



RADIO TEST REPORT

Test Report No. : 11640275S-B-R1

Applicant : RICOH COMPANY, LTD.
Type of Equipment : Digital Camera
Model No. : RICOH THETA V
FCC ID : BBP-RR214
Test regulation : FCC Part 15 Subpart C: 2017
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11640275S-B.

Date of test: May 15 to 24, 2017

Representative test engineer:

Hikaru Shirasawa

Engineer

Consumer Technology Division

Approved by:

Toyokazu Imamura

Leader

Consumer Technology Division



JAB
Testing
RTL02610

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

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.: 11640275S-B

[illegible]

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Conducted Emission.....	11
SECTION 6: Radiated Spurious Emission	12
SECTION 7: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Test data	14
Conducted Emission	14
20dB Bandwidth and Carrier Frequency Separation.....	20
Number of Hopping Frequency	23
Dwell time.....	25
Maximum Peak Output Power.....	28
Average Output Power.....	29
Burst Rate Confirmation	30
Radiated Spurious Emission	31
Conducted Spurious Emission	42
Conducted Emission Band Edge compliance	48
99%Occupied Bandwidth	50
APPENDIX 2: Test instruments	52
APPENDIX 3: Photographs of test setup	53
Conducted Emission	53
Radiated Spurious Emission	54
Worst Case Position	56

Radio Specification

Equipment type	: Transceiver
Frequency of operation	: 2.4 GHz: 2402 MHz -2480 MHz (Bluetooth BDR/EDR/Low Energy (LE)) 2412 MHz -2462 MHz (IEEE 802.11b, 11g, 11n (HT20)) 2412 MHz -2462 MHz (Wireless LAN) W52: 5180 MHz -5240 MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5190 MHz -5230 MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5210 MHz (IEEE 802.11ac (VHT80))
Bandwidth	: 20 MHz (IEEE 802.11a/b/g/n/ac), 40 MHz (IEEE 802.11n/ac), 80 MHz(IEEE 802.11ac) , 1 MHz (Bluetooth BDR/EDR), 2MHz (Bluetooth LE)
Channel spacing	: 5 MHz (Wi-Fi 2.4 GHz), 20 MHz/40 MHz/80 MHz (Wi-Fi 5 GHz), 1 MHz (Bluetooth BDR/EDR), 2MHz (Bluetooth LE)
Type of modulation	: DSSS (IEEE 802.11b), OFDM (IEEE 802.11a/g/n/ac), FHSS (Bluetooth BDR/EDR/ Low Energy (LE))
Antenna type	: PCB Antenna
Antenna connector type	: None
Antenna gain	: [2.4 GHz] 0.119 dBi [5 GHz] -3.8 dBi
ITU code	: F1D, G1D (Bluetooth BDR/EDR/Low Energy (LE)) D1D, G1D (IEEE802.11b/g/n/a/ac)
Operation temperature range	: 0 deg. C to +40 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017

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

* The revision on June 14, 2017, does not affect the test specification applied to the EUT.

* Also the EUT complies with FCC Part 15 Subpart B.

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	QP 16.1 dB, 0.15000 MHz, L1 Tx DH5 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	7.9 dB 931.170 MHz, QP, Hori. Tx DH5 2402 MHz 863.969 MHz, QP, Hori. Tx 3DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *1)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420.

*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)

This EUT provides stable voltage (DC 1.3 V/1.8 V/3.0 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Shonan EMC Lab.

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

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

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

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

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

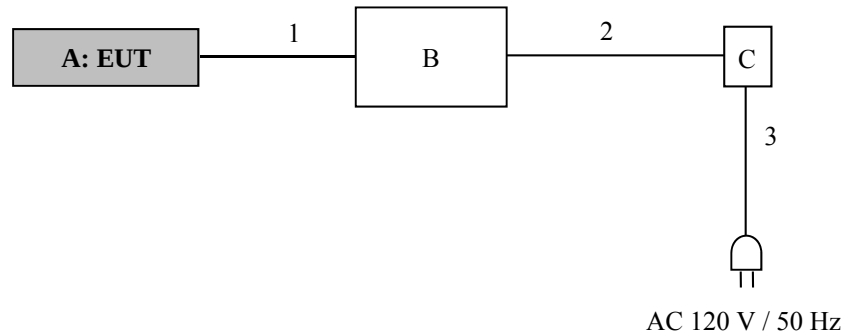
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered 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.

*EUT has the power settings by the software as follows;
Power settings: 07(Fixed)
Software: RICHO_BT_RF_Test6

Camera Serial number	Firmware Ver.	Remarks
YL00000192	00500000	(Antenna Terminal conducted test)
YL00000259	00500000	(Conducted Emission test and Radiated Emission test)

*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

4.2 Configuration and peripherals



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

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Digital Camera	RICOH THETA V	YL00000192 *1) YL00000259 *2)	RICOH	EUT
B	Laptop PC	PC-VJ23LLZGR	66000071A	NEC	-
C	AC Adaptor	ADP-45TD E	0115924DB	NEC	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	0.5+1.0	Shielded	Shielded	Extension Manufacturer: RICOH Supplied with EUT
2	DC	1.8	Unshielded	Unshielded	-
3	AC	0.9	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The 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. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

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

[For below 1 GHz]

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

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 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	3.98 m *2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.98 m *2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 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: $20 \times \log(3.98 \text{ m}/3.0 \text{ m}) = 2.45 \text{ dB}$

*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 -13 GHz)	Spurious (13 GHz -26.5 GHz)
Horizontal	Y	X	Y	X
Vertical	Z	Z	Z	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	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 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) The measurement was performed with Max Hold since the duty cycle was not 100 %.

*2) Reference data

*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.

(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

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

Test data : **APPENDIX**

Test result : **Pass**

APPENDIX 1: Test data

Conducted Emission

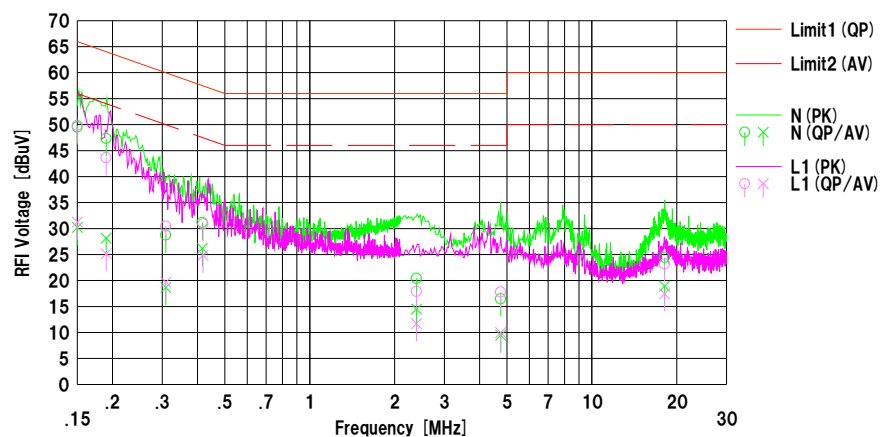
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/05/24

Mode : Tx DH5 2402 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 50 %RH

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]	<QP> [dBuV]	<AV> [dBuV]		
1	0.15000	36.80	17.50	12.74	49.54	30.24	66.00	56.00	16.4	25.7	N	
2	0.19000	34.60	15.40	12.74	47.34	28.14	64.04	54.04	16.7	25.9	N	
3	0.30900	16.00	5.90	12.76	28.76	18.66	60.00	50.00	31.2	31.3	N	
4	0.41620	18.40	13.40	12.78	31.18	26.18	57.52	47.52	26.3	21.3	N	
5	2.39000	7.50	1.60	12.91	20.41	14.51	56.00	46.00	35.5	31.4	N	
6	4.75200	3.40	-3.60	13.08	16.48	9.48	56.00	46.00	39.5	36.5	N	
7	18.11600	10.70	5.20	13.76	24.46	18.96	60.00	50.00	35.5	31.0	N	
8	0.15000	37.10	18.50	12.74	49.84	31.24	66.00	56.00	16.1	24.7	L1	
9	0.19000	30.90	12.40	12.74	43.64	25.14	64.04	54.04	20.4	28.9	L1	
10	0.30900	17.70	6.90	12.76	30.46	19.66	60.00	50.00	29.5	30.3	L1	
11	0.41907	18.10	12.10	12.78	30.88	24.88	57.47	47.47	26.5	22.5	L1	
12	2.39000	5.00	-1.20	12.91	17.91	11.71	56.00	46.00	38.0	34.2	L1	
13	4.75200	4.70	-3.10	13.08	17.78	9.98	56.00	46.00	38.2	36.0	L1	
14	18.11558	9.40	3.70	13.76	23.16	17.46	60.00	50.00	36.8	32.5	L1	

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

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

Conducted Emission

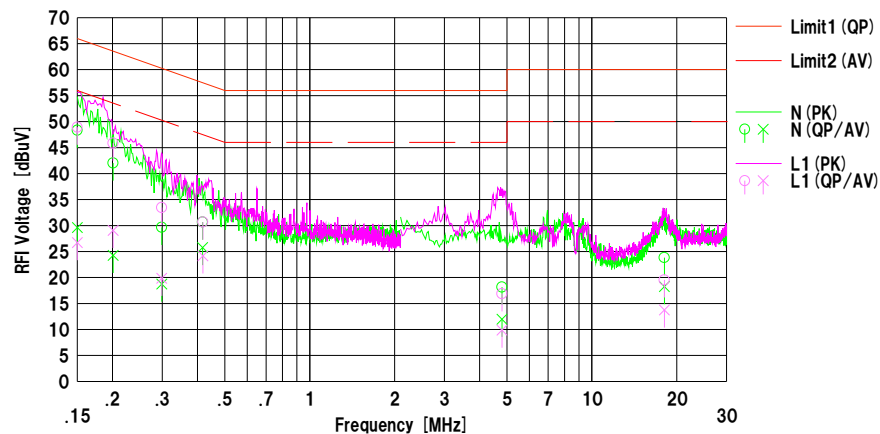
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/05/24

Mode : Tx DH5 2441 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 50 %RH

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]	<QP> [dBuV]	<AV> [dBuV]		
1	0.15000	35.60	16.90	12.74	48.34	29.64	66.00	56.00	17.6	26.3	N	
2	0.20100	29.30	11.50	12.75	42.05	24.25	63.57	53.57	21.5	29.3	N	
3	0.29900	16.90	6.00	12.76	29.66	18.76	60.27	50.27	30.6	31.5	N	
4	0.41729	17.90	13.00	12.78	30.68	25.78	57.50	47.50	26.8	21.7	N	
5	4.80200	5.10	-1.10	13.08	18.18	11.98	56.00	46.00	37.8	34.0	N	
6	18.07500	10.10	4.50	13.75	23.85	18.25	60.00	50.00	36.1	31.7	N	
7	0.15000	36.20	14.00	12.74	48.94	29.74	66.00	56.00	17.0	29.2	L1	
8	0.20100	33.10	16.30	12.75	45.85	29.05	63.57	53.57	17.7	24.5	L1	
9	0.29880	20.70	7.10	12.76	33.46	19.66	60.28	50.28	26.8	30.4	L1	
10	0.41816	17.90	11.40	12.78	30.68	24.18	57.48	47.48	26.8	23.3	L1	
11	4.80200	3.80	-3.20	13.08	16.88	9.88	56.00	46.00	39.1	36.1	L1	
12	18.07500	5.80	0.00	13.75	19.55	13.75	60.00	50.00	40.4	36.2	L1	

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

Conducted Emission

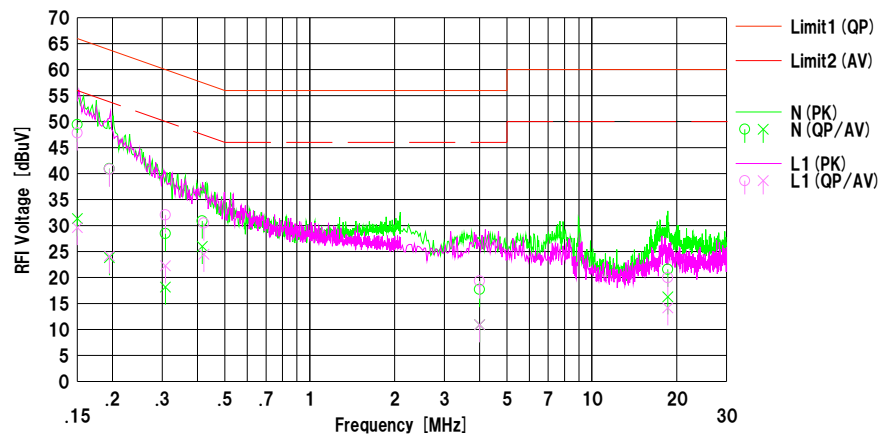
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/05/24

Mode : Tx DH5 2480 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 50 %RH

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]	<QP> [dB]	<AV> [dB]		
1	0.15000	36.70	18.60	12.74	49.44	31.34	66.00	56.00	16.5	24.6	N	
2	0.19500	28.20	11.10	12.75	40.95	23.85	63.82	53.82	22.8	29.9	N	
3	0.30800	15.70	5.40	12.76	28.46	18.16	60.02	50.02	31.5	31.8	N	
4	0.41600	18.10	13.20	12.78	30.88	25.98	57.53	47.53	26.6	21.5	N	
5	3.99900	4.70	-2.10	13.02	17.72	10.92	56.00	46.00	38.2	35.0	N	
6	18.58900	7.80	2.50	13.78	21.58	16.28	60.00	50.00	38.4	33.7	N	
7	0.15000	35.10	16.90	12.74	47.84	29.64	66.00	56.00	18.1	26.3	L1	
8	0.19500	28.10	11.40	12.75	40.85	24.15	63.82	53.82	22.9	29.6	L1	
9	0.30800	19.30	9.50	12.76	32.06	22.26	60.02	50.02	27.9	27.7	L1	
10	0.42128	17.70	11.70	12.78	30.48	24.48	57.42	47.42	26.9	22.9	L1	
11	3.99900	6.30	-2.10	13.02	19.32	10.92	56.00	46.00	36.6	35.0	L1	
12	18.58900	6.20	0.40	13.78	19.98	14.18	60.00	50.00	40.0	35.8	L1	

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

Conducted Emission

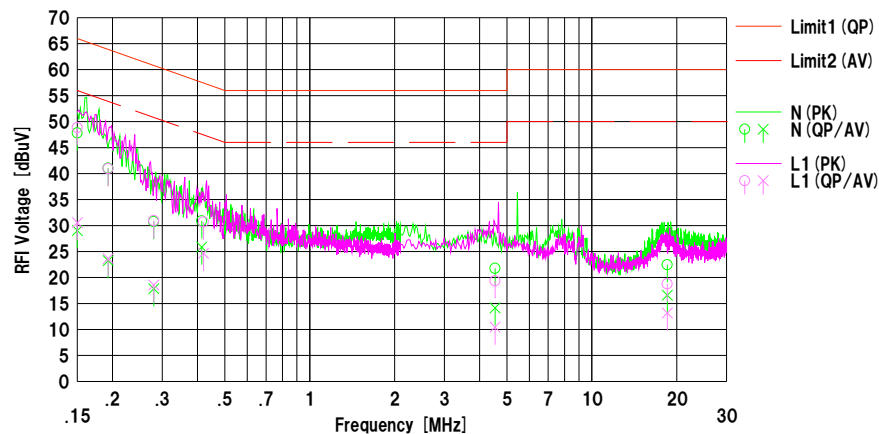
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/05/24

Mode : Tx 3-DH5 2402 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 50 %RH

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>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	35.10	16.30	12.74	47.84	29.04	66.00	56.00	18.1	26.9	N	
2	0.19300	28.30	10.50	12.74	41.04	23.24	63.91	53.91	22.8	30.6	N	
3	0.28000	18.00	5.10	12.76	30.76	17.86	60.82	50.82	30.0	32.9	N	
4	0.41409	18.10	13.10	12.78	30.88	25.88	57.57	47.57	26.6	21.6	N	
5	4.53700	8.70	1.10	13.06	21.76	14.16	56.00	46.00	34.2	31.8	N	
6	18.51700	8.70	2.80	13.78	22.48	16.58	60.00	50.00	37.5	33.4	N	
7	0.15000	36.10	17.80	12.74	48.84	30.54	66.00	56.00	17.1	25.4	L1	
8	0.19300	28.20	10.90	12.74	40.94	23.64	63.91	53.91	22.9	30.2	L1	
9	0.28000	18.20	5.80	12.76	30.96	18.56	60.82	50.82	29.8	32.2	L1	
10	0.42020	17.90	11.90	12.78	30.68	24.68	57.44	47.44	26.7	22.7	L1	
11	4.53700	6.30	-2.60	13.06	19.36	10.46	56.00	46.00	36.6	35.5	L1	
12	18.51700	5.00	-0.60	13.78	18.78	13.18	60.00	50.00	41.2	36.8	L1	

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

Conducted Emission

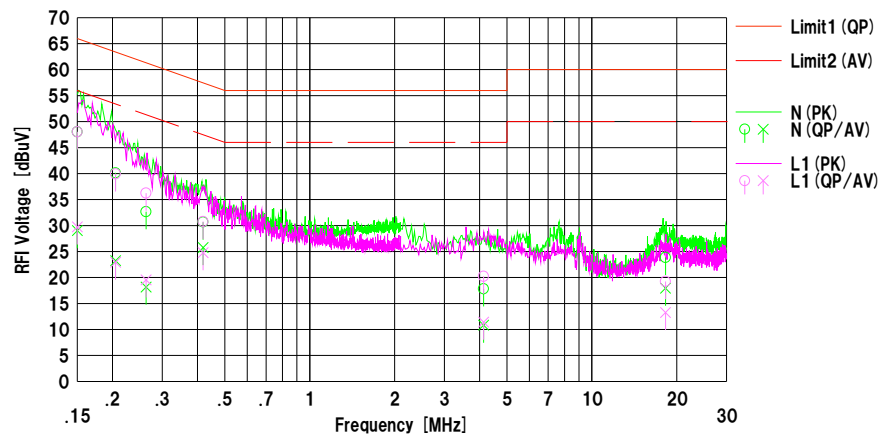
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/05/24

Mode : Tx 3-DH5 2441 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 50 %RH

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]	<QP> [dBuV]	<AV> [dBuV]		
1	0.15000	35.30	16.30	12.74	48.04	29.04	66.00	56.00	17.9	26.9	N	
2	0.20500	27.40	10.50	12.75	40.15	23.25	63.41	53.41	23.2	30.1	N	
3	0.26300	19.90	5.40	12.76	32.66	18.16	61.34	51.34	28.6	33.1	N	
4	0.41900	17.90	13.00	12.78	30.68	25.78	57.47	47.47	26.7	21.6	N	
5	4.13400	4.80	-2.20	13.04	17.84	10.84	56.00	46.00	38.1	35.1	N	
6	18.24100	10.10	4.20	13.76	23.86	17.96	60.00	50.00	36.1	32.0	N	
7	0.15000	35.30	17.00	12.74	48.04	29.74	66.00	56.00	17.9	26.2	L1	
8	0.20500	27.20	10.20	12.75	39.95	22.95	63.41	53.41	23.4	30.4	L1	
9	0.26300	23.50	6.80	12.76	36.26	19.56	61.34	51.34	25.0	31.7	L1	
10	0.41900	18.00	12.00	12.78	30.78	24.78	57.47	47.47	26.6	22.6	L1	
11	4.13400	7.20	-1.60	13.04	20.24	11.44	56.00	46.00	35.7	34.5	L1	
12	18.24100	5.50	-0.50	13.76	19.26	13.26	60.00	50.00	40.7	36.7	L1	

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

Conducted Emission

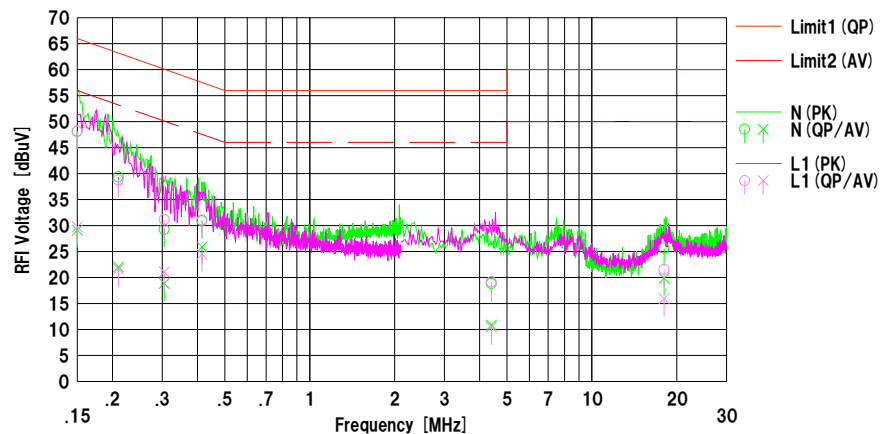
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2017/05/24

Mode : Tx 3-DH5 2480 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 50 %RH

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]	<QP> [dB]	<AV> [dB]		
1	0.15000	35.40	16.40	12.74	48.14	29.14	66.00	56.00	17.8	26.8	N	
2	0.21000	26.60	9.30	12.75	39.35	22.05	63.21	53.21	23.8	31.1	N	
3	0.30500	16.50	6.10	12.76	29.26	18.86	60.11	50.11	30.8	31.2	N	
4	0.41500	18.10	13.10	12.78	30.88	25.88	57.55	47.55	26.6	21.6	N	
5	4.40600	5.80	-2.20	13.05	18.85	10.85	56.00	46.00	37.1	35.1	N	
6	18.04300	11.90	6.10	13.75	25.65	19.85	60.00	50.00	34.3	30.1	N	
7	0.15000	35.40	17.00	12.74	48.14	29.74	66.00	56.00	17.8	26.2	L1	
8	0.21000	26.00	8.90	12.75	38.75	21.65	63.21	53.21	24.4	31.5	L1	
9	0.30500	18.40	8.30	12.76	31.16	21.06	60.11	50.11	28.9	29.0	L1	
10	0.41500	18.30	11.70	12.78	31.08	24.48	57.55	47.55	26.4	23.0	L1	
11	4.40600	6.10	-2.60	13.05	19.15	10.45	56.00	46.00	36.8	35.5	L1	
12	18.04300	7.80	2.20	13.75	21.55	15.95	60.00	50.00	38.4	34.0	L1	

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

20dB Bandwidth and Carrier Frequency Separation

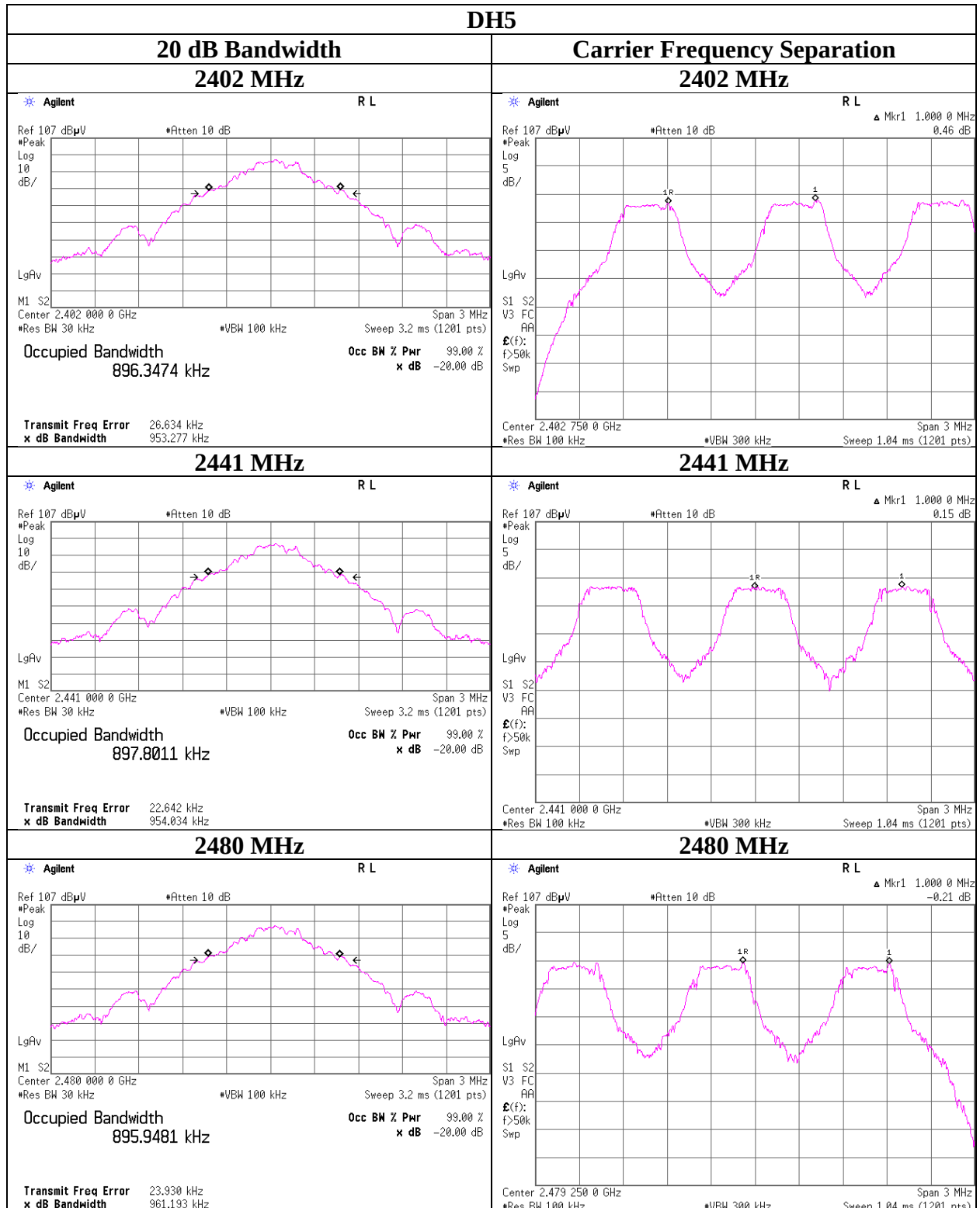
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11640275S-B-R1
Date May 18, 2017
Temperature / Humidity 25 deg. C / 52 % RH
Engineer Hikaru Shirasawa
Mode Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.953	1.000	≥ 0.636
DH5	2441.0	0.954	1.000	≥ 0.636
DH5	2480.0	0.961	1.000	≥ 0.641
3DH5	2402.0	1.295	1.000	≥ 0.863
3DH5	2441.0	1.302	1.000	≥ 0.868
3DH5	2480.0	1.291	1.000	≥ 0.860

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.

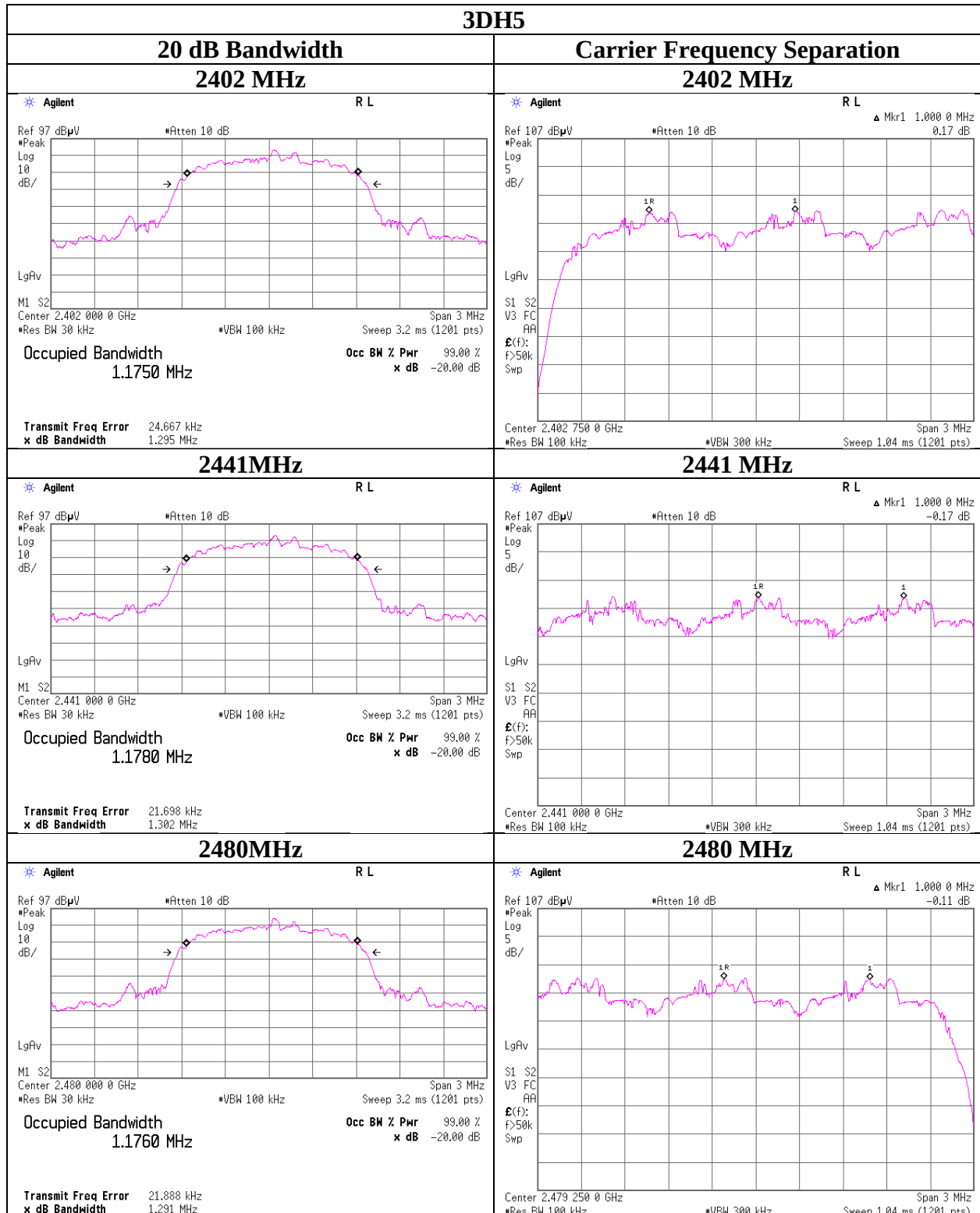
Shonan EMC Lab.

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



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

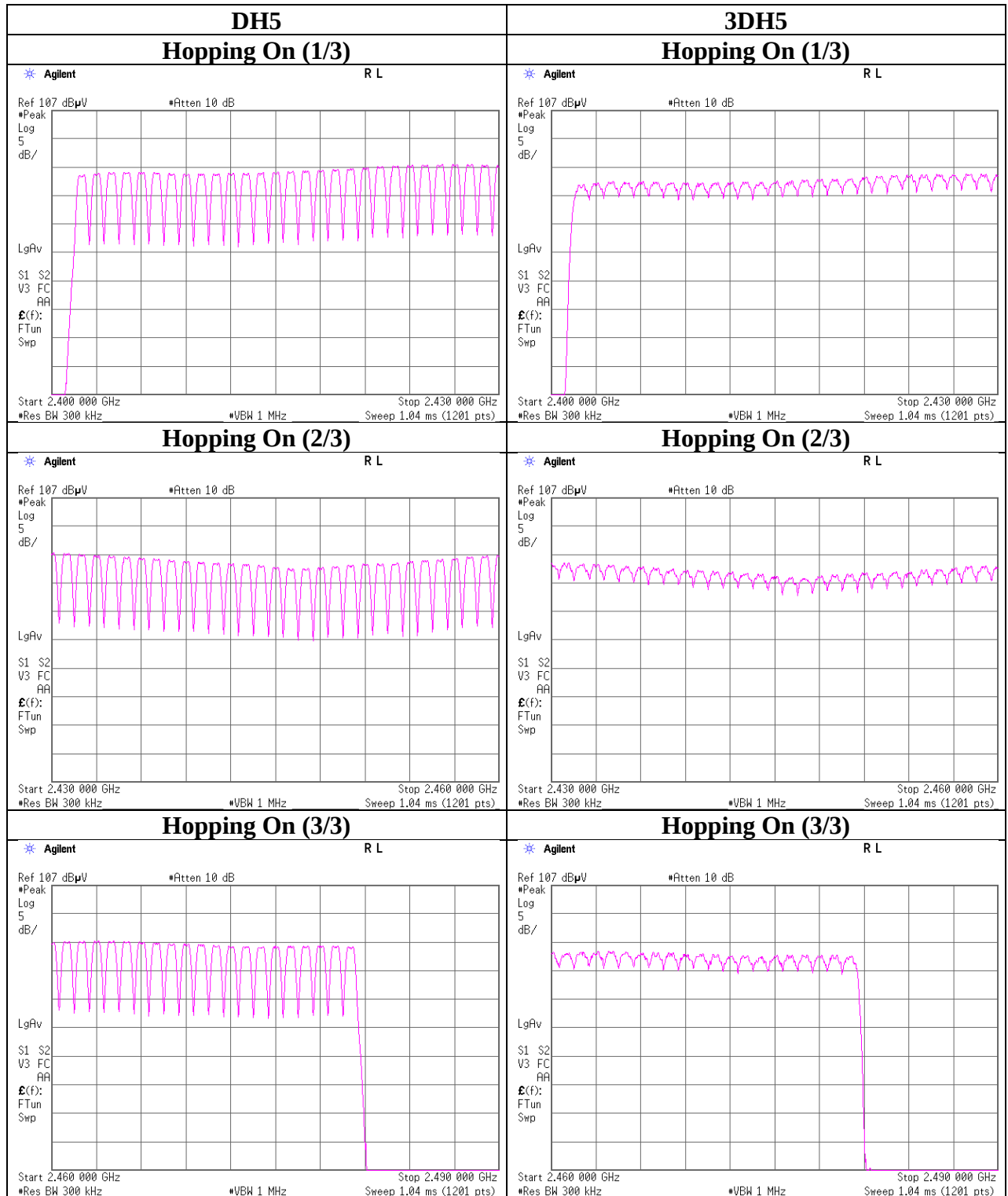
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11640275S-B-R1
Date May 18, 2017
Temperature / Humidity 25 deg. C / 52 % RH
Engineer Hikaru Shirasawa
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



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

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
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	49.0 times	/	5 sec.	x 31.6 sec. =	310 times	0.399	400
DH3	24.0 times	/	5 sec.	x 31.6 sec. =	152 times	1.656	400
DH5	20.6 times	/	5 sec.	x 31.6 sec. =	131 times	2.904	400
3DH1	49.8 times	/	5 sec.	x 31.6 sec. =	315 times	0.405	400
3DH3	25.0 times	/	5 sec.	x 31.6 sec. =	158 times	1.658	400
3DH5	20.2 times	/	5 sec.	x 31.6 sec. =	128 times	2.908	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

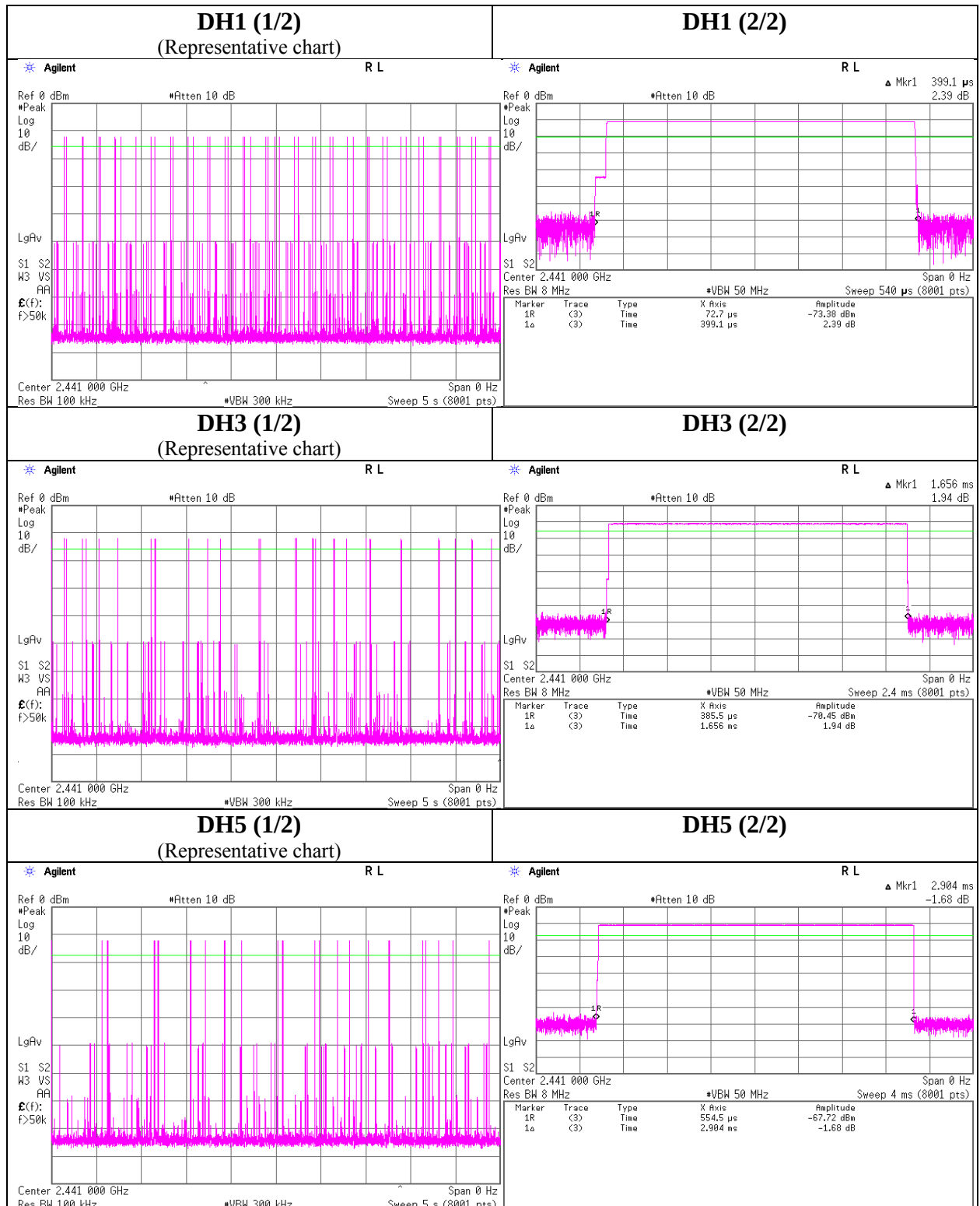
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	47	51	51	46	49.0
DH3	26	21	23	24	26	24.0
DH5	22	21	17	20	23	20.6
3DH1	49	49	49	51	51	49.8
3DH3	24	25	25	24	27	25.0
3DH5	18	19	24	20	20	20.2

Sample Calculation

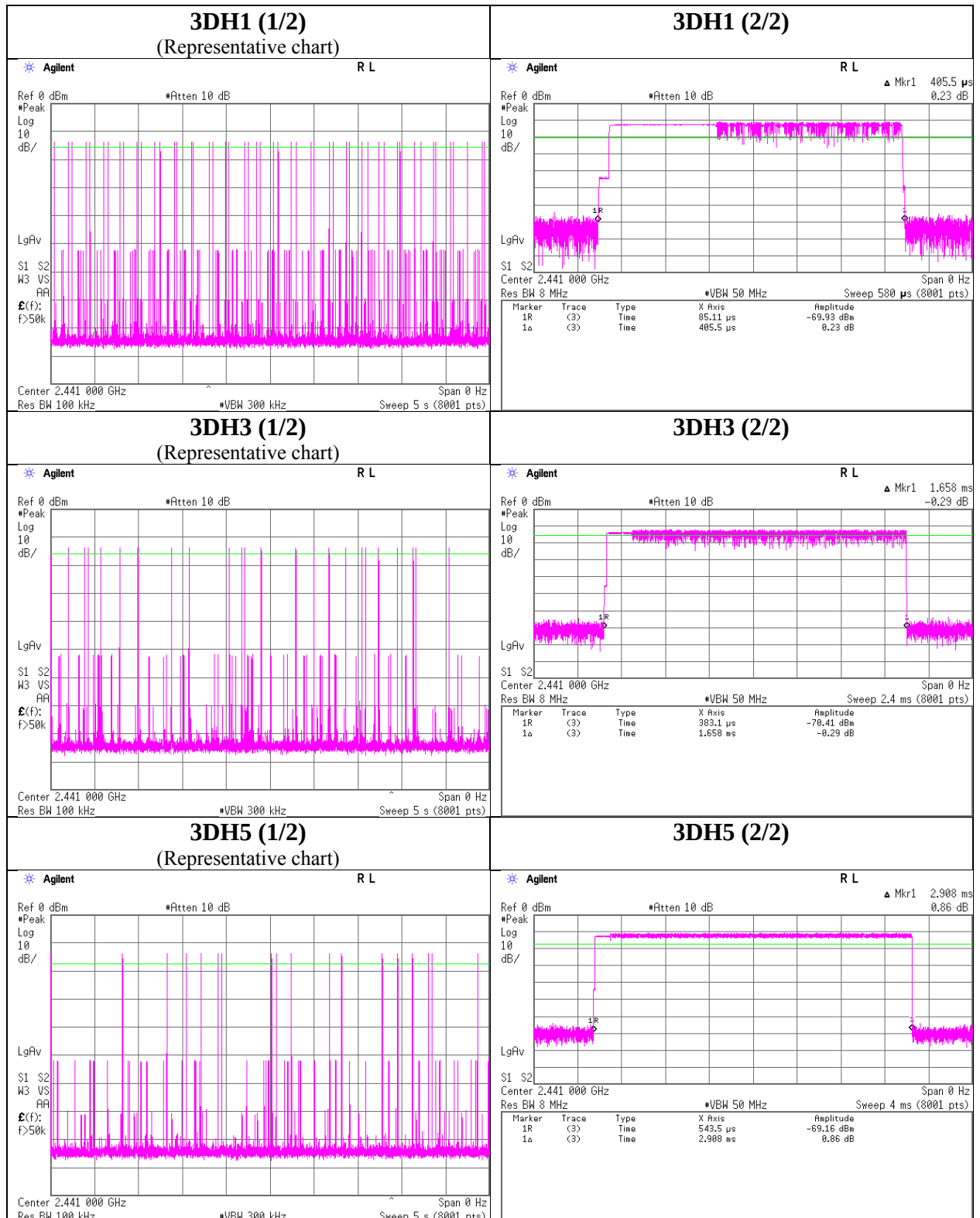
Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



Dwell time



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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11640275S-B-R1
Date	May 18, 2017
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Hikaru Shirasawa
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	-10.73	2.10	9.85	1.22	1.32	20.96	125	19.74
DH5	2441.0	-10.80	2.11	9.84	1.15	1.30	20.96	125	19.81
DH5	2480.0	-10.20	2.12	9.84	1.76	1.50	20.96	125	19.20
2DH5	2402.0	-11.12	2.10	9.85	0.83	1.21	20.96	125	20.13
2DH5	2441.0	-11.52	2.11	9.84	0.43	1.10	20.96	125	20.53
2DH5	2480.0	-11.70	2.12	9.84	0.26	1.06	20.96	125	20.70
3DH5	2402.0	-10.72	2.10	9.85	1.23	1.33	20.96	125	19.73
3DH5	2441.0	-10.91	2.11	9.84	1.04	1.27	20.96	125	19.92
3DH5	2480.0	-10.96	2.12	9.84	1.00	1.26	20.96	125	19.96

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.

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

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

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11640275S-B-R1
Date May 18, 2017
Temperature / Humidity 25 deg. C / 52 % RH
Engineer Hikaru Shirasawa
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	-12.40	2.10	9.85	-0.45	0.90	1.11	0.66	1.16
DH5	2441.0	-12.45	2.11	9.84	-0.50	0.89	1.11	0.61	1.15
DH5	2480.0	-11.81	2.12	9.84	0.15	1.04	1.11	1.26	1.34
2DH5	2402.0	-13.57	2.10	9.85	-1.62	0.69	1.10	-0.52	0.89
2DH5	2441.0	-13.90	2.11	9.84	-1.95	0.64	1.10	-0.85	0.82
2DH5	2480.0	-14.12	2.12	9.84	-2.16	0.61	1.10	-1.06	0.78
3DH5	2402.0	-13.09	2.10	9.85	-1.14	0.77	1.10	-0.04	0.99
3DH5	2441.0	-13.56	2.11	9.84	-1.61	0.69	1.10	-0.51	0.89
3DH5	2480.0	-13.79	2.12	9.84	-1.83	0.66	1.10	-0.73	0.85

Sample Calculation:

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

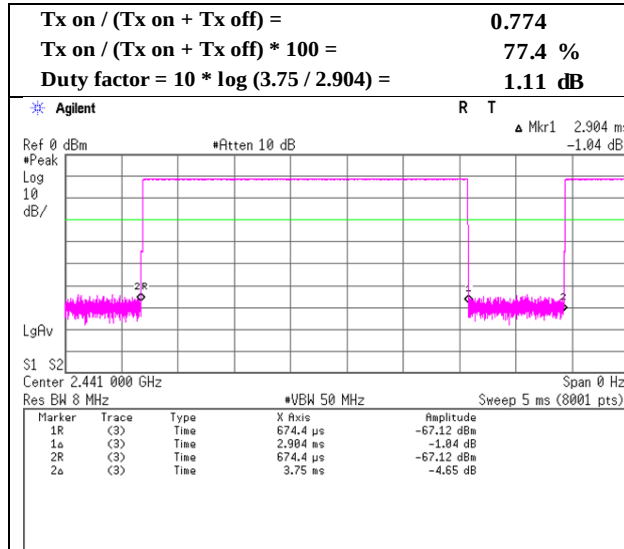
Result (Burst power average) = Time average + Duty factor

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

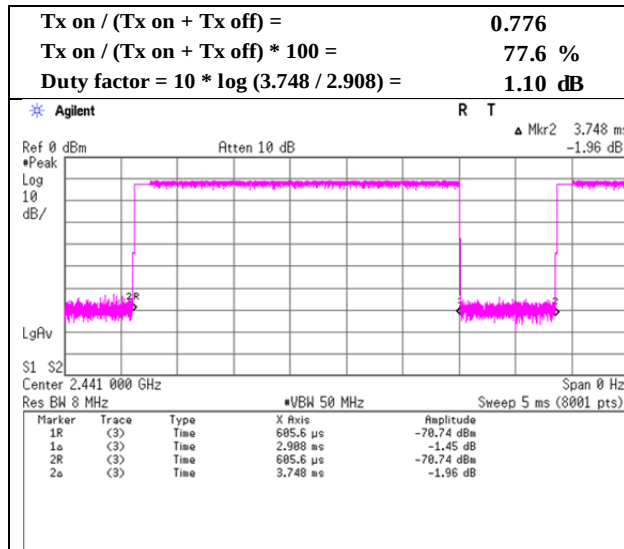
Burst Rate Confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off

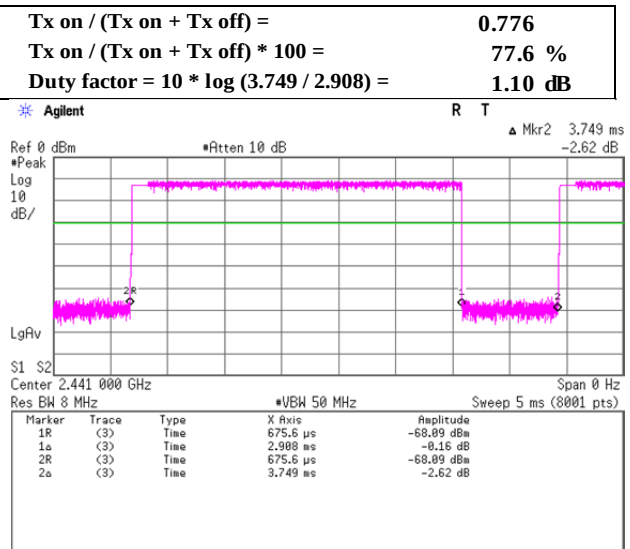
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 11640275S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date May 22, 2017 May 15, 2017 May 18, 2017
Temperature / Humidity 23 deg. C / 54 % RH 23 deg. C / 58 % RH 24 deg. C / 52 % RH
Engineer Hikaru Shirasawa Hiroyuki Morikawa Hiroyuki Morikawa
(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.	478.060	QP	29.20	17.34	7.80	31.60	0.00	22.74	46.00	23.2	100	194	
Hori.	827.552	QP	35.30	21.26	9.50	31.18	0.00	34.88	46.00	11.1	100	272	
Hori.	863.965	QP	36.70	21.79	9.67	31.03	0.00	37.13	46.00	8.8	100	155	
Hori.	931.170	QP	36.20	22.43	9.99	30.61	0.00	38.01	46.00	7.9	100	136	
Hori.	2390.000	PK	44.26	27.17	14.19	36.83	2.45	51.24	73.90	22.7	163	113	
Hori.	4804.000	PK	44.22	31.13	6.57	36.99	2.45	47.38	73.90	26.5	150	0	
Hori.	7206.000	PK	44.34	36.43	7.87	37.81	2.45	53.28	73.90	20.6	150	0	
Hori.	9608.000	PK	44.27	38.28	8.87	38.48	2.45	55.39	73.90	18.5	150	0	
Hori.	2390.000	AV	31.63	27.17	14.19	36.83	2.45	38.61	53.90	15.3	163	113	
Hori.	4804.000	AV	31.57	31.13	6.57	36.99	2.45	34.73	53.90	19.2	150	0	
Hori.	7206.000	AV	32.14	36.43	7.87	37.81	2.45	41.08	53.90	12.8	150	0	
Hori.	9608.000	AV	32.71	38.28	8.87	38.48	2.45	43.83	53.90	10.1	150	0	
Vert.	47.662	QP	35.10	11.63	7.22	31.89	0.00	22.06	40.00	17.9	100	357	
Vert.	100.837	QP	34.20	10.24	8.03	31.85	0.00	20.62	43.50	22.8	100	0	
Vert.	191.837	QP	32.00	16.25	8.84	31.77	0.00	25.32	43.50	18.1	100	234	
Vert.	2390.000	PK	44.29	27.17	14.19	36.83	2.45	51.27	73.90	22.6	125	104	
Vert.	4804.000	PK	43.66	31.13	6.57	36.99	2.45	46.82	73.90	27.1	150	0	
Vert.	7206.000	PK	43.84	36.43	7.87	37.81	2.45	52.78	73.90	21.1	150	0	
Vert.	9608.000	PK	43.72	38.28	8.87	38.48	2.45	54.84	73.90	19.1	150	0	
Vert.	2390.000	AV	31.73	27.17	14.19	36.83	2.45	38.71	53.90	15.2	125	104	
Vert.	4804.000	AV	31.38	31.13	6.57	36.99	2.45	34.54	53.90	19.4	150	0	
Vert.	7206.000	AV	32.44	36.43	7.87	37.81	2.45	41.38	53.90	12.5	150	0	
Vert.	9608.000	AV	32.73	38.28	8.87	38.48	2.45	43.85	53.90	10.1	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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.

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	85.75	27.21	14.20	36.83	2.45	92.78	-	-	Carrier
Hori.	2400.000	PK	35.20	27.20	14.19	36.83	2.45	42.21	72.78	30.6	
Vert.	2402.000	PK	85.22	27.21	14.20	36.83	2.45	92.25	-	-	Carrier
Vert.	2400.000	PK	35.13	27.20	14.19	36.83	2.45	42.14	72.25	30.1	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

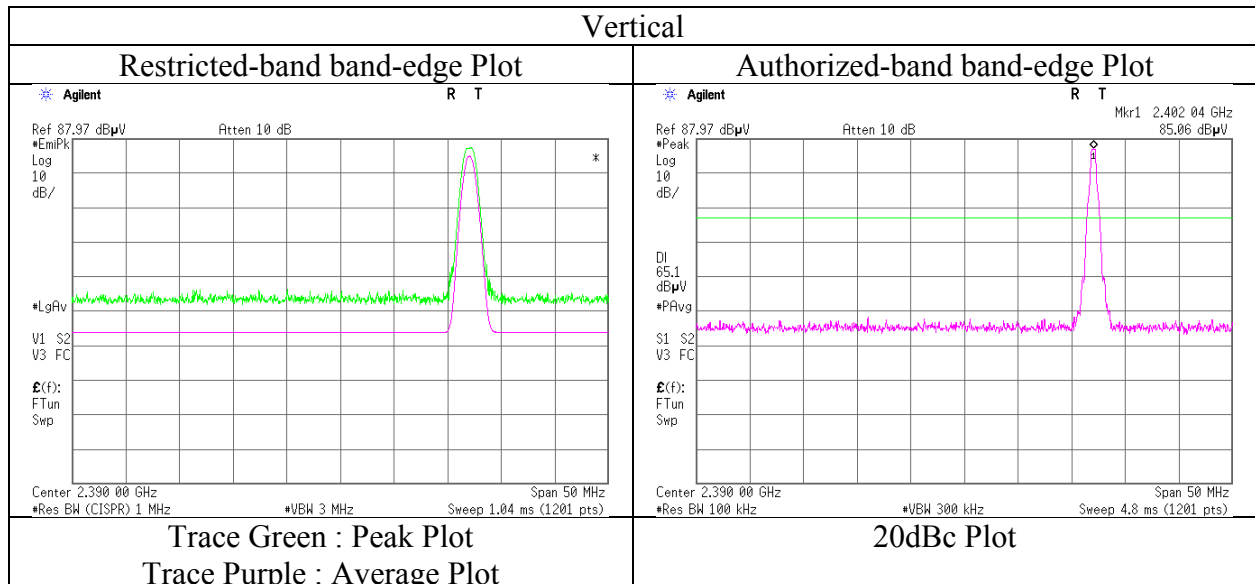
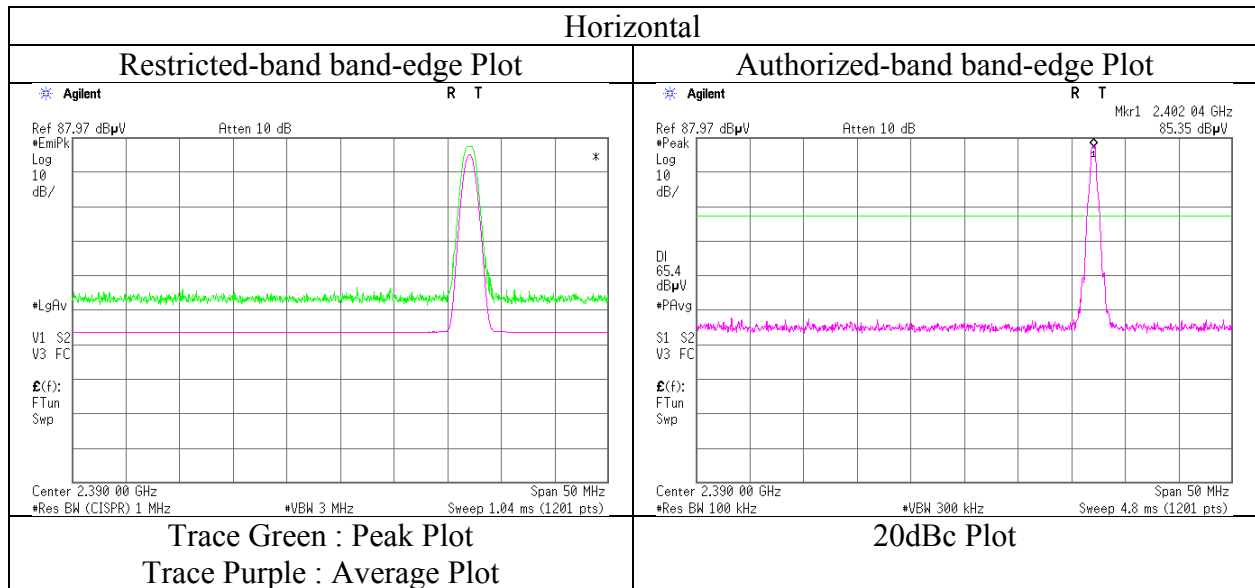
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11640275S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 15, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 11640275S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date May 22, 2017 May 15, 2017 May 18, 2017
Temperature / Humidity 23 deg. C / 54 % RH 23 deg. C / 58 % RH 24 deg. C / 52 % RH
Engineer Hikaru Shirasawa Hiroyuki Morikawa Hiroyuki Morikawa
(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.	312.000	QP	34.80	13.68	6.72	31.66	0.00	23.54	46.00	22.4	100	151	
Hori.	827.967	QP	36.20	21.27	9.50	31.18	0.00	35.79	46.00	10.2	103	282	
Hori.	863.956	QP	37.50	21.79	9.67	31.03	0.00	37.93	46.00	8.0	100	166	
Hori.	931.169	QP	35.40	22.43	9.99	30.61	0.00	37.21	46.00	8.7	100	144	
Hori.	4882.000	PK	43.71	31.29	6.59	37.03	2.45	47.01	73.90	26.9	150	0	
Hori.	7323.000	PK	44.78	36.64	7.87	37.88	2.45	53.86	73.90	20.0	150	0	
Hori.	9764.000	PK	45.71	38.52	8.90	38.67	2.45	56.91	73.90	17.0	150	0	
Hori.	4882.000	AV	31.25	31.29	6.59	37.03	2.45	34.55	53.90	19.4	150	0	
Hori.	7323.000	AV	32.34	36.64	7.87	37.88	2.45	41.42	53.90	12.5	150	0	
Hori.	9764.000	AV	33.07	38.52	8.90	38.67	2.45	44.27	53.90	9.6	150	0	
Vert.	47.128	QP	39.00	11.83	7.22	31.89	0.00	26.16	40.00	13.8	100	253	
Vert.	107.158	QP	35.00	11.13	7.98	31.84	0.00	22.27	43.50	21.2	100	345	
Vert.	192.217	QP	31.90	16.26	8.84	31.77	0.00	25.23	43.50	18.2	100	312	
Vert.	4882.000	PK	43.99	31.29	6.59	37.03	2.45	47.29	73.90	26.6	150	0	
Vert.	7323.000	PK	45.70	36.64	7.87	37.88	2.45	54.78	73.90	19.1	150	0	
Vert.	9764.000	PK	44.90	38.52	8.90	38.67	2.45	56.10	73.90	17.8	150	0	
Vert.	4882.000	AV	31.54	31.29	6.59	37.03	2.45	34.84	53.90	19.1	150	0	
Vert.	7323.000	AV	32.47	36.64	7.87	37.88	2.45	41.55	53.90	12.4	150	0	
Vert.	9764.000	AV	33.18	38.52	8.90	38.67	2.45	44.38	53.90	9.5	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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. 11640275S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date May 22, 2017 May 15, 2017 May 18, 2017
Temperature / Humidity 23 deg. C / 54 % RH 23 deg. C / 58 % RH 24 deg. C / 52 % RH
Engineer Hikaru Shirasawa Hiroyuki Morikawa Hiroyuki Morikawa
(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.	311.994	QP	33.00	13.68	6.72	31.66	0.00	21.74	46.00	24.2	100	161	
Hori.	827.966	QP	35.30	21.27	9.50	31.18	0.00	34.89	46.00	11.1	100	288	
Hori.	863.965	QP	37.30	21.79	9.67	31.03	0.00	37.73	46.00	8.2	100	158	
Hori.	931.179	QP	35.10	22.43	9.99	30.61	0.00	36.91	46.00	9.0	101	146	
Hori.	2483.500	PK	44.44	27.49	14.27	36.79	2.45	51.86	73.90	22.0	155	102	
Hori.	4960.000	PK	43.28	31.46	6.61	37.07	2.45	46.73	73.90	27.2	150	0	
Hori.	7440.000	PK	44.95	36.84	7.89	37.95	2.45	54.18	73.90	19.7	150	0	
Hori.	9920.000	PK	45.65	38.76	8.94	38.87	2.45	56.93	73.90	17.0	150	0	
Hori.	2483.500	AV	31.43	27.49	14.27	36.79	2.45	38.85	53.90	15.1	155	102	
Hori.	4960.000	AV	31.27	31.46	6.61	37.07	2.45	34.72	53.90	19.2	150	0	
Hori.	7440.000	AV	32.20	36.84	7.89	37.95	2.45	41.43	53.90	12.5	150	0	
Hori.	9920.000	AV	33.02	38.76	8.94	38.87	2.45	44.30	53.90	9.6	150	0	
Vert.	47.646	QP	39.30	11.63	7.22	31.89	0.00	26.26	40.00	13.7	100	324	
Vert.	107.376	QP	34.80	11.16	7.97	31.84	0.00	22.09	43.50	21.4	100	351	
Vert.	192.137	QP	33.00	16.26	8.84	31.77	0.00	26.33	43.50	17.1	100	317	
Vert.	2483.500	PK	44.52	27.49	14.27	36.79	2.45	51.94	73.90	22.0	123	99	
Vert.	4960.000	PK	43.48	31.46	6.61	37.07	2.45	46.93	73.90	27.0	150	0	
Vert.	7440.000	PK	45.81	36.84	7.89	37.95	2.45	55.04	73.90	18.9	150	0	
Vert.	9920.000	PK	45.24	38.76	8.94	38.87	2.45	56.52	73.90	17.4	150	0	
Vert.	2483.500	AV	31.32	27.49	14.27	36.79	2.45	38.74	53.90	15.2	123	99	
Vert.	4960.000	AV	31.33	31.46	6.61	37.07	2.45	34.78	53.90	19.1	150	0	
Vert.	7440.000	AV	32.32	36.84	7.89	37.95	2.45	41.55	53.90	12.4	150	0	
Vert.	9920.000	AV	32.99	38.76	8.94	38.87	2.45	44.27	53.90	9.6	150	0	

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

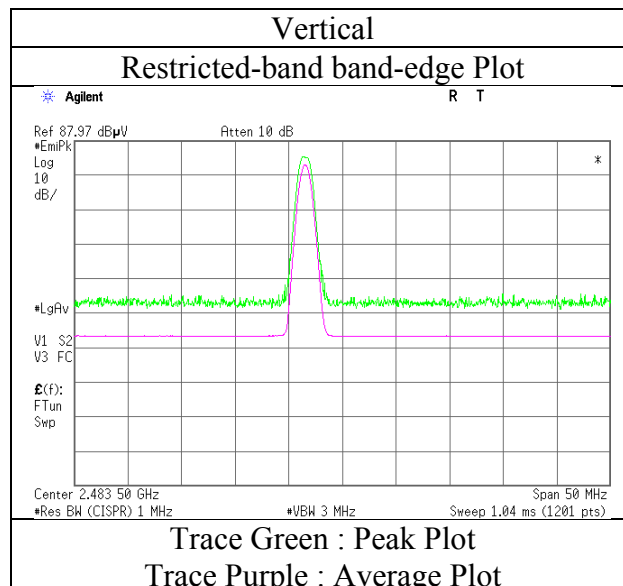
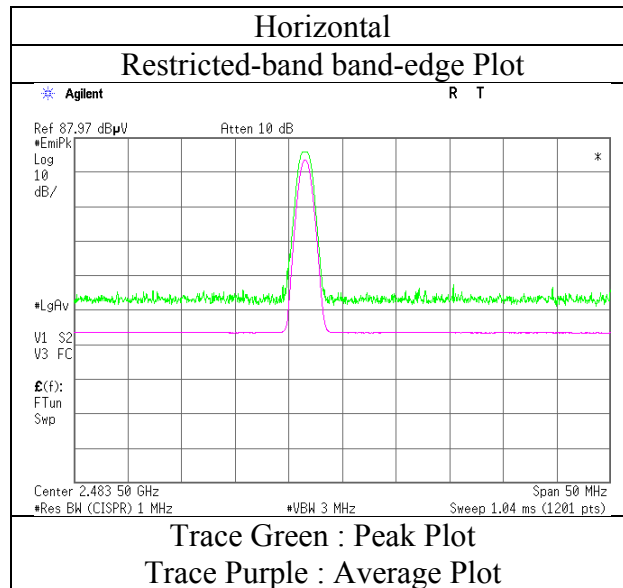
Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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.	11640275S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 15, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No. 11640275S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date May 22, 2017 May 15, 2017 May 18, 2017
Temperature / Humidity 23 deg. C / 54 % RH 23 deg. C / 58 % RH 24 deg. C / 52 % RH
Engineer Hikaru Shirasawa Hiroyuki Morikawa Hiroyuki Morikawa
(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.	312.003	QP	33.90	13.68	6.72	31.66	0.00	22.64	46.00	23.3	100	318	
Hori.	827.963	QP	35.80	21.27	9.50	31.18	0.00	35.39	46.00	10.6	100	295	
Hori.	863.969	QP	37.60	21.79	9.67	31.03	0.00	38.03	46.00	7.9	100	154	
Hori.	931.244	QP	35.10	22.43	9.99	30.61	0.00	36.91	46.00	9.0	100	166	
Hori.	2390.000	PK	43.89	27.17	14.19	36.83	2.45	50.87	73.90	23.0	165	72	
Hori.	4804.000	PK	43.63	31.13	6.57	36.99	2.45	46.79	73.90	27.1	150	0	
Hori.	7206.000	PK	45.08	36.43	7.87	37.81	2.45	54.02	73.90	19.9	150	0	
Hori.	9608.000	PK	45.04	38.28	8.87	38.48	2.45	56.16	73.90	17.7	150	0	
Hori.	2390.000	AV	31.57	27.17	14.19	36.83	2.45	38.55	53.90	15.4	165	72	
Hori.	4804.000	AV	31.26	31.13	6.57	36.99	2.45	34.42	53.90	19.5	150	0	
Hori.	7206.000	AV	32.03	36.43	7.87	37.81	2.45	40.97	53.90	12.9	150	0	
Hori.	9608.000	AV	32.75	38.28	8.87	38.48	2.45	43.87	53.90	10.0	150	0	
Vert.	47.200	QP	38.80	11.80	7.22	31.89	0.00	25.93	40.00	14.0	100	113	
Vert.	92.234	QP	33.70	8.62	8.15	31.86	0.00	18.61	43.50	24.8	100	3	
Vert.	193.115	QP	30.70	16.26	8.85	31.77	0.00	24.04	43.50	19.4	100	277	
Vert.	2390.000	PK	43.75	27.17	14.19	36.83	2.45	50.73	73.90	23.2	127	123	
Vert.	4804.000	PK	43.48	31.13	6.57	36.99	2.45	46.64	73.90	27.3	150	0	
Vert.	7206.000	PK	44.92	36.43	7.87	37.81	2.45	53.86	73.90	20.0	150	0	
Vert.	9608.000	PK	45.36	38.28	8.87	38.48	2.45	56.48	73.90	17.4	150	0	
Vert.	2390.000	AV	32.08	27.17	14.19	36.83	2.45	39.06	53.90	14.8	127	123	
Vert.	4804.000	AV	31.26	31.13	6.57	36.99	2.45	34.42	53.90	19.5	150	0	
Vert.	7206.000	AV	32.04	36.43	7.87	37.81	2.45	40.98	53.90	12.9	150	0	
Vert.	9608.000	AV	32.80	38.28	8.87	38.48	2.45	43.92	53.90	10.0	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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.

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	83.44	27.21	14.20	36.83	2.45	90.47	-	-	Carrier
Hori.	2400.000	PK	34.55	27.20	14.19	36.83	2.45	41.56	70.47	28.9	
Vert.	2402.000	PK	83.25	27.21	14.20	36.83	2.45	90.28	-	-	Carrier
Vert.	2400.000	PK	34.07	27.20	14.19	36.83	2.45	41.08	70.28	29.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

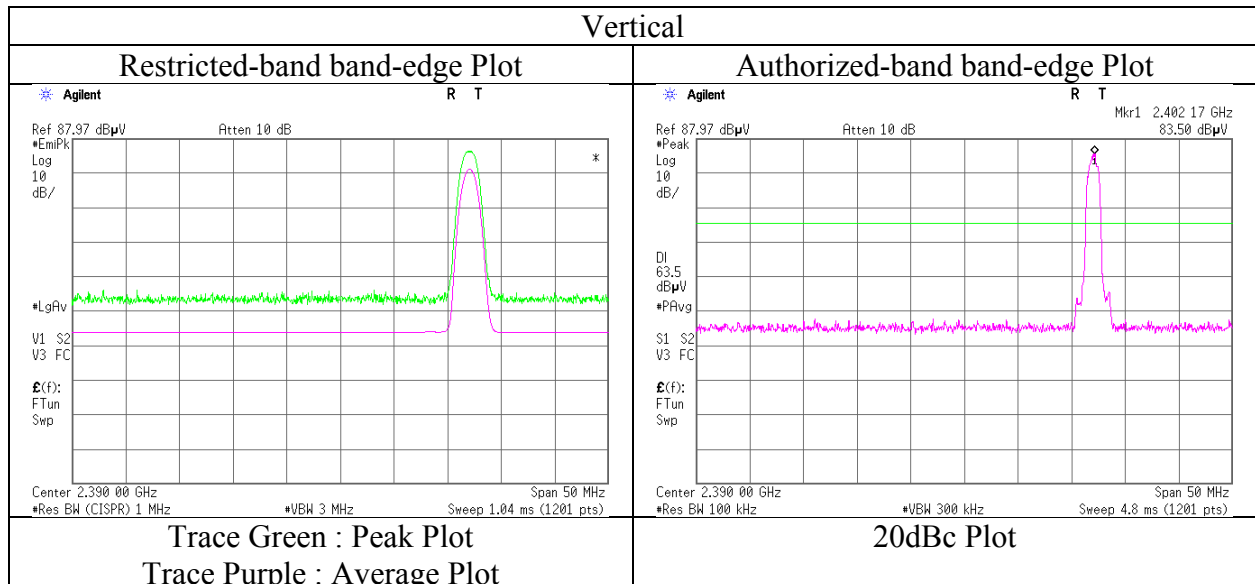
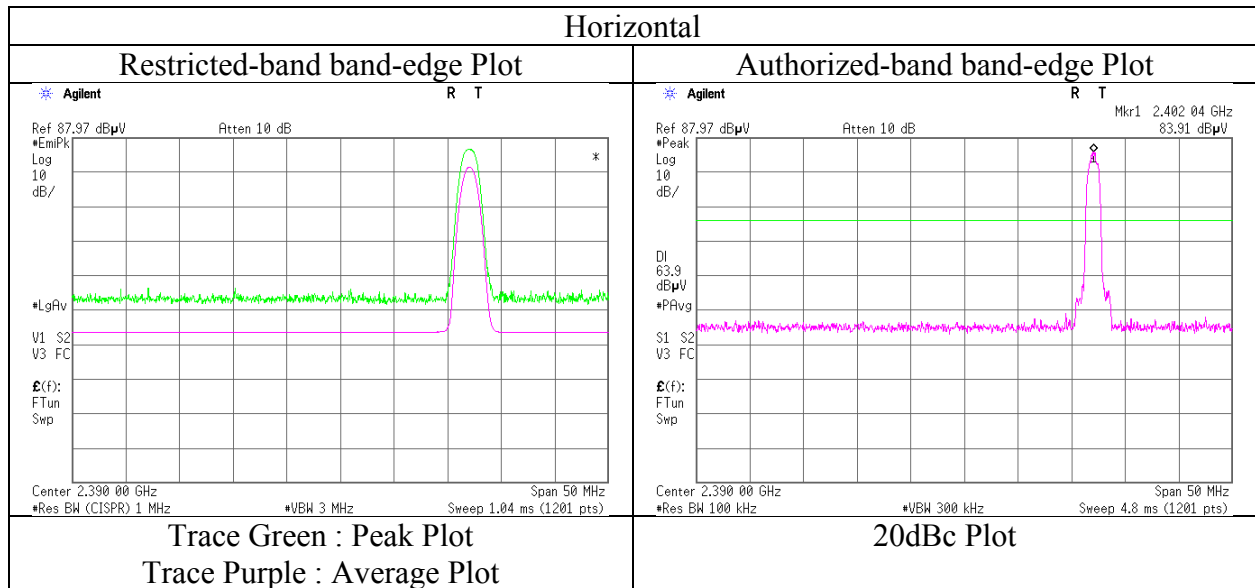
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11640275S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 15, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Report No. 11640275S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date May 22, 2017 May 15, 2017 May 18, 2017
Temperature / Humidity 23 deg. C / 54 % RH 23 deg. C / 58 % RH 24 deg. C / 52 % RH
Engineer Hikaru Shirasawa Hiroyuki Morikawa Hiroyuki Morikawa
(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.	312.029	QP	36.90	13.68	6.72	31.66	0.00	25.64	46.00	20.3	150	354	
Hori.	827.966	QP	35.00	21.27	9.50	31.18	0.00	34.59	46.00	11.4	100	284	
Hori.	863.963	QP	37.00	21.79	9.67	31.03	0.00	37.43	46.00	8.5	100	170	
Hori.	931.160	QP	35.00	22.43	9.99	30.61	0.00	36.81	46.00	9.1	100	197	
Hori.	4882.000	PK	42.90	31.29	6.59	37.03	2.45	46.20	73.90	27.7	150	0	
Hori.	7323.000	PK	45.03	36.64	7.87	37.88	2.45	54.11	73.90	19.8	150	0	
Hori.	9764.000	PK	44.86	38.52	8.90	38.67	2.45	56.06	73.90	17.8	150	0	
Hori.	4882.000	AV	31.35	31.29	6.59	37.03	2.45	34.65	53.90	19.3	150	0	
Hori.	7323.000	AV	32.27	36.64	7.87	37.88	2.45	41.35	53.90	12.6	150	0	
Hori.	9764.000	AV	32.96	38.52	8.90	38.67	2.45	44.16	53.90	9.7	150	0	
Vert.	47.343	QP	40.30	11.75	7.22	31.89	0.00	27.38	40.00	12.6	100	148	
Vert.	92.581	QP	35.60	8.69	8.15	31.86	0.00	20.58	43.50	22.9	100	337	
Vert.	192.126	QP	31.80	16.26	8.84	31.77	0.00	25.13	43.50	18.3	100	355	
Vert.	4882.000	PK	42.91	31.29	6.59	37.03	2.45	46.21	73.90	27.7	150	0	
Vert.	7323.000	PK	44.82	36.64	7.87	37.88	2.45	53.90	73.90	20.0	150	0	
Vert.	9764.000	PK	45.66	38.52	8.90	38.67	2.45	56.86	73.90	17.0	150	0	
Vert.	4882.000	AV	31.12	31.29	6.59	37.03	2.45	34.42	53.90	19.5	150	0	
Vert.	7323.000	AV	32.22	36.64	7.87	37.88	2.45	41.30	53.90	12.6	150	0	
Vert.	9764.000	AV	32.94	38.52	8.90	38.67	2.45	44.14	53.90	9.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

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. 11640275S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date May 22, 2017 May 15, 2017 May 18, 2017
Temperature / Humidity 23 deg. C / 54 % RH 23 deg. C / 58 % RH 24 deg. C / 52 % RH
Engineer Hikaru Shirasawa Hiroyuki Morikawa Hiroyuki Morikawa
(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.	311.995	QP	31.00	13.68	6.72	31.66	0.00	19.74	46.00	26.2	103	140	
Hori.	827.967	QP	30.70	21.27	9.50	31.18	0.00	30.29	46.00	15.7	105	139	
Hori.	863.961	QP	36.80	21.79	9.67	31.03	0.00	37.23	46.00	8.7	105	173	
Hori.	931.150	QP	35.10	22.43	9.99	30.61	0.00	36.91	46.00	9.0	100	131	
Hori.	2483.500	PK	44.08	27.49	14.27	36.79	2.45	51.50	73.90	22.4	152	109	
Hori.	4960.000	PK	42.95	31.46	6.61	37.07	2.45	46.40	73.90	27.5	150	0	
Hori.	7440.000	PK	44.37	36.84	7.89	37.95	2.45	53.60	73.90	20.3	150	0	
Hori.	9920.000	PK	44.82	38.76	8.94	38.87	2.45	56.10	73.90	17.8	100	0	
Hori.	2483.500	AV	31.04	27.49	14.27	36.79	2.45	38.46	53.90	15.4	152	109	
Hori.	4960.000	AV	31.18	31.46	6.61	37.07	2.45	34.63	53.90	19.3	150	0	
Hori.	7440.000	AV	32.23	36.84	7.89	37.95	2.45	41.46	53.90	12.4	150	0	
Hori.	9920.000	AV	32.91	38.76	8.94	38.87	2.45	44.19	53.90	9.7	100	0	
Vert.	47.440	QP	40.30	11.71	7.22	31.89	0.00	27.34	40.00	12.6	100	130	
Vert.	106.875	QP	35.20	11.09	7.98	31.84	0.00	22.43	43.50	21.0	100	60	
Vert.	192.235	QP	31.70	16.26	8.84	31.77	0.00	25.03	43.50	18.4	100	293	
Vert.	2483.500	PK	43.71	27.49	14.27	36.79	2.45	51.13	73.90	22.8	125	84	
Vert.	4960.000	PK	42.83	31.46	6.61	37.07	2.45	46.28	73.90	27.6	150	0	
Vert.	7440.000	PK	44.96	36.84	7.89	37.95	2.45	54.19	73.90	19.7	150	0	
Vert.	9920.000	PK	45.44	38.76	8.94	38.87	2.45	56.72	73.90	17.2	150	0	
Vert.	2483.500	AV	31.20	27.49	14.27	36.79	2.45	38.62	53.90	15.3	125	84	
Vert.	4960.000	AV	31.09	31.46	6.61	37.07	2.45	34.54	53.90	19.4	150	0	
Vert.	7440.000	AV	32.23	36.84	7.89	37.95	2.45	41.46	53.90	12.4	150	0	
Vert.	9920.000	AV	32.96	38.76	8.94	38.87	2.45	44.24	53.90	9.7	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.98\text{ m} / 3.0\text{ m}) = 2.45\text{ dB}$

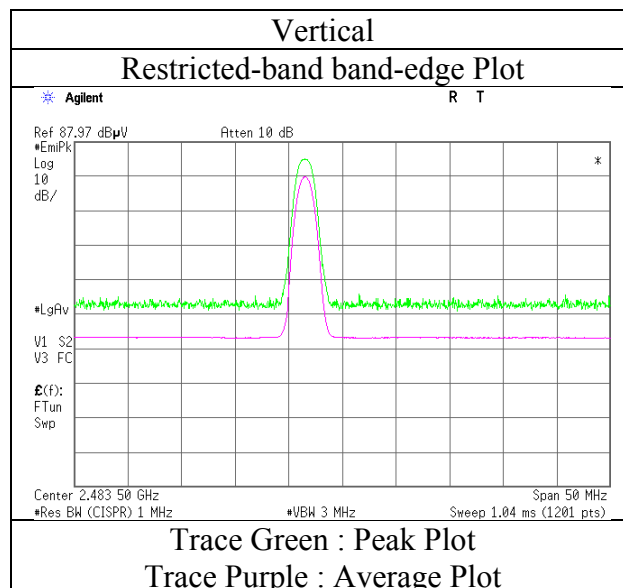
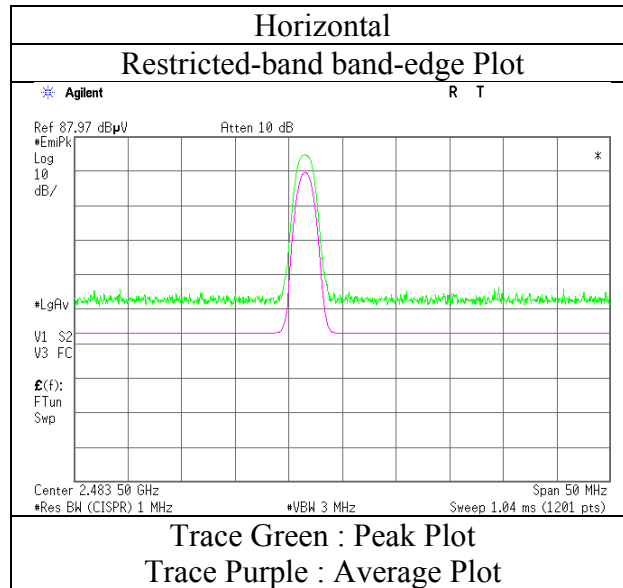
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Dwell (time) factor refer to "Dwell time factor Calculation chart" sheet.

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11640275S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 15, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Hiroyuki Morikawa

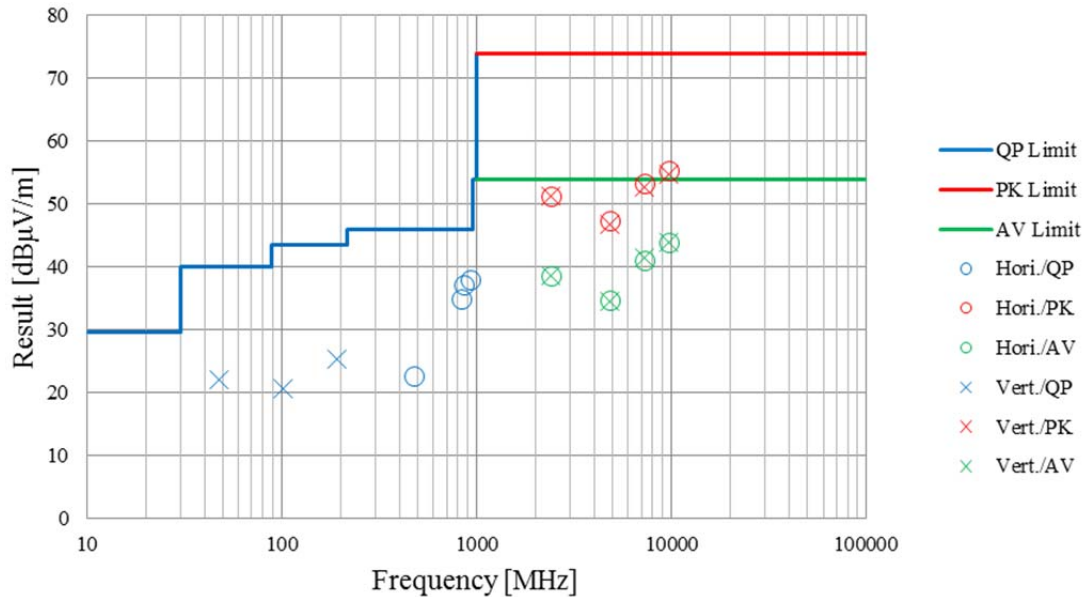
Mode	Tx, Hopping Off, 3DH5 2480 MHz
------	--------------------------------



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11640275S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2		
Date	May 22, 2017	May 15, 2017	May 18, 2017
Temperature / Humidity	23 deg. C / 54 % RH	23 deg. C / 58 % RH	24 deg. C / 52 % RH
Engineer	Hikaru Shirasawa (30 MHz – 1 GHz)	Hiroyuki Morikawa (1 GHz – 13 GHz)	Hiroyuki Morikawa (13 GHz – 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz		

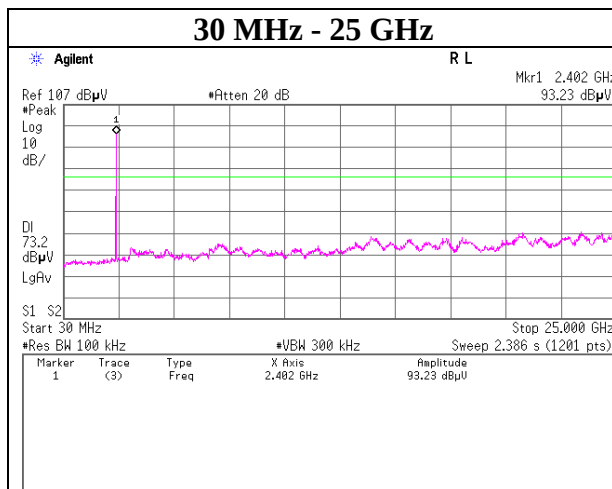
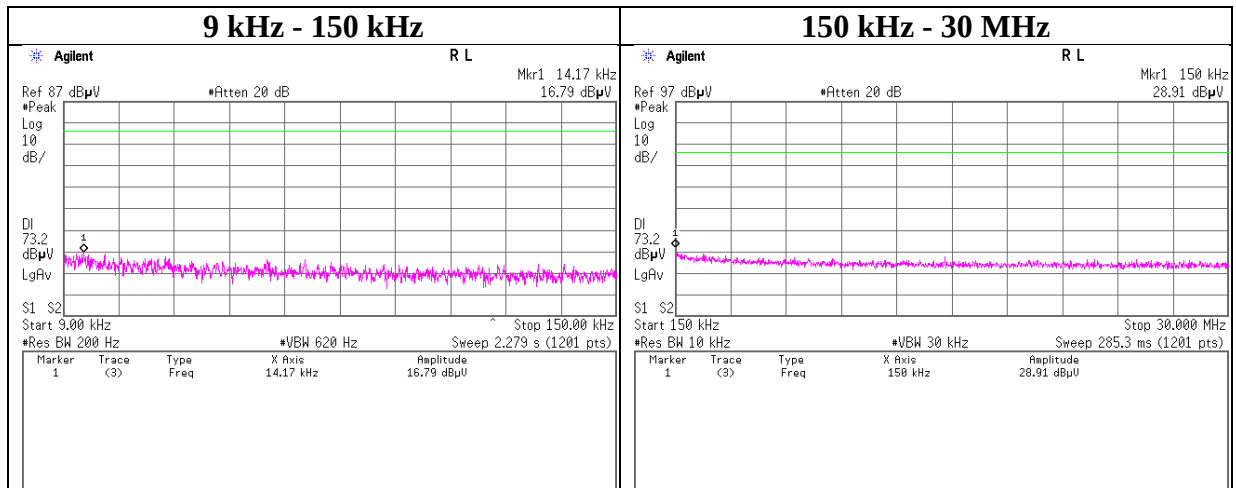


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off, DH5

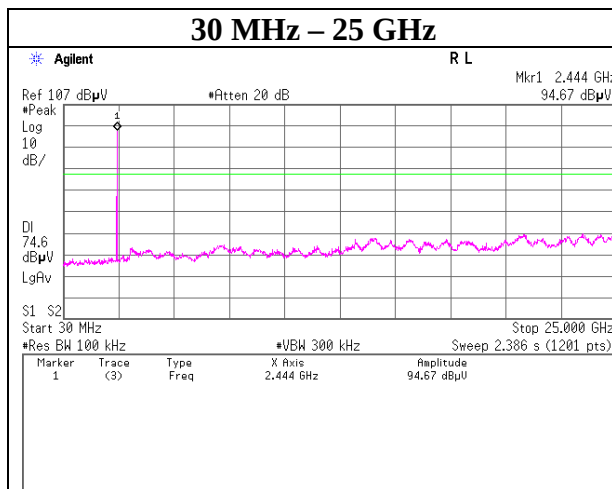
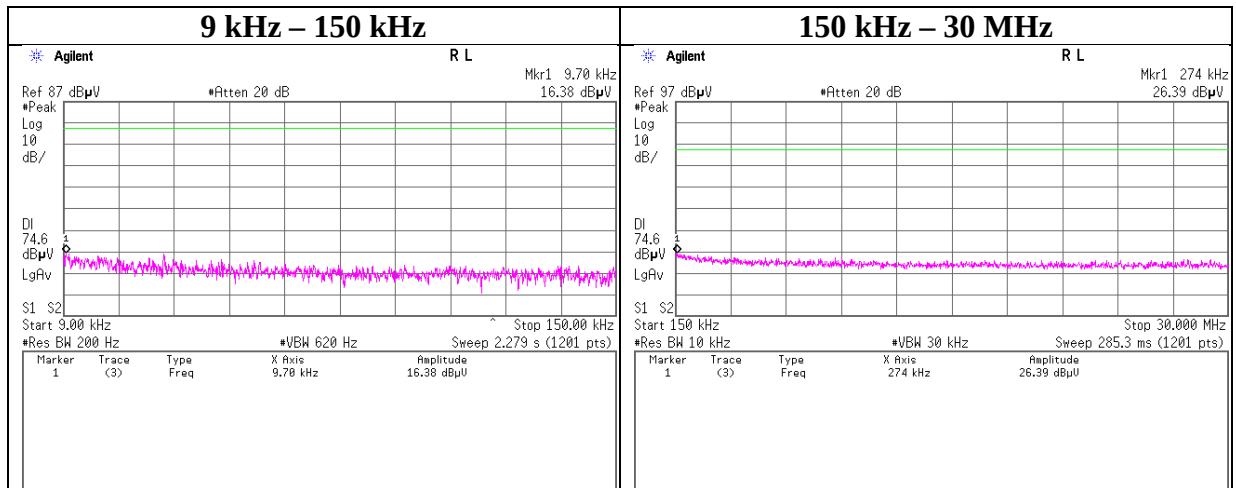
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off, DH5

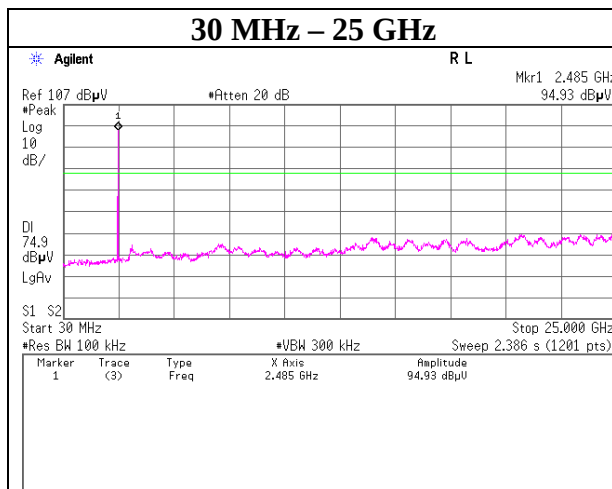
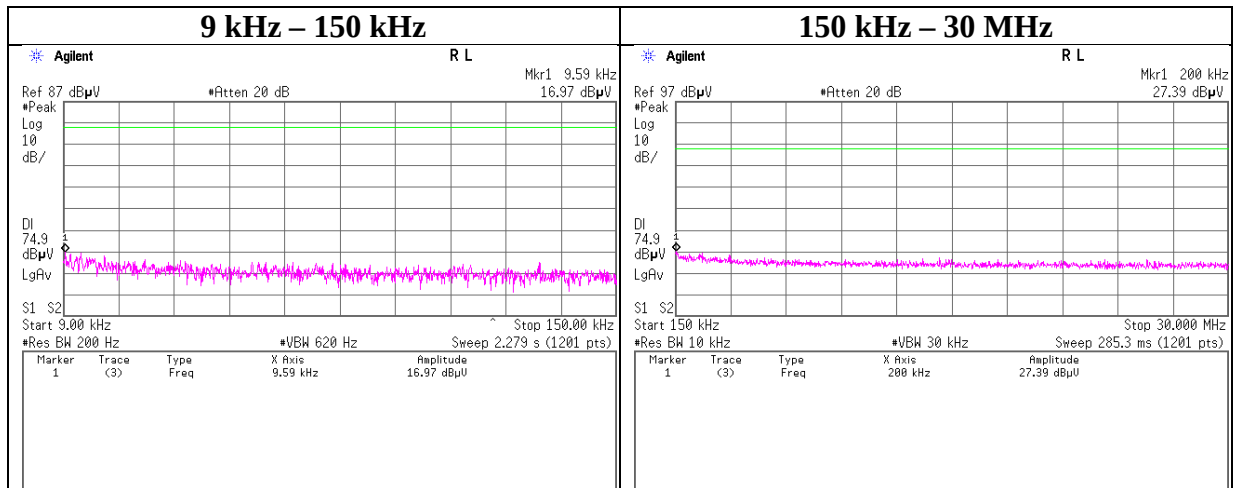
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off, DH5

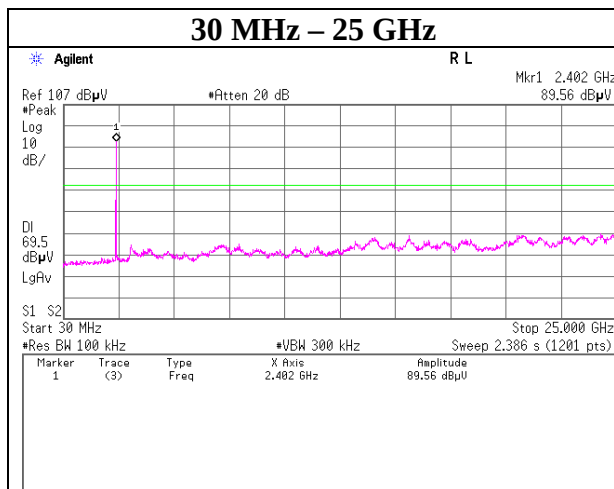
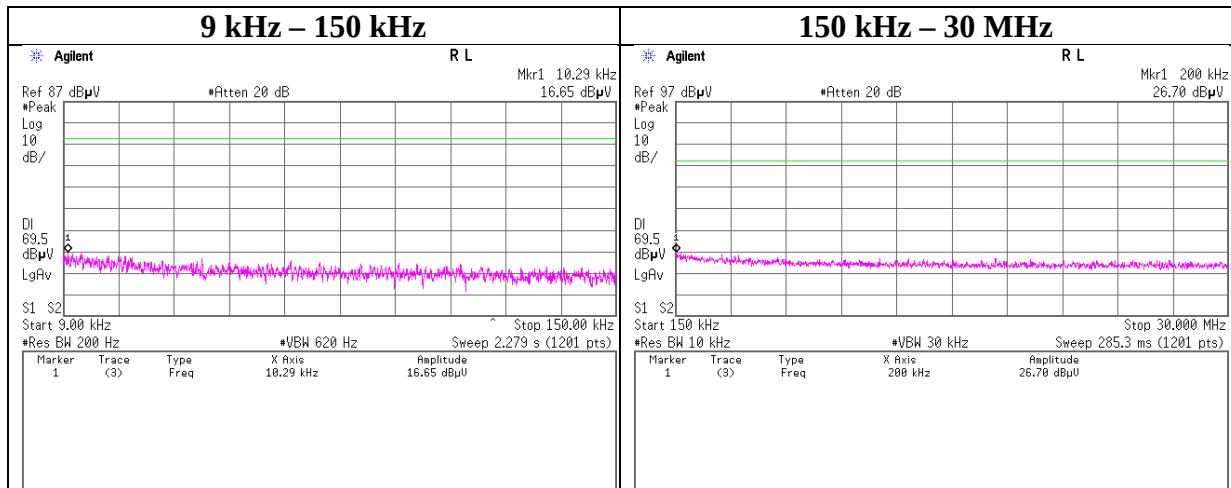
2480 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping On, 3DH5

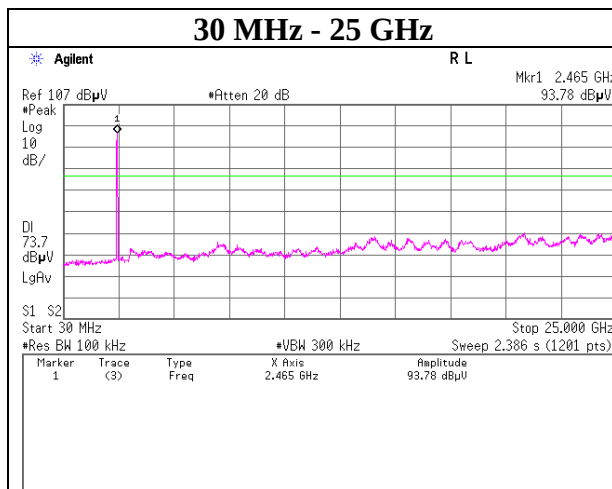
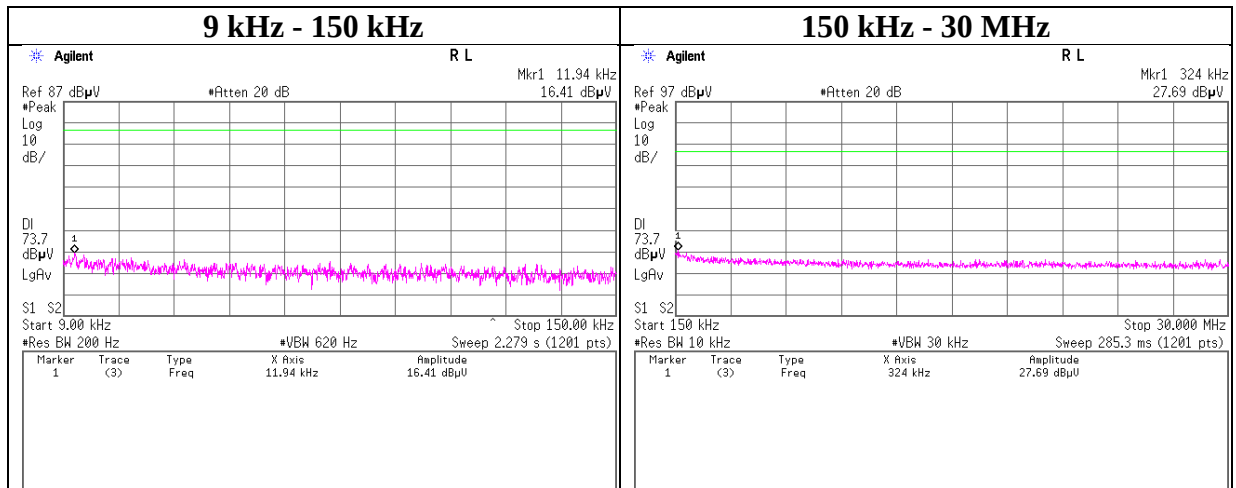
2402 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping On, 3DH5

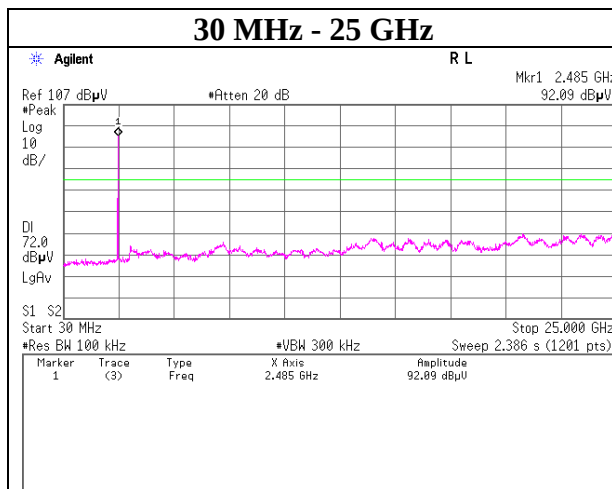
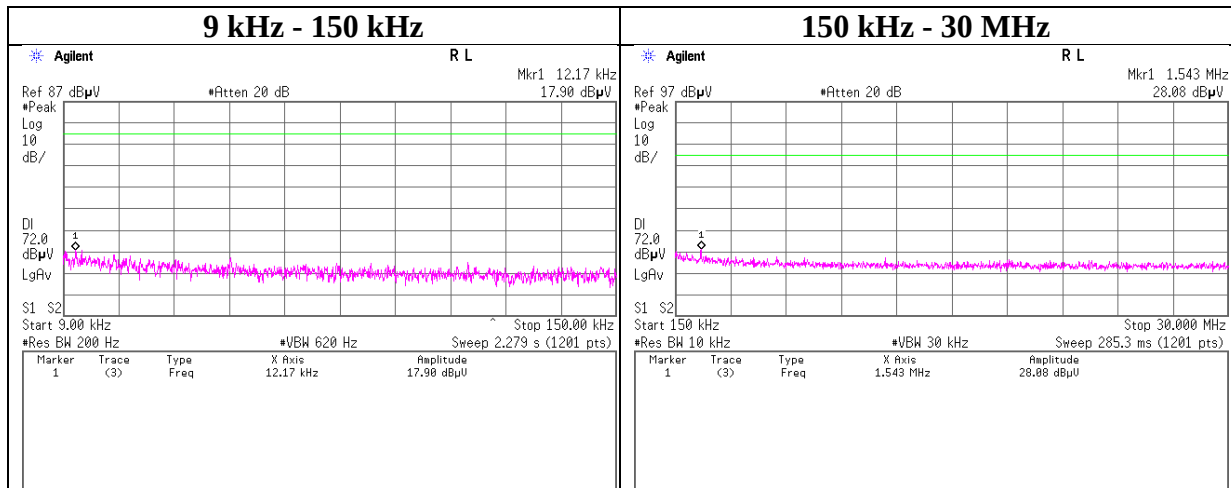
2441 MHz



Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping On, 3DH5

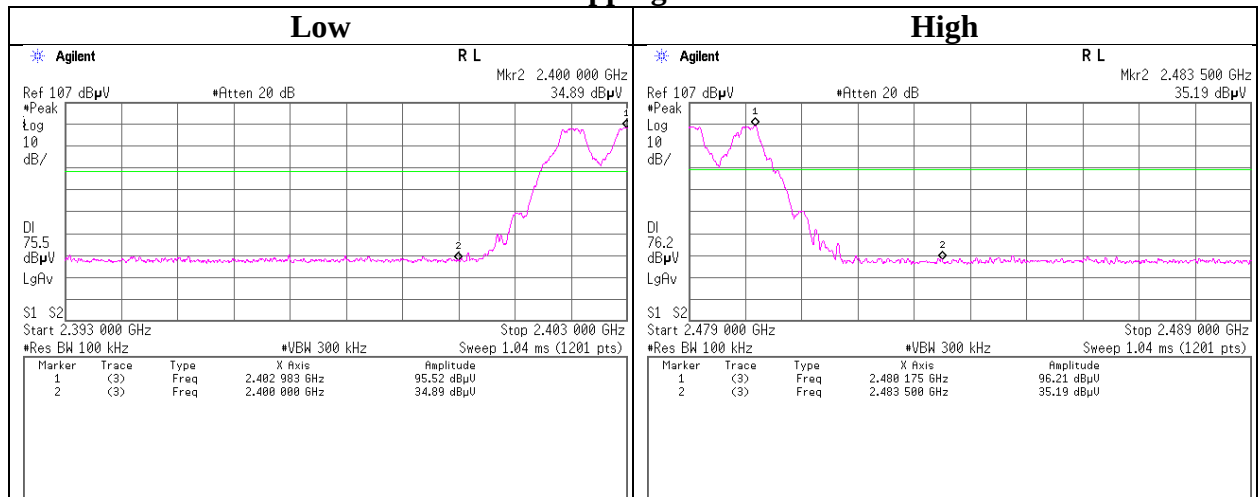
2480 MHz



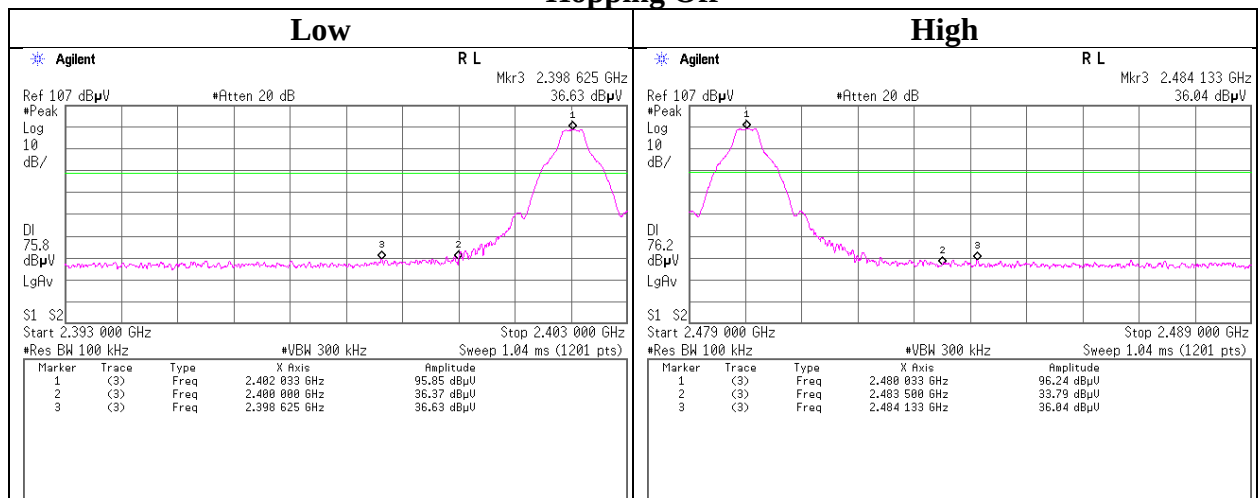
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11640275S-B-R1
Date	May 18, 2017
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Hikaru Shirasawa
Mode	Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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

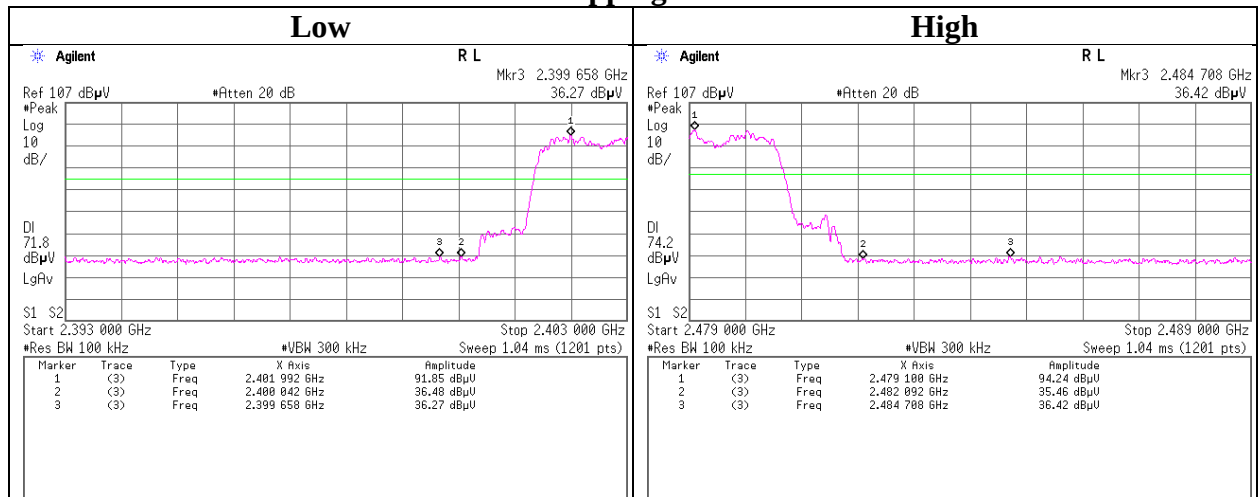
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

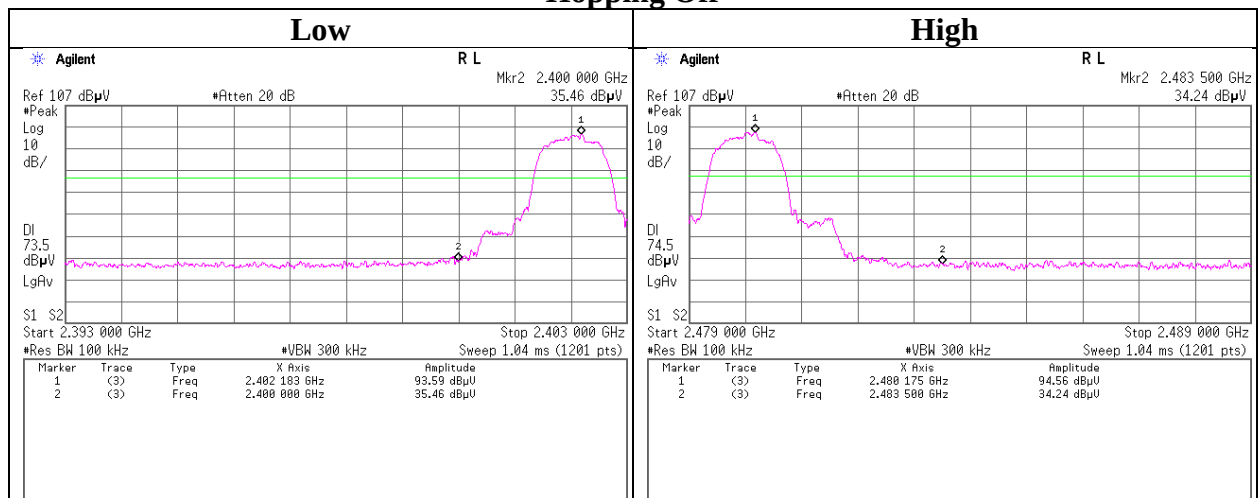
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11640275S-B-R1
Date	May 18, 2017
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Hikaru Shirasawa
Mode	Tx 3DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

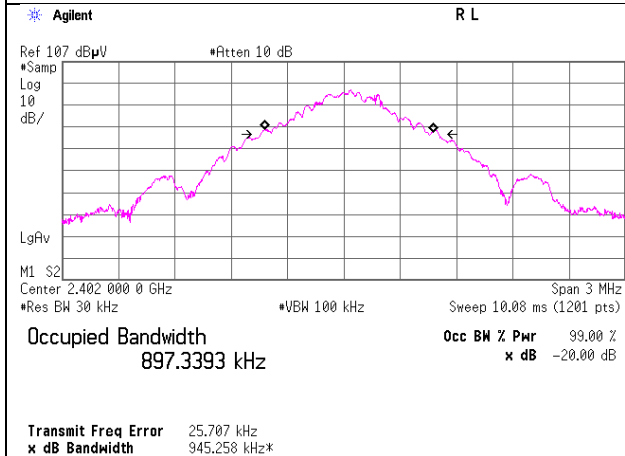
Facsimile : +81 463 50 6401

99%Occupied Bandwidth

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11640275S-B-R1
Date : May 18, 2017
Temperature / Humidity : 25 deg. C / 52 % RH
Engineer : Hikaru Shirasawa
Mode : Tx, Hopping Off

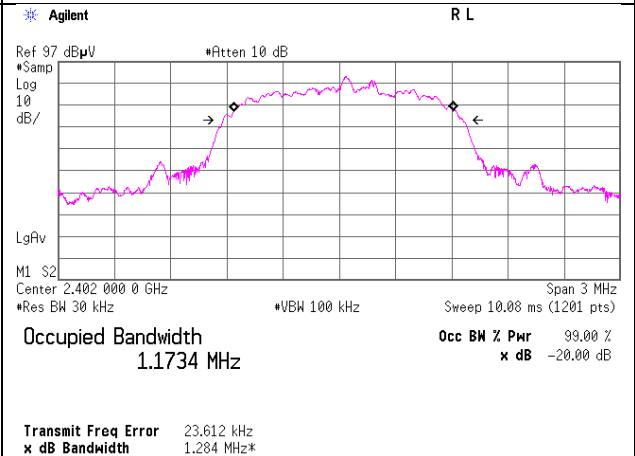
Hopping Off, DH5

2402 MHz

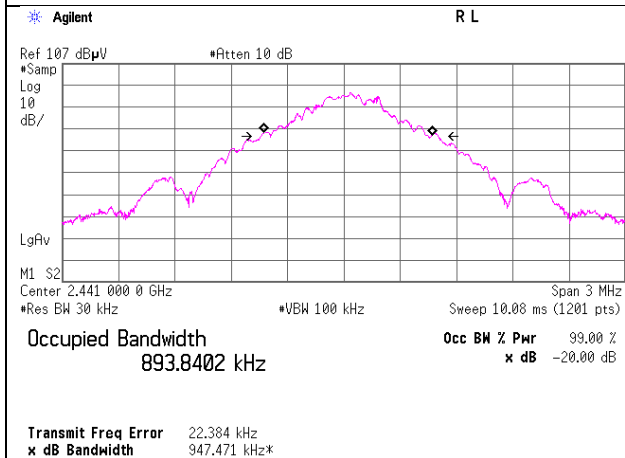


Hopping Off, 3DH5

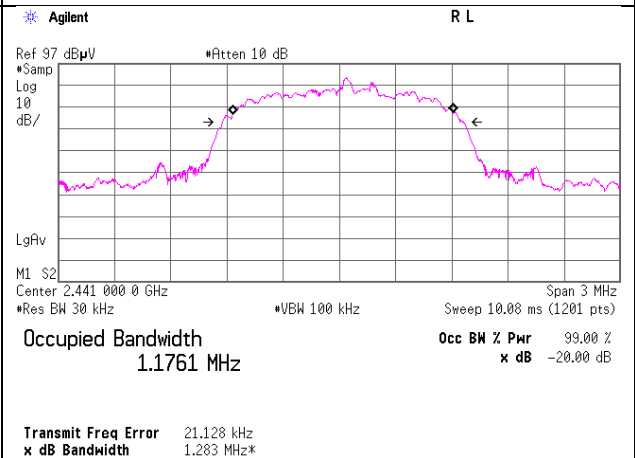
2402 MHz



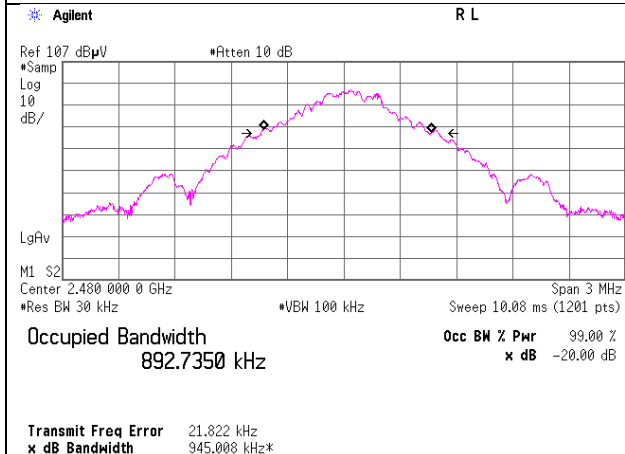
2441 MHz



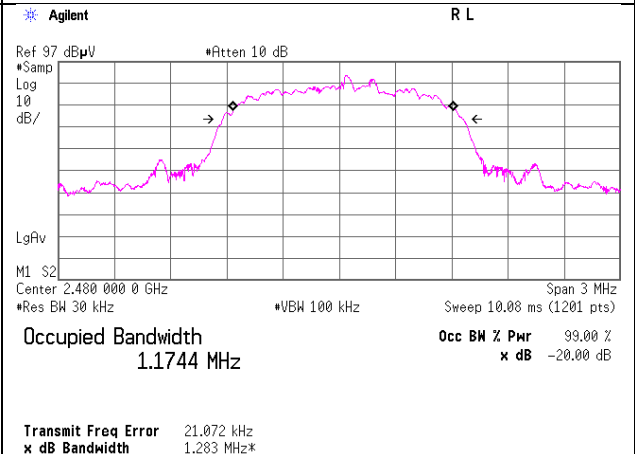
2441 MHz



2480 MHz



2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

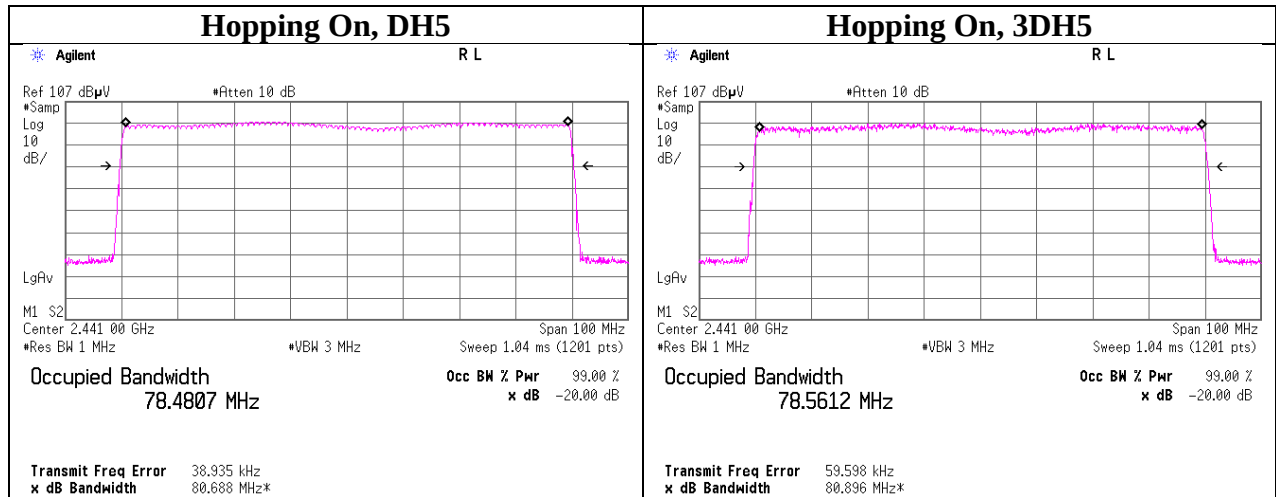
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11640275S-B-R1
Date	May 18, 2017
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Hikaru Shirasawa
Mode	Tx, Hopping On



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2017/02/17 * 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	2016/05/11 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000NF SNMS/B	1612S006	RE	2017/01/08 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2016/08/09 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	RE	2016/10/24 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE,CE	-
SAEC-02(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2016/07/22 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE,CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE,CE	2017/03/08 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2016/11/07 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 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	2016/09/27 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2017/04/20 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2017/03/23 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2017/02/09 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2017/02/09 * 12
KAT3-10	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2016/07/26 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2016/11/23 * 12
SCC-B1/B3/B5/ B7/B8/B13/SRS E-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/141 PE/141PE/141PE/14 1PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SCC-B2/B4/B6/ B7/B8/B13/SRS E-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/141 PE/141PE/141PE/14 1PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	RE	2017/01/05 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2017/04/12 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2016/07/13 * 12
SCC-B12/B13/S RSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS 4906	-/0901-270(RF Selector)	CE	2017/04/07 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2017/02/27 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2017/02/09 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2016/12/13 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	CE	2016/09/28 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2016/09/26 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2017/03/23 * 12
SAT10-12	Attenuator	Weinschel Corp.	54A-10	81601	AT	2017/03/23 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2017/04/25 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2017/04/25 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 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

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