

RADIO TEST REPORT

Test Report No. : 12652966S-J-R1

Applicant : Foster Electric Company, Limited
Type of Equipment : Bluetooth Headphone
Model No. : MB WHP 1
FCC ID : 2ASG7614997
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied (Refer to SECTION 3.2)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
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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. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 12652966S-J. 12652966S-J is replaced with this report.

Date of test: March 1 to 18, 2019

Representative test engineer:

K. Noda

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Engineer

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Leader

Consumer Technology Division



CERTIFICATE 1266.03

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

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SECTION 1: Customer information

Company Name	:	Foster Electric Company, Limited
Address	:	1-1-109, Tsutsujigaoka, Akishima City, Tokyo, 196-8550, Japan
Telephone Number	:	+81-42-546-2311
Facsimile Number	:	+81-42-546-2317
Contact Person	:	Hidehito Miho

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	Bluetooth Headphone
Model No.	:	MB WHP 1
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 3.2 V (DC 3.0 V - 3.7 V) (Battery)
Receipt Date of Sample (Information from test lab.)	:	February 28, 2019
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: MB WHP 1 (referred to as the EUT in this report) is a Bluetooth Headphone.

Clock frequency(ies) in the system : 26 MHz

Radio Specification

Bluetooth

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	FHSS
Antenna type	:	Monopole Antenna
Antenna Gain	:	1.37 dBi
Operating Temperature	:	-20 deg. C to +60 deg. C

NFC (Passive Tag)

Radio Type	:	Receiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods	FCC: Section 15.207	QP 31.7 dB 0.1500 MHz, L1, Tx DH5 2480 MHz 0.1500 MHz, N, Tx 2DH5 2480 MHz	Complied a)	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: -	FCC: Section 15.247(a)(1) IC: RSS-247 5.1 (b)	See data.	Complied b)	Conducted
20dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: -	FCC: Section 15.247(a)(1) IC: RSS-247 5.1 (a)		Complied b)	Conducted
Number of Hopping Frequency	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied c)	Conducted
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: -	FCC: Section 15.247(a)(1)(iii) IC: RSS-247 5.1 (d)		Complied d)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: RSS-Gen 6.12	FCC: Section 15.247(a)(b)(1) IC: RSS-247 5.4 (b)		Complied e)	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.2 dB 12010.000 MHz, AV, Vert. Tx, DH5 2402 MHz	Complied# f) / g)	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).

- a) Refer to APPENDIX 1 (data of Conducted Emission)
- b) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99% Occupied Bandwidth and Carrier Frequency Separation)
- c) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
- d) Refer to APPENDIX 1 (data of Dwell time)
- e) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
- f) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
- g) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

- Complied The data of this test item has enough margin, more than the measurement uncertainty.
- Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC Part 15.31 (e)

This EUT provides the stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	RSS-Gen 6.7	IC: -	N/A	- a), b)	Conducted
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. a) b) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					
Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

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

3.4 Uncertainty

EMI

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.9 dB	2.8 dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.1 dB
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.7 dB
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.1 dB
	1 GHz-6 GHz	4.8 dB	4.8 dB	4.8 dB
	6 GHz-18 GHz	5.4 dB	5.4 dB	5.4 dB
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.81 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.53 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.95 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.21 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.90 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.04 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.3 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.4 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	0.61 %

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3.5 Test Location

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 A2LA Certificate Number: 1266.03
 FCC Test Firm Registration Number: 626366

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measureme nt 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

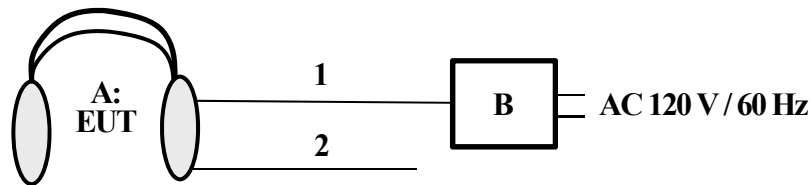
4.1 Operating Mode(s)

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, 2DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 2DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 2DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 2DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -2DH1, 2DH3, 2DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 2DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 2DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *EDR is 2DH mode (2Mb/s EDR: pi/4DQPSK) only. * 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. *EUT has the power settings by the software as follows; - Power settings: BDR: Power target 3 dBm EDR: Power target 3 dBm - Software: CSR BlueSuite BlueTest Version 2.6.9 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.		

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Bluetooth Headphone	MB WHP 1	8 *1) 13 *2)	Foster	EUT
B	AC Adapter	A2014	AFZFD51903100759	Anker	-

*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	USB Type C	1.3	Shielded	Shielded	-
2	AUX	1.3	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

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

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

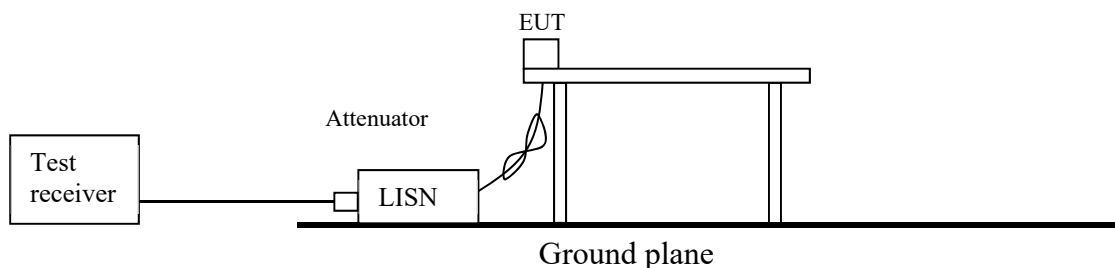
For the tests on EUT itself (as a standalone equipment)

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

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

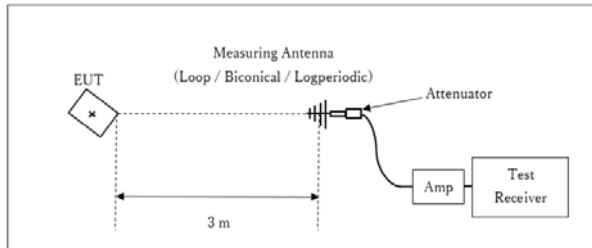
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r01.

Figure 2: Test Setup

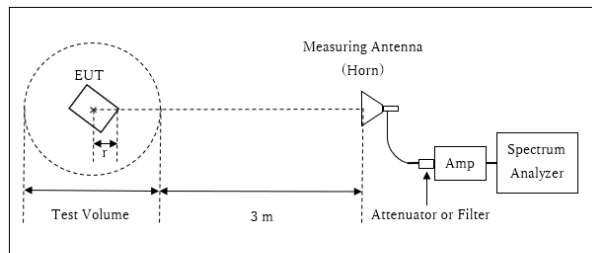
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor: $20 \times \log (3.87 \text{ m} / 3.0 \text{ m}) = 2.21 \text{ dB}$

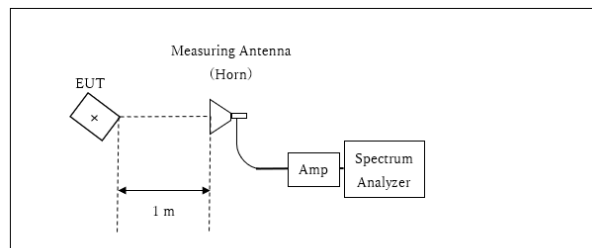
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.87 \text{ m}$

Test Volume : 2.0 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.13 \text{ m}$

13 GHz - 26.5 GHz



x : Center of turn table

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

*Test Distance: 1 m

- 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.

Test Antenna	Frequency	Carrier	Spurious				
			30 MHz -1 GHz	1 GHz - 2.8 GHz	2.8 GHz -13 GHz	13 GHz -18 GHz	18 GHz -26.5 GHz
Horizontal		Y	Y	Y	X	Z	X
Vertical		Z	Y	Z	Z	Z	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

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

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

*1) Peak hold was applied as Worst-case measurement.

*2) Reference data

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

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

The test results and limit are rounded off to two decimals place, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX

Test result : Pass

APPENDIX 1: Test data

Conducted Emission

2019/03/17

DATA OF CONDUCTED EMISSION TEST

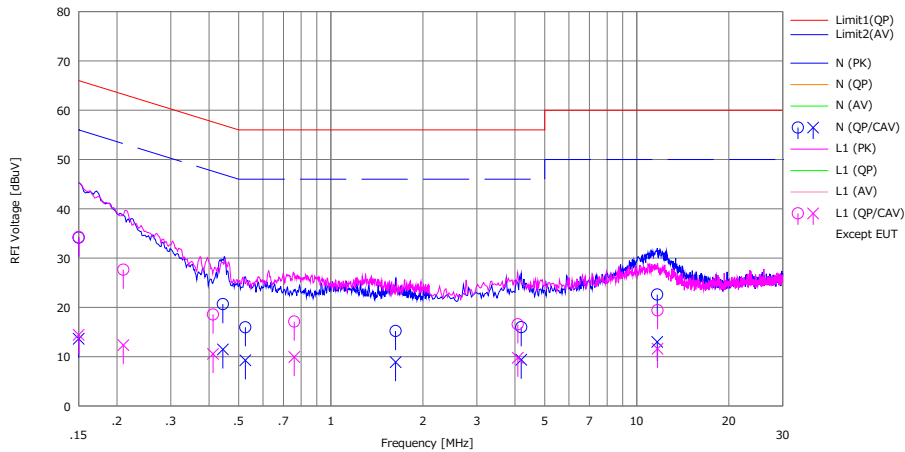
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2019/03/17

Company : Foster Electric Company, Limited
Kind of EUT : Wireless Headphone
Model No. : MB WHP 1
Serial No. : 13
Remarks : -

Mode : Tx DH5 2480 MHz
Order No. : 12652966S
Power : AC 120 V / 60 Hz
Temp./Humi. : 21 deg.C / 24 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP) [dBuV]	(CAV) [dBuV]		(QP) [dBuV]	(CAV) [dBuV]	(QP) [dBuV]	(AV) [dBuV]	(QP) [dB]	(AV) [dB]		
1	0.15000	21.60	1.10	12.55	34.15	13.65	66.00	56.00	31.8	42.3	N	
2	0.44399	8.10	-1.10	12.58	20.68	11.48	56.99	46.99	36.3	35.5	N	
3	0.52557	3.40	-3.30	12.58	15.98	9.28	56.00	46.00	40.0	36.7	N	
4	1.62846	2.50	-3.80	12.71	15.21	8.91	56.00	46.00	40.7	37.0	N	
5	4.19399	3.00	-3.60	13.00	16.00	9.40	56.00	46.00	40.0	36.6	N	
6	11.66932	8.60	-1.00	14.01	22.61	13.01	60.00	50.00	37.3	36.9	N	
7	0.15000	21.70	1.90	12.55	34.25	14.45	66.00	56.00	31.7	41.5	L1	
8	0.20973	15.10	-0.20	12.55	27.65	12.35	63.22	53.22	35.5	40.8	L1	
9	0.41203	6.00	-2.00	12.57	18.57	10.57	57.61	47.61	39.0	37.0	L1	
10	0.75935	4.50	-2.70	12.64	17.14	9.94	56.00	46.00	38.8	36.0	L1	
11	4.08291	3.60	-3.20	12.98	16.58	9.78	56.00	46.00	39.4	36.2	L1	
12	11.69279	5.40	-2.40	14.01	19.41	11.61	60.00	50.00	40.5	38.3	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN: SLS-02

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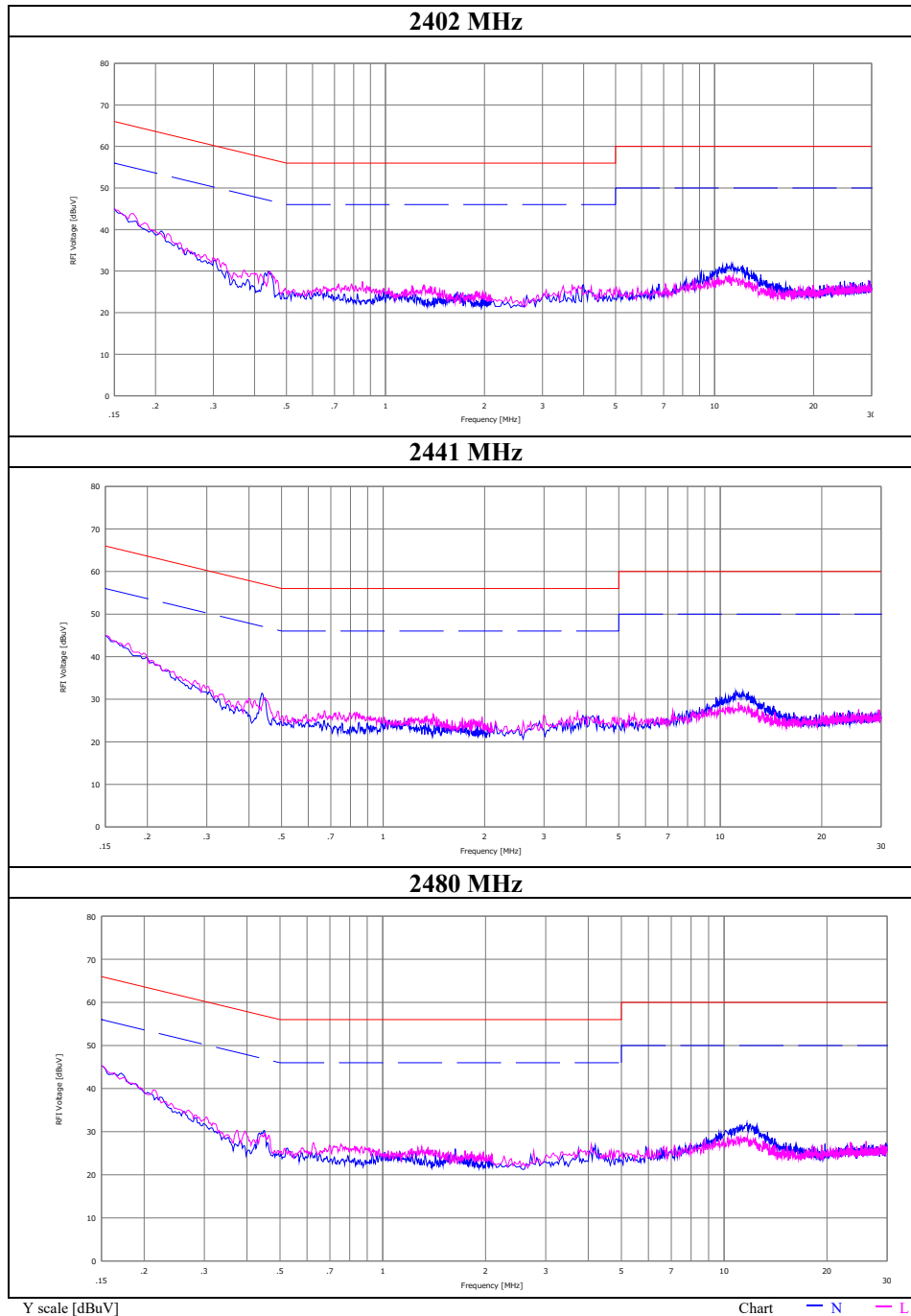
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Conducted Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.2 Shielded Room
Date March 17, 2019
Temperature / Humidity 21 deg. C / 24 % RH
Engineer Yosuke Ishikawa
Mode Tx, Hopping Off, DH5



UL Japan, Inc.

Shonan EMC Lab.

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Conducted Emission

2019/03/17

DATA OF CONDUCTED EMISSION TEST

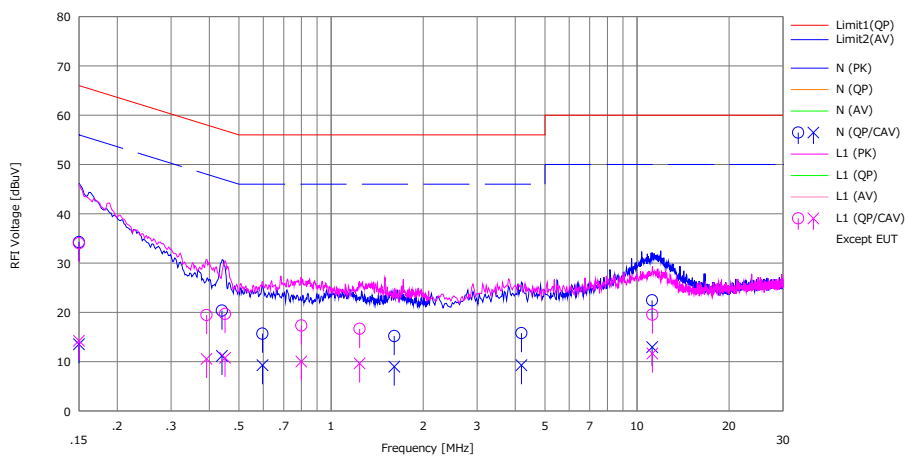
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2019/03/17

Company : Foster Electric Company, Limited
Kind of EUT : Wireless Headphone
Model No. : MB WHP 1
Serial No. : 13
Remarks : -

Mode : Tx 2DH5 2480 MHz
Order No. : 12652966S
Power : AC 120 V / 60 Hz
Temp./Humi. : 21 deg.C / 24 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	21.70	1.00	12.55	34.25	13.55	66.00	56.00	31.7	42.4	N	
2	0.43992	7.80	-1.40	12.57	20.37	11.17	57.06	47.06	36.6	35.8	N	
3	0.59699	3.10	-3.30	12.59	15.69	9.29	56.00	46.00	40.3	36.7	N	
4	1.60961	2.50	-3.70	12.70	15.20	9.00	56.00	46.00	40.8	37.0	N	
5	4.18888	2.80	-3.70	13.00	15.80	9.30	56.00	46.00	40.2	36.7	N	
6	11.20135	8.50	-1.00	13.95	22.45	12.95	60.00	50.00	37.5	37.0	N	
7	0.15000	21.50	1.70	12.55	34.05	14.25	66.00	56.00	31.9	41.7	L1	
8	0.39179	6.90	-2.00	12.57	19.47	10.57	58.03	48.03	38.5	37.4	L1	
9	0.45030	7.10	-1.80	12.58	19.68	10.78	56.87	46.87	37.1	36.0	L1	
10	0.79937	4.70	-2.60	12.64	17.34	10.04	56.00	46.00	38.6	35.9	L1	
11	1.23923	4.00	-3.00	12.67	16.67	9.67	56.00	46.00	39.3	36.3	L1	
12	11.22165	5.60	-2.30	13.95	19.55	11.65	60.00	50.00	40.4	38.3	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN: SLS-02

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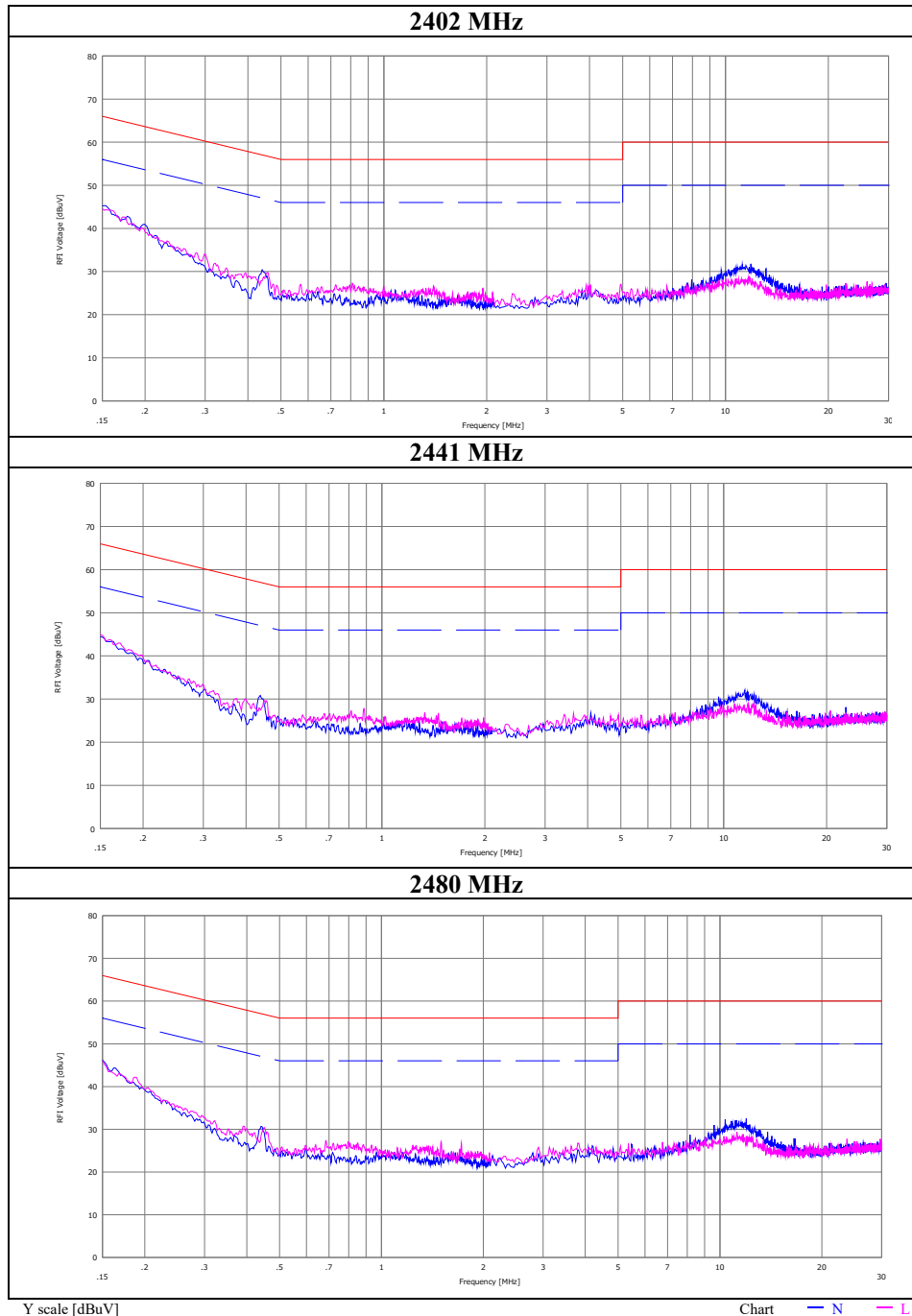
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Conducted Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.2 Shielded Room
Date March 17, 2019
Temperature / Humidity 21 deg. C / 24 % RH
Engineer Yosuke Ishikawa
Mode Tx, Hopping Off, 2DH5



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

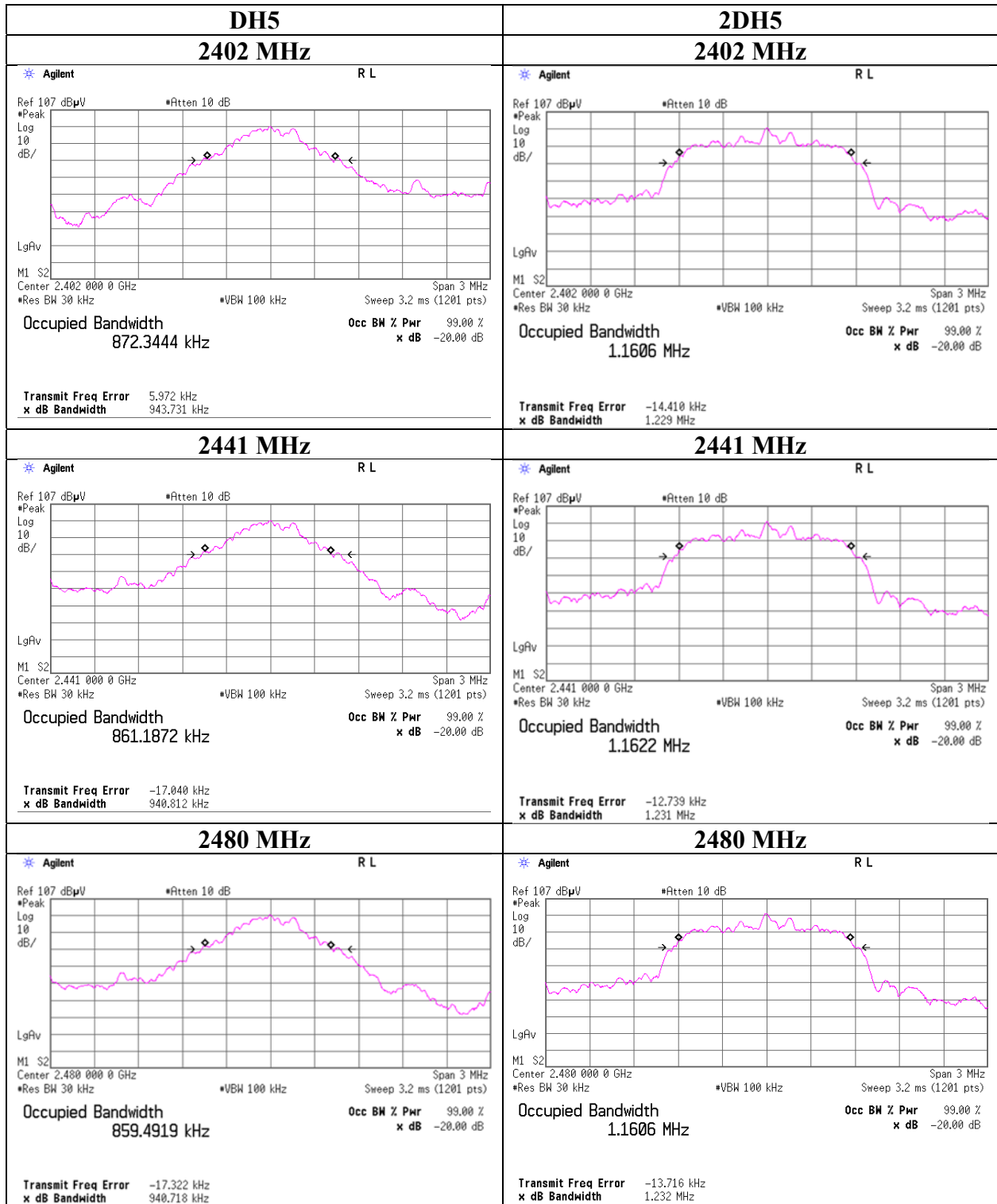
Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.944	872.3	1.000	≥ 0.629
DH5	2441.0	0.941	861.2	1.000	≥ 0.627
DH5	2480.0	0.941	859.5	1.000	≥ 0.627
DH5	Hopping On	80.828	78622.8	-	-
2DH5	2402.0	1.229	1160.6	1.000	≥ 0.820
2DH5	2441.0	1.231	1162.2	1.000	≥ 0.820
2DH5	2480.0	1.232	1160.6	1.000	≥ 0.821
2DH5	Hopping On	81.117	78716.7	-	-

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

No limit applies to 20dB Bandwidth.

20dB Bandwidth and 99% Occupied Bandwidth



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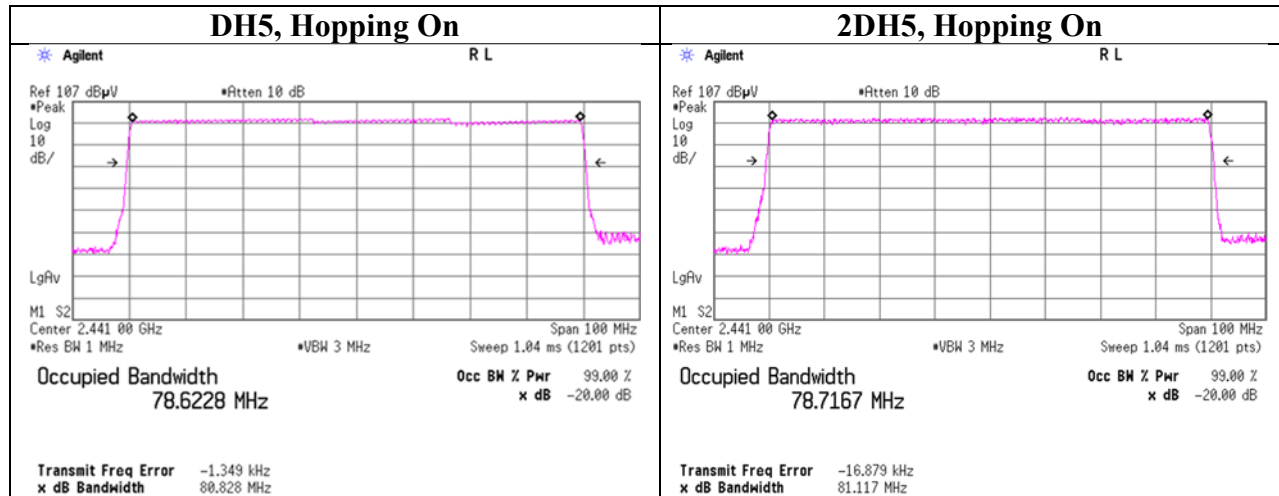
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20dB Bandwidth and 99% Occupied Bandwidth



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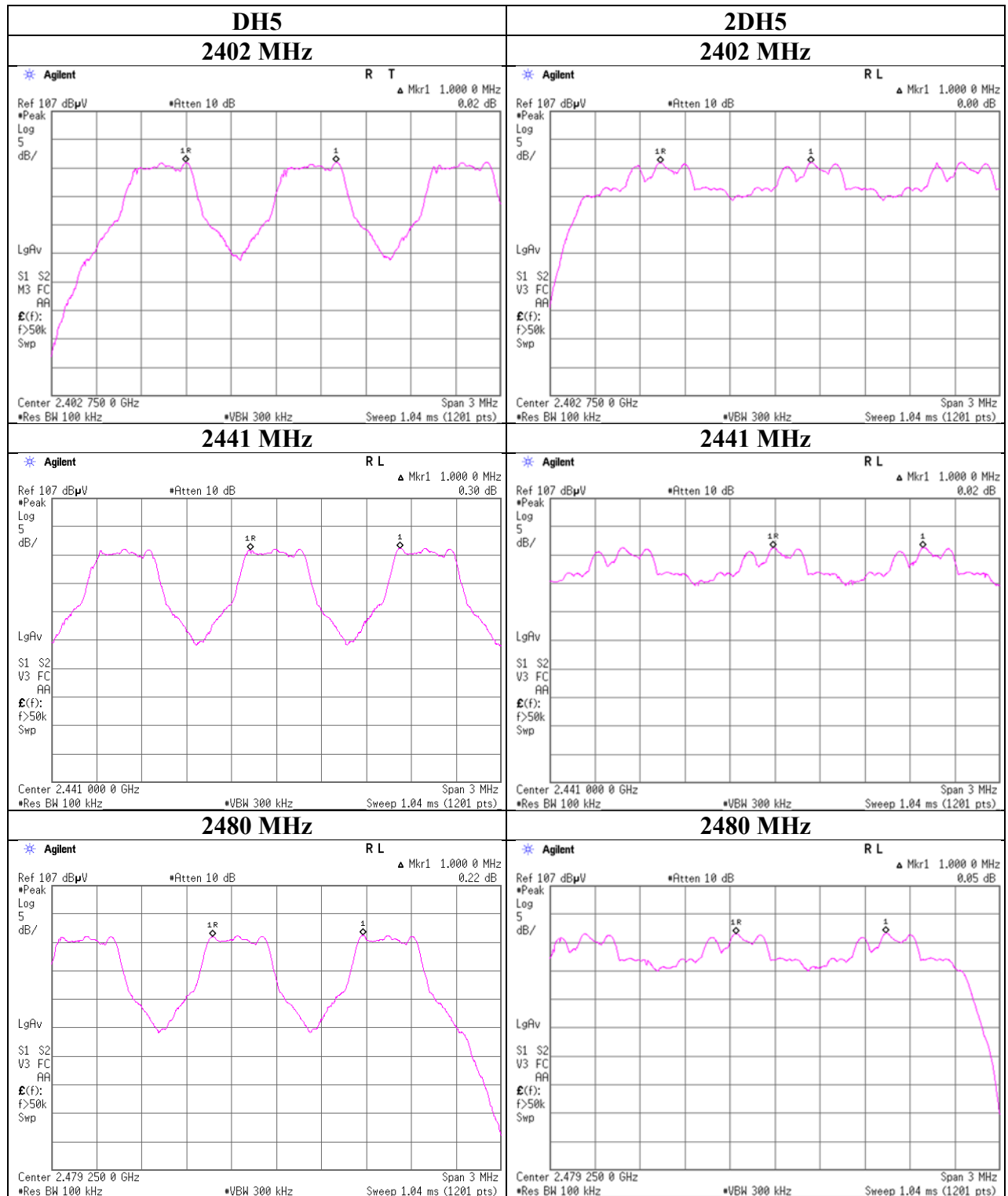
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Carrier Frequency Separation



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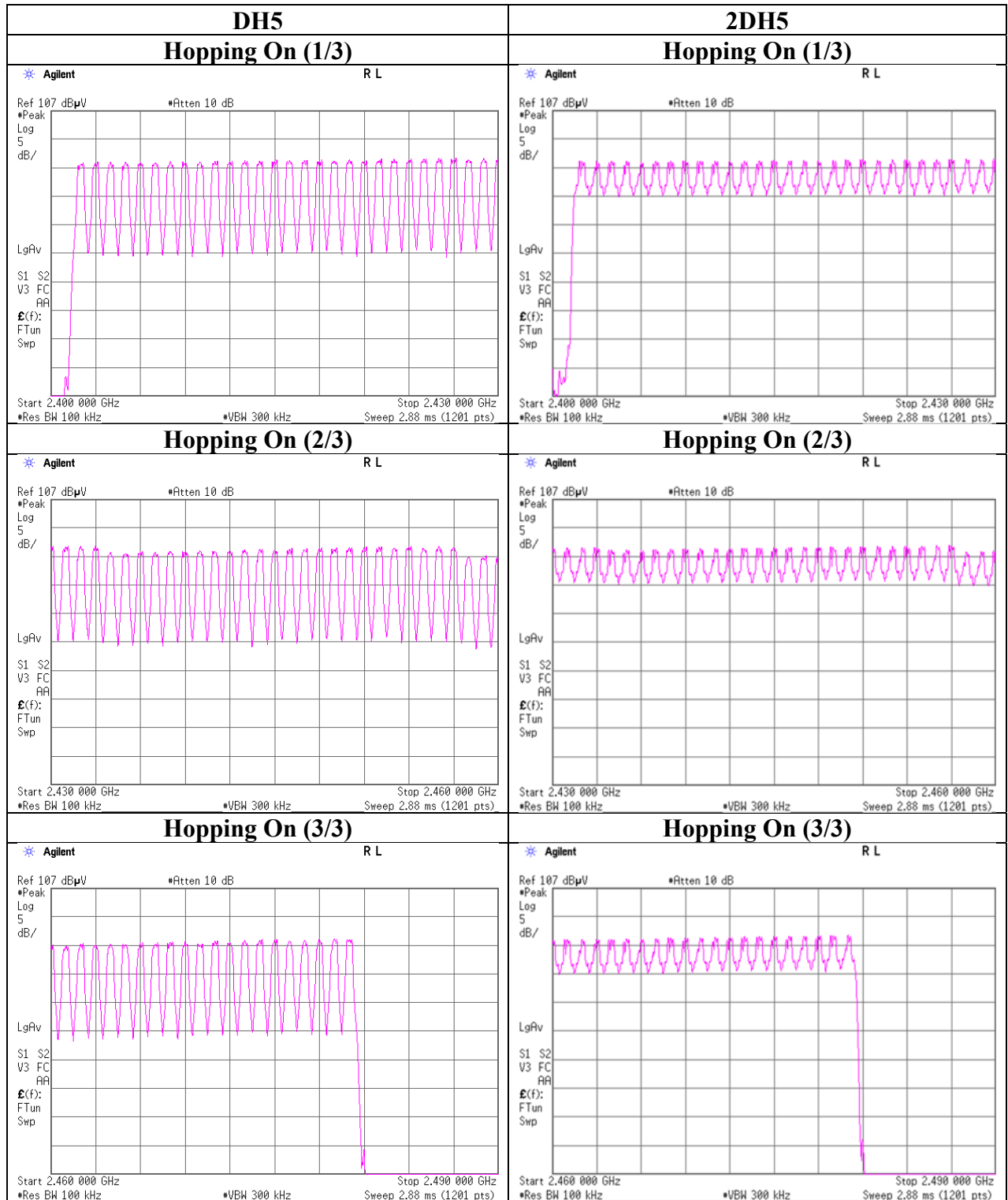
Number of Hopping Frequency

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	≥ 15
2DH5	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



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Dwell time

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period			Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times /	5 sec. x	31.6 sec. =	323 times	0.418	400
DH3	26.0 times /	5 sec. x	31.6 sec. =	165 times	1.686	400
DH5	17.0 times /	5 sec. x	31.6 sec. =	108 times	2.927	400
2DH1	51.0 times /	5 sec. x	31.6 sec. =	323 times	0.436	400
2DH3	26.0 times /	5 sec. x	31.6 sec. =	165 times	1.701	400
2DH5	17.0 times /	5 sec. x	31.6 sec. =	108 times	2.941	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

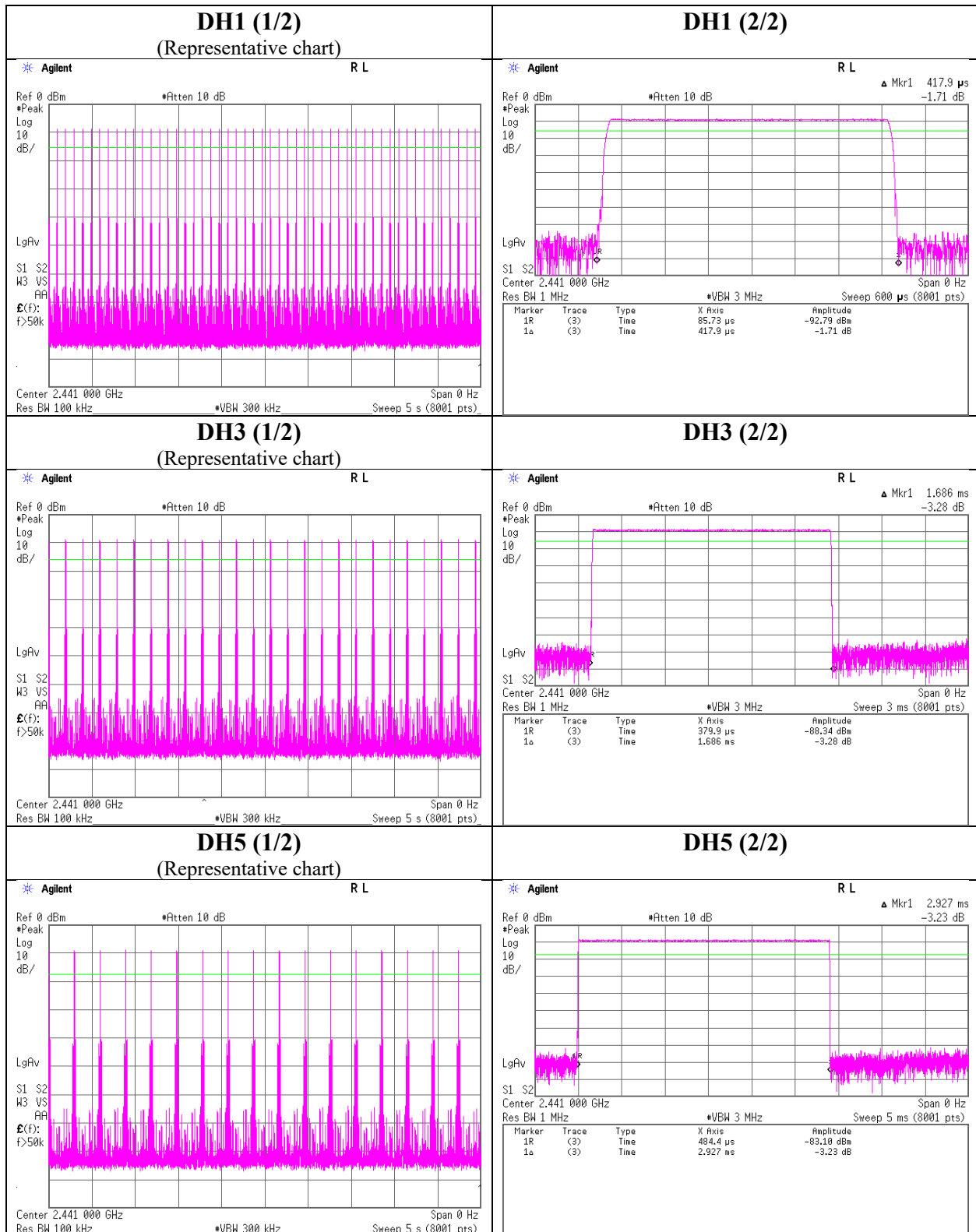
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	51	51	51
DH3	26	26	26	26	26	26
DH5	17	17	17	17	17	17
2DH1	51	51	51	51	51	51
2DH3	26	26	26	26	26	26
2DH5	17	17	17	17	17	17

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



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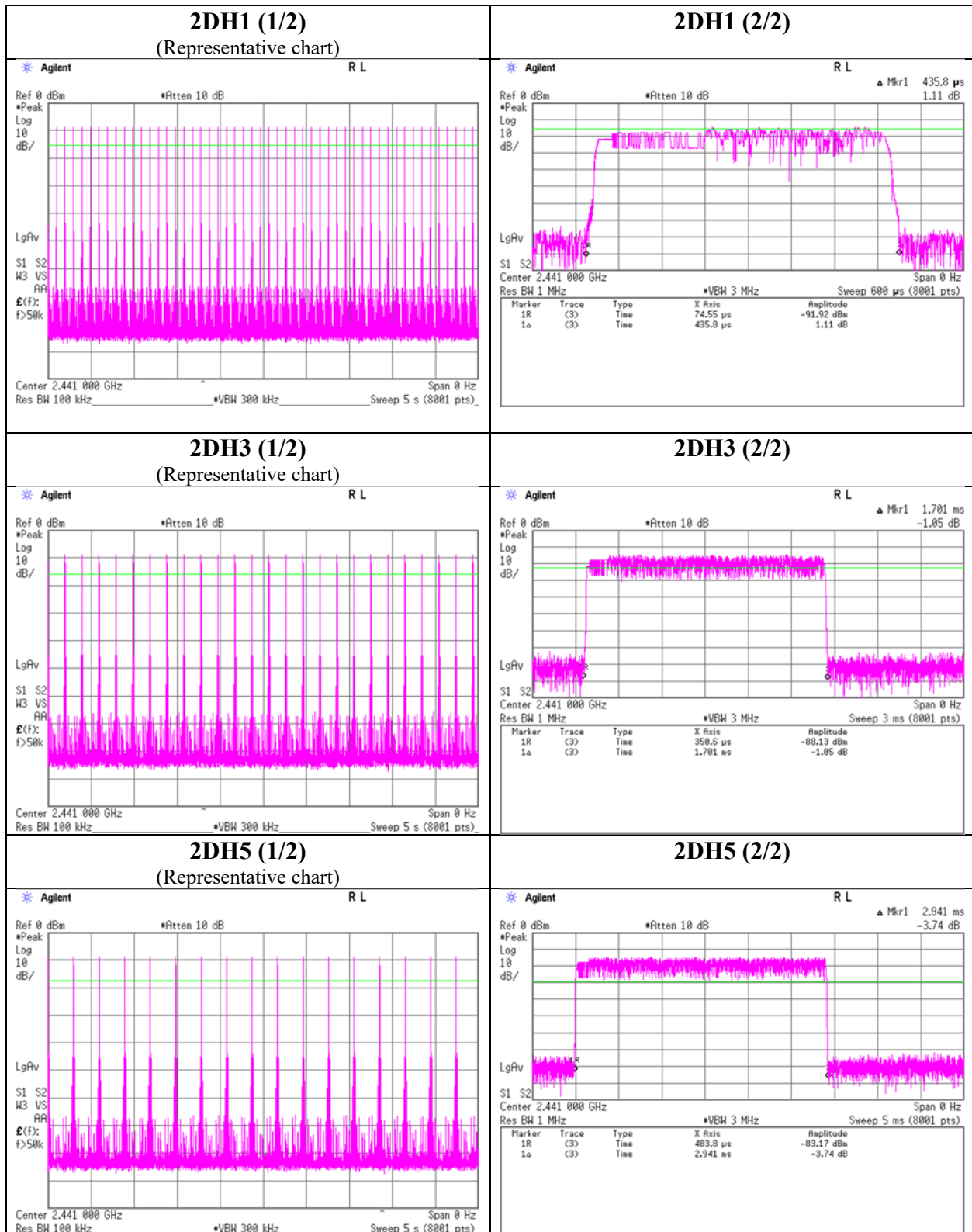
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Dwell time



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Shonan EMC Lab.

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Maximum Peak Output Power

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 1, 2019
Temperature / Humidity 23 deg. C / 41 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off

					Conducted Power					e.i.r.p. for RSS-247						
Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin	
					[dBm]	[mW]	[dBm]	[mW]			[dB]	[dBi]	[dBm]	[mW]		[dBm]
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]	
DH5	2402.0	-8.64	1.52	9.86	2.74	1.88	20.96	125	18.22	1.37	4.11	2.58	36.02	4000	31.91	
DH5	2441.0	-8.51	1.54	9.86	2.89	1.95	20.96	125	18.07	1.37	4.26	2.67	36.02	4000	31.76	
DH5	2480.0	-8.44	1.55	9.85	2.96	1.98	20.96	125	18.00	1.37	4.33	2.71	36.02	4000	31.69	
2DH5	2402.0	-7.19	1.52	9.86	4.19	2.62	20.96	125	16.77	1.37	5.56	3.60	36.02	4000	30.46	
2DH5	2441.0	-6.92	1.54	9.86	4.48	2.81	20.96	125	16.48	1.37	5.85	3.85	36.02	4000	30.17	
2DH5	2480.0	-6.64	1.55	9.85	4.76	2.99	20.96	125	16.20	1.37	6.13	4.10	36.02	4000	29.89	

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

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

UL Japan, Inc.

Shonan EMC Lab.

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Average Output Power (Reference data for RF Exposure)

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab. No.6 Shielded Room
Date	March 1, 2019
Temperature / Humidity	23 deg. C / 41 % RH
Engineer	Kazuya Noda
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	-10.37	1.52	9.86	1.01	1.26	1.07	2.08	1.61
DH5	2441.0	-10.32	1.54	9.86	1.08	1.28	1.07	2.15	1.64
DH5	2480.0	-10.22	1.55	9.85	1.18	1.31	1.07	2.25	1.68
2DH5	2402.0	-11.28	1.52	9.86	0.10	1.02	1.06	1.16	1.31
2DH5	2441.0	-11.01	1.54	9.86	0.39	1.09	1.06	1.45	1.40
2DH5	2480.0	-10.67	1.55	9.85	0.73	1.18	1.06	1.79	1.51

Sample Calculation:

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

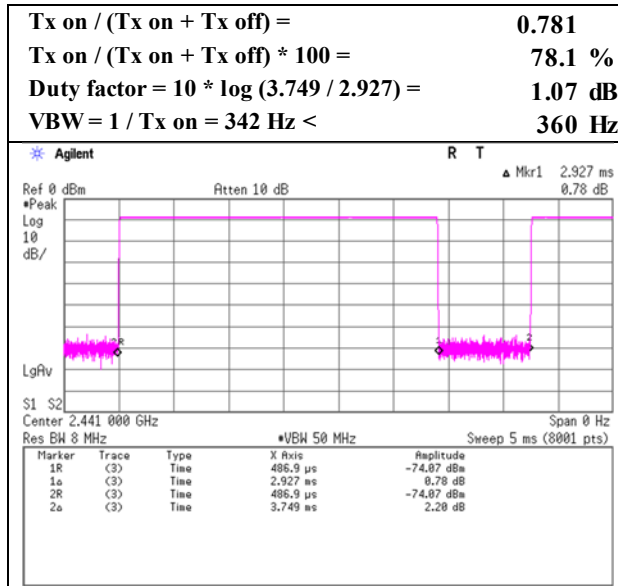
Result (Burst power average) = Time average + Duty factor

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

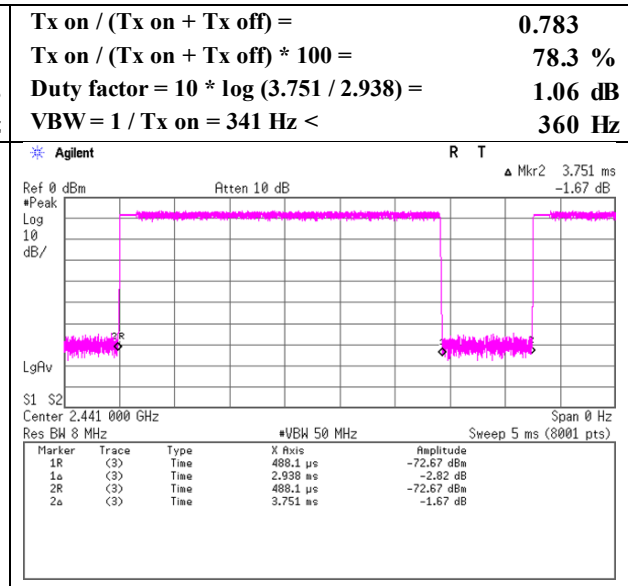
Burst Rate Confirmation

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 1, 2019
Temperature / Humidity 23 deg. C / 41 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off

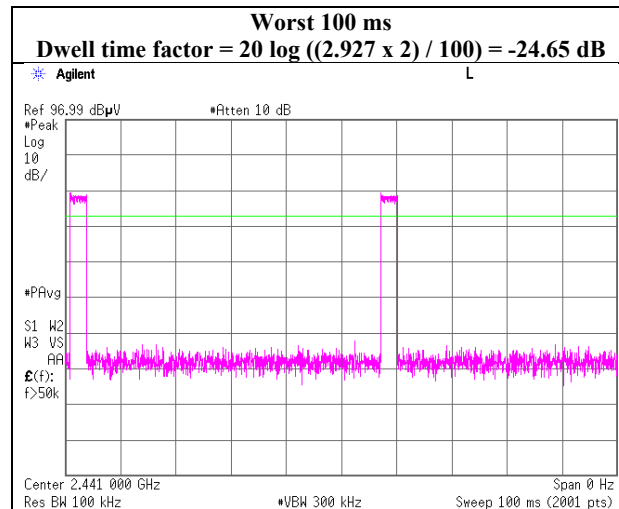
DH5



2DH5



DH5



Radiated Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 2
Date March 18, 2019 March 17, 2019 March 13, 2019
Temperature / Humidity 22 deg. C / 32 % RH 21 deg. C / 24 % RH 22 deg. C / 32 % RH
Engineer Toshinori Yamada Yosuke Ishikawa Kazuya Noda
(30 MHz -1 GHz) (1 GHz -13 GHz) (13 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	255.999	QP	45.20	11.93	5.86	31.73	0.00	31.26	46.00	14.7	133	114	
Hori.	440.003	QP	39.00	16.34	7.22	31.65	0.00	30.91	46.00	15.0	100	2	
Hori.	608.004	QP	35.10	19.41	7.87	31.61	0.00	30.77	46.00	15.2	138	212	
Hori.	2390.000	PK	46.11	27.86	14.74	41.59	2.21	49.33	73.90	24.5	400	38	
Hori.	2558.024	PK	49.16	27.84	14.88	41.65	2.21	52.44	73.90	21.4	300	33	
Hori.	4804.000	PK	57.90	31.43	7.28	42.88	2.21	55.94	73.90	17.9	148	42	
Hori.	7206.000	PK	47.30	36.79	9.14	42.92	2.21	52.52	73.90	21.3	100	0	
Hori.	9608.000	PK	48.74	38.51	10.55	43.17	2.21	56.84	73.90	17.0	100	0	
Hori.	12010.000	PK	49.02	39.24	11.66	42.29	2.21	59.84	73.90	14.0	100	0	
Hori.	19216.000	PK	46.48	40.14	11.69	48.17	-9.54	40.60	73.90	33.3	129	189	
Hori.	2390.000	AV	35.20	27.86	14.74	41.59	2.21	38.42	53.90	15.4	400	38	VBW: 360 Hz
Hori.	2558.024	AV	42.57	27.84	14.88	41.65	2.21	45.85	53.90	8.0	300	33	VBW: 360 Hz
Hori.	7206.000	AV	36.32	36.79	9.14	42.92	2.21	41.54	53.90	12.3	100	0	VBW: 360 Hz
Hori.	9608.000	AV	37.36	38.51	10.55	43.17	2.21	45.46	53.90	8.4	100	0	VBW: 360 Hz
Hori.	12010.000	AV	37.11	39.24	11.66	42.29	2.21	47.93	53.90	5.9	100	0	VBW: 360 Hz
Hori.	19216.000	AV	42.71	40.14	11.69	48.17	-9.54	36.83	53.90	17.0	129	189	VBW: 360 Hz
Vert.	60.133	QP	43.50	8.11	6.97	31.91	0.00	26.67	40.00	13.3	100	338	
Vert.	72.500	QP	42.60	6.35	7.45	31.90	0.00	24.50	40.00	15.5	100	328	
Vert.	124.001	QP	34.70	13.54	7.97	31.86	0.00	24.35	43.50	19.1	100	260	
Vert.	216.006	QP	41.90	11.08	5.54	31.78	0.00	26.74	46.00	19.2	100	217	
Vert.	257.597	QP	47.70	12.01	5.87	31.73	0.00	33.85	46.00	12.1	100	201	
Vert.	588.007	QP	38.60	18.88	7.79	31.62	0.00	33.65	46.00	12.3	100	198	
Vert.	608.003	QP	39.00	19.41	7.87	31.61	0.00	34.67	46.00	11.3	100	193	
Vert.	2390.000	PK	46.73	27.86	14.74	41.59	2.21	49.95	73.90	23.9	100	35	
Vert.	2558.014	PK	50.61	27.84	14.88	41.65	2.21	53.89	73.90	20.0	108	19	
Vert.	4804.000	PK	56.17	31.43	7.28	42.88	2.21	54.21	73.90	19.6	171	38	
Vert.	7206.000	PK	47.84	36.79	9.14	42.92	2.21	53.06	73.90	20.8	100	0	
Vert.	9608.000	PK	48.95	38.51	10.55	43.17	2.21	57.05	73.90	16.8	100	0	
Vert.	12010.000	PK	48.89	39.24	11.66	42.29	2.21	59.71	73.90	14.1	100	0	
Vert.	19216.000	PK	46.18	40.14	11.69	48.17	-9.54	40.30	73.90	33.6	170	101	
Vert.	2390.000	AV	35.20	27.86	14.74	41.59	2.21	38.42	53.90	15.4	100	35	VBW: 360 Hz
Vert.	2558.014	AV	44.89	27.84	14.88	41.65	2.21	48.17	53.90	5.7	108	19	VBW: 360 Hz
Vert.	7206.000	AV	36.71	36.79	9.14	42.92	2.21	41.93	53.90	11.9	100	0	VBW: 360 Hz
Vert.	9608.000	AV	38.00	38.51	10.55	43.17	2.21	46.10	53.90	7.8	100	0	VBW: 360 Hz
Vert.	12010.000	AV	37.85	39.24	11.66	42.29	2.21	48.67	53.90	5.2	100	0	VBW: 360 Hz
Vert.	19216.000	AV	42.04	40.14	11.69	48.17	-9.54	36.16	53.90	17.7	170	101	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : 20log(3.87 m / 3.0 m) = 2.21 dB

13 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

* These results have sufficient margin without taking account Duty factor.

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	PK	57.90	31.43	7.28	42.88	-24.65	2.21	31.29	53.90	22.6	
Vert.	4804.000	PK	56.17	31.43	7.28	42.88	-24.65	2.21	29.56	53.90	24.3	

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(3.87 m / 3.0 m) = 2.21 dB

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

Duty factor refer to "Burst Rate Confirmation" 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	96.89	27.86	14.75	41.60	2.21	100.11	-	-	Carrier
Hori.	2399.681	PK	49.88	27.86	14.75	41.60	2.21	53.10	80.11	27.0	
Hori.	2400.000	PK	49.10	27.86	14.75	41.60	2.21	52.32	80.11	27.7	
Vert.	2402.000	PK	96.41	27.86	14.75	41.60	2.21	99.63	-	-	Carrier
Vert.	2399.679	PK	49.52	27.86	14.75	41.60	2.21	52.74	79.63	26.8	
Vert.	2400.000	PK	48.83	27.86	14.75	41.60	2.21	52.05	79.63	27.5	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.87 m / 3.0 m) = 2.21 dB

13 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

UL Japan, Inc.

Shonan EMC Lab.

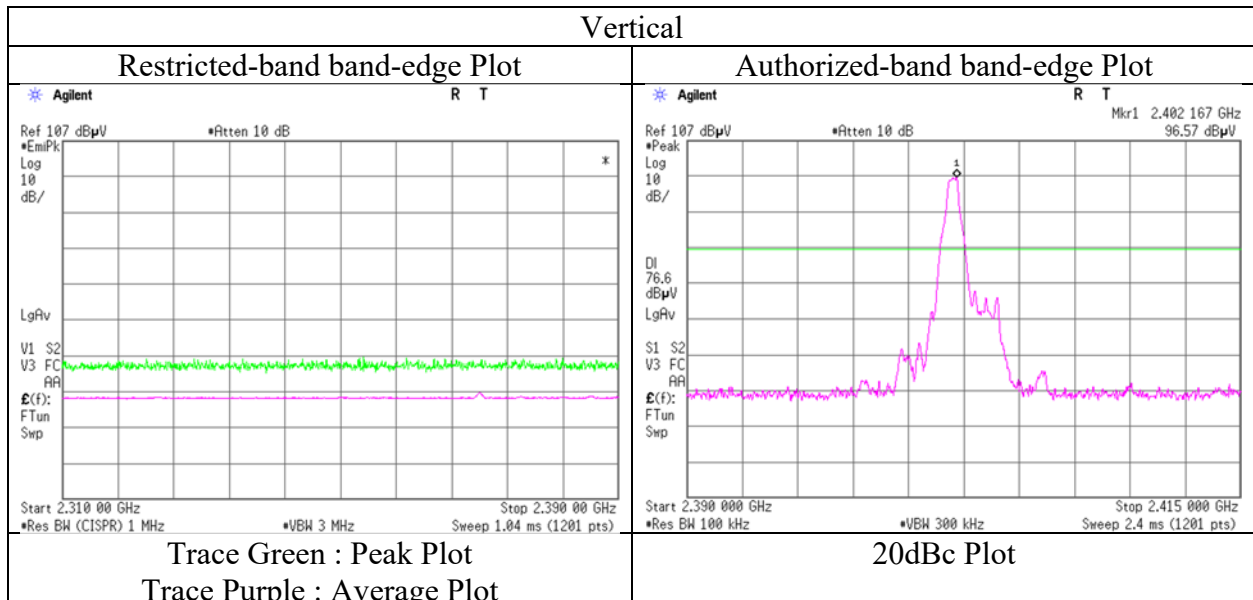
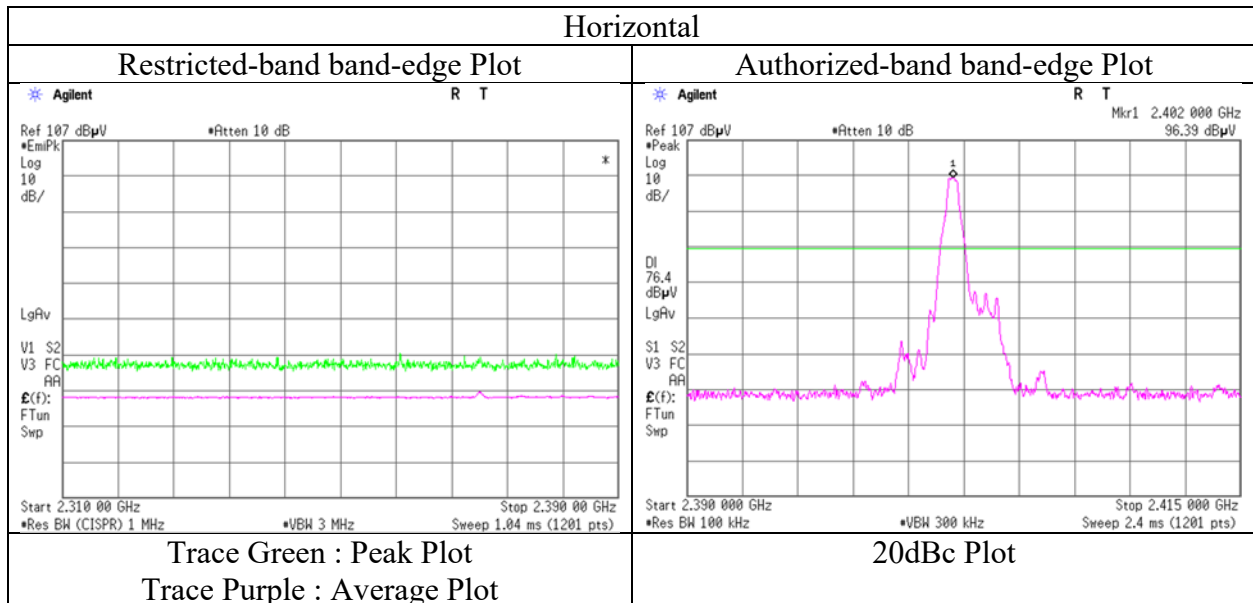
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2019
Temperature / Humidity	21 deg. C / 24 % RH
Engineer	Yosuke Ishikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

UL Japan, Inc.

Shonan EMC Lab.

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

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Facsimile : +81 463 50 6401

Radiated Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 2
Date March 18, 2019 March 17, 2019 March 13, 2019
Temperature / Humidity 22 deg. C / 32 % RH 21 deg. C / 24 % RH 22 deg. C / 32 % RH
Engineer Toshinori Yamada Yosuke Ishikawa Kazuya Noda
(30 MHz -1 GHz) (1 GHz -13 GHz) (13 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2441 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	255.995	QP	45.60	11.93	5.86	31.73	0.00	31.66	46.00	14.3	129	116	
Hori.	440.000	QP	38.80	16.34	7.22	31.65	0.00	30.71	46.00	15.2	100	3	
Hori.	607.999	QP	35.20	19.41	7.87	31.61	0.00	30.87	46.00	15.1	143	263	
Hori.	2597.061	PK	49.89	27.87	14.92	41.66	2.21	53.23	73.90	20.6	322	164	
Hori.	4882.000	PK	56.87	31.37	7.34	42.89	2.21	54.90	73.90	19.0	132	43	
Hori.	7323.000	PK	47.73	37.01	9.14	43.15	2.21	52.94	73.90	20.9	100	0	
Hori.	9764.000	PK	47.74	38.92	10.46	43.01	2.21	56.32	73.90	17.5	100	0	
Hori.	12205.000	PK	47.67	39.22	11.73	42.19	2.21	58.64	73.90	15.2	100	0	
Hori.	19528.000	PK	45.40	40.08	11.88	47.70	-9.54	40.12	73.90	33.7	137	175	
Hori.	2597.061	AV	42.89	27.87	14.92	41.66	2.21	46.23	53.90	7.6	322	164	VBW: 360 Hz
Hori.	7323.000	AV	36.99	37.01	9.14	43.15	2.21	42.20	53.90	11.7	100	0	VBW: 360 Hz
Hori.	9764.000	AV	36.75	38.92	10.46	43.01	2.21	45.33	53.90	8.5	100	0	VBW: 360 Hz
Hori.	12205.000	AV	36.04	39.22	11.73	42.19	2.21	47.01	53.90	6.8	100	0	VBW: 360 Hz
Hori.	19528.000	AV	41.02	40.08	11.88	47.70	-9.54	35.74	53.90	18.1	137	175	VBW: 360 Hz
Vert.	60.941	QP	43.90	7.92	6.96	31.91	0.00	26.87	40.00	13.1	100	333	
Vert.	73.310	QP	42.80	6.32	7.53	31.90	0.00	24.75	40.00	15.2	100	325	
Vert.	124.003	QP	34.70	13.54	7.97	31.86	0.00	24.35	43.50	19.1	100	251	
Vert.	208.001	QP	42.70	11.17	5.47	31.79	0.00	27.55	43.50	15.9	100	203	
Vert.	255.998	QP	47.50	11.93	5.86	31.73	0.00	33.56	46.00	12.4	100	202	
Vert.	588.000	QP	38.20	18.88	7.79	31.62	0.00	33.25	46.00	12.7	100	209	
Vert.	607.999	QP	38.90	19.41	7.87	31.61	0.00	34.57	46.00	11.4	100	190	
Vert.	2597.034	PK	49.56	27.87	14.92	41.66	2.21	52.90	73.90	21.0	100	325	
Vert.	4882.000	PK	55.89	31.37	7.34	42.89	2.21	53.92	73.90	19.9	159	31	
Vert.	7323.000	PK	47.68	37.01	9.14	43.15	2.21	52.89	73.90	21.0	100	0	
Vert.	9764.000	PK	47.58	38.92	10.46	43.01	2.21	56.16	73.90	17.7	100	0	
Vert.	12205.000	PK	46.40	39.22	11.73	42.19	2.21	57.37	73.90	16.5	100	0	
Vert.	19528.000	PK	44.07	40.08	11.88	47.70	-9.54	38.79	73.90	35.1	149	102	
Vert.	2597.034	AV	43.61	27.87	14.92	41.66	2.21	46.95	53.90	6.9	100	325	VBW: 360 Hz
Vert.	7323.000	AV	36.78	37.01	9.14	43.15	2.21	41.99	53.90	11.9	100	0	VBW: 360 Hz
Vert.	9764.000	AV	36.54	38.92	10.46	43.01	2.21	45.12	53.90	8.7	100	0	VBW: 360 Hz
Vert.	12205.000	AV	36.10	39.22	11.73	42.19	2.21	47.07	53.90	6.8	100	0	VBW: 360 Hz
Vert.	19528.000	AV	36.43	40.08	11.88	47.70	-9.54	31.15	53.90	22.7	149	102	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.21\text{ dB}$

13 GHz - 26.5 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* These results have sufficient margin without taking account Duty factor.

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	PK	56.87	31.37	7.34	42.89	-24.65	2.21	30.25	53.90	23.7	
Vert.	4882.000	PK	55.89	31.37	7.34	42.89	-24.65	2.21	29.27	53.90	24.6	

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 : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.21\text{ dB}$

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

Duty factor refer to "Burst Rate Confirmation" sheet.

UL Japan, Inc.

Shonan EMC Lab.

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

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Radiated Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 2
Date March 18, 2019 March 17, 2019 March 13, 2019
Temperature / Humidity 22 deg. C / 32 % RH 21 deg. C / 24 % RH 22 deg. C / 32 % RH
Engineer Toshinori Yamada Yosuke Ishikawa Kazuya Noda
(30 MHz -1 GHz) (1 GHz -13 GHz) (13 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	259.989	QP	46.60	12.13	5.89	31.73	0.00	32.89	46.00	13.1	126	125	
Hori.	440.000	QP	38.60	16.34	7.22	31.65	0.00	30.51	46.00	15.4	100	357	
Hori.	607.997	QP	35.30	19.41	7.87	31.61	0.00	30.97	46.00	15.0	139	264	
Hori.	2483.500	PK	48.86	27.65	14.83	41.62	2.21	51.93	73.90	21.9	133	19	
Hori.	2484.006	PK	50.31	27.65	14.83	41.62	2.21	53.38	73.90	20.5	133	19	
Hori.	2635.993	PK	48.59	27.90	14.95	41.68	2.21	51.97	73.90	21.9	261	177	
Hori.	4960.000	PK	55.67	31.54	7.39	42.91	2.21	53.90	73.90	20.0	176	42	
Hori.	7440.000	PK	48.04	37.10	9.15	43.38	2.21	53.12	73.90	20.7	100	0	
Hori.	9920.000	PK	47.32	38.97	10.37	42.84	2.21	56.03	73.90	17.8	100	0	
Hori.	12400.000	PK	45.88	38.65	11.78	42.08	2.21	56.44	73.90	17.4	100	0	
Hori.	19840.000	PK	45.66	39.94	12.02	47.72	-9.54	40.36	73.90	33.5	122	174	
Hori.	2483.500	AV	38.20	27.65	14.83	41.62	2.21	41.27	53.90	12.6	133	19	VBW: 360 Hz
Hori.	2484.006	AV	41.41	27.65	14.83	41.62	2.21	44.48	53.90	9.4	133	19	VBW: 360 Hz
Hori.	2635.993	AV	40.94	27.90	14.95	41.68	2.21	44.32	53.90	9.5	261	177	VBW: 360 Hz
Hori.	7440.000	AV	36.80	37.10	9.15	43.38	2.21	41.88	53.90	12.0	100	0	VBW: 360 Hz
Hori.	9920.000	AV	35.91	38.97	10.37	42.84	2.21	44.62	53.90	9.2	100	0	VBW: 360 Hz
Hori.	12400.000	AV	34.93	38.65	11.78	42.08	2.21	45.49	53.90	8.4	100	0	VBW: 360 Hz
Hori.	19840.000	AV	41.33	39.94	12.02	47.72	-9.54	36.03	53.90	17.8	122	174	VBW: 360 Hz
Vert.	59.995	QP	43.90	8.14	6.97	31.91	0.00	27.10	40.00	12.9	100	338	
Vert.	73.306	QP	42.90	6.32	7.53	31.90	0.00	24.85	40.00	15.1	100	341	
Vert.	123.996	QP	34.10	13.54	7.97	31.86	0.00	23.75	43.50	19.7	100	261	
Vert.	207.989	QP	42.70	11.17	5.47	31.79	0.00	27.55	43.50	15.9	100	206	
Vert.	256.003	QP	47.30	11.93	5.86	31.73	0.00	33.36	46.00	12.6	100	207	
Vert.	595.993	QP	38.00	19.12	7.82	31.61	0.00	33.33	46.00	12.6	100	197	
Vert.	607.999	QP	38.60	19.41	7.87	31.61	0.00	34.27	46.00	11.7	100	191	
Vert.	2483.500	PK	48.84	27.65	14.83	41.62	2.21	51.91	73.90	21.9	118	27	
Vert.	2483.980	PK	49.17	27.65	14.83	41.62	2.21	52.24	73.90	21.6	118	27	
Vert.	2635.991	PK	49.73	27.90	14.95	41.68	2.21	53.11	73.90	20.7	143	288	
Vert.	4960.000	PK	53.87	31.54	7.39	42.91	2.21	52.10	73.90	21.8	100	75	
Vert.	7440.000	PK	48.92	37.10	9.15	43.38	2.21	54.00	73.90	19.9	100	0	
Vert.	9920.000	PK	47.17	38.97	10.37	42.84	2.21	55.88	73.90	18.0	100	0	
Vert.	12400.000	PK	45.76	38.65	11.78	42.08	2.21	56.32	73.90	17.5	100	0	
Vert.	19840.000	PK	44.06	39.94	12.02	47.72	-9.54	38.76	73.90	35.1	143	122	
Vert.	2483.500	AV	37.92	27.65	14.83	41.62	2.21	40.99	53.90	12.9	118	27	VBW: 360 Hz
Vert.	2483.980	AV	41.34	27.65	14.83	41.62	2.21	44.41	53.90	9.4	118	27	VBW: 360 Hz
Vert.	2635.991	AV	41.86	27.90	14.95	41.68	2.21	45.24	53.90	8.6	143	288	VBW: 360 Hz
Vert.	7440.000	AV	37.11	37.10	9.15	43.38	2.21	42.19	53.90	11.7	100	0	VBW: 360 Hz
Vert.	9920.000	AV	35.96	38.97	10.37	42.84	2.21	44.67	53.90	9.2	100	0	VBW: 360 Hz
Vert.	12400.000	AV	34.95	38.65	11.78	42.08	2.21	45.51	53.90	8.3	100	0	VBW: 360 Hz
Vert.	19840.000	AV	38.16	39.94	12.02	47.72	-9.54	32.86	53.90	21.0	143	122	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.21\text{ dB}$

13 GHz - 26.5 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* These results have sufficient margin without taking account Duty factor.

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	PK	55.67	31.54	7.39	42.91	-24.65	2.21	29.25	53.90	24.7	
Vert.	4960.000	PK	53.87	31.54	7.39	42.91	-24.65	2.21	27.45	53.90	26.5	

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 : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.21\text{ dB}$

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

Duty factor refer to "Burst Rate Confirmation" sheet.

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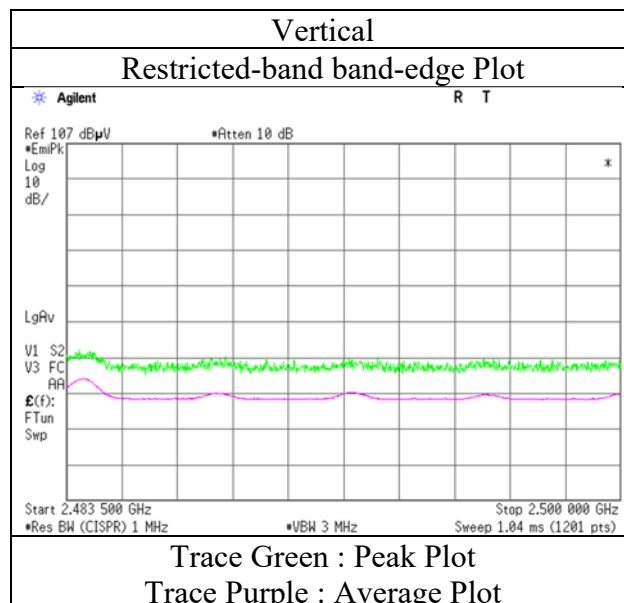
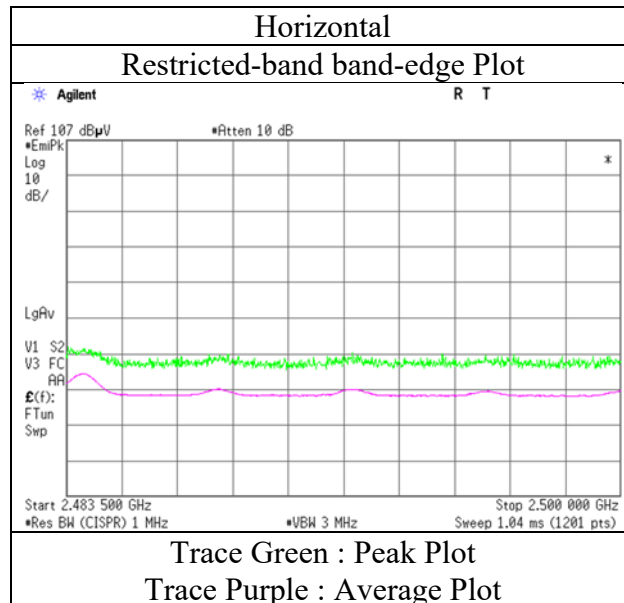
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2019
Temperature / Humidity	21 deg. C / 24 % RH
Engineer	Yosuke Ishikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

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Radiated Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 3 2
Date March 18, 2019 March 17, 2019 March 13, 2019
Temperature / Humidity 22 deg. C / 32 % RH 21 deg. C / 24 % RH 22 deg. C / 32 % RH
Engineer Toshinori Yamada Yosuke Ishikawa Kazuya Noda
(30 MHz -1 GHz) (1 GHz -13 GHz) (13 GHz -26.5 GHz)
Mode Tx, Hopping Off, 2DH5 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.	256.002	QP	46.10	11.93	5.86	31.73	0.00	32.16	46.00	13.8	133	115	
Hori.	440.002	QP	38.20	16.34	7.22	31.65	0.00	30.11	46.00	15.8	100	2	
Hori.	608.000	QP	35.60	19.41	7.87	31.61	0.00	31.27	46.00	14.7	137	272	
Hori.	2390.000	PK	46.75	27.86	14.74	41.59	2.21	49.97	73.90	23.9	247	15	
Hori.	2558.042	PK	47.75	27.84	14.88	41.65	2.21	51.03	73.90	22.8	100	324	
Hori.	4804.000	PK	54.93	31.43	7.28	42.88	2.21	52.97	73.90	20.9	191	38	
Hori.	7206.000	PK	47.68	36.79	9.14	42.92	2.21	52.90	73.90	21.0	100	0	
Hori.	9608.000	PK	48.96	38.51	10.55	43.17	2.21	57.06	73.90	16.8	100	0	
Hori.	12010.000	PK	47.60	39.24	11.66	42.29	2.21	58.42	73.90	15.4	100	0	
Hori.	19216.000	PK	47.28	40.14	11.69	48.17	-9.54	41.40	73.90	32.5	134	202	
Hori.	2390.000	AV	35.82	27.86	14.74	41.59	2.21	39.04	53.90	14.8	247	15	VBW: 360 Hz
Hori.	2558.042	AV	38.26	27.84	14.88	41.65	2.21	41.54	53.90	12.3	100	324	VBW: 360 Hz
Hori.	4804.000	AV	47.86	31.43	7.28	42.88	2.21	45.90	53.90	8.0	191	38	VBW: 360 Hz
Hori.	7206.000	AV	36.60	36.79	9.14	42.92	2.21	41.82	53.90	12.0	100	0	VBW: 360 Hz
Hori.	9608.000	AV	37.68	38.51	10.55	43.17	2.21	45.78	53.90	8.1	100	0	VBW: 360 Hz
Hori.	12010.000	AV	37.23	39.24	11.66	42.29	2.21	48.05	53.90	5.8	100	0	VBW: 360 Hz
Hori.	19216.000	AV	43.06	40.14	11.69	48.17	-9.54	37.18	53.90	16.7	134	202	VBW: 360 Hz
Vert.	60.002	QP	44.10	8.14	6.97	31.91	0.00	27.30	40.00	12.7	100	335	
Vert.	73.344	QP	43.20	6.32	7.53	31.90	0.00	25.15	40.00	14.8	100	342	
Vert.	124.006	QP	34.70	13.54	7.97	31.86	0.00	24.35	43.50	19.1	100	253	
Vert.	212.006	QP	42.60	11.10	5.51	31.78	0.00	27.43	43.50	16.0	100	222	
Vert.	256.019	QP	47.50	11.93	5.86	31.73	0.00	33.56	46.00	12.4	100	209	
Vert.	588.003	QP	37.90	18.88	7.79	31.62	0.00	32.95	46.00	13.0	100	203	
Vert.	607.998	QP	38.60	19.41	7.87	31.61	0.00	34.27	46.00	11.7	100	189	
Vert.	2390.000	PK	46.90	27.86	14.74	41.59	2.21	50.12	73.90	23.7	158	31	
Vert.	2557.973	PK	49.98	27.84	14.88	41.65	2.21	53.26	73.90	20.6	108	24	
Vert.	4804.000	PK	53.95	31.43	7.28	42.88	2.21	51.99	73.90	21.9	147	22	
Vert.	7206.000	PK	47.23	36.79	9.14	42.92	2.21	52.45	73.90	21.4	100	0	
Vert.	9608.000	PK	48.31	38.51	10.55	43.17	2.21	56.41	73.90	17.4	100	0	
Vert.	12010.000	PK	48.96	39.24	11.66	42.29	2.21	59.78	73.90	14.1	100	0	
Vert.	19216.000	PK	46.00	40.14	11.69	48.17	-9.54	40.12	73.90	33.7	133	120	
Vert.	2390.000	AV	35.09	27.86	14.74	41.59	2.21	38.31	53.90	15.5	158	31	VBW: 360 Hz
Vert.	2557.973	AV	42.66	27.84	14.88	41.65	2.21	45.94	53.90	7.9	108	24	VBW: 360 Hz
Vert.	4804.000	AV	46.19	31.43	7.28	42.88	2.21	44.23	53.90	9.6	147	22	VBW: 360 Hz
Vert.	7206.000	AV	36.53	36.79	9.14	42.92	2.21	41.75	53.90	12.1	100	0	VBW: 360 Hz
Vert.	9608.000	AV	37.68	38.51	10.55	43.17	2.21	45.78	53.90	8.1	100	0	VBW: 360 Hz
Vert.	12010.000	AV	37.54	39.24	11.66	42.29	2.21	48.36	53.90	5.5	100	0	VBW: 360 Hz
Vert.	19216.000	AV	40.24	40.14	11.69	48.17	-9.54	34.36	53.90	19.5	133	120	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.21\text{ dB}$

13 GHz - 26.5 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* These results have sufficient margin without taking account Duty 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	96.56	27.86	14.75	41.60	2.21	99.78	-	-	Carrier
Hori.	2400.000	PK	58.96	27.86	14.75	41.60	2.21	62.18	79.78	17.6	
Vert.	2402.000	PK	96.39	27.86	14.75	41.60	2.21	99.61	-	-	Carrier
Vert.	2400.000	PK	58.72	27.86	14.75	41.60	2.21	61.94	79.61	17.6	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.87\text{ m} / 3.0\text{ m}) = 2.21\text{ dB}$

13 GHz - 26.5 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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Shonan EMC Lab.

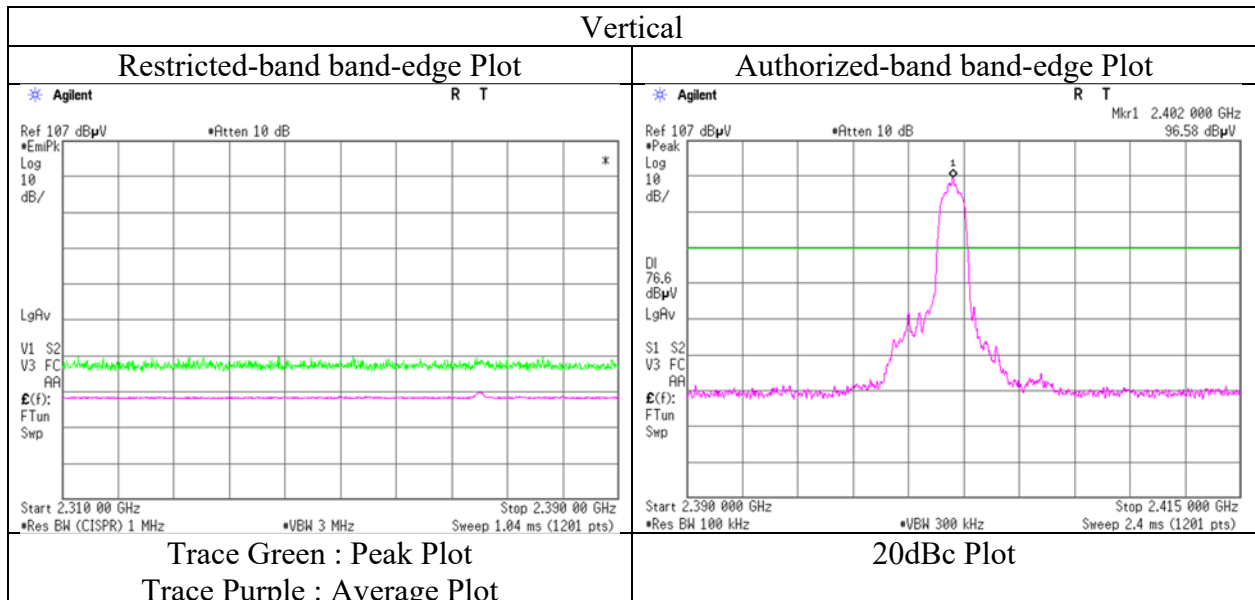
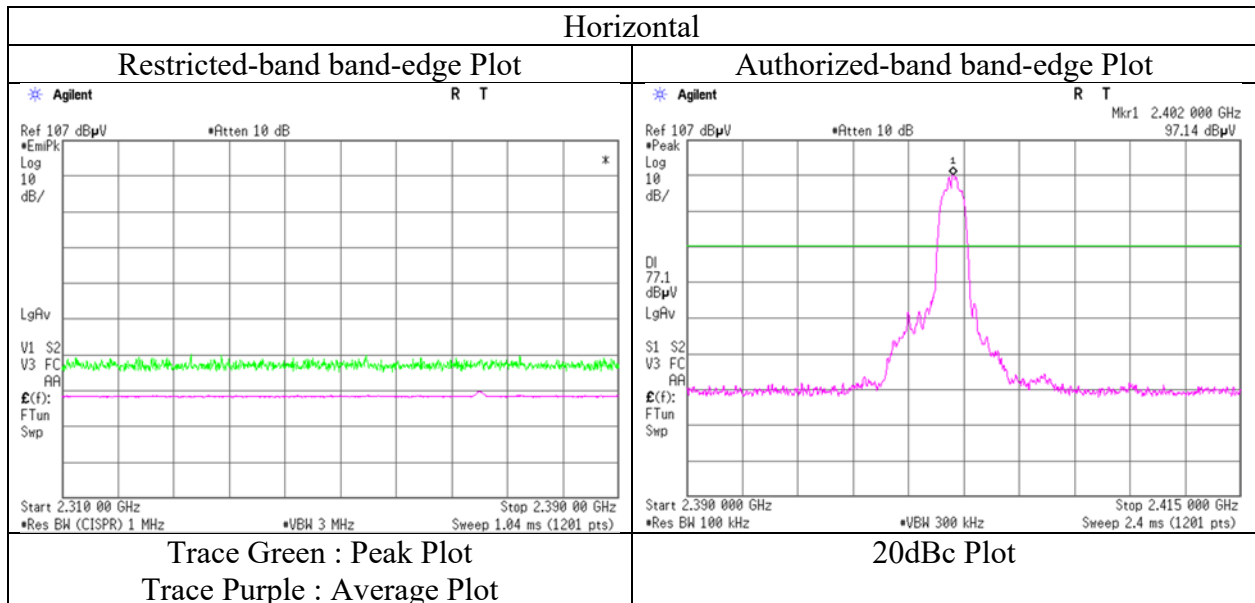
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2019
Temperature / Humidity	21 deg. C / 24 % RH
Engineer	Yosuke Ishikawa
	(1 GHz -13 GHz)
Mode	Tx, Hopping Off, 2DH5 2402 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

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Radiated Spurious Emission

Report No.	12652966S-J-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	2	3	2
Date	March 13, 2019	March 17, 2019	March 13, 2019
Temperature / Humidity	22 deg. C / 32 % RH	21 deg. C / 24 % RH	22 deg. C / 32 % RH
Engineer	Kazuya Noda	Yosuke Ishikawa	Kazuya Noda
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 2DH5 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.	124.001	QP	31.40	13.54	8.15	31.86	0.00	21.23	43.50	22.2	200	212	
Hori.	245.858	QP	38.70	11.62	5.78	31.74	0.00	24.36	46.00	21.6	141	331	
Hori.	608.003	QP	33.60	19.41	7.87	31.61	0.00	29.27	46.00	16.7	143	179	
Hori.	2596.910	PK	47.92	27.87	14.92	41.66	2.21	51.26	73.90	22.6	171	321	
Hori.	4882.000	PK	54.86	31.37	7.34	42.89	2.21	52.89	73.90	21.0	193	42	
Hori.	7323.000	PK	47.32	37.01	9.14	43.15	2.21	52.53	73.90	21.3	100	0	
Hori.	9764.000	PK	46.87	38.92	10.46	43.01	2.21	55.45	73.90	18.4	100	0	
Hori.	12205.000	PK	47.16	39.22	11.73	42.19	2.21	58.13	73.90	15.7	100	0	
Hori.	19528.000	PK	46.16	40.08	11.88	47.70	-9.54	40.88	73.90	33.0	108	198	
Hori.	2596.910	AV	38.86	27.87	14.92	41.66	2.21	42.20	53.90	11.7	171	321	VBW: 360 Hz
Hori.	4882.000	AV	47.74	31.37	7.34	42.89	2.21	45.77	53.90	8.1	193	42	VBW: 360 Hz
Hori.	7323.000	AV	36.72	37.01	9.14	43.15	2.21	41.93	53.90	11.9	100	0	VBW: 360 Hz
Hori.	9764.000	AV	36.38	38.92	10.46	43.01	2.21	44.96	53.90	8.9	100	0	VBW: 360 Hz
Hori.	12205.000	AV	35.74	39.22	11.73	42.19	2.21	46.71	53.90	7.1	100	0	VBW: 360 Hz
Hori.	19528.000	AV	41.62	40.08	11.88	47.70	-9.54	36.34	53.90	17.5	108	198	VBW: 360 Hz
Vert.	61.499	QP	41.90	7.82	7.36	31.91	0.00	25.17	40.00	14.8	100	210	
Vert.	124.001	QP	34.90	13.54	8.15	31.86	0.00	24.73	43.50	18.7	241	226	
Vert.	221.865	QP	40.10	11.12	5.58	31.77	0.00	25.03	46.00	20.9	100	308	
Vert.	259.833	QP	40.80	12.12	5.89	31.73	0.00	27.08	46.00	18.9	100	266	
Vert.	332.035	QP	33.00	14.60	6.51	31.68	0.00	22.43	46.00	23.5	100	218	
Vert.	608.005	QP	39.00	19.41	7.87	31.61	0.00	34.67	46.00	11.3	100	290	
Vert.	2596.960	PK	49.30	27.87	14.92	41.66	2.21	52.64	73.90	21.2	113	31	
Vert.	4882.000	PK	52.78	31.37	7.34	42.89	2.21	50.81	73.90	23.0	100	68	
Vert.	7323.000	PK	47.14	37.01	9.14	43.15	2.21	52.35	73.90	21.5	100	0	
Vert.	9764.000	PK	48.00	38.92	10.46	43.01	2.21	56.58	73.90	17.3	100	0	
Vert.	12205.000	PK	46.79	39.22	11.73	42.19	2.21	57.76	73.90	16.1	100	0	
Vert.	19528.000	PK	44.59	40.08	11.88	47.70	-9.54	39.31	73.90	34.5	152	97	
Vert.	2596.960	AV	41.71	27.87	14.92	41.66	2.21	45.05	53.90	8.8	113	31	VBW: 360 Hz
Vert.	4882.000	AV	45.07	31.37	7.34	42.89	2.21	43.10	53.90	10.8	100	68	VBW: 360 Hz
Vert.	7323.000	AV	36.75	37.01	9.14	43.15	2.21	41.96	53.90	11.9	100	0	VBW: 360 Hz
Vert.	9764.000	AV	36.46	38.92	10.46	43.01	2.21	45.04	53.90	8.8	100	0	VBW: 360 Hz
Vert.	12205.000	AV	35.00	39.22	11.73	42.19	2.21	45.97	53.90	7.9	100	0	VBW: 360 Hz
Vert.	19528.000	AV	39.37	40.08	11.88	47.70	-9.54	34.09	53.90	19.8	152	97	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.21 dB

13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* These results have sufficient margin without taking account Duty factor.

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Shonan EMC Lab.

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Radiated Spurious Emission

Report No.	12652966S-J-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	2	3	2
Date	March 13, 2019	March 17, 2019	March 13, 2019
Temperature / Humidity	22 deg. C / 32 % RH	21 deg. C / 24 % RH	22 deg. C / 32 % RH
Engineer	Kazuya Noda	Yosuke Ishikawa	Kazuya Noda
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 2DH5 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.	58.796	QP	30.40	8.44	7.32	31.91	0.00	14.25	40.00	25.7	346	215	
Hori.	264.794	QP	37.20	12.44	5.93	31.73	0.00	23.84	46.00	22.1	100	306	
Hori.	2483.500	PK	48.75	27.65	14.83	41.62	2.21	51.82	73.90	22.0	236	4	
Hori.	2484.017	PK	48.96	27.65	14.83	41.62	2.21	52.03	73.90	21.8	236	4	
Hori.	2511.999	PK	48.11	27.64	14.85	41.63	2.21	51.18	73.90	22.7	100	320	
Hori.	4960.000	PK	53.22	31.54	7.39	42.91	2.21	51.45	73.90	22.4	100	55	
Hori.	7440.000	PK	48.14	37.10	9.15	43.38	2.21	53.22	73.90	20.6	100	0	
Hori.	9920.000	PK	47.51	38.97	10.37	42.84	2.21	56.22	73.90	17.6	100	0	
Hori.	12400.000	PK	46.24	38.65	11.78	42.08	2.21	56.80	73.90	17.1	100	0	
Hori.	19840.000	PK	46.37	39.94	12.02	47.72	-9.54	41.07	73.90	32.8	130	199	
Hori.	2483.500	AV	38.22	27.65	14.83	41.62	2.21	41.29	53.90	12.6	236	4	VBW: 360 Hz
Hori.	2484.017	AV	38.83	27.65	14.83	41.62	2.21	41.90	53.90	12.0	236	4	VBW: 360 Hz
Hori.	2511.999	AV	38.43	27.64	14.85	41.63	2.21	41.50	53.90	12.4	100	320	VBW: 360 Hz
Hori.	4960.000	AV	45.03	31.54	7.39	42.91	2.21	43.26	53.90	10.6	100	55	VBW: 360 Hz
Hori.	7440.000	AV	37.21	37.10	9.15	43.38	2.21	42.29	53.90	11.6	100	0	VBW: 360 Hz
Hori.	9920.000	AV	35.98	38.97	10.37	42.84	2.21	44.69	53.90	9.2	100	0	VBW: 360 Hz
Hori.	12400.000	AV	34.81	38.65	11.78	42.08	2.21	45.37	53.90	8.5	100	0	VBW: 360 Hz
Hori.	19840.000	AV	42.77	39.94	12.02	47.72	-9.54	37.47	53.90	16.4	130	199	VBW: 360 Hz
Vert.	51.701	QP	40.00	10.59	7.22	31.92	0.00	25.89	40.00	14.1	100	185	
Vert.	61.809	QP	42.10	7.76	7.36	31.91	0.00	25.31	40.00	14.6	100	160	
Vert.	217.470	QP	40.70	11.08	5.55	31.78	0.00	25.55	46.00	20.4	100	41	
Vert.	252.423	QP	40.60	11.81	5.83	31.73	0.00	26.51	46.00	19.4	171	31	
Vert.	591.999	QP	38.00	19.00	7.81	31.62	0.00	33.19	46.00	12.8	117	99	
Vert.	2483.500	PK	47.30	27.65	14.83	41.62	2.21	50.37	73.90	23.5	337	47	
Vert.	2512.038	PK	47.39	27.64	14.85	41.63	2.21	50.46	73.90	23.4	210	47	
Vert.	4960.000	PK	52.27	31.54	7.39	42.91	2.21	50.50	73.90	23.4	100	69	
Vert.	7440.000	PK	47.83	37.10	9.15	43.38	2.21	52.91	73.90	20.9	100	0	
Vert.	9920.000	PK	46.71	38.97	10.37	42.84	2.21	55.42	73.90	18.4	100	0	
Vert.	12400.000	PK	45.80	38.65	11.78	42.08	2.21	56.36	73.90	17.5	100	0	
Vert.	19840.000	PK	44.40	39.94	12.02	47.72	-9.54	39.10	73.90	34.8	149	105	
Vert.	2483.500	AV	36.07	27.65	14.83	41.62	2.21	39.14	53.90	14.7	337	47	VBW: 360 Hz
Vert.	2512.038	AV	38.28	27.64	14.85	41.63	2.21	41.35	53.90	12.5	210	47	VBW: 360 Hz
Vert.	4960.000	AV	43.85	31.54	7.39	42.91	2.21	42.08	53.90	11.8	100	69	VBW: 360 Hz
Vert.	7440.000	AV	36.96	37.10	9.15	43.38	2.21	42.04	53.90	11.8	100	0	VBW: 360 Hz
Vert.	9920.000	AV	35.97	38.97	10.37	42.84	2.21	44.68	53.90	9.2	100	0	VBW: 360 Hz
Vert.	12400.000	AV	34.83	38.65	11.78	42.08	2.21	45.39	53.90	8.5	100	0	VBW: 360 Hz
Vert.	19840.000	AV	40.05	39.94	12.02	47.72	-9.54	34.75	53.90	19.1	149	105	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : 20log (3.87 m / 3.0 m) = 2.21 dB

13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* These results have sufficient margin without taking account Duty factor.

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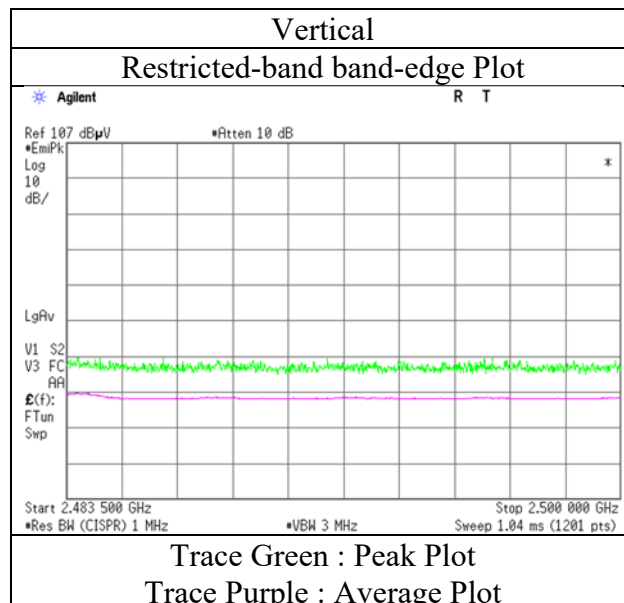
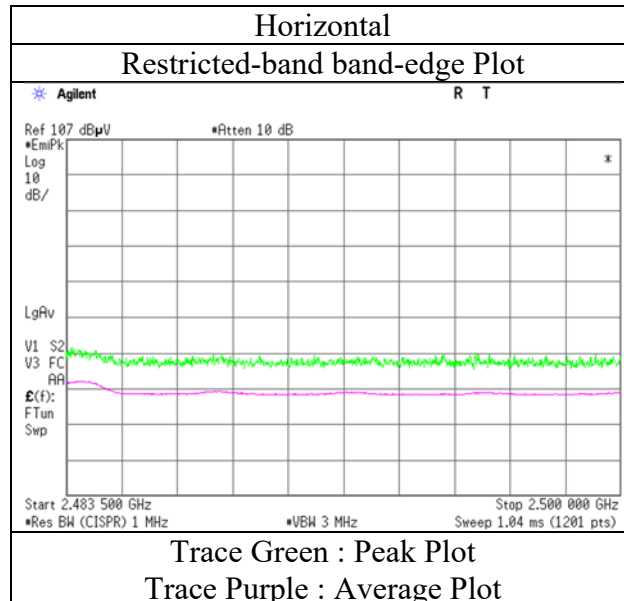
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Radiated Spurious Emission (Reference Plot for band-edge)

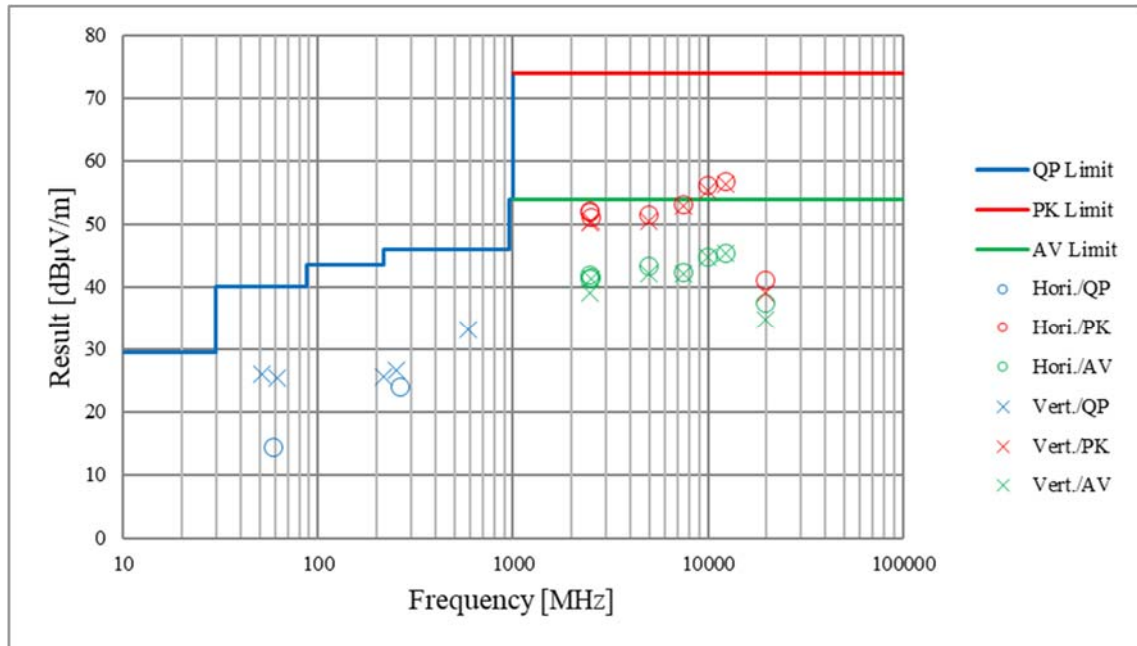
Report No.	12652966S-J-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2019
Temperature / Humidity	21 deg. C / 24 % RH
Engineer	Yosuke Ishikawa (1 GHz -13 GHz)
Mode	Tx, Hopping Off, 2DH5 2480 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12652966S-J-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	2	3	2
Date	March 13, 2019	March 17, 2019	March 13, 2019
Temperature / Humidity	22 deg. C / 32 % RH	21 deg. C / 24 % RH	22 deg. C / 32 % RH
Engineer	Kazuya Noda	Yosuke Ishikawa	Kazuya Noda
	(30 MHz -1 GHz)	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 2DH5 2480 MHz		

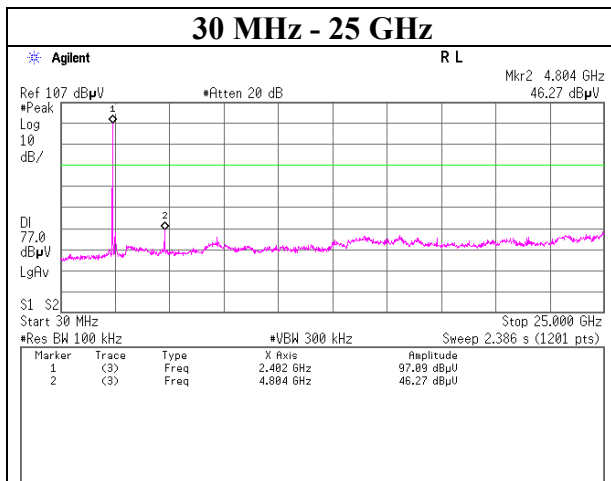
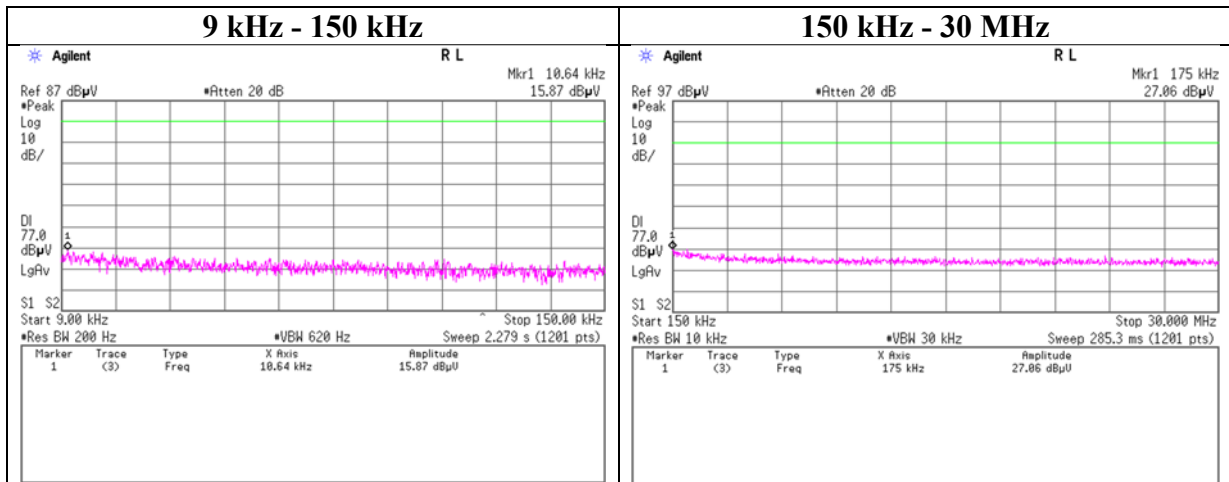


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	March 5, 2019
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, DH5

2402 MHz



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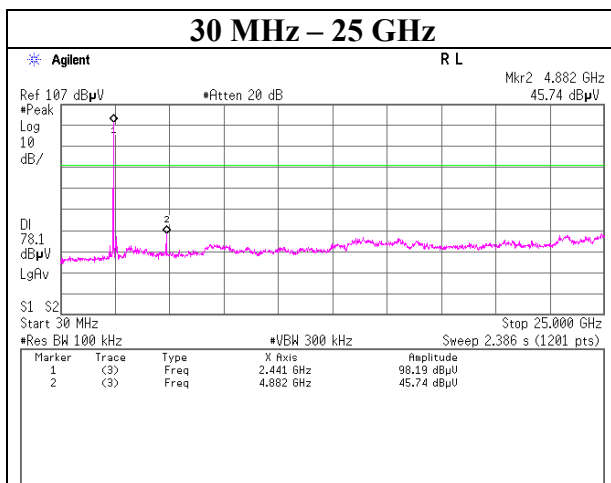
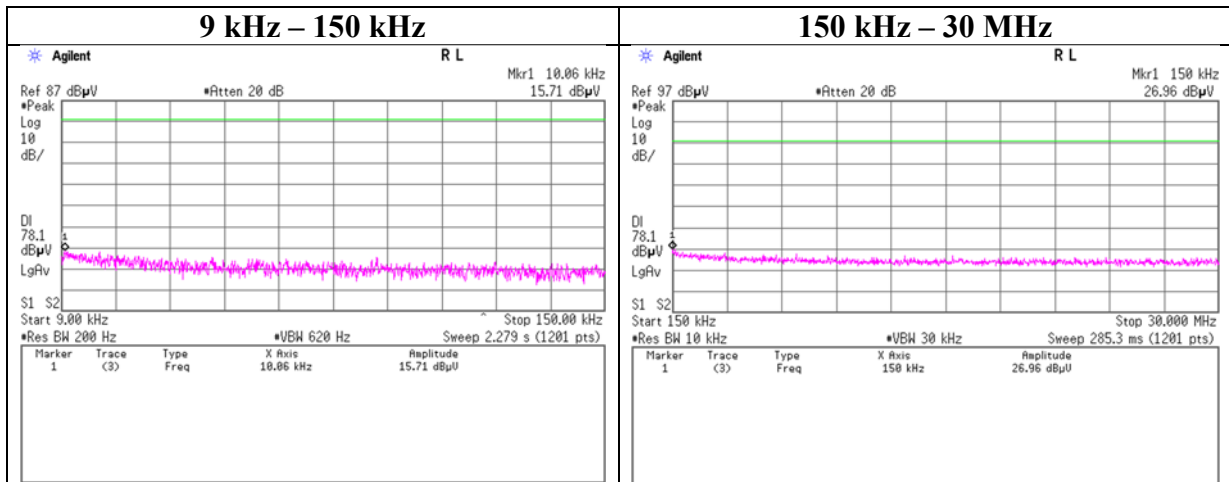
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Conducted Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off, DH5

2441 MHz



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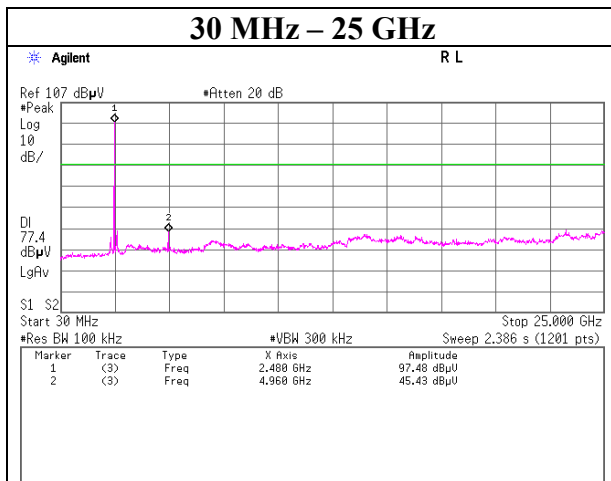
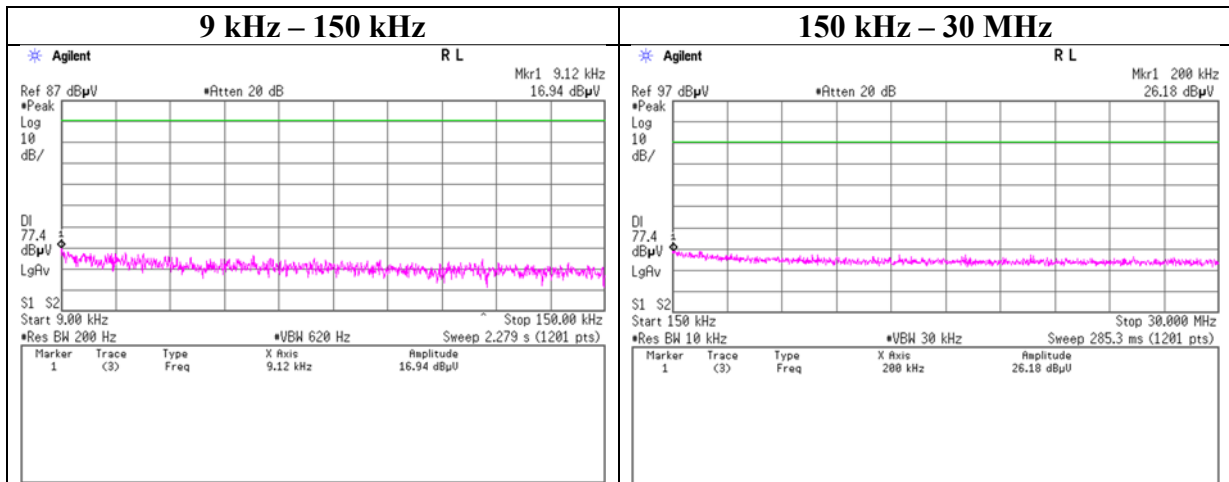
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Conducted Spurious Emission

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	March 5, 2019
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, DH5

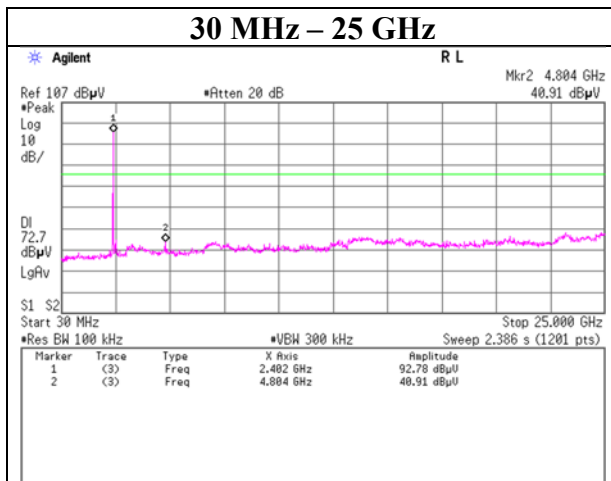
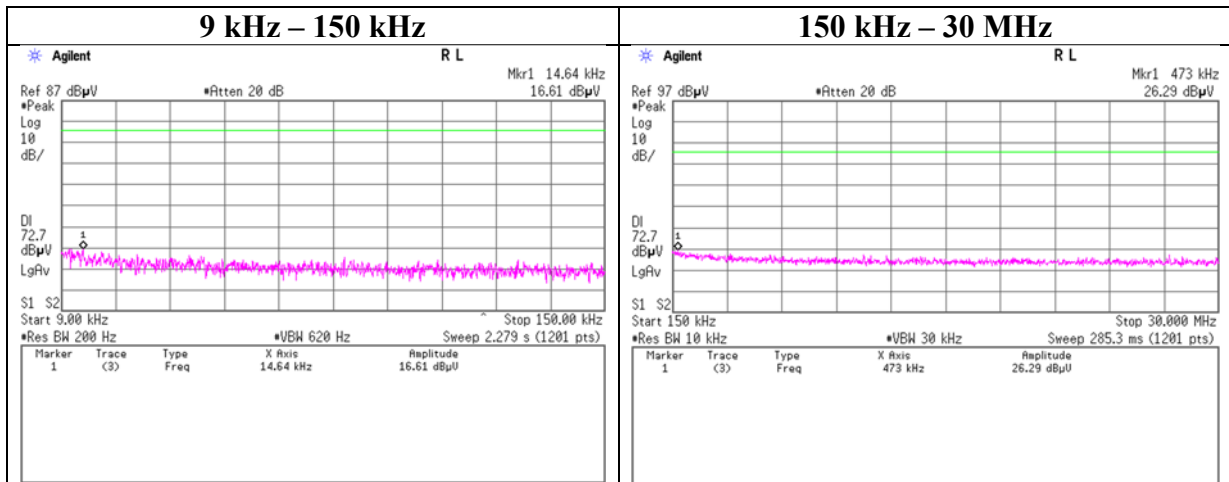
2480 MHz



Conducted Spurious Emission

Report No.	12652966S-J-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	March 5, 2019
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, 2DH5

2402 MHz



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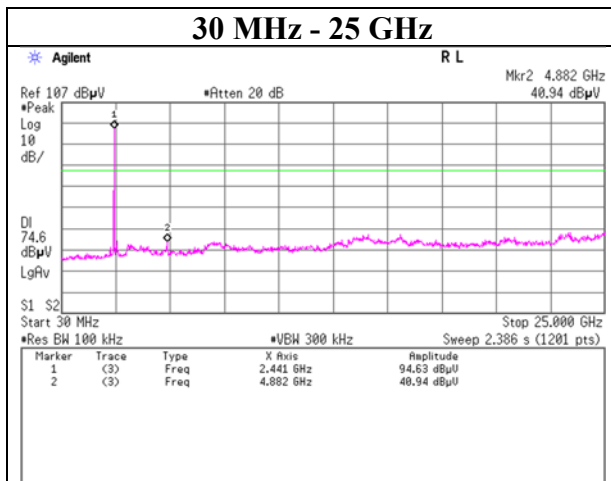
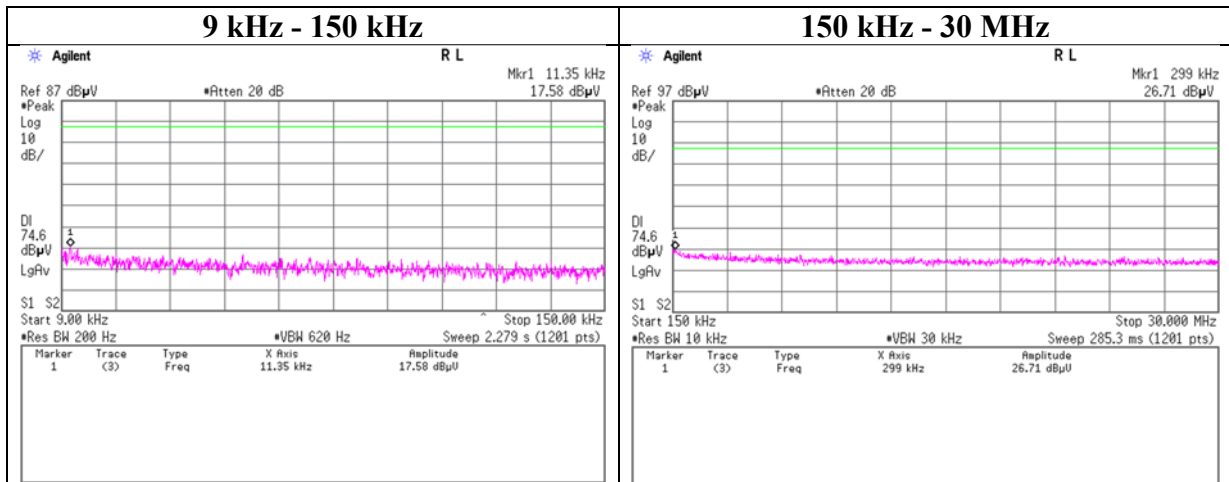
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Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off, 2DH5

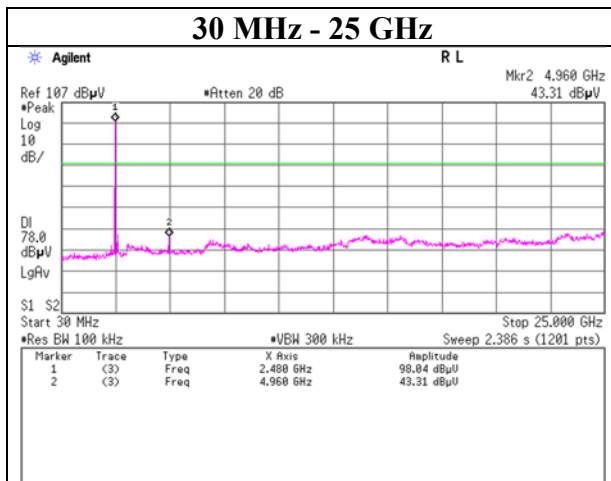
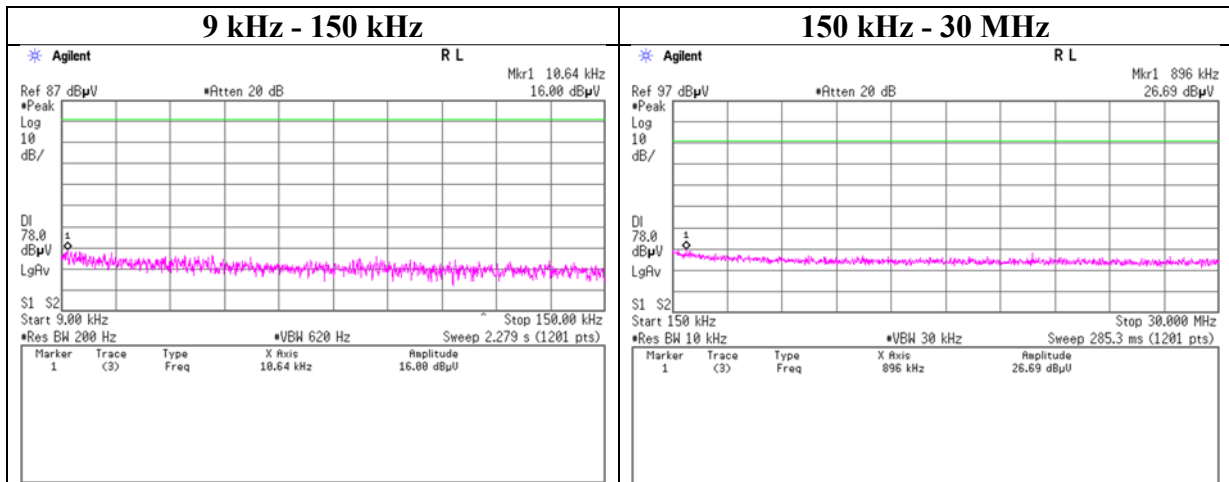
2441 MHz



Conducted Spurious Emission

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off, 2DH5

2480 MHz



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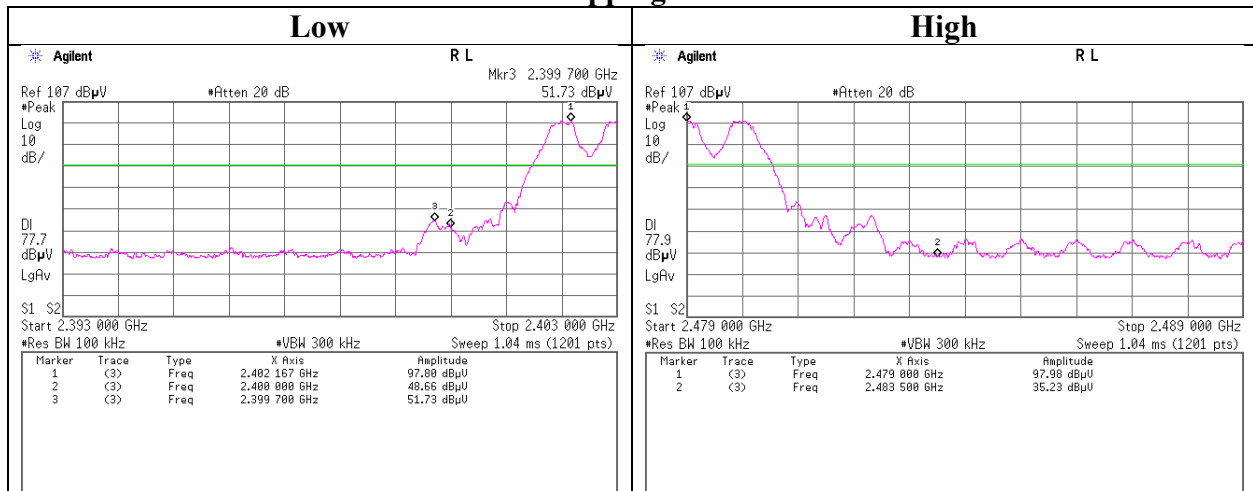
Telephone : +81 463 50 6400

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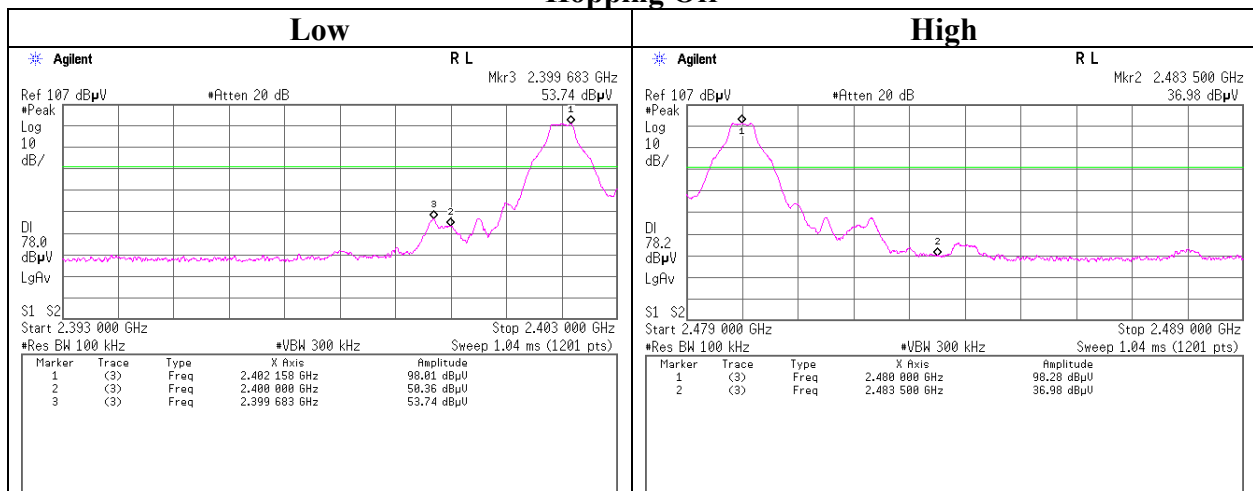
Conducted Emission Band Edge compliance

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx DH5

Hopping On



Hopping Off



UL Japan, Inc.

Shonan EMC Lab.

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

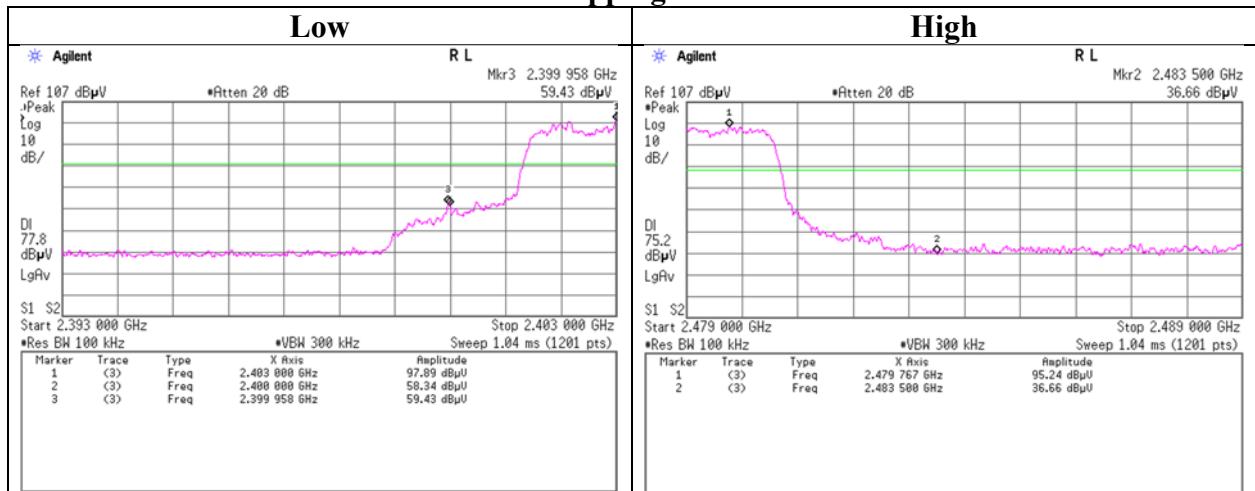
Telephone : +81 463 50 6400

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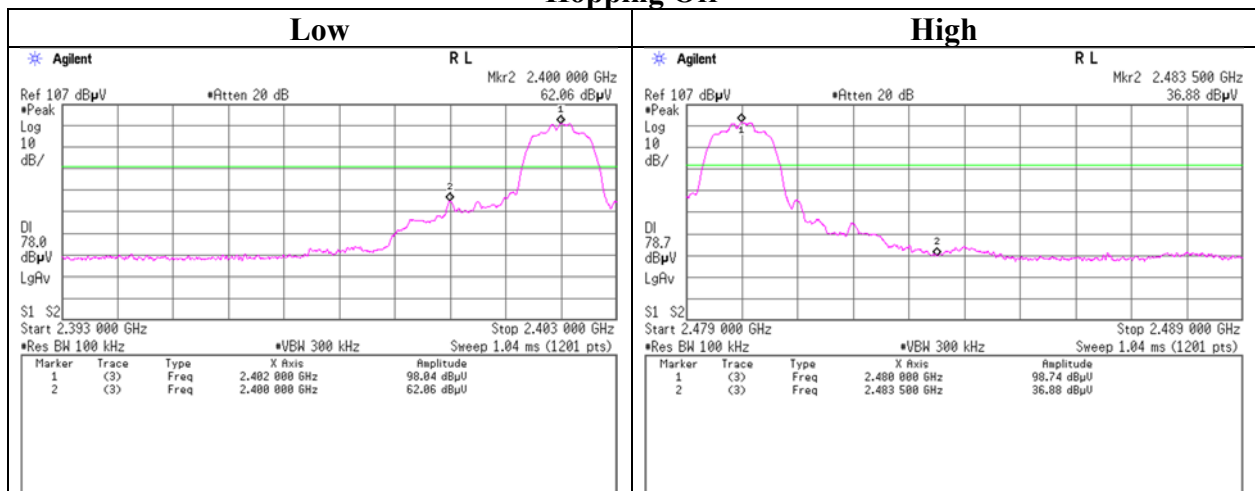
Conducted Emission Band Edge compliance

Report No. 12652966S-J-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2019
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Kazuya Noda
Mode Tx 2DH5

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APPENDIX 2: Test instruments

Test Instruments (1/2)

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
SAT10-14	AT	154591	Attenuator	Weinschel Corp.	54A-10	81595	2018/4/20	2019/4/30	12
SCC-G32	AT	145183	Coaxial Cable	Junkosha	MWX241-02000KMSK MS	OCT-09-13-005	2018/11/25	2019/11/30	12
SOS-09	AT	146318	Humidity Indicator	A&D	AD-5681	4061484	2018/12/5	2019/12/31	12
SPM-07	AT	146247	Power Meter	AGILENT	8990B	MY5100272	2018/7/13	2019/7/31	12
SPSS-04	AT	146310	Power sensor	AGILENT	N1923A	MY5326009	2018/7/13	2019/7/31	12
SSA-03	AT,RE	145801	Spectrum Analyzer	AGILENT	E4448A	MY48250152	2018/8/30	2019/8/31	12
SAT3-13	CE	150923	Attenuator	JFW	50HF-003N		2019/1/25	2020/1/31	12
SCC-C9/C10/SR SE-03	CE	145036	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141 PE/NS4906	-/0901-271(RF Selector)	2018/4/9	2019/4/30	12
SLS-02	CE	145539	LISN	Rohde & Schwarz	ENV216	100512	2019/2/20	2020/2/29	12
SOS-06	CE	146294	Humidity Indicator	A&D	AD-5681	4062118	2018/12/5	2019/12/31	12
STM-05	CE	145762	Terminator	TME	CT-01 BP	-	2018/12/25	2019/12/31	12
STR-08	CE	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2018/11/28	2019/11/30	12
COTS-SEMI-5	CE,RE	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE, ME,PE)	-	-	-	-
KJM-02	CE,RE	146432	Measure	TAJIMA	GL19-55	-	-	-	-
STS-03	CE,RE	146210	Digital Hitester	HIOKI	3805-50	80997823	2018/10/16	2019/10/31	12
SAEC-02(NSA)	RE	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2018/5/31	2019/5/31	12
SAEC-02(SVSWR)	RE	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2018/7/15	2019/7/31	12
SAEC-03(SVSWR)	RE	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2018/7/17	2019/7/31	12
SAF-02	RE	145004	Pre Amplifier	SONOMA	310N	290212	2019/2/5	2020/2/29	12
SAF-06	RE	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2019/2/8	2020/2/29	12
SAF-08	RE	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2018/3/27	2019/3/31	12

*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

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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Test Instruments (2/2)

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
SAT10-05	RE	145136	Attenuator(above 1GHz)	AGILENT	8493C-010	74864	2018/11/25	2019/11/30	12
SAT3-11	RE	150921	Attenuator	JFW	50HF-003N	-	2019/1/25	2020/1/31	12
SAT6-02	RE	145045	Attenuator	JFW	50HF-006N	-	2019/2/5	2020/2/29	12
SBA-02	RE	145022	Biconical Antenna	Schwarzbeck	BBA9106	91032665	2018/6/5	2019/6/30	12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	RE	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/TOYO	8D2W/12DSF A/141PE/141PE/141PE/141P	-/0901-270(RF Selector)	2018/4/9	2019/4/30	12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	RE	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/TOYO	8D2W/12DSF A/141PE/141PE/141PE/141P	-/0901-270(RF Selector)	2018/4/7	2019/4/30	12
SCC-G05	RE	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2019/1/25	2020/1/31	12
SCC-G22	RE	145180	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	2018/5/11	2019/5/31	12
SCC-G33	RE	145184	Coaxial Cable	Junkosha	MWX241-01000KMSK MS	-	2018/4/20	2019/4/30	12
SCC-G40	RE	166491	Coaxial Cable	Junkosha	MWX221-01000NFSN MS/B	1612S005	2019/1/25	2020/1/31	12
SCC-G45	RE	168301	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102 E	800137/2E A	2018/3/28	2019/3/31	12
SFL-02	RE	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2018/11/16	2019/11/30	12
SFL-18	RE	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2018/4/20	2019/4/30	12
SHA-02	RE	145384	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	2018/7/23	2019/7/31	12
SHA-03	RE	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2018/7/23	2019/7/31	12
SHA-04	RE	145512	Horn Antenna	ETS LINDGREN	Sep-60	LM3640	2018/7/23	2019/7/31	12
SJM-09	RE	145336	Measure	PROMART	SEN1935	-	-	-	-
SLA-06	RE	145528	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	2018/6/5	2019/6/30	12
SOS-03	RE	146317	Humidity Indicator	A&D	AD-5681	4063325	2018/10/25	2019/10/31	12
SOS-05	RE	146293	Humidity Indicator	A&D	AD-5681	4062518	2018/10/25	2019/10/31	12
SSA-02	RE	145800	Spectrum Analyzer	AGILENT	E4448A	MY48250106	2018/3/5	2019/3/31	12
STR-07	RE	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2018/9/26	2019/9/30	12
STS-02	RE	145793	Digital Hitester	HIOKI	3805-50	80997819	2018/3/8	2019/3/31	12

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Test item: RE: Radiated Emission test