



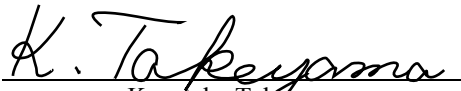
RADIO TEST REPORT


Test Report No. : 11837856S-A-R2

Applicant : CASIO COMPUTER CO., LTD.
Type of Equipment : Wireless Module
Model No. : K1506M
FCC ID : BBQGZE1P
Test regulation : FCC Part 15 Subpart C: 2017
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11837856S-A-R1. 11837856S-A-R1 is replaced with this report.

Date of test: July 5 to August 12, 2017

Representative test engineer: 
Kazutaka Takeyama
Engineer
Consumer Technology Division

Approved by: 
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.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : CASIO COMPUTER CO., LTD.
Address : 2-1, Sakaecho 3-chome, Hamura-shi Tokyo 205-8555, Japan
Telephone Number : +81-42-579-7521
Facsimile Number : +81-42-579-7157
Contact Person : Hidetoshi Sumi

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless Module
Model No. : K1506M
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.7 V/ DC 5 V
Receipt Date of Sample : July 3, 2017
Country of Mass-production : China
Condition of EUT : Engineering 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: K1506M (referred to as the EUT in this report) is a Wireless Module.

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
Antenna type : Dipole antenna
Antenna Gain : 0.96 dBi
Operating Temperature : -10 deg. C to +40 deg. C
Clock frequency(ies) in the system : 26 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 2, 2017

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

* The revision on November 2, 2017, 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	QP 20.0 dB, 0.40211 MHz, N, Tx DH5 2402 MHz USB circuit side 0.42347 MHz, N, Tx 3DH5 2441 MHz USB circuit side	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (b)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (b)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.5 dB 2483.500 MHz, PK, Hori. Tx, Hopping Off, 3-DH5 2480 MHz	Complied	Conducted/ Radiated (above 30 MHz) *1)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

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

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

FCC Part 15.31 (e)

The EUT provides stable voltage (DC 3.3 V) constantly to the RF module regardless of input voltage.
Therefore the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has an external antenna connector.

The module and Antenna are contacted by the Spring finger connector, and they are mechanically fixed by being installed by the professionals. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

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

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.
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Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

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

Conducted Emission test

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

Radiated emission test

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

3.5 Test Location

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Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

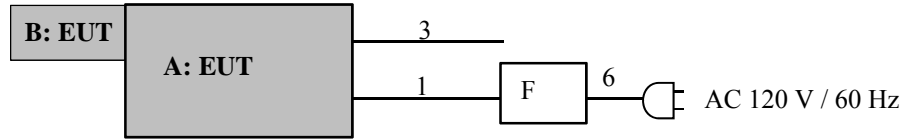
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

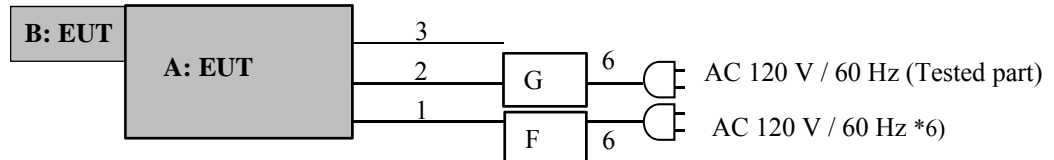
Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20 dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number 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: HCI tester Application Version 1.0.0.1</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>		

4.2 Configuration and peripherals

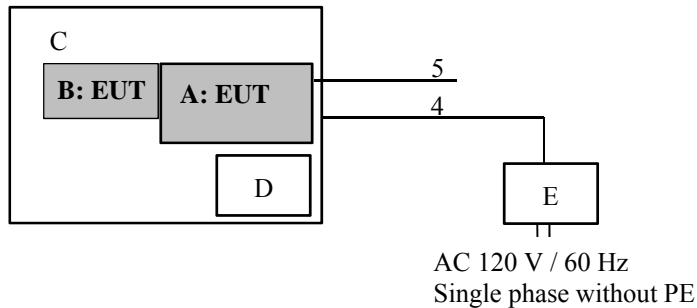
[Conducted emission tests (battery circuit side) and Antenna terminal conducted test]



[Conducted emission tests (USB circuit side)]



[Radiated emission tests]



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Module	K1506M	005 *1) 202 *2) 219 *3)	Casio Computer Co., Ltd.	EUT
B	Antenna	-	-	Casio Computer Co., Ltd.	EUT
C	Digital Camera	GZE-1	91	Casio Computer Co., Ltd.	*4)
D	Battery	NP-150	-	Casio Computer Co., Ltd.	-
E	AC Adaptor	AD-C54UJ	-	Casio Computer Co., Ltd.	-
F	DC power supply	PAN35-10A	NA000955	Kikusui	-
G	DC power supply	PAN35-10A	DE001677	Kikusui	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.15+0.7	Unshielded	Unshielded	DC 4.0 V *5)
2	DC	1.0	Unshielded	Unshielded	DC 5.0 V
3	Signal	0.15	Unshielded	Unshielded	-
4	USB	0.8	Shielded	Shielded	-
5	Signal	0.15	Unshielded	Unshielded	-
6	AC	2.00	Unshielded	Unshielded	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test

*3) Used for Radiated Emission test

*4) Since the EUT does not have own shielding, the radiated emission test was applied with representative host.

*5) The testing was performed with DC 4.0 V as a representative as a test voltage according to the customer's request.

*6) As a product specification, power input to the battery terminal is monitored and the EUT will not operate without this power input.

Therefore, the test had also been performed with power input (DC4.0 V) of the battery terminal, even though the power supplied from the USB power supply. (As a specification of the product, USB circuit side has given priority to power supply to the RF part.)

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m/ 2.0 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a shielded room. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

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

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

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

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

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.97 m*2) (1 GHz – 13 GHz), 1 m*3) (13 GHz – 26.5 GHz)		3.97 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: $20 \times \log(3.97 \text{ m}/3.0 \text{ m}) = 2.43 \text{ dB}$

*3) Distance Factor: $20 \times \log(1.0 \text{ m}/3.0 \text{ m}) = -9.54 \text{ dB}$

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

EUT polarization	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz -13 GHz)	Spurious (13 GHz -18 GHz)	Spurious (18 GHz -26.5 GHz)
Horizontal	X	Z	Y	X	Z
Vertical	Z	X	Z	X	Z

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 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20 dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 160 MHz 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	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. *2) 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 low enough 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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

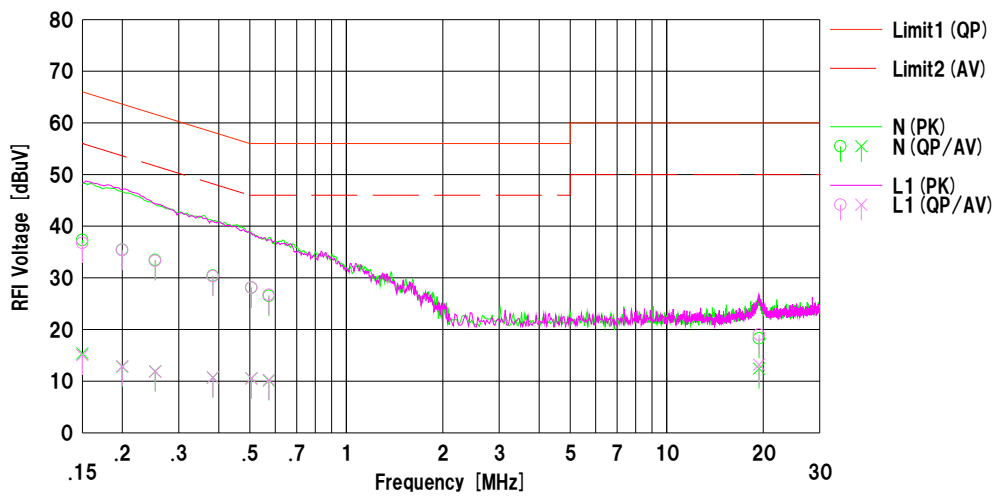
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2017/07/06

Mode : BT Tx DH5 2402MHz
Power : AC 120 V / 60 Hz (DC 4 V)
Temp./Humi. : 25 deg.C / 58 %RH

Remarks : Battery circuit side

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

Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15010	24.90	2.96	12.41	37.31	15.37	65.99	55.99	28.6	40.6	N	
2	0.19983	23.03	0.38	12.39	35.42	12.77	63.62	53.62	28.2	40.8	N	
3	0.25323	21.05	-0.53	12.41	33.46	11.88	61.65	51.65	28.1	39.7	N	
4	0.38332	18.01	-1.71	12.42	30.43	10.71	58.21	48.21	27.7	37.5	N	
5	0.50562	15.67	-1.92	12.44	28.11	10.52	56.00	46.00	27.8	35.4	N	
6	0.57353	14.05	-2.32	12.45	26.50	10.13	56.00	46.00	29.5	35.8	N	
7	19.41043	4.95	-0.92	13.35	18.30	12.43	60.00	50.00	41.7	37.5	N	
8	0.15010	24.35	2.66	12.41	36.76	15.07	65.99	55.99	29.2	40.9	L1	
9	0.19985	22.98	0.50	12.39	35.37	12.89	63.62	53.62	28.2	40.7	L1	
10	0.25320	20.90	-0.56	12.41	33.31	11.85	61.65	51.65	28.3	39.8	L1	
11	0.38330	17.88	-1.70	12.42	30.30	10.72	58.21	48.21	27.9	37.4	L1	
12	0.50565	15.67	-1.93	12.44	28.11	10.51	56.00	46.00	27.8	35.4	L1	
13	0.57351	14.25	-2.21	12.45	26.70	10.24	56.00	46.00	29.3	35.7	L1	
14	19.41050	5.65	-0.17	13.35	19.00	13.18	60.00	50.00	41.0	36.8	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

Conducted Emission

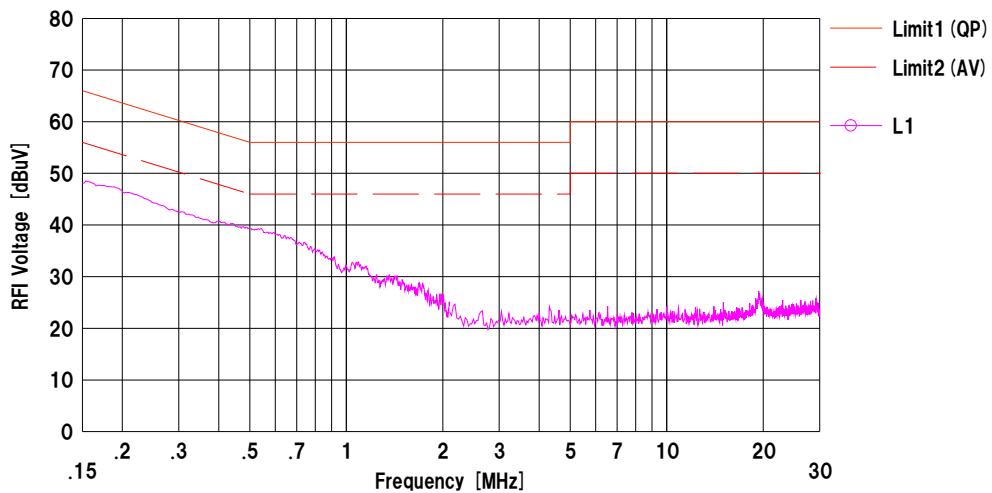
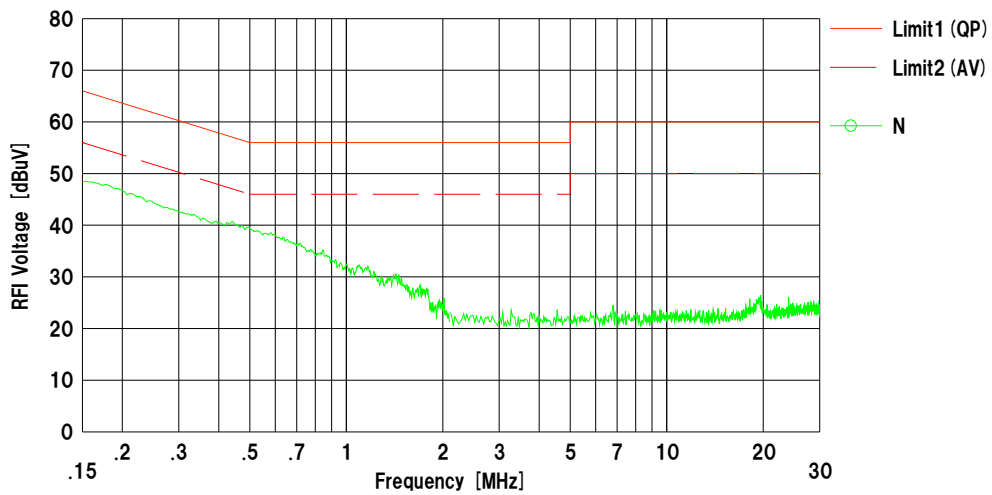
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2017/07/06

Mode : BT Tx DH5 2441MHz
Power : AC 120 V / 60 Hz (DC 4 V)
Temp./Humi. : 25 deg.C / 58 %RH

Remarks : Battery circuit side

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV
Engineer : Yosuke Ishikawa



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

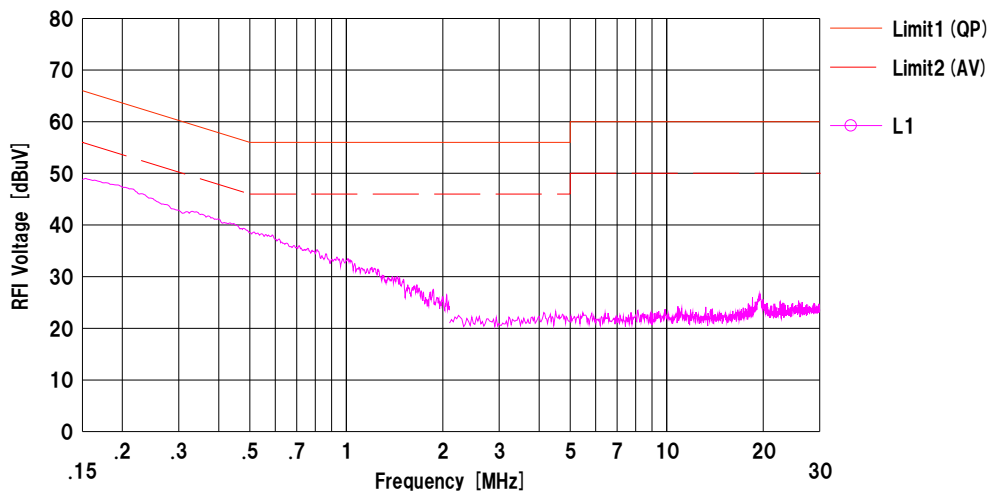
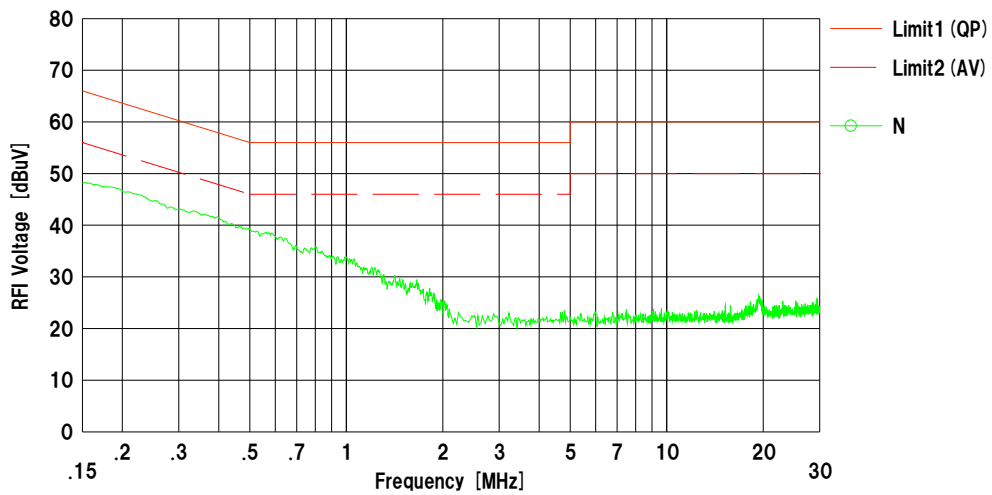
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2017/07/06

Mode : BT Tx DH5 2480MHz
Power : AC 120 V / 60 Hz (DC 4 V)
Temp./Humi. : 25 deg.C / 58 %RH

Remarks : Battery circuit side

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

Engineer : Yosuke Ishikawa



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

UL Japan, Inc.

Shonan EMC Lab.

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Telephone : +81 463 50 6400

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Conducted Emission

DATA OF CONDUCTED EMISSION TEST

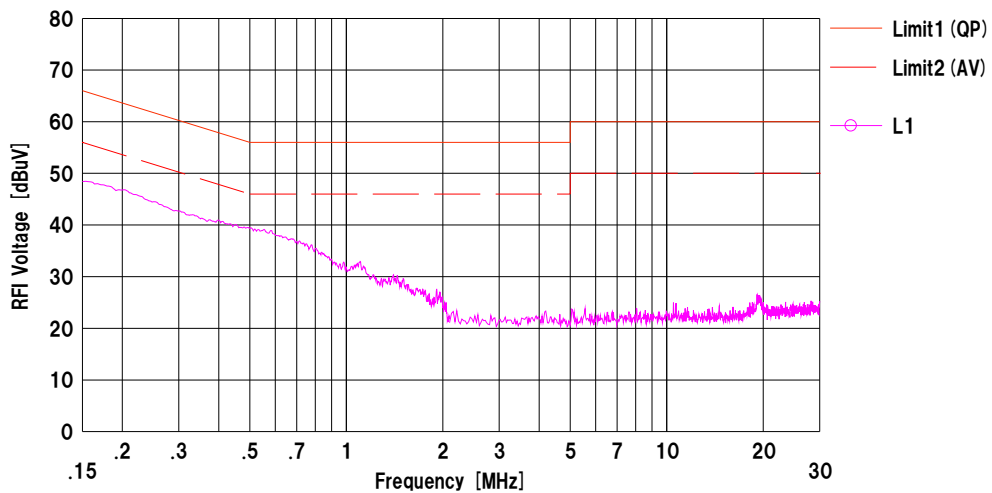
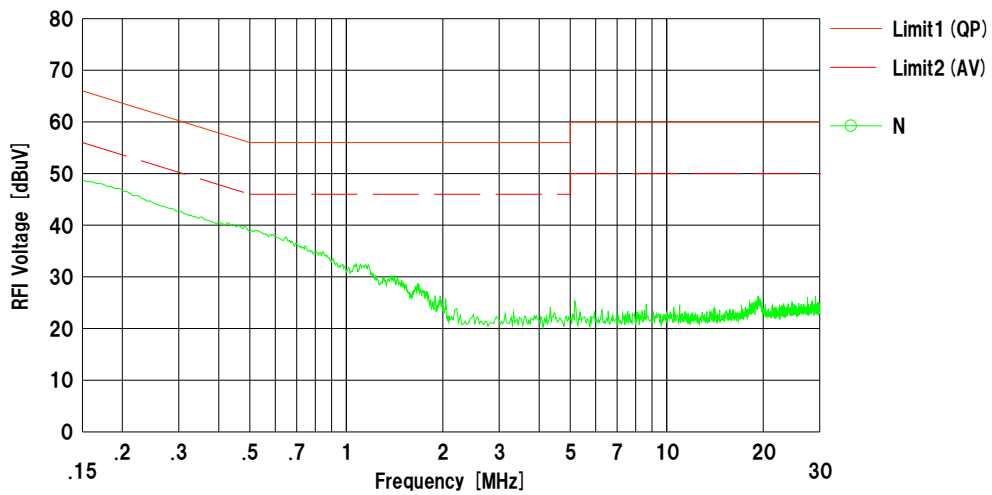
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
 Date : 2017/07/06

Mode : BT Tx 3DH5 2402MHz
 Power : AC 120 V / 60 Hz (DC 4 V)
 Temp./Humi. : 25 deg.C / 58 %RH

Remarks : Battery circuit side

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

Engineer : Yosuke Ishikawa



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
 LISN: SLS-05

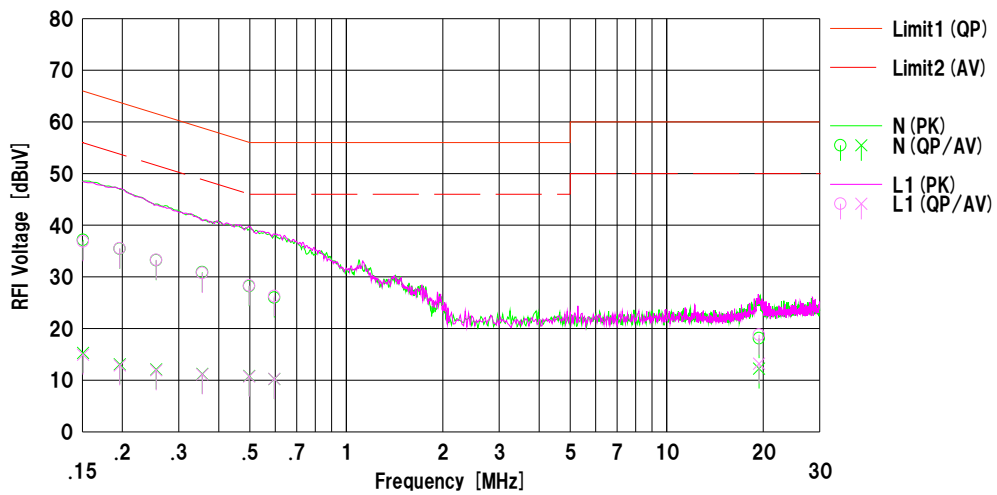
Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2017/07/06

Mode : BT Tx 3DH5 2441MHz
Power : AC 120 V / 60 Hz (DC 4 V)
Temp./Humi. : 25 deg.C / 58 %RH
Remarks : Battery circuit side

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV
Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15078	24.75	2.86	12.41	37.16	15.27	65.96	55.96	28.8	40.6	N	
2	0.19638	23.06	0.68	12.39	35.45	13.07	63.76	53.76	28.3	40.6	N	
3	0.25506	20.81	-0.32	12.41	33.22	12.09	61.59	51.59	28.3	39.5	N	
4	0.35547	18.45	-1.21	12.43	30.88	11.22	58.83	48.83	27.9	37.6	N	
5	0.49752	15.75	-1.63	12.44	28.19	10.81	56.04	46.04	27.8	35.2	N	
6	0.59604	13.55	-2.24	12.45	26.00	10.21	56.00	46.00	30.0	35.7	N	
7	19.41042	4.76	-1.12	13.35	18.11	12.23	60.00	50.00	41.8	37.7	N	
8	0.15080	24.45	2.51	12.41	38.86	14.92	65.96	55.96	29.1	41.0	L1	
9	0.19635	23.12	0.46	12.39	35.51	12.85	63.76	53.76	28.2	40.9	L1	
10	0.25512	20.88	-0.51	12.41	33.29	11.90	61.59	51.59	28.3	39.6	L1	
11	0.35545	18.33	-1.31	12.43	30.76	11.12	58.83	48.83	28.0	37.7	L1	
12	0.49756	15.88	-1.74	12.44	28.32	10.70	56.04	46.04	27.7	35.3	L1	
13	0.59612	13.81	-2.21	12.45	26.26	10.24	56.00	46.00	29.7	35.7	L1	
14	19.41032	5.45	-0.14	13.35	18.80	13.21	60.00	50.00	41.2	36.7	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

Conducted Emission

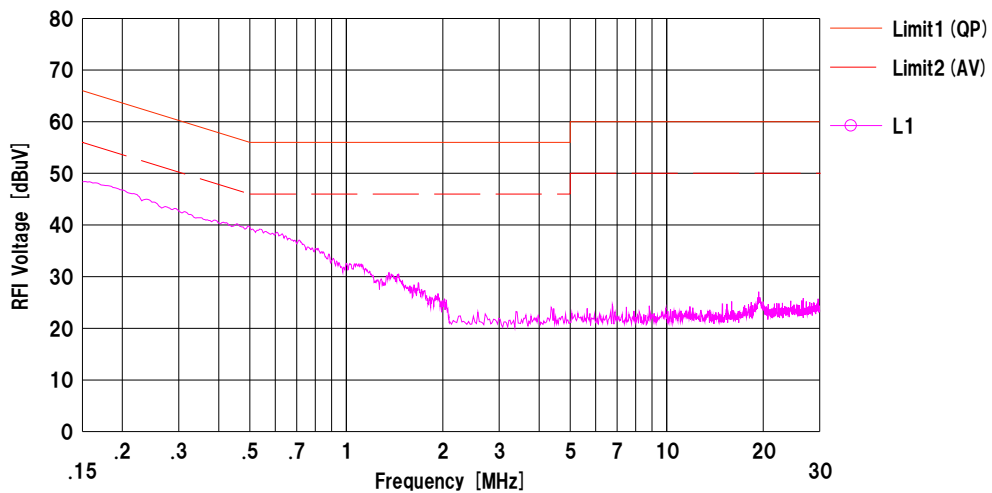
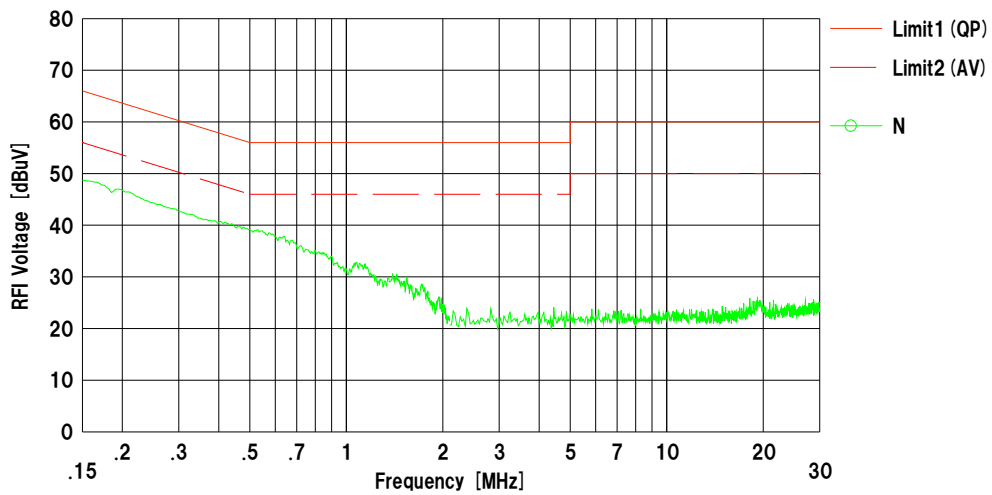
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2017/07/06

Mode : BT Tx 3DH5 2480MHz
Power : AC 120 V / 60 Hz (DC 4 V)
Temp./Humi. : 25 deg.C / 58 %RH
Remarks : Battery circuit side

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

Engineer : Yosuke Ishikawa



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

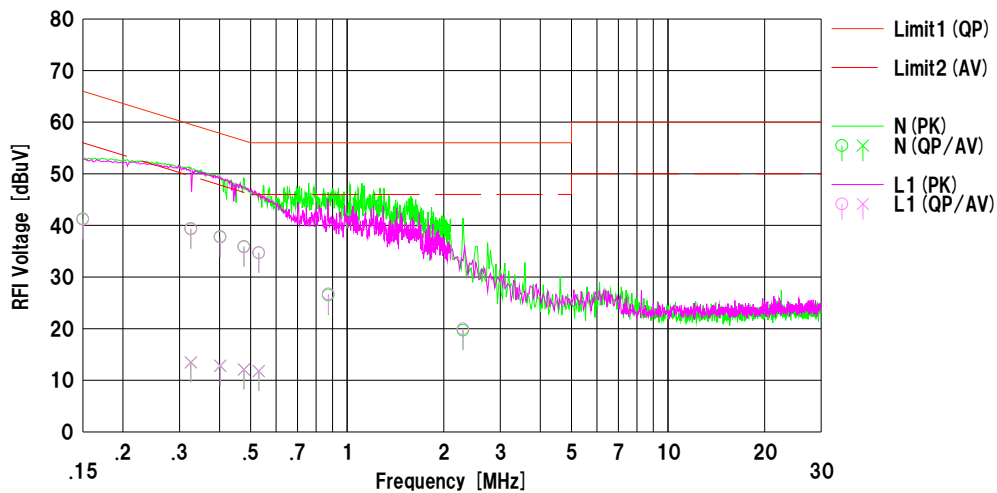
UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
Date : 2017/08/12

Mode : BT Tx DH5 2402MHz
Power : 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 25 deg.C / 48 %RH

Remarks : USB circuit side

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

Engineer : Makoto Hosaka



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.90	---	12.37	41.27	---	66.00	56.00	24.7	---	N	
2	0.32560	27.00	1.10	12.38	39.38	13.48	59.56	49.56	20.1	36.0	N	
3	0.40211	25.40	0.40	12.39	37.79	12.79	57.81	47.81	20.0	35.0	N	
4	0.47652	23.50	-0.30	12.41	35.91	12.11	56.40	46.40	20.4	34.2	N	
5	0.53004	22.30	-0.60	12.40	34.70	11.80	56.00	46.00	21.3	34.2	N	
6	0.87316	14.10	---	12.42	26.52	---	56.00	46.00	29.4	---	N	
7	2.29527	7.20	---	12.48	19.68	---	56.00	46.00	36.3	---	N	
8	0.15000	28.80	---	12.37	41.17	---	66.00	56.00	24.8	---	L1	
9	0.32560	26.90	1.10	12.38	39.28	13.48	59.56	49.56	20.2	36.0	L1	
10	0.40211	25.30	0.40	12.39	37.69	12.79	57.81	47.81	20.1	35.0	L1	
11	0.47652	23.40	-0.30	12.41	35.81	12.11	56.40	46.40	20.5	34.2	L1	
12	0.53004	22.30	-0.60	12.40	34.70	11.80	56.00	46.00	21.3	34.2	L1	
13	0.87316	14.30	---	12.42	26.72	---	56.00	46.00	29.2	---	L1	
14	2.29527	7.50	---	12.48	19.98	---	56.00	46.00	36.0	---	L1	

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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

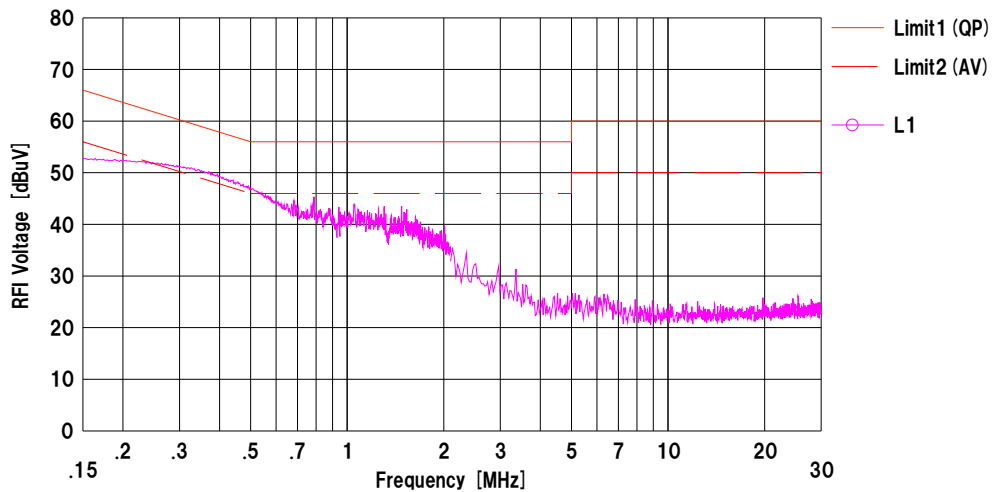
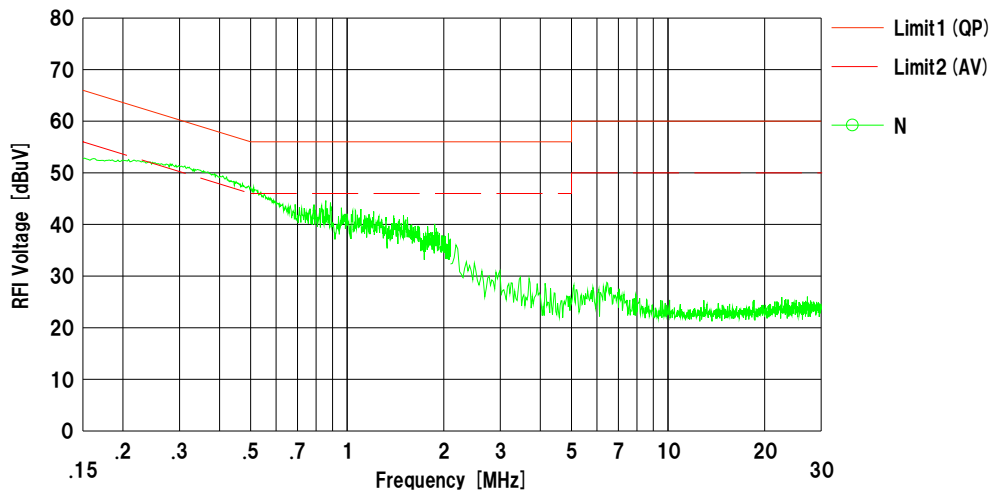
UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date : 2017/08/12

Mode : BT Tx DH5 2441MHz
 Power : 120 V / 60 Hz (DC 5 V)
 Temp./Humi. : 25 deg.C / 48 %RH

Remarks : USB circuit side

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

Engineer : Makoto Hosaka



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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

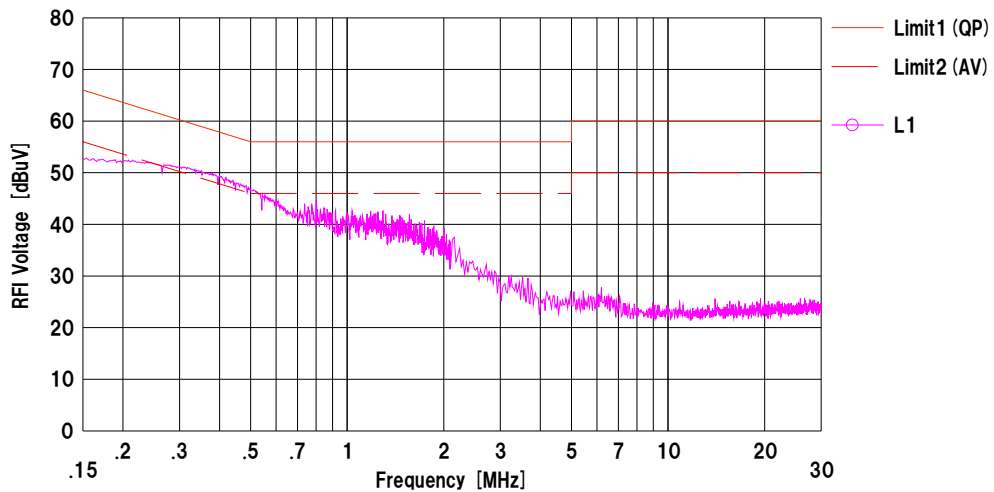
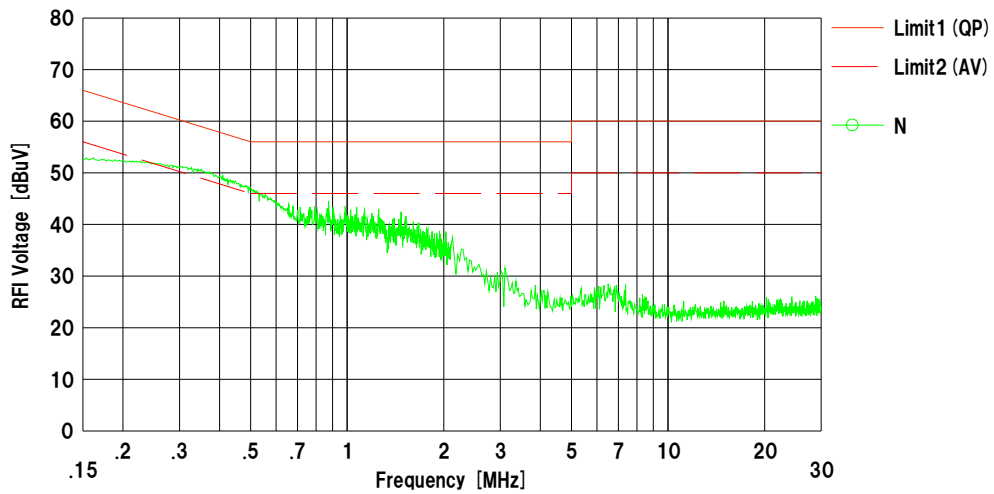
UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
Date : 2017/08/12

Mode : BT Tx DH5 2480MHz
Power : 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 25 deg.C / 48 %RH

Remarks : USB circuit side

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

Engineer : Makoto Hosaka



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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

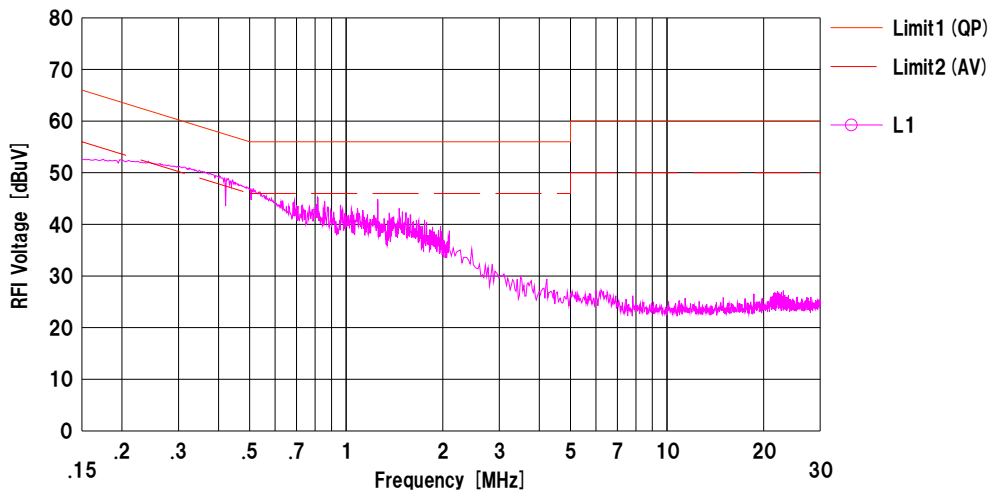
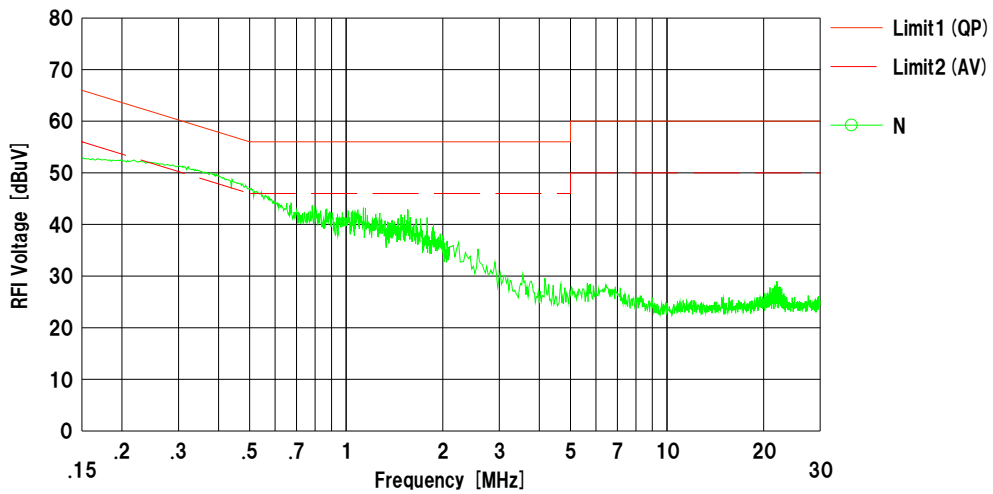
UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date : 2017/08/12

Mode : BT Tx 3DH5 2402MHz
 Power : 120 V / 60 Hz (DC 5 V)
 Temp./Humi. : 25 deg.C / 48 %RH

Remarks : USB circuit side

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

Engineer : Makoto Hosaka



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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

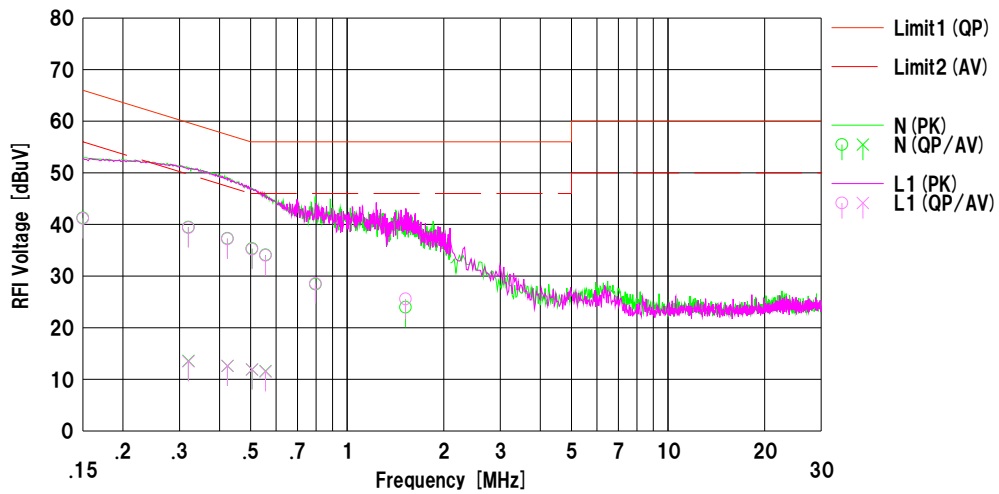
UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
Date : 2017/08/12

Mode : BT Tx 3DH5 2441MHz
Power : 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 25 deg.C / 48 %RH

Remarks : USB circuit side

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

Engineer : Makoto Hosaka



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.90	---	12.37	41.27	---	66.00	56.00	24.7	---	N	
2	0.31991	27.10	1.20	12.38	39.48	13.58	59.71	49.71	20.2	36.1	N	
3	0.42347	24.90	0.20	12.40	37.30	12.60	57.38	47.38	20.0	34.7	N	
4	0.50519	22.90	-0.50	12.41	35.31	11.91	56.00	46.00	20.6	34.0	N	
5	0.55657	21.70	-0.80	12.40	34.10	11.60	56.00	46.00	21.9	34.4	N	
6	0.79644	16.00	---	12.44	28.44	---	56.00	46.00	27.5	---	N	
7	1.52016	11.50	---	12.46	23.96	---	56.00	46.00	32.0	---	N	
8	0.15000	28.80	---	12.37	41.17	---	66.00	56.00	24.8	---	L1	
9	0.31991	27.00	1.10	12.38	39.38	13.48	59.71	49.71	20.3	36.2	L1	
10	0.42347	24.80	0.20	12.40	37.20	12.60	57.38	47.38	20.1	34.7	L1	
11	0.50519	22.80	-0.50	12.41	35.21	11.91	56.00	46.00	20.7	34.0	L1	
12	0.55657	21.60	-0.90	12.40	34.00	11.50	56.00	46.00	22.0	34.5	L1	
13	0.79644	16.10	---	12.44	28.54	---	56.00	46.00	27.4	---	L1	
14	1.52016	13.10	---	12.46	25.56	---	56.00	46.00	30.4	---	L1	

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

Conducted Emission

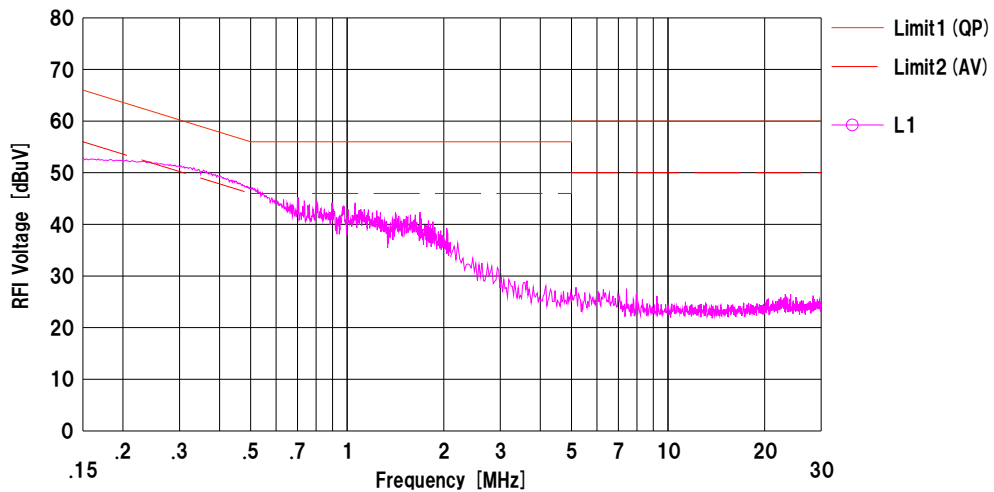
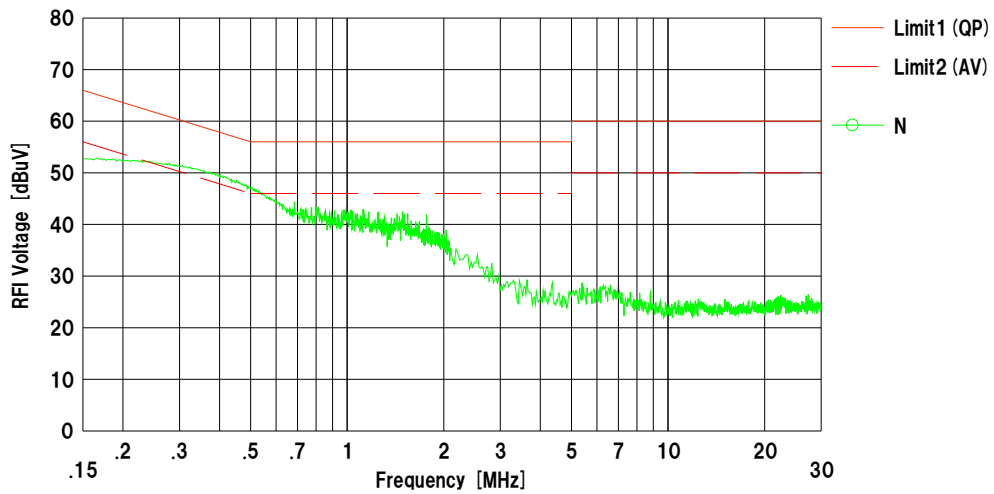
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date : 2017/08/12

Mode : BT Tx 3DH5 2480MHz
 Power : 120 V / 60 Hz (DC 5 V)
 Temp./Humi. : 25 deg.C / 48 %RH

Remarks : USB circuit side

Limit1 : FCC 15C (15.207) QP
 Limit2 : FCC 15C (15.207) AV
 Engineer : Makoto Hosaka



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

20dB Bandwidth and Carrier Frequency Separation

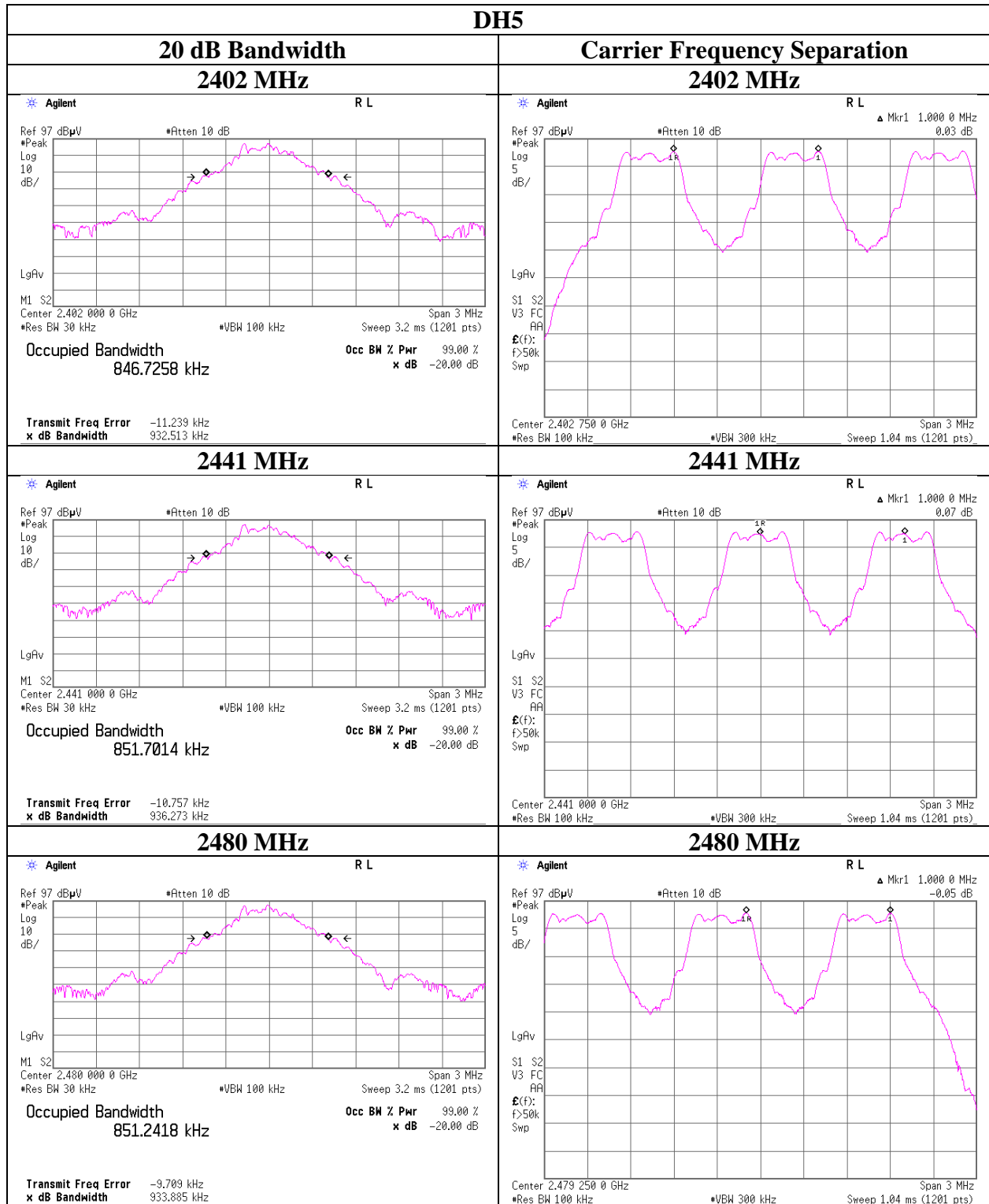
Test place Shonan EMC Lab. No.3 Shielded Room
Report No. 11837856S-A-R2
Date July 5, 2017
Temperature / Humidity 24 deg. C / 54 % RH
Engineer Kazutaka Takeyama
Mode Tx, Hopping Off, DH5

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.933	1.000	≥ 0.622
DH5	2441.0	0.936	1.000	≥ 0.624
DH5	2480.0	0.934	1.000	≥ 0.623
3DH5	2402.0	1.269	1.000	≥ 0.846
3DH5	2441.0	1.267	1.000	≥ 0.845
3DH5	2480.0	1.286	1.000	≥ 0.857

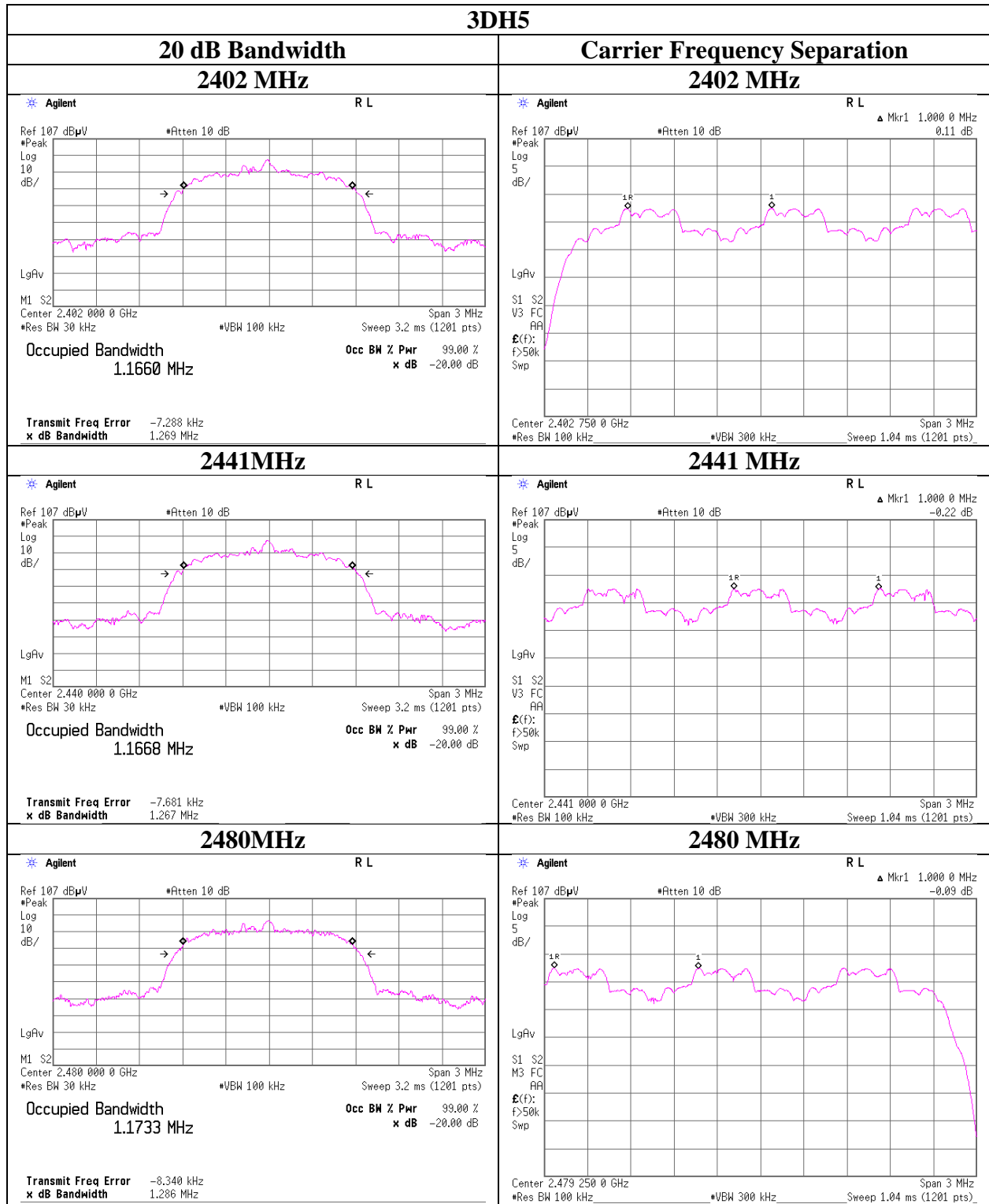
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation



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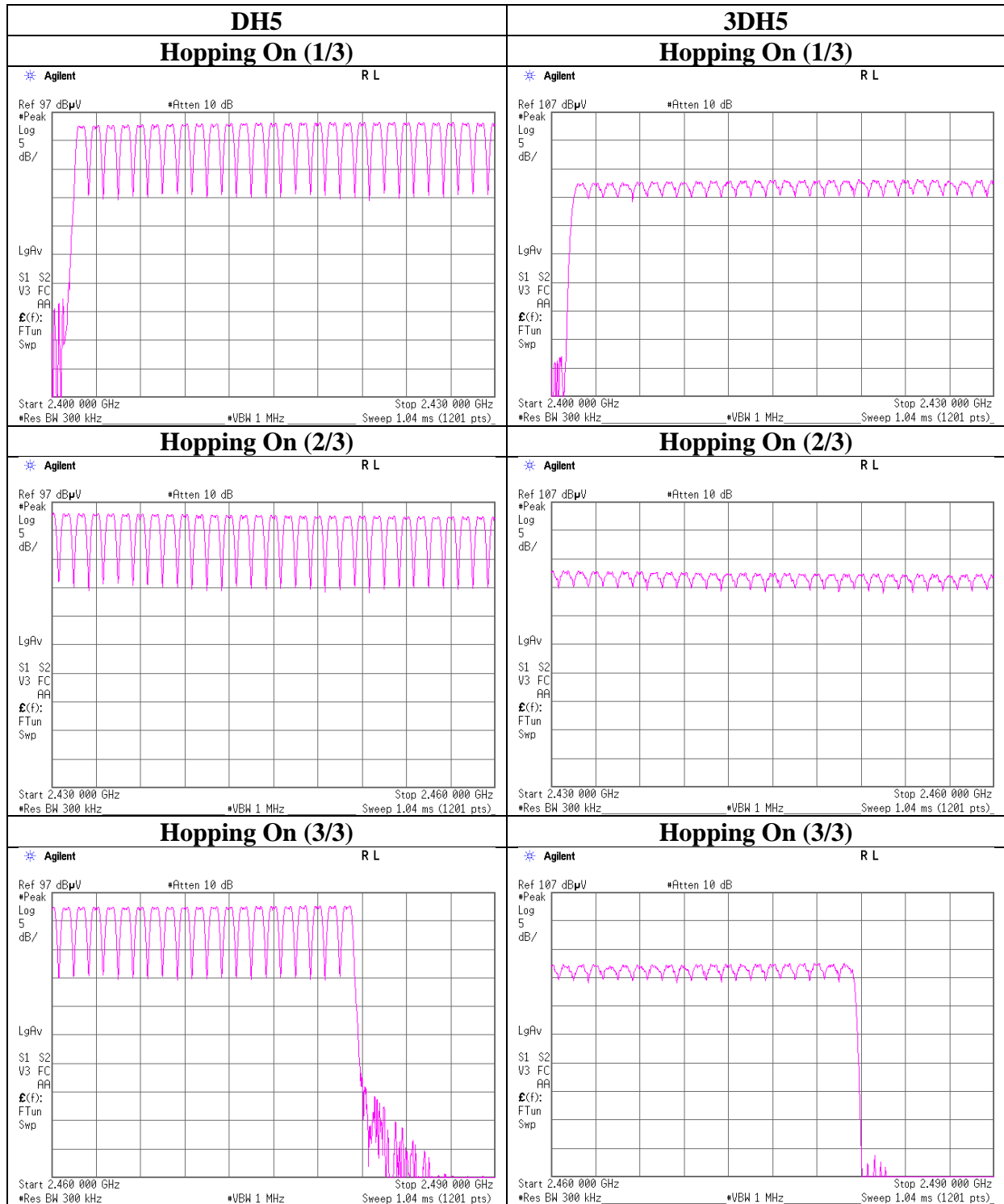
Number of Hopping Frequency

Test place Shonan EMC Lab. No.3 Shielded Room
Report No. 11837856S-A-R2
Date July 5, 2017
Temperature / Humidity 24 deg. C / 54 % RH
Engineer Kazutaka Takeyama
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.3 Shielded Room
Report No. : 11837856S-A-R2
Date : July 5, 2017
Temperature / Humidity : 24 deg. C / 54 % RH
Engineer : Kazutaka Takeyama
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]
	47.8 times / 5 sec. x	31.6 sec. =	303 times			
DH1	47.8 times / 5 sec. x	31.6 sec. =	303 times	0.455	138	400
DH3	26.8 times / 5 sec. x	31.6 sec. =	170 times	1.713	291	400
DH5	17.2 times / 5 sec. x	31.6 sec. =	109 times	2.960	323	400
3DH1	49.4 times / 5 sec. x	31.6 sec. =	313 times	0.454	142	400
3DH3	25.6 times / 5 sec. x	31.6 sec. =	162 times	1.703	276	400
3DH5	18.8 times / 5 sec. x	31.6 sec. =	119 times	2.949	351	400

Sample Calculation

Result = Number of transmission x Length of transmission

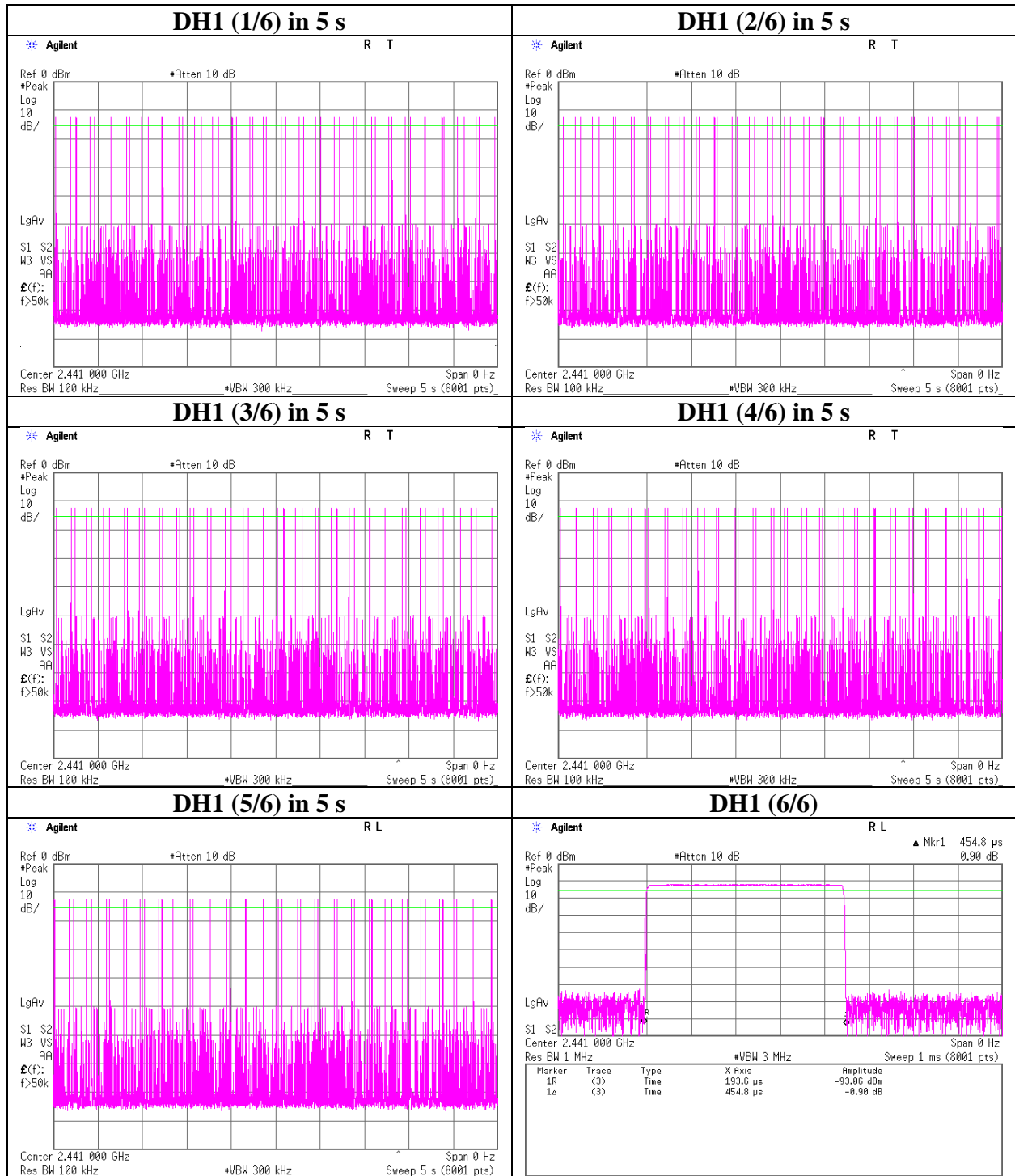
*Average data of 5 tests. (except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	48	48	50	47	46	47.8
DH3	26	26	28	28	26	26.8
DH5	18	16	17	19	16	17.2
3DH1	47	50	51	51	48	49.4
3DH3	26	21	26	27	28	25.6
3DH5	17	20	18	20	19	18.8

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 $N = 79$.



UL Japan, Inc.

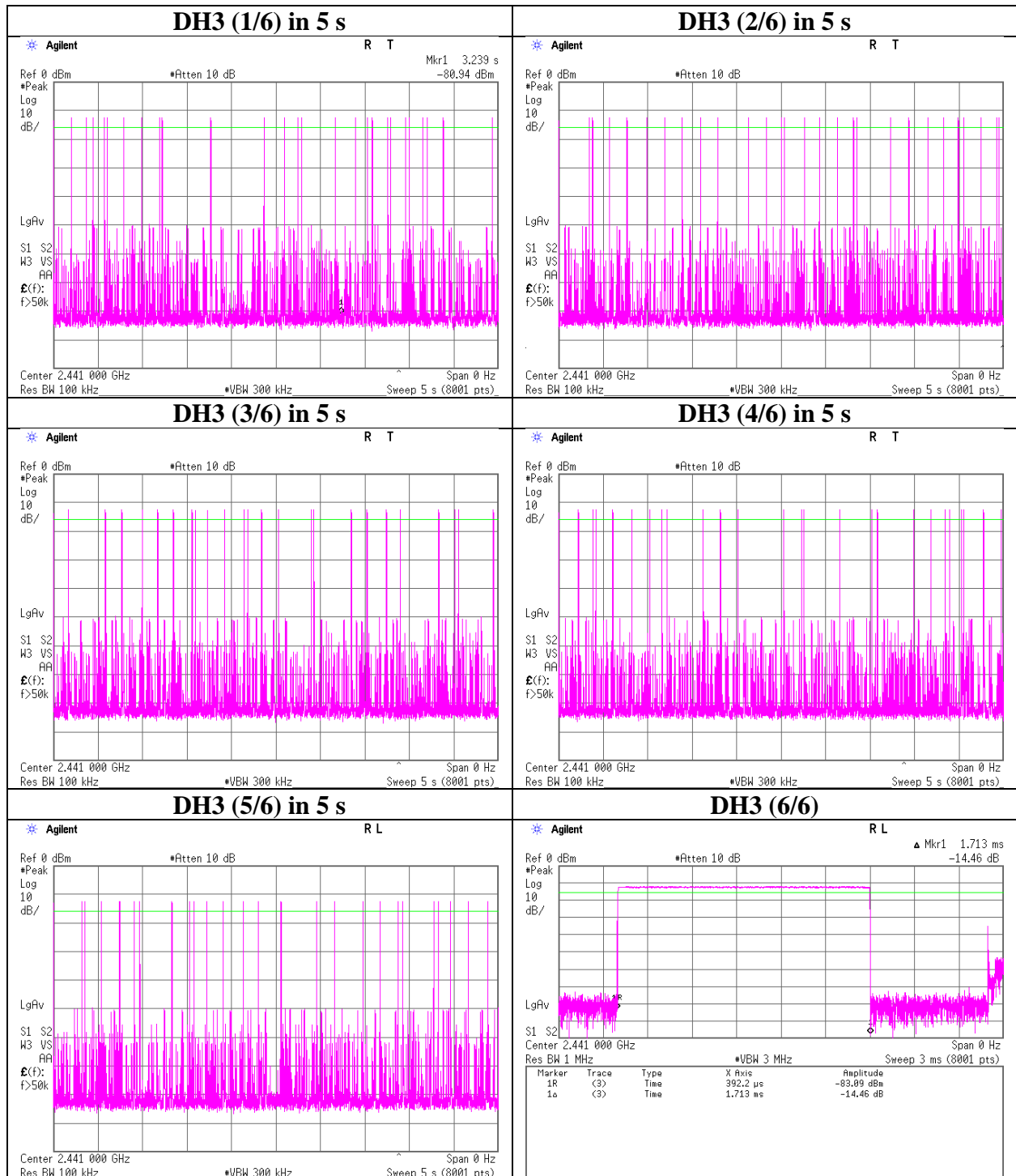
Shonan EMC Lab.

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Dwell time



UL Japan, Inc.

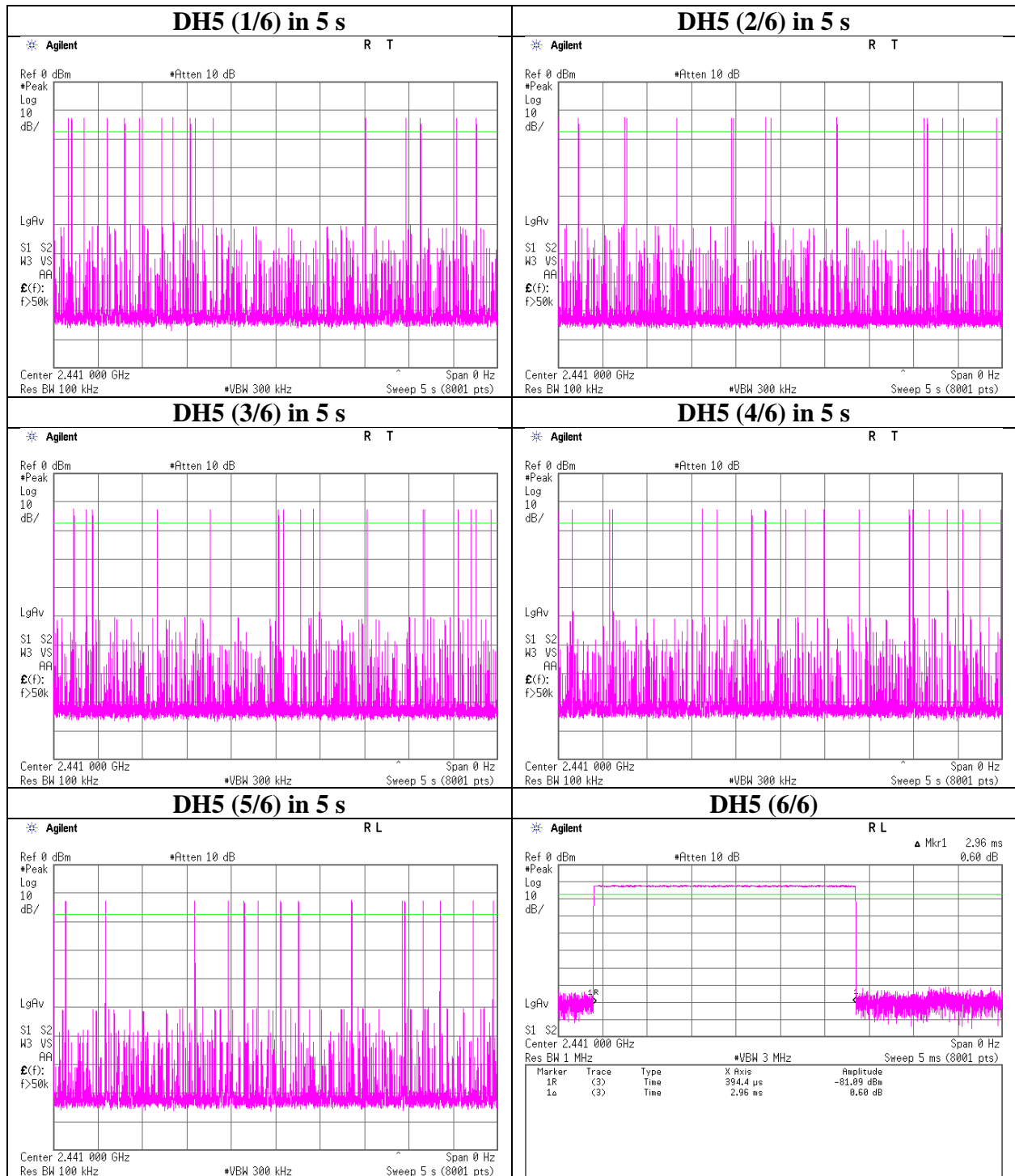
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Dwell time



UL Japan, Inc.

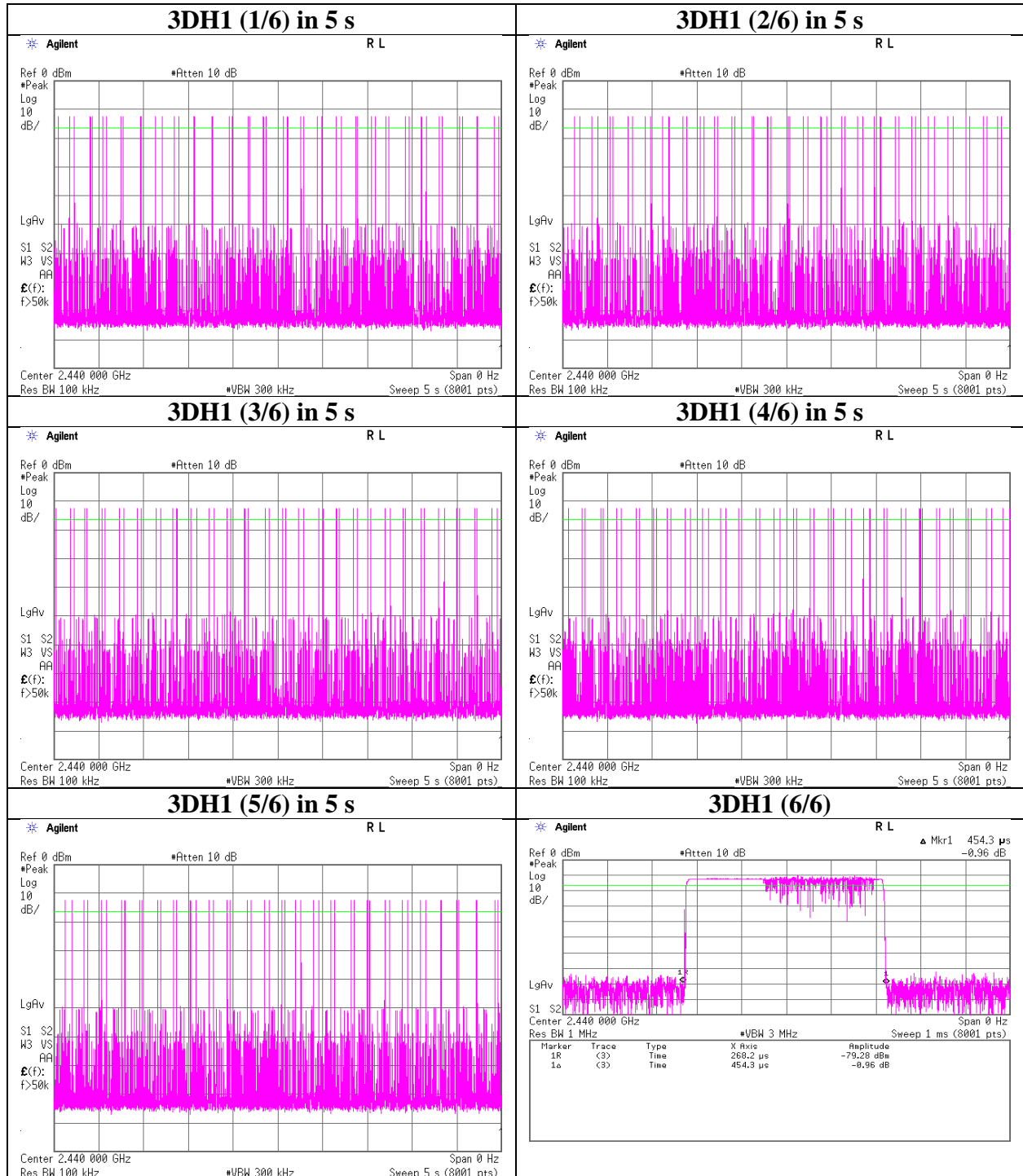
Shonan EMC Lab.

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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time



UL Japan, Inc.

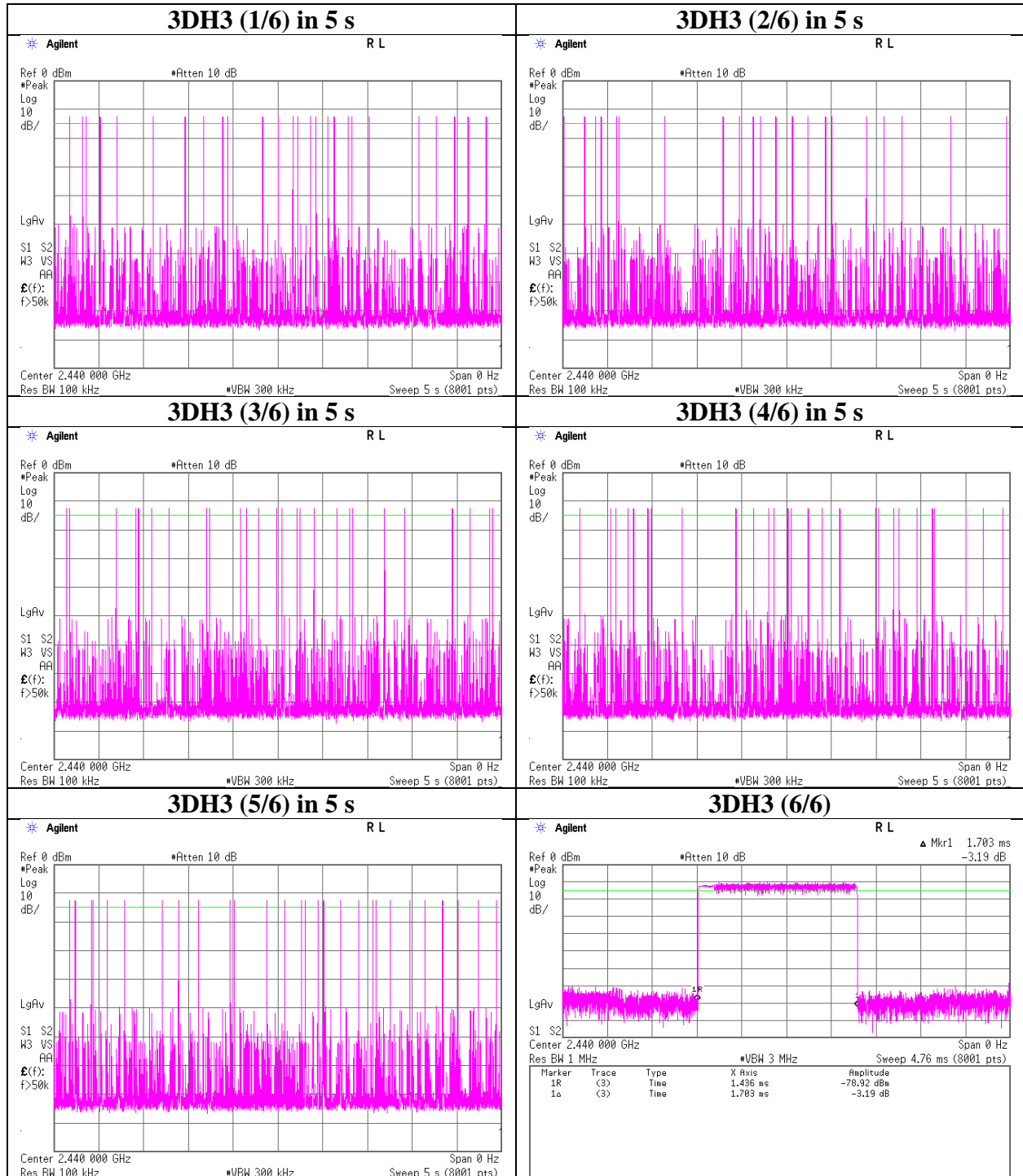
Shonan EMC Lab.

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Telephone : +81 463 50 6400

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Dwell time



UL Japan, Inc.

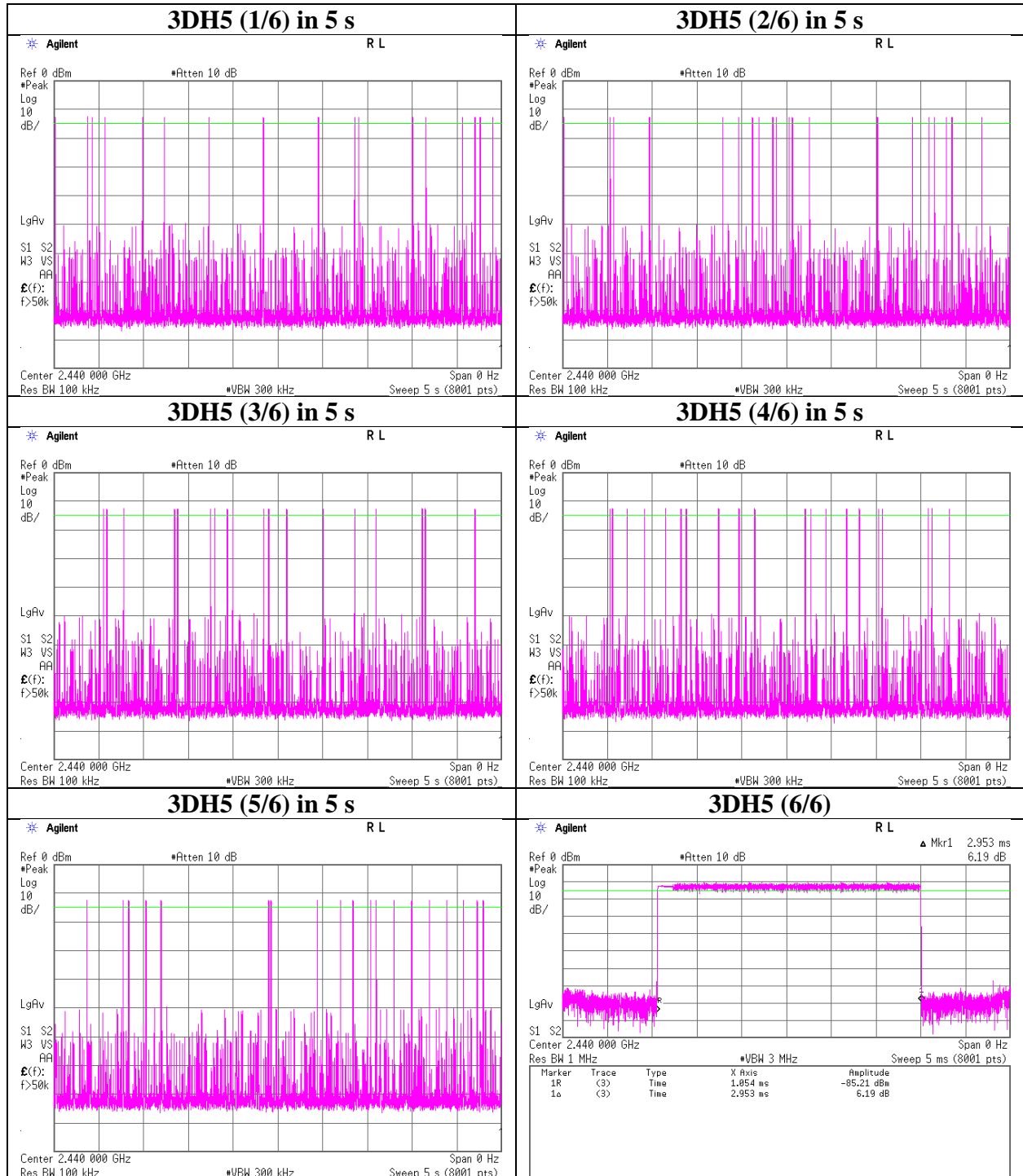
Shonan EMC Lab.

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Telephone : +81 463 50 6400

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Dwell time



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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Peak Output Power

Test place : Shonan EMC Lab. No.3 Shielded Room
 Report No. : 11837856S-A-R2
 Date : July 5, 2017
 Temperature / Humidity : 24 deg. C / 54 % RH
 Engineer : Kazutaka Takeyama
 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	-12.00	1.80	9.80	-0.40	0.91	20.96	125	21.36
DH5	2441.0	-12.02	1.81	9.80	-0.41	0.91	20.96	125	21.37
DH5	2480.0	-12.13	1.82	9.80	-0.51	0.89	20.96	125	21.47
2DH5	2402.0	-10.90	1.80	9.80	0.70	1.17	20.96	125	20.26
2DH5	2441.0	-10.70	1.81	9.80	0.91	1.23	20.96	125	20.05
2DH5	2480.0	-10.83	1.82	9.80	0.79	1.20	20.96	125	20.17
3DH5	2402.0	-10.84	1.80	9.80	0.76	1.19	20.96	125	20.20
3DH5	2441.0	-10.62	1.81	9.80	0.99	1.26	20.96	125	19.97
3DH5	2480.0	-10.77	1.82	9.80	0.85	1.22	20.96	125	20.11

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.

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Average Output Power
(Reference data for RF Exposure)

Test place Shonan EMC Lab. No.3 Shielded Room
Report No. 11837856S-A-R2
Date July 5, 2017
Temperature / Humidity 24 deg. C / 54 % RH
Engineer Kazutaka Takeyama
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]		[dBm]	[mW]
DH5	2402.0	-13.91	1.80	9.80	-2.31	0.59	1.03	-1.28	0.74
DH5	2441.0	-13.79	1.81	9.80	-2.18	0.61	1.03	-1.15	0.77
DH5	2480.0	-13.92	1.82	9.80	-2.30	0.59	1.03	-1.27	0.75
2DH5	2402.0	-14.64	1.80	9.80	-3.04	0.50	1.04	-2.00	0.63
2DH5	2441.0	-14.41	1.81	9.80	-2.80	0.52	1.04	-1.76	0.67
2DH5	2480.0	-14.54	1.82	9.80	-2.92	0.51	1.04	-1.88	0.65
3DH5	2402.0	-14.60	1.80	9.80	-3.00	0.50	1.04	-1.96	0.64
3DH5	2441.0	-14.40	1.81	9.80	-2.79	0.53	1.04	-1.75	0.67
3DH5	2480.0	-14.49	1.82	9.80	-2.87	0.52	1.04	-1.83	0.66

Sample Calculation:

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

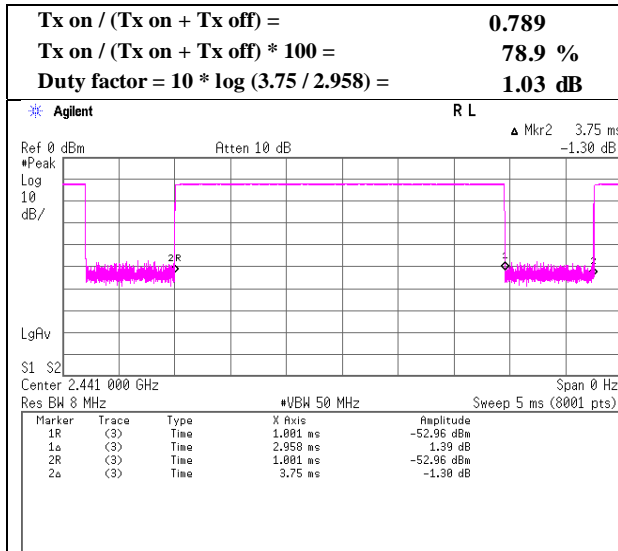
Result (Burst power average) = Time average + Duty factor

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

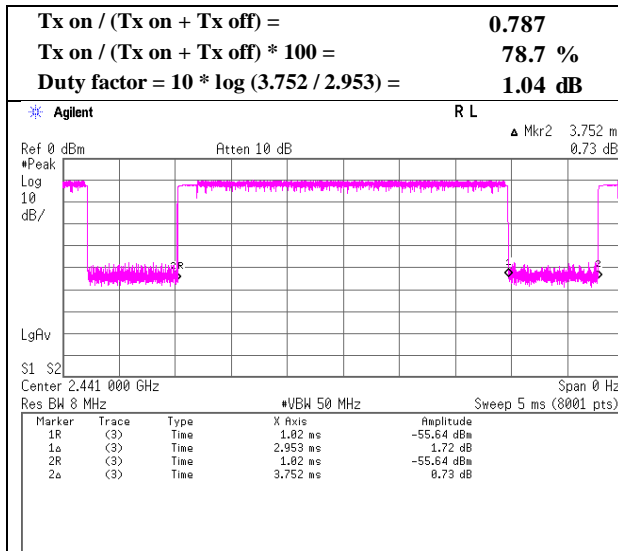
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off

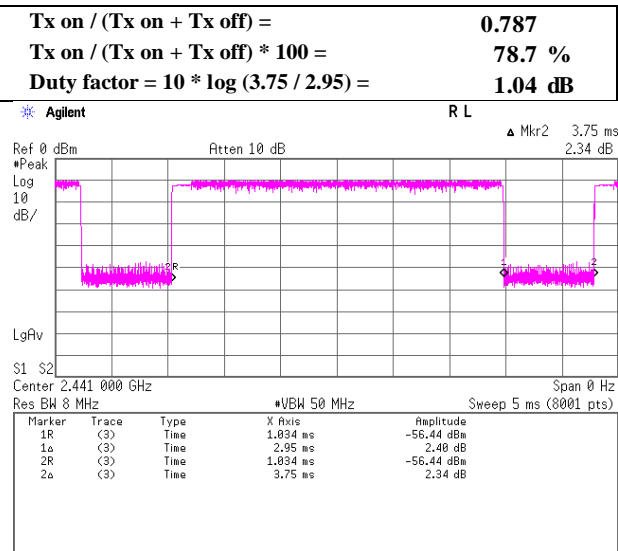
DH5



2DH5



3DH5

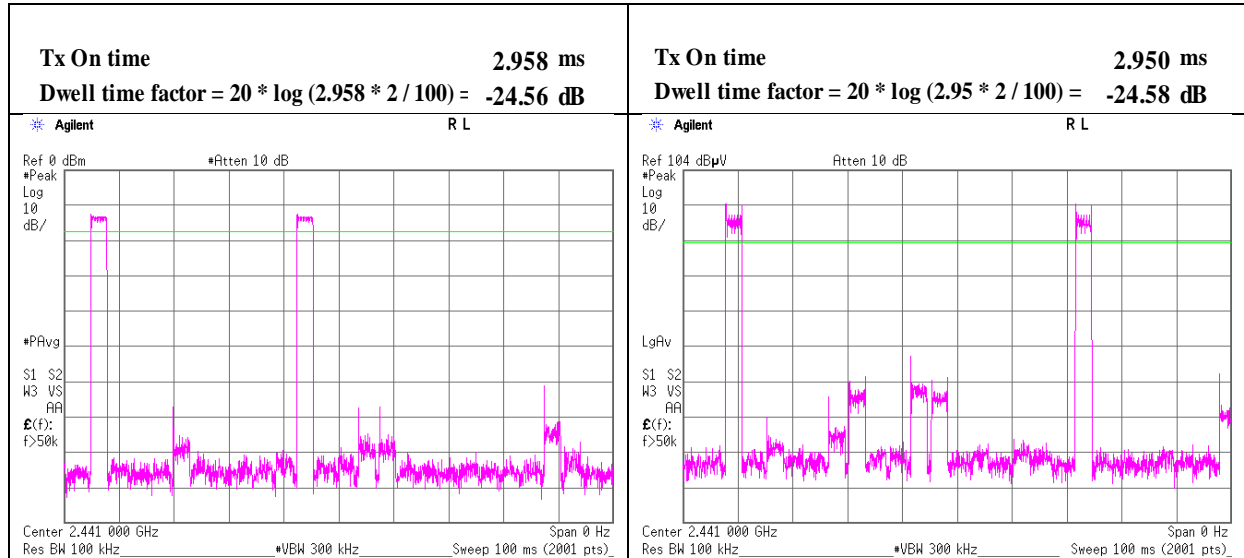


Dwell time factor

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping On

DH5

3DH5



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Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa (30-1000MHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-26.5GHz)
Mode	Tx, Hopping On, 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.	359.998	QP	38.77	14.85	7.08	31.61	0.00	29.09	46.00	16.9	100	311	
Hori.	431.995	QP	37.25	16.44	7.56	31.62	0.00	29.63	46.00	16.3	100	126	
Hori.	503.993	QP	35.26	17.82	7.95	31.59	0.00	29.44	46.00	16.5	170	96	
Hori.	647.994	QP	32.21	19.47	8.67	31.61	0.00	28.74	46.00	17.2	128	137	
Hori.	2390.000	PK	47.44	27.17	13.74	40.85	2.43	49.93	73.90	24.0	223	96	
Hori.	4804.000	PK	48.61	31.13	6.02	41.86	2.43	46.33	73.90	27.6	150	2	
Hori.	7206.000	PK	50.73	36.43	7.33	41.18	2.43	55.74	73.90	18.2	119	336	
Hori.	9608.000	PK	46.76	38.28	8.41	40.59	2.43	55.29	73.90	18.6	150	1	
Hori.	12010.000	PK	46.29	39.15	9.30	40.20	2.43	56.97	73.90	16.9	150	3	
Hori.	19216.000	PK	46.07	40.44	8.30	45.06	-9.54	40.21	73.90	33.6	124	53	
Vert.	68.707	QP	42.46	6.47	7.24	31.88	0.00	24.29	40.00	15.7	100	98	
Vert.	71.992	QP	46.11	6.27	7.50	31.87	0.00	28.01	40.00	11.9	100	79	
Vert.	152.146	QP	29.36	14.93	8.69	31.80	0.00	21.18	43.50	22.3	100	36	
Vert.	359.995	QP	41.16	14.85	7.08	31.61	0.00	31.48	46.00	14.5	160	289	
Vert.	431.994	QP	42.00	16.44	7.56	31.62	0.00	34.38	46.00	11.6	130	240	
Vert.	503.991	QP	36.77	17.82	7.95	31.59	0.00	30.95	46.00	15.0	100	220	
Vert.	2390.000	PK	47.58	27.17	13.74	40.85	2.43	50.07	73.90	23.8	141	211	
Vert.	4804.000	PK	48.40	31.13	6.02	41.86	2.43	46.12	73.90	27.8	150	2	
Vert.	7206.000	PK	51.23	36.43	7.33	41.18	2.43	56.24	73.90	17.7	113	198	
Vert.	9608.000	PK	46.69	38.28	8.41	40.59	2.43	55.22	73.90	18.7	150	1	
Vert.	12010.000	PK	46.02	39.15	9.30	40.20	2.43	56.70	73.90	17.2	150	2	
Vert.	19216.000	PK	46.60	40.44	8.30	45.06	-9.54	40.74	73.90	33.1	114	204	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant. Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.70	27.17	13.74	40.85	-24.56	2.43	12.63	53.90	41.3	
Hori.	4804.000	AV	36.16	31.13	6.02	41.86	-24.56	2.43	9.32	53.90	44.6	
Hori.	7206.000	AV	40.96	36.43	7.33	41.18	-24.56	2.43	21.41	53.90	32.5	
Hori.	9608.000	AV	34.88	38.28	8.41	40.59	-24.56	2.43	18.85	53.90	35.1	
Hori.	12010.000	AV	34.32	39.15	9.30	40.20	-24.56	2.43	20.44	53.90	33.5	
Hori.	19216.000	AV	36.04	40.44	8.30	45.06	-24.56	-9.54	5.62	53.90	48.3	
Vert.	2390.000	AV	34.87	27.17	13.74	40.85	-24.56	2.43	12.80	53.90	41.1	
Vert.	4804.000	AV	36.21	31.13	6.02	41.86	-24.56	2.43	9.37	53.90	44.5	
Vert.	7206.000	AV	40.78	36.43	7.33	41.18	-24.56	2.43	21.23	53.90	32.7	
Vert.	9608.000	AV	34.78	38.28	8.41	40.59	-24.56	2.43	18.75	53.90	35.2	
Vert.	12010.000	AV	34.12	39.15	9.30	40.20	-24.56	2.43	20.24	53.90	33.7	
Vert.	19216.000	AV	35.98	40.44	8.30	45.06	-24.56	-9.54	5.56	53.90	48.3	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

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

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	93.62	27.21	13.75	40.84	2.43	96.17	-	-	Carrier
Hori.	2400.000	PK	52.29	27.20	13.74	40.84	2.43	54.82	76.17	21.4	
Vert.	2402.000	PK	91.48	27.21	13.75	40.84	2.43	94.03	-	-	Carrier
Vert.	2400.000	PK	50.72	27.20	13.74	40.84	2.43	53.25	74.03	20.8	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

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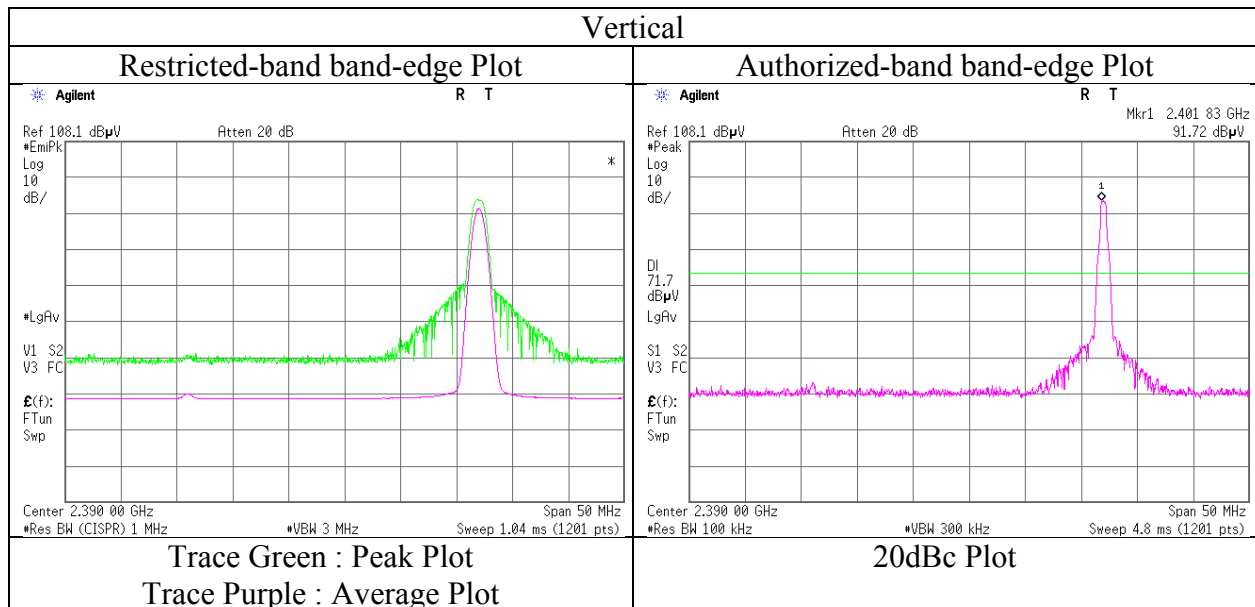
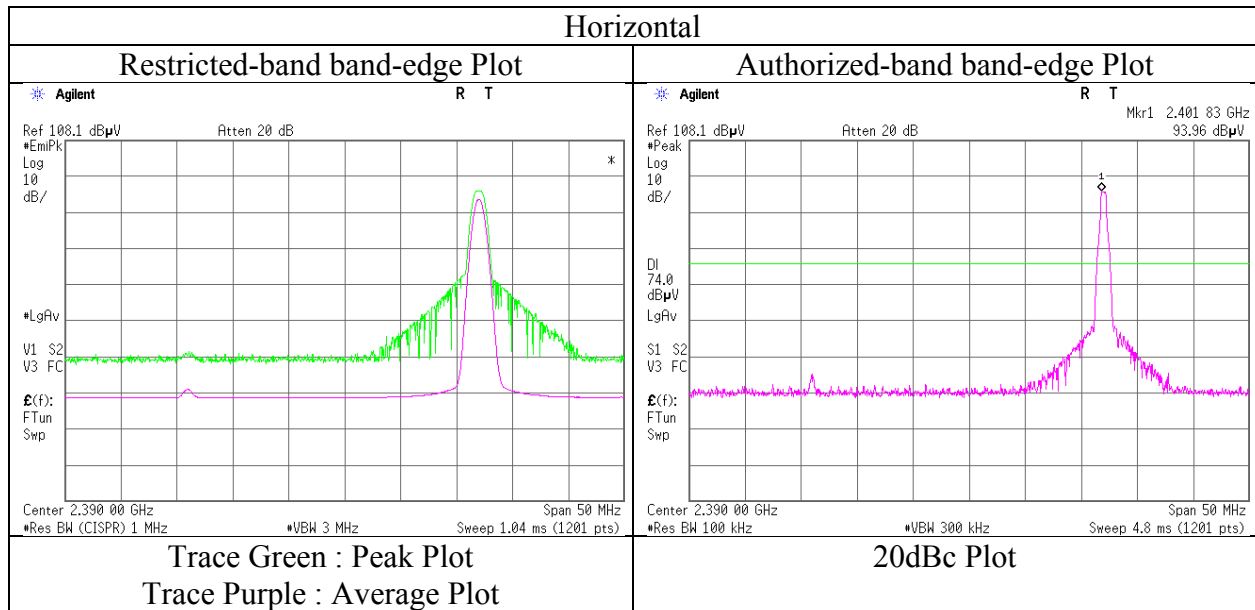
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	August 2, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On, DH5 2402 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa (30-1000MHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-26.5GHz)
Mode	Tx, Hopping On, 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.	360.000	QP	37.30	14.85	7.08	31.61	0.00	27.62	46.00	18.3	100	264	
Hori.	431.998	QP	40.21	16.44	7.56	31.62	0.00	32.59	46.00	13.4	100	109	
Hori.	503.993	QP	35.93	17.82	7.95	31.59	0.00	30.11	46.00	15.8	162	290	
Hori.	647.989	QP	35.29	19.47	8.67	31.61	0.00	31.82	46.00	14.1	132	136	
Hori.	4882.000	PK	47.50	31.29	6.03	41.76	2.43	45.49	73.90	28.4	150	2	
Hori.	7323.000	PK	51.30	36.64	7.34	41.27	2.43	56.44	73.90	17.5	127	328	
Hori.	9764.000	PK	46.65	38.52	8.44	40.62	2.43	55.42	73.90	18.5	150	1	
Hori.	12205.000	PK	45.50	39.15	9.31	40.17	2.43	56.22	73.90	17.7	150	4	
Hori.	19528.000	PK	46.31	40.34	8.39	45.01	-9.54	40.49	73.90	33.4	132	45	
Vert.	68.135	QP	42.25	6.56	7.20	31.88	0.00	24.13	40.00	15.8	100	93	
Vert.	71.997	QP	45.41	6.27	7.50	31.87	0.00	27.31	40.00	12.6	100	116	
Vert.	146.637	QP	28.84	14.68	8.59	31.80	0.00	20.31	43.50	23.1	100	34	
Vert.	359.998	QP	39.51	14.85	7.08	31.61	0.00	29.83	46.00	16.1	193	37	
Vert.	431.992	QP	45.08	16.44	7.56	31.62	0.00	37.46	46.00	8.5	128	236	
Vert.	503.995	QP	40.39	17.82	7.95	31.59	0.00	34.57	46.00	11.4	100	233	
Vert.	4882.000	PK	47.75	31.29	6.03	41.76	2.43	45.74	73.90	28.2	150	3	
Vert.	7323.000	PK	50.35	36.64	7.34	41.27	2.43	55.49	73.90	18.4	154	231	
Vert.	9764.000	PK	46.86	38.52	8.44	40.62	2.43	55.63	73.90	18.3	150	2	
Vert.	12205.000	PK	45.04	39.15	9.31	40.17	2.43	55.76	73.90	18.1	150	1	
Vert.	19528.000	PK	46.74	40.34	8.39	45.01	-9.54	40.92	73.90	32.9	113	245	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB

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

Dwell time factor relaxation

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Dwell Factor	Distance Factor	Result	Limit	Margin	Remark
Hori.	4882.000	AV	36.35	31.29	6.03	41.76	-24.56	2.43	9.78	53.90	44.1	
Hori.	7323.000	AV	42.83	36.64	7.34	41.27	-24.56	2.43	23.41	53.90	30.5	
Hori.	9764.000	AV	34.49	38.52	8.44	40.62	-24.56	2.43	18.70	53.90	35.2	
Hori.	12205.000	AV	33.61	39.15	9.31	40.17	-24.56	2.43	19.77	53.90	34.1	
Hori.	19528.000	AV	36.67	40.34	8.39	45.01	-24.56	-9.54	6.29	53.90	47.6	
Vert.	4882.000	AV	36.27	31.29	6.03	41.76	-24.56	2.43	9.70	53.90	44.2	
Vert.	7323.000	AV	40.07	36.64	7.34	41.27	-24.56	2.43	20.65	53.90	33.3	
Vert.	9764.000	AV	34.53	38.52	8.44	40.62	-24.56	2.43	18.74	53.90	35.2	
Vert.	12205.000	AV	33.62	39.15	9.31	40.17	-24.56	2.43	19.78	53.90	34.1	
Vert.	19528.000	AV	36.26	40.34	8.39	45.01	-24.56	-9.54	5.88	53.90	48.0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB

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

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

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Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa (30-1000MHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-26.5GHz)
Mode	Tx, Hopping On, 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.	359.998	QP	39.16	14.85	7.08	31.61	0.00	29.48	46.00	16.5	100	286	
Hori.	431.997	QP	40.62	16.44	7.56	31.62	0.00	33.00	46.00	13.0	100	118	
Hori.	503.994	QP	36.51	17.82	7.95	31.59	0.00	30.69	46.00	15.3	100	141	
Hori.	647.995	QP	35.62	19.47	8.67	31.61	0.00	32.15	46.00	13.8	134	137	
Hori.	2483.500	PK	62.11	27.49	13.81	40.81	2.43	65.03	73.90	8.9	150	204	
Hori.	2506.050	PK	49.15	27.56	13.82	40.81	2.43	52.15	73.90	21.8	105	203	
Hori.	4960.000	PK	47.40	31.46	6.04	41.65	2.43	45.68	73.90	28.2	150	2	
Hori.	7440.000	PK	50.58	36.84	7.37	41.36	2.43	55.86	73.90	18.0	108	325	
Hori.	9920.000	PK	46.22	38.76	8.48	40.66	2.43	55.23	73.90	18.7	150	2	
Hori.	12400.000	PK	45.52	39.15	9.34	40.14	2.43	56.30	73.90	17.6	150	1	
Hori.	19840.000	PK	46.74	40.24	8.45	45.11	-9.54	40.78	73.90	33.1	122	45	
Vert.	68.104	QP	42.50	6.56	7.20	31.88	0.00	24.38	40.00	15.6	100	98	
Vert.	71.994	QP	45.63	6.27	7.50	31.87	0.00	27.53	40.00	12.4	100	109	
Vert.	152.147	QP	29.86	14.93	8.69	31.80	0.00	21.68	43.50	21.8	100	8	
Vert.	360.000	QP	39.99	14.85	7.08	31.61	0.00	30.31	46.00	15.6	195	359	
Vert.	431.996	QP	45.18	16.44	7.56	31.62	0.00	37.56	46.00	8.4	131	243	
Vert.	503.993	QP	41.30	17.82	7.95	31.59	0.00	35.48	46.00	10.5	100	226	
Vert.	2483.500	PK	61.37	27.49	13.81	40.81	2.43	64.29	73.90	9.6	245	107	
Vert.	4960.000	PK	47.43	31.46	6.04	41.65	2.43	45.71	73.90	28.2	150	2	
Vert.	7440.000	PK	49.45	36.84	7.37	41.36	2.43	54.73	73.90	19.2	130	217	
Vert.	9920.000	PK	46.03	38.76	8.48	40.66	2.43	55.04	73.90	18.9	150	1	
Vert.	12400.000	PK	45.52	39.15	9.34	40.14	2.43	56.30	73.90	17.6	150	2	
Vert.	19840.000	PK	47.84	40.24	8.45	45.11	-9.54	41.88	73.90	32.0	128	254	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	35.81	27.49	13.81	40.81	-24.56	2.43	14.17	53.90	39.7	
Hori.	2506.050	AV	39.06	27.56	13.82	40.81	-24.56	2.43	17.50	53.90	36.4	
Hori.	4960.000	AV	36.16	31.46	6.04	41.65	-24.56	2.43	9.88	53.90	44.0	
Hori.	7440.000	AV	42.01	36.84	7.37	41.36	-24.56	2.43	22.73	53.90	31.2	
Hori.	9920.000	AV	34.05	38.76	8.48	40.66	-24.56	2.43	18.50	53.90	35.4	
Hori.	12400.000	AV	33.88	39.15	9.34	40.14	-24.56	2.43	20.10	53.90	33.8	
Hori.	19840.000	AV	33.38	40.24	8.45	45.11	-24.56	-9.54	2.86	53.90	51.0	
Vert.	2483.500	AV	35.41	27.49	13.81	40.81	-24.56	2.43	13.77	53.90	40.1	
Vert.	4960.000	AV	35.89	31.46	6.04	41.65	-24.56	2.43	9.61	53.90	44.3	
Vert.	7440.000	AV	40.25	36.84	7.37	41.36	-24.56	2.43	20.97	53.90	32.9	
Vert.	9920.000	AV	33.88	38.76	8.48	40.66	-24.56	2.43	18.33	53.90	35.6	
Vert.	12400.000	AV	33.74	39.15	9.34	40.14	-24.56	2.43	19.96	53.90	33.9	
Vert.	19840.000	AV	37.27	40.24	8.45	45.11	-24.56	-9.54	6.75	53.90	47.1	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB

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

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

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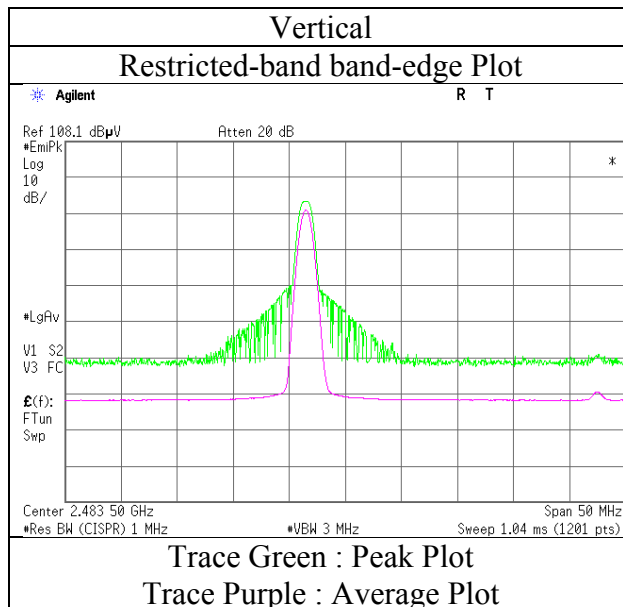
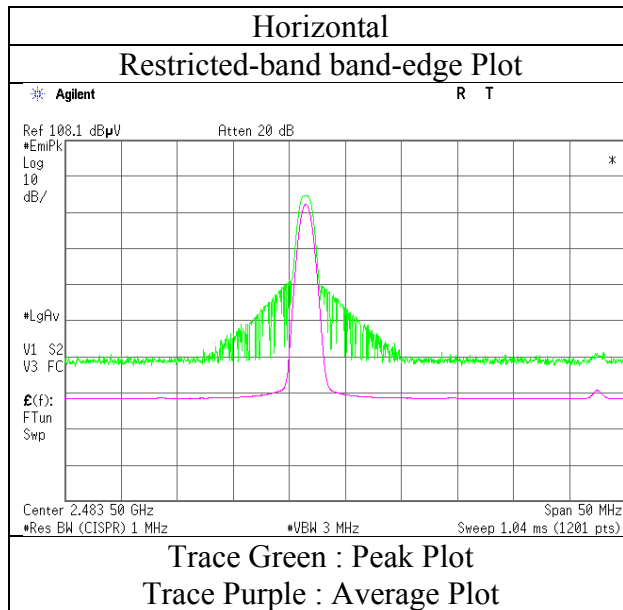
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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	August 2, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping On, DH5 2480 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa	Yosuke Ishikawa	Yosuke Ishikawa
	(30-1000MHz)	(1-13GHz)	(13-26.5GHz)
Mode	Tx, Hopping On, 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.	359.996	QP	37.75	14.85	7.08	31.61	0.00	28.07	46.00	17.9	100	261	
Hori.	431.994	QP	40.38	16.44	7.56	31.62	0.00	32.76	46.00	13.2	100	110	
Hori.	503.994	QP	36.31	17.82	7.95	31.59	0.00	30.49	46.00	15.5	100	131	
Hori.	647.992	QP	33.53	19.47	8.67	31.61	0.00	30.06	46.00	15.9	130	142	
Hori.	2375.121	PK	48.76	27.12	13.73	40.85	2.43	51.19	73.90	22.7	118	210	
Hori.	2390.000	PK	47.34	27.17	13.74	40.85	2.43	49.83	73.90	24.1	152	209	
Hori.	4804.000	PK	47.62	31.13	6.02	41.86	2.43	45.34	73.90	28.6	150	2	
Hori.	7206.000	PK	50.31	36.43	7.33	41.18	2.43	55.32	73.90	18.6	131	333	
Hori.	9608.000	PK	46.51	38.28	8.41	40.59	2.43	55.04	73.90	18.9	150	2	
Hori.	12010.000	PK	45.32	39.15	9.30	40.20	2.43	56.00	73.90	17.9	150	2	
Hori.	19216.000	PK	45.90	40.44	8.30	45.06	-9.54	40.04	73.90	33.8	146	32	
Hori.	2375.121	AV	37.60	27.12	13.73	40.85	2.43	40.03	53.90	13.9	118	210	
Vert.	68.113	QP	42.70	6.56	7.20	31.88	0.00	24.58	40.00	15.4	100	80	
Vert.	71.988	QP	45.87	6.27	7.50	31.87	0.00	27.77	40.00	12.2	100	129	
Vert.	152.174	QP	29.38	14.94	8.69	31.80	0.00	21.21	43.50	22.2	100	23	
Vert.	359.997	QP	40.34	14.85	7.08	31.61	0.00	30.66	46.00	15.3	181	147	
Vert.	431.996	QP	45.74	16.44	7.56	31.62	0.00	38.12	46.00	7.8	130	241	
Vert.	503.995	QP	39.73	17.82	7.95	31.59	0.00	33.91	46.00	12.0	100	237	
Vert.	2390.000	PK	47.74	27.17	13.74	40.85	2.43	50.23	73.90	23.7	183	89	
Vert.	4804.000	PK	47.91	31.13	6.02	41.86	2.43	45.63	73.90	28.3	150	2	
Vert.	7206.000	PK	49.77	36.43	7.33	41.18	2.43	54.78	73.90	19.1	184	191	
Vert.	9608.000	PK	46.55	38.28	8.41	40.59	2.43	55.08	73.90	18.8	150	3	
Vert.	12010.000	PK	45.62	39.15	9.30	40.20	2.43	56.30	73.90	17.6	150	2	
Vert.	19216.000	PK	45.66	40.44	8.30	45.06	-9.54	39.80	73.90	34.1	136	232	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant. Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.91	27.17	13.74	40.85	-24.58	2.43	12.82	53.90	41.1	
Hori.	4804.000	AV	36.05	31.13	6.02	41.86	-24.58	2.43	9.19	53.90	44.7	
Hori.	7206.000	AV	40.15	36.43	7.33	41.18	-24.58	2.43	20.58	53.90	33.3	
Hori.	9608.000	AV	34.92	38.28	8.41	40.59	-24.58	2.43	18.87	53.90	35.0	
Hori.	12010.000	AV	34.15	39.15	9.30	40.20	-24.58	2.43	20.25	53.90	33.7	
Hori.	19216.000	AV	35.61	40.44	8.30	45.06	-24.58	-9.54	5.17	53.90	48.7	
Vert.	2390.000	AV	34.85	27.17	13.74	40.85	-24.58	2.43	12.76	53.90	41.1	
Vert.	4804.000	AV	36.07	31.13	6.02	41.86	-24.58	2.43	9.21	53.90	44.7	
Vert.	7206.000	AV	38.28	36.43	7.33	41.18	-24.58	2.43	18.71	53.90	35.2	
Vert.	9608.000	AV	34.92	38.28	8.41	40.59	-24.58	2.43	18.87	53.90	35.0	
Vert.	12010.000	AV	34.17	39.15	9.30	40.20	-24.58	2.43	20.27	53.90	33.6	
Vert.	19216.000	AV	37.79	40.44	8.30	45.06	-24.58	-9.54	7.35	53.90	46.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Dwell(time)factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB
Dwell (time) factor refer to "Dwell time factor Calculation chart" sheet.

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	93.74	27.21	13.75	40.84	2.43	96.29	-	-	Carrier
Hori.	2400.000	PK	52.45	27.20	13.74	40.84	2.43	54.98	76.29	21.3	
Vert.	2402.000	PK	91.89	27.21	13.75	40.84	2.43	94.44	-	-	Carrier
Vert.	2400.000	PK	50.34	27.20	13.74	40.84	2.43	52.87	74.44	21.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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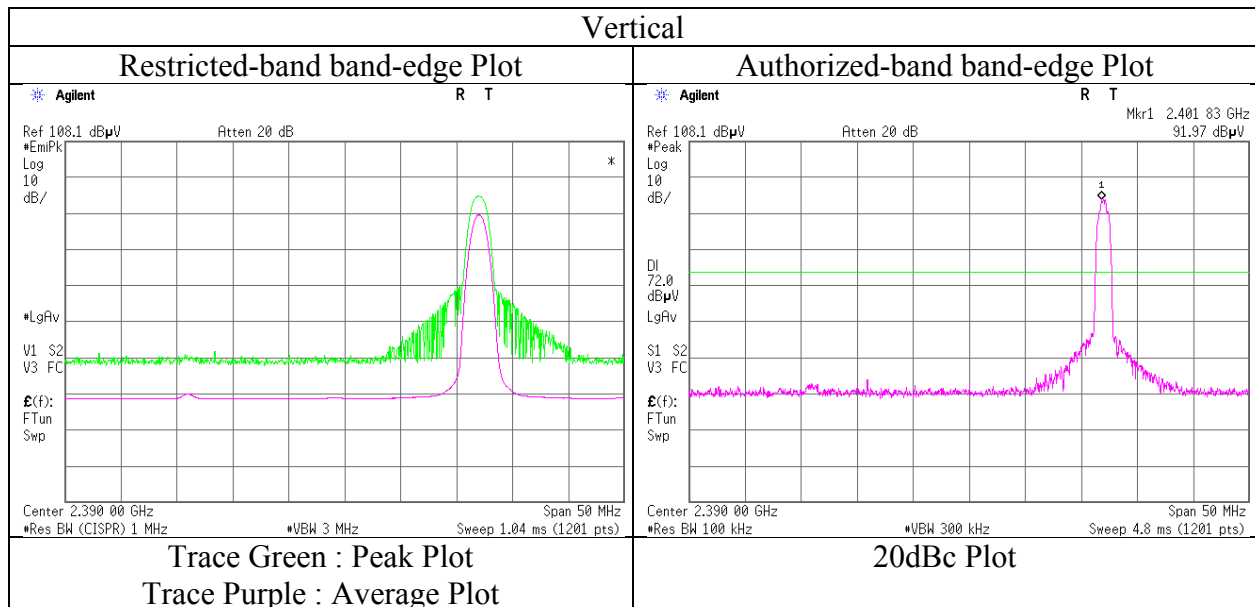
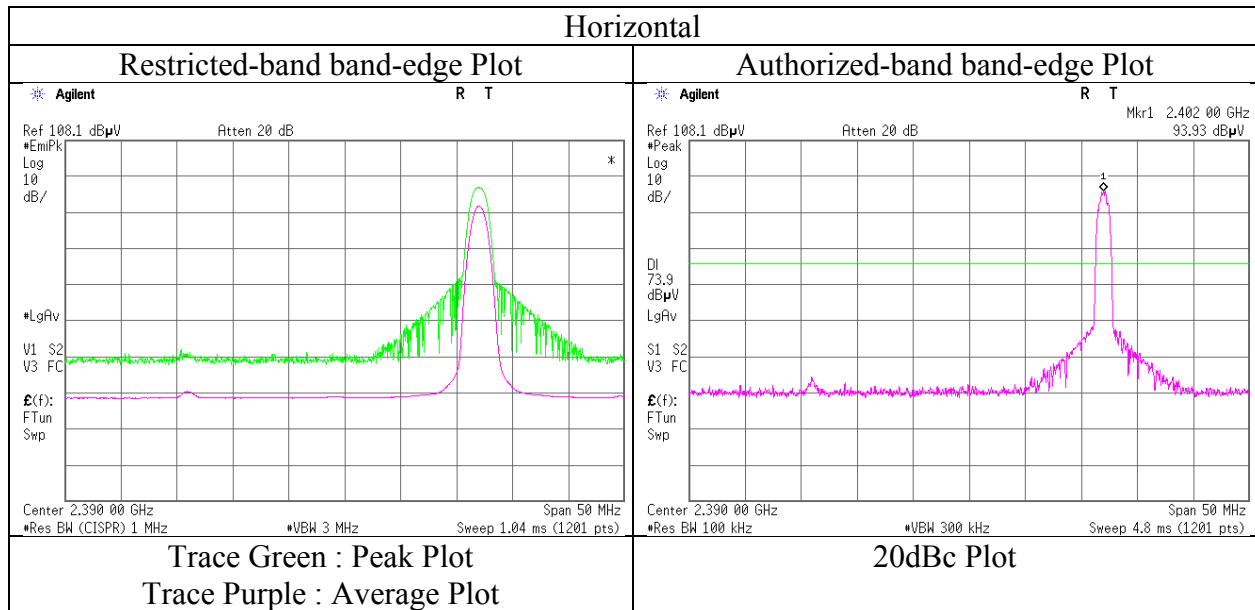
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	August 2, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Yosuke Ishikawa
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.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa (30-1000MHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-26.5GHz)
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.	359.993	QP	38.11	14.85	7.08	31.61	0.00	28.43	46.00	17.5	100	254	
Hori.	431.994	QP	39.51	16.44	7.56	31.62	0.00	31.89	46.00	14.1	100	108	
Hori.	504.000	QP	35.55	17.82	7.95	31.59	0.00	29.73	46.00	16.2	184	114	
Hori.	647.994	QP	34.98	19.47	8.67	31.61	0.00	31.51	46.00	14.4	127	127	
Hori.	4882.000	PK	48.15	31.29	6.03	41.76	2.43	46.14	73.90	27.8	150	1	
Hori.	7323.000	PK	51.28	36.64	7.34	41.27	2.43	56.42	73.90	17.5	105	333	
Hori.	9764.000	PK	46.40	38.52	8.44	40.62	2.43	55.17	73.90	18.7	150	2	
Hori.	12205.000	PK	45.24	39.15	9.31	40.17	2.43	55.96	73.90	17.9	150	1	
Hori.	19528.000	PK	44.46	40.34	8.39	45.01	-9.54	38.64	73.90	35.2	134	54	
Vert.	68.828	QP	42.51	6.45	7.24	31.87	0.00	24.33	40.00	15.6	100	136	
Vert.	72.003	QP	44.78	6.27	7.50	31.87	0.00	26.68	40.00	13.3	100	86	
Vert.	109.687	QP	33.22	11.49	7.97	31.84	0.00	20.84	43.50	22.6	100	136	
Vert.	360.011	QP	38.54	14.85	7.08	31.61	0.00	28.86	46.00	17.1	162	209	
Vert.	431.988	QP	43.88	16.44	7.56	31.62	0.00	36.26	46.00	9.7	127	243	
Vert.	503.994	QP	39.09	17.82	7.95	31.59	0.00	33.27	46.00	12.7	100	244	
Vert.	4882.000	PK	48.13	31.29	6.03	41.76	2.43	46.12	73.90	27.8	150	2	
Vert.	7323.000	PK	49.83	36.64	7.34	41.27	2.43	54.97	73.90	18.9	172	132	
Vert.	9764.000	PK	46.19	38.52	8.44	40.62	2.43	54.96	73.90	18.9	150	1	
Vert.	12205.000	PK	45.92	39.15	9.31	40.17	2.43	56.64	73.90	17.3	150	3	
Vert.	19528.000	PK	46.67	40.34	8.39	45.01	-9.54	40.85	73.90	33.0	131	225	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	36.23	31.29	6.03	41.76	-24.58	2.43	9.64	53.90	44.3	
Hori.	7323.000	AV	41.66	36.64	7.34	41.27	-24.58	2.43	22.22	53.90	31.7	
Hori.	9764.000	AV	34.50	38.52	8.44	40.62	-24.58	2.43	18.69	53.90	35.2	
Hori.	12205.000	AV	33.66	39.15	9.31	40.17	-24.58	2.43	19.80	53.90	34.1	
Hori.	19528.000	AV	33.20	40.34	8.39	45.01	-24.58	-9.54	2.80	53.90	51.1	
Vert.	4882.000	AV	36.36	31.29	6.03	41.76	-24.58	2.43	9.77	53.90	44.1	
Vert.	7323.000	AV	39.50	36.64	7.34	41.27	-24.58	2.43	20.06	53.90	33.8	
Vert.	9764.000	AV	34.56	38.52	8.44	40.62	-24.58	2.43	18.75	53.90	35.2	
Vert.	12205.000	AV	33.59	39.15	9.31	40.17	-24.58	2.43	19.73	53.90	34.2	
Vert.	19528.000	AV	35.85	40.34	8.39	45.01	-24.58	-9.54	5.45	53.90	48.5	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.43 dB

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

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

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Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa (30-1000MHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-26.5GHz)
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.	359.996	QP	37.09	14.85	7.08	31.61	0.00	27.41	46.00	18.5	100	157	
Hori.	431.997	QP	37.33	16.44	7.56	31.62	0.00	29.71	46.00	16.2	100	100	
Hori.	503.995	QP	37.01	17.82	7.95	31.59	0.00	31.19	46.00	14.8	100	126	
Hori.	647.997	QP	35.21	19.47	8.67	31.61	0.00	31.74	46.00	14.2	137	137	
Hori.	2483.500	PK	63.52	27.49	13.81	40.81	2.43	66.44	73.90	7.5	154	308	
Hori.	4960.000	PK	47.59	31.46	6.04	41.65	2.43	45.87	73.90	28.0	150	2	
Hori.	7440.000	PK	50.15	36.84	7.37	41.36	2.43	55.43	73.90	18.5	172	329	
Hori.	9920.000	PK	45.96	38.76	8.48	40.66	2.43	54.97	73.90	18.9	150	2	
Hori.	12400.000	PK	45.03	39.15	9.34	40.14	2.43	55.81	73.90	18.1	150	1	
Hori.	19840.000	PK	45.32	40.24	8.45	45.11	-9.54	39.36	73.90	34.5	140	35	
Vert.	68.481	QP	43.03	6.50	7.23	31.88	0.00	24.88	40.00	15.1	100	71	
Vert.	72.008	QP	45.56	6.27	7.50	31.87	0.00	27.46	40.00	12.5	100	130	
Vert.	147.271	QP	27.72	14.71	8.60	31.80	0.00	19.23	43.50	24.2	100	55	
Vert.	359.999	QP	39.95	14.85	7.08	31.61	0.00	30.27	46.00	15.7	144	205	
Vert.	431.996	QP	45.27	16.44	7.56	31.62	0.00	37.65	46.00	8.3	126	231	
Vert.	503.995	QP	41.29	17.82	7.95	31.59	0.00	35.47	46.00	10.5	100	274	
Vert.	2483.500	PK	60.54	27.49	13.81	40.81	2.43	63.46	73.90	10.4	240	204	
Vert.	4960.000	PK	47.78	31.46	6.04	41.65	2.43	46.06	73.90	27.8	150	2	
Vert.	7440.000	PK	49.50	36.84	7.37	41.36	2.43	54.78	73.90	19.1	179	233	
Vert.	9920.000	PK	46.20	38.76	8.48	40.66	2.43	55.21	73.90	18.7	150	2	
Vert.	12400.000	PK	45.41	39.15	9.34	40.14	2.43	56.19	73.90	17.7	150	1	
Vert.	19840.000	PK	46.14	40.24	8.45	45.11	-9.54	40.18	73.90	33.7	133	319	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	37.99	27.49	13.81	40.81	-24.58	2.43	16.33	53.90	37.6	
Hori.	4960.000	AV	35.92	31.46	6.04	41.65	-24.58	2.43	9.62	53.90	44.3	
Hori.	7440.000	AV	40.14	36.84	7.37	41.36	-24.58	2.43	20.84	53.90	33.1	
Hori.	9920.000	AV	33.92	38.76	8.48	40.66	-24.58	2.43	18.35	53.90	35.6	
Hori.	12400.000	AV	33.74	39.15	9.34	40.14	-24.58	2.43	19.94	53.90	34.0	
Hori.	19840.000	AV	34.80	40.24	8.45	45.11	-24.58	-9.54	4.26	53.90	49.6	
Vert.	2483.500	AV	35.86	27.49	13.81	40.81	-24.58	2.43	14.20	53.90	39.7	
Vert.	4960.000	AV	35.80	31.46	6.04	41.65	-24.58	2.43	9.50	53.90	44.4	
Vert.	7440.000	AV	38.98	36.84	7.37	41.36	-24.58	2.43	19.68	53.90	34.2	
Vert.	9920.000	AV	33.93	38.76	8.48	40.66	-24.58	2.43	18.36	53.90	35.5	
Vert.	12400.000	AV	33.73	39.15	9.34	40.14	-24.58	2.43	19.93	53.90	34.0	
Vert.	19840.000	AV	36.42	40.24	8.45	45.11	-24.58	-9.54	5.88	53.90	48.0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.43 dB

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

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

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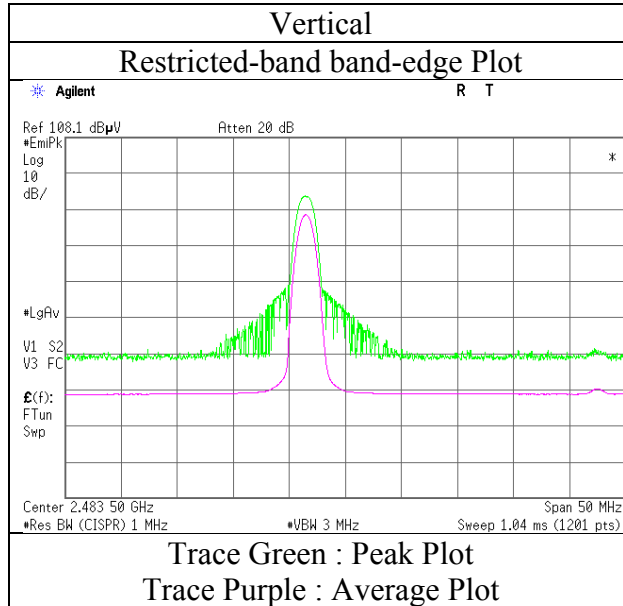
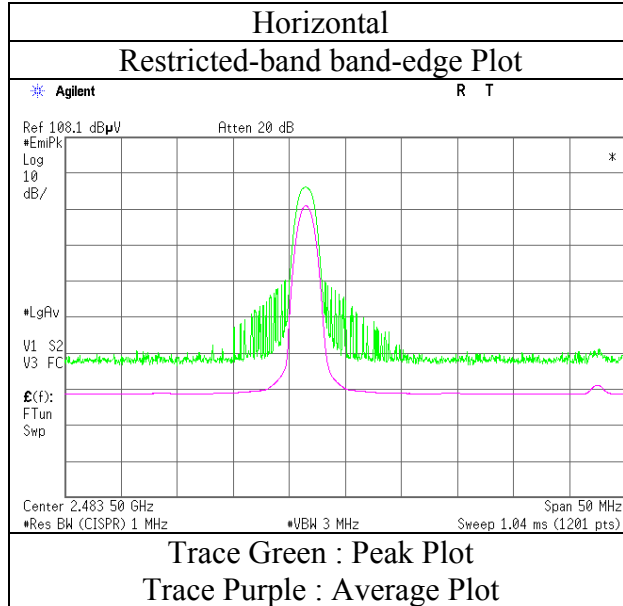
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Radiated Spurious Emission (Reference Plot for band-edge)

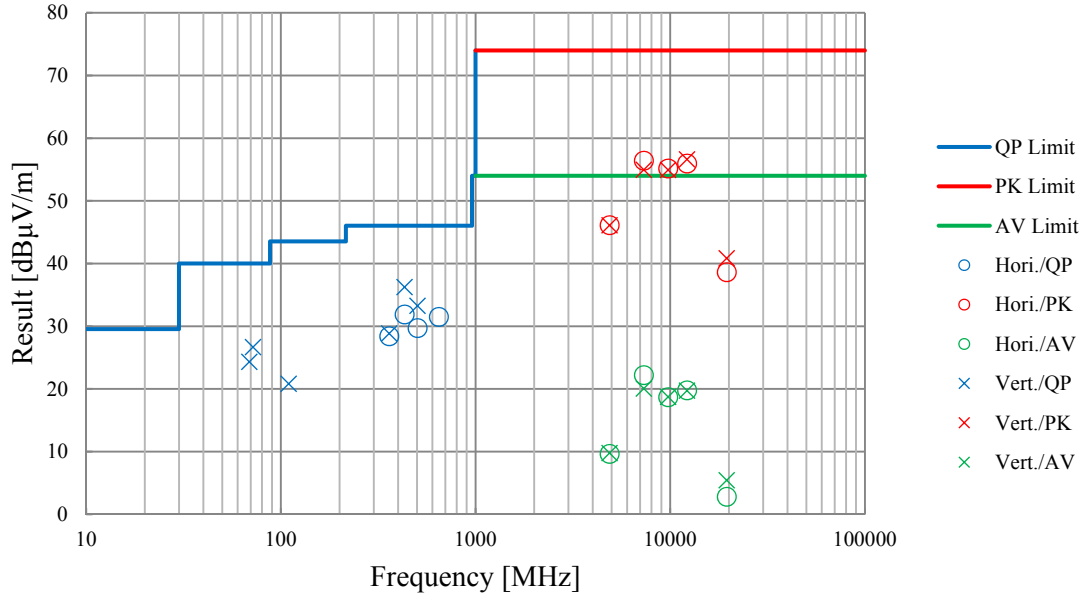
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	August 2, 2017
Temperature / Humidity	23 deg. C / 62 % RH
Engineer	Yosuke Ishikawa
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	August 4, 2017	August 2, 2017	August 3, 2017
Temperature / Humidity	23 deg. C / 65 % RH	23 deg. C / 62 % RH	20 deg. C / 70 % RH
Engineer	Hikaru Shirasawa (30-1000MHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-26.5GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

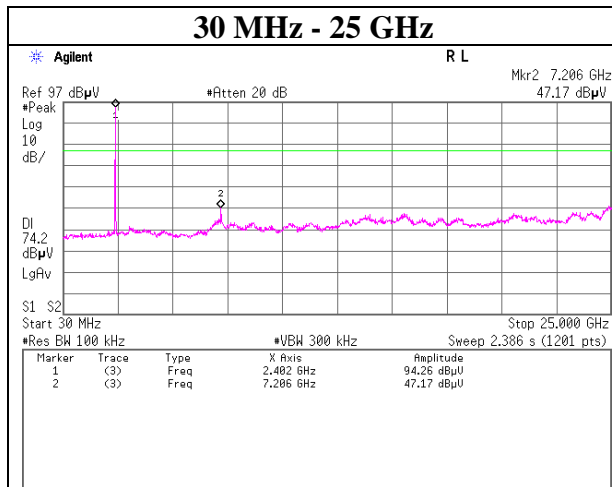
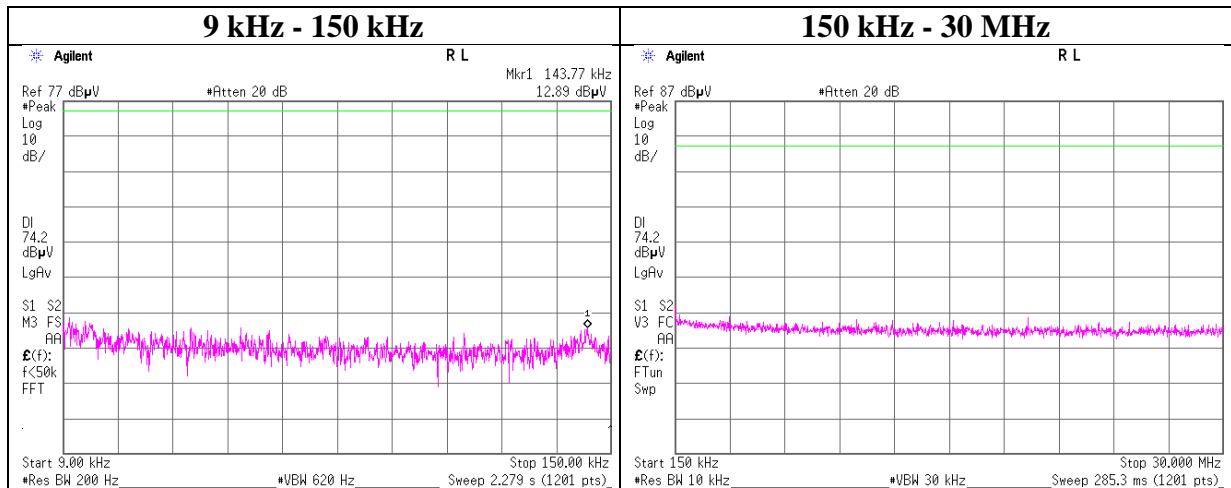


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, DH5

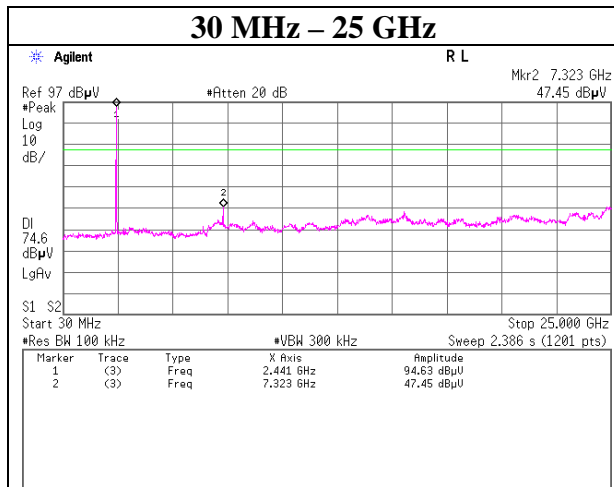
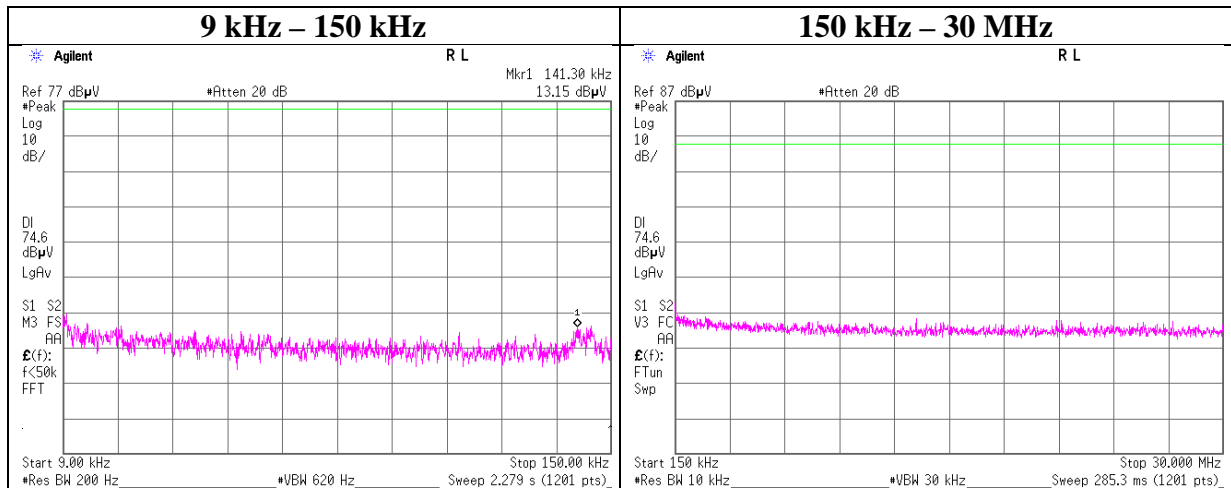
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, DH5

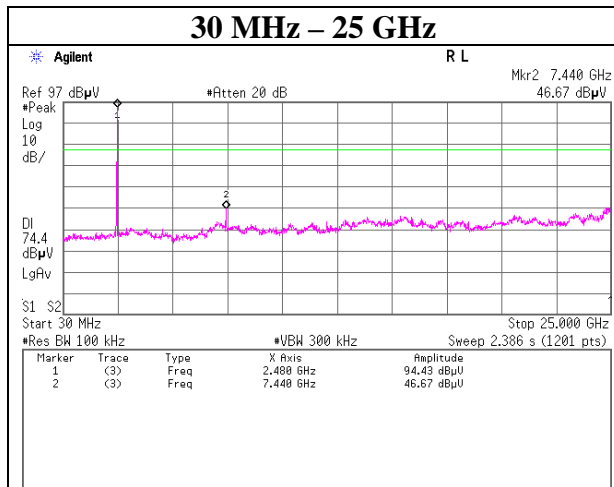
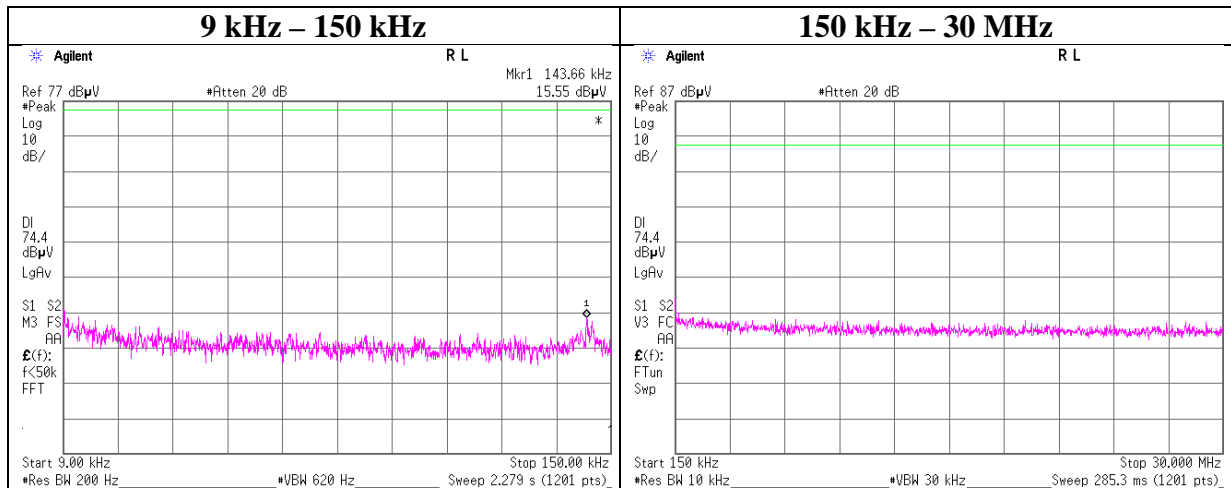
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, DH5

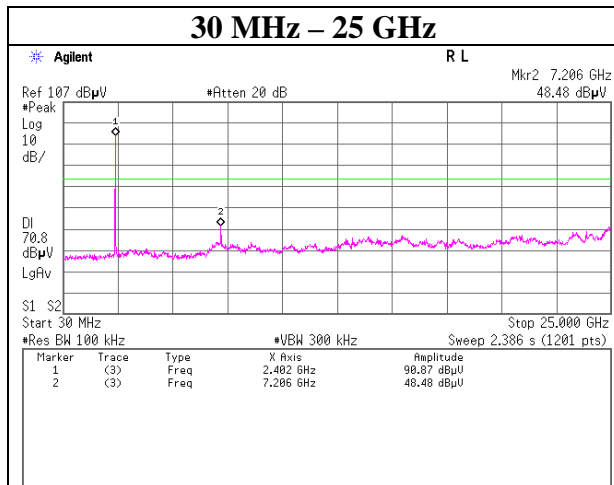
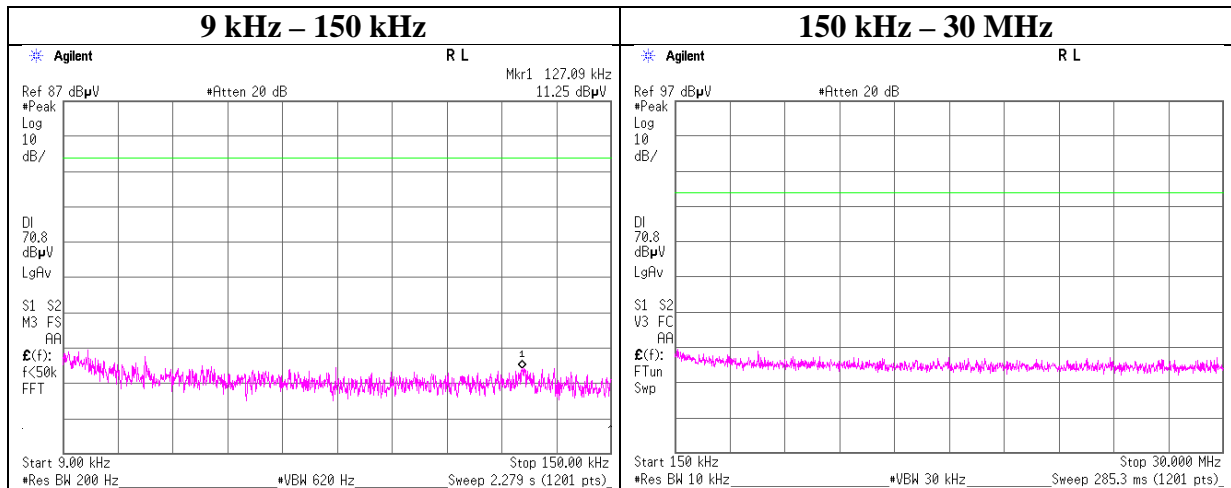
2480 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, 3DH5

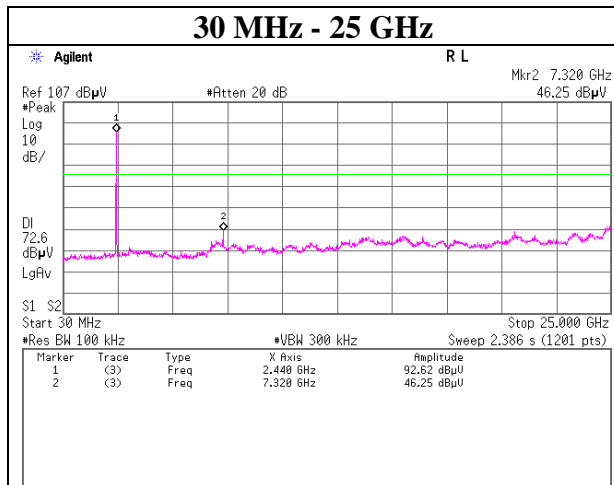
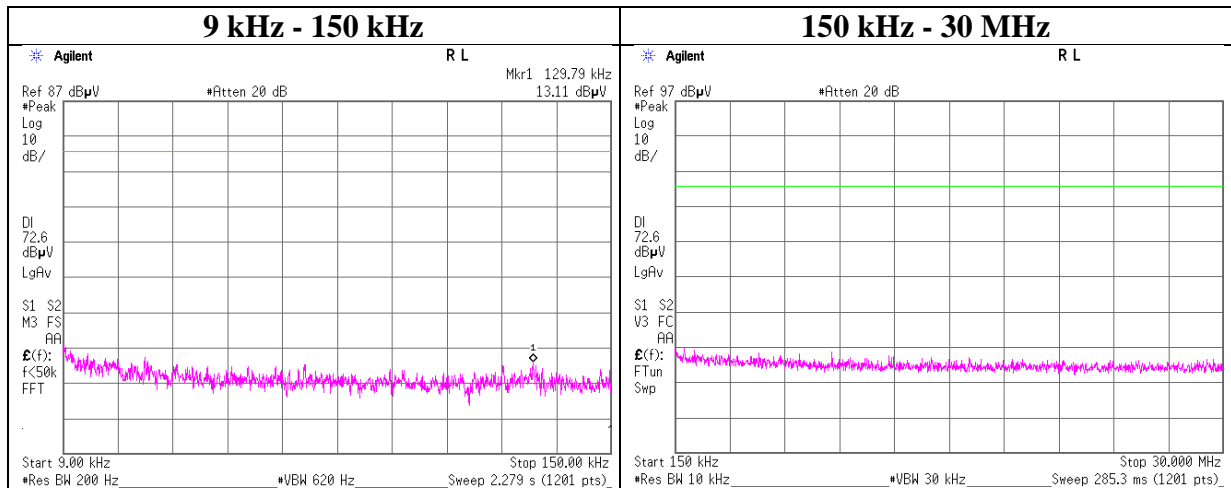
2402 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, 3DH5

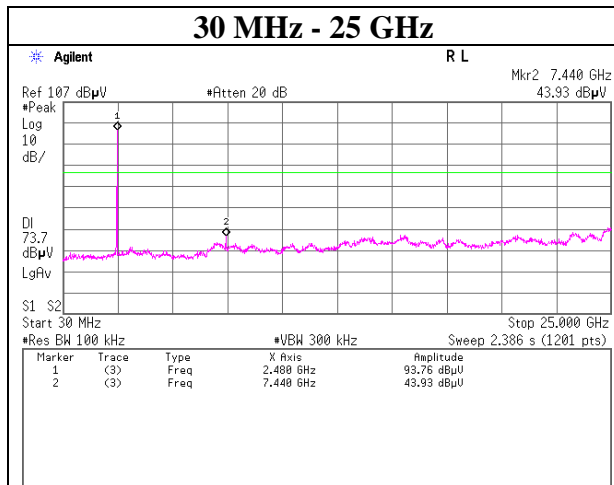
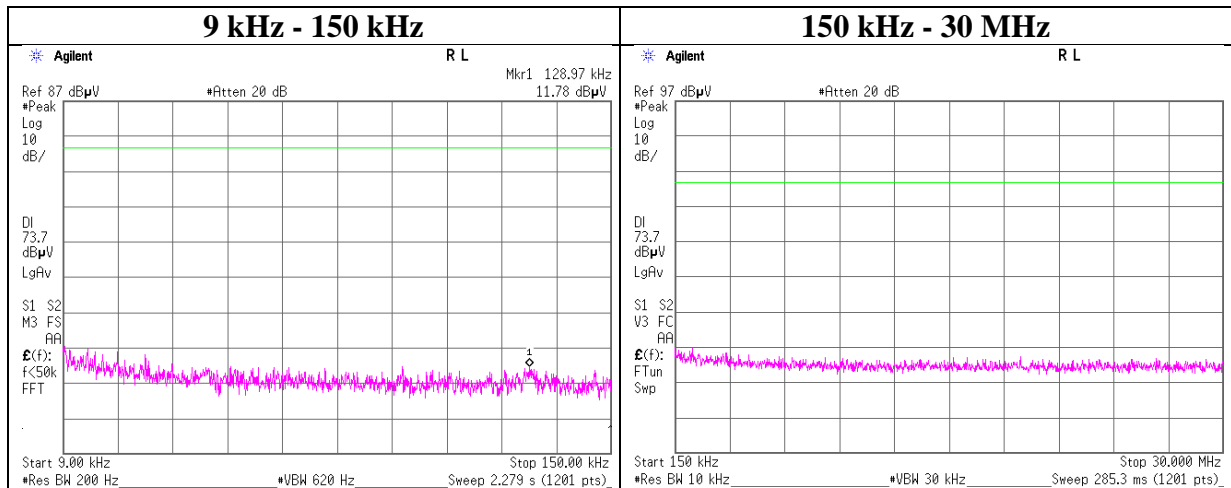
2441 MHz



Conducted Spurious Emission

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx, Hopping Off, 3DH5

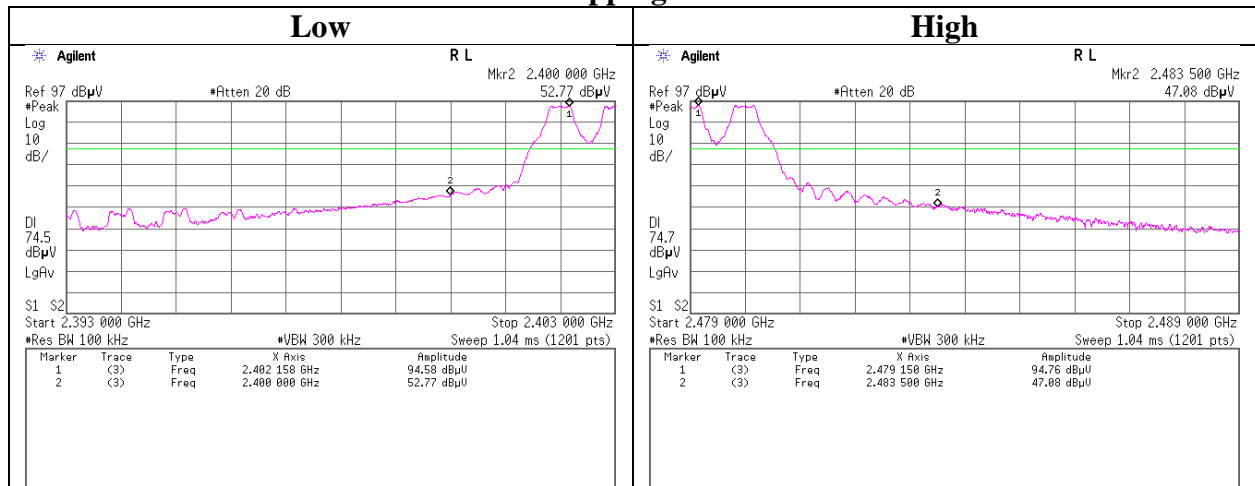
2480 MHz



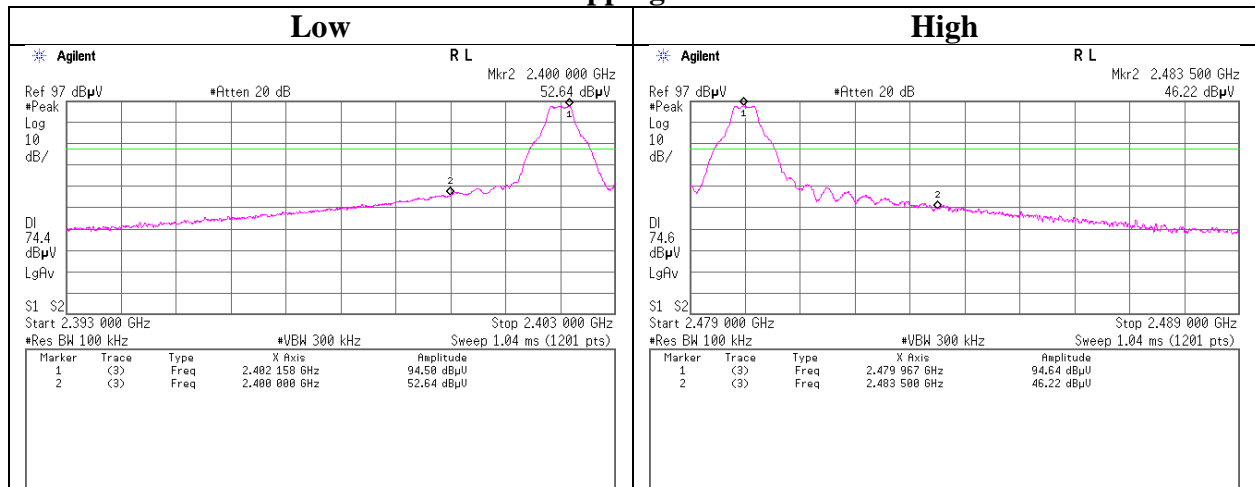
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx DH5

Hopping On



Hopping Off



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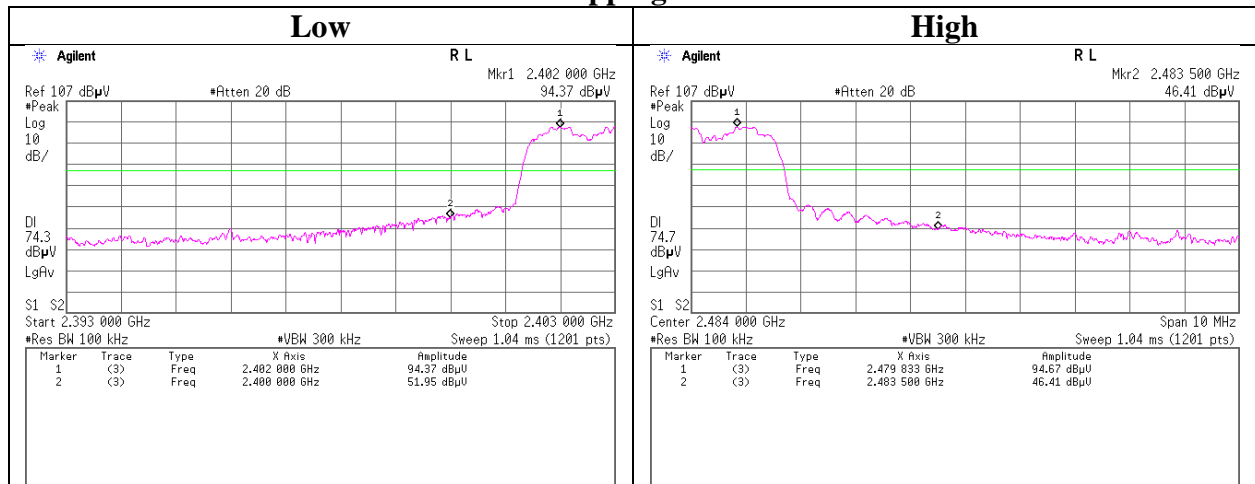
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Facsimile : +81 463 50 6401

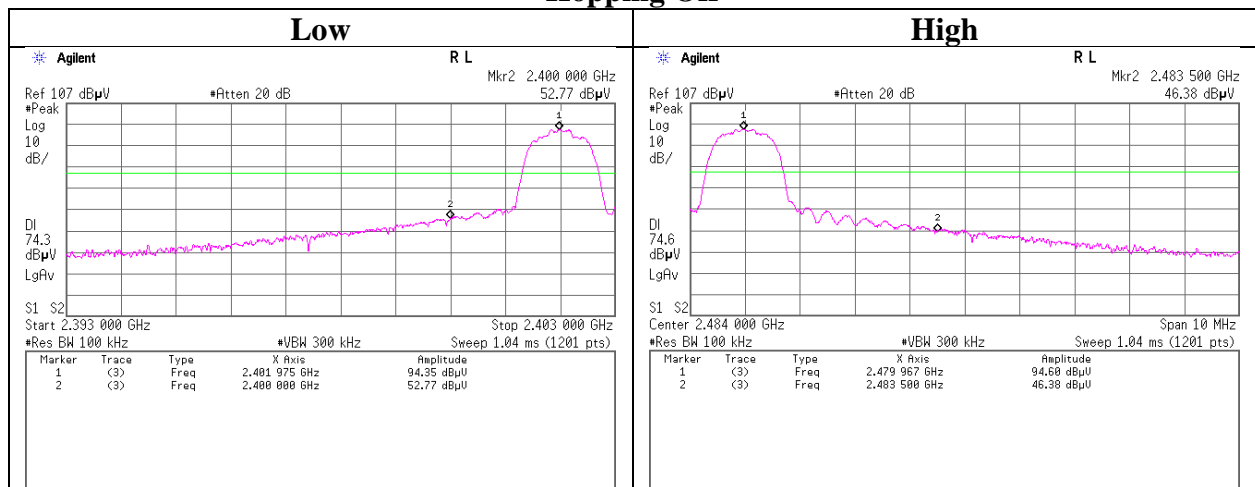
Conducted Emission Band Edge compliance

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx 3DH5

Hopping On



Hopping Off



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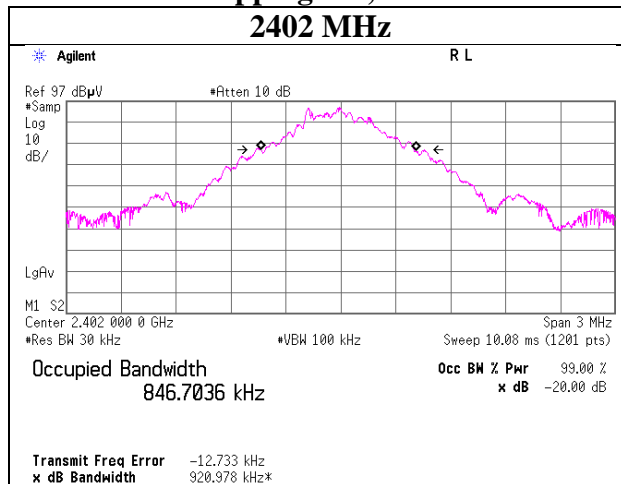
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

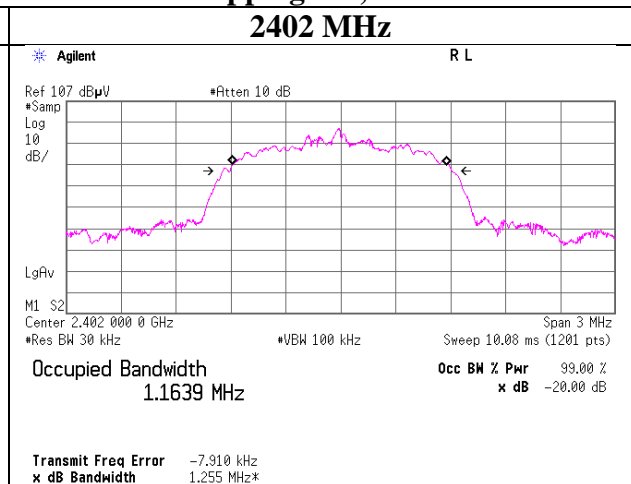
99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx Hopping Off

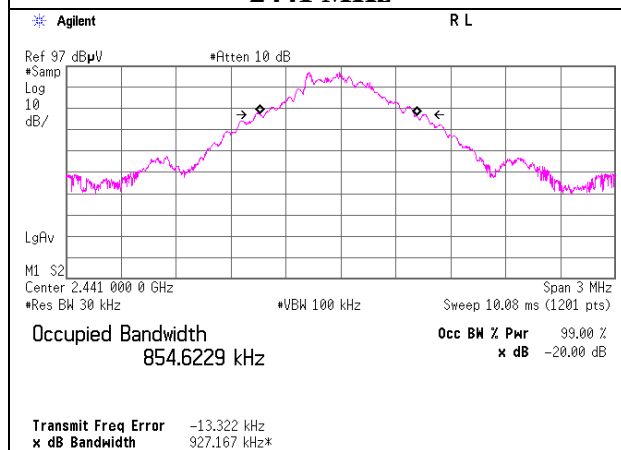
Hopping Off, DH5



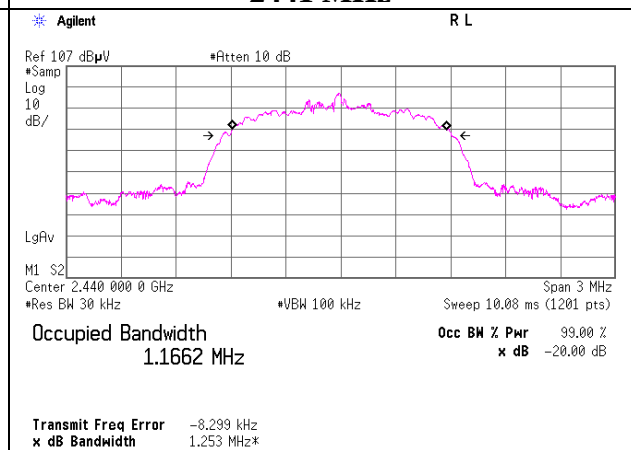
Hopping Off, 3DH5



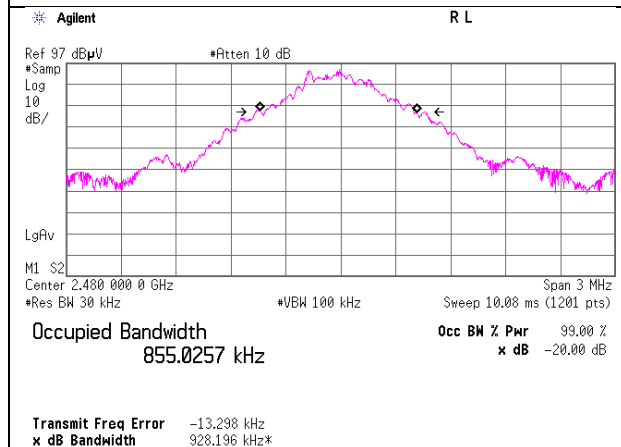
2441 MHz



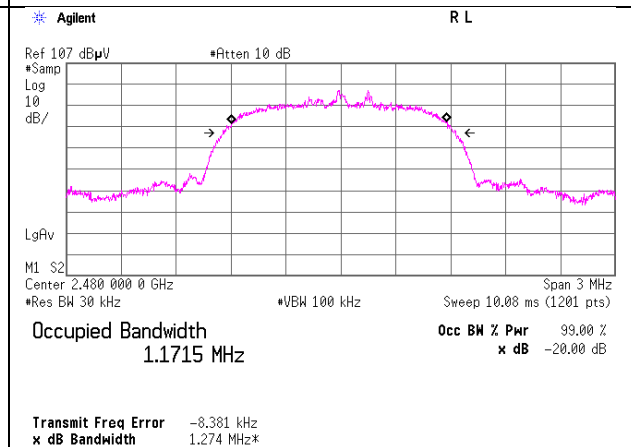
2441 MHz



2480 MHz



2480 MHz



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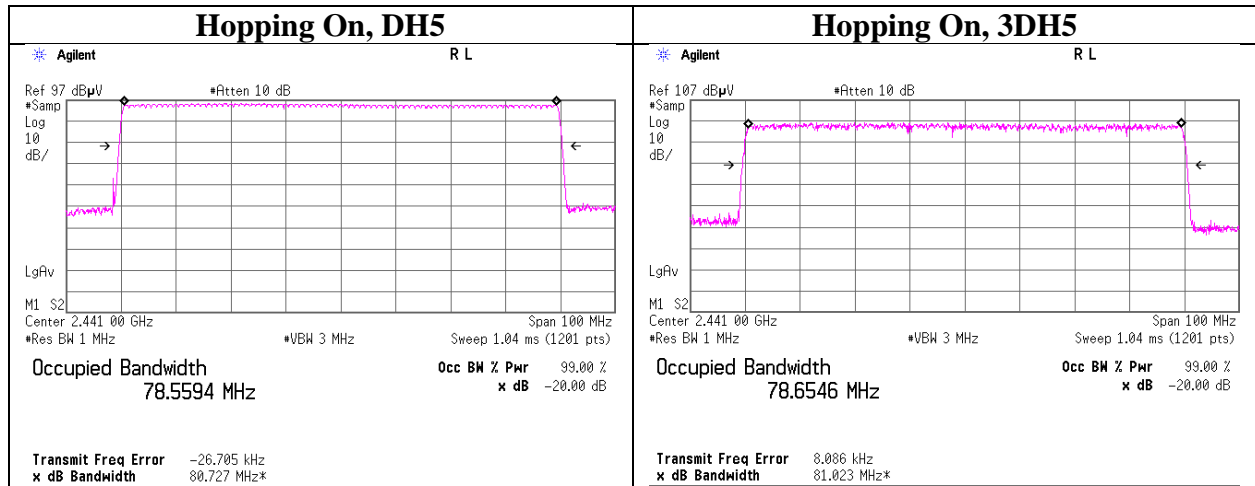
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99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.3 Shielded Room
Report No.	11837856S-A-R2
Date	July 5, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Kazutaka Takeyama
Mode	Tx Hopping On



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APPENDIX 2: Test instruments

Test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY461805 25	AT	2016/10/11 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2017/03/23 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2017/03/23 * 12
SPM-07	Power Meter	Agilent	8990B	MY510027 2	AT	2017/05/01 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY532600 9	AT	2017/05/01 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT,CE	2016/12/13 * 12
STS-03	Digital Hitester	Hioki	3805-50	080997823	AT,CE	2016/10/17 * 12
SJM-02	Measure	KOMELON	KMC-36	-	CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF1, MF)	-	CE	-
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2016/09/23 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2017/02/27 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	CE	2016/11/08 * 12
SCC-C9/C10/S RSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141 PE/NS4906	-/0901-271 (RF Selector)	CE	2017/04/07 * 12
SCC-C9	Coaxial Cable	Suhner	RG223U	-	CE	2017/04/07 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2017/02/27 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE	2017/02/27 * 12
SAT3-11	Attenuator	JFW	50HF-003N	-	CE	2017/02/23 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	CE	2016/10/12 * 12
STM-03	Terminator	TME	CT-01 BP	-	CE	2016/12/15 * 12
KJM-10	Measure	KOMELON	KMC-36	-	CE	-
STS-06	Digital Hitester	Hioki	3805-50	080997830	CE	2017/03/08 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	CE	2017/03/23 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2017/02/09 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2017/02/09 * 12
KAT3-10	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2017/07/24 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2016/11/23 * 12
SCC-B1/B3/B5 /B7/B8/B13/SR SE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Su hner/Suhner/Suhner/Su hner/TOYO	8D2W/12DSF A/141PE/141 PE/141PE/14 1PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SCC-B2/B4/B6 /B7/B8/B13/SR SE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Su hner/Suhner/Suhner/Su hner/TOYO	8D2W/12DSF A/141PE/141 PE/141PE/14 1PE/NS4906	-/0901-270(RF Selector)	RE	2017/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111 B	195	RE	2017/01/05 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2016/09/28 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NS A)	2	RE	2017/06/08 * 12

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Test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SRENT-10	Spectrum Analyzer	Agilent	E4440A	US4142151 1	RE	2016/12/05 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2016/08/09 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01 000NFSNMS/ B	1612S005	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-0 0	APR-30-15- 037	RE	2017/01/08 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2017/03/17 * 12
SAEC-02(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-02(SV SWR)	2	RE	2017/07/18 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2017/03/08 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,M F)	-	RE	-
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY501800 19	RE	2016/10/24 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2016/08/22 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2016/09/27 * 12
SCC-G20	Coaxial Cable	Junkosha	J12J102518-0 0	APR-15-15- 003	RE	2017/04/20 * 12
SCC-G43	Coaxial Cable	HUBER+SUHNER	SUCOFLEX_ 104 E	SN MY 13406/4E	RE	2017/07/10 * 12
SCC-G07	Coaxial Cable	Junkosha	J12J103316-0 0	MAY-25-17 -008	RE	2017/06/13 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01 000KMSKM S	-	RE	2017/04/20 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2017/02/17 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SAT10-05	Attenuator(above1GH z)	Agilent	8493C-010	74864	RE	2016/11/07 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NS A)	3	RE	2017/06/11 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2016/10/17 * 12

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

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

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

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

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