



# RADIO TEST REPORT

Test Report No. : 11014760S-B-R1

**Applicant** : Sony Corporation  
**Type of Equipment** : Wireless Transceiver Module  
**Model No.** : BNSY25  
**FCC ID** : AK8BNSY25  
**Test regulation** : FCC Part 15 Subpart C: 2015  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11014760S-B. 11014760S-B is replaced with this report.

**Date of test:** October 31 to November 16, 2015

**Representative test engineer:**

Yosuke Ishikawa  
Engineer  
Consumer Technology Division

**Approved by:**

Toyokazu Imamura  
Leader  
Consumer Technology Division



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

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13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : Sony Corporation  
Address : 8-4 Shiomi Kisarazu-shi, Chiba, 292-0834 Japan  
Telephone Number : +81-438-37-3982  
Contact Person : Kazuhiko Nagano

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

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

Type of Equipment : Wireless Transceiver Module  
Model No. : BNSY25  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.3 V, DC 2.8 V, DC 1.8 V  
Receipt Date of Sample : October 7, 2015  
Country of Mass-production : China, Taiwan  
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: BNSY25 (referred to as the EUT in this report) is a Wireless Transceiver Module.  
\* BNSY25 is Controller IC (MT8591, etc.) and RF front-end part (DHSR-SY25).

#### **General Specification**

Clock frequency(ies) in the system : 26 MHz

#### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : Wireless LAN part:  
2412-2462 MHz,  
5180-5320 MHz, 5500-5700 MHz, 5745-5825 MHz  
Bluetooth part:  
2402-2480 MHz  
Modulation : Wireless LAN part:  
2.4 GHz bands: DBPSK, DQPSK, CCK, OFDM  
5 GHz bands: OFDM  
Bluetooth part:  
BDR (Basic Data Rate): GFSK  
EDR (Enhanced Data Rate):  $\pi/4$ -DQPSK, 8DPSK  
LE (Low Energy mode): GFSK  
Antenna type : Dipole  
Antenna connector : MHF4  
Antenna Gain : 2400 - 2483.5 MHz: +0.21 dBi max (include antenna cable 199 mm)  
5150 - 5250 MHz: -2.06 dBi max (include antenna cable 199 mm)  
5250 - 5350 MHz: -0.99 dBi max (include antenna cable 199 mm)  
5470 - 5725 MHz: -0.01 dBi max (include antenna cable 199 mm)  
5725 - 5850 MHz: -0.95 dBi max (include antenna cable 199 mm)

Remarks: This Wireless Module consists of 1 chip each of 5 GHz band and 2.4 GHz band.

\*1) Refer to the test reports: 11014760S-A-R1 for FCC 15.247 (Wireless LAN part).

\*2) Refer to the test reports: 11014760S-C-R1 and 11014760S-D for FCC 15.407.

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

\*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst Margin	Results	Remarks	
Conducted Emission	FCC: ANSI C63.10- 2013 IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	17.3 dB, QP, 0.15210 MHz, L1 (Tx, 3DH5, 2402 MHz)	Complied	-	
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted	
20 dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (1)		-	Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted	
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted	
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a),(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted	
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10		5.5 dB 12010.00 MHz, AV, Horizontal/Vertical (Tx, 3DH5, 2402 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) Radiated test was selected over 30 MHz based on section 15.247(d).						

\* In case any questions arise about test procedure, ANSI C 63.10:2013 is also referred.

However, there is one deviation from ANSI C 63.10:2013. (ANSI C63.10:2013 is Non-accreditation)  
Measurement height is not 1.5 m, but 0.8 m.

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

This EUT is provided the stable voltage (DC 3.3 V, DC 2.8 V, DC 1.8 V) constantly to RF unit regardless of input voltage from PMIC. Therefore, the equipment complies with the requirement.

#### **FCC Part 15.203 / 212**

The EUT has a unique coupling/antenna connector. Therefore, the equipment complies with the antenna requirement.

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### 3.3 Addition to standard

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

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

### 3.4 Uncertainty

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

Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.6 dB	3.4 dB	3.4 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.7 dB	3.5 dB	3.5 dB
	30 MHz-300 MHz	4.9 dB	4.9 dB	4.7 dB
	300 MHz-1 GHz	5.0 dB	5.0 dB	4.8 dB
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	4.5 dB	4.3 dB	4.3 dB

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

#### Conducted Emission test

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

#### Radiated emission test

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

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### 3.5 Test Location

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JAB Accreditation No. RTL02610

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

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

Refer to APPENDIX.

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

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

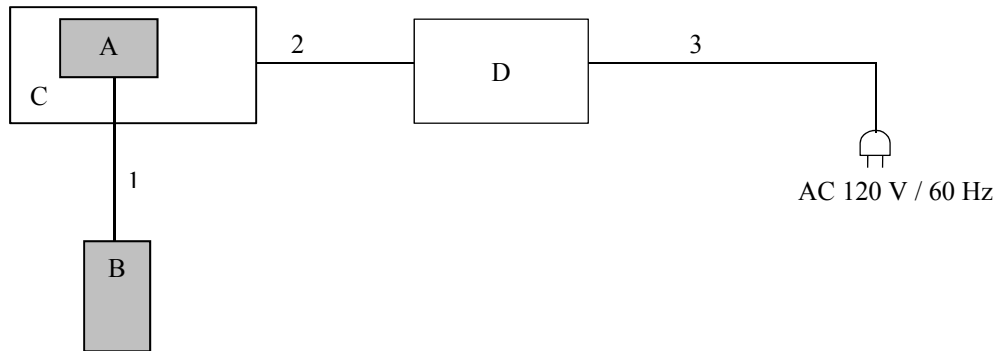
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9  
Inquiry

Details of Operating Mode(s)

<b>Test Item</b>	<b>Mode</b>	<b>Tested Antenna cable (length) *1)</b>	<b>Tested frequency</b>
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	worst: 400 mm, (bandedge was measured by each cable)	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5 Inquiry	-	2402 MHz 2441 MHz 2480 MHz
20 dB Bandwidth	Tx (Hopping Off) DH5, 3DH5 Inquiry	-	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5 Inquiry	-	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	-	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)  *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>*EUT has the power settings by the software as follows;  Power settings: Fixed  Software: MT6625 BT Test Version 0.2</p> <p>*This setting of software is the worst case.  Any conditions under the normal use do not exceed the condition of setting.  In addition, end users cannot change the settings of the output power of the product.</p> <p>*1) The test was performed with the representative antenna cable that was worst measured value by pre-check test.</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	Wireless Transceiver Module	BNSY25	0F081530001703	Front-end: Wistron NeWeb Corporation	EUT
				Control IC: MediaTek	
B	PWB Antenna	1-980-877-02	-	Sony	EUT
C	Jig board	-	-	Sony	-
D	AC Adaptor	AC-M1208WW	M1521540404	Sony	-

### List of cables used

No.	Cable name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Cable (Antenna)	0.4 or 0.199	Shielded	Shielded	-
2	Output cord (AC Adaptor)	1.0	Unshielded	Unshielded	-
3	Power Supply Cord	0.7	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via AC adaptor in a Shielded room.

The EUT via AC adaptor was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

**Detector** : QP and CISPR AV  
**Measurement range** : 0.15 MHz - 30 MHz  
**Test data** : APPENDIX  
**Test result** : Pass

## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 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.

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

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

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

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

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

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

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.87 m *2) (below 13 GHz, SVSWR, 2AC), 4.37 m *2) (below 13 GHz, SVSWR, 3AC), 1 m *3) (above 13 GHz)		3.87 m *2) (below 13 GHz, SVSWR, 2AC), 4.37 m *2) (below 13 GHz, SVSWR, 3AC), 1 m *3) (above 13 GHz)

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

\*2) Distance Factor:  $20 \times \log(3.87 \text{ m}/3 \text{ m}) = 2.3 \text{ dB}$  (for 1AC)

Distance Factor:  $20 \times \log(4.37 \text{ m}/3 \text{ m}) = 3.3 \text{ dB}$  (for 3AC)

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m}/3.0 \text{ m}) = -9.5 \text{ dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

	Test Antenna \ Frequency	Carrier	Spurious			
			30 MHz-1 GHz	1-13 GHz	13-18 GHz	18-26 GHz
Module	Horizontal	Z	X	Z	Y	Z
	Vertical	Z	Z	Z	X	Z
Antenna	Horizontal	X	Y	X	Y	X
	Vertical	Y	Z	Y	Y	X

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

**Measurement range : 30 M - 26 GHz**

**Test data : APPENDIX**

**Test result : Pass**

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## **SECTION 7: 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>
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 *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

\*1) The measurement was performed with Max Hold since the duty cycle was not 100 %.

\*2) In the frequency range below 30 MHz, 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 = 9.1 kHz)

\*3) Reference data

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

**Test data** : APPENDIX  
**Test result** : Pass

**APPENDIX 1: Test data**

**Conducted Emission**

**DATA OF CONDUCTED EMISSION TEST**

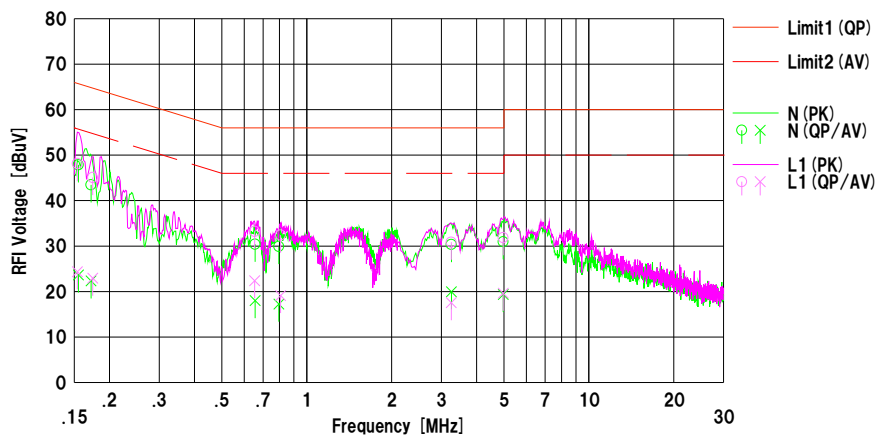
UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber  
Date : 2015/11/14

Mode : Tx, DH5, 2402 MHz  
Power : AC 120 V / 60 Hz  
Temp./Humi. : 25 deg.C / 40 %RH

Remarks : Ant.cable: 400mm

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Hikaru Shirasawa

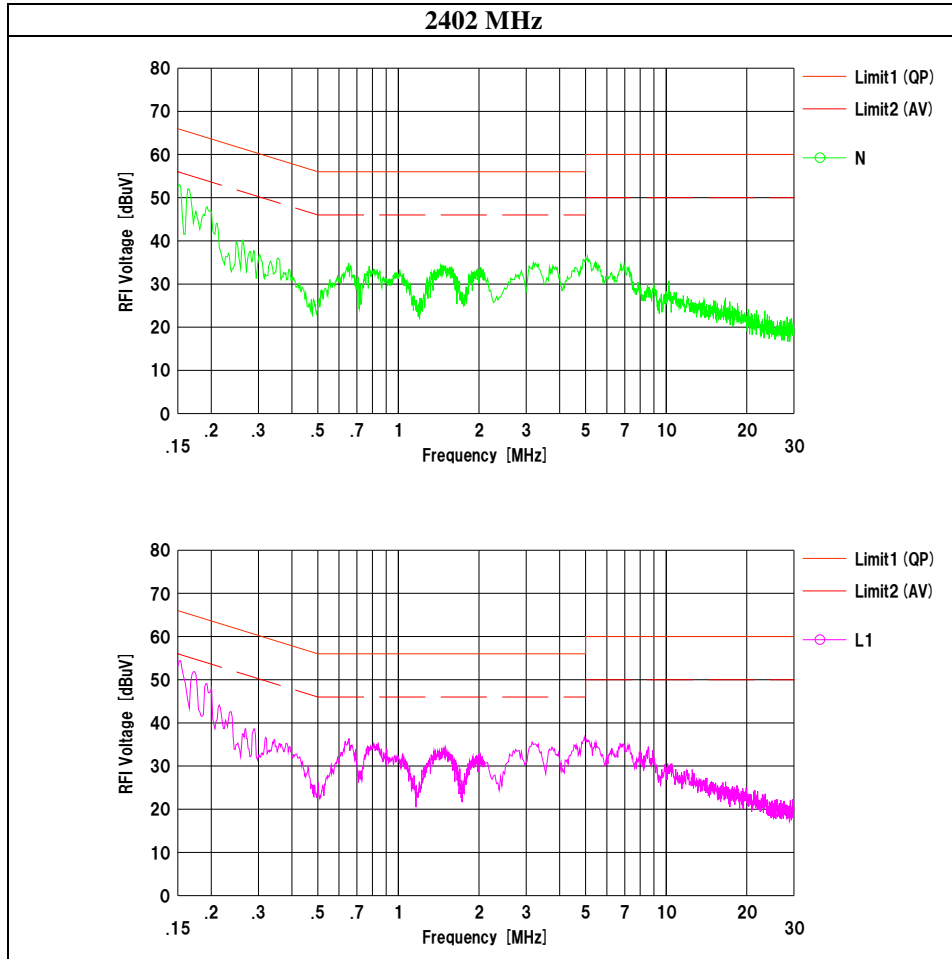


No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15520	35.50	11.30	12.35	47.85	23.65	65.72	55.72	17.8	32.0	N	
2	0.17190	31.10	10.00	12.36	43.46	22.36	64.87	54.87	21.4	32.5	N	
3	0.65600	18.00	5.60	12.40	30.40	18.00	56.00	46.00	25.6	28.0	N	
4	0.79660	17.50	4.80	12.42	29.92	17.22	56.00	46.00	26.0	28.7	N	
5	3.25680	17.80	7.40	12.55	30.35	19.95	56.00	46.00	25.6	26.0	N	
6	4.97080	18.30	6.70	12.65	30.95	19.35	56.00	46.00	25.0	26.6	N	
7	0.15380	35.80	12.00	12.35	48.15	24.35	65.79	55.79	17.6	31.4	L1	
8	0.17440	32.70	10.60	12.36	45.06	22.96	64.75	54.75	19.6	31.7	L1	
9	0.65400	20.80	10.00	12.40	33.20	22.40	56.00	46.00	22.8	23.6	L1	
10	0.80790	20.00	6.70	12.42	32.42	19.12	56.00	46.00	23.5	26.8	L1	
11	3.25260	18.30	5.00	12.55	30.85	17.55	56.00	46.00	25.1	28.4	L1	
12	4.97300	19.20	7.00	12.65	31.85	19.65	56.00	46.00	24.1	26.3	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN-SLS-07

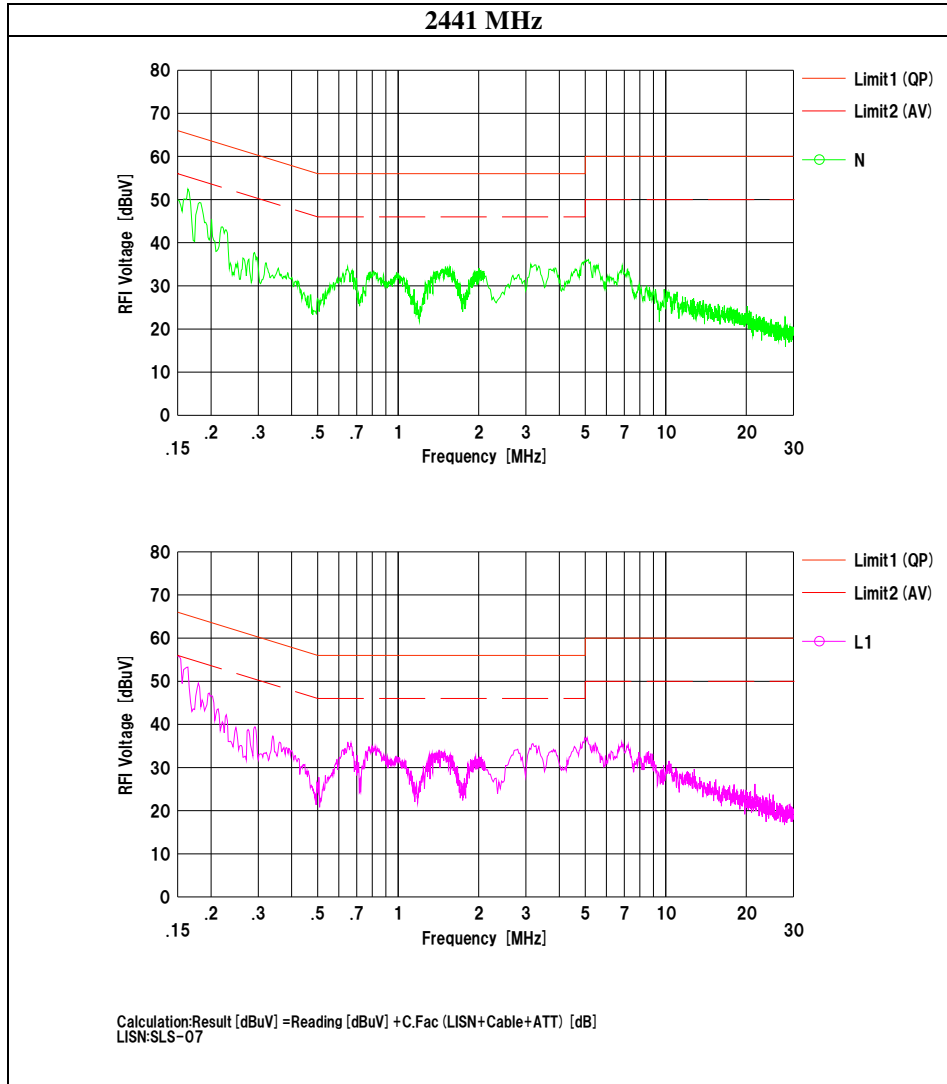
### Conducted Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 14, 2015  
Temperature / Humidity : 25 deg. C / 40 % RH  
Engineer : Hikaru Shirasawa  
Mode : Tx, Hopping Off, DH5



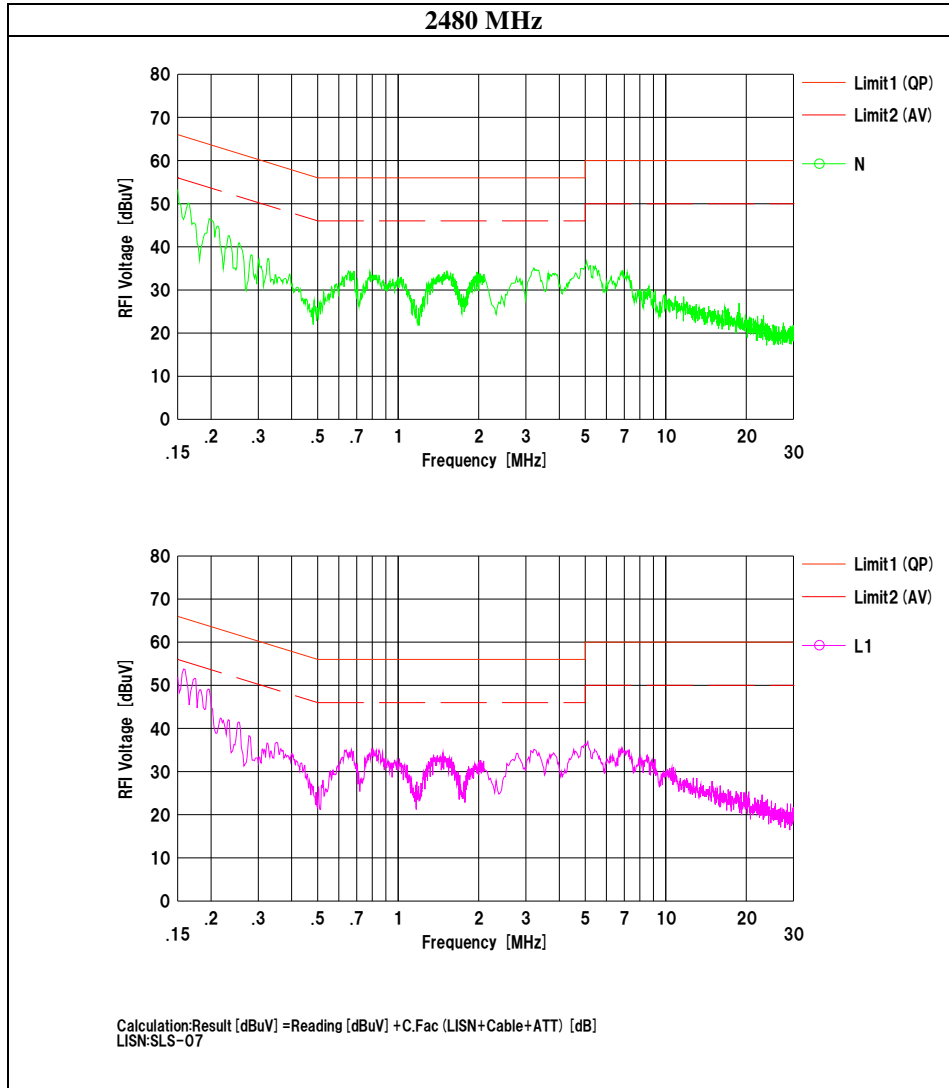
## Conducted Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 14, 2015
Temperature / Humidity	25 deg. C / 40 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping Off, DH5



## Conducted Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 14, 2015
Temperature / Humidity	25 deg. C / 40 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping Off, DH5





## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

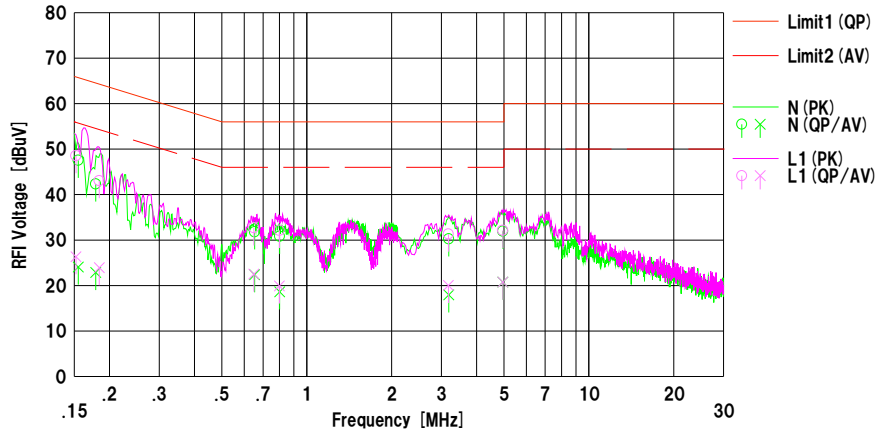
UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber  
Date : 2015/11/14

Mode : Tx, 3-DH5, 2402 MHz  
Power : AC 120 V / 60 Hz  
Temp./Humi. : 25 deg.C / 40 %RH

Remarks : Ant.cable: 400mm

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Hikaru Shirasawa

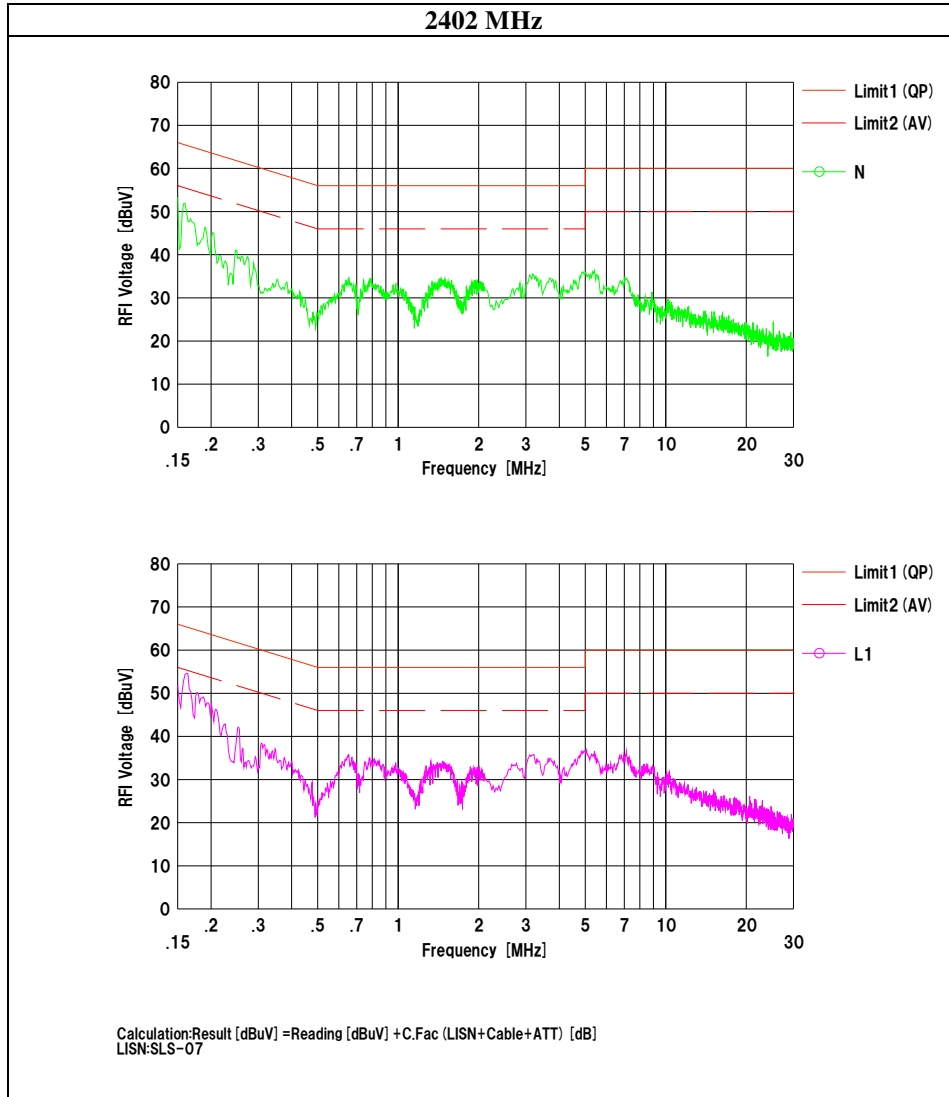


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]				
1	0.15490	35.20	11.70	12.35	47.55	24.05	65.73	55.73	18.1	31.6	N	
2	0.17870	30.00	10.50	12.35	42.35	22.85	64.55	54.55	22.2	31.7	N	
3	0.65330	19.40	10.00	12.40	31.80	22.40	56.00	46.00	24.2	23.6	N	
4	0.80160	18.40	6.20	12.42	30.82	18.62	56.00	46.00	25.1	27.3	N	
5	3.18880	17.70	5.40	12.54	30.24	17.94	56.00	46.00	25.7	28.0	N	
6	4.95950	19.30	8.10	12.65	31.95	20.75	56.00	46.00	24.0	25.2	N	
7	0.15210	36.20	14.00	12.35	48.55	26.35	65.88	55.88	17.3	29.5	L1	
8	0.18397	30.70	11.60	12.35	43.05	23.95	64.30	54.30	21.2	30.3	L1	
9	0.64960	20.30	10.10	12.41	32.71	22.51	56.00	46.00	23.2	23.4	L1	
10	0.80020	19.70	7.50	12.42	32.12	19.92	56.00	46.00	23.8	26.0	L1	
11	3.17740	18.80	7.50	12.54	31.34	20.04	56.00	46.00	24.6	25.9	L1	
12	4.95530	19.50	8.10	12.65	32.15	20.75	56.00	46.00	23.8	25.2	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN-SLS-07

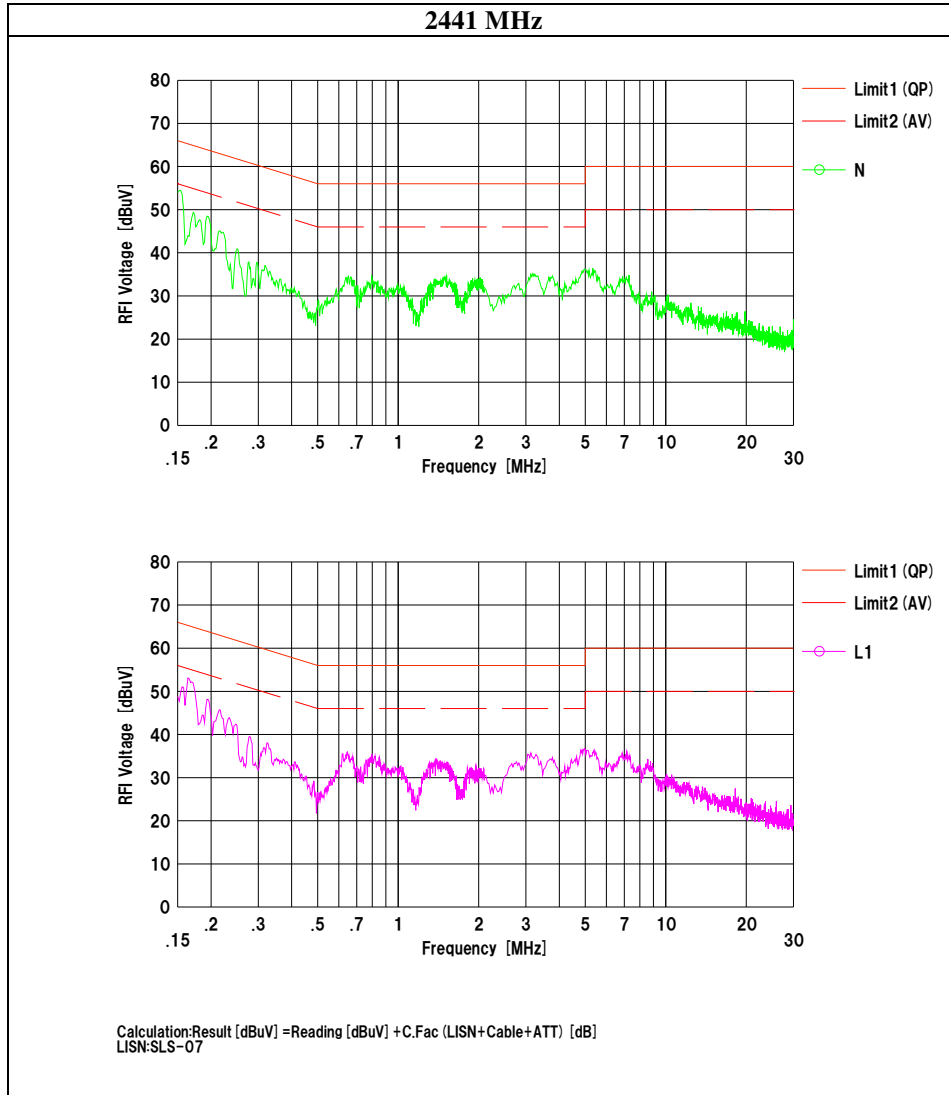
## Conducted Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 14, 2015
Temperature / Humidity	25 deg. C / 40 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping On, 3DH5



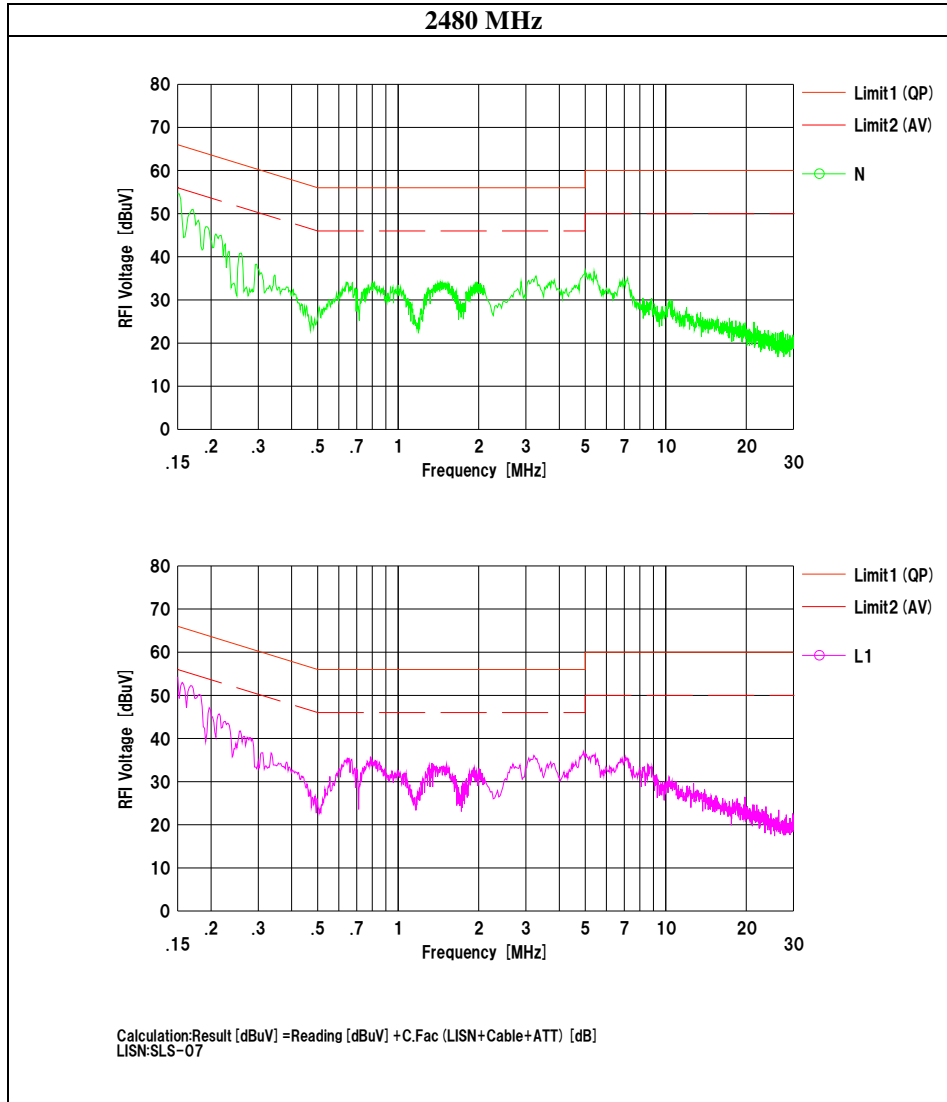
## Conducted Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 14, 2015
Temperature / Humidity	25 deg. C / 40 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping On, 3DH5



## Conducted Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 14, 2015
Temperature / Humidity	25 deg. C / 40 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping On, 3DH5



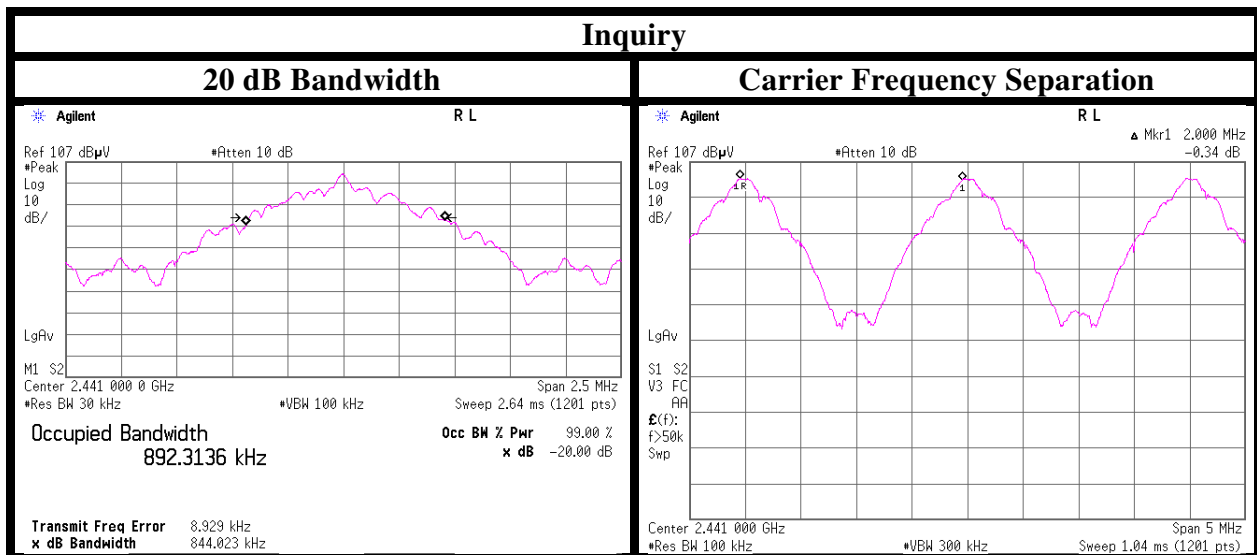
## 20 dB Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.970	1.000	>= 0.647
DH5	2441.0	0.971	1.000	>= 0.647
DH5	2480.0	0.973	1.000	>= 0.649
3DH5	2402.0	1.290	1.000	>= 0.860
3DH5	2441.0	1.293	1.000	>= 0.862
3DH5	2480.0	1.293	1.000	>= 0.862
Inquiry	2441.0	0.844	2.000	>= 0.563

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

No limit applies to 20dB Bandwidth.



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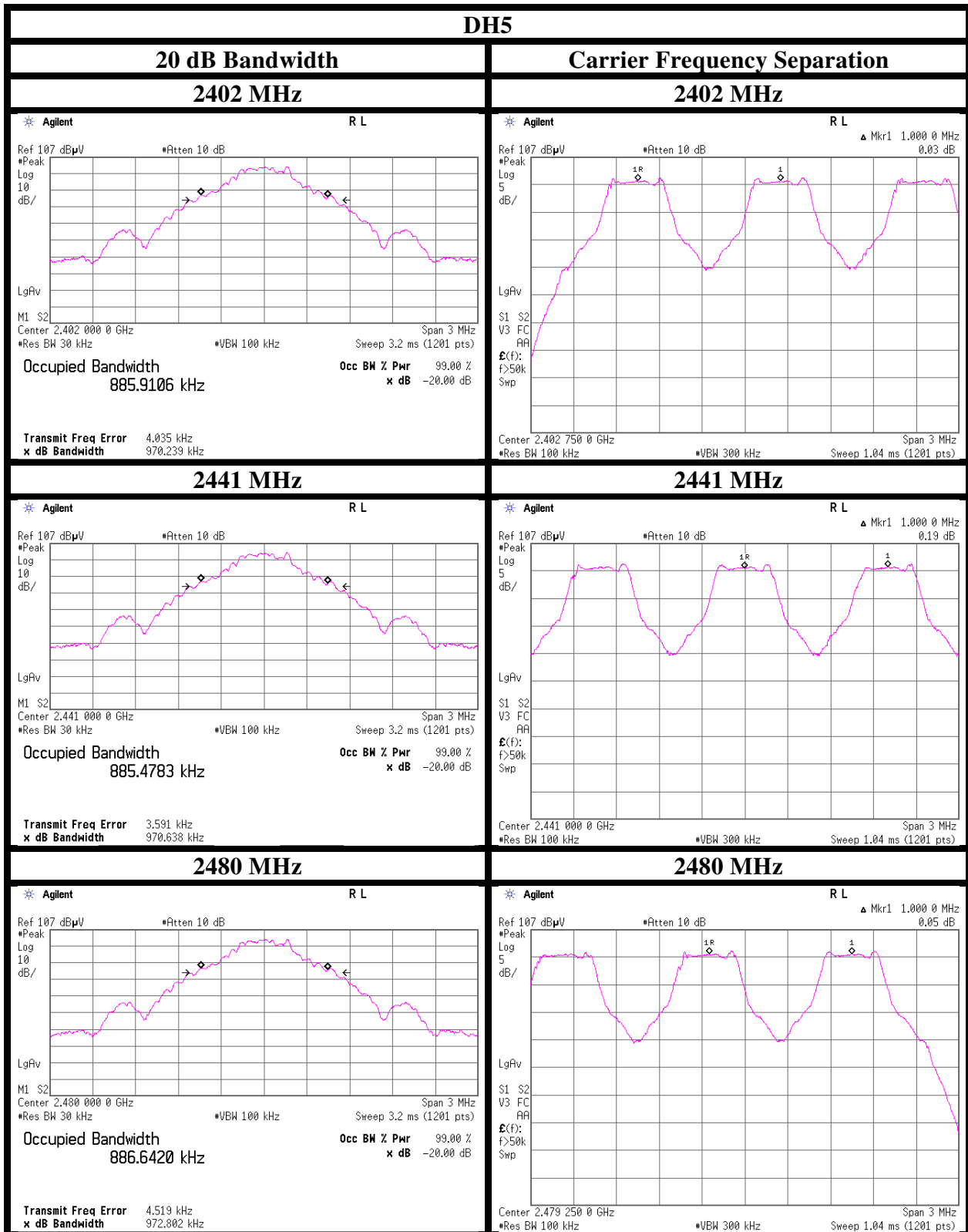
**Shonan EMC Lab.**

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**20 dB Bandwidth and Carrier Frequency Separation**



**UL Japan, Inc.**

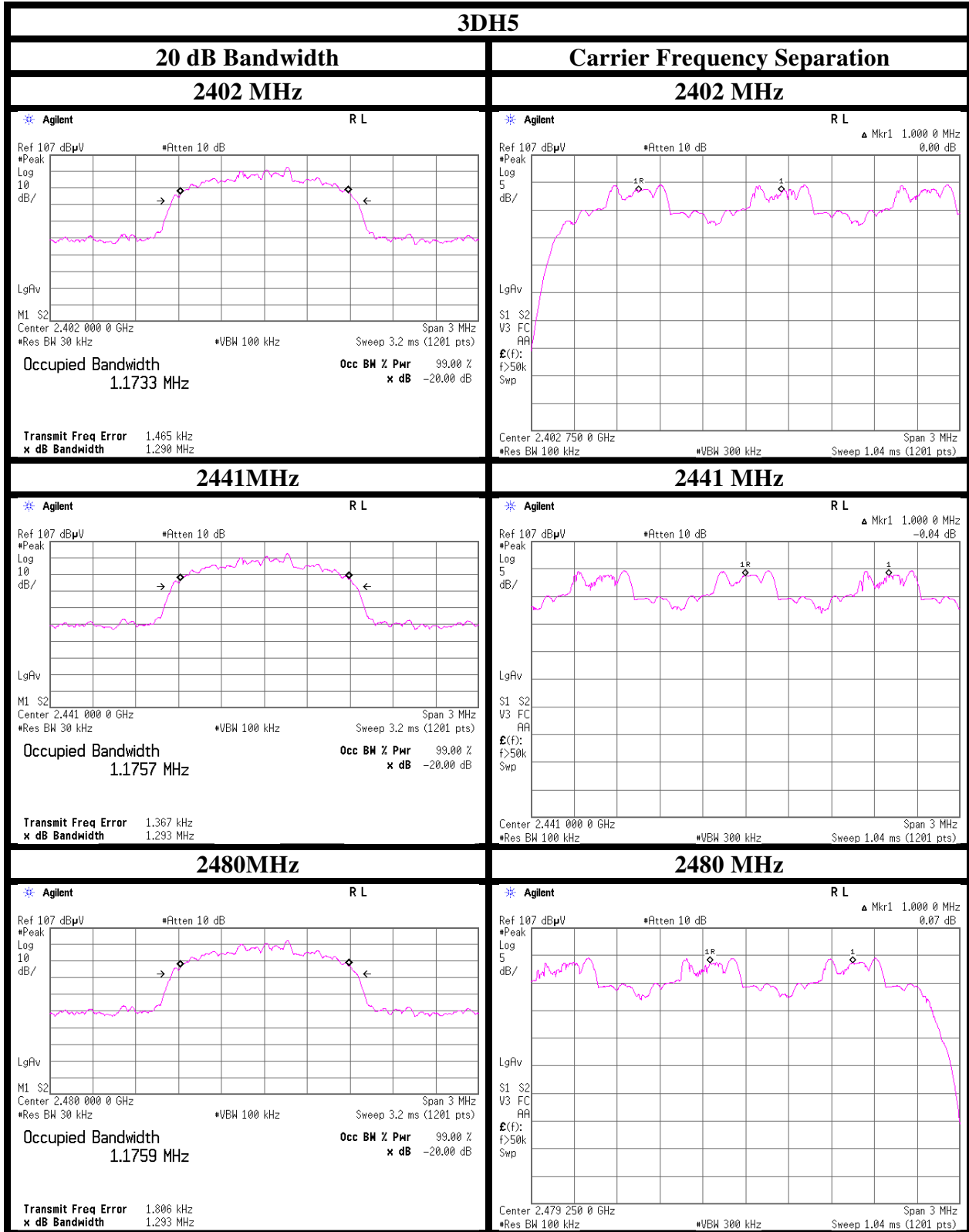
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**20 dB Bandwidth and Carrier Frequency Separation**

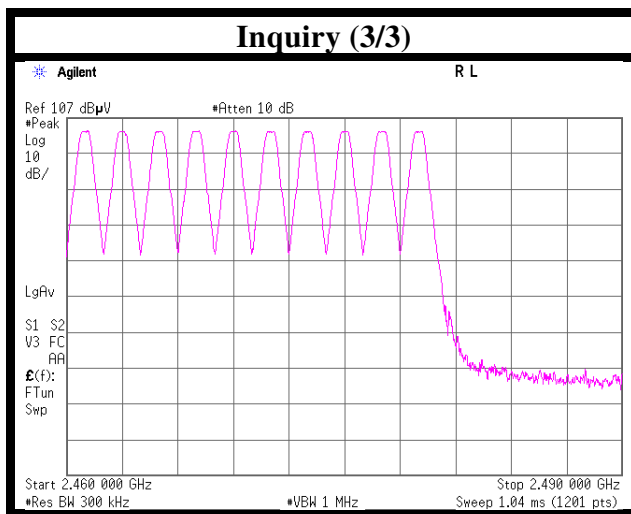
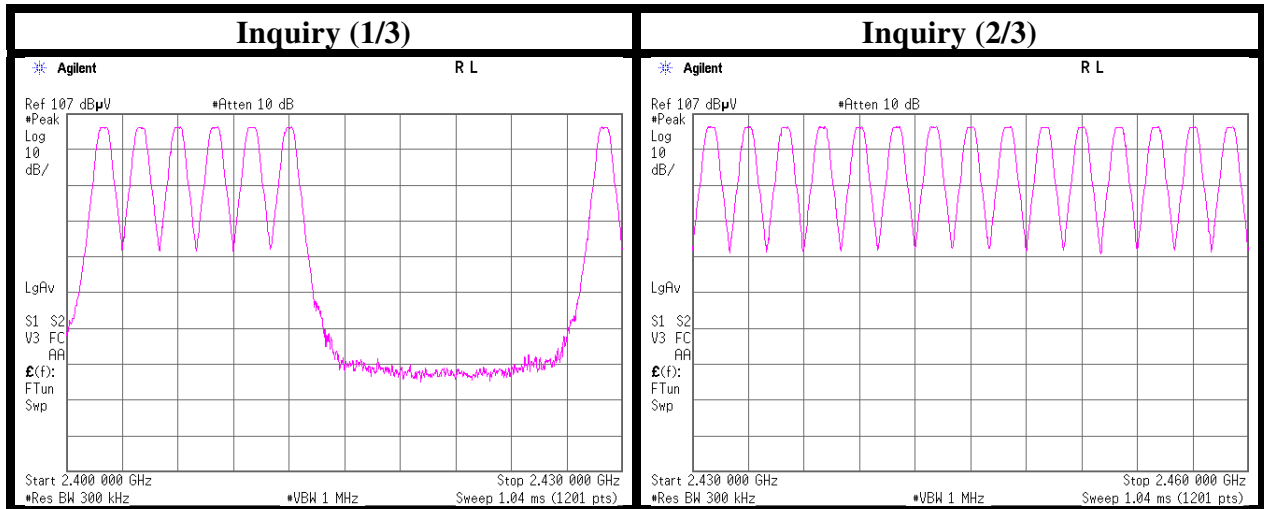


### Number of Hopping Frequency

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15
Inquiry	32	>= 15

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



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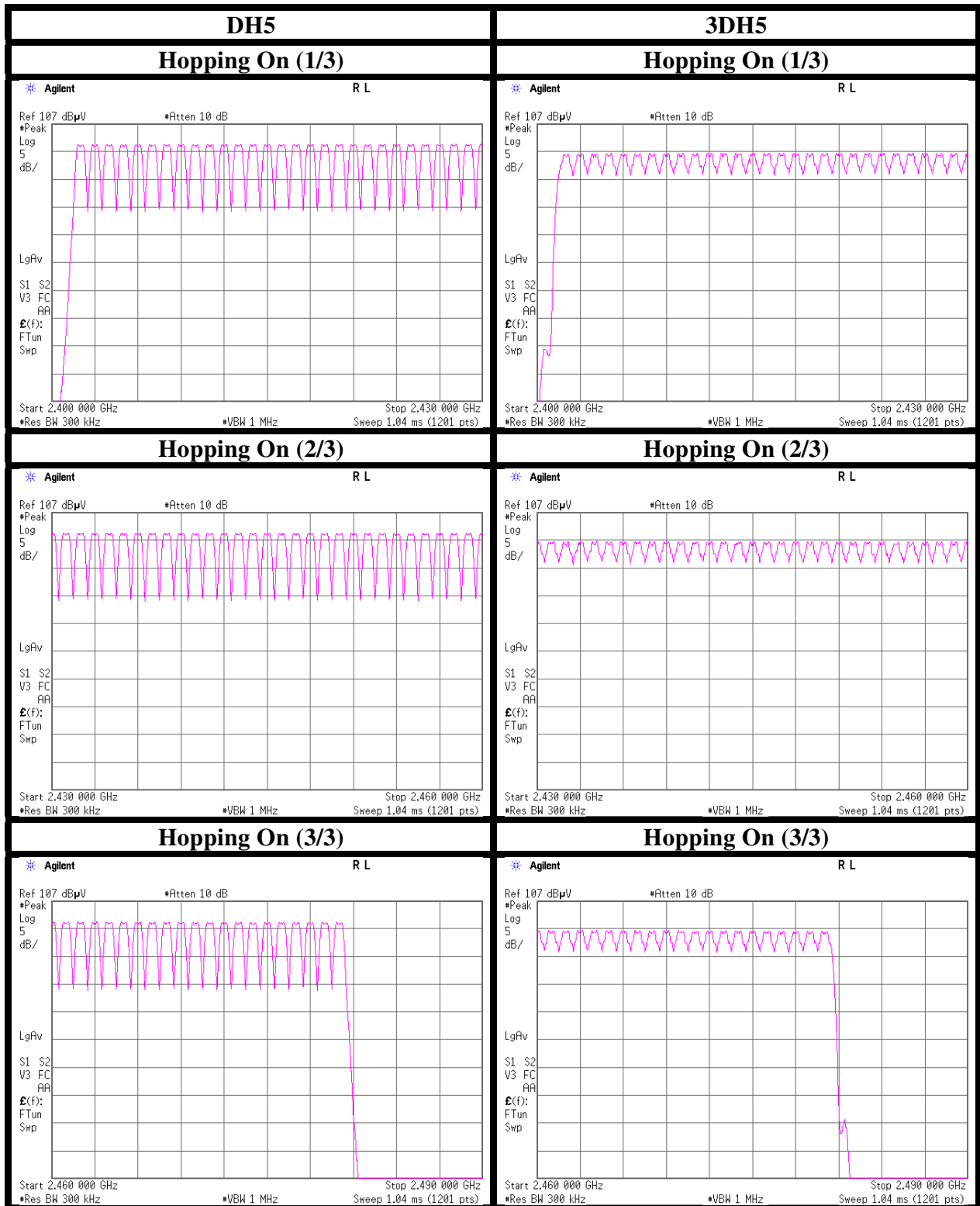
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**Number of Hopping Frequency**



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### Dwell time

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
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	0.390	126	400
DH3	21.8 times / 5 sec.	x 31.6 sec. = 138 times	0.412	57	400
DH5	17.2 times / 5 sec.	x 31.6 sec. = 109 times	2.893	315	400
3DH1	51.0 times / 5 sec.	x 31.6 sec. = 323 times	0.393	127	400
3DH3	24.4 times / 5 sec.	x 31.6 sec. = 155 times	1.654	256	400
3DH5	17.0 times / 5 sec.	x 31.6 sec. = 108 times	2.906	314	400
Inquiry	100.0 times / 1 sec.	x 12.8 sec. = 1280 times	0.088	113	400

Sample Calculation

Result = Number of transmission x Length of transmission

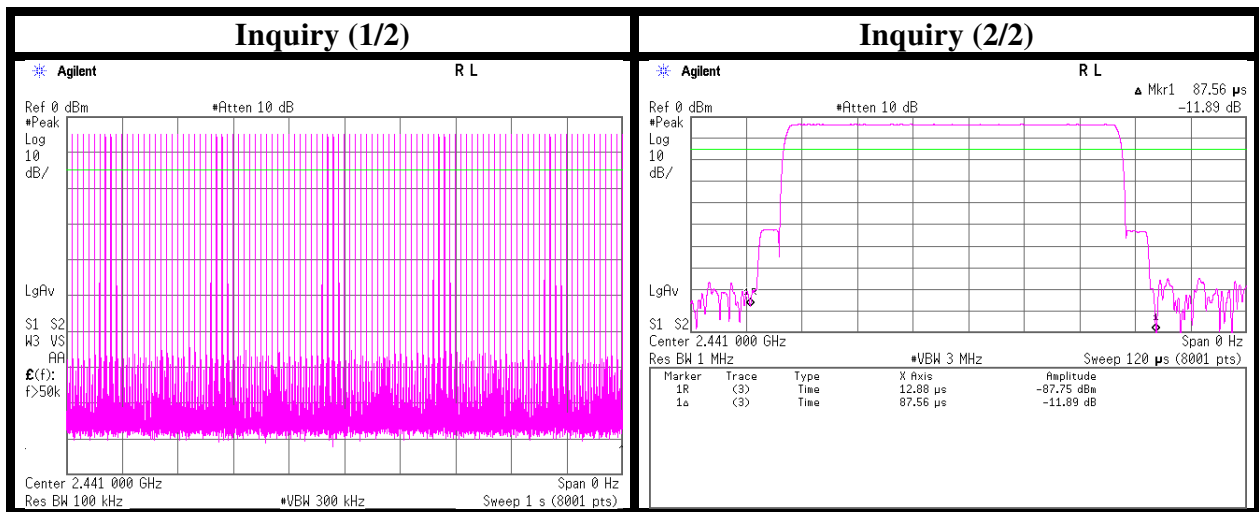
\*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	51	51	51
DH3	24	20	22	21	22	21.8
DH5	19	18	15	16	18	17.2
3DH1	51	51	51	51	51	51
3DH3	26	24	25	22	25	24.4
3DH5	16	17	19	16	17	17

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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



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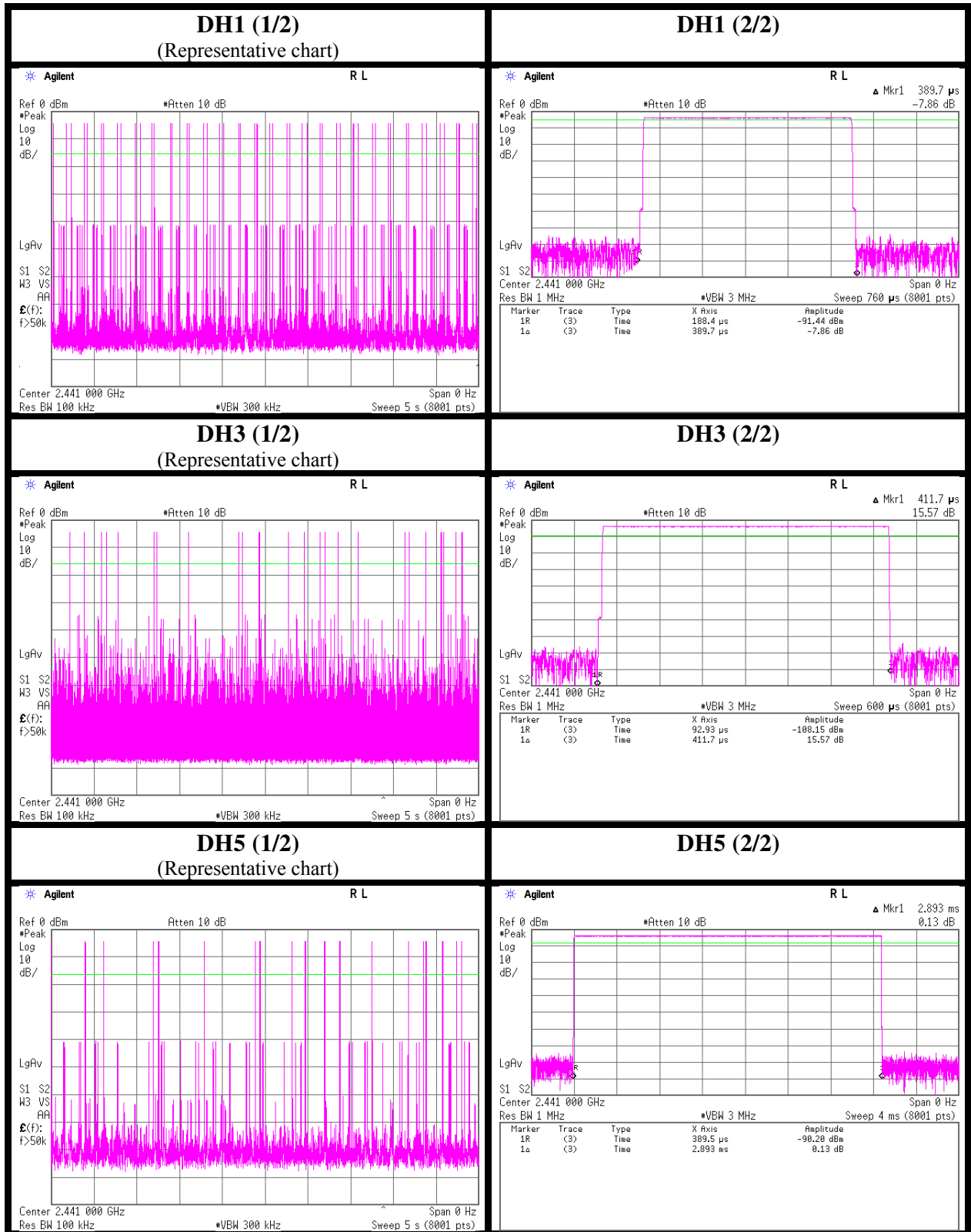
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**Dwell time**



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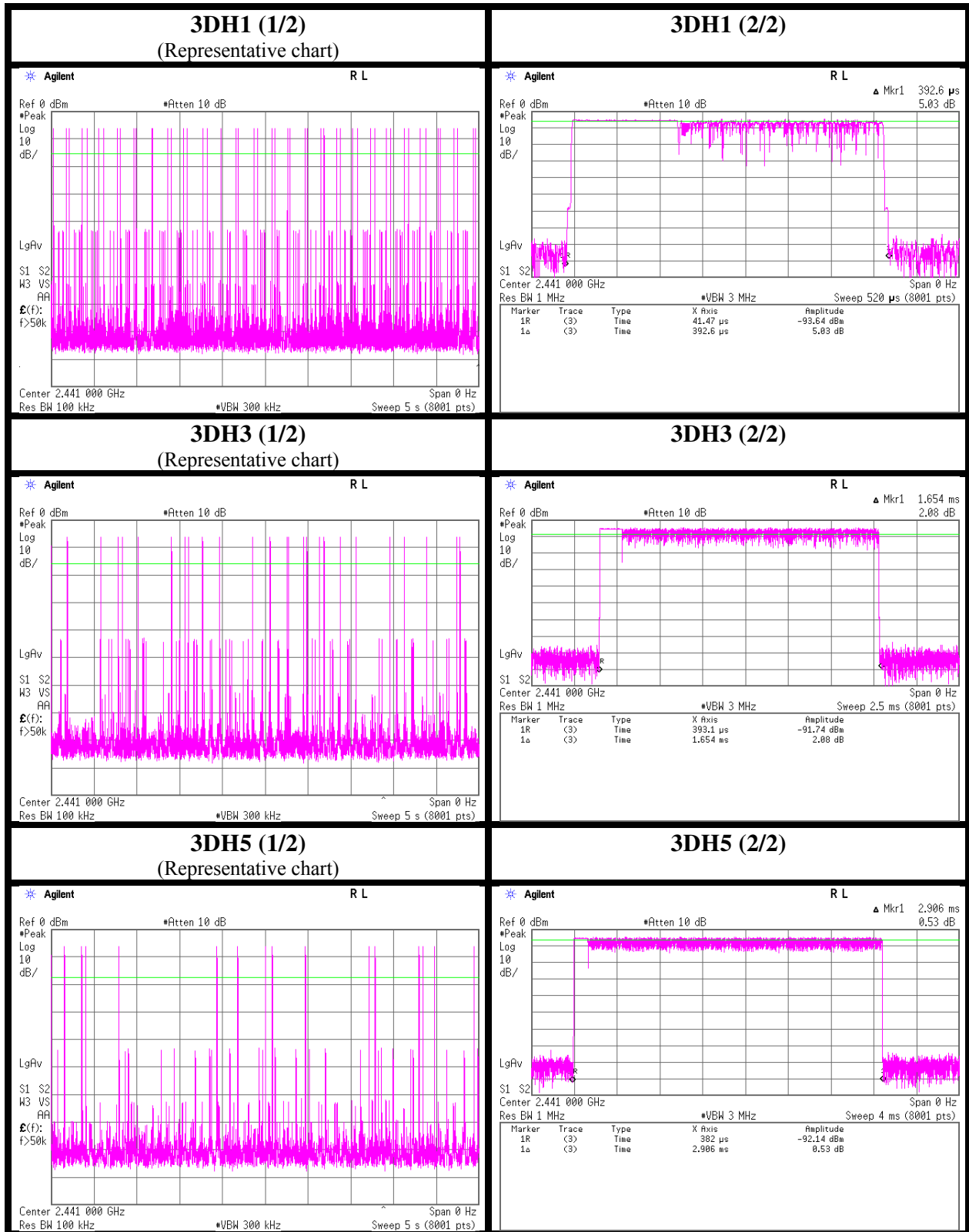
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**Dwell time**



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## Maximum Peak Output Power

Test place : Shonan EMC Lab. No.6 Shielded Room  
Report No. : 11014760S-B-R1  
Date : November 16, 2015  
Temperature / Humidity : 23 deg. C / 55 % RH  
Engineer : Tomohiro Hara  
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-3.67	1.62	9.63	7.58	5.73	20.96	125	13.38
DH5	2441.0	-3.64	1.62	9.63	7.61	5.77	20.96	125	13.35
DH5	2480.0	-3.80	1.64	9.63	7.47	5.58	20.96	125	13.49
2DH5	2402.0	-4.56	1.62	9.63	6.69	4.67	20.96	125	14.27
2DH5	2441.0	-4.49	1.62	9.63	6.76	4.74	20.96	125	14.20
2DH5	2480.0	-4.66	1.64	9.63	6.61	4.58	20.96	125	14.35
3DH5	2402.0	-4.37	1.62	9.63	6.88	4.88	20.96	125	14.08
3DH5	2441.0	-4.29	1.62	9.63	6.96	4.97	20.96	125	14.00
3DH5	2480.0	-4.45	1.64	9.63	6.82	4.81	20.96	125	14.14

Sample Calculation:

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

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

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

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

**Average Output Power**  
**(Reference data)**

Test place                      Shonan EMC Lab. No.6 Shielded Room  
Report No.                      11014760S-B-R1  
Date                              November 16, 2015  
Temperature / Humidity      23 deg. C / 55 % RH  
Engineer                        Tomohiro Hara  
Mode                              Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-5.10	1.62	9.63	6.15	4.12	1.11	7.26	5.32
DH5	2441.0	-5.04	1.62	9.63	6.21	4.18	1.11	7.32	5.40
DH5	2480.0	-5.20	1.64	9.63	6.07	4.05	1.11	7.18	5.22
2DH5	2402.0	-8.16	1.62	9.63	3.09	2.04	1.11	4.20	2.63
2DH5	2441.0	-8.02	1.62	9.63	3.23	2.10	1.11	4.34	2.72
2DH5	2480.0	-8.18	1.64	9.63	3.09	2.04	1.11	4.20	2.63
3DH5	2402.0	-8.16	1.62	9.63	3.09	2.04	1.11	4.20	2.63
3DH5	2441.0	-8.01	1.62	9.63	3.24	2.11	1.11	4.35	2.72
3DH5	2480.0	-8.18	1.64	9.63	3.09	2.04	1.11	4.20	2.63

Sample Calculation:

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

Result (Burst power) = Frame power + Duty factor

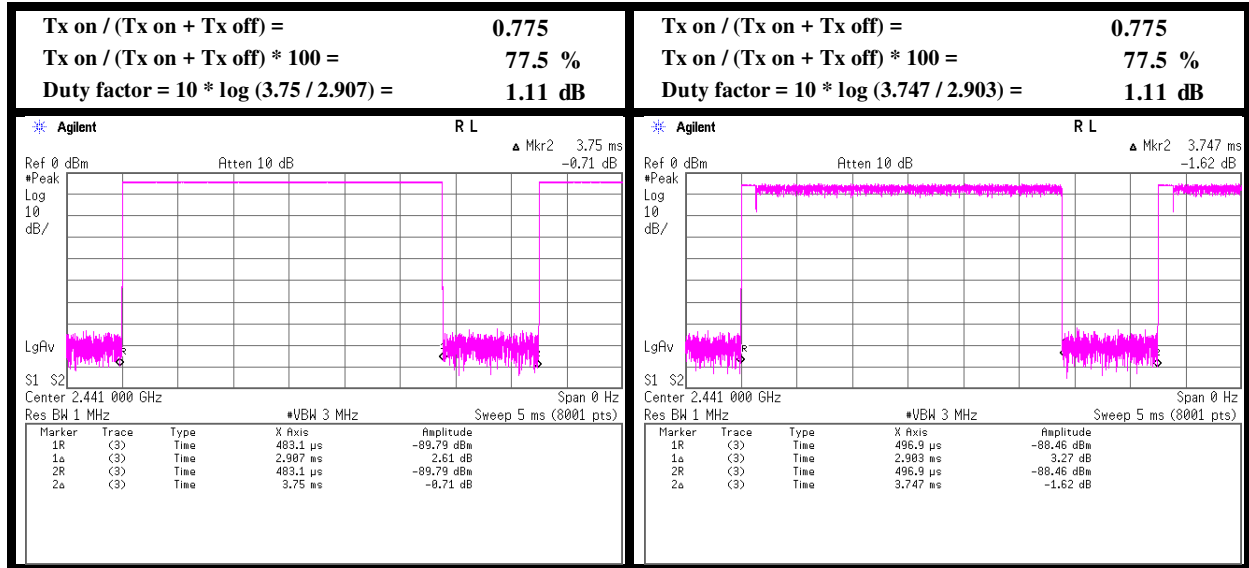
\*The equipment and cables were not used for factor 0 dB of the data sheets.

### Burst Rate Confirmation

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off

#### DH5

#### 3DH5



\* Duty factor was used for average output power.

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## Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 10, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	24 deg. C / 55 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz with antenna cable 400 mm			

(\* 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.	225.797	QP	36.9	16.7	9.4	31.7	0.0	31.3	46.0	14.7	145	89	
Hori.	540.676	QP	33.8	18.0	7.9	32.0	0.0	27.7	46.0	18.3	187	202	
Hori.	835.590	QP	32.0	21.5	9.3	31.6	0.0	31.2	46.0	14.8	106	114	
Hori.	2390.000	PK	47.0	27.8	13.7	41.0	3.3	50.8	73.9	23.1	100	325	
Hori.	4804.000	PK	50.8	31.3	7.4	41.7	2.3	50.1	73.9	23.8	100	268	
Hori.	7206.000	PK	46.5	36.6	9.0	41.2	2.3	53.2	73.9	20.7	100	0	
Hori.	9608.000	PK	46.1	37.9	9.9	40.1	2.3	56.1	73.9	17.8	100	0	
Hori.	12010.000	PK	46.6	39.6	11.1	39.4	2.3	60.2	73.9	13.7	100	0	
Hori.	2390.000	AV	32.8	27.8	13.7	41.0	3.3	36.6	53.9	17.3	100	325	
Hori.	4804.000	AV	41.9	31.3	7.4	41.7	2.3	41.2	53.9	12.7	100	268	
Hori.	7206.000	AV	33.7	36.6	9.0	41.2	2.3	40.4	53.9	13.5	100	0	
Hori.	9608.000	AV	32.9	37.9	9.9	40.1	2.3	42.9	53.9	11.0	100	0	
Hori.	12010.000	AV	33.4	39.6	11.1	39.4	2.3	47.0	53.9	6.9	100	0	
Vert.	67.501	QP	49.0	6.3	7.7	31.8	0.0	31.2	40.0	8.8	100	201	
Vert.	70.963	QP	50.6	6.0	7.7	31.8	0.0	32.5	40.0	7.5	100	238	
Vert.	344.071	QP	35.1	14.8	6.8	31.8	0.0	24.9	46.0	21.1	100	124	
Vert.	2390.000	PK	47.3	27.8	13.7	41.0	3.3	51.1	73.9	22.8	100	0	
Vert.	4804.000	PK	48.8	31.3	7.4	41.7	2.3	48.1	73.9	25.8	100	236	
Vert.	7206.000	PK	46.1	36.6	9.0	41.2	2.3	52.8	73.9	21.1	100	0	
Vert.	9608.000	PK	45.5	37.9	9.9	40.1	2.3	55.5	73.9	18.4	100	0	
Vert.	12010.000	PK	46.8	39.6	11.1	39.4	2.3	60.4	73.9	13.5	100	0	
Vert.	2390.000	AV	32.8	27.8	13.7	41.0	3.3	36.6	53.9	17.3	100	0	
Vert.	4804.000	AV	36.9	31.3	7.4	41.7	2.3	36.2	53.9	17.7	100	236	
Vert.	7206.000	AV	33.0	36.6	9.0	41.2	2.3	39.7	53.9	14.2	100	0	
Vert.	9608.000	AV	33.0	37.9	9.9	40.1	2.3	43.0	53.9	10.9	100	0	
Vert.	12010.000	AV	33.4	39.6	11.1	39.4	2.3	47.0	53.9	6.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.5	27.8	13.7	41.0	3.3	103.3	-	-	Carrier
Hori.	2400.000	PK	45.9	27.8	13.7	41.0	3.3	49.7	83.3	33.6	
Vert.	2402.000	PK	100.3	27.8	13.7	41.0	3.3	104.1	-	-	Carrier
Vert.	2400.000	PK	46.4	27.8	13.7	41.0	3.3	50.2	84.1	33.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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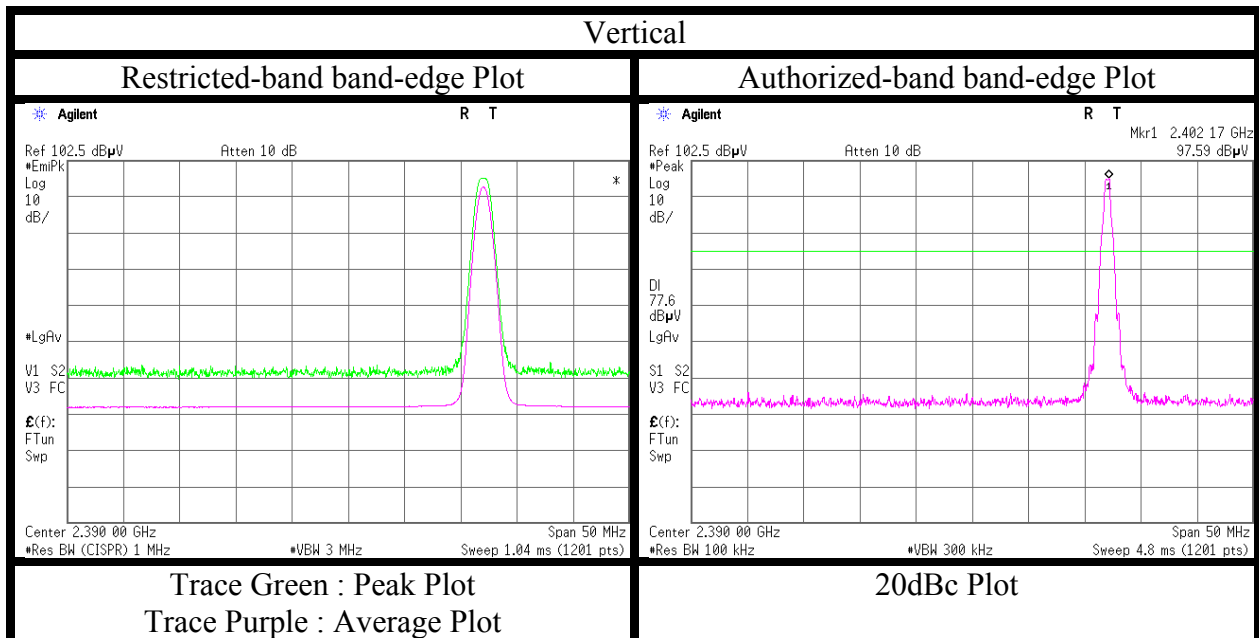
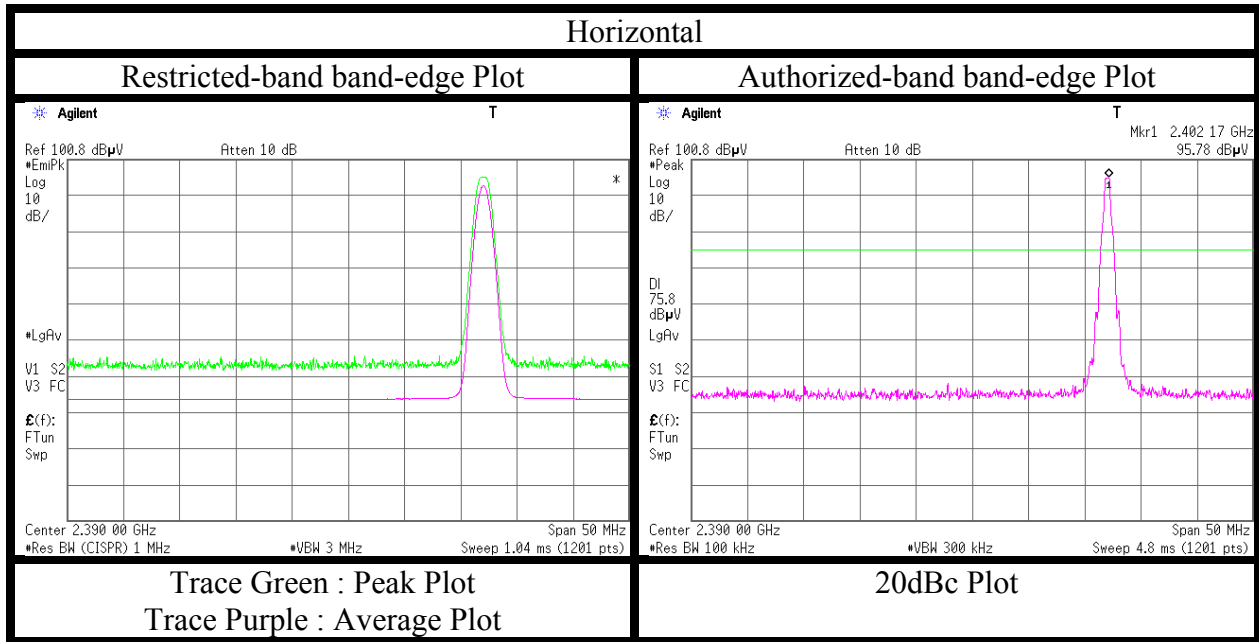
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 10, 2015  
Temperature / Humidity : 24 deg. C / 55 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, DH5 2402 MHz with antenna cable 400 mm



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

## Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 11, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	23 deg. C / 35 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz with antenna cable 400 mm			

(\* 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.	225.793	QP	36.5	16.7	9.4	31.7	0.0	30.9	46.0	15.1	144	83	
Hori.	540.676	QP	33.8	18.0	7.9	32.0	0.0	27.7	46.0	18.3	185	199	
Hori.	835.590	QP	32.0	21.5	9.3	31.6	0.0	31.2	46.0	14.8	109	108	
Hori.	4882.000	PK	48.4	31.6	7.4	41.6	2.3	48.1	73.9	25.8	100	304	
Hori.	7323.000	PK	45.6	36.7	8.9	41.3	2.3	52.2	73.9	21.7	100	0	
Hori.	9764.000	PK	45.9	38.0	9.9	40.1	2.3	56.0	73.9	17.9	100	0	
Hori.	12205.000	PK	45.4	39.6	11.2	39.2	2.3	59.3	73.9	14.6	100	0	
Hori.	4882.000	AV	37.2	31.6	7.4	41.6	2.3	36.9	53.9	17.0	100	304	
Hori.	7323.000	AV	34.8	36.7	8.9	41.3	2.3	41.4	53.9	12.5	100	0	
Hori.	9764.000	AV	33.9	38.0	9.9	40.1	2.3	44.0	53.9	9.9	100	0	
Hori.	12205.000	AV	34.0	39.6	11.2	39.2	2.3	47.9	53.9	6.0	100	0	
Vert.	67.501	QP	48.8	6.3	7.7	31.8	0.0	31.0	40.0	9.0	100	167	
Vert.	70.911	QP	50.6	6.0	7.7	31.8	0.0	32.5	40.0	7.5	100	242	
Vert.	344.067	QP	35.2	14.8	6.8	31.8	0.0	25.0	46.0	21.0	100	106	
Vert.	4882.000	PK	46.0	31.6	7.4	41.6	2.3	45.7	73.9	28.2	100	0	
Vert.	7323.000	PK	45.3	36.7	8.9	41.3	2.3	51.9	73.9	22.0	100	0	
Vert.	9764.000	PK	44.7	38.0	9.9	40.1	2.3	54.8	73.9	19.1	100	0	
Vert.	12205.000	PK	44.4	39.6	11.2	39.2	2.3	58.3	73.9	15.6	100	0	
Vert.	4882.000	AV	35.4	31.6	7.4	41.6	2.3	35.1	53.9	18.8	100	0	
Vert.	7323.000	AV	35.0	36.7	8.9	41.3	2.3	41.6	53.9	12.3	100	0	
Vert.	9764.000	AV	34.1	38.0	9.9	40.1	2.3	44.2	53.9	9.7	100	0	
Vert.	12205.000	AV	34.0	39.6	11.2	39.2	2.3	47.9	53.9	6.0	100	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

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## Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 11, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	23 deg. C / 35 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz with antenna cable 400 mm			

(\* 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.	225.793	QP	36.7	16.7	9.4	31.7	0.0	31.1	46.0	14.9	144	93	
Hori.	638.980	QP	33.2	19.5	8.4	32.0	0.0	29.1	46.0	16.9	140	177	
Hori.	835.589	QP	32.2	21.5	9.3	31.6	0.0	31.4	46.0	14.6	109	109	
Hori.	2483.500	PK	47.8	27.9	13.8	41.0	3.3	51.8	73.9	22.1	257	7	
Hori.	4960.000	PK	47.8	31.9	7.5	41.6	2.3	47.9	73.9	26.0	100	265	
Hori.	7440.000	PK	48.1	36.7	8.9	41.3	2.3	54.7	73.9	19.2	100	0	
Hori.	9920.000	PK	43.8	38.1	10.0	40.0	2.3	54.2	73.9	19.7	100	0	
Hori.	12400.000	PK	43.0	39.6	11.3	39.0	2.3	57.2	73.9	16.7	100	0	
Hori.	2483.500	AV	34.0	27.9	13.8	41.0	3.3	38.0	53.9	15.9	257	7	
Hori.	4960.000	AV	36.6	31.9	7.5	41.6	2.3	36.7	53.9	17.2	100	265	
Hori.	7440.000	AV	36.3	36.7	8.9	41.3	2.3	42.9	53.9	11.0	100	0	
Hori.	9920.000	AV	33.2	38.1	10.0	40.0	2.3	43.6	53.9	10.3	100	0	
Hori.	12400.000	AV	32.7	39.6	11.3	39.0	2.3	46.9	53.9	7.0	100	0	
Vert.	67.505	QP	48.9	6.3	7.7	31.8	0.0	31.1	40.0	8.9	100	173	
Vert.	71.159	QP	50.5	6.0	7.7	31.8	0.0	32.4	40.0	7.6	100	204	
Vert.	344.066	QP	35.1	14.8	6.8	31.8	0.0	24.9	46.0	21.1	100	120	
Vert.	2483.500	PK	49.9	27.9	13.8	41.0	3.3	53.9	73.9	20.0	180	3	
Vert.	4960.000	PK	46.9	31.9	7.5	41.6	2.3	47.0	73.9	26.9	100	0	
Vert.	7440.000	PK	45.3	36.7	8.9	41.3	2.3	51.9	73.9	22.0	100	0	
Vert.	9920.000	PK	44.3	38.1	10.0	40.0	2.3	54.7	73.9	19.2	100	0	
Vert.	12400.000	PK	44.5	39.6	11.3	39.0	2.3	58.7	73.9	15.2	100	0	
Vert.	2483.500	AV	35.4	27.9	13.8	41.0	3.3	39.4	53.9	14.5	180	3	
Vert.	4960.000	AV	35.0	31.9	7.5	41.6	2.3	35.1	53.9	18.8	100	0	
Vert.	7440.000	AV	34.4	36.7	8.9	41.3	2.3	41.0	53.9	12.9	100	0	
Vert.	9920.000	AV	33.2	38.1	10.0	40.0	2.3	43.6	53.9	10.3	100	0	
Vert.	12400.000	AV	32.7	39.6	11.3	39.0	2.3	46.9	53.9	7.0	100	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$

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

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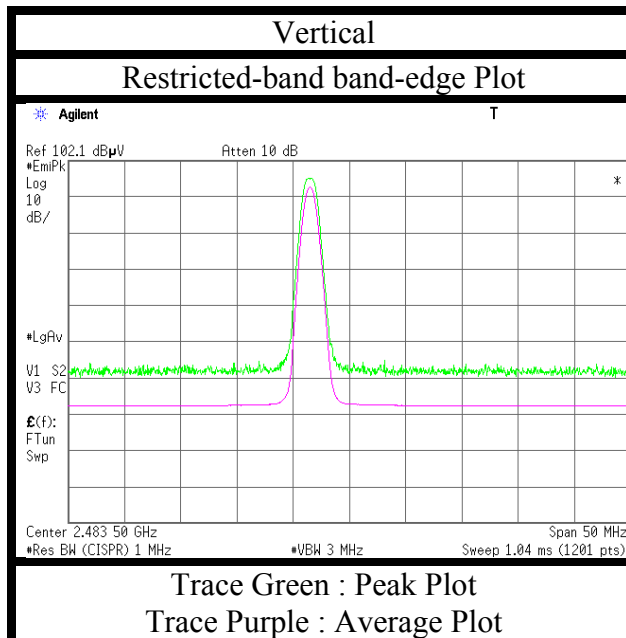
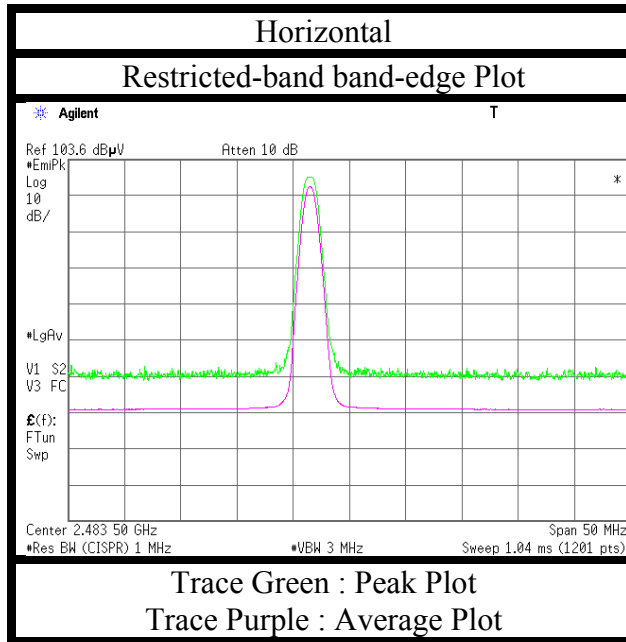
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 11, 2015  
Temperature / Humidity : 23 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, DH5 2480 MHz with antenna cable 400 mm



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

## Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 11, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	23 deg. C / 35 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz with antenna cable 400 mm			

(\* 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.	225.793	QP	36.6	16.7	9.4	31.7	0.0	31.0	46.0	15.0	141	96	
Hori.	638.980	QP	33.1	19.5	8.4	32.0	0.0	29.0	46.0	17.0	142	173	
Hori.	835.589	QP	32.2	21.5	9.3	31.6	0.0	31.4	46.0	14.6	105	114	
Hori.	2390.000	PK	46.9	27.8	13.7	41.0	3.3	50.7	73.9	23.2	266	19	
Hori.	4804.000	PK	48.4	31.3	7.4	41.7	2.3	47.7	73.9	26.2	100	317	
Hori.	7206.000	PK	46.2	36.6	9.0	41.2	2.3	52.9	73.9	21.0	100	0	
Hori.	9608.000	PK	45.4	37.9	9.9	40.1	2.3	55.4	73.9	18.5	100	0	
Hori.	12010.000	PK	45.9	39.6	11.1	39.4	2.3	59.5	73.9	14.4	100	0	
Hori.	2390.000	AV	32.9	27.8	13.7	41.0	3.3	36.7	53.9	17.2	266	19	
Hori.	4804.000	AV	36.8	31.3	7.4	41.7	2.3	36.1	53.9	17.8	100	317	
Hori.	7206.000	AV	34.9	36.6	9.0	41.2	2.3	41.6	53.9	12.3	100	0	
Hori.	9608.000	AV	34.2	37.9	9.9	40.1	2.3	44.2	53.9	9.7	100	0	
Hori.	12010.000	AV	34.8	39.6	11.1	39.4	2.3	48.4	53.9	5.5	100	0	
Vert.	67.505	QP	48.8	6.3	7.7	31.8	0.0	31.0	40.0	9.0	100	179	
Vert.	70.797	QP	50.7	6.0	7.7	31.8	0.0	32.6	40.0	7.4	100	248	
Vert.	344.066	QP	35.2	14.8	6.8	31.8	0.0	25.0	46.0	21.0	100	143	
Vert.	2390.000	PK	46.3	27.8	13.7	41.0	3.3	50.1	73.9	23.8	100	5	
Vert.	4804.000	PK	47.2	31.3	7.4	41.7	2.3	46.5	73.9	27.4	100	0	
Vert.	7206.000	PK	46.5	36.6	9.0	41.2	2.3	53.2	73.9	20.7	100	0	
Vert.	9608.000	PK	45.3	37.9	9.9	40.1	2.3	55.3	73.9	18.6	100	0	
Vert.	12010.000	PK	46.3	39.6	11.1	39.4	2.3	59.9	73.9	14.0	100	0	
Vert.	2390.000	AV	32.9	27.8	13.7	41.0	3.3	36.7	53.9	17.2	100	5	
Vert.	4804.000	AV	35.5	31.3	7.4	41.7	2.3	34.8	53.9	19.1	100	0	
Vert.	7206.000	AV	34.9	36.6	9.0	41.2	2.3	41.6	53.9	12.3	100	0	
Vert.	9608.000	AV	34.5	37.9	9.9	40.1	2.3	44.5	53.9	9.4	100	0	
Vert.	12010.000	AV	34.8	39.6	11.1	39.4	2.3	48.4	53.9	5.5	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.87 m / 3.0 m) = 2.3 dB (1AC) / 20log(4.37 m / 3.0 m) = 3.3 dB (3AC)  
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	100.5	27.8	13.7	41.0	3.3	104.3	-	-	Carrier
Hori.	2400.000	PK	65.4	27.8	13.7	41.0	3.3	69.2	84.3	15.1	Carrier
Vert.	2402.000	PK	100.2	27.8	13.7	41.0	3.3	104.0	-	-	Carrier
Vert.	2400.000	PK	44.7	27.8	13.7	41.0	3.3	48.5	84.0	35.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.87 m / 3.0 m) = 2.3 dB (1AC) / 20log(4.37 m / 3.0 m) = 3.3 dB (3AC)  
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

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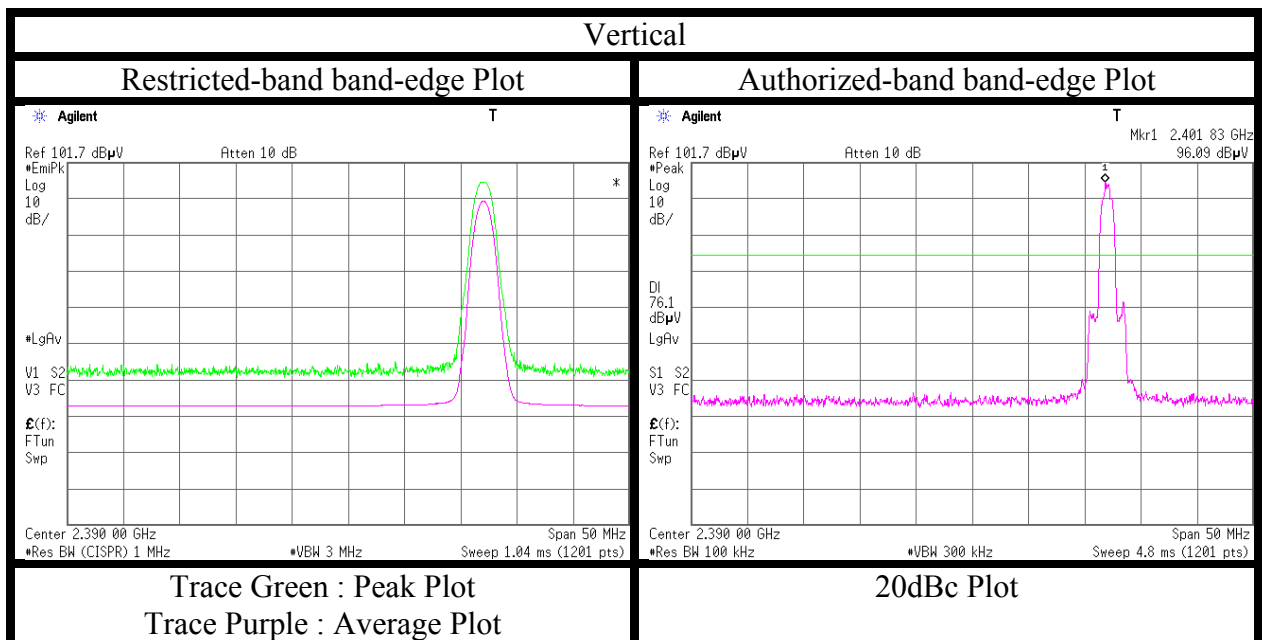
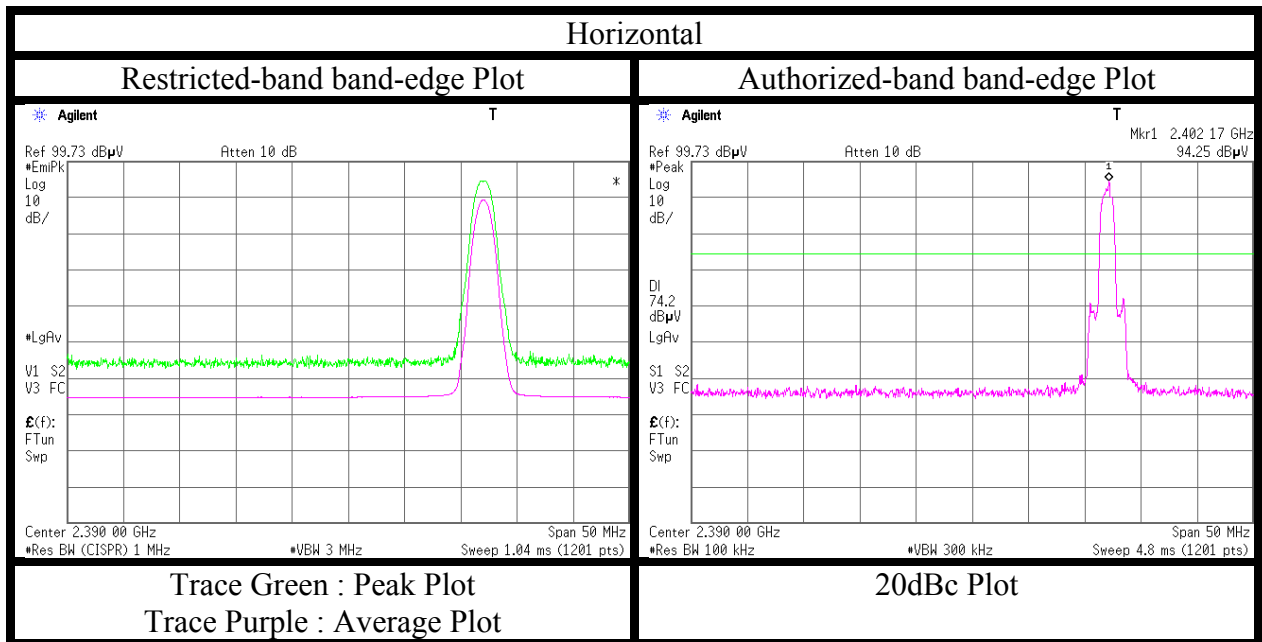
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 11, 2015
Temperature / Humidity	23 deg. C / 35 % RH
Engineer	Hikaru Shirasawa (1-2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz with antenna cable 400 mm



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

## Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 11, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	23 deg. C / 35 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz with antenna cable 400 mm			

(\* 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.	225.793	QP	36.6	16.7	9.4	31.7	0.0	31.0	46.0	15.0	147	95	
Hori.	638.980	QP	33.2	19.5	8.4	32.0	0.0	29.1	46.0	16.9	140	177	
Hori.	835.590	QP	32.1	21.5	9.3	31.6	0.0	31.3	46.0	14.7	109	109	
Hori.	4882.000	PK	47.0	31.6	7.4	41.6	2.3	46.7	73.9	27.2	100	239	
Hori.	7323.000	PK	46.9	36.7	8.9	41.3	2.3	53.5	73.9	20.4	100	0	
Hori.	9764.000	PK	45.3	38.0	9.9	40.1	2.3	55.4	73.9	18.5	100	0	
Hori.	12205.000	PK	45.5	39.6	11.2	39.2	2.3	59.4	73.9	14.5	100	0	
Hori.	4882.000	AV	35.9	31.6	7.4	41.6	2.3	35.6	53.9	18.3	100	239	
Hori.	7323.000	AV	34.9	36.7	8.9	41.3	2.3	41.5	53.9	12.4	100	0	
Hori.	9764.000	AV	33.9	38.0	9.9	40.1	2.3	44.0	53.9	9.9	100	0	
Hori.	12205.000	AV	33.9	39.6	11.2	39.2	2.3	47.8	53.9	6.1	100	0	
Vert.	67.505	QP	48.7	6.3	7.7	31.8	0.0	30.9	40.0	9.1	100	187	
Vert.	70.742	QP	50.6	6.0	7.7	31.8	0.0	32.5	40.0	7.5	100	267	
Vert.	344.066	QP	35.1	14.8	6.8	31.8	0.0	24.9	46.0	21.1	100	116	
Vert.	4882.000	PK	47.4	31.6	7.4	41.6	2.3	47.1	73.9	26.8	100	0	
Vert.	7323.000	PK	46.6	36.7	8.9	41.3	2.3	53.2	73.9	20.7	100	0	
Vert.	9764.000	PK	44.8	38.0	9.9	40.1	2.3	54.9	73.9	19.0	100	0	
Vert.	12205.000	PK	46.2	39.6	11.2	39.2	2.3	60.1	73.9	13.8	100	0	
Vert.	4882.000	AV	35.1	31.6	7.4	41.6	2.3	34.8	53.9	19.1	100	0	
Vert.	7323.000	AV	34.8	36.7	8.9	41.3	2.3	41.4	53.9	12.5	100	0	
Vert.	9764.000	AV	33.8	38.0	9.9	40.1	2.3	43.9	53.9	10.0	100	0	
Vert.	12205.000	AV	33.9	39.6	11.2	39.2	2.3	47.8	53.9	6.1	100	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$

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

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## Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 11, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	23 deg. C / 35 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz with antenna cable 400 mm			

(\* 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.	225.793	QP	36.6	16.7	9.4	31.7	0.0	31.0	46.0	15.0	149	96	
Hori.	638.980	QP	33.1	19.5	8.4	32.0	0.0	29.0	46.0	17.0	144	174	
Hori.	835.589	QP	32.1	21.5	9.3	31.6	0.0	31.3	46.0	14.7	107	108	
Hori.	2483.500	PK	50.5	27.9	13.8	41.0	3.3	54.5	73.9	19.4	257	10	
Hori.	4960.000	PK	47.5	31.9	7.5	41.6	2.3	47.6	73.9	26.3	100	325	
Hori.	7440.000	PK	45.8	36.7	8.9	41.3	2.3	52.4	73.9	21.5	100	0	
Hori.	9920.000	PK	44.4	38.1	10.0	40.0	2.3	54.8	73.9	19.1	100	0	
Hori.	12400.000	PK	43.8	39.6	11.3	39.0	2.3	58.0	73.9	15.9	100	0	
Hori.	2483.500	AV	34.6	27.9	13.8	41.0	3.3	38.6	53.9	15.3	257	10	
Hori.	4960.000	AV	35.3	31.9	7.5	41.6	2.3	35.4	53.9	18.5	100	325	
Hori.	7440.000	AV	34.7	36.7	8.9	41.3	2.3	41.3	53.9	12.6	100	0	
Hori.	9920.000	AV	33.2	38.1	10.0	40.0	2.3	43.6	53.9	10.3	100	0	
Hori.	12400.000	AV	32.5	39.6	11.3	39.0	2.3	46.7	53.9	7.2	100	0	
Vert.	67.499	QP	48.8	6.3	7.7	31.8	0.0	31.0	40.0	9.0	100	184	
Vert.	70.834	QP	50.6	6.0	7.7	31.8	0.0	32.5	40.0	7.5	100	247	
Vert.	344.066	QP	35.1	14.8	6.8	31.8	0.0	24.9	46.0	21.1	100	116	
Vert.	2483.500	PK	51.5	27.9	13.8	41.0	3.3	55.5	73.9	18.4	133	8	
Vert.	4960.000	PK	46.9	31.9	7.5	41.6	2.3	47.0	73.9	26.9	100	0	
Vert.	7440.000	PK	45.0	36.7	8.9	41.3	2.3	51.6	73.9	22.3	100	0	
Vert.	9920.000	PK	45.0	38.1	10.0	40.0	2.3	55.4	73.9	18.5	100	0	
Vert.	12400.000	PK	43.3	39.6	11.3	39.0	2.3	57.5	73.9	16.4	100	0	
Vert.	2483.500	AV	34.9	27.9	13.8	41.0	3.3	38.9	53.9	15.0	133	8	
Vert.	4960.000	AV	35.0	31.9	7.5	41.6	2.3	35.1	53.9	18.8	100	0	
Vert.	7440.000	AV	34.4	36.7	8.9	41.3	2.3	41.0	53.9	12.9	100	0	
Vert.	9920.000	AV	33.3	38.1	10.0	40.0	2.3	43.7	53.9	10.2	100	0	
Vert.	12400.000	AV	32.5	39.6	11.3	39.0	2.3	46.7	53.9	7.2	100	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$

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

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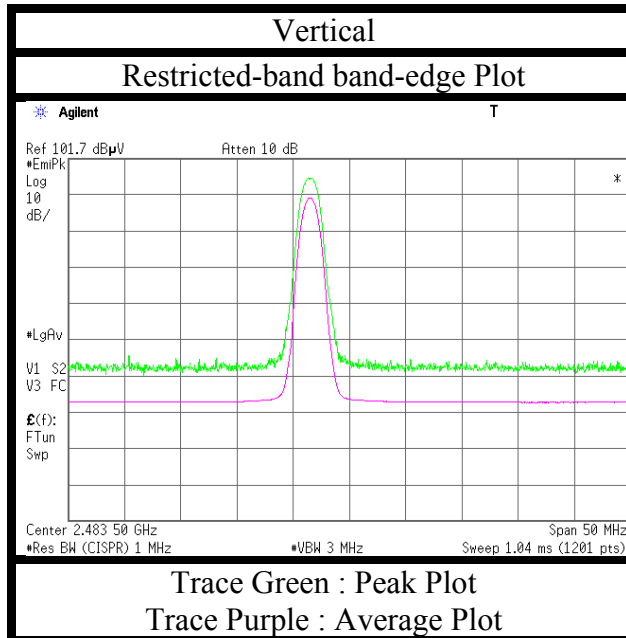
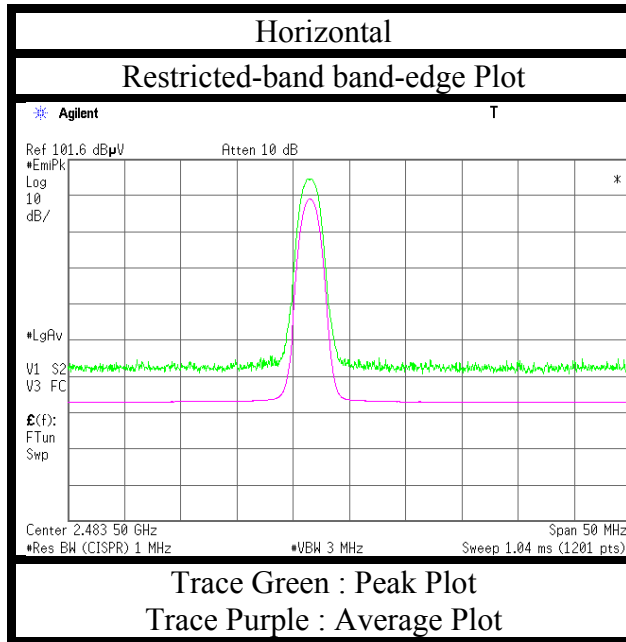
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 11, 2015  
Temperature / Humidity : 23 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz with antenna cable 400 mm



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 10, 2015  
Temperature / Humidity : 24 deg. C / 55 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, DH5 2402 MHz with antenna cable 199 mm

(\* 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.	2390.000	PK	46.4	27.8	13.7	41.0	3.3	50.2	73.9	23.7	100	268	
Hori.	2390.000	AV	32.6	27.8	13.7	41.0	3.3	36.4	53.9	17.5	100	268	
Vert.	2390.000	PK	45.9	27.8	13.7	41.0	3.3	49.7	73.9	24.2	228	341	
Vert.	2390.000	AV	32.7	27.8	13.7	41.0	3.3	36.5	53.9	17.4	228	341	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

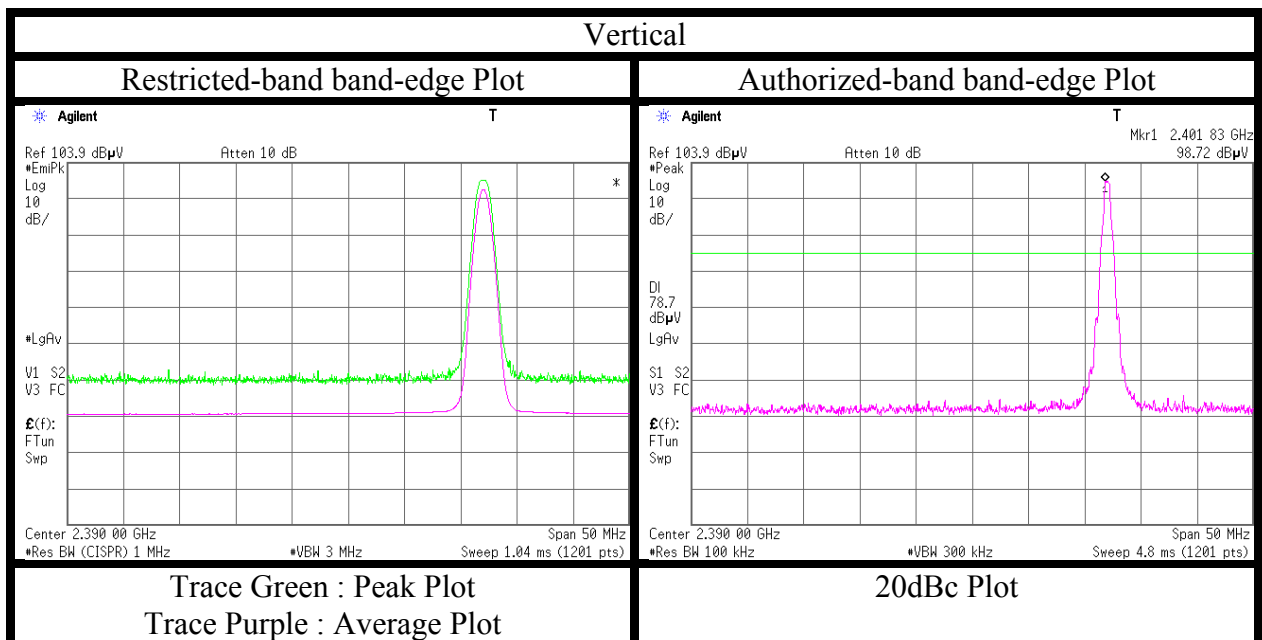
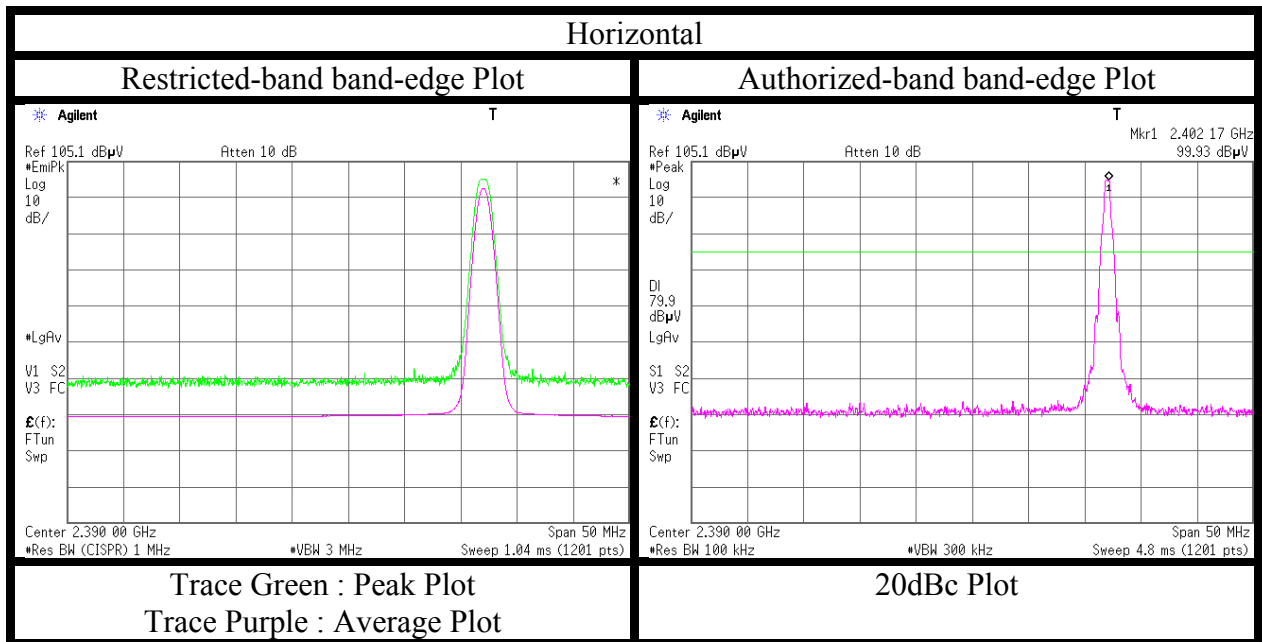
### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.7	27.8	13.7	41.0	3.3	98.5	-	-	Carrier
Hori.	2400.000	PK	41.1	27.8	13.7	41.0	3.3	44.9	78.5	33.6	
Vert.	2402.000	PK	97.9	27.8	13.7	41.0	3.3	101.7	-	-	Carrier
Vert.	2400.000	PK	43.5	27.8	13.7	41.0	3.3	47.3	81.7	34.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 10, 2015
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Hikaru Shirasawa (1-2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz with antenna cable 199 mm



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
 Report No. : 11014760S-B-R1  
 Date : November 11, 2015  
 Temperature / Humidity : 23 deg. C / 35 % RH  
 Engineer : Hikaru Shirasawa  
 (1-2.8 GHz)  
 Mode : Tx, Hopping Off, DH5 2480 MHz with antenna cable 199 mm

(\* 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.	2483.500	PK	47.5	27.9	13.8	41.0	3.3	51.5	73.9	22.4	159	162	
Hori.	2483.500	AV	33.3	27.9	13.8	41.0	3.3	37.3	53.9	16.6	159	162	
Vert.	2483.500	PK	47.2	27.9	13.8	41.0	3.3	51.2	73.9	22.7	133	209	
Vert.	2483.500	AV	33.4	27.9	13.8	41.0	3.3	37.4	53.9	16.5	133	209	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$

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

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**Shonan EMC Lab.**

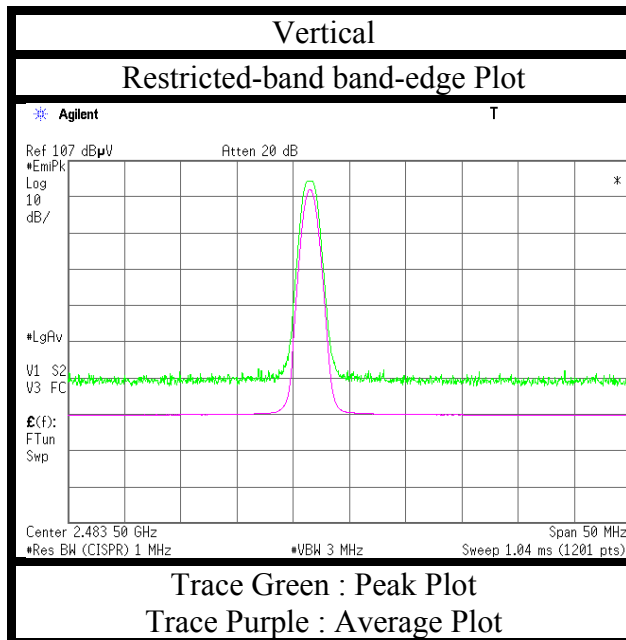
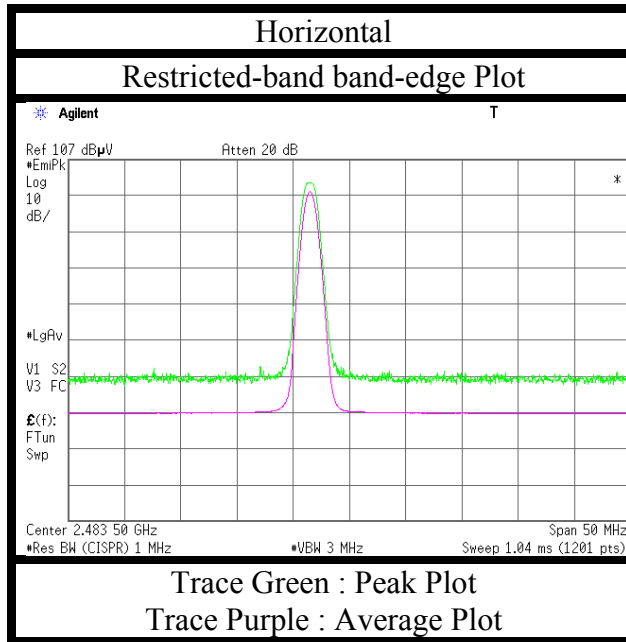
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 11, 2015  
Temperature / Humidity : 23 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, DH5 2480 MHz with antenna cable 199 mm



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 11, 2015  
Temperature / Humidity : 23 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, 3DH5 2402 MHz with antenna cable 199 mm

(\* 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.	2390.000	PK	45.7	27.8	13.7	41.0	3.3	49.5	73.9	24.4	100	188	
Hori.	2390.000	AV	32.6	27.8	13.7	41.0	3.3	36.4	53.9	17.5	100	188	
Vert.	2390.000	PK	46.9	27.8	13.7	41.0	3.3	50.7	73.9	23.2	100	212	
Vert.	2390.000	AV	32.7	27.8	13.7	41.0	3.3	36.5	53.9	17.4	100	212	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

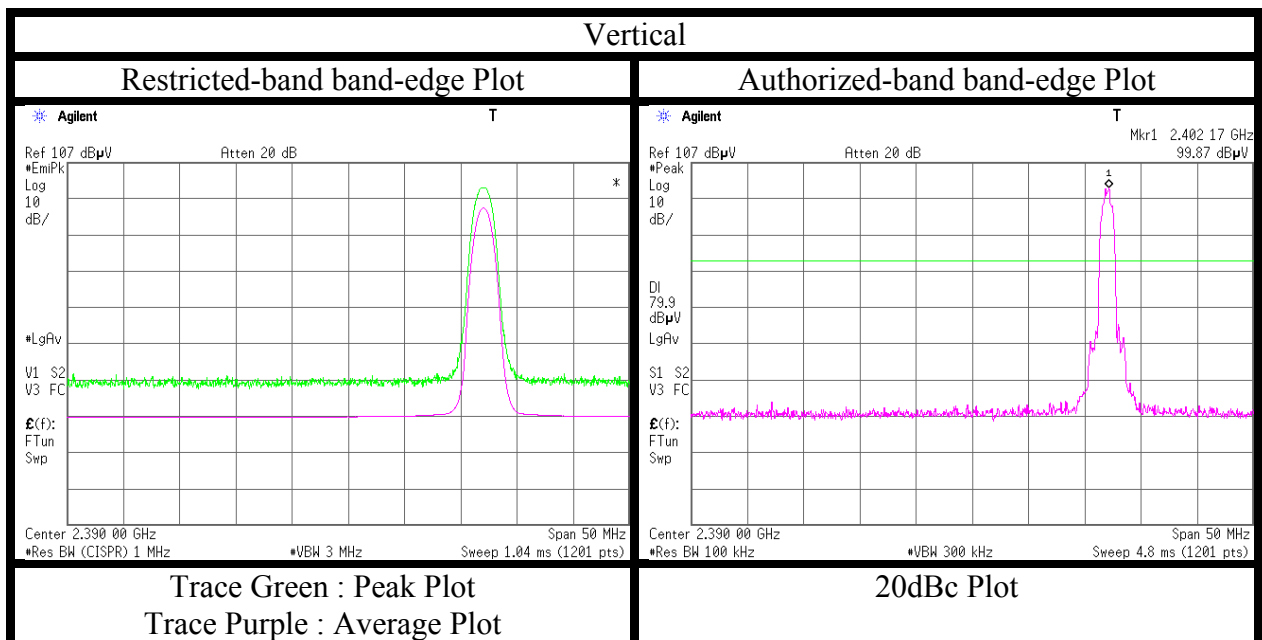
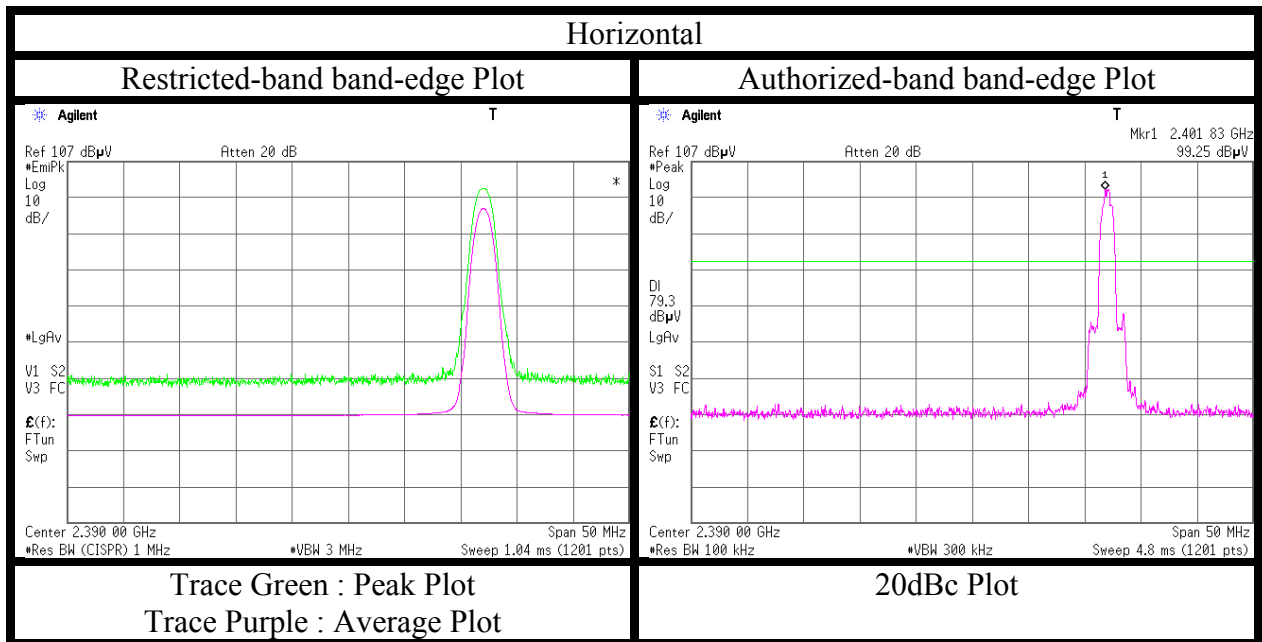
### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.4	27.8	13.7	41.0	3.3	98.2	-	-	Carrier
Hori.	2400.000	PK	41.5	27.8	13.7	41.0	3.3	45.3	78.1	32.8	
Vert.	2402.000	PK	96.2	27.8	13.7	41.0	3.3	100.0	-	-	Carrier
Vert.	2400.000	PK	41.1	27.8	13.7	41.0	3.3	44.9	80.0	35.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11014760S-B-R1
Date	November 11, 2015
Temperature / Humidity	23 deg. C / 35 % RH
Engineer	Hikaru Shirasawa (1-2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz with antenna cable 199 mm



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 11, 2015  
Temperature / Humidity : 23 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz with antenna cable 199 mm

(\* 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.	2483.500	PK	47.3	27.9	13.8	41.0	3.3	51.3	73.9	22.6	155	40	
Hori.	2483.500	AV	33.3	27.9	13.8	41.0	3.3	37.3	53.9	16.6	155	40	
Vert.	2483.500	PK	48.5	27.9	13.8	41.0	3.3	52.5	73.9	21.4	129	221	
Vert.	2483.500	AV	33.4	27.9	13.8	41.0	3.3	37.4	53.9	<b>16.5</b>	129	221	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.3\text{ dB (1AC)} / 20\log(4.37\text{ m} / 3.0\text{ m}) = 3.3\text{ dB (3AC)}$

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

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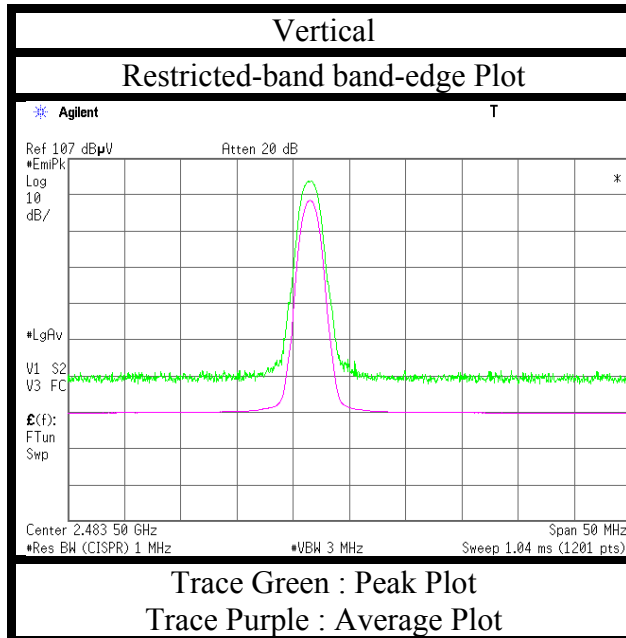
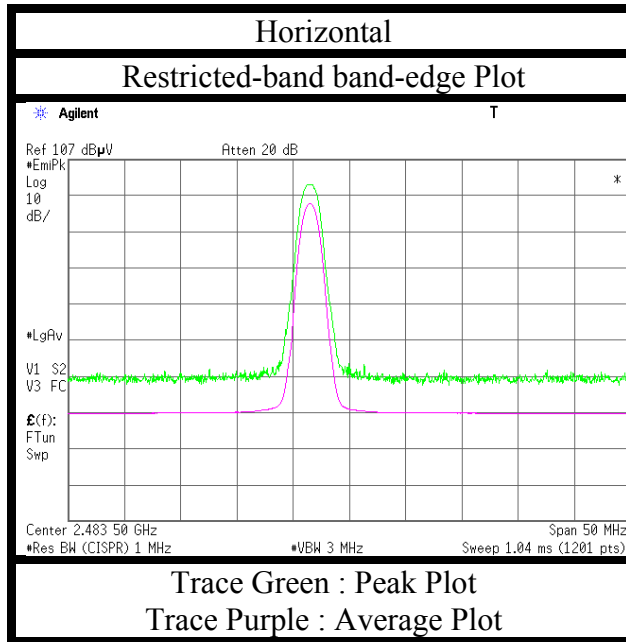
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

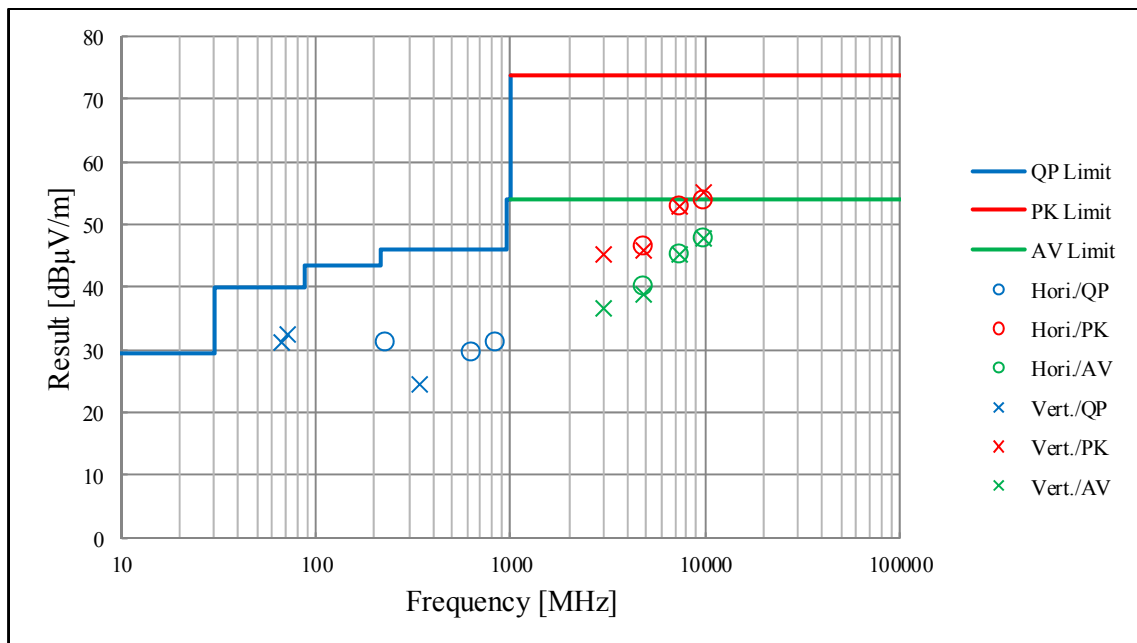
Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11014760S-B-R1  
Date : November 11, 2015  
Temperature / Humidity : 23 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa  
(1-2.8 GHz)  
Mode : Tx, Hopping Off, 3DH5 2480 MHz with antenna cable 199 mm



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

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

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber	Shonan EMC Lab. No.3 Semi Anechoic Chamber	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11014760S-B-R1			
Date	October 31, 2015	November 4, 2015	November 11, 2015	November 14, 2015
Temperature / Humidity	23 deg. C / 40 % RH	23 deg. C / 39 % RH	23 deg. C / 35 % RH	23 deg. C / 36 % RH
Engineer	Shinichi Takano (30-1000 MHz)	Hiroyuki Morikawa (13-26 GHz)	Hikaru Shirasawa (1-2.8 GHz)	Yosuke Ishikawa (2.8-13 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz with antenna cable 400 mm			

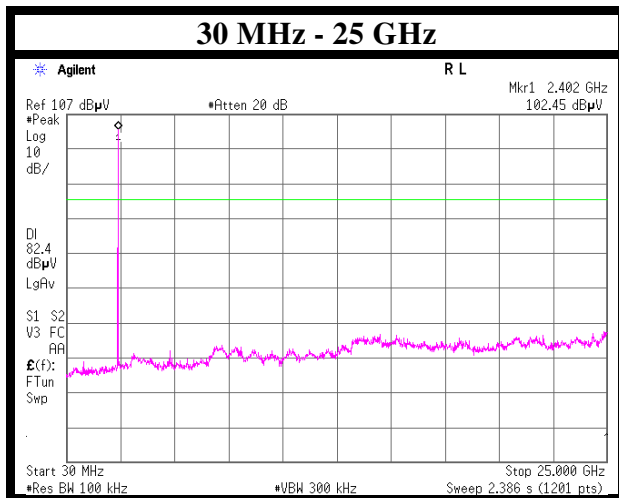
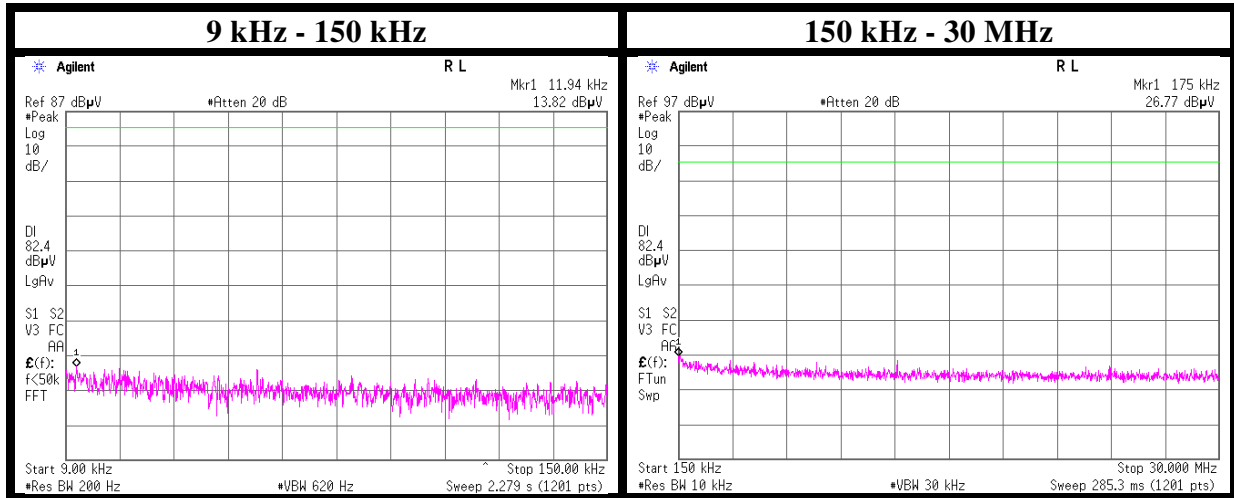


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off, DH5

### 2402 MHz



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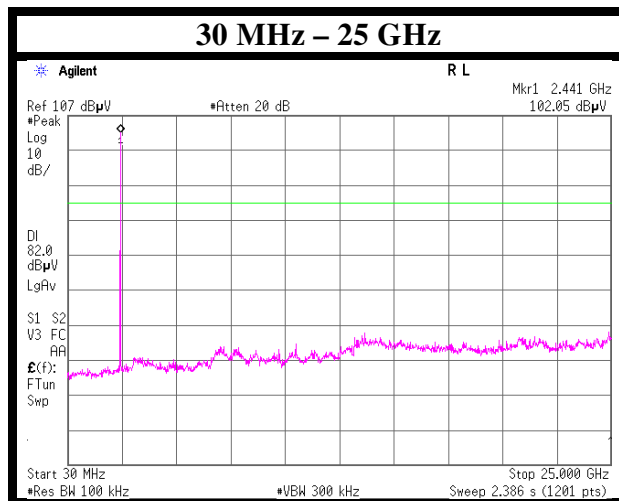
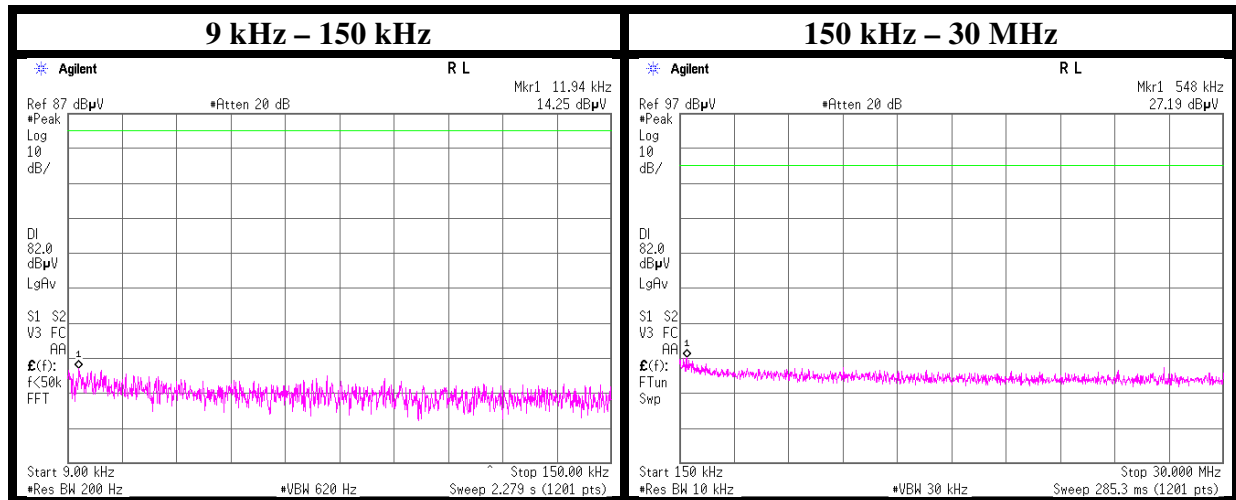
Telephone : +81 463 50 6400

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## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off, DH5

### 2441 MHz



**UL Japan, Inc.**

**Shonan EMC Lab.**

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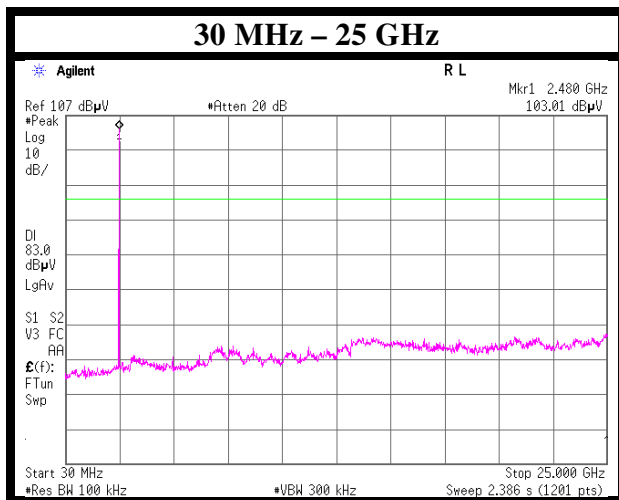
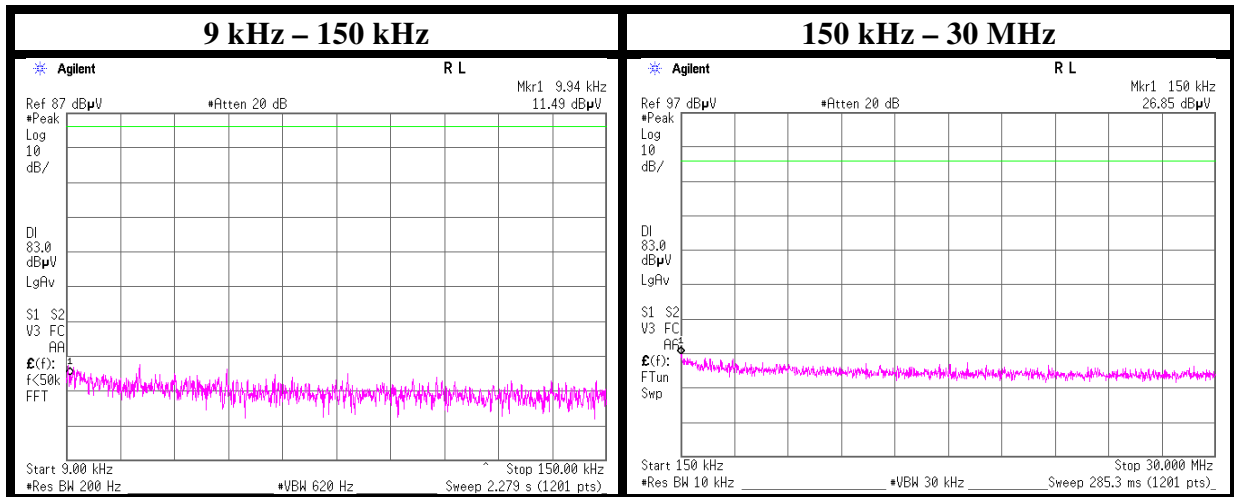
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off, DH5

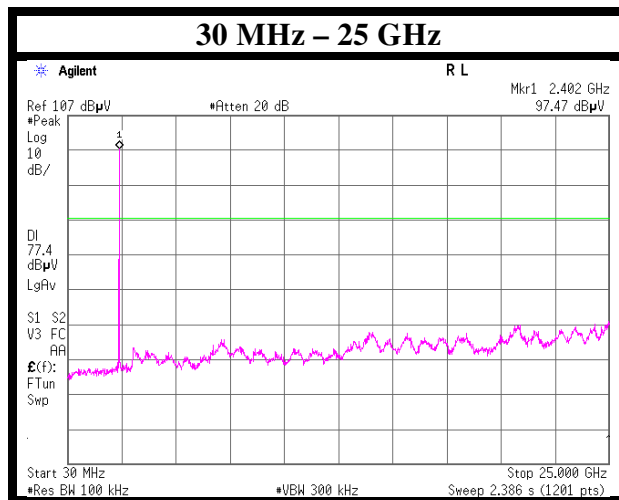
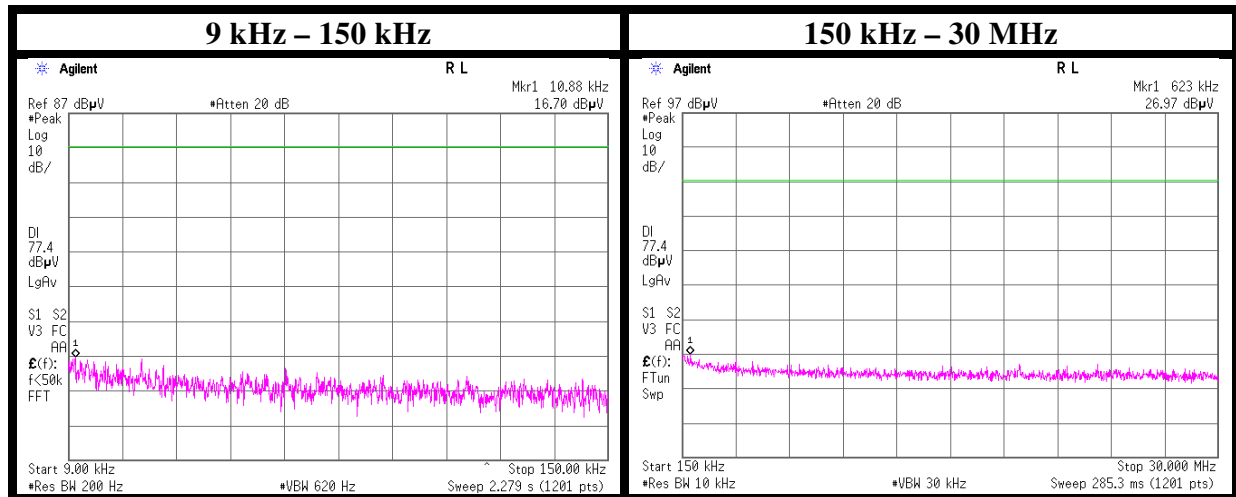
### 2480 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off, DH5

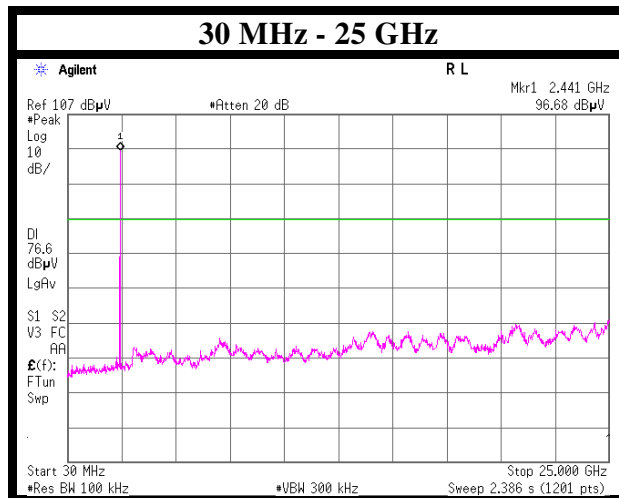
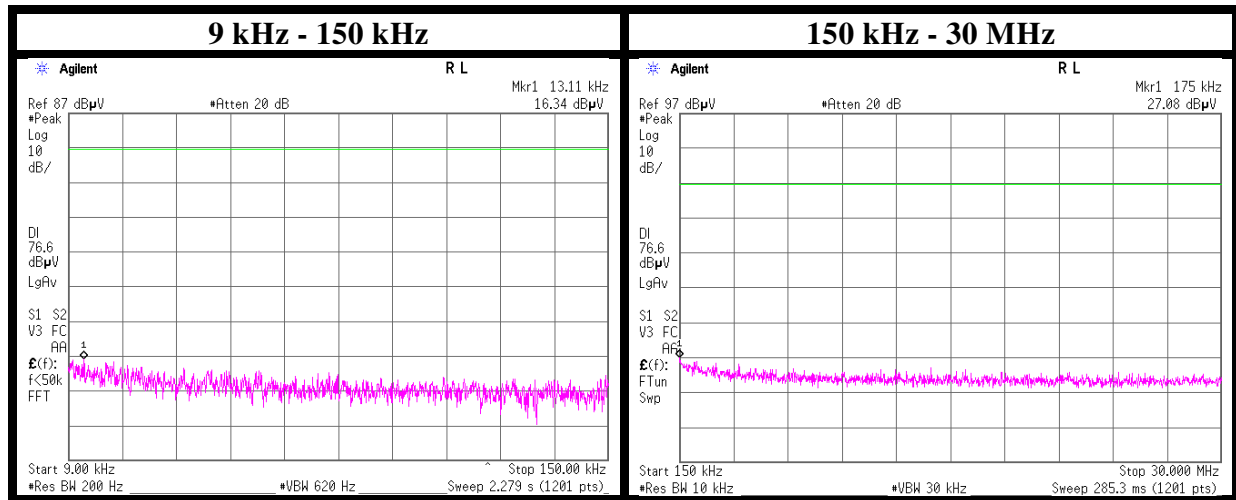
### 2402 MHz



## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off, 3DH5

### 2441 MHz



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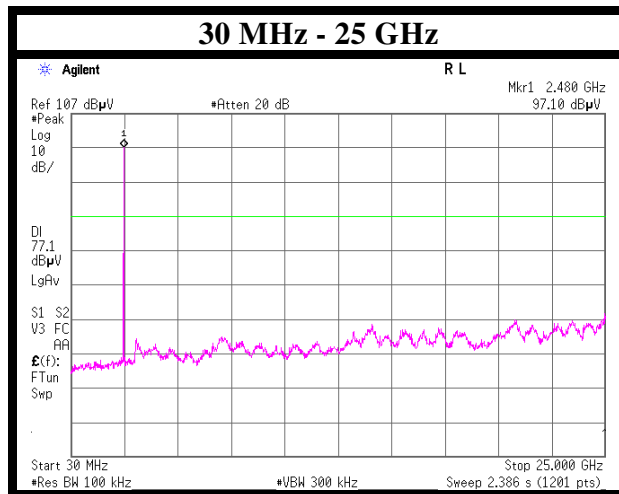
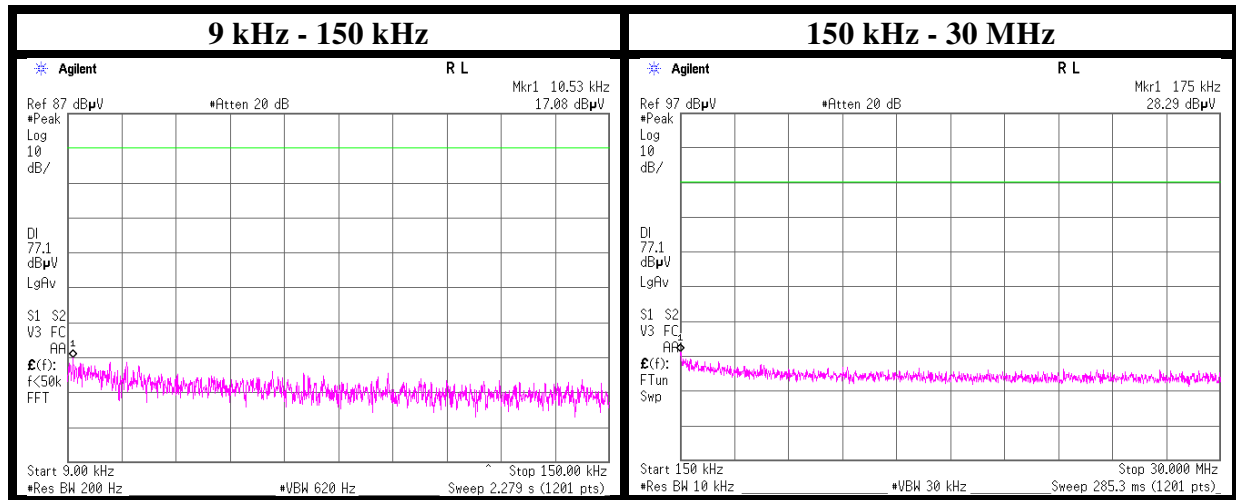
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx, Hopping Off, 3DH5

### 2480 MHz



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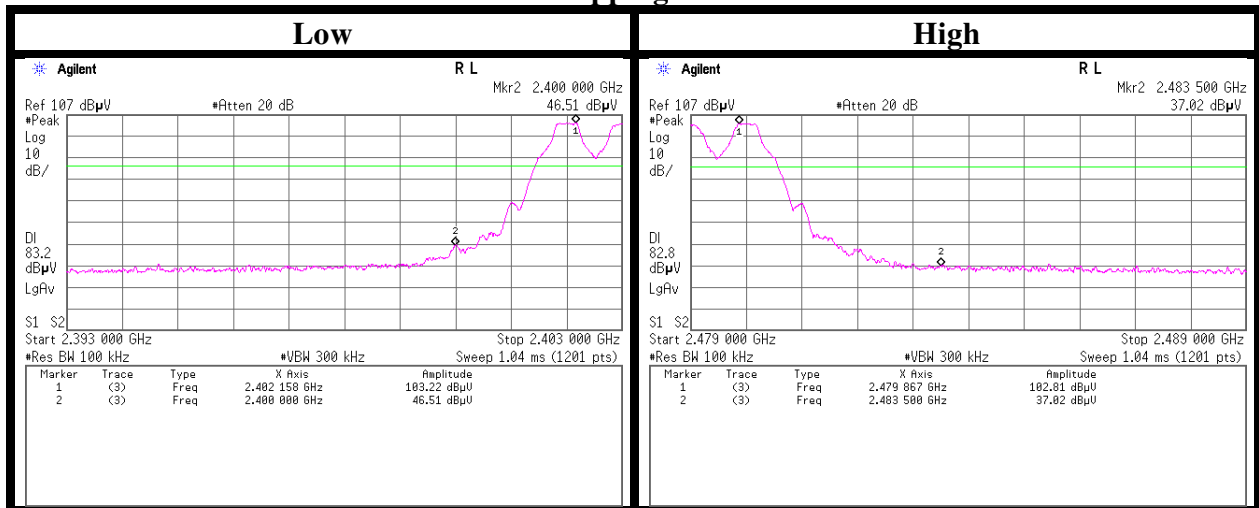
Facsimile : +81 463 50 6401



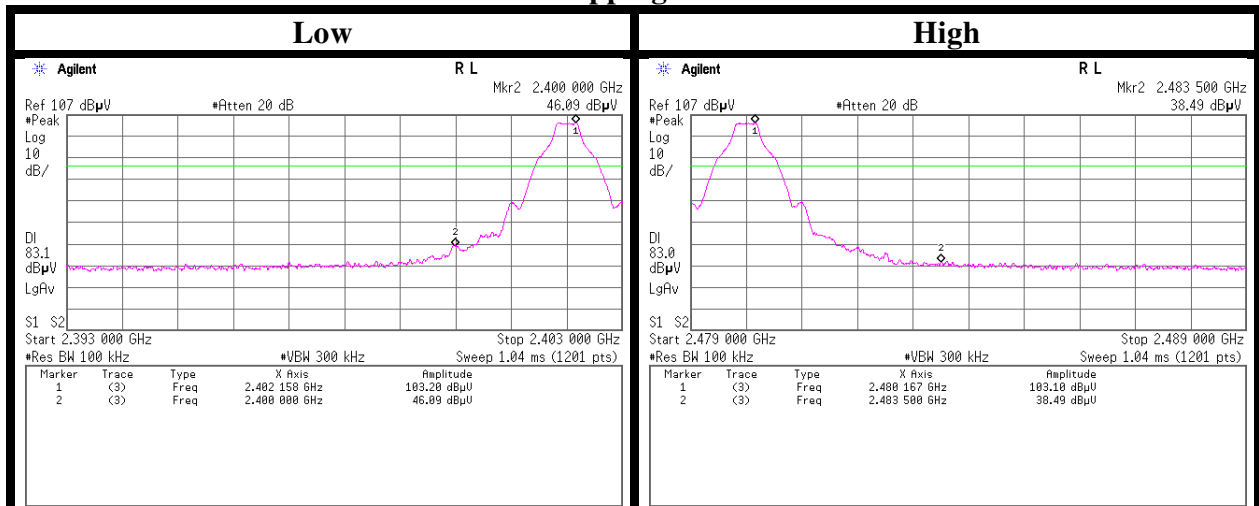
## Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx DH5

### Hopping On



### Hopping Off



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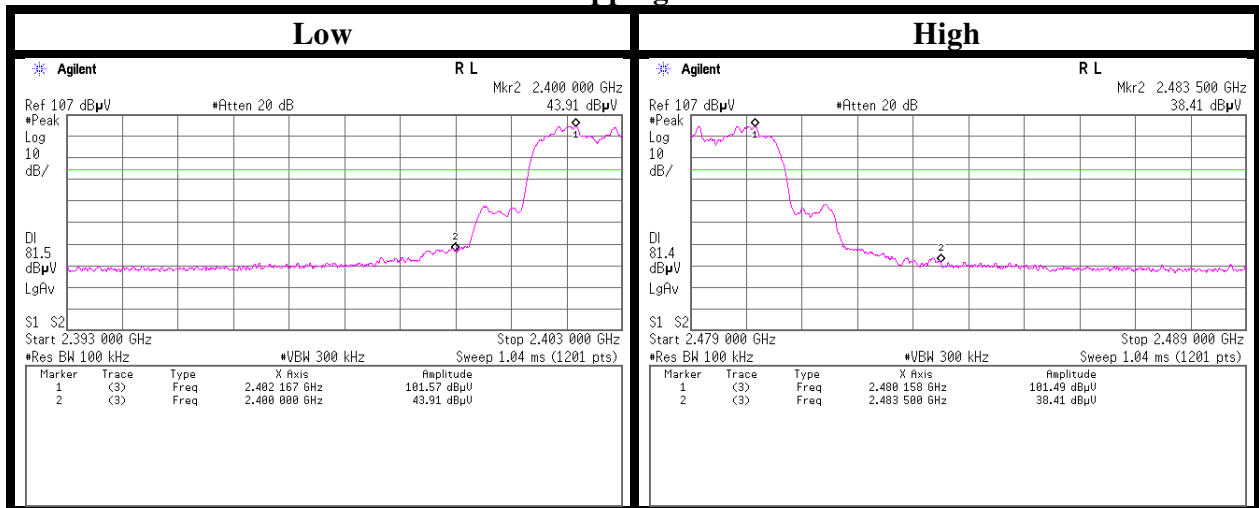
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

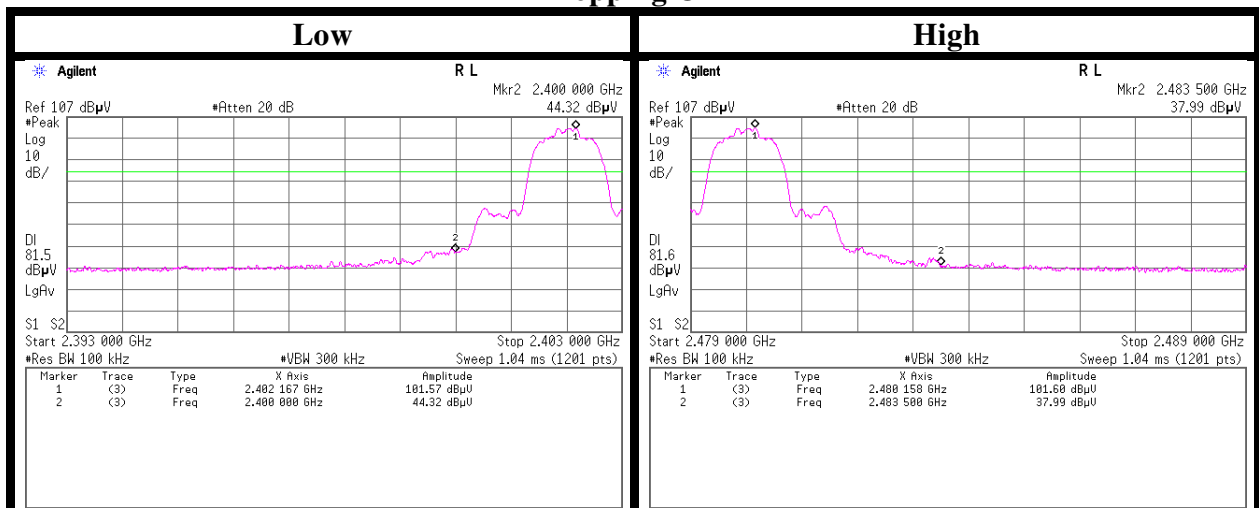
## Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx 3DH5

### Hopping On



### Hopping Off



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**Shonan EMC Lab.**

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Telephone : +81 463 50 6400

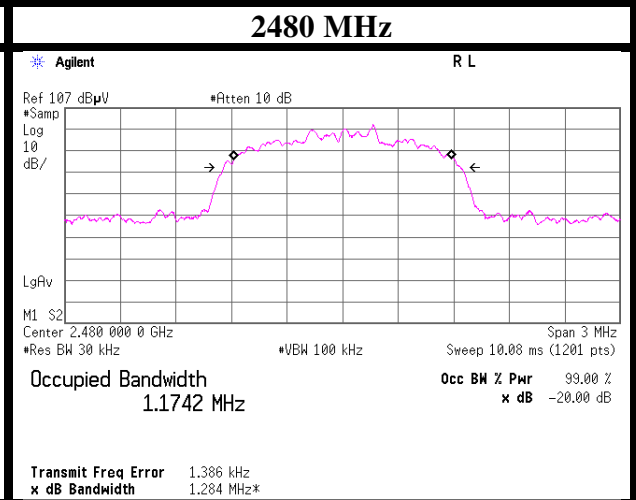
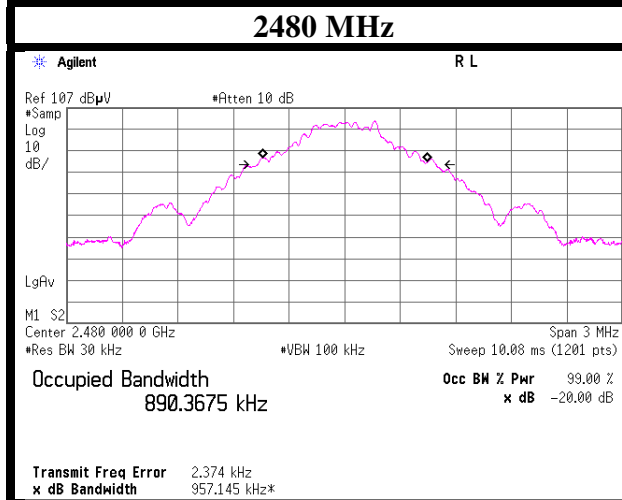
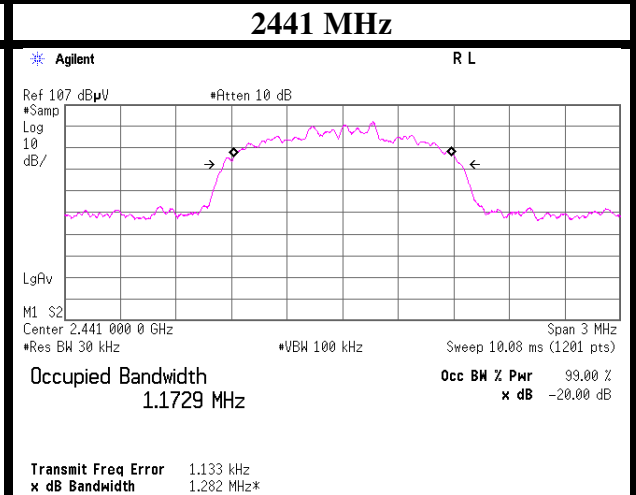
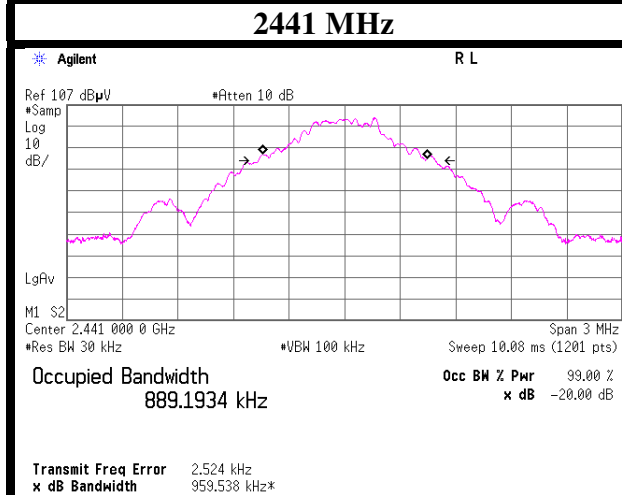
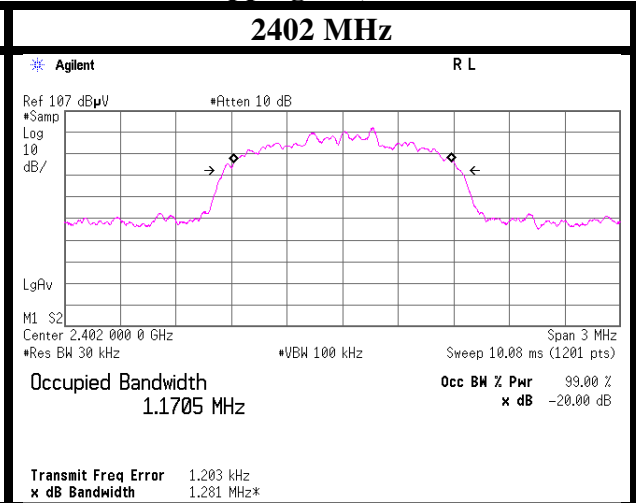
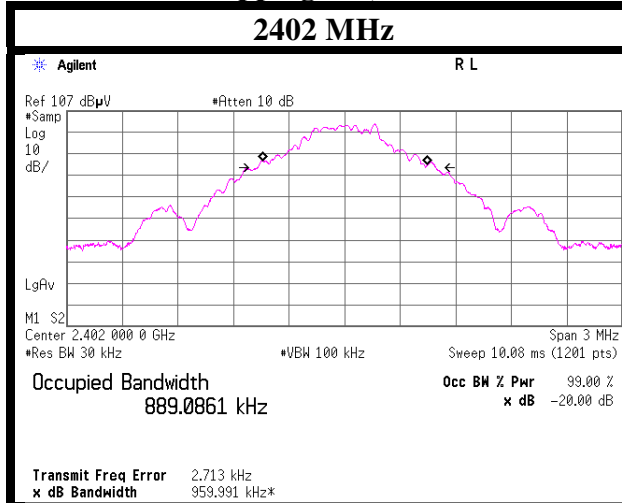
Facsimile : +81 463 50 6401

### 99 % Occupied Bandwidth

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx Hopping Off

#### Hopping Off, DH5

#### Hopping Off, 3DH5



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**Shonan EMC Lab.**

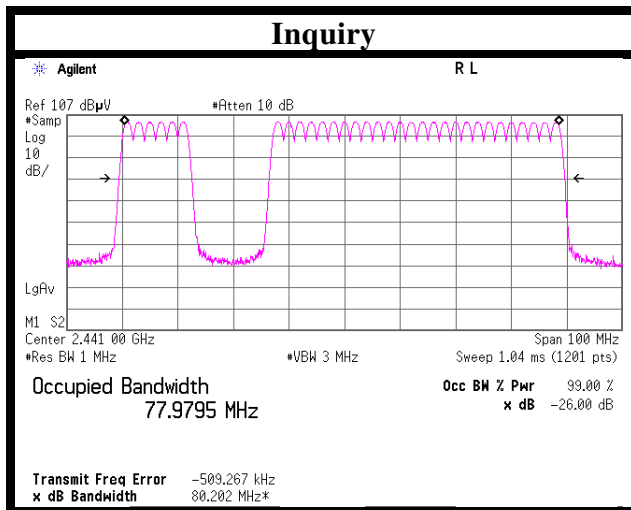
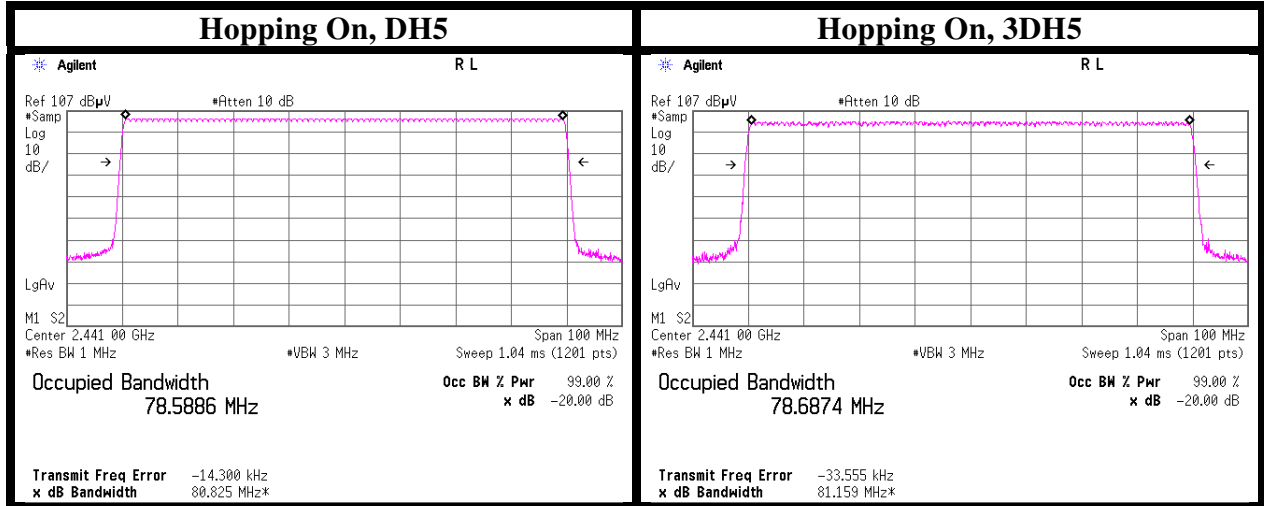
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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## 99 % Occupied Bandwidth

Test place	Shonan EMC Lab. No.6 Shielded Room
Report No.	11014760S-B-R1
Date	November 16, 2015
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Tomohiro Hara
Mode	Tx Hopping On



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## **APPENDIX 2: Test instruments**

### **Test equipment**

<b>Control No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Serial No</b>	<b>Test Item</b>	<b>Calibration Date * Interval(month)</b>
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2015/02/18 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2014/12/19 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2015/08/31 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2015/10/11 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2015/04/17 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2015/04/17 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP9108-A0888	RE	2015/10/11 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2015/10/22 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE	2015/09/11 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2015/07/13 * 12
SAEC-01(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2015/07/08 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE, CE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812		2014/11/11 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2015/03/23 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX104A	46497/4A	RE	2015/04/17 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX104	296169/4	RE	2015/05/19 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2015/08/10 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2015/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2015/03/17 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2015/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX102	32703/2	RE	2015/03/11 * 12
SFL-03	Highpass Filter	MICRO-TRONICS	HPM50112	028	RE	2014/11/21 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2015/05/27 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2015/06/08 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX104	297342/4	RE	2015/05/19 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2015/08/11 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2015/08/28 * 12
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2014/11/11 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2015/04/09 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2014/11/21 * 12

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### Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SRENT-04	Spectrum Analyzer	KEYSIGHT	E4440A	MY461863 88	AT	2015/10/06 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2015/11/04 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2015/03/11 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2015/04/07 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2015/04/07 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	AT	2015/10/22 * 12
SCC-C9/C10/S RSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141 PE/NS4906	-/0901-271( RF Selector)	CE	2015/04/17 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE(EUT)	2015/02/24 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2015/09/18 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2014/12/24 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2014/12/19 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	CE	2015/03/24 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:           CE: Conducted Emission test  
                      RE: Radiated Emission test  
                      AT: Antenna Terminal Conducted test