



RADIO TEST REPORT

Test Report No. : 12475916H-C-R1

Applicant : RICOH COMPANY, LTD.
Type of Equipment : Digital Camera
Model No. : R02070
FCC ID : BBP-R02070
Test regulation : FCC Part 15 Subpart C: 2019
*Bluetooth part
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12475916H-C. 12475916H-C is replaced with this report.

Date of test: March 14 to June 13, 2019

Representative test engineer:

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Engineer
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- ☐ 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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REVISION HISTORY

Original Test Report No.: 12475916H-C

[illegible]

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SECTION 1: Customer information

Company Name	:	RICOH COMPANY, LTD.
Address	:	2-7-1 Izumi, Ebina, Kanagawa, 243-0460 Japan
Telephone Number	:	+81-46-249-8146
Facsimile Number	:	+81-3-6673-4430
Contact Person	:	Naohito Yazaki

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	:	Digital Camera
Model No.	:	R02070
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.6 V (Battery)
Receipt Date of Sample (Information from test lab.)	:	October 2, 2018
Country of Mass-production	:	Indonesia
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: R02070 (referred to as the EUT in this report) is a Digital Camera.

Operating Temperature: -10 deg. C to +40 deg. C

Radio Specification

WLAN (2.4 GHz band)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Radio type	Transceiver			
Frequency of operation	2412 MHz - 2462 MHz			2422 MHz - 2452 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz			
Antenna type	Chip Antenna			
Antenna Gain	+0.6 dBi			

WLAN (5 GHz band)

Type of radio	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11ac (20 M band)	IEEE802.11n (40 M band)	IEEE802.11ac (40 M band)	IEEE802.11ac (80 M band)
Radio type	Transceiver					
Frequency of operation	5180 MHz - 5240 MHz			5190 MHz - 5230 MHz		5210 MHz
Type of modulation	OFDM (64QAM, 16QAM, QPSK)		OFDM (256QAM, 64QAM, 16QAM, QPSK)	OFDM (64QAM, 16QAM, QPSK)	OFDM (256QAM, 64QAM, 16QAM, QPSK)	
Channel spacing	20 MHz			40 MHz		80 MHz
Antenna type	Chip Antenna					
Antenna Gain	+1.8 dBi					

Bluetooth *1)

Type of radio	Bluetooth Ver.4.2
Radio type	Transceiver
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK): BDR/EDR GFSK: BLE
Channel spacing	1 MHz: BDR/EDR 2 MHz: BLE
Antenna type	Chip Antenna
Antenna Gain	+0.6 dBi

NFC

Type of radio	NFC
Radio type	Transceiver
Frequency of operation	13.56 MHz
Type of modulation	ASK
Channel spacing	-
Antenna type	Pattern Antenna
Antenna Gain	-

*1) This test report applies to Bluetooth (BDR/EDR).

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on June 4, 2019 and effective July 5, 2019 except 15.258

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

* The revision on June 4, 2019, does not affect the test specification applied to the EUT.

** The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

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 5.62 dB, 0.20246 MHz, N AV 13.32 dB, 0.20246 MHz, N	Complied a)	-
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: -	FCC: Section15.247(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: Section15.247(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: Section15.247(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: Section15.247(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: Section15.247(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: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.4 dB 370.882 MHz, QP, Hori.	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.

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FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module through the regulator 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.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	RSS-Gen 6.7	IC: -	N/A	- a)	Conducted
Note: UL Japan, Inc. 's EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					
a) 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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Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.3 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.7 dB

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.9 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 dB

3.5 Test Location

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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: BDR : 8 dBm EDR : 2 dBm Software: Certification FW 001 *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.		

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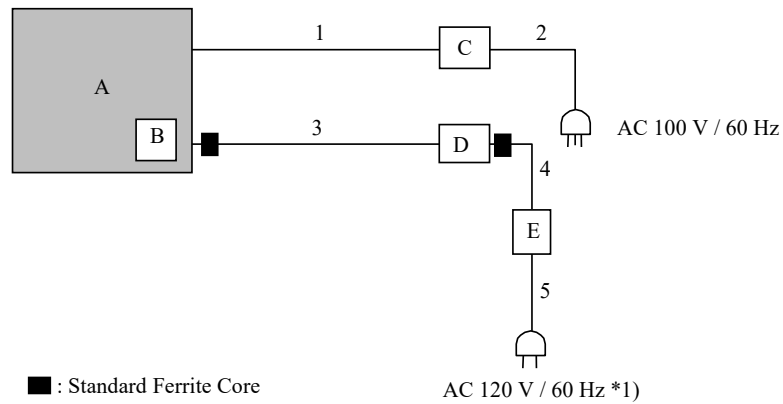
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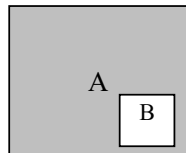
4.2 Configuration and peripherals

Conducted Emission and Radiated Emission test



*1) Conducted emission was performed on this port.

Antenna Terminal Conducted test



* 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	Digital Camera	R02070	1004 used for CE* and RE* 1009 used for AT*	RICOH COMPANY, LTD.	EUT
B	LI-ION Battery Pack	DB-110	20170328WAB	RICOH COMPANY, LTD.	-
C	Monitor	M237WS-PM	107KC8020445	LG	-
D	Laptop PC	CF-N8HWC DPS	9LKSA04258	Panasonic	-
E	AC Adapter	CF-AA6372B	6372BM409X14190B	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	HDMI Cable	1.0	Shielded	Shielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	USB Cable	1.0	Shielded	Shielded	*1)
4	DC cable	1.0	Unshielded	Unshielded	-
5	AC cable	1.0	Unshielded	Unshielded	-

*1) This Cable was accessory of the EUT. This is only used to the EUT.

* CE: Conducted Emission

* RE: Radiated Emission

* AT: Antenna Terminal Conducted test

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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.

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

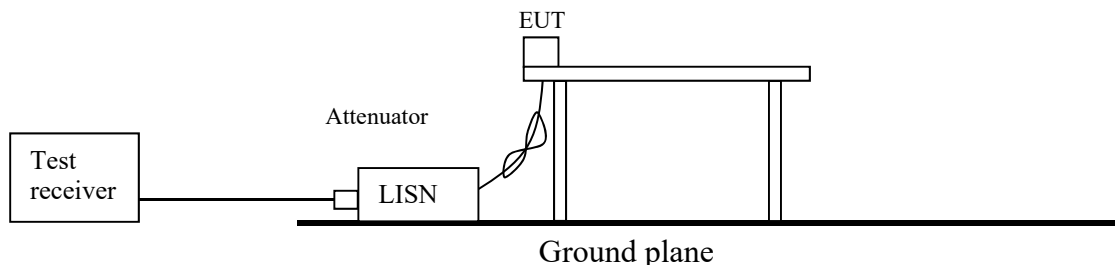
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).

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

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, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

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.

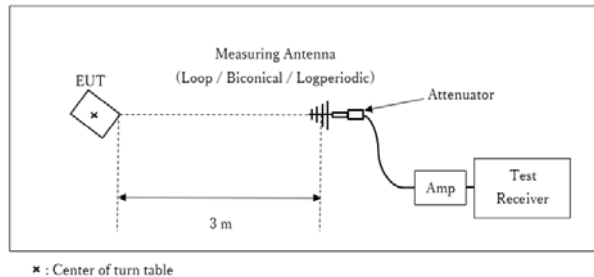
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

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: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

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

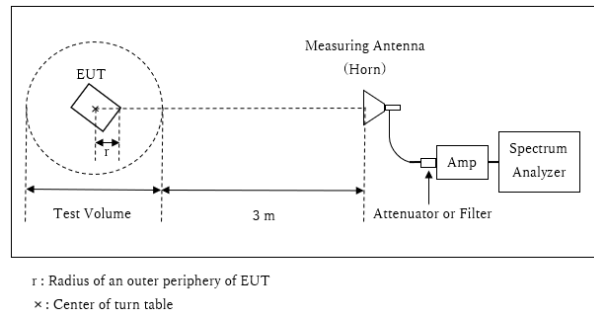
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz

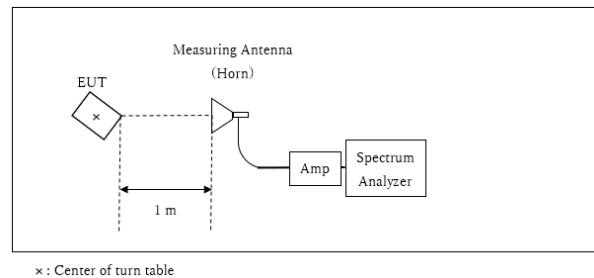


Distance Factor: $20 \times \log (4.0 \text{ m} / 3.0 \text{ m}) = 2.5 \text{ dB}$
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 4.0 \text{ m}$

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.0 \text{ m}$

* The test was performed with $r = 0.0 \text{ m}$ since EUT is small and it was the rather conservative condition.

10 GHz - 26.5 GHz



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

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
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	200 kHz	620 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	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. 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.
 (9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

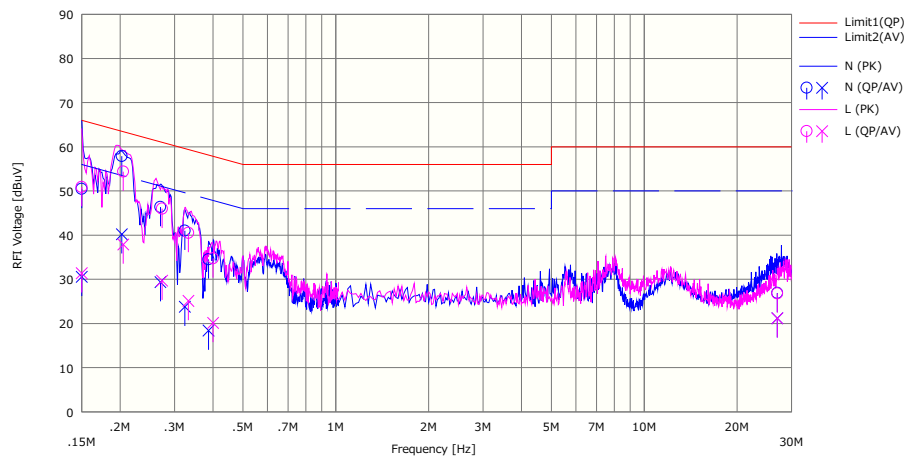
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Date March 16, 2019
Temperature / Humidity 23 deg. C / 34 % RH
Engineer Hiroyuki Furutaka
Mode Tx, Hopping Off, DH5 2402MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		USN [dB]	LOSS [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	37.30	17.40	0.06	13.11	50.47	30.57	66.00	56.00	15.53	25.43	N	
2	0.20246	44.70	27.00	0.06	13.12	57.88	40.18	63.50	53.50	5.62	13.32	N	
3	0.27006	33.20	16.20	0.05	13.13	46.38	29.38	61.10	51.10	14.72	21.72	N	
4	0.32400	27.80	10.60	0.05	13.14	40.99	23.79	59.60	49.60	18.61	25.81	N	
5	0.38664	21.30	5.20	0.05	13.16	34.51	18.41	58.10	48.10	23.59	29.69	N	
6	0.2700725	11.90	6.20	0.49	14.50	26.89	21.19	60.00	50.00	33.11	28.81	N	
7	0.15000	37.70	18.20	0.06	13.11	50.87	31.37	66.00	56.00	15.13	24.63	L	
8	0.20470	41.20	24.70	0.06	13.12	54.38	37.88	63.40	53.40	9.02	15.52	L	
9	0.27354	32.80	16.50	0.05	13.13	45.98	29.68	61.00	51.00	15.02	21.32	L	
10	0.33290	27.30	11.90	0.05	13.15	40.50	25.10	59.40	49.40	18.90	24.30	L	
11	0.40000	21.50	6.90	0.06	13.16	34.72	20.12	57.90	47.90	23.18	27.78	L	
12	27.00000	11.80	6.20	0.49	14.50	26.79	21.19	60.00	50.00	33.21	28.81	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

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Ise EMC Lab.

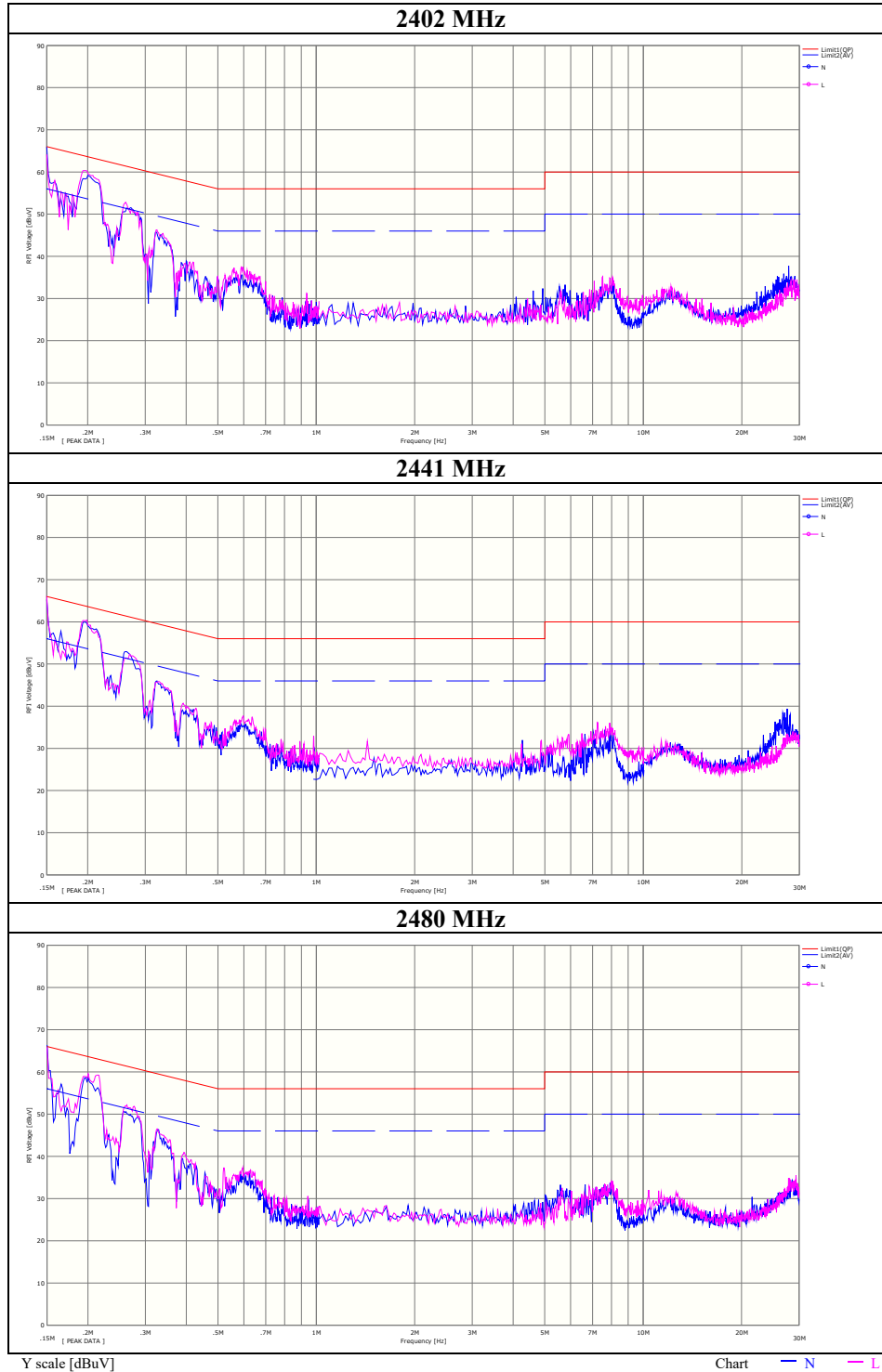
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Date March 16, 2019
Temperature / Humidity 23 deg. C / 34 % RH
Engineer Hiroyuki Furutaka
Mode Tx, Hopping Off, DH5



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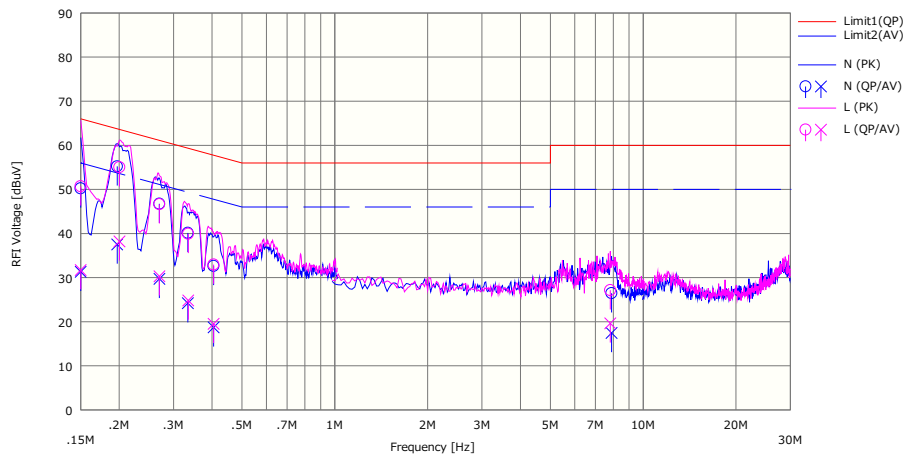
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Date March 16, 2019
Temperature / Humidity 23 deg. C / 34 % RH
Engineer Hiroyuki Furutaka
Mode Tx, Hopping Off, 3DH5 2402MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [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	37.00	18.10	0.06	13.15	50.21	31.31	66.00	56.00	15.79	24.69	N	
2	0.19698	42.00	24.30	0.06	13.15	55.21	37.51	63.70	53.70	8.49	16.19	N	
3	0.27000	33.50	16.50	0.05	13.16	46.71	29.71	61.10	51.10	14.39	21.39	N	
4	0.33400	26.90	11.00	0.05	13.17	40.12	24.22	59.40	49.40	19.28	25.18	N	
5	0.40500	19.40	5.50	0.06	13.18	32.64	18.74	57.80	47.80	25.16	29.06	N	
6	7.89588	12.70	3.70	0.21	13.54	26.45	17.45	60.00	50.00	33.55	32.55	N	
7	0.15000	37.50	18.50	0.06	13.15	50.71	31.71	66.00	56.00	15.29	24.29	L	
8	0.20046	41.80	25.00	0.06	13.15	55.01	38.21	63.60	53.60	8.59	15.39	L	
9	0.27000	33.40	17.10	0.05	13.16	46.61	30.31	61.10	51.10	14.49	20.79	L	
10	0.33500	26.70	11.60	0.05	13.17	39.92	24.82	59.30	49.30	19.38	24.48	L	
11	0.40500	19.70	6.30	0.06	13.18	32.94	19.54	57.80	47.80	24.86	28.26	L	
12	7.82785	13.40	5.90	0.21	13.53	27.14	19.64	60.00	50.00	32.86	30.36	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

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Ise EMC Lab.

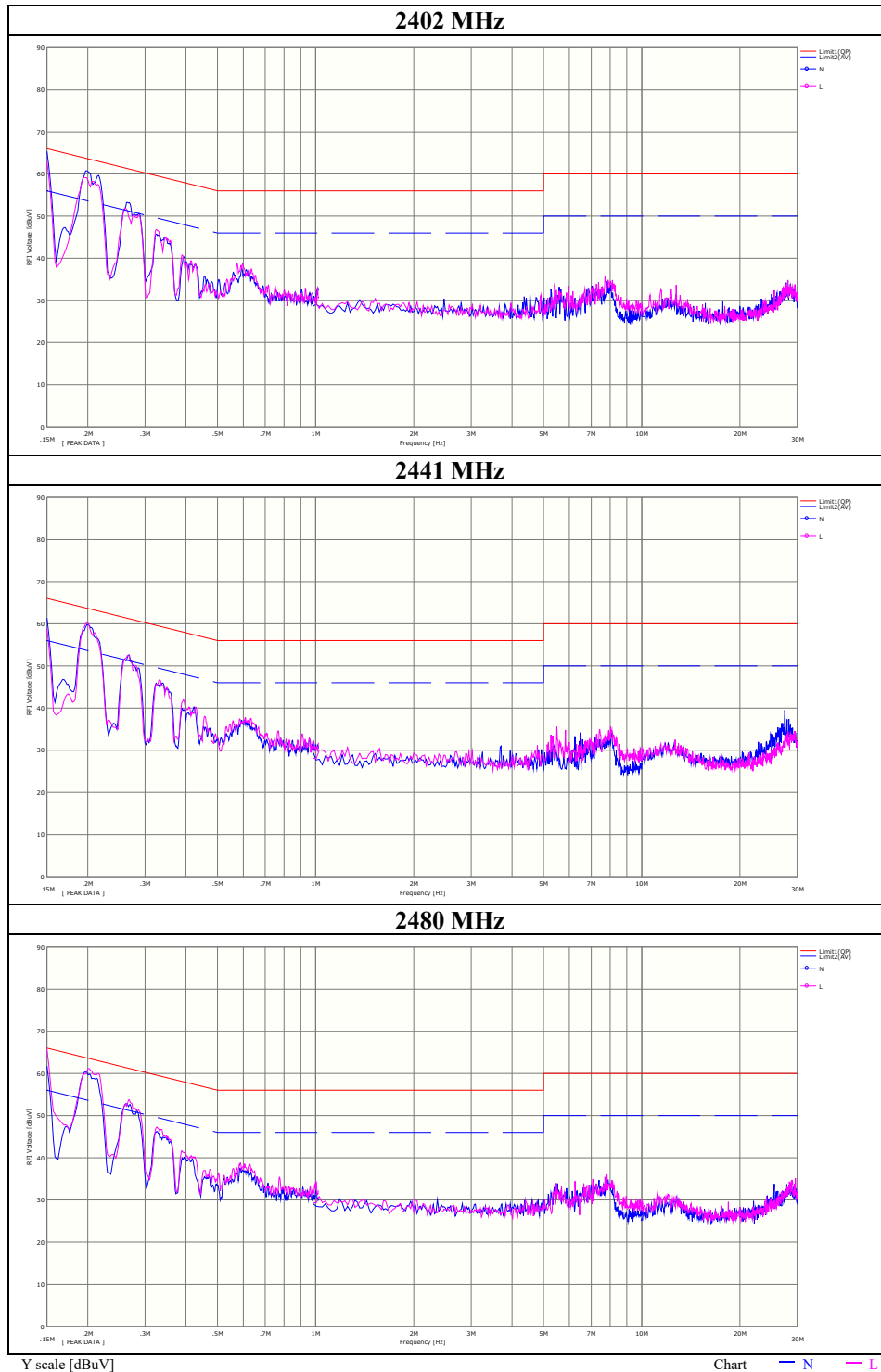
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Date March 16, 2019
Temperature / Humidity 23 deg. C / 34 % RH
Engineer Hiroyuki Furutaka
Mode Tx, Hopping Off, 3DH5



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

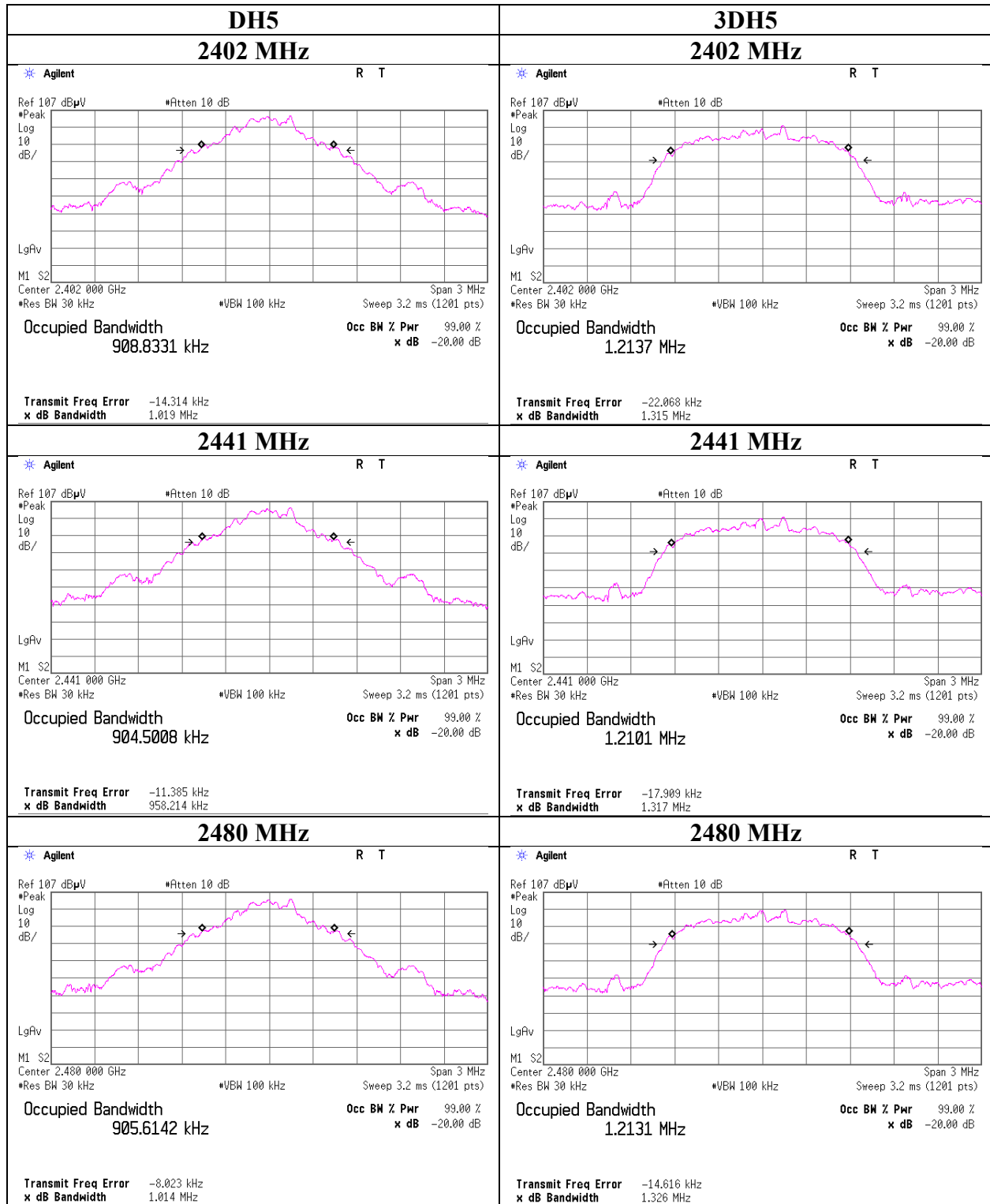
Report No. 12475916H
Test place Ise EMC Lab. No.6 Measurement Room
Date March 14, 2019
Temperature / Humidity 24 deg. C / 50 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.019	908.833	1.000	≥ 0.679
DH5	2441.0	0.958	904.501	1.000	≥ 0.639
DH5	2480.0	1.014	905.614	1.000	≥ 0.676
DH5	Hopping On	-	78633.700	-	-
3DH5	2402.0	1.315	1213.700	1.000	≥ 0.877
3DH5	2441.0	1.317	1210.100	1.000	≥ 0.878
3DH5	2480.0	1.326	1213.100	1.000	≥ 0.884
3DH5	Hopping On	-	78695.400	-	-

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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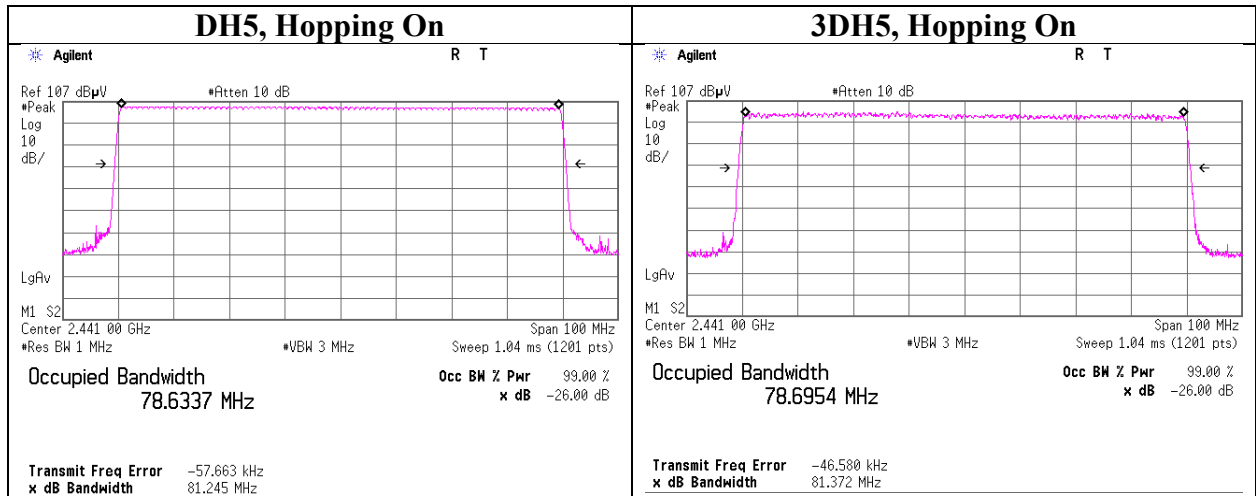
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20dB Bandwidth and 99% Occupied Bandwidth



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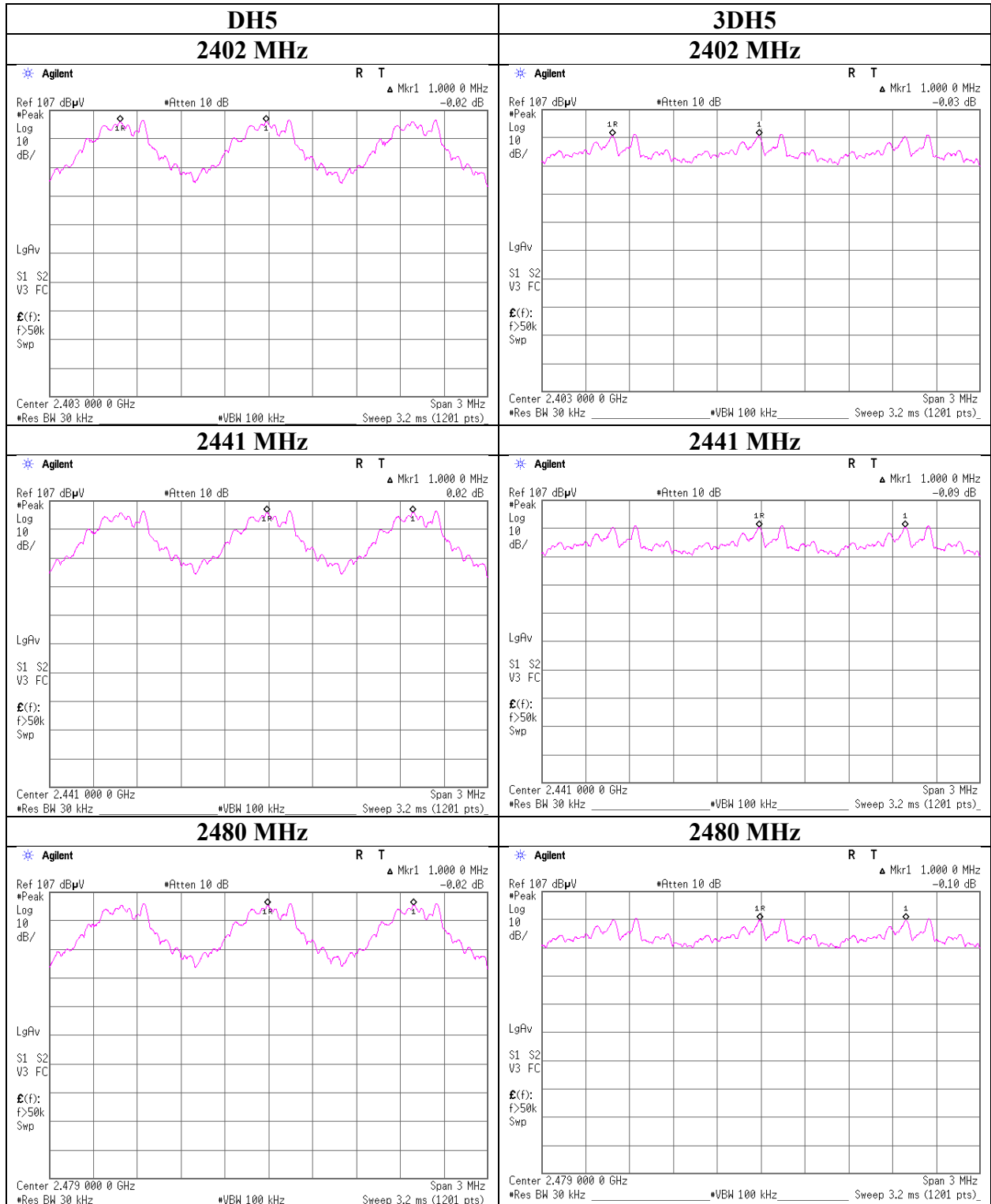
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Carrier Frequency Separation



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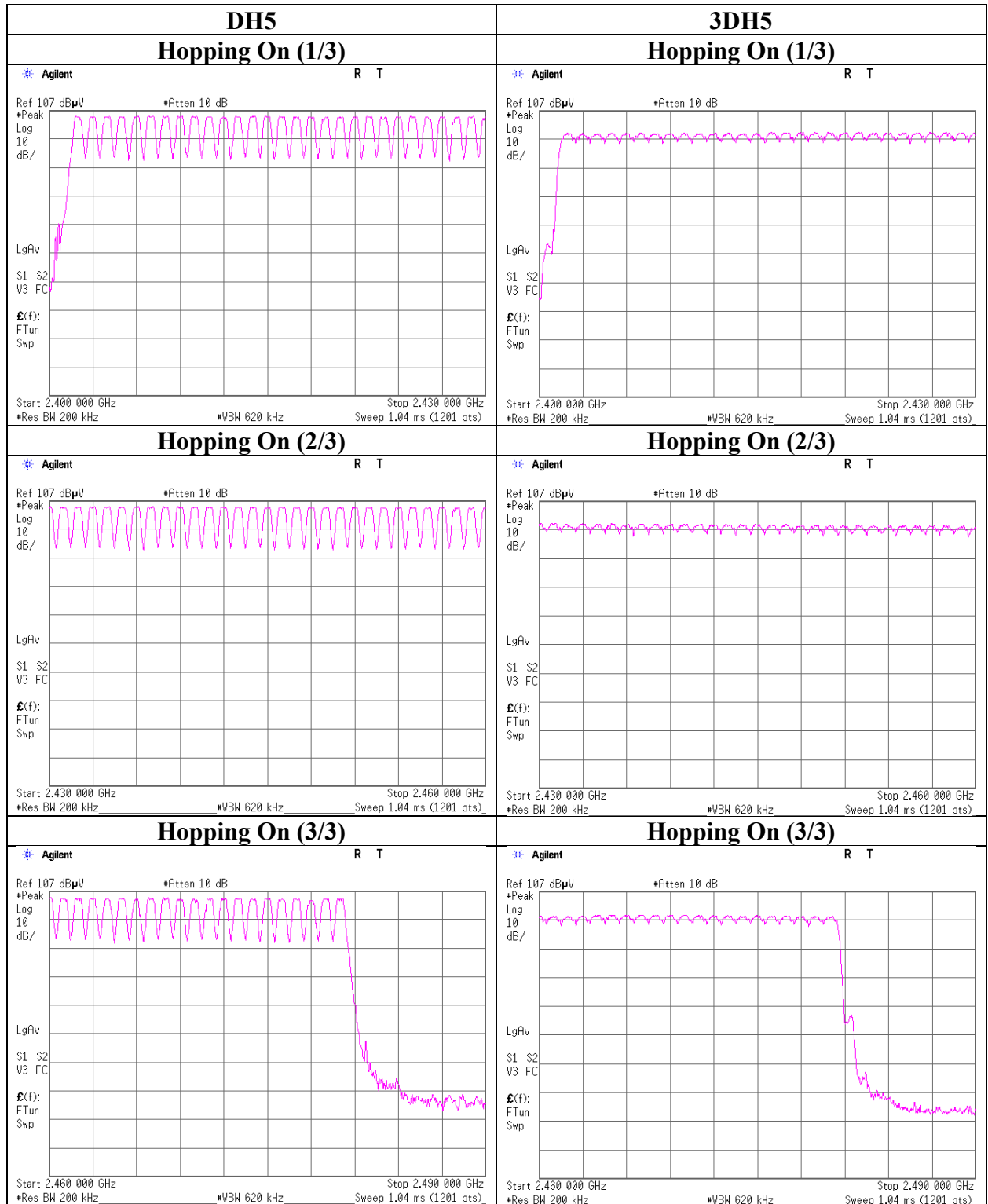
Number of Hopping Frequency

Report No. 12475916H
Test place Ise EMC Lab. No.6 Measurement Room
Date March 14, 2019
Temperature / Humidity 24 deg. C / 50 % RH
Engineer Takafumi Noguchi
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



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Dwell time

Report No. 12475916H
Test place Ise EMC Lab. No.6 Measurement Room
Date March 14, 2019
Temperature / Humidity 24 deg. C / 50 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period				Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	49.6 times	/	5 sec.	x 31.6 sec. = 314 times	0.423	133	400
DH3	26.4 times	/	5 sec.	x 31.6 sec. = 167 times	1.682	281	400
DH5	17.4 times	/	5 sec.	x 31.6 sec. = 110 times	2.937	323	400
3DH1	50.2 times	/	5 sec.	x 31.6 sec. = 318 times	0.430	137	400
3DH3	24.6 times	/	5 sec.	x 31.6 sec. = 156 times	1.697	265	400
3DH5	17.6 times	/	5 sec.	x 31.6 sec. = 112 times	2.937	329	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

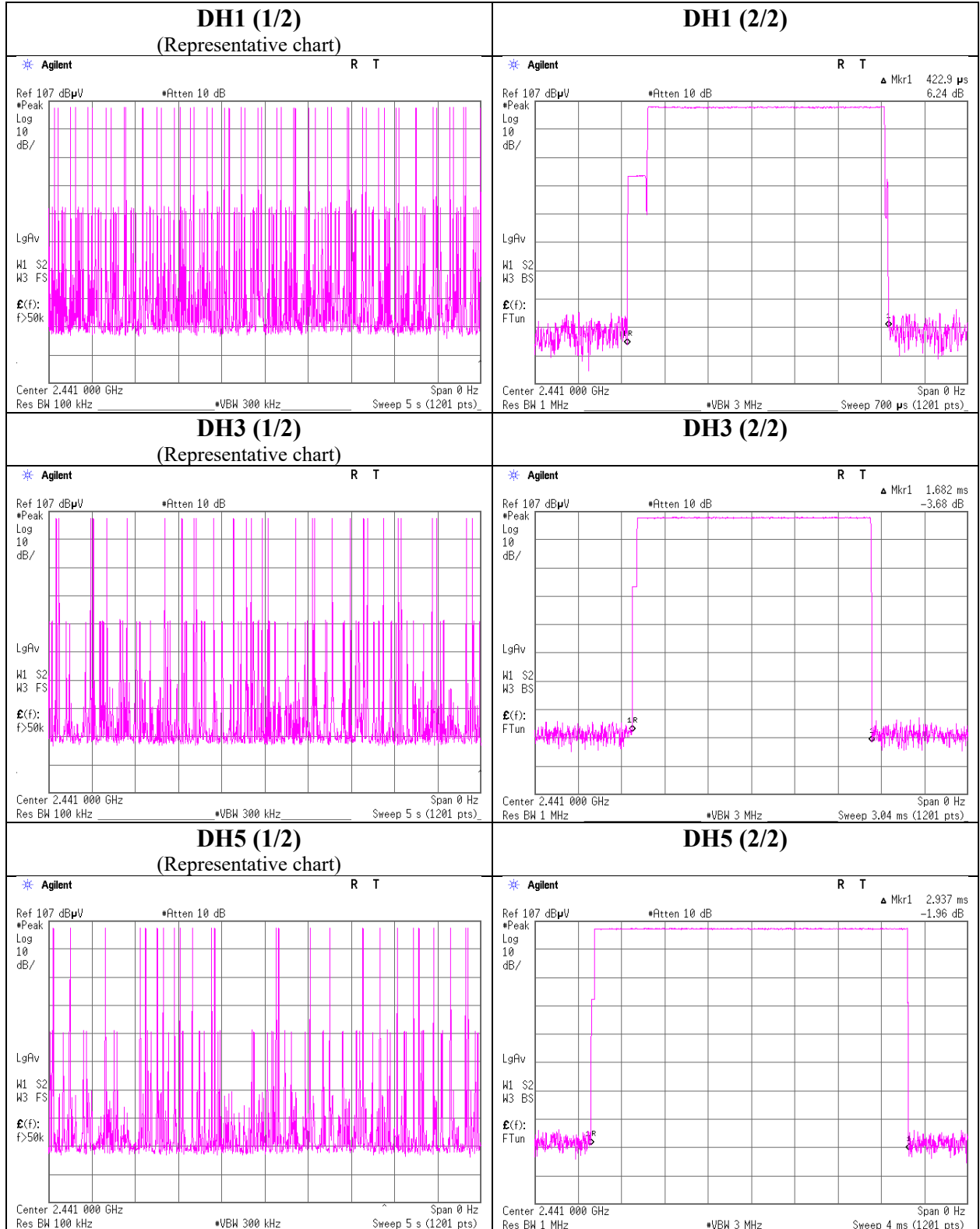
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	49	51	49	50	49.6
DH3	30	26	25	26	25	26.4
DH5	18	13	19	16	21	17.4
3DH1	50	50	50	51	50	50.2
3DH3	25	30	23	26	19	24.6
3DH5	20	16	15	21	16	17.6

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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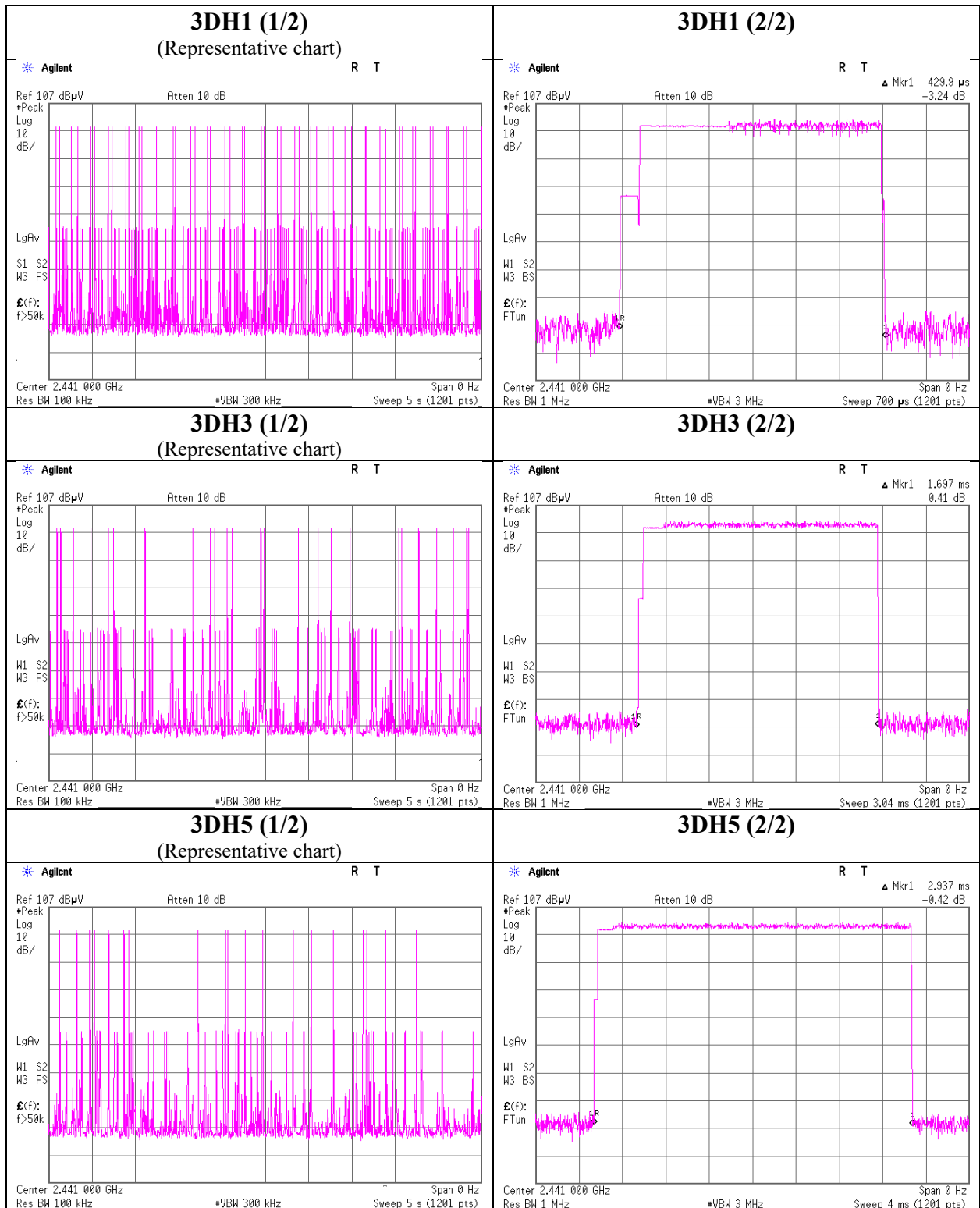
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Dwell time



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Maximum Peak Output Power

Report No. 12475916H
Test place Ise EMC Lab. No.6 Measurement Room
Date March 14, 2019
Temperature / Humidity 24 deg. C / 50 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
					Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-2.54	0.40	10.10	7.96	6.25	20.96	125	13.00	0.60	8.56	7.18	36.02	4000	27.46
DH5	2441.0	-2.71	0.40	10.10	7.79	6.01	20.96	125	13.17	0.60	8.39	6.90	36.02	4000	27.63
DH5	2480.0	-3.19	0.40	10.10	7.31	5.38	20.96	125	13.65	0.60	7.91	6.18	36.02	4000	28.11
2DH5	2402.0	-5.28	0.40	10.10	5.22	3.33	20.96	125	15.74	0.60	5.82	3.82	36.02	4000	30.20
2DH5	2441.0	-5.50	0.40	10.10	5.00	3.16	20.96	125	15.96	0.60	5.60	3.63	36.02	4000	30.42
2DH5	2480.0	-6.08	0.40	10.10	4.42	2.77	20.96	125	16.54	0.60	5.02	3.18	36.02	4000	31.00
3DH5	2402.0	-5.13	0.40	10.10	5.37	3.44	20.96	125	15.59	0.60	5.97	3.95	36.02	4000	30.05
3DH5	2441.0	-5.30	0.40	10.10	5.20	3.31	20.96	125	15.76	0.60	5.80	3.80	36.02	4000	30.22
3DH5	2480.0	-5.85	0.40	10.10	4.65	2.92	20.96	125	16.31	0.60	5.25	3.35	36.02	4000	30.77

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.

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

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019 June 13, 2019
Temperature / Humidity	24 deg. C / 50 % RH 23 deg. C / 48 % RH
Engineer	Takafumi Noguchi Hiroyuki Furutaka
	DH5 2DH5, 3DH5
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	-3.75	0.40	10.10	6.75	4.73	1.07	7.82	6.05
DH5	2441.0	-3.91	0.40	10.10	6.59	4.56	1.07	7.66	5.83
DH5	2480.0	-4.45	0.40	10.10	6.05	4.03	1.07	7.12	5.15
2DH5	2402.0	-9.69	0.40	10.10	0.81	1.21	1.07	1.88	1.54
2DH5	2441.0	-10.02	0.40	10.10	0.48	1.12	1.07	1.55	1.43
2DH5	2480.0	-10.52	0.40	10.10	-0.02	1.00	1.07	1.05	1.27
3DH5	2402.0	-9.65	0.40	10.10	0.85	1.22	1.07	1.92	1.56
3DH5	2441.0	-9.96	0.40	10.10	0.54	1.13	1.07	1.61	1.45
3DH5	2480.0	-10.47	0.40	10.10	0.03	1.01	1.07	1.10	1.29

Sample Calculation:

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

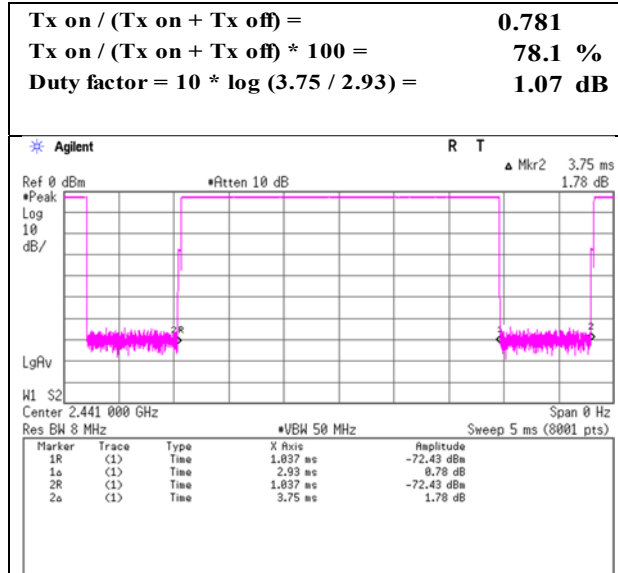
Result (Burst power average) = Time average + Duty factor

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

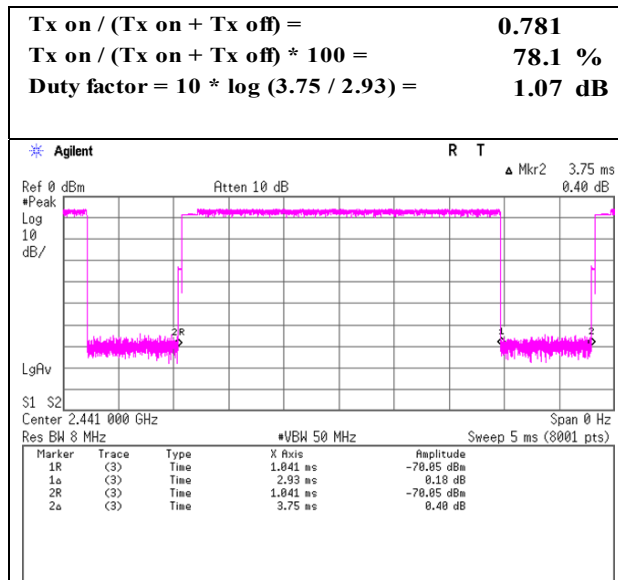
Burst Rate Confirmation

Report No. 12475916H
Test place Ise EMC Lab. No.6 Measurement Room
Date March 14, 2019
Temperature / Humidity 24 deg. C / 50 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off

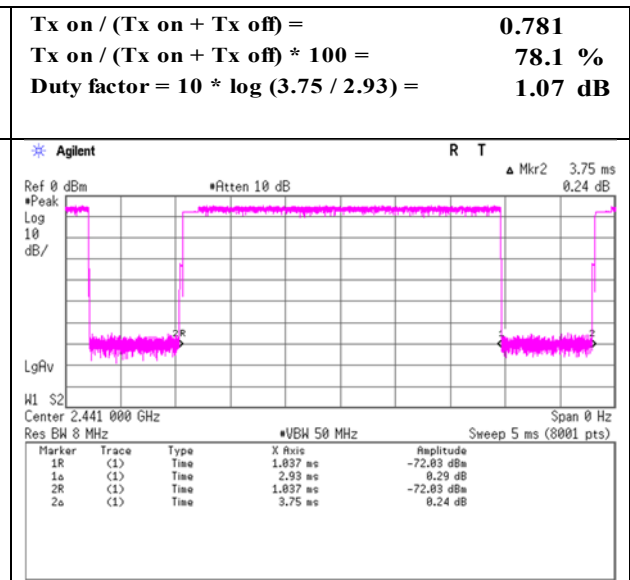
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 14, 2019 March 15, 2019
Temperature / Humidity 22 deg. C / 34 % RH 21 deg. C / 35 % RH
Engineer Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.283	QP	25.0	16.0	7.3	32.2	-	16.1	40.0	23.9	
Hori.	148.362	QP	34.2	15.0	8.8	32.1	-	25.8	43.5	17.7	
Hori.	296.036	QP	42.9	13.6	10.1	31.9	-	34.6	46.0	11.4	
Hori.	296.800	QP	43.0	13.6	10.1	31.9	-	34.7	46.0	11.3	
Hori.	370.884	QP	48.7	15.1	10.6	31.9	-	42.5	46.0	3.5	
Hori.	445.000	QP	39.5	16.7	11.1	32.0	-	35.4	46.0	10.6	
Hori.	2390.000	PK	41.8	27.8	5.5	32.8	-	42.4	73.9	31.5	
Hori.	4804.000	PK	40.5	31.7	7.7	31.8	-	48.0	73.9	25.9	Floor noise
Hori.	7206.000	PK	42.0	35.7	8.9	32.7	-	53.9	73.9	20.0	Floor noise
Hori.	9608.000	PK	42.6	38.6	9.4	33.3	-	57.4	73.9	16.6	Floor noise
Hori.	2390.000	AV	33.5	27.8	5.5	32.8	1.1	35.2	53.9	18.7	*1)
Hori.	4804.000	AV	34.0	31.7	7.7	31.8	-	41.5	53.9	12.4	Floor noise
Hori.	7206.000	AV	34.5	35.7	8.9	32.7	-	46.4	53.9	7.5	Floor noise
Hori.	9608.000	AV	32.9	38.6	9.4	33.3	-	47.7	53.9	6.3	Floor noise
Vert.	37.382	QP	40.1	15.9	7.3	32.2	-	31.1	40.0	8.9	
Vert.	148.362	QP	38.3	15.0	8.8	32.1	-	29.9	43.5	13.6	
Vert.	296.036	QP	36.7	13.6	10.1	31.9	-	28.4	46.0	17.6	
Vert.	296.800	QP	38.3	13.6	10.1	31.9	-	30.0	46.0	16.0	
Vert.	370.884	QP	35.8	15.1	10.6	31.9	-	29.6	46.0	16.4	
Vert.	445.000	QP	34.5	16.7	11.1	32.0	-	30.4	46.0	15.6	
Vert.	2390.000	PK	42.4	27.8	5.5	32.8	-	43.0	73.9	30.9	
Vert.	4804.000	PK	42.4	31.7	7.7	31.8	-	49.9	73.9	24.0	Floor noise
Vert.	7206.000	PK	42.0	35.7	8.9	32.7	-	53.9	73.9	20.0	Floor noise
Vert.	9608.000	PK	42.8	38.6	9.4	33.3	-	57.6	73.9	16.4	Floor noise
Vert.	2390.000	AV	33.6	27.8	5.5	32.8	1.1	35.3	53.9	18.6	*1)
Vert.	4804.000	AV	33.6	31.7	7.7	31.8	-	41.1	53.9	12.8	Floor noise
Vert.	7206.000	AV	34.3	35.7	8.9	32.7	-	46.2	53.9	7.7	Floor noise
Vert.	9608.000	AV	32.8	38.6	9.4	33.3	-	47.6	53.9	6.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	89.7	27.8	5.6	32.7	90.3	-	-	Carrier
Hori.	2400.000	PK	34.6	27.8	5.6	32.7	35.2	70.3	35.1	
Vert.	2402.000	PK	89.7	27.8	5.6	32.7	90.3	-	-	Carrier
Vert.	2400.000	PK	34.6	27.8	5.6	32.7	35.2	70.3	35.1	

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

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Ise EMC Lab.

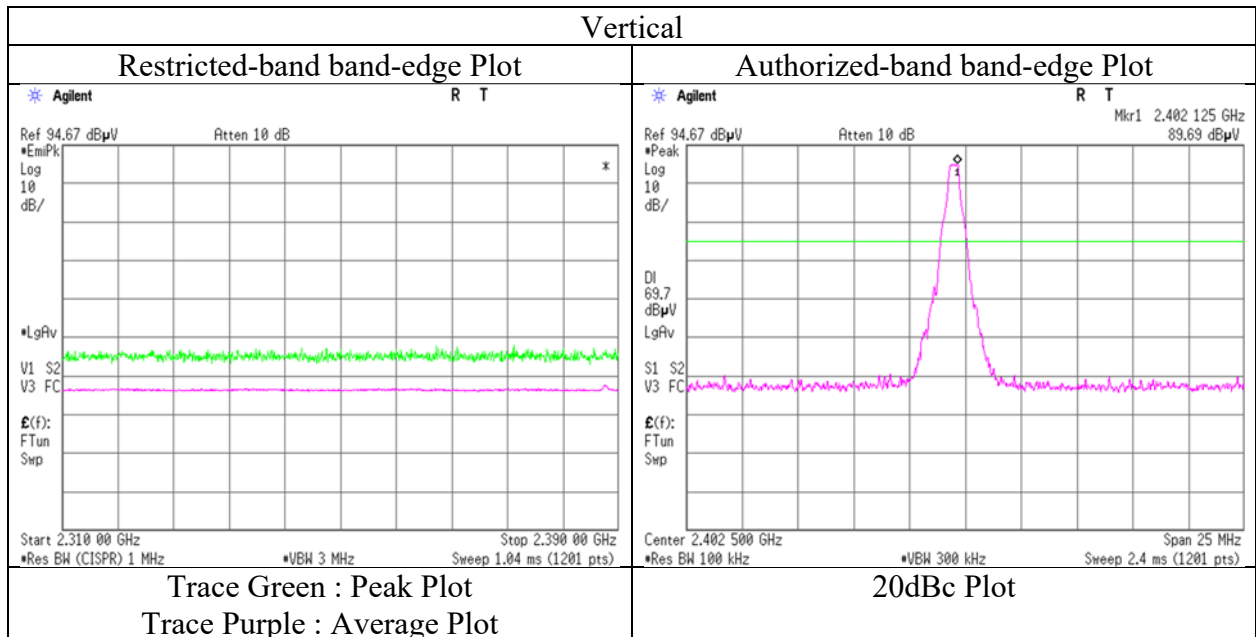
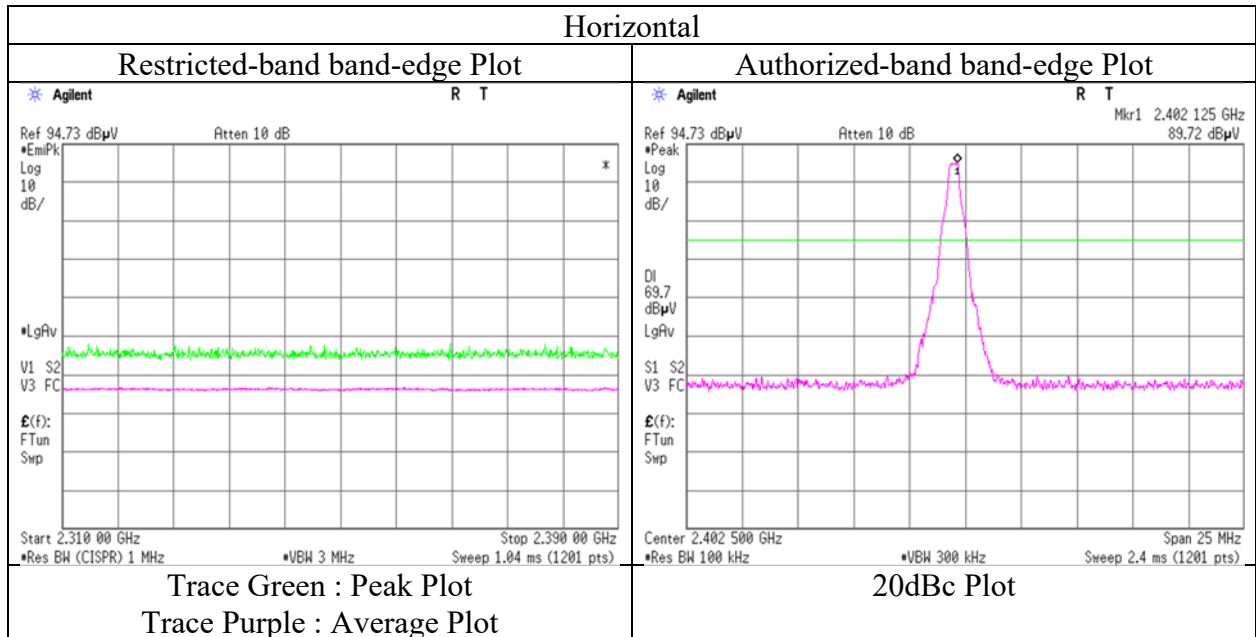
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 14, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx, Hopping Off, DH5 2402 MHz



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

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 14, 2019 March 15, 2019
Temperature / Humidity 22 deg. C / 34 % RH 21 deg. C / 35 % RH
Engineer Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.284	QP	24.8	16.0	7.3	32.2	-	15.9	40.0	24.1	
Hori.	148.362	QP	34.1	15.0	8.8	32.1	-	25.7	43.5	17.8	
Hori.	296.034	QP	42.8	13.6	10.1	31.9	-	34.5	46.0	11.5	
Hori.	296.800	QP	43.0	13.6	10.1	31.9	-	34.7	46.0	11.3	
Hori.	370.880	QP	48.6	15.1	10.6	31.9	-	42.4	46.0	3.6	
Hori.	445.000	QP	39.5	16.7	11.1	32.0	-	35.4	46.0	10.6	
Hori.	4882.000	PK	40.0	31.7	7.7	31.8	-	47.6	73.9	26.3	Floor noise
Hori.	7323.000	PK	41.2	36.3	8.9	32.7	-	53.7	73.9	20.2	Floor noise
Hori.	9764.000	PK	42.7	39.1	9.4	33.4	-	57.8	73.9	16.1	Floor noise
Hori.	4882.000	AV	32.5	31.7	7.7	31.8	-	40.1	53.9	13.8	Floor noise
Hori.	7323.000	AV	35.5	36.3	8.9	32.7	-	48.0	53.9	5.9	Floor noise
Hori.	9764.000	AV	32.7	39.1	9.4	33.4	-	47.8	53.9	6.1	Floor noise
Vert.	37.280	QP	40.0	16.0	7.3	32.2	-	31.1	40.0	8.9	
Vert.	148.363	QP	38.2	15.0	8.8	32.1	-	29.8	43.5	13.7	
Vert.	296.034	QP	36.6	13.6	10.1	31.9	-	28.3	46.0	17.7	
Vert.	296.800	QP	38.2	13.6	10.1	31.9	-	29.9	46.0	16.1	
Vert.	370.880	QP	35.8	15.1	10.6	31.9	-	29.6	46.0	16.4	
Vert.	445.000	QP	34.5	16.7	11.1	32.0	-	30.4	46.0	15.6	
Vert.	4882.000	PK	42.0	31.7	7.7	31.8	-	49.6	73.9	24.3	Floor noise
Vert.	7323.000	PK	41.2	36.3	8.9	32.7	-	53.7	73.9	20.2	Floor noise
Vert.	9764.000	PK	42.0	39.1	9.4	33.4	-	57.1	73.9	16.8	Floor noise
Vert.	4882.000	AV	34.5	31.7	7.7	31.8	-	42.1	53.9	11.8	Floor noise
Vert.	7323.000	AV	34.1	36.3	8.9	32.7	-	46.6	53.9	7.3	Floor noise
Vert.	9764.000	AV	32.8	39.1	9.4	33.4	-	47.9	53.9	6.0	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 14, 2019 March 15, 2019
Temperature / Humidity 22 deg. C / 34 % RH 21 deg. C / 35 % RH
Engineer Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.284	QP	25.0	16.0	7.3	32.2	-	16.1	40.0	23.9	
Hori.	148.362	QP	34.3	15.0	8.8	32.1	-	25.9	43.5	17.6	
Hori.	296.033	QP	42.8	13.6	10.1	31.9	-	34.5	46.0	11.5	
Hori.	296.801	QP	43.1	13.6	10.1	31.9	-	34.8	46.0	11.2	
Hori.	370.890	QP	48.7	15.1	10.6	31.9	-	42.5	46.0	3.5	
Hori.	445.000	QP	39.4	16.7	11.1	32.0	-	35.3	46.0	10.7	
Hori.	2483.500	PK	41.6	27.5	5.6	32.7	-	42.0	73.9	31.9	
Hori.	4960.000	PK	40.6	31.8	7.7	31.8	-	48.3	73.9	25.6	Floor noise
Hori.	7440.000	PK	41.8	36.6	8.9	32.7	-	54.6	73.9	19.3	Floor noise
Hori.	9920.000	PK	42.6	39.1	9.4	33.4	-	57.7	73.9	16.3	Floor noise
Hori.	2483.500	AV	33.5	27.5	5.6	32.7	1.1	35.0	53.9	18.9	*1)
Hori.	4960.000	AV	34.0	31.8	7.7	31.8	-	41.7	53.9	12.2	Floor noise
Hori.	7440.000	AV	34.4	36.6	8.9	32.7	-	47.2	53.9	6.7	Floor noise
Hori.	9920.000	AV	32.7	39.1	9.4	33.4	-	47.8	53.9	6.2	Floor noise
Vert.	37.280	QP	39.9	16.0	7.3	32.2	-	31.0	40.0	9.0	
Vert.	148.363	QP	38.3	15.0	8.8	32.1	-	29.9	43.5	13.6	
Vert.	296.034	QP	36.5	13.6	10.1	31.9	-	28.2	46.0	17.8	
Vert.	296.800	QP	38.2	13.6	10.1	31.9	-	29.9	46.0	16.1	
Vert.	370.890	QP	35.7	15.1	10.6	31.9	-	29.5	46.0	16.5	
Vert.	445.000	QP	34.6	16.7	11.1	32.0	-	30.5	46.0	15.5	
Vert.	2483.500	PK	41.7	27.5	5.6	32.7	-	42.1	73.9	31.8	
Vert.	4960.000	PK	41.3	31.8	7.7	31.8	-	49.0	73.9	24.9	Floor noise
Vert.	7440.000	PK	42.5	36.6	8.9	32.7	-	55.3	73.9	18.6	Floor noise
Vert.	9920.000	PK	31.9	39.1	9.4	33.4	-	47.0	73.9	27.0	Floor noise
Vert.	2483.500	AV	33.9	27.5	5.6	32.7	1.1	35.4	53.9	18.5	*1)
Vert.	4960.000	AV	33.2	31.8	7.7	31.8	-	40.9	53.9	13.0	Floor noise
Vert.	7440.000	AV	33.8	36.6	8.9	32.7	-	46.6	53.9	7.3	Floor noise
Vert.	9920.000	AV	32.8	39.1	9.4	33.4	-	47.9	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

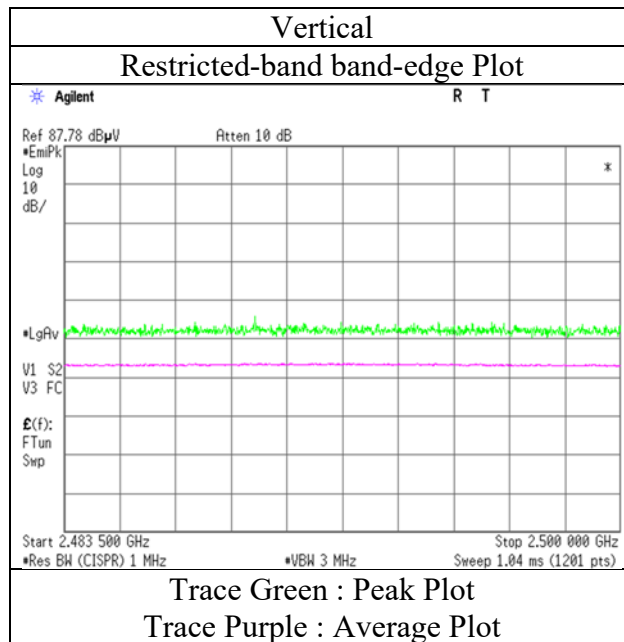
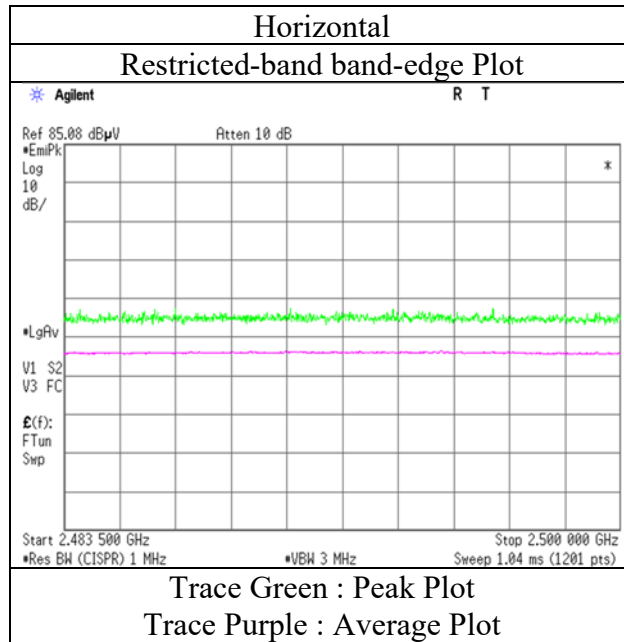
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

*1) Not Out of Band emission(Leakage Power)

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 14, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 14, 2019 March 15, 2019
Temperature / Humidity 22 deg. C / 34 % RH 21 deg. C / 35 % RH
Engineer Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.300	QP	25.6	16.0	7.3	32.2	-	16.7	40.0	23.4	
Hori.	148.376	QP	34.1	15.0	8.8	32.1	-	25.8	43.5	17.8	
Hori.	296.000	QP	40.6	13.6	10.1	31.9	-	32.3	46.0	13.7	
Hori.	296.720	QP	45.6	13.6	10.1	31.9	-	37.3	46.0	8.7	
Hori.	370.882	QP	48.8	15.1	10.6	31.9	-	42.6	46.0	3.4	
Hori.	445.000	QP	40.2	16.7	11.1	32.0	-	36.1	46.0	9.9	
Hori.	2390.000	PK	42.8	27.8	5.5	32.8	-	43.4	73.9	30.5	
Hori.	4804.000	PK	40.8	31.7	7.7	31.8	-	48.3	73.9	25.6	Floor noise
Hori.	7206.000	PK	42.7	35.7	8.9	32.7	-	54.6	73.9	19.3	Floor noise
Hori.	9608.000	PK	42.1	38.6	9.4	33.3	-	56.9	73.9	17.1	Floor noise
Hori.	2390.000	AV	34.1	27.8	5.5	32.8	1.1	35.8	53.9	18.1	*1)
Hori.	4804.000	AV	33.0	31.7	7.7	31.8	-	40.5	53.9	13.4	Floor noise
Hori.	7206.000	AV	34.6	35.7	8.9	32.7	-	46.5	53.9	7.4	Floor noise
Hori.	9608.000	AV	32.8	38.6	9.4	33.3	-	47.6	53.9	6.4	Floor noise
Vert.	36.114	QP	41.0	16.4	7.3	32.2	-	32.5	40.0	7.5	
Vert.	148.376	QP	38.7	15.0	8.8	32.1	-	30.4	43.5	13.2	
Vert.	296.000	QP	35.9	13.6	10.1	31.9	-	27.6	46.0	18.4	
Vert.	296.720	QP	41.4	13.6	10.1	31.9	-	33.1	46.0	12.9	
Vert.	370.882	QP	36.0	15.1	10.6	31.9	-	29.8	46.0	16.2	
Vert.	445.000	QP	32.6	16.7	11.1	32.0	-	28.5	46.0	17.5	
Vert.	2390.000	PK	42.7	27.8	5.5	32.8	-	43.3	73.9	30.6	
Vert.	4804.000	PK	41.0	31.7	7.7	31.8	-	48.5	73.9	25.4	Floor noise
Vert.	7206.000	PK	42.0	35.7	8.9	32.7	-	53.9	73.9	20.0	Floor noise
Vert.	9608.000	PK	42.8	38.6	9.4	33.3	-	57.6	73.9	16.4	Floor noise
Vert.	2390.000	AV	33.7	27.8	5.5	32.8	1.1	35.4	53.9	18.5	*1)
Vert.	4804.000	AV	33.2	31.7	7.7	31.8	-	40.7	53.9	13.2	Floor noise
Vert.	7206.000	AV	34.8	35.7	8.9	32.7	-	46.7	53.9	7.2	Floor noise
Vert.	9608.000	AV	32.9	38.6	9.4	33.3	-	47.7	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	82.6	27.8	5.6	32.7	83.2	-	-	Carrier
Hori.	2400.000	PK	34.3	27.8	5.6	32.7	34.9	63.2	28.3	
Vert.	2402.000	PK	83.1	27.8	5.6	32.7	83.7	-	-	Carrier
Vert.	2400.000	PK	32.8	27.8	5.6	32.7	33.4	63.7	30.3	

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

UL Japan, Inc.

Ise EMC Lab.

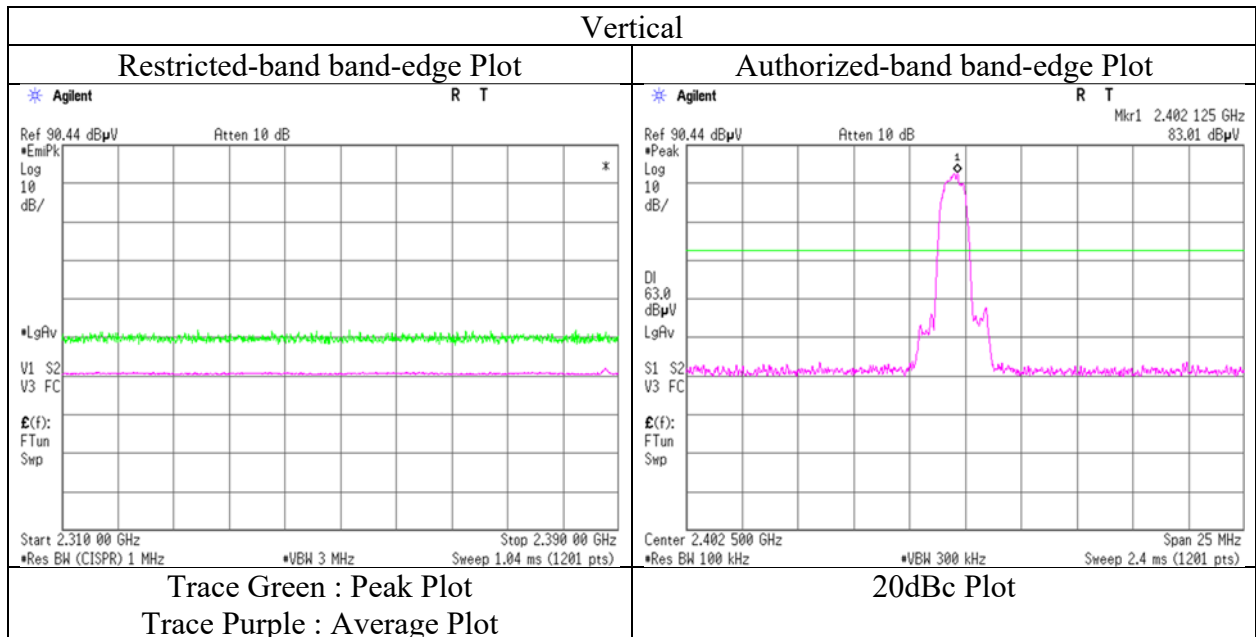
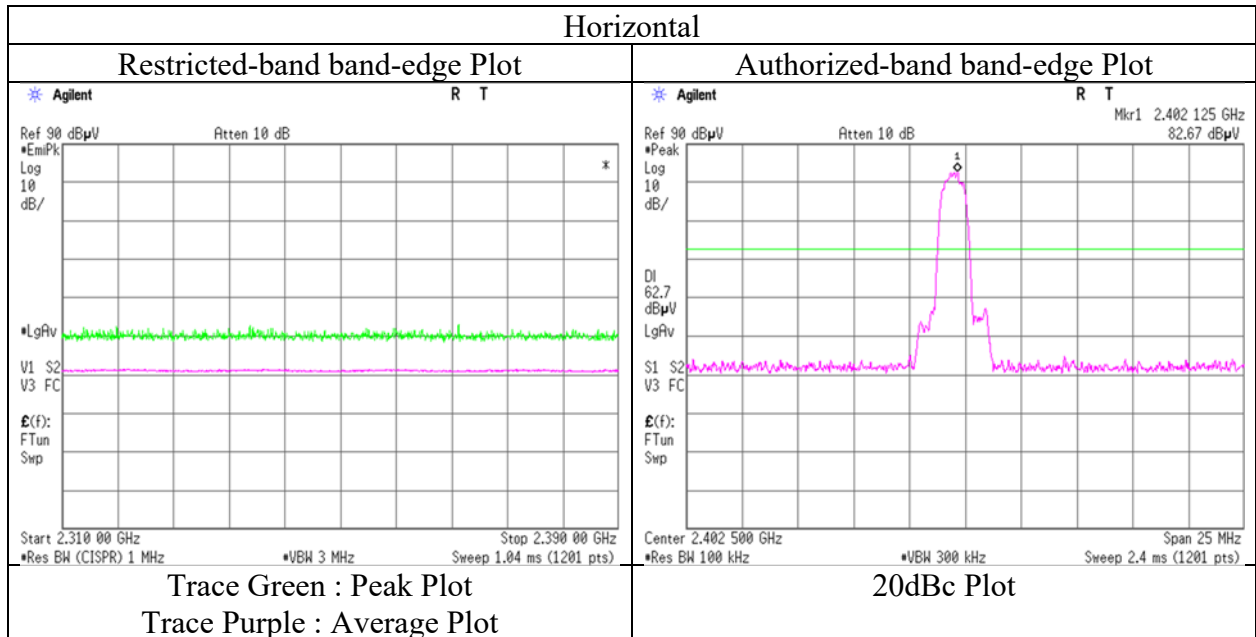
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 14, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

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Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
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Date March 14, 2019 March 15, 2019
Temperature / Humidity 22 deg. C / 34 % RH 21 deg. C / 35 % RH
Engineer Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.280	QP	25.5	16.0	7.3	32.2	-	16.6	40.0	23.4	
Hori.	148.547	QP	34.0	15.0	8.8	32.1	-	25.7	43.5	17.8	
Hori.	296.000	QP	40.5	13.6	10.1	31.9	-	32.2	46.0	13.8	
Hori.	296.032	QP	42.8	13.6	10.1	31.9	-	34.5	46.0	11.5	
Hori.	370.900	QP	48.6	15.1	10.6	31.9	-	42.4	46.0	3.6	
Hori.	445.010	QP	39.3	16.7	11.1	32.0	-	35.2	46.0	10.8	
Hori.	4882.000	PK	40.8	31.7	7.7	31.8	-	48.4	73.9	25.5	Floor noise
Hori.	7323.000	PK	41.8	36.3	8.9	32.7	-	54.3	73.9	19.6	Floor noise
Hori.	9764.000	PK	42.0	39.1	9.4	33.4	-	57.1	73.9	16.8	Floor noise
Hori.	4882.000	AV	32.3	31.7	7.7	31.8	-	39.9	53.9	14.0	Floor noise
Hori.	7323.000	AV	34.5	36.3	8.9	32.7	-	47.0	53.9	6.9	Floor noise
Hori.	9764.000	AV	32.7	39.1	9.4	33.4	-	47.8	53.9	6.1	Floor noise
Vert.	37.280	QP	40.5	16.0	7.3	32.2	-	31.6	40.0	8.4	
Vert.	148.547	QP	38.5	15.0	8.8	32.1	-	30.2	43.5	13.3	
Vert.	296.000	QP	35.8	13.6	10.1	31.9	-	27.5	46.0	18.5	
Vert.	296.034	QP	36.9	13.6	10.1	31.9	-	28.6	46.0	17.4	
Vert.	370.900	QP	36.0	15.1	10.6	31.9	-	29.8	46.0	16.2	
Vert.	445.010	QP	34.5	16.7	11.1	32.0	-	30.4	46.0	15.6	
Vert.	4882.000	PK	40.2	31.7	7.7	31.8	-	47.8	73.9	26.1	Floor noise
Vert.	7323.000	PK	41.8	36.3	8.9	32.7	-	54.3	73.9	19.6	Floor noise
Vert.	9764.000	PK	42.6	39.1	9.4	33.4	-	57.7	73.9	16.2	Floor noise
Vert.	4882.000	AV	32.3	31.7	7.7	31.8	-	39.9	53.9	14.0	Floor noise
Vert.	7323.000	AV	33.4	36.3	8.9	32.7	-	45.9	53.9	8.0	Floor noise
Vert.	9764.000	AV	32.6	39.1	9.4	33.4	-	47.7	53.9	6.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

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Radiated Spurious Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 14, 2019 March 15, 2019
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Engineer Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.285	QP	25.3	16.0	7.3	32.2	-	16.4	40.0	23.6	
Hori.	148.363	QP	34.2	15.0	8.8	32.1	-	25.8	43.5	17.7	
Hori.	296.033	QP	42.8	13.6	10.1	31.9	-	34.5	46.0	11.5	
Hori.	296.720	QP	45.8	13.6	10.1	31.9	-	37.5	46.0	8.5	
Hori.	370.890	QP	48.6	15.1	10.6	31.9	-	42.4	46.0	3.6	
Hori.	445.000	QP	39.3	16.7	11.1	32.0	-	35.2	46.0	10.8	
Hori.	2483.500	PK	41.7	27.5	5.6	32.7	-	42.1	73.9	31.8	
Hori.	4960.000	PK	41.0	31.8	7.7	31.8	-	48.7	73.9	25.2	Floor noise
Hori.	7440.000	PK	41.9	36.6	8.9	32.7	-	54.7	73.9	19.2	Floor noise
Hori.	9920.000	PK	42.6	39.1	9.4	33.4	-	57.7	73.9	16.3	Floor noise
Hori.	2483.500	AV	33.1	27.5	5.6	32.7	1.1	34.6	53.9	19.3	*1)
Hori.	4960.000	AV	32.4	31.8	7.7	31.8	-	40.1	53.9	13.8	Floor noise
Hori.	7440.000	AV	34.0	36.6	8.9	32.7	-	46.8	53.9	7.1	Floor noise
Hori.	9920.000	AV	32.8	39.1	9.4	33.4	-	47.9	53.9	6.1	Floor noise
Vert.	37.280	QP	40.0	16.0	7.3	32.2	-	31.1	40.0	8.9	
Vert.	148.364	QP	38.4	15.0	8.8	32.1	-	30.0	43.5	13.5	
Vert.	296.034	QP	36.6	13.6	10.1	31.9	-	28.3	46.0	17.7	
Vert.	296.720	QP	41.5	13.6	10.1	31.9	-	33.2	46.0	12.8	
Vert.	370.890	QP	35.8	15.1	10.6	31.9	-	29.6	46.0	16.4	
Vert.	445.000	QP	34.7	16.7	11.1	32.0	-	30.6	46.0	15.4	
Vert.	2483.500	PK	41.8	27.5	5.6	32.7	-	42.2	73.9	31.7	
Vert.	4960.000	PK	40.8	31.8	7.7	31.8	-	48.5	73.9	25.4	Floor noise
Vert.	7440.000	PK	41.3	36.6	8.9	32.7	-	54.1	73.9	19.8	Floor noise
Vert.	9920.000	PK	42.7	39.1	9.4	33.4	-	57.8	73.9	16.2	Floor noise
Vert.	2483.500	AV	33.5	27.5	5.6	32.7	1.1	35.0	53.9	18.9	*1)
Vert.	4960.000	AV	32.5	31.8	7.7	31.8	-	40.2	53.9	13.7	Floor noise
Vert.	7440.000	AV	34.1	36.6	8.9	32.7	-	46.9	53.9	7.0	Floor noise
Vert.	9920.000	AV	32.7	39.1	9.4	33.4	-	47.8	53.9	6.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

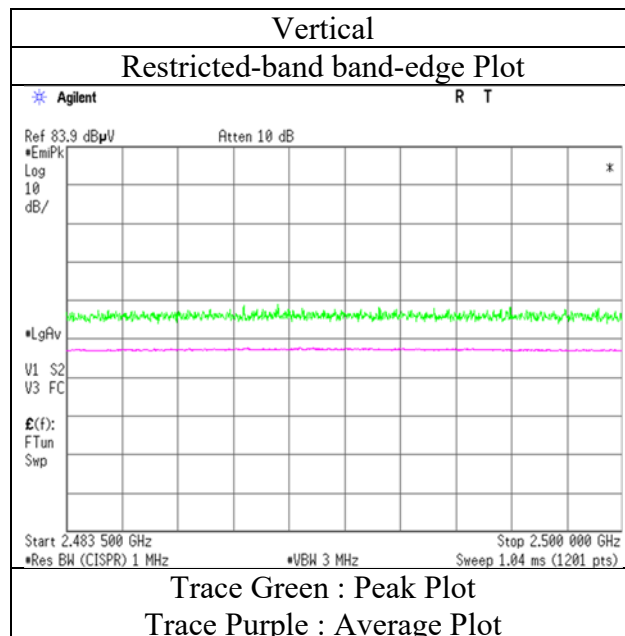
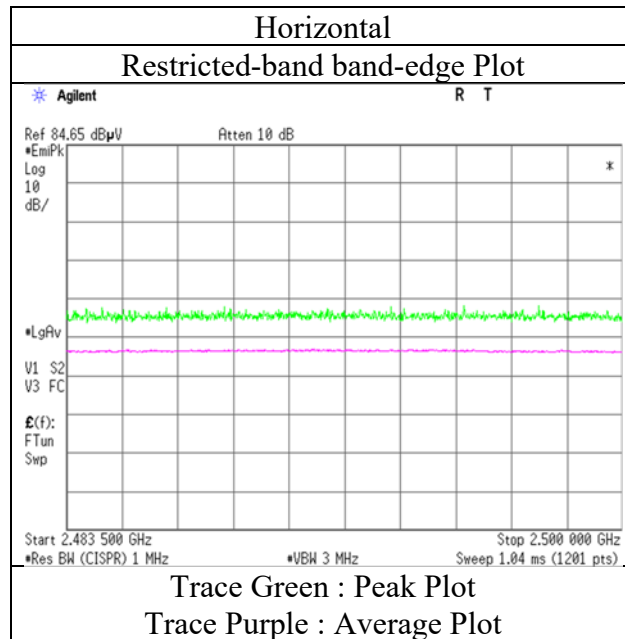
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

*1) Not Out of Band emission(Leakage Power)

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 14, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

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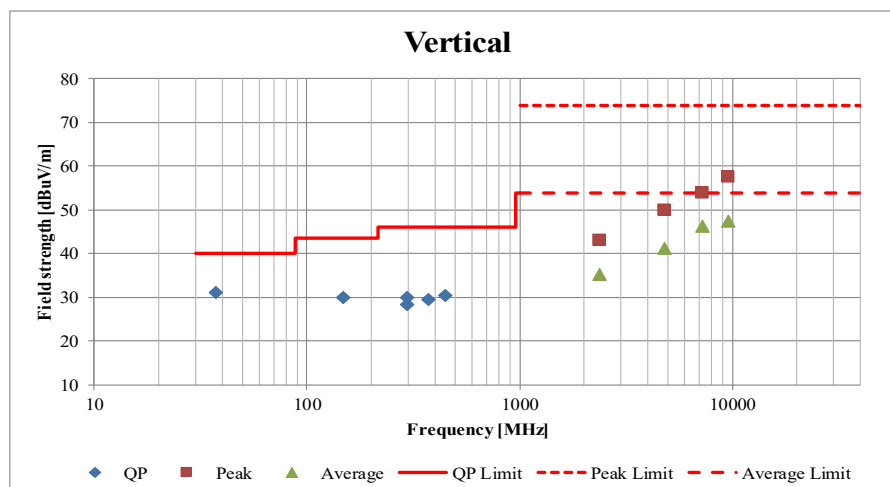
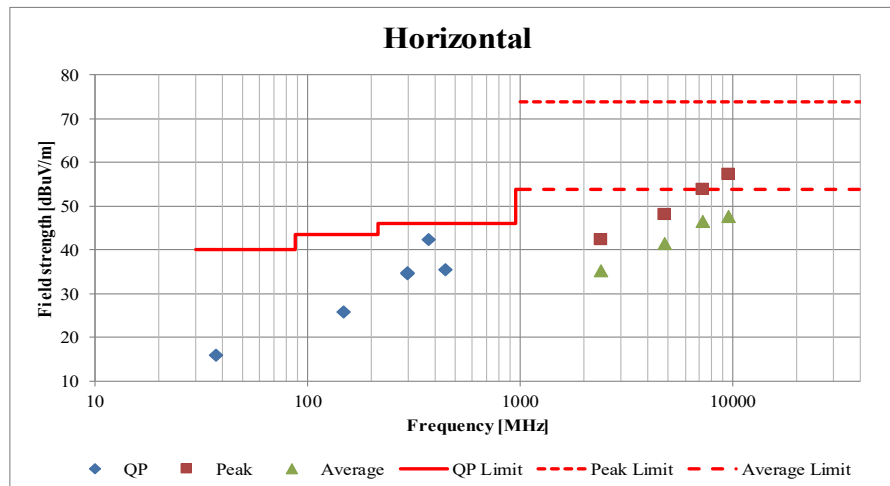
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Facsimile : +81 596 24 8124

Radiated Spurious Emission **(Plot data, Worst case)**

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	
Date	March 14, 2019	March 15, 2019
Temperature / Humidity	22 deg. C / 34 % RH	21 deg. C / 35 % RH
Engineer	Hiroyuki Furutaka	Hiroyuki Furutaka
	(1 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz	

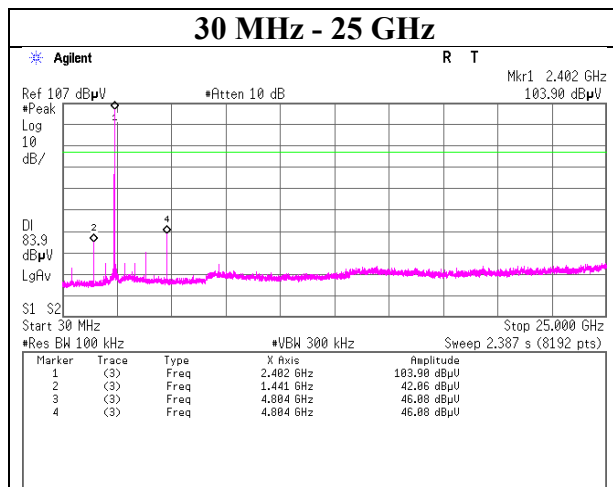
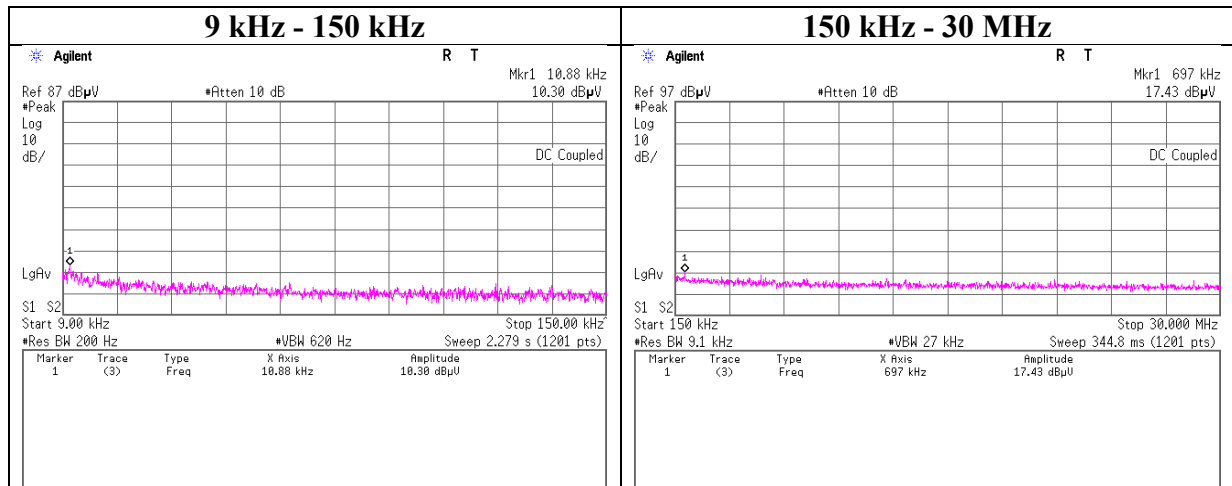


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2402 MHz



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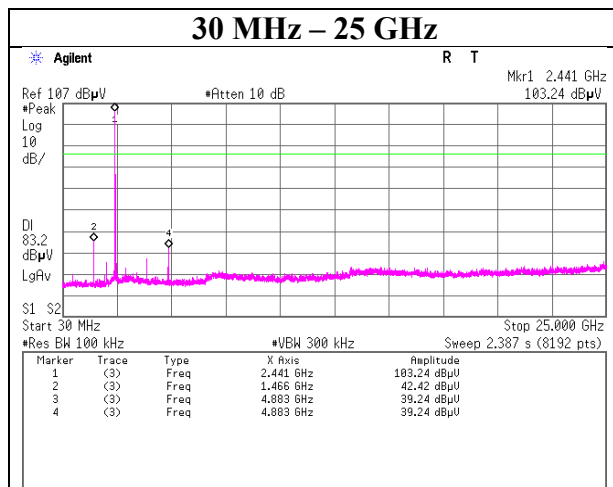
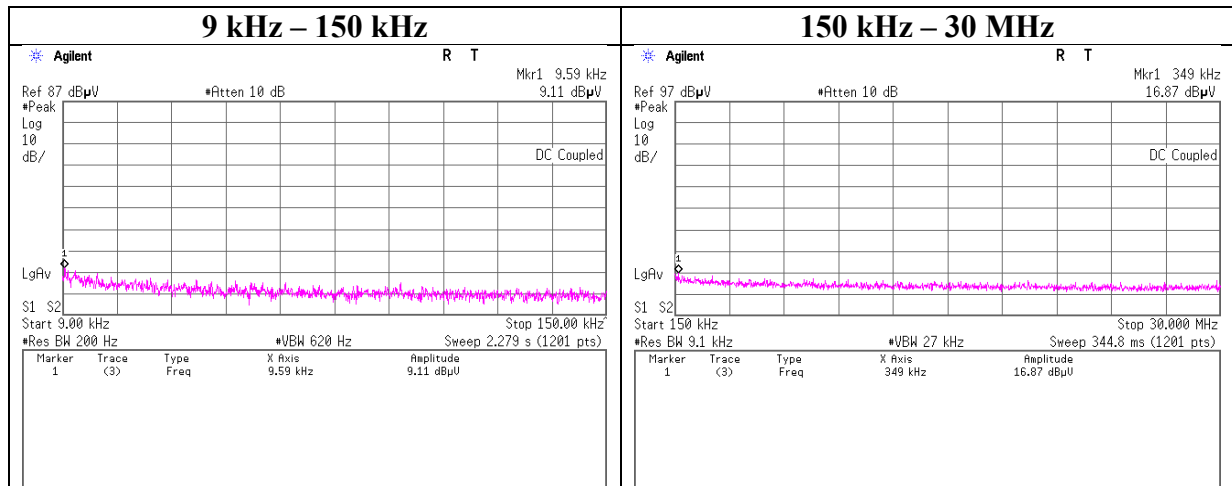
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2441 MHz



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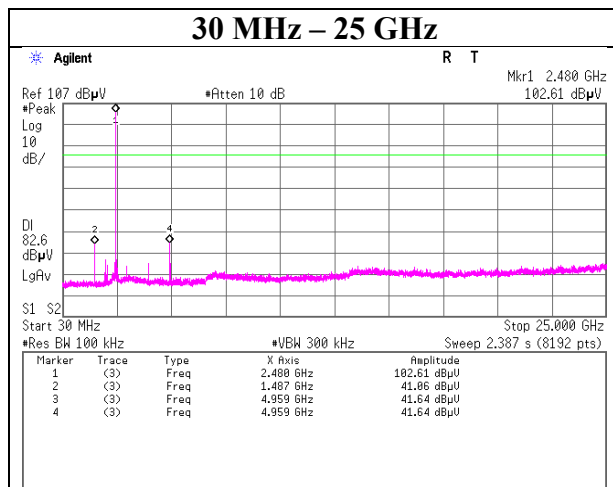
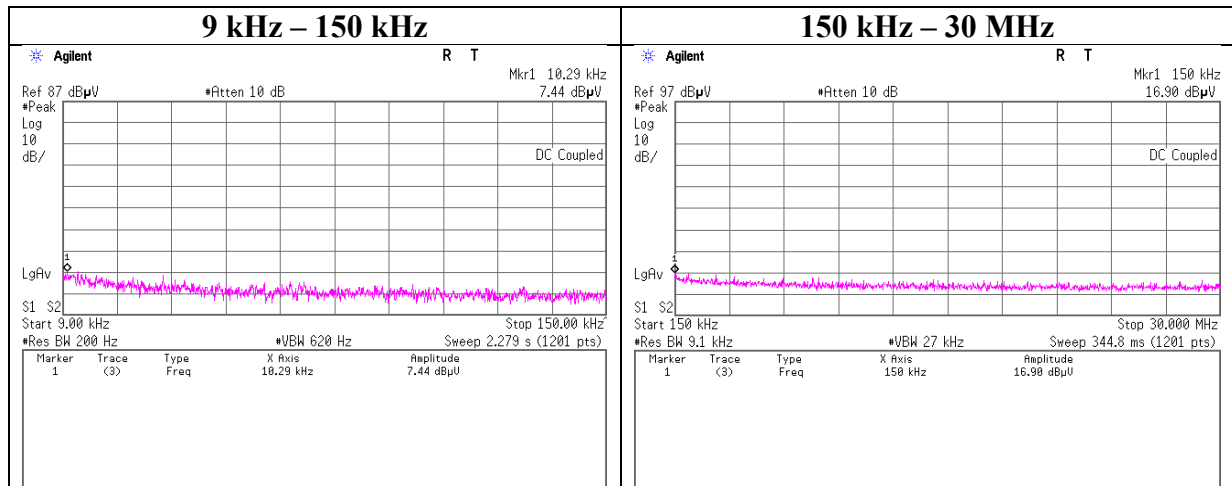
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2480 MHz



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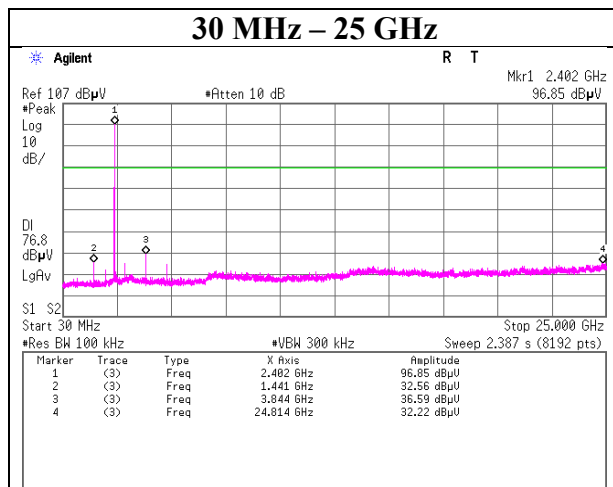
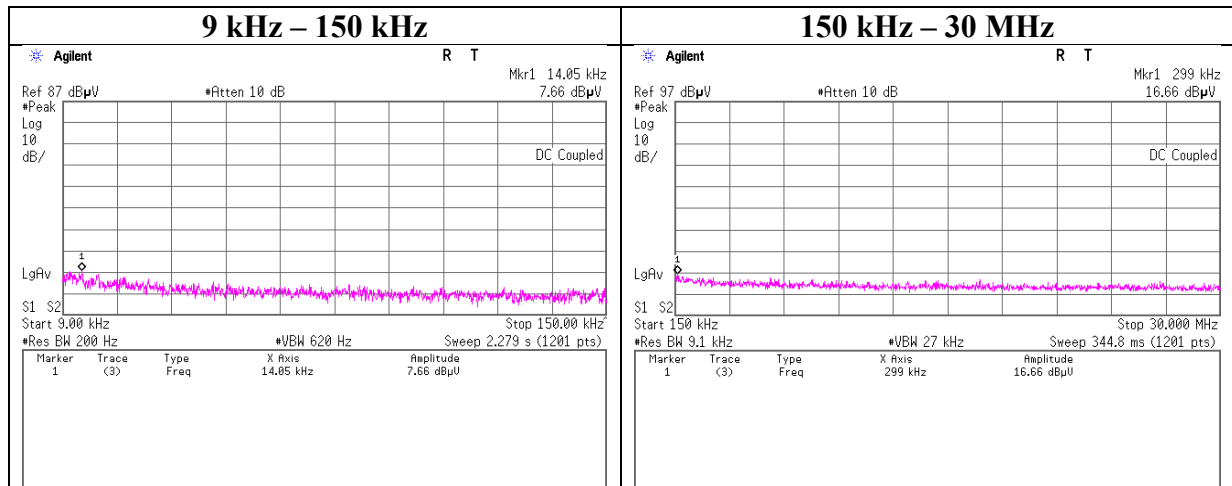
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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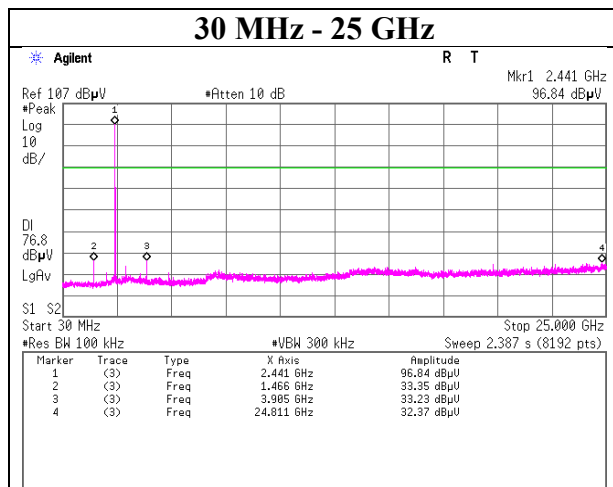
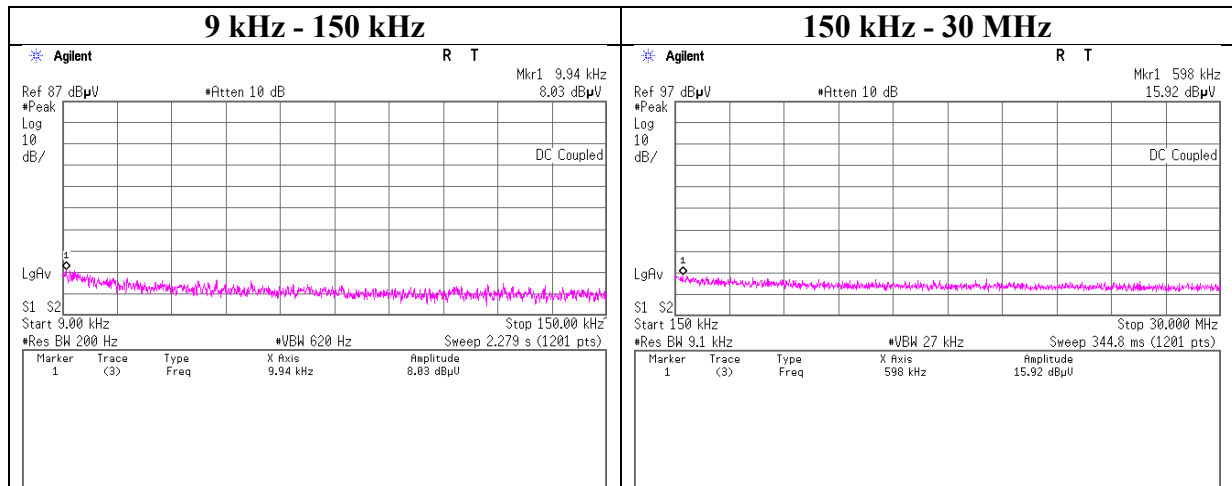
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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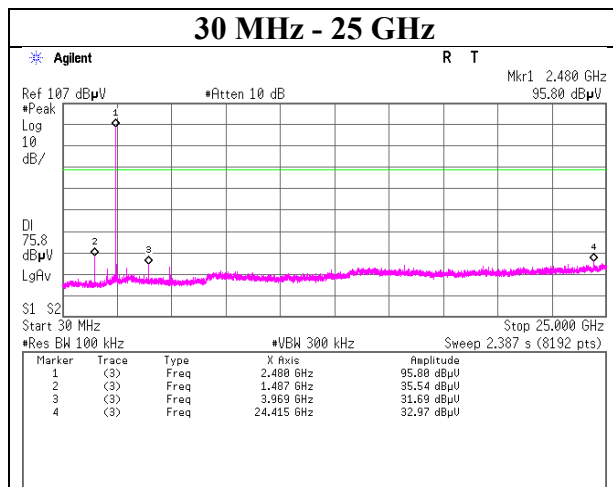
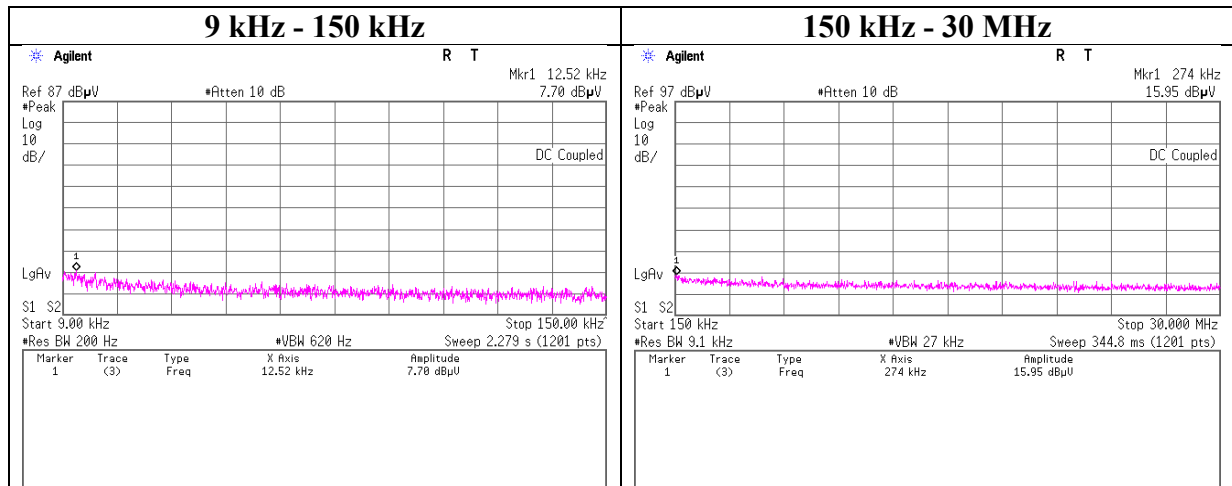
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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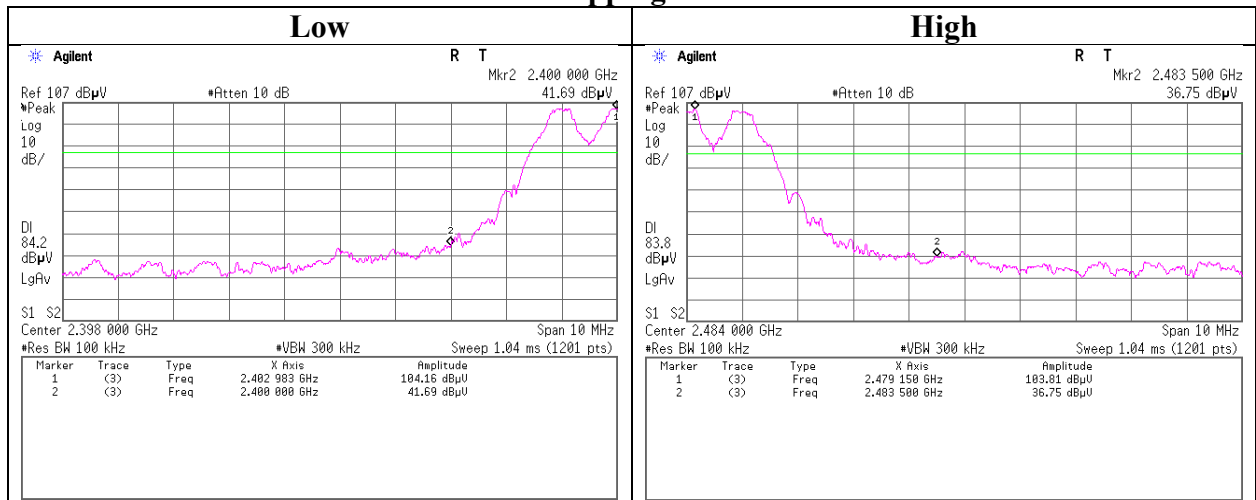
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

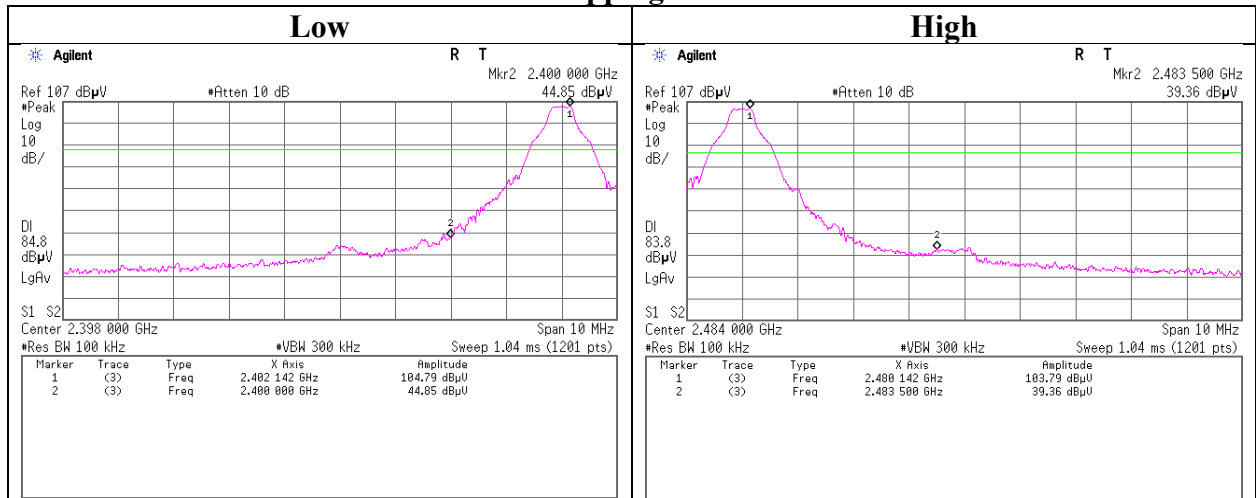
Conducted Emission Band Edge compliance

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx DH5

Hopping On



Hopping Off



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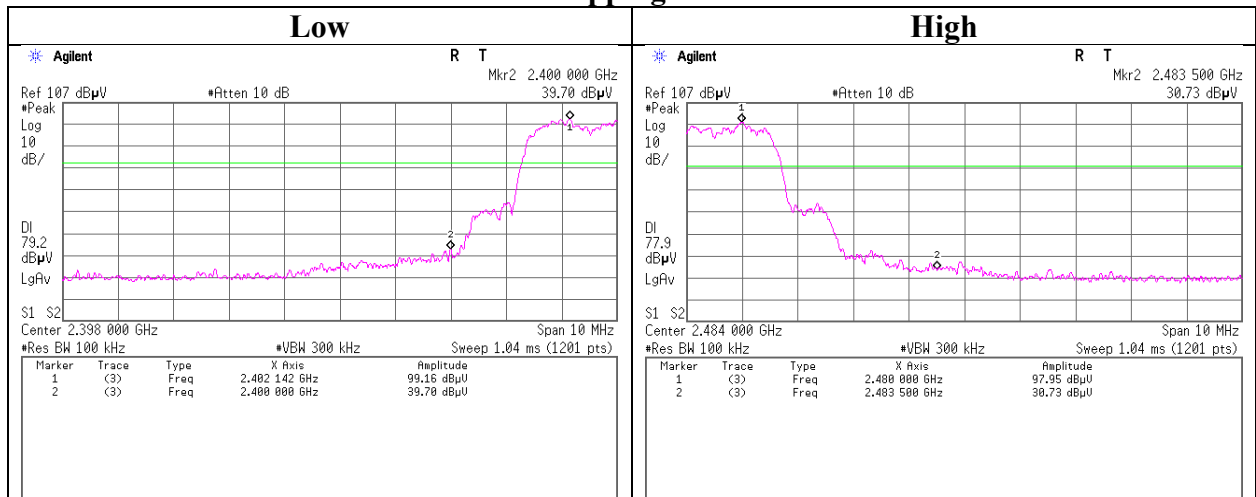
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

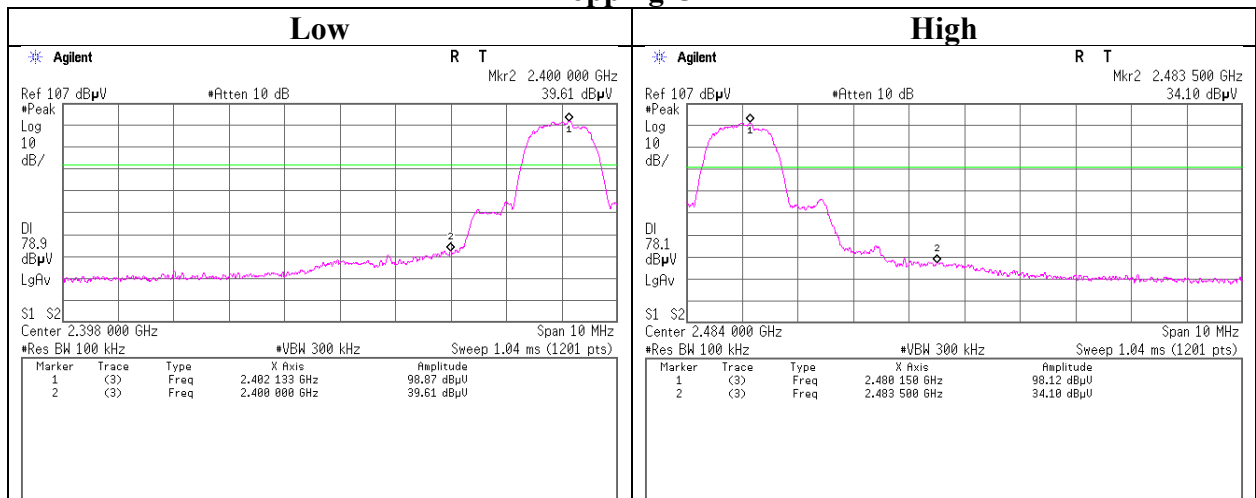
Conducted Emission Band Edge compliance

Report No. 12475916H
Test place Ise EMC Lab. No.6 Measurement Room
Date March 14, 2019
Temperature / Humidity 24 deg. C / 50 % RH
Engineer Takafumi Noguchi
Mode Tx 3DH5

Hopping On



Hopping Off



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APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	142182	Measure	KOMELON	KMC-36	-	-	-	-
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	06/29/2018	06/30/2020	24
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/05/2018	12/30/2019	12
RE/AT	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/07/2018	11/30/2019	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/21/2018	08/31/2019	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	08/08/2018	08/31/2019	12
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	01/21/2019	01/31/2020	12
RE	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/19/2018	09/30/2019	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	06/06/2018	06/30/2019	12
RE/AT	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	08/10/2018	08/31/2019	12
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
RE/AT	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/29/2019	01/31/2020	12
RE/AT	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE/AT	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/15/2018	11/30/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	06/30/2020	24
RE/CE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/11/2019	01/31/2020	12
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/06/2018	08/31/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	06/04/2018	06/30/2019	12
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	141323	Coaxial cable	UL Japan	-	-	07/03/2018	07/31/2019	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/20/2018	12/31/2019	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/08/2019	02/29/2020	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/29/2019	01/31/2020	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	06/04/2018	06/30/2019	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	06/07/2018	06/30/2019	12
RE	141513	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	06/07/2018	06/30/2019	12
RE	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/19/2018	09/30/2019	12
RE	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	03/05/2019	03/31/2020	12
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	07/25/2018	07/31/2019	12
RE	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	03/05/2019	03/31/2020	12
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/06/2018	04/30/2019	12
CE	141927	Terminator	TME	CT-01	-	10/26/2018	10/31/2019	12
CE	141247	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/06/2018	12/31/2019	12
CE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ sucoform141-PE/ 421-010	-/00640	07/03/2018	07/31/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/24/2018	07/31/2019	12
AT	141835	Power sensor	AGILENT	N1923A	MY54070004	08/21/2018	08/31/2019	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	08/21/2018	08/31/2019	12
AT	141269	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	03/26/2019	03/31/2020	12

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*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int 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