



RADIO TEST REPORT

Test Report No. : 11834855S-B-R1

Applicant : OLYMPUS CORPORATION
Type of Equipment : Wireless LAN/Bluetooth Module
Model No. : S080WIFI-PCA
FCC ID : YSKW80
Test regulation : FCC Part 15 Subpart C: 2018
* Bluetooth BDR/EDR part
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 11834855S-B. 11834855S-B is replaced with this report.

Date of test:

November 2 to 22, 2017

Representative test engineer:

Shiro Kobayashi
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".

UL Japan, Inc.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11834855S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11834855S-B	February 19, 2018	-	-
1	11834855S-B-R1	March 1, 2018	4	Correction of Radio Specification

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SECTION 1: Customer information

Company Name : OLYMPUS CORPORATION
Address : 2951 Ishikawa-machi Hachioji-shi Tokyo 192-8507 Japan
Telephone Number : +81-42-642-2283
Facsimile Number : +81-42-642-2398
Contact Person : Kazuma Tajiri

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless LAN/Bluetooth Module
Model No. : S080WIFI-PCA
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.35 V - 4.2 V
Receipt Date of Sample : June 24, 2017
Country of Mass-production : Vietnam
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: S080WIFI-PCA (referred to as the EUT in this report) is a Wireless LAN/Bluetooth Module.

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2.4 GHz: 2402 MHz - 2480 MHz (Bluetooth BDR/EDR, Bluetooth Low Energy)
2412 MHz - 2462 MHz (Wireless LAN)
U-NII-1 / 5180 MHz - 5320 MHz (IEEE 802.11a/n-20/ac-20)
U-NII-2A: 5190 MHz - 5310 MHz (IEEE 802.11n-40/ac-40)
5210 MHz - 5290 MHz (IEEE 802.11ac-80)
U-NII-2C: 5500 MHz - 5700 MHz (IEEE 802.11a/n-20/ac-20)
5510 MHz - 5670 MHz (IEEE 802.11n-40/ac-40)
5530 MHz (IEEE 802.11ac-80)
U-NII-3: 5745 MHz - 5825 MHz (IEEE 802.11a/n-20/ac-20)
5755 MHz - 5795 MHz (IEEE 802.11n-40/ac-40)
5775 MHz (IEEE 802.11ac-80)
Modulation : DSSS (IEEE 802.11b), OFDM (IEEE 802.11g/n/a/ac)
FHSS (Bluetooth BDR/EDR), GFSK (Bluetooth Low Energy)
Power Supply (inner) : VBAT: DC 3.8 V (3.35 V - 4.2 V),
VIO: DC 1.8 V, DC 3.3 V (1.62 V - 3.63 V)
Antenna type : Pattern Antenna
Antenna Gain : 2.4 GHz: -2.9 dBi
5 GHz: +1.3 dBi
Operating Temperature : -10 deg. C to +40 deg. C
Clock frequency (Maximum) : 37.4 MHz

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on February 2, 2018 and effective March 5, 2018

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

* The revisions made after testing date do 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 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	33.1 dB 0.17900 MHz, N and L1, AV BT 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 (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		10.7 dB 9920.00 MHz, AV, Vert., Tx, Hopping Off, DH5 2480 MHz 9920.00 MHz, AV, Hori., Tx, Hopping Off, 3DH5 2480 MHz	Complied

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 C63.10: 2013 is also referred.

FCC Part 15.31 (e)

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC 3.8 V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

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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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.5 dB	2.5 dB	2.6 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	30 MHz-200 MHz	4.3 dB	4.3 dB	4.3 dB	-	-
	200 MHz-1 GHz	5.9 dB	5.9 dB	5.9 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 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	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.91 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

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.

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

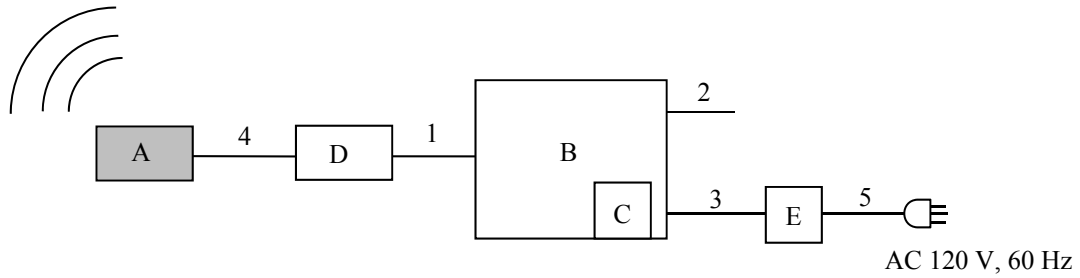
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, 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: Fixed Software: Bluetooth version: 1.9.6.5 *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	Remark
A	Wireless LAN/Bluetooth Module	S080WIFI-PCA	5	OLYMPUS CORPORATION	EUT
B	Jig Board	T3050TB	-	OLYMPUS CORPORATION	-
C	SD Card	SD-K08G	1572 CS00156	TOSHIBA	-
D	UART – USB Conversion Board	T3050 UART - USB	-	OLYMPUS CORPORATION	-
E	Power Supply(DC)	PAN35-10A	NA000955	Kikusui	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal	0.2	Unshielded	Unshielded	-
2	DC	0.3	Unshielded	Unshielded	-
3	DC	1.5	Unshielded	Unshielded	-
4	Signal	0.2	Unshielded	Unshielded	-
5	AC	1.8	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

The rear of tabletop was located 40 cm 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 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

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

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]

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.

[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	3.99 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 40 GHz)		3.99 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: $20 \times \log(3.99 \text{ m}/3.0 \text{ m}) = 2.47 \text{ dB}$

*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 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.

Antenna polarization	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz -2.8 GHz)	Spurious (2.8 GHz -13 GHz)	Spurious (13 GHz -26.5 GHz)
Horizontal	Z	Z	Z	Z	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 MHz – 26.5 GHz
Test data : APPENDIX
Test result : Pass

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	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	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Max 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.

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

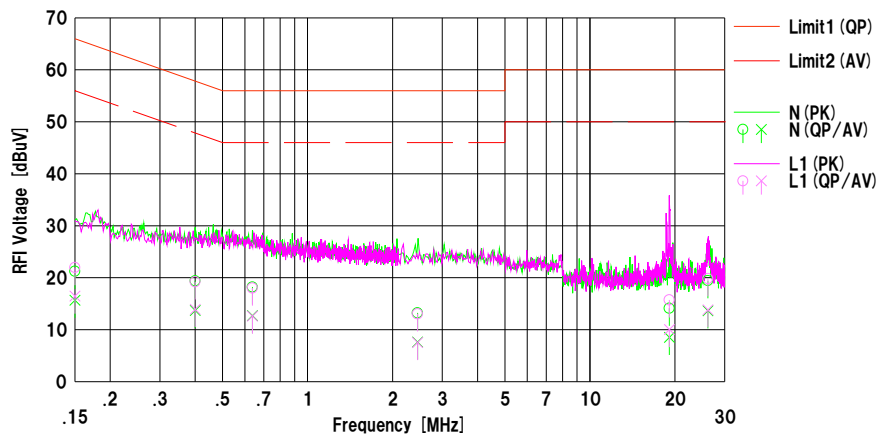
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/11/22

Mode : BT_DH5.2402MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 20 deg.C / 42 %RH

Remarks : -

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

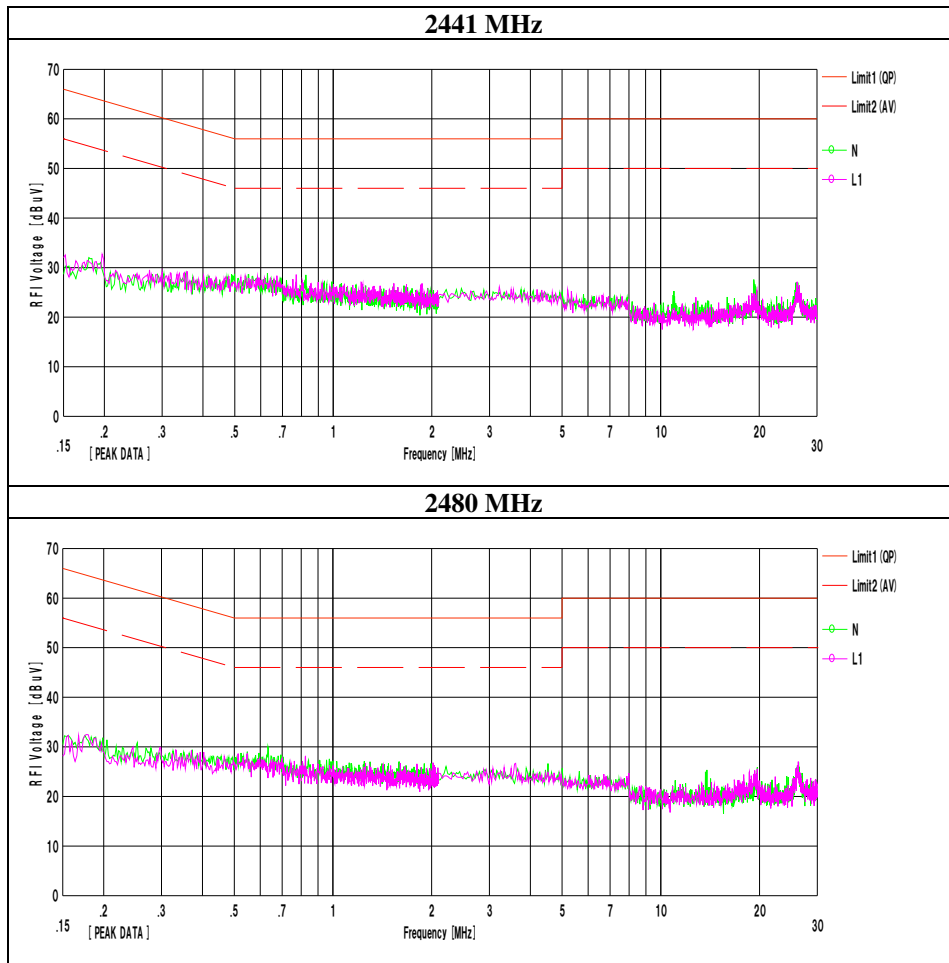
Engineer : Kazutaka Takeyama



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	0.15000	8.80	3.20	12.46	21.26	15.66	66.00	56.00	44.7	40.3	N	
2	0.40000	6.90	1.20	12.50	19.40	13.70	57.85	47.85	38.4	34.1	N	
3	0.63800	5.70	0.20	12.52	18.22	12.72	56.00	46.00	37.7	33.2	N	
4	2.45200	0.60	-5.00	12.64	13.24	7.64	56.00	46.00	42.7	38.3	N	
5	19.12100	0.60	-5.00	13.53	14.13	8.53	60.00	50.00	45.8	41.4	N	
6	26.19000	5.60	-0.20	13.84	19.44	13.64	60.00	50.00	40.5	36.3	N	
7	0.15000	9.50	4.00	12.46	21.96	16.46	66.00	56.00	44.0	39.5	L1	
8	0.40000	6.70	1.40	12.50	19.20	13.90	57.85	47.85	38.6	33.9	L1	
9	0.63800	5.50	0.10	12.52	18.02	12.62	56.00	46.00	37.9	33.3	L1	
10	2.45200	0.40	-5.10	12.64	13.04	7.54	56.00	46.00	42.9	38.4	L1	
11	19.12100	2.20	-3.50	13.53	15.73	10.03	60.00	50.00	44.2	39.9	L1	
12	26.19000	6.00	0.00	13.84	19.84	13.84	60.00	50.00	40.1	36.1	L1	

Calculation:Result [dBuV]=Reading [dBuV]+C.Fac (LISN (AMN)+Cable+ATT) [dB]
LISN (AMN)=SLS-03

Conducted Emission



Conducted Emission

DATA OF CONDUCTED EMISSION TEST

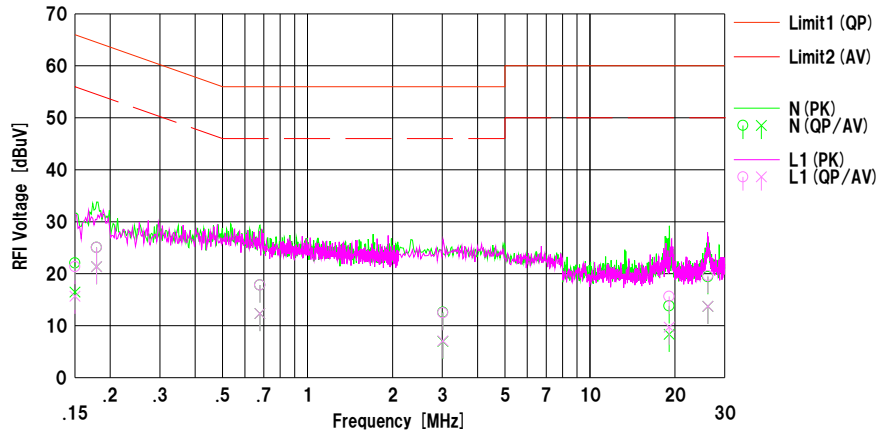
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/11/22

Mode : BT_3DH5_2402MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 20 deg.C / 42 %RH

Remarks : -

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

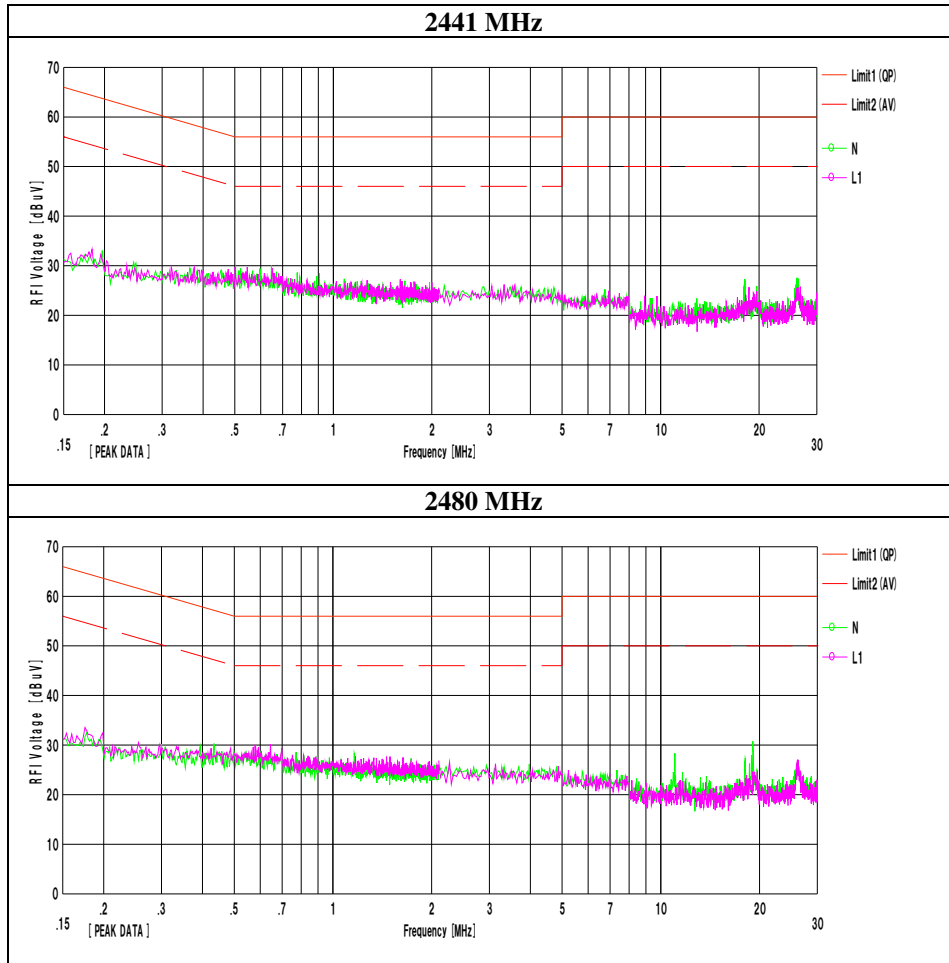
Engineer : Kazutaka Takeyama



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	9.60	4.00	12.46	22.06	16.46	66.00	56.00	43.9	39.5	N	
2	0.17900	12.60	8.90	12.46	25.06	21.36	64.53	54.53	39.4	33.1	N	
3	0.67800	5.30	-0.20	12.53	17.83	12.33	56.00	46.00	38.1	33.6	N	
4	3.01700	-0.10	-5.70	12.69	12.59	6.99	56.00	46.00	43.4	39.0	N	
5	19.08500	0.30	-5.20	13.53	13.83	8.33	60.00	50.00	46.1	41.6	N	
6	26.16200	5.60	-0.10	13.83	19.43	13.73	60.00	50.00	40.5	36.2	N	
7	0.15000	8.90	3.20	12.46	21.36	15.66	66.00	56.00	44.6	40.3	L1	
8	0.17900	12.60	8.90	12.46	25.06	21.36	64.53	54.53	39.4	33.1	L1	
9	0.67800	5.30	-0.20	12.53	17.83	12.33	56.00	46.00	38.1	33.6	L1	
10	3.01700	-0.20	-5.60	12.69	12.49	7.09	56.00	46.00	43.5	38.9	L1	
11	19.08500	2.10	-3.80	13.53	15.83	9.73	60.00	50.00	44.3	40.2	L1	
12	26.16200	5.80	-0.10	13.83	19.63	13.73	60.00	50.00	40.3	36.2	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) = SLS-03

Conducted Emission



20dB Bandwidth, 99% Occupied Bandwidth and Carrier Frequency Separation

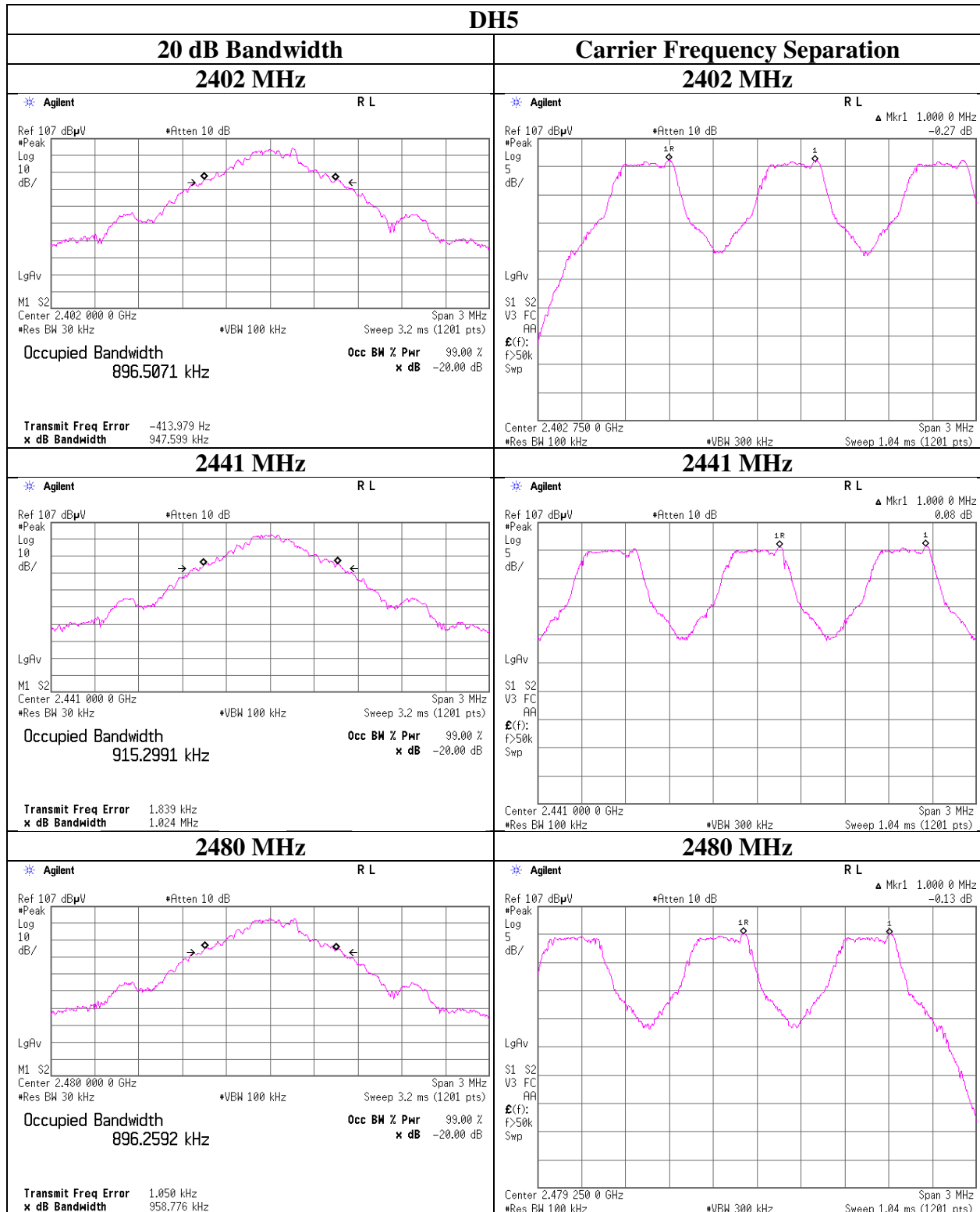
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11834855S-B-R1
Date November 16, 2017 November 20, 2017
Temperature / Humidity 26deg. C / 37 % RH 24deg. C / 31 % RH
Engineer Makoto Hosaka Shiro Kobayashi
Mode Tx, Hopping Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.948	900.600	1.000	>= 0.632
DH5	2441.0	1.024	901.300	1.000	>= 0.683
DH5	2480.0	0.959	905.000	1.000	>= 0.639
DH5	Hopping On	-	78623.100	-	-
3DH5	2402.0	1.312	1210.700	1.000	>= 0.875
3DH5	2441.0	1.313	1213.900	1.000	>= 0.875
3DH5	2480.0	1.314	1213.000	1.000	>= 0.876
3DH5	Hopping On	-	78750.800	-	-

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



UL Japan, Inc.

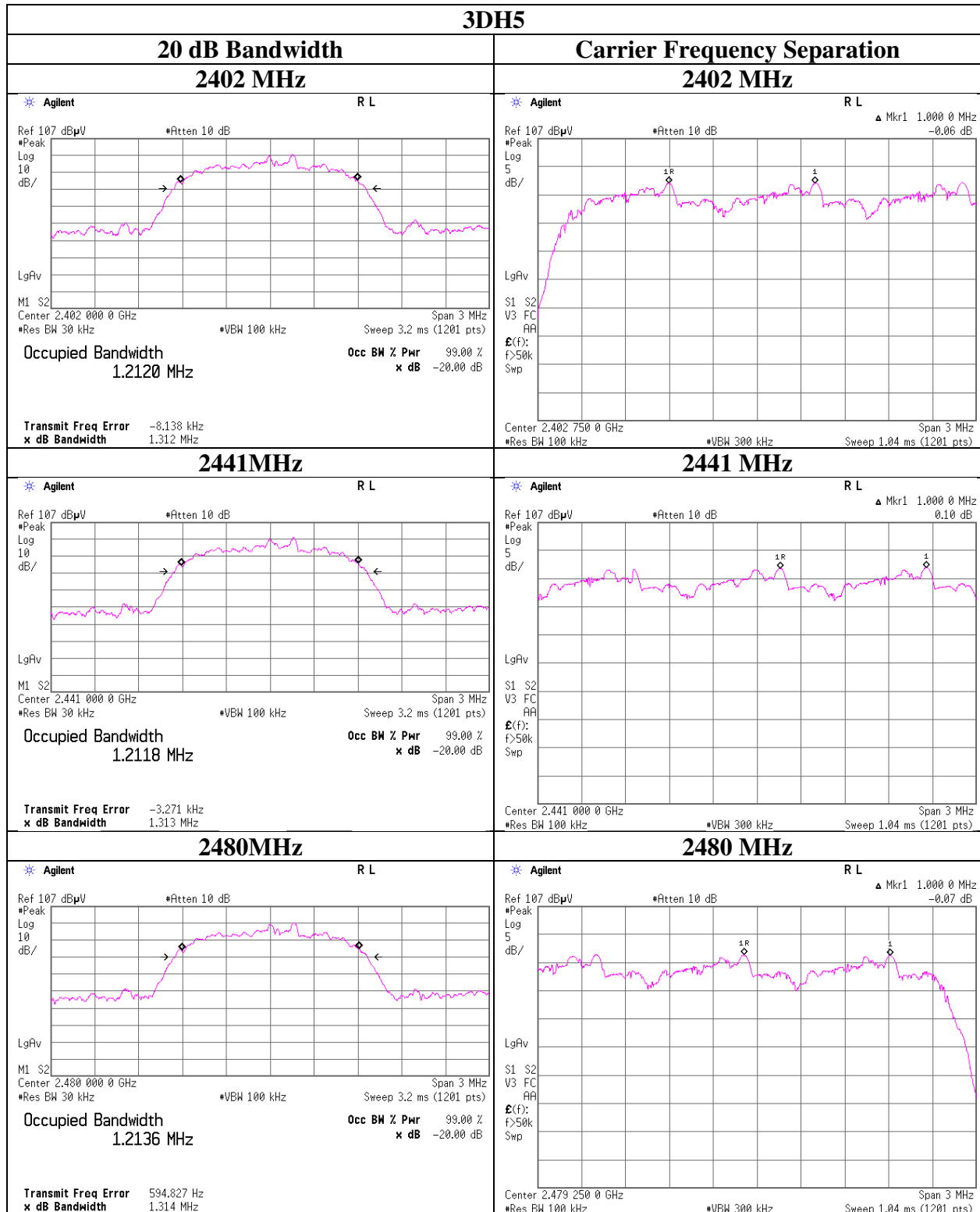
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20dB Bandwidth and Carrier Frequency Separation



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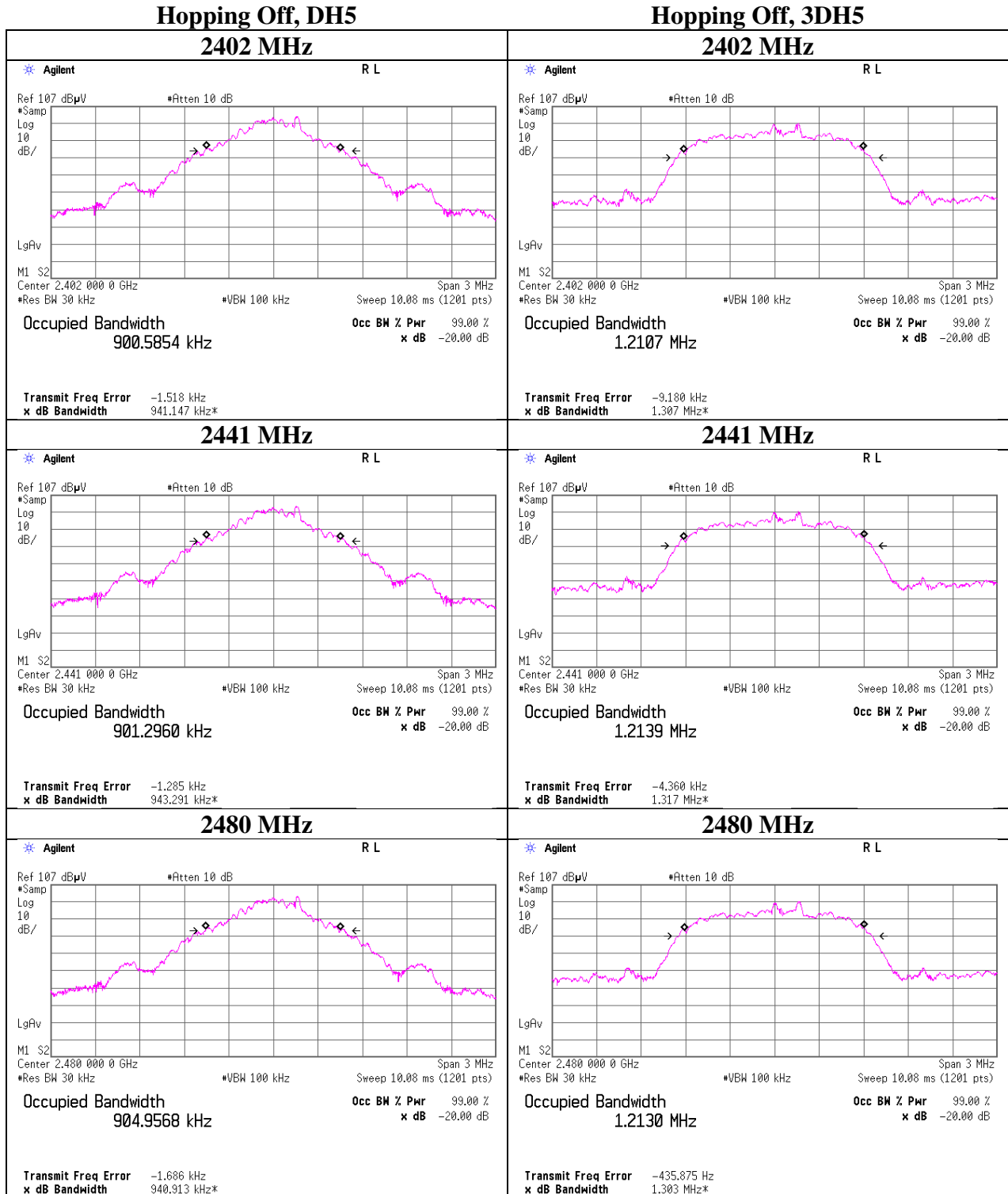
Shonan EMC Lab.

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

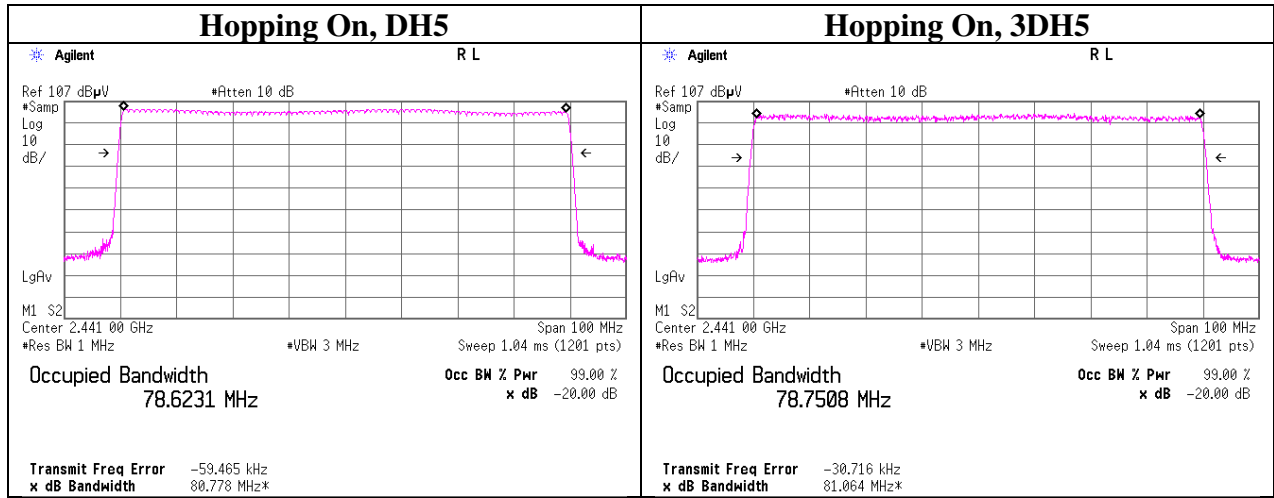
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth



99% Occupied Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

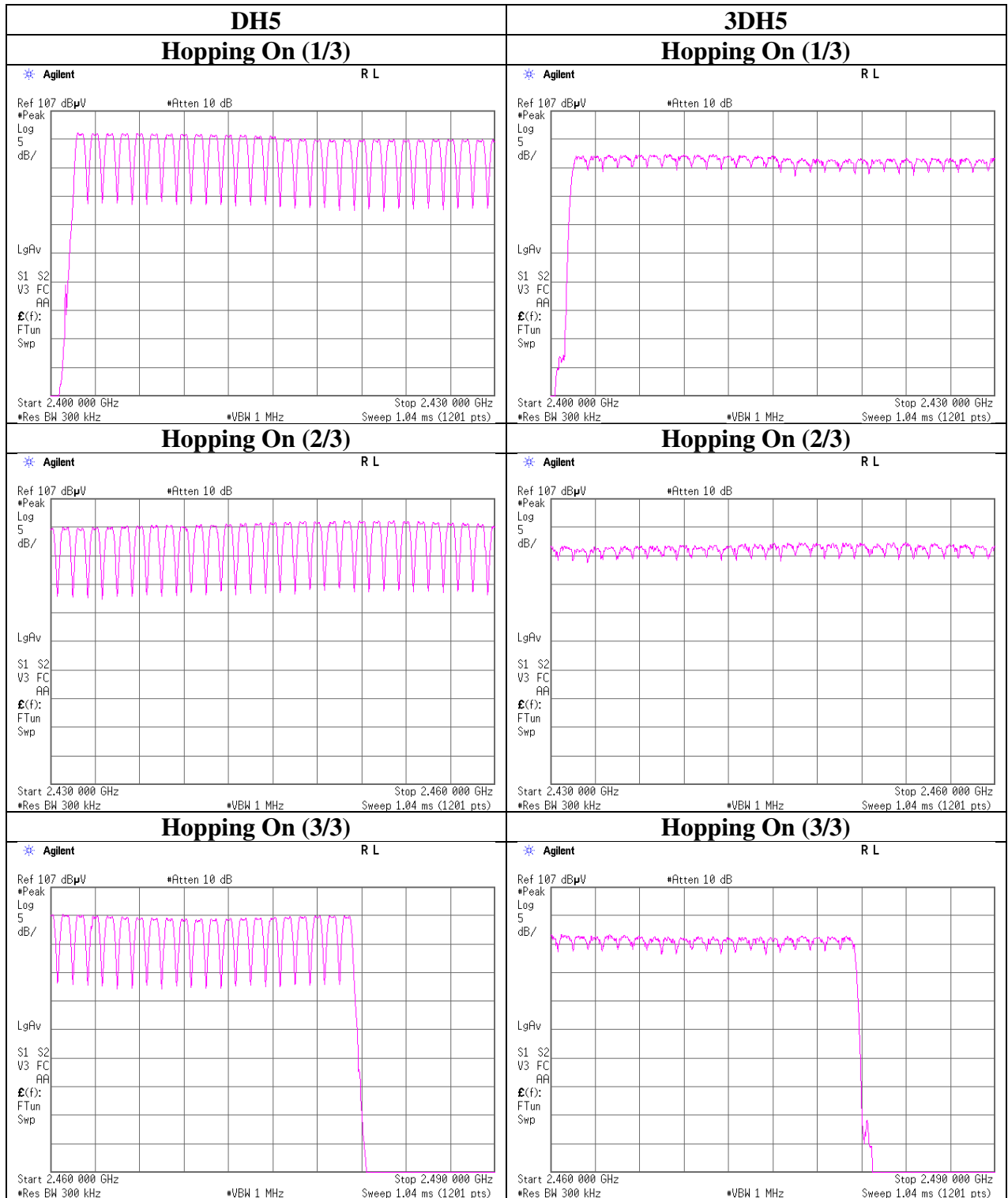
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11834855S-B-R1
Date November 20, 2017
Temperature / Humidity 24deg. C / 31 % RH
Engineer Shiro Kobayashi
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



Dwell time

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11834855S-B-R1
Date : November 20, 2017
Temperature / Humidity : 24deg. C / 31 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	49.2 times /	5 sec. x	31.6 sec. =	311 times	0.423	132	400
DH3	22.8 times /	5 sec. x	31.6 sec. =	145 times	1.680	244	400
DH5	21.2 times /	5 sec. x	31.6 sec. =	134 times	2.931	393	400
3DH1	50.8 times /	5 sec. x	31.6 sec. =	322 times	0.429	138	400
3DH3	23.4 times /	5 sec. x	31.6 sec. =	148 times	1.685	249	400
3DH5	16.0 times /	5 sec. x	31.6 sec. =	102 times	2.937	300	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

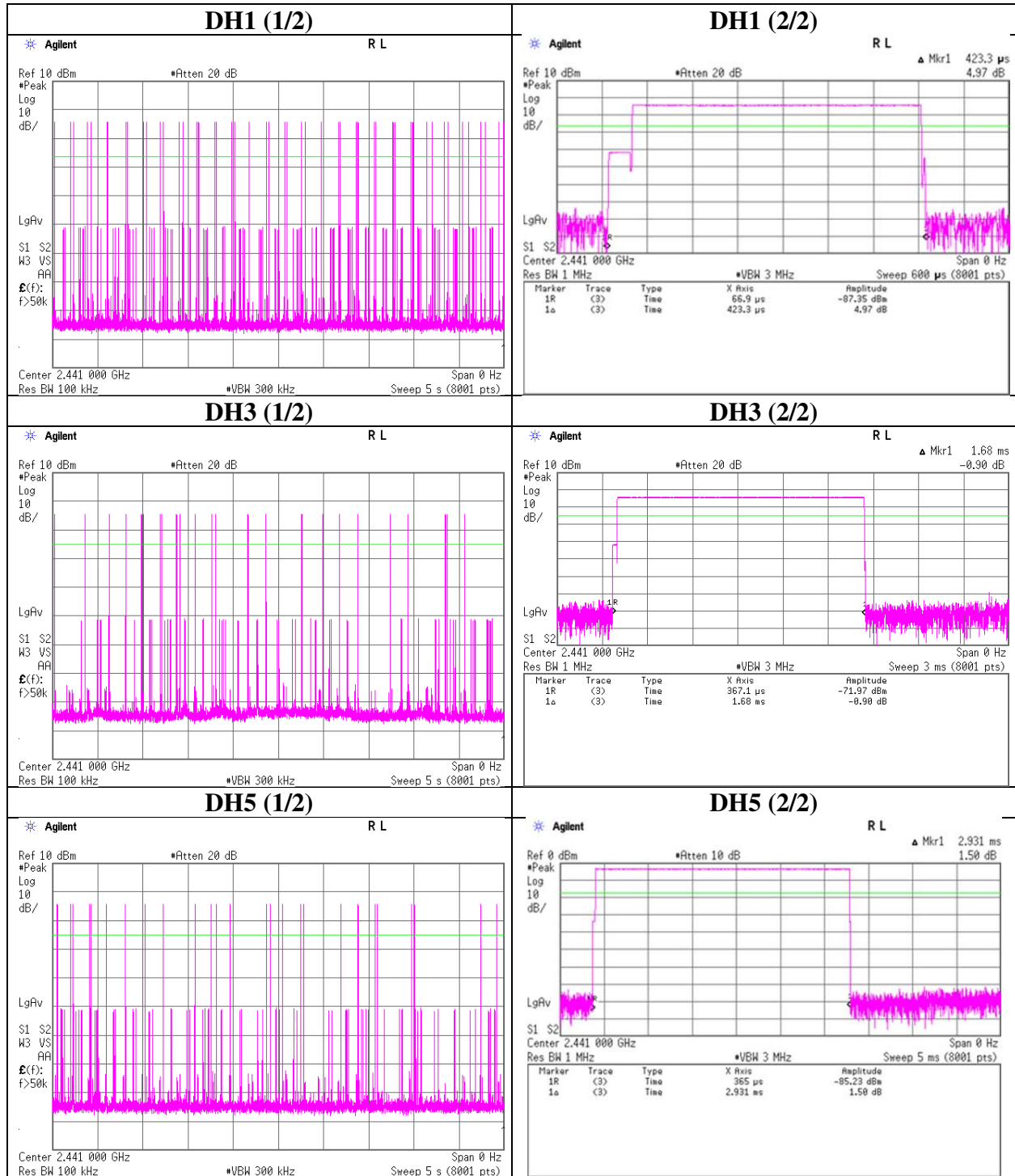
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	48	50	49	50	49	49.2
DH3	23	26	20	21	24	22.8
DH5	26	21	19	20	20	21.2
3DH1	51	51	51	50	51	50.8
3DH3	19	21	24	25	28	23.4
3DH5	16	14	13	19	18	16.0

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



UL Japan, Inc.

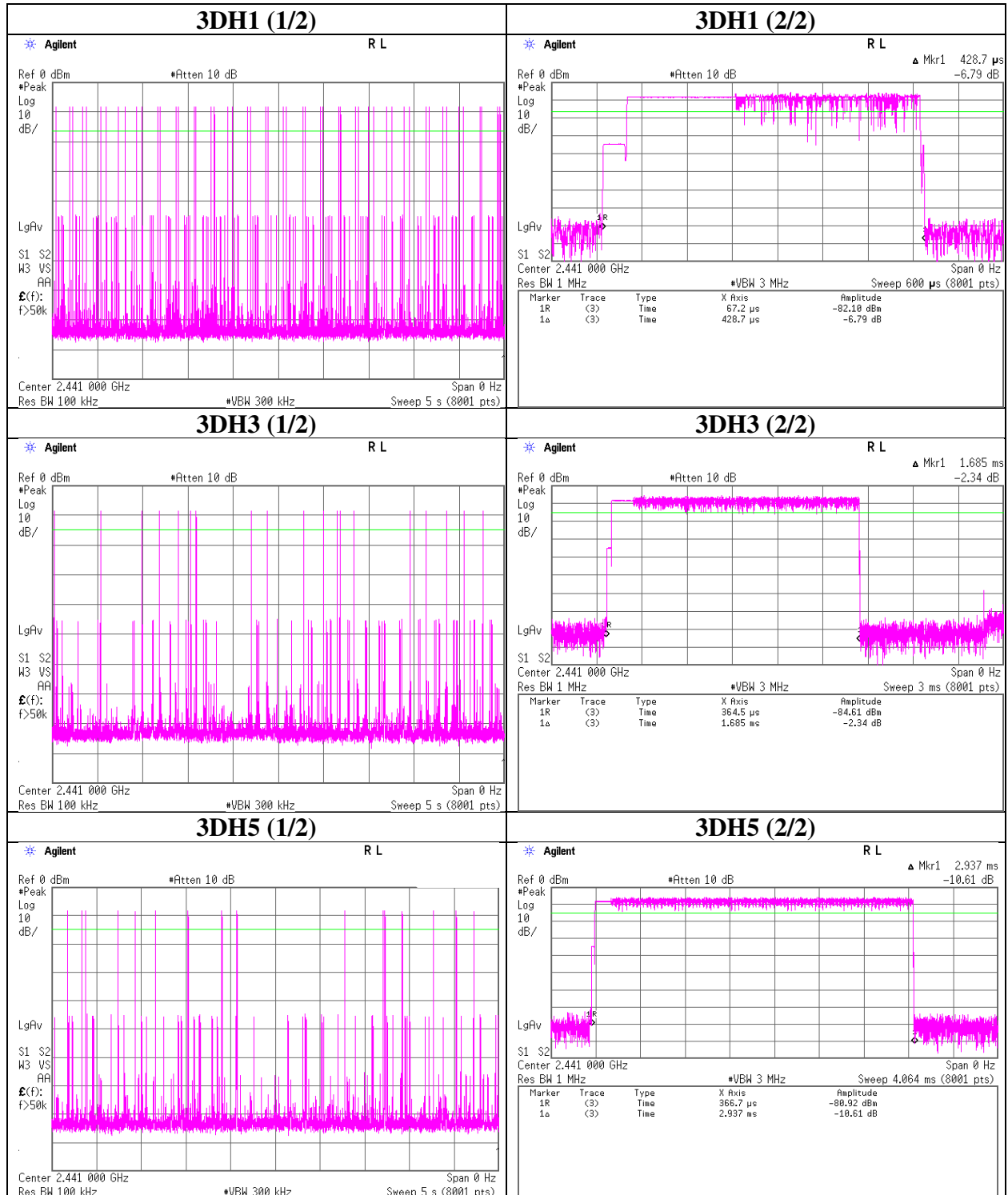
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11834855S-B-R1
Date : November 2, 2017
Temperature / Humidity : 22 deg. C / 41 % RH
Engineer : Makoto Hosaka
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	-4.53	1.60	9.96	7.03	5.05	20.96	125	13.93
DH5	2441.0	-4.90	1.61	9.97	6.68	4.66	20.96	125	14.28
DH5	2480.0	-5.36	1.62	9.97	6.23	4.20	20.96	125	14.73
2DH5	2402.0	-6.36	1.60	9.96	5.20	3.31	20.96	125	15.76
2DH5	2441.0	-6.31	1.61	9.97	5.27	3.37	20.96	125	15.69
2DH5	2480.0	-6.90	1.62	9.97	4.69	2.94	20.96	125	16.27
3DH5	2402.0	-6.26	1.60	9.96	5.30	3.39	20.96	125	15.66
3DH5	2441.0	-6.30	1.61	9.97	5.28	3.37	20.96	125	15.68
3DH5	2480.0	-6.83	1.62	9.97	4.76	2.99	20.96	125	16.20

Sample Calculation:

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

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

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

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

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

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11834855S-B-R1
Date November 2, 2017
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Makoto Hosaka
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	-5.86	1.60	9.96	5.70	3.72	1.07	6.77	4.75
DH5	2441.0	-6.24	1.61	9.97	5.34	3.42	1.07	6.41	4.38
DH5	2480.0	-6.73	1.62	9.97	4.86	3.06	1.07	5.93	3.92
2DH5	2402.0	-10.10	1.60	9.96	1.46	1.40	1.07	2.53	1.79
2DH5	2441.0	-10.02	1.61	9.97	1.56	1.43	1.07	2.63	1.83
2DH5	2480.0	-10.61	1.62	9.97	0.98	1.25	1.07	2.05	1.60
3DH5	2402.0	-10.14	1.60	9.96	1.42	1.39	1.07	2.49	1.77
3DH5	2441.0	-10.14	1.61	9.97	1.44	1.39	1.07	2.51	1.78
3DH5	2480.0	-10.64	1.62	9.97	0.95	1.24	1.07	2.02	1.59

Sample Calculation:

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

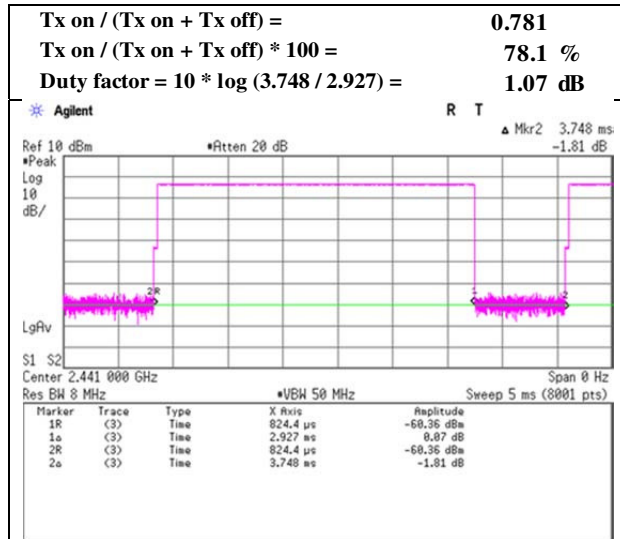
Result (Burst power average) = Time average + Duty factor

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

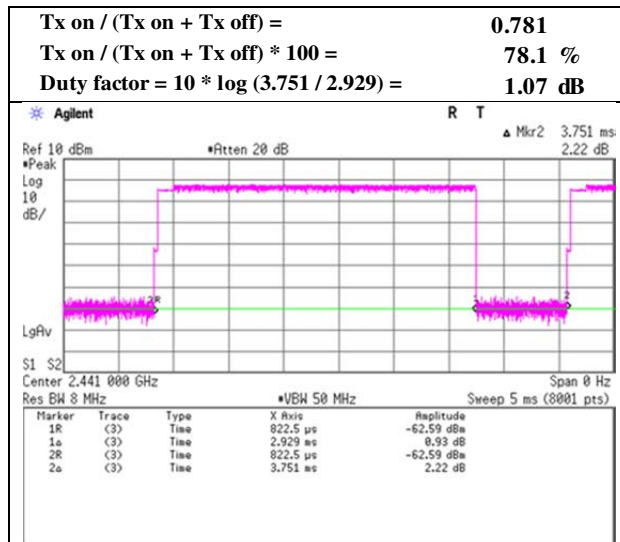
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11834855S-B-R1
Date : November 20, 2017
Temperature / Humidity : 24deg. C / 31 % RH
Engineer : Shiro Kobayashi
Mode : Tx, Hopping Off

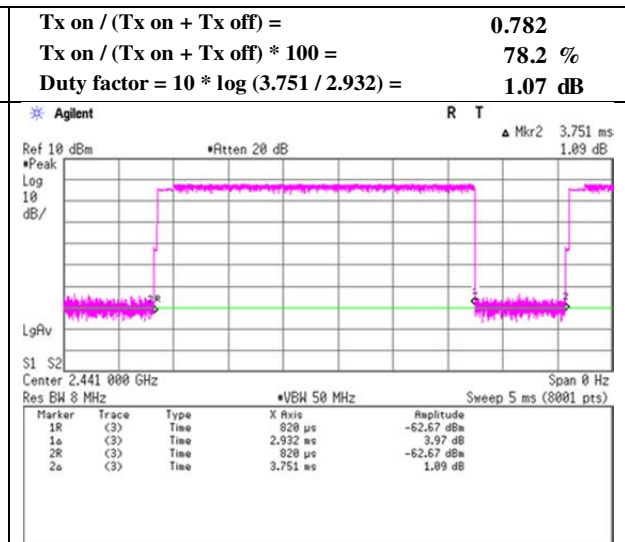
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa	Yosuke Ishikawa	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	307.592	QP	25.70	13.68	6.85	31.76	0.00	14.47	46.00	31.5	100	107	
Hori.	337.517	QP	30.60	14.36	7.10	31.75	0.00	20.31	46.00	25.6	100	28	
Hori.	376.784	QP	23.40	15.25	7.43	31.77	0.00	14.31	46.00	31.6	100	166	
Hori.	533.027	QP	28.80	18.18	8.33	31.93	0.00	23.38	46.00	22.6	240	220	
Hori.	2390.000	PK	45.67	27.14	14.23	40.85	2.47	48.66	73.90	25.2	145	93	
Hori.	4804.000	PK	45.49	31.13	6.79	41.86	2.47	44.02	73.90	29.9	151	341	
Hori.	7206.000	PK	45.28	36.35	8.41	41.18	2.47	51.33	73.90	22.6	150	0	
Hori.	9608.000	PK	44.69	38.11	9.48	40.59	2.47	54.16	73.90	19.7	150	0	
Hori.	2390.000	AV	33.27	27.14	14.23	40.85	2.47	36.26	53.90	17.6	145	93	
Hori.	4804.000	AV	34.05	31.13	6.79	41.86	2.47	32.58	53.90	21.3	151	341	
Hori.	7206.000	AV	33.20	36.35	8.41	41.18	2.47	39.25	53.90	14.7	150	0	
Hori.	9608.000	AV	32.27	38.11	9.48	40.59	2.47	41.74	53.90	12.2	150	0	
Vert.	352.186	QP	21.60	14.69	7.23	31.74	0.00	11.78	46.00	34.2	100	0	
Vert.	464.404	QP	22.70	17.01	7.98	31.85	0.00	15.84	46.00	30.1	100	116	
Vert.	533.022	QP	29.10	18.18	8.33	31.93	0.00	23.68	46.00	22.3	102	105	
Vert.	2390.000	PK	46.06	27.14	14.23	40.85	2.47	49.05	73.90	24.9	248	135	
Vert.	4804.000	PK	45.86	31.13	6.79	41.86	2.47	44.39	73.90	29.5	149	7	
Vert.	7206.000	PK	45.75	36.35	8.41	41.18	2.47	51.80	73.90	22.1	150	0	
Vert.	9608.000	PK	45.03	38.11	9.48	40.59	2.47	54.50	73.90	19.4	150	0	
Vert.	2390.000	AV	33.60	27.14	14.23	40.85	2.47	36.59	53.90	17.3	248	135	
Vert.	4804.000	AV	34.43	31.13	6.79	41.86	2.47	32.96	53.90	20.9	149	7	
Vert.	7206.000	AV	33.68	36.35	8.41	41.18	2.47	39.73	53.90	14.2	150	0	
Vert.	9608.000	AV	32.55	38.11	9.48	40.59	2.47	42.02	53.90	11.9	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(3.99 m / 3.0 m) = 2.47 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	97.91	27.18	14.24	40.84	2.47	100.96	-	-	Carrier
Hori.	2400.000	PK	41.35	27.17	14.23	40.84	2.47	44.38	80.96	36.6	
Vert.	2402.000	PK	94.08	27.18	14.24	40.84	2.47	97.13	-	-	Carrier
Vert.	2400.000	PK	38.64	27.17	14.23	40.84	2.47	41.67	77.13	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(3.99 m / 3.0 m) = 2.47 dB

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

UL Japan, Inc.

Shonan EMC Lab.

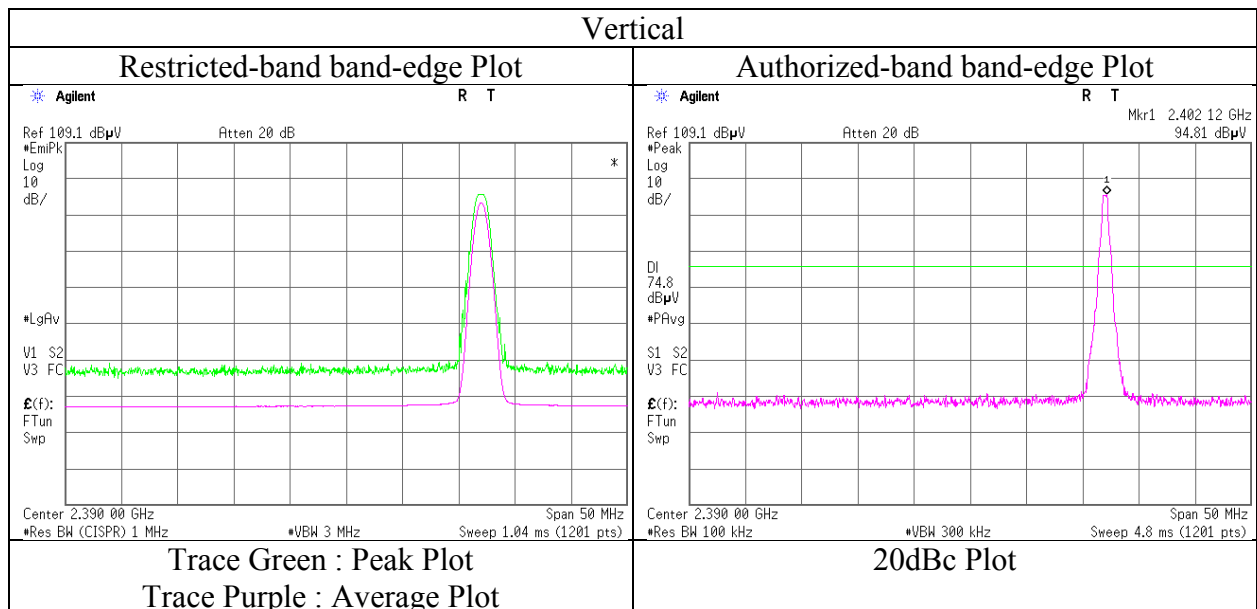
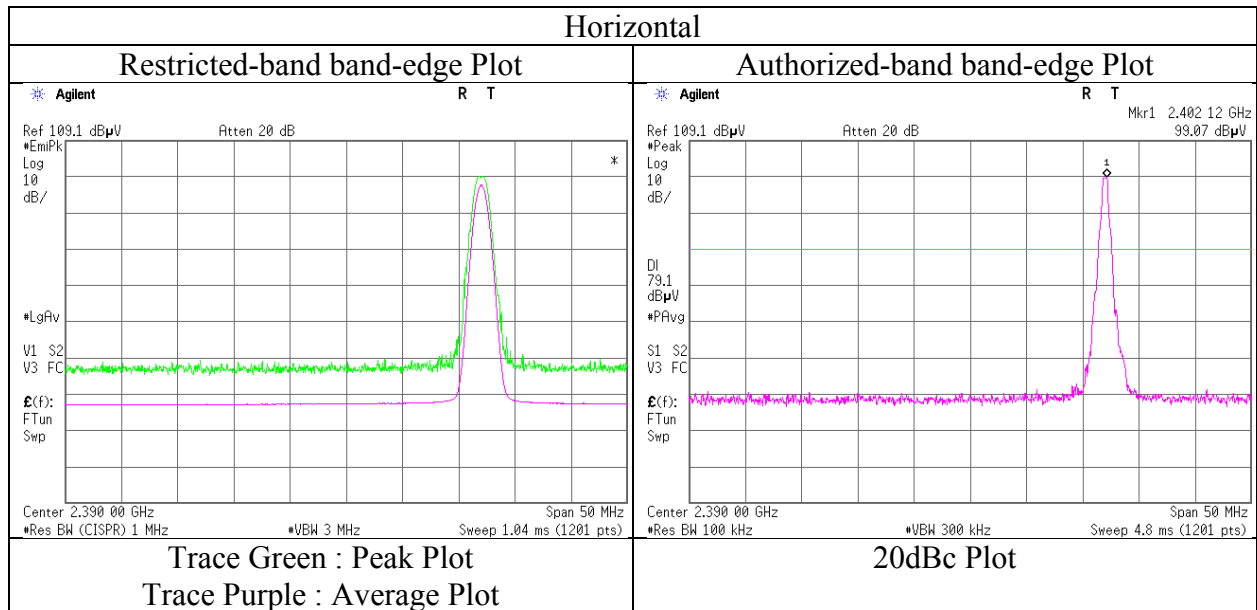
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 11834855S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date November 17, 2017
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Yosuke Ishikawa
(1 GHz -13 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa	Yosuke Ishikawa	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	307.534	QP	25.40	13.68	6.84	31.76	0.00	14.16	46.00	31.8	100	113	
Hori.	337.520	QP	31.70	14.36	7.10	31.75	0.00	21.41	46.00	24.5	100	189	
Hori.	376.660	QP	23.70	15.24	7.43	31.77	0.00	14.60	46.00	31.4	100	167	
Hori.	533.021	QP	29.50	18.18	8.33	31.93	0.00	24.08	46.00	21.9	202	219	
Hori.	4882.000	PK	46.17	31.31	6.87	41.76	2.47	45.06	73.90	28.8	151	335	
Hori.	7323.000	PK	46.57	36.51	8.57	41.27	2.47	52.85	73.90	21.1	150	0	
Hori.	9764.000	PK	45.11	38.37	9.60	40.62	2.47	54.93	73.90	19.0	150	0	
Hori.	4882.000	AV	33.88	31.31	6.87	41.76	2.47	32.77	53.90	21.1	151	335	
Hori.	7323.000	AV	34.10	36.51	8.57	41.27	2.47	40.38	53.90	13.5	150	0	
Hori.	9764.000	AV	32.67	38.37	9.60	40.62	2.47	42.49	53.90	11.4	150	0	
Vert.	337.519	QP	27.10	14.36	7.10	31.75	0.00	16.81	46.00	29.1	157	225	
Vert.	463.580	QP	22.70	17.00	7.98	31.85	0.00	15.83	46.00	30.1	100	101	
Vert.	533.017	QP	27.80	18.18	8.33	31.93	0.00	22.38	46.00	23.6	100	106	
Vert.	4882.000	PK	45.32	31.31	6.87	41.76	2.47	44.21	73.90	29.7	152	2	
Vert.	7323.000	PK	46.34	36.51	8.57	41.27	2.47	52.62	73.90	21.3	150	0	
Vert.	9764.000	PK	44.88	38.37	9.60	40.62	2.47	54.70	73.90	19.2	150	0	
Vert.	4882.000	AV	34.08	31.31	6.87	41.76	2.47	32.97	53.90	20.9	152	2	
Vert.	7323.000	AV	34.36	36.51	8.57	41.27	2.47	40.64	53.90	13.3	150	0	
Vert.	9764.000	AV	33.06	38.37	9.60	40.62	2.47	42.88	53.90	11.0	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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.

Radiated Spurious Emission

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa	Yosuke Ishikawa	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	308.420	QP	25.60	13.70	6.85	31.76	0.00	14.39	46.00	31.6	100	122	
Hori.	337.515	QP	31.40	14.36	7.10	31.75	0.00	21.11	46.00	24.8	100	181	
Hori.	387.401	QP	23.40	15.49	7.52	31.78	0.00	14.63	46.00	31.3	100	161	
Hori.	533.031	QP	29.70	18.18	8.33	31.93	0.00	24.28	46.00	21.7	209	220	
Hori.	2483.500	PK	50.17	27.45	14.32	40.81	2.47	53.60	73.90	20.3	147	89	
Hori.	4960.000	PK	45.73	31.48	6.94	41.65	2.47	44.97	73.90	28.9	149	340	
Hori.	7440.000	PK	45.56	36.68	8.75	41.36	2.47	52.10	73.90	21.8	150	0	
Hori.	9920.000	PK	45.07	38.63	9.72	40.66	2.47	55.23	73.90	18.7	150	0	
Hori.	2483.500	AV	34.87	27.45	14.32	40.81	2.47	38.30	53.90	15.6	147	89	
Hori.	4960.000	AV	33.76	31.48	6.94	41.65	2.47	33.00	53.90	20.9	149	340	
Hori.	7440.000	AV	33.99	36.68	8.75	41.36	2.47	40.53	53.90	13.4	150	0	
Hori.	9920.000	AV	32.75	38.63	9.72	40.66	2.47	42.91	53.90	11.0	150	0	
Vert.	337.516	QP	26.90	14.36	7.10	31.75	0.00	16.61	46.00	29.3	154	230	
Vert.	462.624	QP	22.90	16.98	7.97	31.85	0.00	16.00	46.00	30.0	100	99	
Vert.	533.022	QP	28.00	18.18	8.33	31.93	0.00	22.58	46.00	23.4	100	119	
Vert.	2483.500	PK	48.42	27.45	14.32	40.81	2.47	51.85	73.90	22.1	220	211	
Vert.	4960.000	PK	45.95	31.48	6.94	41.65	2.47	45.19	73.90	28.7	152	5	
Vert.	7440.000	PK	46.75	36.68	8.75	41.36	2.47	53.29	73.90	20.6	150	0	
Vert.	9920.000	PK	45.82	38.63	9.72	40.66	2.47	55.98	73.90	17.9	150	0	
Vert.	2483.500	AV	33.61	27.45	14.32	40.81	2.47	37.04	53.90	16.9	220	211	
Vert.	4960.000	AV	34.13	31.48	6.94	41.65	2.47	33.37	53.90	20.5	152	5	
Vert.	7440.000	AV	34.48	36.68	8.75	41.36	2.47	41.02	53.90	12.9	150	0	
Vert.	9920.000	AV	33.03	38.63	9.72	40.66	2.47	43.19	53.90	10.7	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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.

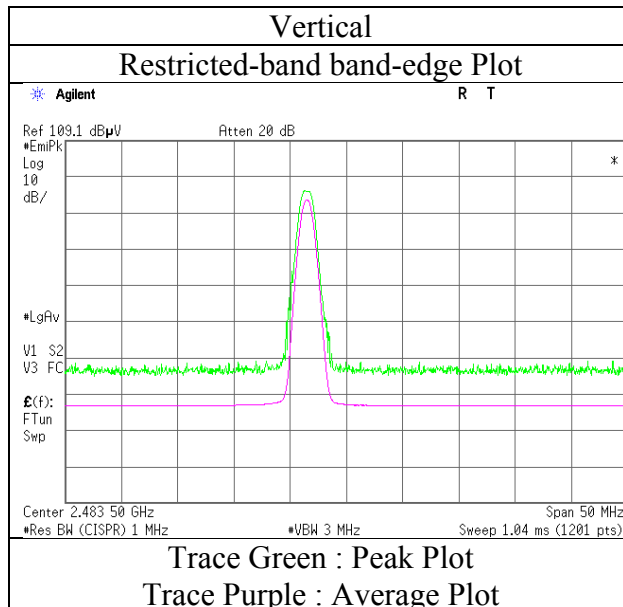
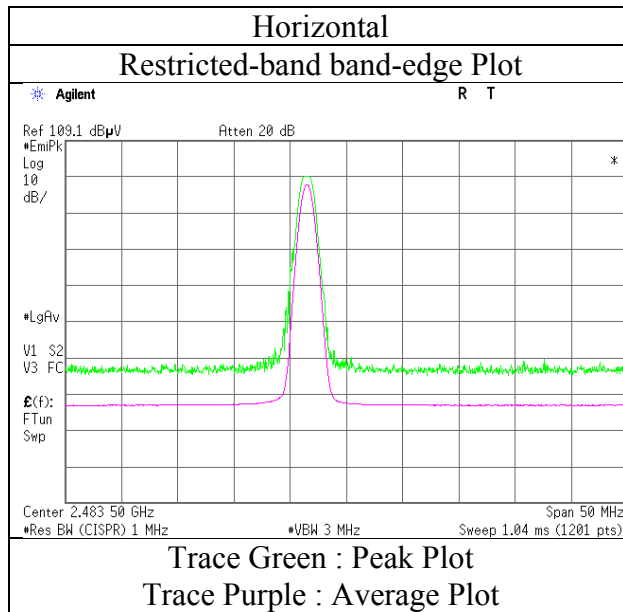
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	11834855S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	November 17, 2017
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Yosuke Ishikawa
	(1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa	Yosuke Ishikawa	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	307.555	QP	25.50	13.68	6.84	31.76	0.00	14.26	46.00	31.7	100	121	
Hori.	337.515	QP	32.40	14.36	7.10	31.75	0.00	22.11	46.00	23.8	100	180	
Hori.	374.850	QP	23.40	15.20	7.42	31.77	0.00	14.25	46.00	31.7	100	164	
Hori.	533.021	QP	29.00	18.18	8.33	31.93	0.00	23.58	46.00	22.4	208	229	
Hori.	2390.000	PK	45.32	27.14	14.23	40.85	2.47	48.31	73.90	25.6	157	92	
Hori.	4804.000	PK	46.56	31.13	6.79	41.86	2.47	45.09	73.90	28.8	148	340	
Hori.	7206.000	PK	45.56	36.35	8.41	41.18	2.47	51.61	73.90	22.3	150	0	
Hori.	9608.000	PK	44.47	38.11	9.48	40.59	2.47	53.94	73.90	20.0	150	0	
Hori.	2390.000	AV	32.97	27.14	14.23	40.85	2.47	35.96	53.90	17.9	157	92	
Hori.	4804.000	AV	34.49	31.13	6.79	41.86	2.47	33.02	53.90	20.9	148	340	
Hori.	7206.000	AV	33.61	36.35	8.41	41.18	2.47	39.66	53.90	14.2	150	0	
Hori.	9608.000	AV	32.71	38.11	9.48	40.59	2.47	42.18	53.90	11.7	150	0	
Vert.	337.515	QP	27.50	14.36	7.10	31.75	0.00	17.21	46.00	28.7	146	230	
Vert.	462.422	QP	22.90	16.97	7.97	31.85	0.00	15.99	46.00	30.0	100	99	
Vert.	533.025	QP	27.70	18.18	8.33	31.93	0.00	22.28	46.00	23.7	100	119	
Vert.	2390.000	PK	45.82	27.14	14.23	40.85	2.47	48.81	73.90	25.1	226	215	
Vert.	4804.000	PK	46.42	31.13	6.79	41.86	2.47	44.95	73.90	29.0	152	4	
Vert.	7206.000	PK	45.42	36.35	8.41	41.18	2.47	51.47	73.90	22.4	150	0	
Vert.	9608.000	PK	44.40	38.11	9.48	40.59	2.47	53.87	73.90	20.0	150	0	
Vert.	2390.000	AV	33.17	27.14	14.23	40.85	2.47	36.16	53.90	17.7	226	215	
Vert.	4804.000	AV	34.52	31.13	6.79	41.86	2.47	33.05	53.90	20.9	152	4	
Vert.	7206.000	AV	33.63	36.35	8.41	41.18	2.47	39.68	53.90	14.2	150	0	
Vert.	9608.000	AV	32.68	38.11	9.48	40.59	2.47	42.15	53.90	11.8	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(3.99 m / 3.0 m) = 2.47 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	94.43	27.18	14.24	40.84	2.47	97.48	-	-	Carrier
Hori.	2400.000	PK	38.28	27.17	14.23	40.84	2.47	41.31	77.48	36.2	
Vert.	2402.000	PK	88.33	27.18	14.24	40.84	2.47	91.38	-	-	Carrier
Vert.	2400.000	PK	36.37	27.17	14.23	40.84	2.47	39.40	71.38	32.0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.99 m / 3.0 m) = 2.47 dB

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

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Shonan EMC Lab.

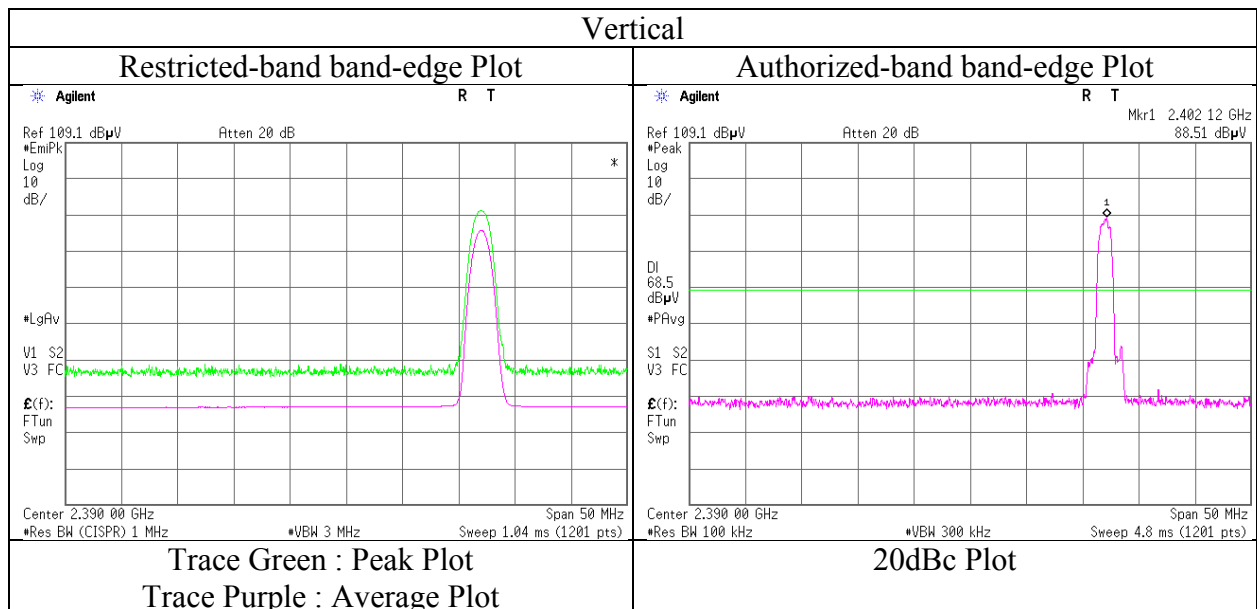
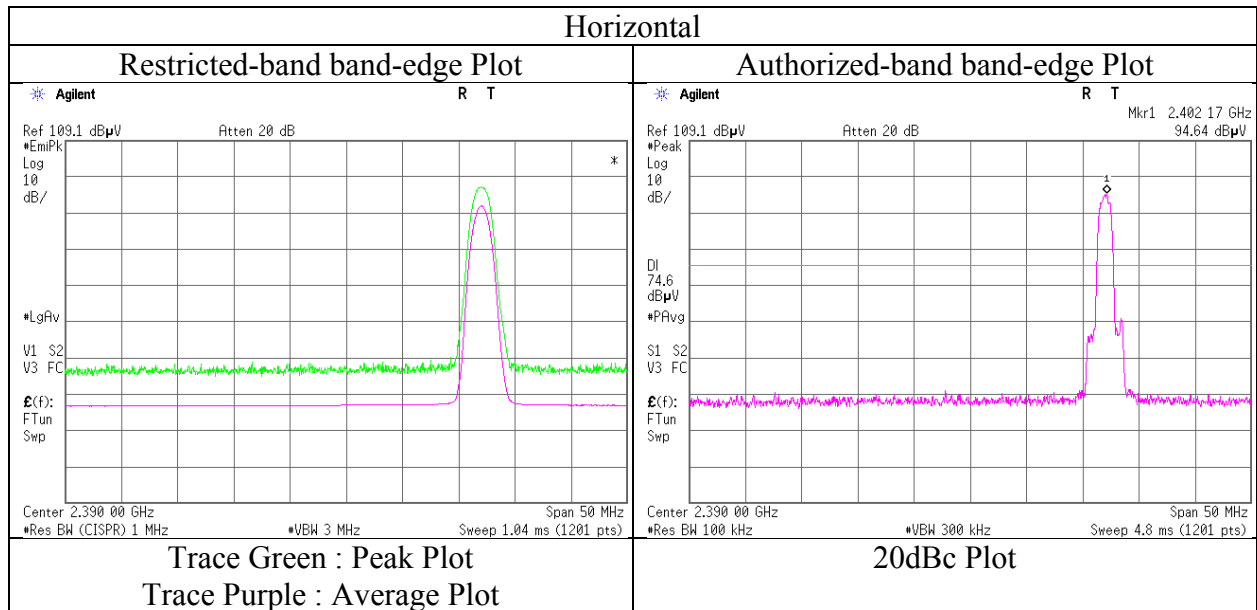
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 11834855S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date November 17, 2017
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Yosuke Ishikawa
(1 GHz -13 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa	Yosuke Ishikawa	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	307.994	QP	25.50	13.69	6.85	31.76	0.00	14.28	46.00	31.7	100	126	
Hori.	337.518	QP	31.90	14.36	7.10	31.75	0.00	21.61	46.00	24.3	100	182	
Hori.	376.325	QP	24.70	15.23	7.43	31.77	0.00	15.59	46.00	30.4	100	178	
Hori.	533.023	QP	29.20	18.18	8.33	31.93	0.00	23.78	46.00	22.2	207	227	
Hori.	4882.000	PK	45.46	31.31	6.87	41.76	2.47	44.35	73.90	29.6	151	351	
Hori.	7323.000	PK	45.55	36.51	8.57	41.27	2.47	51.83	73.90	22.1	150	0	
Hori.	9764.000	PK	44.48	38.37	9.60	40.62	2.47	54.30	73.90	19.6	150	0	
Hori.	4882.000	AV	34.15	31.31	6.87	41.76	2.47	33.04	53.90	20.9	151	351	
Hori.	7323.000	AV	34.18	36.51	8.57	41.27	2.47	40.46	53.90	13.4	150	0	
Hori.	9764.000	AV	33.14	38.37	9.60	40.62	2.47	42.96	53.90	10.9	150	0	
Vert.	337.512	QP	27.20	14.36	7.10	31.75	0.00	16.91	46.00	29.0	154	221	
Vert.	462.606	QP	22.90	16.98	7.97	31.85	0.00	16.00	46.00	30.0	100	99	
Vert.	533.025	QP	27.90	18.18	8.33	31.93	0.00	22.48	46.00	23.5	100	144	
Vert.	4882.000	PK	45.14	31.31	6.87	41.76	2.47	44.03	73.90	29.9	148	8	
Vert.	7323.000	PK	45.66	36.51	8.57	41.27	2.47	51.94	73.90	22.0	150	0	
Vert.	9764.000	PK	45.11	38.37	9.60	40.62	2.47	54.93	73.90	19.0	150	0	
Vert.	4882.000	AV	34.16	31.31	6.87	41.76	2.47	33.05	53.90	20.9	148	8	
Vert.	7323.000	AV	34.38	36.51	8.57	41.27	2.47	40.66	53.90	13.2	150	0	
Vert.	9764.000	AV	33.15	38.37	9.60	40.62	2.47	42.97	53.90	10.9	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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.

Radiated Spurious Emission

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa	Yosuke Ishikawa	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	307.897	QP	25.50	13.69	6.85	31.76	0.00	14.28	46.00	31.7	100	123	
Hori.	337.519	QP	32.30	14.36	7.10	31.75	0.00	22.01	46.00	23.9	100	185	
Hori.	376.309	QP	23.90	15.23	7.43	31.77	0.00	14.79	46.00	31.2	100	165	
Hori.	533.036	QP	29.80	18.18	8.33	31.93	0.00	24.38	46.00	21.6	209	219	
Hori.	2483.500	PK	48.36	27.45	14.32	40.81	2.47	51.79	73.90	22.1	149	91	
Hori.	4960.000	PK	46.02	31.48	6.94	41.65	2.47	45.26	73.90	28.6	151	334	
Hori.	7440.000	PK	46.21	36.68	8.75	41.36	2.47	52.75	73.90	21.2	150	0	
Hori.	9920.000	PK	45.04	38.63	9.72	40.66	2.47	55.20	73.90	18.7	150	0	
Hori.	2483.500	AV	33.81	27.45	14.32	40.81	2.47	37.24	53.90	16.7	149	91	
Hori.	4960.000	AV	34.31	31.48	6.94	41.65	2.47	33.55	53.90	20.4	151	334	
Hori.	7440.000	AV	34.40	36.68	8.75	41.36	2.47	40.94	53.90	13.0	150	0	
Hori.	9920.000	AV	33.01	38.63	9.72	40.66	2.47	43.17	53.90	10.7	150	0	
Vert.	337.515	QP	27.40	14.36	7.10	31.75	0.00	17.11	46.00	28.8	153	229	
Vert.	462.615	QP	22.90	16.98	7.97	31.85	0.00	16.00	46.00	30.0	100	99	
Vert.	533.027	QP	27.80	18.18	8.33	31.93	0.00	22.38	46.00	23.6	100	145	
Vert.	2483.500	PK	45.95	27.45	14.32	40.81	2.47	49.38	73.90	24.5	228	210	
Vert.	4960.000	PK	45.68	31.48	6.94	41.65	2.47	44.92	73.90	29.0	150	10	
Vert.	7440.000	PK	46.23	36.68	8.75	41.36	2.47	52.77	73.90	21.1	150	0	
Vert.	9920.000	PK	44.78	38.63	9.72	40.66	2.47	54.94	73.90	19.0	150	0	
Vert.	2483.500	AV	33.40	27.45	14.32	40.81	2.47	36.83	53.90	17.1	228	210	
Vert.	4960.000	AV	34.09	31.48	6.94	41.65	2.47	33.33	53.90	20.6	150	10	
Vert.	7440.000	AV	34.32	36.68	8.75	41.36	2.47	40.86	53.90	13.0	150	0	
Vert.	9920.000	AV	32.93	38.63	9.72	40.66	2.47	43.09	53.90	10.8	150	0	

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

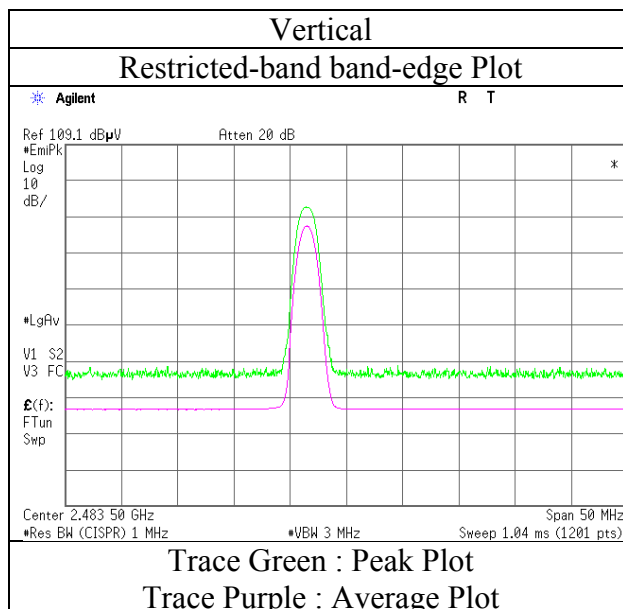
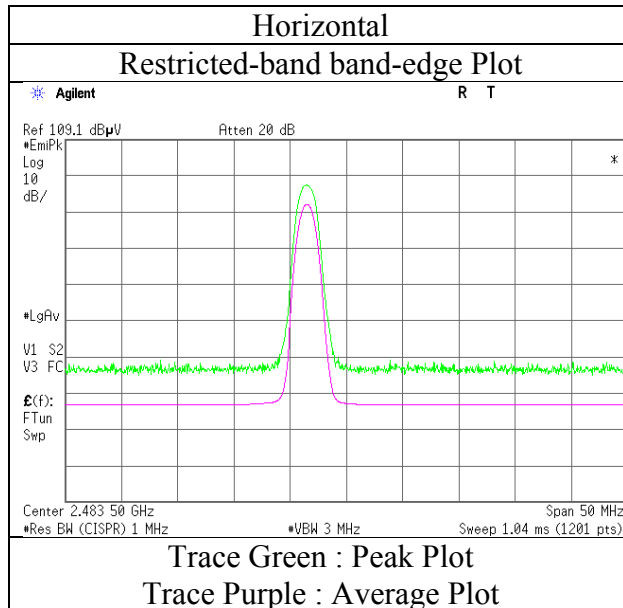
Distance factor : 1 GHz - 13 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.47\text{ dB}$

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.

Radiated Spurious Emission
(Reference Plot for band-edge)

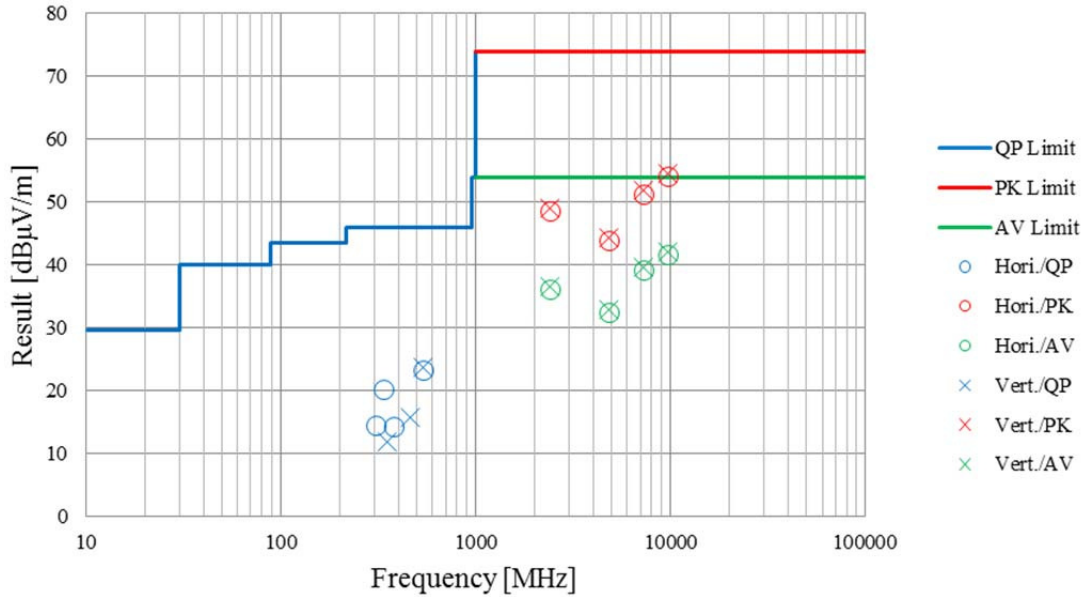
Report No. 11834855S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date November 17, 2017
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Yosuke Ishikawa
(1 GHz -13 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11834855S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.1
Date	November 19, 2017	November 17, 2017	November 18, 2017
Temperature / Humidity	20 deg. C / 42 % RH	23 deg. C / 39 % RH	21 deg. C / 30 % RH
Engineer	Hiroyuki Morikawa (30 MHz -1 GHz)	Yosuke Ishikawa (1 GHz -13 GHz)	Shiro Kobayashi (13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz		

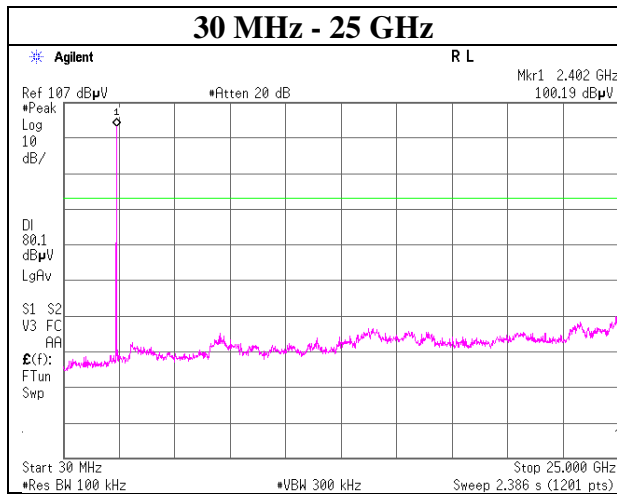
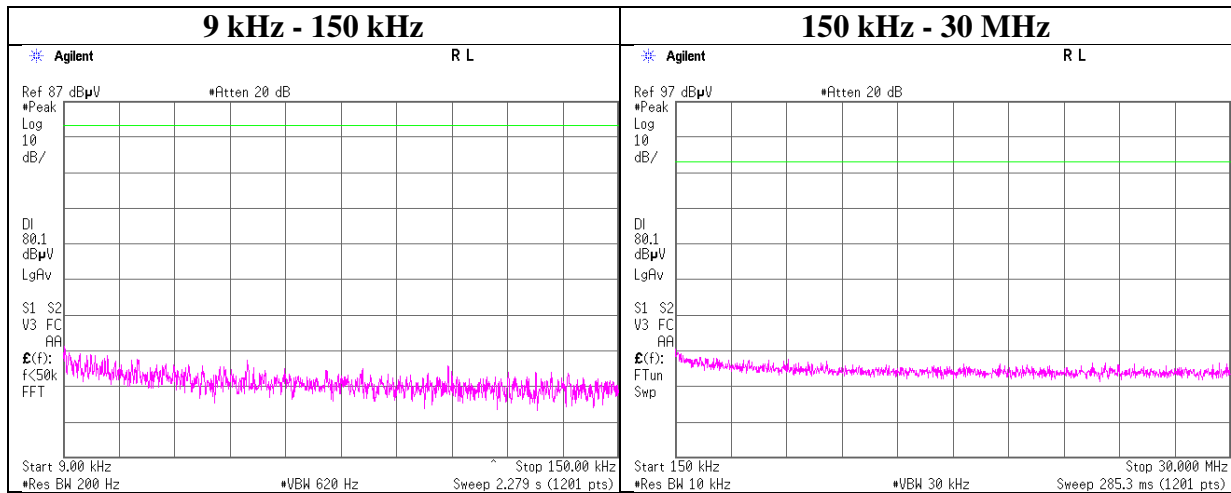


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 16, 2017
Temperature / Humidity	26deg. C / 37 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

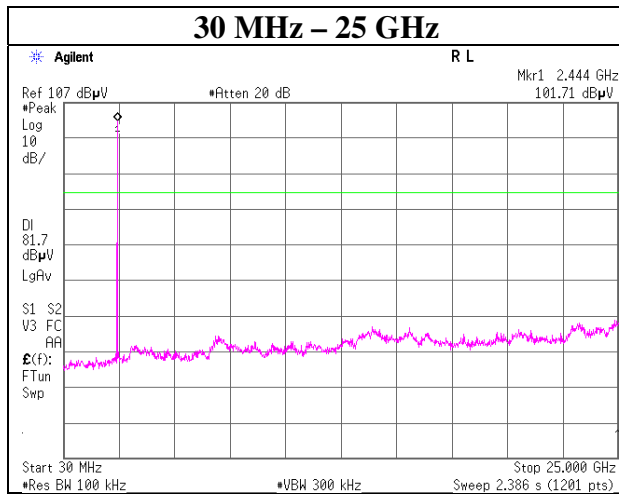
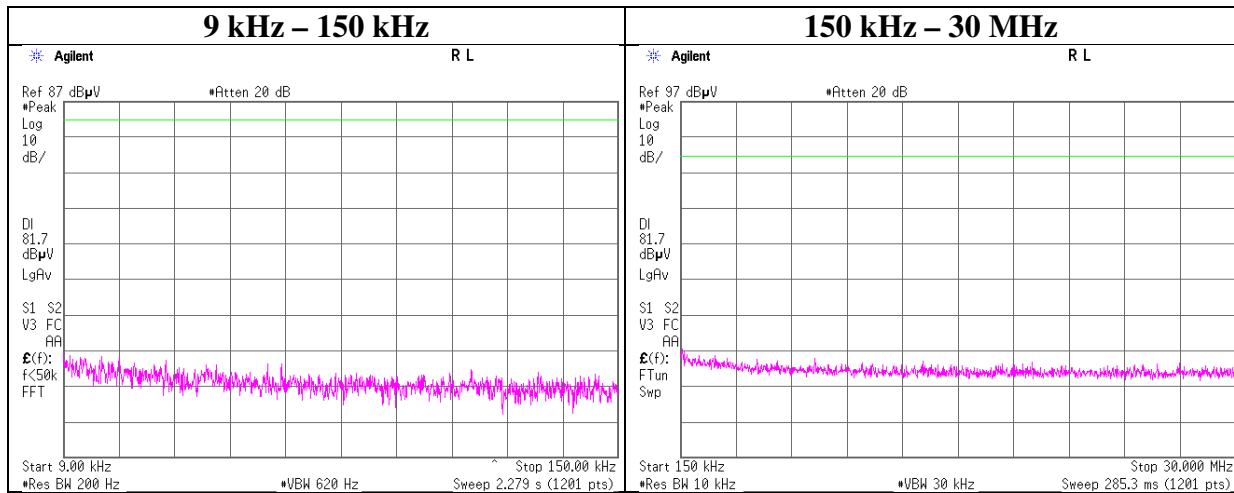
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 16, 2017
Temperature / Humidity	26deg. C / 37 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

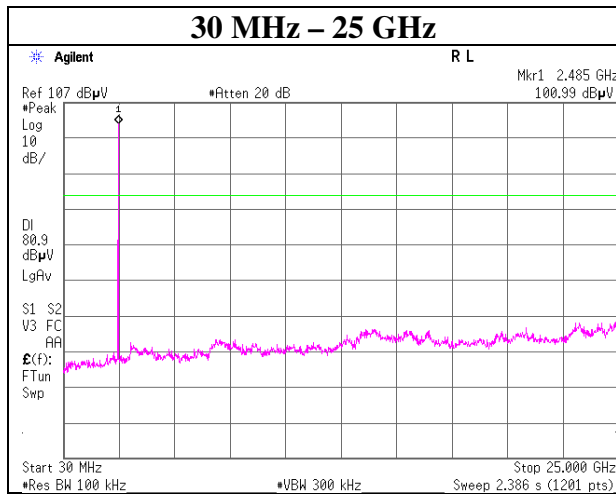
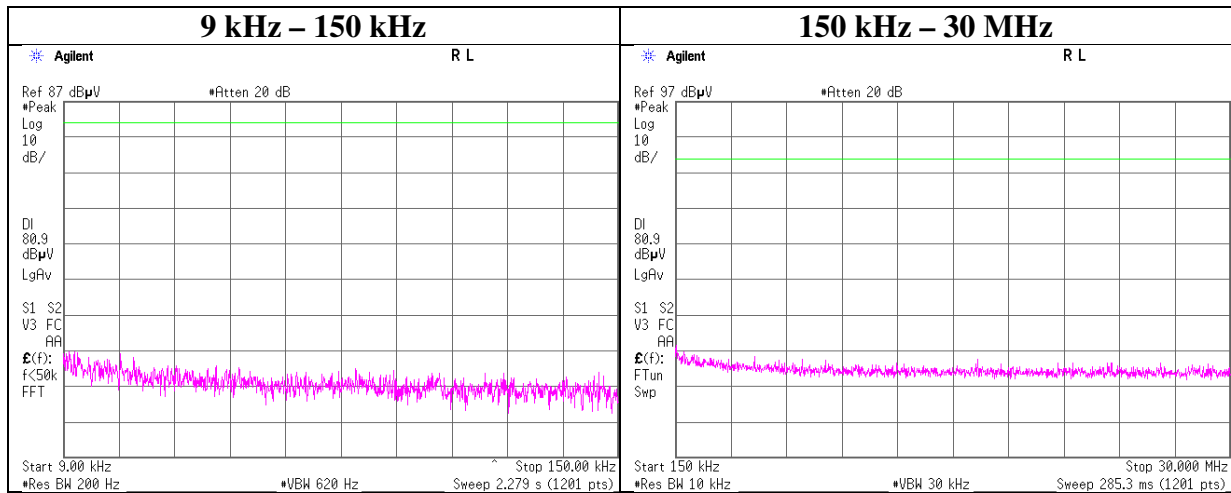
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 16, 2017
Temperature / Humidity	26deg. C / 37 % RH
Engineer	Makoto Hosaka
Mode	Tx, Hopping Off, DH5

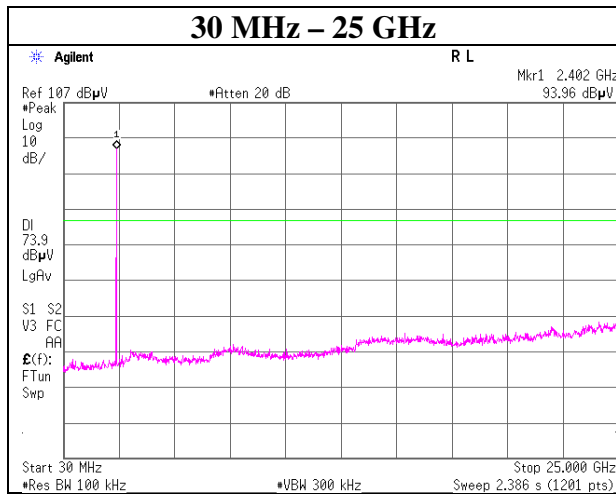
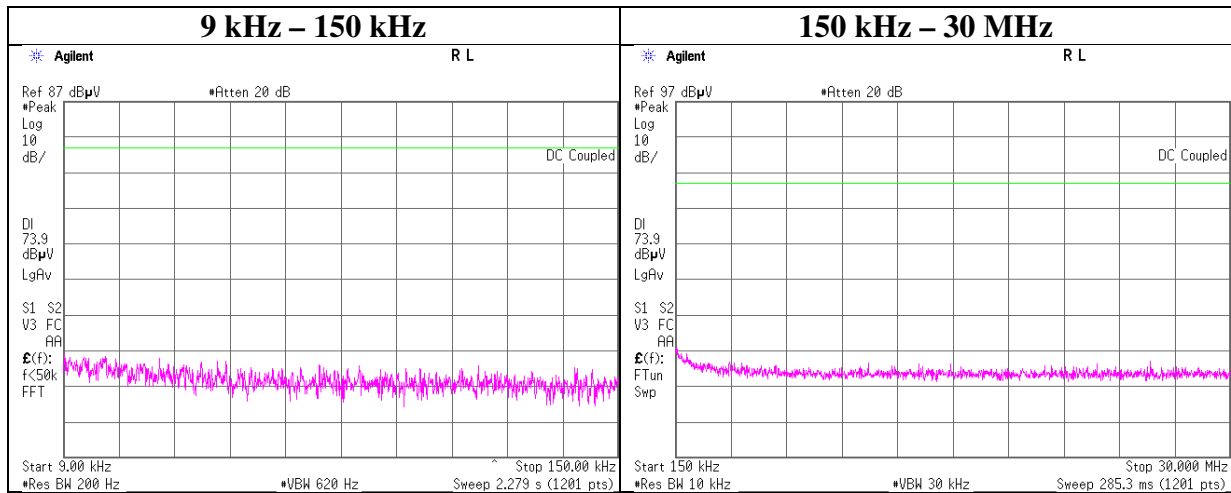
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 20, 2017
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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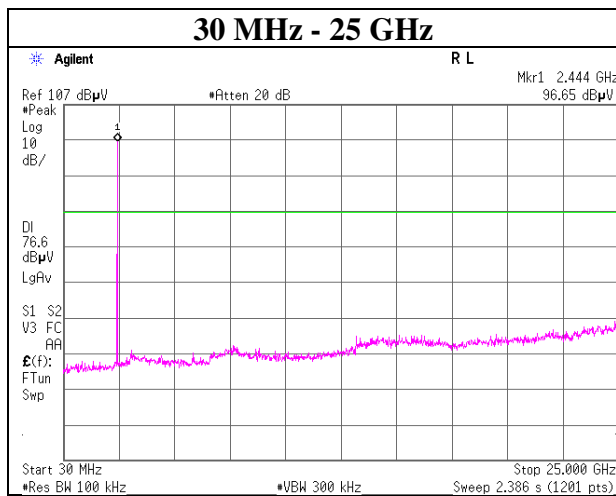
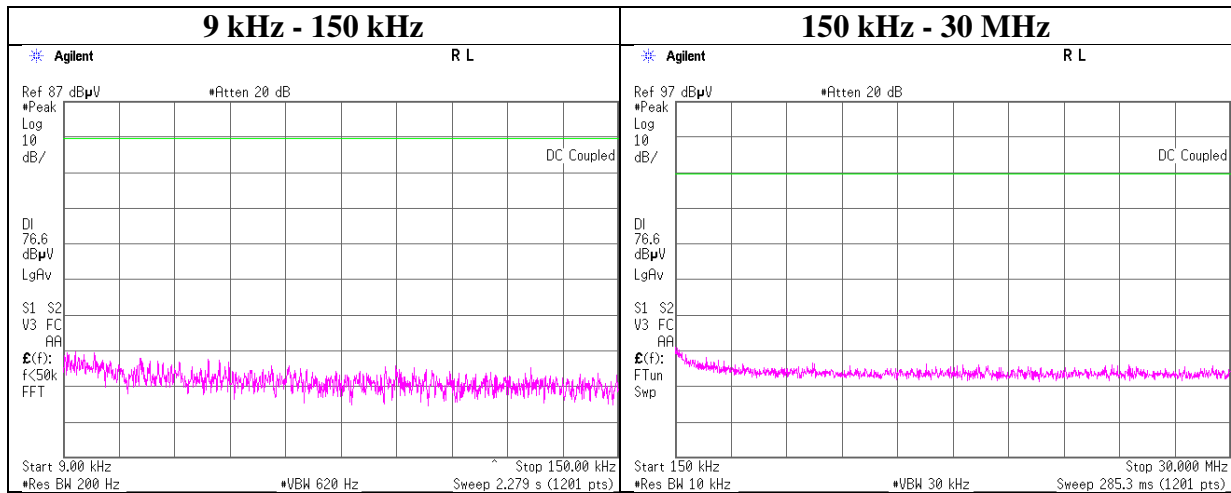
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 20, 2017
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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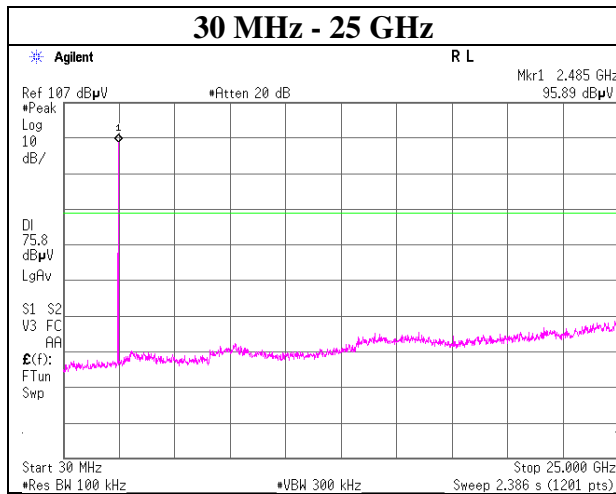
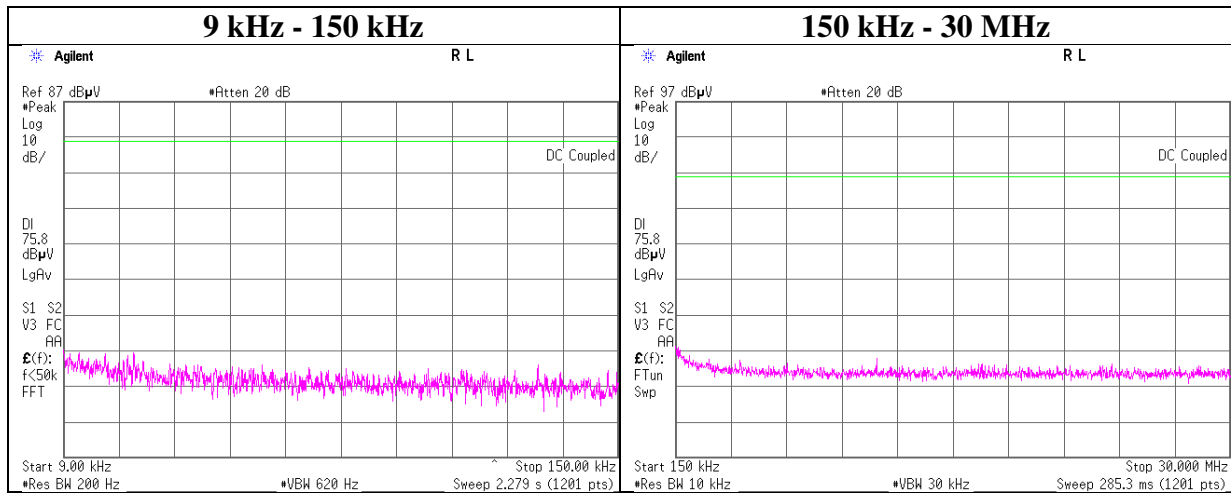
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 20, 2017
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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Shonan EMC Lab.

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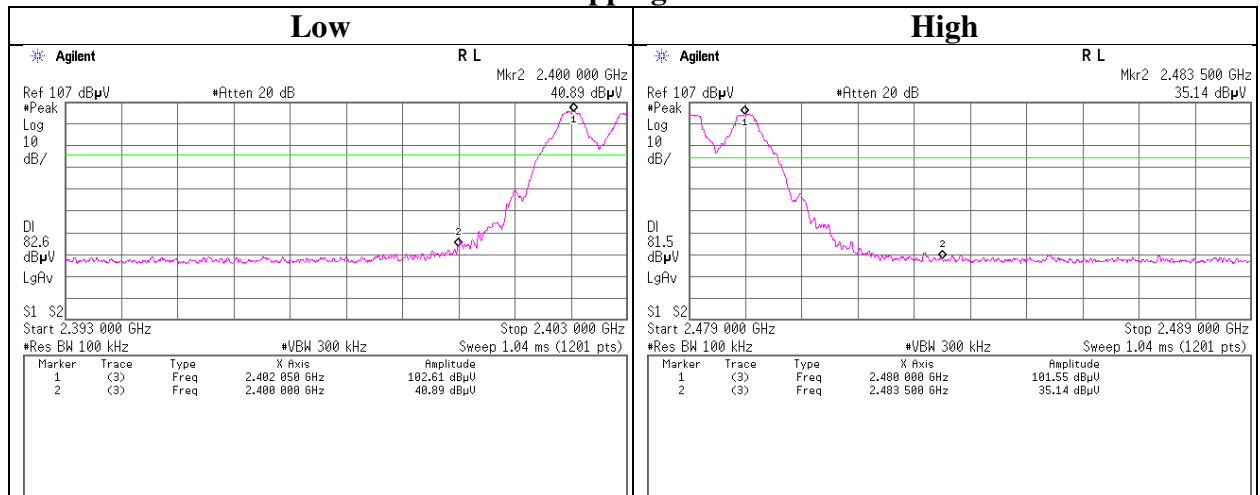
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

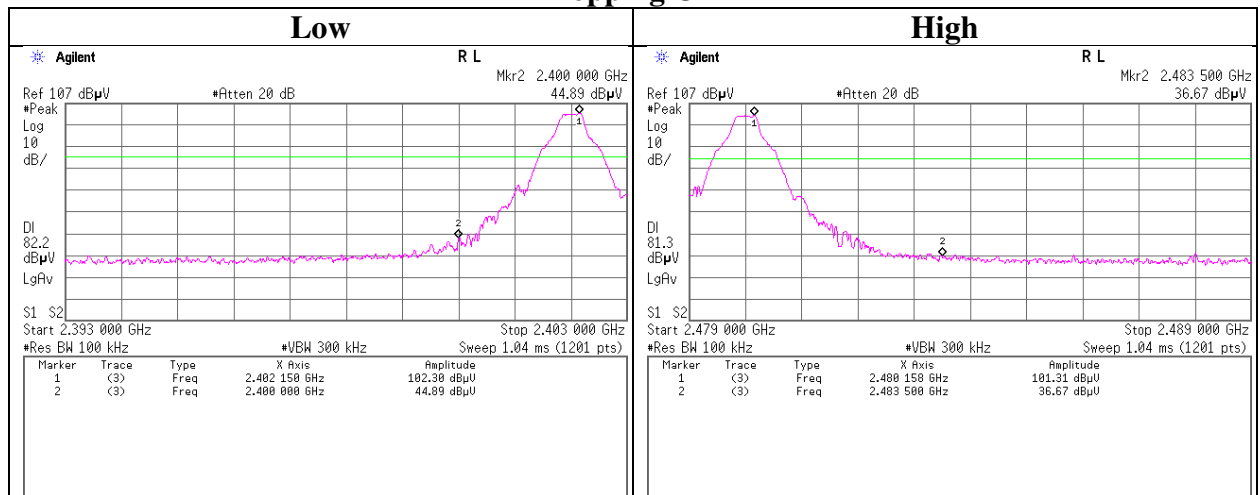
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 16, 2017
Temperature / Humidity	26deg. C / 37 % RH
Engineer	Makoto Hosaka
Mode	Tx DH5

Hopping On



Hopping Off



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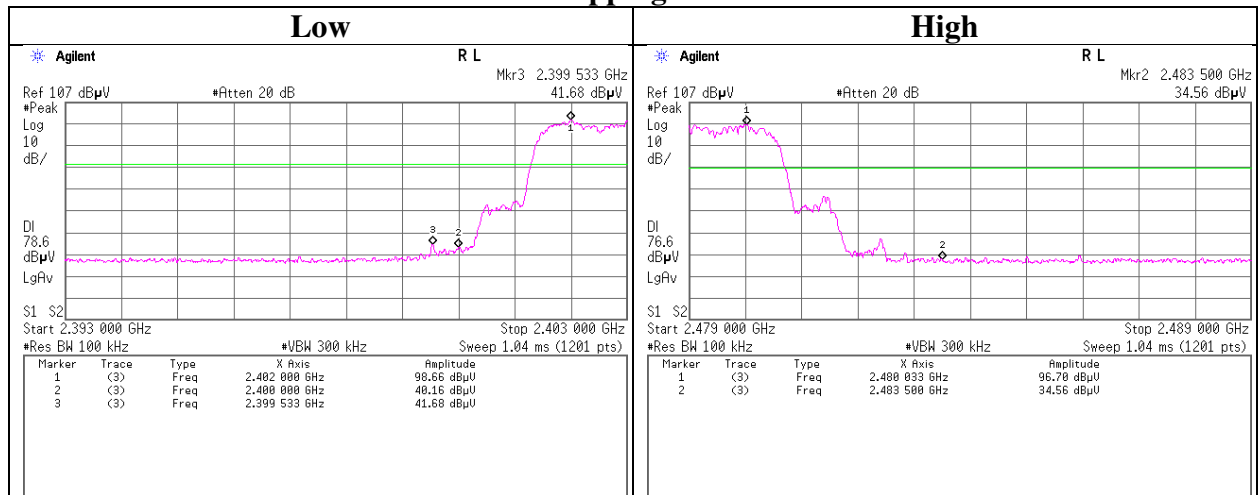
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

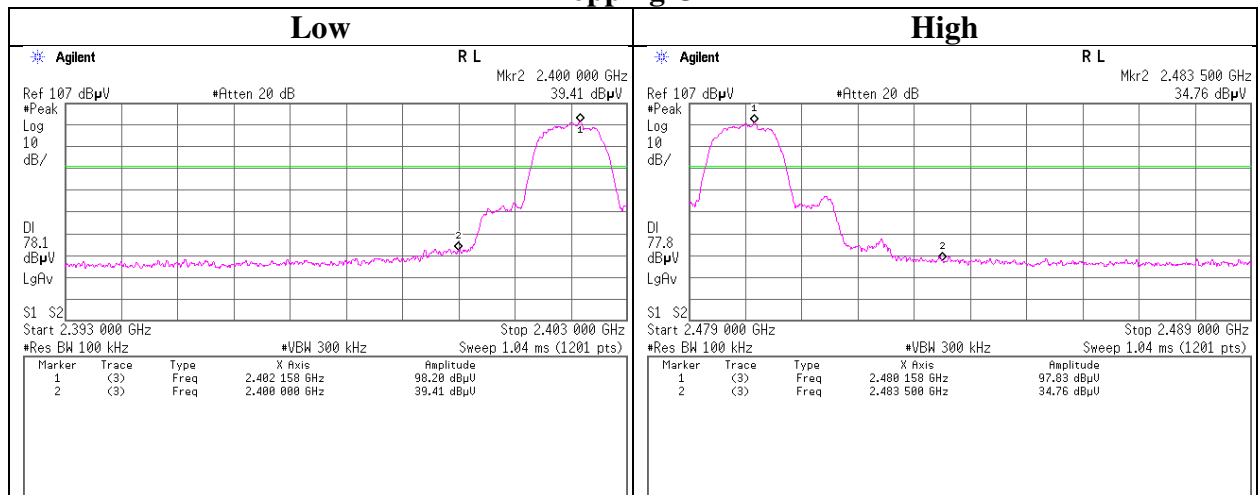
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11834855S-B-R1
Date	November 20, 2017
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx 3DH5

Hopping On



Hopping Off



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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2017/03/17 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120 D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	RE	2017/10/12 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(S VSWR)	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
SCC-G40	Coaxial Cable	Junkosha	MWX221-01 000NFSNM S/B	1612S005	RE	2017/01/08 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01 000KMSKM S	-	RE	2017/04/20 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2017/03/23 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2017/02/09 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2016/12/15 * 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/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DS FA/141PE/141PE/141PE/NS4906	-/0901-269 (RF Selector)	RE	2017/04/07 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DS FA/141PE/141PE/141PE/NS4906	-/0901-269 (RF Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111 B	193	RE	2017/01/05 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2017/04/12 * 12

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Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SPM-07	Power Meter	Agilent	8990B	MY510027 2	AT	2017/05/01 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY532600 9	AT	2017/05/01 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2017/03/23 * 12
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2017/03/23 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY482501 52	AT	2017/08/20 * 12
SRENT-10	Spectrum Analyzer	Agilent	E4440A	US4142151 1	AT	2016/12/05 * 12
SCC-B12/B13/ SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141 PE/NS4906	-/0901-270(RF Selector)	CE	2017/04/07 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2017/02/27 * 12
KAT3-12	Attenuator	JFW IND. INC.	50HF-003N	-	CE	2017/07/24 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2016/12/13 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	CE	2017/09/26 * 12
SJM-09	Measure	PROMART	SEN1935	-	CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,M F)	-	CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	CE	2017/03/08 * 12

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

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

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

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

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