



RADIO TEST REPORT

Test Report No. : 11274192S-A-R1

Applicant : **Alpine Electronics, Inc.**
Type of Equipment : **Entry Evo**
Model No. : **EE0001**
FCC ID : **A269ZUA149**
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)
7. This report is a revised version of 11274192S-A. 11274192S-A is replaced with this report.

Date of test: May 9 to June 27, 2016

Representative test engineer:

Y. Ishikawa
Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by:

A. Hayashi
Akio Hayashi
Leader
Consumer Technology Division



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

UL Japan, Inc.
Shonan EMC Lab.

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

13-EM-F0429

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.....	8
SECTION 5: Radiated Spurious Emission	11
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
Burst Rate Confirmation	24
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
Radiated Spurious Emission	47
Worst Case Position	48

SECTION 1: Customer information

Company Name : Alpine Electronics, Inc.
Address : 20-1 Yoshima-Kogyodanchi, Iwaki-shi, Fukushima, 970-1192 Japan
Telephone Number : +81-246-36-4111
Facsimile Number : +81-246-36-6492
Contact Person : Mitsuru Yoshida

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

2.1 Identification of E.U.T.

Type of Equipment : Entry Evo
Model No. : EE0001
Serial No. : Refer to Clause 4.2
Rating : DC 14 V
Receipt Date of Sample : March 10, 2016
Country of Mass-production : Hungary, China
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: EE0001 (referred to as the EUT in this report) is a Entry Evo.

General Specification

Clock frequency(ies) in the system : 26 MHz, 32.768 kHz

Radio Specification

[Bluetooth]

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : GFSK, $\pi/4$ -DQPSK, 8DPSK
Power Supply (radio part input) : DC 3.3 V/ 1.8 V
Antenna type : $\lambda/4$ Monopole antenna
Antenna Gain : -3 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.

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: Section15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (1)		-	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	8.1dB 665.583 MHz, QP, Hori. Tx, Hopping Off, DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *2)

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 EUT provides stable voltage (DC 3.3 V/ 1.8 V) constantly to the wireless transmitter regardless of input voltage. 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 EUT has a unique coupling/antenna connector. 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.

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	10m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

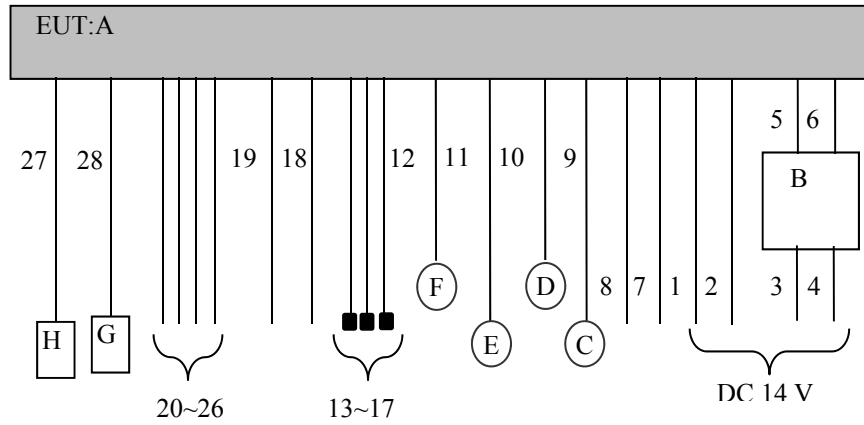
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation, 20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)</p> <p>*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.</p> <p>*EUT has the power settings by the software as follows; Power settings: Fixed Software: Tera Term Ver. 4.88 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>		

4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Entry Evo	EE0001	AL07FFF0910407 *1) AL07FFF0910403 *2)	Alpine Electronics, Inc.	EUT
B	CAN-BOX	NEW CAN-BOX HS	G0032437	Harman/Backer Automotive Systems	-
C	Speaker	LV-002	S11014200775	L&V	-
D	Speaker	LV-002	S11014200775	L&V	-
E	Speaker	LV-002	S11014200773	L&V	-
F	Speaker	LV-002	S11014200773	L&V	-
G	BT ANT	-	-	-	EUT
H	WLAN ANT	-	-	-	-

*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		Remark
			Cable	Connector	
1	DC (+)	0.3+2.0	Unshielded	Unshielded	-
2	DC (-)	0.3+2.0	Unshielded	Unshielded	-
3	DC (+)	0.3+2.0	Unshielded	Unshielded	-
4	DC (-)	0.3+2.0	Unshielded	Unshielded	-
5	B-CAN+	0.3+0.3	Unshielded	Unshielded	-
6	B-CAN-	0.3+0.3	Unshielded	Unshielded	-
7	LAN	0.3+1.0	Unshielded	Unshielded	-
8	RS232C	0.3+1.0	Shielded	Shielded	-
9	Speaker	0.3+2.0	Unshielded	Unshielded	-
10	Speaker	0.3+2.0	Unshielded	Unshielded	-
11	Speaker	0.3+2.0	Unshielded	Unshielded	-
12	Speaker	0.3+2.0	Unshielded	Unshielded	-
13	Signal	0.3+1.0	Shielded	Shielded	-
14	Signal	0.3+1.0	Shielded	Shielded	-
15	Signal	0.3+1.0	Shielded	Shielded	-
16	Signal	0.3+1.0	Shielded	Shielded	-
17	Signal	0.3+1.0	Shielded	Shielded	-
18	USB	5.3	Shielded	Shielded	-
19	USB	5.3	Shielded	Shielded	-
20	Signal	5.3	Shielded	Shielded	-
21	Signal	5.3	Shielded	Shielded	-
22	Signal	5.3	Shielded	Shielded	-
23	Signal	5.3	Shielded	Shielded	-
24	Signal	5.3	Shielded	Shielded	-
25	Signal	5.3	Shielded	Shielded	-
26	Signal	5.3	Shielded	Shielded	-
27	ANT	2.0	Shielded	Shielded	-
28	ANT	2.0	Shielded	Shielded	-

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: $20 \times \log(4.3 \text{ m}/3.0 \text{ m}) = 3.1 \text{ dB}$

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

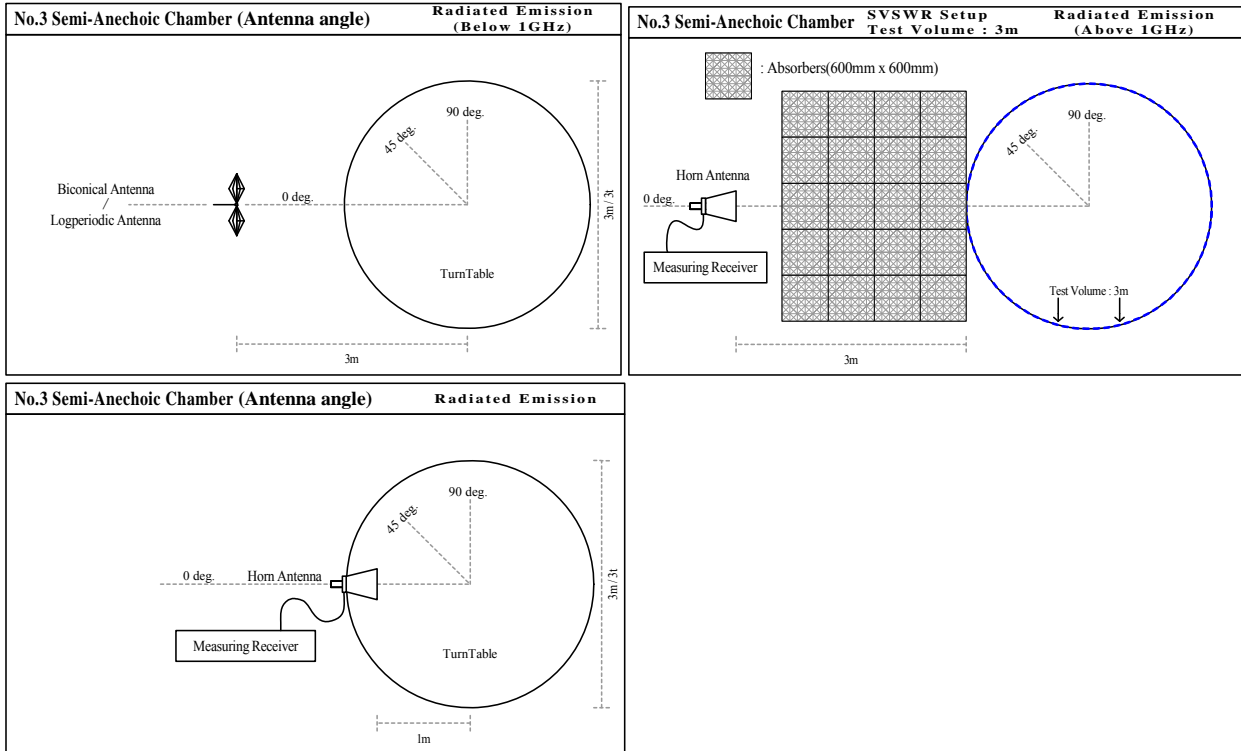
UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401



- The carrier level and noise levels were confirmed at angle of -90 to 30 deg of EUT and at each position of X and Y axis of antenna to see the position of maximum noise, and the test was made at the position that has the maximum noise, and the test was made at the position (30 deg. and X axis) 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

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	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) Refer to 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

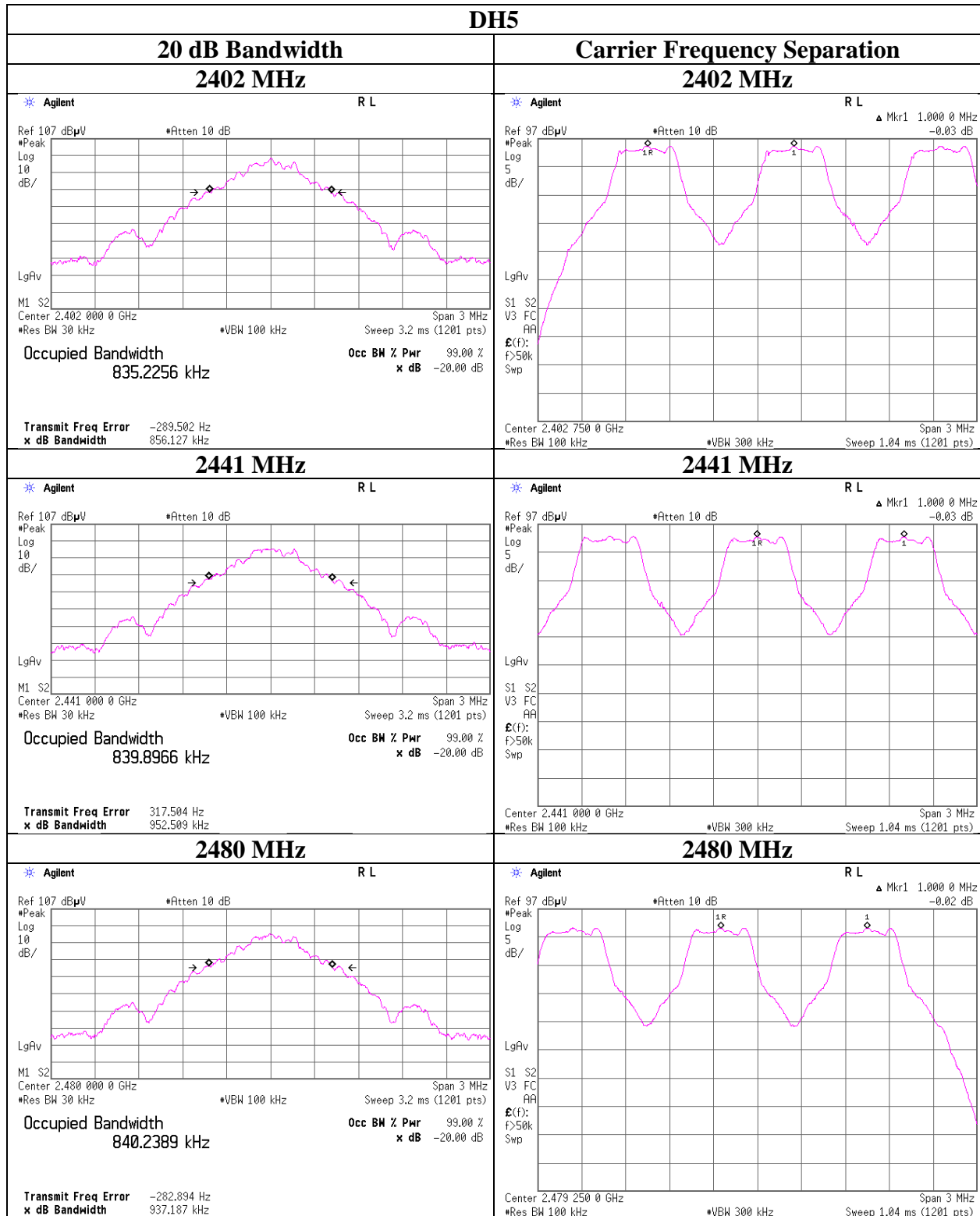
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11274192S-A-R1
Date June 27, 2016
Temperature / Humidity 24 deg. C / 40 % RH
Engineer Hiroyuki Morikawa
Mode Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.856	1.000	≥ 0.571
DH5	2441.0	0.953	1.000	≥ 0.635
DH5	2480.0	0.937	1.000	≥ 0.625
3DH5	2402.0	1.306	1.000	≥ 0.870
3DH5	2441.0	1.282	1.000	≥ 0.855
3DH5	2480.0	1.303	1.000	≥ 0.869

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.

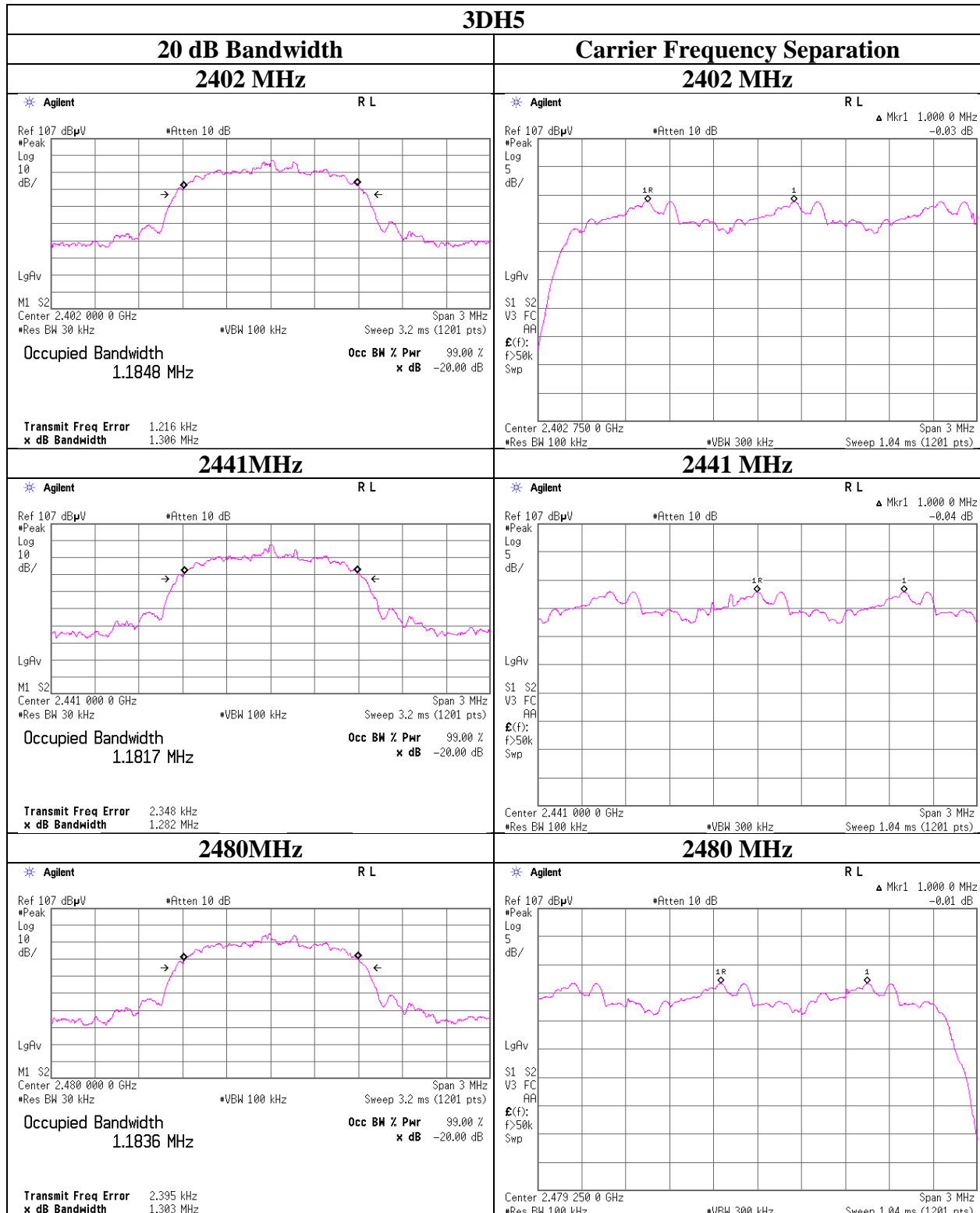
Shonan EMC Lab.

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

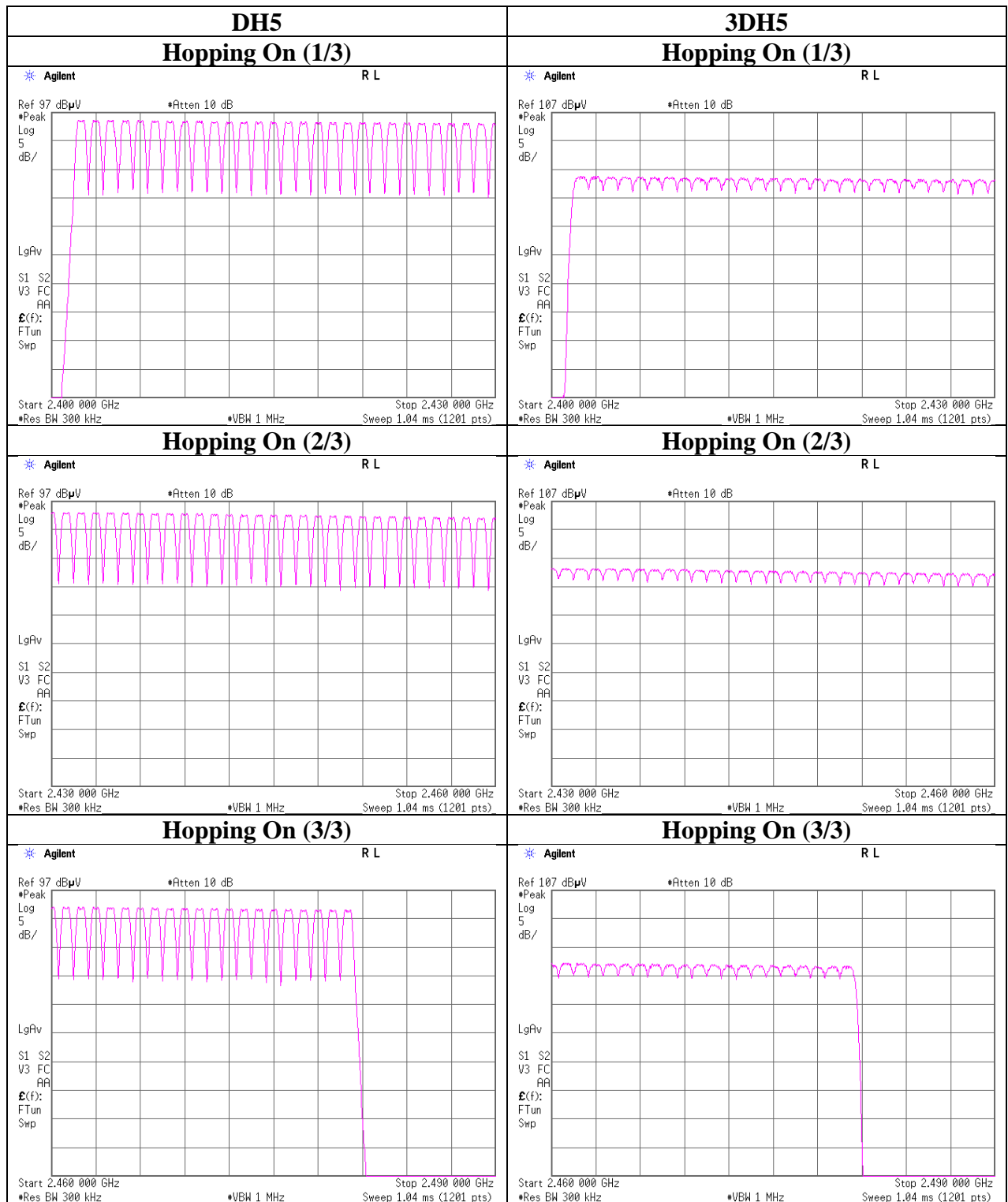
Number of Hopping Frequency

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11274192S-A-R1
Date June 27, 2016
Temperature / Humidity 24 deg. C / 40 % RH
Engineer Hiroyuki Morikawa
Mode Tx, Hopping On

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

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

Number of Hopping Frequency



Dwell time

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11274192S-A-R1
Date : June 27, 2016
Temperature / Humidity : 24 deg. C / 40 % RH
Engineer : Hiroyuki Morikawa
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]
	50.4 times / 5 sec. x	31.6 sec. =	319 times			
DH1	50.4 times / 5 sec. x	31.6 sec. =	319 times	0.417	133	400
DH3	26.8 times / 5 sec. x	31.6 sec. =	170 times	1.674	285	400
DH5	17.2 times / 5 sec. x	31.6 sec. =	109 times	2.926	319	400
3DH1	50.2 times / 5 sec. x	31.6 sec. =	318 times	0.429	136	400
3DH3	24.8 times / 5 sec. x	31.6 sec. =	157 times	1.674	263	400
3DH5	18.4 times / 5 sec. x	31.6 sec. =	117 times	2.927	342	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

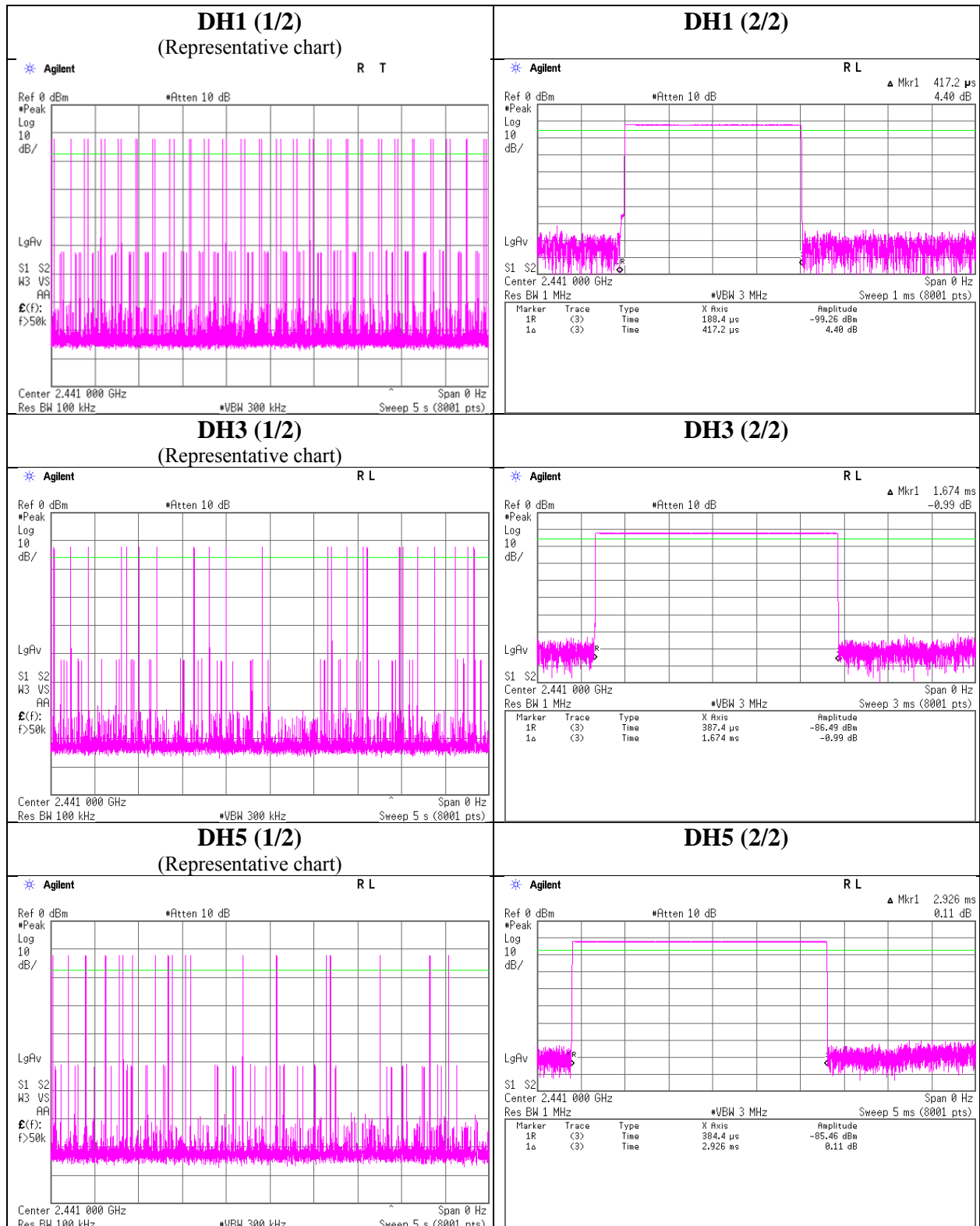
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	51	49	51	51	50.4
DH3	24	25	27	28	30	26.8
DH5	20	17	9	19	21	17.2
3DH1	49	51	50	51	50	50.2
3DH3	21	27	24	25	27	24.8
3DH5	14	16	21	17	24	18.4

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



UL Japan, Inc.

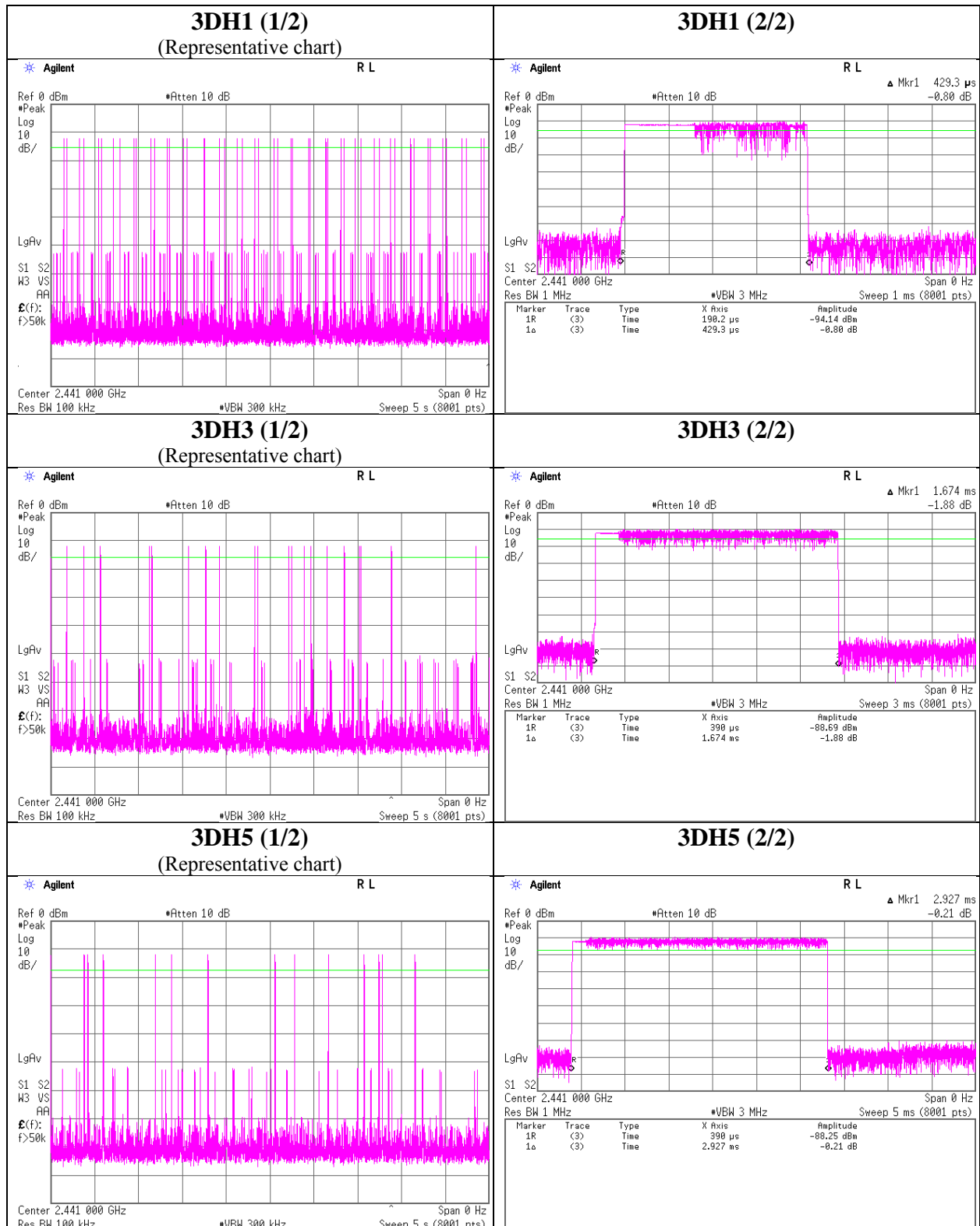
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11274192S-A-R1
Date : June 27, 2016
Temperature / Humidity : 24 deg. C / 40 % RH
Engineer : Hiroyuki Morikawa
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	-11.03	1.97	9.92	0.86	1.22	20.96	125	20.10
DH5	2441.0	-11.88	1.97	9.92	0.01	1.00	20.96	125	20.95
DH5	2480.0	-12.83	1.98	9.92	-0.93	0.81	20.96	125	21.89
2DH5	2402.0	-8.70	1.97	9.92	3.19	2.08	20.96	125	17.77
2DH5	2441.0	-9.51	1.97	9.92	2.38	1.73	20.96	125	18.58
2DH5	2480.0	-10.66	1.98	9.92	1.24	1.33	20.96	125	19.72
3DH5	2402.0	-8.22	1.97	9.92	3.67	2.33	20.96	125	17.29
3DH5	2441.0	-8.98	1.97	9.92	2.91	1.95	20.96	125	18.05
3DH5	2480.0	-10.12	1.98	9.92	1.78	1.51	20.96	125	19.18

Sample Calculation:

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

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. 11274192S-A-R1
Date June 27, 2016
Temperature / Humidity 24 deg. C / 40 % RH
Engineer Hiroyuki Morikawa
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	-13.59	1.97	9.92	-1.70	0.68	1.07	-0.63	0.86
DH5	2441.0	-14.01	1.97	9.92	-2.12	0.61	1.07	-1.05	0.79
DH5	2480.0	-15.22	1.98	9.92	-3.32	0.47	1.07	-2.25	0.60
2DH5	2402.0	-13.60	1.97	9.92	-1.71	0.67	1.06	-0.65	0.86
2DH5	2441.0	-13.99	1.97	9.92	-2.10	0.62	1.06	-1.04	0.79
2DH5	2480.0	-15.20	1.98	9.92	-3.30	0.47	1.06	-2.24	0.60
3DH5	2402.0	-13.59	1.97	9.92	-1.70	0.68	1.06	-0.64	0.86
3DH5	2441.0	-13.99	1.97	9.92	-2.10	0.62	1.06	-1.04	0.79
3DH5	2480.0	-15.20	1.98	9.92	-3.30	0.47	1.06	-2.24	0.60

Sample Calculation:

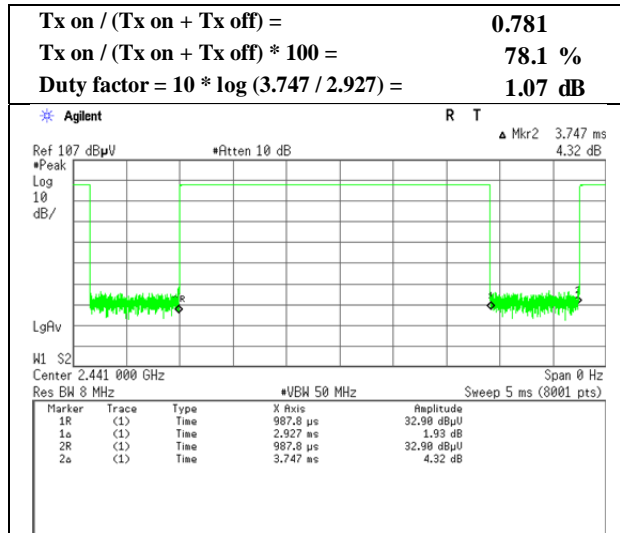
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Result (Burst power) = Frame power + Duty factor

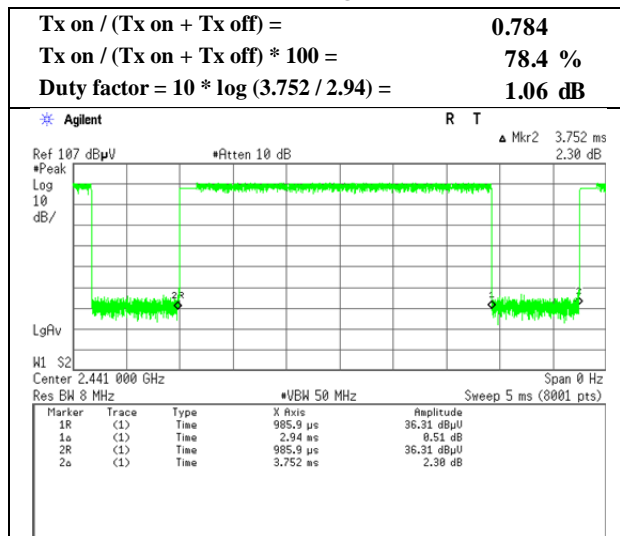
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off

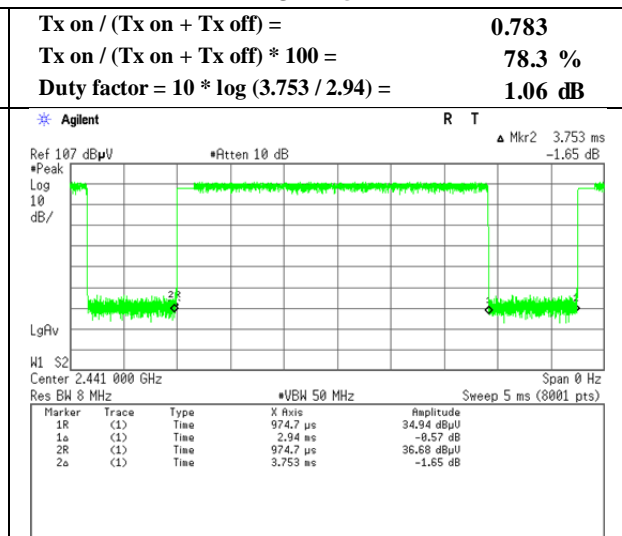
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11274192S-A-R1
Date : May 9, 2016 May 9, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 53 % RH
Engineer : Kazutaka Takeyama Yosuke Ishikawa
 (30-1000 MHz) (1-26.5 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.	250.007	QP	36.2	17.1	8.4	32.0	0.0	29.7	46.0	16.3	150	206	
Hori.	665.583	QP	39.8	19.8	10.2	31.9	0.0	37.9	46.0	8.1	165	172	
Hori.	2390.000	PK	46.1	27.8	13.7	41.0	3.1	49.7	73.9	24.2	100	140	
Hori.	2999.984	PK	50.9	28.2	5.3	40.7	3.1	46.8	73.9	27.1	182	215	
Hori.	4804.000	PK	45.8	31.4	5.8	39.6	3.1	46.5	73.9	27.4	100	80	
Hori.	7206.000	PK	44.8	36.9	7.2	40.1	3.1	51.9	73.9	22.0	100	0	
Hori.	9608.000	PK	44.6	38.5	8.2	39.6	3.1	54.8	73.9	19.1	100	0	
Hori.	2390.000	AV	33.7	27.8	13.7	41.0	3.1	37.3	53.9	16.6	100	140	
Hori.	2999.984	AV	45.3	28.2	5.3	40.7	3.1	41.2	53.9	12.7	182	215	
Hori.	4804.000	AV	34.9	31.4	5.8	39.6	3.1	35.6	53.9	18.3	100	80	
Hori.	7206.000	AV	33.8	36.9	7.2	40.1	3.1	40.9	53.9	13.0	100	0	
Hori.	9608.000	AV	32.7	38.5	8.2	39.6	3.1	42.9	53.9	11.0	100	0	
Vert.	34.369	QP	36.5	15.9	6.7	32.2	0.0	26.9	40.0	13.1	100	90	
Vert.	37.697	QP	29.0	14.7	6.8	32.2	0.0	18.3	40.0	21.7	100	165	
Vert.	42.624	QP	33.3	12.9	6.9	32.2	0.0	20.9	40.0	19.1	100	185	
Vert.	47.247	QP	33.5	11.2	6.9	32.2	0.0	19.4	40.0	20.6	100	54	
Vert.	50.184	QP	35.3	10.2	7.0	32.2	0.0	20.3	40.0	19.7	100	261	
Vert.	66.918	QP	35.3	6.3	6.7	32.2	0.0	16.1	40.0	23.9	100	240	
Vert.	665.581	QP	37.5	19.8	10.2	31.9	0.0	35.6	46.0	10.4	106	239	
Vert.	2390.000	PK	46.3	27.8	13.7	41.0	3.1	49.9	73.9	24.0	179	116	
Vert.	3000.038	PK	49.5	28.2	5.3	40.7	3.1	45.4	73.9	28.5	100	8	
Vert.	4804.000	PK	46.7	31.4	5.8	39.6	3.1	47.4	73.9	26.5	100	57	
Vert.	7206.000	PK	45.0	36.9	7.2	40.1	3.1	52.1	73.9	21.8	100	0	
Vert.	9608.000	PK	43.9	38.5	8.2	39.6	3.1	54.1	73.9	19.8	100	0	
Vert.	2390.000	AV	33.6	27.8	13.7	41.0	3.1	37.2	53.9	16.7	179	116	
Vert.	3000.038	AV	43.4	28.2	5.3	40.7	3.1	39.3	53.9	14.6	100	8	
Vert.	4804.000	AV	36.6	31.4	5.8	39.6	3.1	37.3	53.9	16.6	100	57	
Vert.	7206.000	AV	33.6	36.9	7.2	40.1	3.1	40.7	53.9	13.2	100	0	
Vert.	9608.000	AV	32.6	38.5	8.2	39.6	3.1	42.8	53.9	11.1	100	0	

Result = Reading + Ant. Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(4.3 m / 3.0 m) = 3.1 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 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	91.9	27.8	13.7	41.0	3.1	95.5	-	-	Carrier
Hori.	2400.000	PK	39.6	27.8	13.7	41.0	3.1	43.2	75.5	32.3	
Vert.	2402.000	PK	90.6	27.8	13.7	41.0	3.1	94.2	-	-	Carrier
Vert.	2400.000	PK	37.1	27.8	13.7	41.0	3.1	40.7	74.2	33.5	

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

Distance factor : 1 GHz - 13 GHz : 20log(4.3 m / 3.0 m) = 3.1 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

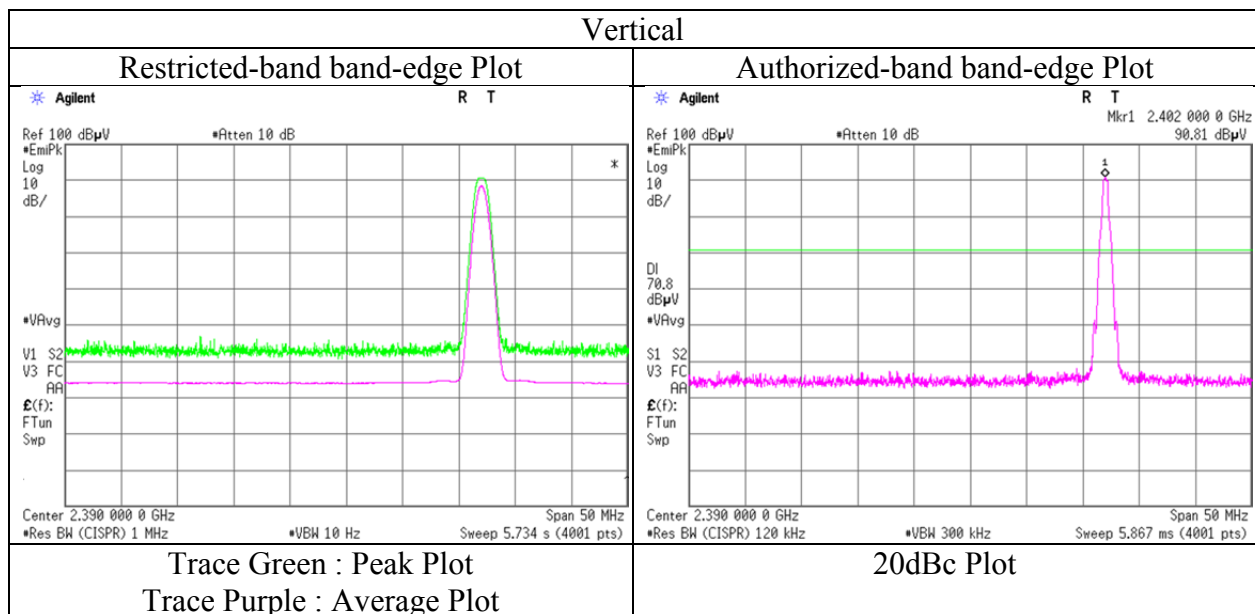
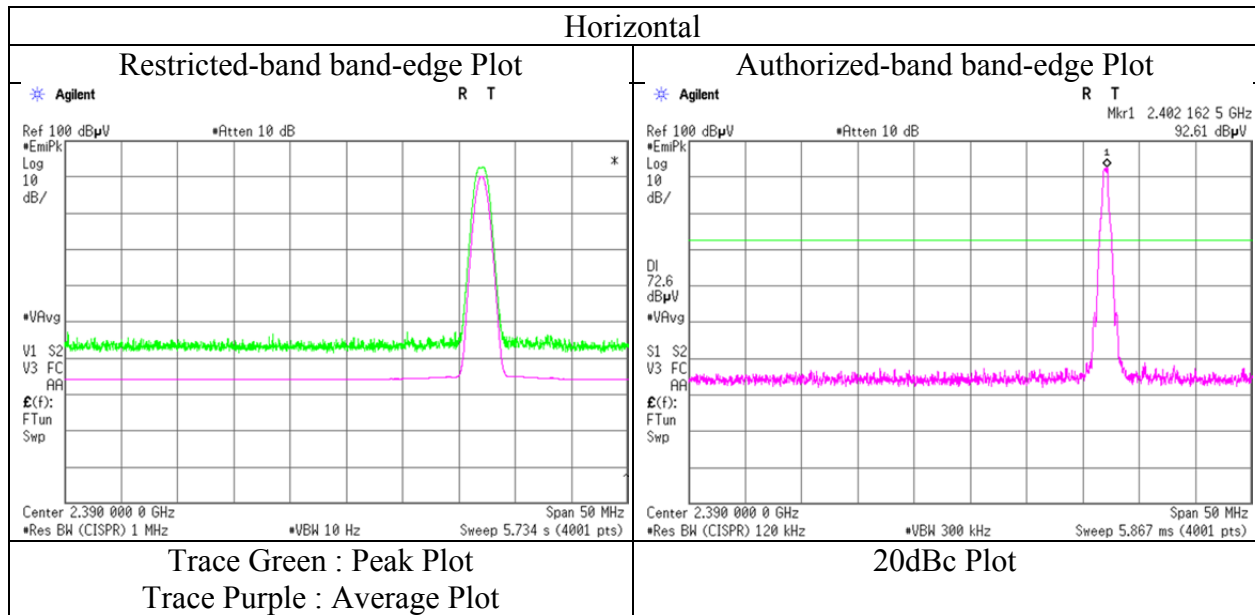
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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.	11274192S-A-R1
Date	May 9, 2016
Temperature / Humidity	25 deg. C / 53 % RH
Engineer	Yosuke Ishikawa (1-26.5 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. : 11274192S-A-R1
Date : May 9, 2016 May 9, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 53 % RH
Engineer : Kazutaka Takeyama Yosuke Ishikawa
(30-1000 MHz) (1-26.5 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.	43.382	QP	25.1	12.6	6.9	32.2	0.0	12.4	40.0	27.6	140	360	
Hori.	531.918	QP	30.8	17.9	9.7	32.0	0.0	26.4	46.0	19.6	100	168	
Hori.	797.977	QP	28.2	21.0	10.7	31.6	0.0	28.3	46.0	17.7	100	270	
Hori.	2999.985	PK	51.0	28.2	5.3	40.7	3.1	46.9	73.9	27.0	179	215	
Hori.	4882.000	PK	45.2	31.7	5.9	39.5	3.1	46.4	73.9	27.5	152	191	
Hori.	7323.000	PK	45.9	36.9	7.3	40.2	3.1	53.0	73.9	20.9	100	0	
Hori.	9764.000	PK	44.1	38.5	8.3	39.5	3.1	54.5	73.9	19.4	100	0	
Hori.	2999.985	AV	45.8	28.2	5.3	40.7	3.1	41.7	53.9	12.2	179	215	
Hori.	4882.000	AV	34.0	31.7	5.9	39.5	3.1	35.2	53.9	18.7	152	191	
Hori.	7323.000	AV	34.3	36.9	7.3	40.2	3.1	41.4	53.9	12.5	100	0	
Hori.	9764.000	AV	33.1	38.5	8.3	39.5	3.1	43.5	53.9	10.4	100	0	
Vert.	34.360	QP	34.9	15.9	6.7	32.2	0.0	25.3	40.0	14.7	100	133	
Vert.	37.757	QP	29.1	14.7	6.8	32.2	0.0	18.4	40.0	21.6	100	30	
Vert.	42.222	QP	33.0	13.0	6.9	32.2	0.0	20.7	40.0	19.3	100	208	
Vert.	47.542	QP	32.7	11.1	6.9	32.2	0.0	18.5	40.0	21.5	100	359	
Vert.	50.528	QP	33.8	10.1	6.9	32.2	0.0	18.6	40.0	21.4	100	69	
Vert.	66.651	QP	35.6	6.4	6.7	32.2	0.0	16.5	40.0	23.5	235	259	
Vert.	807.347	QP	21.2	21.1	10.7	31.5	0.0	21.5	46.0	24.5	100	0	
Vert.	3000.003	PK	49.3	28.2	5.3	40.7	3.1	45.2	73.9	28.7	100	9	
Vert.	4882.000	PK	45.1	31.7	5.9	39.5	3.1	46.3	73.9	27.6	143	242	
Vert.	7323.000	PK	44.6	36.9	7.3	40.2	3.1	51.7	73.9	22.2	100	0	
Vert.	9764.000	PK	43.6	38.5	8.3	39.5	3.1	54.0	73.9	19.9	100	0	
Vert.	3000.003	AV	42.9	28.2	5.3	40.7	3.1	38.8	53.9	15.1	100	9	
Vert.	4882.000	AV	34.1	31.7	5.9	39.5	3.1	35.3	53.9	18.6	143	242	
Vert.	7323.000	AV	34.8	36.9	7.3	40.2	3.1	41.9	53.9	12.0	100	0	
Vert.	9764.000	AV	32.9	38.5	8.3	39.5	3.1	43.3	53.9	10.6	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(4.3\text{ m} / 3.0\text{ m}) = 3.1\text{ dB}$

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

* 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

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11274192S-A-R1
Date : May 9, 2016 May 9, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 53 % RH
Engineer : Kazutaka Takeyama Yosuke Ishikawa
(30-1000 MHz) (1-26.5 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.	250.004	QP	32.9	17.1	8.4	32.0	0.0	26.4	46.0	19.6	323	211	
Hori.	531.967	QP	32.4	17.9	9.7	32.0	0.0	28.0	46.0	18.0	100	356	
Hori.	665.581	QP	26.3	19.8	10.2	31.9	0.0	24.4	46.0	21.6	221	78	
Hori.	2483.500	PK	47.0	27.9	13.8	41.0	3.1	50.8	73.9	23.1	100	131	
Hori.	2999.982	PK	51.1	28.2	5.3	40.7	3.1	47.0	73.9	26.9	152	213	
Hori.	4960.000	PK	46.2	32.0	6.0	39.4	3.1	47.9	73.9	26.0	151	196	
Hori.	7440.000	PK	45.3	37.0	7.5	40.4	3.1	52.5	73.9	21.4	100	0	
Hori.	9920.000	PK	44.7	38.4	8.4	39.4	3.1	55.2	73.9	18.7	100	0	
Hori.	2483.500	AV	34.1	27.9	13.8	41.0	3.1	37.9	53.9	16.0	100	131	
Hori.	2999.982	AV	45.9	28.2	5.3	40.7	3.1	41.8	53.9	12.1	152	213	
Hori.	4960.000	AV	34.2	32.0	6.0	39.4	3.1	35.9	53.9	18.0	151	196	
Hori.	7440.000	AV	34.5	37.0	7.5	40.4	3.1	41.7	53.9	12.2	100	0	
Hori.	9920.000	AV	33.5	38.4	8.4	39.4	3.1	44.0	53.9	9.9	100	0	
Vert.	37.836	QP	29.1	14.7	6.8	32.2	0.0	18.4	40.0	21.6	100	289	
Vert.	40.979	QP	30.6	13.5	6.8	32.2	0.0	18.7	40.0	21.3	100	273	
Vert.	42.774	QP	32.5	12.8	6.9	32.2	0.0	20.0	40.0	20.0	115	161	
Vert.	43.985	QP	32.5	12.4	6.9	32.2	0.0	19.6	40.0	20.4	347	353	
Vert.	249.998	QP	32.2	17.1	8.4	32.0	0.0	25.7	46.0	20.3	100	117	
Vert.	665.586	QP	25.8	19.8	10.2	31.9	0.0	23.9	46.0	22.1	100	264	
Vert.	2483.500	PK	45.5	27.9	13.8	41.0	3.1	49.3	73.9	24.6	100	105	
Vert.	3000.023	PK	49.3	28.2	5.3	40.7	3.1	45.2	73.9	28.7	100	339	
Vert.	4960.000	PK	45.4	32.0	6.0	39.4	3.1	47.1	73.9	26.8	138	81	
Vert.	7440.000	PK	45.7	37.0	7.5	40.4	3.1	52.9	73.9	21.0	100	0	
Vert.	9920.000	PK	45.0	38.4	8.4	39.4	3.1	55.5	73.9	18.4	100	0	
Vert.	2483.500	AV	33.5	27.9	13.8	41.0	3.1	37.3	53.9	16.6	100	105	
Vert.	3000.023	AV	43.3	28.2	5.3	40.7	3.1	39.2	53.9	14.7	100	339	
Vert.	4960.000	AV	34.6	32.0	6.0	39.4	3.1	36.3	53.9	17.6	138	81	
Vert.	7440.000	AV	34.4	37.0	7.5	40.4	3.1	41.6	53.9	12.3	100	0	
Vert.	9920.000	AV	33.6	38.4	8.4	39.4	3.1	44.1	53.9	9.8	100	0	

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

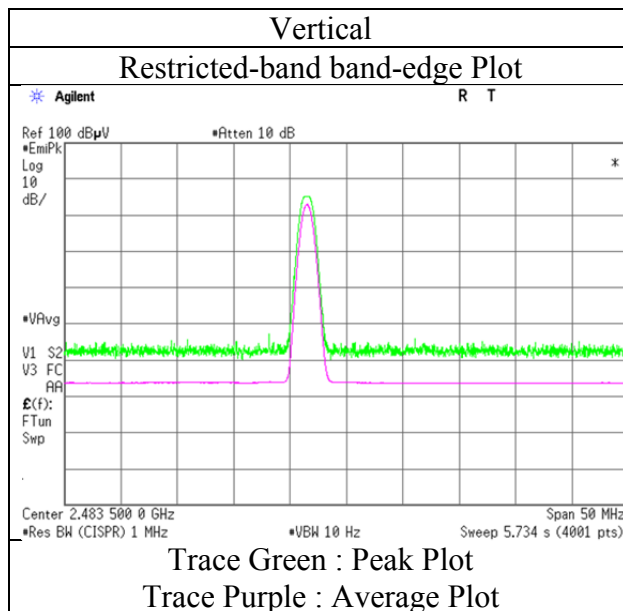
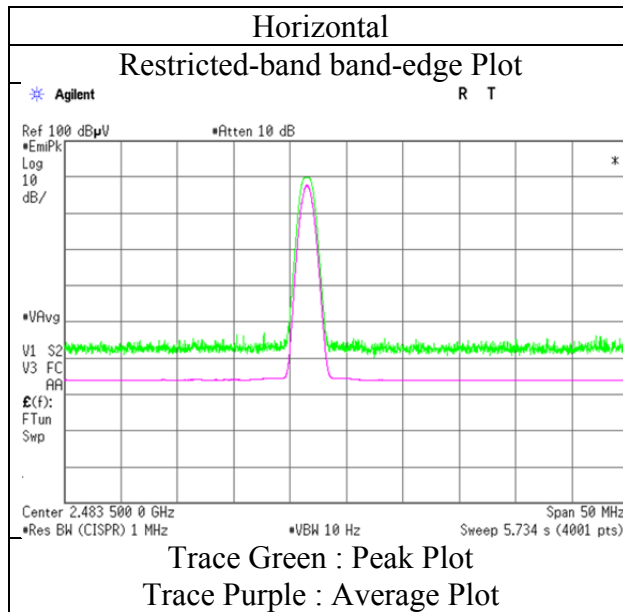
Distance factor : 1 GHz - 13 GHz : $20\log(4.3\text{ m} / 3.0\text{ m}) = 3.1\text{ dB}$

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11274192S-A-R1
Date : May 9, 2016
Temperature / Humidity : 25 deg. C / 53 % RH
Engineer : Yosuke Ishikawa
(1-26.5 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. : 11274192S-A-R1
Date : May 9, 2016 May 9, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 53 % RH
Engineer : Kazutaka Takeyama Yosuke Ishikawa
(30-1000 MHz) (1-26.5 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.	45.998	QP	27.5	11.7	6.9	32.2	0.0	13.9	40.0	26.1	143	120	
Hori.	250.001	QP	31.3	17.1	8.4	32.0	0.0	24.8	46.0	21.2	242	113	
Hori.	531.979	QP	34.5	17.9	9.7	32.0	0.0	30.1	46.0	15.9	100	347	
Hori.	2390.000	PK	45.5	27.8	13.7	41.0	3.1	49.1	73.9	24.8	100	142	
Hori.	3000.001	PK	50.8	28.2	5.3	40.7	3.1	46.7	73.9	27.2	177	216	
Hori.	4804.000	PK	45.6	31.4	5.8	39.6	3.1	46.3	73.9	27.6	146	186	
Hori.	7206.000	PK	44.8	36.9	7.2	40.1	3.1	51.9	73.9	22.0	100	0	
Hori.	9608.000	PK	43.9	38.5	8.2	39.6	3.1	54.1	73.9	19.8	100	0	
Hori.	2390.000	AV	33.8	27.8	13.7	41.0	3.1	37.4	53.9	16.5	100	142	
Hori.	3000.001	AV	45.5	28.2	5.3	40.7	3.1	41.4	53.9	12.5	177	216	
Hori.	4804.000	AV	34.4	31.4	5.8	39.6	3.1	35.1	53.9	18.8	146	186	
Hori.	7206.000	AV	33.8	36.9	7.2	40.1	3.1	40.9	53.9	13.0	100	0	
Hori.	9608.000	AV	32.7	38.5	8.2	39.6	3.1	42.9	53.9	11.0	100	0	
Vert.	42.273	QP	31.8	13.0	6.9	32.2	0.0	19.5	40.0	20.5	100	350	
Vert.	42.743	QP	32.4	12.9	6.9	32.2	0.0	20.0	40.0	20.0	100	215	
Vert.	44.669	QP	32.1	12.1	6.9	32.2	0.0	18.9	40.0	21.1	165	39	
Vert.	47.353	QP	32.2	11.2	6.9	32.2	0.0	18.1	40.0	21.9	100	329	
Vert.	250.001	QP	32.1	17.1	8.4	32.0	0.0	25.6	46.0	20.4	100	138	
Vert.	531.971	QP	28.0	17.9	9.7	32.0	0.0	23.6	46.0	22.4	100	143	
Vert.	2390.000	PK	46.6	27.8	13.7	41.0	3.1	50.2	73.9	23.7	100	217	
Vert.	2999.992	PK	49.4	28.2	5.3	40.7	3.1	45.3	73.9	28.6	100	340	
Vert.	4804.000	PK	46.9	31.4	5.8	39.6	3.1	47.6	73.9	26.3	100	57	
Vert.	7206.000	PK	44.7	36.9	7.2	40.1	3.1	51.8	73.9	22.1	100	0	
Vert.	9608.000	PK	44.6	38.5	8.2	39.6	3.1	54.8	73.9	19.1	100	0	
Vert.	2390.000	AV	33.6	27.8	13.7	41.0	3.1	37.2	53.9	16.7	100	217	
Vert.	2999.992	AV	43.8	28.2	5.3	40.7	3.1	39.7	53.9	14.2	100	340	
Vert.	4804.000	AV	36.3	31.4	5.8	39.6	3.1	37.0	53.9	16.9	100	57	
Vert.	7206.000	AV	33.6	36.9	7.2	40.1	3.1	40.7	53.9	13.2	100	0	
Vert.	9608.000	AV	32.6	38.5	8.2	39.6	3.1	42.8	53.9	11.1	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(4.3 m / 3.0 m) = 3.1 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.3	27.8	13.7	41.0	3.1	97.9	-	-	Carrier
Hori.	2400.000	PK	40.7	27.8	13.7	41.0	3.1	44.3	77.9	33.6	
Vert.	2402.000	PK	87.7	27.8	13.7	41.0	3.1	91.3	-	-	Carrier
Vert.	2400.000	PK	37.7	27.8	13.7	41.0	3.1	41.3	71.3	30.0	

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

Distance factor : 1 GHz - 13 GHz : 20log(4.3 m / 3.0 m) = 3.1 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Shonan EMC Lab.

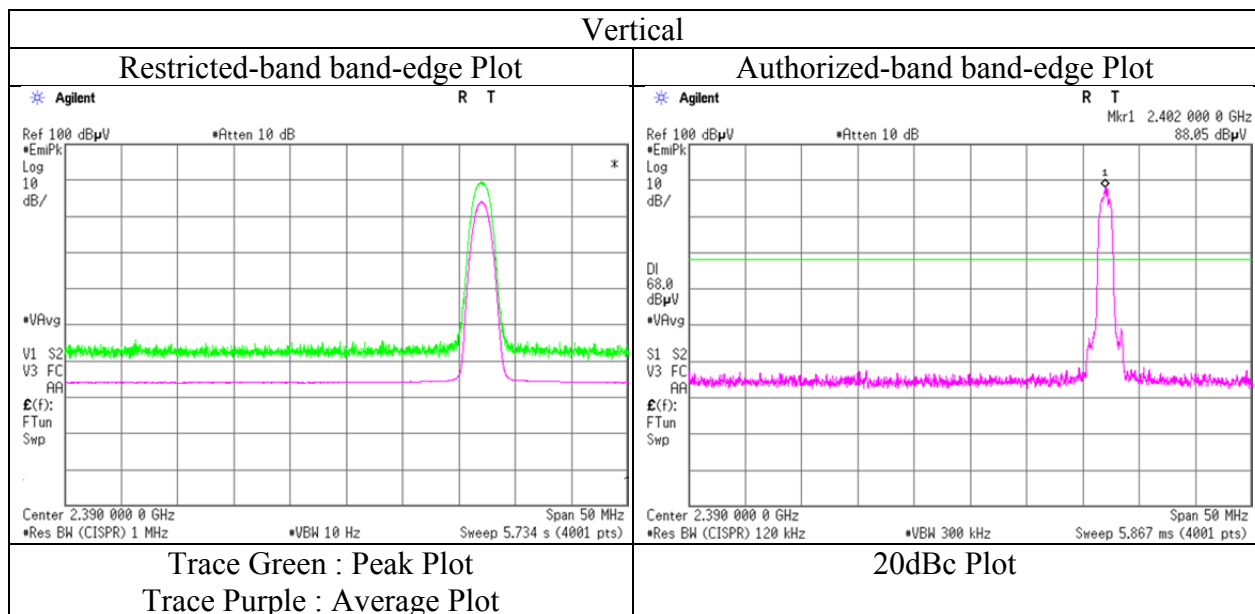
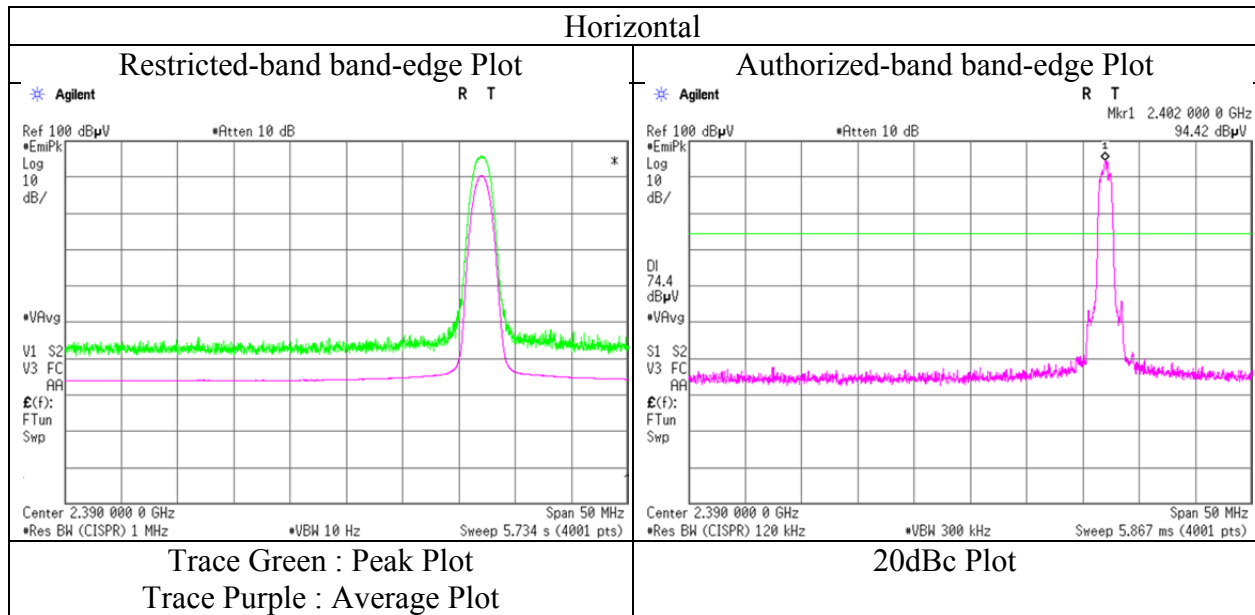
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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. : 11274192S-A-R1
 Date : May 9, 2016
 Temperature / Humidity : 25 deg. C / 53 % RH
 Engineer : Yosuke Ishikawa
 (1-26.5 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. : 11274192S-A-R1
Date : May 9, 2016 May 9, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 53 % RH
Engineer : Kazutaka Takeyama Yosuke Ishikawa
(30-1000 MHz) (1-26.5 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.	62.268	QP	28.7	7.0	6.7	32.2	0.0	10.2	40.0	29.8	301	116	
Hori.	250.001	QP	32.0	17.1	8.4	32.0	0.0	25.5	46.0	20.5	259	216	
Hori.	531.827	QP	27.6	17.9	9.7	32.0	0.0	23.2	46.0	22.8	100	336	
Hori.	797.754	QP	25.1	21.0	10.7	31.6	0.0	25.2	46.0	20.8	123	113	
Hori.	3000.008	PK	50.7	28.2	5.3	40.7	3.1	46.6	73.9	27.3	177	217	
Hori.	4882.000	PK	45.2	31.7	5.9	39.5	3.1	46.4	73.9	27.5	149	165	
Hori.	7323.000	PK	45.3	36.9	7.3	40.2	3.1	52.4	73.9	21.5	100	0	
Hori.	9764.000	PK	43.6	38.5	8.3	39.5	3.1	54.0	73.9	19.9	100	0	
Hori.	3000.008	AV	45.6	28.2	5.3	40.7	3.1	41.5	53.9	12.4	177	217	
Hori.	4882.000	AV	33.4	31.7	5.9	39.5	3.1	34.6	53.9	19.3	149	165	
Hori.	7323.000	AV	34.2	36.9	7.3	40.2	3.1	41.3	53.9	12.6	100	0	
Hori.	9764.000	AV	32.9	38.5	8.3	39.5	3.1	43.3	53.9	10.6	100	0	
Vert.	42.630	QP	31.6	12.9	6.9	32.2	0.0	19.2	40.0	20.8	100	220	
Vert.	43.253	QP	32.1	12.7	6.9	32.2	0.0	19.5	40.0	20.5	121	81	
Vert.	50.218	QP	33.3	10.1	7.0	32.2	0.0	18.2	40.0	21.8	100	16	
Vert.	52.418	QP	35.2	9.5	6.9	32.2	0.0	19.4	40.0	20.6	230	16	
Vert.	249.992	QP	28.5	17.1	8.4	32.0	0.0	22.0	46.0	24.0	100	193	
Vert.	714.316	QP	21.7	20.3	10.4	31.8	0.0	20.6	46.0	25.4	100	0	
Vert.	3000.000	PK	50.1	28.2	5.3	40.7	3.1	46.0	73.9	27.9	100	341	
Vert.	4882.000	PK	45.1	31.7	5.9	39.5	3.1	46.3	73.9	27.6	160	104	
Vert.	7323.000	PK	45.3	36.9	7.3	40.2	3.1	52.4	73.9	21.5	100	0	
Vert.	9764.000	PK	45.2	38.5	8.3	39.5	3.1	55.6	73.9	18.3	100	0	
Vert.	3000.000	AV	44.0	28.2	5.3	40.7	3.1	39.9	53.9	14.0	100	341	
Vert.	4882.000	AV	33.6	31.7	5.9	39.5	3.1	34.8	53.9	19.1	160	104	
Vert.	7323.000	AV	34.3	36.9	7.3	40.2	3.1	41.4	53.9	12.5	100	0	
Vert.	9764.000	AV	33.0	38.5	8.3	39.5	3.1	43.4	53.9	10.5	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(4.3 m / 3.0 m) = 3.1 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 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. : 11274192S-A-R1
Date : May 9, 2016 May 9, 2016
Temperature / Humidity : 24 deg. C / 45 % RH 25 deg. C / 53 % RH
Engineer : Kazutaka Takeyama Yosuke Ishikawa
 (30-1000 MHz) (1-26.5 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.	61.972	QP	29.3	7.0	6.7	32.2	0.0	10.8	40.0	29.2	328	15	
Hori.	249.999	QP	34.5	17.1	8.4	32.0	0.0	28.0	46.0	18.0	257	217	
Hori.	531.971	QP	31.3	17.9	9.7	32.0	0.0	26.9	46.0	19.1	100	351	
Hori.	665.577	QP	26.2	19.8	10.2	31.9	0.0	24.3	46.0	21.7	201	27	
Hori.	798.291	QP	26.0	21.0	10.7	31.6	0.0	26.1	46.0	19.9	100	206	
Hori.	2483.500	PK	47.2	27.9	13.8	41.0	3.1	51.0	73.9	22.9	100	129	
Hori.	3000.040	PK	49.9	28.2	5.3	40.7	3.1	45.8	73.9	28.1	182	222	
Hori.	4960.000	PK	44.2	32.0	6.0	39.4	3.1	45.9	73.9	28.0	161	84	
Hori.	7440.000	PK	45.9	37.0	7.5	40.4	3.1	53.1	73.9	20.8	100	0	
Hori.	9920.000	PK	45.0	38.4	8.4	39.4	3.1	55.5	73.9	18.4	100	0	
Hori.	2483.500	AV	34.4	27.9	13.8	41.0	3.1	38.2	53.9	15.7	100	129	
Hori.	3000.040	AV	44.7	28.2	5.3	40.7	3.1	40.6	53.9	13.3	182	222	
Hori.	4960.000	AV	33.5	32.0	6.0	39.4	3.1	35.2	53.9	18.7	161	84	
Hori.	7440.000	AV	34.5	37.0	7.5	40.4	3.1	41.7	53.9	12.2	100	0	
Hori.	9920.000	AV	33.5	38.4	8.4	39.4	3.1	44.0	53.9	9.9	100	0	
Vert.	43.084	QP	33.6	12.7	6.9	32.2	0.0	21.0	40.0	19.0	122	197	
Vert.	44.755	QP	33.2	12.1	6.9	32.2	0.0	20.0	40.0	20.0	139	253	
Vert.	249.993	QP	34.9	17.1	8.4	32.0	0.0	28.4	46.0	17.6	100	122	
Vert.	665.580	QP	26.1	19.8	10.2	31.9	0.0	24.2	46.0	21.8	158	235	
Vert.	798.309	QP	28.1	21.0	10.7	31.6	0.0	28.2	46.0	17.8	100	172	
Vert.	2483.500	PK	46.5	27.9	13.8	41.0	3.1	50.3	73.9	23.6	100	105	
Vert.	3000.022	PK	49.8	28.2	5.3	40.7	3.1	45.7	73.9	28.2	100	340	
Vert.	4960.000	PK	45.3	32.0	6.0	39.4	3.1	47.0	73.9	26.9	100	78	
Vert.	7440.000	PK	45.8	37.0	7.5	40.4	3.1	53.0	73.9	20.9	100	0	
Vert.	9920.000	PK	45.0	38.4	8.4	39.4	3.1	55.5	73.9	18.4	100	0	
Vert.	2483.500	AV	33.9	27.9	13.8	41.0	3.1	37.7	53.9	16.2	100	105	
Vert.	3000.022	AV	43.6	28.2	5.3	40.7	3.1	39.5	53.9	14.4	100	340	
Vert.	4960.000	AV	34.2	32.0	6.0	39.4	3.1	35.9	53.9	18.0	100	78	
Vert.	7440.000	AV	34.3	37.0	7.5	40.4	3.1	41.5	53.9	12.4	100	0	
Vert.	9920.000	AV	33.6	38.4	8.4	39.4	3.1	44.1	53.9	9.8	100	0	

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

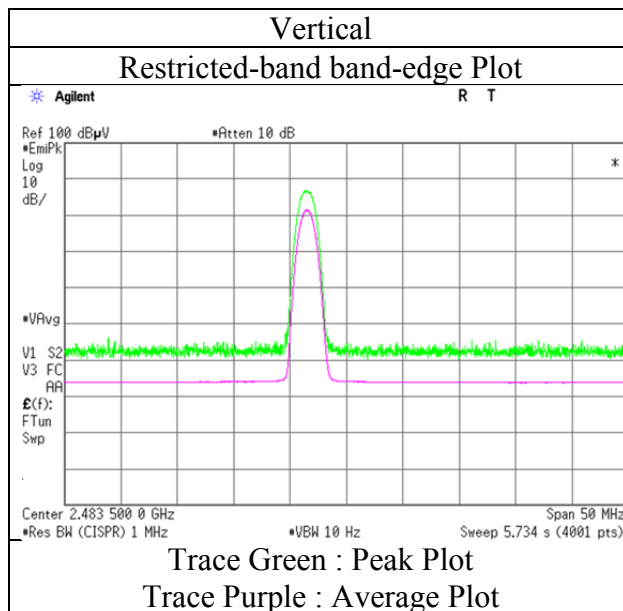
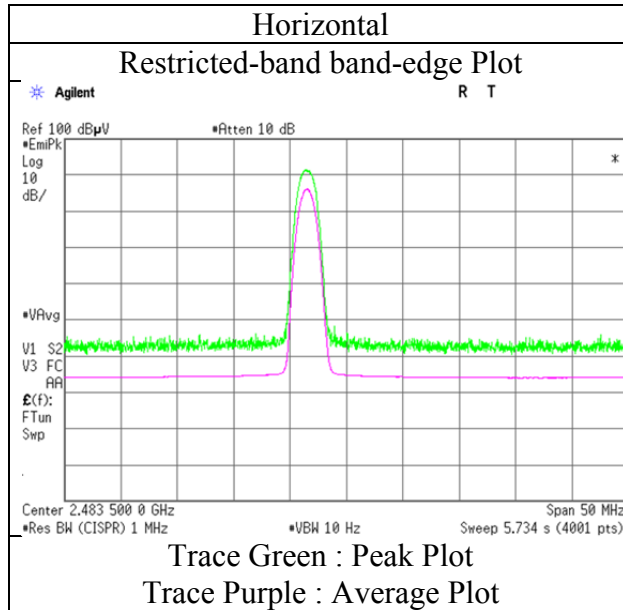
Distance factor : 1 GHz - 13 GHz : $20\log(4.3\text{ m} / 3.0\text{ m}) = 3.1\text{ dB}$

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

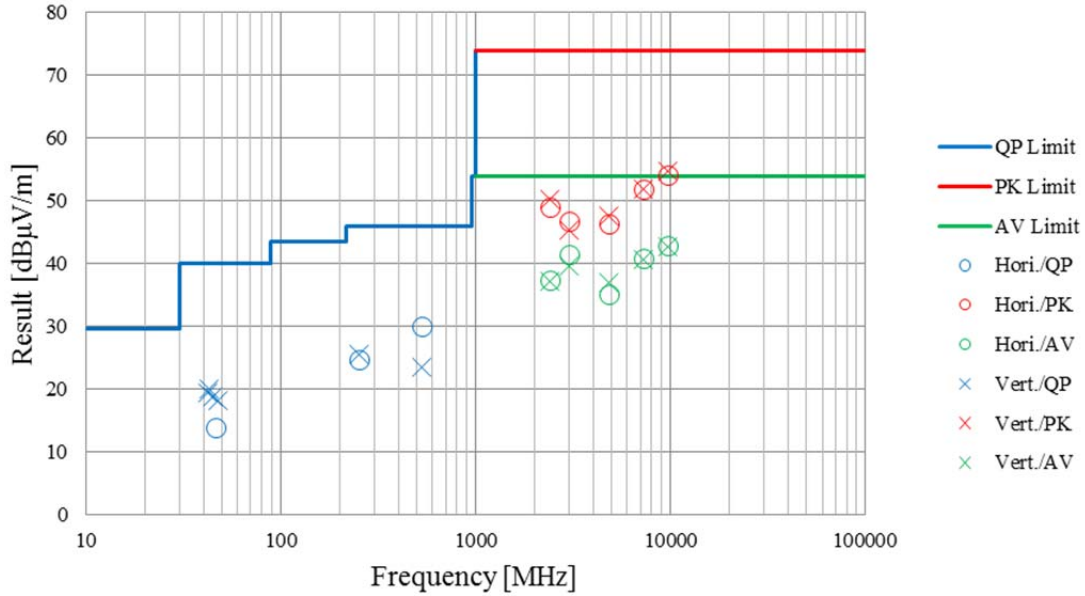
Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11274192S-A-R1
Date : May 9, 2016
Temperature / Humidity : 25 deg. C / 53 % RH
Engineer : Yosuke Ishikawa
(1-26.5 GHz)
Mode : Tx, Hopping Off, 3DH5 2480 MHz



* 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.	11274192S-A-R1	
Date	May 9, 2016	May 9, 2016
Temperature / Humidity	24 deg. C / 45 % RH	25 deg. C / 53 % RH
Engineer	Kazutaka Takeyama	Yosuke Ishikawa
	(30-1000 MHz)	(1-26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

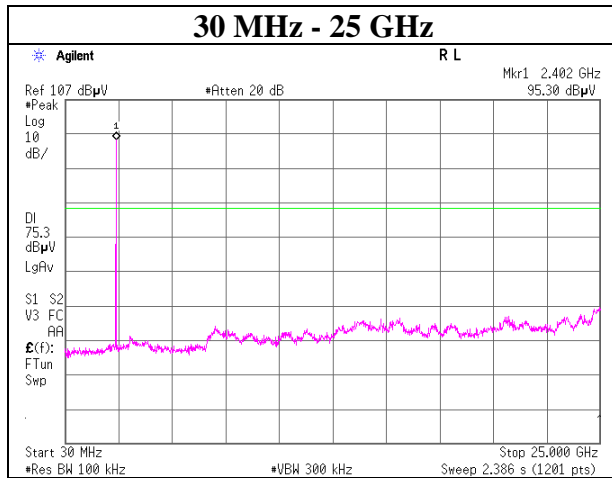
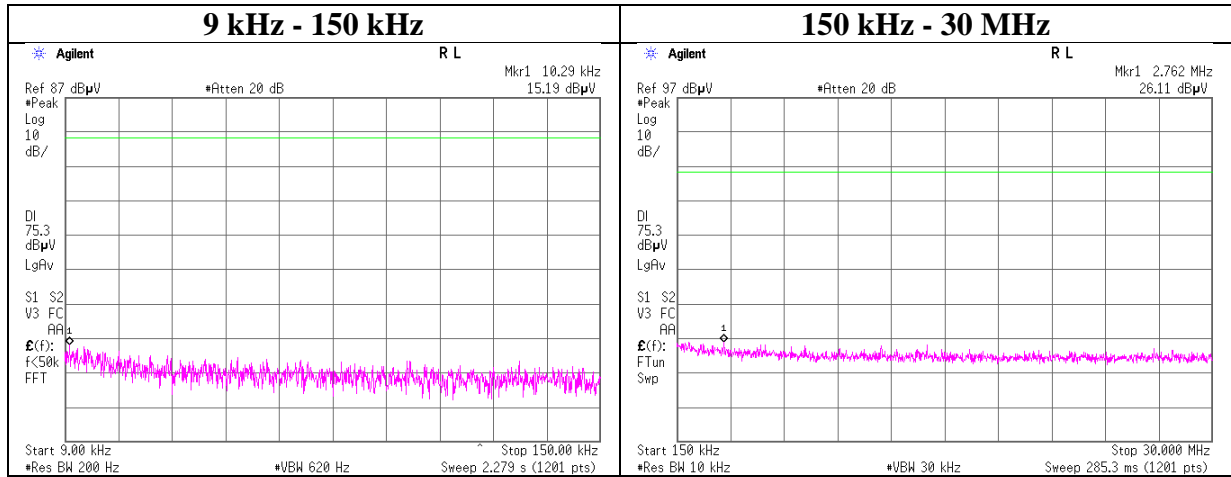


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

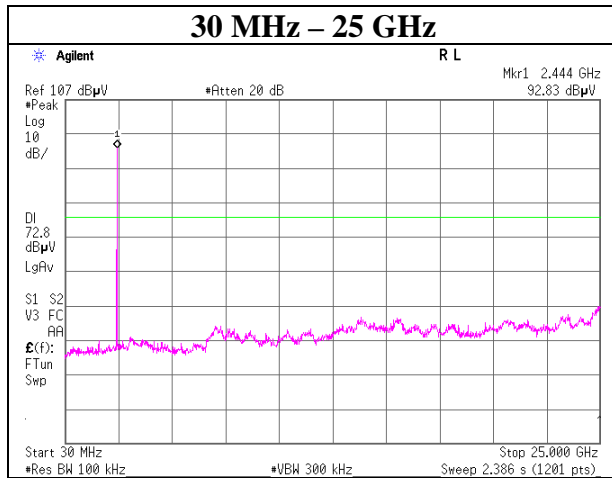
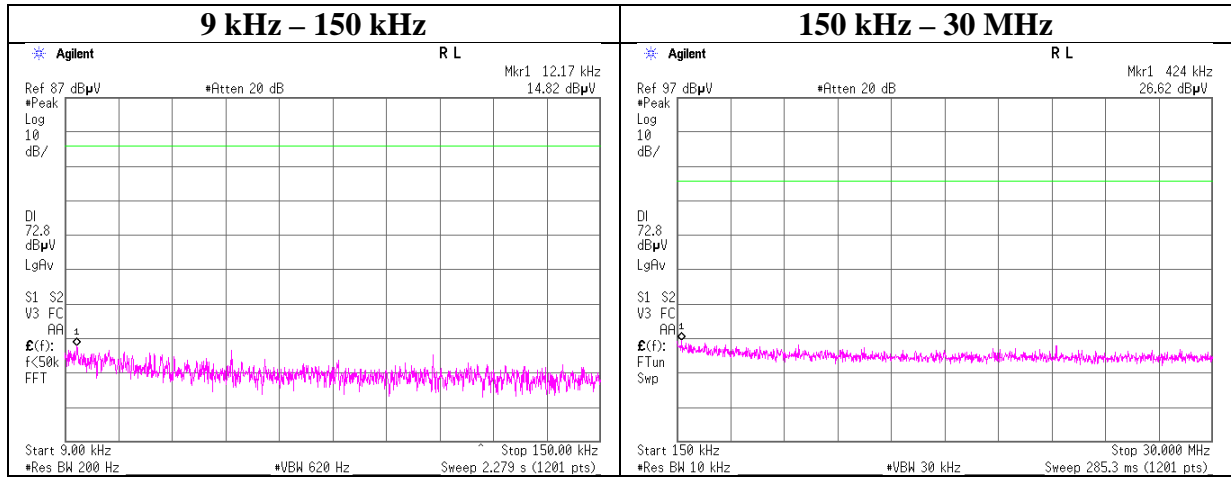
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

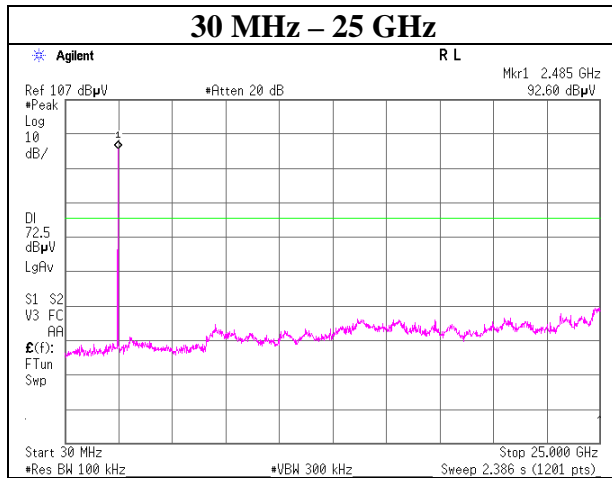
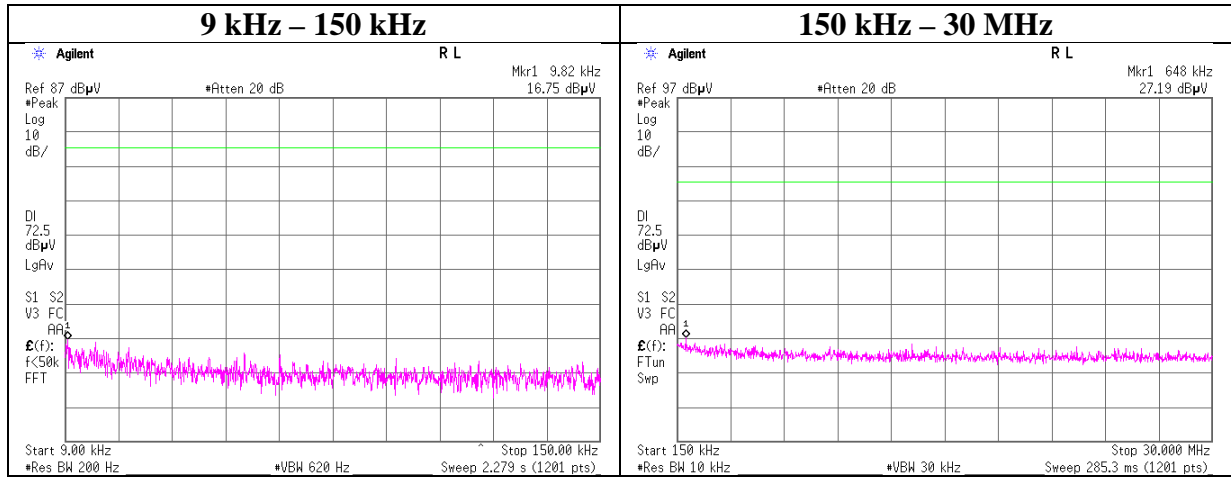
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, DH5

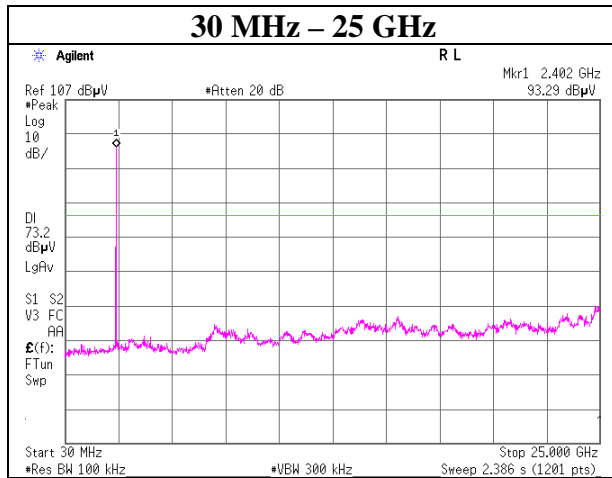
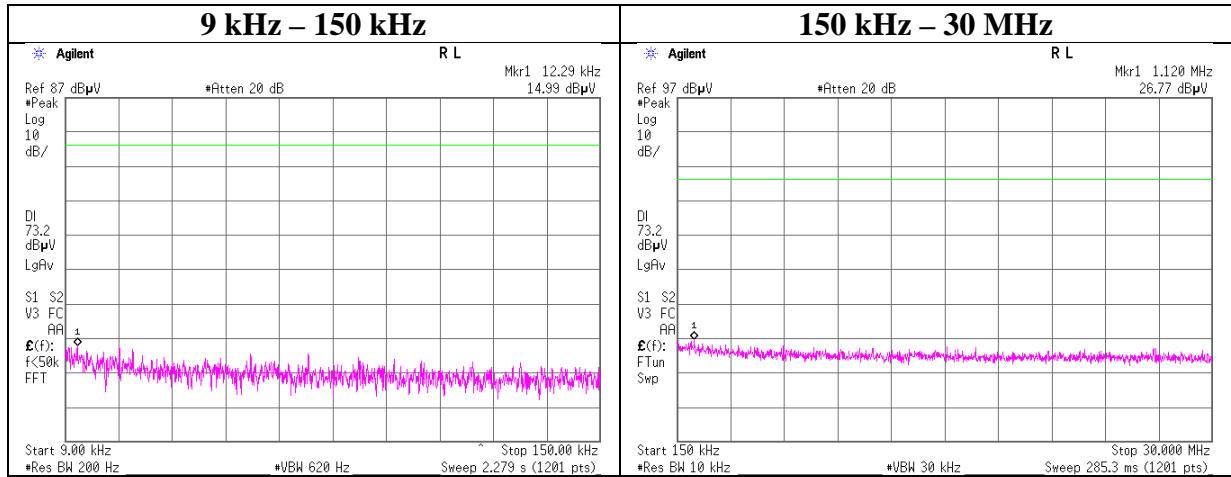
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

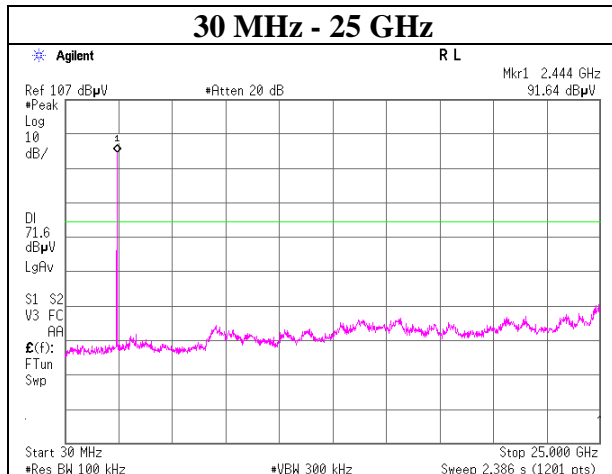
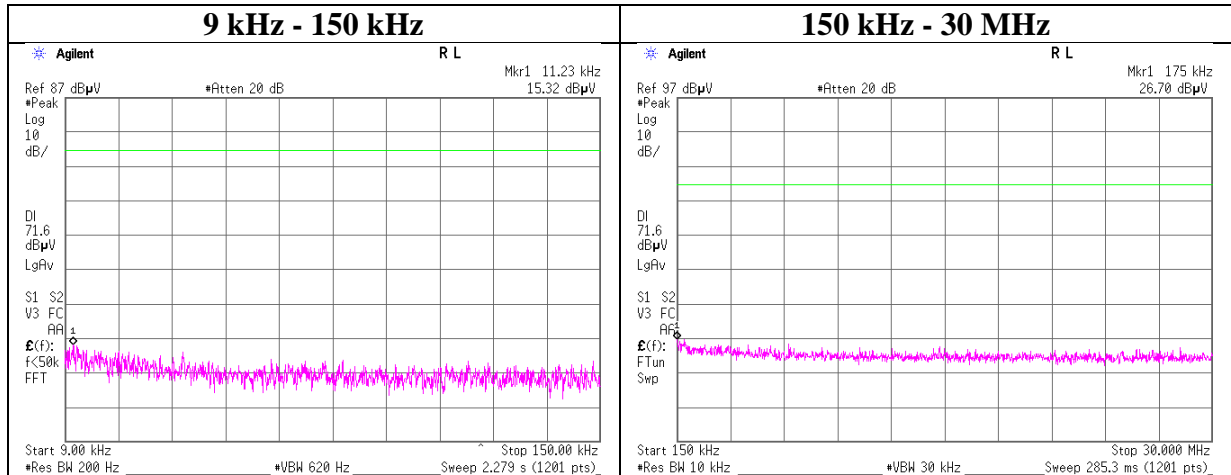
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

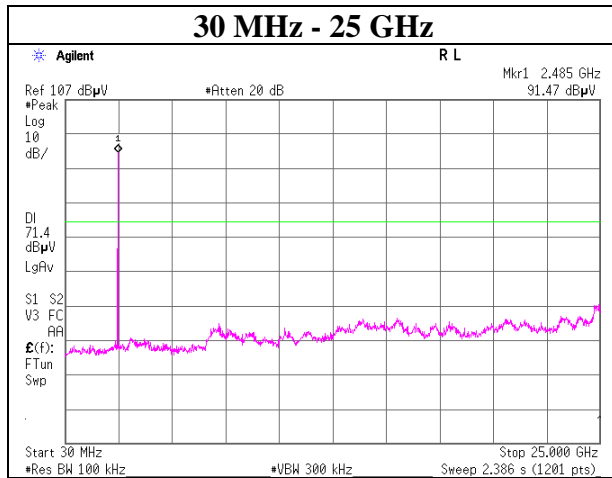
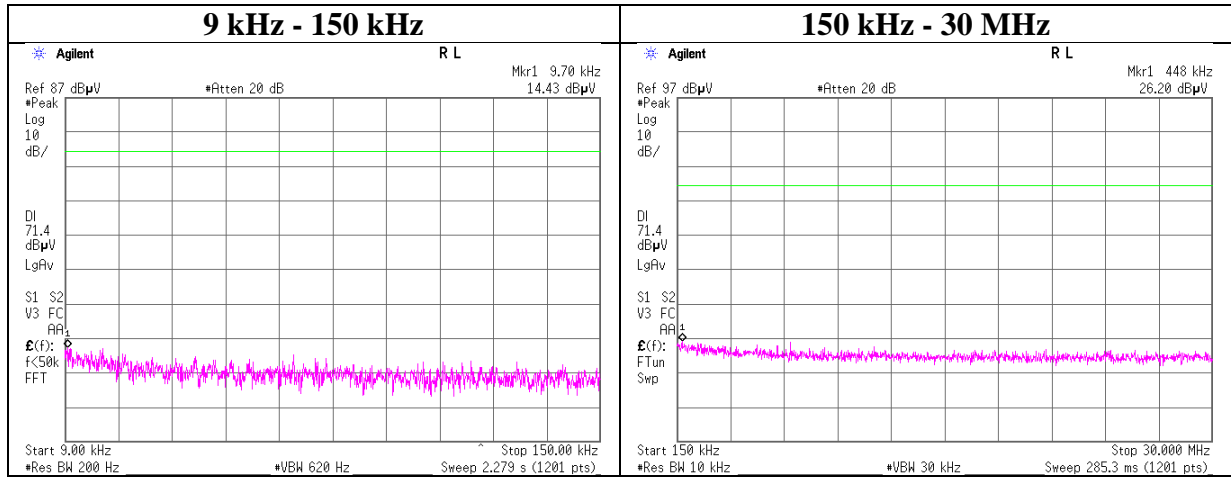
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx, Hopping Off, 3DH5

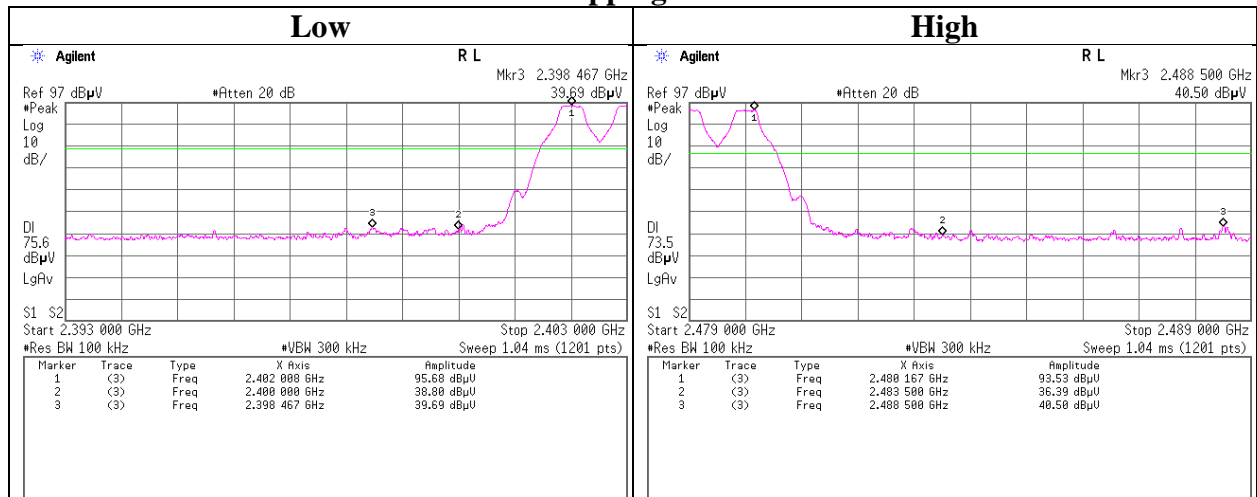
2480 MHz



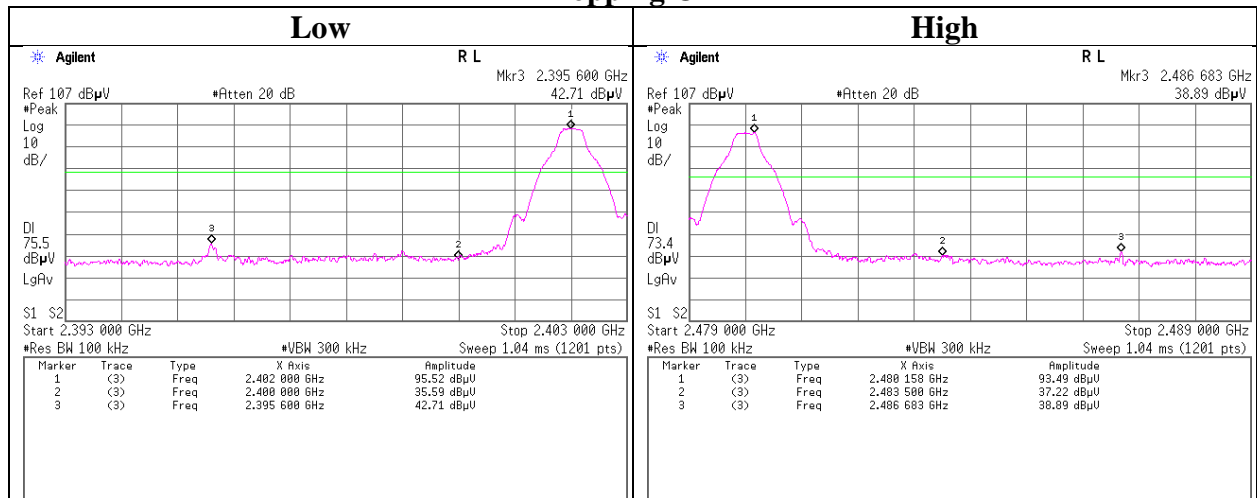
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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

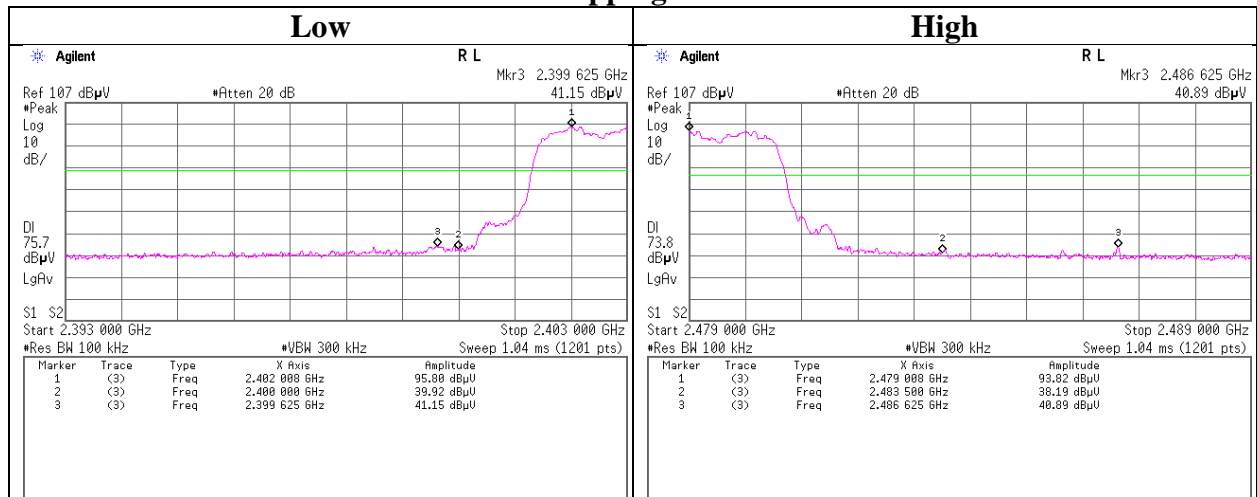
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

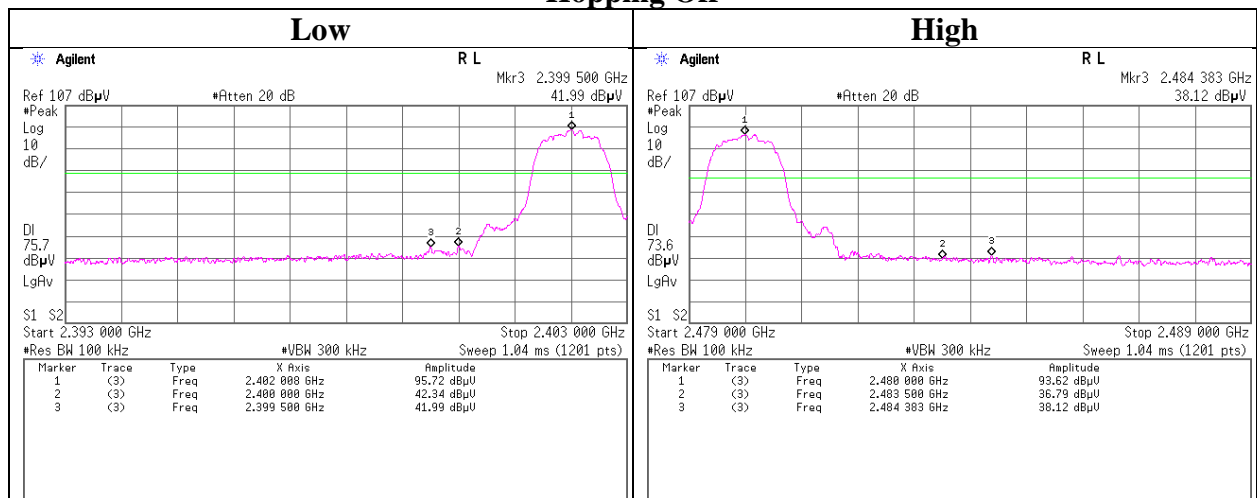
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
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

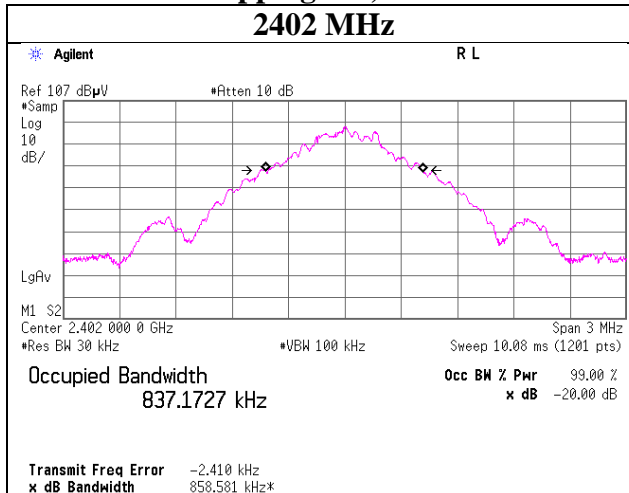
Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx Hopping Off

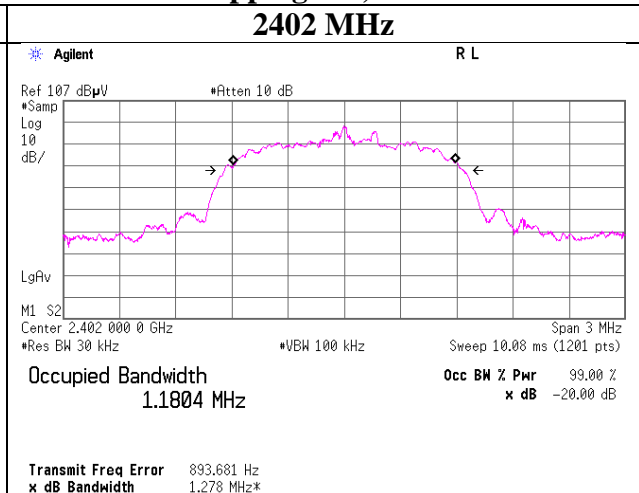
Hopping Off, DH5

2402 MHz

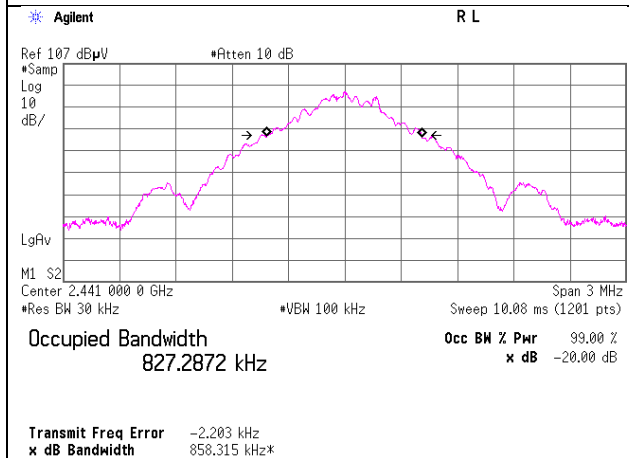


Hopping Off, 3DH5

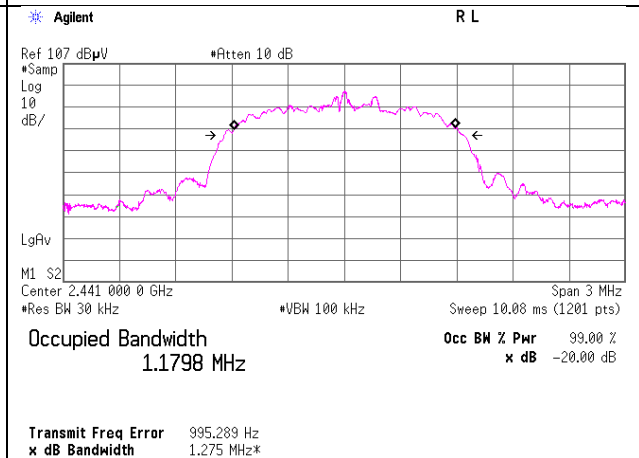
2402 MHz



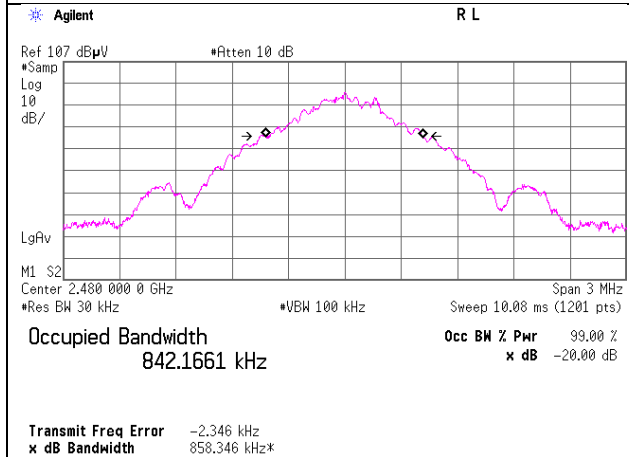
2441 MHz



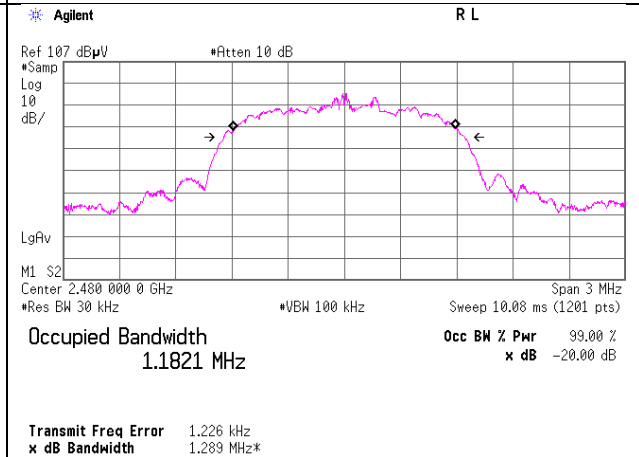
2441 MHz



2480 MHz



2480 MHz



UL Japan, Inc.

Shonan EMC Lab.

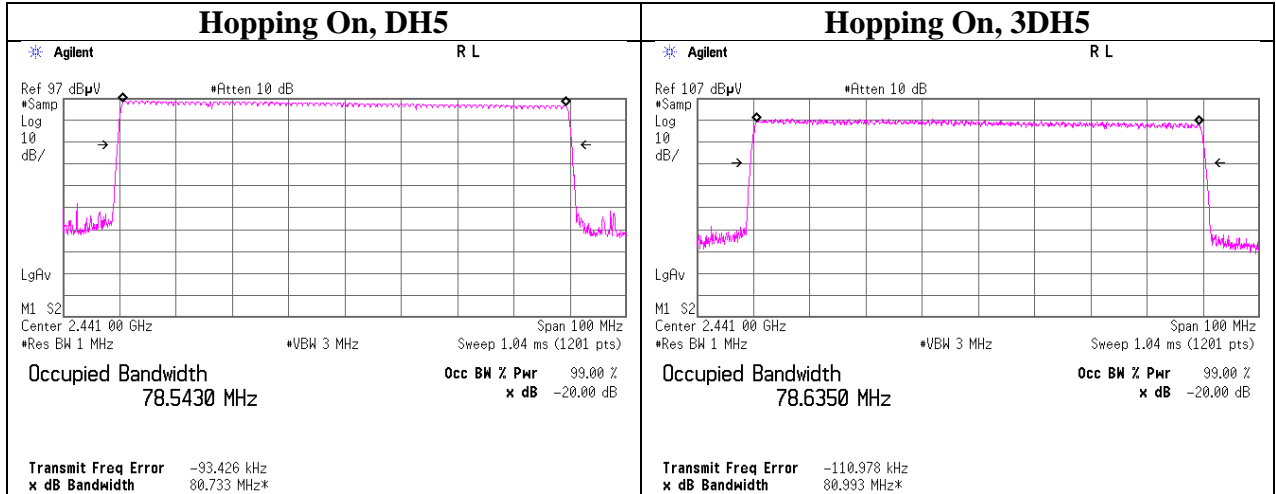
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11274192S-A-R1
Date	June 27, 2016
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx Hopping On



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2015/07/16 * 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	AT-406(40)	-	RE	2015/08/31 * 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/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
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV (RE,CE,RFI,MF)	-	RE	
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2015/11/18 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2015/05/27 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2015/06/08 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2015/05/19 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2015/08/11 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE, AT	2016/03/28 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2015/08/28 * 12
SAT10-05	Attenuator (above 1GHz)	Agilent	8493C-010	74864	RE	2015/11/04 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2016/03/24 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2015/09/07 * 12
SCC-G20	Coaxial Cable	Junkosha	J12J102518-00	APR-15-15-003	RE	2016/04/18 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMS KMS	-	RE	2016/04/18 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2016/04/04 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/23 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2016/04/18 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2015/11/18 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 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