.	7206.000	PK	46.05	36.35	8.80	37.26	2.24	56.18	73.90	17.7	161	267	
Vert.	9608.000	PK	45.72	38.11	10.39	38.47	2.24	57.99	73.90	15.9	150	0	
Vert.	2390.000	AV	31.33	27.14	14.56	36.58	2.24	38.69	53.90	15.2	146	164	
Vert.	4804.000	AV	47.85	31.13	7.17	36.88	2.24	51.51	53.90	2.3	111	299	
Vert.	7206.000	AV	35.42	36.35	8.80	37.26	2.24	45.55	53.90	8.3	161	267	
Vert.	9608.000	AV	33.81	38.11	10.39	38.47	2.24	46.08	53.90	7.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 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	80.82	27.18	14.57	36.57	2.24	88.24	-	-	Carrier
Hori.	2397.917	PK	37.02	27.17	14.57	36.58	2.24	44.42	68.24	23.8	
Hori.	2400.000	PK	37.04	27.17	14.57	36.58	2.24	44.44	68.24	23.8	
Vert.	2402.000	PK	80.38	27.18	14.57	36.57	2.24	87.80	-	-	Carrier
Vert.	2397.137	PK	35.93	27.16	14.57	36.58	2.24	43.32	67.80	24.5	
Vert.	2400.000	PK	37.19	27.17	14.57	36.58	2.24	44.59	67.80	23.2	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

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

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**Shonan EMC Lab.**

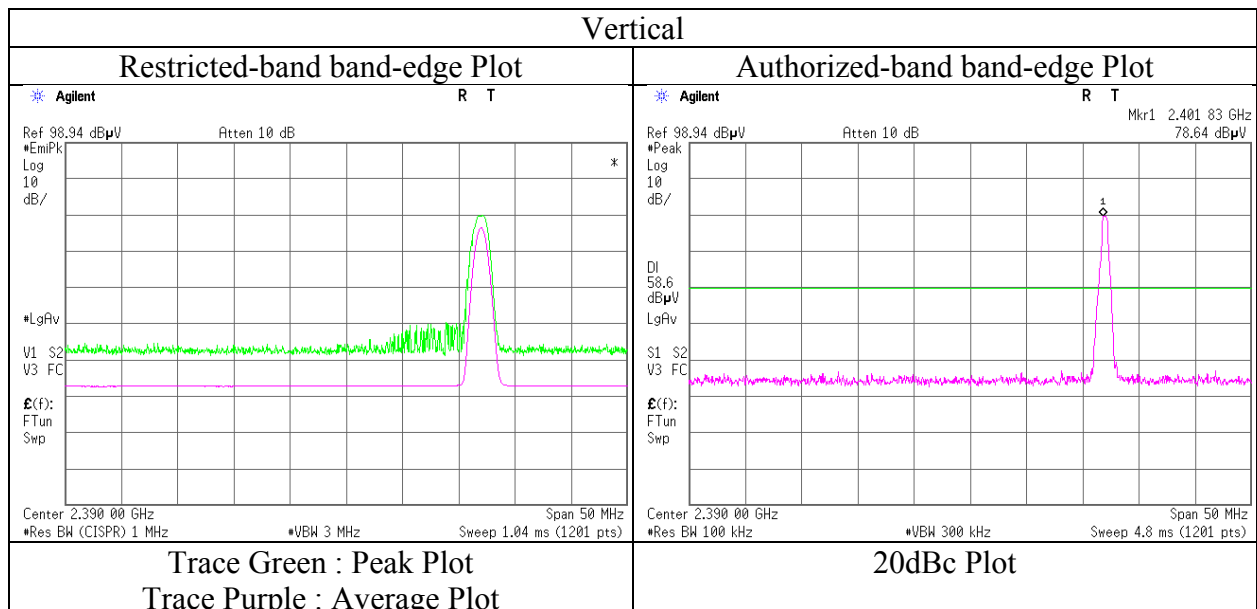
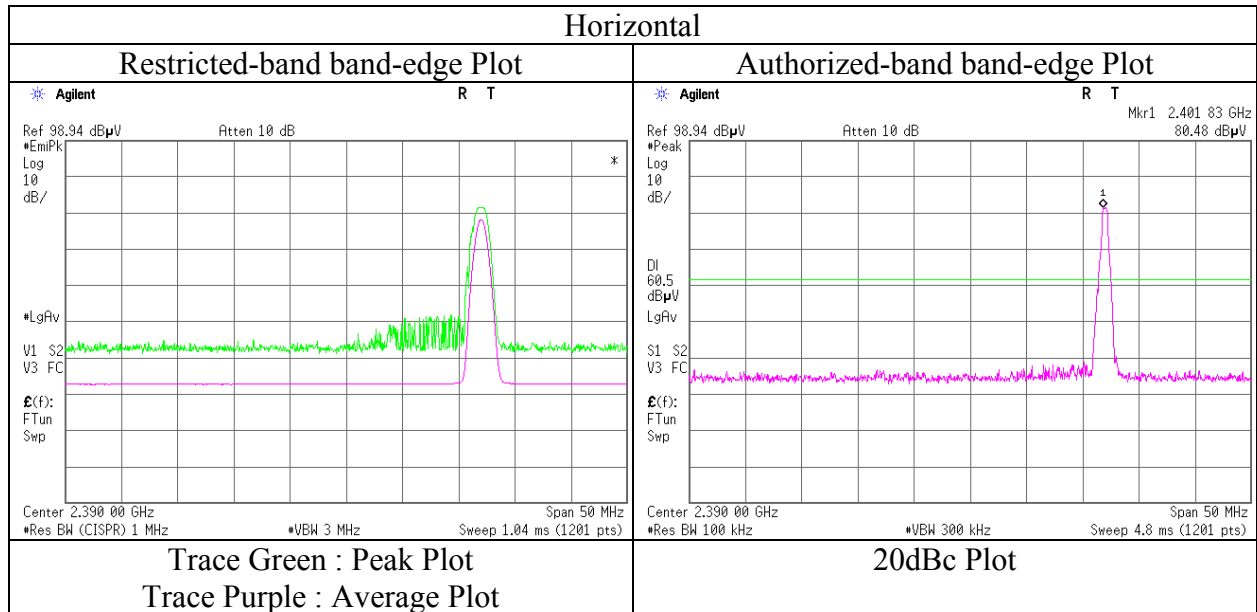
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Report No.	12180028S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 1
Date	April 19, 2018
Temperature / Humidity	23 deg. C / 48 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, DH5 2402 MHz



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

## Radiated Spurious Emission

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 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.	221.230	QP	45.10	11.57	6.05	31.76	0.00	30.96	46.00	15.0	100	8	
Hori.	337.501	QP	50.00	14.26	7.10	31.77	0.00	39.59	46.00	6.4	100	6	
Hori.	512.258	QP	36.20	17.84	8.22	31.93	0.00	30.33	46.00	15.6	100	207	
Hori.	681.594	QP	37.70	19.68	9.00	32.05	0.00	34.33	46.00	11.6	100	75	
Hori.	785.000	QP	35.70	20.58	9.43	31.91	0.00	33.80	46.00	12.2	100	143	
Hori.	802.763	QP	36.10	20.76	9.50	31.88	0.00	34.48	46.00	11.5	100	55	
Hori.	4882.000	PK	53.02	31.31	7.20	36.91	2.24	56.86	73.90	17.0	145	211	
Hori.	7323.000	PK	45.83	36.51	8.86	37.44	2.24	56.00	73.90	17.9	150	57	
Hori.	9764.000	PK	45.03	38.37	10.37	38.66	2.24	57.35	73.90	16.5	150	0	
Hori.	4882.000	AV	46.42	31.31	7.20	36.91	2.24	50.26	53.90	<b>3.6</b>	145	211	
Hori.	7323.000	AV	35.71	36.51	8.86	37.44	2.24	45.88	53.90	8.0	150	57	
Hori.	9764.000	AV	32.89	38.37	10.37	38.66	2.24	45.21	53.90	8.6	150	0	
Vert.	145.978	QP	36.00	14.53	8.75	31.78	0.00	27.50	43.50	16.0	100	180	
Vert.	337.513	QP	46.00	14.26	7.10	31.77	0.00	35.59	46.00	10.4	100	150	
Vert.	528.041	QP	36.50	18.08	8.30	31.98	0.00	30.90	46.00	15.1	100	357	
Vert.	676.392	QP	36.30	19.65	8.98	32.05	0.00	32.88	46.00	13.1	100	323	
Vert.	767.853	QP	35.80	20.42	9.36	31.92	0.00	33.66	46.00	12.3	100	345	
Vert.	4882.000	PK	50.95	31.31	7.20	36.91	2.24	54.79	73.90	19.1	190	209	
Vert.	7323.000	PK	47.09	36.51	8.86	37.44	2.24	57.26	73.90	16.6	193	346	
Vert.	9764.000	PK	45.38	38.37	10.37	38.66	2.24	57.70	73.90	16.2	150	0	
Vert.	4882.000	AV	44.76	31.31	7.20	36.91	2.24	48.60	53.90	5.3	190	209	
Vert.	7323.000	AV	36.66	36.51	8.86	37.44	2.24	46.83	53.90	7.0	193	346	
Vert.	9764.000	AV	32.81	38.37	10.37	38.66	2.24	45.13	53.90	8.7	150	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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

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Facsimile : +81 463 50 6401

## Radiated Spurious Emission

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 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.	221.216	QP	46.30	11.57	6.05	31.76	0.00	32.16	46.00	13.8	100	10	
Hori.	337.506	QP	48.10	14.26	7.10	31.77	0.00	37.69	46.00	8.3	100	7	
Hori.	511.220	QP	35.70	17.83	8.22	31.93	0.00	29.82	46.00	16.1	100	248	
Hori.	666.014	QP	35.20	19.58	8.92	32.06	0.00	31.64	46.00	14.3	100	109	
Hori.	788.313	QP	35.10	20.61	9.44	31.90	0.00	33.25	46.00	12.7	100	140	
Hori.	808.194	QP	36.30	20.82	9.53	31.84	0.00	34.81	46.00	11.1	100	85	
Hori.	2483.500	PK	44.09	27.45	14.66	36.52	2.24	51.92	73.90	21.9	158	163	
Hori.	4960.000	PK	50.07	31.48	7.22	36.93	2.24	54.08	73.90	19.8	145	214	
Hori.	7440.000	PK	45.65	36.68	8.94	37.63	2.24	55.88	73.90	18.0	133	188	
Hori.	9920.000	PK	44.53	38.63	10.34	38.84	2.24	56.90	73.90	17.0	150	0	
Hori.	2483.500	AV	31.84	27.45	14.66	36.52	2.24	39.67	53.90	14.2	158	163	
Hori.	4960.000	AV	43.03	31.48	7.22	36.93	2.24	47.04	53.90	<b>6.8</b>	145	214	
Hori.	7440.000	AV	34.62	36.68	8.94	37.63	2.24	44.85	53.90	9.0	133	188	
Hori.	9920.000	AV	32.14	38.63	10.34	38.84	2.24	44.51	53.90	9.3	150	0	
Vert.	145.899	QP	33.70	14.52	8.75	31.78	0.00	25.19	43.50	18.3	100	185	
Vert.	337.508	QP	43.00	14.26	7.10	31.77	0.00	32.59	46.00	13.4	100	150	
Vert.	524.399	QP	35.10	18.02	8.28	31.97	0.00	29.43	46.00	16.5	100	1	
Vert.	658.237	QP	37.20	19.53	8.88	32.06	0.00	33.55	46.00	12.4	100	358	
Vert.	776.392	QP	35.20	20.50	9.40	31.91	0.00	33.19	46.00	12.8	100	320	
Vert.	2483.500	PK	43.63	27.45	14.66	36.52	2.24	51.46	73.90	22.4	146	132	
Vert.	4960.000	PK	49.22	31.48	7.22	36.93	2.24	53.23	73.90	20.6	100	350	
Vert.	7440.000	PK	46.23	36.68	8.94	37.63	2.24	56.46	73.90	17.4	146	22	
Vert.	9920.000	PK	43.96	38.63	10.34	38.84	2.24	56.33	73.90	17.5	150	0	
Vert.	2483.500	AV	31.55	27.45	14.66	36.52	2.24	39.38	53.90	14.5	146	132	
Vert.	4960.000	AV	41.04	31.48	7.22	36.93	2.24	45.05	53.90	8.8	100	350	
Vert.	7440.000	AV	34.56	36.68	8.94	37.63	2.24	44.79	53.90	9.1	146	22	
Vert.	9920.000	AV	32.11	38.63	10.34	38.84	2.24	44.48	53.90	9.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 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.

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**Shonan EMC Lab.**

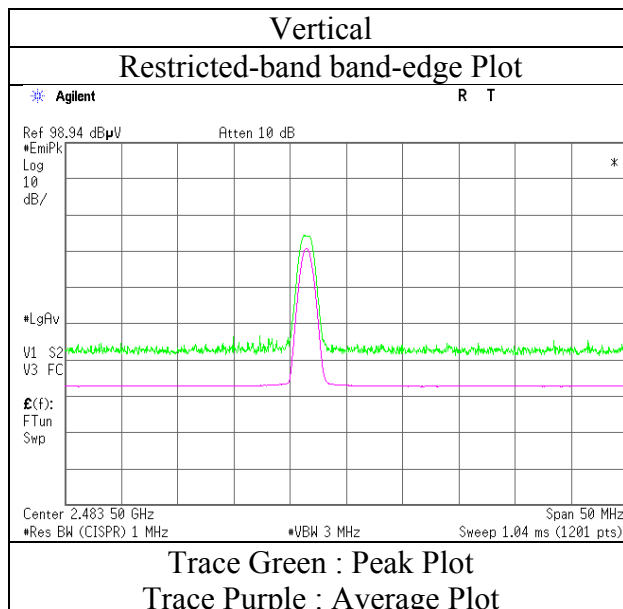
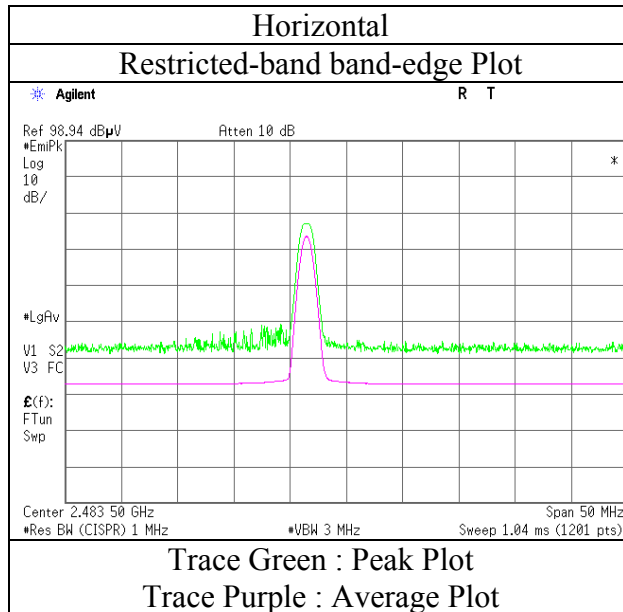
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Facsimile : +81 463 50 6401

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

Report No.	12180028S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 1
Date	April 19, 2018
Temperature / Humidity	23 deg. C / 48 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, DH5 2480 MHz



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

## Radiated Spurious Emission

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 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.	151.023	QP	35.30	14.68	8.84	31.78	0.00	27.04	43.50	16.4	100	133	
Hori.	221.260	QP	42.60	11.57	6.05	31.76	0.00	28.46	46.00	17.5	100	359	
Hori.	337.506	QP	51.00	14.26	7.10	31.77	0.00	40.59	46.00	5.4	100	126	
Hori.	472.504	QP	37.50	17.09	8.02	31.89	0.00	30.72	46.00	15.2	100	276	
Hori.	678.573	QP	36.80	19.66	8.99	32.05	0.00	33.40	46.00	12.6	100	36	
Hori.	787.419	QP	35.10	20.60	9.44	31.90	0.00	33.24	46.00	12.7	100	142	
Hori.	2390.000	PK	45.84	27.14	14.56	36.58	2.24	53.20	73.90	20.7	100	0	
Hori.	4804.000	PK	53.78	31.13	7.17	36.88	2.24	57.44	73.90	16.4	161	209	
Hori.	7206.000	PK	46.23	36.35	8.80	37.26	2.24	56.36	73.90	17.5	126	172	
Hori.	9608.000	PK	46.75	38.11	10.39	38.47	2.24	59.02	73.90	14.8	150	0	
Hori.	2390.000	AV	31.33	27.14	14.56	36.58	2.24	38.69	53.90	15.2	100	0	
Hori.	4804.000	AV	45.36	31.13	7.17	36.88	2.24	49.02	53.90	4.8	161	209	
Hori.	7206.000	AV	35.26	36.35	8.80	37.26	2.24	45.39	53.90	8.5	126	172	
Hori.	9608.000	AV	33.84	38.11	10.39	38.47	2.24	46.11	53.90	7.7	150	0	
Vert.	337.507	QP	48.20	14.26	7.10	31.77	0.00	37.79	46.00	8.2	128	162	
Vert.	528.056	QP	35.60	18.08	8.30	31.98	0.00	30.00	46.00	16.0	100	125	
Vert.	662.033	QP	36.20	19.55	8.90	32.06	0.00	32.59	46.00	13.4	100	336	
Vert.	679.988	QP	37.60	19.67	9.00	32.05	0.00	34.22	46.00	11.7	100	358	
Vert.	773.810	QP	35.10	20.48	9.39	31.92	0.00	33.05	46.00	12.9	100	323	
Vert.	2390.000	PK	43.43	27.14	14.56	36.58	2.24	50.79	73.90	23.1	146	160	
Vert.	4804.000	PK	52.93	31.13	7.17	36.88	2.24	56.59	73.90	17.3	153	297	
Vert.	7206.000	PK	46.34	36.35	8.80	37.26	2.24	56.47	73.90	17.4	137	325	
Vert.	9608.000	PK	45.61	38.11	10.39	38.47	2.24	57.88	73.90	16.0	150	0	
Vert.	2390.000	AV	31.33	27.14	14.56	36.58	2.24	38.69	53.90	15.2	146	160	
Vert.	4804.000	AV	45.08	31.13	7.17	36.88	2.24	48.74	53.90	5.1	153	297	
Vert.	7206.000	AV	35.51	36.35	8.80	37.26	2.24	45.64	53.90	8.2	137	325	
Vert.	9608.000	AV	33.81	38.11	10.39	38.47	2.24	46.08	53.90	7.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 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	77.80	27.18	14.57	36.57	2.24	85.22	-	-	Carrier
Hori.	2399.613	PK	40.05	27.17	14.57	36.58	2.24	47.45	65.22	17.8	
Hori.	2400.000	PK	39.69	27.17	14.57	36.58	2.24	47.09	65.22	18.1	
Vert.	2402.000	PK	75.90	27.18	14.57	36.57	2.24	83.32	-	-	Carrier
Vert.	2399.549	PK	38.19	27.17	14.57	36.58	2.24	45.59	63.32	17.7	
Vert.	2400.000	PK	38.04	27.17	14.57	36.58	2.24	45.44	63.32	17.9	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

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

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**Shonan EMC Lab.**

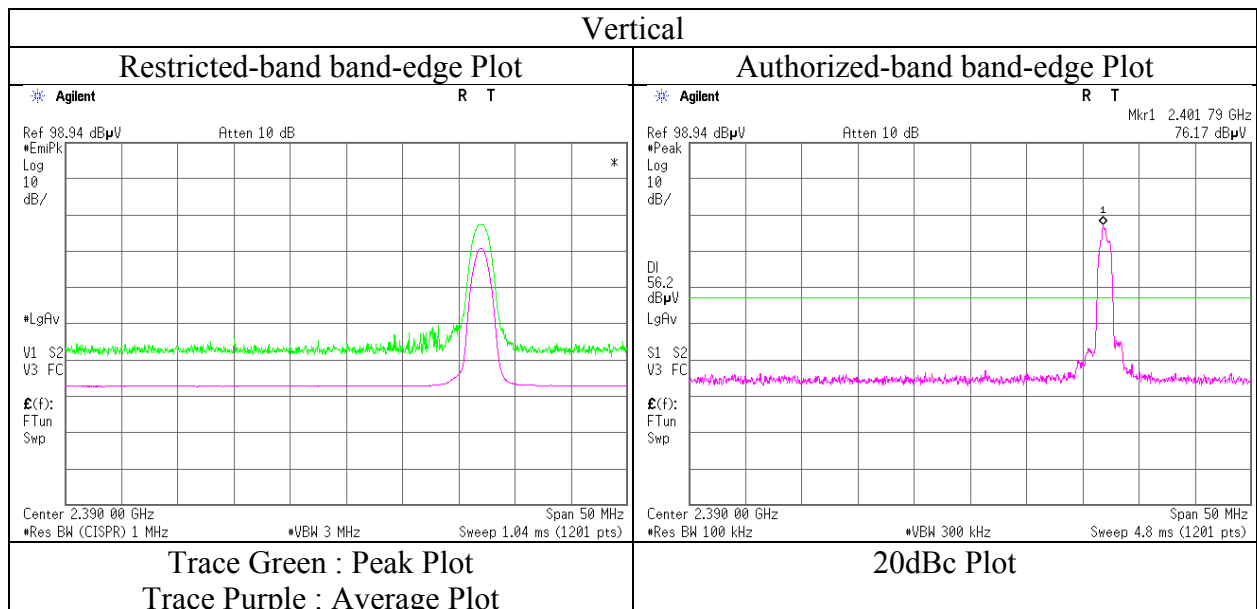
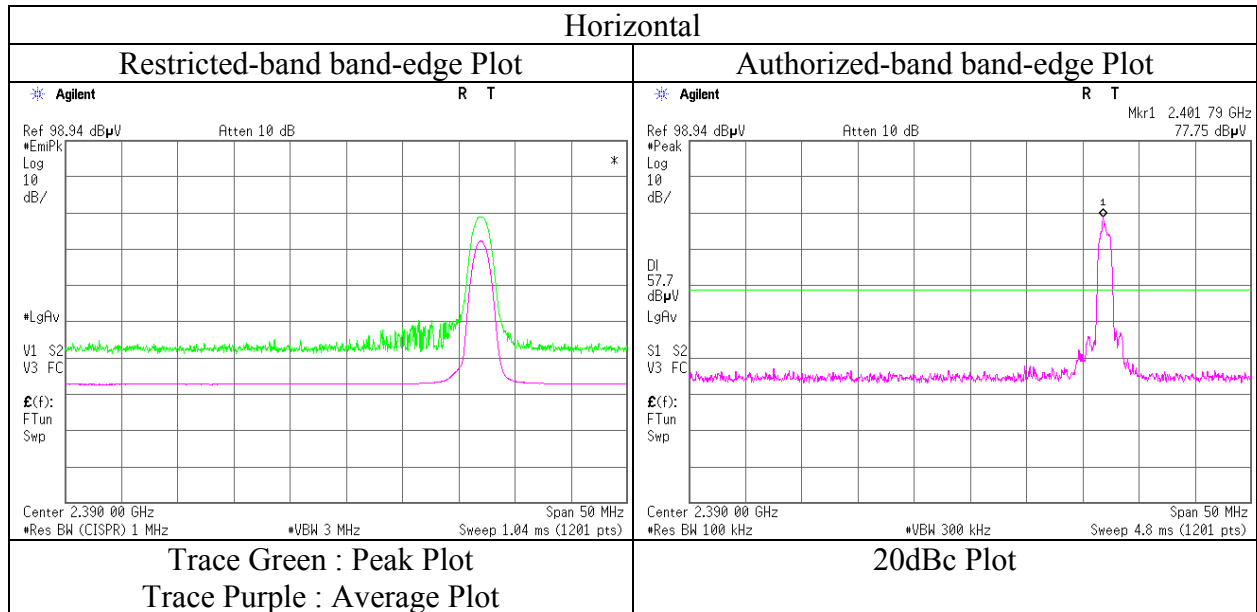
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Facsimile : +81 463 50 6401

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

Report No. 12180028S-A-R1  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber No. 1  
Date April 19, 2018  
Temperature / Humidity 23 deg. C / 48 % RH  
Engineer Kazutaka Takeyama  
Mode Tx, Hopping Off, 3DH5 2402 MHz



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

## Radiated Spurious Emission

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 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.	151.042	QP	34.70	14.68	8.84	31.78	0.00	26.44	43.50	17.0	100	121	
Hori.	221.210	QP	43.00	11.57	6.05	31.76	0.00	28.86	46.00	17.1	100	358	
Hori.	337.509	QP	50.00	14.26	7.10	31.77	0.00	39.59	46.00	<b>6.4</b>	100	125	
Hori.	472.509	QP	37.00	17.09	8.02	31.89	0.00	30.22	46.00	15.7	100	270	
Hori.	675.013	QP	36.70	19.64	8.97	32.05	0.00	33.26	46.00	12.7	100	93	
Hori.	787.881	QP	36.50	20.61	9.44	31.90	0.00	34.65	46.00	11.3	100	8	
Hori.	805.630	QP	35.20	20.79	9.52	31.86	0.00	33.65	46.00	12.3	100	137	
Hori.	4882.000	PK	51.78	31.31	7.20	36.91	2.24	55.62	73.90	18.2	105	209	
Hori.	7323.000	PK	45.67	36.51	8.86	37.44	2.24	55.84	73.90	18.0	153	58	
Hori.	9764.000	PK	44.68	38.37	10.37	38.66	2.24	57.00	73.90	16.9	150	0	
Hori.	4882.000	AV	43.64	31.31	7.20	36.91	2.24	47.48	53.90	<b>6.4</b>	105	209	
Hori.	7323.000	AV	34.64	36.51	8.86	37.44	2.24	44.81	53.90	9.0	153	58	
Hori.	9764.000	AV	32.97	38.37	10.37	38.66	2.24	45.29	53.90	8.6	150	0	
Vert.	337.516	QP	46.70	14.26	7.10	31.77	0.00	36.29	46.00	9.7	130	161	
Vert.	522.649	QP	35.50	18.00	8.27	31.97	0.00	29.80	46.00	16.2	100	7	
Vert.	658.837	QP	36.60	19.53	8.89	32.06	0.00	32.96	46.00	13.0	100	308	
Vert.	679.211	QP	37.60	19.66	8.99	32.05	0.00	34.20	46.00	11.8	100	355	
Vert.	771.428	QP	35.20	20.46	9.38	31.92	0.00	33.12	46.00	12.8	100	290	
Vert.	4882.000	PK	52.20	31.31	7.20	36.91	2.24	56.04	73.90	17.8	115	1	
Vert.	7323.000	PK	45.08	36.51	8.86	37.44	2.24	55.25	73.90	18.6	180	350	
Vert.	9764.000	PK	45.09	38.37	10.37	38.66	2.24	57.41	73.90	16.4	150	0	
Vert.	4882.000	AV	43.04	31.31	7.20	36.91	2.24	46.88	53.90	7.0	115	1	
Vert.	7323.000	AV	34.18	36.51	8.86	37.44	2.24	44.35	53.90	9.5	180	350	
Vert.	9764.000	AV	32.94	38.37	10.37	38.66	2.24	45.26	53.90	8.6	150	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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

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**Shonan EMC Lab.**

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## Radiated Spurious Emission

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 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.	151.048	QP	36.10	14.68	8.84	31.78	0.00	27.84	43.50	15.6	100	153	
Hori.	221.220	QP	42.60	11.57	6.05	31.76	0.00	28.46	46.00	17.5	103	357	
Hori.	337.509	QP	47.80	14.26	7.10	31.77	0.00	37.39	46.00	<b>8.6</b>	100	197	
Hori.	472.501	QP	36.10	17.09	8.02	31.89	0.00	29.32	46.00	16.6	100	257	
Hori.	664.960	QP	36.10	19.57	8.92	32.06	0.00	32.53	46.00	13.4	100	43	
Hori.	811.151	QP	35.20	20.86	9.55	31.83	0.00	33.78	46.00	12.2	100	95	
Hori.	828.808	QP	36.30	21.09	9.64	31.72	0.00	35.31	46.00	10.6	100	161	
Hori.	2483.500	PK	43.49	27.45	14.66	36.52	2.24	51.32	73.90	22.5	146	158	
Hori.	4960.000	PK	49.38	31.48	7.22	36.93	2.24	53.39	73.90	20.5	132	215	
Hori.	7440.000	PK	45.31	36.68	8.94	37.63	2.24	55.54	73.90	18.3	134	188	
Hori.	9920.000	PK	44.37	38.63	10.34	38.84	2.24	56.74	73.90	17.1	150	0	
Hori.	2483.500	AV	31.52	27.45	14.66	36.52	2.24	39.35	53.90	14.5	146	158	
Hori.	4960.000	AV	39.60	31.48	7.22	36.93	2.24	43.61	53.90	10.2	132	215	
Hori.	7440.000	AV	33.40	36.68	8.94	37.63	2.24	43.63	53.90	10.2	134	188	
Hori.	9920.000	AV	32.14	38.63	10.34	38.84	2.24	44.51	53.90	9.3	150	0	
Vert.	337.513	QP	45.10	14.26	7.10	31.77	0.00	34.69	46.00	11.3	143	201	
Vert.	524.763	QP	33.60	18.03	8.28	31.97	0.00	27.94	46.00	18.0	100	345	
Vert.	659.287	QP	36.70	19.54	8.89	32.06	0.00	33.07	46.00	12.9	100	355	
Vert.	759.828	QP	36.60	20.35	9.33	31.93	0.00	34.35	46.00	11.6	100	320	
Vert.	2483.500	PK	43.43	27.45	14.66	36.52	2.24	51.26	73.90	22.6	143	131	
Vert.	4960.000	PK	48.21	31.48	7.22	36.93	2.24	52.22	73.90	21.6	100	351	
Vert.	7440.000	PK	45.35	36.68	8.94	37.63	2.24	55.58	73.90	18.3	100	36	
Vert.	9920.000	PK	44.54	38.63	10.34	38.84	2.24	56.91	73.90	16.9	150	0	
Vert.	2483.500	AV	31.53	27.45	14.66	36.52	2.24	39.36	53.90	14.5	143	131	
Vert.	4960.000	AV	38.44	31.48	7.22	36.93	2.24	42.45	53.90	11.4	100	351	
Vert.	7440.000	AV	33.62	36.68	8.94	37.63	2.24	43.85	53.90	10.0	100	36	
Vert.	9920.000	AV	32.13	38.63	10.34	38.84	2.24	44.50	53.90	9.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 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.

**UL Japan, Inc.**

**Shonan EMC Lab.**

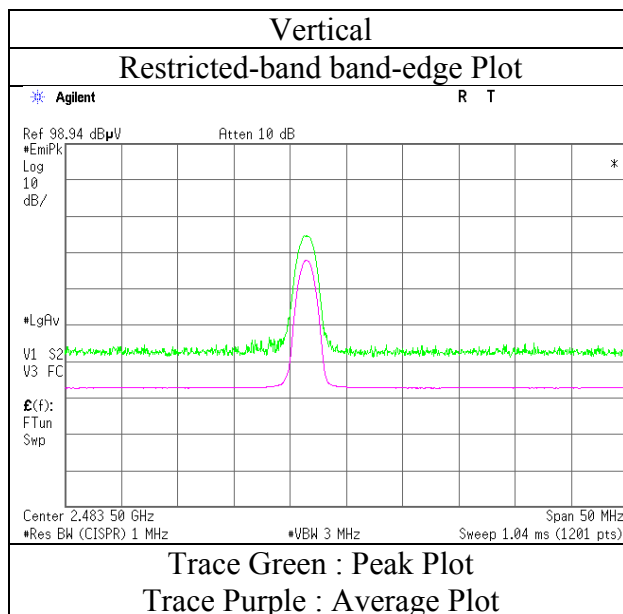
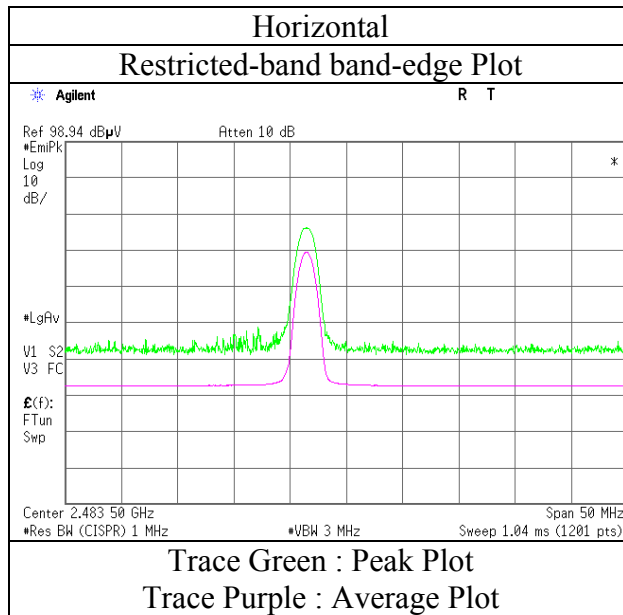
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

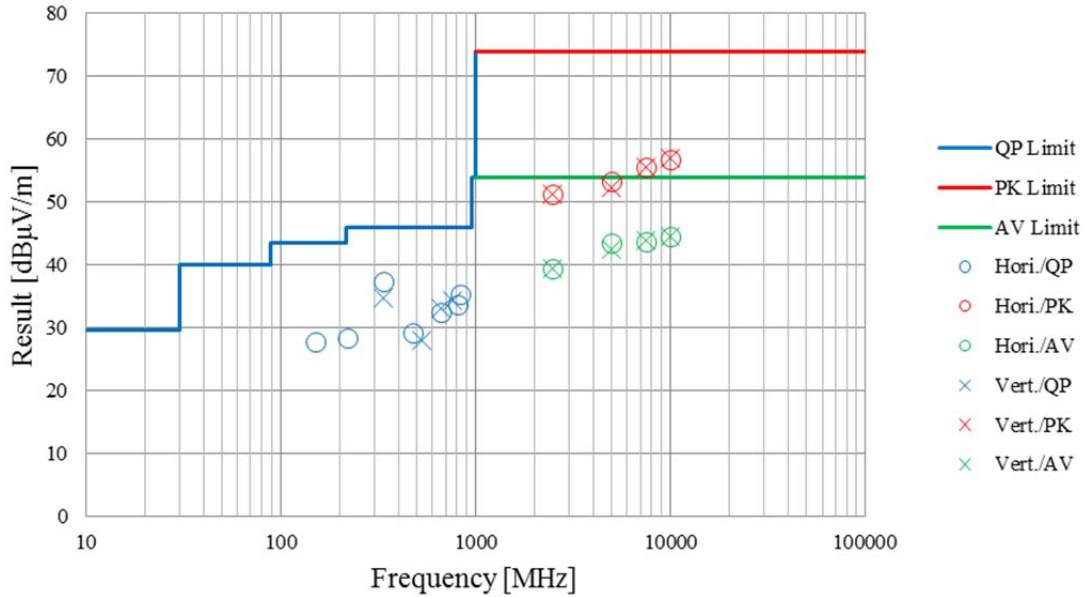
Report No.	12180028S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 1
Date	April 19, 2018
Temperature / Humidity	23 deg. C / 48 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

**Radiated Spurious Emission**  
**(Plot data, Worst case)**

Report No.	12180028S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	April 21, 2018	April 20, 2018	April 19, 2018
Temperature / Humidity	22 deg. C / 37 % RH	24 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Yosuke Ishikawa	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz -1000 MHz)	(1 GHz -13 GHz)	(13 GHz -32 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

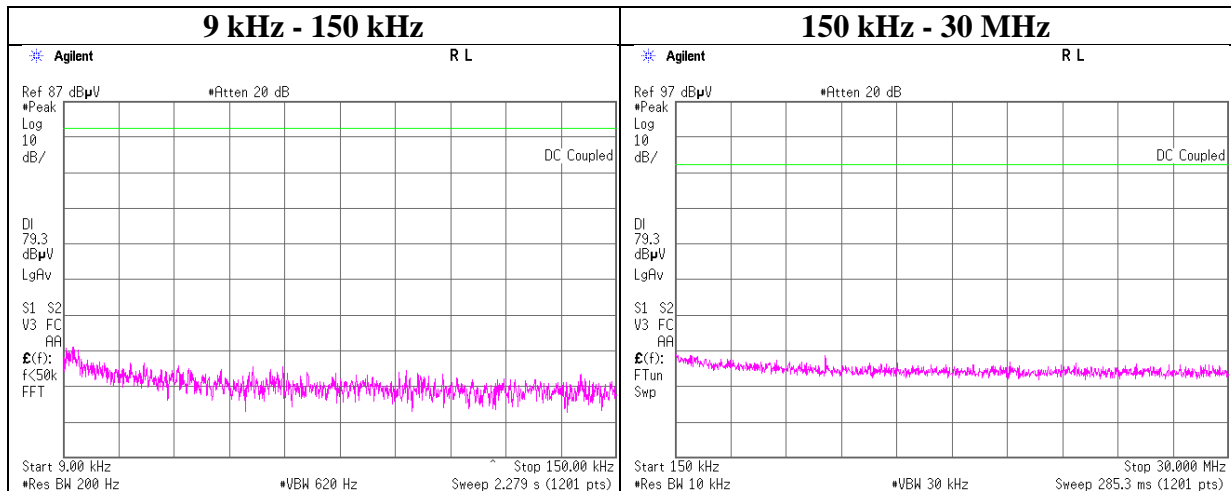


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

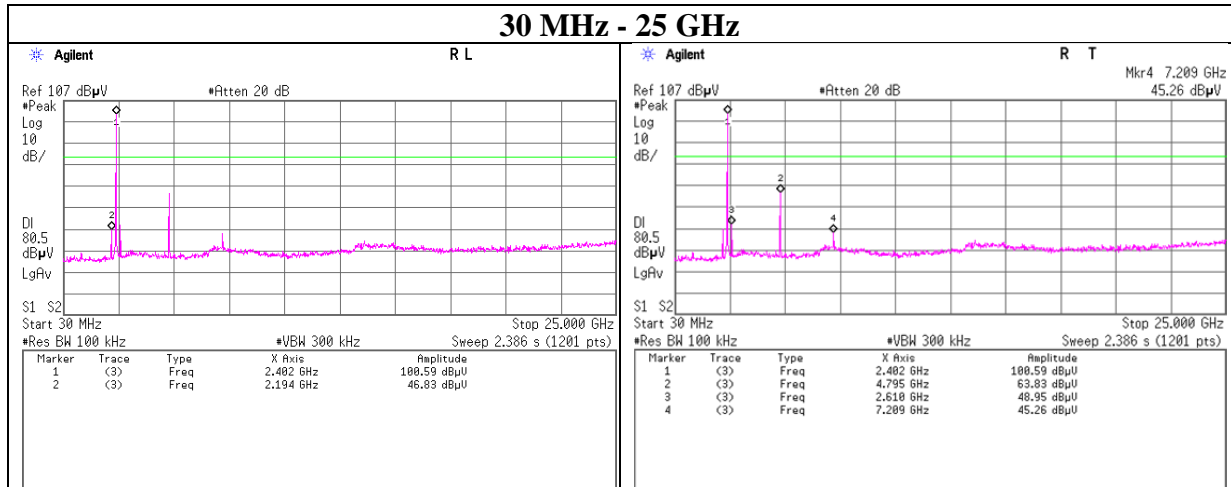
## Conducted Spurious Emission

Report No. 12180028S-A-R1  
 Test place Shonan EMC Lab. No.5 Shielded Room  
 Date April 17, 2018  
 Temperature / Humidity 24 deg. C / 31 % RH  
 Engineer Tatsuya Arai  
 Mode Tx, Hopping Off, DH5

### 2402 MHz



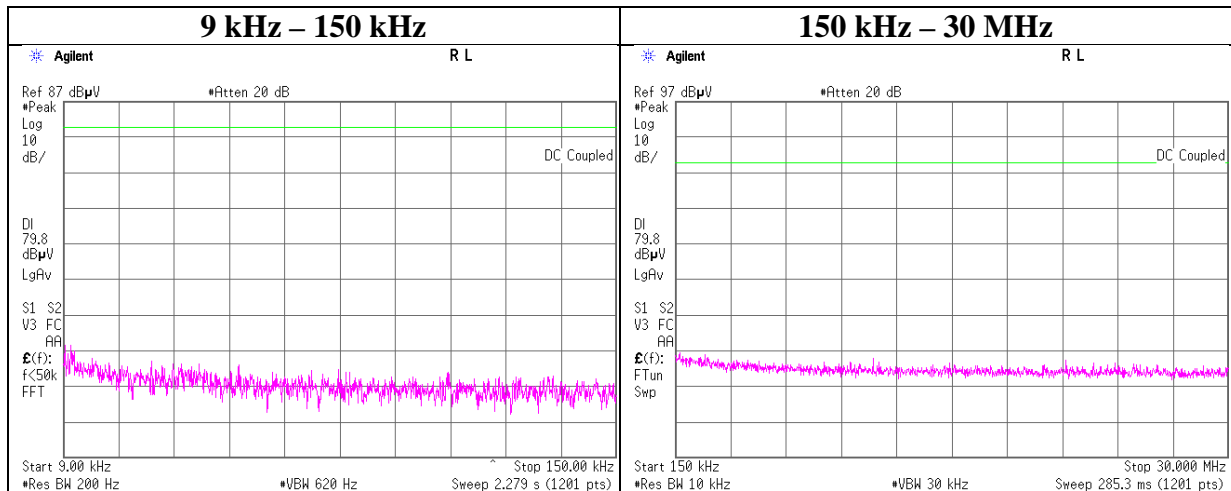
### 30 MHz - 25 GHz



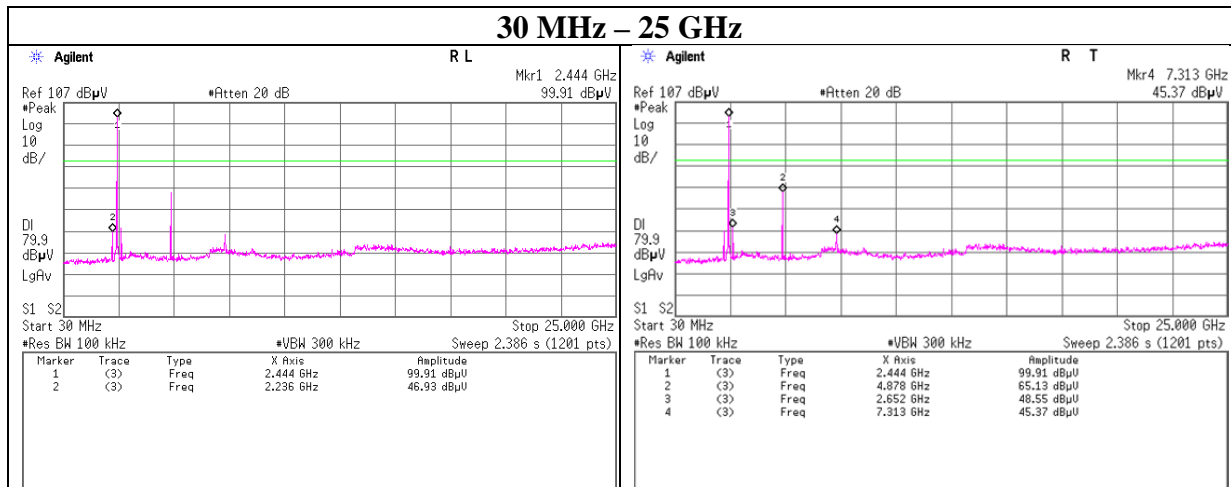
## Conducted Spurious Emission

Report No.	12180028S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 17, 2018
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Tatsuya Arai
Mode	Tx, Hopping Off, DH5

### 2441 MHz



### 30 MHz – 25 GHz



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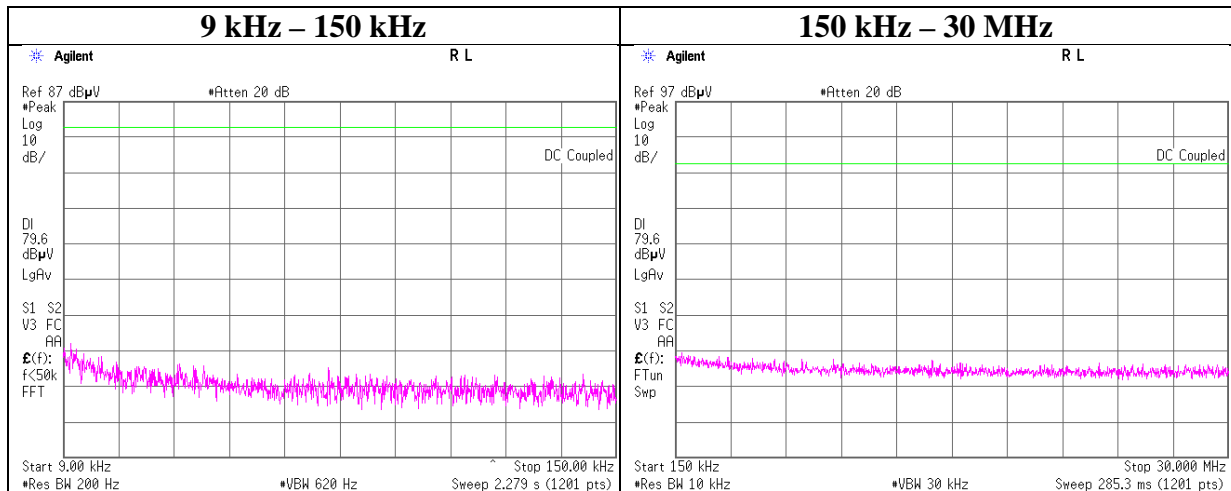
Telephone : +81 463 50 6400

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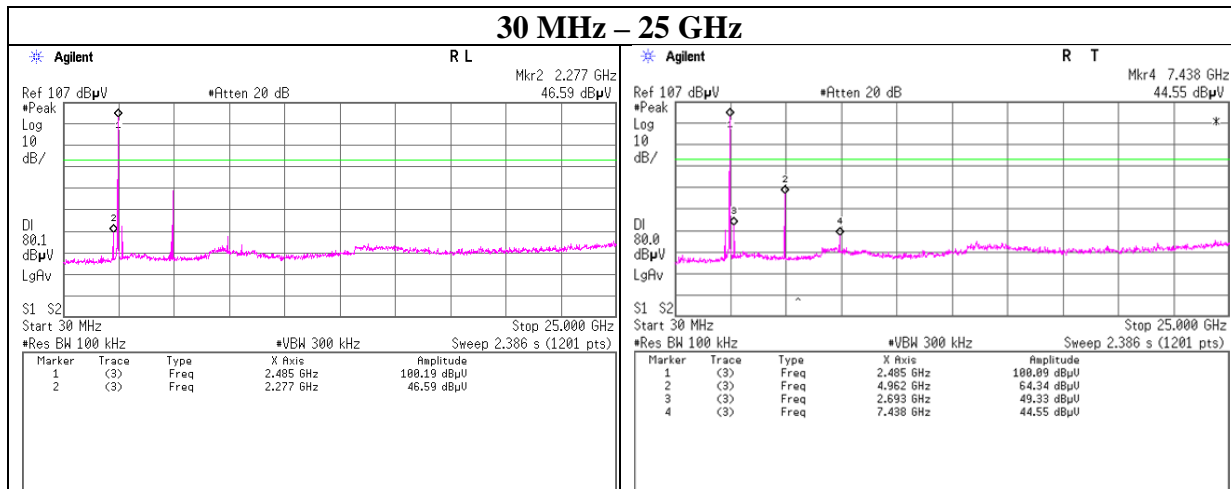
## Conducted Spurious Emission

Report No. 12180028S-A-R1  
 Test place Shonan EMC Lab. No.5 Shielded Room  
 Date April 17, 2018  
 Temperature / Humidity 24 deg. C / 31 % RH  
 Engineer Tatsuya Arai  
 Mode Tx, Hopping Off, DH5

### 2480 MHz



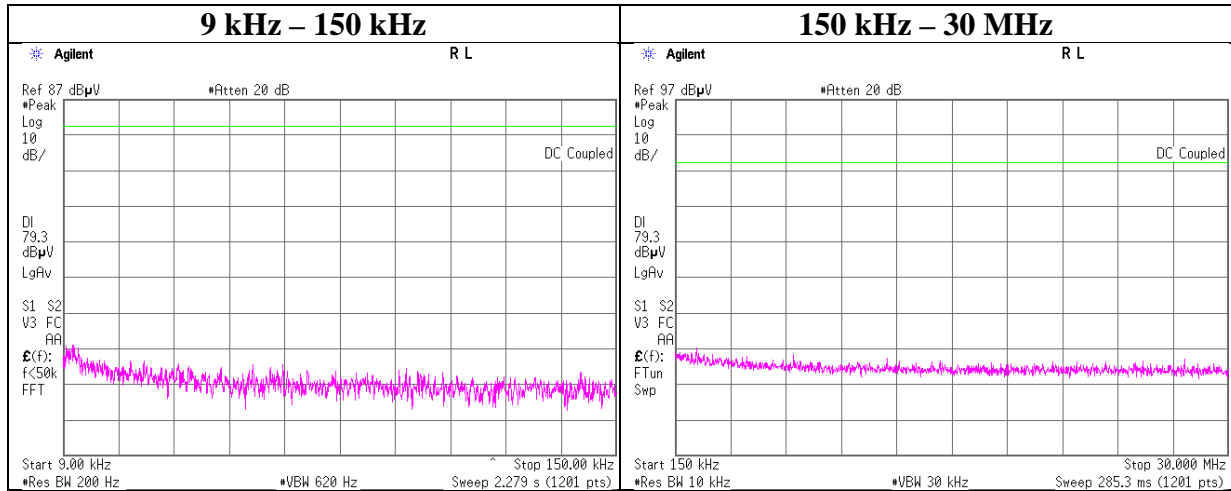
### 30 MHz – 25 GHz



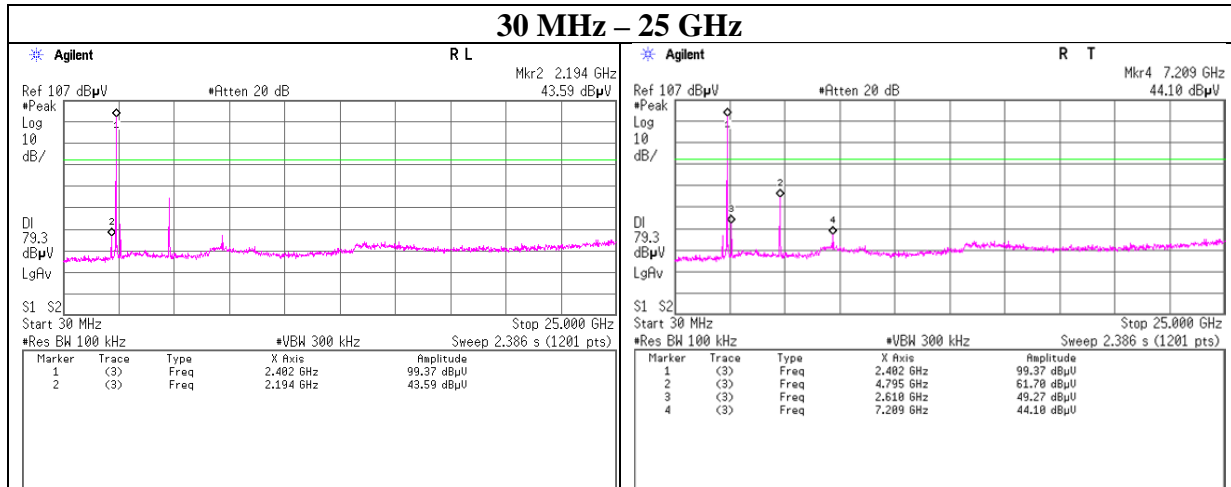
## Conducted Spurious Emission

Report No. 12180028S-A-R1  
 Test place Shonan EMC Lab. No.5 Shielded Room  
 Date April 17, 2018  
 Temperature / Humidity 24 deg. C / 31 % RH  
 Engineer Tatsuya Arai  
 Mode Tx, Hopping Off, 3DH5

### 2402 MHz



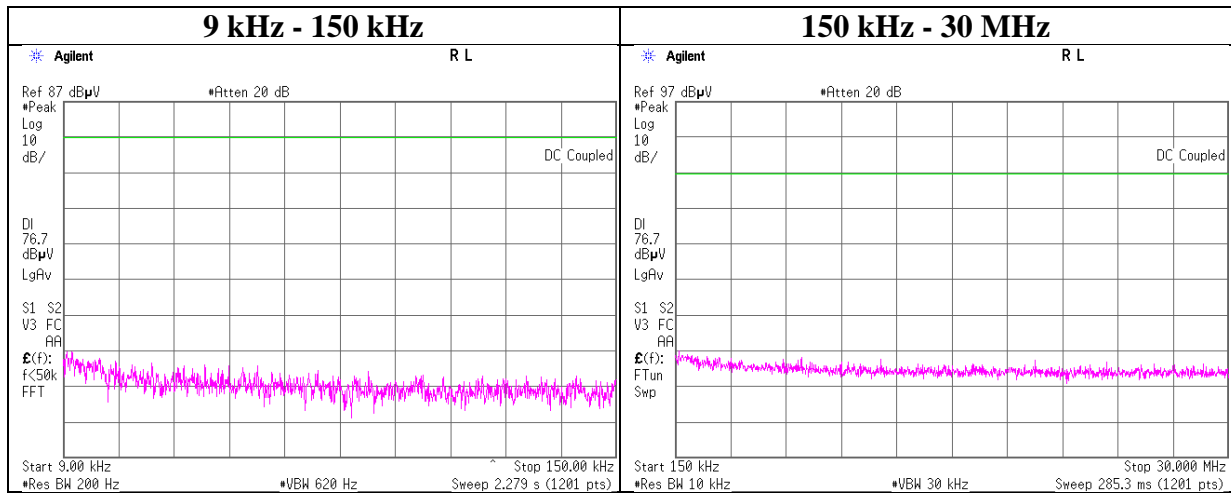
### 30 MHz – 25 GHz



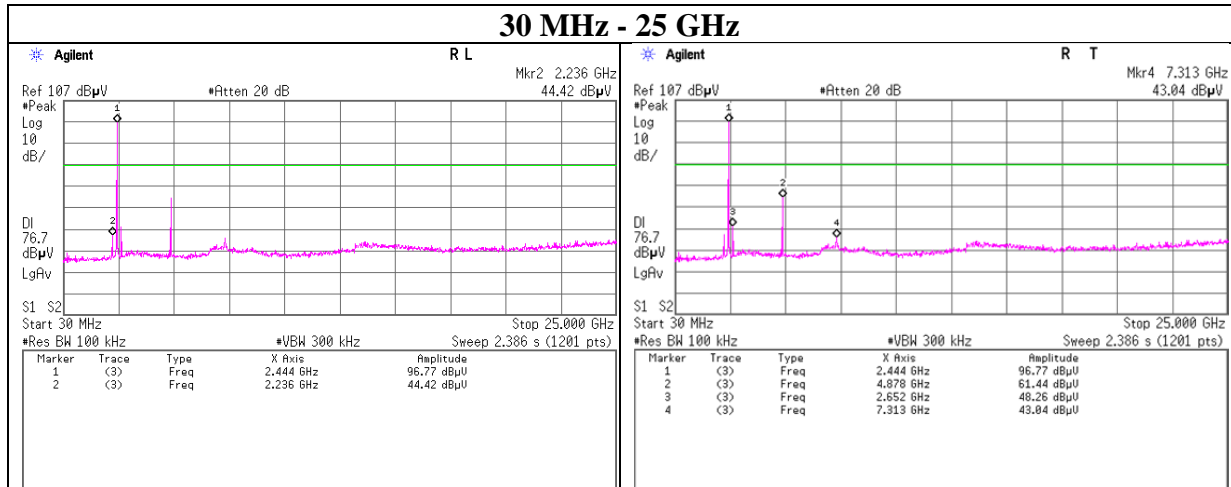
## Conducted Spurious Emission

Report No. 12180028S-A-R1  
 Test place Shonan EMC Lab. No.5 Shielded Room  
 Date April 17, 2018  
 Temperature / Humidity 24 deg. C / 31 % RH  
 Engineer Tatsuya Arai  
 Mode Tx, Hopping Off, 3DH5

### 2441 MHz



### 30 MHz - 25 GHz

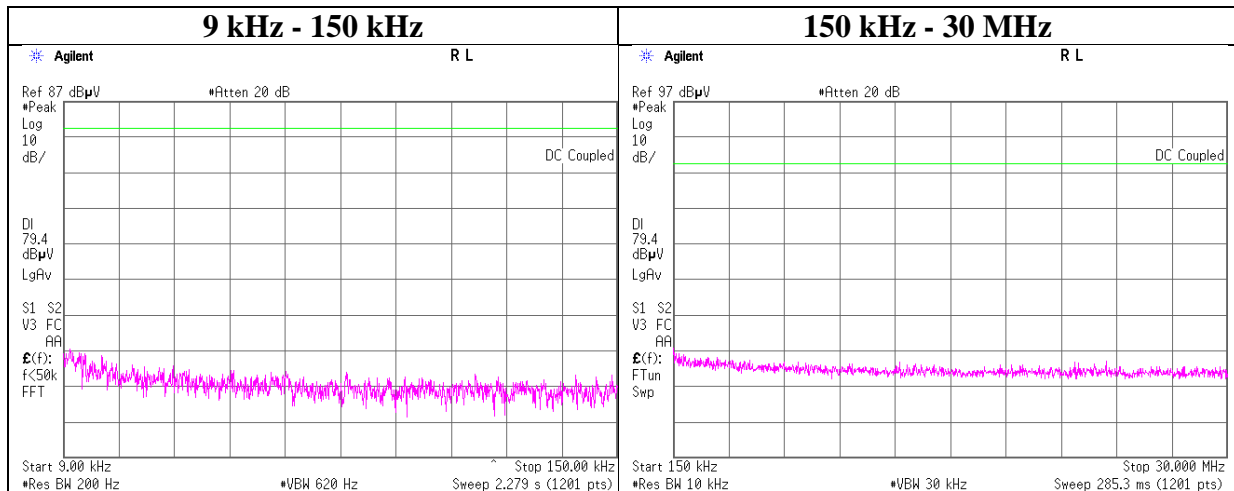




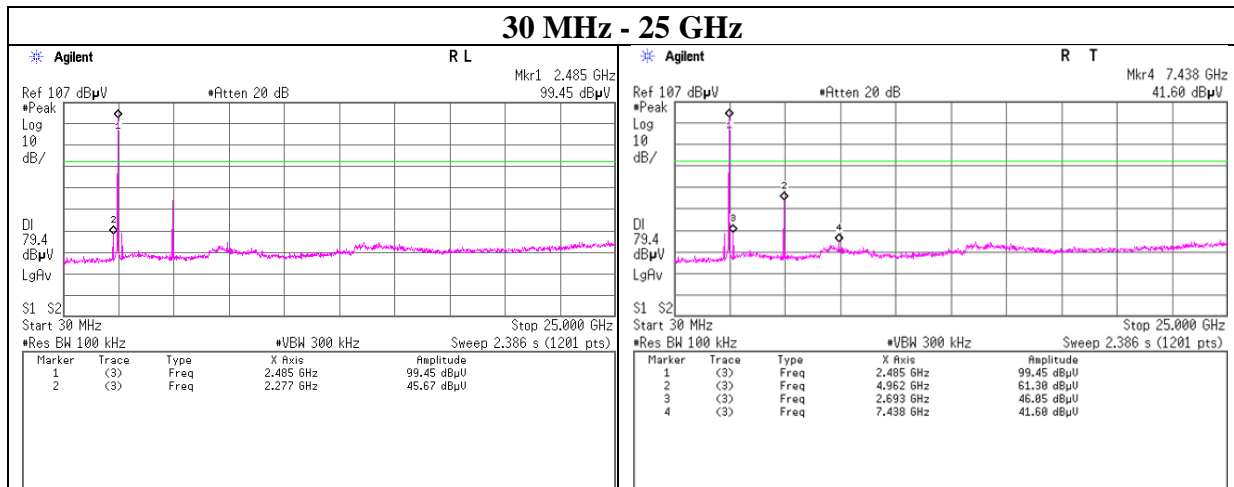
## Conducted Spurious Emission

Report No.	12180028S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 17, 2018
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Tatsuya Arai
Mode	Tx, Hopping Off, 3DH5

### 2480 MHz



### 30 MHz - 25 GHz



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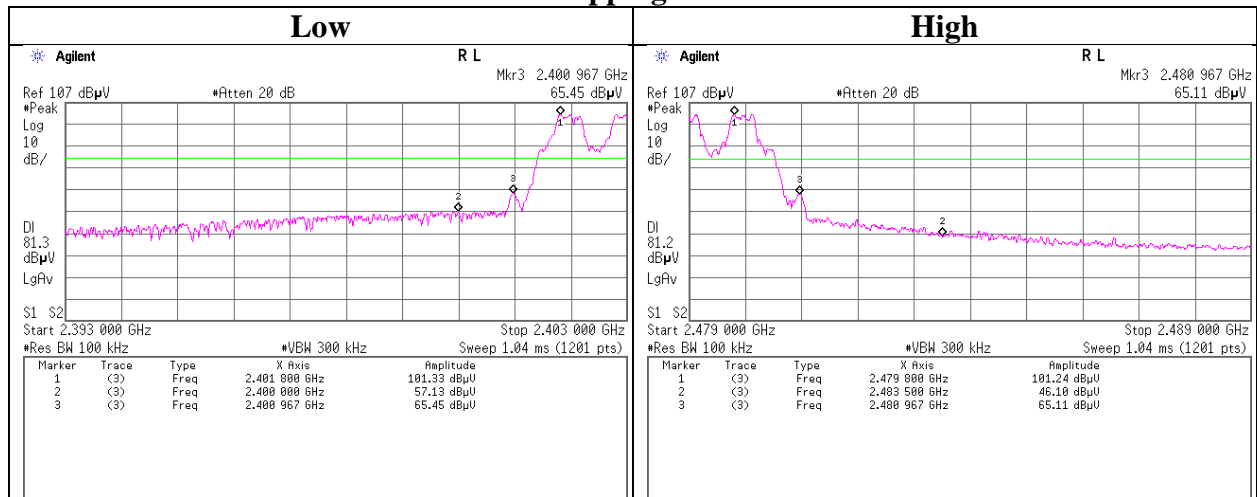
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

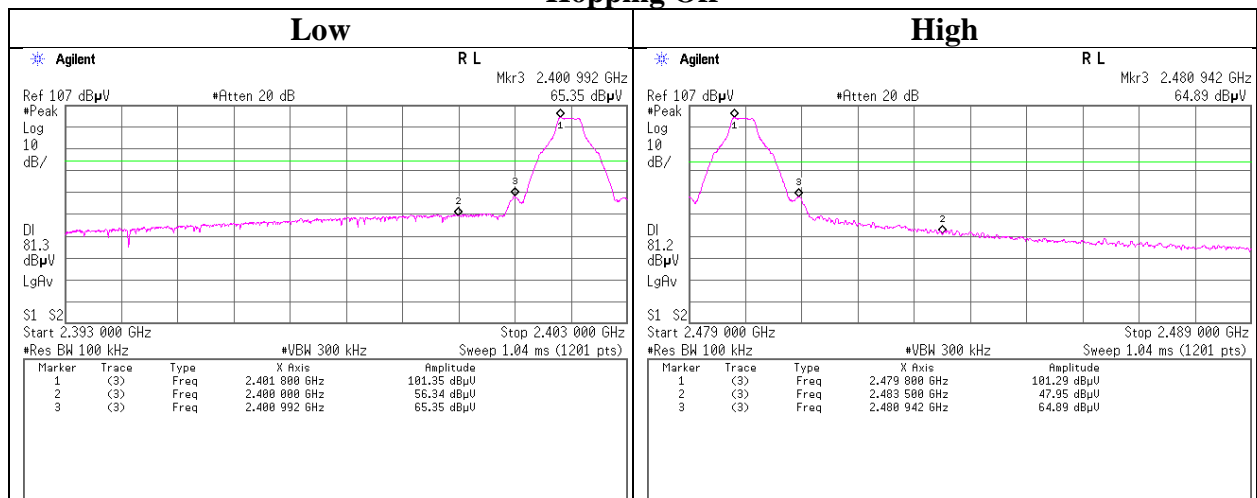
## Conducted Emission Band Edge compliance

Report No.	12180028S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 18, 2018
April 17, 2018	23 deg. C / 44 % RH
24 deg. C / 31 % RH	Tatsuya Arai
Tatsuya Arai	Tx DH5

### Hopping On



### Hopping Off



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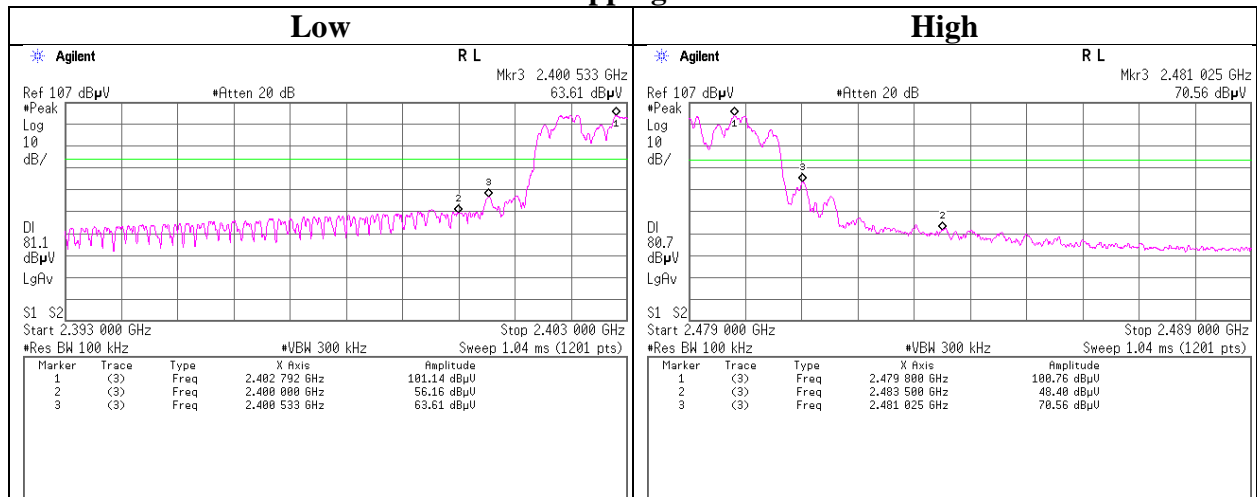
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

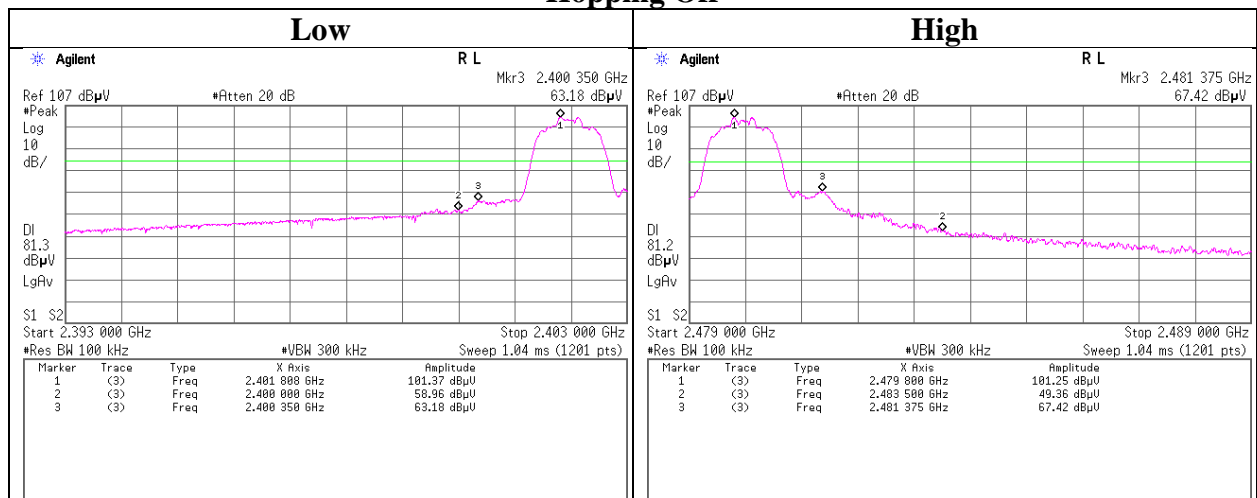
## Conducted Emission Band Edge compliance

Report No. 12180028S-A-R1  
 Test place Shonan EMC Lab. No.5 Shielded Room  
 Date April 17, 2018  
 Temperature / Humidity 24 deg. C / 31 % RH  
 Engineer Tatsuya Arai  
 Mode Tx 3DH5

### Hopping On



### Hopping Off



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## **APPENDIX 2: Test instruments**

### **Test Instruments (1/2)**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2018/02/15 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2018/01/29 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000NF SNMS/B	1612S006	RE	2018/01/29 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2018/03/05 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	RE	2017/07/20 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2017/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2018/04/20 * 12
SCC-G45	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102 E	800137/2EA	RE	2018/03/28 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2018/04/20 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SHA-06	Horn Antenna	ETS LINDGREN	3160-10	LM3459	RE	2018/03/22 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
SAF-10	Pre Amplifier	TOYO Corporation	HAP26-40W	00000010	RE	2018/03/27 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2018/02/16 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2017/12/14 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2017/08/24 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2017/10/21 * 12
SCC-A1/A3/A5/A7/A8/A13/SR SE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2018/04/12 * 12
SCC-A2/A4/A6/A7/A8/A13/SR SE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2018/04/12 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/12/10 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2018/04/13 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
SBM-09	Barometer	Sunoh	SBR121	001074	AT	2017/12/13 * 36
SJM-17	Measure	ASKUL	-	-	AT	-
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2017/10/16 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2018/03/05 * 12
SRENT-15	Spectrum Analyzer	Agilent	E4440A	MY46185516	AT	2017/12/26 * 12

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**Test Instruments (2/2)**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2018/03/19 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2018/03/19 * 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

**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**