



RADIO TEST REPORT

Test Report No. : 11483196S-A

Applicant : **Panasonic Corporation**
Type of Equipment : **Car Audio System**
Model No. : **AT1607**
FCC ID : **ACJ932AT1607**
Test regulation : **FCC Part 15 Subpart C: 2016**
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)

Date of test:

November 10, 2015
October 12 to 14, 2016

Representative test engineer:


Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:


Makoto Hosaka
Engineer
Consumer Technology Division



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

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

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Radiated Spurious Emission	12
SECTION 6: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Test data	14
20dB Bandwidth and Carrier Frequency Separation.....	14
Number of Hopping Frequency	17
Dwell time.....	19
Maximum Peak Output Power	22
Average Output Power	23
Radiated Spurious Emission	25
Conducted Spurious Emission	36
Conducted Emission Band Edge compliance	42
99%Occupied Bandwidth	44
APPENDIX 2: Test instruments	46
APPENDIX 3: Photographs of test setup	47

SECTION 1: Customer information

Company Name : Panasonic Corporation
Address : 4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-city, 224-8520, Japan
Telephone Number : +81-50-3380-3285
Contact Person : Kohei Tanaka

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

2.1 Identification of E.U.T.

Type of Equipment : Car Audio System
Model No. : AT1607
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 13.2 V
Receipt Date of Sample : October 27, 2015 (AT1603)
October 12, 2016 (AT1607)
Country of Mass-production : Japan, Czech, Mexico, Thailand
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model: AT1607 (referred to as the EUT in this report) is a Car Audio System.

General Specification

Clock frequency(ies) in the system : 37 MHz, 48 MHz, 54.9 MHz, 194 MHz, 795 MHz, 1.56 GHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : FHSS
Power Supply (radio part input) : DC 3.3 V, DC 1.8 V
Antenna type : Dipole Antenna
Antenna gain with cable loss : 3.55 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

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 November 14, 2016, does not affect the test specification applied to the EUT.

*All the revisions made after testing date (November 10, 2015) 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	N/A	N/A	*1)
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1) IC: RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section 15.247(a)(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10		6.2 dB 658.570 MHz, QP, Hori. Tx, Hopping Off, 3DH5 2480 MHz	Complied

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

*1) The test is not applicable since the EUT has no AC mains.

*2) Radiated test was selected over 30 MHz based on section 15.247(d).

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

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (RF: 3.3 V, I/O: 1.8 V).

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 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	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

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

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

3.5 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
Inquiry

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping Off) DH5, 3DH5 Inquiry	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5 Inquiry	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5 Inquiry	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Inquiry	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>*EUT has the power settings by the software as follows; Power settings: Fixed Software (Firmware): D17517010700001V0, Ver. 1.0</p> <p>*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>		

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Car Audio System	AT1607	CV-DL57N0AJ No.500331	Panasonic Corporation	EUT
A'	Car Audio System	AT1603 (Display Separated Type (L2))	CV-DL56N0AJ No.13	Panasonic Corporation	EUT *1)
B	Steering SW	-	0009	-	-
C	IF-Box	CA-UL56X0AJ	3	Panasonic	-
D	USB Memory	SDK-USM4GL(B)	-	SONY	-
E	USB Memory	SDK-USM4GL(B)	-	SONY	-
F	Display	83290-48130	-	DENSO	-
G	Microphone	86730-20050	-	-	-
H	AMP	86280-76050	521343	Panasonic	-
I	RSE-ECU	CV-UL45H0AJ	-	Panasonic	-
J	DCM	86741-53054	-	DENSO	-
K	MEU	CN-SL56N0AJ	004	Panasonic	-
L	Jig Board	-	-	-	-

*1) For Antenna terminal conducted test, the result of AT1603 (Display Separate Type (L2)) is used since there is no difference in the radio block of AT1607 and AT1603 (Display Separate Type (L2)).

List of cables used

No.	Name	Length (m)	Cable Shield	Connector Shield	Remark
1-A	General-purpose	2.0	Unshielded	Unshielded	-
1-B	General-purpose	2.0	Unshielded	Unshielded	-
1-C	General-purpose	2.0	Unshielded	Unshielded	-
2	Radio/D-Radio antenna	2.0	Shielded	Shielded	-
3	XM antenna	2.0	Shielded	Shielded	-
4	AVC-LAN Step3	1.0	Unshielded	Unshielded	-
5	USB (IF-BOX)	1.0	Shielded	Shielded	-
6	GVIF	1.0	Shielded	Shielded	-
7	GVIF, USB from MEU	0.15	Unshielded	Unshielded	-
8	DC Power / Signal	1.0	Unshielded	Unshielded	-
9	DC Power	0.5	Unshielded	Unshielded	-
10	DC Power	1.0	Unshielded	Unshielded	-
11	Signal	1.0	Unshielded	Unshielded	-
12	DC Power / Signal	0.9	Unshielded	Unshielded	-
13	Signal	2.4	Unshielded	Unshielded	-
14	GVIF	1.0	Unshielded	Unshielded	-
15	Signal	2.0	Unshielded	Unshielded	-

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 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 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 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3 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: $20 \times \log(3.88 \text{ m}/3.0 \text{ m}) = 2.23 \text{ dB}$

*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 angle of 0 to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (30 deg.) that has the maximum noise.

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

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

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 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %.
*2) In the frequency range below 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)
*3) Reference data

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

Test data : APPENDIX
Test result : Pass

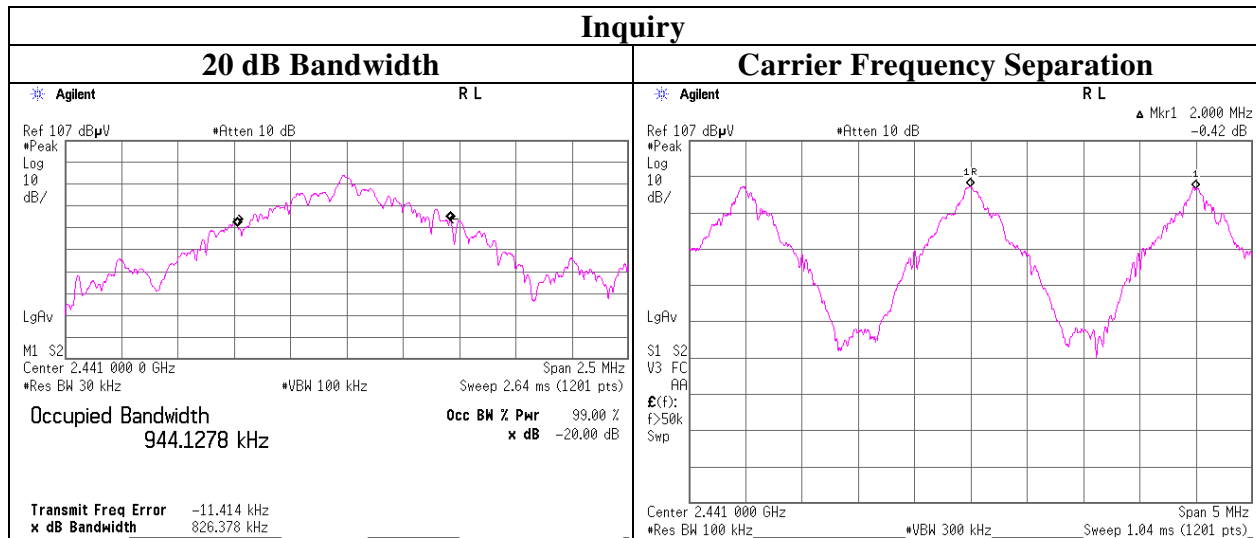
APPENDIX 1: Test data

20dB Bandwidth and Carrier Frequency Separation

Test place : Shonan EMC Lab. No.5 Shielded Room
 Report No. : 11483196S-A
 Date : November 10, 2015
 Temperature / Humidity : 25 deg. C / 44 % RH
 Engineer : Yosuke Ishikawa
 Mode : Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.970	1.000	≥ 0.646
DH5	2441.0	0.964	1.000	≥ 0.643
DH5	2480.0	0.973	1.000	≥ 0.649
3DH5	2402.0	1.295	1.000	≥ 0.863
3DH5	2441.0	1.301	1.000	≥ 0.867
3DH5	2480.0	1.297	1.000	≥ 0.865
Inquiry	2441.0	0.826	2.000	≥ 0.551

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



UL Japan, Inc.

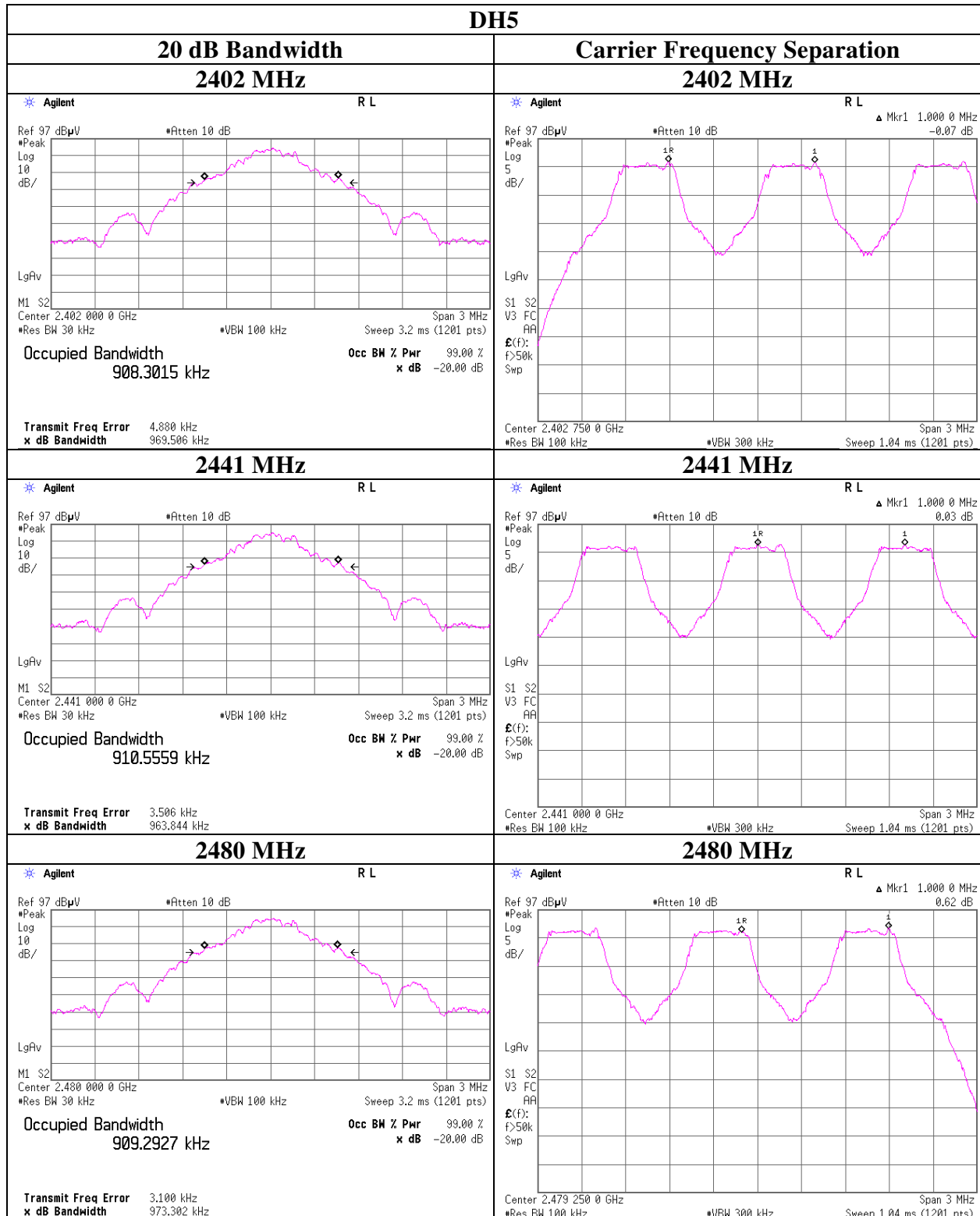
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20dB Bandwidth and Carrier Frequency Separation



UL Japan, Inc.

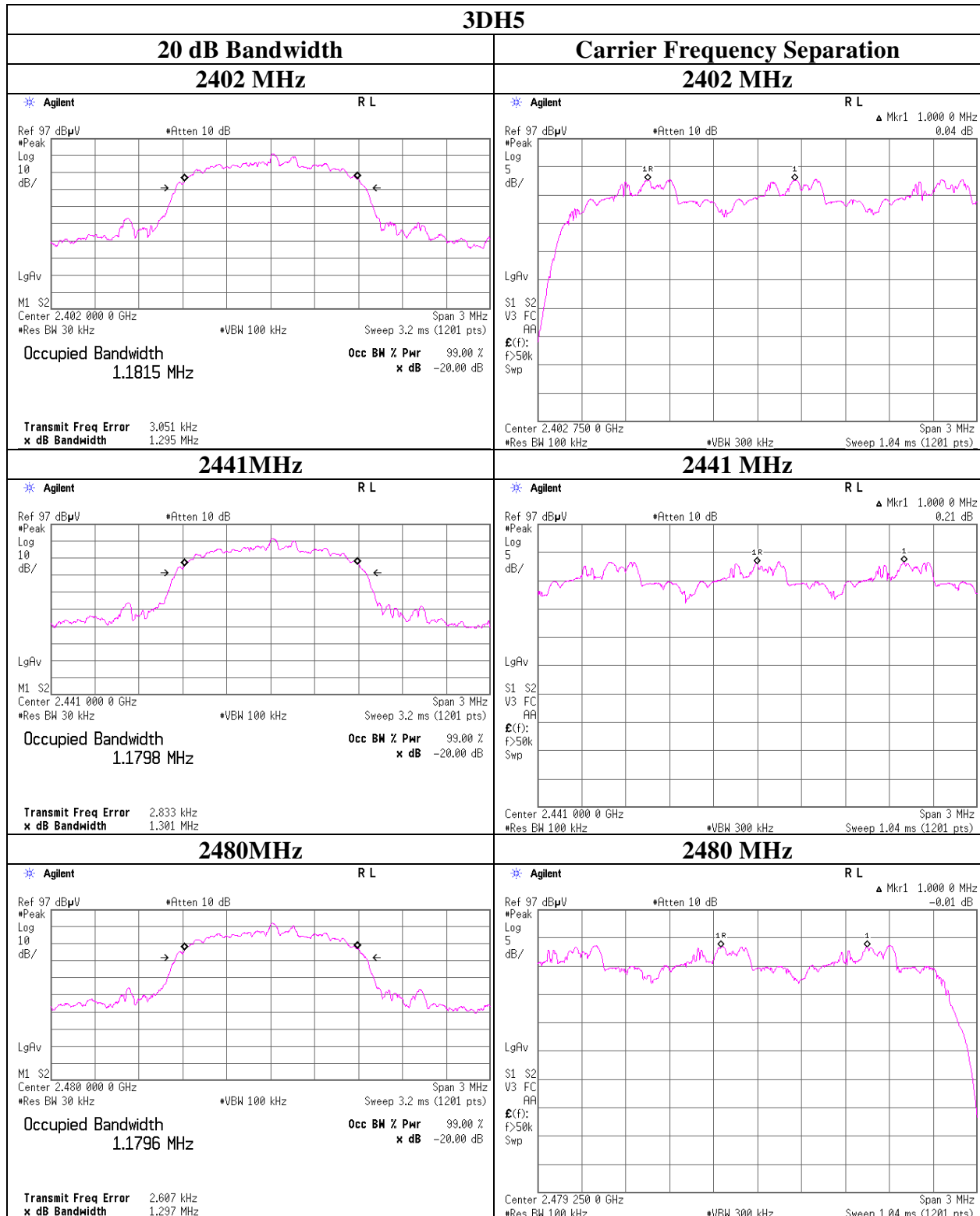
Shonan EMC Lab.

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

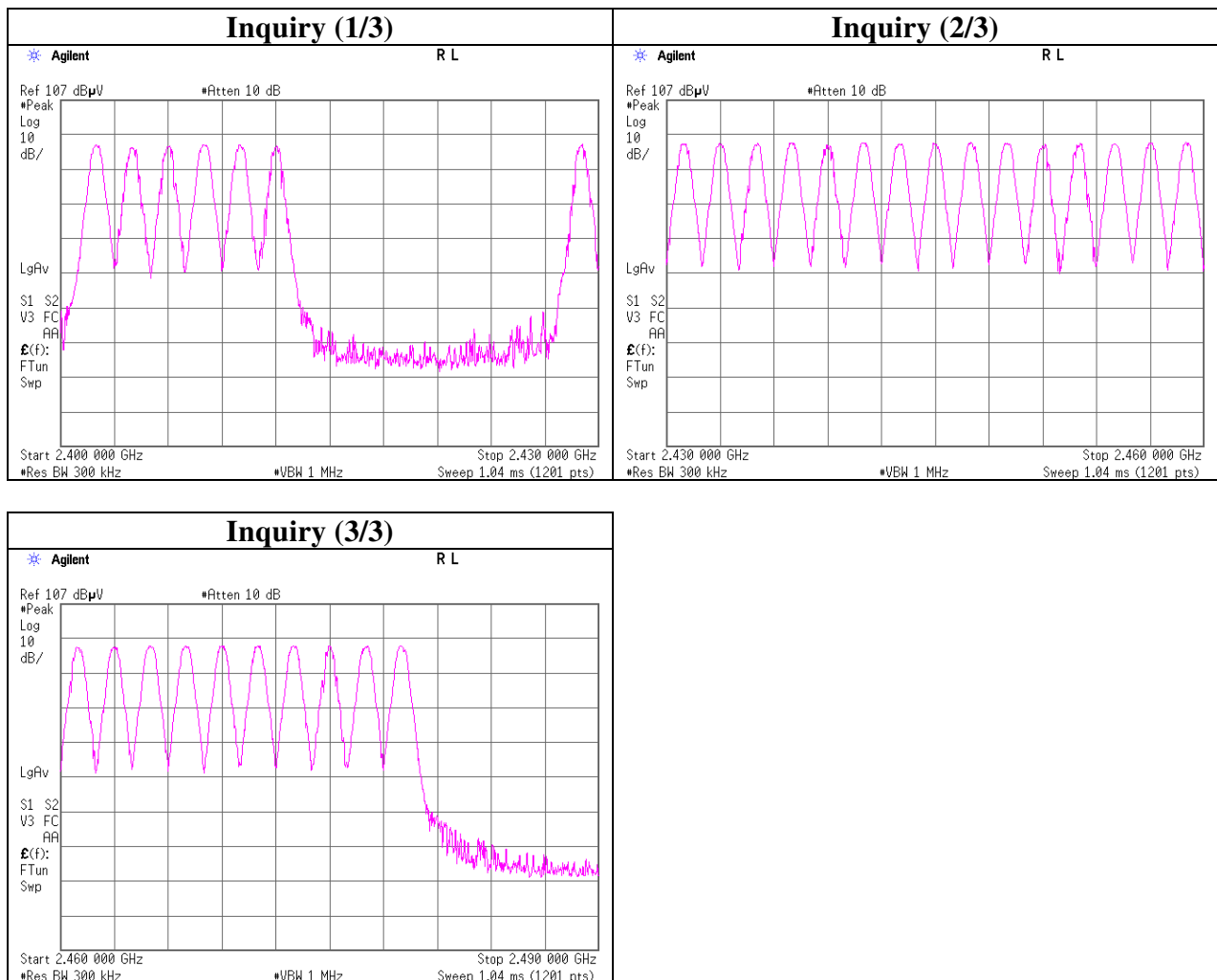
Facsimile : +81 463 50 6401

Number of Hopping Frequency

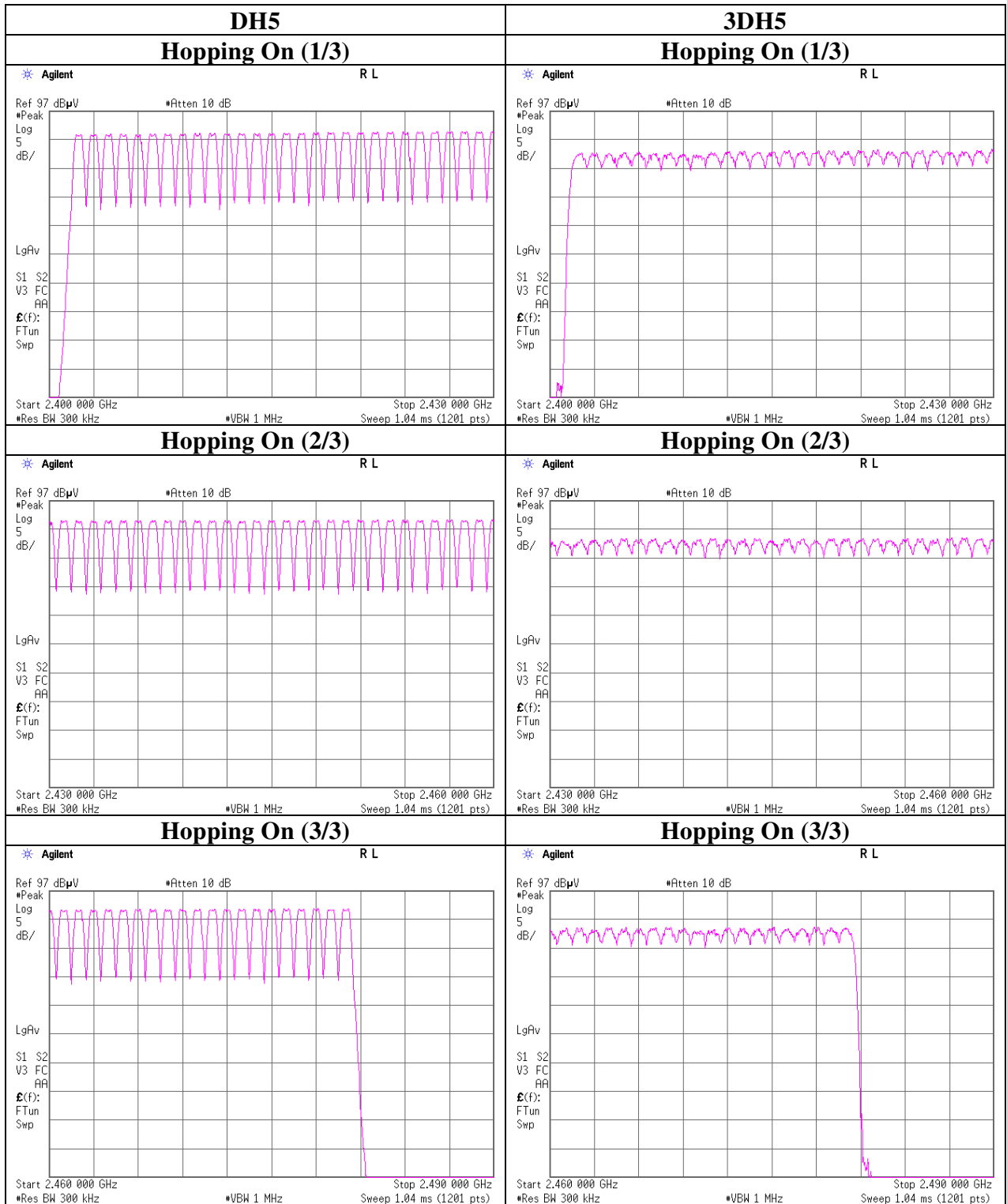
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On

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

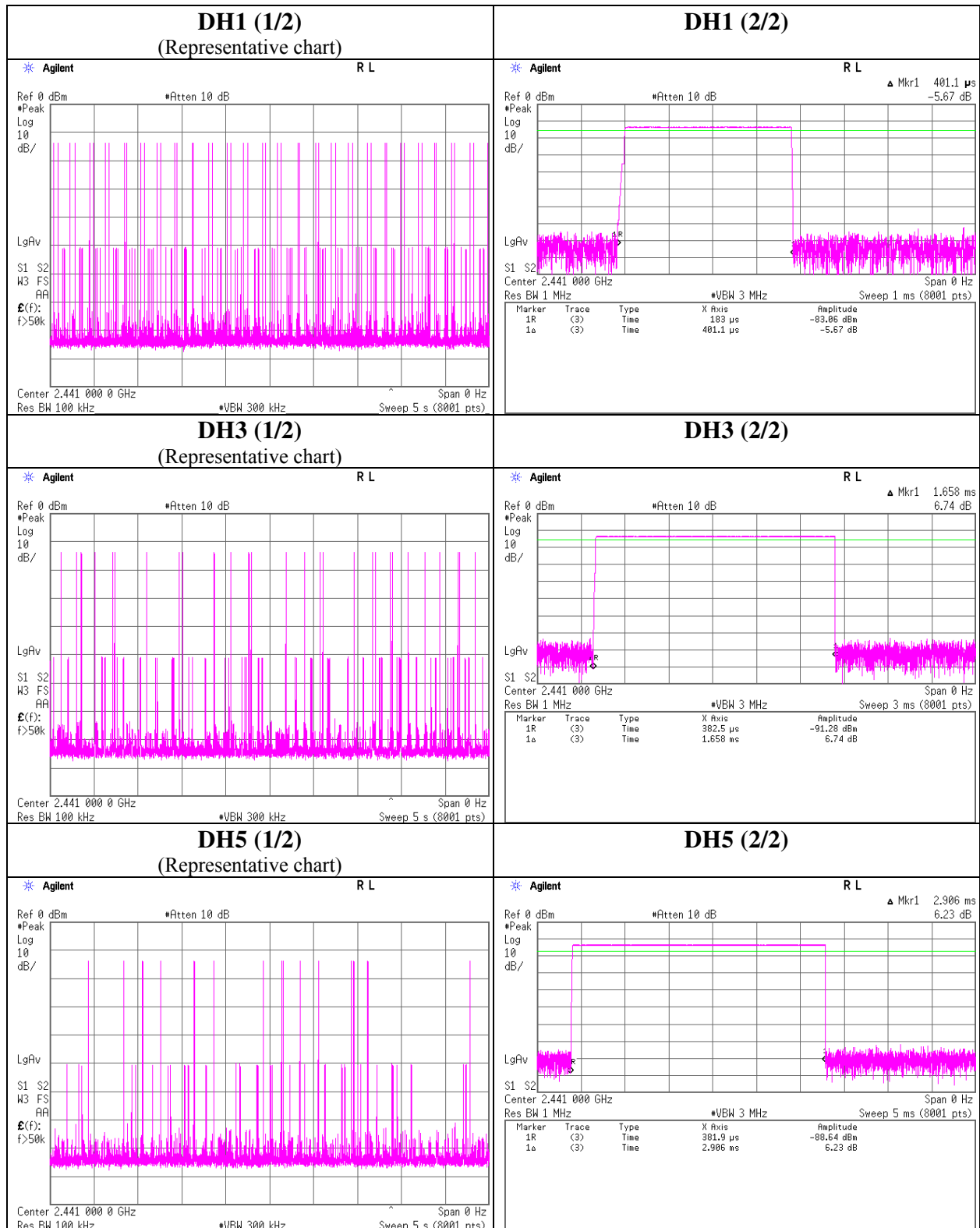
Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.



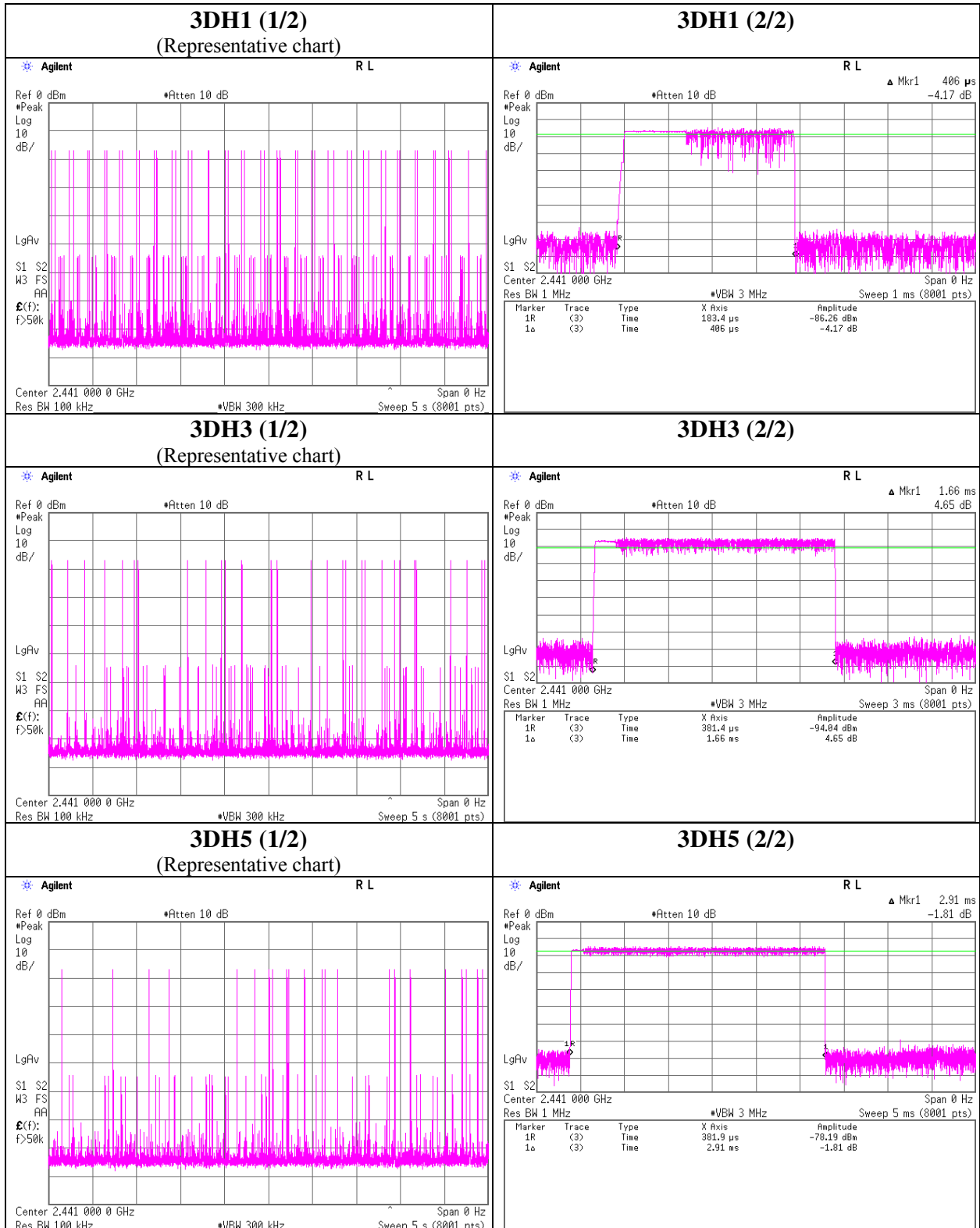
Number of Hopping Frequency



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. 11483196S-A
Date November 10, 2015
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Yosuke Ishikawa
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	-13.31	2.03	10.01	-1.27	0.75	20.96	125	22.23
DH5	2441.0	-12.88	2.04	10.01	-0.83	0.83	20.96	125	21.79
DH5	2480.0	-12.51	2.05	10.01	-0.45	0.90	20.96	125	21.41
2DH5	2402.0	-14.50	2.03	10.01	-2.46	0.57	20.96	125	23.42
2DH5	2441.0	-13.99	2.04	10.01	-1.94	0.64	20.96	125	22.90
2DH5	2480.0	-13.64	2.05	10.01	-1.58	0.70	20.96	125	22.54
3DH5	2402.0	-14.17	2.03	10.01	-2.13	0.61	20.96	125	23.09
3DH5	2441.0	-13.54	2.04	10.01	-1.49	0.71	20.96	125	22.45
3DH5	2480.0	-13.28	2.05	10.01	-1.22	0.76	20.96	125	22.18

Sample Calculation:

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

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

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

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

Average Output Power
(Reference data for RF Exposure)

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11483196S-A
Date : November 10, 2015
Temperature / Humidity : 25 deg. C / 44 % RH
Engineer : Yosuke Ishikawa
Mode : Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-15.36	2.03	10.01	-3.32	0.47	1.08	-2.24	0.60
DH5	2441.0	-14.75	2.04	10.01	-2.70	0.54	1.08	-1.62	0.69
DH5	2480.0	-14.42	2.05	10.01	-2.36	0.58	1.08	-1.28	0.74
2DH5	2402.0	-19.09	2.03	10.01	-7.05	0.20	1.09	-5.96	0.25
2DH5	2441.0	-18.48	2.04	10.01	-6.43	0.23	1.09	-5.34	0.29
2DH5	2480.0	-18.18	2.05	10.01	-6.12	0.24	1.09	-5.03	0.31
3DH5	2402.0	-19.09	2.03	10.01	-7.05	0.20	1.08	-5.97	0.25
3DH5	2441.0	-18.51	2.04	10.01	-6.46	0.23	1.08	-5.38	0.29
3DH5	2480.0	-18.20	2.05	10.01	-6.14	0.24	1.08	-5.06	0.31

Sample Calculation:

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

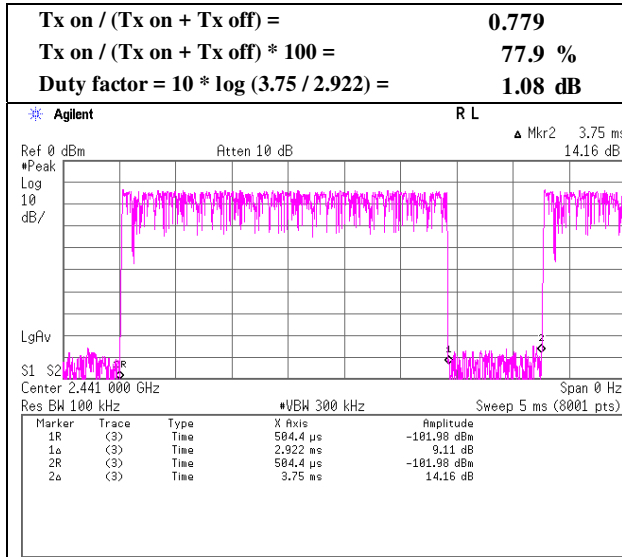
Result (Burst power) = Frame power + Duty factor

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

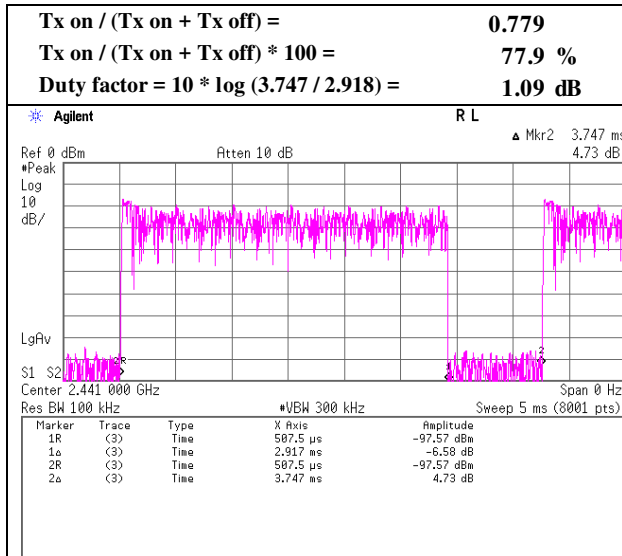
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off

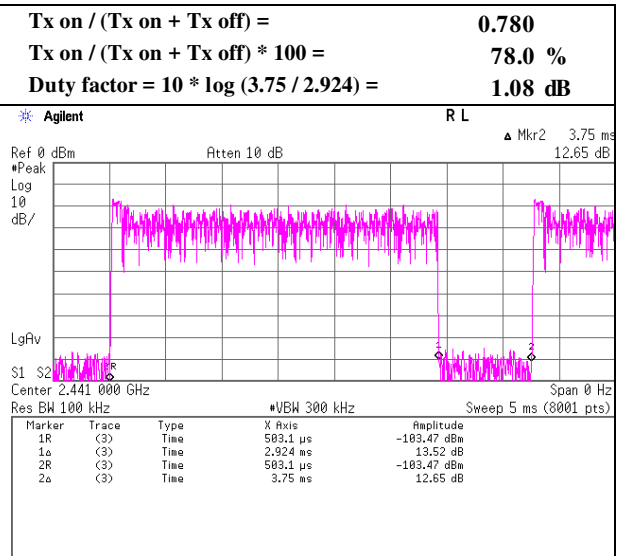
DH5



2DH5



3DH5



UL Japan, Inc.

Shonan EMC Lab.

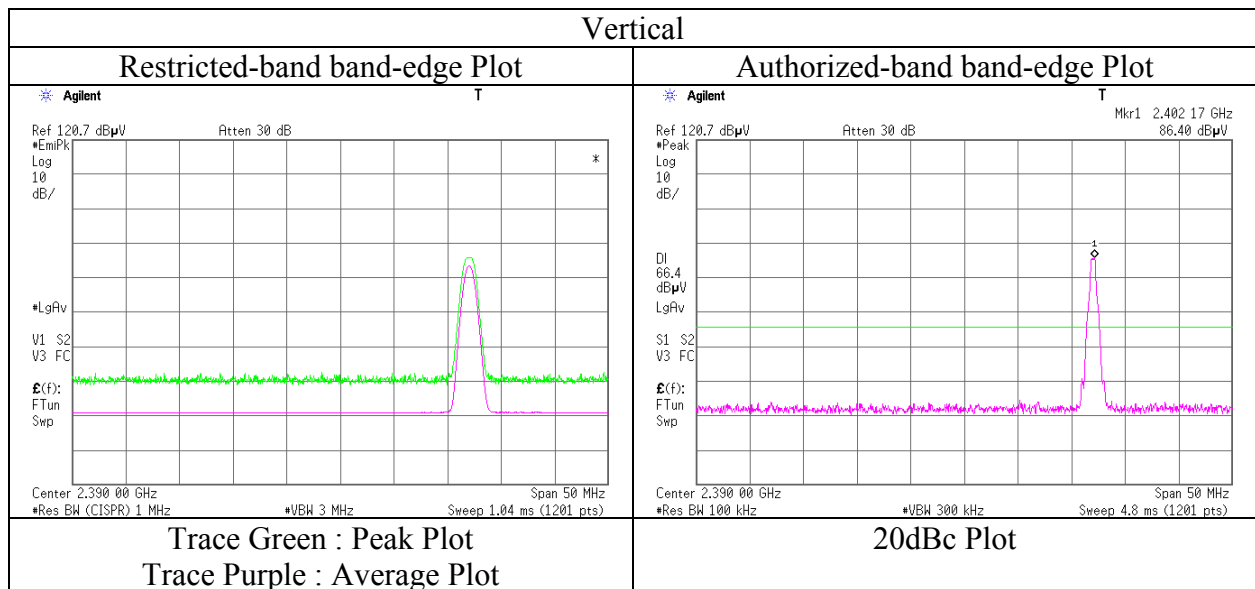
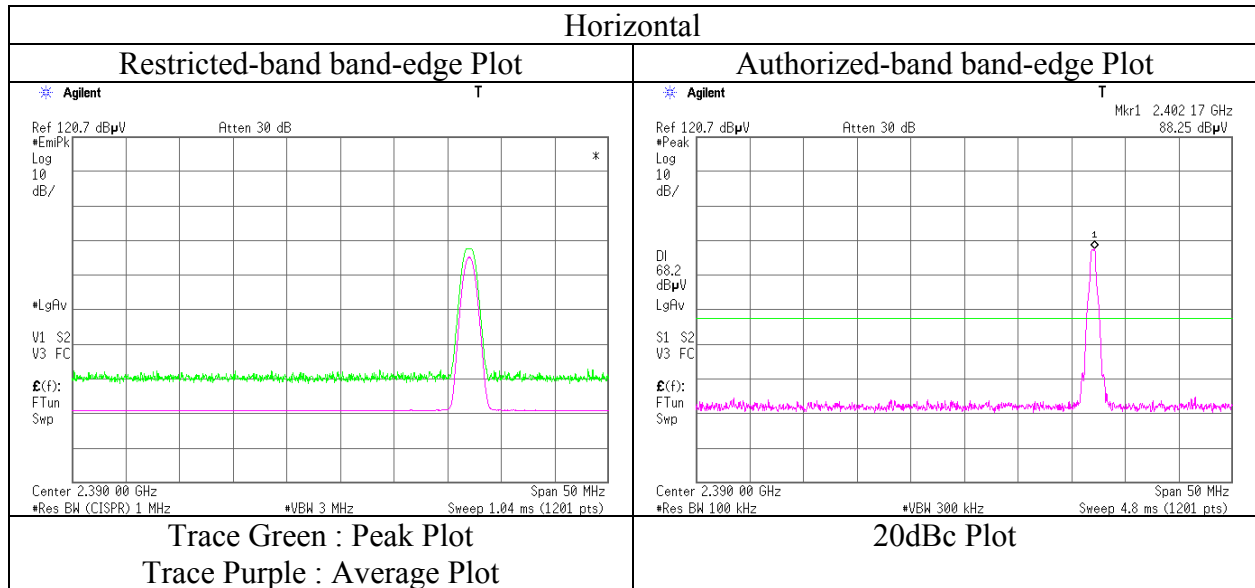
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11483196S-A
Date	October 12, 2016
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Hiroyuki Morikawa (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11483196S-A
Date : October 12, 2016 October 13, 2016 October 12, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 44 % RH 24 deg. C / 44 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki Hiroyuki Morikawa
(1 GHz -2.8 GHz) (30 MHz -1 GHz) (2.8 GHz - 13 GHz)
(13 GHz -18 GHz) (18 GHz -26.5 GHz)

Mode : Tx, Hopping Off, DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	372.064	QP	38.91	15.41	9.06	31.93	0.00	31.45	46.00	14.5	100	335	
Hori.	658.566	QP	41.41	19.71	10.21	31.93	0.00	39.40	46.00	6.6	168	185	
Hori.	737.274	QP	33.14	20.51	10.51	31.79	0.00	32.37	46.00	13.6	156	61	
Hori.	956.730	QP	32.09	22.67	11.21	30.54	0.00	35.43	46.00	10.5	100	250	
Hori.	960.260	QP	40.26	22.69	11.22	30.51	0.00	43.66	53.90	10.2	110	266	
Hori.	987.848	QP	40.08	22.86	11.30	30.31	0.00	43.93	53.90	9.9	100	206	
Hori.	3531.570	PK	54.29	28.81	5.68	41.33	2.23	49.68	73.90	24.2	219	174	
Hori.	4882.000	PK	49.83	31.29	5.97	41.39	2.23	47.93	73.90	25.9	100	0	
Hori.	7323.000	PK	49.33	36.77	7.36	41.25	2.23	54.44	73.90	19.4	100	0	
Hori.	9764.000	PK	48.23	38.75	8.35	40.41	2.23	57.15	73.90	16.7	100	0	
Hori.	12205.000	PK	47.67	39.30	9.57	39.79	2.23	58.98	73.90	14.9	100	0	
Hori.	3531.570	AV	48.63	28.81	5.68	41.33	2.23	44.02	53.90	9.8	219	174	
Hori.	4882.000	AV	37.35	31.29	5.97	41.39	2.23	35.45	53.90	18.4	100	0	
Hori.	7323.000	AV	36.59	36.77	7.36	41.25	2.23	41.70	53.90	12.2	100	0	
Hori.	9764.000	AV	35.88	38.75	8.35	40.41	2.23	44.80	53.90	9.1	100	0	
Hori.	12205.000	AV	35.42	39.30	9.57	39.79	2.23	46.73	53.90	7.1	100	0	
Vert.	637.819	QP	34.32	19.44	10.13	31.94	0.00	31.95	46.00	14.0	100	309	
Vert.	658.565	QP	39.69	19.71	10.21	31.93	0.00	37.68	46.00	8.3	100	200	
Vert.	666.117	QP	33.88	19.80	10.25	31.91	0.00	32.02	46.00	13.9	100	170	
Vert.	797.273	QP	29.14	20.95	10.69	31.58	0.00	29.20	46.00	16.8	100	34	
Vert.	956.729	QP	30.01	22.67	11.21	30.54	0.00	33.35	46.00	12.6	100	48	
Vert.	960.262	QP	41.79	22.69	11.22	30.51	0.00	45.19	53.90	8.7	152	329	
Vert.	3531.577	PK	54.19	28.81	5.68	41.33	2.23	49.58	73.90	24.3	144	21	
Vert.	4882.000	PK	49.11	31.29	5.97	41.39	2.23	47.21	73.90	26.6	100	0	
Vert.	7323.000	PK	49.23	36.77	7.36	41.25	2.23	54.34	73.90	19.5	100	0	
Vert.	9764.000	PK	48.26	38.75	8.35	40.41	2.23	57.18	73.90	16.7	100	0	
Vert.	12205.000	PK	47.94	39.30	9.57	39.79	2.23	59.25	73.90	14.6	100	0	
Vert.	3531.577	AV	48.77	28.81	5.68	41.33	2.23	44.16	53.90	9.7	144	21	
Vert.	4882.000	AV	37.22	31.29	5.97	41.39	2.23	35.32	53.90	18.5	100	0	
Vert.	7323.000	AV	36.56	36.77	7.36	41.25	2.23	41.67	53.90	12.2	100	0	
Vert.	9764.000	AV	35.88	38.75	8.35	40.41	2.23	44.80	53.90	9.1	100	0	
Vert.	12205.000	AV	35.41	39.30	9.57	39.79	2.23	46.72	53.90	7.1	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.23 dB

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

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11483196S-A
Date : October 12, 2016 October 13, 2016 October 12, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 44 % RH 24 deg. C / 44 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki Hiroyuki Morikawa
(1 GHz -2.8 GHz) (30 MHz -1 GHz) (2.8 GHz – 13 GHz)
(13 GHz-18 GHz) (18 GHz -26.5 GHz)

Mode : Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	372.070	QP	38.86	15.41	9.06	31.93	0.00	31.40	46.00	14.6	100	336	
Hori.	658.571	QP	41.62	19.71	10.21	31.93	0.00	39.61	46.00	6.3	160	179	
Hori.	737.273	QP	33.38	20.51	10.51	31.79	0.00	32.61	46.00	13.3	153	65	
Hori.	956.729	QP	32.58	22.67	11.21	30.54	0.00	35.92	46.00	10.0	100	249	
Hori.	987.855	QP	40.12	22.86	11.30	30.31	0.00	43.97	53.90	9.9	100	204	
Hori.	2483.500	PK	45.08	27.79	13.91	36.85	2.23	52.16	73.90	21.7	148	310	
Hori.	3531.571	PK	54.37	28.81	5.68	41.33	2.23	49.76	73.90	24.1	223	173	
Hori.	4960.000	PK	49.53	31.45	5.98	41.23	2.23	47.96	73.90	25.9	124	5	
Hori.	7440.000	PK	49.05	37.11	7.33	41.37	2.23	54.35	73.90	19.5	100	0	
Hori.	9920.000	PK	47.33	38.87	8.38	40.32	2.23	56.49	73.90	17.4	100	0	
Hori.	12400.000	PK	47.05	39.32	9.57	39.71	2.23	58.46	73.90	15.4	100	0	
Hori.	2483.500	AV	32.93	27.79	13.91	36.85	2.23	40.01	53.90	13.8	148	310	
Hori.	3531.571	AV	48.99	28.81	5.68	41.33	2.23	44.38	53.90	9.5	223	173	
Hori.	4960.000	AV	37.82	31.45	5.98	41.23	2.23	36.25	53.90	17.6	124	5	
Hori.	7440.000	AV	36.53	37.11	7.33	41.37	2.23	41.83	53.90	12.0	100	0	
Hori.	9920.000	AV	35.00	38.87	8.38	40.32	2.23	44.16	53.90	9.7	100	0	
Hori.	12400.000	AV	35.17	39.32	9.57	39.71	2.23	46.58	53.90	7.3	100	0	
Vert.	637.823	QP	34.91	19.44	10.13	31.94	0.00	32.54	46.00	13.4	100	308	
Vert.	658.578	QP	40.48	19.71	10.21	31.93	0.00	38.47	46.00	7.5	100	199	
Vert.	835.571	QP	29.91	21.45	10.81	31.41	0.00	30.76	46.00	15.2	100	38	
Vert.	933.872	QP	27.21	22.53	11.14	30.74	0.00	30.14	46.00	15.8	100	6	
Vert.	956.731	QP	30.07	22.67	11.21	30.54	0.00	33.41	46.00	12.5	100	48	
Vert.	960.257	QP	39.45	22.69	11.22	30.51	0.00	42.85	53.90	11.0	143	328	
Vert.	987.851	QP	39.04	22.86	11.30	30.31	0.00	42.89	53.90	11.0	122	196	
Vert.	2483.500	PK	44.65	27.79	13.91	36.85	2.23	51.73	73.90	22.1	265	47	
Vert.	3531.555	PK	54.33	28.81	5.68	41.33	2.23	49.72	73.90	24.1	145	28	
Vert.	4960.000	PK	50.68	31.45	5.98	41.23	2.23	49.11	73.90	24.7	100	0	
Vert.	7440.000	PK	48.82	37.11	7.33	41.37	2.23	54.12	73.90	19.7	100	0	
Vert.	9920.000	PK	48.26	38.87	8.38	40.32	2.23	57.42	73.90	16.4	100	0	
Vert.	12400.000	PK	47.08	39.32	9.57	39.71	2.23	58.49	73.90	15.4	100	0	
Vert.	2483.500	AV	32.95	27.79	13.91	36.85	2.23	40.03	53.90	13.8	265	47	
Vert.	3531.555	AV	48.79	28.81	5.68	41.33	2.23	44.18	53.90	9.7	145	28	
Vert.	4960.000	AV	37.56	31.45	5.98	41.23	2.23	35.99	53.90	17.9	100	0	
Vert.	7440.000	AV	36.59	37.11	7.33	41.37	2.23	41.89	53.90	12.0	100	0	
Vert.	9920.000	AV	35.41	38.87	8.38	40.32	2.23	44.57	53.90	9.3	100	0	
Vert.	12400.000	AV	35.21	39.32	9.57	39.71	2.23	46.62	53.90	7.2	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88 \text{ m} / 3.0 \text{ m}) = 2.23 \text{ dB}$

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.

UL Japan, Inc.

Shonan EMC Lab.

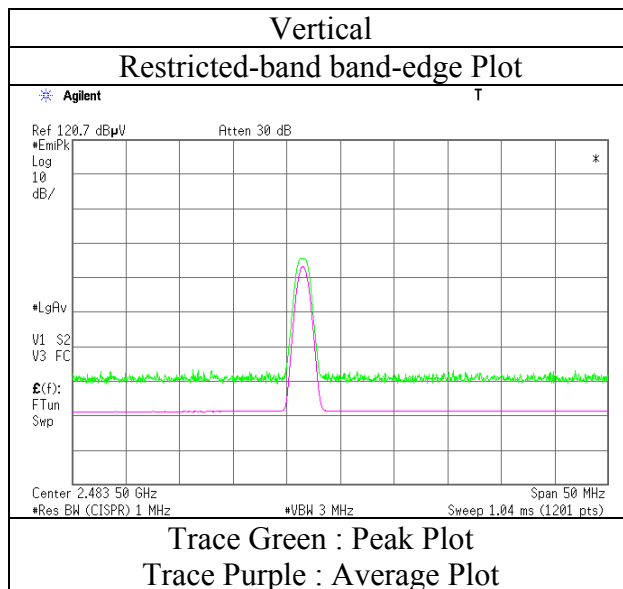
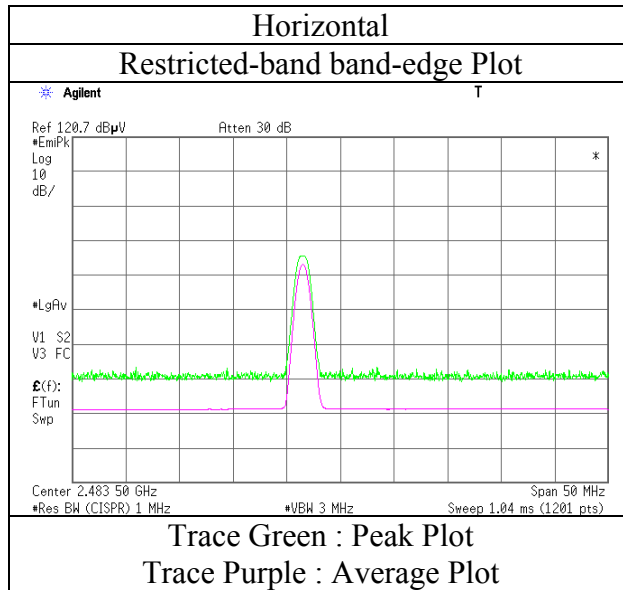
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11483196S-A
Date	October 12, 2016
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Hiroyuki Morikawa (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11483196S-A
Date : October 12, 2016 October 13, 2016 October 12, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 44 % RH 24 deg. C / 44 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki Hiroyuki Morikawa
(1 GHz -2.8 GHz) (30 MHz -1 GHz) (2.8 GHz - 13 GHz)
(13 GHz-18 GHz) (18 GHz -26.5 GHz)

Mode : Tx, Hopping Off, 3DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	372.072	QP	38.97	15.41	9.06	31.93	0.00	31.51	46.00	14.4	100	333	
Hori.	658.574	QP	41.51	19.71	10.21	31.93	0.00	39.50	46.00	6.5	168	179	
Hori.	737.273	QP	33.55	20.51	10.51	31.79	0.00	32.78	46.00	13.2	151	66	
Hori.	956.729	QP	32.59	22.67	11.21	30.54	0.00	35.93	46.00	10.0	100	252	
Hori.	960.268	QP	39.91	22.69	11.22	30.51	0.00	43.31	53.90	10.5	113	266	
Hori.	987.854	QP	39.03	22.86	11.30	30.31	0.00	42.88	53.90	11.0	100	202	
Hori.	2390.000	PK	44.53	27.41	13.82	36.87	2.23	51.12	73.90	22.7	256	356	
Hori.	3531.535	PK	54.47	28.81	5.68	41.33	2.23	49.86	73.90	24.0	224	172	
Hori.	4804.000	PK	49.56	31.13	5.95	41.54	2.23	47.33	73.90	26.5	100	0	
Hori.	7206.000	PK	48.52	36.44	7.38	41.12	2.23	53.45	73.90	20.4	100	0	
Hori.	9608.000	PK	48.55	38.63	8.32	40.49	2.23	57.24	73.90	16.6	100	0	
Hori.	12010.000	PK	47.52	39.28	9.57	39.88	2.23	58.72	73.90	15.1	100	0	
Hori.	2390.000	AV	32.94	27.41	13.82	36.87	2.23	39.53	53.90	14.3	256	356	
Hori.	3531.535	AV	49.66	28.81	5.68	41.33	2.23	45.05	53.90	8.8	224	172	
Hori.	4804.000	AV	37.29	31.13	5.95	41.54	2.23	35.06	53.90	18.8	100	0	
Hori.	7206.000	AV	36.29	36.44	7.38	41.12	2.23	41.22	53.90	12.6	100	0	
Hori.	9608.000	AV	36.01	38.63	8.32	40.49	2.23	44.70	53.90	9.2	100	0	
Hori.	12010.000	AV	35.20	39.28	9.57	39.88	2.23	46.40	53.90	7.5	100	0	
Vert.	637.821	QP	34.64	19.44	10.13	31.94	0.00	32.27	46.00	13.7	100	309	
Vert.	658.573	QP	39.58	19.71	10.21	31.93	0.00	37.57	46.00	8.4	100	198	
Vert.	666.119	QP	34.58	19.80	10.25	31.91	0.00	32.72	46.00	13.2	100	172	
Vert.	835.573	QP	30.02	21.45	10.81	31.41	0.00	30.87	46.00	15.1	100	36	
Vert.	956.731	QP	30.21	22.67	11.21	30.54	0.00	33.55	46.00	12.4	100	47	
Vert.	960.262	QP	38.19	22.69	11.22	30.51	0.00	41.59	53.90	12.3	155	326	
Vert.	2390.000	PK	45.35	27.41	13.82	36.87	2.23	51.94	73.90	21.9	317	54	
Vert.	3531.583	PK	54.26	28.81	5.68	41.33	2.23	49.65	73.90	24.2	145	25	
Vert.	4804.000	PK	59.78	31.13	5.95	41.54	2.23	57.55	73.90	16.3	100	0	
Vert.	7206.000	PK	48.74	36.44	7.38	41.12	2.23	53.67	73.90	20.2	100	0	
Vert.	9608.000	PK	48.09	38.63	8.32	40.49	2.23	56.78	73.90	17.1	100	0	
Vert.	12010.000	PK	48.74	39.28	9.57	39.88	2.23	59.94	73.90	13.9	100	0	
Vert.	2390.000	AV	32.89	27.41	13.82	36.87	2.23	39.48	53.90	14.4	317	54	
Vert.	3531.583	AV	48.92	28.81	5.68	41.33	2.23	44.31	53.90	9.5	145	25	
Vert.	4804.000	AV	37.33	31.13	5.95	41.54	2.23	35.10	53.90	18.8	100	0	
Vert.	7206.000	AV	36.27	36.44	7.38	41.12	2.23	41.20	53.90	12.7	100	0	
Vert.	9608.000	AV	35.98	38.63	8.32	40.49	2.23	44.67	53.90	9.2	100	0	
Vert.	12010.000	AV	35.12	39.28	9.57	39.88	2.23	46.32	53.90	7.5	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.23 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	85.43	27.46	13.83	36.87	2.23	92.08	-	-	Carrier
Hori.	2400.000	PK	36.63	27.45	13.83	36.87	2.23	43.27	72.08	28.8	
Vert.	2402.000	PK	83.36	27.46	13.83	36.87	2.23	90.01	-	-	Carrier
Vert.	2400.000	PK	35.99	27.45	13.83	36.87	2.23	42.63	70.01	27.4	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.23 dB

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

UL Japan, Inc.

Shonan EMC Lab.

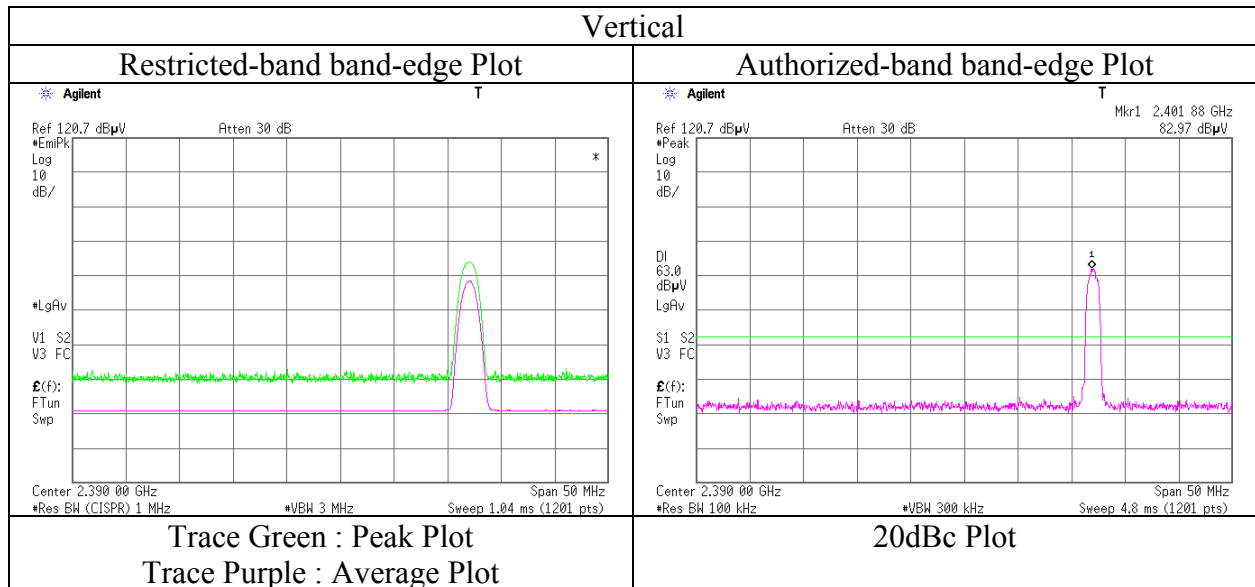
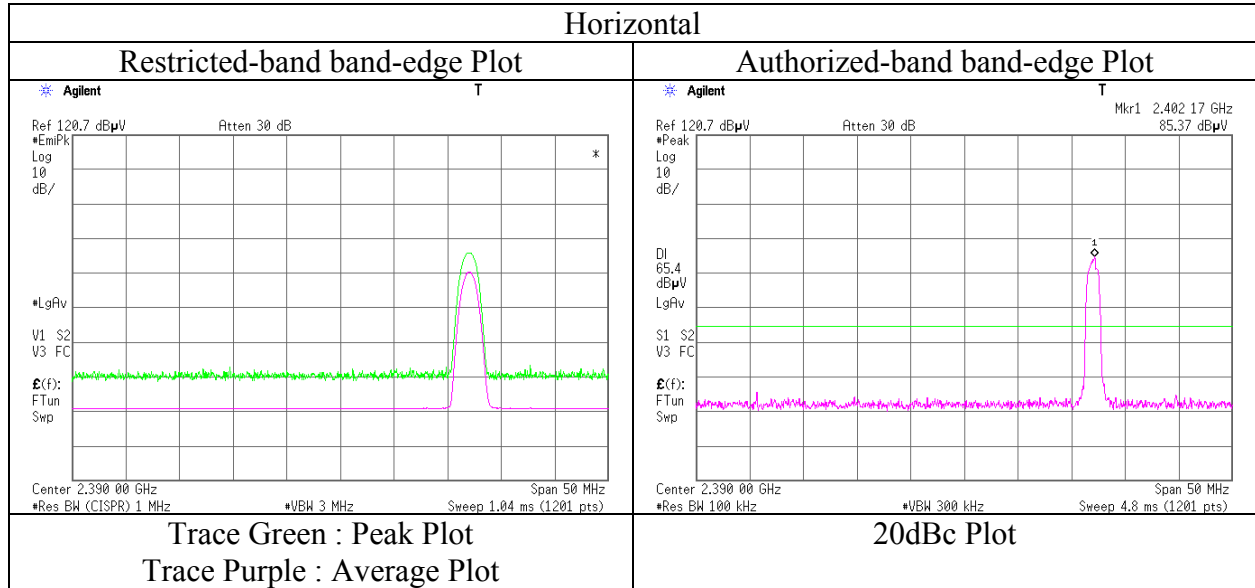
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11483196S-A
Date	October 12, 2016
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Hiroyuki Morikawa (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Test place Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. 11483196S-A
Date October 12, 2016 October 13, 2016 October 12, 2016
Temperature / Humidity 24 deg. C / 45 % RH 25 deg. C / 44 % RH 24 deg. C / 44 % RH
Engineer Hiroyuki Morikawa Yasumasa Owaki Hiroyuki Morikawa
(1 GHz -2.8 GHz) (30 MHz -1 GHz) (2.8 GHz – 13 GHz)
(13 GHz-18 GHz) (18 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	658.569	QP	41.46	19.71	10.21	31.93	0.00	39.45	46.00	6.5	171	180	
Hori.	737.274	QP	33.37	20.51	10.51	31.79	0.00	32.60	46.00	13.4	158	61	
Hori.	956.728	QP	32.66	22.67	11.21	30.54	0.00	36.00	46.00	10.0	100	250	
Hori.	960.258	QP	40.05	22.69	11.22	30.51	0.00	43.45	53.90	10.4	115	265	
Hori.	987.856	QP	38.94	22.86	11.30	30.31	0.00	42.79	53.90	11.1	100	204	
Hori.	3531.551	PK	54.30	28.81	5.68	41.33	2.23	49.69	73.90	24.2	224	174	
Hori.	4882.000	PK	49.93	31.29	5.97	41.39	2.23	48.03	73.90	25.8	100	0	
Hori.	7323.000	PK	49.17	36.77	7.36	41.25	2.23	54.28	73.90	19.6	100	0	
Hori.	9764.000	PK	48.84	38.75	8.35	40.41	2.23	57.76	73.90	16.1	100	0	
Hori.	12205.000	PK	47.80	39.30	9.57	39.79	2.23	59.11	73.90	14.7	100	0	
Hori.	3531.551	AV	49.15	28.81	5.68	41.33	2.23	44.54	53.90	9.3	224	174	
Hori.	4882.000	AV	37.42	31.29	5.97	41.39	2.23	35.52	53.90	18.3	100	0	
Hori.	7323.000	AV	36.56	36.77	7.36	41.25	2.23	41.67	53.90	12.2	100	0	
Hori.	9764.000	AV	35.89	38.75	8.35	40.41	2.23	44.81	53.90	9.0	100	0	
Hori.	12205.000	AV	35.44	39.30	9.57	39.79	2.23	46.75	53.90	7.1	100	0	
Vert.	637.818	QP	34.72	19.44	10.13	31.94	0.00	32.35	46.00	13.6	100	308	
Vert.	658.575	QP	40.09	19.71	10.21	31.93	0.00	38.08	46.00	7.9	100	201	
Vert.	749.562	QP	31.37	20.60	10.55	31.78	0.00	30.74	46.00	15.2	100	59	
Vert.	851.150	QP	29.47	21.66	10.85	31.33	0.00	30.65	46.00	15.3	100	201	
Vert.	956.727	QP	30.15	22.67	11.21	30.54	0.00	33.49	46.00	12.5	100	48	
Vert.	960.258	QP	38.61	22.69	11.22	30.51	0.00	42.01	53.90	11.8	157	326	
Vert.	987.854	QP	37.60	22.86	11.30	30.31	0.00	41.45	53.90	12.4	124	194	
Vert.	3531.500	PK	54.10	28.81	5.68	41.33	2.23	49.49	73.90	24.4	130	24	
Vert.	4882.000	PK	49.30	31.29	5.97	41.39	2.23	47.40	73.90	26.5	100	0	
Vert.	7323.000	PK	49.26	36.77	7.36	41.25	2.23	54.37	73.90	19.5	100	0	
Vert.	9764.000	PK	47.88	38.75	8.35	40.41	2.23	56.80	73.90	17.1	100	0	
Vert.	12205.000	PK	47.74	39.30	9.57	39.79	2.23	59.05	73.90	14.8	100	0	
Vert.	3531.500	AV	49.07	28.81	5.68	41.33	2.23	44.46	53.90	9.4	130	24	
Vert.	4882.000	AV	37.11	31.29	5.97	41.39	2.23	35.21	53.90	18.6	100	0	
Vert.	7323.000	AV	36.55	36.77	7.36	41.25	2.23	41.66	53.90	12.2	100	0	
Vert.	9764.000	AV	35.87	38.75	8.35	40.41	2.23	44.79	53.90	9.1	100	0	
Vert.	12205.000	AV	35.42	39.30	9.57	39.79	2.23	46.73	53.90	7.1	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.23 dB

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

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11483196S-A
Date : October 12, 2016 October 13, 2016 October 12, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 44 % RH 24 deg. C / 44 % RH
Engineer : Hiroyuki Morikawa Yasumasa Owaki Hiroyuki Morikawa
(1 GHz -2.8 GHz) (30 MHz -1 GHz) (2.8 GHz – 13 GHz)
(13 GHz-18 GHz) (18 GHz -26.5 GHz)

Mode : Tx, Hopping Off, 3DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	658.570	QP	41.75	19.71	10.21	31.93	0.00	39.74	46.00	6.2	165	180	
Hori.	737.274	QP	33.35	20.51	10.51	31.79	0.00	32.58	46.00	13.4	157	63	
Hori.	749.560	QP	31.76	20.60	10.55	31.78	0.00	31.13	46.00	14.8	153	64	
Hori.	946.167	QP	23.66	22.60	11.18	30.63	0.00	26.81	46.00	19.1	100	131	
Hori.	956.727	QP	32.59	22.67	11.21	30.54	0.00	35.93	46.00	10.0	100	251	
Hori.	960.263	QP	40.45	22.69	11.22	30.51	0.00	43.85	53.90	10.0	105	267	
Hori.	987.853	QP	39.81	22.86	11.30	30.31	0.00	43.66	53.90	10.2	100	205	
Hori.	2483.500	PK	45.18	27.79	13.91	36.85	2.23	52.26	73.90	21.6	149	310	
Hori.	3531.550	PK	54.30	28.81	5.68	41.33	2.23	49.69	73.90	24.2	224	173	
Hori.	4960.000	PK	50.03	31.45	5.98	41.23	2.23	48.46	73.90	25.4	100	0	
Hori.	7440.000	PK	48.44	37.11	7.33	41.37	2.23	53.74	73.90	20.1	100	0	
Hori.	9920.000	PK	47.15	38.87	8.38	40.32	2.23	56.31	73.90	17.5	100	0	
Hori.	12400.000	PK	47.29	39.32	9.57	39.71	2.23	58.70	73.90	15.2	100	0	
Hori.	2483.500	AV	32.87	27.79	13.91	36.85	2.23	39.95	53.90	13.9	149	310	
Hori.	3531.550	AV	49.96	28.81	5.68	41.33	2.23	45.35	53.90	8.5	224	173	
Hori.	4960.000	AV	37.14	31.45	5.98	41.23	2.23	35.57	53.90	18.3	100	0	
Hori.	7440.000	AV	36.35	37.11	7.33	41.37	2.23	41.65	53.90	12.2	100	0	
Hori.	9920.000	AV	35.34	38.87	8.38	40.32	2.23	44.50	53.90	9.4	100	0	
Hori.	12400.000	AV	35.12	39.32	9.57	39.71	2.23	46.53	53.90	7.3	100	0	
Vert.	658.566	QP	40.42	19.71	10.21	31.93	0.00	38.41	46.00	7.5	100	199	
Vert.	933.874	QP	27.18	22.53	11.14	30.74	0.00	30.11	46.00	15.8	100	7	
Vert.	956.728	QP	30.05	22.67	11.21	30.54	0.00	33.39	46.00	12.6	100	47	
Vert.	960.262	QP	38.99	22.69	11.22	30.51	0.00	42.39	53.90	11.5	156	328	
Vert.	987.851	QP	38.62	22.86	11.30	30.31	0.00	42.47	53.90	11.4	125	199	
Vert.	2483.500	PK	45.55	27.79	13.91	36.85	2.23	52.63	73.90	21.2	271	46	
Vert.	3531.540	PK	54.43	28.81	5.68	41.33	2.23	49.82	73.90	24.0	130	24	
Vert.	4960.000	PK	48.71	31.45	5.98	41.23	2.23	47.14	73.90	26.7	100	0	
Vert.	7440.000	PK	48.70	37.11	7.33	41.37	2.23	54.00	73.90	19.9	100	0	
Vert.	9920.000	PK	47.57	38.87	8.38	40.32	2.23	56.73	73.90	17.1	100	0	
Vert.	12400.000	PK	47.28	39.32	9.57	39.71	2.23	58.69	73.90	15.2	100	0	
Vert.	2483.500	AV	32.89	27.79	13.91	36.85	2.23	39.97	53.90	13.9	271	46	
Vert.	3531.540	AV	49.28	28.81	5.68	41.33	2.23	44.67	53.90	9.2	130	24	
Vert.	4960.000	AV	37.00	31.45	5.98	41.23	2.23	35.43	53.90	18.4	100	0	
Vert.	7440.000	AV	36.38	37.11	7.33	41.37	2.23	41.68	53.90	12.2	100	0	
Vert.	9920.000	AV	35.32	38.87	8.38	40.32	2.23	44.48	53.90	9.4	100	0	
Vert.	12400.000	AV	35.11	39.32	9.57	39.71	2.23	46.52	53.90	7.3	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.23 dB

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

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

UL Japan, Inc.

Shonan EMC Lab.

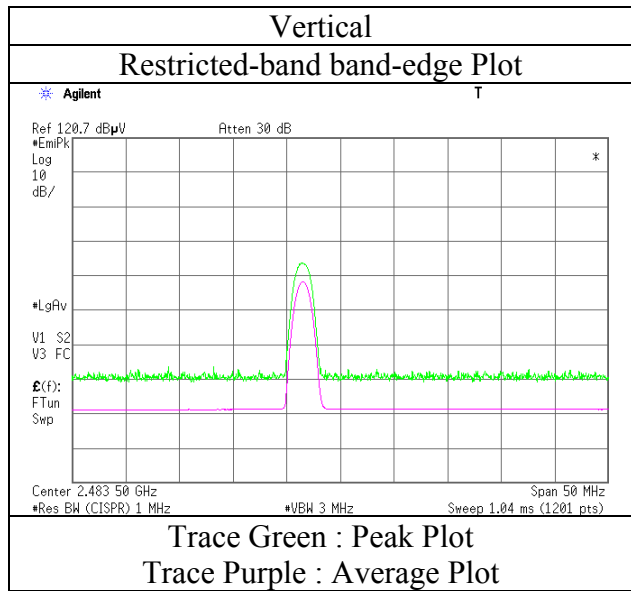
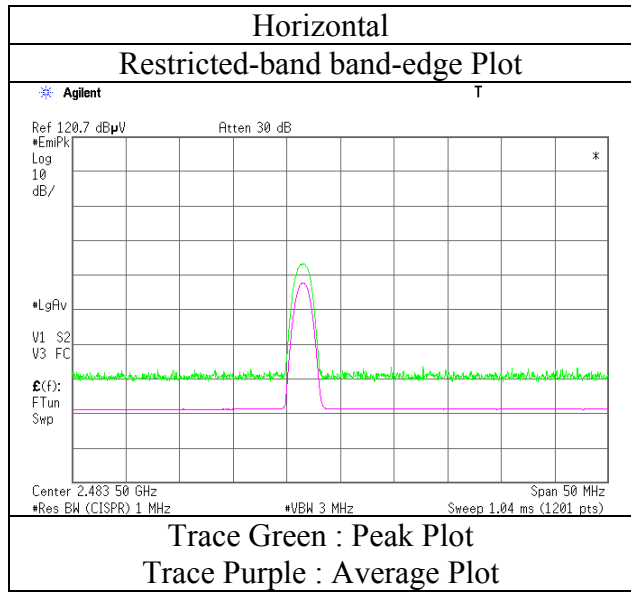
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

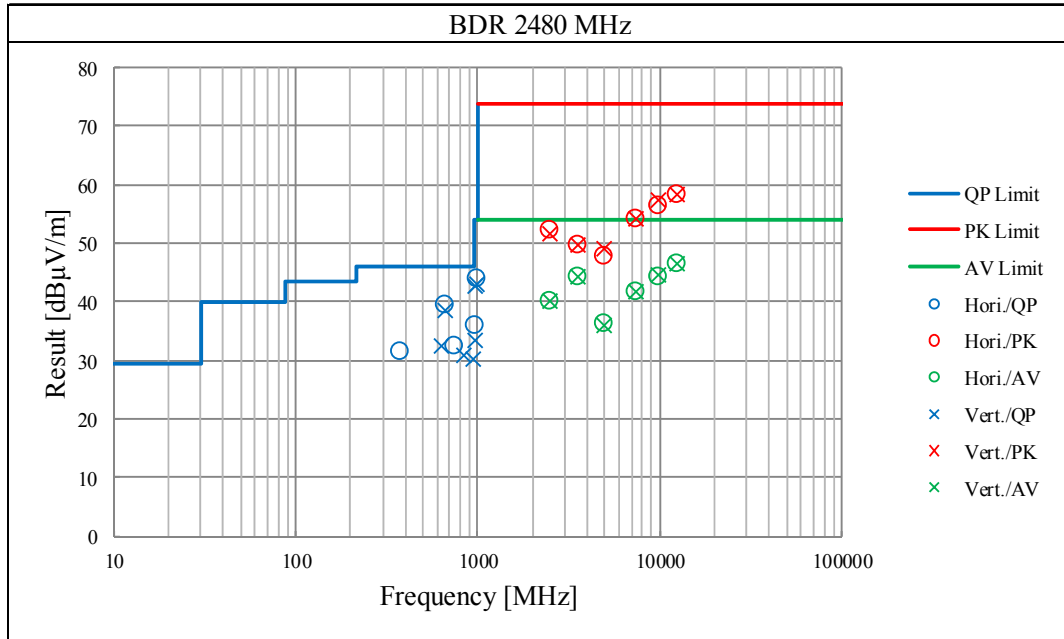
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11483196S-A
Date	October 12, 2016
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Hiroyuki Morikawa (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

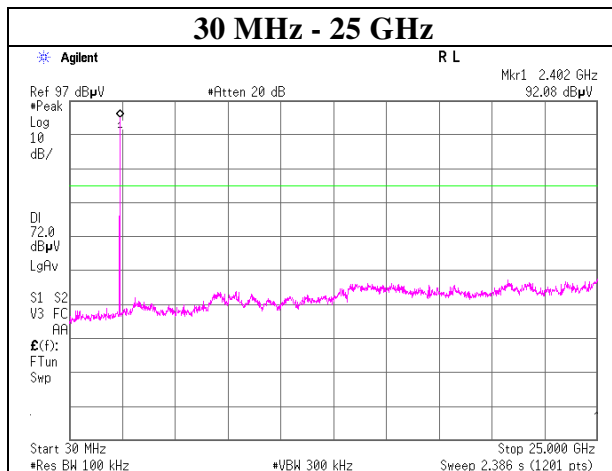
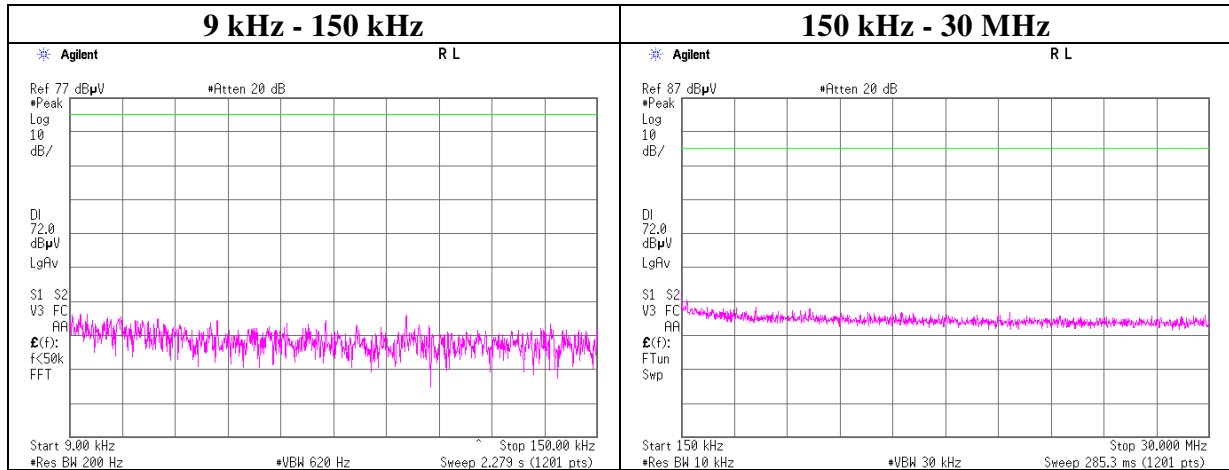
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11483196S-A		
Date	October 12, 2016	October 13, 2016	October 12, 2016
Temperature / Humidity	24 deg. C / 45 % RH	25 deg. C / 44 % RH	24 deg. C / 44 % RH
Engineer	Hiroyuki Morikawa (1 GHz -2.8 GHz)	Yasumasa Owaki (30 MHz -1 GHz) (13 GHz-18 GHz)	Hiroyuki Morikawa (2.8 GHz – 13 GHz) (18 GHz -26.5 GHz)
Mode	Tx, Hopping On, DH5 2480 MHz		



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

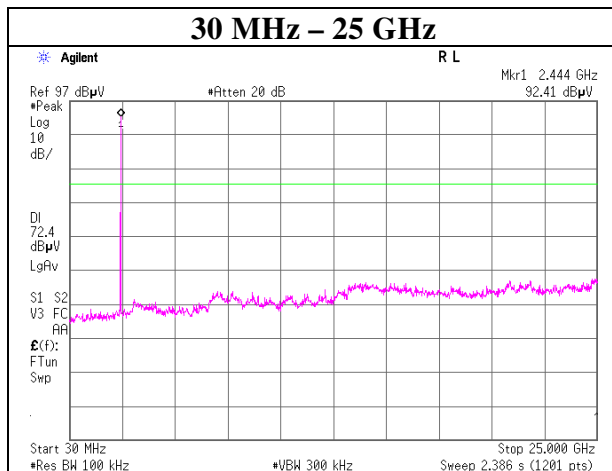
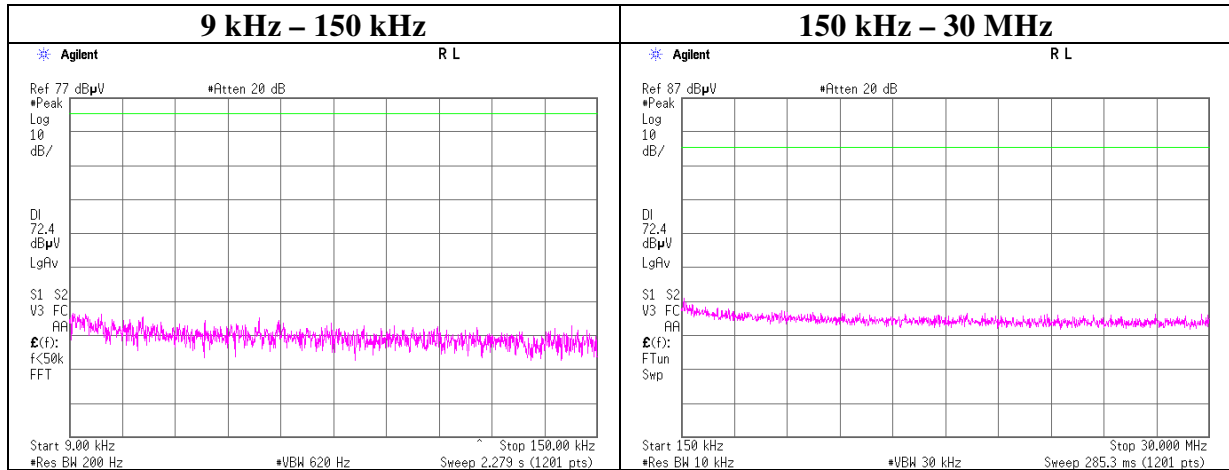
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

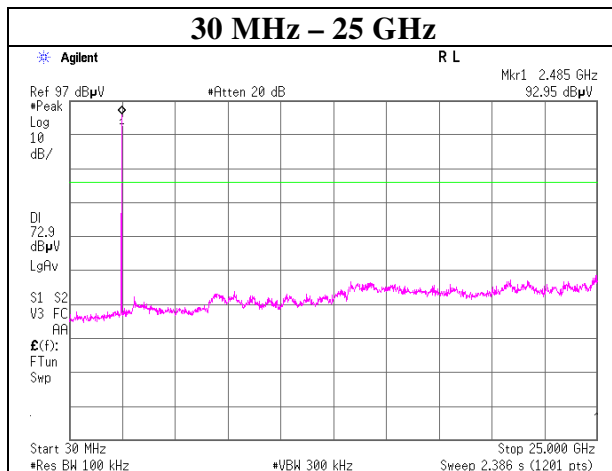
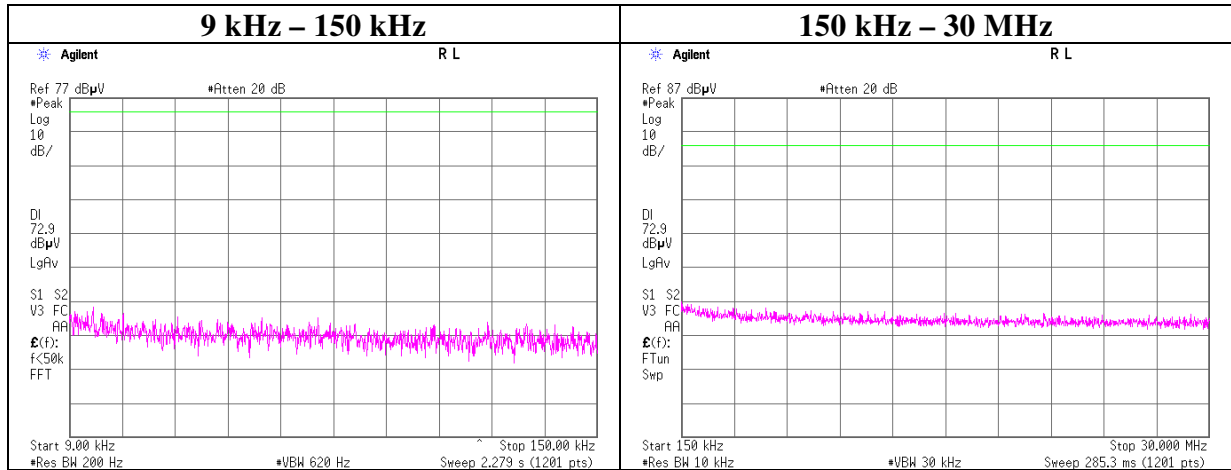
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, DH5

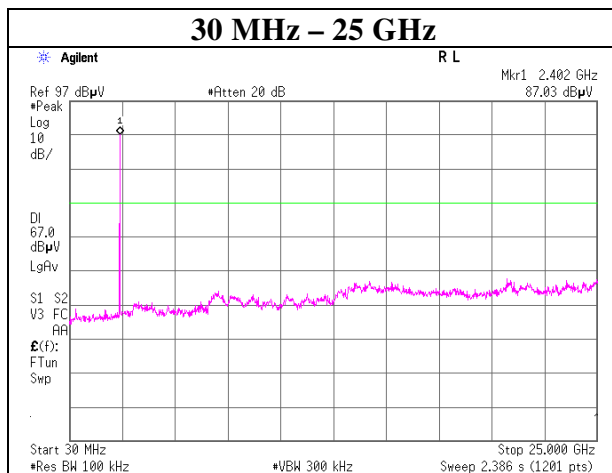
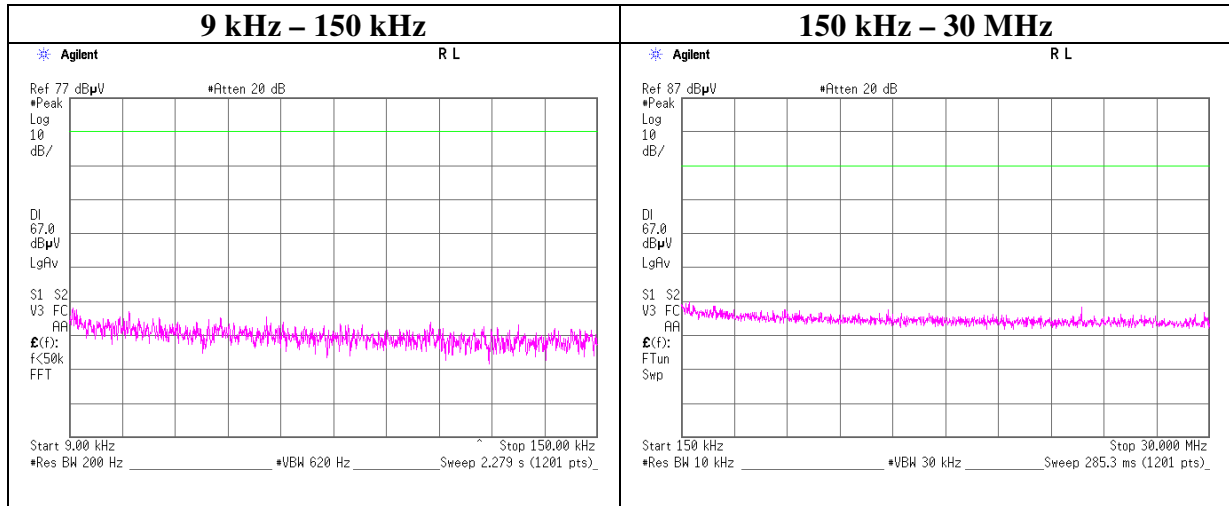
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5

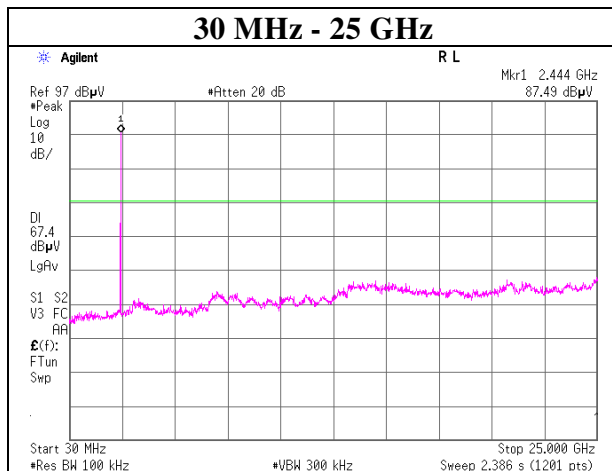
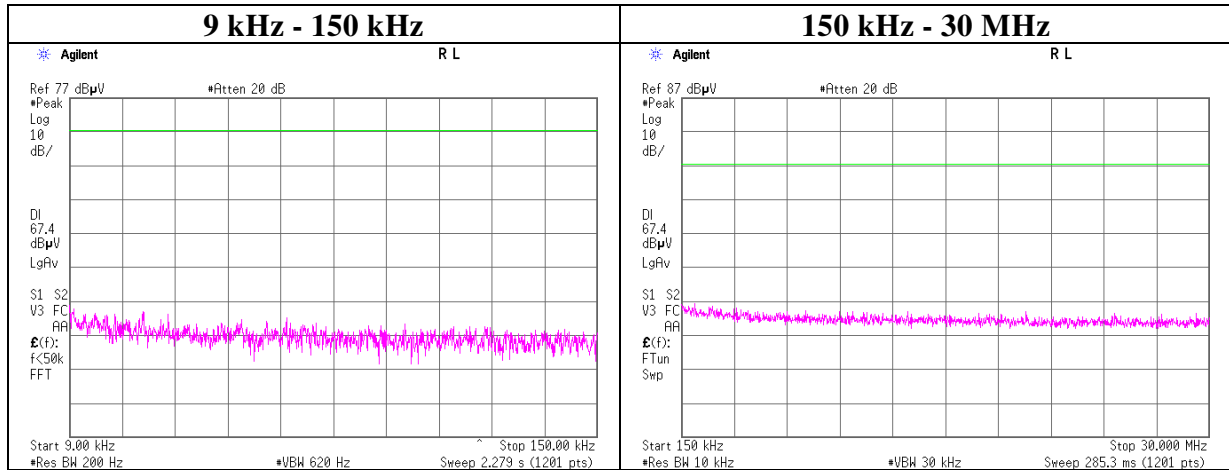
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5

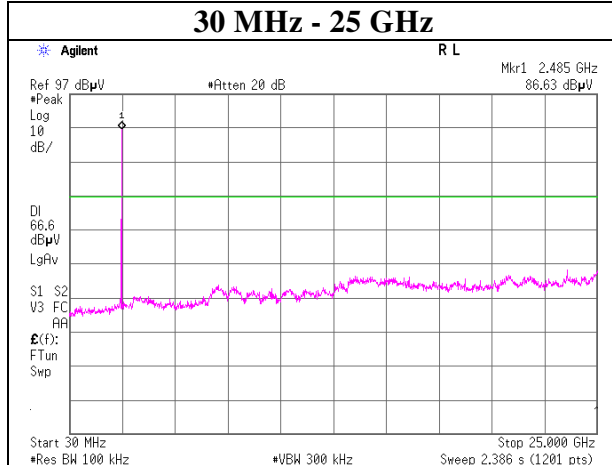
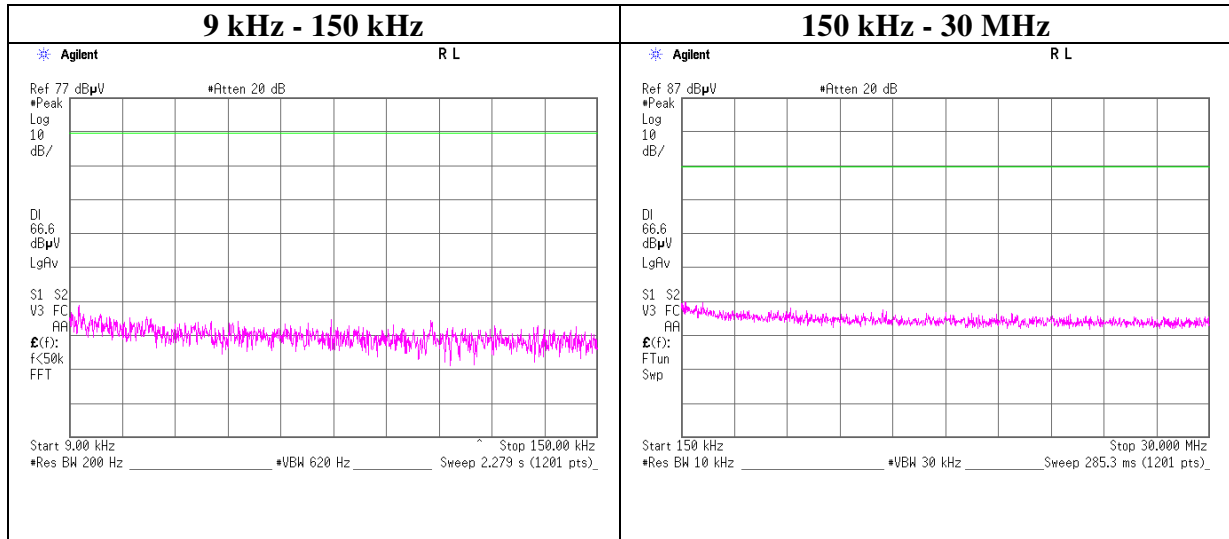
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5

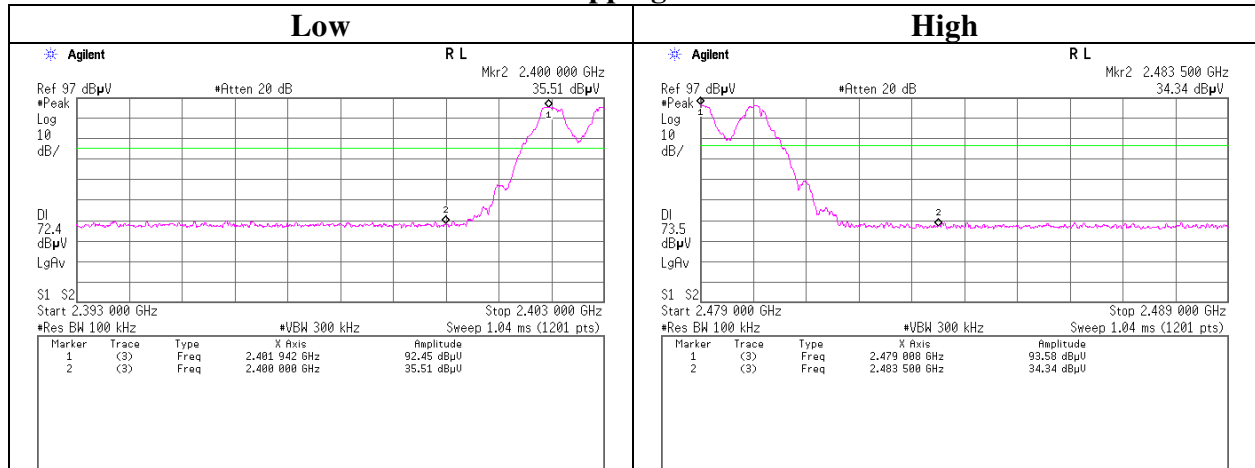
2480 MHz



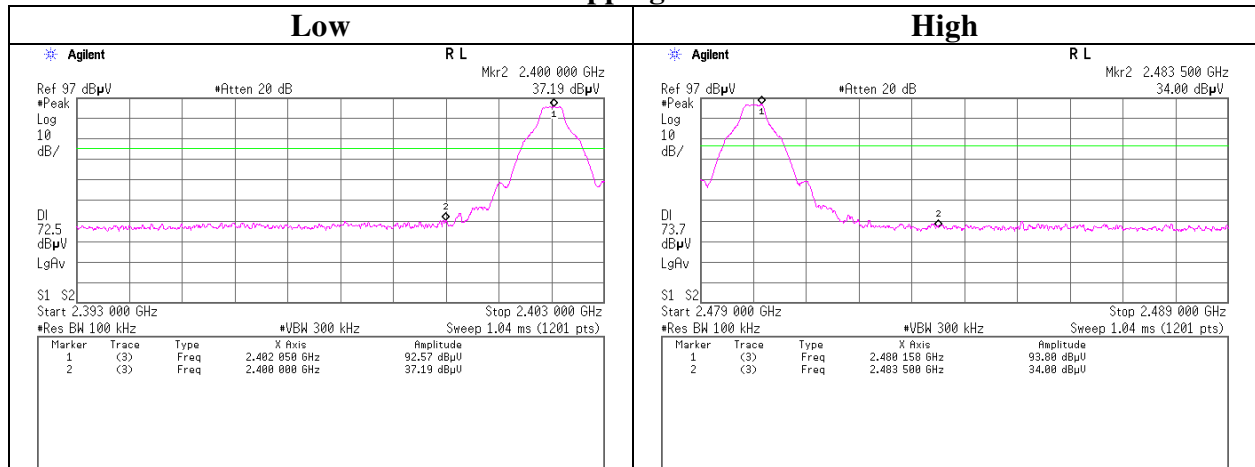
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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

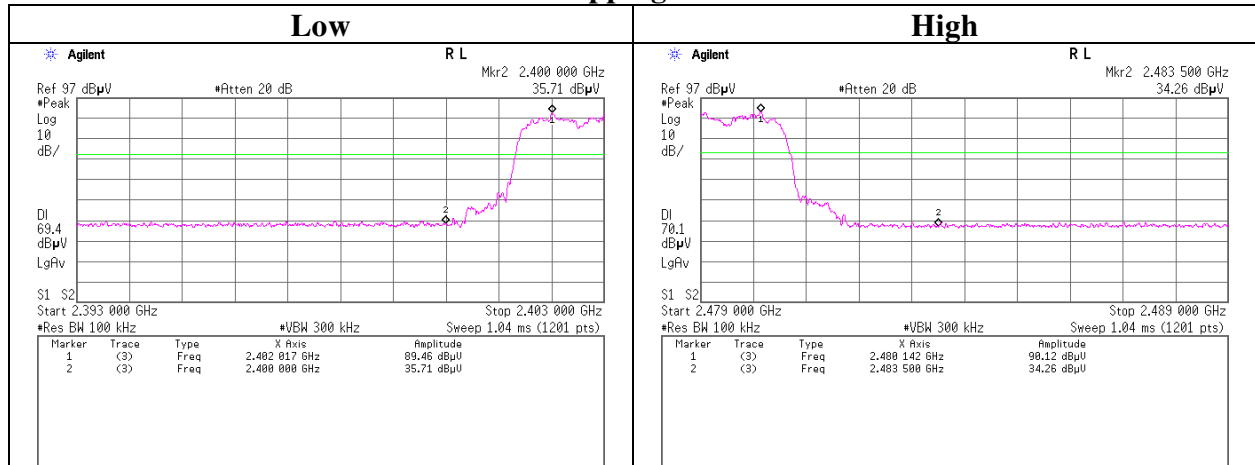
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

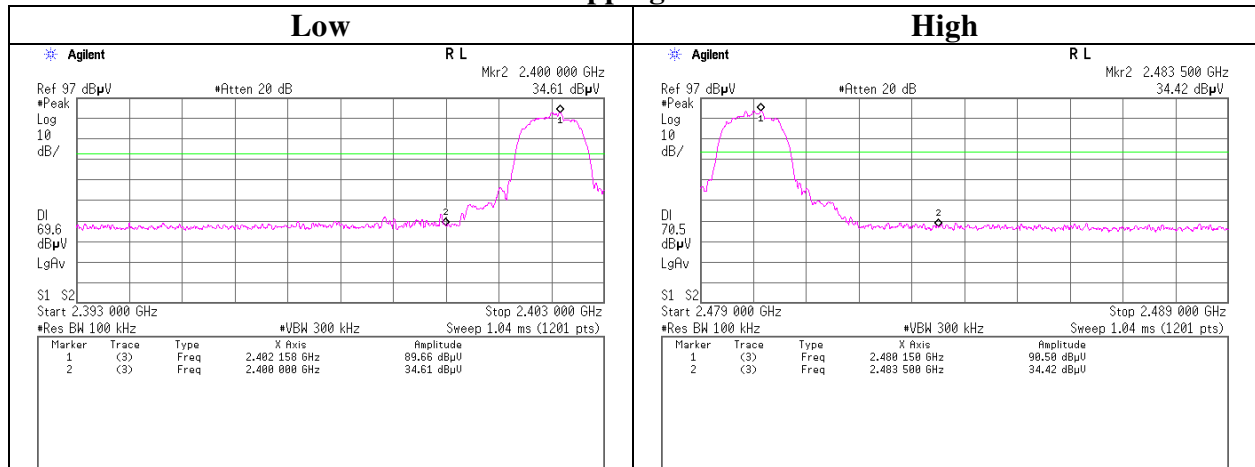
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx 3DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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

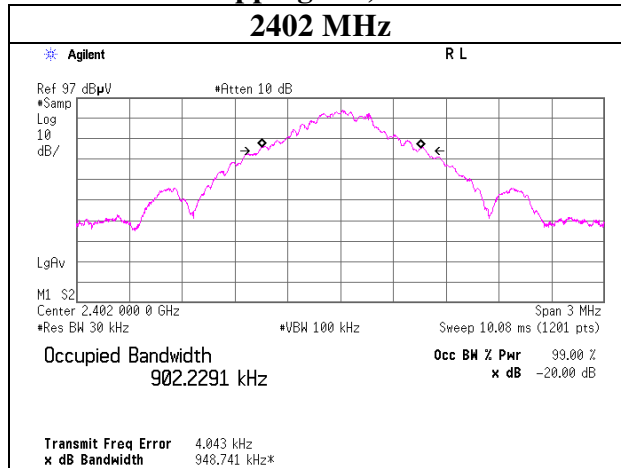
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

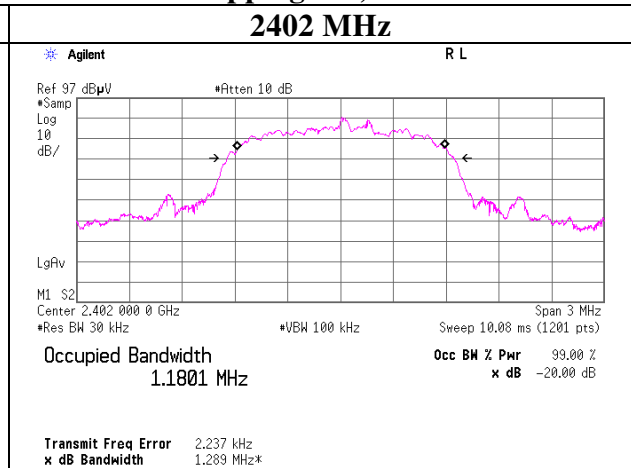
99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx Hopping Off

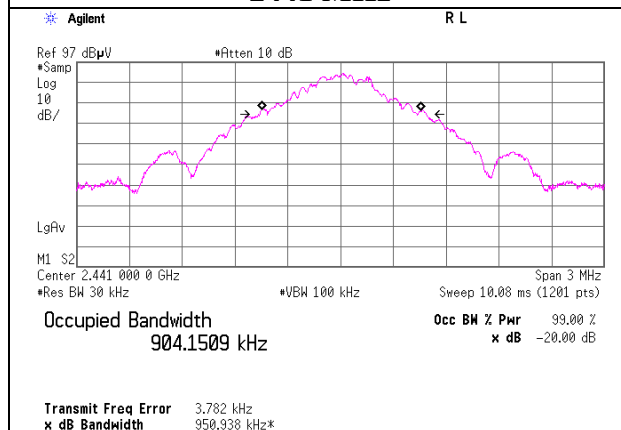
Hopping Off, DH5



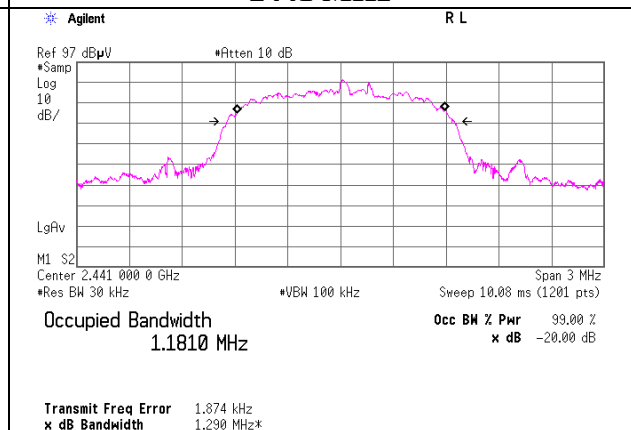
Hopping Off, 3DH5



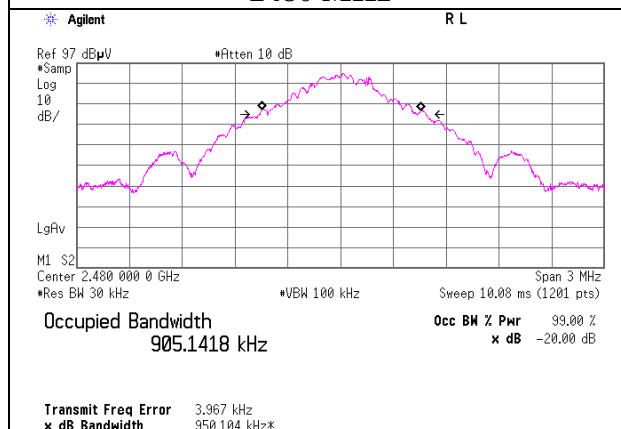
2441 MHz



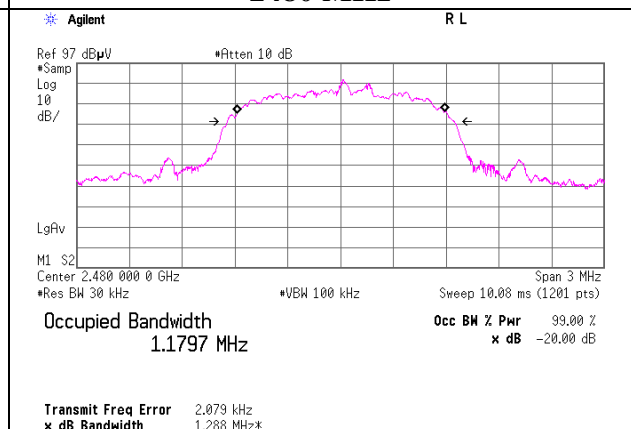
2441 MHz



2480 MHz



2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

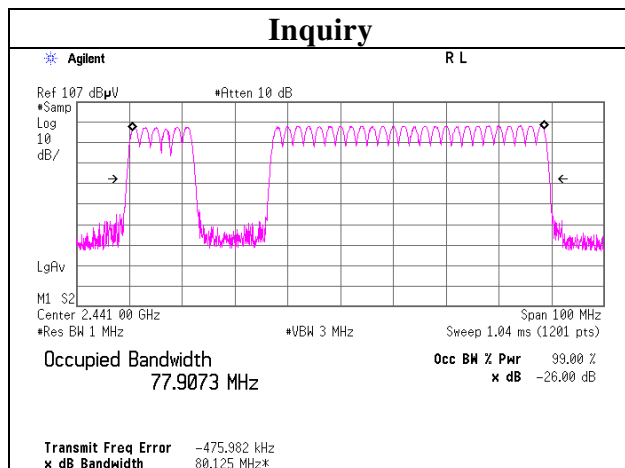
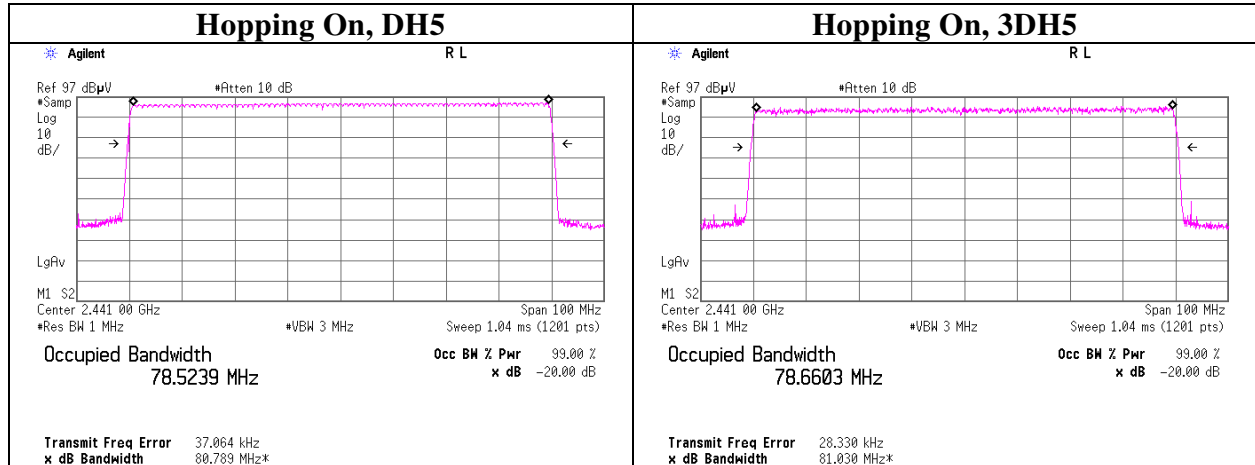
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11483196S-A
Date	November 10, 2015
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Yosuke Ishikawa
Mode	Tx Hopping On



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2016/09/26 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2016/04/0412
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/2312
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2016/11/0712
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/0712
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2016/10/1712
KAF-02	Pre Amplifier	Hewlett Packard	8449B	3008A01268	RE	2016/04/22 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2016/06/23 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2016/05/11 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2016/08/22 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	RE	2015/12/07 * 12
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2016/02/08 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2016/07/25 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,C E,RFI,MF)	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2015/11/18 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2016/04/18 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2016/07/15 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2015/10/11 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2015/10/11 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12
SCC-C1/C2/C3/C4/C5/C10/SRS E-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2016/04/22 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2016/02/25 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2016/03/28 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2016/03/22 * 12
SSA-01	Spectrum Analyzer	Agilent	N9010A-526	MY48031482	RE	2016/04/28 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2016/04/18 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12

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

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

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

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

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